

# CodeLine® 40S Series RO Pressure Vessels

## — User's Guide —

### DANGER - HIGH PRESSURE DEVICE

This vessel may cause loss of life, severe bodily harm, or property damage if not correctly installed, operated and maintained. Read and understand all guidelines given in this bulletin before attempting to open, operate or service this vessel. Failure to follow these guidelines and observe every precaution will result in malfunction and could result in catastrophic failure. Misuse, incorrect assembly, or use of damaged or corroded components can result in high-velocity release of the end closure. We recommend that only a qualified technician experienced in servicing high-pressure hydraulic systems, open, close and service this vessel.

### Important Safety Precautions

- |   |   |
|---|---|
| <p>Do... read, understand and follow every guideline in this bulleting. Failure to take every precaution may void warranty and could result in catastrophic failure.</p> <p>Do... install in an area where a vessel or piping malfunction that result in water leakage would not damage sensitive or expensive equipment, such as electronic components.</p> <p>Do... verify that head locking components are properly placed and secured.</p> <p>Do... inspect end closures regularly, replace deteriorated components and correct causes of corrosion.</p> <p>Do... follow membrane element manufacturer's recommendations for loading elements into the vessel (see Replacing Elements).</p> | <p>Do not... operate vessel at pressures and temperatures in excess of their specific rating.</p> <p>Do not... service any component until you verify that pressure is fully relieved from the vessel.</p> <p>Do not... use corroded components. Use of such components may result in catastrophic failure.</p> <p>Do not... pressurize vessel until after visually inspecting to ensure that the spiral retaining ring is correctly installed.</p> <p>Do not... tolerate leaks or allow end closures to be routinely wetted in any way.</p> <p>Do not... use excessive silicone lubricant.</p> <p>Do not... pressurize vessel without element in place unless permeate ports are plugged internally.</p> <p>Do not... overtighten fittings in ports.</p> <p>Do not... Use petroleum products on Noryl components.</p> <p>Do not... Allow petroleum or silicone based products to come in contact with membrane elements during installation or maintenance.</p> <p>Do not... Use the vessel at negative pressure</p> <p>Do not... Stand or climb on the pressure vessels, or the feed / concentrate or permeate ports.</p> |
|---|---|

Distributed By:



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### General Information

The 40S Series Fiberglass RO/UF Pressure Vessel is designed for continuous, long-term use as a housing for reverse osmosis and ultrafiltration elements in typical industrial water treatment systems at pressures of 300, 450 & 600 psi..

The 40S Series is designed to accommodate any make of 4-inch nominal diameter element.

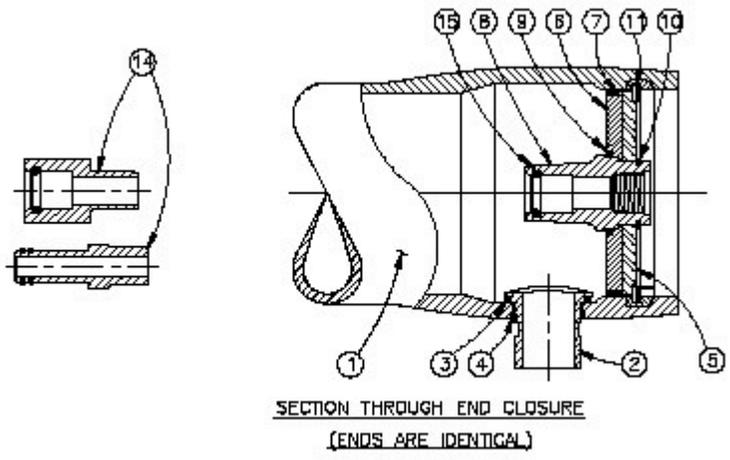
The fiberglass shell can be damaged by rigid clamping, impact, scratches or abrasion. Metal parts must be maintained free of corrosion to eliminate potentially unsafe conditions due to corrosion.

