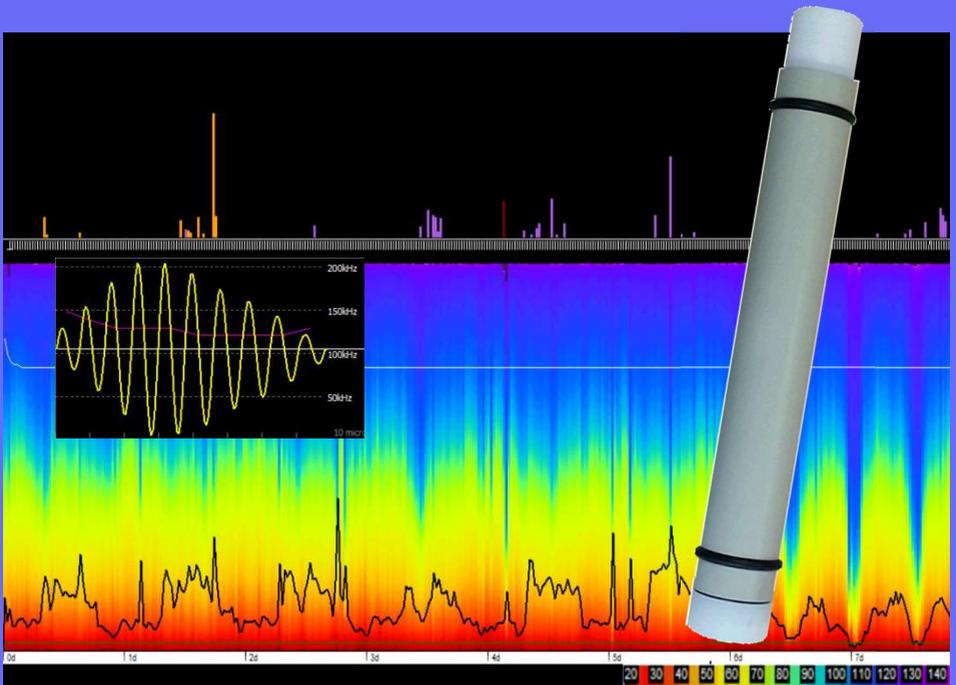




Chelonia Limited
Wildlife Acoustic Monitoring

F-POD R25 User Guide



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1 Introduction

This User Guide describes how to set up, deploy and retrieve data from your F-POD R25.

F-PODs are fully automated, static, passive acoustic monitoring systems that detect porpoises, dolphins and other toothed whales by recognising the trains of echo-location clicks they make to detect their prey, orientate and interact.

The ability of F-PODs to accept broadband clicks means that:

- different filter settings are unnecessary, making setup very simple
- logging is very uniform between different F-PODs within a project
- there is an opportunity to integrate data from different projects over wide geographical areas.

The F-POD click data are stored on an SD card in the POD.

After deployment, the data are downloaded from the SD card onto a PC and are then analysed using the supplied F-POD PC app. The app automatically identifies the presence of cetaceans by detecting the trains of ultrasonic echo-location clicks they produce. The app can also be used to compare F-POD and C-POD (the F-POD's predecessor) data.

Help and support

We offer full email support and will be pleased to help with queries on any aspect of F-POD use.

Your F-POD purchase also entitles you to free future app upgrades.

We offer a range of additional services, including data analysis and interpretation.

You can find more information and the latest app and documentation on our web site at www.chelonia.co.uk.

Keep up-to-date with important changes by joining the Chelonia User Group, at www.chelonia.co.uk/contact.

You can also contact us in the following ways:

