Ultra Whisper 200-600

Owner's Manual

Revision A - 24 September 2008

SRC Ultra Whisper Compact 200
SRC Ultra Whisper Compact 300
SRC Ultra Whisper Compact 400
SRC Ultra Whisper Compact 500
SRC Ultra Whisper Compact 600

SRC Ultra Whisper Modular 200
SRC Ultra Whisper Modular 300
SRC Ultra Whisper Modular 400
SRC Ultra Whisper Modular 500
SRC Ultra Whisper Modular 600

EFD 10/01/11

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Ultra Whisper 200-600

Owner's Manual

SRC ULTRA WHISPER OWNER'S MANUAL

Revision History

Date	*Section/Page*	*Change Descriptions*
Jan 15, 2008	Sec 1 p 7	Update P&ID p 7; Update component location graphic p 8. *Reported 1/12/08*
Jan 15, 2008	Sec 9, p 8-10	Replace feed water pump. *Reported 1/12/08*
July 23, 2008	Sec 2 p 13-66	Add installation by illustration section, pages 13-30: *Reported 7/10/08*
July 23, 2008	Sec 7 p 5-33	Add feed pump maintenance and repair section, pages 5-7: *Reported 7/10/08*
July 23, 2008	Sec 9 p 8-49	Add feed pump exploded part views, pages 8-10: *Reported 7/10/08*
Sept 24, 2008	Sec 2 p 40 Sec 2 p 59 Sec 2 p 66	Add reference to UV installation details p 40. Add reference to UV installation details p 59. Add UV installation details p 66-68. *Reported 8/28/08*
Sept 24, 2008	Sec 7 p 31 Sec 7 p 34	Add reference to UV maintenance details p 31. Add UV maintenance details p 34-39. *Reported 8/28/08*
Nov 12, 2010	Sec 9 p 21	Updated Fresh Water Flush Drawings
Nov 16, 2010	Cover	Updated cover page
Oct. 1, 2011	Cover	Updated Cover (New ETD Picture)

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Your use of this Owner's Manual acknowledges acceptance of the terms and conditions provided herewith and your agreement to comply with all applicable laws and regulations pertaining to the use of this Owner's Manual.

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PATENT NOTIFICATION

Certain aspects of the Sea Recovery Ultra Whisper Reverse Osmosis Desalination System are protected by U.S. and International Patent Laws.

Sea Recovery's **Reverse Osmosis Desalination Systems are Type Accepted by the American Bureau of Shipping, ABS.**

ABS

American Bureau of Shipping.

Safety, Service, Solutions

These three goals define the activities of ABS. They are the bedrock upon which the American Bureau of Shipping's commitment to set standards of excellence as one of the world's leading ship classification societies is founded.

From its inception in 1862, setting safety standards for the marine industry has been the core commitment of ABS. This is achieved through the establishment and application of technical standards, known as Rules, for the design, construction and operational maintenance of ships and other marine structures. Classification is a process that certifies adherence to these Rules.

The core competencies of this worldwide network of ABS professionals lie in the fields of survey, engineering and auditing. Backing these field representatives is an unequivocal commitment to research and development.

The ABS Type Approval Program

The ABS Type Approval program has existed in some form since 1983. Today it is formalized in the Rules. Two basic processes and certificates establish the validity of a product and all other certificates that may be issued in the program. The format imitates the format of the European Marine Equipment Directive (MED).

- Satisfactory evaluation of a product to a set of Rules or standards is recorded in the issue of a "Product Design Assessment (PDA)" certificate. The process is the same as would be followed for an ABS Design Review Letter. It imitates the Module B category of the MED.
- Satisfactory evaluation of the manufacturing (Works) facility to confirm their ability to consistently manufacture the product in accordance with the PDA is recorded in the issue of a "Manufacturing Assessment (MA)" certificate. This was previously known in ABS as the MMEC program. This imitates the modules D and E of the MED.

The IACS Ad-Hoc Committee for the Certification of Materials and Components have consensus that Type Approval requires; 1) an evaluation of the product including prototype tests (if necessary), 2) a witness of the manufacture of the product (type test), and 3) an assessment of the manufacturer's ability to consistently manufacture the product in accordance with the approved specifications. There are a multitude of derivations of this process; following is an abbreviated outline of the basic certificates:

A **Type Approved Product** has satisfied the processes of:

1. An Engineer's evaluation of a design to determine conformance with specifications. The manufacturer should submit sufficient information to allow ABS to determine if the product meets specification. This results in a Product Design Assessment Certificate (PDA).

2. Witnessing manufacture and testing of a type of the product to determine compliance with the specification

3. A Surveyor's evaluation of the manufacturing arrangements to confirm that the product can be consistently produced in accordance with the specification. This results in the issue of a Manufacturing Assessment Certificate

CERTIFICATE NUMBER
06-HS159834D-PDA

DATE
17 May 2006

ABS TECHNICAL OFFICE
Houston SED - Ship Systems

CERTIFICATE OF
Design Assessment

This is to Certify that a representative of this Bureau did, at the request of

Sea Recovery Corporation

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate. It will remain valid as noted below or until the Rules or specifications used in the assessment are revised (whichever occurs first).

PRODUCT:	Reverse Osmosis Desalinator
MODEL:	Ultra Whisper
ABS RULE:	2006 Steel Vessel Rules 1-1-4/7.7, 4-6-2/5.7
OTHER STANDARD:	None.;

AMERICAN BUREAU OF SHIPPING

Hans P. Haendler
Engineering Type Approval Co-ordinator

AB258(07/03)

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of American Bureau of Shipping or a statutory, industrial or manufacturer's standard and is issued solely for the use of the Bureau, its committees, its clients or other authorized entities. Any significant changes to the aforementioned product without ABS approval will result in this certificate becoming null and void. **This certificate is governed by the terms and conditions on the reverse side hereof.**

TX 05/05 5099A
LTR 1000

Sea Recovery Corporation
P. O. Box 5288
Carson
California 90745-5288
United States
Telephone: 310-637-3400
Fax: 310-637-3430

Plant Address:
19610 S. Rancho Way
Rancho Dominguez, California
90220

Product: **Reverse Osmosis Desalinator**

Model: **Ultra Whisper**

Intended Service:
Production of Fresh Water by Sea Desalination

Description:
Reverse Osmosis Desalination Unit. See attached "pdf" product details

Ratings:
Ultra Whisper Compact: 8 GPH - 25 GPH
Ultra Whisper Modular: 8 GPH - 25 GPH

Service Restrictions:
Unit Certification is not required for this product.

Comments:
1) The use of PVC piping is limited to 35 psi for water application.

Term of Validity:
This product/model is covered under Product Design Assessment (PDA) Certificate # 06-HS159834D-PDA, dated 17/May/2006. This PDA Certificate expires May of 2011. It will remain valid for the 5 years from date of issue or until the Rules or specifications used in the assessment are revised (whichever occurs first).

STANDARDS

ABS Rules:
2006 Steel Vessel Rules 1-1-4/7.7, 4-6-2/5.7

None.

Sea Recovery's **Reverse Osmosis Desalination Systems comply with FCC § 15.105**

United States Federal Communications Commission Compliance

FCC § 15.105

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Sea Recovery's **Reverse Osmosis Desalination Systems have been independently tested and determined to be in compliance with European CE (Conformité Européne)**

CE The CE Mark ('Trade Passport to Europe') is a visible declaration by the manufacturer (or his representative, importer, etc.) that the equipment which is marked complies with all the requirements of all the applicable directives. This mark allows manufacturers and exporters to circulate products freely within the 15 European Union (EU) members. Having ensured that the equipment does indeed meet all these requirements (including all the administrative requirements involved in being able to demonstrate compliance), the CE Mark may then be affixed and the product released.

The letters, "CE", indicate that the manufacturer has undertaken all assessment procedures required for the product. The CE mark indicates conformity to the legal requirements of the EU Directives.

The "CE" mark is now mandatory for regulated products sold in the European Union.

Declaration Of Conformity

CE

CONFORMITY DECLARATION

Manufacturer's Name: **Sea Recovery Corp.**

Manufacturer's Address: **19610 South Rancho Way**
Rancho Dominguez, Ca.
90220 U.S.A.

SEA RECOVERY CORP. Declares that the:

Product Series: **Aqua Series and**
High Sea Series of
Revese Osmosis Desalinators

Model Names: **Aqua Matic, Aqua Whisper,**
Aqua Mini, Ultra Whisper,
Coral Sea, Tasman Sea,
and North Sea

Conforms to the following Standard(s): EN 55011A and EN 50082-2

SUPPLEMENTARY INFORMATION:

"The product complies with the requirements of the EMC Directive 89/336/EEC."

SEA RECOVERY CORPORATION
Seal of Quality
GARDENA, CALIFORNIA

Official Seal

CHRIS ROLLINS
VP Director of Quality Assurance, SRC
Manufacturer's Contact

Sea Recovery®
REVERSE OSMOSIS DESALINATORS

Sea Recovery Corporation, Rancho Dominguez, California U.S.A. © 2005

Sea Recovery Ultra Whisper **LIMITED WARRANTY**

Sea Recovery warrants that the Sea Recovery Desalination System performs according to specifications for a period of twelve (12) months from the date of shipment. Sea Recovery's liability under this warranty is limited to repair or replacement of the Ultra Whisper Desalination System at Sea Recovery's discretion. Under no circumstances is Sea Recovery liable for consequential damages arising out of or in any way connected with the failure of the system to perform as set forth herein. This limited warranty is in lieu of all other expressed or implied warranties, including those of merchantability and fitness for a particular purpose.

Warranty Period starts from the date of original shipment by Sea Recovery, or with proof of purchase from the date of sale to the original retail purchaser:

1. System and accessories: 1 (one) year
2. Repairs made by Sea Recovery after the original warranty period has expired: 3 (three) months

Normal reoccurring user maintenance listed below is not covered by this or any Sea Recovery limited warranty:

1. Sea Strainer Element
2. Cartridge Filter Elements
3. Fuses
4. Pump Seals & Packings
5. Pump Valve Assemblies
6. Gauge Instrument Calibration
7. Valve Seals and Packings
8. Exterior Corrosion
9. ETD Seals
10. ETD Valve Surfacing
11. ETD Wear Spring
12. U.V. Lamps

This or any Sea Recovery limited warranty does not cover installation components not supplied by Sea Recovery, and does not cover System problems and System failures directly caused by and related to improper installation. Improper installation resulting in the System or Sea Recovery component failure or decline in performance is not covered by this or any Sea Recovery limited warranty.

The Sea Recovery Reverse Osmosis Membrane Element is guaranteed to be cleanable for a minimum of one year from date of shipment, providing cleaning periods are adhered to, and fouling is acid soluble metal hydroxides and calcium carbonates or alkaline soluble organic, inorganic substances and microbiological slimes. The Sea Recovery Membrane Element is not guaranteed against iron fouling (rust), chemical or petroleum products attack, extreme temperatures (over 120° F/under 32° F), drying out, or extreme pressures (over 1000 psig).

In the event of a defect, a malfunction, or failure specifically covered by this warranty and during the warranty period, Sea Recovery will repair or replace, at its option, the product or component therein which upon examination by Sea Recovery appears to be defective. Products broken by the installer or user and found to have no defects will not be covered by this warranty.

To obtain warranty service, the defective product or part must be returned to an authorized Sea Recovery Service Center or direct to Sea Recovery. An updated listing of Sea Recovery Factory Service Centers can be found on the Sea Recovery web site at **http://www.searecovery.com**. The purchaser must pay any transportation or labor expenses incurred in removing and returning the product to the service center or to Sea Recovery.

The limited warranty does not extend to any system or system component which has been subjected to alteration, misuse, neglect, accident, improper installation, inadequate or improper repair or maintenance or subject to use in violation of instructions furnished by Sea Recovery, nor does the warranty extend to components on which the serial number has been removed, defaced, or changed.

Sea Recovery reserves the right to make changes or improvements in its product, during subsequent production, without incurring the obligation to incorporate such changes or improvements on previously manufactured equipment.

The implied warranties, which the law imposes on the sale of this product, are expressly LIMITED in duration to the time period above. Sea Recovery shall not be liable for damages, consequential or otherwise, resulting from the installation, use and or operation of this product, or from the breach of this LIMITED WARRANTY.

CAUTION: Use of non Sea Recovery supplied parts and accessories, including but not limited to, maintenance parts, pre-filter elements, cleaning and storage chemical, spare parts, replacement parts, system components, installation components and or system accessories, shall void all warranty expressed or implied.

Sea Recovery Corporation
P.O. Box 5288
Carson, California 90745-5288 U.S.A.

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Email: srcsales@searecovery.com • Web: http://www.searecovery.com

Sea Recovery®

Ultra Whisper™

System Warranty Registration Information

INSTRUCTIONS: At the time of purchase of the Sea Recovery Reverse Osmosis Desalinator, please complete the warranty information listed below. After completing this form, please make a copy and mail it to the address provided at the bottom of this form.

System Information: Ultra Whisper 200, 300, 400, 500, or 600

Model Number: _____ Serial Number: _____

Operating Voltage:

Direct Current: ___ 12 VDC or ___ 24 VDC

Alternating Current: ___ 110/115 VAC or ___ 220/230 VAC

Cycles: ___50 Hz or ___ 60 Hz

Date Purchased: _____

Date Commissioned: _____
(First tested or operated)

Dealer Information:

Dealer's Name: _____

Address: _____

_____

City: _____ State: _____

Country: _____ Postal Code: _____

Dealer's Invoice Number: _____

Mail a copy of this form to:

Sea Recovery Corporation
P.O. Box 5288
Carson, California 90745-5288 U.S.A.

Tel: 1-310-637-3400 • Fax: 1-310-637-3430
Email: srcsales@searecovery.com • Web: http://www.searecovery.com

Customer's comments: _____

Sea Recovery®

Ultra Whisper™

System Identification Information

INSTRUCTIONS: It is important that this form is completely filled in at the time of purchase of the Sea Recovery Ultra Whisper Reverse Osmosis Desalinator. This information will be requested by our Service Department and Parts Order Desk whenever contacting Sea Recovery for technical assistance or by the Sales Department whenever ordering parts.

System Information: Ultra Whisper 200, 300, 400, 500, or 600

Model Number: _____ Serial Number: _____

Operating Voltage:

Direct Current: ___ 12 VDC or ___ 24 VDC

Alternating Current: ___ 110/115 VAC or ___ 220/230 VAC

Cycles: ___50 Hz or ___ 60 Hz

Date Purchased: _____ Date Commissioned: _____
(First tested or operated)

Dealer Information:
Dealer's Name: _____
Address: _____
_____
City: _____ State: _____
Country: _____ Postal Code: _____
Dealer's Invoice Number: _____

Customer Information:
Customer's Name: _____
Address: _____
_____
City: _____ State: _____
Country: _____ Postal Code: _____
Telephone Number: _____ E-Mail Address: _____

If Vessel Installation:
Boat's Manufacture: _____
Boat's Model: _____, Length: _____ Feet or _____ Meters.
Boat's Name: _____

RETAIN THIS FORM WITHIN THE OWNER'S MANUAL FOR REFERENCE.

PREFACE

Thank you for your purchase of a Sea Recovery Ultra Whisper Energy Efficient Reverse Osmosis Desalination System. This manual contains instructions for the installation, operation, maintenance and repair of the Sea Recovery Desalination System. This information is provided to ensure extended life and safe operation of your Sea Recovery System.

Please read this manual thoroughly before installation or operation and keep it for future reference. A better understanding of the system ensures optimum performance and longer service life from the system.

The instructions in this manual are intended for personnel with some general training and experience in the installation, operation and maintenance of electro-mechanical fluid handling systems.

Sea Recovery's Ultra Whisper Systems are designed and engineered to function as a complete working unit. Generally speaking, the performance of each component within the unit is dependent on the component prior to it and governs the performance of all components after it. Proper performance of the system is thus dependent upon proper operation of every single component within the system.

The intent of this manual is to allow the operator to become familiar with each component within the Sea Recovery System. By understanding the function, importance, and normal operation of each component within each subsystem of the unit, the operator can readily diagnose minor problems, which if detected early are usually easily corrected. However, if left unattended, a problem in one component eventually affects the rest of the system and leads to further repairs.

The manual is divided into chapters that address different subject matter. Each chapter should be reviewed before installing or operating the Reverse Osmosis Desalination System.

The use of Third Party, non Sea Recovery, parts are the major documented cause of failures and problems caused to the Sea Recovery System. The use of third party, non Sea Recovery, consumables, spares, and assemblies have, can, and will damage the Sea Recovery System and or specific components within the System. Do not use parts, components, consumables, or assemblies from any source other than Sea Recovery. Use of third party, non Sea Recovery, components, consumables, or assemblies will void any and all warranty of the System and or the affected component within the system.

Sea Recovery maintains inventory for immediate shipment and our Service Dealers throughout the world maintain stock of Sea Recovery parts. Always insist on Sea Recovery supplied parts for your System in order to avoid failures, eliminate problems, and maintain your Sea Recovery Warranty.

Ultra Whisper SPECIFICATIONS

SYSTEM FEED WATER & RECOVERY

ULTRA WHISPER SIZE CODES OF THE FEED PUMP, ETD, R.O. MEMBRANE ELEMENT, AND PRESSURE VESSEL IN RELATIONSHIP TO THE GALLON PER DAY PRODUCTION OF THE SPECIFIC ULTRA WHISPER:

If any of these components are miss-matched the System will not function properly. Either the Operating Pressure and Amperage Draw will be higher than specified causing damage to one or more of these components, or the Operating Pressure will be lower than required resulting in low Product Water production and poor Product Water Quality.

12 VDC, 24 VDC & Alternating Current 60 Hz powered Systems

Ultra Whisper Model	Product Water Production GPD / LPD	Feed Pump Elect. Mtr	Feed Pump Size Code	Feed Pump Flow GPH /LPH	ETD Size Code	ETD Recovery Percentage	R.O. Membrane Element Size Code	Pressure Vessel Size Code
UW 200	**216 / 818**	**1/3 H.P.**	**10**	**100 / 379**	**B-22**	**9%**	**A**	**A**
UW 300	**298 / 1128**	**1/3 H.P.**	**15**	**140 / 530**	**B-22**	**9%**	**B**	**B**
UW 400	**403 / 1526**	**1/3 H.P.**	**15**	**140 / 530**	**B-25**	**12%**	**C**	**C**
UW 500	**547 / 2071**	**1/2 H.P.**	**16**	**190 / 719**	**B-25**	**12%**	**C**	**C**
UW 600	**619 / 2343**	**1/2 H.P.**	**17**	**215 / 814**	**B-25**	**12%**	**C**	**C**

Alternating Current 50 Hz powered Systems

Ultra Whisper Model	Product Water Production GPD / LPD	Feed Pump Elect. Mtr	Feed Pump Size Code	Feed Pump Flow GPH / LPH	ETD Size Code	ETD Recovery Percentage	R.O. Membrane Element Size Code	Pressure Vessel Size Code
UW 200	**224 / 848**	**1/3 H.P.**	**35**	**104.2 / 394**	**B-22**	**9%**	**A**	**A**
UW 300	**297 / 1124**	**1/3 H.P.**	**36**	**137.5 / 520**	**B-22**	**9%**	**B**	**B**
UW 400	**396 / 1499**	**1/3 H.P.**	**36**	**137.5 / 520**	**B-25**	**12%**	**C**	**C**
UW 500	**516 / 1953**	**1/2 H.P.**	**17**	**179.2 / 678**	**B-25**	**12%**	**C**	**C**
UW 600	**600 / 2271**	**1/2 H.P.**	**18**	**208.3 / 788**	**B-25**	**12%**	**C**	**C**

SYSTEM PRESSURES: Seawater @ 35,000 PPM & 77° F / 25° C. Refer to Conversion Charts & Cross Reference Information in Section 11 of this manual

	Feed Water Pump Nominal Discharge Pressure into ETD				**Nominal Operating Pressure Developed by ETD at R.O. Membrane Element**			
Model	**PSI**	**BAR**	**Kg/cm²**	**kPa**	**PSI**	**BAR**	**Kg/cm²**	**kPa**
Ultra Whisper 200	100	6.9	7.03	690	620	42.75	43.59	4275
Ultra Whisper 300	150	10.34	10.55	1034	590	40.68	41.48	4068
Ultra Whisper 400	135	9.31	9.49	931	590	40.68	41.48	4068
Ultra Whisper 500	150	10.34	10.55	1034	650	44.82	45.70	4482
Ultra Whisper 600	175	12.07	12.30	1207	680	46.89	47.81	4689

PERFORMANCE:

PRODUCT WATER PRODUCED PER HOUR AND PER DAY OF OPERATION:

12 VDC, 24 VDC & 60 Hz powered Systems

	per 1 hour of operation:			per 24 hours of operation:		
Model Number	**U.S. Gallons**	**/**	**Liters**	**U.S. Gallons**	**/**	**Liters**
Ultra Whisper 200	9	/	34	216	/	818
Ultra Whisper 300	12.4	/	47	298	/	1128
Ultra Whisper 400	16.8	/	63.6	403	/	1,526
Ultra Whisper 500	22.8	/	86.3	547	/	2,071
Ultra Whisper 600	25.8	/	97.6	619	/	2,343

50 Hz powered Systems

	per 1 hour of operation:			per 24 hours of operation:		
Model Number	**U.S. Gallons**	**/**	**Liters**	**U.S. Gallons**	**/**	**Liters**
Ultra Whisper 200	9.3	/	35.3	224	/	848
Ultra Whisper 300	12.4	/	46.8	297	/	1,124
Ultra Whisper 400	16.5	/	62.5	396	/	1,499
Ultra Whisper 500	21.5	/	81.4	516	/	1,954
Ultra Whisper 600	25	/	94.6	600	/	2,271

SPECIFICATIONS:

SALT REJECTION (CHLORIDE ION): Minimum 99.2 %, Average 99.4%

PRODUCT WATER TEMPERATURE: Ambient to feed water temperature

SALINITY MONITORING: Automatic computer controlled electronic monitoring. Temperature compensated with Water Quality Indicator. The salinity monitoring components of the system give a continuous readout in micromhos per cubic centimeter, are temperature compensated and of a fail-safe design.

FEED WATER SALINITY RANGE: up to 50,000 PPM TDS (NaCl), typical seawater salinity is 35,000 PPM. Refer to Conversion Charts & Cross Reference Information in Section 11 of this manual

FEED WATER TEMPERATURE RANGE: Max. 122°F / 50°C, Min. 33°F / .5°C. Refer to Conversion Charts & Cross Reference Information in Section 11 of this manual

FEED WATER pH RANGE: 3-11 (typical seawater pH is 8)

CHLORINE TOLERANCE: 0.1 PPM.

REVERSE OSMOSIS MEMBRANE: Specifically selected High Rejection / High Yield aromatic tri-polyamides, thin film composite, spiral wound, single pass reverse osmosis membrane element.

EXTERNAL INSTALLATION WATER CONNECTIONS:

Pipe sizes to be supplied by the installer for connection of the Sea Recovery supplied components

Feed Inlet:	1/2" MNPT Male National Pipe Thread U.S. Standard
Brine Discharge	1/2" MNPT Male National Pipe Thread U.S. Standard
Product	1/4" FNPT Female National Pipe Thread U.S. Standard

FEED WATER PUMP MOTOR ELECTRICAL SPECIFICATIONS:

12 & 24 VDC	**UW 200**	**UW 300**	**UW 400**	**UW 500**	**UW 600**
	12V / 24V	**12V / 24V**	**12V / 24V**	**24V**	**24V**
Nominal Operating Amps	16 / 8	24 / 12	24 / 12	24	26
Maximum Motor Amps	28 / 13.4	28 / 13.4	28 / 13.4	20	20
Horse Power	.3	.3	.3	.5	.5
Recommended Circuit Breaker	30 / 15	30 / 15	30 / 15	25	25
Minimum Size Power Wire AWG	6 / 8	6 / 8	6 / 8	6	6
Minimum Size Power Wire mm^2	13 / 8	13 / 8	13 / 8	13	13

115 & 230 VAC 60 Hz	**UW 200**	**UW 300**	**UW 400**	**UW 500**	**UW 600**
	115V / 230V	**115V / 230V**	**115V / 230V**	**115V / 230V**	**115V / 230V**
Nominal Operating Amps	5 / 2.5	5.3 / 2.7	5.3 / 2.7	7.2 / 3.6	7.5 / 3.7
Maximum Motor Amps	6.6 / 3.5	6.6 / 3.5	6.6 / 3.5	8.6 / 4.3	8.6 / 4.3
Starting Amps	25 / 12.5	25 / 12.5	25 / 12.5	46 / 23	46 / 23
Horse Power	.3	.3	.3	.5	.5
Recommended Circuit Breaker	10 / 5	10 / 5	10 / 5	10 / 5	10 / 5
Minimum Size Power Wire AWG	12	12	12	12	12
Minimum Size Power Wire mm^2	3	3	3	3	3

110 & 220 VAC 50 Hz	**UW 200**	**UW 300**	**UW 400**	**UW 500**	**UW 600**
	110V / 220V	**110V / 220V**	**110V / 220V**	**110V / 220V**	**110V / 220V**
Nominal Operating Amps	4.8 / 2.4	5.1 / 2.5	5.1 / 2.5	7 / 3.5	7.3 / 3.6
Maximum Motor Amps	5.2 / 2.6	5.2 / 2.6	5.2 / 2.6	7.4 / 3.7	7.4 / 3.7
Starting Amps	26 / 13	26 / 13	26 / 13	44 / 22	44 / 22
Horse Power	.3	.3	.3	.5	.5
Recommended Circuit Breaker	10 / 5	10 / 5	10 / 5	10 / 5	10 / 5
Minimum Size Power Wire AWG	12	12	12	12	12
Minimum Size Power Wire mm^2	3	3	3	3	3

NOTE:

Nominal Operating Amperage Will Increase if:

- the Feed Water Temperature is Lower than 77° Fahrenheit / 25° Celsius.
- the Feed Water Salinity is Greater than 35,000 PPM TDS (3.5% Total Dissolved Solids)
- the R.O. Membrane Element becomes fouled
- the R.O. Membrane Element is new and on the minus 15% side of the specifications

Nominal Operating Amperage Will Decrease if:

- the Feed Water Temperature is Higher than 77° Fahrenheit / 25° Celsius.
- the Feed Water Salinity is Less than 35,000 PPM TDS (3.5% Total Dissolved Solids)
- the R.O. Membrane Element is new and on the plus 15% side of the specifications

WEIGHT:

MODEL	**WEIGHT**	**MODEL**	**WEIGHT**
Ultra Whisper Compact 200	130 lbs. / 59.0 kg	Ultra Whisper Modular 200	125 lbs. / 59.0 kg
Ultra Whisper Compact 300	145 lbs. / 65.8 kg	Ultra Whisper Modular 300	140 lbs. / 63.5 kg
Ultra Whisper Compact 400	145 lbs. / 65.8 kg	Ultra Whisper Modular 400	140 lbs. / 63.5 kg
Ultra Whisper Compact 500	155 lbs. / 70.3 kg	Ultra Whisper Modular 500	150 lbs. / 68.0 kg
Ultra Whisper Compact 600	155 lbs. / 70.3 kg	Ultra Whisper Modular 600	150 lbs. / 68.0 kg

NOTES:

Section 1

Introduction

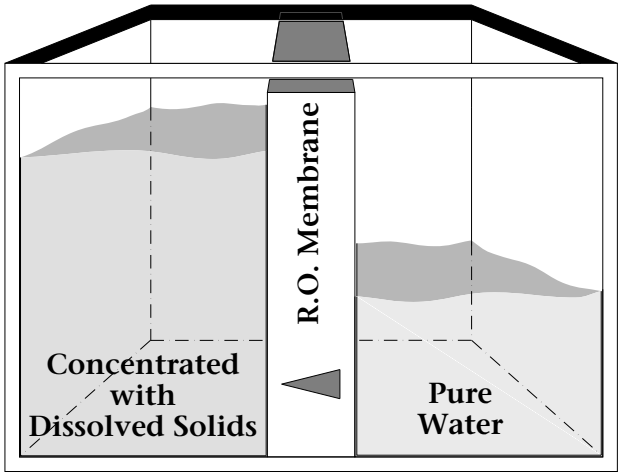
Component Descriptions

Operational Understanding

Notes:

Sea Recovery's
Approach to Water Desalination:

The Challenge:

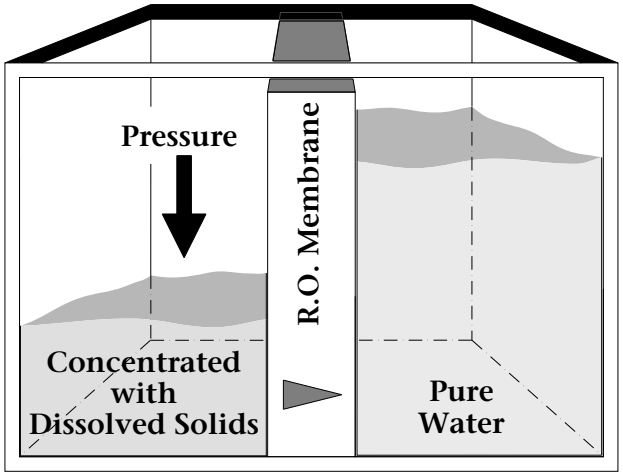


Osmosis is the diffusion of two mixable solutions through a semi permeable membrane in such a manner as to equalize their concentration. This diffusion occurs by allowing a lesser concentration, potable water, to naturally diffuse through a semi permeable membrane into a higher concentration, sea or brackish water.

Sea water or brackish water is a high concentration solution. Potable water is a low concentration solution.

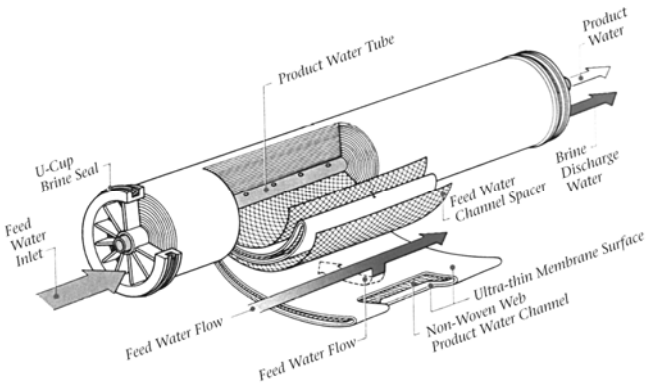
Therefore, sea water or brackish water cannot naturally diffuse through a semi permeable membrane to provide potable, drinking water.

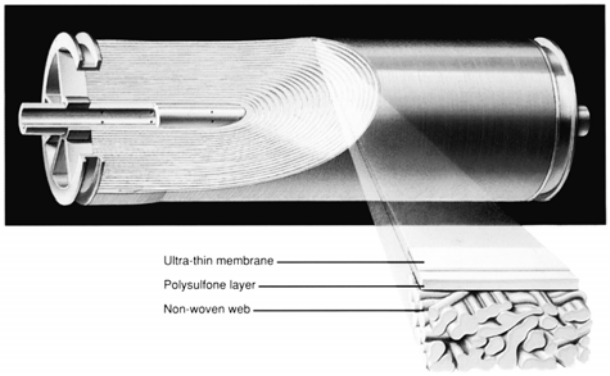
The Solution:



Reverse Osmosis, overcomes this natural phenomenon. By forcing sea or brackish water at high pressure through a semi permeable membrane potable water is realized. Reverse Osmosis Desalination Systems by Sea Recovery make possible the once impossible, potable water from undrinkable water sources.

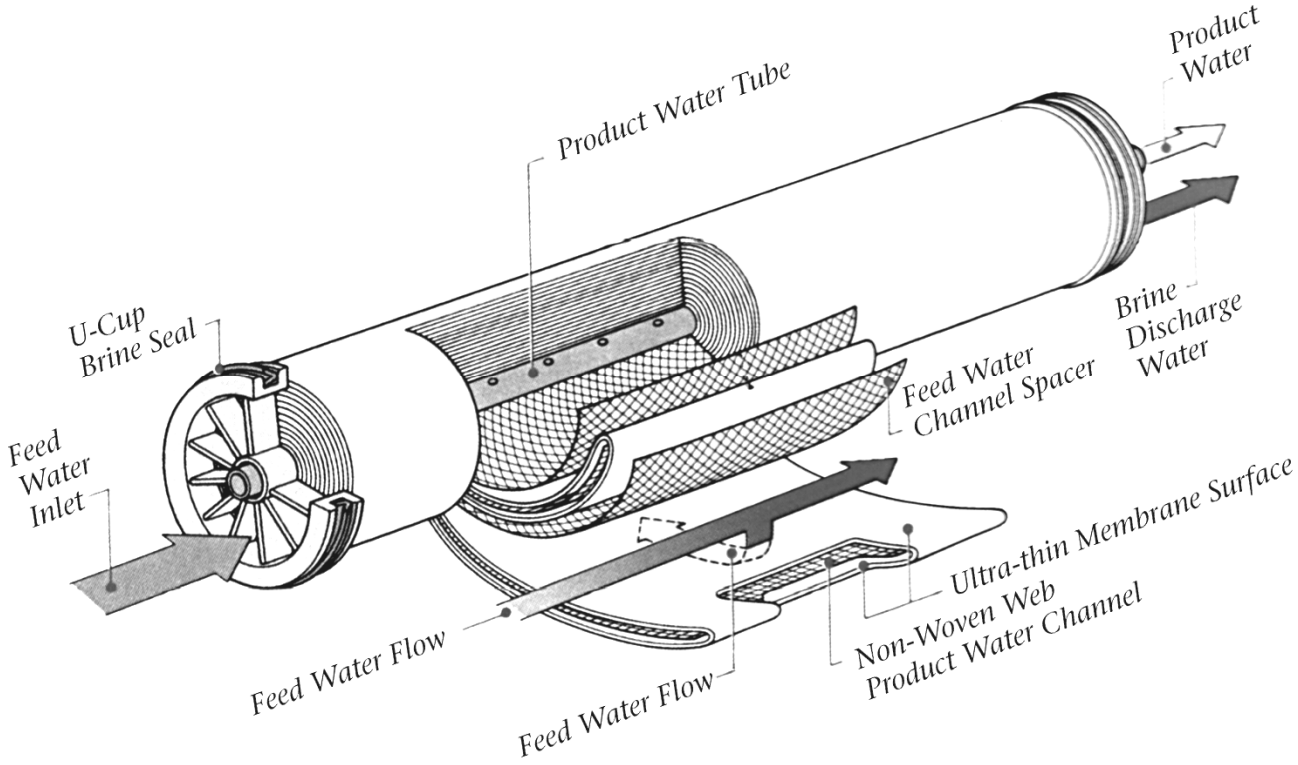
SPIRAL-WOUND REVERSE OSMOSIS MEMBRANE ELEMENT: (larger illustration on the following page)

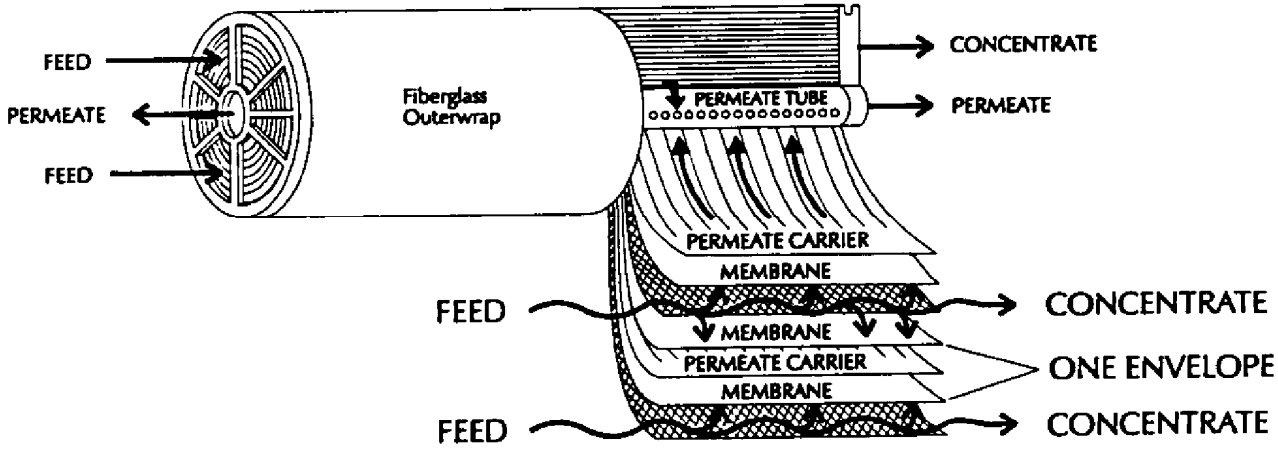




The spiral-wound membrane consists of one or more membrane envelopes each formed by enclosing a channelized product water carrying material between two large flat membrane sheets. The membrane envelope is sealed on three edges with a special adhesive and attached with the adhesive to a small diameter pipe to form a cylinder. A polypropylene screen is used to form the feed water channel between the membrane envelopes. A wrap is applied to the membrane element to maintain the cylindrical configuration. The center tube is also the permeate (product water) collecting channel. Several elements may be connected in series within a single or multiple pressure vessel(s).

ANATOMY OF A SPIRAL-WOUND REVERSE OSMOSIS MEMBRANE ELEMENT





1. INTRODUCTION

COMPONENT DESCRIPTIONS

All components supplied by Sea Recovery, both standard and optional, are described in this section along with items required or desired by the installer. The location, operation, and purpose of each major component is briefly explained in this section.