The information and guidelines incorporated in this User's Guide are intended only as a supplement to good industrial practice. Full responsibility for correct operation and maintenance of vessel remains with the user.

This guide should be used in conjunction with drawing numbers 40S30(C):#99311; 40S30(NC):#99312; 40S45(C):#99315; 40S45(NC):#99316, 40S60(C):#99313; 40S60(NC):#99314

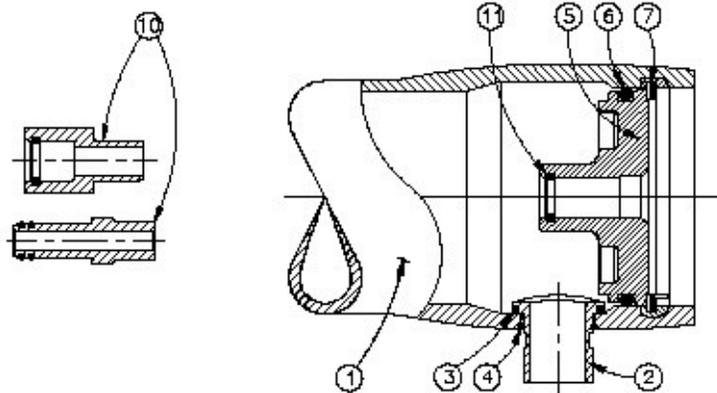
When properly installed and maintained, the 40S Series vessels can be expected to provide safe operation over a long service life.

CODED 40S: 300 / 450 / 600 psig



Dwg Ref	Qty Per	Item #	Description	Materials
Shell				
1	1	Order Section	Shell	Filament Wound epoxy/glass composite. Head locking grooves internally wound in place.
2	A/R		F/C Port	CF8M*
3	A/R		F/C Port Seal	Ethylene Propylene - Square Cut
4	A/R		F/C Port Retainer	300 Series SST
Head				
5	2	96803	Bearing Plate	316 Stainless Steel / Equivalent.
6	2	96855	Sealing Plate	Engineering Thermoplastic.
7	2	45317	Head Seal	Ethylene Propylene - O - Ring
8	2	96807	Permeate Port	Engineering Thermoplastic.
9	2	45335	Permeate Port Seal	Ethylene Propylene - O - Ring
10	2	45242	Port Retainer	300 Series SST
Head Interlock				
11	2	45260	Retaining Ring	316 L Stainless Steel.
Vessel Support				
12	3*	45058	Saddle	Cast Urethane Elastomer
13	3*	47459	Strap Assy	304 Stainless Steel-PVC Cushion.
Element Interface				
14	2	A/R	Adapter	Engineering Thermoplastic.
15	2	A/R	PWT/Adapter seal	Ethylene Propylene - O - Ring
* 2 each furnished with length code 1,2 & 3.				
Item No. 12 and 13 not shown in the section view				

**NON-CODED 40S: 300 / 450 / 600 psig**



**SECTION THROUGH END CLOSURE**  
**(ENDS ARE IDENTICAL)**

Dwg Ref	Qty Per	Item #	Description	Materials
Shell				
1	1	Order Section	Shell	Filament Wound epoxy/glass composite. Head locking grooves internally wound in place.
2	A/R		F/C Port	CF8M*
3	A/R		F/C Port Seal	Ethylene Propylene - Square Cut
4	A/R		F/C Port Retainer	300 Series SST
Head				
5	2	96827	End Plug	Engineering Thermoplastic.
6	2	45317	Head Seal	Ethylene Propylene - O - Ring
Head Interlock				
7	2	45260	Retaining Ring	316 L Stainless Steel.
Vessel Support				
8	3*	45058	Saddle	Cast Urethane Elastomer
9	3*	47459	Strap Assy	304 Stainless Steel-PVC Cushion.
Element Interface				
10	2	A/R	Adapter	Engineering Thermoplastic.
11	2	A/R	PWT/Adapter seal	Ethylene Propylene - O - Ring
* 2 each furnished with length code 1,2 & 3.				
Item No. 8 and 9 not shown in the section view				

