

Deck Purge Box Model 120 Operators Manual



San Diego, CA USA

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*Congratulations on selecting the **Global Ocean Design Deck Purge Box**. The unit is the result of many years of field experience, and solves an important problem that can easily compromise the integrity of your underwater equipment. We designed it to be rugged, yet light, and ready to go to work immediately, where ever on Earth you happen to be. Together with the self-sealing purge ports, the complete system provides an uncompromised solution to entrained water vapor, as well as providing other tangible advantages. Each Deck Purge Box and every purge port is carefully assembled and rigorously tested, with you in mind. The self-sealing purge ports are individually tested to 18,000psi. We hope you'll be pleased with the performance of the device, and invite your comments and suggestions for improvement.*

Best wishes for your success at sea.

The team of Global Ocean Design LLC

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Specifications

Warranty

I. The need to control water vapor in a sealed housing.

Any closed volume sealed in a warm, moist environment, will contain water vapor. Any closed pressure resistant case, whether a cylinder, a sphere, or some irregular body, will maintain a constant volume. The interior pressure may rise or fall a small amount with change in ambient temperature as the interior air expands or contracts.

But the biggest affect on the trapped water vapor is from temperature. The only factors that determine how much water vapor will be in the air are 1) the source of water, and 2) the amount of heat needed to cause evaporation. As an instrument descends deeper into the ocean, ambient temperature gets colder. For a given amount of water vapor captured at warm temperatures in a housing at the surface, the temperature in the deep sea can easily drop below the “Dew Point Temperature”. At that moment, the housing will fill with fog, and water vapor condenses on everything including circuit boards, camera lenses, and the housing interior walls. It can cost a researcher his data, “the Shot” from a camera, or even the instrument itself.

By reducing the amount of water vapor, the Dew Point Temperature is lowered to below the coldest temperatures found in the ocean.

One means to do this is through the use of **desiccants**, hygroscopic materials also known as “drying agents”. Most common desiccants are chemically inert and non-toxic. An indicating desiccant contains a humidity indicator that changes color to show the degree of water-saturation of the desiccant. One commonly used indicator is cobalt chloride, which starts with a blue color, turning to purple, and finally a light reddish or pink. This gives a visual confirmation of operation, and remaining life of the desiccant cartridge.

Desiccant bags placed on the inside of the housing operate passively, that is, they only collect moisture as it randomly comes in contact with the desiccant crystals. Manufacturers recommend a minimum of two hours before deployment for the random motion of air and diffusion to bring the water vapor into contact with the drying agent.

The Global Ocean Design Deck Purge Box, however, dynamically dries the air by forcing the air to pass through a drying column, wasting no time on deck. When the purge cycle is complete, and the pressure cap installed, the instrument is ready to deploy.

II. Introduction to the Model 120 Deck Purge Box

A. The advantages of your Deck Purge Box include that it:

1. works through a single port on your housing;
2. has a self-sealing fitting holds a partial vacuum inside the housing while the pressure proof cap is installed, allowing the o-ring seals to be carefully cleaned;
3. provides simple, single valve operation;
4. includes zero HazMat, such as pressurized inert gas cylinders, making shipping simple, and the confidence of knowing your purge box is ready to work on arrival;
5. utilizes an indicating Desiccant to provide a visual check of operation;
6. uses desiccant cartridges which are easily changed;
7. can be used in a pinch, even at sea, because the desiccant cartridges can be recharged in an oven;
8. is conveniently portable due to its light weight, and small size;
9. provides a partial vacuum inside the housing to preload the housing seals prior to deployment, thereby reducing chances of a low pressure leak;

10. uses a single piece lower plastic box which repels surface water on a wet deck. When closed, the case serves to preserve the unused desiccant cartridge by preventing air exchange while in storage or in transit;
11. contains a Universal power supply with AC power cords for both U.S. and EU standards;
12. is built with two Heavy Duty Stainless Steel clasps to secure the lid;
13. incorporates a large carrying handle for an easy grip, even with gloves on;
14. has numerous purge fitting options to fit all Global Ocean Design self-sealing purge ports, plus Edgetech release housings, and SAE#4 fittings;
15. has numerous accessories such as: a) exhaust hose for use with removing sticky endcaps on cylindrical pressure case, b) power inverter to operate the deck purge box off a car or marine 12vdc battery, c) optional interior mechanical vacuum gauge shows pressure through the glass housing, and d) handheld Vacuum gauge to check sphere or cylinder pressure. Other practical accessories are in development.