The descriptions in this chapter are listed according to the ID numbers each component is given in the System Piping and Interconnect Diagram illustrated on the following page.

Through out this manual, components are followed by a number in brackets i.e., "Sea Strainer [4]", which refers to the component's location in the illustration on the following page, the P&ID (Piping & Interconnect Diagram).

** Denotes items supplied by installer
*** Denotes optional equipment.

Through out this Owners Manual cautions are given to the technician, operator, and owner to ensure that you use only Sea Recovery supplied components, consumables, spares, and replacement parts. Since 1981 Sea Recovery has shipped over 12,000 R.O. Systems and most of them are still in use today. Of all the reported problems that we help our customers with the majority are problems caused by using third party replacement parts and consumables. Use of third party, Non Sea Recovery, components will lead to premature failure, added operating costs, added maintenance costs and labor, and will void any and all Sea Recovery Warranty. We only wish to help you enjoy the luxury of owning a Sea Recovery R.O. System.

COMPONENT DESCRIPTIONS
THE ILLUSTRATION ON PAGE 7 SHOWS ALL STANDARD COMPONENTS & ALL OPTIONAL ACCESSORIES.

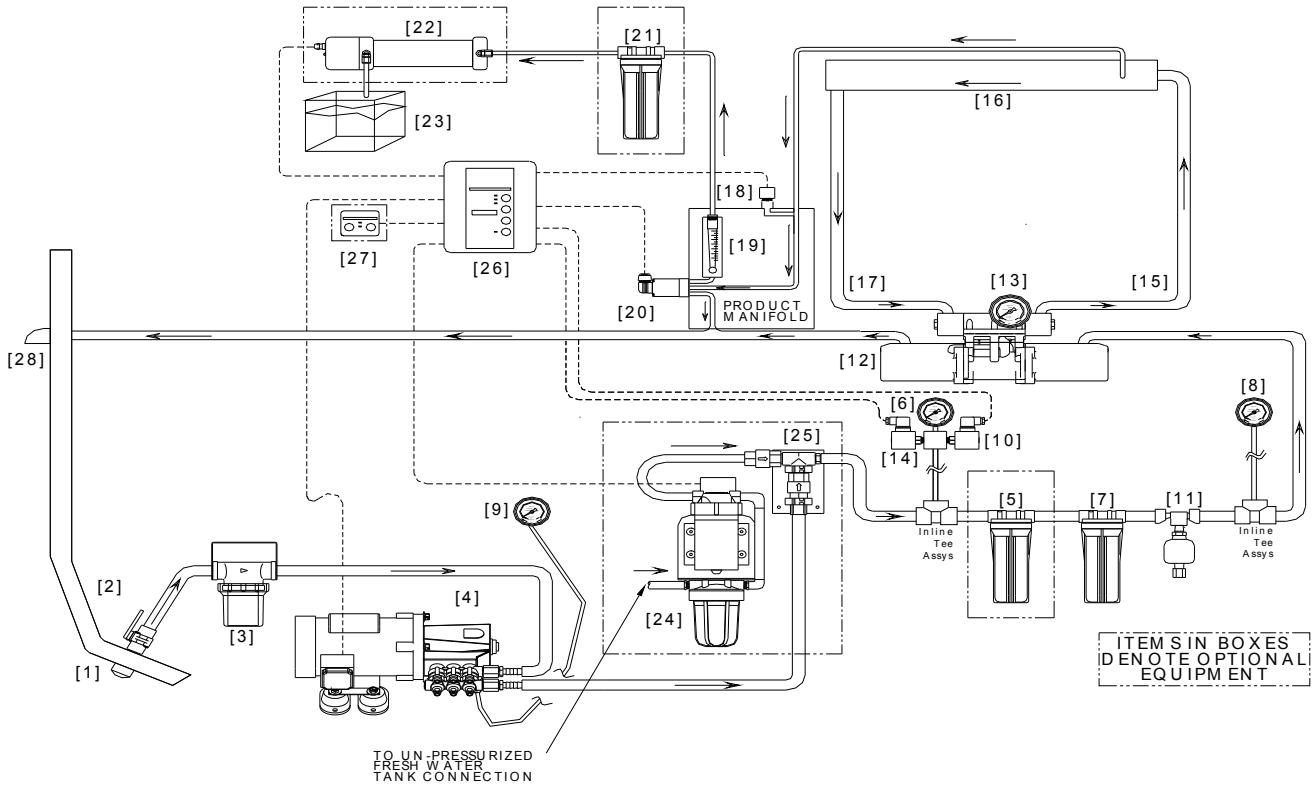
** Denotes items supplied by installer
*** Denotes optional equipment

1. Inlet Thru Hull Fitting Forward Facing Scoop **
2. Sea Cock Valve **
3. Feed Water Connector
4. Sea Strainer
5. Feed Pump Inlet
   Compound Vacuum/Pressure Gauge -30-0-60
6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
20. R.O. Membrane Element & Pressure Vessel
21. High Pressure Hose
22. Brine Discharge Tee Connector
23. Thru Hull Discharge Fitting **
24. Product Water Manifold
25. Temperature Compensated Salinity Probe
26. 3-Way Product Water Diversion Valve
    Electric Solenoid Actuated
27. Flow Meter, Product Water
28. Charcoal Filter
29. pH Neutralizer Filter***
30. Ultra Violet Sterilizer***
31. Potable Water Storage Tank Tube Connector
32. Potable Water Storage Tank**
33. Fresh Water Flush Pump
    included with the Fresh Water Flush Assembly
34. Fresh Water Flush Carbon Filter
    included with the Fresh Water Flush Assembly
35. Fresh Water Flush Check Valve
    included with the Fresh Water Flush Assembly
36. Inlet Rinse Clean Valve ***
37. Discharge Rinse Clean Valve ***
38. Rinse/Clean Solution Container **
39. Salinity Controller
40. Remote Controller ***
41. Soft Start***

Ultra Whisper P&ID with all options

Optional Accessories include:
Clean/Rinse Valves, Plankton Filter, pH Neutralizing Filter, Ultra Violet Sterilizer, remote Control, and Soft Motor Starter

Sea Recovery "Ultra Whisper" Series
Reverse Osmosis Desalination System
General Piping and Interconnect Diagram (P&ID)



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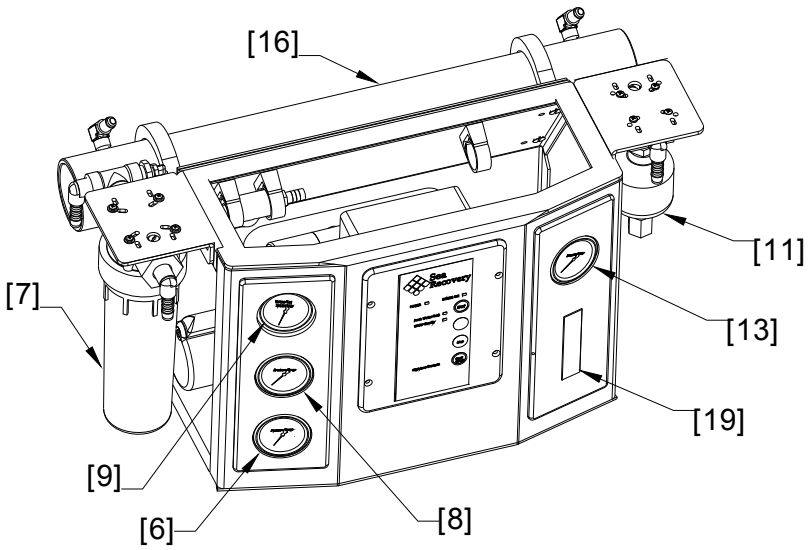
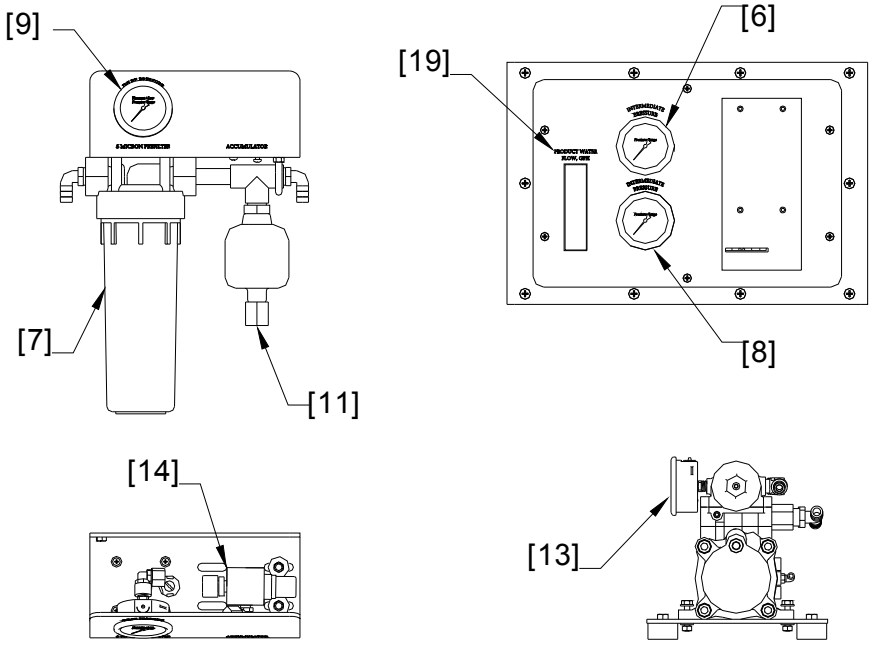
COMPONENT LOCATIONS:

ULTRA WHISPER COMPACT:



ULTRA WHISPER MODULAR:



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COMPONENT FUNCTIONS & DESCRIPTIONS:
This section describes every Ultra Whisper standard and optional component along with its function or purpose, location, and operation. Also described are items required or desired for installation. The component definitions in this chapter must be understood before continuing through this manual. The manual beyond this section assumes that the customer has read and understood the system component definitions. A glossary of terms is available at the end of this Section.

The descriptions are listed according to the ID numbers. This ID number is used throughout this manual to locate the component in the System Piping and Interconnect Diagram illustrated on page 4 of this section. Throughout this manual, the ID number follows system components, i.e., Sea Strainer [4]

** Denotes items supplied by installer
*** Denotes optional equipment

COMPONENT SUBDIVISION:
The Ultra Whisper System is broken down into six sections: (A) The Pre-filtration Section, (B) the Pressurization Section, (C) Brine Discharge Section, (D) Product Water & Optional Post Filtration Section, (E) Fresh Water Flush & R.O. Membrane Element Cleaning & Rinsing Section, and (F) Electronic Controls.

A. PRE-FILTRATION SECTION collects and filters the feed water. The feed water is filtered to remove suspended solids larger than 5 Microns in size (5/1,000,000 of a meter). The pre-filtration section protects the Membrane Element from premature suspended solids fouling.

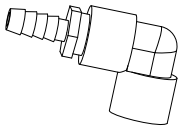
1. **Inlet Thru Hull Fitting with Forward Facing Scoop** ** This is the point at which the feed water enters the system. It is important that the installer utilizes a forward facing scoop so that the system receives a positive flow of water as the boat is under way.

   CAUTION: A flat or flush inlet thru-hull fitting will cause a vacuum as the boat is under way and this will cause loss of feed water flow and cavitation of the feed water pump resulting in continual System shut down due to low feed water flow and pressure. The resulting failure of the System to remain in operation is attributed to improper installation, is the liability of the installer, and is not covered by the Sea Recovery warranty.

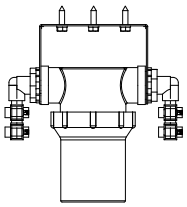
   CAUTION: If the thru-hull fitting is placed in a position that allows air to continually enter the thru-hull fitting this will cause the system to continually shut down due to loss of feed water. The resulting failure of the System to remain in operation is attributed to improper installation, is the liability of the installer, and is not covered by the Sea Recovery warranty.

2. **Sea Cock Valve** ** is used in a ship installation for safety reasons to close the feed water line during repair, maintenance, and nonuse of the System.

3. **Feed Water Connector** is attached to the Sea Cock Valve [2] for connection of the Feed Water Suction Hose.

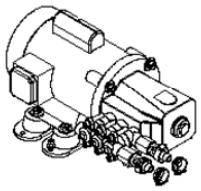


4. **Sea Strainer** has a clear bowl with nylon body filter housing containing a cleanable monel fine mesh filter screen. The Sea Strainer filters out large particulate matter and suspended particles that would otherwise damage or wear the Feed Pump [6] and or prematurely foul the cartridge Prefilter Elements [7, 13 & 14].

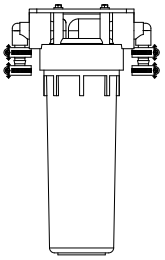


5. **Feed Pump Inlet Compound Vacuum/Pressure Gauge -30-0-60** is mounted on the Compact Series System Control Panel or on the Modular Series Prefilter Bracket. This Vacuum/Pressure gauge monitors the condition of the Sea Strainer [4] and the Feed Water pressure or vacuum entering the Inlet of the Feed Pump [6] from the Sea Strainer [4].

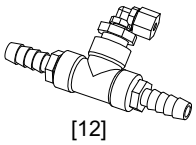
6. Feed Pump supplies a positive pressure through the Prefiltration [7, 13, & 14], and into the Energy Transfer Device [17] (ETD). The Feed Pump Flow and Pressure causes the ETD [17] to function.



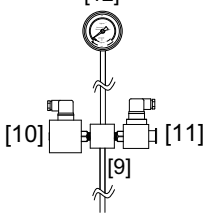
7. Plankton Filter *** This filter assembly contains a cleanable ultra fine monel mesh screen. The mesh screen removes suspended solids or biological growth such as plankton and provides reduced maintenance costs and longer life to the Pre-filter Elements [13 & 14].



8. Inline Pressure Pick-Up Tee for delivers line pressure to the low pressure manifold [9].



9. Low Pressure Manifold connects the Feed Pump outlet pressure to the Low Pressure Switch [10], the High Pressure Switch [11], and the Prefilter Inlet Pressure Gauge [12].



10. Low Pressure Switch (see illustration above) shuts the System off automatically when the Feed Pump fails or when the suction line prior to the Feed Pump Inlet becomes blocked causing an abnormal vacuum to the Feed Pump Inlet.

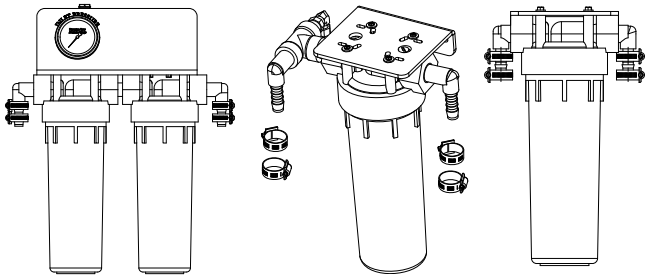
The Low Pressure Switch is a Normally Open Switch that Closes at or above 40 PSI to keep the System in operation. The Low Pressure Switch is attached to the Compact Frame or the Modular Prefilter bracket.

11. High Pressure Switch (see illustration above) is a safety device that stops the system if the Feed Pump outlet pressure exceeds 190 PSI. The High Pressure Switch is a Normally Closed Switch that Opens at 190 PSI to shut the system off. The Low Pressure Switch is attached to the Compact Frame or the Modular Prefilter bracket.

12. Pre-Filter Inlet Pressure Gauge 0-300 PSI (see illustration at item 9) is mounted on the System Control Panel and monitors the pressure from the Outlet of the Feed Pump [6] entering the Inlet of the Prefiltration [13]. This Gauge is used along with the Prefilter Outlet Gauge [16] to determine the condition of the Prefilter Elements.

13 & 14 PREFILTRATION:

COMPACT STYLE **MODULAR STYLE**



25 mμ 5 mμ 25 mμ 5 mμ

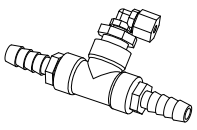
13. Pre-Filter 25 mμ This filter removes suspended solids 25 Microns and larger to prolong the life of the final 5 Micron Prefilter.[14] element.

14. Pre-Filter 5 mμ This filter removes suspended solids 5 Microns and larger to prolong the life of and protect the Reverse Osmosis Membrane [20] from fouling.

WARNING: Do not use third party prefilter elements, use only Sea Recovery Prefilter Elements. Third party prefilter elements on the market do not properly fit, the seams fall apart resulting in damage to the ETD, and they will allow by-pass resulting in premature fouling of the R.O. Membrane Element.

CAUTION: Do not use "string wound" or "fiber" prefilter elements. These type of elements are designed for the Photographic Film Developing industry. When used in sea water they will plug up rapidly in 1/10th or less the time causing frequent shut down of the system and very frequent changing resulting in very high cost of maintenance.

15. Inline Pressure Pick-Up Tee for the Prefilter Outlet Pressure Gauge [16].

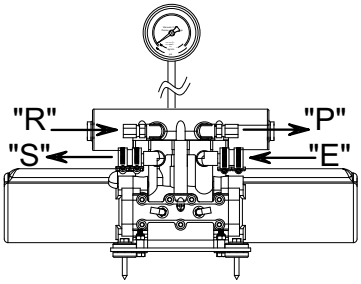


16. **Pre-Filter Outlet Pressure Gauge 0-300 PSI** is mounted on the System Control Panel and monitors the outlet pressure of the Pre-Filtration [13 & 14].

This Gauge is used along with the Pre-Filter Inlet Pressure Gauge [12] to determine the condition of the Pre-Filtration Elements.

B. PRESSURIZATION SECTION supplies the proper pressure across the Membrane Element to produce the required product water within a safe operating condition. Proper pressure and proper flow across the Membrane Element are two basic requirements of Reverse Osmosis.

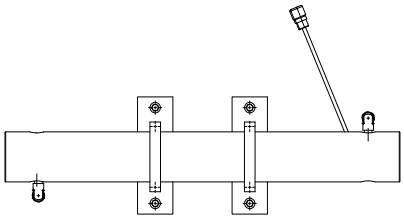
17. **Energy Transfer Device (ETD)** "enhances" (increases) pressure from the Feed Pump [6] by approximately a 5:1 or 6:1 ratio. For every 100 PSI delivered from the Feed Pump [6] the ETD [17] enhances the pressure to 500 to 600 PSI, depending on the specific System Model number and configuration. Pressurized water returns from the R.O. Membrane Element [20]. This pressurized water entering the Return Chamber of the ETD port "R" assists the ETD as recovered energy. This allows the ETD to deliver the required flow and pressure to the R.O. Membrane Element [20] with minimal power consumption.



18. **High Pressure Gauge 0-300 PSI** is a stainless steel glycerin filled pressure gauge that is used to monitor the high pressure of the Feed Water developed by the ETD [17].

19. **High Pressure Hose,** *Energy Transfer Device Outlet port "P" / MVA Inlet***,** transfers pressurized Feed Water from the ETD [17] to the inlet of the R. O. Membrane Element [20].

20. **R.O. Membrane Element & Pressure Vessel**

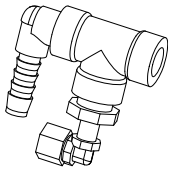


The Membrane Element allows potable water molecules to pass through while rejecting the salt ions. Only 9 – 12% of the Feed Water becomes Product Water. The remainder (concentrated brine) transfers energy back into the EDT then becomes Brine Discharge which carries the rejected salt ions out of the Membrane Element.

21. **High Pressure Hose,** *MVA Outlet/ Energy Transfer Device Return port "R"***,** transfers pressurized Brine Water from the Membrane Vessel Assembly [20] back to the ETD [17].

C. BRINE DISCHARGE SECTION transfers the Brine Discharge exiting the ETD back to the Feed Water source.

22. **Brine Discharge Tee Connector** allows for the Brine Discharge Hose to connect to the Thru Hull Over Board Discharge Fitting [23].

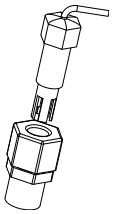


23. **Thru Hull Discharge Fitting** ** should be installed above water level for discharge of the Brine Discharge Water from the System.

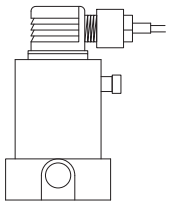
D. PRODUCT WATER & POST-FILTRATION SECTION collects the product water as it exits the Reverse Osmosis Membrane Element [20]. The product water is tested for quality at the salinity probe [25], enters a 3-Way Product Water Diversion Valve [26], then measured for flow [27]. When the Product Water Salinity decreases to the "safe" level it is then diverted into the Post Filtration components [28, 29, & 30] which are the final steps in Product Water quality control.

24. **Product Water Manifold** allows transfer of product water flow through the compaonets attached to it.

25. **Temperature Compensated Salinity Probe** electronically determines whether the salinity content of the Product Water has decreased to the "safe" level. This Salinity Probe retains an accurate reading throughout varying temperature ranges.

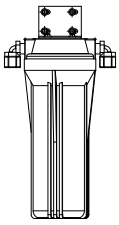


26. **3-Way Product Water Diversion Valve, Electric Solenoid Actuated.**
The Salinity Controller [39] energizes this valve to the "Potable" position when the system produces water which meets the low salinity requirement.
If the Product Water being produced is "Un-potable", high in salinity, then no signal is sent to the valve and it remains in the normally open position. The "fail safe" normally open position diverts the un-potable Product Water to discharge through the Brine Discharge Tee Connector [22].

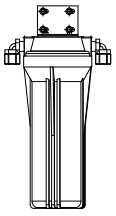


27. **Flow Meter, Product Water.** This flow-through meter measures the rate of Product Water flow in gallons per hour from the R.O. Membrane Element [20].

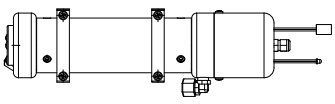
28. **Charcoal Filter** is designed to remove foul odors from the Product Water. Sulfurous smell (rotten egg smell) is caused by decaying biological matter in the Feed Water section. Fresh water flushing of the System helps to minimize the source of this odor.



29. **pH Neutralizer Filter***** The Product Water produced by Reverse Osmosis is slightly acidic. The pH Neutralizer Filter neutralizes the pH of the Product Water.



30. **Ultra Violet Sterilizer***** sterilizes up to 99.9% of any virus, bacteria and other micro-organisms which may pass through the R.O. Membrane Element [20]. The U.V. sterilizer is recommended if the Product Water Storage Tank [32] is not otherwise treated by means such as chlorination.

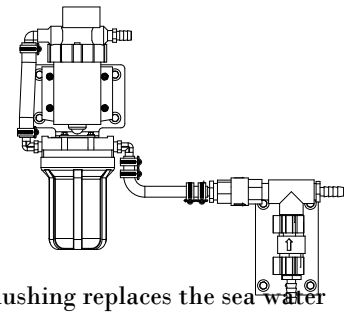


31. **Potable Water Storage Tank Tube Connector** is used to connect the Systems Potable Product Water output to the Potable Water Storage Tank [32].

32. **Potable Water Storage Tank**** may be any container suitable for storing Potable Water such as existing water storage tanks.

E. FRESH WATER FLUSH & R.O. MEMBRANE ELEMENT CLEANING & RINSING SECTION.

The Fresh Water Flush rinses the high salinity Feed Water from the System with Fresh Water. This process is automatic at each shut down of the system and repeats automatically every 7 days. Fresh Water Flushing replaces the sea water in the system with less corrosive fresh water. This reduces the biological growth that naturally occurs if the Feed Water (sea water) is left to stand in the System.



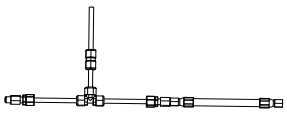
Optional manually operated Valves are also available that allow for ease of rinsing and cleaning the R.O. Membrane Element.

33. **Fresh Water Flush Pump, included with the Fresh Water Flush Assembly**. The Fresh Water Flush Pump draws fresh water from the Potable Water Storage Tank and pushes the water, at 45 PSI, through the Fresh Water Flush Charcoal Filter and into the rest of the System.

34. **Fresh Water Flush Carbon Filter, included with the Fresh Water Flush Assembly**. The Carbon Filter removes particulate matter and chlorine from the fresh water to prevent chlorine attack to the R.O. Membrane Element [20].

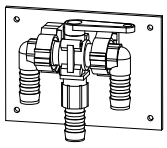
35. **Fresh Water Flush Check Valve, included with the Fresh Water Flush Assembly**. The Check Valve routes the fresh water to the System and prevents the fresh water from expelling out the Inlet Thru Hull Fitting [1].

Not numbered on P&ID. Cleaning and Winterizing Pressure



Relief Kit. This kit, consisting of low and high pressure hoses and fittings is connected between the R.O. Membrane Pressure Vessel and ETD during Winterizing and Membrane Cleaning to relieve pressure at the R.O. Membrane.

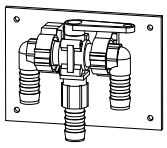
36. Inlet Rinse Clean Valve *** used in conjunction with the Discharge Rinse Clean Valve [37] simplifies the storage and cleaning procedures by allowing the operator to turn a valve rather than disconnect a hose.



Rinse/Clean Valve

Also used for a manual fresh water flush if the Automatic Fresh Water Flush System [33-35] is not installed.

37. Discharge Rinse Clean Valve *** used in conjunction with the Inlet Rinse Clean Valve [36] simplifies the storage and cleaning procedures by allowing the operator to turn a valve rather than disconnect a hose.



Rinse/Clean Valve

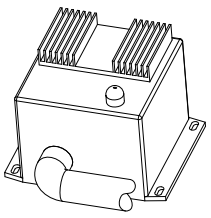
38. Rinse/Clean Solution Container ** used to hold rinse water, storage solution, winterization solution, or cleaning solution may be any 5 gallon or larger container portable or permanently installed.

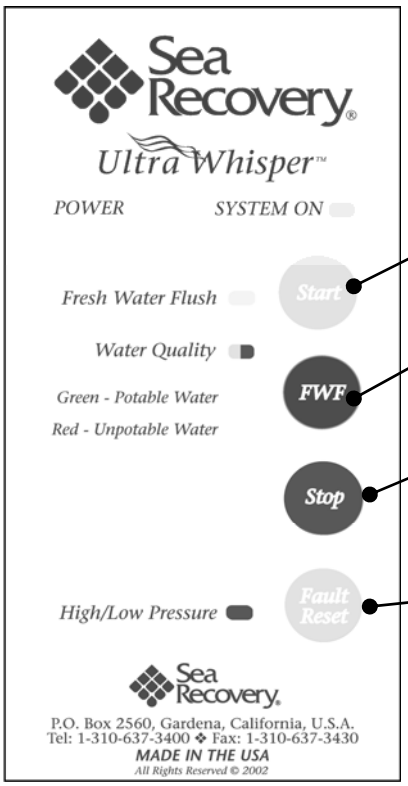
F. ELECTRONIC SUBSYSTEM measures water quality, controls the direction of Product Water flow, Starts and Stops the System, and contains the central electrical connection point of the System. It also ensures only potable Product Water passes into the Product Water Storage Tank.

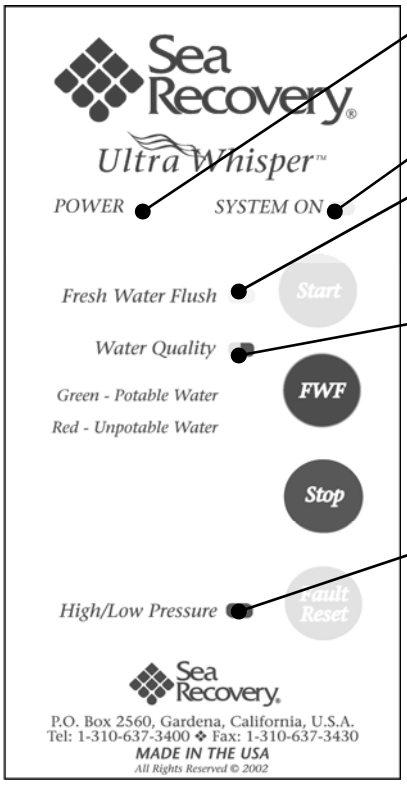
39. Salinity Controller The controller monitors the salt content of the product water via the Salinity Probe [25], and signals the 3-Way Product Diversion Valve [26] when Potable Water is being produced. The 3-Way Product Diversion Valve [26], Feed Pump Motor [6], Remote Control [40] U.V. Sterilizer [30], and Soft Motor Starter [41] are each governed by this Controller. This enclosure also contains the high-voltage components of the system. It serves as the connection point for all the electrical systems such as the motors, switches, and valves.

40. Remote Controller * allows for remote** monitoring and controlling of the system.

41. Soft Start*** The soft start, used only in AC (Alternating Current) Single Phase systems reduces by 40% the initial startup amperage required to start the Feed Pump Motor [6] and in turn allows a smaller sized KW generator to start the system.







TOUCH PAD CONTROL DESCRIPTIONS:

SWITCHES

START: This switch initiates the start cycle of the Feed Pump [6] and the System.

FRESH WATER FLUSH: This switch initiates the Fresh Water Flush Cycle. When pressed, the Fresh Water Flush Cycle begins and the Fresh Water Flush lamp illuminates steady green.

STOP: This switch, when pressed, stops the System if it is in operation or stops the Fresh Water Flush Cycle if it is in the "stand by" mode or actually in the flushing mode. Each time the system is stopped, the Fresh Water Flush system is initiated as indicated by a steady illumination of the Fresh Water Flush lamp. The Fresh Water Flush cycle is aborted by pressing the Stop switch a second time.

FAULT RESET: This switch resets the High/Low Pressure fault and allows the system to start.

INDICATION LAMPS:

Power: This lamp is illuminated when power is supplied to the controller indicating that the System is receiving power from the main power breaker.

System On: This lamp illuminates when the System has been Started and is operating.

Fresh Water Flush: This lamp illuminates continually during the Fresh Water Flushing operation. When the Fresh Water Flush is in the stand-by mode, in between the flushing cycle that repeats automatically every seven days, the lamp illuminates intermittently on and off (blinks). If this lamp is not illuminated when the System is not in operation the Fresh Water Flush cycle has been terminated.

Product Water Quality: This lamp indicates the quality of the water being produced by the system. A red illumination indicates that the System is producing "un-potable" product water that is being discharged over board. A green lamp illuminates when the system is producing safe water (potable water) that is being diverted to the potable water storage tank.

High/Low Pressure: The High/Low pressure fault lamp illuminates when the system shuts down due to either a low-pressure condition, or a high-pressure condition. During operation if the Low Pressure Switch senses a low-pressure condition, this lamp blinks for twenty seconds, and then the system shuts down and the lamp remains illuminated until the Fault Reset Switch is pressed. If the High Pressure Switch senses a high pressure condition during operation the system will shut down immediately and the lamp will illuminate until the Fault Reset Switch is pressed.

Helpful Terms to become familiar with:

A. OSMOTIC PRESSURE: The transfer of the water from one side of the membrane to the other will continue until the head (pressure) is great enough to prevent any net transfer of the solvent (water) to the more concentrated (feed water) solution. At equilibrium, the quantity of water passing in either direction is equal, and the head pressure is then defined as the **"Osmotic Pressure"** of the solution having that particular concentration of dissolved solids.

B. SPIRAL-WOUND MEMBRANE: The spiral-wound membrane consists of multiple membrane envelopes each formed by enclosing a channelized product water carrying material between two large flat membrane sheets. The membrane envelope is sealed on three edges with a special adhesive and attached with the adhesive to a small diameter pipe. A polypropylene screen is used to form the feed water channel between the membrane envelopes. A wrap is applied to the membrane element to maintain the cylindrical configuration. The center tube is also the permeate (product water) collecting channel. Several elements may be connected in series within a single or multiple pressure vessel(s).

C. BOUNDARY LAYER / CONCENTRATION POLARIZATION: When water permeates through the membrane, nearly all the salt is left behind in the brine channel. In any dynamic hydraulic system, the fluid adjacent to the wall of the vessel is moving relatively slowly. Even though the main body of the stream is turbulent, a thin film adjacent to the wall (membrane) is laminar. This thin film is called the boundary layer. At the boundary layer the salts are saturated and can readily adhere to and pack into the R.O. Membrane Element surface if the Feed Water Flow is insufficient to prevent this.

For this reason it is important to maintain sufficient Feed Water flow, to prevent Concentration Polarization, through the R.O. Membrane Element. The Sea Recovery ETD chambers are designed to travel in shorter and more frequent strokes than other such enhancers in use. This minimizes the potential for Concentration Polarization.

D. COMPACTION: Some densification of the membrane structure may take place while operating at elevated pressures, above 1000 PSI. The change is known as compaction and is accompanied by a reduction in the water permeation rate. When the R.O. Membrane Element is subjected to elevated pressures beyond 1000 PSI the Product Water Channel becomes squeezed which results in restriction and in turn product water recovery reduction.

E. WATER TEMPERATURE EFFECT: The product water flow through the membrane is significantly affected by the water temperature. At any given pressure this flow increases with increasing water temperature and is reduced at lower temperatures. The Ultra Whisper System over comes this factor by self adjusting the operating pressure to maintain a precise amount of Product Water Flow.

F. PRESSURE: The operating pressure has a direct affect on product water quality and quantity. Both factors will increase as the system pressure increases (higher quantity and higher {better} quality within design limits). The system must be operated at the lowest pressure required to achieve the designed product water flow rate. This parameter also minimizes compaction, which proceeds at a faster rate at higher pressures as well as at higher temperatures. The Ultra Whisper System self adjusts its operating pressure to maintain a precise amount of Product Water Flow. However in so doing, at low temperatures and or high salinity feed water conditions the Ultra Whisper will operate at higher than normal pressure in maintaining the specified amount of product water flow. This is normal, to be expected, and is due to the design characteristics of the ETD [14].

G. BRINE VELOCITY: The brine flow over the membrane surface is very important to both product water quality and quantity. At low flows, concentration polarization occurs, causing the water quality to decline. In addition to inferior product water quality, low brine flows can increase the precipitation of sparingly soluble salts which will foul the R.O. Membrane Element [16] surface (concentration polarization). If this occurs, the product water flux (production) will decline. The Ultra Whisper Feed Pump [6] and ETD [16] integrated design provide a relatively smooth and continual flow of Feed Water across and through the R.O. Membrane Element [16].

H. ENERGY TRANSFER DEVICE (ETD) [14] or ENHANCER: Pressure from the Feed Pump [6] into the ETD is "enhanced" by the ETD by a ratio of approximately 5:1 to 6:1; and the pressurized water entering the Return Chamber of the ETD is transferred as recovered energy back to the Inlet Chamber. These two factors allow the Ultra

Whisper System to operate with minimal power consumption.

The Feed Water, pressurized by the Feed Pump [6] enters the Inlet Chamber of the Energy Transfer Device port “E”, exits the ETD at port “P”, passes through the R.O. Membrane Vessel [16], is returned to the Return Chamber of the Energy Transfer Device port “R”, and exits the ETD at port “S” for onward flow back to the Brine Discharge Thru Hull Fitting [35].

The Return Chamber of the Energy Transfer Device has a smaller volume than the Inlet Chamber. The excess water, from the Inlet Chamber that is not accepted by the smaller Return Chamber, is recovered as Product Water through the R.O. Membrane Element [16].

Operational Understanding

In order to operate the Sea Recovery Ultra Whisper System one SHOULD first gain understanding of the System’s design and theory. In order to trouble shoot and diagnose abnormalities one MUST first gain understanding of the System’s design and theory. Those familiar with “Conventional” Reverse Osmosis Systems will be totally confused if “conventional” methods are applied to diagnosing abnormalities with the Ultra Whisper System.

Section 2

System Storage prior to Installation

Pre-Installation R.O. Membrane Care

System Installation

Notes: _____

A. SYSTEM INSTALLATION PRECAUTIONS AND INFORMATION:

1. STORAGE PRIOR TO UNCRATING:

a. Adhere to crate markings:
- **DO NOT** store in direct sunlight;
- **DO NOT** store above 120 degrees F / 50 degrees C;
- **DO NOT** allow the system to freeze. Do Not store below 32 degrees F / 0 degrees C;
- **DO NOT** store longer than 4 months without flushing with storage chemical;

b. Refer to Chapter 5 of this manual for further cautions of the R.O. Membrane Element.

2. ARE YOU QUALIFIED AND COMPETENT IN INSTALLATION?

Are you Installation competent to professionally install a Reverse Osmosis Desalination System?

Installation, Commissioning and Troubleshooting, if problems are encountered, will require you to have understanding of, technical knowledge in, and mechanical ability with:

- Electrical Circuits
- Water Pressure Lines
- Thru-Hull Fitting below water level
- High Voltage Electrical Circuits
- Low Voltage Electrical Circuits
- Liquid Pressures and Flows
- Water Suction Lines
- Water High Pressure Lines
- Thru-Hull Fitting above water level
- Electric Motor Wiring
- Electro-mechanical Hydraulic Systems
- Mechanical dexterity, knowledge, and skills

Do not attempt Installation, Commissioning, or Troubleshooting and or Repair if you are not familiar with, are not confident in, or are not proficient in the above fields of expertise.

3. UNCRATING:

a. DO NOT DISCARD ANY PACKAGING UNTIL YOU HAVE FOUND AND IDENTIFIED ALL PARTS!

b. Remove the Ultra Whisper system from the shipping carton.

c. Some of the components are loose or separately packaged in the shipping container.

d. Refer to the Illustrated Packing List pages to identify and confirm the contents of the Shipping Crate. Ultra Whisper Compact refer to page 13; Ultra Whisper Modular refer to pages 28.

