Biomark HPR Plus Reader User Manual

Manual Version 3

Biomark®
SPECIALISTS IN IDENTIFICATION SOLUTIONS

Regularity Notices and Conformity

USA – FCC

Information to the user (FCC Part 15.105

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encourage trying to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Modification warning (FCC Part 15.21)

Warning: Any changes or modifications not expressively approved by Aleis could void the user's authority to operate this equipment.

The following antennas are approved to be used with this device:

Biomark Handheld 7" Loop Antenna, Model number HPR-ANT

Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Table of Contents

1 Reader Overview

1.1 Product Description

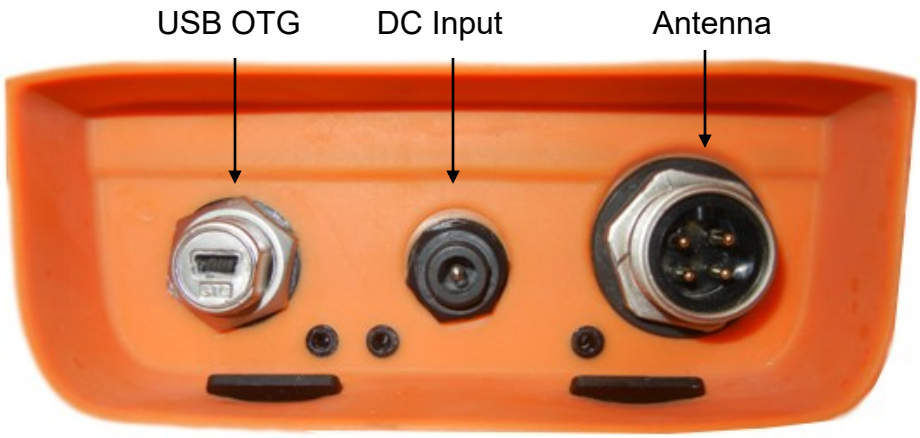
The HPR Plus (Reader) is a handheld 134.2 kHz radio frequency identification (RFID) tag reader intended for use with animal tags. The HPR Plus reader has been designed specifically for use in fish and wildlife research applications. Consequently, it is the most capable and versatile reader available today for this purpose. The HPR Plus reader is well suited to handheld field and bench top use, but also contains additional features to facilitate standalone remote monitoring applications.

The Reader features:

- Rugged drop resistant and IP67 waterproof housing
- Memory for storage of over 1 million tag reads
- High-performance ISO 11784/11785 HDX/FDX-B 134.2 kHz RFID reader with continuous automatic antenna tuning
- Internal high-capacity lithium battery pack
- 4.3” High resolution color TFT LCD display
- 454MHz ARM9 core CPU
- Class 2 Bluetooth interface
- GPS synchronized clock
- "Geotagging" of RFID tag reads
- USB 2.0 On-The-Go (OTG) interface for PC or memory stick connection
- Dual purpose hand strap and belt loop
- Sophisticated data logging and diagnostic features
- Detachable antenna
- Wide range DC power input for use in remote monitoring applications and easier field recharging
- Simple upgrading of Reader software via a USB memory stick
- Remote control of the Reader via Bluetooth, USB, or USB RS232 adapter

1.2 Illustrated Diagram

Front Panel



Reader Connectors

Folding Desk Stand Attached

Loop Antenna

1.3 Supplied Equipment

1. Biomark HPR Plus Unit, (the Reader)
2. Biomark HPR Plus Loop Antenna
3. Fish-Shaped FDX-B RFID Key-chain Test Tag
4. Power Charger Kit (100-240V input, 24V 30W output)
5. 2 m Antenna Cable
6. 2 m USB Cable for PC Connection
7. 0.5 m USB Cable for Flash Drive connection
8. Desk Stand
9. Combined Adjustable Hand Strap & Belt-Loop
10. User Manual (on Biomark flash drive provided)
11. Custom soft case

Please ensure you have received all of the above equipment upon receipt of your new Reader.

Optional Accessory Equipment

1. DC Power Input Cable
2. HPR Plus to LEGACY Antenna Cable Adapter
3. HPR Plus Custom Protective Case
4. 20’ or 50’ Antenna Cable (for custom antennas)

1.4 Care and Maintenance

While the HPR Plus Reader has been designed to be as rugged and durable as possible, please observe the following points to ensure your Reader provides many years of trouble free service:

- Charge the battery before first using the Reader or before putting the Reader into storage.
- To maximize the life of the internal battery, it is recommended that the battery be completely discharged before recharging.
- The protective caps should be fitted to the connectors whenever possible to protect them from corrosion, dust, and physical damage.
- Always properly tighten the locking collets on cables connected to the Reader to prevent moisture entering the connectors and damaging the contacts.
- If the Reader has become wet, ensure the connectors and their caps are dry before removing the cables and replacing the caps. This is to avoid “locking in” the moisture and causing corrosion damage to the contacts.
- If the Reader is exposed to salt water, rinse the entire unit with fresh water and dry it before removing the cables.
- Clean and dry the reader before putting it back into its carry case.

NOTE: *Water cannot enter into the Reader through the connectors with or without the protective caps fitted, but the moisture could damage the terminals in the connectors.*

1.5 Updating Software

Updates may become available that either enhance the HPR Plus readers ability function or to fix a known error. To successfully update the reader, please observe the following steps:

- Download the latest software from the below link. It will read "HPR-X.XX", where X is the version number.

  http://www.biomark.com/technical_services/firmware___applications/

- Download and unzip the file.
- Place the file in a folder named 'HPR' and copy the folder onto a Flash Drive.
- Power the Reader up and allow it to boot to the main screen.
- Plug the 0.5 m USB Cable for Flash Drive connection into the Reader.
- Plug the Flash Drive into the cable end. The Reader will automatically detect the new software on the Flash Drive and will ask for if you would like to update.

NOTE: *If multiple versions of software are loaded on the Flash Drive, you will have to scroll to the version you wish to load using the up and down arrows.*

- Select 'Yes' and the Reader will begin to update its software. It is normal for the Reader to reboot during this process. Once the Reader has returned to the main screen the update is complete.

2 Getting Started

2.1 Switching the Reader On and Off

The unit can be powered on by any of the following methods:

1. Connecting the unit to the AC Adapter
2. Holding the OK button for more than 1 second.

NOTE: *Once the unit has been powered up, it will take up to 30 seconds to boot into the software.*

The unit can be powered off by holding the OK button for more than 1 second. A menu will pop up asking the user to confirm the shutdown.

In the event of a software crash, the unit can be forced off by holding the OK button down for ***longer than*** 10 seconds.

2.2 Charging the Reader

The Reader has an internal 28.8W/h lithium iron phosphate ($LiFePO_4$) battery. This type of lithium battery is much safer and has a longer cycle life than lithium batteries typically used in consumer electronics.

To preserve the life of the battery, the Reader should be fully charged before first used and also before the Reader is put away into storage.

To charge the Reader's internal lithium battery, follow these steps:

1. Plug the DC Jack on the charger into the center plug on the end of the Reader.
2. Connect the charger to a grounded AC power socket.

The battery charge indicator will continuously light orange while the battery is charging, and change to green once the battery is charged. The Reader will take around 4-5 hours to charge a completely depleted battery.

If the charger is connected and the charge indicator is *neither green nor orange* then the Reader is not charging. Check the connections and verify that the DC input voltage cutoff setting discussed in section 3 is configured correctly.

NOTE: *The battery cannot charge if the internal temperature of the Reader is below 0°C (32°F) or above 60°C (140°F). The unit will indicate a charging error under these conditions.*

Please be aware that when using the reader in environments below freezing temperature, the battery's ability to supply current will be reduced. This will reduce the Reader's battery run-time and possibly reduce the maximum usable RF transmit power setting. Please use the lowest practical RF power setting (refer to section 4.2.2) under these conditions to avoid excessively loading the battery.

2.3 Sleep Mode

Momentarily pressing the OK/Power button when the Reader is displaying the main screen will put the Reader into low power “Sleep” mode. In this mode, the screen is switched off, tag reading stops, and any PC connection (USB or Bluetooth) is lost. Sleep mode is useful for extending battery runtime when there is a long period between reading tags.

The Reader can be reactivated by pressing the OK or READ buttons. The Reader can also be configured to auto-sleep after a certain amount of time if it is not being used. Please refer to Section 3 for more information about configuring this setting.

2.4 Using Alternate DC Power Sources

It is possible to use alternate DC sources to charge and power the Reader provided the following points are considered:

- The charging input to the Reader operates over 11-30V DC. Connecting voltages sources above 30V DC will damage the Reader.
- Observe the polarity of the DC connection. The tip of the charger connection is positive and the ring is negative.
- The Reader requires a power source capable of providing at least 20W to operate at full transmit power and charge the internal battery.
- The Reader will draw approximately 1 amp per hour using a 12V DC source.
- Use of AC adapters (particularly ungrounded types) other than the one provided with the Reader may result in poor read range of tags due to radio interference (noise).

DC Power Input Cable is an available accessory item from Biomark.

