

TITAN DIVE GEAR

Titan PRE-DIVE CHECKLIST

NAME: _____ CLASS: _____

DATE #1: _____ #2: _____ #3: _____ #4: _____ #5: _____

Check for signs of dirt, deterioration and damage to any part of the CCR at all stages

DIVE NUMBER
1 2 3 4 5

- 1. Inspect pneumatics hoses
- 2. Inspect handsets, cables, electrical connections, HUD
- 3. Install scrubber cartridge in basket.
- 4. Attach lid to scrubber basket, attach oxygen hose and hose from manual gas addition block
- 5. Check hoses, mouthpiece, verify valve operation, and install
- 6. Attach ADV IP diluent supply hose to ADV, confirm ADV shutoff valve is open.
- 7. Attach HUD to mount on mouthpiece.
- 8. Analyze, check pressure, and install filled gas cylinders
 - O₂ _____ % _____ psi/bar Diluent _____ % _____ psi/bar
 - O₂ _____ % _____ psi/bar Diluent _____ % _____ psi/bar
 - O₂ _____ % _____ psi/bar Diluent _____ % _____ psi/bar
 - O₂ _____ % _____ psi/bar Diluent _____ % _____ psi/bar
 - O₂ _____ % _____ psi/bar Diluent _____ % _____ psi/bar
- 9. Turn on cylinders, pressure hoses, turn off, look for pressure drop
- 10. Turn on cylinders
- 11. Confirm ADV operation
- 12. Negative pressure test and isolation valve check
- 13. Check interstage pressures (8-10 bar/120-150psi) of O₂ and diluent
- 14. Install external battery
- 15. Turn on handset and HUD
- 16. Check battery voltage; handset >3.4, external >13
- 17. Calibrate electronics if first dive of the day (follow calibration procedure below)
- 18. Verify operation of oxygen, diluent, and off-board manual addition valves.
- 19. Positive pressure test (dip test)
- 20. If not diving immediately, turn cylinders off, drain IP lines, flush breathing loop with air, and turn electronics off
- 21. Attach cover and stow

Calibration Procedure:

- 1. Confirm oxygen cylinder and electronics (handset and HUD) on
- 2. Open mouthpiece.
- 3. Scroll to "Calibrate," begin calibration
- 4. Check mV output (40-65 .mV)
- 5. Confirm cells read 0.98 – 1.0 atm
- 6. Calibrate HUD
- 7. Confirm all three HUD LEDs flash orange once (red/green mix together)
- 8. Close mouthpiece

Immediate Pre-Dive Checks:

- 1. Verify all gas supplies on
- 2. Verify bailout supply (ies)
- 3. Check BC
- 4. Verify both handset and HUD are on
- 5. Check PO₂ at least 0.5 atm, pre-breathe

- 6. Verify mouthpiece (open/closed)
- 7. Bubble check

TITAN DIVE GEAR Titan POST-DIVE CHECKLIST

NAME: _____ Class # _____

DATE #1: _____ #2: _____ #3: _____ #4: _____ #5: _____

Check for signs of dirt, deterioration and damage to any part of the CCR at all stages. For hygienic reasons a post-dive check must be completed between users.

DIVE NUMBER
1 2 3 4 5

- 1. Unclip cover and rinse unit with fresh water
- 2. Check harness and other rebreather parts
- 3. Switch handset and HUD off
- 4. Check and remove gas cylinders; refill if necessary

- O₂ _____ psi/bar Diluent _____ psi/bar

- 5. Remove breathing hose assembly
- 6. Remove and recharge battery
- 7. Remove scrubber assembly
- 8. Check counterlungs for water ingress (drain)
- 9. Disinfect breathing hoses, mouthpiece, and counterlungs
- 10. Open scrubber basket, remove absorbent cartridge
- 11. If absorbent canister is still usable, seal canister and log absorbent use (hours: minutes)