## Installation

Regardless of when or by whom your vessel may have been installed, there are a few quick checks you should make before use. Check that each vessel is:

- Mounted with compliant material (Polyurethane saddle) between the fiberglass shell and any rigid frame.
- Free to expand under pressure - shell not clamped rigidly in place, no rigid piping connections to port fittings.
- Not used in any way to support other components such as piping, manifolds hanging from ports.

## Opening the Vessel

### WARNING

Relieve pressure from vessel before beginning this procedure.

### Contamination Removal

Metal oxidation products and mineral deposits can interfere with vessel disassembly. Remove all foreign matter from both ends of vessel as follows:

1. Remove contaminants using a small wire brush or suitable abrasive (such as medium-grade ScotchBrite™).



Cleaning inside the vessel

2. Flush away loosened deposits with clean water.

### Removing the Head

The head assembly is shown in Figure 1.

Remove head as follows:

Disconnect Permeate Piping

1. Disconnect permeate piping as required at nearest convenient joint, being careful not to place undue stress on the threaded connections of the plastic permeate port(s).

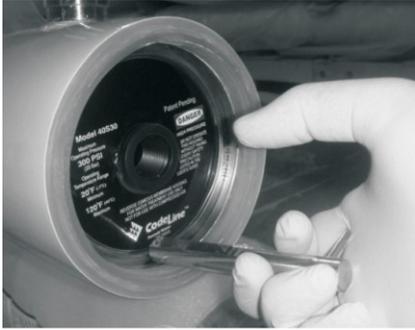
### CAUTION

DO NOT tap on fittings as this could damage the ports.

Remove the Retaining Ring from the groove

1. Lift the tabbed end of the retaining ring up out of the stainless steel groove in the shell and then away from the head so that it rests in the end margin of the vessel. This is best accomplished by using CodeLine® Removal Tool, part number 50303, which is available from your supplier. This can also be accomplished using a screwdriver and a pair of pliers if the tool is not readily available.

With the removal tool the retaining ring can be lifted upward by simply rotating the tool counterclockwise after inserting it over the tab on the retaining ring. (Use the smaller hole). Hold the tool flat against the end margin and parallel to the vessel bore. It is then possible to pull the end of the retaining ring straight out. The retaining ring may snap back into the groove if this alignment is not closely adhered to. If the retaining ring is difficult to remove, try soaking with a release agent such as LPS™ or WD40™, being careful to avoid any contamination of a membrane element.



Retaining Ring Removal Tool

When using screwdriver and pliers, pry the tabbed end of the retaining ring out of the stainless steel groove with the tip of the screwdriver. Once the end of the retaining ring is clear of the groove, grab the tab with the pliers and pull towards the end of the vessel until the end of the ring is resting in the end margin of the shell.

2. Remove the 4" retaining ring from the stainless groove in the shell by rotating your finger behind the ring as it continues to exit the groove.



Removal of Retaining Ring

3. Once the retaining ring has been removed, examine the area for burrs or dings which could damage the head or membrane. If necessary, use ScotchBrite™ or 600 grade sandpaper to smooth the area.

#### Removing Head Assembly

1. Install a ½"NPT x 6" long nipple into the product port of the head on one end of the vessel .

2. Grasp the nipple and pull the head straight out. A small amount of side-to-side movement may be necessary to start the end plug moving. Care should be taken to avoid placing too much stress on the product port threads.



Removing the head assembly

3. Remove and discard plug seal, taking care not to scratch or otherwise damage the sealing surfaces.
4. Repeat above procedure for the opposite end of the vessel.
5. As soon as possible after removal, disassemble and check all head components, as described in Rebuilding the Head and Refurbishing Parts.