4. USE CAUTION WHEN TROUBLESHOOTING. DO NOT PERFORM MAINTENANCE UNLESS:

a. The System Feed Water Sea Cock Valve [2] is closed.

b. The system main electrical disconnect switch is switched **"OFF"**, **LOCKED**, and **TAGGED**.

c. Chapter 9, "EXPLODED PARTS VIEWS" of this Owner's Manual is available.

5. CAUTION: ELECTRICAL SHOCK HAZARD. A Volt / Ohm Meter will be necessary. The Installation procedures expose the Installer to High Voltage and electrical shock hazard. Only attempt this if you are a qualified electrician and only if surrounding conditions are safe.

B. TOOLS REQUIRED FOR INSTALLATION: Not all installations are typical, therefore, it is recommended to have a full set of Mechanic's, Plumber's, and Electrician's tools available. No special system tools are required for installation. A separate TDS Meter, available from Sea Recovery will assist in confirming system product water quality. A volt/ohm meter (VOM) is required for system installation and commissioning to ensure proper electrical power and connection.

C. SPECIAL CONSIDERATIONS:

1. Length of Connection Lines:

- All connection lines should be as short and straight as possible using minimum fittings.
  Increased length causes vacuum and line-loss in the Suction section of the Feed Water line.
  Increased length causes pressure loss in the Pressurized section of the Feed Water line.
  Increased length causes excessive pressure build up in the Brine Discharge line.
  Increased length causes excessive pressure build up in the Product Water line.

- The connection lines must not be "kinked".
  Kinks in the Feed Water line cause Feed Pump [6] cavitation & continual System shut down.
  Kinks in the Pressurized section of the Feed Water line cause excessive pressure build up and damage, as well as loss of required pressure to the ETD [17].
  Kinks in the Brine Discharge line cause excessive pressure build up and damage.
  Kinks in the Product Water line cause excessive pressure build up and damage.

2. Accessibility:

- This is a simple rule: Install the system and supporting components in an accessible manner. The Ultra Whisper System requires regular operator maintenance such as filter element changing. As with any Electro Mechanical system utilized in the Marine environment the Ultra Whisper System will require repair from time to time. Hidden or out of reach items may become forgotten, not maintained, and cause damage to other system components.
- The Electrical Control Panel [39] Touch Pad must be accessible for operation of the System.
- The ETD [17] and R.O. Membrane Element Pressure Vessel [20] must be accessible for Membrane Element cleaning, rinsing, storing, and winterizing.
- Sea Strainer [4], Prefilters [7, 13, & 14], Charcoal Filter [28], and pH Neutralizer [29] must be accessible for user changing.

D. INSTALLATION CAUTIONS:

1. Do not over tighten PVC fittings. PVC fittings should only be hand tightened.

2. If threaded tapered pipe fittings leak after installation, remove the fitting, clean the mating threads, tightly apply 3 to 4 wraps of Teflon tape to the male threads and thread the parts back together. Applied sparingly only to the male threads, Liquid Teflon pipe sealant will assist in stopping leaks.

3. The Inlet Thru Hull Fitting with Forward Facing Scoop [1] MUST obviously be below water level. The Sea Cock Valve [2], Sea Strainer [4], Inlet 3-way Clean/Rinse Valve [36], and Feed Pump [6] SHOULD be below water level if at all possible. This will aid the Feed Pump [6] in priming. If mounting of these components at or below water level is not possible then keep the height above water level as minimal as possible. No to exceed 7 feet above water level else cavitation and subsequent wear to the Feed Pump [6] will occur, and continual shut down of the System will result.

4. Always allow hoses and tubes to enter and exit straight from the connection for a minimum of one inch prior to a bend

5. Avoid skin and eye contact with the membrane packaging solution. In case of skin contact, rinse the skin thoroughly with water. In case of eye contact, flush repeatedly with water and notify a physician immediately. The R.O. Membrane Element [20] is stored in sodium bisulfite.

6. NEVER mount any liquid holding component of the system above an electrical or electronic circuit or device. NEVER mount any Electrical or Electronic device below any opening or component that can drip or spill water onto them. Extensive damage to the electrical or electronic device or circuit will result if water spills from the system during maintenance and or component failure, or if water spills onto the components through an open hatch.

E. REVERSE OSMOSIS MEMBRANE ELEMENT [20] SUSCEPTIBILITY TO CHEMICAL ATTACK:

CAUTION: Do Not expose the Sea Recovery System to intake Feed Water containing:

Hydrogen peroxide	chloramines	chloramines-T	N-chlorioisocyanurates
Chlorine dioxide	hypochlorite	chlorine	iodine
Bromine	Bromide	phenolic disinfectants	petroleum products

Any chemical, not approved in writing by Sea Recovery.

USE OF NON-AUTHORIZED OR MISUSE OF AUTHORIZED CHEMICALS VOIDS SYSTEM WARRANTY. Do not connect any water line to the System that may contain any of the above listed chemicals. Example: Do not connect the inlet of the System to the ship's potable water system if the system contains chlorinated or brominated water. These chemicals destroy the copolymer components within the system. These oxidants and others also damage the R.O. Membrane Element [20]. The Sea Recovery Optional Fresh Water Flush Accessory [33-35]removes chlorine and bromine from the ship's potable water system.

NOTE: Sea Recovery has an OEM policy wherein the R.O. Membrane Element is not shipped until the System is actually ready to be commissioned for the first time. This allows Sea Recovery to extend the warranty from the Date of Shipment to the Date of Commissioning. Therefore, some Sea Recovery Systems are, at the original buyer's request, shipped without the R.O. Membrane Element installed within the Pressure Vessel. Lack of communication from the original buyer (for example a Boat Builder) to the Installer, to the person commissioning the system, and finally to the End User can cause wasted time, added expenses, and grief if these intermediary people are not informed by the original buyer that the Sea Recovery System was shipped without the R.O. Membrane Element installed within the Pressure Vessel.

F. COMPONENTS SUPPLIED BY INSTALLER OR OWNER:

CAUTION: All fittings, valving, and piping installed prior to, within, and after the Sea Recovery System must not contain iron, they must be non-ferrous material (not containing iron). Iron fittings or piping will cause rust fouling and failure of the R.O. Membrane Element [20]. The resulting failure of the R.O. Membrane Element [20] is attributed to improper installation, is the liability of the installer, and is not covered by the Sea Recovery warranty.

1. **Water Connections for Ultra Whisper hook up to be supplied by the installer:**

Feed Inlet [1]:	1/2" MNPT Male National Pipe Thread U.S. Standard
Brine Discharge[23]:	1/2" MNPT Male National Pipe Thread U.S. Standard
Product [32]:	1/4" FNPT Female National Pipe Thread U.S. Standard

2. **Inlet Thru Hull Fitting with Forward Facing Scoop [1].** The inlet Thru Hull Fitting must be dedicated to only the Sea Recovery System. It is important that the installer utilizes a forward facing scoop so that the system receives a positive flow of water as the boat is under way. The fitting must be installed on the boats hull in a position that provides continual feed water flow without air to the System.

   CAUTION: A flush inlet thru-hull fitting will cause a vacuum as the boat is under way and this will cause loss of feed water flow and cavitation of the Feed Pump [6] resulting in continual System shut down due to low feed water flow and low pressure. Install a "forward facing scoop" type thru hull inlet fitting.

   CAUTION: The Sea Recovery System must receive an uninterrupted supply of feed water without air. If the thru-hull fitting is placed in a position on the underside of the hull that allows air to continually enter the thru-hull fitting this will cause the system to continually shut down due to loss of feed water.

CAUTION: The Sea Recovery System must not be tied into another existing auxiliary water line already supplying another accessory on the boat. Connecting the Sea Recovery System into a Thru-Hull fitting already supplying other equipment will cause the Sea Recovery System to draw air, or cavitate leading to continual system shut down, or may starve the other equipment.

CAUTION: If the Sea Recovery System is connected to a Sea Chest or Stand Up Pipe DO NOT plumb the Sea Recovery System feed line to the "top" of the Sea Chest or Stand Up Pipe. If plumbed into the top of these feed water arrangements the Sea Recovery System will experience continual shut down do to air inducement into the System. Plumb the Sea Recovery System to the "bottom" of such feed water arrangements to ensure a continual air free supply of feed water to the System.

The resulting failure of the System to remain in operation due to any of the above improper installation is the liability of the installer, and is not covered by the Sea Recovery warranty.

3. **Inlet Sea Cock Valve [2]** Quarter turn ball valve min. ½" size, with a ½" MNPT connection for mating to the supplied 1/2" FNPT fitting.

4. **Brine Discharge Thru Hull Fitting [23]** minimum ½" size with a ½" MNPT connection for mating to the supplied 1/2" FNPT fitting. The Brine Discharge Thru Hull Fitting should be installed above water level. No valves should be installed in this line. Damage to and failure of the system due to a closed valve will not be covered by the Sea Recovery Warranty.

5. **Connection of the Potable Water Storage Tank Tube Connector [31] to the boat's Potable Water Storage Tank [32]** requires a 1/4" FNPT connection for mating to the supplied 1/4" MNPT fitting. In order to avoid problems such as reverse flow (osmosis) from the tank to the system and chlorination attack of the R.O. Membrane Element [20], the fitting must terminate above the maximum water level. Tying into the tank fill line is a good choice. No valves should be installed in this line. Damage to and failure of the system due to a closed valve will not be covered by the Sea Recovery Warranty.

6. **Connection of the Sea Recovery Fresh Water Flush sub assembly to the boat's un-pressurized Potable Water Line [32]** requires a 1/2" FNPT connection for mating to the 1/2" MNPT fitting supplied with the Fresh Water Flush sub assembly.

7. **Circuit Breaker** with appropriate Amperage Rating. Refer to Section 8 of this Owner's Manual.

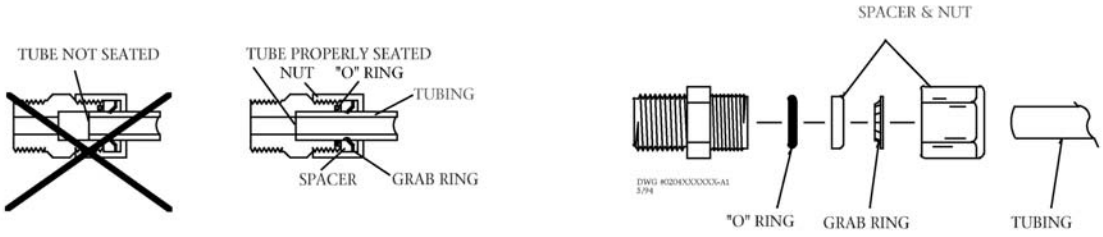
8. **Properly sized Power Cables**. Refer to Section 8 of this Owner's Manual.

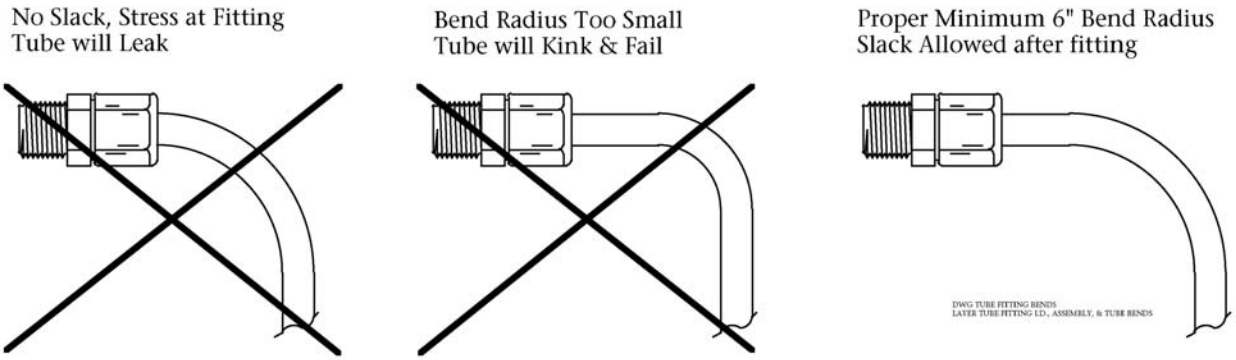
9. **An electrical power source** capable of delivering the required constant voltage and cycles during start up and operation of the System. Refer to Section 8 of this Owner's Manual.

G. PLUMBING CONNECTION NOTES:

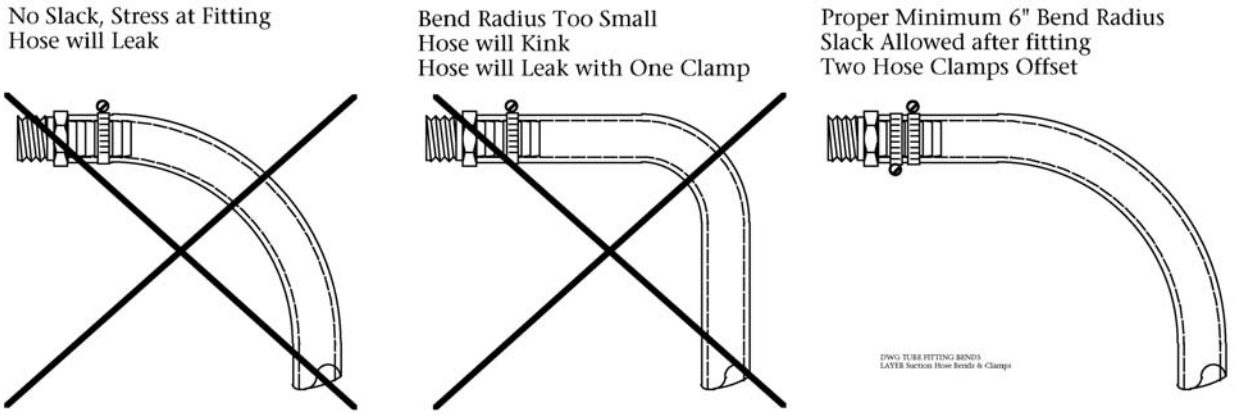
1. Tube Fitting Connections and Assembly:
   a Cut tube end square and clean
   b Loosen nut on fitting three turns.
   c Wet the end of the Tube and Insert tube into fitting until it bottoms. Loosen nut completely and remove tube with attached parts from body. Check to ensure that the O-Ring is seated onto the tube under the spacer (and not pinched into the body). Insert tube with attached parts into the body and tighten nut finger tight.

2. Refer to the illustration below. Always allow slack in all tube and hose lines. Never cause the tube or hose to immediately bend from the fitting. Allow the line to enter or leave from the fitting in a straight manner for several inches to ensure proper connection, to relieve stress to the fitting and tube or hose, and to allow ease of detachment and reattachment during maintenance or repair. If water lines are pulled tight causing them to bend at the fitting they will leak, allow air to enter, fail prematurely, and or break the fitting that they are attached to.





3. Ensure all Suction Hose connections use two hose clamps rotated 180 degrees with the screw heads facing the same direction. Remove any flash on the Hose Barb fittings using fine sandpaper.



4. Ensure all High Pressure Hoses [19 & 21] have sufficient slack and are not pulled tight into a sharp or immediate bend.

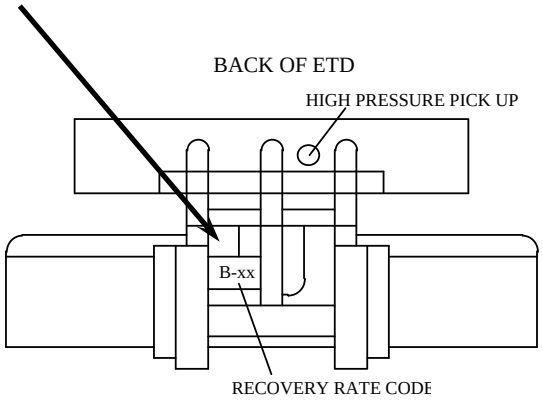
H. COMPONENT MATCHING:

a. Three components must be properly matched in order to attain acceptable operating pressure limits and resulting Product Water Production Limits. The ETD [17], the Reverse Osmosis Membrane Element [20], and the Feed Pump [6] Output Flow of water must all be matched. Upon leaving Sea Recovery's factory at the time of shipment these components have been matched and tested together.

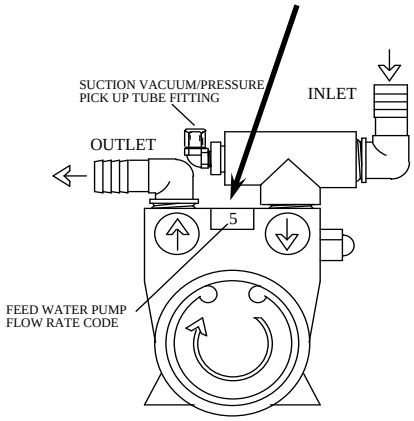
If the initial Sea Recovery customer (Distributor, Dealer, or Boat Builder) has mistakenly interchanged one or more of these components this will cause a mismatch resulting in insufficient operating pressure, insufficient product water flow, excessive operating pressure, or excessive product water flow.

Prior to installation, please check to ensure that the three components are properly matched. Refer to the following:

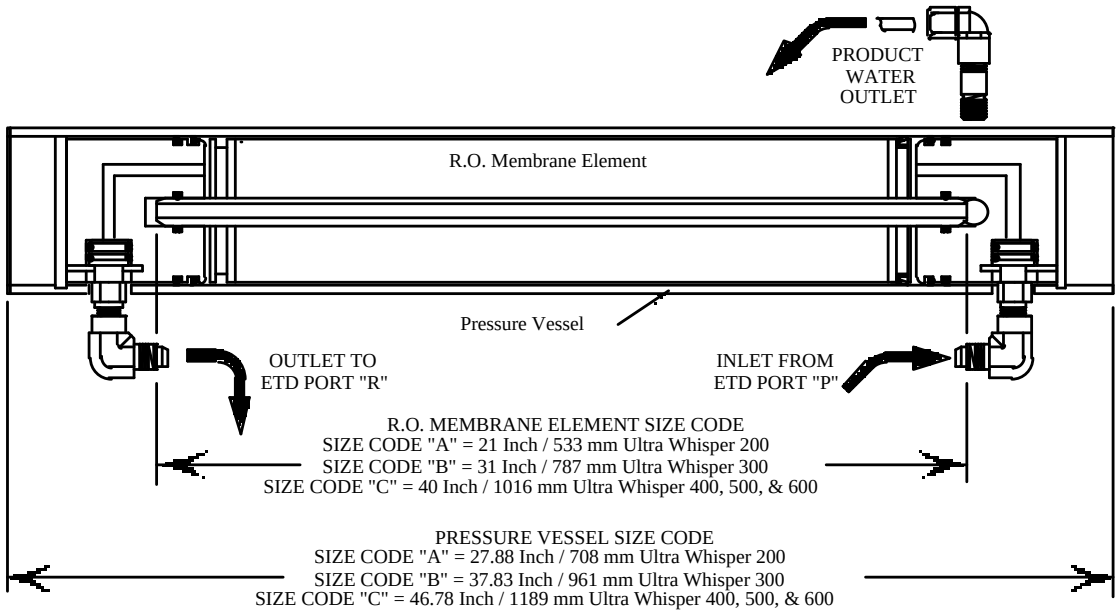
ETD [17] SIZE CODE LOCATION:



FEED PUMP [6] SIZE CODE LOCATION:



R.O. MEMBRANE ELEMENT [20] SIZE CODE AND PRESSURE VESSEL SIZE CODE IN RELATIONSHIP TO LENGTH:



ULTRA WHISPER SIZE CODES OF THE FEED PUMP, ETD, R.O. MEMBRANE ELEMENT, AND PRESSURE VESSEL IN RELATIONSHIP TO THE GALLON PER DAY PRODUCTION OF THE SPECIFIC ULTRA WHISPER:

If any of these components are miss-matched the System will not function properly. Either the Operating Pressure and Amperage Draw will be higher than specified causing damage to one or more of these components, or the operating pressure will be too low resulting in decreased product water quantity and poor product water quality.

12 VDC, 24 VDC & 60 Hz powered Systems

Ultra Whisper Model	Ultra Whisper Production GPD / LPD	Feed Pump Elect Mtr	Feed Pump Size Code	Feed Pump Flow GPH /LPH	ETD Size Code	ETD Recovery Percentage	R.O. Membrane Element Size Code	Pressure Vessel Size Code
UW 200	**216 / 818**	**1/3 H.P.**	**10**	**100 / 379**	**B-22**	**9%**	**A**	**A**
UW 300	**298 / 1128**	**1/3 H.P.**	**15**	**140 / 530**	**B-22**	**9%**	**B**	**B**
UW 400	**403 / 1526**	**1/3 H.P.**	**15**	**140 / 530**	**B-25**	**12%**	**C**	**C**
UW 500	**547 / 2071**	**1/2 H.P.**	**16**	**190 / 719**	**B-25**	**12%**	**C**	**C**
UW 600	**619 / 2343**	**1/2 H.P.**	**17**	**215 / 814**	**B-25**	**12%**	**C**	**C**

50 Hz powered Systems

Ultra Whisper Model	Ultra Whisper Production GPD / LPD	Feed Pump Elect. Mtr	Feed Pump Size Code	Feed Pump Flow GPH / LPH	ETD Size Code	ETD Recovery Percentage	R.O. Membrane Element Size Code	Pressure Vessel Size Code
UW 200	**224 / 848**	**1/3 H.P.**	**35**	**104.2 / 394**	**B-22**	**9%**	**A**	**A**
UW 300	**297 / 1124**	**1/3 H.P.**	**36**	**137.5 / 520**	**B-22**	**9%**	**B**	**B**
UW 400	**396 / 1499**	**1/3 H.P.**	**36**	**137.5 / 520**	**B-25**	**12%**	**C**	**C**
UW 500	**516 / 1953**	**1/2 H.P.**	**17**	**179.2 / 678**	**B-25**	**12%**	**C**	**C**
UW 600	**600 / 2271**	**1/2 H.P.**	**18**	**208.3 / 788**	**B-25**	**12%**	**C**	**C**

INSTALLATION OF THE ULTRA WHISPER COMPACT AND MODULAR SYSTEMS ARE ILLUSTRATED AND DISCUSSED SEPARATELY WITHIN THIS SECTION.

ULTRA WHISPER COMPACT SYSTEM
PACKING LIST, DIMENSIONS, PLACEMENT, MOUNTING,
& INTERCONNECT PLUMBING
REFER TO THIS SECTION PAGES 12 THROUGH AND INCLUDING 26

ULTRA WHISPER MODULAR SYSTEM
PACKING LIST DIMENSIONS, PLACEMENT, MOUNTING,
& INTERCONNECT PLUMBING
REFER TO THIS SECTION PAGES 27 THROUGH AND INCLUDING 46

ULTRA WHISPER COMPACT STYLE SYSTEM

PACKING LIST, DIMENSIONS, PLACEMENT, MOUNTING, & INTERCONNECT PLUMBING

REFER TO THIS SECTION PAGES 13 THROUGH AND INCLUDING 26

STEP 1 STANDARD COMPONENT MOUNTING

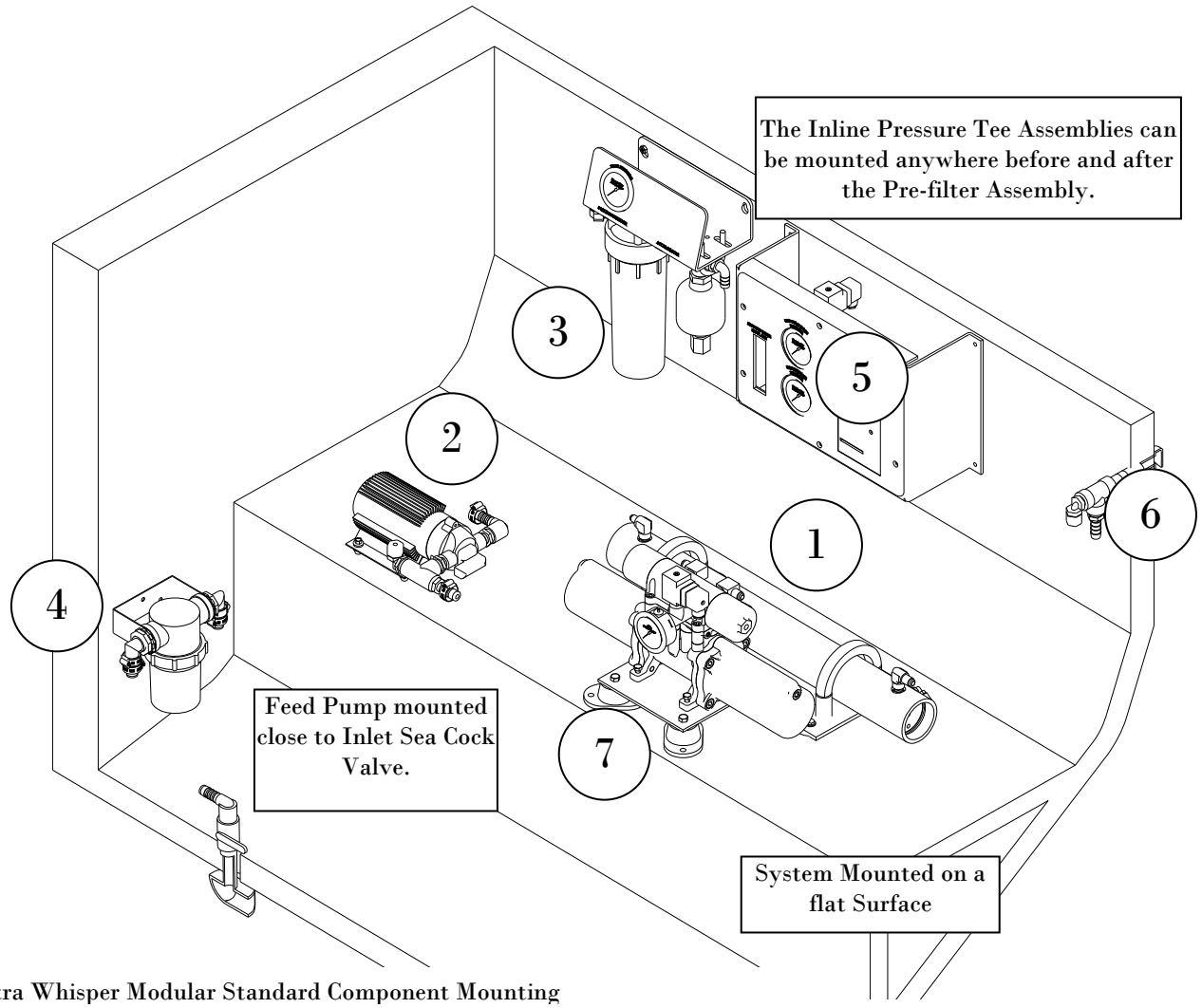
Compact Systems- Skip steps labeled *Modular Only*
NUMBERS IN [brackets] REFER TO P&ID

1. (*Modular Only*) The Pressure Vessel Assembly (page 9.9) [16] is mounted to a flat surface using the supplied 1/4" x 1" Type "A" lag screws. The Pressure Vessel Assembly must be at least 1 vessel length from a bulkhead to allow access for membrane installation. *The modular flexible high-pressure hoses that connect the Membrane Vessel Assembly to the Energy Transfer Device are 6ft. long. See page 2.13 for installation instructions.*

2. Mount the Feed Pump (page 9.3 or 9.4) to a flat surface using the supplied 1/4" x 1 1/4" Type "A" lag screws. The Feed Pump [4] is mounted horizontally and in an accessible location to allow access for maintenance. *The inlet hoses must be easily accessible so that they can be relocated during storage or cleaning operations.* Mount the Feed Pump close to the [1] Inlet Thru Hull/ Sea Cock Valve [2] and the Sea Strainer [3].

3. (*Modular Only*) Mount the Pre-filter Assembly (page 9.6) [7][11] and optional Plankton-filter (page 9.5) [5] to a bulkhead using the supplied 1/4" x 1" Type "A" lag screws. The Low Pressure Gauge [9] and the high-pressure switch [14] are located on the Pre-filter Assembly. Inline Pressure Tee Assemblies are installed before and after the Pre-filter Assembly, for plumbing instructions see page 2.20.

4. Mount the Sea Strainer (page 9.2) [3] to a clearly visible and accessible bulkhead near the Sea Cock Valve [2] and the Feed Pump [4] using the supplied 1/4" x 1" Type "A" lag screws.



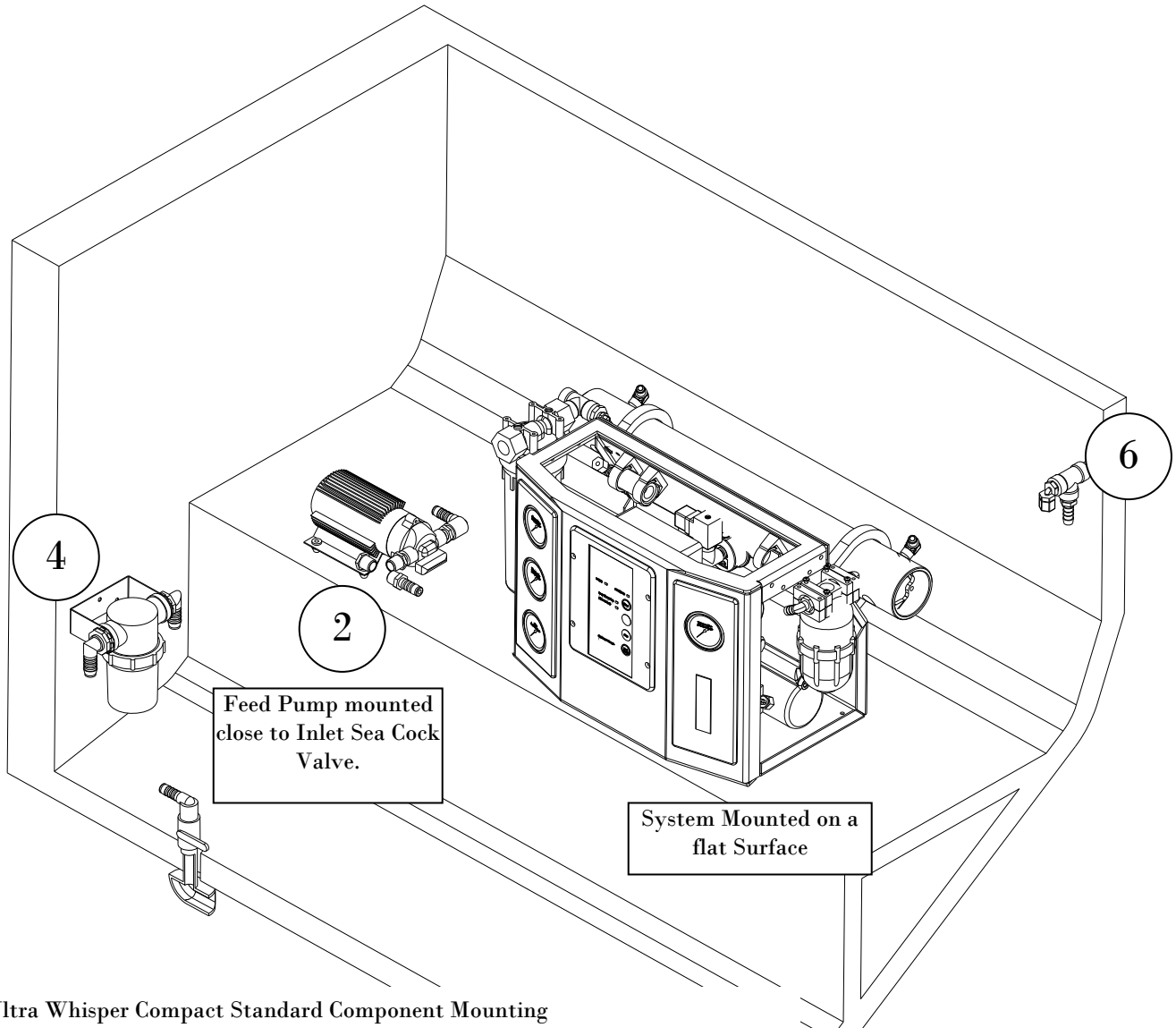
Ultra Whisper Modular Standard Component Mounting

5. The Front Control Panel Assembly [26] should be located to allow quick access. Mount the Front Control Panel Assembly (page 9.12) to a bulkhead using the supplied 1/4“x 1" Type "A" lag screws. *The Product Manifold [18-20], Inlet [6], and Outlet [8] Gauges have 1/4” tubing entering/exiting below the Front Control Panel. 50 feet of tubing is supplied in the installation kit, for plumbing instructions see page 2.11.*

6. The brine discharge exits through the Hull Discharge Fitting [28] that must be installed above the water line. The reject water assembly is supplied in the installation kit to allow the brine discharge from the Energy Transfer Device [12] and the 3-Way Diversion Valve [20] to exit through the Hull Discharge Fitting.

7. (*Modular Only*) Mount the Energy Transfer Device (page 9.7) [12] to a flat surface using the supplied 1/4“ x 2” Type "A” screws and rubber mounts. The Energy Transfer Device is mounted horizontally and in an accessible location to allow access for maintenance. *The inlet hoses must be accessible so that they can be relocated during storage or cleaning operations.* Mount the Energy Transfer Device close to the Pressure Vessel Assembly [16]. Check that the supplied high-pressure hoses can readily be assembled before mounting.

These instructions are also illustrated at the end of the Chapter 2.2.



Ultra Whisper Compact Standard Component Mounting

STEP 2 OPTIONAL COMPONENT MOUNTING

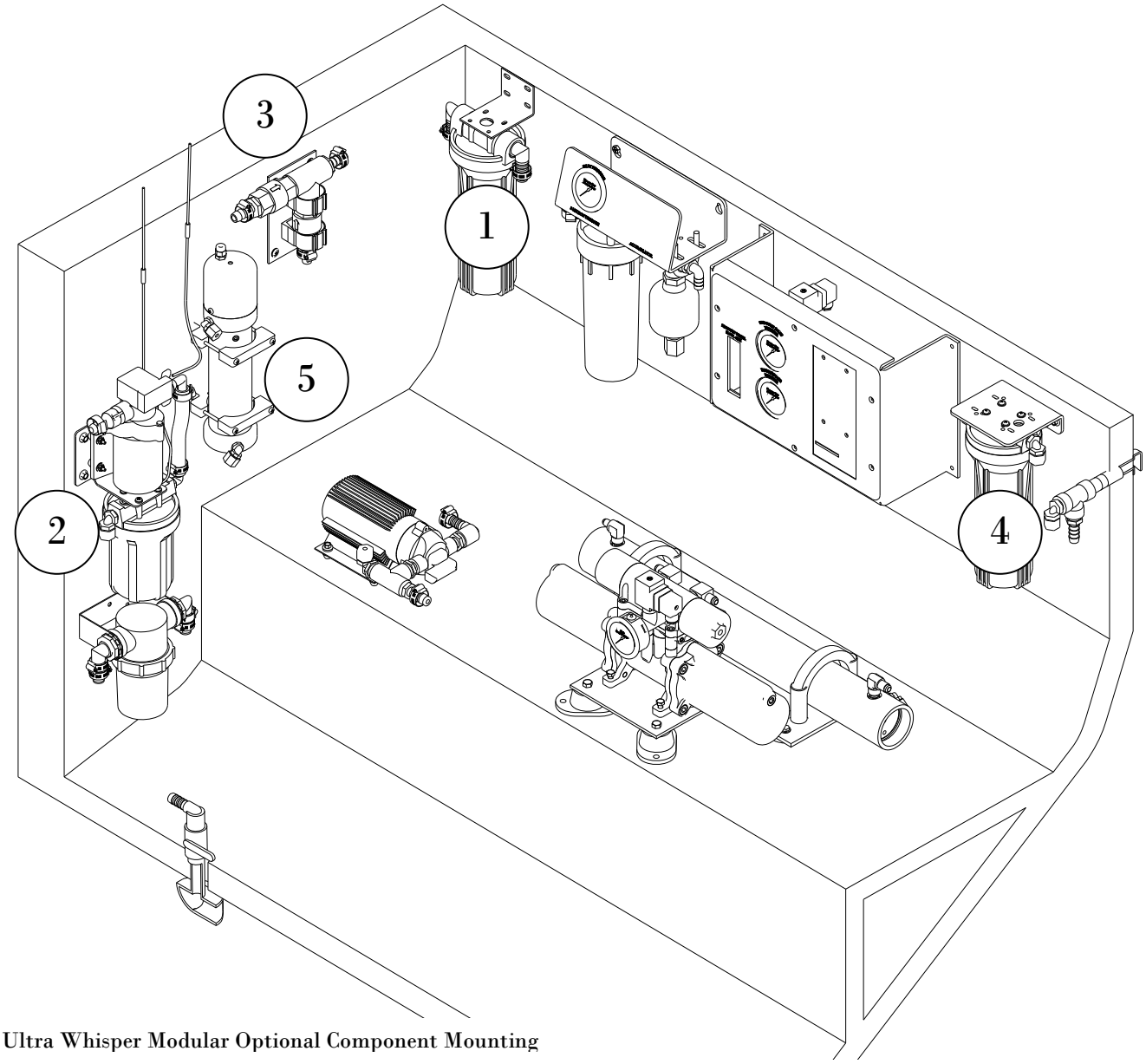
1. If installed, the Plankton Filter (page 9.20) [5] should be mounted inline between the Feed Pump [4] or Fresh Water Flush [25] and the Pre-filter Assembly.

2. Mount the Fresh Water Flush Filter & Boost Pump (page 9.16) [24] to a Vertical Bulkhead. Allow at least three inches of clearance below for element replacement.

3. Mount the Fresh Water Flush Check Valve Assembly (page 9.16) [25] *vertically* in close proximity to the Feed Pump [4] and Fresh Water Flush Filter Canister [24] as shown below.