- Total Time Used: _____ hr: _____ minutes

- 12. Rinse scrubber housing and let dry
- 13. Rinse and drain breathing hoses and mouthpiece, hang breathing hoses to dry; rinse counterlungs
- 14. Rinse and drain BC
- 15. Inspect handset and HUD displays, cables, and electrical connectors
- 16. Inspect pneumatics assemblies, cap if not re-attaching gas cylinders
- 17. Plug breathing hose ports
- 18. Allow CCR to dry

- 19. Reassemble CCR
- 20. Secure straps
- 21. Stow unit

Appendix 6.2

PROCEDURES GUIDE

TITAN DIVE GEAR Titan

Because CCRs are in a continual state of modification and development, these procedures are provided as guidelines only. The manufacturer's procedures should be referred to and followed in all cases. In the event of any discrepancies, always follow the most current version of the manufacturer's instructions. **At all stages the operator should be checking for signs of dirt, deterioration or damage to any part of the apparatus.** Note that gas flow in the Titan flows in from over the left shoulder, and out over the right shoulder.

PRE-DIVE PROCEDURES

TITAN DIVE GEAR Titan

Step #	Step	Procedure
1	Inspect pneumatics hoses	Check all hoses, connections, regulators, addition valves, and HP gauges for signs of looseness, dirt, corrosion or damage. Replace if necessary.
2	Inspect handset, cables, electrical connections, HUD	Inspect the handset, HUD, battery, cables, connectors, and HUD pod for correct alignment, looseness, dirt, corrosion and damage; clean or replace as necessary.
3	Install Scrubber Cartridge in basket	Remove bottom ring from inner scrubber basket. Verify scrubber seal is in the proper orientation with ridges to the outside edge. Check the outer edge of the scrubber cartridge (the side that will go against the scrubber seal) to make sure there are no nicks, cuts, or indentations. Correct any telescoping of the cartridge, by placing on a flat surface and firmly realigning the coils. Confirm there is a plug in the center core. Drop cartridge with clean edge into the inner basket. Screw on the bottom ring. Insert inner housing into basket. Clean, grease and install the inner housing O-ring.
4	Attach lid to scrubber basket. Attach oxygen hose, and hose from manual gas addition block	Clean and grease two O-rings on lid. Place large ring around lid before pressing lid onto scrubber basket. Screw down the ring. Lay scrubber assembly on the backplate between counterlungs, with the HUD switch oriented away from the diver. Strap in place with Velcro band. Attach black gas feed hose from manual gas addition block onto black-color-coded hose fitting by screwing it on. Screw on the green oxygen hose fitting onto the green color-coded hose fitting.
5	Check hoses, mouthpiece, verify valve operation and install	Inspect mouthpiece barrel, hoses, connectors and o-rings for dirt, cuts, nicks, deterioration or damage; replace if necessary. Operate mouthpiece several times to ensure free operation; repair or replace components if necessary. Open mouthpiece and breathe through it. Seal the two openings AND the ADV connector on the inhalation (green, left) side, and simultaneously try to inhale. If it is possible to inhale, then the exhalation valve is either missing, defective or installed incorrectly; replace/reinstall as necessary. Repeat this process with the exhalation hose (orange, right) side by sealing the two openings and attempt to exhale, if it is possible to exhale then the inhalation valve is either missing, defective or installed incorrectly; replace/reinstall as necessary. Close mouthpiece. Clean and grease the four sets of double o-rings on the breathing hose connectors. Attach the ADV to the inhalation (green, left) counterlung with the lid hose oriented towards the lid. Attach the lid hose to the outer lid hose adapter (green to green). Attach the exhalation

