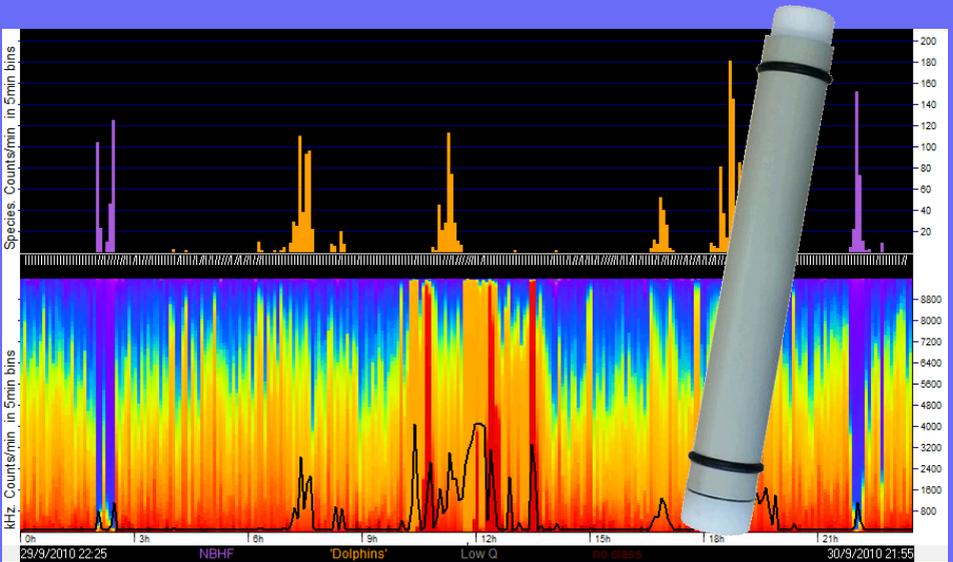# Chelonia Limited
Wildlife Acoustic Monitoring

C-POD
User Guide

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November 2019

Contents

1   Introduction

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

C-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.

C-PODs record the time of occurrence, centre frequency, intensity, duration, bandwidth and frequency trend of tonal clicks within the frequency range 20 kHz to 160 kHz. This allows them to monitor clicks from all odontocetes except sperm whales. Digitised sound is not stored.

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

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

The C-POD characteristics, settings in use during logging and click data are stored on a Secure Digital (SD) flash card in the C-POD.

After deployment, the data are downloaded from the SD card onto a PC and are then analysed using the supplied C-POD PC software. The software automatically identifies the presence of cetaceans by detecting the trains of ultrasonic echo-location clicks they produce.

Help and support

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

Your C-POD purchase also entitles you to free future software upgrades.

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

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

Keep up-to-date with important changes by joining the C-POD User Group, at www.chelonia.co.uk/cug_join.htm.

You can also contact us in the following ways:

Chelonia Limited
The Barkhouse
North Cliff
Mousehole
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TR19 6PH
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2   Checking parts

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

Houses the hydrophone

Contains the battery pack, SD card and electronics

C-POD User Guide

Spare O-rings

Battery pack connector spring

SD cards, located inside the POD lid and SD card holder

SD card reader

Silica gel

Lid
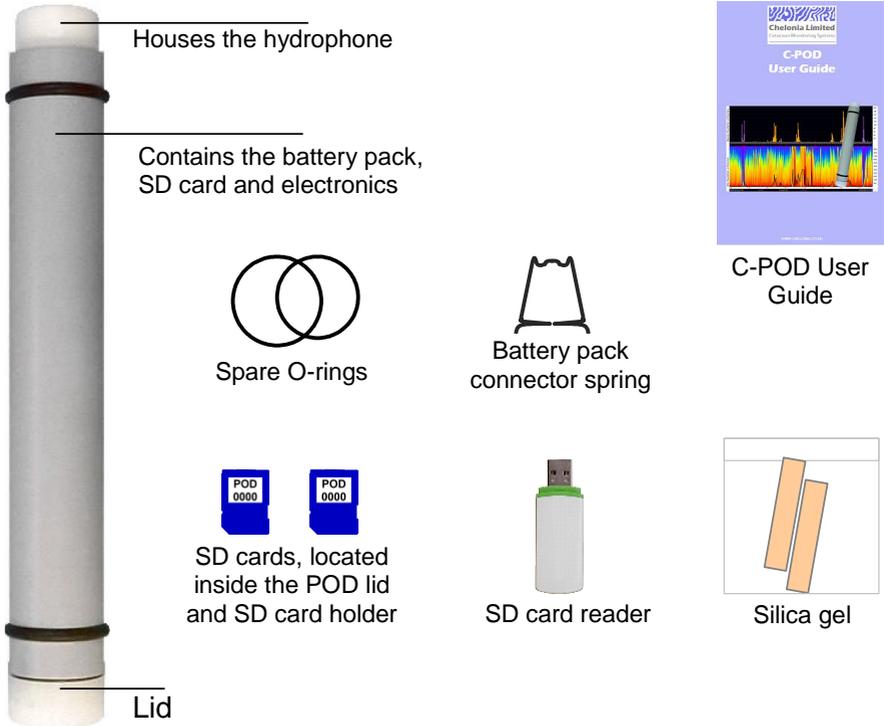
C-POD

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

C-PODs are very robust, but be careful not to drop the C-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 C-POD lid and keep it waterproof when it is closed. Use these spares to replace the existing O-rings if they become damaged.