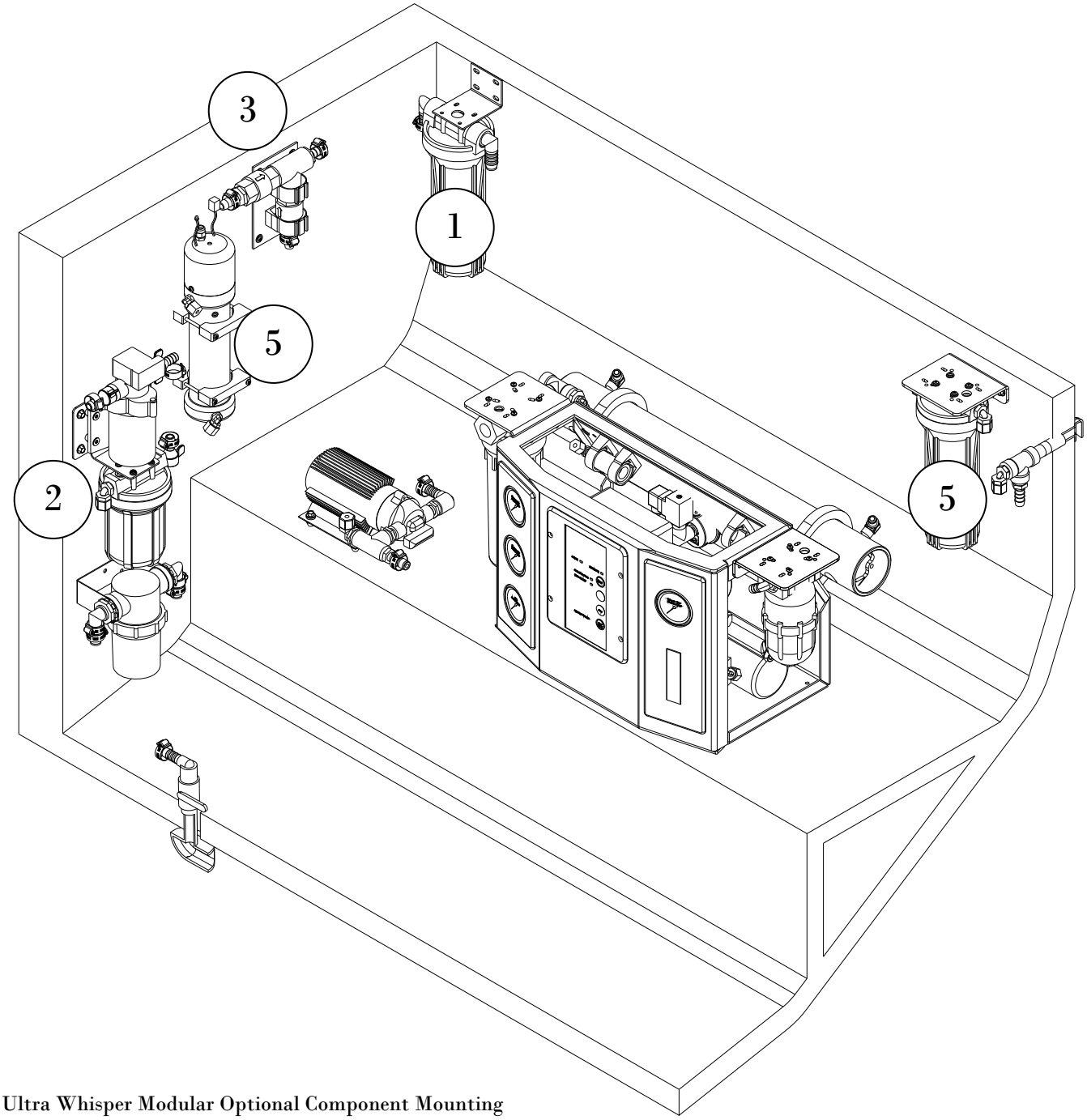
4. If installed, Mount the Charcoal Filter (page 9.14) [21] to a bulkhead using the supplied #10 x 1" Type "A" screws. Mount the UV Sterilizer (page 9.15) [22] to a bulkhead directly after the Charcoal Filter.

5. The UV should be mounted vertically with the electrical fitting on the top. The UV should be plumbed with the inlet on the bottom and the outlet on top.



Ultra Whisper Modular Optional Component Mounting

STEP 2 OPTIONAL COMPONENT MOUNTING CONTINUED



Ultra Whisper Modular Optional Component Mounting

STEP 3 ELECTRICAL CONNECTIONS

1. Remove the Front Cover from the system controller to access the Main Terminal Strip and PC Board.

2. Connect main power as shown in Chapter 7, using cable recommendations. The main power cable is inserted through one of the large Strain Reliefs on the bottom of the controller enclosure (pages 9.17-9.19). For AC Systems only, the boat's 12 VDC power source is also inserted through a small Strain Relief indicated on the diagram below.

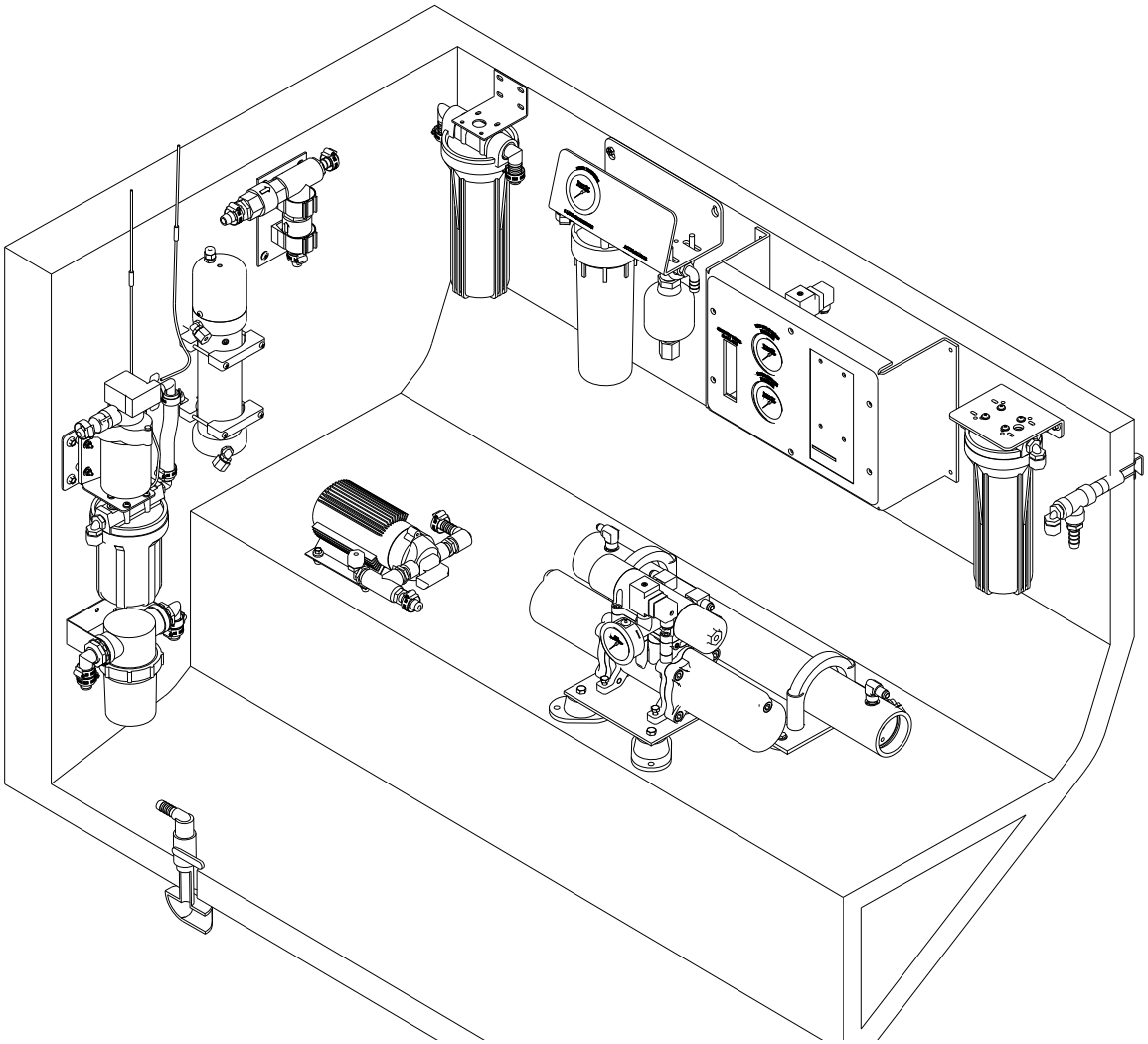
3. Connect the Feed Pump [4] motor power through the other large Strain Relief on the bottom of the controller enclosure to terminals as indicated in Chapter 7.

CONNECT ANY OPTIONAL ACCESSORIES
(Refer to Chapter 7, page 2.9 and page 6.6)

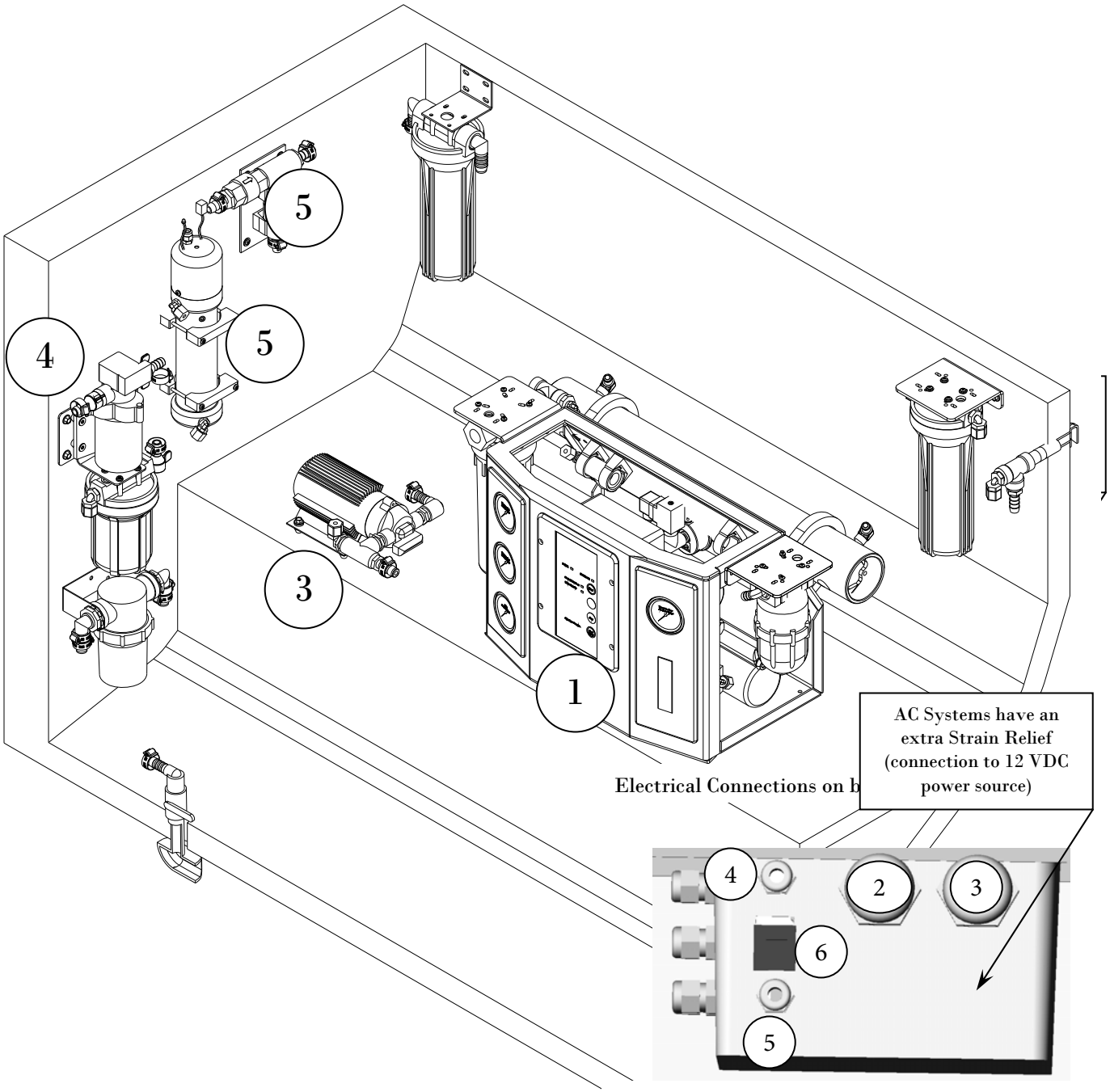
4. Connect the Fresh Water Flush Boost Pump using the supplied cable. Loosen the FWF Strain Relief on the Controller Enclosure and insert the cable. Refer to Wiring Diagrams for connection inside Controller.

5. Connect UV Sterilizer (illustrated on page 9.15) [22] using supplied purple cable. Loosen the other small Strain Relief on the bottom of the Controller Enclosure and insert the Purple cable. Connect to the PC Board.

6. Remote Control: Close supplied Square Relief around the flat cable and snap together. Insert into square cutout on bottom of Controller. Connect other end to modular plug on PC Board.



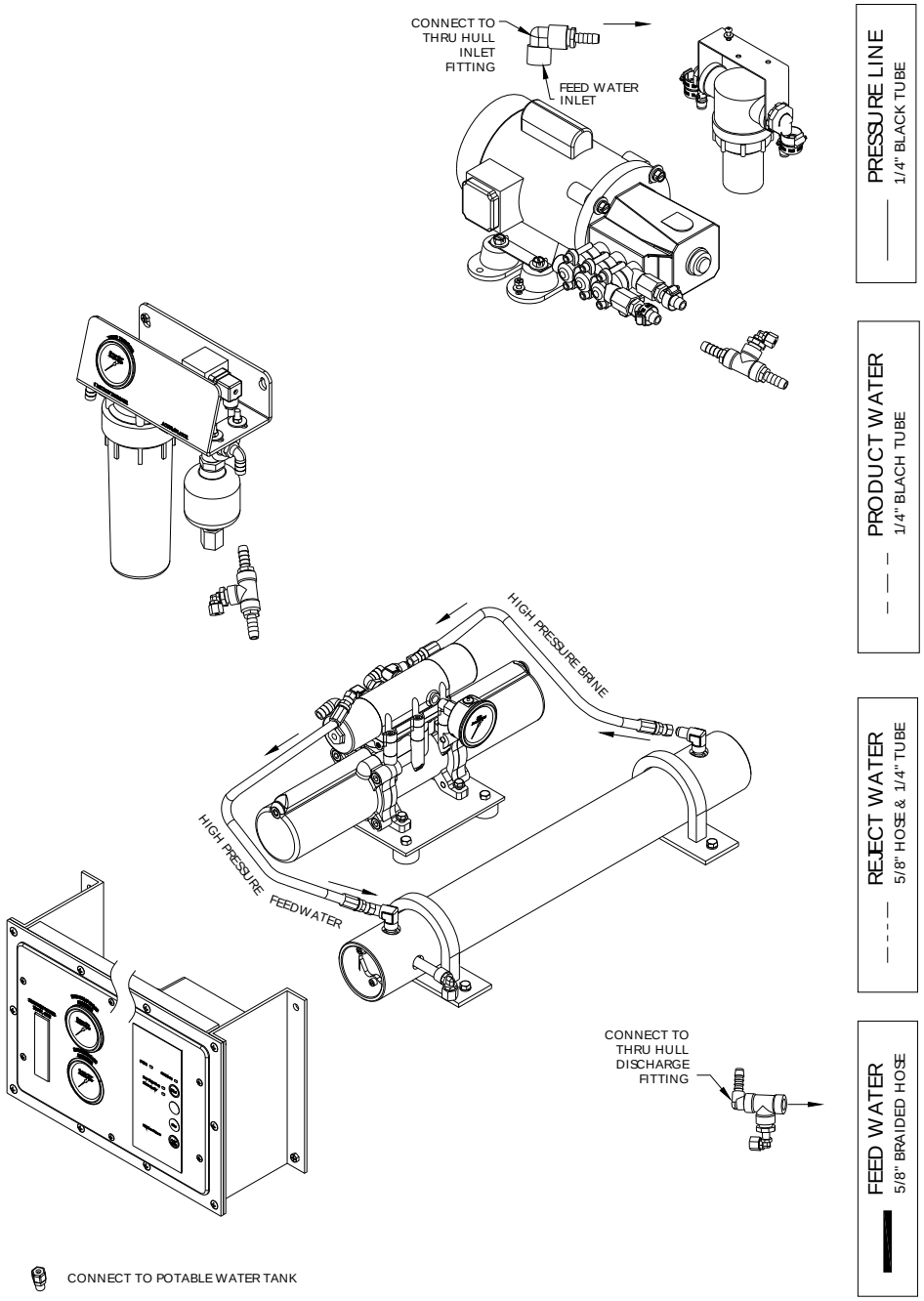
STEP 3 ELECTRICAL CONNECTIONS CONTINUED



Ultra Whisper Compact Electrical Connections

Electrical Connections on b

Electrical Connections on bottom of Controller

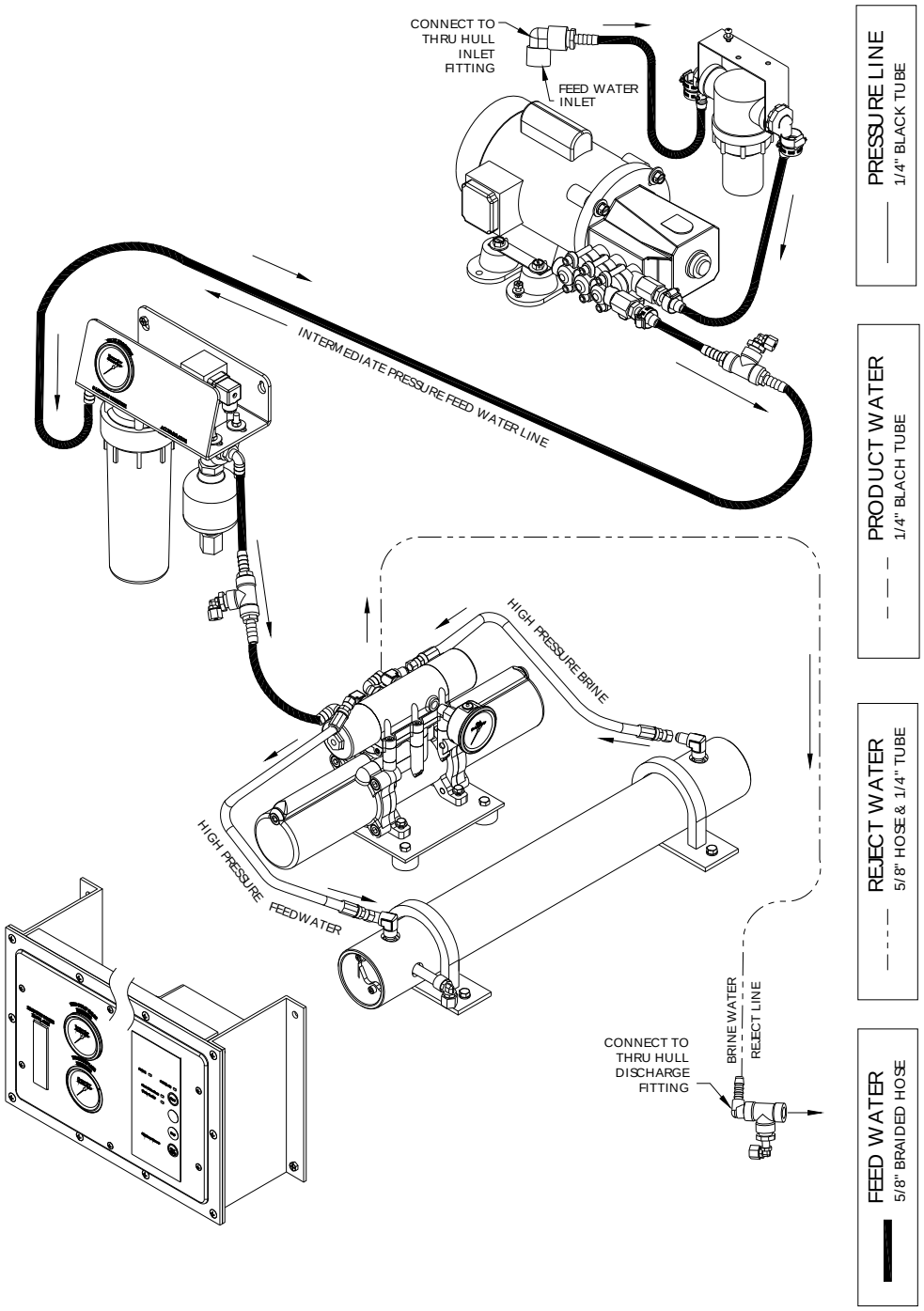


Connect the 3/4" Elbow to the Inlet Thru Hull Fitting or the Sea Cock Valve. The installer should use common sense when installing the Inlet Thru Hull Fitting, the Sea Cock Valve and the Inlet Elbow assembly.

Install the Sea Strainer, Pre-filter Assembly, and Front Panel Assembly to a bulkhead. The installer should know where the hose and tube lines are going to be placed before securing these components.

The Feed Pump, Energy Transfer Device, and Membrane Vessel Assembly should be mounted to a flat surface with enough surrounding area to allow for maintenance. The Feed Pump and Energy Transfer Device must be mounted horizontally. The installer should check the length of the high-pressure hose before securing the Energy Transfer Device and Membrane Vessel Assembly.

of the Sea Strainer to the Feed Pump Inlet. Connect the Feed Pump Outlet to the Inline Tee Assembly then to the Pre-filter Inlet. Connect the Accumulator Outlet



FEED WATER 5/8" HOSE LINE

Use the 5/8" braided hose to Connect the 1/2" hose barb on the 3/4" Inlet Elbow Assembly to the Sea Strainer Inlet. Always use two 3/4" hose clamps when assembling the 5/8" braided hose. Connect the Outlet to the other Inline Tee Assembly then to the Inlet of the ETD labeled "E".

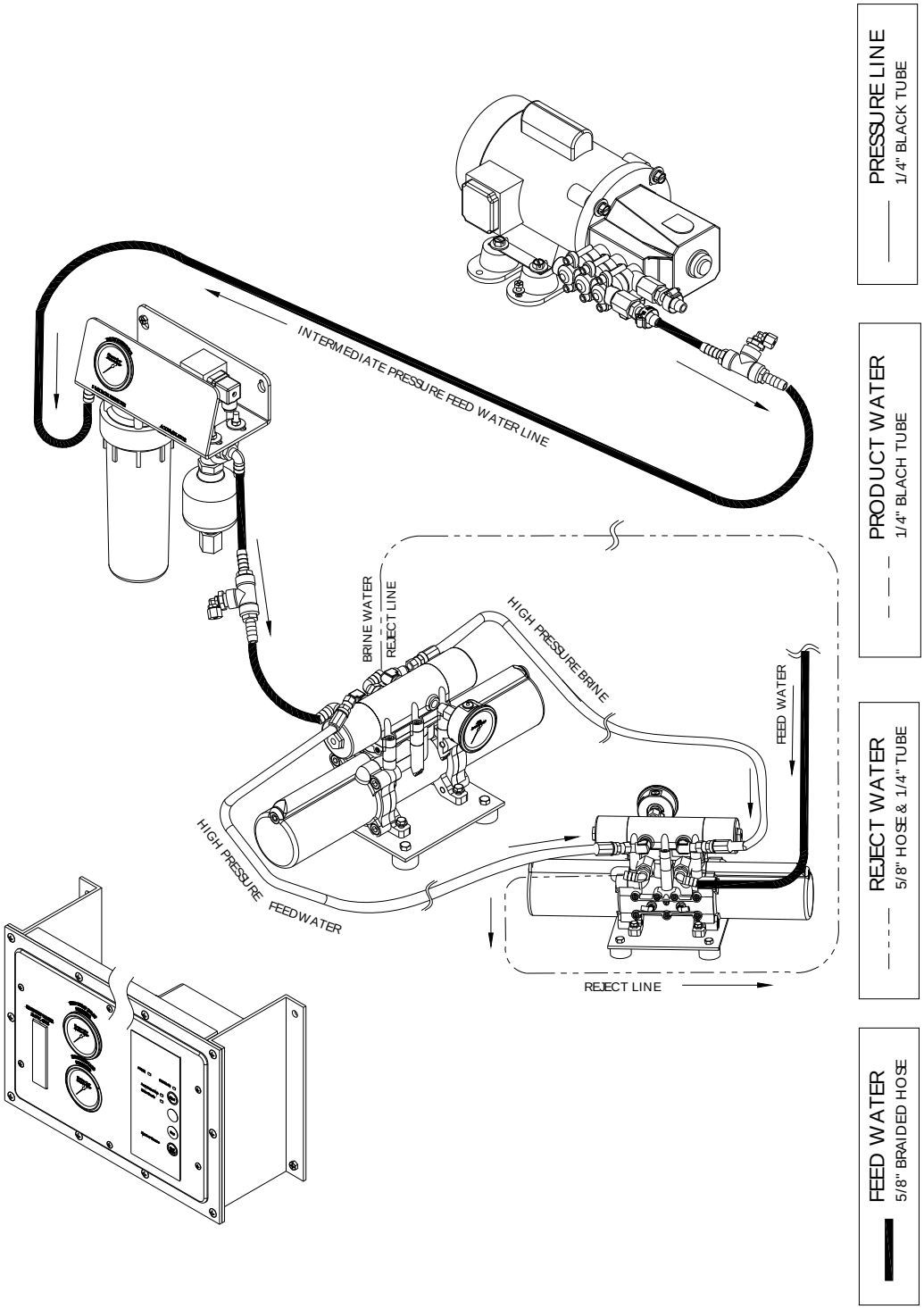


Figure 2.2.3 Illustration of the 5/8" braided hose connections to the Energy Transfer Device.

REJECT WATER 5/8" HOSE LINE

Use the 5/8" braided hose to Connect the 1/2" hose barb on the ETD Outlet labeled "S" to the 1/2" hose barb on the Reject Water Assembly. The Reject Water Assembly should be connected to the Thru Hull Discharge Fitting.

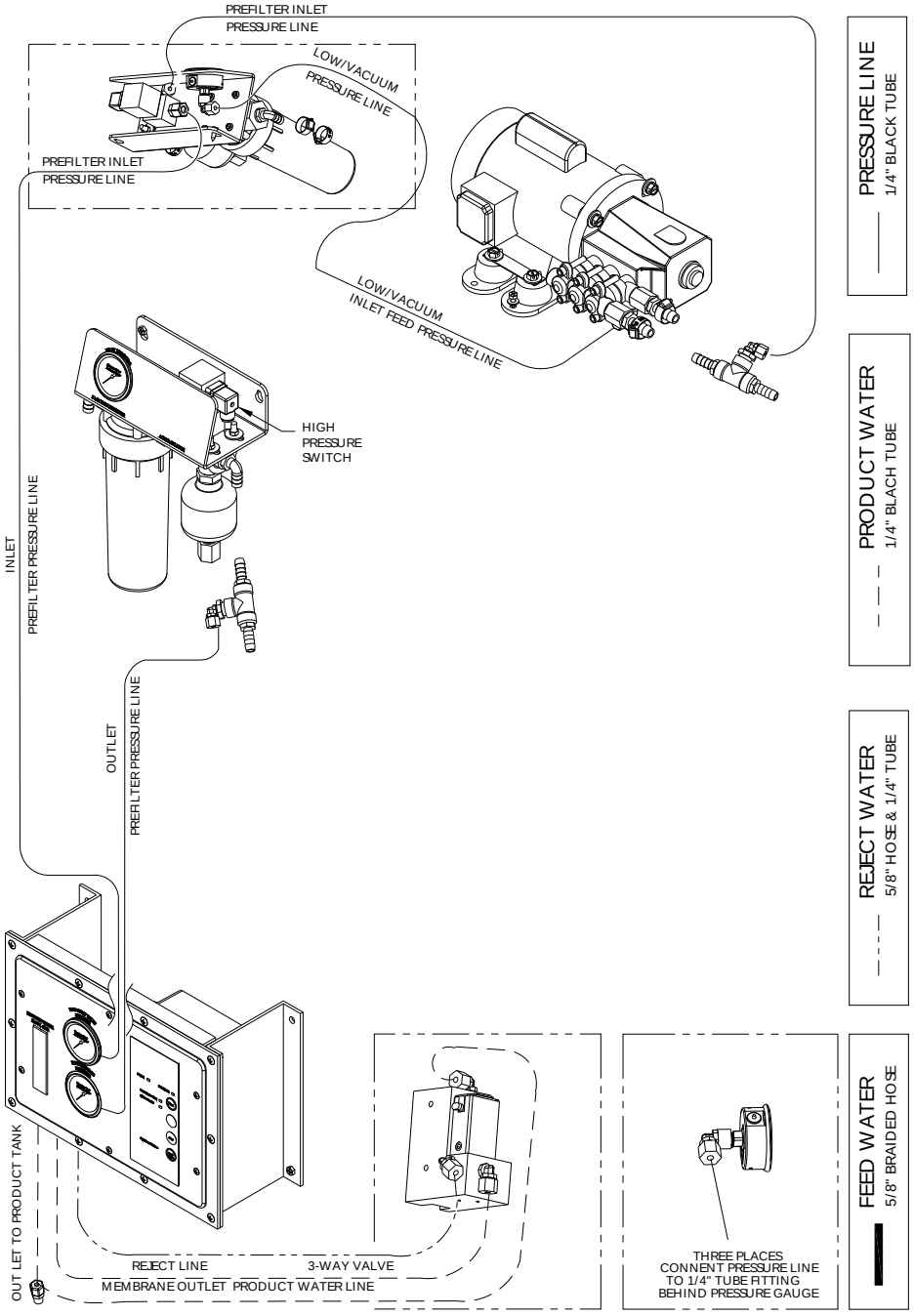


Figure 2.2.4 Illustration of the 1/4" black tube connections on a Modular System.

PRESSURE LINES - 1/4" BLACK TUBE

Use the 1/4" black tube to connect the tube connection on the Feed Pump to the Vacuum Gauge on the Pre-filter Assembly.
Use the 1/4" black tube to connect the tube connection on the first Inline Tee Assembly to the tube connection on the high-pressure switch manifold on the Pre-filter Assembly then use the other tube connection to connect to the Inlet Pre-filter Pressure Gauge on the Front Panel Assembly.
Use the 1/4" black tube to connect the tube connection on the second Inline Tee Assembly to the tube connection behind the Outlet Pre-filter Pressure Gauge on the Front Panel Assembly.

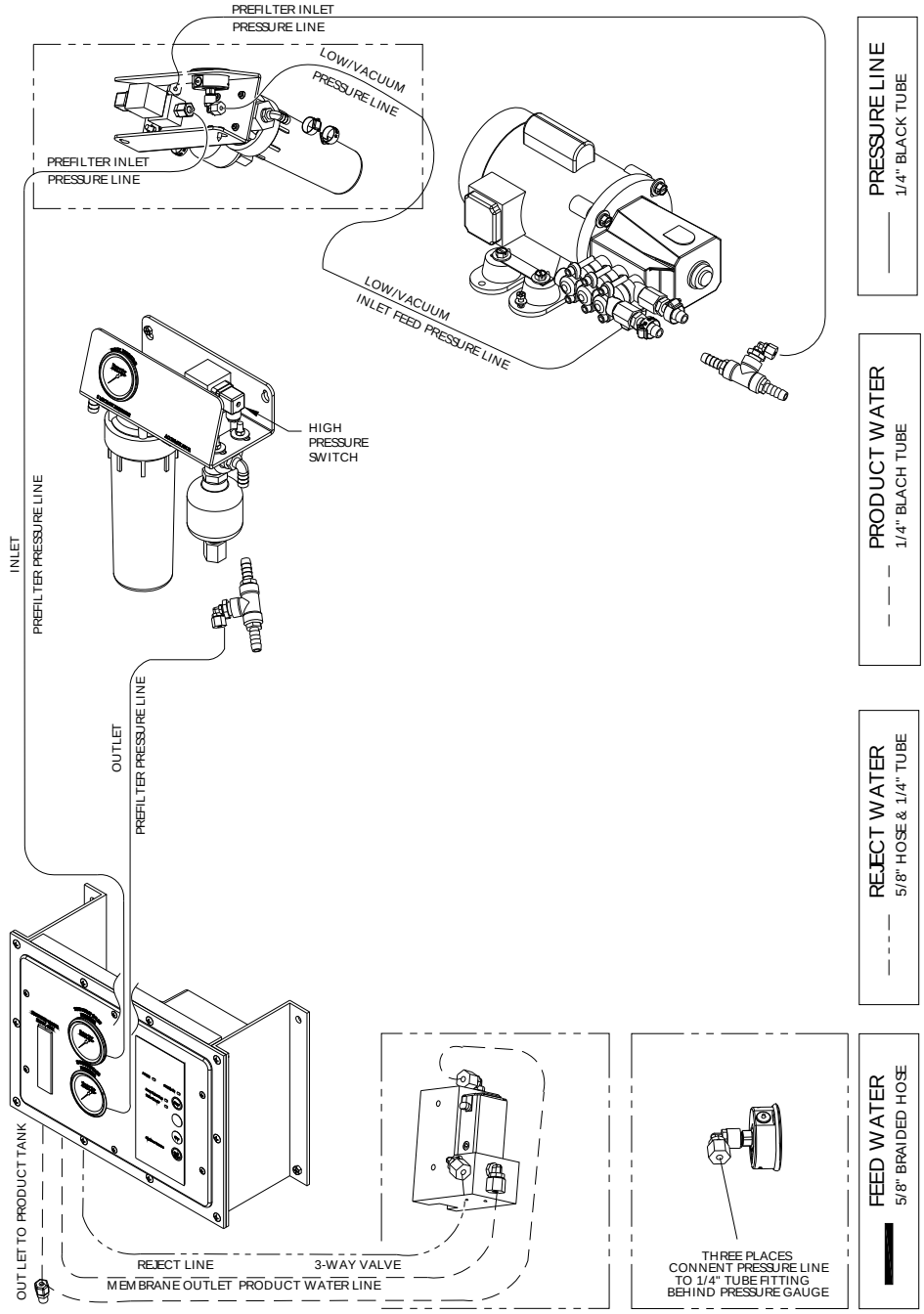


Figure 2.2.5 Illustration of the 1/4" black tube connections to sub-assemblies on a Modular System.

PRODUCT LINES - 1/4" BLACK TUBE

Use the 1/4" black tube to connect the tube connection on the back of the Product Manifold to the tube connection on the Membrane Vessel Assembly. Use the 1/4" black tube to connect the tube connection on top of the Product Manifold to the tube connection on the Boat's Product Tank.

REJECT LINES - 1/4" BLACK TUBE

Use the 1/4" black tube to connect the tube connection on the side of the Product Manifold to the tube connection on the Reject Water Assembly.

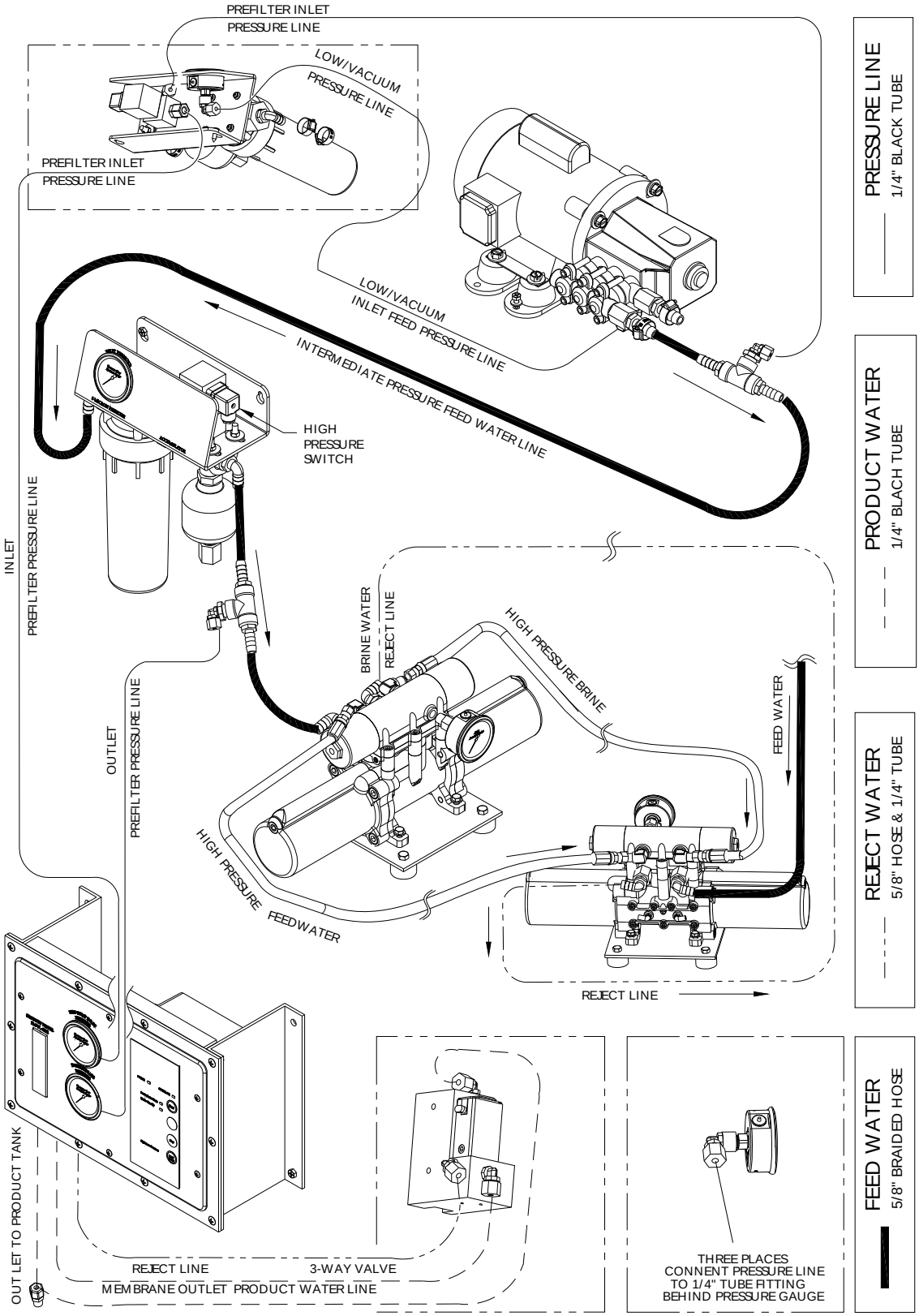


Figure 2.2.6 Use the flow arrows on this figure and to double-check the Modular installation.

