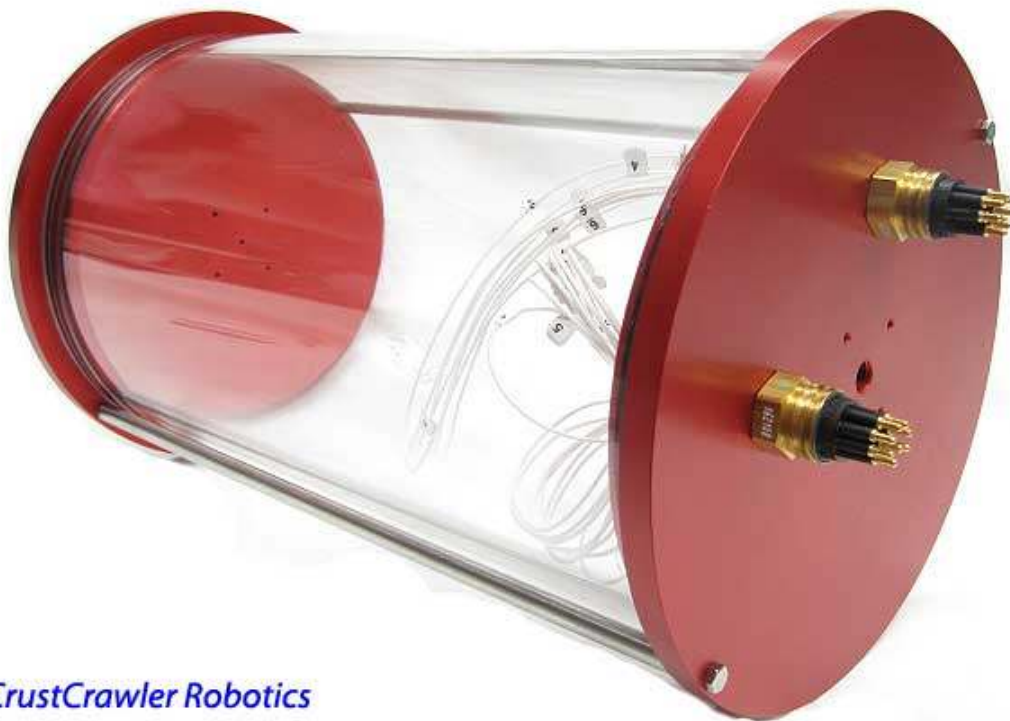


# Waterproof Vessel

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## Construction Guide

VERSION 1.0



*CrustCrawler Robotics*



**Author –Alex Dirks**

CrustCrawler Inc.  
Rev 1.0  
06/20/2014

# Limited Warranty

CrustCrawler has a strong commitment to the high quality production of its Waterproof Vessel and to provide industry leading after-sales support for our customers. Every Waterproof Vessel (GOODS) is fully covered by a comprehensive warranty to the original owner (OWNER) against defects in materials or workmanship for a period of 60 days from the date of shipment, whether or not use starts from that date. All claims under this limited warranty shall be deemed waived unless received by CrustCrawler within 10 days of delivery if visibly damaged or defective, and, otherwise, within 60 days after the defect to which each claim relates is discovered. This is not an unconditional guarantee against all hazards or failures and the Limitations and Exclusions listed below apply.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS.

This warranty is extended to the original OWNER of the GOODS and is not transferable. This warranty is limited solely to the repair or replacement, at our factory, of the defective GOODS. CrustCrawler shall not be liable for any damage or harm, nor for any exemplary, special, punitive, consequential or incidental damages, including but not limited to any loss of revenue, profit or use resulting thereby. If a component is found to be defective during the period of this warranty, CrustCrawler reserves the right to repair or replace the defective component or to refund the original purchase price at its own discretion. In no event shall CrustCrawler be liable for more than the original purchase price of the defective GOODS.

## Limitations and Exclusions

This limited warranty does not cover:

- Damage caused by improper use, improper maintenance, incorrect assembly / Reassembly or accidental damage
- Items subject to normal wear including but not limited to surface finish, seals and cables unless found to be defective in workmanship or materials
- Modification made to the Waterproof Vessel without prior authorization from CrustCrawler Inc.
- Damage or failure that is caused by acts of God, acts of war, or other such similar or dissimilar occurrences beyond CrustCrawler's control.