***NOTE**: It is possible to configure the cut-off voltage for the DC input via the settings menu. This feature is useful when powering the reader from an external battery or other alternate power supply. Refer to Section 3 for more information on configuring these settings.*

2.5 Connecting the Accessories

The unit should be connected to the loop antenna with the supplied cable. Depending on what other functionality is required, the unit can also be connected to a USB port on a PC, or USB Flash Drive.

The threaded locking collets should be fully screwed onto their mating connectors.

***NOTE:** When data is transferring from the reader to a USB drive, the USB icon will show a lock symbol. DO NOT remove the USB drive while the lock status symbol is showing. Failure to observe this procedure can result in loss or corruption of data from the USB drive.*

Un-safe to disconnect: 

Safe to disconnect: 

2.6 Setting the Clock

To keep the clock in the Reader accurate, it will update automatically via the GPS satellite network whenever a GPS signal is available. The precise clock is useful for synchronizing tag reads in multiple Reader installations. In this situation, ensure that all of the Readers have been synchronized with the GPS time when setting up a multi-reader system.

***NOTE**: So that your local time appears correctly on the display and in log files, please set the current time zone in the settings menu (refer to Section 3).*

To set the clock, move outside or place the unit near a window with a clear view of the sky. The time taken to update the clock will depend on the quality of the GPS signal, varying from a few seconds to a few minutes. You will notice the time and date change to the correct values. If the clock has not updated after 5 minutes, try positioning the reader in an area with a better view of the sky.

If the reader clock has become invalid, a message will appear upon turning on the reader: *"The Clock Could Not Synchronize – GPS Signal Is Required."*

This can happen if the Reader has been in storage for a long time and the internal battery has become deeply discharged. Fully recharge the battery as soon as possible before using the unit to read tags. Follow the above procedure to set the clock.

2.7 Using the GPS Receiver

The Reader is able to store location information (latitude and longitude) along with each tag read, this is known as "geotaging." When using this feature, be sure that the unit has a valid GPS lock; otherwise the geotag information will not be stored along with the tag read. Geotagging can be turned on or off in the settings menu, please refer to Section 3.

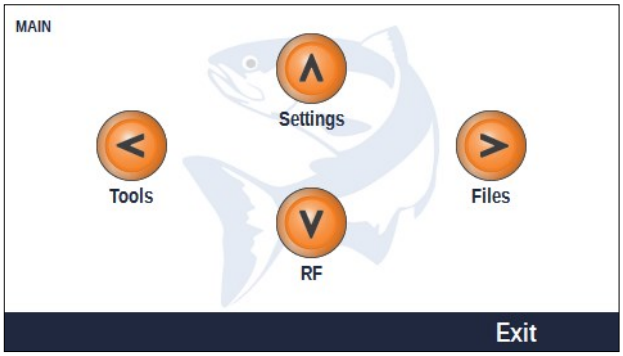
***NOTE**: While the Geotagging option can be turned off, the GPS itself cannot. The power draw of the GPS module is insignificant to overall battery life.*

The GPS icon on the main screen will change from red to blue when a valid GPS lock is obtained and the Reader is now tracking its location. One arc indicates a fix on 4 satellites and two arcs indicates a fix on more than 4 satellites.

To obtain a GPS lock, position the Reader in an area with a clear view of the sky. Achieving a valid GPS lock usually takes less than 2 minutes, but can take up to 5 minutes or more, particularly if the Reader has not been operated in the area previously or has been switched off for a long period of time.

3 Configuring the Reader

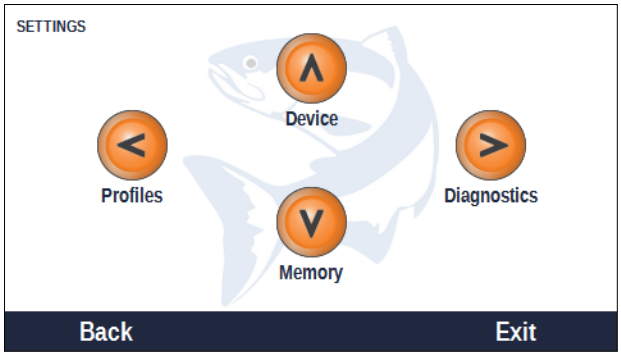
The Main Menu can be accessed by pressing the left hand “soft-key” labeled MENU on the home screen. From here, pressing the corresponding arrow keys allows for fast navigation through the menus.



Main Menu Screen

3.1 Settings Menu

Pressing the UP key from the main menu screen will display the Settings menu.

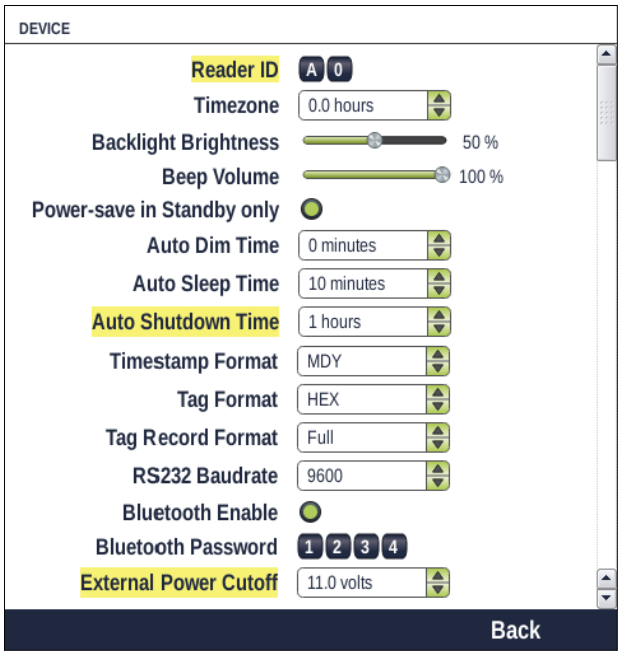


Settings Menu

When in the Settings menu, use the toggle arrow buttons to select a sub-setting. Press OK to edit the highlighted setting. Use the arrows keys to alter the selection, and then press Save to confirm the change. Pressing the Back button will return to return to previous menu.

3.1.1 Device

The Device Settings menu allows the user to configure the hardware and set local settings.



Device Settings

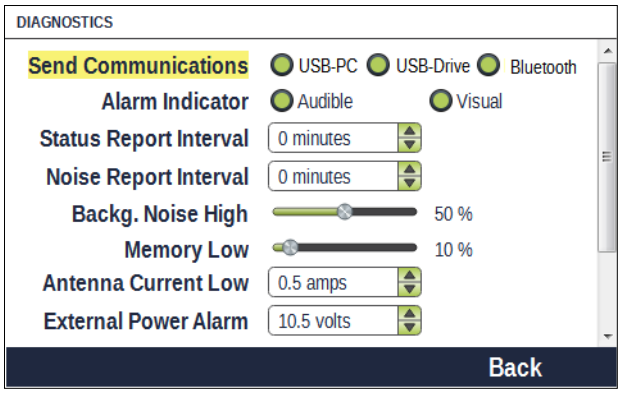
Parameters that can be customized are:

- **Reader ID** – The ID number of the Reader. This number will appear in log files, tag files, and when connecting the Reader to a PC. It is useful for Readers to have different IDs when more than one Reader is used at a time. The Reader ID also forms part of the Bluetooth name, e.g. HPR-XX, where XX is the Reader ID.
- **Time zone** – Set this to your current UTC offset to ensure the correct local time is displayed and stored in tag/log files. Refer to Appendix A for a time zone map or look up your current time zone on the internet. Be sure to account for any daylight saving hours that may be in effect in your area.
- **Backlight Brightness** – Set the desired screen backlight brightness. Lower settings will save battery power; a higher setting is useful for viewing the device in full sun. Note that under dark or shady conditions the display will auto-dim. The Reader will return to the configured brightness level when it encounters bright conditions again.
- **Beep Volume** – Adjusts the volume of the audible indicator.
- **Power-save in Standby only** – When selected, reader will only Auto Sleep or Auto Shutdown when in Standby mode. When de-selected, readers will Auto Sleep after identified time elapses while in Standby or Reading mode. Setting the Auto Sleep Time to ‘0 minutes’ will disable the feature while in Standby or Reading mode. Reader will not shutdown automatically unless external power is removed; regardless of operating mode. Reader will boot-up automatically, in last operating mode, when power is re-applied.