B. Opening the Deck Purge Box Case



Figure 1: Opening the Deck Purge Box case

1. Two secure latches to either side of the carrying handle hold the waterproof case closed. A manual vent plug in the center under the handle maybe used to event the interior of the case was sealed at much higher altitude. Once open, be careful to avoid any water splashing on the front panel as this will compromise the operation.

2. The Deck Purge Box has room inside the lid for both AC power cords, the vacuum line, and a couple of spare desiccant cartridges. Use the hook-and-loop cable straps to maintain coil diameter of the hoses to avoid interference when closing the lid.

C. Control panel layout

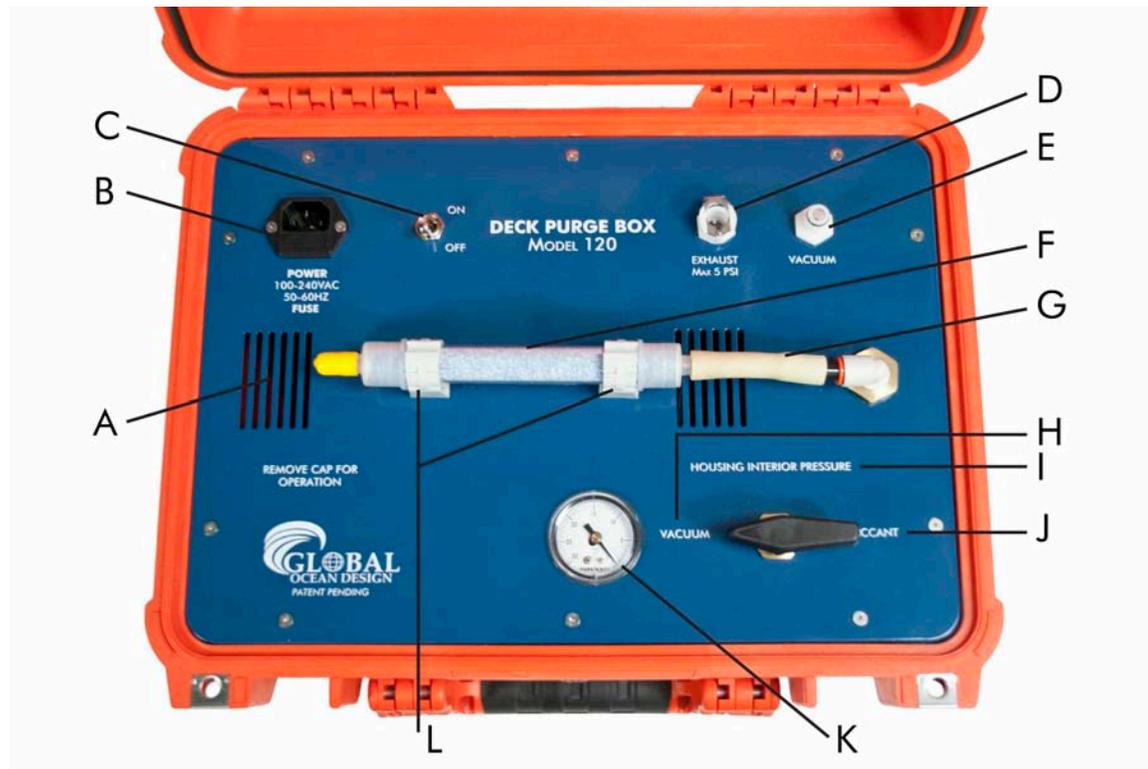


Figure 2: Control Panel Lay-out

Once the box is snapped open, you will become familiar with the layout of the front control panel.

- A. Rubber Cap on desiccant cartridge, helps isolate the desiccant material from moisture in the air in between times of use. The cap must be removed during the desiccation operation, then replaced when finished.
- B. AC Power Inlet with fuse holder and spare fuse, panel mount,
Type: EC 320-C14
Max Rating (UL, VDE, CSA) 10A/250VAC
Fuse: 5 x 20mm x 10A, glass, 10A, 1 ea + 1 spare
Requires plug C13 on power cord.
See "Section I.D." below.
- C. Vacuum Pump power on-off toggle switch
- D. Exhaust port (socket), limited to 5psi with a relief valve
- E. Vacuum port (plug)
- F. Desiccant cartridge
- G. Silicone rubber tubing
- H. "Vacuum" position of three-way valve
- I. "Housing Interior Pressure" position of three-way valve
- J. "Desiccant" position of three-way valve
- K. Vacuum gauge, 0-30" Hg
- L. Desiccant cartridge clamp holders (2)

Caution: Note the ventilation slots in the front panel are open to the interior, meaning the unit is not waterproof or splash proof when the plastic case lid is open.

