



CodeLine™

Pentair Water

USER'S GUIDE 80A Series

Side Ported Pressure Vessels

**Model
80A15**



**Model
80A45**



**Model
80A30**



**Model
80A60**



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PREFACE

The CodeLine™ 80A Series Sidewall Ported RO pressure vessels are designed for continuous long-term use as housings for reverse osmosis membranes. Typically, the pressure rating, overall length and total number of vessels is determined by calculations used during membrane element selection. Vessels are installed into a system frame that provides the recommended support points & then strapped snugly to the frame using mounting hardware provided. Vessel installation and piping connections should allow for expansion due to change in temperature and pressure in both length and diameter as the vessel is operated.

During maintenance, it may be necessary to remove a pressure vessel from a bank for repair or replacement. Sufficient space must be available for this to happen.

Care must be taken in installation and in removal of the vessels not to damage the shell. Damage to the shell can result in explosive head failure of the vessel and possible injury to personnel.

Corrections or recommendations for improvement of this manual should be addressed to:

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80A SERIES - SIDEPORT OPERATION AND MAINTENANCE GUIDE

**Model
80A15**



**Model
80A30**



**Model
80A45**



**Model
80A60**



Danger - High Pressure Device

This vessel may cause loss of life, severe bodily harm, and/or property damage if not correctly installed, operated and maintained. Read and understand all guidelines given before attempting to open, operate or service this vessel.

Failure to follow these guidelines and observe every precaution may 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 mechanic, experienced in servicing high-pressure hydraulic systems, open, close and service this vessel.

This section is a guide to proper operation and maintenance of CodeLine™ 80A Series pressure vessels. Good industrial practice must be used in applying this information to assure safe vessel use. These guidelines are not intended to relieve the user from full responsibility for correct operation and maintenance of the vessels.

For technical specifications and dimensions, refer to the Engineering Drawing of each specific model.

The information in all sections must be carefully adhered to in order for the vessels to provide the safe, long service life for which its designed.

OPERATION AND MAINTENANCE GUIDE

Proper vessel handling and installation are important to safe use and long vessel life. The guidelines outlined herein should be followed carefully; however, they are intended only as guidelines and do not relieve the purchaser from full responsibility for proper inspection, handling and installation. Damage due to improper handling or installation is the sole responsibility of the purchaser.

Improper assembly, misuse or corrosion damage can result in mechanical failure, property damage and serious injury or death. *Read and follow all instructions carefully.* Pay particular attention to the safety precautions given in this **Operation and Maintenance** section. Should any information in this guide not agree with the system supplier's instructions, call the CodeLine™ Division, Pentair Water, for clarification.

SAFETY PRECAUTIONS

DO

- Read, understand and follow every part of this section. Failure to take every precaution may void warranty and could result in catastrophic failure.
- Install in an area where water leakage resulting from a vessel or piping malfunction would not damage sensitive or expensive equipment, such as electronic components.
- Install protective covering over equipment located below pressure vessels when performing maintenance.
- Verify that head locking components are properly placed and secured.
- Inspect end closures regularly, replace deteriorated components and correct causes of corrosion.
- Follow membrane element manufacturer's recommendations for loading elements into vessel (see **Replacing Elements** on page OM-09).

DO NOT

- Operate vessel at pressures in excess of specific rating
- Service any component until you verify that vessel pressure is fully relieved from the vessel.
- Stand or climb on the pressure vessels, or the feed/concentrate or permeate ports
- Use corroded components. Use of such components may result in explosive head failure.
- Use Petroleum products on Noryl Components.
- Allow force in excess of 15 lbs (7 kgs) to be applied laterally to feed, concentrate or permeate ports.
- Pressurize vessel until after visually inspecting to insure that the interlock is correctly installed and secured.
- Tolerate leaks or allow end closures to be routinely wetted in any way.
- Allow petroleum or silicone based products to come in contact with membrane elements during installation or maintenance.
- Use at negative pressure.

INSTALLATION NOTES

Even though your vessel may have been installed by others, there are a few quick checks on installation you should make before system start-up. Vessel must be installed correctly to ensure safe use and long service life.

- Check that vessels are mounted on horizontal support frames using compliant black urethane saddles with hold-down straps snugly, not too tight
- Check that each vessel is free to expand under pressure; shell is not clamped rigidly in place; piping to vessel port is not connected using rigid connections.

WARNING

FAILURE TO ALLOW EXPANSION IN DIAMETER OR LENGTH WILL RESULT IN VESSEL DAMAGE.

- Check that each vessel does not support any other component; that piping manifolds are separately mounted, and that interconnecting piping is self-supported and connected to the pressure vessel with IPS grooved couplings. (Use of Victaulic® couplings is recommended).

If you have any questions about the installation of the vessels in your unit, contact your supplier. For installation guidelines, refer to the pages I1 -I5.

VESSEL INFORMATION CHART				
	80A15	80A30	80A45	80A60
MAX. OPERATING PRESSURE (PSI)	150	300	450	600
OPERATING TEMPERATURE RANGE	20°F - 120°F (-7°C - 49°C)			
FACTORY TEST PRESSURE (PSI)	225	450	675	900
PROTOTYPE MIN. BURST PRESSURE (PSI)	900	1800	2700	3600
ENGINEERING DRAWING NO.	519005	519001	519002	519013* 519016

* For 80A60, refer drawing no. 519013 for F/C port size 1.5" and 519016 for F/C port size 2" & 2.5"

PRE-PRESSURIZATION CHECKLIST

Danger - High Pressure Device

This vessel may cause loss of life, severe bodily harm, and/or property damage if not correctly installed, operated and maintained. Read and understand all guidelines given before attempting to open, operate or service this vessel.

Failure to follow these guidelines and observe every precaution may 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 mechanic, experienced in servicing high-pressure hydraulic systems, open, close and service this vessel.

This checklist is an operational aid intended to augment detailed guidelines given in the 80A Series Operation and Maintenance Guide.

Note that the checklist alone does not include all the details needed for safe vessel operation. Use the checklist each time any service operation is carried out to ensure that each step is completed before pressurizing the vessel.

MEMBRANE ELEMENTS

- Installed per manufacturer's recommendations.
- Feed flow direction correctly noted and elements correctly oriented.

ELEMENT INTERFACE

- Adapters installed at both ends of element column.
- Thrust cone installed downstream (Concentrate or brine end) of the element column.

HEAD

- All components in as-new condition, clean and free of damage or corrosion.
- All components properly assembled with new, freshly lubricated seals.
- Permeate port nut installed.
- Head stamped with proper pressure rating for system

HEAD ASSEMBLY INTERLOCK

- Retaining ring groove at each end of the shell clean, free of corrosion and/or delamination with outboard face of groove true and in sound condition.
- All components in as-new condition, clean and free of damage or corrosion.
- Retaining ring fully seated in the vessel retaining ring groove.

PIPING CONNECTIONS

- Properly secured.
- Leak free.