		T to the exhalation counterlung (orange, right) with lid hose oriented toward the lid. Attach the exhalation lid hose to the center lid adaptor (orange to orange). Assemble hand tight. Do not over-tighten. The nuts merely hold the hose in place; they do not provide o-ring sealing pressure.
6	Attach ADV IP diluent supply hose to ADV. Confirm ADV shutoff valve is open.	The ADV IP diluent hose supply comes from the BC adaptor. Screw it on to the hose port on the ADV. Confirm ADV shutoff valve is in open position (slide towards the BC button).
7	Attach HUD to mount on mouthpiece	You may wish to wrap the HUD cable around the hose several times to prevent entanglement.
8	Analyze, check pressure, and install filled gas cylinders	Select appropriate diluent for intended dive profile. Analyze the gas in both the diluent and oxygen cylinders. Confirm both are full. Slide the cylinders into the restraining bands with the valves pointed down, and secure the Velcro straps, oxygen on the right, and diluent on the left. Check o-rings are in place and attach the regulators.
9	Turn on cylinders, pressurize lines, turn off, look for pressure drop	Turn on the oxygen cylinder valve. Pressurize the gas lines. Turn off the valve. Watch the SPG and look for pressure drop. If drop is seen, check the oxygen regulator DIN connector. Try again. If drop is still seen, check all other connectors. Repeat with diluent cylinder.
10	Turn on cylinders	Turn both cylinders on.
11	Confirm ADV operation	Place mouthpiece in mouth and open. Breathe in from the loop, and out through your nose until you hear or feel the ADV add gas. Close mouthpiece.
12	Negative pressure test and isolation valve check	Close the isolation valve by sliding it away from the BC button. Open the mouthpiece and inhale until there is a slight vacuum. Close mouthpiece and remove from mouth. Wait 30 seconds. Open the mouthpiece. You should hear an inrush of air. If unsuccessful, repeat test with the cylinders turned off and the interstage pressure lines completely drained. If now successful, check for gas leakages into the breathing loop through the ADV, solenoid, or manual addition valves. If still unsuccessful, check for loose or poor connections or a hole in the breathing loop. Once test is successful, open the ADV isolation valve.
13	Check interstage pressures (8-10 bar/120-150psi) of O ₂ and diluent	Using an interstage pressure (IP) gauge, check both oxygen and diluent IPs by disconnecting hoses at the manual gas addition block. Both should be 120-150 psi (8-10 bar).
14	Install external battery	Plug the 3-pin battery connector into the battery. Move the locking ring down, and screw it onto the battery, locking it in place.
15	Turn on handset and HUD	Turn on handset by pressing left handset switch, followed by the right handset switch. Turn on HUD by pressing once on the HUD switch on the top of the lid.
16	Check battery voltage; handset >3.4, external >13	Check the battery voltages by pressing the left handset switch 4 times. Confirm that they are above the minimum values: handset (int) greater than 3.4, external (ext) greater than 13.
17	Calibrate electronics if first dive of the day	See calibration procedure below.
18	Verify operation of oxygen, diluent, and off-board manual	Press oxygen button (center, yellow on the manual gas addition block) manual addition valve and audibly confirm that gas is being added. Open mouthpiece. Press the diluent (red, upper) manual addition valve (MDV)

	addition valves	while watching oxygen sensor readings on handset until you hear the solenoid adding oxygen just below the set point level. Close mouthpiece. Press offboard (black, lower) manual addition valve, if used, and audibly confirm addition of gas.
19	Positive pressure test (dip test)	Place mouthpiece in mouth and open. Orally inflate the breathing loop by inhaling through your nose, and exhaling through your mouth. Repeat until the breathing loop is completely full. Close the mouthpiece. Submerge the CCR in water, looking for bubbles. There should be none. If found, remove CCR from water and correct problem.
20	If not diving immediately, turn cylinders off, drain IP lines, flush breathing loop with air, and turn electronics off	If you will not be diving until the following day, turn the cylinder valves off, and drain the IP lines using the gas addition block controls. Flush the breathing loop manually with air until PO ₂ drops below 0.3 atm. Then turn the handset off. To do this, press the MENU button once, followed by the SELECT button. If it will not go to TURN OFF option, dry the water contacts and try again. Turn the HUD off by tapping the HUD switch once. Finally, close the mouthpiece.
21	Replace cover and stow	Fold the cover back over the scrubber assembly, and fasten. Use two Fastex [®] clips on each side of the cover. Stow the unit securely, so it will not shift during transport. Verify that no SPG hoses, electronics cables, or BC are pinched or liable to contact hard surfaces. Secure wrist displays to prevent mechanical shocks and vibration.