## Replacing Elements

The following procedures are provided for information only. Elements should be installed in accordance with the element manufacturer's recommendations. Where conflicts exist, contact the element manufacturer or Pentair Water for clarification.

To replace elements, proceed as follows:

### Removing Elements

1. Remove heads from both ends of vessels as described in Opening the Vessel.

#### NOTE

Always remove and install element in the direction of feed flow. The feed end (upstream end) is the end plumbed most directly to the pump.

2. Push element(s) out of vessel from the upstream end.
3. For multi-element vessels, remove the interconnectors and retain for reinstallation.

### Inserting Elements

1. Ensure that heads are available in clean, as-new condition before proceeding. (If in doubt as to head condition see section on inspecting parts, page 12).
2. Check that all required elements are ready for assembly, with no dings or other damage which could scratch the inside of the vessel.
3. Reinstall head assembly at the downstream end as described in Closing the Vessel. Make sure the smaller of the two adapters supplied with the vessel is installed in the permeate port.

4. Lubricate element seal sparingly with the manufacturer's recommended lubricant or with glycerine ( a commercially available lubricant that will not foul elements).

#### CAUTION

DO NOT lubricate element seals with a silicone based material (such as Parker Super O-Lube™, the recommended lubricant for head seals).

5. Insert the element with the brine seal (typically a U-cup seal) installed on the upstream end with its lip facing upstream.

#### CAUTION

System malfunctions and element damage may result if elements are installed in the wrong direction.

6. Install interconnectors between multiple elements as each succeeding element is inserted.
7. Push each element downstream into shell until the elements fully engage with the downstream head. If element is hard to push, make sure the brine seal is properly installed and you are pushing from the upstream end.
8. When the elements are installed, close the vessel as described in the following section.

## Closing the Vessel

Prepare and install head assemblies as described below.

1. Refurbish or replace head components as required to ensure as-new condition. (See Refurbishing Parts). The PWT O-ring should be replaced each time.
2. Cover O-rings with a thin, even layer of Parker Super O-Lube™ silicone lubricant or the lubricant recommended by your element supplier.

### NOTE

Glycerine is a commercially available lubricant that will not foul elements. However, silicone lubricant is recommended for this application.

3. Remove any residual lubricant from the head and work a fresh, thin film of Parker Super O-Lube™ silicone lubricant into the outer diameter of the bearing seal plates, where it contacts the plate seal in the vessel.
4. Install adapter into one end plug. At downstream end of vessel, orient end plug ports into desired position and push plug fully into vessel. A sharp, forceful thrust may be needed to enter plug seal into the vessel bore.



Installation of the End Plug Assembly into the vessel

### CAUTION

If vessel is to be pressurized above 125 psi without elements installed, the central permeate port should be plugged from the inside. Solid adapters are available for this purpose.

5. Carefully insert retaining ring into its groove. This is done by inserting the lead end of the spiral retaining ring (end without bent tab) into the stainless steel retaining ring groove located in the shell, and slowly pushing the remaining turns into the shell.



Inserting Retaining Ring into the groove

6. Check that the spiral retaining ring is fully seated in groove. If it is not, remove and check for foreign materials causing the spiral ring not to fully seat.



Retaining ring seated in the groove

### CAUTION

DO NOT pressurize vessel without element(s) properly installed.

7. Insert elements if not already installed, and insert longer adapter into the remaining head. Then install this head in the upstream end of the vessel, using technique given in steps 4 and 5.
8. Reconnect piping to vessel, as described in Refurbishing Parts..

**CAUTION**

Be sure to hold feed/concentrate port with a wrench when tightening fittings.

11. If threading fittings into the head, avoid overtightening. Hand tight plus approximately 1/4 turn should produce a satisfactory seal. If leak occur on pressurization, a small amount of further tightening may be required.