Assembled by: _____

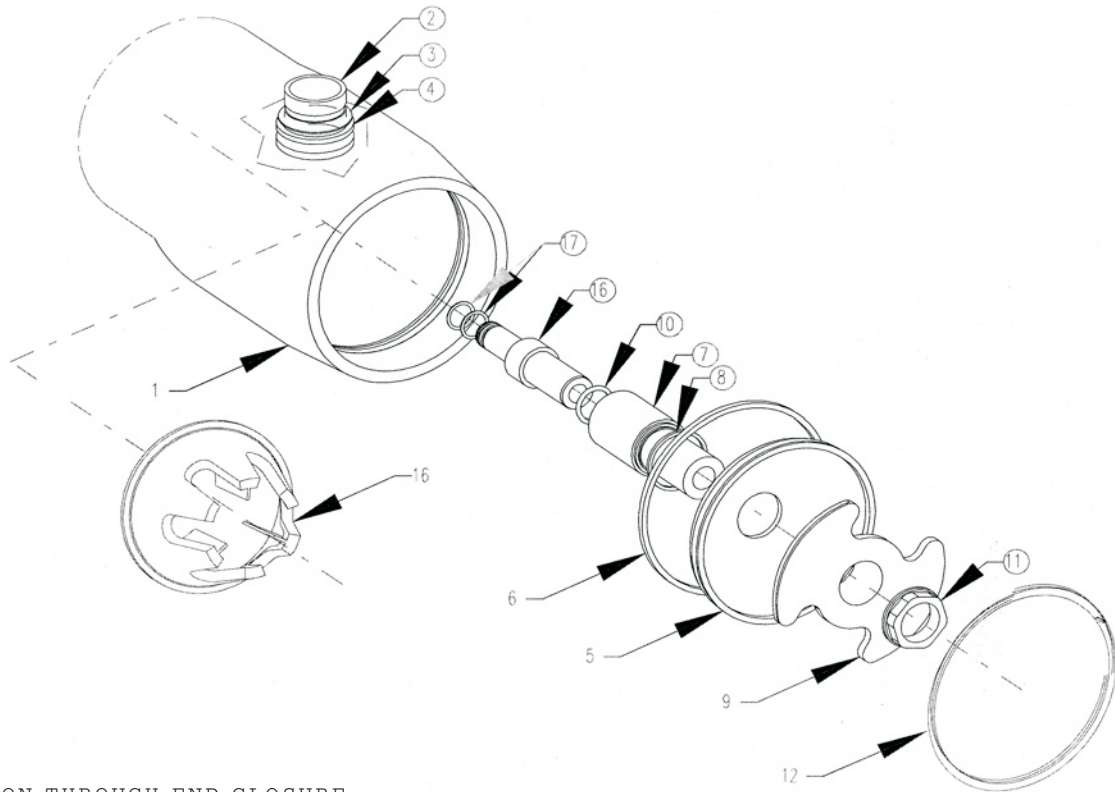
Date of Assembly: _____

Checked by: _____

Date of Inspection: _____

The following vessels listed by serial number below were serviced under this checklist:

COMPONENT IDENTIFICATION



SECTION THROUGH END CLOSURE

Dwg. Qty.

Ref. Per Part Name Materials/Remarks

SHELL			
1	1	Shell	Filament wound epoxy/glass composite - with SS head locking groove integrally wound in place
2	2	Feed/Concentrate Port	CF3M
3	2	Port Retainer Ring	300 Series stainless steel
4	2	F/C Port Seal	Ethylene Propylene - square cut
5	2	Elliptical Head	316 stainless steel
6	2	Head Seal	Ethylene Propylene - square cut (445)
7	2	Permeate Port	Engineering Thermoplastic
8	2	Permeate Port Seal	Ethylene Propylene - square cut (228)
9	2	Securing Plate	Engineering Thermoplastic
10	2	Adapter Seal	Ethylene Propylene - O-ring (124)
11	2	Port Nut	Engineering Thermoplastic
HEAD INTERLOCK			
12	2	Retaining Ring	316 Series SST
ELEMENT INTERFACE			
14	2	PWT Adapter	Engineering Thermoplastic
15	4	PWT Seal	Ethylene Propylene - O-ring
16	1	Thrust Cone	Engineering Thermoplastic



End Closure component Identification

OPENING THE VESSEL

Step-By-Step Guide

NOTE

Read all guidelines in this section before attempting to open the vessel.

Warning

Do not attempt to service any component without first verifying that the vessel pressure is fully relieved from the vessel. Attempting to remove any component before pressure is relieved may result in EXPLOSIVE release of the head.



Loosening Deposits

Step 1 Relieve pressure

1. Shut off all sources of pressure and relieve pressure from the vessel, following the system manufacturer's recommendations.

Step 2 Disconnect PERMEATE port

1. Disconnect and remove permeate piping from the permeate port of the vessel.

Step 3 Examine end closure

1. Examine end closure of the vessel for corrosion. If any is evident, proceed as follows:
 - A. Loosen any deposits with a small wire brush and/or a medium grade piece of Scotchbrite®.
 - B. Flush away loosened deposits with clean water.

CAUTION

Corroded products can cause difficulty in removing head and/or other components. Do not attempt to remove components until all apparent corrosion is removed.

Step 4 Remove Retaining Ring

1. No special tools are required for this operation. Engage your forefinger in the end tab of the retaining ring, lift it up and out of the stainless steel groove in the shell. If the retaining ring is difficult to remove, try soaking with a warm release agent such as LPS™ or WD40™, being careful to avoid any contamination of a membrane element. Take care to avoid hitting or levering against the vessel, as this could result in delamination.



Lifting the end of the retaining ring

2. Remove the retaining ring from the stainless steel groove in the shell. This is accomplished by running your finger behind the retaining ring as it continues to exit the groove.



Removing the retaining ring from the groove

Step 5 Remove Head

1. Grasp the securing plate with both hands.
2. Pull straight outward to remove the dished metal head from the vessel.



Removing dished metal head

NOTE

It may be necessary to rock the head slightly and/or tap the head inboard to break head seal bond. See troubleshooting section for more information.

REPLACING ELEMENTS

NOTE

Read all parts of this section before replacing elements. These procedures are provided for general information only. Elements should be installed in accordance with the element manufacturer's recommendations.

WARNING

Do not attempt to service any component without first verifying that VESSEL pressure is fully relieved from the vessel.

MAKE SURE THAT THE CENTRAL(PERMEATE) TUBE OF MEMBRANE ELEMENT STACK IS CONNECTED TO THE PERMEATE PORTS INSIDE BOTH ENDS OF VESSEL, using the adapters supplied. Pressurizing vessel without elements and both adapters installed could result in explosive head failure.

Preliminary Steps

Do not proceed with step by step instructions until.....

1. All pressure has been relieved from the vessel, following system manufacturer's recommendation
2. Both heads have been removed from the vessel following step by step instructions in the Opening the Vessel section.

Step 1 Remove element interface hardware

1. Remove thrust cone from downstream (Concentrate end).
2. Remove adapters from elements at each end.



Thrust Cone

Adapter



Examine bore for scratches

Step 2 Element Removal

1. Remove elements from vessel following element manufacturer's instructions. Clean off any excess lubricant from vessel inside diameter before removing elements.
4. Using an approximate 50% mixture of glycerine in water, lubricate the inside of the vessel. This may best be accomplished using a suitably sized swab soaked in the mixture. This procedure will ease membrane element loading and reduce the chances of scratching the vessel bore.

NOTE

Always remove and install elements in the direction of feed flow. The feed end (upstream end) is the end plumbed most directly to the pump. A record of element serial numbers and locations should be made and checked during loading.

