rEvo RMS
on the Shearwater Petrel 3

A practical field guide to using and interpreting the rEvo Monitoring System (scrubber monitoring) on your Petrel 3 controller — written because I struggled to understand it myself.

USAGE · DATA INTERPRETATION · DIVE PLANNING

Prepared for an experienced CCR diver · Practical + theory · Compiled May 2026

Based on rEvo's official “How to use the scrubber monitoring system” (V 11.17) and supporting documentation.

Why I wrote this

I put this guide together because I had a genuinely hard time understanding how to use the RMS properly. The official documentation is thorough but scattered, the on-screen symbols and colours aren't obvious at first, and the dive-planning maths took me a while to internalise. So I worked through it all, pulled the essentials into one place, and wrote it the way I wish it had been explained to me — plain language, the practical steps up front, and just enough theory to understand why the numbers behave the way they do. If it helps you get to grips with the system faster than I did, it's done its job.

1 · What the RMS actually is

The RMS (rEvo Monitoring System) is a temperature-based scrubber-monitoring system. It does not measure CO_2 directly. Instead, it watches the heat given off by the absorption reaction as your exhaled CO_2 is captured by the sorb, and from the position and movement of that heat it predicts how much usable scrubber you have left.

How the hardware fits together

The Petrel runs over a fully digital DiveCAN bus rather than analog wiring. The advantage for you is that any cable or communication fault is detected immediately and shown as an error, instead of silently producing a wrong reading.

- Each of the two radial scrubbers holds a **temperature-sensing probe** with fast-response sensors distributed *inside* the absorbent (not in a central rod), so it reacts quickly and resolves differences smaller than 0.3 °C.
- The probe electronics are potted, battery-free, and **powered and read wirelessly** by the board in the corresponding counterlung.
- The Petrel runs the prediction algorithm and displays PPO_2, deco, and the scrubber prediction, talking to every board over the CAN bus.

> **Why two scrubbers make this work**
> The riskiest moment with any scrubber is near saturation, when a small spike in CO_2 output can cause breakthrough. On a single canister you must add a big safety margin and dump while a lot of sorb is still unused. The rEvo's dual canister lets you **cycle only the near-saturated canister**, and because the RMS sees how far each canister has been used, you can safely run well past the usual 66% rule of thumb — typically reaching 80–90% of the duration you'd get from changing a whole single canister of the same volume.

2 · The two numbers that matter: RCT and RST

Term	Full name	What it means to you
RCT	Remaining Cycle Time	Time left until you **must cycle** (swap) one canister. This is your working planning number.
RST	Remaining Scrubber Time	Time left until **breakthrough** — when CO_2 starts coming past the scrubber. This is your safety buffer, not a planning target.

> **Golden rule**
> Plan against **RCT**. Never plan a dive that would let RCT reach zero. RST is the margin that sits underneath RCT — diving into RST territory should be treated as an emergency, not a plan.

It is a prediction, like TTS

RCT/RST work the same way as your time-to-surface estimate: the algorithm assumes a future scenario and reports the result. It deliberately assumes a **high, conservative CO_2 production** (higher than an average diver) and sets the breakthrough point well below the CE standard. A practical consequence you'll notice: for most divers **RCT drops by less than one minute for each minute dived** — and that is exactly how it should behave.

Because it is a live prediction tied to your current conditions, the number on the main screen **moves with depth, temperature and workload**: go deeper and it falls, come shallow and it rises again. That live value is the truth for the moment you read it — but it is not what you use to plan the *next* dive (see §6).

3 · Reading the main screen

When the RMS is active, the main Petrel screen shows a scrubber field beginning with **"C"** (Cycle), followed by two status symbols — one per canister. The **first symbol is the top scrubber** (on the exhale lung); the **second symbol is the bottom scrubber** (on the inhale lung).

> **Petrel colour note**
> rEvo's manual screenshots are from the older Predator, where the "ready/OK" colour is **green**. On the **Petrel the same OK state is shown in WHITE**. The attention colour (yellow/amber) and the alarm colour (red) are the same on both. So wherever rEvo says "green", read it as **white** on your Petrel 3.

Main-screen status symbols (after the "C")

Symbol	Colour	Meaning	Action
? ?	Yellow/amber	Asking both probes for data, nothing received yet.	Wait. Do **not** breathe on the loop yet.
? ?	White (Petrel)	Communication established, but no prediction yet — usually because the scrubber is still cold.	OK to begin pre-breathing.
X ?	Red X	Communication attempt failed for that canister (e.g. canister not seated against the board).	Check canister seating; the unit will retry.
0:45	White number	Enough warm-up data — a real RCT is now shown (e.g. 0:45).	Once C > 0:45 and checks done, you may dive.

Two red X's mean neither probe is talking. One X and one symbol means only one canister is communicating — for example "exhale OK, no data from inhale probe."