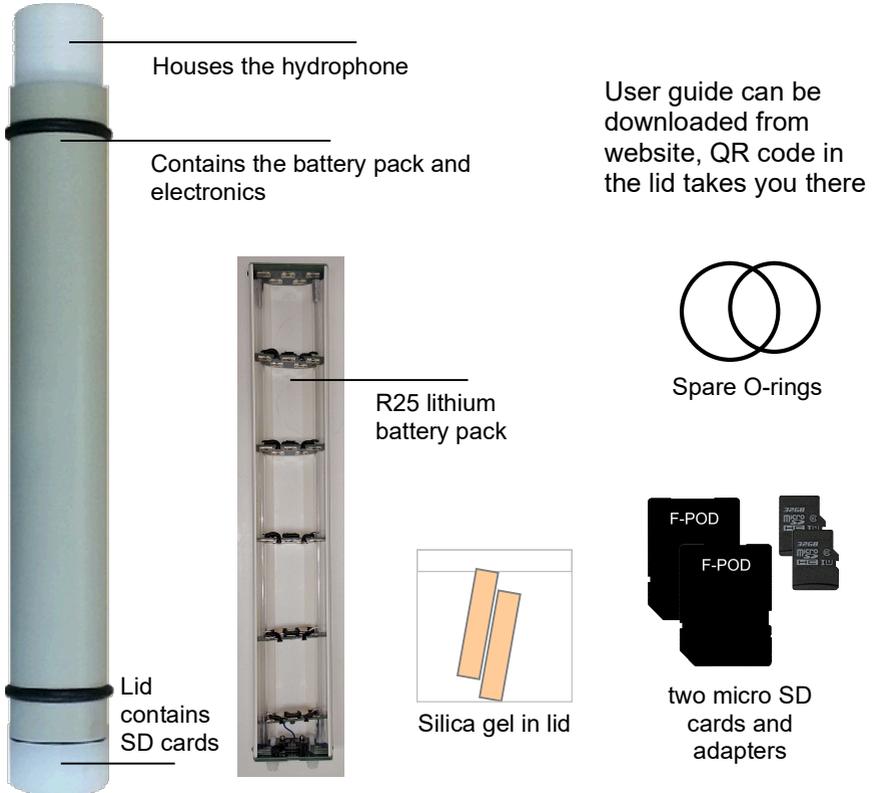
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TR19 6PH
UK

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Email: team@chelonia.co.uk

2 Checking parts

Once you have unpacked your F-POD R25, check to make sure that you have all the correct parts:



The F-POD consists of a polypropylene casing with hydrophone housing at one end and a removable lid at the other end.

F-PODs are very robust, but be careful not to drop the F-POD or subject it to hard knocks, as this might interrupt the power supply.

PODs are identified by a unique number that is shown on labels on the SD cards and on the POD housing under the upper buffer ring.

Spare O-rings

O-rings are used to seal the lid and keep it waterproof when it is closed. Use these spares to replace the existing O-rings if they become damaged.

SD cards

Two 32 GB micro-SD cards and adapters are supplied with each POD.

No setup is required – all the setup information for the F-POD is already in the POD. When the POD is deployed, it writes click data to the SD card. On retrieval, you copy the data from the SD card to a PC by running the FPOD.exe app. When you retrieve a POD after deployment, you can replace the micro-SD card with the spare and immediately redeploy the POD.

F-PODs can use any *blank* micro-SD card up to 32 GB. See *Calculating the maximum deployment time* on page 9 for more information about micro-SD card capacity.

Silica gel pack

The silica gel pack is used to prevent condensation on the inside of the F-POD when it is deployed. Two packs are supplied, to be placed in the lid of the each POD, one for deployment and one spare.



There may be a risk of corrosion if there is no silica gel to keep the humidity low. Corrosion may cause power loss or failure of electronic components which may lead to data loss.

Additional requirements

In order to run the POD app and download data from the SD cards, you need a computer running Microsoft Windows.

The F-POD R25 uses 25x 21700 rechargeable lithium batteries (not supplied). See the section *Calculating the maximum deployment time* on page 9 for advice on how to plan your deployment time.

The section *Retrieving F-PODs* on page 18 contains a recommended kit list for deploying and retrieving PODs.

3 Software installation

The F-POD app is used to analyse and automatically identify the presence of cetaceans by detecting the trains of ultrasonic echo-location clicks they produce. The app can also be used to compare F-POD and C-POD (the F-POD's predecessor) data.

The installation procedure consists of downloading files from the Chelonia web site.

Tip: Visit the hardware and software pages of www.chelonia.co.uk on a regular basis to check for updates and modification information and join the Chelonia User Group at www.chelonia.co.uk/cug_join.htm.

Installing the app

Tip: The F-POD app is being developed and improved continuously. Make sure you have the latest version of the app as well as the Software Guide.