- **Auto Dim Time** - Sets the amount of time before the reader display dims to save power.
- **Auto Sleep Time** – Sets the amount of time before the reader automatically goes into to sleep mode to save power. Note that this will not occur if the Reader is currently in tag reading mode or connected to a PC via USB or Bluetooth unless the Power-Save In Standby Only option is disabled .
- **Auto Shutdown Time** – Sets the amount of time before the reader automatically powers off. Note that this will not occur if the Reader is currently in tag reading mode, connected to external power, or a PC.
- **Timestamp Format** – Selects the date display format.
- **Tag Format** – Chooses between hexadecimal (e.g. 3D9.1748D3AD9F) or decimal (e.g. 985.100006080033) tag number display.
- **Tag Record Format** – Allows the user to choose between transmitting the full tag message (e.g., Timestamp, Reader ID, Tag Code, and Lat/Long) or only the Tag Code. All information is recorded in the internal memory, regardless of setting, and can be retrieved by changing the setting to 'Full' and downloading the file again.
- **RS232 Baudrate** – Choose between serial connection baudrates (e.g., 9600, 38400, 115200).
- **Bluetooth Enable** – Enables or disables the Bluetooth function.
- **Bluetooth Password** – Sets the Bluetooth passkey for connecting the Reader to other devices via Bluetooth.
- **External Power Cutoff** - The Reader will stop drawing power from the external DC input when the voltage drops below this level. This is useful when powering the reader from an external battery pack. Be aware that if this setting is configured incorrectly, the Reader may not charge the battery as expected. Normally, this setting should be kept at the minimum value of 10.5 volts unless an unusual DC power input is being used (e.g. an external battery pack). Note that a low power draw will still continue from the external power source even if the voltage is below the cutoff level.

3.1.2 Diagnostics

The Diagnostic Settings menu allows the user to configure parameters relating to alarms and diagnostic reports.

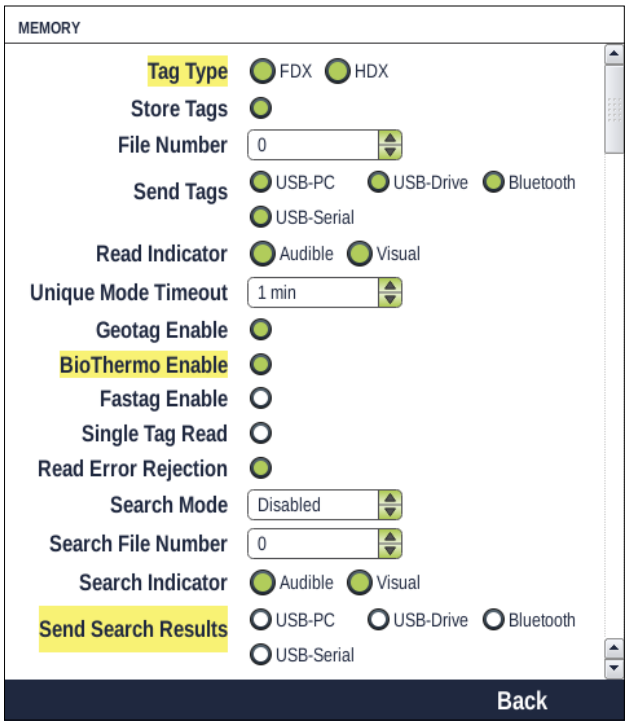


Diagnostics Settings

- **Send Communications** – Send diagnostic messages to the selected device (e.g. battery low, memory full, low antenna current, etc.).
- **Alarm Indicator** – Choose to beep and/or flash the orange LED indicator.
- **Status Report Interval** –How often to run and store a new Status report.
- **Noise Report Interval** – How often to run and store a new Noise report.
- **Backg. Noise High** – Triggers an alarm message when RF background noise is above the selected level. This alarm will become disabled when HDX detection is turned off.
- **Memory Low** – Triggers an alarm message when Memory capacity has dropped below the selected level.
- **Antenna Current Low** – Triggers an alarm message when the antenna current falls below the selected level.
- **External Power Alarm** – Triggers an alarm message when external power input voltage falls below the selected level. Does not cut off power being drawn from the DC power input, this function is achieved by the “External Power Cutoff” parameter in the “Device” settings (see previous subsection).

3.1.3 Memory

The Memory Settings menu allows the user to configure parameters associated with tag reading and data storage.



Memory Settings

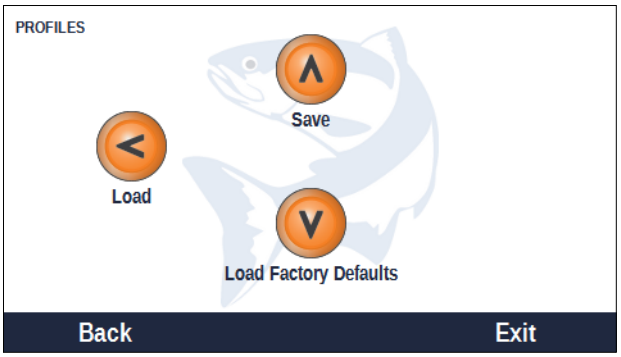
- **Tag Type** – Selects which tag types to read (FDX-B and/or HDX)
- **Store Tags** – When unselected, read tags will be displayed on the screen, but will not be stored into a file.
- **File Number** – Selects which file number to store tag reads into. The Reader can store up to 100 different files.
- **Send Tags** – Selects which port(s) to stream live tag read data out of.
- **Read Indicator** – Choose to beep and/or flashing the blue Read Indicator LED at bottom of unit when a tag is read.
- **Unique Mode Timeout** – Choose the time before a tag of the same number will be re-read and stored when the Reader is operating in “Unique” mode. A value of zero performs similar to Continuous mode.
- **Geotag Enable** – When selected will store GPS data with tag number.
- **BioThermo Enable** – Displays temperature of BioThermo tag if temperature is between 24.2 ^{o}C and 50 ^{o}C (75.6 ^{o}F to 122 ^{o}F). “Temperature below range” is displayed if temperature below 24.2 ^{o}C.
- **Fastag Enable** – Feature to be added in the future.
- **Single Tag Read** – When selected, the Reader will read one tag then return to Standby mode. The READ button needs to be pressed before another tag can be read.

- **Read Error Rejection** – Provides enhanced tag read error rejection (i.e., ghost tags). When enabled, read efficiency is decreased at tag speeds greater than 1.5 mps.
- **Search Mode** – (e.g., Disabled, Match, No Match, Audible).
    - **Disable**: Search function not active.
    - **Match**: Searches identified tag file stored on unit and extends audible and visual tag detect indicators when scanned tag matches tag in file.
    - **No Match**: Searches identified tag file stored on unit and extends audible and visual tag detect indicators when scanned tag DOES NOT match tag in file.
- **Search File Number** – Selects which file to perform search function.
- **Search Indicator** – Choose to beep and/or flash the blue Read Indicator LED at bottom of unit when a tag satisfies search criteria.
- **Send Search Results** – Selects which port(s) to stream search results out of.

NOTE: *Once a tag file contains more than 20,000 tags, a "Tag File Full" alarm will occur. Tags will continue to be recorded in this file, however only 20,000 tags can be displayed on the Reader screen in the File Management Menu.*

3.2 Profiles

The Reader settings can be saved into “profiles” for loading at a later time. Keeping several settings “profiles” stored on the reader allows speedy reconfiguration of the settings for different applications.



Profiles Menu

- **Save** – This function saves the current settings into memory. A window will appear asking for which “Profile Number” to save to. The data in the profile will be overwritten if it already exists. The Reader will ask for confirmation if this occurs.
- **Load** – This function will load specific settings from memory. A message will appear asking for the “Profile Number” to load.
- **Load Factory Defaults** – This will reset the settings back the way they were when the Reader was first delivered from the factory. A confirmation window will appear asking to verify this action. When “Yes” is pressed, the Reader will automatically reset all of the settings. Tag data will not be erased.

4 Reading Tags

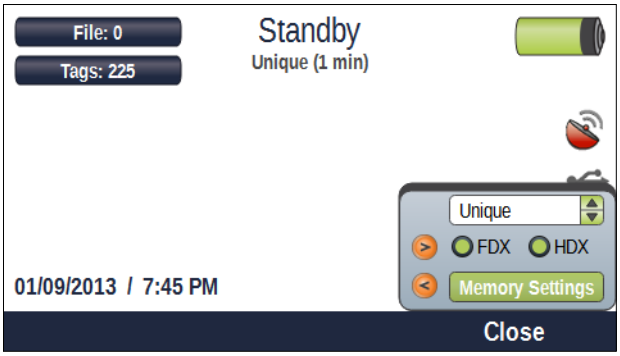
4.1 Reading RFID tags with the Reader

Upon starting up, the Reader will resume the last state it was in, i.e. Reading or Standby. Reading can be started and stopped by pushing the "READ" button on the device. The text at the top of the Main Screen will toggle between "Reading" and "Standby" when the “READ” button is pressed.

NOTE: *If external power is not connected to the unit, a fully charged battery will deplete itself after approximately 3-10 hours of continuously being in READING mode depending on the RF power setting.*

4.2 The Shortcut Button

The Shortcut button on the Main Screen allows quick access to tag reading related settings via a popup menu.



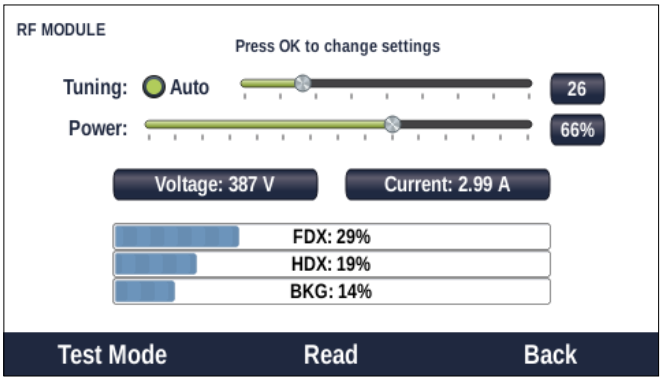
Shortcut Popup

- **Press the Up/Down arrows** to toggle from Continuous (constantly log the same tag) to Unique (will log a particular tag once and will not again until a preset time limit has elapsed).
- **Press the Right arrow** to toggle reading FDX-B and/or HDX tags.
- **Press the Left arrow** to jump to the Memory Settings screen; this is a useful shortcut to adjust tag reading and storage settings. The Memory Settings screen is described in Section 3.