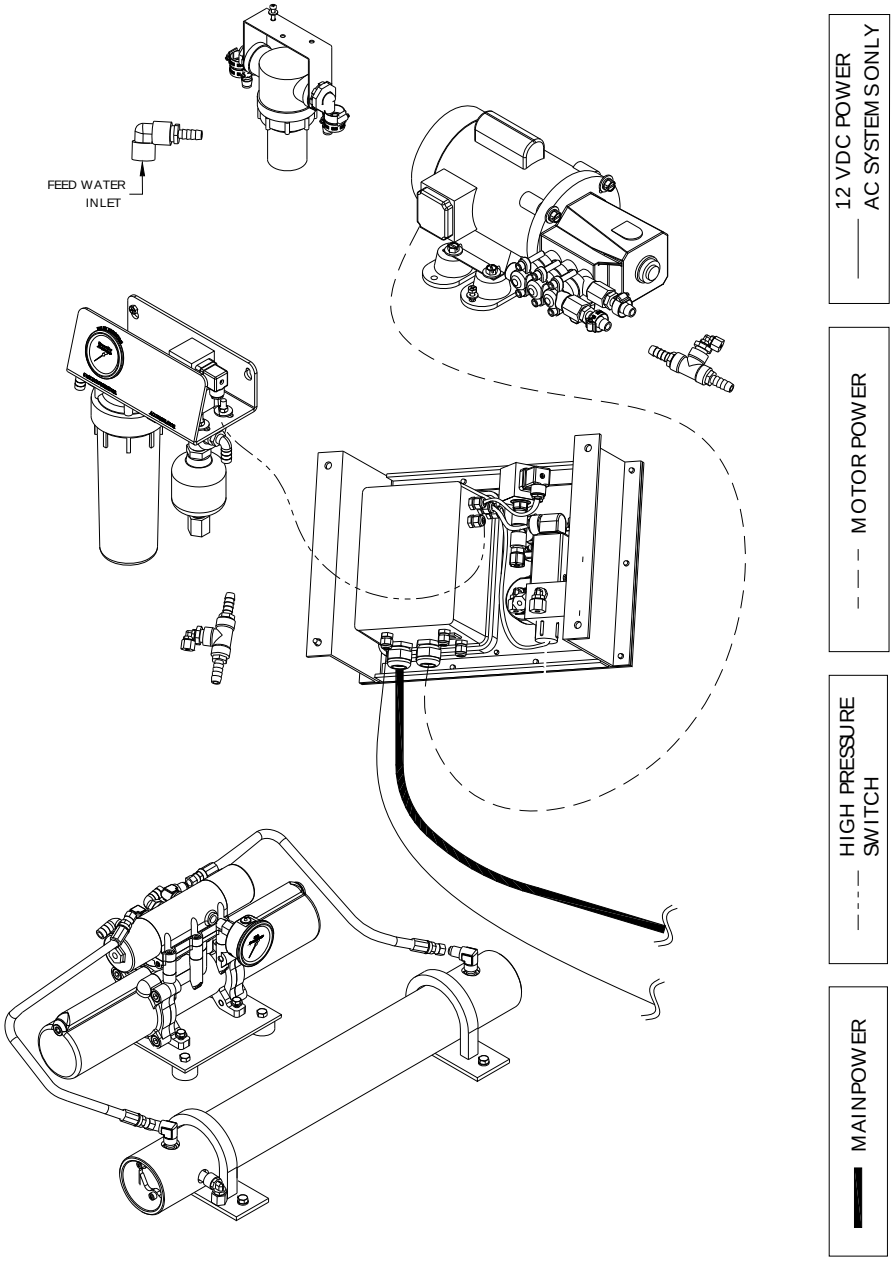


Figure 2.2.7 Illustration of the Modular electrical connections

Connect **main power** to the assigned terminal block in Chapter 7. The main power cable is inserted through a large Strain Relief on the bottom of the controller enclosure.

Connect the **Feed Pump** motor power through the other large Strain Relief on the bottom of the controller enclosure to the assigned terminal blocks as indicated in Chapter 7.

Connect **high-pressure switch** cable to Printed Circuit Board. The high-pressure switch cable is inserted through the lower small Strain Relief on the side of the controller enclosure

AC Systems only- Connect the boat's 12 VDC power source through the small Strain Relief under the controller enclosure and to the fuse terminals below the terminal block assembly

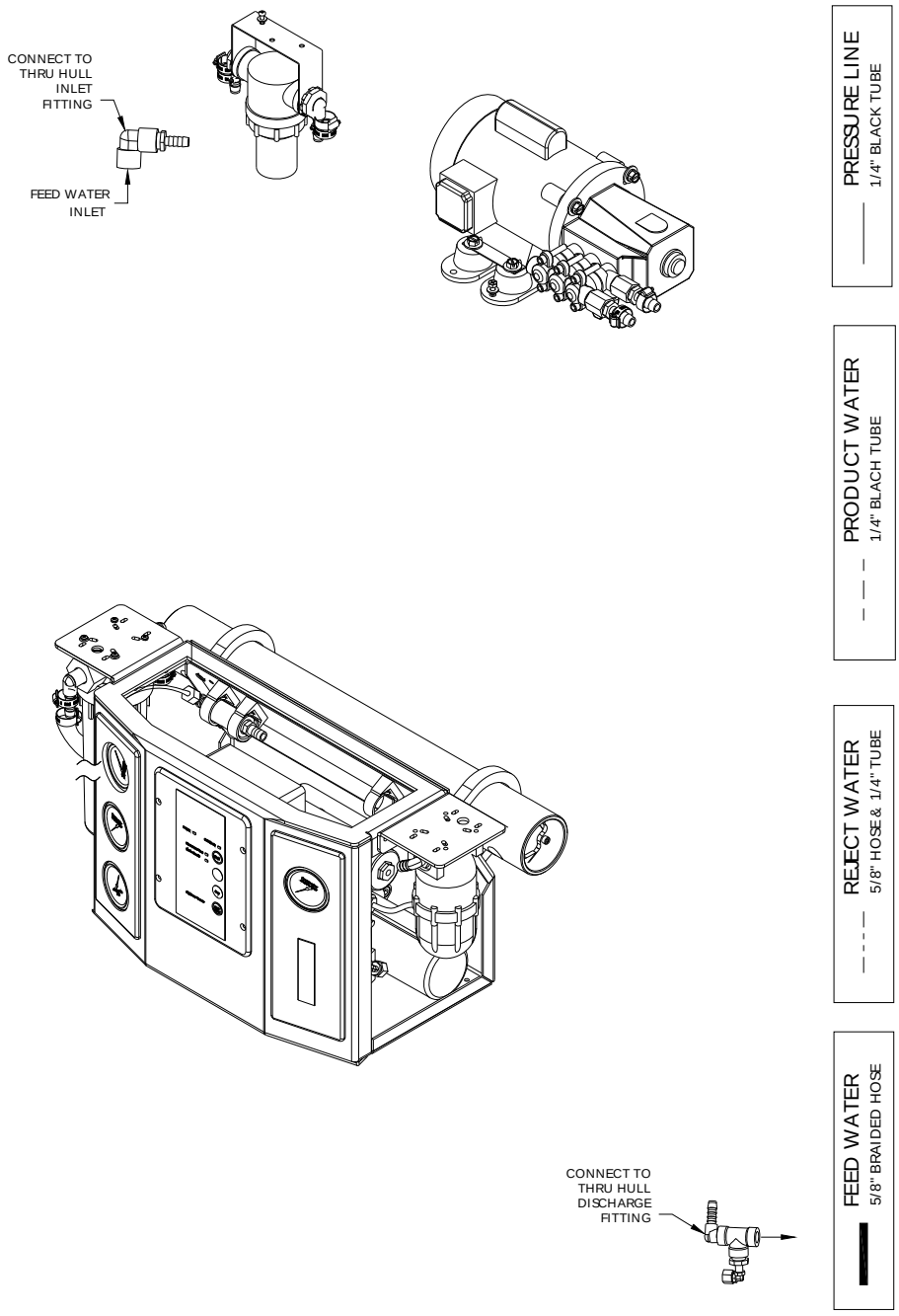


Figure 2.2.8 Illustration of the standard Compact Components required for installation.

Connect the 3/4" Elbow to the Inlet Hull Fitting or the Sea Cock Valve. The installer should use common sense when installing the Inlet Hull Fitting, the Sea Cock Valve and the Inlet Elbow assembly.

Install the Sea Strainer to a bulkhead. The installer should know where the hose and tube lines are placed before securing this component in place.

The Feed Pump and the Compact Frame Assembly should be mounted to a flat surface with enough surrounding area to allow for maintenance. The Compact Frame Assembly comes with rubber washers that are used a vibration insulators. The Feed Pump must be mounted horizontally. Before securing the Compact Frame Assembly, the installer should check that a membrane element could be installed without obstruction.

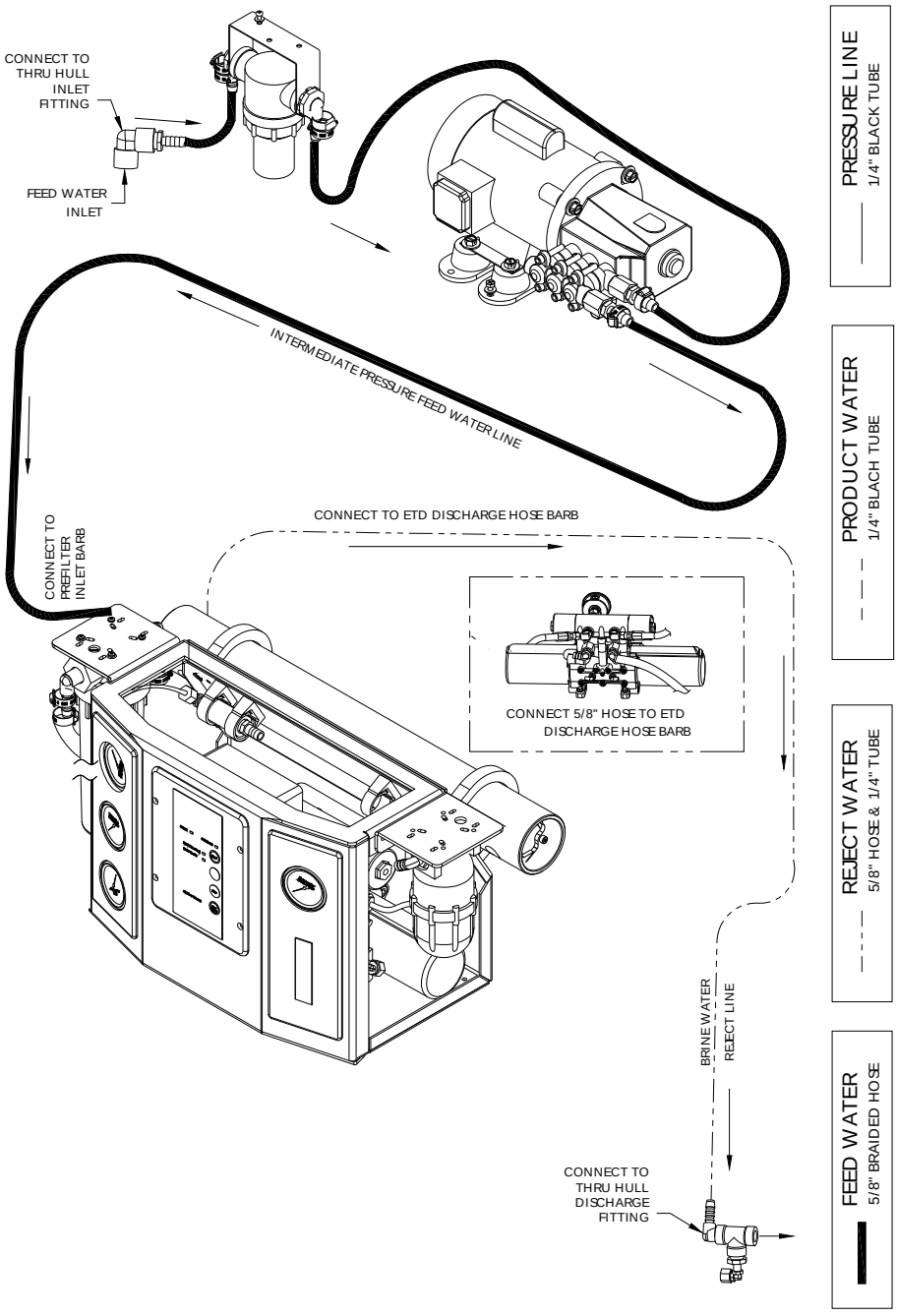


Figure 2.2.9 Illustration of the 5/8" braided hose connections on a Compact System.

FEED WATER 5/8" HOSE LINE

Use the 5/8" braided hose to Connect the 1/2" hose barb on the 3/4" Inlet Elbow Assembly to the Sea Strainer Inlet. Always use two 3/4" hose clamps when assembling the 5/8" braided hose. Connect the Outlet of the Sea Strainer to the Feed Pump then to the Pre-filter Inlet Tee on the Compact Frame Assembly.

REJECT WATER 5/8" HOSE LINE

Use the 5/8" braided hose to Connect the 1/2" hose barb on the ETD Outlet labeled "S" to the 1/2" hose barb on the Reject Water Assembly. The Reject Water Assembly should be connected to the Thru Hull Discharge Fitting.

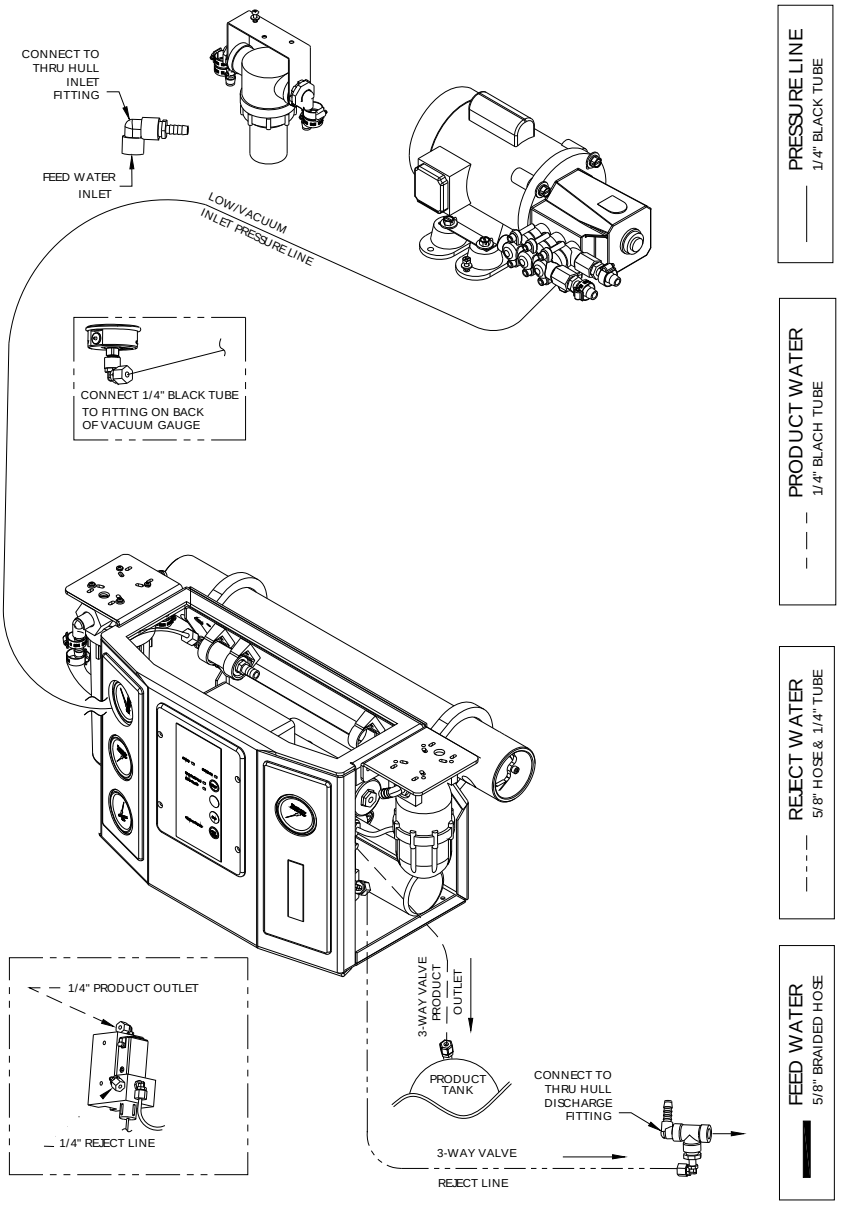


Figure 2.2.10 Illustration of the 1/4" black tube connections

PRESSURE LINE - 1/4" BLACK TUBE
Use the 1/4" black tube to connect the tube connection on the Feed Pump to the tube connection behind the Vacuum Gauge on the Compact Frame Assembly.

PRODUCT LINE - 1/4" BLACK TUBE
Use the 1/4" black tube to connect the tube connection on top of the Product Manifold to the tube connection on the Boat's Product Tank.

REJECT LINE - 1/4" BLACK TUBE
Use the 1/4" black tube to connect the tube connection on the side of the Product Manifold to the tube connection on the Reject Water Assembly.

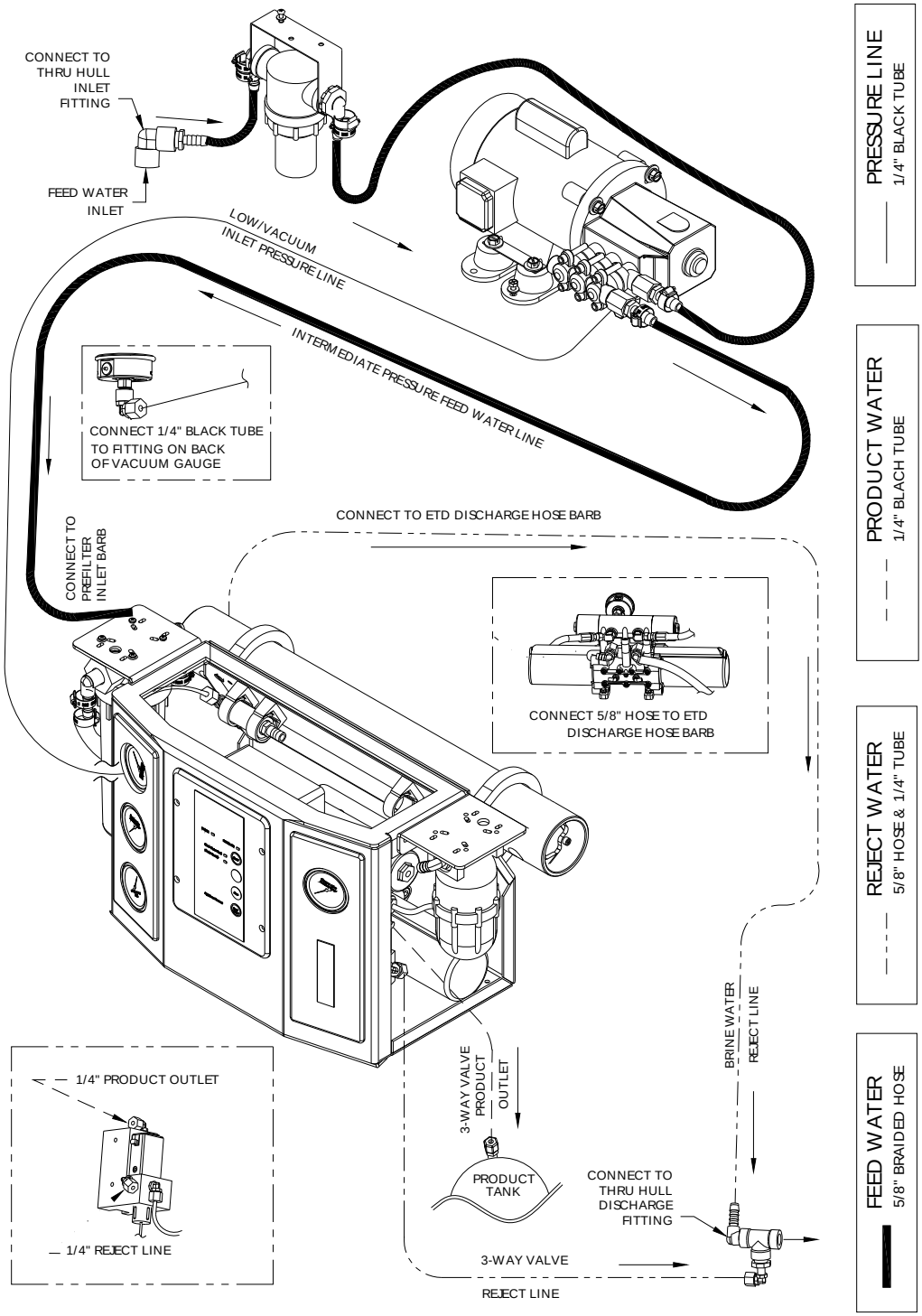


Figure 2.2.11 Use the flow arrows on this figure and to check the Ultra Whisper Compact installation.

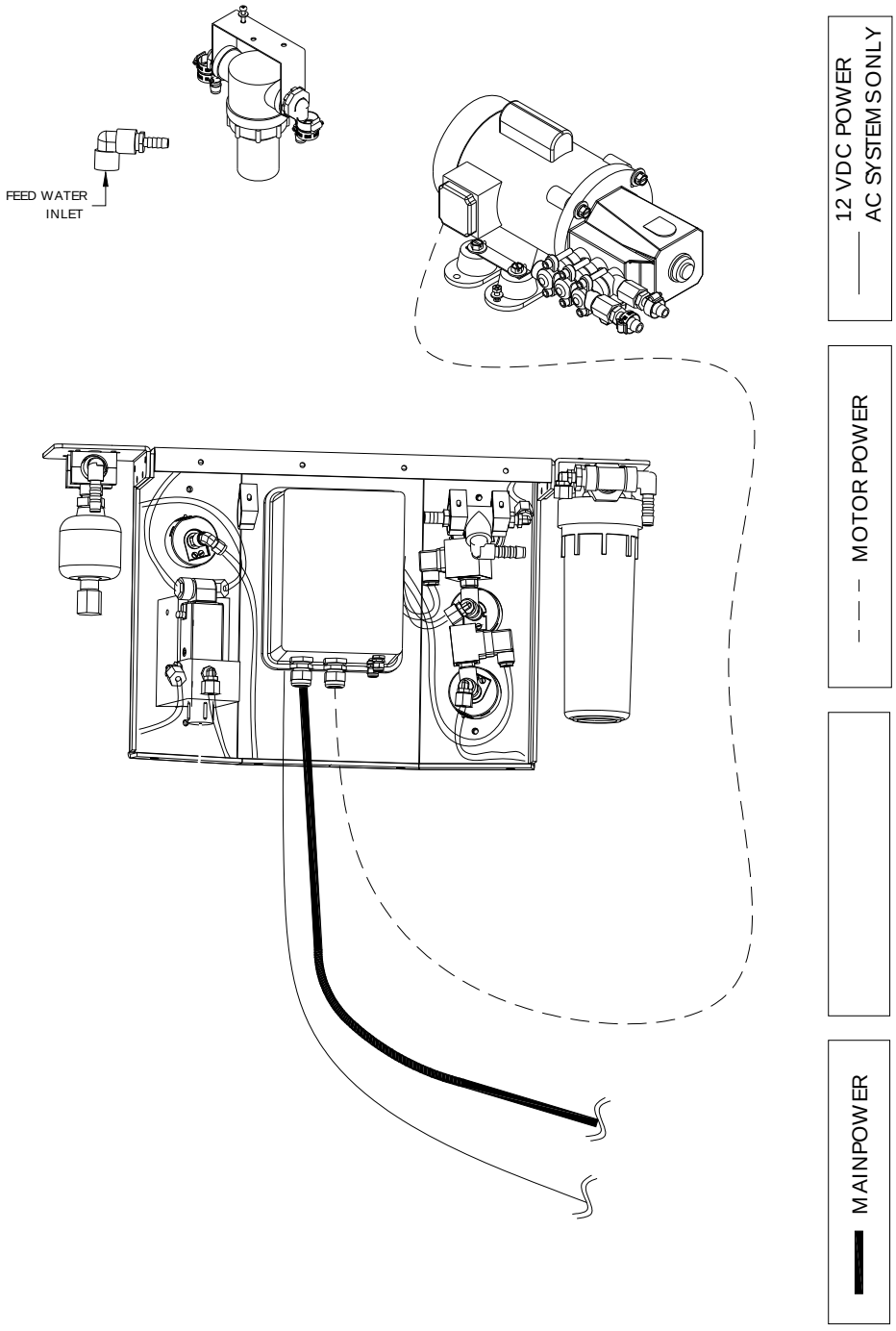


Figure 2.2.12 Illustration of the Compact electrical connections

Connect **main power** to the assigned terminal block in Chapter 7. The main power cable is inserted through a large Strain Relief on the bottom of the controller enclosure.

Connect the **Feed Pump** motor power through the other large Strain Relief on the bottom of the controller enclosure to assigned terminal blocks as indicated in Chapter 7.

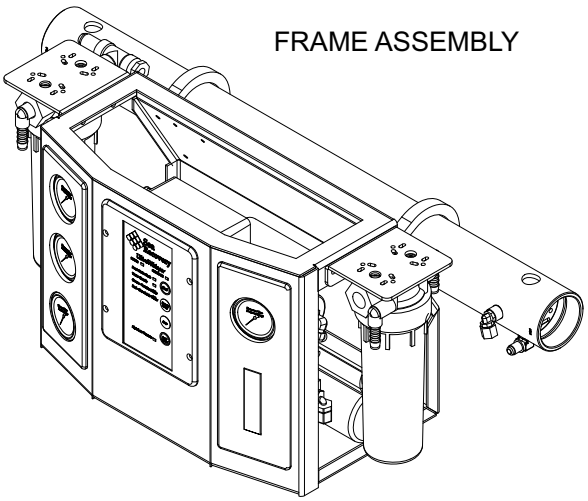
AC Systems only- Connect the boat's 12 VDC power source through the small Strain Relief under the controller enclosure and to the fuse terminals below the terminal block assembly.

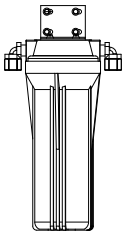
A. ULTRA WHISPER COMPACT PACKING LIST:

SYSTEM VISUAL PACKING LIST:
FOR THE ULTRA WHISPER COMPACT:

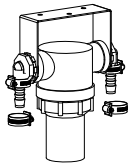
INSTALLATION KIT
SEA STRAINER
FRAME ASSY
CLEANING AND STORAGE KIT
OWNERS MANUAL
CHARCOAL FILTER ASSY
FEED PUMP ASSY
FRESH WATER FLUSH

FRAME ASSEMBLY

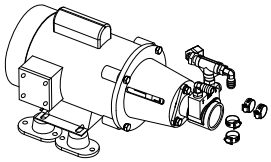




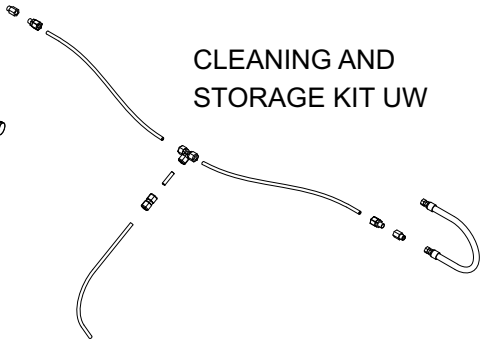
CHARCOAL
FILTER ASSY



SEA STRAINER

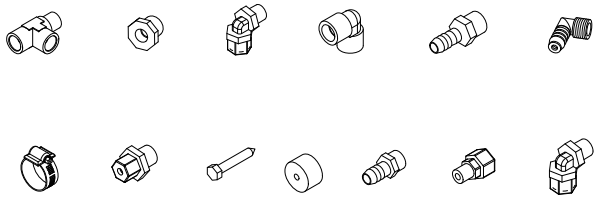


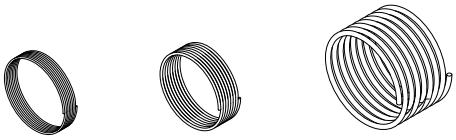
FEED PUMP



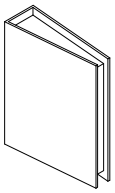
CLEANING AND
STORAGE KIT UW

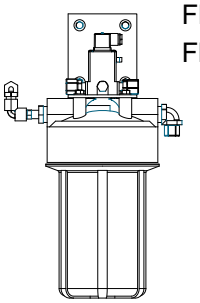
INSTALLATION KIT



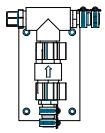


OWNER'S
MANUAL



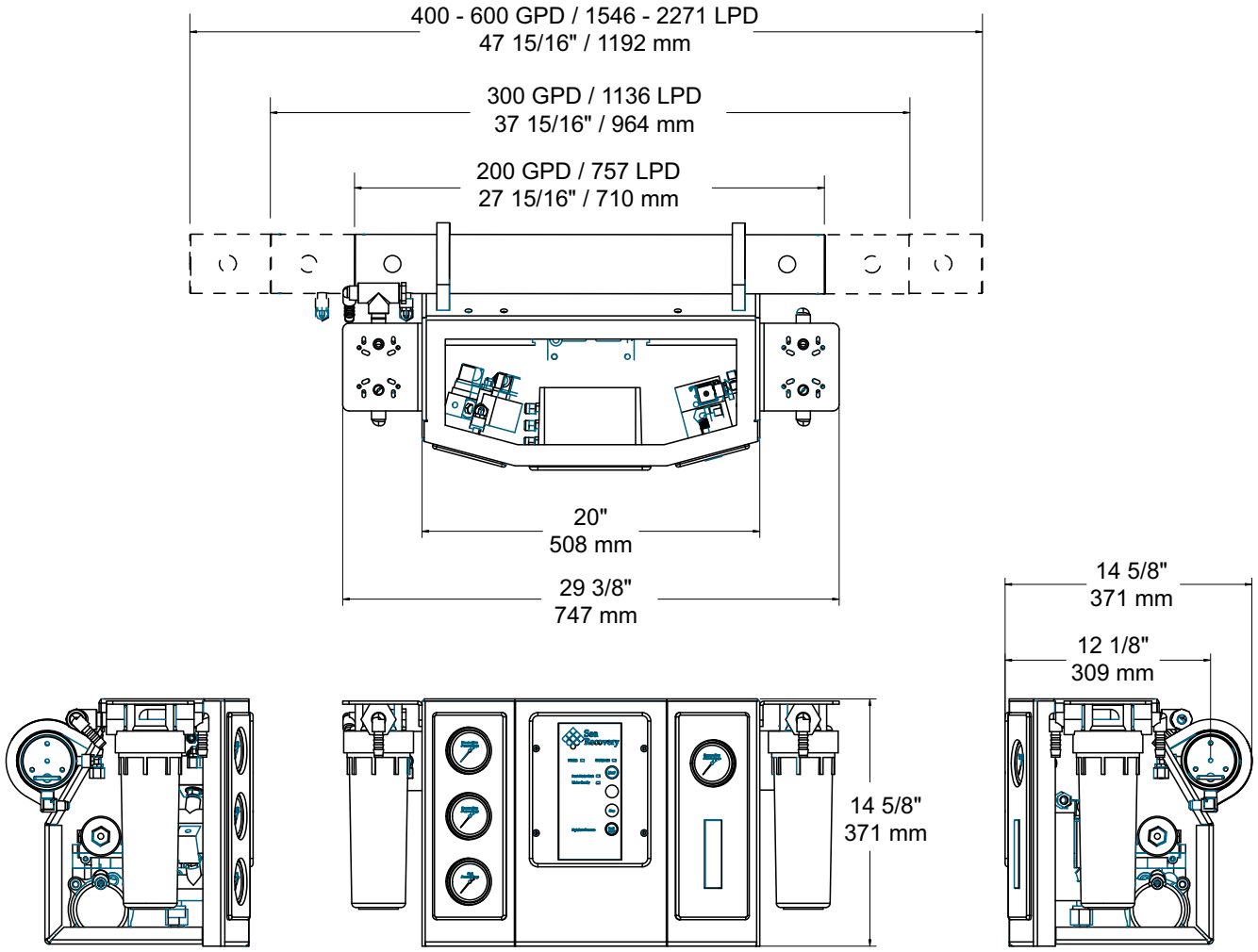


FRESH WATER
FLUSH



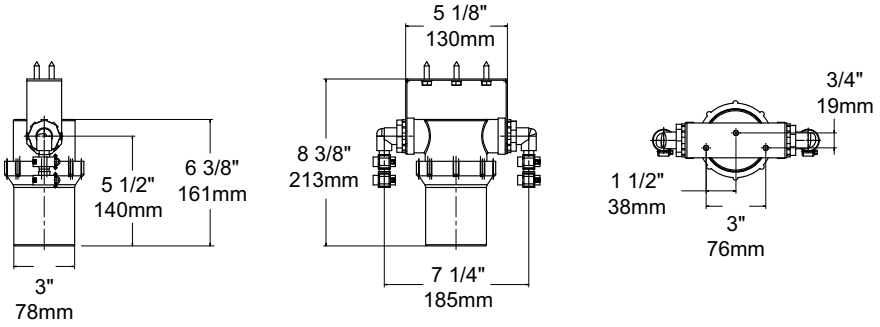
B. Dimensions of the Ultra Whisper Compact System:

Note: All dimensions are identical for all compact style models except for the length of the R.O. Membrane Vessel as shown.