To install the F-POD app:

1. Create a folder called **FPOD** on your computer.
2. Go to the F-POD downloads page at:
https://www.chelonia.co.uk/fpod_downloads.htm
3. Download the file **FPOD.ZIP**.
4. Double-click on the ZIP file to open it. The ZIP file contains:
 - **FPOD.EXE** which is the F-POD app that analyses, displays and exports F-POD data
5. Drag and drop the FPOD.exe into the **FPOD** folder.
6. Download any other support documents such as setup videos, Software Guides and example files.
7. Create another folder for your data files.

Installation is complete.

Other files

Download the latest version of this *User Guide*, the *Software Guide* and example files from:

https://www.chelonia.co.uk/fpod_downloads.htm

Uninstalling the app

To uninstall the F-POD app:

1. Delete the **FPOD.EXE** application from the FPOD folder.

4 Planning your deployments

This section contains advice and information to help you plan your deployments.

Calculating the maximum deployment time

The F-POD R25 uses the 21700 lithium rechargeable battery format. Please see the separate document on the “Lithium battery pack” for more details.

Maximum deployment time is dependent upon the following factors:

- The capacity of the 21700 cells.
- The capacity of the SD card. Noisy environments fill SD cards a little more quickly than quiet ones. The FPOD.exe app has a field on the Analysis tab that tells you how long your SD card will take to fill up, based on existing data. See the *F-POD Software Guide*.
- To extend deployment time, the F-POD can be set to record data intermittently: 1 minute in 2, 1 minute in 5 or 1 minute in 10. See the *F-POD Software Guide*.



Deployment environments are very variable and therefore you should consider carrying out preliminary tests of battery consumption and memory use at sea, before full deployment.



If you plan to reuse batteries, be aware that no-load voltage readings can give a very misleading view of remaining battery capacity. The FPOD.exe PC app has an option for checking the battery levels found during a deployment.

Lost and found

Write your contact details on the outside of the POD using indelible ink. Place a label inside the POD as well.

If you prefer not to write your contact details on the POD, the lid has the web site address **www.phonehome.org.uk** etched in the top.

This is a simple web site that will allow someone who finds a POD to contact us. We will then contact you to arrange its return.

Moorings

This section provides general information and guidelines that you should consider carefully when designing your moorings.

Buoyancy

When deployed, F-POD R25s have a positive buoyancy of approximately 0.68kg.

This means that PODs can be moored and allowed to float with the hydrophone housing upwards.

Location

The seabed is a source of noise from sand movement and crustaceans and the surface is a source of ultrasound from rain and breaking waves.

In shallow water, PODs should be moored midway between the bottom and the surface. In deep water, any position between 10 metres up and 10 metres down is good. The POD's polypropylene housing can be used down to 100 metres.

Deep diving cetaceans can be heard by a shallow water POD set to point downwards. Please contact us for more information.

Directionality

All PODs show lower sensitivity directly along the long axis of the housing, especially in the battery pack direction.

Security

The main problems with moorings are theft, being moved by trawlers or storms and abrasion of lines.

Theft

This is a serious risk in many areas. Some possible solutions are suggested below:

- Get cooperation and advice from local fishermen, who may allow you to use their gear.
- Use a very small marker, for example, a single fishing float on a thin line that is only at the surface at low slack tide. The disadvantage is that it may wind itself around weed or anything else and sink.
- Do not use buoys. Use a line between two anchors that can be located via GPS using a grapple.
- Use pop-ups. These are commercially available acoustic releases. We have developed our own, see hardware guides page on our website.

- Use C-links that dissolve after a set time in the water and then release a recovery buoy from the bottom.
- Use divers to deploy and recover your PODs.

Mooring lines

Design the mooring using a mixture of sinking ropes and buoyant ropes. Use sinking ropes so that no loops of cordage float at the surface to entangle propellers and buoyant ropes that do not lie on the bottom and suffer excessive abrasion.

Use knots or fixings that grip the POD lid so that there is no possibility of continual movement, creating noise that may fill the SD card. If you use a shackle you can tape this with electrical tape.