NOTE: *Ensure that the Reader is correctly configured to operate as required for the application, paying particular attention to the Memory Settings and RF Settings.*

4.3 RF Settings and Diagnostics

Detailed information and settings related to the Radio Frequency (RF) functions of the device are configured in the RF Menu screen. This is accessible from the Main Menu by pressing the down arrow key.



RF Settings

This screen indicates the present antenna tuning setting, power setting, peak-to-peak antenna voltage, and RMS antenna current. Three bar graphs show the amount of "noise" (radio interference) present.

FDX-B Noise – This is the amount of interference that will affect the read range of FDX-B tags. The higher the noise the lower the read range will be. FDX noise will jump to 99% while a FDX tag is being read, this is normal.

HDX Noise – This is the amount of interference that will affect the read range of HDX tags. The higher the noise the lower the read range will be. HDX noise will jump to 99% while a HDX tag is being read, this is normal. HDX noise should normally track the background noise value fairly closely unless HDX specific interference is present.

BKG Noise – This is the amount of background noise that will affect the read range of both FDX-B and HDX tags. If HDX detection is disabled, this graph will also become disabled.

Possible sources of noise include:

- Adjacent metal objects
- Other electronic equipment
- Motorized equipment
- Structures with embedded reinforcing steel
- Excessive vibration
- Excessive water fluctuation or water splashing onto the antenna
- Adjacent power lines or power generating equipment
- Adjacent antennas that are in operation
- Overhead lights and power lines

The RF Menu allows the user to configure the following:

4.3.1 Tuning

The HPR Plus allows for manual or auto tuning of the antenna. The Reader will continuously automatically tune the antenna for peak antenna current/voltage.

NOTE: *Using auto tuning will reduce the number of tag reads per second from 10 to 8. It is only recommended that auto tuning be disabled if tag detection speed is critical.*

4.3.2 Power

The transmit output power to the antenna can be set to one of 15 different power levels. The higher the power, the greater the tag read range. However, keep in mind this is not always a linear relationship. That is, the amount of read range increase will become less and less with each step up in power setting. Use the lowest practical power setting to prolong battery run time.

4.4 Testing the Unit

The supplied Fish RFID Keychain Test Tag can be placed near the loop antenna to verify correct operation of the unit. This tag is an FDX-B tag. When the RFID tag is placed on-axis, i.e. the fish pointing into the loop, the tag should have read range of approximately 10 cm from the center of the loop, depending on the power setting. The tag ID will appear on the display and the Reader may beep and/or the tag read indicator will flash blue, depending on the audible and visual indicator settings.

NOTE: *The antenna and tag should not be placed on or near any metallic object while reading, as this will significantly reduce the tag read range.*

The Antenna and FDX-B Test Tag

4.5 Test Mode

The "Test Mode" button will count the number of successful tag reads out of 100 tag reading cycles when a tag is present in the field. This is useful for testing the performance of an antenna setup.

5 File Management and Communication

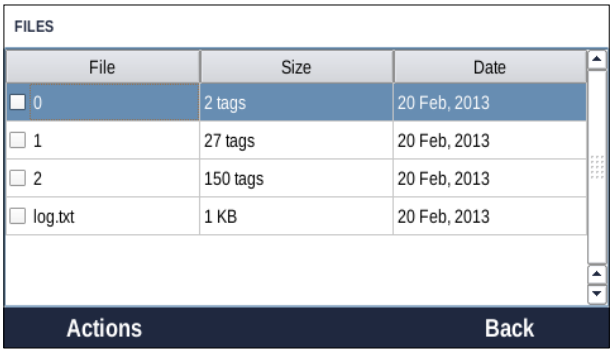
The Reader can interface to a PC or other equipment via USB and Bluetooth. It is possible to view, copy, and delete tag and log files from the Reader itself.

It is also possible to "stream" live data via USB or Bluetooth. The Reader can be controlled remotely by commands received via USB or Bluetooth.

Note: *Biomark's Terminal Application 'BioTerm' is available on the Biomark website* at: http://www.biomark.com/technical_services/firmware___applications/

5.1 File Management Menu

To access these features, select the "Files" menu from the Main menu screen.



Files Menu

The Files menu will list all the files currently stored on the reader, their corresponding size, and the date of the most recent tag read stored in the file.

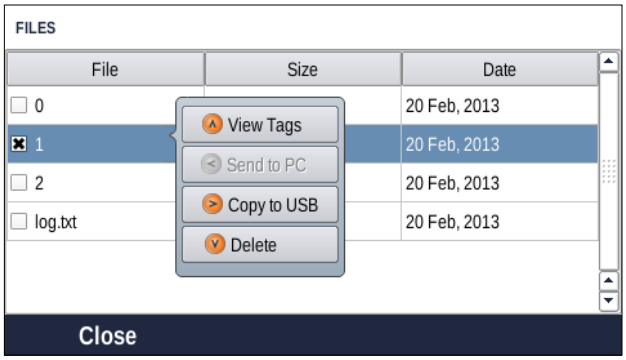
Use the UP/DOWN arrows to highlight the file you wish to perform an action on, then use the OK button to select the file.

NOTE: *You can select more than one file at a time.*

After selecting the file(s), press the "Actions" button. A pop-up box will appear with the following options:

- **View Tags** – displays the tag file on the screen (only available if a single tag file is selected)
- **Send to PC** – transfer the file(s) to the PC via USB or Bluetooth (only available if the PC is running a terminal application such as BioTerm)
- **Copy to USB** – copies the file(s) to a USB memory stick (only available if a memory stick is connected to the Reader)
- **Delete** – Deletes the file(s) selected

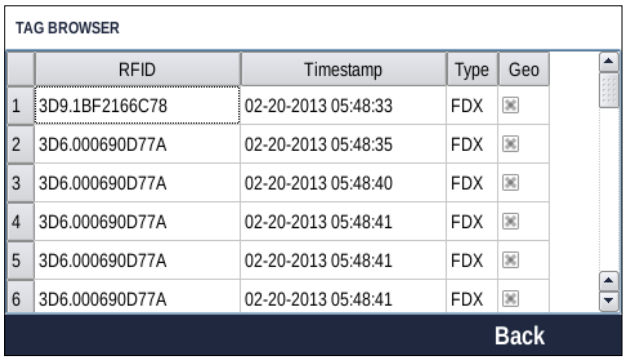
Press the corresponding arrow key for the desired action.



File Actions Popup

5.1.1 Viewing Tags

It is possible to review the data contained in a tag file. To do this, select the tag file you wish to view from the Files menu and press the Actions button. The “View Tags” action will display the following screen:



View Tags Screen

- All tag numbers in this file will be displayed.
- Use the UP/DOWN arrow buttons to scroll through the data.
- The “Geo” box will be checked if valid GPS location information is available with this tag read. The detailed geotag information is visible when the file is downloaded.

5.2 Connecting the Reader to other devices via USB or Bluetooth

5.2.1 Connecting a PC to the Reader using USB

1. Plug the Reader into a computer via USB port. A dialog will appear on the Reader for 10 seconds when the USB connection is detected. This allows the operator to choose a mode: **USB serial mode (legacy) or Native USB (HID) mode. USB serial mode is automatically selected after 10 seconds if the user takes no action.** Legacy mode is useful when using the Reader with software that only supports COM ports. The USB icon on the main screen will go blue once a connection has been made.
2. Run the terminal application on your PC.
3. The “Send to PC” action in the “Actions Popup” (refer Section 5.1) will now be available if this function is supported by the particular PC software in use. Data can also be streamed to the PC. Commands can be sent to and from the Reader (the available commands are listed later in this section).

NOTE: *Additional information on installation of the driver(s) required for legacy serial port mode are provided in Appendix B.*

5.2.2 Connecting to the Reader using Bluetooth

1. Use whatever Bluetooth software is installed in the PC to pair with the device. It will be named "HPR-XX", where XX is the Reader’s ID. The password is the number set in “Menu/Settings/ Device” on the Reader.
2. Ensure that the Bluetooth software has assigned a COM port to the device and note the number.
3. Run communication application (BioTerm, Tag Manager, etc.) on your PC.
4. Select the appropriate COM port in the application and connect. Once the Reader is successfully connected the Bluetooth icon on the main screen of the HPR Plus will go blue, indicating that the HPR Plus has an active Bluetooth Connection.
5. The “Send to PC” action in the “Actions Popup” (refer Section 5.1) will now be available if this function is supported by the particular PC software in use. Data can also be streamed to the PC. Commands can be sent to and from the Reader (the available commands are listed later in this section).

