CYLINDER REFILL AND INSPECTION

1.0 General Information

This procedure outlines the process in which Authorized BCA refill centers should complete a refill on an empty Float cylinder. The refill equipment utilized should meet BCA minimum requirements to ensure a quality refill is performed.

2.0 Minimum Requirements

1. The air utilized to fill the cylinder must be SCUBA grade (less than 67ppm of water vapor).
2. The refill equipment must be capable of filling to a pressure of 3000 psi.
3. The refill equipment should include a pressure gauge separate from the gauge on the Float cylinder. The pressure gauge should have an accuracy of at least ±50 psi across the operating range or be Grade 2A or higher.
4. A water bath with a depth that allows ¾ of cylinder body to be submerged should be used during filling. The temperature of the water bath shall be between 50°F – 70°F.
5. The fill station shall have a bleed port. The port must allow the pressure to bleed fast enough that the Float cylinder check valve closes and no pressure drop is observed.
6. A clean work place shall be available for resetting and re-greasing the cylinder O-ring.

3.0 Cylinder Inspection

1. Record the following on the refill inspection log
2. Valve head serial number;
3. Cylinder serial number;
4. Manufacturer code;
5. Cylinder type (Pi or DOT);
6. Shop/Technician name and date;
7. Complete a visual inspection of the cylinder and valve head. If any damage as described below is observed, the cylinder shall not be refilled and the customer instructed to contact BCA.

8. Inspect the Quick Connect Coupler and ensure it has an O-ring and retaining clip installed. See Figure 2.

9. Inspect the trigger pin threads for damage and ensure the pin is not bent. See Figure 3 and 4.
10. Inspect the cylinder body for damage and dents. See Figure 5 and 6.

4.0 Cylinder Refill

**WARNING:** Before refilling or working on a cylinder, ensure there is no pressure left in the system, by checking the pressure gauge and deploying the cylinder.

**NOTE:** The refilling equipment utilized should meet BCA minimum requirements.

4.1 Cleaning the Valve to Tank O-ring

**NOTE:** This procedure is only to be performed if the customer has removed valve head from the cylinder.

1. Unscrew the valve head from the cylinder tank.
2. Remove the valve head to Tank O-ring and use rubbing alcohol and a lint free cloth to clean the O-ring, the valve head and O-ring groove. Allow components to dry. See Figure 7.

![Figure 7. Backcountry Access Refill Procedure](image)

3. Inspect and clean the threads on the valve head and cylinder and allow components to dry.
4. Apply fresh vacuum grease to the O-ring and place it in the O-ring groove.
5. Screw the valve head back onto the tank until hand tight.

**WARNING:** Do not utilize tools or excessive force to tighten the valve head onto the cylinder; this may damage the valve head assembly.

### 4.2 Resetting the Valve Stem O-ring

**NOTE:** The workspace must be clean to prevent contamination of the O-ring.

1. Unscrew the hex screws on the trigger housing.
2. Pull the trigger pin out with your finger and then slowly remove the trigger housing from the valve stem. See Figure 8.

![Figure 8. Removing the trigger housing](image)

3. Pull the valve stem out of the valve head with your finger.
4. Inspect the Valve stem rubber washer and larger O-ring for damage. See Figure 9 below.

![Figure 9. Reject for damage to rubber washer](image)

5. Use a dental pick or tooth pick to remove the valve stem O-ring, as shown in the below picture. See Figure 10 below.

**WARNING:** Use care to avoid scratching the valve stem O-ring groove.

![Figure 10. Resetting the valve stem O-ring](image)

6. Apply vacuum grease to the new valve stem O-ring and install it on the valve stem groove. Place the valve stem back inside the cylinder valve head.