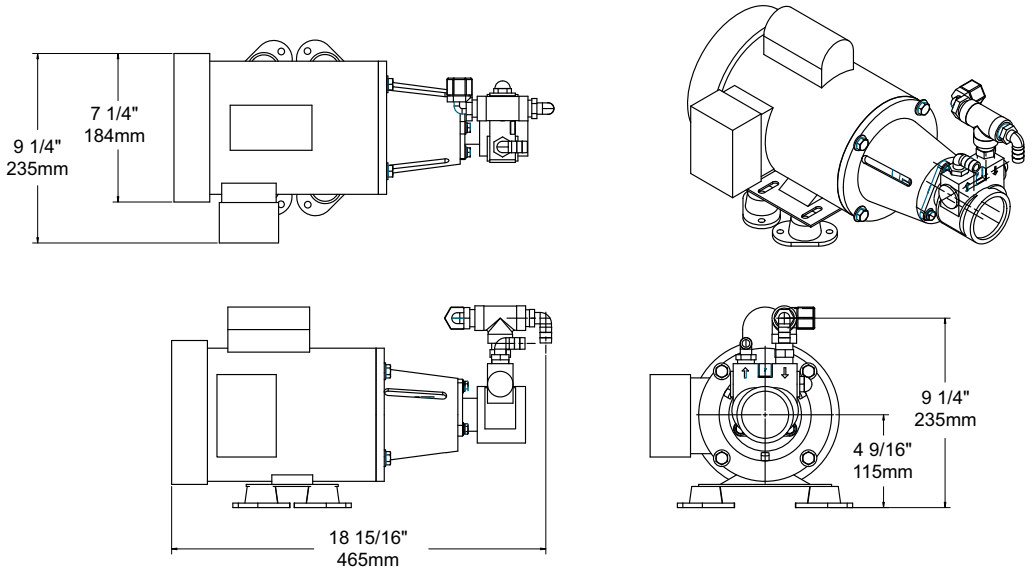


Dimensions of the Ultra Whisper Compact System
EXTERNAL COMPONENTS and Plankton Filter:

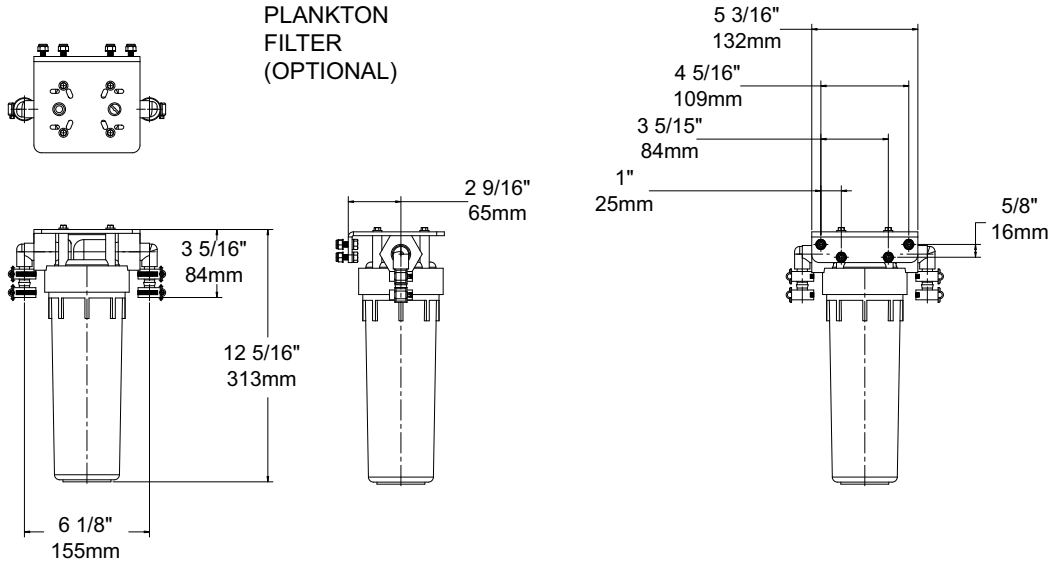
SEA STRAINER



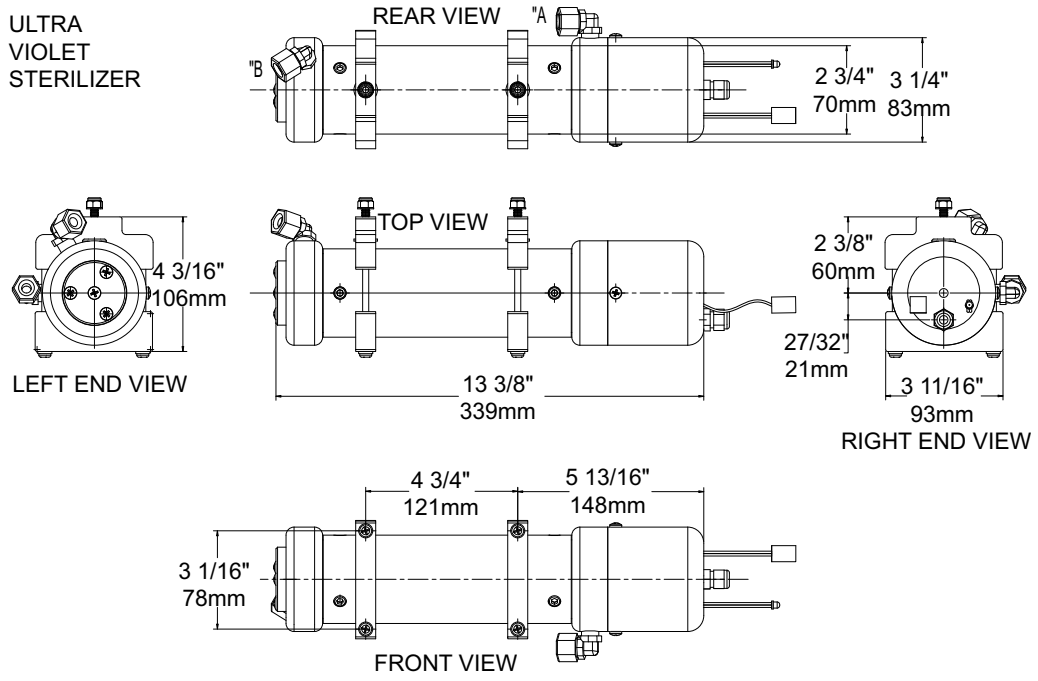
FEED WATER PUMP

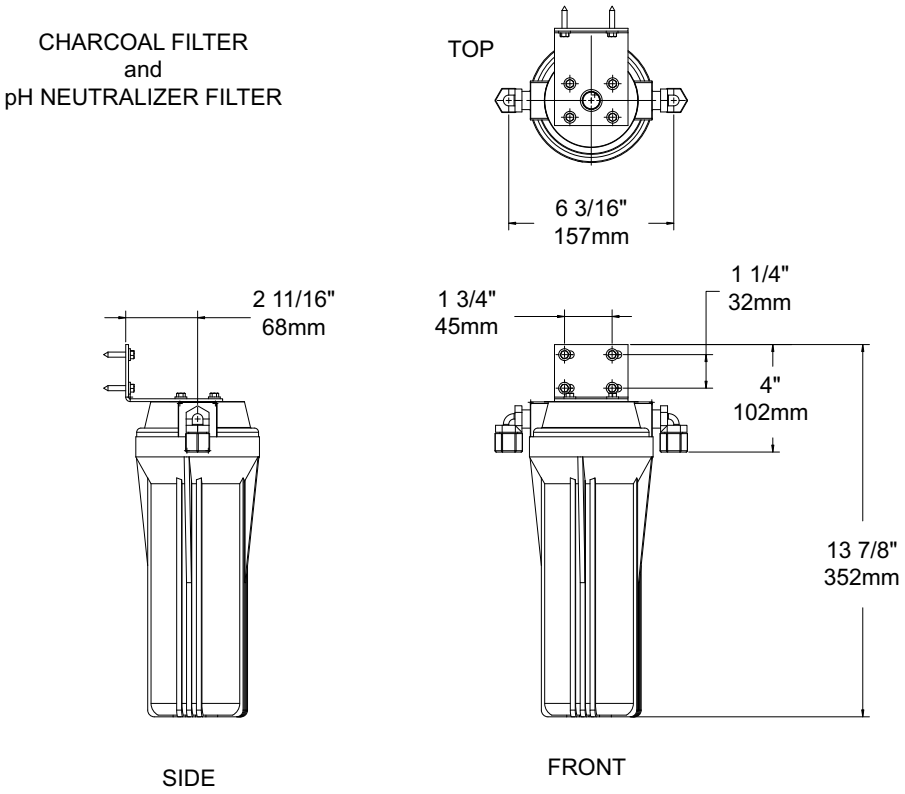


PLANKTON FILTER (OPTIONAL)

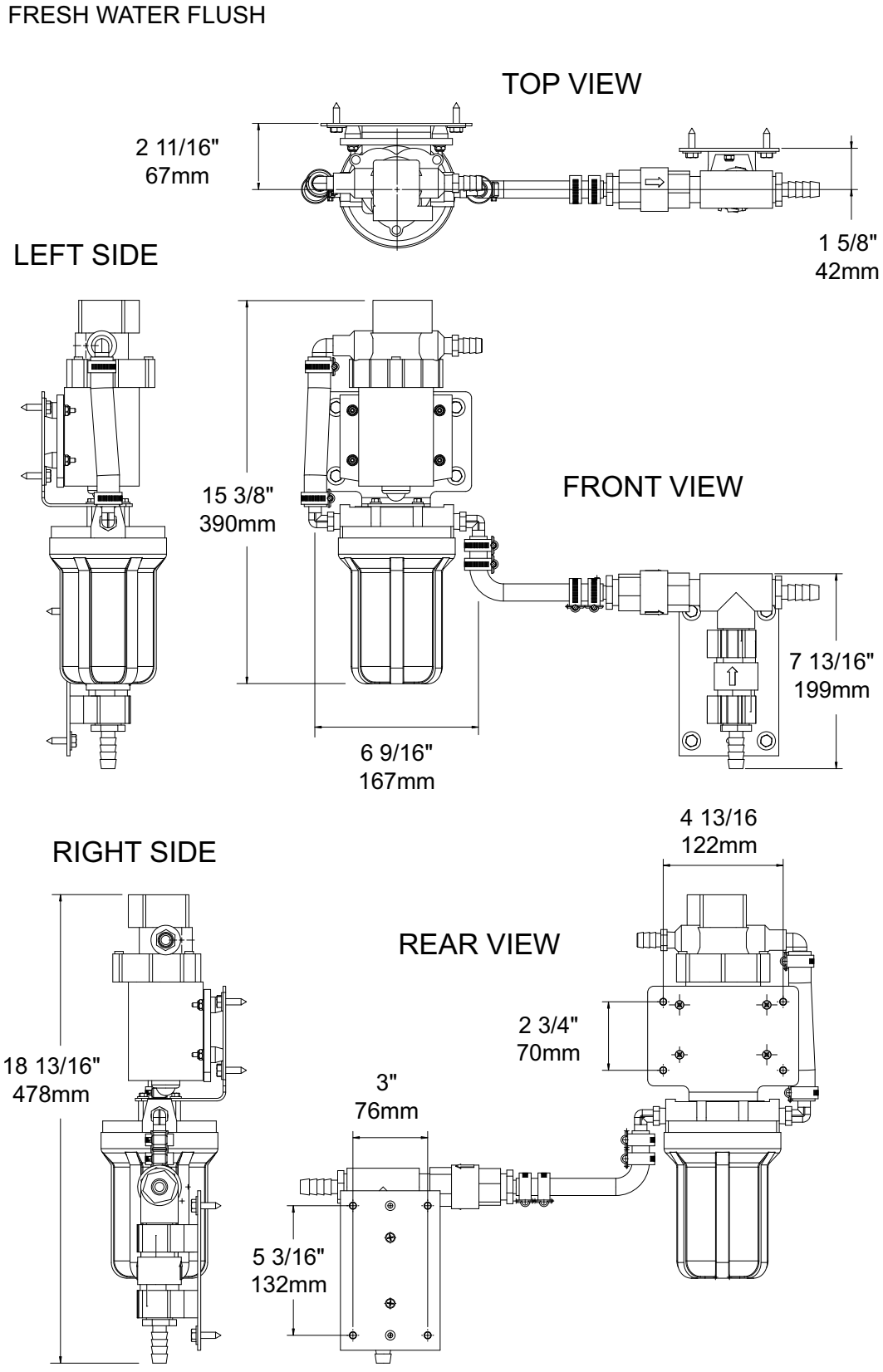


Dimensions of the Ultra Whisper Compact System
EXTERNAL Post Filtration: Ultra Violet Sterilizer and Charcoal Filter and pH Neutralizer Filter:





Dimensions of the Ultra Whisper Compact System
EXTERNAL Fresh Water Flush:



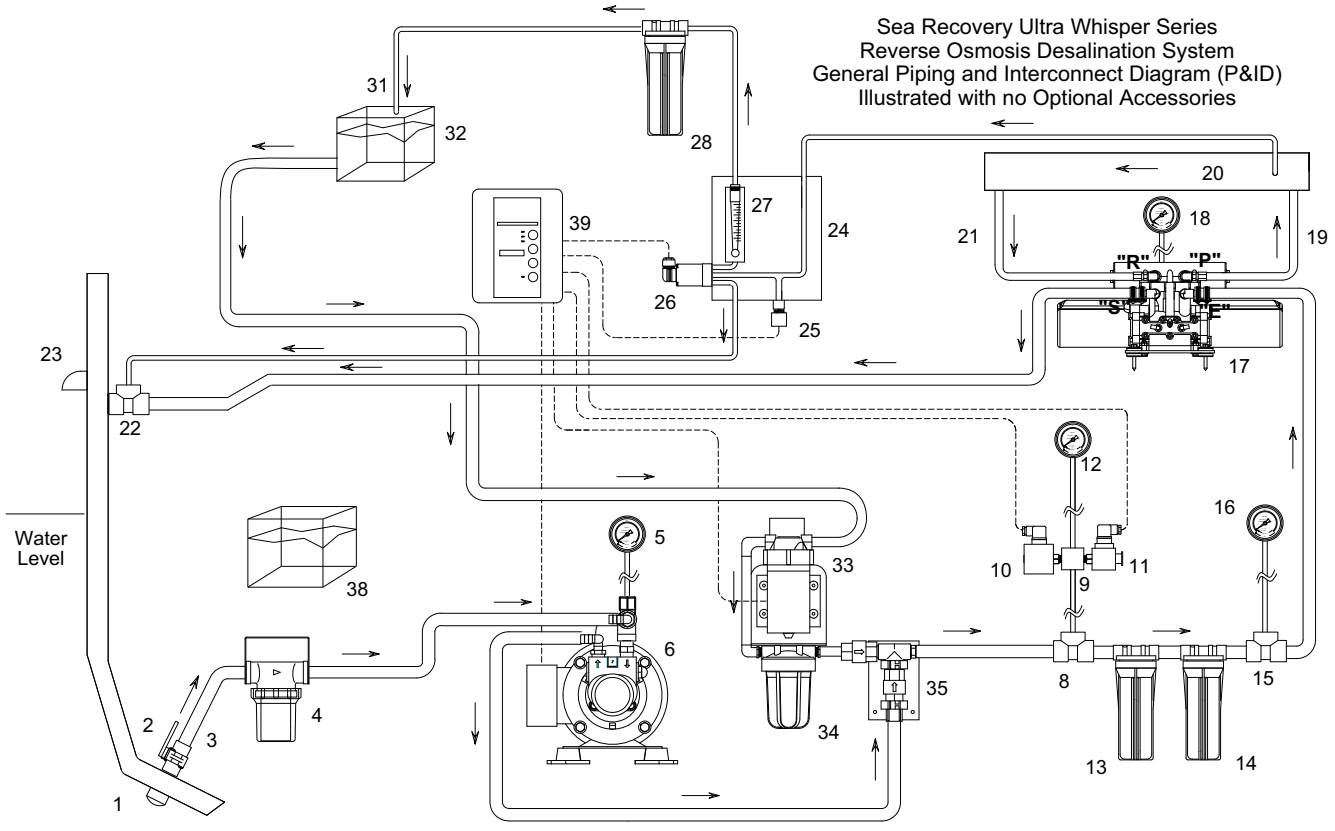
C. COMPONENT DESCRIPTIONS & PIPING AND INTERCONNECT DIAGRAM:

ALL STANDARD COMPONENTS AND ALL OPTIONAL ACCESSORIES.

** Denotes items supplied by installer
*** Denotes optional equipment

1. Inlet Thru Hull Fitting Forward Facing Scoop
2. Sea Cock Valve **
3. Feed Water Connector
4. Sea Strainer
5. Feed Pump Inlet Compound Vacuum/Pressure Gauge -30-0-60
6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
20. R.O. Membrane Element & Pressure Vessel
21. High Pressure Hose
22. Brine Discharge Tee Connector
23. Thru Hull Discharge Fitting **
24. Product Water Manifold
25. Temperature Compensated Salinity Probe
26. 3-Way Product Water Diversion Valve Electric Solenoid Actuated
27. Flow Meter, Product Water
28. Charcoal Filter
29. pH Neutralizer Filter***
30. Ultra Violet Sterilizer***
31. Potable Water Storage Tank Tube Connector
32. Potable Water Storage Tank**
33. Fresh Water Flush Pump
    included with the Fresh Water Flush Assembly
34. Fresh Water Flush Carbon Filter
    included with the Fresh Water Flush Assembly
35. Fresh Water Flush Check Valve
    included with the Fresh Water Flush Assembly
36. Inlet Rinse Clean Valve ***
37. Discharge Rinse Clean Valve ***
38. Rinse/Clean Solution Container **
39. Salinity Controller
40. Remote Controller ***
41. Soft Start***

ILLUSTRATED WITH NO OPTIONAL ACCESSORIES:



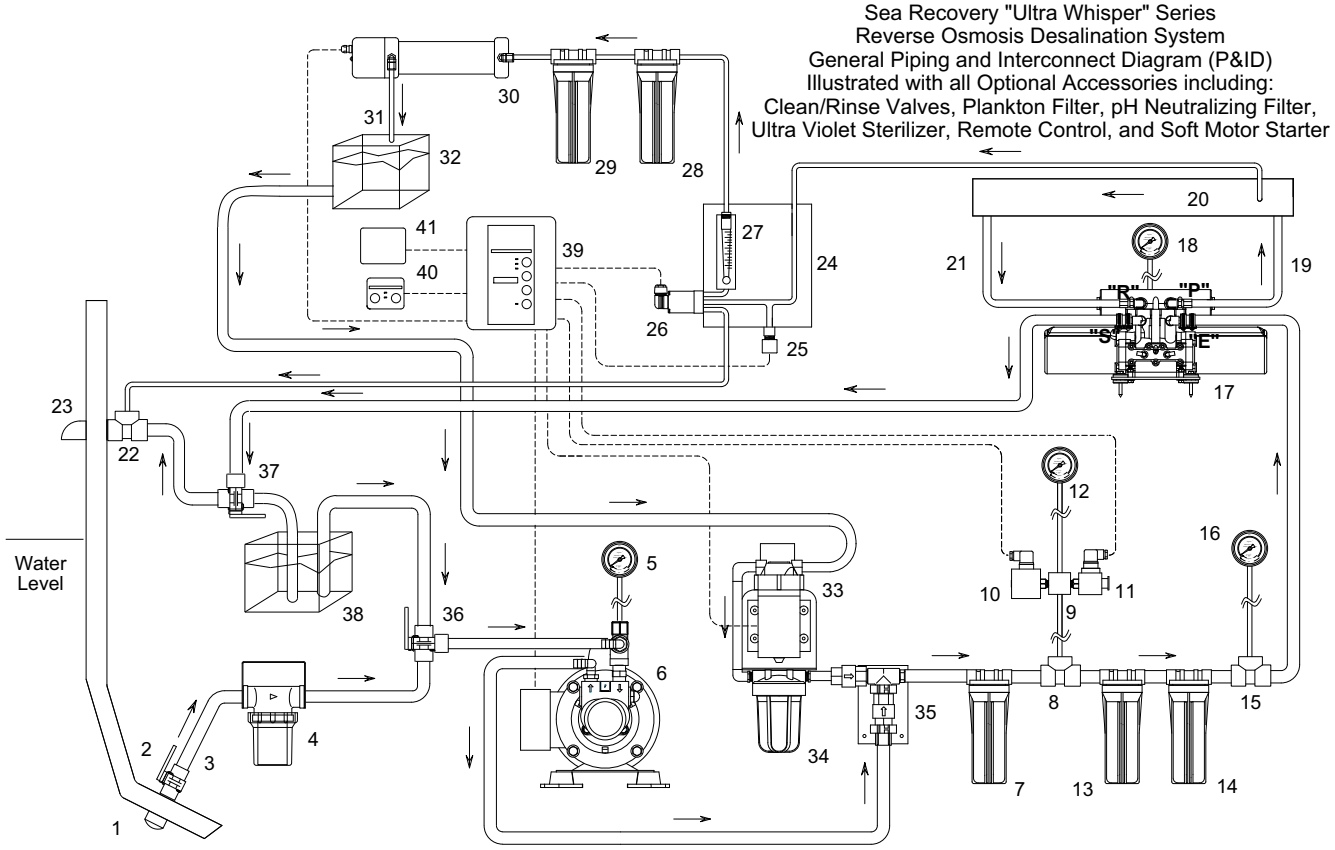
D. COMPONENT DESCRIPTIONS & PIPING AND INTERCONNECT DIAGRAM:

ALL STANDARD COMPONENTS AND ALL OPTIONAL ACCESSORIES.

** Denotes items supplied by installer
*** Denotes optional equipment

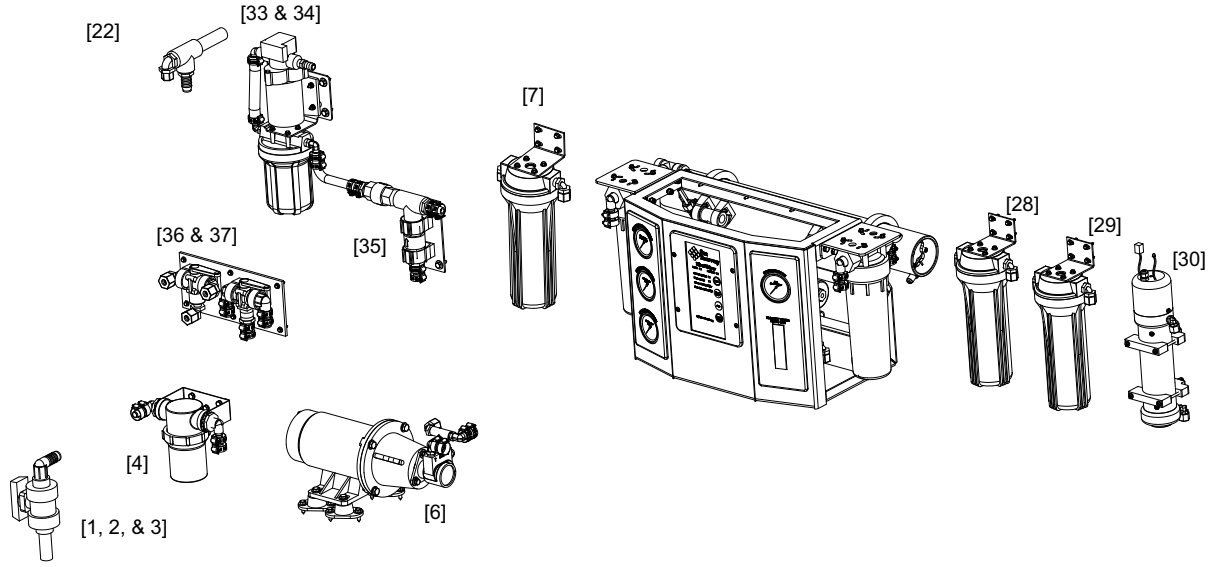
1. Inlet Thru Hull Fitting Forward Facing Scoop
2. Sea Cock Valve **
3. Feed Water Connector
4. Sea Strainer
5. Feed Pump Inlet Compound Vacuum/Pressure Gauge -30-0-60
6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
20. R.O. Membrane Element & Pressure Vessel
21. High Pressure Hose
22. Brine Discharge Tee Connector
23. Thru Hull Discharge Fitting **
24. Product Water Manifold
25. Temperature Compensated Salinity Probe
26. 3-Way Product Water Diversion Valve Electric Solenoid Actuated
27. Flow Meter, Product Water
28. Charcoal Filter
29. pH Neutralizer Filter***
30. Ultra Violet Sterilizer***
31. Potable Water Storage Tank Tube Connector
32. Potable Water Storage Tank**
33. Fresh Water Flush Pump
    included with the Fresh Water Flush Assembly
34. Fresh Water Flush Carbon Filter
    included with the Fresh Water Flush Assembly
35. Fresh Water Flush Check Valve
    included with the Fresh Water Flush Assembly
36. Inlet Rinse Clean Valve ***
37. Discharge Rinse Clean Valve ***
38. Rinse/Clean Solution Container **
39. Salinity Controller
40. Remote Controller ***
41. Soft Start***

ILLUSTRATED WITH ALL OPTIONAL ACCESSORIES:



D. TYPICAL COMPONENT PLACEMENT AND MOUNTING ILLUSTRATION OF THE ULTRA WHISPER COMPACT SYSTEM:

Following the Piping and Interconnect Diagrams illustrated on pages 18 and 19 lay out the individual components so as to create the shortest tubing and hose connections.



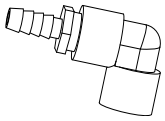
E. ULTRA WHISPER COMPACT SYSTEM & COMPONENT MOUNTING: The following steps discuss the placement and mounting of the various Ultra Whisper Compact system components. The illustration on the previous page shows the Ultra Whisper Compact Style System with and without options. If an Optional Accessory is not included ignore the respective step and move to the next.

CAUTION: Mounting surfaces must be flat in order to avoid warping of brackets and frames. Use appropriate shims on uneven surfaces to ensure that mounting of the system components does not cause bending or warping, and subsequent leaking or breakage. Damage to any system component due to attachment to uneven surfaces is the responsibility and liability of the installer and is not covered by the Sea Recovery warranty.

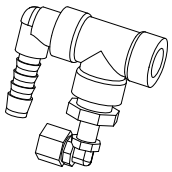
ATTACHMENT: All individual components are supplied with common mounting hardware. Some installations may require different hardware than what has been supplied.

SUPPLIED HOSE AND TUBE LENGTHS: When planning out the location and mounting of the System and related components give consideration to the length of hose and tube supplied with the system.

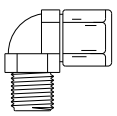
1. Attach the supplied Feed Water Connector Assembly [3], 1/2 " FNPT elbow with attached 1/2" hose barb, to the boats Sea Cock 1/4 turn ball Valve [2]. Position the Outlet Hose Barb towards the Sea Strainer Inlet [4].



2. Attach the supplied Brine Discharge Tee Connector [22] Assembly, 1/2 " FNPT elbow with attached 1/4" Tube Fitting, to the boats Over board Discharge Fitting [23]. Position the Inlet Tube Fitting towards the System Brine Discharge.

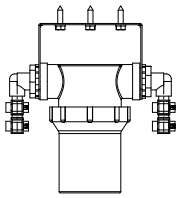


3. Attach the supplied Potable Water Storage Tank Tube Connector [31] 1/4" MNPT x 1/4" Tube Fitting to the 1/4" FNPT tap at the Potable Water Tank [32]. The Product Water line may also be attached to the Potable Water Storage Tank Fill Line rather than drilling and tapping into the top of the tank itself.

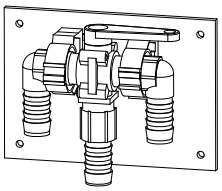


CAUTION: Do not use water tank diversion valves in this line to fill more than one tank. If it is absolutely necessary to use a diversion valve to fill more than one tank use only a "never closed" type ball valve which allows water to flow regardless of the valve handle position. If a valve in this line is closed during operation extensive damage to the system will occur. Damage caused to the system due to installation of valves in the product water line is the responsibility and liability of the installer and is not covered by the Sea Recovery warranty.

4. The Sea Strainer [4] is mounted in an accessible location below water level between the Inlet Sea Cock Valve [2] and Feed Pump [6]. Allow at least 4 inches (10 cm) of clearance below the bowl to access the mesh screen for cleaning or replacement.

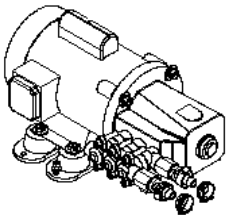


5. The ***Inlet Rinse Clean Valve [36] is mounted in an accessible location below water level between the Sea Strainer [4] Outlet and the ***Fresh Water Flush Check Valve [35] Inlet if used, otherwise the Feed Pump [6] Inlet.



6. The Feed Pump [6] is mounted at or below water level to assist the pump in priming. Mount the Feed Pump between the Sea Strainer [4] Outlet and the ***Plankton Filter [7] Inlet if used, otherwise the Prefilter [13] Inlet.

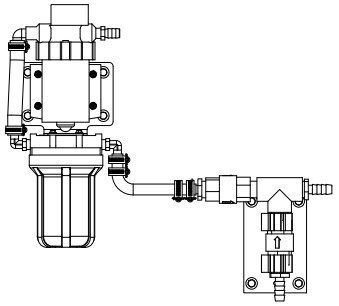
   It is best to mount the Feed Pump below water level to assist priming, and in an accessible location to allow access for maintenance.



   CAUTION: Do not mount the pump head vertically above the motor, as motor damage will occur if the pump or it's fittings should develop a leak. Eventually, from use the pump seal will wear and leak requiring replacement. Water damage to the motor, if mounted improperly, is the responsibility and liability of the installer and not covered by Sea Recovery warranty.

   CAUTION: Mounting of the Feed Pump above water level will cause a vacuum at the inlet of the pump and will result in premature wear resulting from cavitation. Improper installation of the Feed Pump causing excessive vacuum at the inlet of the pump resulting in cavitation and premature wear is the responsibility and liability of the installer and not covered by the Sea Recovery warranty.

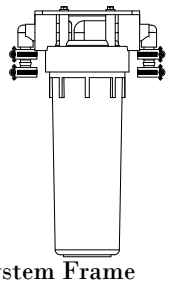
7. The ***Fresh Water Flush [34] Filter Canister with attached Flush Pump [33] is mounted in an accessible location to a vertical surface between an UN-PRESSURIZED line in the Potable Water system and the Fresh Water Flush Check Valve [35]. Allow at least 4 inches (10 cm)of clearance below the bowl for element replacement.



   CAUTION: Potable water may spill during filter element replacing. Therefore, Do Not mount the prefilter above any electrical or electronic component

8. The ***Fresh Water Flush Check Valve [35] Assembly (lower right component in the above illustration) is mounted vertically in close proximity to the Outlet of the Feed Water Pump [6] and the Inlet of the Plankton Filter [7] or 25 micron Prefilter [13].

9. The ***Plankton Filter [7] is mounted in an accessible location to a vertical surface between the Feed Pump [6] Outlet and the Pre Filter [13] Inlet which is mounted to the System Frame. Allow at least 4 inches (10 cm) of clearance below the bowl for element replacement.

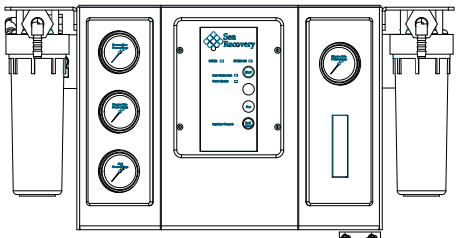


CAUTION: Feed water may spill during filter element replacing. Therefore, Do Not mount the plankton filter above any electrical or electronic component.

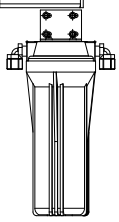
10. The Pre-filters [13 & 14] are mounted to the System Frame. They may be removed from the System Frame and mounted separately in an accessible location to a bulkhead. Allow minimum 4 inches (10 cm) below the bowl for filter element removal.

CAUTION: Feed water may spill during filter element replacing. Therefore, Do Not mount the prefilter above any electrical or electronic component

11. The System Frame is mounted in an accessible location to a flat surface allowing ease of access to controls and for maintenance.

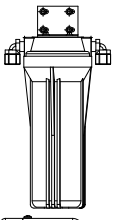


12. The Charcoal Filter [28] is mounted in an accessible location to a vertical bulkhead. Allow minimum 4 inches (10 cm) below the bowl for filter element removal.



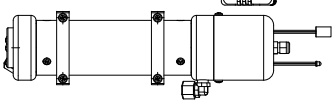
CAUTION: Product water may spill during filter element replacing. Therefore, Do Not mount the charcoal filter above any electrical or electronic component

13. The ***pH Neutralizing Filter [29] is mounted in an accessible location to a vertical bulkhead after the Charcoal Filter [28] and prior to the U.V. Sterilizer [30].

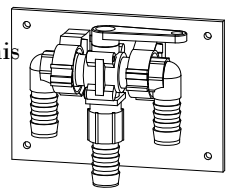


CAUTION: Product water may spill during filter element replacing. Therefore, Do Not mount the pH Neutralizing filter above any electrical or electronic component

14. The ***UV Sterilizer [30] is mounted to a bulkhead directly after the Charcoal Filter [28], or after the pH Neutralizing Filter [29] if used. The U.V. Sterilizer should be mounted vertically with the electrical fitting on the top. The U.V. should be plumbed with the inlet on the bottom and the outlet on top. Horizontal mounting is acceptable with outlet port on top (pointed up) to displace air. Do Not mount the U.V. Sterilizer with the electrical fitting on the bottom. Refer to Page 66 of this section for installation details.

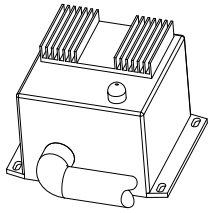


15. The ***Discharge Rinse Clean Valve [37] is mounted in an accessible location between the System Brine Discharge Outlet and the Brine Discharge Thru-Hull Fitting [23]. Mount this valve in an accessible location.

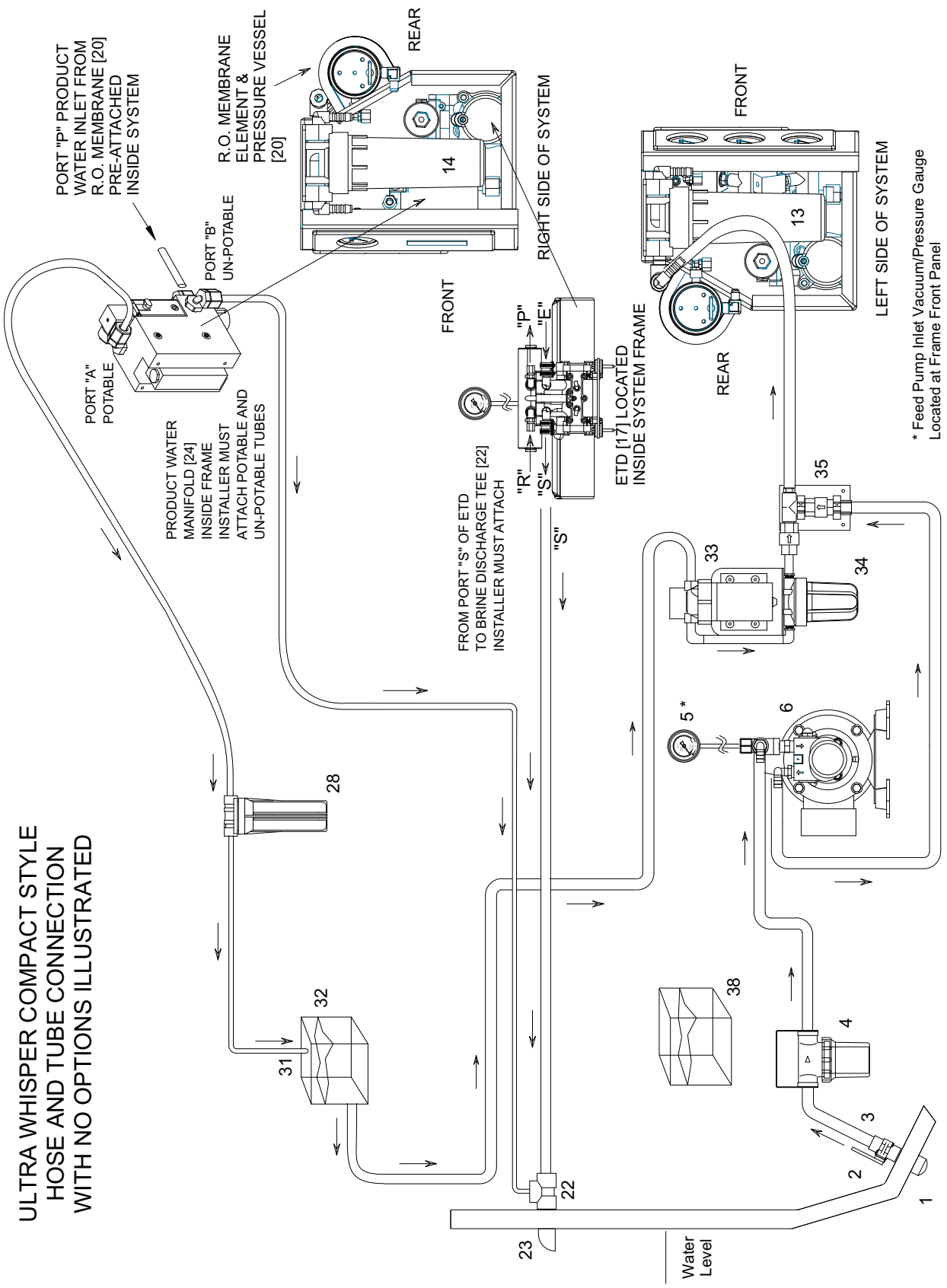


16. The ***Remote Controller [40] is mounted to a flat surface with appropriate cut out for flush mounting to the flat surface. Mount the Remote Controller in a protected area away from water spray. Refer to dimensional drawings in this Section 2.

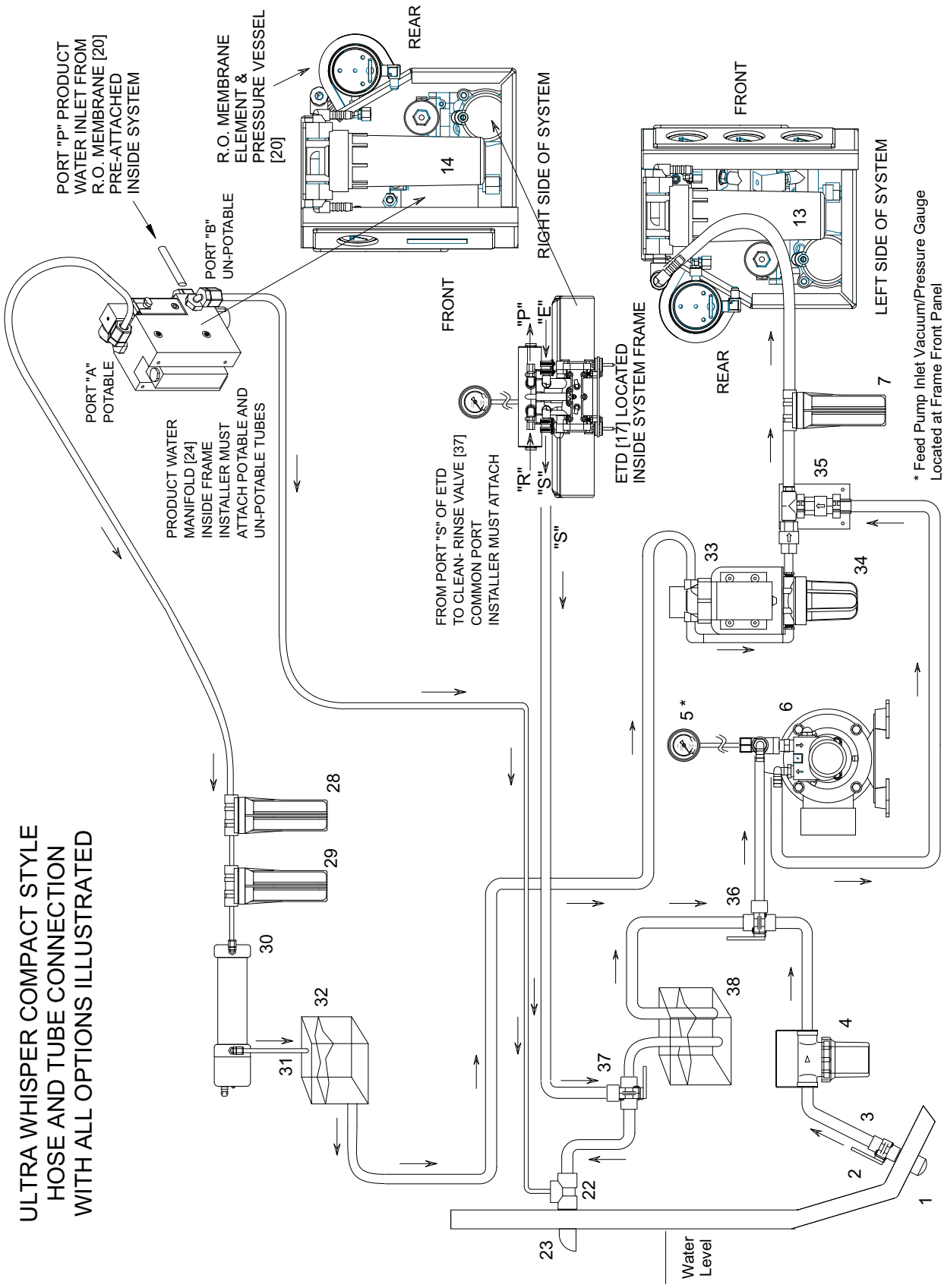
17. The Soft Start [41] is mounted in close proximity to the System Salinity Controller.