Secure Digital (SD) cards

Two SD cards are supplied with each C-POD. On delivery, you will find one SD card in the POD's SD card holder and one in the lid.

SD cards are **not interchangeable** between C-PODs and are labelled with their correct C-POD number to help prevent them from being used in the wrong C-POD.

⚠️ **The SD cards are specially formatted with the files SETUP.CHE, DATA0.CHE, DATA1.CHE, DATA2.CHE and DATA3.CHE. These files should not be changed and no other files should be added.**

No setup is required – all the setup information for the C-POD is already stored on the SD card. When the C-POD is deployed, it writes click data to the card. On retrieval, you copy the data from the card by using a PC, running the CPOD.exe software. When you retrieve a C-POD after deployment, you can replace the SD card with the spare and immediately redeploy the C-POD.

The SD cards have a write protect tab on the side. To run the POD, the tab should always be down, in the unlocked (read/write) position, as shown below. **If it is moved up to the locked position, the POD will not start.**

Required for the POD to run.

Lock after deployment to protect your data.

UNLOCKED

LOCKED
(write protected)

Silica gel pack

The silica gel pack is used to prevent condensation on the inside of the C-POD when it is deployed. Two packs are supplied for 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.

The silica gel pack slides down between the batteries and the POD housing.

Additional requirements

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

C-PODs use 10 alkaline D-cell batteries (not supplied). See the section *Calculating the maximum deployment time* on page 11 for advice on how to plan your deployment time.

The section *Retrieving C-PODs* on page 24 contains a recommended kit list for deploying and retrieving PODs.

3   Software installation

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

Tip: Visit the links below on a regular basis to check for updates and modification information or join the C-POD User Group, at www.chelonia.co.uk/cug_join.htm.

Installing the software

Tip: The C-POD software is being developed and improved continuously. Make sure you have the latest version of the program as well as the software guides.

To install the C-POD software:

1. Create a folder called **CPOD** on your computer.
2. Go to the Chelonia C-POD downloads page at:

   http://www.chelonia.co.uk/cpod_downloads.htm
3. Download **CPOD.ZIP**.
4. Double-click on the ZIP file to open it. The ZIP file contains two files:
   - **CPOD.EXE** which is the C-POD software that analyses, displays and exports C-POD data
   - **CPOD specific settings.txt** which contains offset values for all individual PODs
5. Drag and drop the two files into the **CPOD** folder.
6. Download any other support documents such as setup videos, software guides and example files.
7. Create a subfolder for your data files, called **cpod data**.

Installation is complete.

Other files

You can also download the latest version of this User Guide, the Software Guide and example files from:

   http://www.chelonia.co.uk/cpod_downloads.htm

Uninstalling the software

To uninstall the C-POD software:

1. Delete the **CPOD** folder, along with any other C-POD files.

4   Planning your deployments

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

Calculating the maximum deployment time

Nominal maximum values for alkaline D-cell batteries are typically:

- 1.5V 20Ah ~30Wh

Maximum deployment time is dependent upon the following factors:

- The capacity of the D-cells.
- The capacity of the SD card.

> 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.

> Battery no-load voltage readings can give a very misleading view of remaining battery capacity.

Lost and found

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

If you prefer not to write your contact details on the C-POD, the POD 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 C-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, C-POD's have a positive buoyancy of approximately 0.7 kg.

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

Angle sensing

The C-POD contains an angle sensor which records the angle-from-vertical each minute. The angle can be viewed in CPOD.exe, when you have copied your data files after deployment, enabling you to ensure that the C-POD was correctly deployed.

By default, the sensor is set to prevent logging until the POD is deployed (when the hydrophone housing floats higher than the lid). This allows the POD to be set up and transported some time before deployment, saving power and memory.

Tip: These default settings can be changed, for example, if you need to deploy the POD with the hydrophone down or need the POD to log at any angle (see the *C-POD Software Guide*). **Care should be taken when using this feature as deployment at the wrong angle could prevent data logging.**

ON/OFF angles can be set up on the POD's SD cards, using the cpod.exe software. This example shows the default for "hydrophone up" deployment.

ON – means the POD is logging clicks, temperature and angle.