**NOTE:** Ensure the installed valve stem O-ring is free of contamination as this can lead to leakage.

7. Reinstall the trigger housing by pulling out the trigger pin and placing it over the valve stem.

8. Install the hex screws on the trigger housing until hand tight.

### 4.3 Pressure Gauge Accuracy and Filling

1. Connect fill port on the cylinder to the fill station.
2. Place the cylinder in water and ensure that ¾ of the cylinder body is submerged in water. The valve head shall not be submerged while filling.
3. If a pressure regulator is used, then set the pressure regulator to 2700 psi and fill the cylinder. Allow the cylinder pressure to equalize to 2700psi for 1 minute while filling.
4. After a minute inspect the cylinder pressure gauge and ensure it reads between 2600-2800 psi. If the pressure gauge does not read between 2600-2800 psi, the cylinder shall be discharged and the customer notified to contact BCA.
5. Now bleed the air from the fill station and remove the cylinder.
6. When bleeding the air from the fill station check the cylinder pressure gauge to ensure the pressure is constant. The cylinders check valve may not close immediately if the system is bled slowly and thus cause a loss in pressure. To avoid this issue bleed the air from the fill station quickly.

7. Allow the cylinder to rest at room temperature for at least 20 minutes.

### 4.4 Two Week Inspection Period/Shelf Life Test

1. Note the pressure of the cylinder after it has been refilled.

2. Refilling the cylinder will cause it to heat up. After the refill process, it is possible that the pressure can decrease as the cylinder cools to room temperature. It is recommended to wait 20 minutes to see if the pressure drops and then top it off as necessary to reach the desired pressure.

3. We recommend performing a two week shelf life test after filling to ensure that there are no leaks in the system. In the absence of this shelf life test, the customer should always sign the BCA Release of Liability, Waiver of Claims, Assumption of Risks, and Indemnity Agreement. It is recommended that this form be filled out and signed after all refill procedures, whether or not the shelf life test is performed. This form should be filed by the refill center along with completed inspection/refill logs.

4. After 20 minutes at room temperature, record the date, technician’s name, cylinder pressure and air temperature at which the measurement is taken on the refill inspection log.

5. To perform the shelf life test, allow the cylinder to sit for 14 days at room temperature. At the end of this time period, record the date, technician’s name, pressure and air temperature at which the measurement is taken on the refill template.

6. If the pressure reading at the end of the shelf life test has only dropped by 100 psi from the original measurement and if the pressure falls within the acceptable range (as shown in Table 1 below), the cylinder has passed the shelf-life test. If the cylinder does not meet the above criteria the cylinder failed the shelf life test.

   **Note:** If there is a large difference in the temperature when the pressure measurement is taken, there may be a pressure drop greater than 100 psi observed. If this occurs bring the temperature of the cylinder to within 5 F of the previous measurement and re-record the value. If there is still a pressure drop greater than 100 psi observed and outside the acceptable range, the cylinder failed the shelf life test.

7. Record if the cylinder passed or failed the shelf-life test on the refill inspection log.

<table>
<thead>
<tr>
<th>Temperature Range (F)</th>
<th>Pressure Range (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50º-58º</td>
<td>2450-2700</td>
</tr>
<tr>
<td>59º-67º</td>
<td>2500-2750</td>
</tr>
<tr>
<td>68º-76º</td>
<td>2550-2800</td>
</tr>
<tr>
<td>77º-85º</td>
<td>2600-2850</td>
</tr>
<tr>
<td>86º-94º</td>
<td>2650-2900</td>
</tr>
<tr>
<td>95º-103º</td>
<td>2700-2950</td>
</tr>
<tr>
<td>104º-112º</td>
<td>2750-3000</td>
</tr>
</tbody>
</table>

8. If no shelf life test is performed, then record the pressure on the BCA cylinder pressure adhesive tag and place it prominently on the refilled cylinder. Advise the customer that the pressure gauge must be checked again in 14 days to ensure that it is still within the tolerances above. If the gauge reads less than 2500 psi at room temperature, then the cylinder should be returned to the refill center or BCA for service. Obtain the signed waiver from the customer, check the appropriate boxes on the refill log and keep both documents on file.