

Weight Release Upgrade

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Product reference: all existing weight release solenoid housings

Introduction

This document describes how to do an in-field upgrade of the solenoid housing used on the VMP-5500 and VMP-6000 instruments.

This upgrade will improve the robustness and reliability of the release. In a nominal rigging of the drop weights, the weight retaining line will be tensioned to 10 pounds. This results in a side load on the solenoid plunger of up to 2 pounds. Under extreme conditions this becomes close to the limits of the solenoid. By replacing the front diaphragm retainer with a new version, the solenoid can fire at up to 5 pounds side load at 10,000 psi external pressure and under cold temperatures.

Tools, Parts Needed

- #2 Phillips Screwdriver [for Item 19; Fill/Vent screws]
- .050 hex driver [for retaining the Item 11 (plunger tip) during assembly]
- 5/64 hex driver [for Item 23; #6-32 Flat Head Hex Socket Cap Screws]
- 3/32 hex driver [for Items 18, 25; #4-40 Socket Head Cap Screws]
- 7/64 hex driver [for Items 16, 16; #6-32 Socket Head Cap Screws]
- Syringe with 18 gauge needle. Cut pointy tip off needle to make a flat tip.
- Silicone Oil – Dow Corning DC-200, 20 centistoke
- Small disposable plastic mixing cups or other container
- Kim-wipes and paper towels
- Isopropyl Alcohol

Refer to the Release Assembly Drawing – 013-016 Rev 3.

Procedure – Retainer Replacement

Refer to the included exploded assembly drawing – 013-016 Rev 1. This document describes how to replace Item 5 – Diaphragm Retainer and to top up the housing with oil.

Step 1 – Using a 5/64 Allen Key, remove the 4 flat head screws (Item 23) that hold the lever plates to the housing.



Figure 1: Removing the lever plate assembly.

Step 2 – Hold the housing assembly vertical with the plunger at the top. Use a 3/32 Allen key to remove the four (4) 4-40 socket head cap screws (Item 21) holding the retainer in place.



Figure 2: Removing the front diaphragm retainer.

Step 3 – Remove the old retainer.



Figure 3: Front retainer removed and diaphragm mounting holes aligned with housing.

Step 4 – Make sure the holes in the diaphragm are aligned with the tapped holes in the housing. Install the new retainer making sure it seats itself down onto the diaphragm and around the solenoid tip evenly. Get all four screws inserted and started in their tapped holes. Tighten all four screws in a criss-cross pattern (like you would do for wheel nuts on a car) a little bit at a time until the screws are snugly tight. DO NOT OVERTIGHTEN as you could strip the threads.



Figure 4: New Front Retainer installed.

Procedure – Oil Filling

It is recommended that you put some shop towels down to absorb any spilled oil.

Step 1 – Remove the sealing screw nearest the aft end of the housing:



Figure 5: Removing aft sealing screw.

Step 2 – Take the 30ml syringe with the blunt tipped 18 Gauge needle and very gently insert the needle into the housing until the needle is fully inside the housing. Take care because the internal wires between the solenoid coil and the underwater connector are in this area – you can see them if you look in the hole.



Figure 6: Inserting syringe and needle into housing.

Step 3 – Use the syringe to remove about 10ml of oil. Leave the syringe and needle in the housing.

Step 4 – The rear diaphragm has to be uncompressed to allow for the extra oil to be injected. This can be done by using your fingertips to work the diaphragm material into its uncompressed state. Or, you can use the syringe to remove 30ml of oil from the housing. Remove the needle and replace the seal screw. Then, while holding the housing vertically with the aft end at the top, take a 7/64 Allen Key (hex driver) and remove the 4 cap screws that hold the rear retainer cap in place. Remove the cap and uncompress the diaphragm. Reassemble the diaphragm and rear cap.



Figure 7: Rear diaphragm uncompressed - note the retaining screws are not fully seated.

Step 5 – With the syringe and needle fully inserted in the housing, slightly compress the rear diaphragm with your finger, fill the housing with oil until the oil just comes out the sealing screw hole. Now push the plunger into the housing all the way and keep the diaphragm slightly compressed then install the sealing screw.



Figure 8: Injecting oil while slightly compressing the rear diaphragm.



Figure 9: Making sure the rear diaphragm is slightly compressed and the solenoid plunger is fully retracted whilst installing the aft sealing screw.

You can use Isopropyl Alcohol (IPA) to clean up any spilled oil

Procedure – Replace the Plunger Tip and Tail

To disassemble the plunger and replace the tip or tail for upgrade or maintenance purposes.

It is recommended that you have a 100ml container such as a beaker to store oil while you work.

It is recommended that you work over shop towels or other paper towels.