The colon between "C" and the number

Once a number is displayed, watch the **colon** in **C:**. A **yellow colon** means the scrubber is still warming up — the prediction will keep rising as more zones come up to temperature. A **white (green on Predator) colon** means the scrubber is fully warm and the full canister length is being used for the prediction.

4 · The detail screens (Scrubber+ and Temperatures)

Press right through the menus to reach the scrubber detail screens. These let you see *why* the main number is doing what it's doing.

Scrubber activity — the 7 zones

The Scrubber+ info screen shows each canister as a row of **7 zones** representing the reaction front travelling down the canister. Read the colours as a progress bar:

Zone colour	State	What it tells you
GREY	Inactive	No reaction detected in that zone yet. All grey = nothing has started; no prediction possible.

Zone colour	State	What it tells you
YELLOW	Warming	That zone is heating up as the front reaches it, but is not yet fully warm.
WHITE/GREEN	Fully warm	That zone has reached full reaction temperature and is contributing to the prediction.

During warm-up you'll watch zones go grey → yellow → white from the inlet end. As more zones turn white, the colon turns white and RCT/RST climb to their maximum for the current depth.

Temperatures screen (surface only)

This screen lists the raw sensor temperatures: **temp 1–4** belong to the top (exhale) probe and **temp 5–8** to the bottom (inhale) probe. It is mainly a troubleshooting aid — if a probe isn't communicating, its four temperatures are blank. You'll also see the inlet temperature rise first once pre-breathing starts. Note this screen is **only available in surface mode**.

5 · Setup and the pre-dive routine

One-time / occasional setup

- If you don't see **C ??** at all, the probes are switched off. Go to **System Setup+** → **rMS Setup** and turn the temperature probes **on**. (You'd switch them off only when diving the dual radial scrubbers without monitoring, or classic non-rMS axial scrubbers.)
- In the same **rMS Setup** page enter your **biometrics** (sex, body weight). CO_2 production differs by sex and body mass, so this lets the algorithm sharpen its real-time prediction.
- Use **Bus Devices+** to confirm every CAN device is present and on the correct firmware — a quick way to spot a missing or mismatched board.

Packing and orientation (RMS-specific bits)

- Fill both scrubbers as normal, fit the spring locking screws and tighten gently to the end of the thread; pour away any loose grains that escape the mesh.
- Fit the **TOP-MARKER** on one canister and place that canister in the **upper** position on the exhale lung; the other goes **lower** on the inhale lung. The arrow on the central axis must point to the top of the unit on both.
- Only ever use **rEvo-approved scrubber material** — the prediction is calibrated to it.
- Leave the spare 3-wire (green/white/blue) molex connector alone; it is reserved for future sensors.

Pre-breathe procedure

1. Switch on the Petrel with the canisters installed and the cover closed. Wait until you see **C ??** with the symbols **white** (communication established).
2. Begin pre-breathing. The inlet zones start to warm; the first symbol turns into a number once there's enough data for a minimum prediction.
3. Keep pre-breathing until the RCT shows **at least 45 minutes and turns white/green**. This is the new hard rule with RMS: **pre-breathe to C ≥ 0:45 (white)**.
4. You do **not** need to wait for the whole scrubber to warm (that takes 20–40 min in the water). Once it's active with C > 0:45 and your logged RCT from last dive is sufficient, finish your other pre-jump checks and dive.

> **Do not power-cycle once warming has started**
> Once the scrubber begins warming, **do not switch the Petrel off**. The algorithm depends on a continuous record of temperature change over time; if you interrupt it, some zones may never reach “warm-up” or “ready,” and the monitor may never reach full working status for that session. Likewise, **never breathe on the loop with the computer off**.

6 · Dive planning from the log

The **Scrubber Times** screen logs RCT and RST for the current dive and the previous two dives. For each it records both the **Now** (actual) and the **Min** (lowest value reached after the scrubber was fully warm), along with the depth and water temperature at which that minimum occurred. **Plan from the logged minimum RCT and its depth — never from the main-screen RCT, which has no planning value once a dive is over.**

The four rules of thumb

1. **Always read the previous dive's minimum RCT and the depth where it was recorded** from the Scrubber Times page — not the main screen.
2. **If that minimum RCT was recorded at 20 m or shallower, treat the depth as 20 m.** (Between surface and 20 m the scrubber duration barely changes, and it keeps the maths simple.)
3. **If the next dive is shallower than (or equal to) the recorded depth, the available RCT is simply the logged minimum RCT.** No reduction.
4. **If the next dive is deeper, RCT scales inversely with depth** using the formula below.

> **Depth-scaling formula (deeper next dive only)**
> RCT(next) = RCT(prev, in minutes) × depth of recorded min RCT ÷ planned next depth

Worked examples

Previous dive min RCT	Recorded at	Planned dive	Available RCT	Why
2h40	30 m	25 m	2h40	Shallower than recorded depth → use logged min (Rule 3).
3h20	10 m	20 m	3h20	Recorded depth treated as 20 m; planned = 20 m → use logged min (Rules 2 & 3).
2h40 (160 min)	30 m	40 m	2h00	160 × 30 ÷ 40 = 120 min (Rule 4).
3h00 (180 min)	10 m → 20 m	70 m	~51 min	180 × 20 ÷ 70 ≈ 51 min → you'd need to cycle for a real 70 m dive (Rules 2 & 4).