NOTE

If the brine seal is not installed on the element and the element supplier does not specify otherwise, a brine seal should be placed on the upstream end of the elements. Open side of a seal must face upstream.

CAUTION

Do not scratch or damage vessel bore when removing or installing elements.

5. Load the first element into the upstream end of the vessel. Leave a few inches of the element projecting from the vessel to facilitate interconnection to the next element.
6. Apply a light film of a non-petroleum based lubricant, such as Parker Super O-Lube, to the interconnector O-ring. (The amount of the O-Lube should be just enough to give a luster to the O-ring. Excess O-lube must be removed to prevent possibility of element contamination.
7. Assemble the interconnector to the loaded element.
8. Line up the next element to be loaded and assemble it to the interconnector already assembled on the first element.

Step 3 Element Loading

1. Examine the inside diameter of the vessel for scratches or imperfections that may affect sealing capability of head or element seals. Corrosion deposits or other foreign matter, including any excess lubricant, should be removed as described in Closing the Vessel, Step 1 on page OM-15.
2. Flush out the vessel with clean water to remove all dust and debris.
3. Examine membrane element surfaces for any imperfection which could scratch the vessel bore. Pay particular attention to edges of anti-telescope device (ATD/brine seal carrier).

CAUTION

Maintain element alignment carefully during assembly process. Do not allow element weight to be supported by interconnector.

Misalignment can result in damage to interconnectors or permeate tubes or to element outer surface.

9. Push both elements in to the vessel until a few inches are projecting from the vessel. Repeat loading process until all the elements are installed.
10. When the final element is installed, push the element stack forward until the face of the first (downstream) element is just short of counter bore ramp.

NOTE

Take care to avoid pushing elements too far as it can be difficult to push the stack in the reverse direction.

Step 4 Install Element Interface Hardware

1. Assemble adapter to element permeate tube at each end of the vessel.
2. Install Head Seals.

Warning

Connect the central (permeate) tube of the membrane element stack, with an adapter on each end, to the permeate port in the head at both ends of the vessel. Pressurizing vessel without both adapters installed could result in explosive head failure.



Installing Thrust Cone

3. Install the thrust cone over the permeate port on the head assembly at the downstream (Concentrate) end of the vessel.

CAUTION

Install the Thrust ring at the downstream (Concentrate) end. Serious damage may result if the thrust ring is not installed in the correct location.

CLOSING THE VESSEL

Step-By-Step Guide

NOTE

Read all guidelines in this section before attempting to close the vessel.

Warning

CHECK THE HEAD ASSEMBLY FOR CORROSION AS DESCRIBED IN THE HEAD REBUILDING SECTION. CORRODED PARTS CAN RESULT IN CATASTROPHIC FAILURE.

Do not pressurize vessel until after visually inspecting to ensure that head retaining ring is fully seated in the stainless steel groove.

PRELIMINARY STEPS

Do not proceed until...

1. Element and adapters have been installed in the vessel following guidelines in the Replacing element section.
2. Head has been checked for correct component assembly by following step-by-step instructions in the Head Rebuilding section.
3. Vessel has been shimmed to prevent movement of the membrane elements if required. See page OM-23 of the troubleshooting section for a description of when shimming is required.



Cleaning vessel inside surface

Step 1 Inspect shell inside surface

1. Inspect the vessel inside surface for any corrosion deposits or other foreign matter. If any are found, clean the surface as follows:
 - A. Using a medium or finer grade of Scotchbrite® and a mild soap solution, clean each end of the vessel liner surface up to 8" from each end of the vessel.
 - B. Rinse away all loosened deposits from the shell inside surface using clean fresh water.
2. Inspect the vessel inside surface for scratches or other damages which could cause leaks. Vessels that leak must be replaced.
3. Inspect Feed/Concentrate port seals and attachments for internal and external damage or deterioration.

NOTE

Contact Pentair Water, CodeLine Division for guidance, if damage to the vessel's internal surface or Feed/Concentrate port, seals or attachments are discovered during inspection.

CAUTION

Never attempt to repair a fiberglass shell.



Installing Head Assembly - By Hand

Step 2 Head seal and head lubrication

1. Install head seal and lubricate I.O. of head seal only.
2. Lubricate all the way around the dished head in the area where it will contact the shell, preferably with glycerine.

2. Using both hands, firmly push the head in as far as it will go. (A sharp, forceful thrust may be necessary to enter the head seal into the vessel bore). When the head is correctly positioned, the stainless steel retaining ring groove will be exposed.

NOTE

Any remaining lubricant should be cleaned from the vessel bore before applying fresh lubricant. Glycerine is a commercially available lubricant that will not foul membranes. Do not use petroleum based lubricants.

NOTE

In some installations it may be advisable to tighten a system-required permeate port nipple or fitting into the Permeate port before the head is assembled into the vessel.

CAUTION

Do not tighten a component into the thermoplastic permeate port more than one turn past hand tight.

Step 3 Install head

1. Hold the head assembly square to the axis of the shell by grasping the securing plate in both hands. Slide it straight in until a slight resistance is felt. Do not rotate the head assembly after insertion in to the vessel as this may cause the head seal to become detached.

Step 4 Install Interlock

1. Carefully wipe out any debris or moisture from the retaining ring groove. The groove must be clear and dry before proceeding.
2. With the head assembly installed in the shell, place the tip of the head retaining ring in the stainless steel groove. (The non-bent end).
3. Begin pushing the retaining ring into the groove as you rotate your hand around the I.D. of the shell.
4. Continue until the entire retaining ring is installed in the groove.
5. Verify that the retaining ring is fully seated in the groove before proceeding.



Installing Retaining Ring

Warning

Retaining ring must be correctly installed. Incorrect assembly or installation can result in EXPLOSIVE HEAD failure.

Step 5 Reconnect Permeate Piping

1. Reconnect manifold piping to the vessel Permeate port.

NOTE

Using teflon tape or anaerobic sealant on all threaded connections will help ensure a leak-free assembly.

It is vitally important that the following checks be carried out before any attempt is made to pressurize the vessel.

It is recommended that the Pre-pressurization Checklist (Page OM-5) be used to systematically verify that all steps have been performed.

HEAD ASSEMBLY

Verify the following at each end of the vessel:

1. Head assembly is in good condition, with no evidence of damage or corrosion. See the sections on Head Rebuilding and Maintenance.
2. Retaining Ring is properly in place.

MEMBRANE ELEMENTS

Verify that...

1. Elements are installed in the vessel.
2. Element adapters are installed at each end of the vessel.
3. Thrust cone is installed at downstream end of the vessel.

PIPING CONNECTIONS

1. Check all piping connections to ensure that they will provide a leak-free seal.

STEP 7 Pressurization

1. After following the above pre-pressurization checks, pressurize vessel in accordance with the element manufacturers specifications.
2. Vessels should be filled slowly to assist trapped air in escaping.
3. Vessels should be pressurized slowly to avoid damage to membrane element and vessel components.

Warning

DO NOT PRESSURIZE THE VESSEL WITHOUT ELEMENTS INSTALLED. Do not pressurize the vessel until verifying that the retaining ring is properly installed.

HEAD REBUILDING - 80A15, 80A30, 80A45 & 80A60

Step-By-Step Guide

NOTE

Read all guidelines in this section before attempting to rebuild the head.

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

Warning

Do not service any component until you verify that the vessel pressure is fully relieved from the vessel.