Step 1 – Take the 30ml syringe with the blunt tipped 18 Gauge needle and very gently insert the needle into the housing until the needle is fully inside the housing. Take care because the internal wires between the solenoid coil and the underwater connector are in this area – you can see them if you look in the hole.

Step 2 – Use the syringe to remove 30ml of oil from the housing. When the rear diaphragm is uncompressed, the housing will hold about 48ml of oil, so there will be about 18ml of oil left in the housing. Empty the syringe into your container and then use it to extract as much of the remaining oil from the housing as possible.

Step 3 – Follow the instructions given in the above sections to remove the Front and Rear diaphragm retainers. The assembly will now look like the photos in Figure 10: Partially disassembled housing. Figure 10.

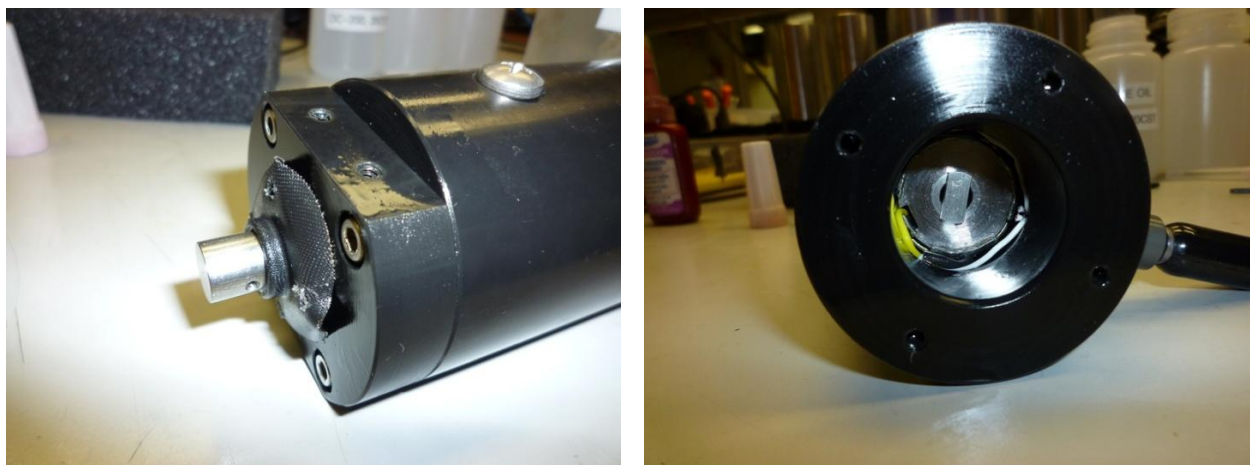


Figure 10: Partially disassembled housing.

Step 4 – To remove the tip and tail you will need to use a .050 Hex Key, a pair of needle nose pliers and possibly a pair of soft jawed channel-lock pliers. Start by putting the .050 hex key through the small hole in the solenoid tip. While holding the key and tip firmly use the needle nose pliers to unscrew the plunger tail. How this all comes apart depends on the strength of the loctite bonds on the two threaded connections. The tip may come off, or the tail may come off. If the tip comes off, remove the diaphragm as well, then grasp the front end of the plunger with the soft jaw channel lock pliers and use the needle nose pliers to unscrew the tail. Figure 11 shows the disassembled plunger and housing.



Figure 11: Fully Disassembled plunger.

Step 5 – At this point it is prudent to inspect everything. Clean the parts with IPA and make sure there aren't any small pieces of material or other contaminants on them or inside the housing.

Step 6 – The plunger tip part and the end of the plunger should be smooth and free of any sharp edges. Polish with 400 grit sandpaper if necessary, then clean with IPA.

Step 7 – Put the front diaphragm on the threaded stud of the plunger tip part with the rubbery side to the inside of the housing and the fabric side to the water side. Put a small drop of loctite 222 or loctite 242 onto the threaded stud and assemble to the plunger so it is secure. Inspect both sides of the diaphragm to make sure the assembly is tight to the diaphragm (no gaps).

Step 8 – Install the plunger into the housing. Put a small drop of loctite into the tapped hole on the plunger tail and use the needle nose pliers to install the tail to the plunger. Tighten securely.

NOTE: make sure the plunger moves smoothly back and forth in the housing at this time.

Step 9 – Install the front diaphragm retainer and check the plunger movement again.

Step 10 – Install the rear diaphragm and rear retainer.

Step 11 – Fill with oil as described in a previous section.

Step 12 – Double check the freedom of motion again.

Step 13 – Use IPA to clean the excess oil off of the housing. Inspect for any oil leaks after 12 hours. Retighten the screws if necessary.

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