The POD lid has three 10 mm diameter holes for attaching mooring lines such as double-braided 8 mm polyester mooring line. The mooring line should go through all three lid holes and under the loop created between the first two. We have never seen this move, but we still put an overhand knot in the end of the line just to be sure.



Using anchors

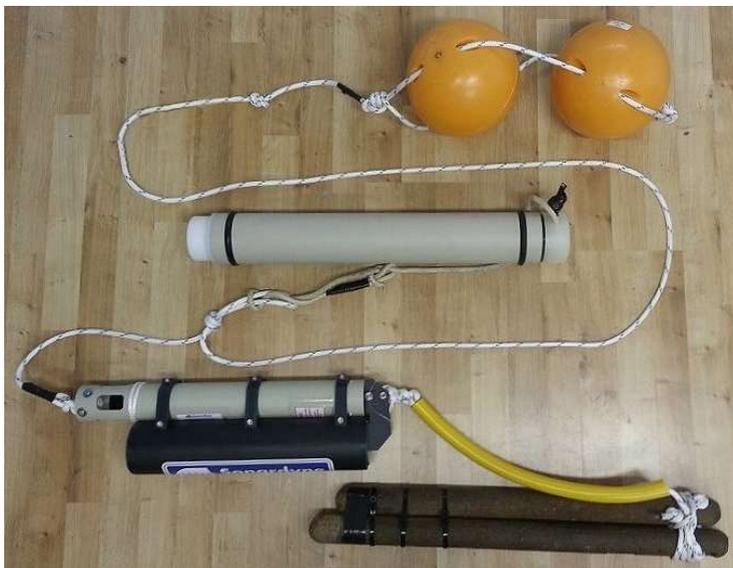
A few concrete blocks are not adequate on a sandy sea bed as these are dynamic and move with tidal currents. Massive concrete anchors, digging metal anchors or heavy metal anchors are needed. Manhole covers with a central attachment are effective but can be hard to lift.

Buoys

Try to use the smallest buoy that you will be able to find on retrieval. This helps to minimise drag in storms. However, some users have deployed large surface markers with radar reflectors and 4 tonne anchors.

You might prefer to use a short line that results in the buoy spending most of the time submerged due to the tide stream or tide height, appearing only briefly at the surface when the tide is slack or at low water. However, make sure the float will not be collapsed by the water pressure.

Another option is to use a remote release mechanism. This allows smaller anchor weights to be used as surface buoys are not required and therefore drag is greatly reduced.



Towing

Towing PODs is not recommended, for the following reasons:

- Animals are more or less undetectable unless they face the hydrophone.
- Porpoises tend to move away from moving boats and become undetectable over a width and distance that varies both with boat characteristics and with porpoise familiarity.
- Detection well beyond the range of responsive movement is unlikely with the POD so no undisturbed data set is available.
- Dolphins find towed PODs very interesting and will follow for long periods and get detected easily, but again the variables controlling this interaction are almost impossible to determine.

Towing a long way behind a yacht might give a usable way of filling weather-gaps in survey data for porpoises, and crude dolphin-encounter data.

5 Setting up F-PODs for deployment



It is strongly recommended that before you deploy your PODs, you practice setup, starting, closing, opening and downloading data, as described in this section and sections 6 and 7, so that you are confident with the operating procedures.

Setup options

The F-POD app allows you to change the following setup options:

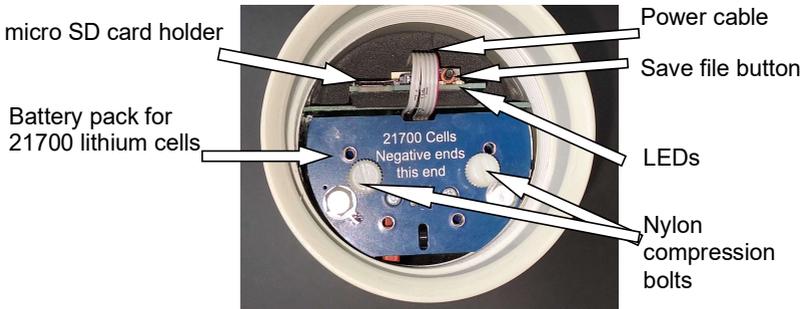
- using different types of battery
- continuous or intermittent logging
- filtering boat sonars
- automatic amplitude threshold control
- switch angle settings
- resetting the internal clock, for example, to use local time rather than UTC.