Replace any components not in "as-new" condition. Reusing corroded or damaged components can result in explosive head failure.



Head component identification - Head dis-assembled

Preliminary Steps

Do not proceed with step by step guidelines until...

1. All pressure has been relieved from the vessel, following the system manufacturer's recommendations.
2. Head has been removed from the vessel following guidelines in the Opening the Vessel section.

TO DISASSEMBLE HEAD

Step 1 Remove permeate port/plug

1. Remove the Permeate Port Membrane Adapter from the Permeate Port.
 - a. Grasp the end of the adapter in one hand and the permeate port in the other and pull apart.



Removing the adapter from the Permeate port

NOTE

It may be necessary to twist the two parts in opposite directions to break a seal between them.

2. Remove the O-ring(s) from the Permeate Port Adapter.

NOTE

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

Step 2 Remove Permeate Port Nut

1. Remove the permeate port nut located on the external side of the securing plate by rotating it clockwise. Note that the port nut has left hand threads.



Removing Permeate port nut

Step 3 Remove the Permeate Port

1. Remove the Permeate port by separating it out from dished metal head.



Press out permeate port

2. Remove the square cut permeate port seal from the outer side of the permeate port.

Step 4 Remove Securing Plate

1. Separate the securing plate from the dished metal head.

Component Cleaning and Examination

Step 1 Wash Components

1. Wash all components in fresh water.
2. Blow components dry with compressed air, if available. Otherwise wipe dry with a dry, lint-free cloth.

CAUTION

Read all guidelines in this section before making decisions on component structure or corrosion problems and treatment.

This section is intended only to provide guidelines in dealing with corrosion or component damage. In combination with good industrial practice, these guidelines provide a basis for safe system operation.

Any condition not covered in this section should be referred to CodeLine.

Corrosion in this context includes metal oxidation products and mineral deposits.

Step 2 Initial component inspection

1. Examine all components for any damage that could affect structural strength or sealing properties.
2. Replace any parts considered to be structurally unacceptable.

CAUTION

Feed and Concentrate ports and attachments to the shell must be carefully inspected to ensure that connections and sealing material are sound and tight. Any questions or evidence of deterioration of these areas should be referred to Pentair Water. Other than seal replacement, field repair should not be attempted by user maintenance personnel without first contacting the manufacturer for guidance.

The following examples indicate when replacement is required.

- A. Permeate port internal thread stripped or overstrained.
- B. Dished metal head dented or distorted (possibly from being dropped or hit)
- C. Port nut cracked or threads stripped.
- D. Retaining ring bent or damaged.

Any other detail considered to be a potential problem should be referred to Pentair Water, CodeLine Division.

NOTE

If any components are cracked, softened or discolored, it may indicate a chemical resistance problem. These components must be replaced. Alternate materials may be required in these applications. Contact Pentair Water for resolution.

Step 3 Evaluating Corroded Metal Components

This procedure applies to the following parts:

- A. Dished metal head
 - B. Retaining Ring
1. Examine these components for corrosion. For any components not in "as-new" condition, proceed as follows:
 - A. Loosen any large deposits with small wire brush.
 - B. Place components in shallow container of soapy water and scrub entire surface with medium grade Scotchbrite® until all corrosion is removed.
 - C. Rinse components clean with fresh water.
 - D. Blow components dry with compressed air, if available.
 - E. Re-examine components for damage that could affect structural strength or sealing properties. Any components not in "as-new" condition must be replaced.
 - F. Inspect components for any condition that may have promoted corrosion, (e.g. external damage, inappropriate material selection, etc.)

CAUTION

This procedure for evaluating corroded components is to be used on any corroded metal parts. If this fails to bring any component to "as-new" standards, the part must be replaced.

Step 4 Removing deposits from plastic components

This procedure applies to the following parts:

- A. Permeate port
- B. Port Nut
- C. Adapter

1. Examine all plastic and PVC components for mineral deposits or other foreign matter. If any are found, proceed as follows:
 - A. Place components in shallow container of soapy water and scrub entire surface with medium grade Scotchbrite® until all foreign matter is removed.
 - B. Rinse components clean with fresh water.
 - C. Blow components dry with compressed air, if available.
 - D. Re-examine components for any damage that properties. Any components not in "as-new" could affect structural strength or sealing condition must be replaced.

Lubricating seals

1. Lubricate and install any O-rings on the product water tube (PWT) end of the adapter.
2. Lubricate and install the adapter seal O-ring on the other side of the adapter.
3. Lubricate and install the square cut port seal on the outer side of the permeate port.

CAUTION

This procedure for removing deposits from plastic components should be used on all plastic components contaminated by mineral deposits or other foreign matter. If any component cannot be brought to "as-new" standards, the part must be replaced.

NOTE

It is recommended that all seals be replaced each time the head is assembled. A seal replacement kit is available from the Pentair Water, CodeLine Division.

Lubricate seals sparingly, using non-petroleum based lubricants, i.e. Parker Super O-Lube®, Glycerine or suitable silicone based lubricants. (Silicone based lubricants, correctly used, will ease head assembly and disassembly.) Glycerine is a commercially available lubricant that will not foul membranes.

Warning

HEAD MUST BE CAREFULLY ASSEMBLED FOLLOWING THESE INSTRUCTIONS. INCORRECT ASSEMBLY CAN RESULT IN EXPLOSIVE HEAD FAILURE.

Step 2 Assemble Securing Plate and Dished Metal Head

1. Place the dished metal head over the smaller diameter bore of the permeate port.



Installing Permeate port

Step 3 Assemble Permeate Port and Dished Metal Head

1. Press the smaller diameter bore of the permeate port through the dished metal head.
 - a. When installed, the threads on the end of the permeate port should be adjacent to the flat face of the securing plate.



Installing the securing plate

2. Thread the port nut on to the end of the permeate port.
 - a. The port nut should be tightened snugly against the face of the securing plate.
NOTE: Threads are left handed.



Installing port retaining ring

PREVENTIVE MAINTENANCE

Corrosion prevention is essential for the maintenance of safe operating conditions and to ease membrane element servicing.

Attention to the points listed below will enhance long-term safe operation and will ease servicing.

For suggestions on cleaning corrosion deposits from the vessel inside surface, refer to Closing the Vessel section.

For suggestions on cleaning corrosion deposits from head components, refer to the Head Rebuilding section.

PREVENTIVE CHECKLIST

- End closures. Inspect for components that may have deteriorated. Replace as needed.
- Keep external head assembly components as dry as possible.
- Do not tolerate leak.

CAUTION
Any leakage indicates a potentially dangerous condition. Failure to eliminate leakage may void the warranty and could result in vessel failure.

TROUBLESHOOTING

This section is intended only to provide guidelines for dealing with problems that might arise while working with CodeLine™ pressure vessels.

These guidelines are not in any way a replacement for the good industrial practice required to ensure safe operation. We recommend that only a qualified mechanic, experienced in servicing high pressure hydraulic systems, carry out the following tasks.

Preliminary Inspection

Inspect the vessel at each end for corrosion which may interfere with head assembly removal. If corrosion is evident, proceed as follows:

1. Loosen any deposits with a small wire brush and/or a medium grade piece of Scotchbrite®.



Loosening deposits

CAUTION

Do not use a wire brush on components made from plastic, fiberglass or PVC material.