ON

lid

OFF

OFF – means the POD is only logging ambient temperature and angle. This mode saves battery power and memory. When the POD goes hydrophone up again, it resumes logging clicks.
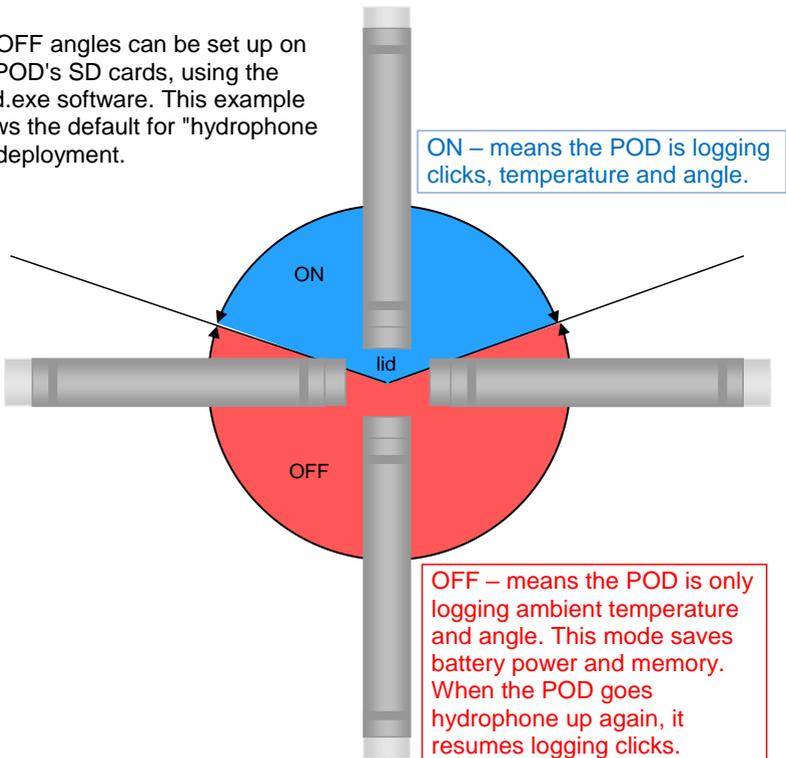
Location

The sea bed 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. However, currently they are very expensive.
- 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 C-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 C-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 C-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.

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 minimises 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, such as the Sonardyne Lightweight Actuation Transponder (see below). This allows smaller anchor weights to be used as surface buoys are not required and therefore drag is greatly reduced.
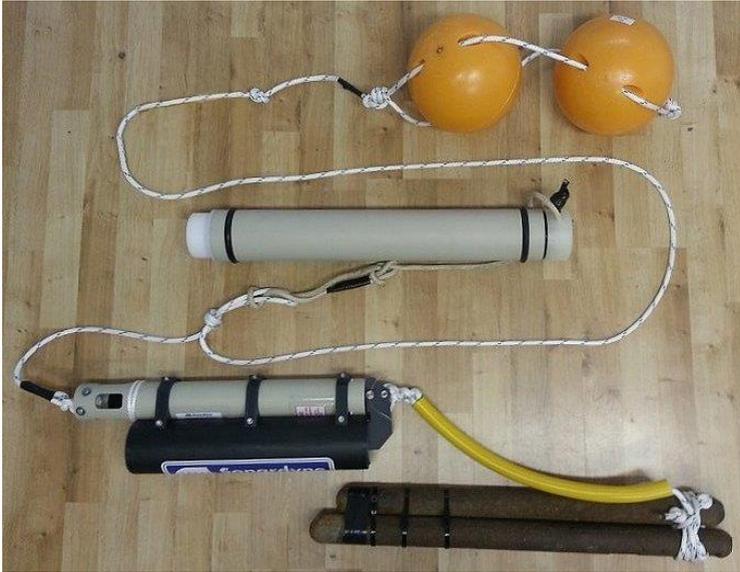
Towing

Towing PODs is not normally 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 C-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 about the operating procedures.
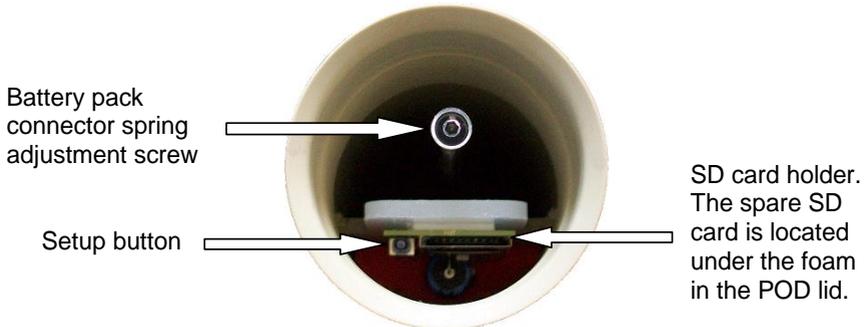
Tip: A link to brief videos showing how to start and stop the POD can be found on the Chelonia web site at:

http://www.chelonia.co.uk/cpod_downloads.htm

Opening the C-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

Battery pack connector spring adjustment screw

Setup button

SD card holder. The spare SD card is located under the foam in the POD lid.

Installing batteries

The POD battery pack consists of 2 stacks of 5 cells, side-by-side in the POD housing, with the positive end of all cells facing inwards.