> **Temperature caveat**
> There is no simple formula when the next dive is colder. If the planned dive will be **more than 4 °C colder** than the previous one, **cycle** a canister before diving. Otherwise the four rules apply. And always: **write down the scrubber time you've used** after every dive, even though the RMS logs it for you.

7 · During the dive, and repetitive dives

In the water

- The main screen shows the **live (Now) RCT/RST** for the current conditions; the Petrel logs the **minimum** reached after full warm-up, with its depth and temperature.
- Expect the live number to **fall at depth and recover shallow** — e.g. it's lowest at the end of a deep bottom phase and climbs again during shallow deco. That higher shallow number is real: it's the time you genuinely have left from that point.

- Watch colour changes on the C number as you approach low RCT. **End the dive before RCT reaches zero** — RST is your buffer, not your plan. You should never see a zero/alarm RCT screen in the water.

Second dive after a short surface interval (warm scrubber)

During the surface interval the temperature profile slowly decays even though no one is breathing, so the main-screen RCT during that time has **no real value**. Two cases:

- **Long enough interval:** if the scrubber has cooled until the main screen returns to **??**, treat the next dive exactly like the first dive of the day.
- **Short interval (still showing a profile):** plan from the **logged** RCT as always, then pre-breathe. You may see RCT **drop sharply then climb** a few minutes in as a fresh breathing profile forms — that's normal. Dive once you again have **> 45 min RCT** on the main screen. Pre-breathing can take longer than usual because the inlet sorb is already partly saturated.

8 · Cycling a canister (the TOP-MARKER discipline)

When the plan says cycle, you replace only the near-saturated canister. The single habit that prevents mistakes: **if you remove the TOP-MARKER, empty that canister.**

1. Take the **top** canister (the one wearing the TOP-MARKER) out of the unit.
2. Unscrew the TOP-MARKER and **immediately empty that canister** — now you're certain the exhausted one is gone.
3. Screw the TOP-MARKER onto the remaining (full) canister and put it in the **upper** position (or into a sealed bag/container if you're done diving).
4. Refill the emptied canister with fresh sorb and place it in the **lower** position (or seal it).
5. Separately note which canister is on top and that the bottom one holds fresh sorb.

9 · Warnings, limits and good practice

- **Never breathe on the unit with the Shearwater off** — the monitor needs to see the temperature changes from your breathing or it may never reach full ready status.
- **Wait for white symbols** (`C ??`) before breathing; while they're amber there is no probe communication yet.
- **Do not touch, bend or force the probe**, and never try to remove it from the canister — it needs a special tool and will be damaged otherwise.
- **Max probe temperature is 70 °C** — never rinse a canister with hot or boiling water.
- **Only rEvo-approved sorb** gives a valid prediction.
- If you see unfamiliar functions in the Scrubber+ menu, you're on **old firmware** — update before relying on those screens.

> **Treat RMS as decision support, not a CO_2 sensor**
> Temperature-stick monitors infer CO_2 status indirectly and can warn of impending breakthrough, but probes do wear and can fail mid-dive (some divers report degradation after a few dozen dives). Keep your trained CO_2 awareness, fixed cycle/dump time limits, and bail-out discipline as the primary defence; the RMS sharpens and extends those decisions rather than replacing them.

10 · One-page cheat sheet

Symbols at a glance

You see	Meaning	Do
?? amber	No probe data yet	Wait — don't breathe
?? white	Comms OK, scrubber cold	Start pre-breathing
X red	Canister not communicating	Check seating
C: yellow	Still warming up	RCT will keep rising
C: white	Fully warm, full prediction	Good to go
C ≥ 0:45	Sufficient cycle time	Dive after checks

The rules you actually run on

- **Plan on RCT, never let it hit zero.** RST is the buffer.
- **Pre-breathe to C ≥ 0:45 white** before diving.
- **Plan from the logged minimum RCT + its depth**, not the main screen.
- **Shallower next dive** → use logged min RCT. **Deeper** → RCT × (rec. depth ÷ new depth).
- **Depth ≤ 20 m counts as 20 m** for planning.
- **Next dive >4 °C colder** → cycle first.
- **Remove TOP-MARKER** → **empty that canister** immediately.
- **Don't power off** once warming has begun; **don't breathe with the unit off**.

Sources: rEvo Rebreathers — *rMS and how to use the scrubber monitoring system* (V 11.17 and V4); rEvo Rebreathers RMS system & Features pages; TekDeep rEvo rMS overview; Mitchell et al., performance of temperature-stick CO_2 monitoring (PMC). This guide summarises manufacturer documentation for personal reference and is not a substitute for formal rEvo / CCR training or the current official manual.