2. Flush away loosened deposits with clean water.
3. Proceed with instructions given in Opening the Vessel section.

Difficulty in Opening the Vessel

NOTE

Recommendations listed below are intended only as a guide. If the head assembly is still difficult to remove after all recommendations have been followed, call Pentair Water for technical assistance.

Retaining ring

1. Will not release from retaining ring groove.
 - A. Apply penetrating fluid (such as WD-40® or LPS-1) to interfacing areas of retaining ring.
 - B. With a screwdriver handle or similar tool, tap the retaining ring to release the bond.
 - C. Again attempt to remove ring per Step 4 on page OM-7.



Applying penetrating fluid

CAUTION

When applying penetrating fluid, be careful to avoid element contamination.

Head Assembly

Will not release from the shell when pulling on securing plate with both hands.

1. Thread a 1" ID Engineering Thermoplastic pipe approx. 1 foot long into the permeate port.
2. Carefully rock the head assembly back and forth to release the seal.



Freeing head seal

3. Once the head seal has been broken, complete removal as instructed in the Opening the Vessel section.

NOTE

If the head assembly will not release from the shell after all recommendations have been followed, call Pentair Water for technical assistance.

Seal Leakage Feed/Concentrate Port

CAUTION

In the following step, exercise extreme caution to avoid damaging the inner vessel surface.

1. Carefully remove the square-cut seal, ensuring that the tool used for removal does not scratch or mar the port or vessel seal surface.
2. Clean the groove surface.
3. Lubricate and install the new square-cut seal, ensuring that the seal is completely seated into the groove.

Head Seal Leak

1. Reach inside vessel and remove the head seal.
2. Carefully inspect the seal gland area in the shell and clean any contaminants from the gland.
3. Clean the seal area on the head and re-lubricate.
4. Install a new head seal that has been properly lubricated.

Sudden Drop in Permeate Quality

If a system is started and stopped frequently and no provision is made to raise the pressure slowly, movement of the membrane column may damage the O-ring seals and reduce permeate quality.

If the quality of the permeate suddenly drops off, and poor membrane performance is suspected, remove the heads as per instructions in the User Guide (See Opening the Vessel section on page no. OM-7 to OM-8). Remove the adapters from each end of the vessel. Remove the PWT seals and the adapter seal from the adapters. Inspect these O-ring seals carefully for breakage or other damage. If the seals have rolled out of the groove, or are damaged, this may indicate excessive movement is occurring during start-up and shutdown. To overcome this problem, the vessel should be shimmed to minimize this movement. Follow the procedure for shimming as mentioned below:

SHIMMING

Shimming is accomplished by placing spacers between the adapter and the hub on the permeate port on the upstream end of the vessel. When done properly, shimming will prevent excessive movement of the membrane elements and the adapters, thus preventing potential damage of the O-ring seals. The spacers used for shimming are shaped like plastic washer and are 0.20 inches thick.

The suggested procedure for shimming is as follows:

1. With the membrane properly loaded, install the adapter in the last element and place the thrust ring on the head for the downstream end of the vessel. (See Replacing Elements section on pages OM-9 through OM-11).
2. Install the head in the downstream end of the vessel following steps 1 through 4 of the section entitled Closing the Vessel on pages OM-12 through OM-14.
3. Remove the product water tube seals from the upstream adapter and the head seal from the sealing plate.
4. Push the straight end of the adapter into the permeate hub, just far enough so that is held in by the adapter seal.

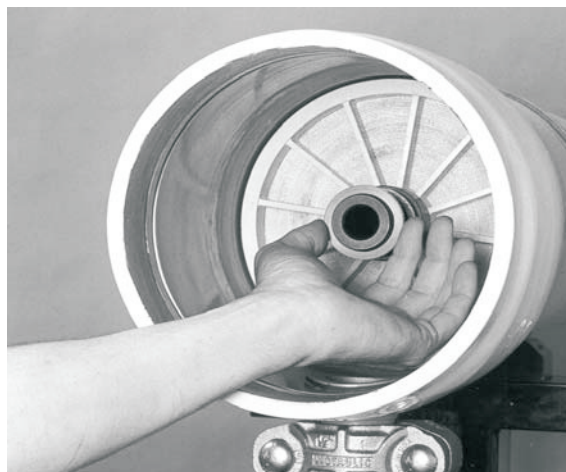
5. Line the adapter up with the product water tube on the first element and install the head far enough into the vessel so that you can place a locking ring segment in the groove.

6. Carefully remove the head and observe the space between the hub and the adapter and the face of the permeate port. Determine the number of spacers necessary to fill this space.

7. Remove the adapter and replace the product water tube seals. Insert the adapter in the product water tube of the first element.

8. Slide the number of spacers determined in Step 6, over the end of the adapter.

9. Now close the vessel according to the Closing the Vessel section which begins on page OM-12.



Sliding spacers on the adapter

INSTALLATION GUIDE

Proper vessel handling and installation are important to safe use and long vessel life. These guidelines should be followed carefully; however, they do not relieve the purchaser from full responsibility for proper inspection, handling and installation. Damage due to improper handling or installation is the sole responsibility of the purchaser.

Improper assembly, misuse or corrosion damage can result in mechanical failure, property damage and serious injury or death. Read and follow all instructions carefully. Pay particular attention to the safety precautions given in this Operation and Maintenance section. Should any information in this guide not agree with the system supplier's instructions, call CodeLine Division, Pentair Water, for clarification.

HANDLING AND RECEIVING

Fiberglass reinforced plastic (FRP) pressure vessels are extremely rugged and durable. They are designed for safe, long-term service when they are handled and installed properly. However, damage to the vessel shell or related components from improper handling or installation could result in malfunction or explosive head failure while in service. Therefore, exercise the following precautions whenever handling vessels.

1. Never lift or move a vessel by placing anything inside it. The vessel is durable and ideally suited to its purpose, but it can be permanently damaged by careless handling.
2. Be careful not to scratch the inside wall of the shell, especially in the O-ring sealing area inboard of retaining ring groove near each end.
3. DO NOT drop the vessel or allow it to hit hard on the ground or against other objects.
4. DO NOT apply undue stress to the shell.
5. Before using a forklift to handle the vessel, pad the forks to lessen the chance of damaging the shell. Severe scratches or gouging of the vessel can result in failure of the vessel wall.
6. Do not allow undue stress to act on the Feed/Concentrate port, which might cause impact damage to the port area, leading to leakage. Do not use the Feed/Concentrate port or the permeate port as a tool to lift a pressure vessel or as a support to manifolds. Manifolds should be self-supporting.

NOTE ON IMPACT DAMAGE

Exterior vessel damage can lead to early vessel failure. Damage received in shipment should be reported to the shipping company immediately upon receipt. Minor damage such as scratches that go no deeper than the paint may be acceptable. Call Pentair Water for advice or if in doubt.

MOUNTING SHELL

NOTE
If mounting vessel for the first time, see "Piping Recommendations for CodeLine 80A Series Sideport Vessels", page APX-2.

This section is concerned with the mounting of 80A30 pressure vessels.

These guidelines must be integrated with any additional procedures required for your specific installation.

Installation Guidelines:

1. Provide adequate room for servicing at both ends of the vessel. Elements are installed from the upstream end (feed), pushed through towards the downstream end (concentrate) and eventually, removed from the downstream end.
2. Follow all applicable handling guidelines. (Page I-2).
3. Position each vessel on its mounting frame such that it is centered between headers.