For most purposes, alkaline D-cells are recommended. See *Calculating the maximum deployment time* on page 11 more information.

Rechargeable D-cells can be used, providing the voltage from each stack does not exceed 11 volts. However, the self-discharge rates and power density of most types of rechargeable D-cell means that running times are reduced below half.

> ⚠️ The total voltage of each stack of cells must not exceed 11 volts. **Supply voltages above 11 volts will damage the C-POD irreversibly.**

⚠️ A stack of Lithium D-cells **must not be used** – the voltage from four cells is too high and will damage the C-POD irreversibly. Two lithium D-cells and conducting 'blank cells' could be used, but the capacity advantage is minimal.

⚠️ NiCad rechargeable batteries are not recommended as they are heavy and are likely to sink the C-POD. They also have a high self-discharge rate so that the running time is shorter than you would expect from the capacity of the cell.

⚠️ No-load voltage readings can give a very misleading view of remaining battery capacity.

C-POD buoyancy varies with total cell weight. Using alkaline D-cells, buoyancy is approximately 0.7 kg.

The C-POD uses one stack of D-cells at a time. The electronics selects the stack that provides the lower voltage. When the voltage from this stack of cells falls too low, the C-POD software selects the other stack of cells automatically.

To install the batteries:

1. Inspect the batteries for damage. If the insulation around the outside casing of the battery is damaged, it can cause the battery pack to short-circuit. Either repair it with tape or use a new battery.

2. Place the C-POD on a horizontal surface.

3. Slide the cells into the C-POD, one by one, filling first one stack and then the other.

⚠️ All the cells should face the same way – **positive end facing into the C-POD**.

4. Fit the battery pack connector spring as shown below by squeezing the spring gently and passing the loop in the bottom of the spring over the rod. Then slide the spring down the rod until it touches the batteries

This part fits underneath the screw head

This part wraps around the metal rod and rests against the partition

These parts fit on the ends of the batteries
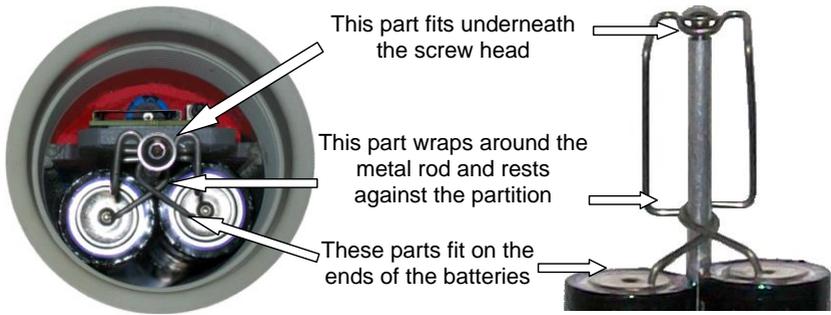
5. Adjust the screw in the top of the rod so that the dome of the screw is just below the top of the connector. This means you will only have to push the connector down approximately 7 mm to engage the head of the screw. This ensures that the battery pack is held securely, but not too tightly, as too much pressure could deform or damage the battery casings.

~ 7 mm

6. Disconnect power for at last 4 minutes, to allow the POD electronics to discharge.

Starting the C-POD

Connect power

1. Fit the battery pack connector spring as shown above.

   The power LED flashes rapidly (approximately 2 times a second) to indicate that power is connected.

Insert the SD card

1. Install the batteries and connect power as described above.
2. Check that the SD card tab is in the unlocked (read/write) position (see *Secure Digital (SD) cards* on page 8).

 If the SD card tab is in the locked position, the POD will not start.

3. Insert the SD card into the card holder in the C-POD and push it down *quickly but gently* until it locates in the card holder.
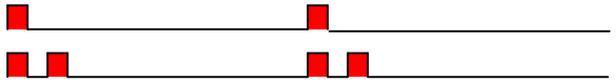

C-PODs up to 2040: The power LED gives either a brief single or double flash per second, depending on which battery stack is being used.

C-PODs 2041 onwards: The LED flashes to indicate the number of power sources connected. If the LED does not flash twice, your battery stacks are not working correctly.
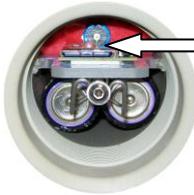
Brief single or double LED flash every second

If the power LED does not show the correct sequence of flashes, your C-POD may not be set up correctly. This can happen if you push the SD card in too slowly – the LED gives a long flash about once a second.

Remove the SD card and disconnect the power for at least 4 minutes to ensure that the POD electronics are reset. Then reconnect the power and reinsert the SD card.

Do not simply remove and reinsert the SD card as the POD will not start properly and this may lead to complete data loss.

Start the POD

The C-POD has an accurate timer but no knowledge of the date or time. In order to have accurate times and dates in your data, **you must record the date and time that you start the C-POD**.

1. Install the batteries, connect power and insert the SD card as described above. Make sure that the LED is giving a brief single or double flash every second.