12. Pressurize vessel. Inspect for leaks at connections to the vessel and all around the vessel itself. If any leaks occur, release pressure from vessel and tighten fittings as necessary. Then pressurize vessel and check for leaks again.

**CAUTION**

DO NOT tolerate any leaks. Leaks can result in corrosion and eventual catastrophic vessel failure

## Head Disassembly - Coded

**NOTE**

Head Rebuilding should be performed in a clean work area. Dust or dirt on O-rings or other parts can scratch inner surfaces, with subsequent leakage.

1. Using a small screwdriver or similar tool remove the Plug Seal. However do not damage the sealing surface in any way as it may lead to leakage.



Removal of the Head Seal

2. Remove Port Retainer from its groove in the Permeate port. Take care not to scratch the hard-anodized surface of the bearing plate.



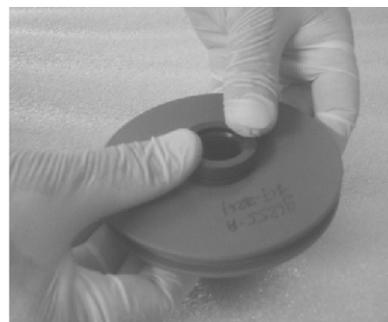
Removal of the Port Retainer Ring

3. Bearing Plate is held in the head assembly by Port Retainer, Once the Port Retainer is removed the bearing plate is free to move.



Removal of the Bearing Plate

4. Remove the Sealing Plate by pressing it out from one end of the permeate Port.



Removal of the Sealing Plate

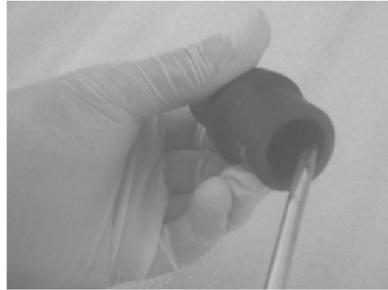
## Head Disassembly - Coded

5. Remove the Permeate Port Seal from the Sealing Plate. However, do not damage the sealing surface in any way as it may lead to leakage.



Removal of the Permeate Port Seal

6. Remove the PWT / Adapter Seal from the permeate Port using a small screw driver or similar tool. However, do not damage the sealing surface in any way as it may lead to leakage.



Removal of the PWT/Adapter Seal

## Head Disassembly - Non Coded

1. Using a small screwdriver or similar tool remove the Head Seal. However do not damage the sealing surface in any way as it may lead to leakage.



Removal of the Head Seal

2. Remove the PWT / Adapter Seal from the End Plug using a small screw driver or similar tool. However, do not damage the sealing surface in any way as it may lead to leakage.