D. Electrical Power Options of the Global Ocean Design Deck Purge Box

Universal Power Supply

Your Global Ocean Design Deck Purge Box incorporates a high efficiency (~90%) Universal Power Supply, with an input voltage/frequency range of 100-240V, 50-60Hz, and a power rating of 65W. Protections include short circuit, overload and overvoltage. No load, standby power consumption is <0.3W.

Standard AC cords, Plug Options: Your Global Ocean Design Deck Purge Box is shipped with 2 power cords, a three prong U.S. NEMA 5-15 and a three contact European CEE 7/7 plug.

Electrical plugs and sockets of different nationalities differ in voltage and current rating, shape, size and type of connectors. The types used in each country are set by national standards, some of which are listed in the IEC technical report TR 60083, “*Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC.*” For more information on international standards for power plugs, please refer to the article “AC Power Plugs and Sockets,” Wikipedia <http://en.wikipedia.org/wiki/Power_outlets>.

Adaptors are made to allow physical connection between a system’s electrical plug and a foreign electrical socket. Adapters do not change voltage or frequency. The Deck Purge Box will accept a variable voltage and frequency input of 100-240V, 50-60Hz.

Battery power: A 12vdc car or boat battery run through a 100W DC-to-AC power inverter will provide power to the AC plug of the Deck Purge Box. The built-in universal power supply of the Deck Purge Box has a maximum power draw of 65W, and will operate on an input voltage/frequency range of 100-240V, 50-60Hz.

E. Operation with Global Ocean Design Self-sealing Purge Ports

The self-sealing purge ports and the Deck Purge Box form an integrated system for the control of water vapor in enclosed housings. The combination has proven to be an effective solution from the sea surface to the floor of ocean trenches, at all latitudes, at all times of year. In addition to the control of water vapor, the self-sealing purge ports provide operators the time to carefully clean, inspect, and install the pressure proof cap under controlled conditions.

The Self-Sealing Purge Ports will hold against an exterior pressure of up to 10psi. Interior vacuums are recommended to never exceed 5psi, so there is a good safety margin to hold a vacuum while on deck.

F. Caution: Faceplate not water tight

Caution: Note the ventilation slots in the front panel are open to the interior, meaning the unit is not waterproof or splash proof when the plastic case lid is open.

G. Recommended spares

- O-rings (Buna-N is recommended. EPDM is NOT recommended.)
- 2-014-N70: Body, 5mm Dia Self-sealing Purge Port retrofit for Nautilus Marine Vitrovex
- 2-015-N70: Pressure proof cap
- 2-018-N70: Body, 7/16” Dia Self-sealing Purge Port

Fuse: 5mm x 20mm glass-tube fuse, Fast Acting, 250 VAC, 10 Amp

Desiccant cartridges
p/n C-103-MK, sold in packs of 4

Pressure proof caps, Ti 6Al 4V
p/n C-101-MK, sold in packs of 4

H. other accessories

Exhaust tubing: Connects the Exhaust line (D) to a self-sealing purge port. This provides a small pressure force not exceeding 5psi to assist with removal of sticky endcaps typically found on cylindrical pressure cases. Operator must be cautious that all endcap retaining screws or other means used to secure endcaps have been removed before applying pressure to the interior of a sealed pressure case.

Alternative Purge Fitting options: While developed initially for purging glass housings, the Deck Purge Box may also be used for cylinders. Purge fittings have been designed for ORE/Edgetech® releases, as well as some SAE#4/AN boss fittings.

Please contact <GlobalOceanDesign.com> if you have a special requirement.

Visit our website to see other applications and new developments.

III. Procedure for purging moisture using the Deck Purge Box



Step 1: remove the pressure proof cap from the self-sealing purge port. Set aside on a clean surface, such as a lint-free wipe.



Step 2: Connect the purge fitting on the end of the vacuum hose to the self-sealing purge fitting.