2. Make sure that you or someone else is ready to note down the date and exact time.

3. Hold down the setup button about 15 seconds before the end of the clock minute (the LED stops flashing for 3 seconds and then stays on).

   The C-POD now reads the setup file on the SD card (this takes about 3 seconds) and then the LED lights and stays on until you release the button.

4. Release the button exactly on the end of the minute **and note the date and exact time**.

   The LED flashes briefly a few times and then gives one very short single flash every few seconds.

   The C-POD starts recording its angle-to-vertical and the ambient temperature each minute.

> The C-POD will not start logging click data until the hydrophone is higher than the lid. This allows you to transport the POD without wasting battery power and memory space. When the C-POD is deployed in the sea, it will float vertically, hydrophone housing upwards, and will start logging automatically (see *Buoyancy* on page 11 and *Angle sensing* on page 12).

Tip: Write the date and time on a small plastic bag that can be left inside the C-POD under the foam in the C-POD lid. When you retrieve the C-POD, place the SD card in the bag. You can enter the date and time into CPOD.exe when you copy your data onto your PC and it will be incorporated into the data file.

Setup summary

The set-up sequence is summarised below:

When the C-POD is deployed and floats vertically, hydrophone up, it will start logging.

If the power LED does not show the correct sequence of flashes, your C-POD may not be set up correctly. Remove the SD card and disconnect the power **for at least 4 minutes** to ensure that the POD electronics are reset. Then reconnect the power and reinsert the SD card.

Tip: A link to brief videos showing how to start and stop the POD can be found on the Chelonia web site at:

http://www.chelonia.co.uk/cpod_downloads.htm

Tip: If your POD fails to start correctly, refer to section *10 Troubleshooting* on page 34.

Checking the POD starts, runs and stops

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. Turn the POD so the hydrophone is up.
3. Wait 1 minute, until the POD start logging.
4. Stroke the hydrophone housing a few times with your finger in a simple sequence such as 1 stroke, pause, 2 strokes, pause, 3 strokes.
5. Stop the POD (see *Checking the status of the POD and removing the SD card* on page 25).
6. View the data in CPOD.exe (see the *C-POD Software Guide*). You should see your sequence if you view the data at 50 ms time resolution. For example:
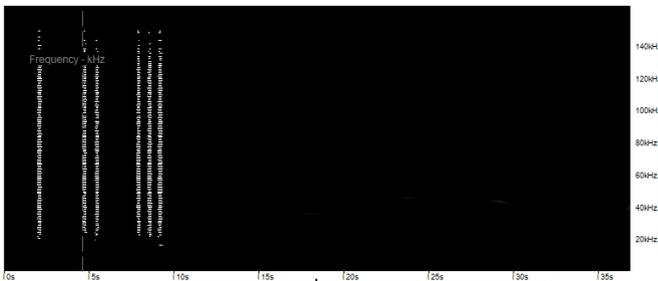
Closing the C-POD

The C-POD 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 wetness and stickiness that might attract dust and grit.

PODs have a lid with 10 mm diameter holes for attached mooring lines (see figure below and *Mooring lines* on page 13). Use a bar or screwdriver located in one of the holes to open and close the lid.

To close the POD:

1. Ensure that the bag for the SD card, with the start date and time, is placed under the foam in the lid.

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

O-rings

Holes for locking bar and security line

 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.

3. Take a silica gel packet out of its moisture-proof container and slide it down **between the batteries and the POD housing**.

 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 jar or bag until you are ready to close the C-POD.

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

To restore the crystals, place the bag in an oven and heat at 120°C for two hours.

4. Align the lid and C-POD housing carefully and begin screwing them together. Screw the C-POD and lid together tightly ensuring that the visible O-ring is compressed.

The C-POD is now ready for deployment and is recording its angle to vertical and the temperature every minute.

The default setting is for logging only when the hydrophone is higher than the lid, so the POD will not start logging click data if it is kept horizontal. This allows you to transport the POD without wasting battery power and memory space. When the POD is deployed in the sea, it will float vertically, hydrophone housing upwards, and will start logging automatically (see *Buoyancy* on page 11 and *Angle sensing* on page 12).

6   Retrieving C-PODs

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

- the spare SD card
- a means of recording your observations
- a watch, to note the exact time of retrieval and redeployment
- a scrubber and scraper to remove bio-fouling
- a heavy screwdriver and C-POD wrench to open and close the C-POD
- a towel
- a pair of tweezers to remove the silica gel
- 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
- the spare battery pack connector spring
- new batteries for redeployment
- a voltmeter to check battery condition, if you want to re-use batteries
- a waterproof marker pen to write contact details on the C-POD housing
- any tools for your attachment method
- a splash-proof box for this kit

Tip: When you retrieve the C-POD, it will continue to log while the hydrophone housing is higher than the lid. If you are not opening the POD immediately, store it horizontally, or hydrophone down, to save power and memory. In this position, it logs only its angle to vertical and ambient temperature.