NOTE
It is important that each vessel be placed to minimize any strain on piping/ tubing that connects a vessel to a header. Normally each vessel should be centered in the frame with the feed and concentrate ports positioned such that piping/tubing connections can be made easily, without undue strain at each end of the vessel.

4. Mount vessels on urethane saddles (provided with the vessel) positioned in line with pre-drilled frame holes for -1 through -3 vessels. Holes for the mounting straps should be drilled at approximate center span 'S'. For -4 through -8 vessels, holes for the mounting straps should be drilled at span 'S' from the middle of the vessel and a third saddle, without a strap, should be placed at mid span. These dimensions are shown on the corresponding engineering drawing.

Warning
DO NOT MOUNT VESSEL RIGIDLY. RESTRICTED EXPANSION CAN RESULT IN DAMAGE TO THE VESSEL. SEE ELASTICITY AND MOUNTING REQUIREMENTS IN THE APPLICATION SECTION FOR FURTHER DETAILS.

5. Place mounting straps over the vessel with plastic strip against the vessel.
6. Provide adequate room for servicing at both ends of the vessel. Elements are installed and removed in the direction of feed flow.
7. Position screw through the frame mounting holes into the strap nuts and run up to the frame, finger tight.
8. Connect vessel feed piping (See Piping Recommendations Page I-5).
9. Using a wrench, tighten mounting bolts one additional full turn. This should result in 25 - 50 lbs-in (3 - 6 kgf.m) of torque.

CAUTION

To avoid damage to the vessel shell **DO NOT** over-tighten the mounting nuts.

NOTE

80A straps are designed to secure the vessels during operation. They are not designed to handle all loads that might occur during shipment. Appropriate vessel restraint should be employed considering such factors as the mode of shipment, distance to be traveled and the design of the system. The vessels and frame should be blocked to prevent any differential movement which could be caused by the forces experienced during shipment.

PIPING CONNECTIONS

The following are suggested guidelines to ensure that the vessel is allowed to expand and is easily serviced.

1. Support the header and interconnecting piping in a manner that they are self-supporting.
2. Connecting piping alignment to feed, concentrate and permeate ports should not exceed 0.030 inches misalignment.
3. Piping connections to the vessel's feed/concentrate ports should be via flexible IPS grooved couplings. (See page APX-2 for further details).

APPLICATION GUIDE

This Application Guide, together with the Installation Guide and the Operation and Maintenance Guide, outlines the general conditions for safe use of 80A Series pressure vessels. Because of the considerable risk inherent in high pressure systems, it is the purchaser's responsibility to carefully evaluate each specified application to ensure that the 80A series vessel selected is appropriate to that application.

Pentair Water, will assist the purchaser in determining the suitability of the standard vessel for their specific operating conditions. For non-standard applications, alternate materials are available on special order. The final determination, however, including evaluation of the standard material of construction for compatibility with the specific environment, is the responsibility of the purchaser.

SUITABILITY FOR INTENDED USE

80A Series RO pressure vessels are designed for continuous, long-term use as housings for reverse osmosis membrane elements. Models are available for 150, 300, 450 and 600 PSI. Any make of eight inch nominal diameter spiral wound element is easily accommodated.

In an RO system there is considerable potential for explosive head failure, which could result in serious injury or loss of life. All decisions as to suitability for use must include full consideration of the various safety aspects involved. These include, but are not limited to:

Process fluid compatibility (e.g. chemical and temperature considerations).

External environmental factors (e.g. corrosive atmosphere; remote or special environments where plastics might be undesirable, etc.)

Abnormal back pressure which might result in pressurizing permeate port above 125 PSI (alternate materials are available).

Capability of the user to maintain vessel properly.

Requirement for increased fire resistance in some circumstances (e.g. may preclude use of PVC for permeate ports).

Use of a CodeLine pressure vessel for other than its intended application will void the warranty.

CodeLine will assist the purchaser in determining the suitability of the standard vessel for their specific operating conditions. For non-standard applications, alternate materials are available on special order. The final determination, however, including evaluation of the standard material of construction for compatibility with the specific environment, is the responsibility of the purchaser.

ELASTICITY AND MOUNTING REQUIREMENTS

Mounting design must allow for vessel expansion, both axially and radially. Although the expansion under pressure is slight, undue restriction can result in damage to the vessel and to other system components. Expansion is typically up to 0.020 inch in diameter and up to 0.007 inch per foot in length. A six-element vessel, for example, would expand approximately 0.150 inch in length. The following suggestions will help to ensure the vessel is allowed to expand and will ease servicing.

1. Mount the vessel on the urethane support pads furnished. Do not mount directly to any rigid structure.
2. Use the stainless steel straps furnished. Straps should be tightened sufficiently to hold the vessel on the urethane support pads, but not so tightly as to restrict expansion. (A torque of 25-50 lbs-in. is sufficient).
3. U-bolts should not be used for vessel mounting under any circumstances.
4. Provide a flexible piping connection to permit decoupling the header from the vessel. The recommended Permeate port connection is a U-bend pipe with flexible connections at each end, or a flexible hose. Recommended Feed/Concentrate connections are via flexible IPS grooved couplings.
5. Do not hard plumb any piping connections to the vessel.
6. Support the header independently. Piping should be self supporting or supported by the headers.
7. Include an expansion loop in the branch connection to allow for:
 - A. Elastic growth under pressure
 - B. Thermal growth in vessel length
8. The total weight of branch connection and fittings supported by the vessel should not exceed 8 lbs for either Feed/Concentrate ports or the permeate port for 80A series vessels.

The above suggestions are intended to help prevent damage in typical applications. Unusual or special applications may involve other considerations, to be determined by the system designer.

CORROSION

Considerations relating to corrosion are an important factor in vessel application. Corrosion can result in explosive head failure and/or cause difficulty in removing head components from the shell. Correct component material selection is essential for safe long-term use. Although the process fluid is the main consideration, external environmental conditions should also be taken into account.

All reasonable precautions should be taken to protect head assemblies from external wetting, particularly in corrosive atmospheres (e.g. salt water areas or acidic atmospheres such as near lead acid battery arrays, etc.) Leaks from vessel or nearby components which allow head parts to be routinely wetted should not be tolerated.

The typical list of CodeLine pressure vessel components that shows the standard material of construction of each part is listed on page OM-6. An evaluation of the possibility of corrosion damage to the metal head interlock components is of critical importance. Alternate materials are available on request.

SAFETY

CAUTION

Pressure vessels may cause loss of life, severe bodily harm or property damage if not correctly installed, operated and maintained.

Safety in service of fiberglass pressure vessels depends on proper application, installation, operation and maintenance. This section is intended to provide guidance towards safe system design. The safety information given in the Installation and Operation and Maintenance sections should also be studied and used appropriately in conjunction with the precautions listed below.

DESIGN CONSIDERATIONS FOR SAFETY

Fluid Compatibility

The material of construction selected must be compatible with the process fluid and with proposed preserving and cleaning fluids. Standard materials are listed on the engineering drawings. In cases where the standard materials are unacceptable, suitable alternates may be available.

Pressure and Temperature Design Limits

Operation of a vessel outside its design limits will void the warranty and could result in vessel fatigue with possible eventual explosive head failure. Although, each 80A vessel is tested to 1.1 times the design pressure, long term operation above design pressure must be prevented. Permeate port pressure must not exceed 125 PSI (with standard material). Vessels should not be continuously operated at temperatures above 120°F.