All the above options and more advanced options are described in the *F-POD Software Guide*.

Opening the F-POD

1. Use a screwdriver or bar through any one of the three holes in the lid to remove it by rotating it anti-clockwise (as seen looking at the lid end).

Internal parts



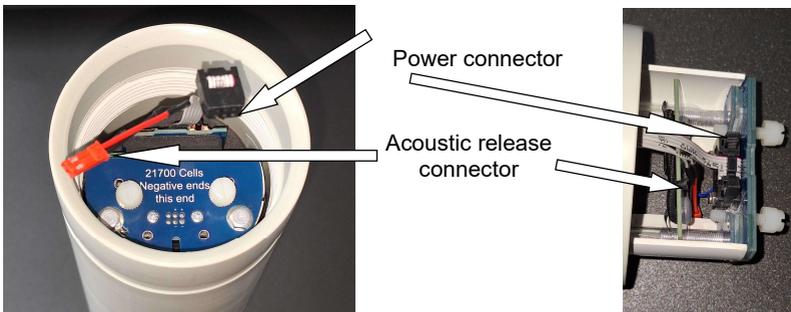
Installing batteries

The F-POD R25 battery pack consists of 25x 21700 rechargeable cells in 5 rows of 5 inside the battery pack, with the positive end of all cells facing inwards.

F-POD buoyancy varies with total cell weight. Positive buoyancy is approximately 0.68 kg with lithium 21700 batteries.

To install the batteries:

1. Please refer to the document “Lithium battery pack” on the Hardware user resources page for detailed instructions on loading batteries into the pack and also charging.
2. Once the batteries are loaded into the battery holder and the nylon compression bolts tightened you can insert the pack into the F-POD so that the negative end plate and compression bolts are facing out. Always do this on a flat surface so the F-POD is horizontal otherwise you risk the battery pack sliding out.
3. If you are not connecting your F-POD to our integrated acoustic release you should tuck the cable (the red connector) behind the end plate in the gap next to the power connector.
4. Next push the power connector into the socket and securely close the jaws around the plug, they should click into place.
5. As you slide the pack into the tube the power cable will loop up, gently slide the cable into the black foam so that it is out of the way and curves neatly over the front of the board in between the SD card reader and the button, not resting on either.



Starting the F-POD

1. Once the battery pack is connected as shown above.
2. Use one of the 32 GB micro SD cards provided by Chelonia. If one is not available, any *blank* micro SD card up to 256 GB can be used.
3. Check that the SD card is blank. This ensures that you have the maximum amount of space on the card.



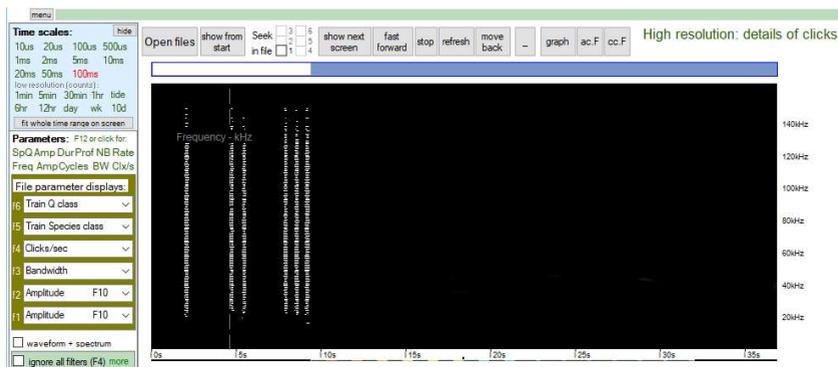
If the SD card still has F-POD data on it, the POD will start, but there is less space available for new data.

4. Insert the SD card into the card holder in the POD. Push the card down gently until it clicks into place. This switches on the POD.
5. Finally after various coloured light flashes, both LEDs flash green several times, don't worry about the exact number, it varies with software version. Once you have seen the 'happy green flashes' you can proceed to close the POD.