## Shipping and Return Material Authorization (RMA) Forms

Immediately upon identifying a problem which you believe to be subject to this limited warranty, you must request warranty service by contacting CrustCrawler. All requests for warranty service must be authorized by CrustCrawler prior to return of the GOODS. You must first attempt to work with our technical support staff to help diagnose the problem. This may include performing routine diagnostic procedures. The technician can determine if the problem can be resolved over the telephone or if return for repair is required. Upon determining that the product may be defective under the terms of the limited warranty, and that return to the repair facility is required, CrustCrawler will issue an RMA number which you must complete and return to CrustCrawler. Upon receipt of the RMA number, the GOODS can then be shipped to CrustCrawler for evaluation.

Do not return the GOODS to CrustCrawler prior to the receipt of the RMA number. The GOODS must be shipped in their original shipping containers and packing material or otherwise adequately packed for shipment, and the RMA number must appear clearly on the outside of the package. If the product is damaged during shipment or received in inadequate packaging, this warranty may not apply.

For warranty shipping, the OWNER is responsible for shipment of all GOODS to CrustCrawler and CrustCrawler will cover the costs of return shipment of GOODS to the OWNER up to \$90.00 USD maximum.

In all cases the OWNER is liable for damage to the GOODS that may occur during shipment and should consider insuring the shipment both to and from CrustCrawler.

## **WaterProof Vessel Parts List**

- 150 ft. Depth Rating - (1) 12in Optically Clear Acrylic Tube (7.00in (17.78cm) OD X 6.50in (16.51cm) ID X 12in (30.48cm))

OR

- 400 ft. Depth Rating - 1) 12in Optically Clear Acrylic Tube (7.25in (18.41cm) OD X 6.50in (16.51cm) ID X 12in (30.48cm))
- (2) 6061 End Caps
- (2) 303 Stainless Steel Rods
- (8) 316 Stainless Steel Bolts / Washers
- (1) O-Ring Set A
- (1) O-Ring Set B
- (1) Novagar G-624 Silicon Lubricant (3oz. Tube)
- (1) Pair of latex gloves
- (2) Hull Penetrator Plugs with O-ring (when no SeaCon Hull penetrators are ordered.)
- (1 or 2) SeaCon MiniWetCon Hull Penetrators with female connector and locking sleeve (optional)

### **Warning!**

- Never substitute the 316 Grade Stainless Steel M4 – 20mm screws for any other type of screw material! Crustcrawler has provided to an extra set of screws with the Waterproof vessel kit. If additional screws are needed, please contact Crustcrawler for replacements.

[Sales@crustcrawler.com](mailto:Sales@crustcrawler.com)

480-577-5557

## **Assembly**

1. Lay the end Caps on a soft, non scratch surface.
2. Using the supplied latex gloves, apply a small amount of the G-624 silicon lubricant to the surface of 3 fingers as shown in figure 1. (Note: A larger amount is shown in figure #1 than is needed for illustration purposes)



**Figure 1**

3. Open the O-Ring Set A and gently pull the (4) O-rings through your fingers (one at a time) to evenly distribute the lubricant as shown in figure 2.



**Figure 2**

4. Install O-ring Set A to each end cap as shown in figure 3.



Figure 3

5. Perform Steps 1 thru 3 for O-Ring Set B

- For the single o-ring that is installed from the O-Ring Set B to the end cap, be sure to GENTLY and EVENLY install the o-ring to the o-ring slot in the end cap. Pressing too hard during installing will stretch the o-ring leaving a loop of the o-ring exposed. Once installed, use your fingers and slide them around the o-ring to gently flatten any small bumps in the o-ring once installed. (See figure 4 and 5)



**Figure 4**



**Figure 5**

6. Placing the acrylic tube on one end, place (1) completed end cap onto the top of the acrylic tube and GENTLY tap the end cap evenly but firmly down until it stops against the tube as shown in figure 6.



Figure 6

- Using (2) 20mm M4 screws and washers, install the (2) retention rods onto the end cap as shown in figure 7. Lightly lubricate each screw before installing!