Over-pressure Protection

It is essential that over-pressure protection be provided such that the pressure to which any vessel is subjected cannot exceed 105% of design pressure.

Mounting

The pressure vessel should not be used as a support. Piping manifolds and other fittings should be supported by properly designed system framework. Operating personnel should be discouraged from applying undue force to any fittings connected directly to a pressure vessel.

Accessibility

Pressure vessels should be positioned within the system such that elements can be inserted at the upstream end and removed from the downstream end (i.e. elements are installed and removed in the direction of feed flow).

APPENDIX

PIPING RECOMMENDATIONS

Various methods of connecting side port vessels to manifolds are possible. The recommended method is to connect each vessel side port to the manifold using two flexible IPS grooved joints and an intermediate piping section. A 90°-elbow would be ideal, however, a straight piping connection would also be acceptable. This two-joint method is preferred over a single IPS grooved connection because it does not require as much care in vessel alignment and manifold welding accuracy. Figures 1 & 2 illustrate the preferred method.

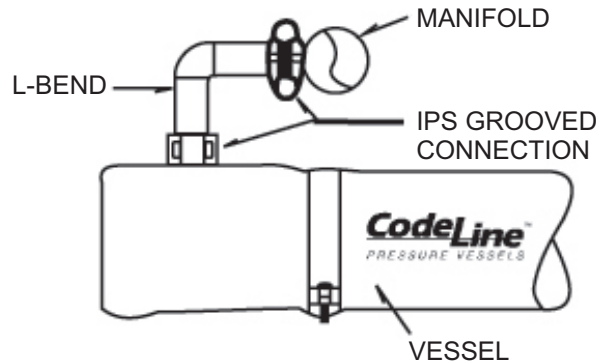


FIGURE 1

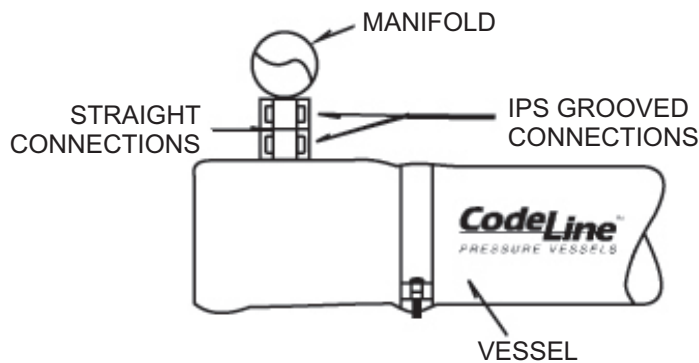


FIGURE 2

PIPING RECOMMENDATIONS (contd.)

An alternate method using a single IPS groove is acceptable but requires more thoughtful execution. The manifold must be fabricated using close tolerances to help ensure correct alignment. Installation must follow a sequence of assembly steps to initially ensure correct shell to manifold alignment. First, the vessel should be set into the rack and secured loosely into position using the mounting straps. Then connect the vessels to the manifold, which is also loosely secured one port a time, while adjusting the shell and manifold position for the best alignment possible. At this time set the side port to manifold clearance at 0.125 inch per IPS groove recommendations for cut groove applications. After proper alignment is achieved, secure the shell and fix the manifolds into position. (See figures 3 & 4 for reference)

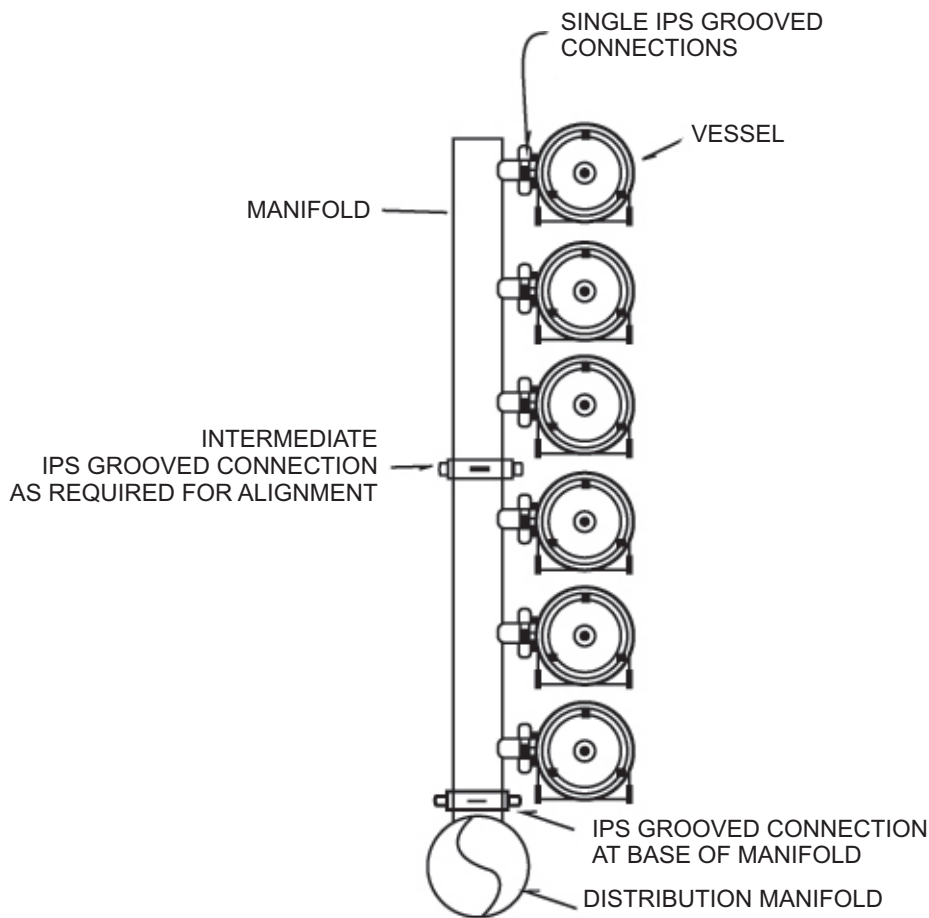


FIGURE 3

PIPING RECOMMENDATIONS (contd.)

Even though a single IPS grooved coupling arrangement may be the choice for low cost and compactness, it brings with it the necessity to provide the required amount of flexibility in some other way.

A IPS grooved coupling allows angular but not lateral misalignment. Two rigidly restrained pipes not lying on a common axis can be forced to align if the fit is close enough to allow the two halves of the coupling to be pulled together by the bolts. This practice is not recommended. The resulting stresses are complex and have leveraged intensity. Any misalignment must therefore be kept to an absolute minimum.

Figure 3 illustrates how IPS grooved couplings must be incorporated in the manifold header and only one flexible IPS grooved joint is used between the vessel and the manifold. In checking for correct alignment, the maximum axial misalignment from port to manifold should be 0.030 inches in any direction (see figure 5). While exceeding 0.030 inches misalignment should not significantly reduce vessel safety, it may decrease vessel service life. A recommended method of checking for acceptable alignment is to test for coupler rotation.