The 'dry land test'

If you want to check that the POD runs and records data before you start a deployment, you can do the following quick test:

1. Start the POD as above.
2. Invert the POD so the hydrophone is pointed upwards in case the angle sensor is set to only switch on when above horizontal.
3. Wait for 2 minutes to roll over.
4. Stroke the hydrophone housing a few times with your finger in a simple sequence such as 1 tap, pause, 2 taps, pause, 3 taps.
5. Stop the POD (see Stopping the POD on page 19).
6. View the data in FPOD.exe (see the *F-POD Software Guide*). You should see your sequence if you view the data at 100ms time resolution. For example:



Closing the POD

The lid is supplied with two O-rings. The O-rings have been lightly lubricated using a PTFE dry-lube oil to ensure that the lid tightens smoothly.

Tip: If you want to lubricate the O-rings before deployment, using a dry-lube lubricant minimises stickiness that might attract dust and grit.

PODs have a lid with 10 mm diameter holes for attaching mooring lines (see the figure below and *Mooring lines* on page 11). Use a bar or screwdriver located in one of the holes to open and close the lid.

To close the POD:

1. Make sure there are two O-rings in place on the lid.



Check that the O-rings are clean. Check particularly that there are no hairs, grit or sand trapped beneath the O-rings as these could cause damaging leaks.

2. Take a silica gel packet out of its moisture-proof container and place in the lid of F-POD.



There may be a risk of corrosion if there is no silica gel to keep the humidity low. Corrosion may cause power loss or failure of electronic components which may lead to data loss.

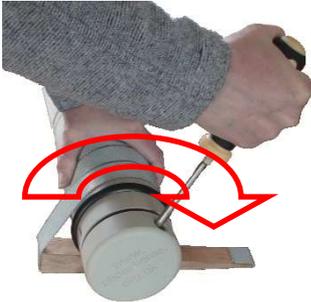


The silica gel pack can become saturated in only 30 minutes of exposure to warm damp air, so keep it in an airtight bag until you are ready to close the POD.

When dry, silica gel is yellow/orange in colour. The crystals turn green when damp.

To restore the crystals, place the bag in a microwave on a piece of cardboard and use a 'defrost' setting for about 10 minutes. For more information see Batteries and Silica gel under Hardware Guides on the website.

3. Align the lid and housing carefully and begin screwing them together until the visible O-ring is beginning to be compressed. You will feel an increase in resistance when the lid starts to press on the outer O-ring. From that point, a further quarter of a turn will complete the closure. The strap wrench shown here is not essential.



The POD is now ready for deployment.

6 Retrieving F-PODs

It is recommended that you take the following kit with you when you retrieve PODs at sea:

- a blank microSD card
- a means of recording your observations
- a scrubber and scraper to remove bio-fouling
- a heavy screwdriver and POD wrench to open and close the POD
- a towel
- an airtight container to put the silica gel in
- paper towels to clean any sand or grit that may have lodged under the O-rings
- a spare set of O-rings in case of damage
- new batteries for redeployment already loaded into a battery carrier
- a voltmeter to check battery condition, if you want to re-use batteries
- a waterproof marker pen to write contact details on the POD housing
- any tools for your attachment method
- a splash-proof box for this kit

Opening the F-POD after deployment

When you retrieve an F-POD:

1. Use a plastic scraper to clean off any heavy fouling.
2. Scrub and wash the housing.
3. Dry the POD and lid, especially around the O-ring.
4. Open the POD in a dry, stable location.

Stopping the POD

To stop the POD:

1. Press and release the **Save File** button carefully.
 - If there is data to save, the right LED flashes amber rapidly while the data is written to the SD card
 - WAIT until the LEDs flash multicolours.
 - When multicolour flashing starts you can eject the SD card.
 - If there are no LED flashes you can eject the SD card.
2. Remove the SD card and put it in its labelled SD card adapter.
3. Remove the battery pack connector spring.
4. Remove the silica gel and put it in a moisture-proof container.
5. Inspect the O-rings for damage and replace them if necessary.
6. Remove the batteries and note which stack each one comes from.

7 Downloading your data

When you have retrieved your SD card from a deployed F-POD, you can read the data from the card to your PC using the FPOD.exe app.

There are various formats of the SD card data but in all cases the data is in files ending with .CHE. The latest format generates one file for every day of logging.