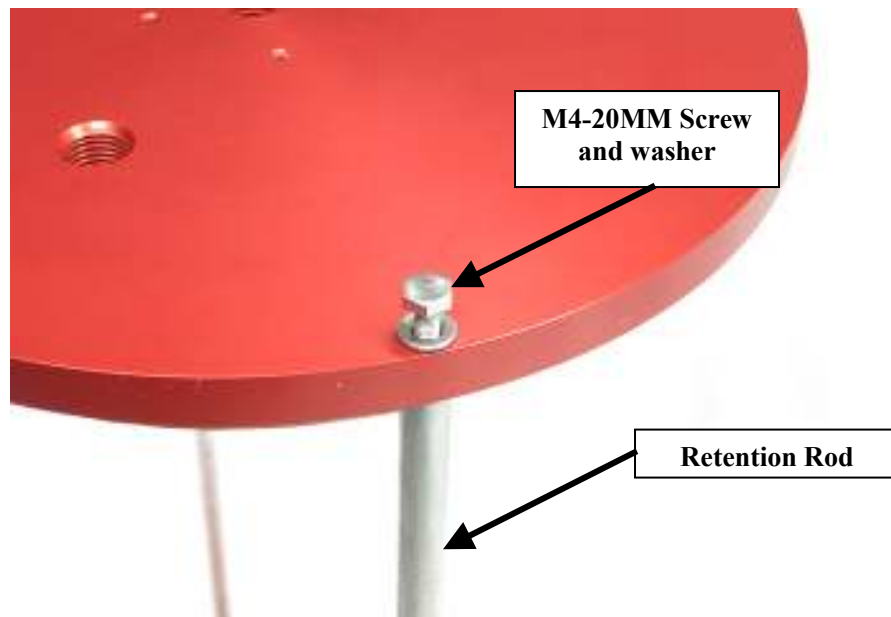


Figure 7



7. Gently tighten the M4-20MM screws until the rods do not move (do not torque tight at this point!)
8. Flip the assembly over 180 degrees as shown in figure 8.



**Figure 8**

9. Install the other end cap to the acrylic tube by lining up the holes of the end cap with the holes of the Retention rods.
10. GENTLY tap the end cap evenly but firmly down until it stops against the tube as shown in figure 6.