F.1 CONNECTING PLUMBING (HOSES & TUBING) FOR THE ULTRA WHISPER COMPACT SYSTEM WITH NO OPTIONS ILLUSTRATED:



F.2 CONNECTING PLUMBING (HOSES & TUBING) FOR THE ULTRA WHISPER COMPACT SYSTEM WITH ALL OPTIONS ILLUSTRATED:



G. Connect all required hoses and tubes: (** = Supplied by Installer or Owner; *** = Optional Accessory.)

1. Connect Feed and Fresh Water Flush Lines with the supplied 20 feet (6 meters) of 1/2" (12.7 mm) I.D. Inlet Suction Hose. Secure the hose with two hose clamps offset 180 degrees at each fitting. Ignore any Optional Accessory that is not to be installed:

Step	from Outlet of	to Inlet of
1.	Feed Water Connector [3]	Sea Strainer [4]
2.	Sea Strainer [4]	***Inlet 3-Way Clean/Rinse Valve [36] (left or right port)
3.	**Rinse/Clean bucket or container [38]	***Inlet 3-way Clean/Rinse Valve [36] (left or right port)
4.	***Inlet 3-way Clean/Rinse Valve [36] (center port)	Feed Pump[6]
5.	Feed Pump [6]	Fresh Water Flush Check Valve [35]
6.	Fresh Water Flush Check Valve [35]	***Plankton Filter [7]
7.	***Plankton Filter [7]	Prefilter 25 micron [13] located on the left of the system frame
8.	**Unpressurized Potable Water Tank line [32]	Fresh Water Flush Pressure Pump [33]
9.	Fresh Water Flush Carbon Filter [34]	Fresh Water Flush Check Valve [35]

2. Connect Brine Discharge line with the supplied 20 feet (6 meters) of 3/8" (9.5 mm) O.D. Brine Discharge Tubing:

Step	from Outlet of	to Inlet of
1.	ETD Port "S" [17] located inside the system frame	***Discharge Rinse Clean Valve [37] (center port)
2.	***Discharge Rinse Clean Valve [37] (left or right port)	**Rinse Clean bucket or container [38]
3.	***Discharge Rinse Clean Valve [37] (left or right port)	Brine Discharge Connector [22]

3. Connect Product Water line with the supplied 30 feet (9.14 meters) of 3/8" (9.52 mm) O.D. nylon tubing:

Step	from Outlet of	to Inlet of
1.	Product Water Manifold Port "B" Unpotable located inside the system frame	Brine Discharge Tee [22]
2.	Product Water Manifold Port "A" Potable located inside the system frame	Charcoal Filter [28]
4.	Charcoal Filter [28]	***pH Neutralizing Filter [29]
5.	***pH Neutralizing Filter [29]	***U.V. Sterilizer [30]
5.	***U.V. Sterilizer [30]	**Potable Water Storage Tank Connector [31]

4. Connect Pressure pick-up with Pressure Gauges with the supplied 20 feet (6 meters) of 1/4" (6.35 mm) O.D. nylon tubing:

Step	from Outlet of	to Inlet of
1.	Feed Pump [6] Pressure Pick Up Tee located on feed water pump	Inlet Compound Vacuum/Pressure Gauge [5] located inside the system frame

H. Electrical Connections Refer To Section 8 of this Owner's Manual

ULTRA WHISPER MODULAR SYSTEM

PACKING LIST, DIMENSIONS, PLACEMENT, MOUNTING, & INTERCONNECT PLUMBING

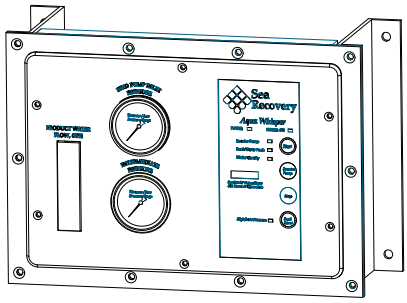
REFER TO THIS SECTION PAGES 28 THROUGH AND INCLUDING 46

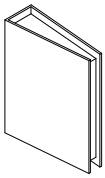
A. PACKING LIST ILLUSTRATION OF THE ULTRA WHISPER MODULAR SYSTEMS:

SYSTEM VISUAL PACKING LIST
FOR THE ULTRA WHISPER MODULAR

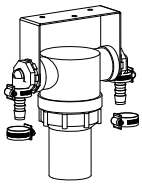
FRONT PANELASSEMBLY

FRONT PANEL ASSY
MEMBRANE VESSEL ASSY
ETD ASSY
PREFILTER ASSY
HOSE HP 2 EACH
SEA STRAINER ASSY
CLEANING AND STORAGE KIT
OWNERS MANUAL
INSTALLATION KIT
CHARCOAL FILTER ASSY
FEED PUMP ASSY
FRESH WATER FLUSH

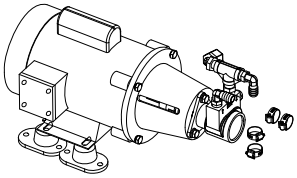




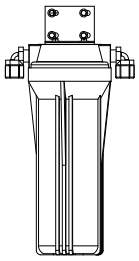
OWNER'S MANUAL



SEA STRAINER

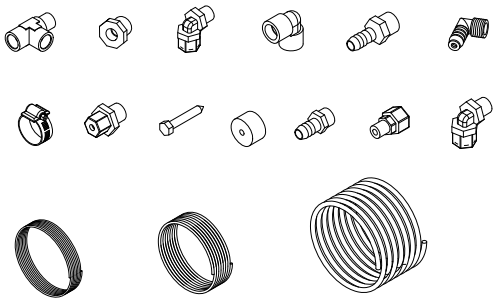


FEED PUMP

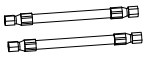


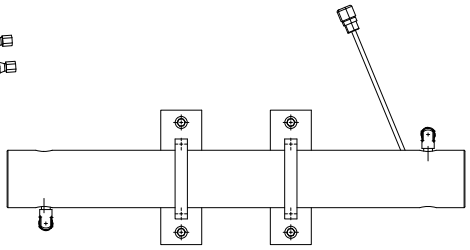
CHARCOAL FILTER ASSY

INSTALLATION KIT

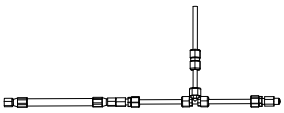


HIGH PRESSURE HOSES

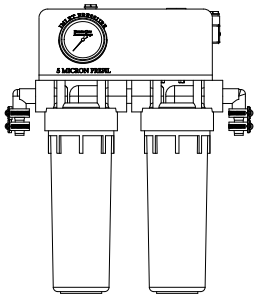




R.O. MEMBRANE AND VESSEL ASSEMBL

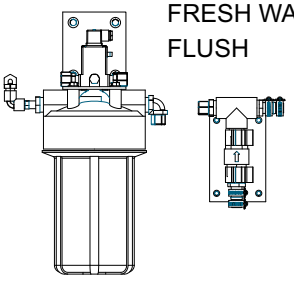


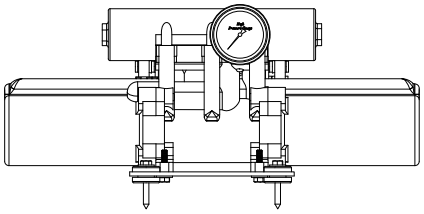
CLEANING AND STORAGE KIT UW



DUAL PREFILTRATION

FRESH WATER FLUSH

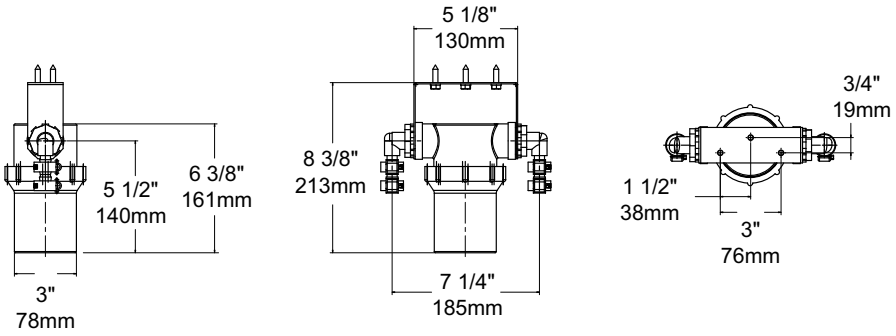




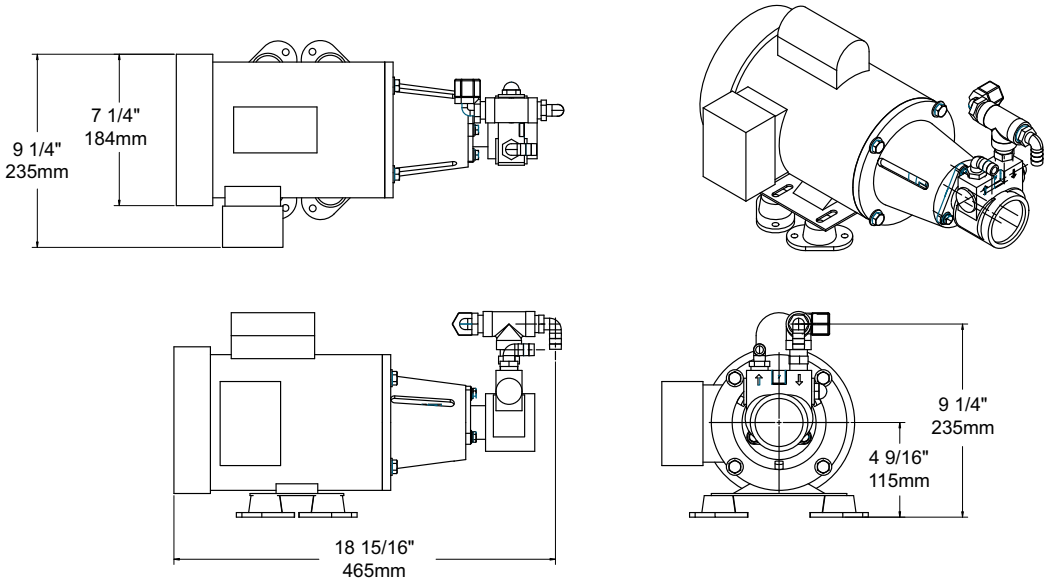
ENERTY TRANSFER DEVICE (ETD)

B. DIMENSIONS OF THE ULTRA WHISPER MODULAR SYSTEM COMPONENTS: SEA STRAINER, FEED WATER PUMP, AND OPTIONAL PLANKTON FILTER.

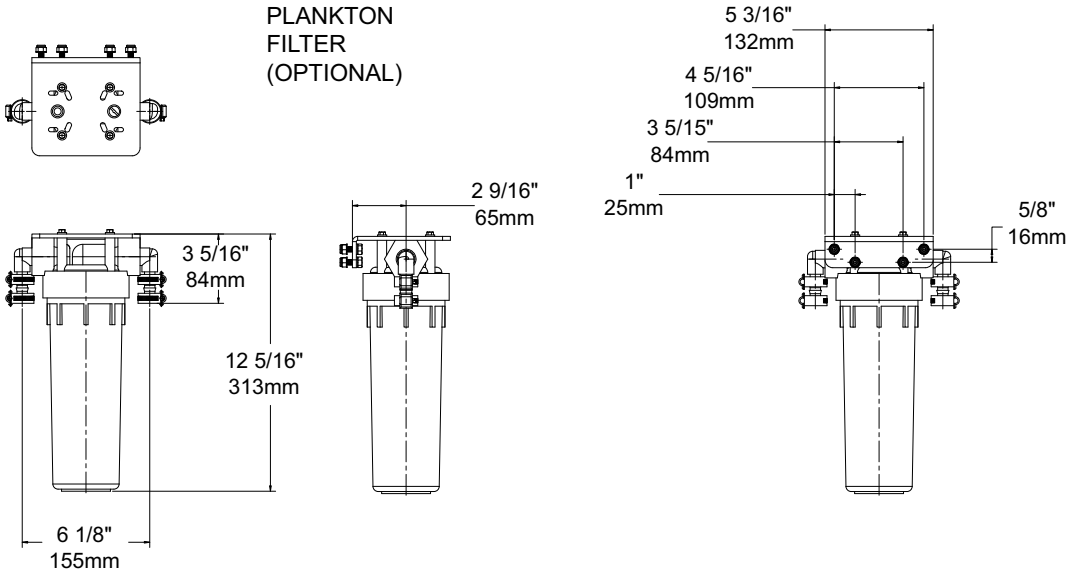
SEA STRAINER



FEED WATER PUMP



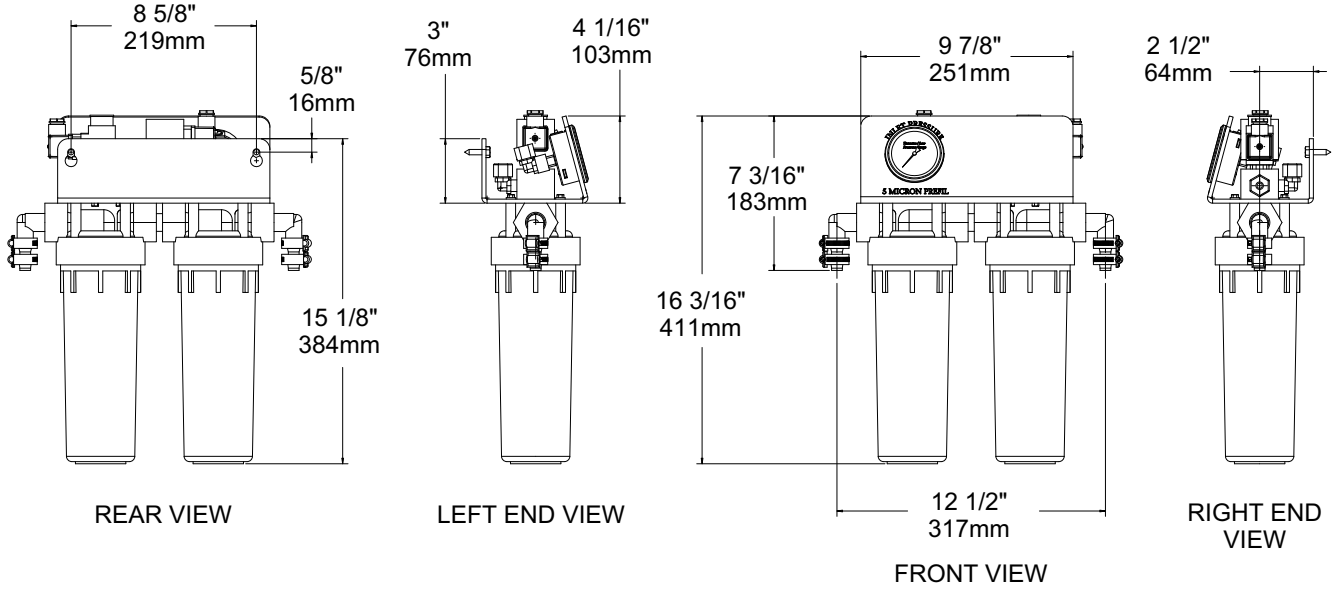
PLANKTON FILTER (OPTIONAL)



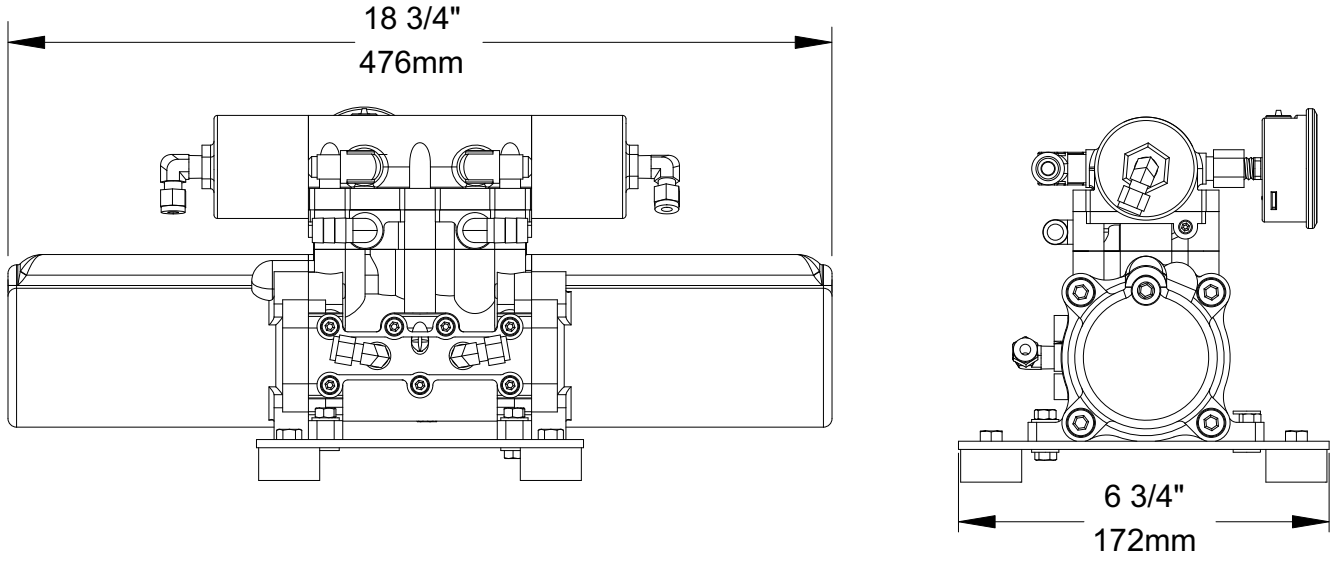
Dimensions of the Ultra Whisper Modular System Components Continued:

DUAL PREFILTER [13 & 14]

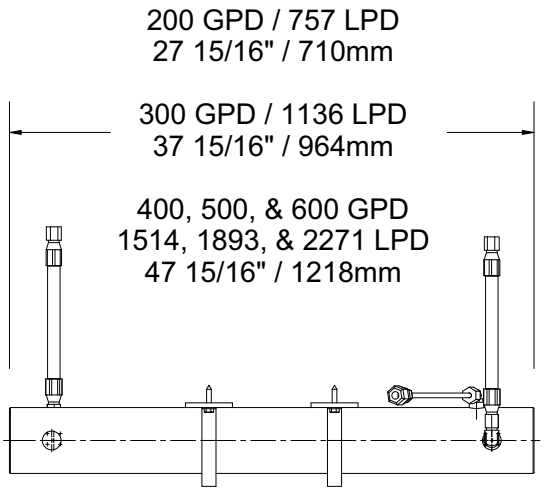
DUAL PREFILTRATION



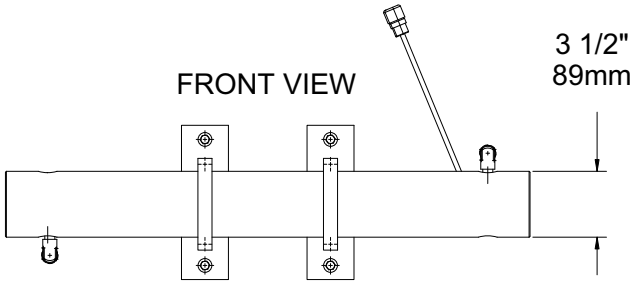
ENERGY TRANSFER DEVICE [17]

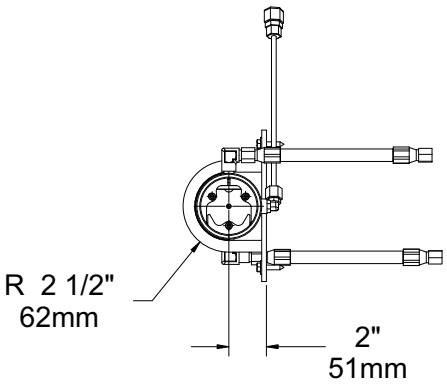


Dimensions of the Ultra Whisper Modular System Components Continued:
MEMBRANE & PRESSURE VESSEL ASSEMBLY [20]:

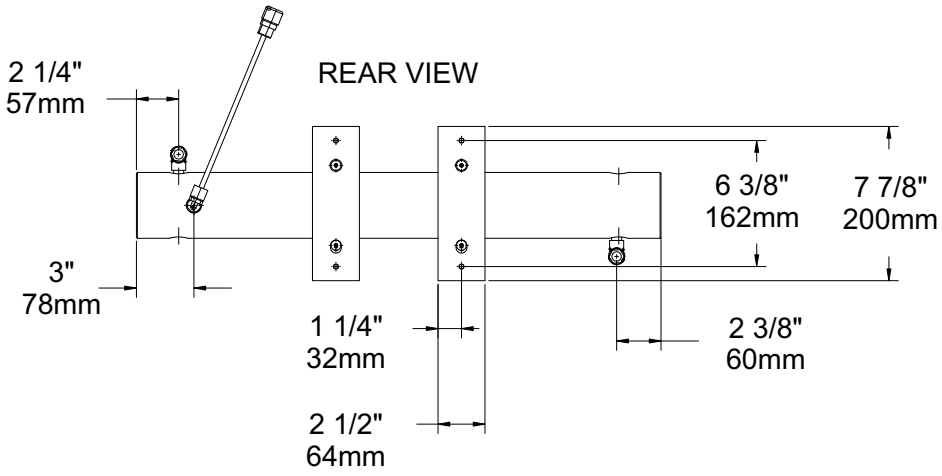


TOP VIEW

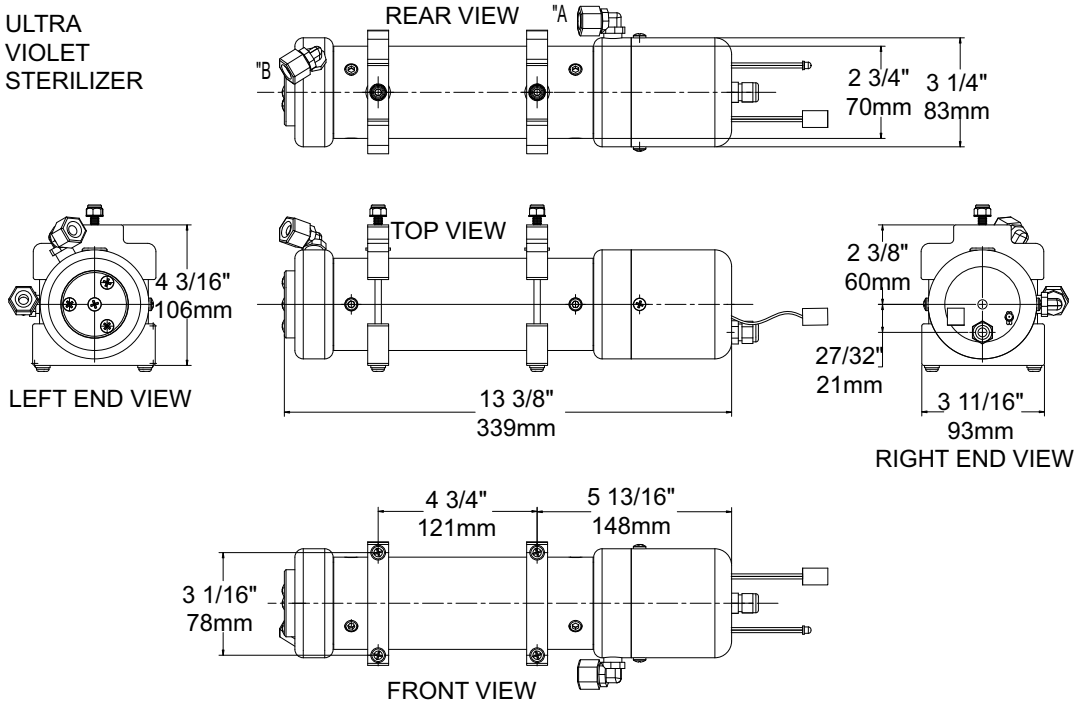


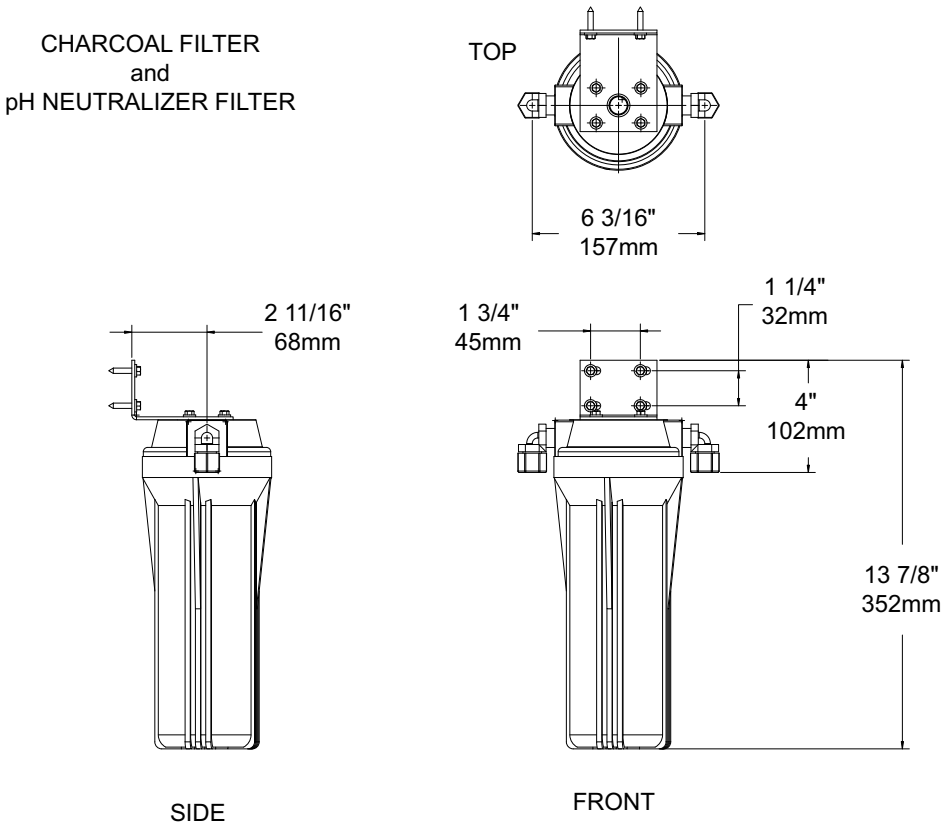


RIGHT END VIEW

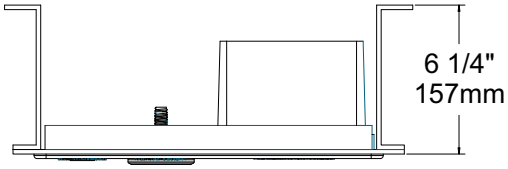


Dimensions of the Seafari Escape Modular System Components Continued:
ULTRA VIOLET STERILIZER [30], CHARCOAL POST FILTER [28], AND pH NEUTRALIZING POST FILTER [29].

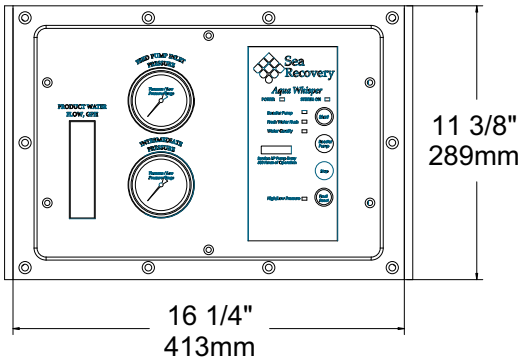


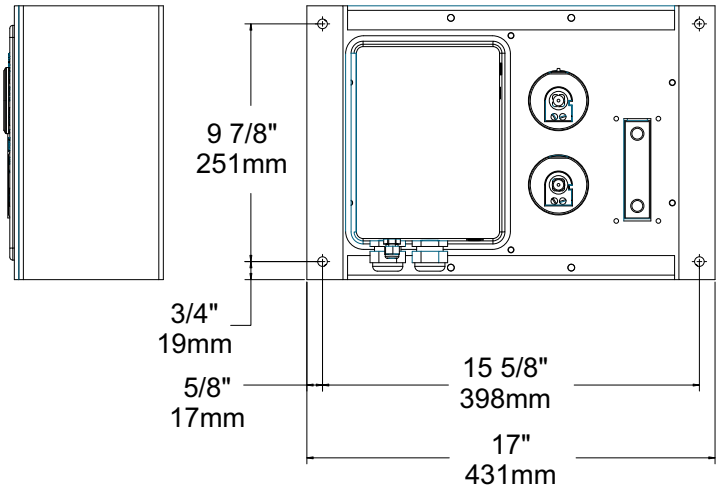


Dimensions of the Ultra Whisper Modular System Components Continued:
CONTROL PANEL.



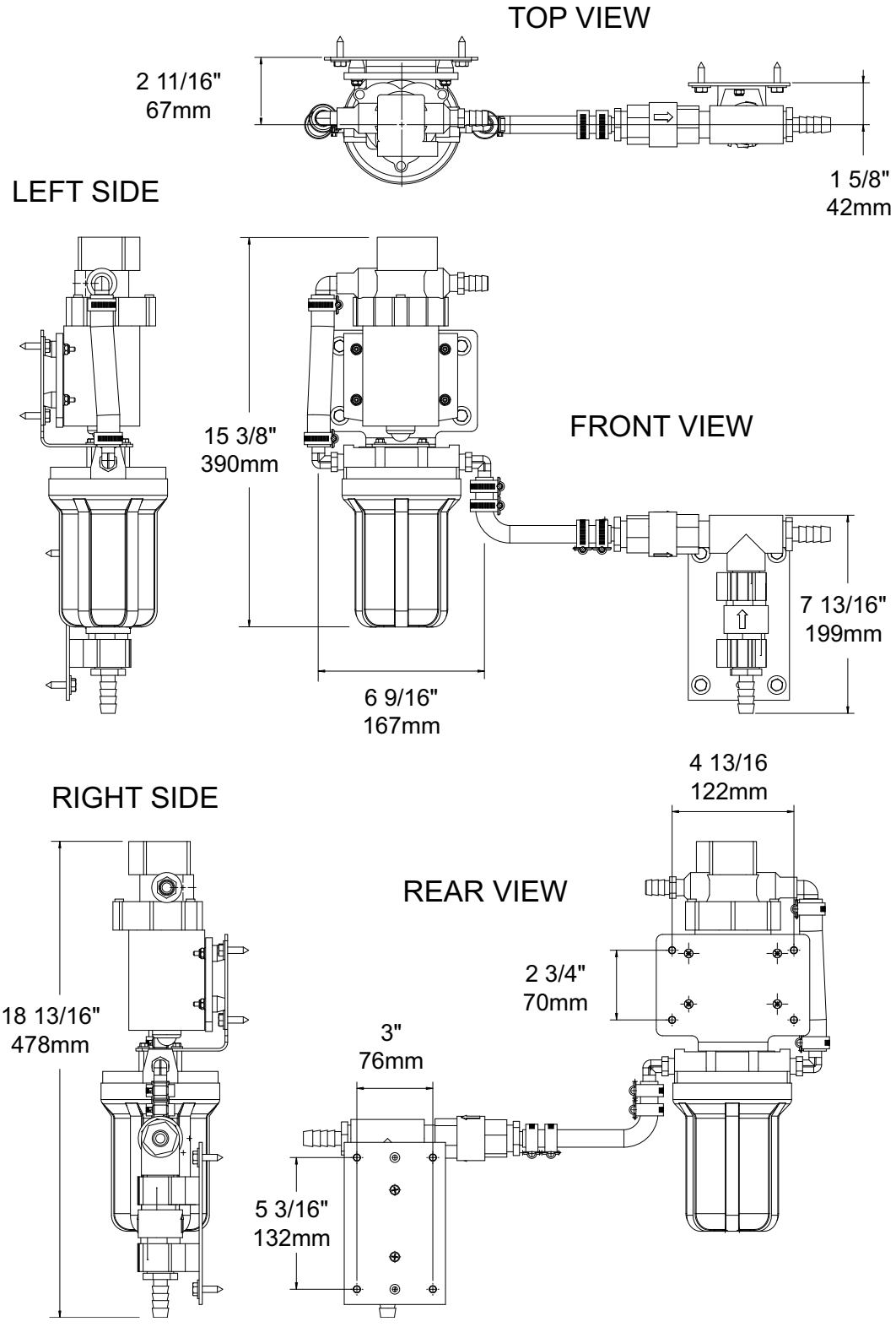
CONTROL PANEL





Dimensions of the Ultra Whisper Modular System Components Continued:
FRESH WATER FLUSH [33 - 35].

FRESH WATER FLUSH



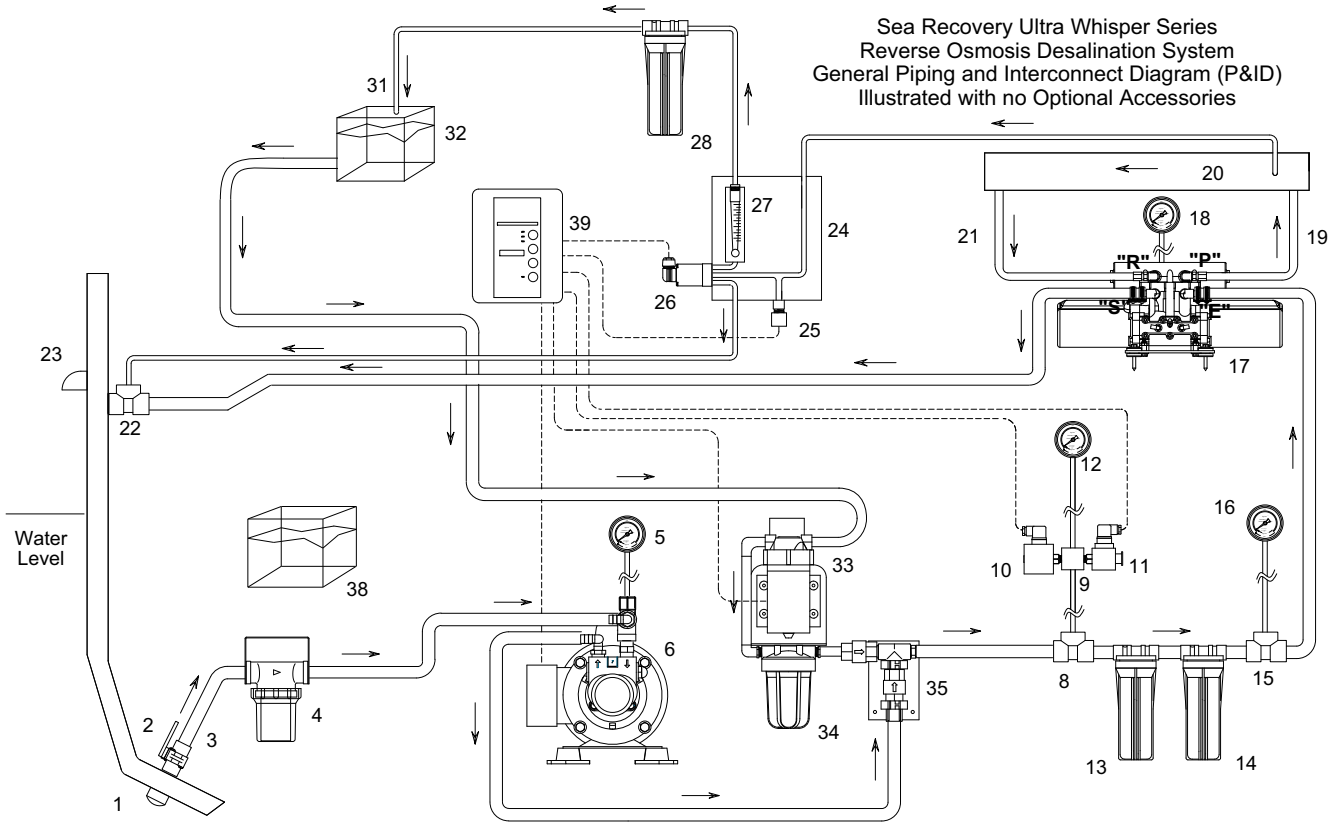
C. COMPONENT DESCRIPTIONS & PIPING AND INTERCONNECT DIAGRAM:

ALL STANDARD COMPONENTS AND ALL OPTIONAL ACCESSORIES.