CALIBRATION PROCEDURE

1	Confirm oxygen cylinder and electronics (handset and HUD) on	If you were interrupted in the preceding portion of the checklist, confirm the oxygen cylinder is still on, the handset is on, the HUD is on (LEDs flashing), and external battery is connected.
2	Open mouthpiece	Open by rotating mouthpiece lever into horizontal position.
3	Scroll to "Calibrate," begin calibration	Press the MENU button (left) two times, followed by the SELECT button (right) two times. Solenoid will add oxygen until oxygen levels are stable and cells calibrate.
4	Check mV output (40-65mV)	While oxygen is being automatically added, confirm that mV output for each sensor is between 40-65 mV and stable as the unit calibrates.
5	Confirm cells read 0.98 – 1.0 atm	All three cells should read 0.98 – 1.0 atm. The readings may be lower if you have the calibration gas setting selected for less than 98%
6	Calibrate HUD	Tap the HUD button three times in rapid succession. At that point, all three LEDs should go solid red for approximately 4 seconds.
7	Confirm all three HUD LEDs flash orange once	Confirm all three HUD LEDs flash orange once (red/green mix together). If any LED flashes green, then red, that indicates failed calibration for that cell. Recalibrate, correct, or replace cell.
8	Close mouthpiece	Rotate lever on mouthpiece to vertical position.

Immediate Pre-Dive Checks

1	Verify all gas supplies on	Verify gas contents on SPG. Confirm cylinders are on by injecting gas into the breathing loop using first the oxygen and then the diluent gas addition block buttons, simultaneously watching appropriate SPG. If SPG needle moves during manual valve operation, check cylinder valves to insure they are turned on.
2	Verify bailout supply (ies)	Turn bailout cylinder ON. Check SPG for contents. Breathe from bailout regulator, while watching SPG. SPG should remain steady. If not, confirm cylinder valve is ON.

3	Check BC	Verify BC LP inflator hose is attached. Add a small amount of air to BC with LP inflator.
4	Verify both handset and HUD are on	Confirm handset is operational and HUD is providing matching LED readings.
5	Check PO ₂ at least 0.5 atm, pre-breathe	Place mouthpiece in mouth and open. Breathe on loop while watching handset. Confirm that all three sensor readings vary with respirations. Raise PO ₂ to at least 0.5 atm. Continue to pre-breathe for three minutes. Ensure you have a mask on or pinch your nose shut during the pre-breathe procedure.
6	Verify mouthpiece (open/closed)	If entering water while using the rebreather, leave mouthpiece in mouth, open. Otherwise, close mouthpiece and remove from mouth.
7	Bubble check	After entering water, submerge just below the surface and have buddy perform visual check of breathing loop and connectors for signs of leakage or bubbles. If found, correct before diving.

POST-DIVE PROCEDURES

TITAN DIVE GEAR Titan

Check for signs of dirt, deterioration or damage to any part of the apparatus at all stages of the post-dive procedures. For hygienic reasons a post-dive check must be completed between users.