11. Install (1) M4 washer to the top of each of the retention rods as shown in figure 9.

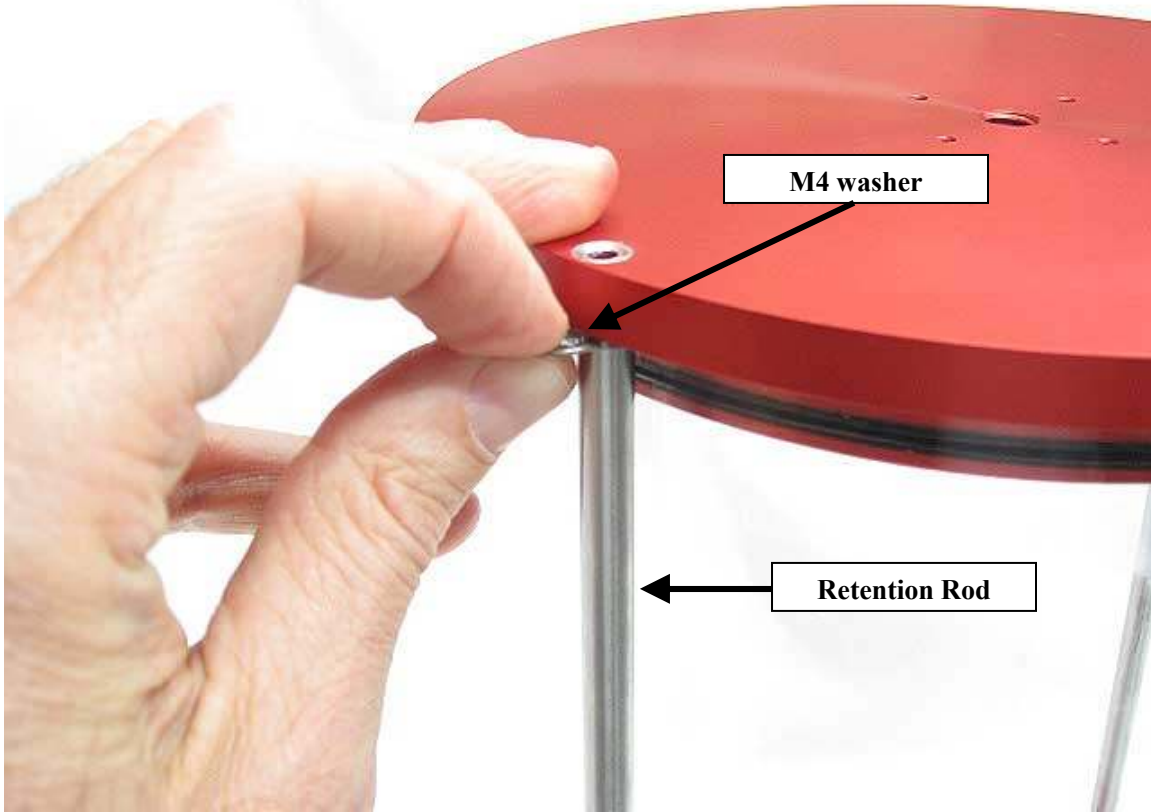


Figure 9

- Using (2) 20mm M4 screws and washers, install the Retention rods onto the end caps as shown in figure 10. Lightly lubricate each screw before installing!



**Figure 10**

12. Torque each of the screws from the previous steps to 30 - 35 Inch pounds (3.72 Nm – 3.95 Nm). (torque each of the screws down evenly until the proper torque is achieved)
13. Turn the assembly over 180 degrees and torque the remaining (2) M4 20mm screws to 30 - 35 Inch pounds (3.72 Nm – 3.95 Nm).