Opening the C-POD after deployment

When you retrieve a C-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.

Checking the status of the POD and removing the SD card

As soon as you have opened the POD after deployment, make a visual inspection and make a note of the LED status. Then read the appropriate section below.

LED OFF

The POD has stopped.

1. Remove the SD card by pressing down gently on the card and then allowing it to spring up.

- If the POD lost power suddenly, there will be no summary file on the SD card.
- If the batteries have run down or if the SD card is full, the POD will have shut down and recorded a summary file.

Flashing on/off twice/second

The POD has reset or was not started.

1. Remove the SD card by pressing down gently on the card and then allowing it to spring up.

Single or double flash/second

The POD was setup but not started.

1. Remove the SD card by pressing down gently on the card and then allowing it to spring up.

One brief flash every 2 seconds

The POD is running correctly, logging temperature and angle to vertical.

Tip: In the step below record the date and exact time that you release the setup button. This will allow you to check in the software later that your deployment time matches the length of your data.

1. Press and hold down the setup button until the power LED lights.
2. As soon as the LED lights, you can release the setup button **and note the date and exact time**.

   The C-POD stops recording and the LED stays on briefly while the POD writes a data summary on the SD card.
3. Remove the SD card by pressing down gently on the card and then allowing it to spring up.
4. Move the SD card tab to the locked (write protected) position.

Completing retrieval

Tip: If you disconnect the batteries before recording the data summary, your data will not be damaged and it can still be copied from the SD card using CPOD.exe. However, you will not be able to view the summary data before you copy the files (see section *7 Downloading your data* on page 28).

1. If you have an SD card bag inside the lid with the start date and time on it, put the card in it now.
2. Remove the battery pack connector spring.
3. Remove the silica gel and put it in a moisture-proof container.
4. Inspect the O-rings for damage and replace them if necessary.
5. Remove the batteries and note which stack each one comes from.
6. Check and record the voltage of each battery.

Redeploying the C-POD immediately

You must disconnect the power **for at least 4 minutes** to ensure that the POD electronics are reset, before you redeploy your POD.

If you want to redeploy the C-POD immediately:

1. Remove the battery pack connector spring, silica gel and batteries.
2. Insert new batteries or re-insert the old ones if they are suitable.
3. Insert the battery pack connector spring. Observe that the power LED flashes rapidly on and off.
4. Check that the spare SD card tab is in the unlocked (read/write) position (see *Secure Digital (SD) cards* on page 5).
5. Insert your spare SD card and press in down *quickly but gently* to locate it in the holder. Observe that the power LED gives either a single or double short flash per second, depending on which battery stack is being used.

Any data on the SD card will be overwritten when you start the C-POD.

6. Insert the silica gel pack between the battery stacks and the POD housing.
7. Press and hold down the setup button until the C-POD power LED goes out and comes on again (about 3 seconds).
8. Release the button and note the date and exact time.

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9. Observe that the power LED is flashing once very briefly every few seconds.
10. Close the C-POD.

7 Downloading your data

When you have retrieved your SD card from a deployed C-POD, you can read the data using the CPOD.exe software.

Do not format the SD card, or write any files on to it. The SD card uses a special format which you can read only by using CPOD.exe. **If you use any other application to write to the SD card it will become unusable and any data on it may be corrupted or lost.**

The CPOD.exe software has a Summary feature that allows you to check the data on the SD card quickly, so that you can make a decision about whether to redeploy the C-POD or spend time downloading the data files and analysing them. Note that logging time in the summary file can be up to 10% lower than your recorded time.

The files are on the SD card are:

DATA0.CHE, DATA1.CHE, etc – the data files, each of about 1 GB

SETUP.CHE – a very small file containing configuration details

After an SD card has been read into a PC it can be put back into a C-POD for redeployment. Any new data will overwrite the old data on the card.

Connecting the SD card to a PC

To set up your SD card:

1. Insert the SD card into the SD card adaptor.
2. Insert the adaptor 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 displays AutoPlay or Scan and Fix options, close the windows without selecting any options.

    If you select AutoPlay options, Windows writes a file called autorun.inf to the SD card that causes data corruption. However, if you have set the SD card switch to read only, the data cannot be corrupted.

    Tip: If you think you may have corrupted the data on your SD card, please contact us as we may still be able to retrieve the data for you.

Running the CPOD.EXE software

In the CPOD folder:

1. Run **CPOD.exe**. The main window is displayed.

2. To display and hide menu options, move the mouse cursor into the blue bar at the top of the CPOD.exe window or click in the toolbar to the right of the buttons.

3. Display the menu options.

4. Click on the **Read SD** tab.

Viewing summary data

To view a summary of the data of the SD card before it is copied:

1. Click the **Show summary from DATA0.CHE** button.

2. Locate the SD card with the volume name CHELONIA and open the file DATA0.CHE. A brief summary of the data is displayed.

   You can use this summary to decide whether to extract the data to your PC now (large amounts of data can take a long time to copy) or wait until a more suitable time.