In all cases you use the F-POD app to select any of the .CHE files and it determines the file sequence and format. The steps are in the 'FPOD reading the SD card.pdf' that you can download from the Chelonia website.

After you have downloaded all the data from your SD card erase the card completely or reformat it.

F-POD report files

When the POD is started, it writes a text file called REPORT.TXT that contains information about the POD and any technical issues encountered in the *previous* deployment. Some 'errors' are technical and not associated with any defect in the data.

If you have problems with a POD, we may ask you to run and stop the POD and then send us the REPORT.TXT file.

Data files

When the CHE files are downloaded using the FPOD.exe app, they are saved on your PC as FP1 files.

In the FPOD app you should enter an accurate and consistent location name in the 'Site name' text box.

The screenshot shows the FPOD app interface with a light blue background. At the top, there are tabs: 'Read SD', 'Files', 'Filters +files', 'Display', and 'Trair'. Below the tabs, there is a text input field with the placeholder text 'Create .FP1 or .CP1 raw data files on your PC from data on an'. The main form area is divided into two sections. Section 1 is titled '1: Site name' and contains a text input field with the value 'TaterDhu2' and a checkbox labeled 'no gaps'. Section 2 is titled '2: Metadata' and contains several input fields: 'Deployment' (with '(saved in the file)' below it), 'other information', 'Water depth m', 'POD de', and 'LAT' (with '...' to its right).

The data will then be saved as an FP1 file with a name such as: *TaterDhu2 2024 5 4 FPOD_7099 file0.FP1* This structure of file name works well – keep all the files in one directory and then sorting them by name has the effect of sorting them by site, then date, then POD number then file number in a deployment which is ideal!

Reading the SD card

Many laptops have satisfactory micro-SD or SD readers. If not purchase a known brand of card reader.

1. Insert the micro-SD card into the card reader.
2. Insert the card reader into a USB port on your computer.
Your PC will detect the SD card automatically and identify it as a removable drive.
3. If Windows reports an error and offers to scan the card, accept that and it generally completes quickly reporting 'no errors found'.

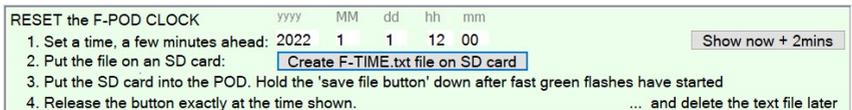
For information about how to use FPOD.exe, refer to the *F-POD Software Guide*.

Resetting the internal clock

The F-POD has a real-time internal clock. The correct UTC time is set during manufacture, but you can also set the clock time very simply, to local time for example, by using an SD card and the FPOD.exe app.

To reset the clock:

1. Open the POD, insert the batteries and fit the battery pack connector spring.
2. Run the **FPOD.exe** app and click on the **Settings** tab. The clock controls are displayed:



3. Using one of the micro SD cards, delete any files on the card.
4. Make sure that you are near an accurate clock.
5. Enter a time value a minute or two ahead of the current time in the **yyyyMMddhhmm** boxes or click the **Show now + 2mins** button assuming your Windows computer clock is accurate.
6. Click **Create F_TIME file on SD card**.
7. Navigate to the micro SD card and click **Save**.
8. Remove the SD card and insert it into the POD.
9. The POD begins its startup sequence and then one LED flashes green rapidly and this will continue indefinitely.

10. Press and hold the **Save file** button about 10 seconds before the time you set and *exactly* when the clock time matches the time you set in the F_TIME file, *release* the button. After a brief pause, the POD completes its start-up and LEDs flash green 4 times – the ‘happy flashes’.
11. Press the **Save file** button to stop the POD.
12. Remove the SD card and delete the files on it.
13. To check the clock:
 - Do the ‘dry land test’ making a note of the exact time of the first tap in your distinctive tap sequence.
 - Stop the POD, read the data and check the time shown for that first tap.

8 Analysing your data

The F-POD app allows you to view, analyze and export your data. It includes automatic click train detection using the KERNO-F classifier and encounter classifiers that we will continue to develop as more data becomes available (see the *F-POD Software Guide*).