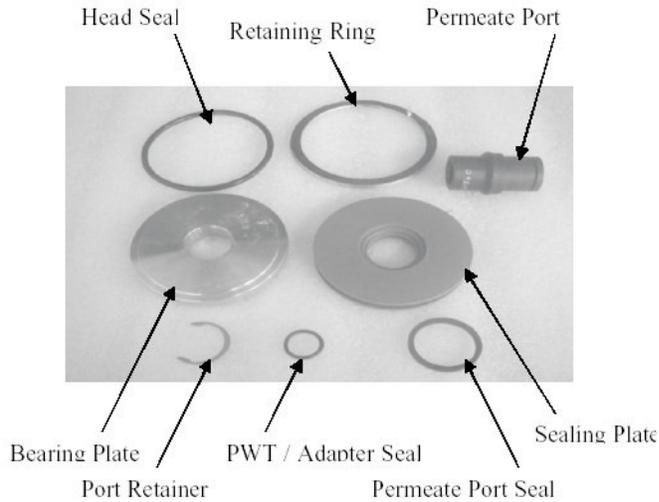


Removal of the PWT/Adapter Seal

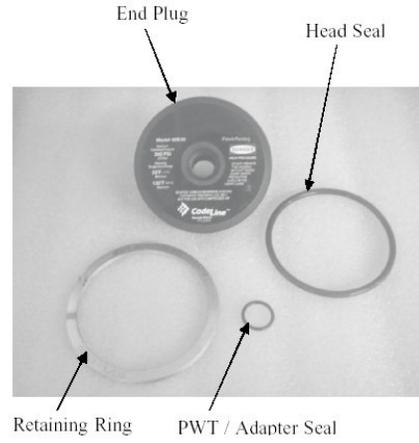
### NOTE

A small screw driver or similar tool may be used to remove the O-rings. However, do not damage the sealing surfaces in any way as it may lead to leakage. It is recommended that all seals be replaced each time the head is assembled.

## Head Disassembly



40S Coded Head Disassembled



40S Non Coded Head Disassembled

Fig 1. Head Component Identification 40S - Head Disassembled

## Head Assembly - Coded

**WARNING**

Head must be carefully assembled following these instructions. Incorrect assembly can result in CATASTROPHIC failure.

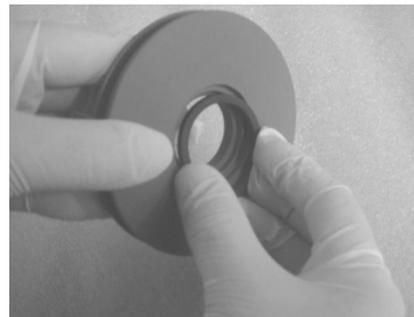
**NOTE**

Glycerine is a commercially available lubricant that will not foul elements. However, silicon lubricant is recommended for this application.

1. Use only head components in as-new condition. Use new O-rings each time the head is assembled.
2. Cover O-rings with a thin even layer of Parker Super O-Lube™ silicon lubricant or the lubricant recommended by your element supplier.
3. Assemble the Permeate Port seal in the Sealing plate groove.



Lubricating Plug seals and O-rings



Inserting Permeate Port seal

## Head Assembly - Coded

4. Assemble the PWT / Adapter seal in the Permeate Port seal groove.



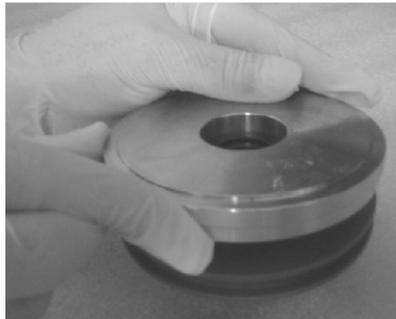
Inserting PWT / Adapter Seal

5. Insert the port retainer end of the permeate port through the sealing plate. Press firmly till permeate port bottoms on the sealing Plate. Please ensure that the side of the sealing Plate with the Permeate Port seal faces the permeate port hub.



Installing Sealing Plate

6. Place the bearing plate over the sealing plate through the permeate port, ensure that the port retainer groove on the permeate port is exposed.



Installing Bearing Plate

7. Snap the port retainer ring into the groove in the permeate port, up against the face of the bearing plate.



Installing Port Retainer

8. Examine the assembly to ensure that the mating faces of the Sealing and Bearing Plate are in complete contact. If they are not, dis-assemble the head and start over.

9. When head is correctly assembled, insert the Head Seal O-ring into the groove on the outside diameter of the Seal Plate.

10. Protect heads from contamination until ready to assemble into the vessel(s).

## Head Assembly - Non Coded

1. Install the Head Seal on the End Plug as Shown in the picture
2. Install the PWT / Adapter Seal in the End Plug as Shown in the picture



Installing Head Seal



Installing PWT / Adapter Seal

## Refurbishing Parts

### Inspecting Parts

Plastic parts: examine for cracking, softening or discoloring. This may indicate chemical attack of the material. Defective parts must be replaced. Alternate material may be required. Contact your supplier or CodeLine® for assistance.

Metal parts: check for corrosion, scratches, dents, cracks or other damages to insert ring and spiral retaining ring.