5.2.3 Connecting a USB Memory Stick

The Reader can be connected to a USB memory stick using the supplied adapter cable. If a USB memory stick has been detected by the reader the USB icon on the main screen will go blue. The “Copy to USB” action will become available in the file actions popup. Live data can also be streamed to the USB stick. When files are copied to the USB stick, they will be placed into a folder called "HPR."

NOTE: *When data is transferring between the reader and a USB drive, the USB icon will show a lock symbol. DO NOT remove the USB drive while the lock status symbol is showing. Failure to observe this procedure can result in loss or corruption of data from the USB drive.*

Un-safe to disconnect:  Safe to disconnect: 

5.3 HPR Plus Commands

It is possible to communicate with the reader remotely using a terminal program on a PC via Bluetooth, USB, or a USB-to-RS232 converter.

The following is a list of the available commands:

General

Command	Description	Example Response
RFV	Report Firmware Version	'1.01'
RHV	Report Hardware Version	‘1.1’
RID	Report Reader ID	'01'

Help

Command	Description
?	List all commands

Files

Command	Description
FLA	List all files
FI 'file'	Get info for a file
FDA	Download all tag files
FD 'file'	Download a tag or log file
FEA	Erase all tag files. A list will be shown of the files to be erased, and confirmation is required before the files are erased.
FE ‘file’	Delete a tag or log file

Reports

Report ID's

ID	Report Type
s	Start-up
a	Status
b	Noise

Command	Description
VR'ID'	View the latest report
RR'ID'	Run a report now

Settings

Command	Description	Example
SLA	List all settings (see Appendix C for list of settings and default values)	
ST'id'	Get current value of a setting	**set 2** 2. Timezone = 0 hours
S'id''value'	Set the value of a setting	**set 2 -7** 2. Timezone = -7 hours

Power

Command	Description	Example Response
POW	Get power information	Battery: 68% 3.11 V Charger: 0.0 V
RSP	Go to sleep (not active while connected to PC or external power)	
RAR	Exit and restart HPR software	
RBT	Power reader off and back on	
RPD	Power off	

RF Control

Command	Description
RA1	Enable the transmitter
RA0	Disable the transmitter

5.4 File Formats

5.4.1 Tag File Format

Tag files are named in the following format:

```
[tag]_[READER ID]_[FILE ID].tag
```

Tag file entries are recorded in the following format:

```
[TIMESTAMP] [READER ID] [RECORD TYPE] [*] [TAG NUMBER] [GPS CO-ORDINATES]
```

Examples:

Live Recorded (i.e. "streamed" data):

```
20-07-2012 11:46:28 01 TAG 3DD.003BA20748
20-07-2012 11:46:29 01 TAG 3DD.003BA20045
```

Extracted from memory (i.e. copied to a USB stick or PC from Reader memory):

```
26-07-2012 15:50:03 01 TAG *3D6.000AC95916
26-07-2012 15:50:03 01 TAG *3E7.0006054AB5
```

Field	Description	Example
Timestamp	Time that the tag was detected, formatted according to “Timestamp Format” setting.	26-07-2012 15:50:03
Reader ID	The Reader ID setting.	01
Record Type	Tag reads are always “TAG”	TAG
Asterisk (*)	An asterisk is included if the tag data has been downloaded from the Reader memory. Tags which are streamed in real -time will not have an asterisk.	*
Tag Number	The tag number, formatted according to “Tag Format” setting.	3D6.000AC95916
Location	If geotagging is enabled, and a valid location is known by GPS, the co-ordinates will be added.	46.563160 N 114.442042 W

5.4.2 Log File Format

Log files are named in the following format:

```
[log]_[READER ID]_[FILE ID].txt
```

Log file entries are recorded in the following format:

```
[TIMESTAMP] [READER ID] [RECORD TYPE] [CONTENTS]
```

Example:

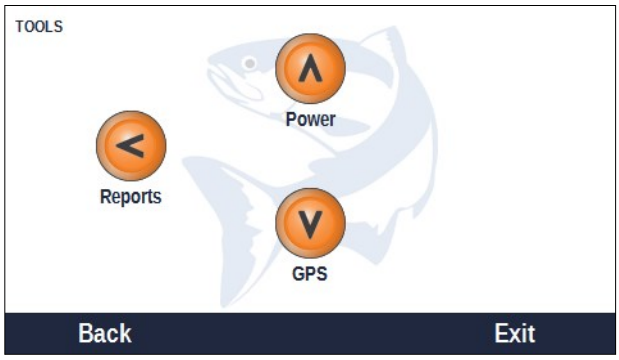
```
06-08-2012 02:12:23 0F MSG Power: 100
```

Field	Description	Example
Timestamp	Time that the message was recorded, formatted according to “Timestamp Format” setting.	26-07-2012 15:50:03
Reader ID	The Reader ID setting.	01
Record Type	MSG/ALM/CNF	

Contents	MSG	A simple message	MSG Shutting down
	ALM	An alarm condition	ALM Low Antenna Current
	CNF	A setting change	CNF10.FileNumber:0,1

6 Tools and Diagnostics

The Reader has built in diagnostic tools that can aid in troubleshooting or logging of the operating parameters. These features are accessed by selecting the “Tools” menu from the Main Menu.

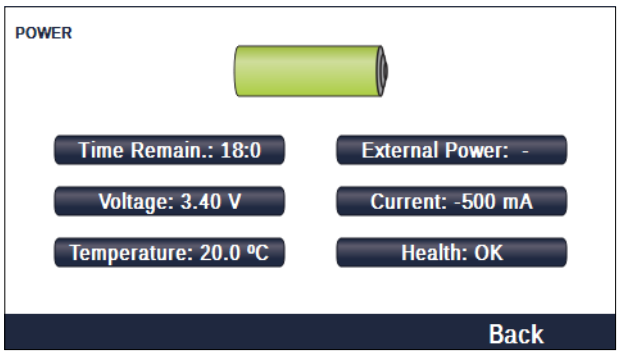


Tools Menu

6.1 Power

This screen shows information about the battery and DC input:

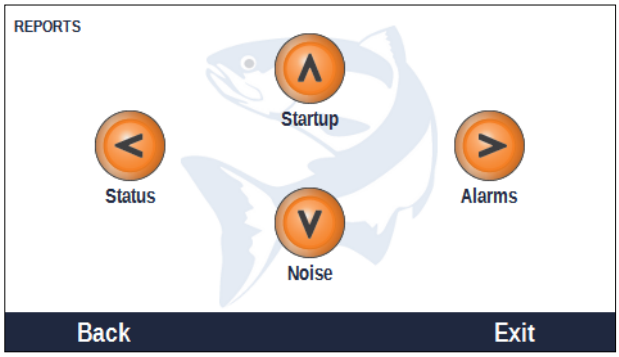
- Battery symbol – Displays the amount of charge remaining in battery.
- Time Remain. – Estimated battery run time (HH:MM) of the Reader given the present rate of power consumption and state of charge.
- Voltage – The voltage of the battery pack.
- Temperature – The temperature inside the Reader (°C)
- External Power – The DC input voltage will be shown if external power is connected.
- Current – The current flowing in or out of the battery pack. A negative value indicates the battery is discharging, a positive value indicates that it is charging.
- Health – Will indicate if the battery is too hot or too cold to allow charging.



Power Info Screen

6.2 Reports

To access the built in diagnostic reporting tools available with the HPR Plus, select the “Reports” menu from the “Tools” menu. There are four types of reports accessible from this menu. When a report is run, the results of the report are shown on the screen and also recorded in the Reader’s log file. It is also possible to configure the Reader to automatically run reports at specified intervals. In the case of the automatic reports, the results are only stored in the log file and not displayed on the Reader screen.



Reports Menu

6.2.1 Startup Report

The Startup Report is only generated once; when the unit is turned on. It can be viewed at any time from the Reports menu, or through a command interface. The reported values were current when the reader started up and do not reflect any changes made afterwards.

Software	Version number of the installed software
OS Version	Version number of the installed operating system
Hardware	Version number of hardware configuration
External Power (V)	Voltage of an external charger (if connected)
Battery (V)	Voltage of the internal battery
Memory	“OK” or an error message
Memory Usage (%)	Percentage of memory used
Total Tags	Total number of tags stored in all files
Tuning	Tuning setting
Power	Power setting

6.2.2 Status Report

The Status Report provides a summary of current operating conditions and settings. It can be run manually at any time from the Reports menu, or through a command interface. It can also be configured to run automatically by setting the “Status Report Interval”.

Software	Version number of the installed software
Read Mode	Value of “Read Mode” setting
Tags in File	Number of tags in current file
Memory Usage (%)	Percentage of memory used
Temperature (°C)	Internal temperature of the Reader
Ant. Tuning	Current antenna tuning position
Ant. Current (A)	Latest antenna current measurement
Ant. Voltage (V)	Latest antenna voltage measurement
External Power (V)	Voltage of an external charger (if connected)
Battery (V)	Voltage of the internal battery
Status Report (mins)	Value of “Status Report Interval” setting
Noise Report (mins)	Value of “Noise Report Interval” setting
Min Ant. Current	Value of “Antenna Current Low” setting
Max Bkg. Noise	Value of “Backg. Noise High” setting

6.2.3 Noise Report

Noise data is sampled every transmit cycle (100-150 ms), and averaged over 0.5 second intervals. The 0.5 s average values are displayed on the “RF” screen, and used to generate the Noise Report which filters that data further.