To use the rotation method, install the IPS grooved coupling between the vessel side port and the manifold. With the two coupling bolts tightened until snug, you should be able to rotate the coupling by hand. If hand rotation is possible, the alignment will be acceptable. Use of IPS grooved coupling at intervals of 1.0 m or 1.5 m is recommended on the header manifold for ease and proper alignment of these pipes.

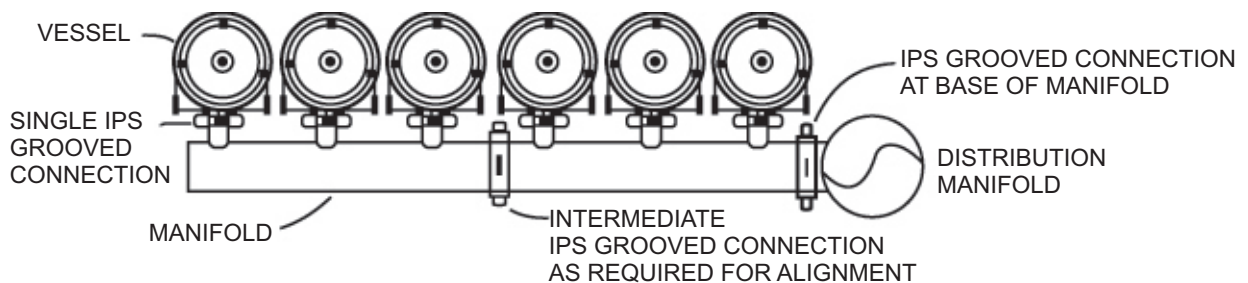


FIGURE 4

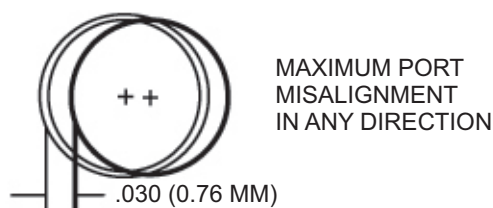


FIGURE 5

LIMITED WARRANTY

Pentair Water India Pvt. Ltd., a division of "Pentair Water" manufactures its products ("Products") and parts ("Parts") under the highest standards of workmanship using quality materials. Accordingly, Pentair Water expressly warrants these Products and Parts as follows:

WARRANTY COVERAGE

- a) All the "CodeLine" & "Pentair" branded membrane housing products are warranted to the original owner to be free of defects in material and/or workmanship under normal use for a period of one (1) year from date of Invoice.
- b) Any replacement Product or Part provided hereunder will be warranted against defects in material and workmanship for the unexpired portion of the one year warranty period applicable to the goods.

EXCLUSIONS FROM THIS LIMITED WARRANTY

This warranty does not cover:

1. Defects not reported to Pentair Water within the above described warranty period.
2. Any items manufactured by other companies. Such items may carry warranties offered by the original manufacturers.
3. Problems resulting from failure to comply with installation instructions or drawings, or improper installation.
4. Damage caused by acts of nature or problems resulting from abuse, misuse, negligence or accident by any party other than Pentair Water.
5. Problems resulting in whole or in part from alteration, modification or attempted repair of these Products or Parts by any party other than Pentair Water.
6. Normal wear of replaceable components, including elastomeric Seals, Spacers etc. These parts require maintenance as part of a yearly service schedule.
7. Non compliance with applicable codes and ordinances including without limitation, plumbing codes.
8. Damage due to chemical attack.
9. Warranty applies only to original owner at the original installation location
10. Shortages in receipt of spares/components/products not intimated to the seller within 60 days of the receipt by buyer.

WARRANTY OBLIGATIONS OF PENTAIR WATER

Should a defect in workmanship and/or material in Products or Parts covered by this warranty become evident during the term of the warranty, then upon compliance with the procedures, as set forth below, Pentair Water, at its option, will: In the case of Products, issue a credit in the amount of the original purchase price of the product, or repair or replace the defective Products. Pentair Water will consider, in good faith customer preferences in making a determination whether to issue a credit or repair or replace a Product. In the case of Parts, whether purchased new or exchanged on a Product by other parts, Parts may not be returned for credit or repair. Pentair Water will only be responsible for the replacement of defective parts.

PROCEDURE FOR OBTAINING WARRANTY PERFORMANCE

If the buyer discovers within this period a failure of the product to conform to specifications, or a defect in material or

Workmanship, the buyer must promptly notify Pentair Water in writing. In no event may that notification be received by Pentair Water more than 30 days after the end of the warranty period. Any goods that the buyer believes to be defective are to be returned to Pentair Water factory for examination. However, upon request of the buyer, Pentair Water may, at its discretion, agree to examine the goods in the field. If, upon examination by Pentair Water, any goods sold under this agreement or purchase order do fail to conform to CodeLine / Pentair specifications, or prove to be defective in material or workmanship, Pentair Water will supply an identical or substantially similar part F.O.B., Pentair Water factory; or Pentair Water, at its option, will repair such part or give credit to the buyer for the original cost of such goods. However, if the goods were examined in the field and Pentair Water determines that they do conform to CodeLine / Pentair specifications, the buyer will be responsible to pay to Pentair Water, a \$750 field service charge, plus travel expenses and a \$750 per diem charge.

NO OTHER WARRANTIES. To the maximum extent permitted by applicable law, PENTAIR WATER DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, with regard to the Product(s), Part(s) and/or any accompanying written materials. This limited warranty gives you specific legal rights. You may have others, which vary from state / jurisdiction to state/jurisdiction.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES. To the maximum extent permitted by applicable law, in no event shall Pentair Water be liable for any damages whatsoever (including without limitation, loss of times, inconveniences, expenses such as telephone calls, labor or material charges incurred in connection with the removal or replacement of the Product(s) or Part(s), special, incidental, consequential, or indirect damages for personal injury, loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use the defective Product(s) or Part(s), even if Pentair Water has been advised of the possibility of such damages. In any case, Pentair Water entire liability under any provision of this Limited Warranty shall be limited to the amount actually paid for the Product(s) or part(s).

PLEASE NOTE: Because some states/jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, the above limitation or exclusion may not apply.

WARRANTIES OR REPRESENTATIONS BY OTHERS - No dealer or another person has any authority to make any warranties or representations concerning Pentair Water or its products. Accordingly, Pentair Water is not responsible for any such warranties or representations.

OTHER RIGHTS This warranty gives specific legal rights, and other rights may apply.

PM2004-Rev A



CodeLine™

Pentair Water

**PENTAIR WATER
REGISTRATION CARD**

Vessel Model:	Serial Numbers Numbers are located at one end of the vessel. (If you have purchased more than 64 vessels, please attach the serial nos. separately).
Date of Purchase	
OEM Purchased From: (Name/ Address/Tel no.) _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
Treatment System wherein used: (Please circle the relevant) • RO • UF • NF • Other	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
System Capacity: _____ GPD	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
No. of Vessels: _____	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
Date of Installation: _____	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
Name/Address/Tel & email of your Company: _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
Installation Site: (Address/Country) _____ _____ _____ _____	<u>Mailing Address:</u> CodeLine Division Pentair Water India Pvt. Ltd. L/52-55, Verna Industrial Area Verna, Goa – 403 722. INDIA Tel: 91-832-2883300 Fax: 91-832-2883312 www.codeline.com

Thank you for purchasing a world class CodeLine vessel. To help us service you better and update you on “improvement and changes”, please fill up the above registration card and mail at the address given in the same.