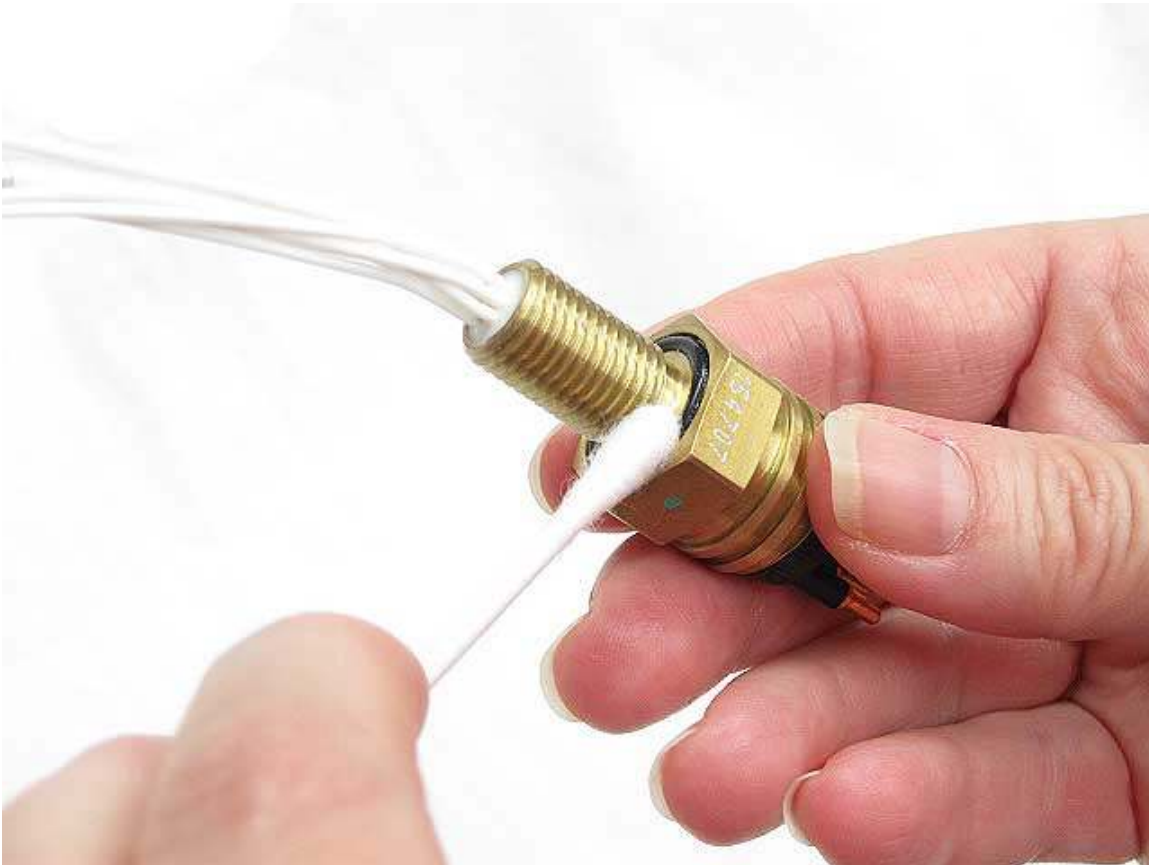
**Note:**

**DO NOT OVERTORQUE THE SCREWS BEYOND THE RECOMMENDED TORQUE VALUE OF 30 – 35 INCH / POUNDS pounds (3.72 Nm – 3.95 Nm)!**

**Note:** There is a built in + -.015in cut tolerance to the length of the acrylic tubes during the cutting process. Due to this tolerance, **DO NOT** expect the (2) washers installed at the top of the stainless retention rods to be tight **AGAINST THE** retention rods and end caps!

## **Installing Hull Penetrators / Plugs**

1. Using the provided cotton swab, lightly lubricate the o-ring on the Seacon MicroWetCon hull penetrator with the Novagar G-624 Silicon Lubricant as shown in figure 11.



**Figure 11**

2. Route the wires through the threaded holes as shown in Figure 12.



**Figure 12**

3. Hand tighten the hull penetrator and then torque the hull penetrator to approximately 50 inch / pounds (5.64 Nm – 6.21 Nm).
4. Lightly lubricate the connectors (just a thin film) with the Novagar G-624 Silicon Lubricant as shown in figure 13.



**Figure 13**

5. Install the Delrin Locking sleeve to the female whip cable as shown in figure 14. Apply a thin film of the G-624 lubricant to the face of the female connector.



Figure 14

6. Match up the pin connections with both connectors and install the female connector by pressing straight down on the female connector.



Figure 15

**Note:**

Do not force the female whip cable all the way down onto the male hull penetrator. The Delrin locking sleeve installed in the next step will seat the connections together.

7. Slide the Delrin locking sleeve down to the hull penetrator and hand tighten the locking sleeve onto the hull penetrator as shown in figure 16.



**Figure 16**

- Repeat steps 1 thru 7 for each Sea-Con connector.

**Note:**

- If you have a threaded hole that is not used, install the threaded plug provided with your waterproof vessel and torque to 50 inch / pounds (5.64 Nm – 6.21 Nm) after lubricating the 0-ring as outlined in step 1.

## Care and Maintenance

### Acrylic Housing / Assembly

- When not in use, always protect the acrylic housing from scratches.
- Wash down the entire assembly with fresh water after use.
- To clean the acrylic housing, wash down with fresh water and dry with a soft lint free cloth (do not use harsh chemicals or detergents!)

### Sea-Con Connectors

The connectors require very little maintenance. They are designed to be used in harsh environments and thus limited amounts of dirt and grit do not affect their performance. It is recommended that, upon disconnecting or retrieving the system, the connectors be cleaned.

Prior to deployment the following maintenance procedure is recommended:

- Demate the connector set.
- Flush connector interface with fresh water (deionized water if available), remove all dirt, grit and grease.
- Inspect for damage in sealing areas, excessive corrosion, debonding of the cable and connector interface and cuts in the cable jacket.
- Apply thin film of dielectric compound (DC) grease, silicon based, to sealing areas of male connector and across the face of the female connector\*. If the BC is removed from it's housing then replace facial o-ring and make sure that o-rings are lubricated and in good condition.
- Mate the connector halves, wipe away any excess grease off the interface line of the mated set.



## Cable and Continuity Preservation

- Avoid sharp bends in cables. Cables subjected to vibration or exposed to seawater drag should be adequately clamped to prevent conductor fatigue and ultimate failure.