Running the Noise Report for the first time will only use data from one 0.5 s sample period. Subsequent Noise Reports will be generated from noise data since the last Noise Report ran. That is, the end of a Noise Report forms the start of data for the next Noise Report.

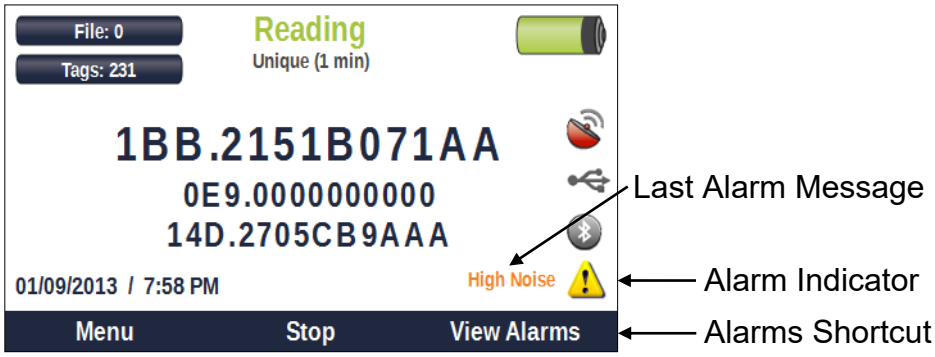
From	The start of the report period (end of previous Noise Report period)		
To	The end of the report period (start of next Noise Report period)		
	Average	Max	Last
FDX HDX BKG	The average over the reporting period	The maximum over the reporting period	The latest reading

6.2.4 Alarms

This is an information only screen listing all the alarms that have occurred and if the condition still persists. For transient conditions (e.g. high noise), the number of occurrences over time will be displayed. The presence of an Alarm is indicated by a yellow exclamation on the main screen.

If an alarm event occurs, the following will happen:

- A message indicating the last un-acknowledged alarm event to occur and a “View Alarms” shortcut will appear on the main screen. Pressing this button will acknowledge the alarm and display the “Alarms” screen to list all of the alarms that have occurred.
- Depending on the selected alarm warning type, the orange light on the Reader will flash rapidly and the Reader will beep until the alarm is acknowledged by pressing the “View Alarms” shortcut.



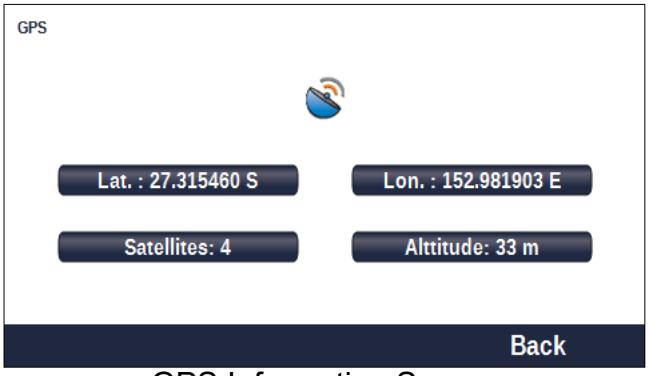
Alarm Message and Shortcut on Main Screen

The following table is a list of possible alarm messages:

Alarm	Problem
High Temperature	The internal temperature is over 70 °C.
Battery Too Hot	Charging has stopped because the battery is too hot, it must cool down below 60 °C before it can charge.
Battery Too Cold	Charging has stopped because the battery is too cold, it must warm up above 0°C before it can charge.
Battery Low	The battery voltage is too low for transmitting (<2.85V). The battery must be charged before transmitting will be enabled.
Battery Dead	The battery is critically low (<2.6V) and must be charged. The unit will shutdown after 10 seconds if no charger is connected.
High Noise	Background noise has been measured over the set threshold (see setting “Backg. Noise High”).
Low Antenna Current	Antenna current has been measured lower than the set threshold (see setting “Antenna Current Low”)
No Antenna	The unit is trying to transmit but no antenna is detected.
RF Overload	This alarm can be caused by (in order of probability): • An RF Power setting that is too high and is causing an overload. • A battery that is below freezing temperature. • A faulty or deeply discharged battery. The RF Power setting should be reduced to avoid this alarm. The Reader will still attempt to read tags but with reduced performance. It may be necessary to stop READ mode and then start READ mode again to clear this fault condition.
Low External Power	An external charger is connected, and its voltage has dropped below the set threshold (see setting “External Power Alarm”).
Tag File Full	The current tag file contains more than 20,000 tags. Tags will continue to be recorded in this file, however only 20,000 tags can be displayed on the Reader screen.
Low Memory	The total free memory has dropped below the set threshold (see setting “Memory Low”). Tags will continue to be recorded.
Memory Full	There is no free memory remaining, delete a tag file to free some memory. Tags will not be recorded to permanent memory, however up to an additional 20,000 tags can be held in RAM until memory is made available by deleting files. Tags stored in RAM will be lost if the unit is powered off.

6.3 GPS Information

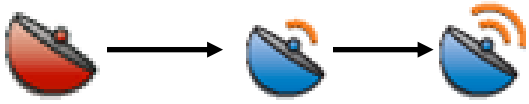
The HPR Plus GPS screen will display the current status of the GPS receiver.



GPS Information Screen

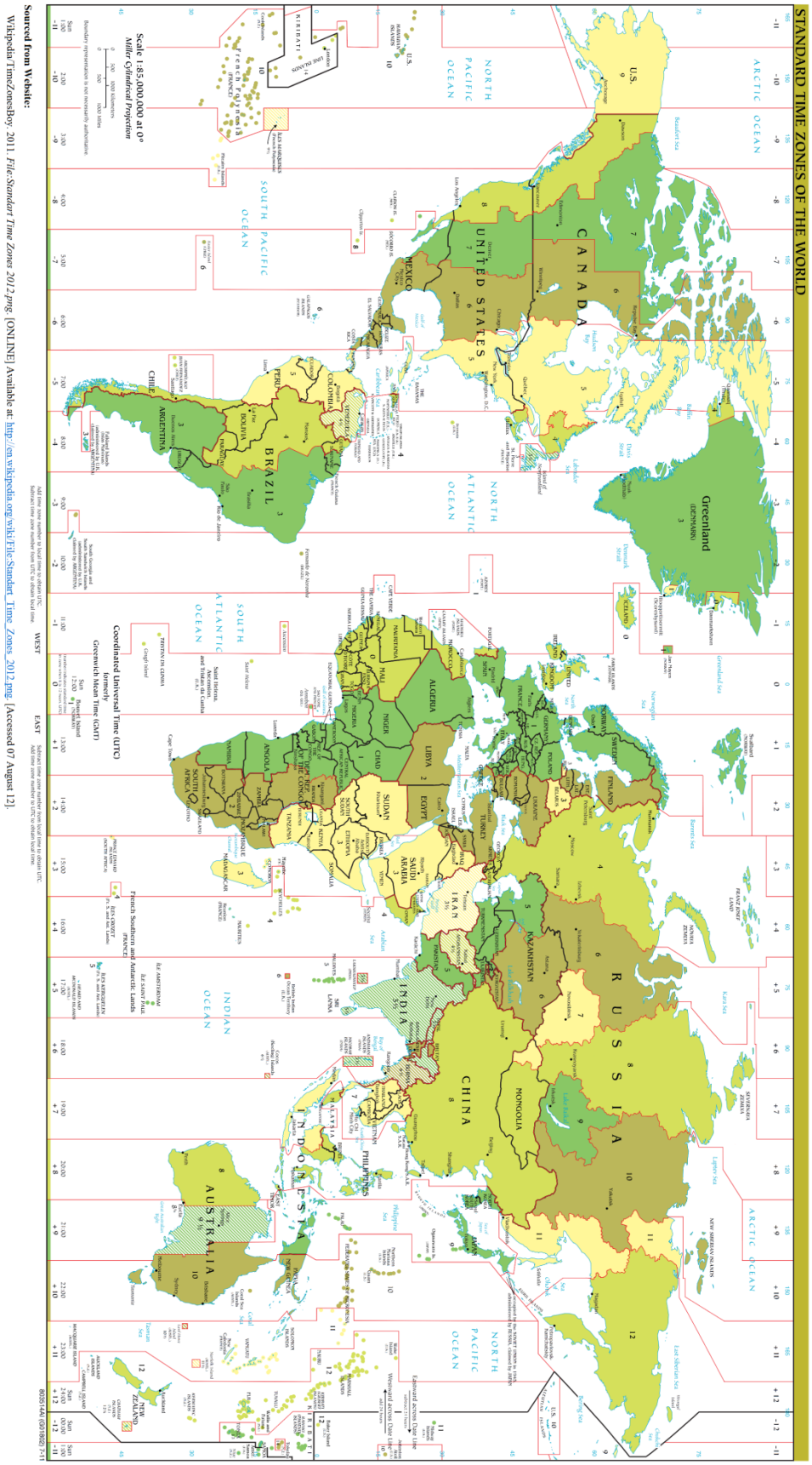
- Lat. – Displays the current latitude.
- Lon. – Displays the current longitude.
- Satellites – The number of satellites currently seen by GPS receiver. A minimum of 4 satellites is required for a valid GPS location fix.
- Altitude – Displays the current altitude (m).