Copying data from the SD card

The date, time and location data that you enter below are important – do not skip the steps.

To extract data from a C-POD SD card:

1. On the **Read SD** page, enter the time the POD was started.

   The date and time will be added to the data in the file when it is copied to your PC.

2. Enter location and date information that CPOD.exe will use to append to the data file name.

3. Enter any deployment notes that you want added to the data file.

4. To extract the data from the SD card to your PC, click **Read SD card**.

5. Locate the SD card, select the data file DATA0.CHE and click **Open**.

   A confirmation dialog box is displayed, showing the POD number.

6. If the POD number is correct, click **Yes**.

   CPOD.exe suggests a name for the data file, based on the parameters you entered above. You can simply accept the default name or change it.

7. Locate the **cpod data** folder where you should store your C-POD data files and click **Save**.

   Tip: If you save all your .CP1 files in the same folder, it's easier to batch process files using the software.

CPOD.exe extracts any data in the .CHE files and creates corresponding data files for each one that contains data from your deployment. This means that the software will create one to four files:

DATA0.CHE → *filename*_file01.CP1
DATA1.CHE → *filename*_file02.CP1
DATA2.CHE → *filename*_file03.CP1
DATA3.CHE → *filename*_file04.CP1

Tip: When you have extracted and safely stored the data from the SD card, you can reuse the card immediately – it does not need to be set up as the C-POD setup information is retained on the card. Any data on the SD card will simply be overwritten by the C-POD when it is deployed.

8   Analysing your data

The CPOD software allows you to view, analyze and export your data. It includes automatic click train detection using the KERNO classifier and encounter classifiers that we will continue to develop as more data becomes available (see the C-POD Software Guide, CPOD.PDF, at www.chelonia.co.uk/cpod_downloads.htm).

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.

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

If you send us a copy of your C-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 any of the following ways:

- email
- post an SD card to us. See our contact details on page 6.
- copy the data files onto a CD-ROM or DVD and post it to us.
- via www.chelonia.wetransfer.com
- via another file transfer service.

For an introduction to analysing your data, download and read the software guides on the Chelonia web site (see *Installing the software* on page 10).

9 Maintenance

Cleaning

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

O-rings

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

Whenever you open the C-POD, follow the guidelines below:

- Place the C-POD housing on a clean hard surface.
- Look to see if there is any water between the outer and inner O-rings when the C-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 C-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.

Electronics

Do not connect batteries or other DC power supplies above 11 volts. **Supply voltages above 11 volts will damage the C-POD irreversibly.**

Silica Gel

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

When you remove a silica gel pack after opening a C-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 an oven and heat at 120°C for two hours.

> 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.

Storage

Before you store your C-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 C-PODs from direct sunlight, which causes slow deterioration of the housing and mooring line.

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

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

10 Troubleshooting

When I connect power, the LED lights and stays on.

▪ Check that the batteries have been inserted correctly by removing and replacing them. See *Installing batteries* on page 16.

When I deployed the POD, I forgot to write down the date and time.

▪ When you recover the POD, if the power LED is still flashing, you can give data files a ±1 minute accuracy by recording the end date and time when you press/release the setup button to record a summary file (see *Checking the status of the POD and removing the SD card* on page 25).

When I connect power, the power LED does not light.

▪ **Batteries inserted incorrectly:** Check that the batteries are inserted correctly – positive end facing into the C-POD.

▪ **Battery voltages too low:** Check the battery voltages. The C-POD requires at least 4 volts in order to run. However, if you are reusing alkaline batteries, be aware that no-load voltage readings can give a very misleading view of remaining battery capacity and load voltage. If you are unsure, use new batteries.

▪ **Batteries damaged:** Check the battery casings for damage to their insulation – breaks in the insulation can cause shorting. Also check for leakage.

▪ **C-POD electronics have not reset:** Disconnect the power for at least 4 minutes or longer, if necessary.

▪ **Corrosion of battery contacts:** The positive terminal battery contacts inside the housing may be corroded. Use a flashlight to inspect them. Lightly abrade them using sandpaper to remove any corrosion.

When I connect power and insert the SD card, the power LED continues to flash on and off, instead of giving either a single or double brief flash per second.

▪ **You inserted the SD card too slowly, so the POD electronics could not set up the card correctly:** Remove the SD card, disconnect the batteries, and wait at least 4 minutes. Then start the setup procedure again (see *Starting the C-POD* on page 18). When you insert the SD card, push in down *quickly but gently* to locate it in the holder. Brief videos showing how to start the POD can be found on the Chelonia web site at: http://www.chelonia.co.uk/cpod_downloads.htm

▪ **The POD electronics have not been discharged and reset:** Remove the SD card, disconnect the batteries, and wait at least 4 minutes. Then start the setup procedure again (see *Starting the C-POD* on page 18).