Step 3: Tighten just to finger tight.



Step 4: Remove the Rubber Cap (A) from the desiccant cartridge (F). There's a helpful reminder on the front panel to "Remove Cap for Operation". Save the cap to re-seal the desiccant cartridge (Step 12). Helpful tip: A good place to store it is on the toggle of the Power On/Off switch (C).



Step 5: Turn the 3-way valve handle to the "Vacuum" position (H).



Step 6: After plugging into AC power, turn the Deck Purge Box "On". You'll hear the electric motor and vacuum pump begin operating.



Step 7: Draw vacuum in housing down to 10” of Hg. This leaves 20” Hg remaining inside the housing. Some electronic components, such as hard drives, are rated for a maximum external vacuum of 15”, so it’s wise to provide a little safety margin.



Step 8: While pulling a vacuum, the gauge shows the *dynamic pressure* in the vacuum line, often a little lower than the true interior pressure. To check, turn the 3-way valve handle to the “Housing Interior Pressure” position to read the true *static pressure* in the housing.



Step 9: *Slowly* turn the 3-way valve to the “Desiccant” position. External air pressure pushes air into the interior of the partially evacuated housing, while the air is forced to travel through the desiccant cartridge. Keep the air from entering too fast by regulating the airflow using the valve. There should be a narrow transition zone between the blue (fresh) and pink (used) desiccant segments in the cartridge.



Step 10: Repeat Steps 5-9 a total of 4 times. A Post-it® note stuck to the front panel or pad of paper is sometimes used by operators to keep score. On the last vacuum draw (Steps 7, 8), stop and hold at 10” of vacuum.



Step 11: Turn off Deck Purge Box.



Step 12: Replace the Rubber Cap (A) onto the desiccant cartridge (F)

Helpful tip: Along with the Deck Purge Box, use of small desiccant bags on the interior of the housing will capture any trace water vapor that may outgas from such materials as cardboard insulators used in battery stacks or other materials.

IV. Cleaning and installing the Pressure Proof Cap

It is recommended that the operator have the following supplies for this task:

1. Lint-free wipes, such as Kimberly-Clark® KimWipes®
2. Silicone spray, food grade
3. High vacuum silicone grease, such as Dow® DC-4®
4. Isopropyl alcohol, 90% purity or better
5. Spare o-rings, as listed in "Recommended Spares"
6. O-ring removal tools such as wood toothpicks, plastic toothpick, or soft brass probe.

Helpful tip: Use nothing harder than the material the o-ring groove is cut into!



Step 13: Check interior pressure gauge, if one is installed inside the sphere, to confirm the interior vacuum is holding. The self-sealing purge port check valve seals with an internal o-ring. In the process of purging water vapor, air is moved back and forth across this o-ring, with some potential for lint or debris to land on the surface, preventing a perfect seal. Normally this is not an issue. The sealing surface is self-lubricating and greaseless so loose materials do not have anything to adhere to. But it's a good detail to pay attention to.



Step 14: Using a lint-free wipe and isopropyl alcohol, clean the o-ring face seal surface.



Step 15: Using a lint-free wipe and isopropyl alcohol, clean the o-ring groove.



Step 16: Using a lint-free wipe and isopropyl alcohol, clean the o-ring. Inspect for nicks, cuts or imperfections. A light tug as you go around will open any cracks or fissures, making them easy to spot.



Step 17: Using the Food Grade Silicone Spray, lubricate the o-ring groove. The spray will get into all the corners of the groove.



Step 18: Lightly lubricate the o-ring with a high vacuum type silicone grease.



Step 19: Press the o-ring into the groove. The groove is a half-dovetail design to hold the o-ring in place while the cap is upside down during installation. Gently smooth the surface.



Step 20: Lightly grease the face seal surface with the high vacuum type silicone grease.



Step 21: Install the pressure proof cap.



Step 22: There is a small relief of 0.005" by design on the outer rim of the pressure proof cap, outside the o-ring outer diameter. This assures metal-to-metal contact where it absolutely matters, inside the o-ring inner diameter. This is a design feature.



Step 23: The operator can set the pressure proof cap with a light torque. Tests have shown a pressure proof cap installed just hand tight, with no wrench, work perfectly fine to 18ksi.



Step 24: The assembled purge port ready for service. Each Purge Port has been individually tested to 18,000 psi, deeper than the Challenger Deep in the Mariana Trench. A serial number is laser etched in the side of every one.