Step #	Step	Procedure
1	Unclip cover and rinse unit with fresh water	Ensure mouthpiece is closed. Release four Fastex clips to remove cover. Thoroughly rinse the exterior with fresh water, including the manual gas addition block, cylinders, SPGs, hoses, and canister housing.
2	Check harness and other rebreather parts	Check harness and all rebreather components for signs of damage, fraying, or other problems. Note and correct.
3	Switch handset and HUD off	Turn off handset by pressing the MENU button (left) one time, and the SELECT (right) button one time. If "TURN OFF" does not show as an option, dry the wet switch contacts and try again. Turn off the HUD by pressing the HUD switch on the scrubber lid one time.
4	Check and remove gas cylinders; refill if necessary	Check cylinder pressures and record. Ensure both cylinder valves are closed and purge lines using the manual gas addition valves. Check that SPGs read 0 psi/bar. Remove regulators and lift cylinders out, refill as needed. Cap the regulators.
5	Remove breathing hose assembly	Disconnect breathing hose couplings from the counterlungs and scrubber lid hose adapters.
6	Remove and recharge battery	Unscrew the external battery connector, and remove the battery. Place some silicone grease in the connector receptacles. Recharge the battery as needed.
7	Remove scrubber assembly	Remove retaining strap. Disconnect all IP hose connectors. Remove HUD from mount on mouthpiece. Remove the scrubber assembly.
8	Check counterlungs for water ingress (drain)	With the unit upright, pull the dump cords at the bottom of each counterlung. Any water in the counterlung will drain out.
9	Disinfect breathing hoses, mouthpiece, and counterlungs	Spray breathing hose interior with disinfectant solution. Spray disinfectant in the upper hose connector port of each counterlung, coating all inside surfaces. Let sit 10 minutes, and then rinse with fresh water. Hang hoses from mouthpiece to dry. Leave counterlungs upright.
10	Open scrubber basket, remove absorbent cartridge	Unscrew the ring securing the lid to the absorbent housing. Dry the inside of the lid, and place to dry. Remove the inner absorbent cartridge, and unscrew the cartridge retaining ring. Remove the absorbent cartridge, and set aside.
11	If absorbent canister is still usable, seal canister and log absorbent use (hours: minutes)	If the ExtendAir [®] cartridge is still usable, replace it in its original container, using both inner and outer plastic bags. Mark the usage of the cartridge (hours:minutes) on the outside of the container, along with the date and your name. Mark the same in your dive log and post-dive checklist
12	Rinse scrubber housing and let dry.	Rinse the basket, housing, cartridge retaining and lid rings, and set to dry.
13	Rinse and drain breathing hoses and	Rinse breathing hoses and mouthpiece by flushing each port or opening with fresh water beginning from the inhalation end and moving

	mouthpiece, hang breathing hoses to dry; rinse counterlungs	progressively to the exhalation end. Hang to dry. Rinse the counterlungs with fresh water by flushing from the top, and pulling the dump valve at the bottom of each counterlung. Leave standing upright to dry. Pull dump valve in each counterlung after drying to drain residual water.
14	Rinse and drain BC	Flush the BC with fresh water through the manual inflator valve. Agitate the BC to rinse all inner surfaces. Drain either through the manual inflator valve or by using the overpressure valve dump cord.
15	Inspect handset and HUD displays, cables, and electrical connectors	Inspect wrist display, HUD, cables, and electrical connections for looseness, dirt, corrosion and damage, clean or replace as necessary.
16	Inspect pneumatics assemblies, cap if not re-attaching gas cylinders	Check all lines, IP hoses, connections, regulators, addition valves, mountings and SPGs for signs of looseness, dirt, corrosion or damage. Replace if necessary.
17	Plug breathing hose ports	Plug the ports on the breathing hoses and counterlungs with paper towels, to prevent ingress of insects or other organisms.
18	Allow CCR to dry	If diving will continue immediately, reassemble the unit, ensuring all components are dry. Otherwise, leave the unit open in a secure place to thoroughly air dry. Leave the canister lid out, but cover the sensors with a dry paper towel.
19	Reassemble CCR	When thoroughly dry, loosely reassemble all components. Unless using the unit within 24 hours, do not install the battery or a packed canister. If a packed canister is installed, clearly mark the outside of the unit with the total time of use.
20	Secure straps	Ensure all straps, buckles and harness components are in good condition and untangled; secure as needed. Stow SPGs and displays to minimize strain and kinking of cables and hoses. The handset should be clipped or otherwise securely fastened to the unit, to prevent damage from dangling.
21	Stow unit	Store unit in a clean, dry location with moderate temperatures; or if diving will continue within 24 hours you may pre-dive as required.