This path of developing an app which can be used on all collected data, has been successfully followed in the F-POD's predecessor, the C-POD. The provision of a single method for use in a wide range of projects has been a key aim in the development of the C-POD and F-POD.

We would like to use customer F-POD data to help us improve the accuracy and sensitivity of the F-POD PC app train filter and species identification. Any app improvements we make will always be retrospectively applicable to all data sets and new versions of the F-POD app will be available free of charge, so that you can re-analyse your data.

If you send us a copy of your F-POD data, we will, in return, provide brief feedback on the quality of your datasets free of charge. Any data you send us will be kept in complete confidence.

You can send your data to us in the form of FP1 files using

- www.chelonia.wetransfer.com

You should examine the major features of each data file, including number of clicks logged per day and detection rates, and compare these with earlier data sets to verify that the instrument is still working normally.

9 Maintenance

Cleaning

Use a scrubbing brush to remove all marine growth and dirt completely. Wash and dry the POD.

O-rings



O-rings must be clean of all contamination – especially hairs and grit – before you close the POD. Any dirt on the O-rings may cause water to leak into the POD housing, causing damage to the electronics and loss of data.

Whenever you open the POD, follow the guidelines below:

- Place the POD housing on a clean hard surface.
- Check if there is any water between the outer and inner O-rings when the POD is opened.
- If an O-ring has picked up particles, remove it using a blunt tool like the end of a small spoon.
- Carefully clean all surfaces.
- If you are in any doubt about the state of the O-rings, replace them with new ones. A spare set of O-rings is supplied with new PODs. Replacements are available from Chelonia Limited.

Transducer housing

Bio-fouling or contamination with grease or paint can be removed using the kind of abrasive pads and preparations used for cleaning cooking utensils.

Mooring lines

Inspect the mooring lines after every deployment for signs of wear – mainly abrasion against rough surfaces.

Silica Gel

Silica gel packs should be inserted into the POD to absorb any water vapour and keep the electronics dry.

When you remove a silica gel pack after opening a POD, put it immediately into an airtight container.

When dry, silica gel is yellow/orange in colour. The crystals turn green when damp.

To restore the crystals, place the bag in a microwave on a piece of cardboard and use a 'defrost' setting for about 10 minutes.

Storage

Before you store your PODs:

- Remove all batteries.
- Clean off all barnacles and other marine encrustations.
- Wash the outside of the POD housing and any mooring lines using fresh water.

Protect the PODs from direct sunlight, which causes slow deterioration of the housing, O-rings and any mooring lines.

If you are storing PODs in a dry place, leave them open.

If you are storing PODs in a damp place, store them closed, with active silica gel packs inside.

10 Troubleshooting

Can I use any SD card in an F-POD?

The F-POD is designed to run using any *blank* micro SD card up to 32 GB capacity. We recommend that you format the SD card before use.

When I try to start the POD, the red LED flashes

If these persist for more than 2 minutes they signify various issues including:

- The SD card is full.
- The SD card is damaged.
- You have run the POD multiple times with the same SD card without deleting the files on the card. Remove the SD card and delete the files on it or format it.
- The batteries are exhausted or faulty
 - Remove the batteries and check that they have been inserted correctly. See “Lithium battery pack” on the Hardware user resources page.

When I try to start the POD, 1 or 2 yellow/amber LEDs stay on

- The time has not been set or has been erased following a software update. See *Resetting the internal clock* on page 21

When I download my data, the app offers to save a second file in format filename series 1 file 0.FP1

You did not delete all the files on the SD card before you ran the POD. This means that there is more than one deployment session on the card. Simply save each FP1 file, but be aware that the *last file you save* is the latest deployment. See *Data files* on page 20 for more information.

Notes on coloured light flashes and possible faults



After various coloured lights both LEDs flash green a few times (usually between 3 and 5 times) - the 'happy flashes' - to indicate that the POD has started running.



If one of the blue LEDs does not light, there is a problem with one battery stack. Left LED off = left battery stack fault, right LED off = right stack fault. Remove the batteries and check their voltages.



If, after startup, one LED flashes red every 4 seconds, there is a problem. Possibly, the SD card is full or there are already 10 deployment data files on the card. Remove the SD card, delete any files on it and try again.



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