Other parts: examine for any damage, such as gouges, chips or cracks, that could affect structural strength or sealing characteristics. The following are some examples of defects that may require replacement of the affected part.

- Bearing/Sealing Plate and Permeate port: cracked, discolored, sealing areas damaged (chipped or gouged), port threads stripped or cross-threaded.
- Spiral Retaining rings: are the sole means of end plug retention. Parts bent, corroded, cracked or damaged in any way must not be used. Carefully check for hairline cracks.

### Refurbishing Shell

1. Using a fine wire brush, remove any large deposits from locking ring groove in the shell.
2. Using a medium or finer grade of ScotchBrite™ and mild soap solution, clean the inside of the vessel at least 4 inches in from each end. Take care not to damage feed/concentrate port and its respective seal.
3. Use clean water to rinse away all loosened deposits and soap residue.
4. Examine inside of vessel for scratches, gouges, or other imperfections that could prevent proper sealing. If such areas exist and leaks are observed when the vessel is placed back in service, the shell may need to be replaced.

### Refurbishing Other Parts

1. Remove any large deposits from metal parts using a wire brush.
2. Scrub the entire surface with medium grade ScotchBrite™ until all contaminants are removed.
3. Rinse parts clean with fresh water and dry.
4. Inspect all parts for serviceability as specified above.

## Refurbishing Parts

### Remaking Pipe Connections to Permeate Port

1. Use a wire brush to remove all foreign matter from threads on pipe fittings.
2. Apply non-hardening thread sealant or Teflon™ tape to fitting and install in permeate port. Tighten fitting a maximum one quarter-turn past hand tight; the plastic port could be damaged if fittings are over-tightened.
3. Fit head and spiral retaining ring as described in Closing the Vessel (page 7).

### Remaking Pipe Connections to Feed/Concentrate Port

1. Follow steps 1 & 2 above. Be sure to hold feed/concentrate port with a wrench when tightening fitting. Movement of the port could damage shell and/or port.

### Part Replacement

Replace all parts that cannot be restored to as-new condition.

Replace any parts showing signs of structural damage or corrosion.

#### CAUTION

Use of components damaged by corrosion can cause catastrophic failure.

Seals should be replaced as necessary each time the vessel is serviced. Any parts that need to be replaced are available from your supplier or from CodeLine®.

## Shimming

1. Shutdown the system and remove both of the vessel fibreglass endcaps.
2. Drain the vessel.
3. Check the location of the membrane column on each end of the vessel.  
A. You want to look at the distance that the face of the membrane is from the ramp on the counter bore of the vessel. Push the membrane column from the feed so that the brine seal has sufficient engagement to the 4.00" dia. bore of the vessel.

#### NOTE

The membrane should be flush to the counter bore ramp.

4. Re-install the end cap on the feed end and make sure that you can get the end cap in far enough to get the spiral ring in.
5. Go around to the reject end / downstream end and remove the square head seal.
6. Remove the adapter

Flush cut membrane or Type II style adapter: Put a shim or two on the membrane side of the adapter and re-insert the adapter into the membrane.

Membrane with male product water tube or Type I adapter: Leave the adapter attached to the membrane and place a shim on the end of the adapter inserted into the permeate port. Insert end cap assembly, engage the adapter and see how far you can push the head assembly into the vessel.

If it can go deep, check the distance between the back of the groove on the stainless steel insert ring on the vessel and the fiberglass end cap. If you have at least .150" gap, take the head out and put another shim on. Repeat the shimming until you reach the point where you can just get the end cap and spiral locking ring to engage. (Use no more than four spacers).

7. Reinstall end cap square head seal and reinstall end cap.
8. Re-start system.

#### NOTE

Ease the water pressure up on start up. You don't want to damage the downstream adapter by ramming the pressure into it.

9. Run the system and check the water quality to make sure that your seals are all in the proper places.