The GPS icon will change from red to blue when a valid GPS lock is obtained.



NOTE: *The HPR Plus GPS uses the WGS84 datum and is accurate to within 3 meters of the readers physical location.*

Appendix A - UTC Time Zone Map

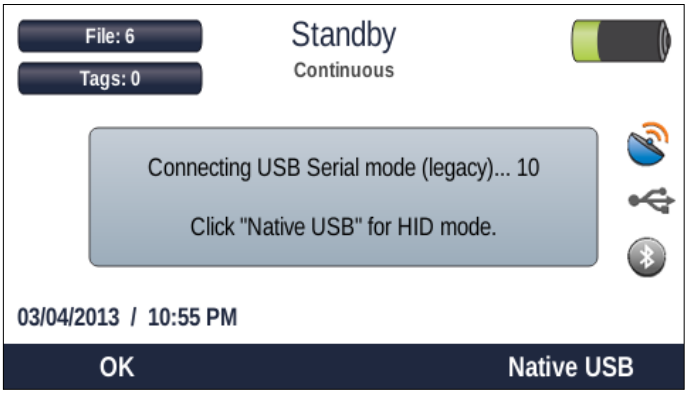


Appendix B - Installation of Legacy Serial Drivers

This instruction sheet details how to create a USB-serial connection between an HPR Plus reader and computer. A serial connection will allow you to communicate between the HPR Plus and computer to download tag files and send tag data to PIT tag programs such as P3, MiniMon and BioTerm. In addition to an HPR Plus and a computer, you will need a Windows XP or Windows 7/8 HPR Serial Emulator Driver (provided by Biomark), an HPR Plus USB cable, an available USB port and communication software.

Appendix B.1. Windows XP Driver Installation

- Unzip the HPR Serial Emulator Drivers on your computer.
- Connect the USB cable to the HPR and turn it on.
- Plug the USB cable into a USB port on your computer. The following message will appear on the screen of the HPR:

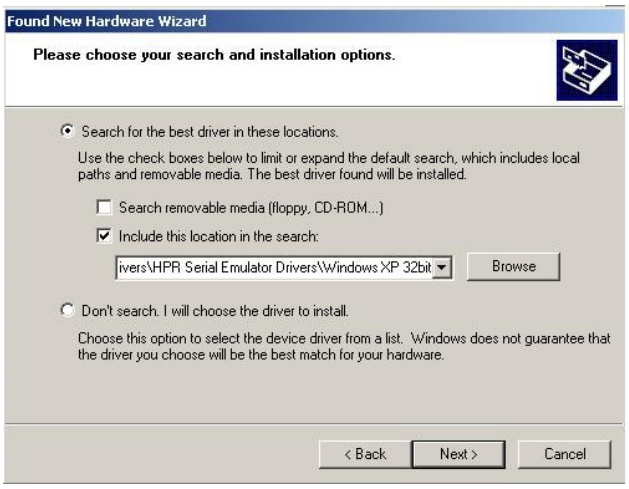


- Press ‘OK’ or take no action to allow the reader to boot-up in USB Serial mode. Unplug the USB cable from the computer and plug it back in to get the message back again.
- The Found New Hardware Wizard dialog box will appear on your computer:

- Select **No, no at this time** and click **Next**.

- Select **Install from a list or specific location (Advanced).** Click **Next**.

- Select **Search for the best driver in these locations** and **include this location in the search:** Click the Browse button and select the Windows XP 32bit driver folder that you unzipped on your computer. Click **Next.**



- If you get the Hardware Installation compatibility warning, click **Continue Anyway**.

- The Hardware Wizard will load the driver.

- When the New Hardware Wizard is complete, click **Finish**.

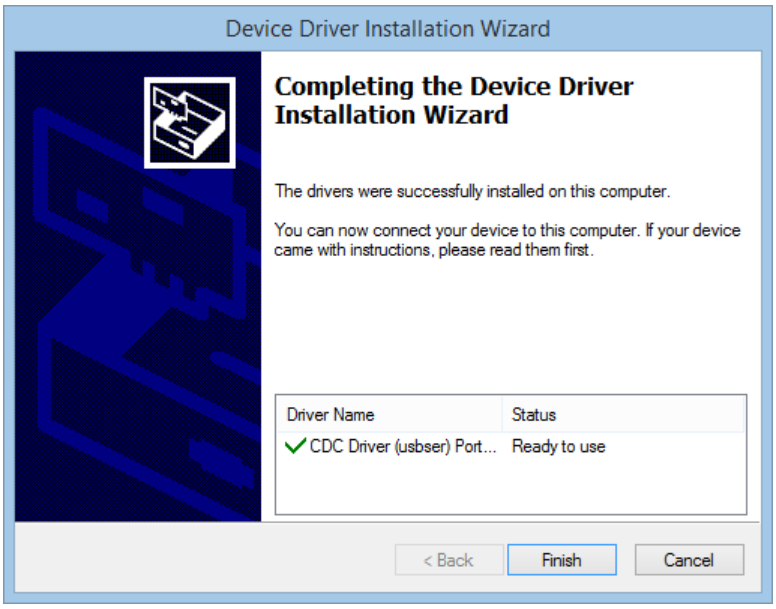
Appendix B.2. Windows 7, Windows 8, and Windows 10 Driver Installation

When installing the HPR Plus Serial Emulator Driver for Windows 7, 8, or 10, please use the **Installer Win7, 8** application.

- Unzip the HPR Serial Emulator Drivers on your computer.
- Find and select the **Installer Win7, 8** folder.
- Select either the **dpinst-x64.exe** or **dpinst-x86.exe** depending on your computers specifications.

***NOTE:** If you select the wrong installer exe file, a message will appear confirming the mistake and which option you need to select. If this happens, click **OK** and select the other installer exe option.*

- A Device Driver Installation Wizard will appear. Click **Next**. The drivers will automatically be installed and you will receive a message saying that the driver is ready to use.
- Click **Finish**.

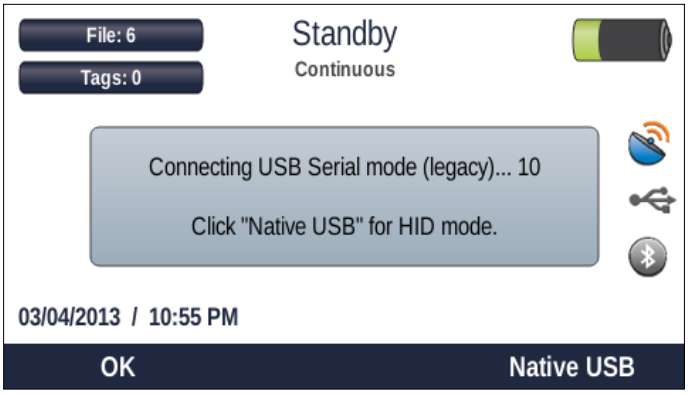


Appendix B.3. Manual Windows 7/Vista, Windows 8, Windows 10 Driver Installation

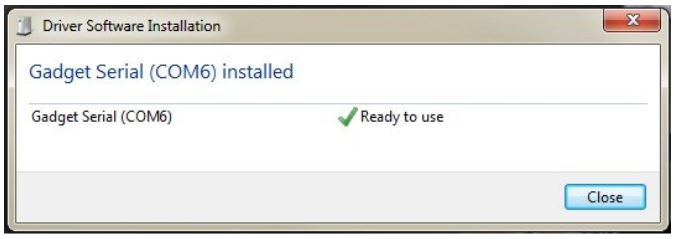
If the automatic installer does not work with Windows 7, 8, 10, or you are running Windows Vista, please follow the following steps to install the HPR Serial Emulator Drivers. **For Windows 10 users, please use the Windows 8 drivers.**

When you plug the HPR USB cable into a Windows 7, 8, 10, or Vista computer for the first time, it will automatically install its own driver, which is not compatible with HPR reader. Therefore, you need change the driver to the Biomark HPR Serial Emulator driver.