V. Changing the Desiccant Cartridge

When the indicating desiccant turns from blue-to purple-to pink, it is time to change the desiccant cartridge.



Step 1: Be sure the Rubber Cap (A) is on the spent desiccant cartridge.



Step 2: Open the Desiccant Cartridge Clamp Holders (L). There are two. This is made easier by pressing down on the Desiccant Cartridge (F) near each clamp, then popping the overlapping clamp halves apart. A small flat blade screwdriver can be a useful tool to assist.



Step 3: Lift the Desiccant Cartridge up and out of the claps.



Step 4: The second end will be inserted into a short length of Silicone rubber tubing (G). Slip the tubing off the end of the used Desiccant Cartridge.



Step 5: Open the sealed bag with the fresh replacement desiccant cartridges. There are 2 in a sealed bag, and two bags connected end-to-end. Keep the second, new cartridge in its original bag, and tape it closed. Place that bag into a sealed Ziplock® bag. Place the used Desiccant Cartridge in a separate sealed Ziplock bag for later regeneration as described below in Appendix A.

Step 6: Remove the Rubber Cap (A) from one end of the new Desiccant Cartridge (F). Attach this Rubber Cap to the open end of the used Desiccant Cartridge from Step 4.

Step 7: Press the tapered end of the new Desiccant Cartridge into the Silicone Rubber Tubing (G).



Step 8: Firmly press the new Desiccant Cartridge down into the open Holding Clamps (L). You should hear each clamp snap as it closes around the desiccant tube.



Step 9: You're ready for the next round of water vapor removal.

VI. Using the Deck Purge Box with a cylinder



Global Ocean Design manufactures a self-sealing purge port that can be incorporated into a cylindrical housing, thereby allowing use of the Deck Purge Box. A tapped 7/16-20 port with a 1"D spot face is preferred. The design permits a pressure cap to be made of the same material as the pressure housing, eliminating galvanic corrosion. The pressure cap will be electrically tied to the housing through the metallic self-sealing purge port fitting, allowing a single sacrificial anode to protect both the case and the pressure cap. For design information or to order, please contact the factory or visit our website at <www.globaloceandesign.com>.

Appendix A: Regenerating desiccant at sea

The operation requires an oven in the galley.

The granules should be spread in a shallow layer one granule deep and heated for 1 hour at 425°F (+/- 25°F)/220°C (+/- 15°C). The temperature range is important. Lower temperatures,

regardless of heating time, will not regenerate the desiccant. High temperatures can render the desiccant permanently inactive.

The regenerated material should be placed in a **glass** or **metal** container with a lid and **sealed while hot**. The color of the indicating desiccant may begin to fade after repeated regenerations.

Once cool, the desiccant may be transferred back into the plastic Desiccant Cartridge of the Model 120 Deck Purge Box. A folded paper plate can make a useful chute to funnel the granules back into the cartridge. Replace the Rubber Caps on both ends. Longest storage is achieved by using a home vacuum Seal-A-Meal®. Alternatively, use one or two heavy wall Ziplock bags.

Specifications

Size: 16" (40.6 cm) L x 13" (33.0 cm) W x 7" (17.8cm)

Weight: 16.5-lbs (7.5 kg)

Power: Universal 100-240VAC, 50-60Hz, 60W

Standard 6-ft (1.8m) compliant polyurethane vacuum hose. Longer lengths are available.

Desiccant: Calcium Sulfate (>98%), indicator: Cobalt Chloride (<2%)

Fuse: 5mm x 20mm glass-tube fuse, Fast Acting, 250 VAC, 10 Amp

O-rings

Purge Port Pressure cap: 2-015-70d

7/16"D body: 2-018-70d

5mm D body: 2-014-70d

Warranty

Global Ocean Design warrants its products against defects in material and workmanship for a period of one (1) year from the date of delivery. During this period, on satisfactory proof of such defects, any unit, which becomes inoperative, may be returned, prepaid, for repair or replacement at the option of Global Ocean Design. No returns will be accepted unless prior authorization has been received and a job number assigned by Global Ocean Design.

This warranty applies only to the original purchaser and only if equipment has been installed and operated in accordance with published operations and service manuals, or in a manner approved by Global Ocean Design or its representatives.

No other warranty is express or implied and in no event shall Global Ocean Design be responsible for collateral or consequential damages.

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