- **The SD card holder is damaged:** Try the spare SD card. If this does not work either, check that the cards are locating in the holder correctly. Please contact us for return and repair.
- **The write protect tab on the SD card has moved up to the locked (read-only) position:** Move the tab down to the unlocked (read/write) position (see secure digital cards *Secure Digital (SD) cards* on page 8). Then start the setup procedure again (see *Starting the C-POD* on page 18).
- **The SD card is damaged:** Start the setup process again, using the spare SD card. Please contact us for a new SD card.

*The POD stopped shortly after I started it.*

- **Corrosion of battery contacts:** The positive terminal battery contacts inside the housing may be corroded. Use a flashlight to inspect them. Lightly abrade them using sandpaper to remove any corrosion. A tool to clean the contacts is available free-of-charge from Chelonia.

When I opened the C-POD after deployment, the power LED was off.

- **Batteries exhausted:** When battery voltage drops too low, the C-POD writes a data summary to the SD card and shuts down automatically. Your data and summary files will be intact. You can copy them to your PC in the normal way using CPOD.exe (see *Downloading your data* on page 28).
- **Battery power failed suddenly:** The C-POD may not have been able to write a data summary. However, any data recorded up until the power failed will be intact. You can copy the data files to your PC in the normal way using CPOD.exe, but you will not be able to view summary information first (see *Downloading your data* on page 28).
- **Corrosion of battery contacts:** The positive terminal battery contacts can suffer from corrosion if they become damp. This can cause a loss of power and data. A tool to clean the contacts is available free-of-charge from Chelonia.
- **SD card full:** If the SD card becomes full, the POD writes a summary file and shuts down automatically. Your data and summary files will be intact. The SD card could become full if the POD has been deployed for a long period in a very noisy environment (see *Calculating the maximum deployment time* on page 11).

I'm not sure what some of the LED flash sequences mean.

▪ The various LED flash sequences are shown below.
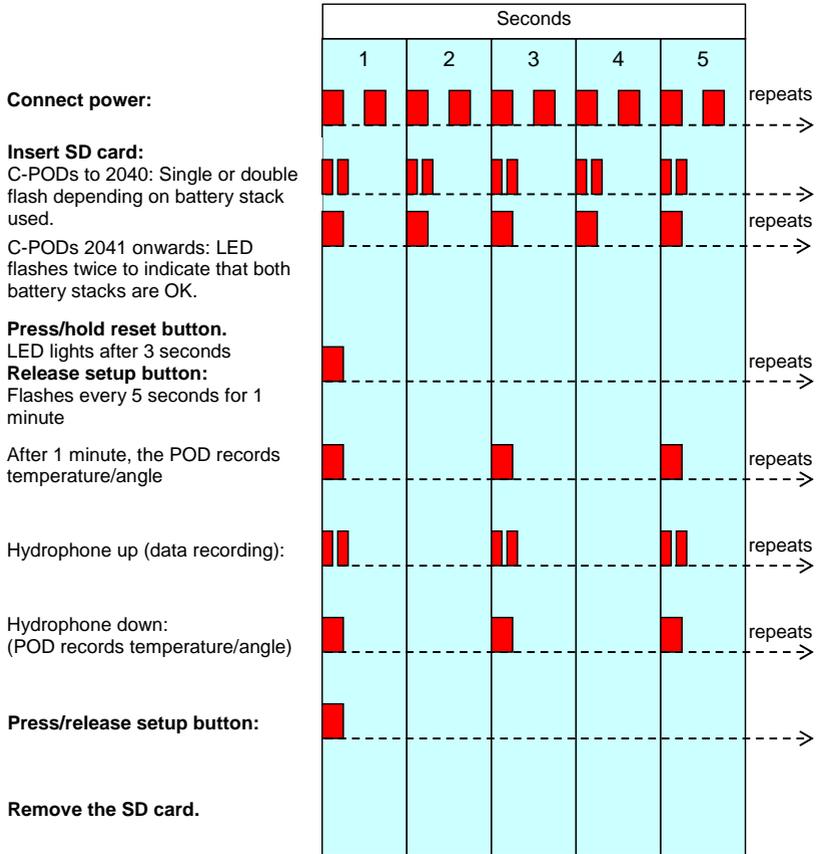
After deployment, I accidentally disconnected power before writing a summary to the SD card.

▪ Your data files will not be damaged. You can still copy them to your PC using CPOD.exe, but you will not be able to view summary information first (see *Downloading your data* on page 28).

After deployment, when I removed the SD card, the LEDs did not flash.

▪ PODs after 2141 do not flash after the SD card has been removed. This is normal.

The CP1/CP3 file starts at the wrong time.

▪ The start time was entered in the **Read SD** page before data was downloaded into the CP1 file. However, you can add, subtract or change the start time in the **Files** section of the **View+** page in CPOD.exe.

The data deployment time in the CP1 file(s) is longer than the deployment time.

▪ It is possible that when your data was downloaded from the SD card, cpod.exe ran on into old data on the card (which can happen on rare occasions). If you recorded the start and stop times for the POD, you can look for and locate when the new data should end in the CP1 files. If you did not record the stop time, look for discontinuities in the data and temperature display in cpod.exe.