- Unzip the HPR Serial Emulator Drivers on your computer.
- Connect the USB cable to the HPR and turn it on. Plug the other end of the USB cable into an available USB port.
- Plug the USB cable into a USB port on your computer. The following message will appear on

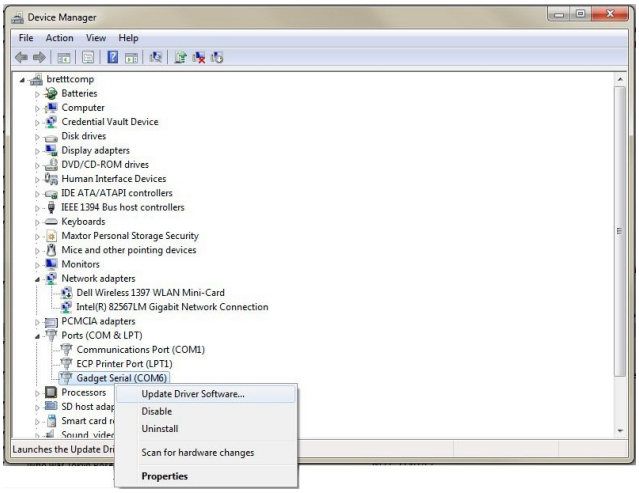


- Press ‘OK’ or take no action to allow the reader to boot-up in USB Serial mode. Unplug the USB cable from the computer and plug it back in to get the message back again.
- A Windows driver will install automatically. Remember, this driver is not compatible with the HPR Plus reader. When it is finished, you will get the following message:

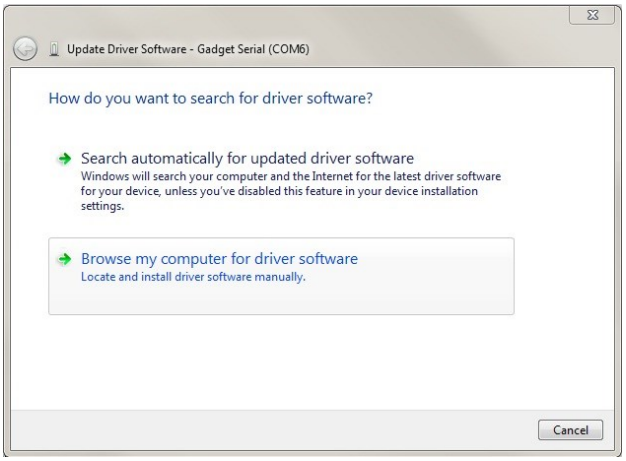


This message is a lie.

- Go to your computer's Device Manager (Control Panel -> System -> Device Manager) and expand the Ports (COM &LPT). Right click on Gadget Serial port and click **Update Driver Software…**

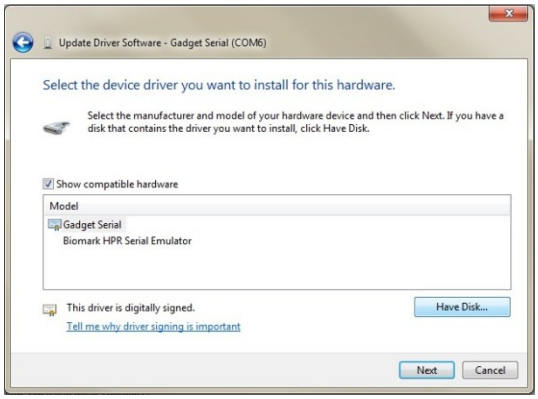


- This will open an Update Driver Software wizard. Select **Browse my computer for driver software.**

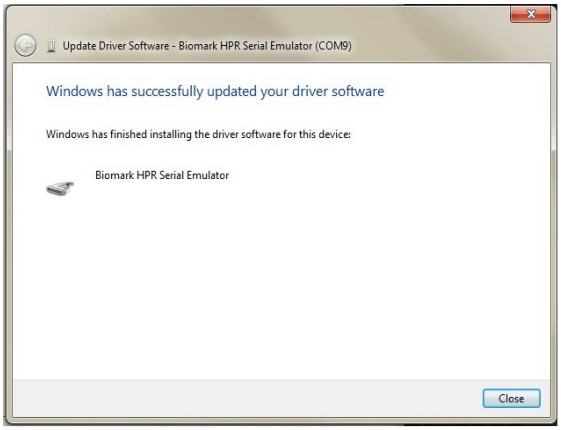


- Select **Let me pick from a list of device drivers on my computer.**

- Click **Have Disk**…and browse to where the Windows 7, 8, 10, or Vista HPR Serial Emulator Driver is stored on your computer. Click **OK** and **Next** to update the driver. **For Windows 10 users, please use the Windows 8 drivers.**



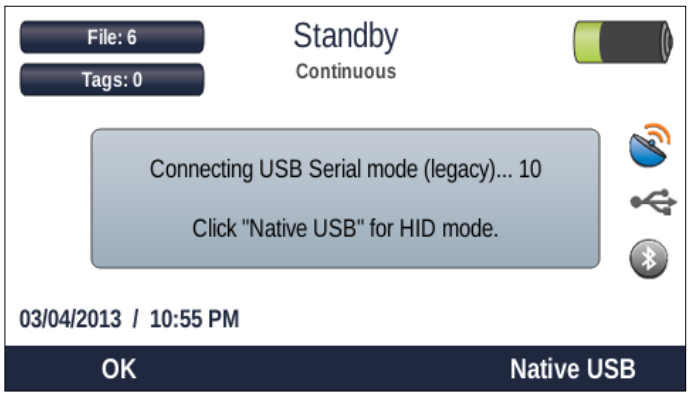
- Once the driver is updated, you will receive the following message. Click **Close** and you are done.



Appendix B.4. Test Serial Connection using BioTerm

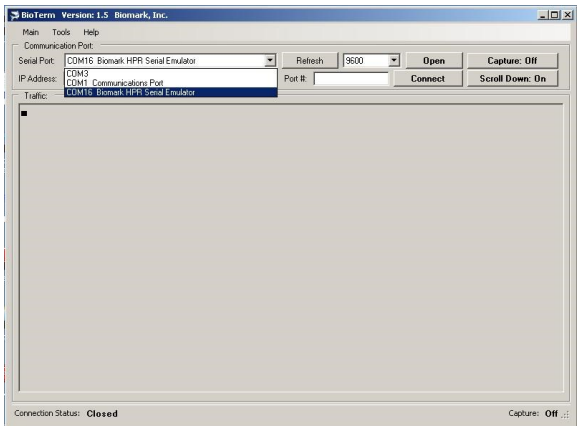
Once the Serial Emulator Drivers have been installed, it is a good idea to verify they have been installed correctly. To do so, we suggest using Biomark's BioTerm software; a free download from www.biomark.com.

- Plug the USB cable into a USB port on your computer. The following message will appear on the screen of the HPR:

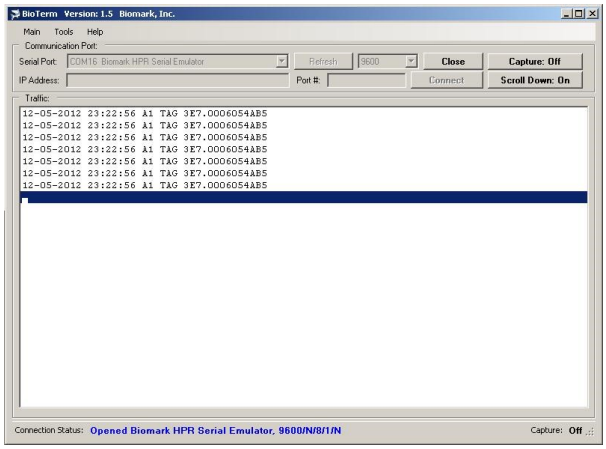


- Press 'OK' or take no action to allow the reader to boot-up in USB Serial mode. Unplug the USB cable from the computer and plug it back in to get the message back again.

- Open BioTerm and select the Serial Emulator port option from the Serial Port option box.



- Click Open, read a tag and the tag code will appear on the screen. Note: you will not have to select a baud rate.



Appendix C - List of Settings and Default Values

1	Reader ID	A0
2	Timezone	0.0 hours
3	Auto Sleep Time	10 minutes
4	Auto Shutdown Time	1 hours
5	Backlight Brightness	50%
6	Beep Volume	100%
7	Timestamp Format	1 (MDY)
8	Tag Format	0 (Hex)
9	Store Tags	Yes
10	File Number	0
11	Search Mode	0 (Disabled)
12	Search File Number	0
13	Search Indicator	3
14	Send Search Results	0 ()
15	Send Tags	15 (USB-PC, USB-Drive, Bluetooth, USB-Serial)
16	Read Indicator	3 (Audible, Visual)
17	Bluetooth Enable	Yes
18	Bluetooth Password	1234
19	Geotag Enable	Yes
20	Single Tag Read	No
21	Read Mode	1 (Unique)
22	Unique Mode Timeout	3 (1 min)
23	Tag Type	3 (FDX, HDX)
24	Tuning	64 (Auto)
25	HDX Tune	0%
26	Power	66%
27	Max Charger Power	7 (16 W)
28	USB Power	1 (3 W)
29	Send Communications	15 (USB-PC, USB-Drive, Bluetooth, USB-Serial)
30	Alarm Indicator	3 (Audible, Visual)
31	Status Report Interval	0 minutes
32	Noise Report Interval	0 minutes
33	Backg. Noise High	80%
34	Memory Low	10%
35	Antenna Current Low	0.5 amps
36	External Power Alarm	11.0 volts
37	External Power Cutoff	11.0 volts

38	Echo Commands	Yes
39	Read Error Rejection	Yes
40	BioThermo Enable	Yes
41	RS232 Baudrate	9600
42	Power-save in Standby only	Yes
43	Tag Record Format	Full
44	Auto Dim Time	0 minutes
45	Fastag Enable	No