** Denotes items supplied by installer
*** Denotes optional equipment

1. Inlet Thru Hull Fitting Forward Facing Scoop
2. Sea Cock Valve **
3. Feed Water Connector
4. Sea Strainer
5. Feed Pump Inlet Compound Vacuum/Pressure Gauge -30-0-60
6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
20. R.O. Membrane Element & Pressure Vessel
21. High Pressure Hose
22. Brine Discharge Tee Connector
23. Thru Hull Discharge Fitting **
24. Product Water Manifold
25. Temperature Compensated Salinity Probe
26. 3-Way Product Water Diversion Valve Electric Solenoid Actuated
27. Flow Meter, Product Water
28. Charcoal Filter
29. pH Neutralizer Filter***
30. Ultra Violet Sterilizer***
31. Potable Water Storage Tank Tube Connector
32. Potable Water Storage Tank**
33. Fresh Water Flush Pump included with the Fresh Water Flush Assembly
34. Fresh Water Flush Carbon Filter included with the Fresh Water Flush Assembly
35. Fresh Water Flush Check Valve included with the Fresh Water Flush Assembly
36. Inlet Rinse Clean Valve ***
37. Discharge Rinse Clean Valve ***
38. Rinse/Clean Solution Container **
39. Salinity Controller
40. Remote Controller ***
41. Soft Start***

ILLUSTRATED WITH NO OPTIONAL ACCESSORIES:



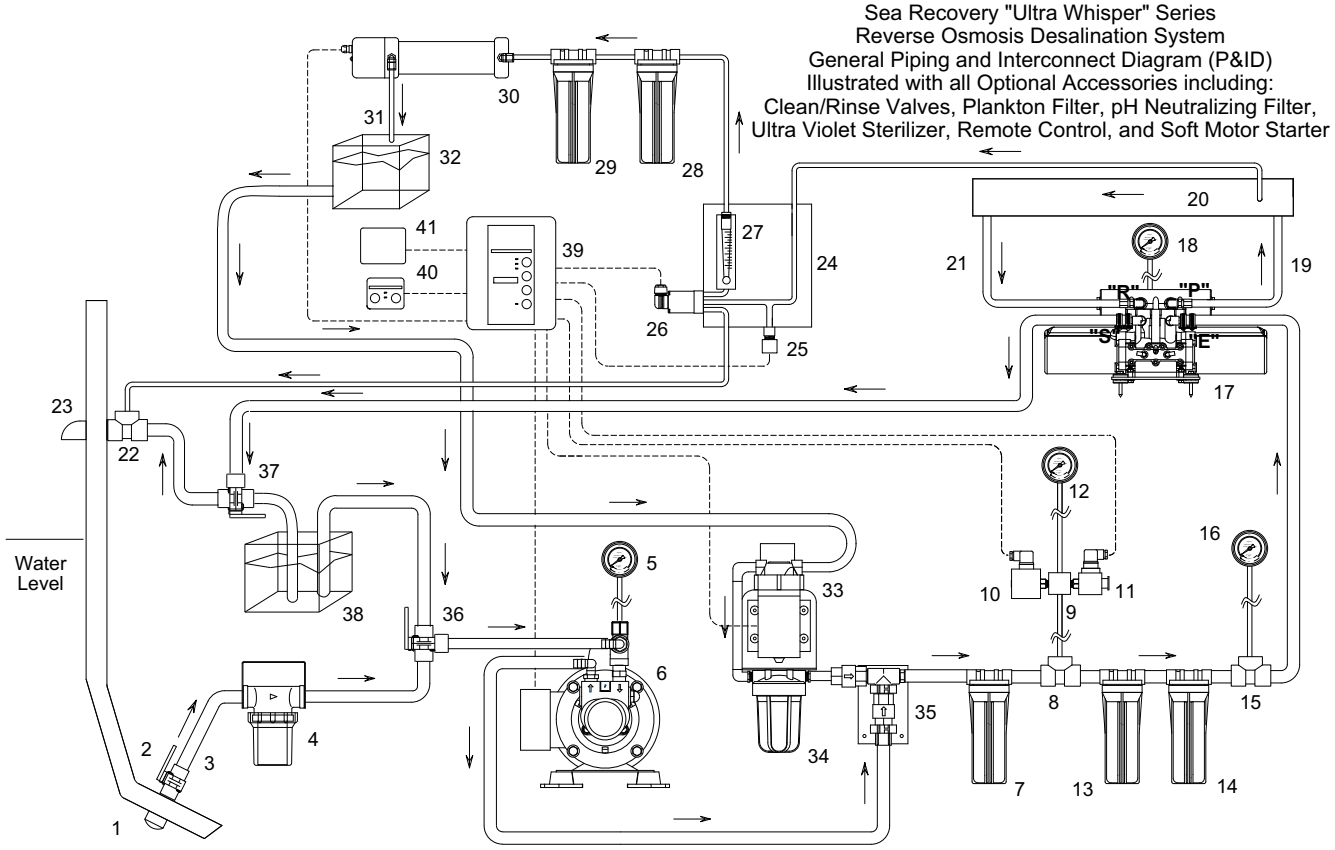
D. COMPONENT DESCRIPTIONS & PIPING AND INTERCONNECT DIAGRAM:

ALL STANDARD COMPONENTS AND ALL OPTIONAL ACCESSORIES.

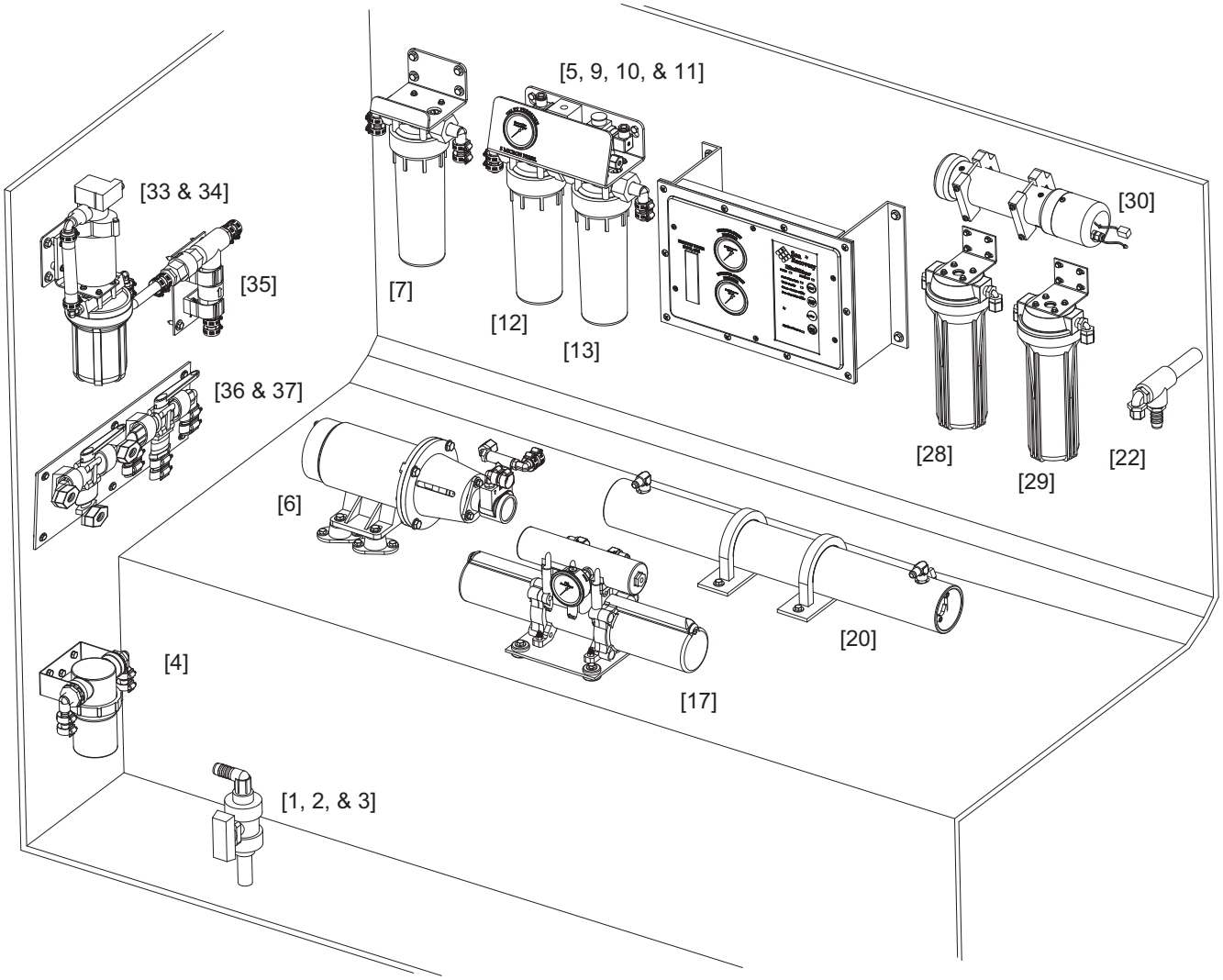
** Denotes items supplied by installer
*** Denotes optional equipment

1. Inlet Thru Hull Fitting Forward Facing Scoop
2. Sea Cock Valve **
3. Feed Water Connector
4. Sea Strainer
5. Feed Pump Inlet Compound Vacuum/Pressure Gauge -30-0-60
6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
20. R.O. Membrane Element & Pressure Vessel
21. High Pressure Hose
22. Brine Discharge Tee Connector
23. Thru Hull Discharge Fitting **
24. Product Water Manifold
25. Temperature Compensated Salinity Probe
26. 3-Way Product Water Diversion Valve Electric Solenoid Actuated
27. Flow Meter, Product Water
28. Charcoal Filter
29. pH Neutralizer Filter***
30. Ultra Violet Sterilizer***
31. Potable Water Storage Tank Tube Connector
32. Potable Water Storage Tank**
33. Fresh Water Flush Pump included with the Fresh Water Flush Assembly
34. Fresh Water Flush Carbon Filter included with the Fresh Water Flush Assembly
35. Fresh Water Flush Check Valve included with the Fresh Water Flush Assembly
36. Inlet Rinse Clean Valve ***
37. Discharge Rinse Clean Valve ***
38. Rinse/Clean Solution Container **
39. Salinity Controller
40. Remote Controller ***
41. Soft Start***

ILLUSTRATED WITH ALL OPTIONAL ACCESSORIES:



TYPICAL COMPONENT PLACEMENT AND MOUNTING ILLUSTRATION OF THE ULTRA WHISPER MODULAR STYLE SYSTEM: SHOWN WITH ALL OPTIONAL ACCESSORIES.



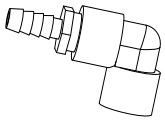
E. ULTRA WHISPER MODULAR SYSTEM & COMPONENT MOUNTING: The following steps discuss the placement and mounting of the various Ultra Whisper Modular Style system components. The illustration on the previous page shows the Ultra Whisper Modular Style System with and without options. If an Optional Accessory is not included ignore the respective step and move to the next.

CAUTION: Mounting surfaces must be flat in order to avoid warping of brackets and frames. Use appropriate shims on uneven surfaces to ensure that mounting of the system components does not cause bending or warping, and subsequent leaking or breakage. Damage to any system component due to attachment to uneven surfaces is the responsibility and liability of the installer and is not covered by the Sea Recovery warranty.

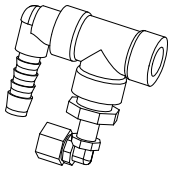
ATTACHMENT: All individual components are supplied with common mounting hardware. Some installations may require different hardware than what has been supplied.

SUPPLIED HOSE AND TUB LENGTHS: When planning out the location and mounting of the System and related components give consideration to the length of hose and tube supplied with the system.

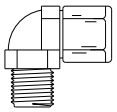
1. Attach the supplied Feed Water Connector Assembly [3], 1/2 " FNPT elbow with attached 1/2" hose barb, to the boats Sea Cock 1/4 turn ball Valve [2]. Position the Outlet Hose Barb towards the Sea Strainer Inlet [4].



2. Attach the supplied Brine Discharge Tee Connector [22] Assembly, 1/2 " FNPT elbow with attached 1/4" Tube Fitting, to the boats Over board Discharge Fitting [23]. Position the Inlet Tube Fitting towards the System Brine Discharge.

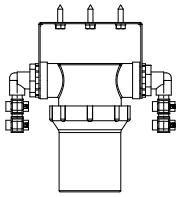


3. Attach the supplied Potable Water Storage Tank Tube Connector [31] 1/4" MNPT x 1/4" Tube Fitting to the 1/4" FNPT tap at the Potable Water Tank [32]. The Product Water line may also be attached to the Potable Water Storage Tank Fill Line rather than drilling and tapping into the top of the tank itself.

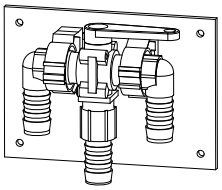


CAUTION: Do not use water tank diversion valves in this line to fill more than one tank. If it is absolutely necessary to use a diversion valve to fill more than one tank use only a "never closed" type ball valve which allows water to flow regardless of the valve handle position. If a valve in this line is closed during operation extensive damage to the system will occur. Damage caused to the system due to installation of valves in the product water line is the responsibility and liability of the installer and is not covered by the Sea Recovery warranty.

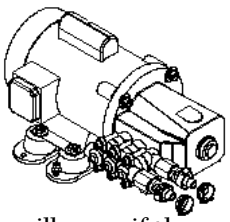
4. The Sea Strainer [4] is mounted in an accessible location below water level between the Inlet Sea Cock Valve [2] and Feed Pump [6]. Allow at least 4 inches (10 cm) of clearance below the bowl to access the mesh screen for cleaning or replacement.



5. The ***Inlet Rinse Clean Valve [36] is mounted in an accessible location below water level between the Sea Strainer [4] Outlet and the ***Fresh Water Flush Check Valve [35] Inlet if used, otherwise the Feed Pump [6] Inlet.



6. The Feed Pump [6] is mounted at or below water level to assist the pump in priming. Mount the Feed Pump between the Sea Strainer [4] Outlet and the ***Plankton Filter [7] Inlet if used, otherwise the Prefilter [13] Inlet.

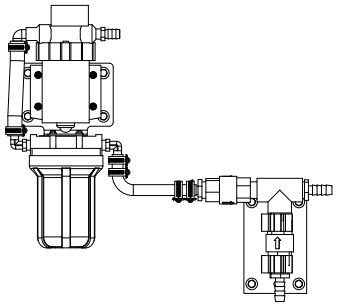


It is best to mount the Feed Pump below water level to assist priming, and in an accessible location to allow access for maintenance.

CAUTION: Do not mount the pump head vertically above the motor else motor damage will occur if the pump or it's fittings should develop a leak. Eventually, from use the pump seal will wear and leak requiring replacement. Water damage to the motor, if mounted improperly, is the responsibility and liability of the installer and not covered by Sea Recovery warranty.

CAUTION: Mounting of the Feed Pump above water level will cause a vacuum at the inlet of the pump and will result in premature wear resulting from cavitation. Improper installation of the Feed Pump causing excessive vacuum at the inlet of the pump resulting in cavitation and premature wear is the responsibility and liability of the installer and not covered by the Sea Recovery warranty.

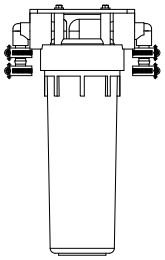
7. The Fresh Water Flush [34] Filter Canister with attached Flush Pump [33] is mounted in an accessible location to a vertical surface between an UN-PRESSURIZED line in the Potable Water system and the Feed Pump [6] Outlet. Allow at least 4 inches (10 cm)of clearance below the bowl for element replacement.



CAUTION: Potable water may spill during filter element replacing. Therefore, Do Not mount the prefilter above any electrical or electronic component

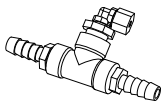
8. The Fresh Water Flush Check Valve [35] Assembly (lower right component in the above illustration) is mounted vertically in close proximity to the Feed Water Pump [6] Outlet and Plankton Filter [7] Inlet or 25 micron Prefilter Inlet [13].

9. The ***Plankton Filter [7] is mounted in an accessible location to a vertical surface between the Feed Pump [6] Outlet and the Pre Filter [13] Inlet which is mounted to the System Frame. Allow at least 4 inches (10 cm) of clearance below the bowl for element replacement.

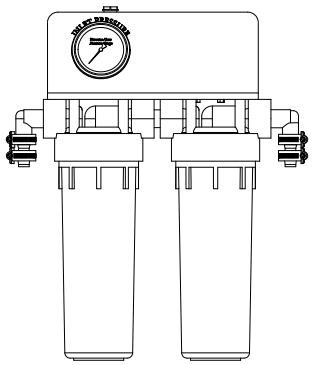


CAUTION: Feed water may spill during filter element replacing. Therefore, Do Not mount the prefilter above any electrical or electronic component.

10. The Inline Tee Pressure Pick-Up [8] will be connected in line between the Feed Pump [6] Outlet or Plankton Filter [7] Outlet and the 25 micron Prefilter [13] Inlet. Allow sufficient space when mounting these components.



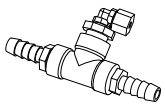
11. The Pre-filters [13 & 14] are mounted in an accessible location to a vertical surface between the Plankton Filter [7] outlet and the Energy Transfer Device [17]. Allow minimum 4 inches (10 cm) below the bowl for filter element removal.



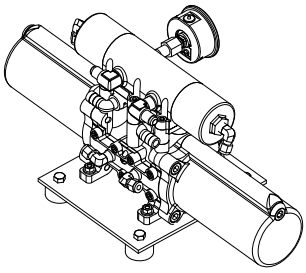
CAUTION: Feed water may spill during filter element replacing. Therefore, Do Not mount the prefilter above any electrical or electronic component

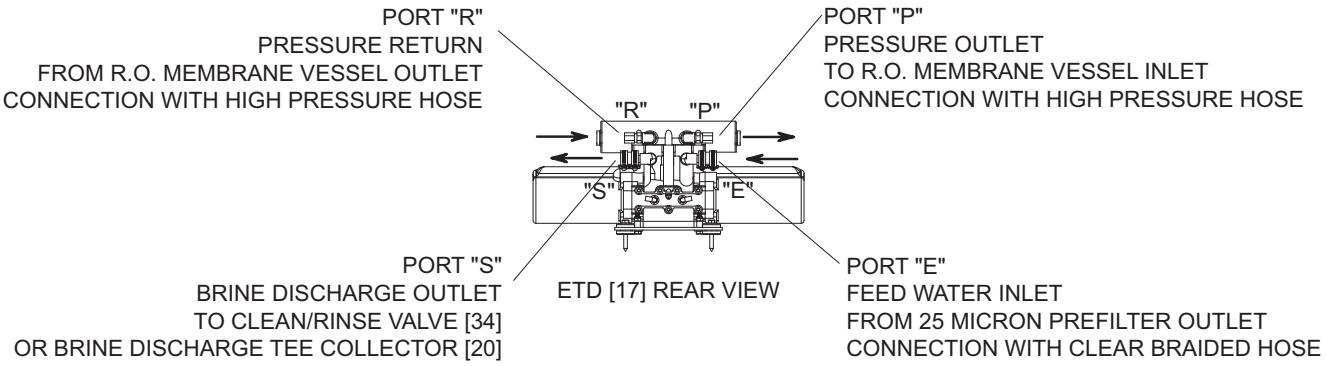
Note: The Vacuum/Pressure gauge shown at the Prefilter Bracket is the Feed Water Pump Inlet Vacuum/Pressure Gauge [5]. The Pressure Manifold [9], Low Pressure Switch [10] and High Pressure Switch [11] are located behind and mounted to the prefilter bracket.

12. The Inline Tee Pressure Pick-Up [15] will be connected in line between the 5 micron Prefilter Outlet [14] and the ETD [17] Inlet. Allow sufficient space when mounting these components.

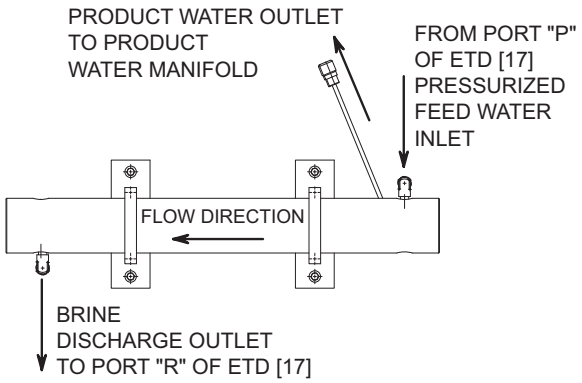


13. The Energy Transfer Device [17] is mounted to a flat surface between the 5 micron Prefilter [14] outlet and the R.O. Membrane Vessel [20] inlet. Attachment of the Energy Transfer Device to the R.O. Membrane Vessel is done using the two supplied 6 foot (1.82 meter) long High Pressure Hoses [19 & 21]. Ensure that the two high pressure hoses will easily connect between the Energy Transfer Device [17] and the R.O. Membrane Vessel [20]. Longer, or shorter, High Pressure Hoses may be ordered from Sea Recovery.

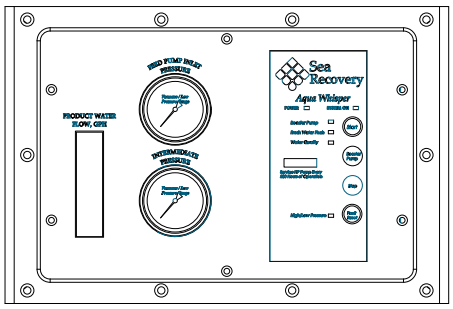




12. The Reverse Osmosis Membrane and Pressure Vessel Assembly [20] is mounted horizontally to any surface. If the assembly is mounted vertically ensure that the inlet is at the bottom and the outlet is at the top. This ensures that any air present in the vessel will be displaced during operation. Attachment of the R.O. Membrane Vessel [20] to the Energy Transfer Device [17] is done using the two supplied 6 foot long High Pressure Hoses [19 & 21]. Ensure that the two high pressure hoses will easily connect between the Energy Transfer Device [17] and the R.O. Membrane Vessel [20].

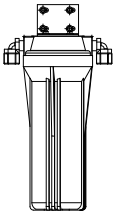


13. The System Control Panel is mounted to a flat vertical surface in a location that allows ease of access to operate the system. Water flows through the control panel. Do not mount the Control Panel above any electrical or electronic component.

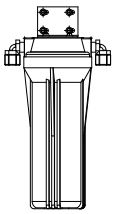


14. The Charcoal Filter [28] is mounted in an accessible location to a vertical bulkhead. Allow minimum 4 inches (10 cm) below the bowl for filter element removal.

CAUTION: Product water may spill during filter element replacing. Therefore, Do Not mount the charcoal filter above any electrical or electronic component

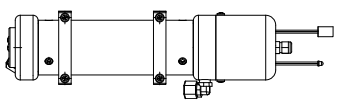


15. The ***pH Neutralizing Filter [29] is mounted in an accessible location to a vertical bulkhead after the Charcoal Filter [28] and prior to the U.V. Sterilizer [30].

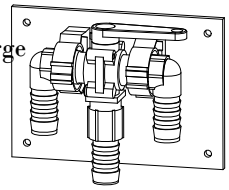


CAUTION: Product water may spill during filter element replacing. Therefore, Do Not mount the pH Neutralizing filter above any electrical or electronic component

16. The ***UV Sterilizer [30] is mounted to a bulkhead directly after the Charcoal Filter [28], or after the pH Neutralizing Filter [29] if used. The U.V. Sterilizer should be mounted vertically with the electrical fitting on the top. The U.V. should be plumbed with the inlet on the bottom and the outlet on top. Horizontal mounting is acceptable with outlet port on top (pointed up) to displace air. Do Not mount the U.V. Sterilizer with the electrical fitting on the bottom. Refer to Page 66 of this section for installation details.

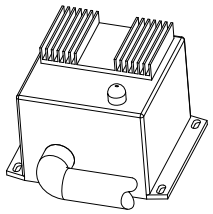


15. The ***Discharge Rinse Clean Valve [37] is mounted in an accessible location between the System Brine Discharge Outlet located at the System Control Panel and the Brine Discharge Thru-Hull Fitting [22]. Mount this valve in an accessible location.

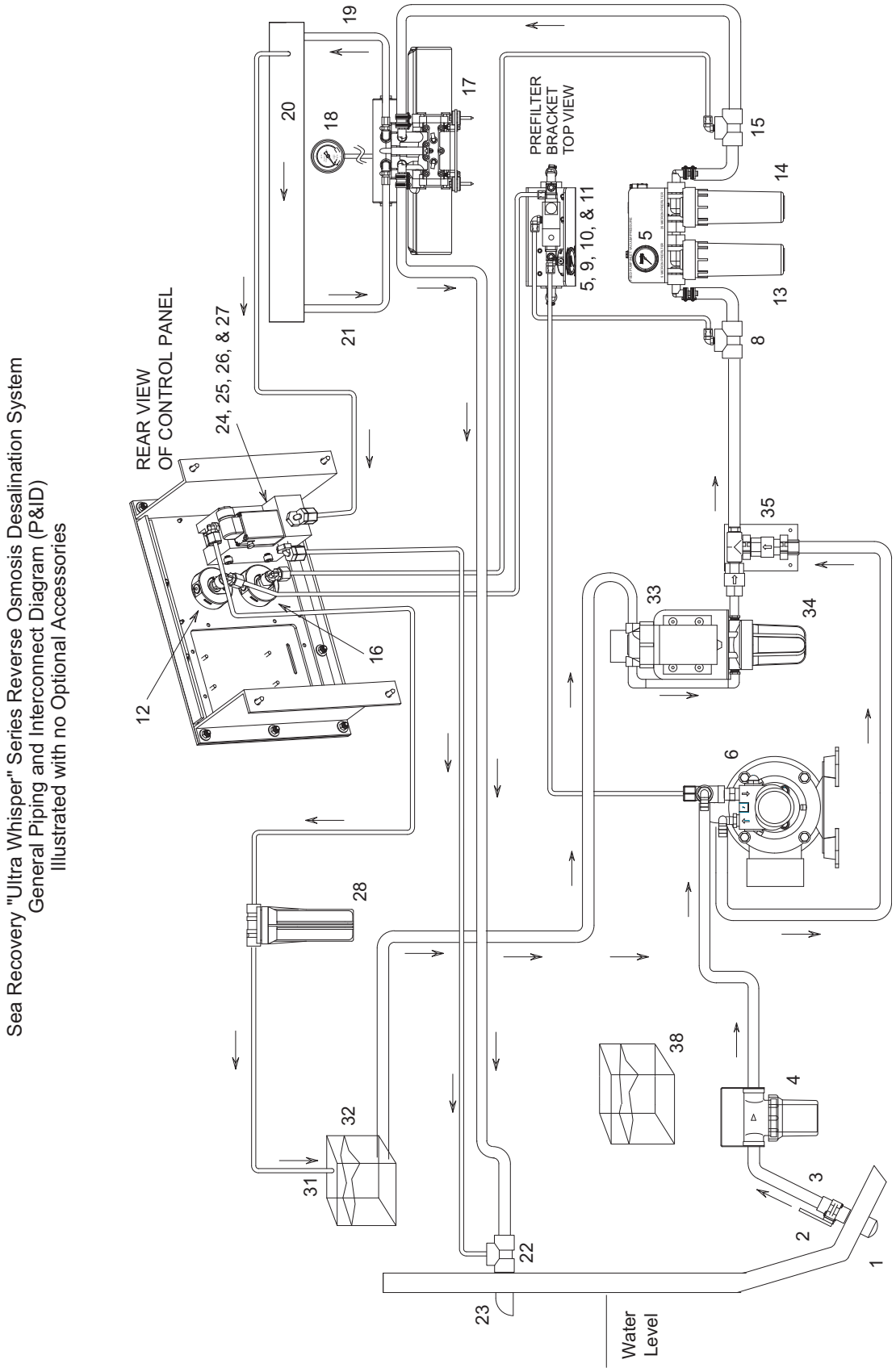


16. The ***Remote Controller [40] is mounted to a flat surface with appropriate cut out for flush mounting to the flat surface. Mount the Remote Controller in a protected area away from water spray. Refer to dimensional drawings in this Section 2.

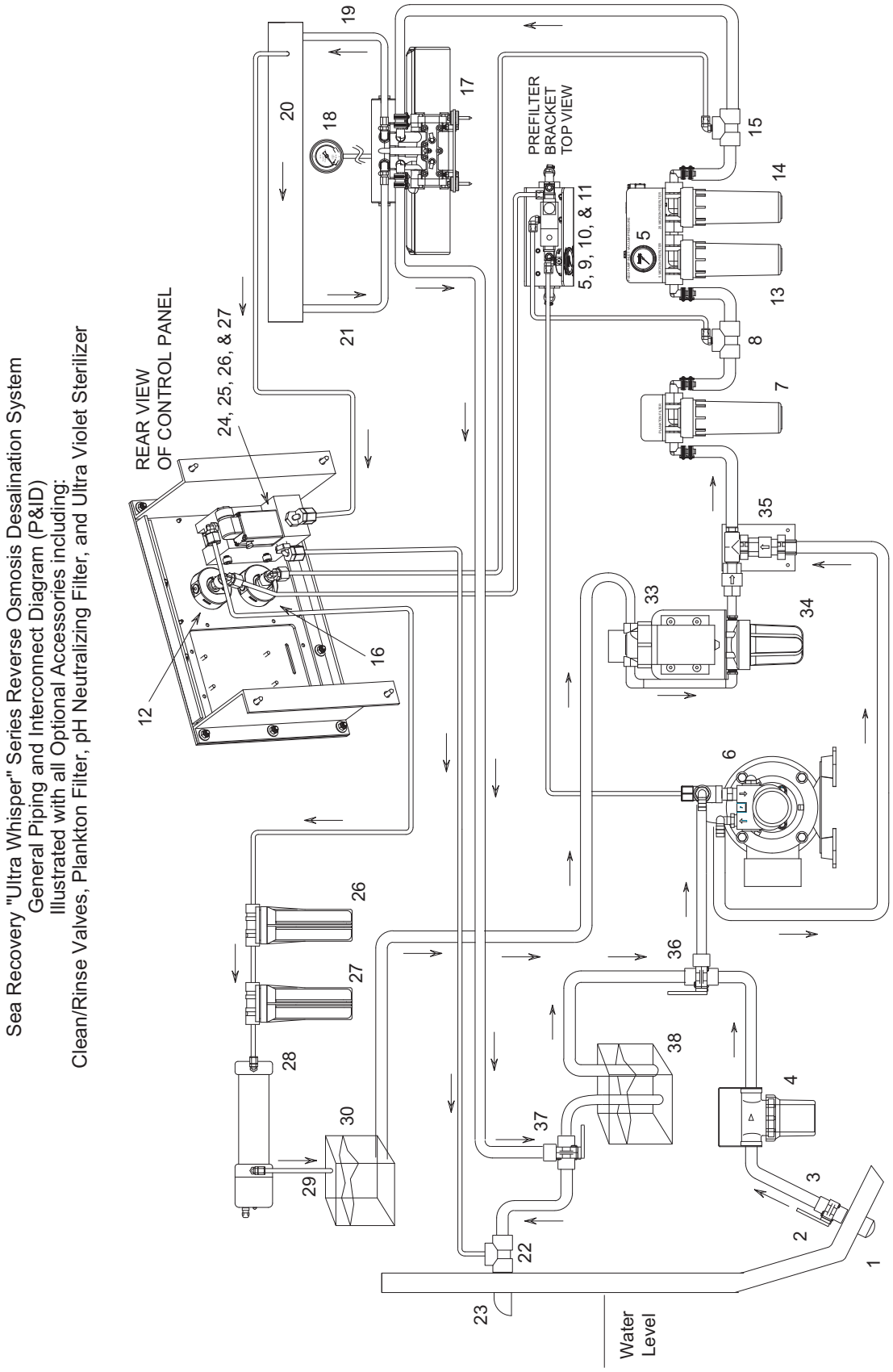
17. The Soft Start [41] is mounted in close proximity to the System Salinity Controller.



F.1 CONNECTING PLUMBING (HOSES & TUBING) FOR THE ULTRA WHISPER COMPACT SYSTEM WITH NO OPTIONS ILLUSTRATED:



F.2 CONNECTING PLUMBING (HOSES & TUBING) FOR THE ULTRA WHISPER COMPACT SYSTEM WITH ALL OPTIONS ILLUSTRATED:



G. Connect all required hoses and tubes: (** = Supplied by Installer or Owner; *** = Optional Accessory.)

1. Connect Feed and Fresh Water Flush Lines with the supplied 20 feet (6 meters) of 1/2" (12.7 mm) I.D. Inlet Suction Hose. Secure the hose with two hose clamps offset 180 degrees at each fitting. Ignore any Optional Accessory that is not to be installed and move to the next component. Refer to Piping and Interconnect diagrams on pages 42 and 43:

Step	from Outlet of	to Inlet of
1.	Feed Water Connector [3]	Sea Strainer [4]
2.	Sea Strainer [4]	***Inlet 3-Way Clean/Rinse Valve [36] (left or right port)
3.	**Rinse/Clean bucket or container [38]	***Inlet 3-way Clean/Rinse Valve [36] (left or right port)
4.	***Inlet 3-way Clean/Rinse Valve [36] (center port)	Feed Pump[6]
5.	Feed Pump [6]	Fresh Water Flush Check Valve [35]
6.	Fresh Water Flush Check Valve [35]	***Plankton Filter [7]
7.	***Plankton Filter [7]	Inline Pressure Pick-Up Tee [8]
8.	Inline Pressure Pick-Up Tee [8]	Prefilter 25 micron [13]
9.	Prefilter 5 micron [14]	Inline Pressure Pick-Up Tee [15]
10.	Inline Pressure Pick-Up Tee [15]	ETD [17] port "E" Feed Water Inlet refer to illustration on page 46
11.	**Unpressurized Potable Water Tank line [32]	Fresh Water Flush Pressure Pump [33]
12.	Fresh Water Flush Carbon Filter [34]	Fresh Water Flush Check Valve [35]

2. Connect Brine Discharge line with the supplied 20 feet (6 meters) of 3/8" (9.5 mm) O.D. Brine Discharge Tubing:

Step	from Outlet of	to Inlet of
1.	ETD [17] Port "S" Brine Discharge Outlet refer to illustration on page 46	***Discharge 3-Way Rinse Clean Valve [37] (center port)
2.	***Discharge 3-Way Rinse Clean Valve [37] (left or right port)	**Rinse Clean bucket or container [38]
3.	***Discharge 3-Way Rinse Clean Valve [37] (left or right port)	Brine Discharge Connector [22]

3. Connect Product Water line with the supplied 30 feet (9.14 meters) of 3/8" (9.52 mm) O.D. nylon tubing:

Step	from Outlet of	to Inlet of
1.	Membrane Product Water connector [20]	Product Water Manifold [24] Inlet refer to illustration on page 47
1.	Product Water Manifold [24] Port "B" Unpotable refer to illustration on page 47	Brine Discharge Tee [21]
2.	Product Water Manifold [24] Port "A" Potable refer to illustration on page 47	Charcoal Filter [28]
3.	Charcoal Filter [28]	***pH Neutralizing Filter [29]
4.	***pH Neutralizing Filter [29]	***U.V. Sterilizer [30]
5.	***U.V. Sterilizer [30]	**Potable Water Tank Connector [31]

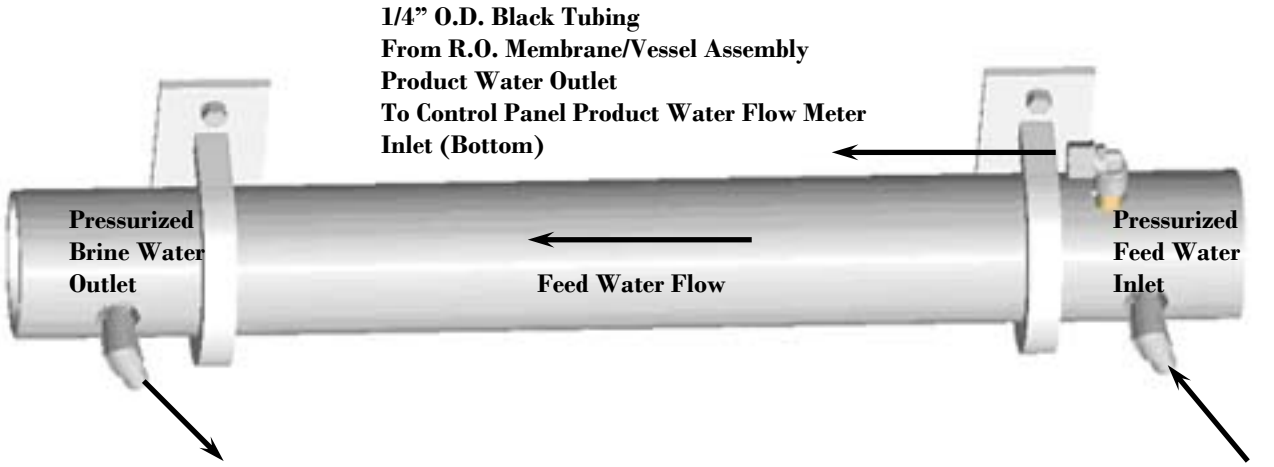
4. Connect Pressure pick-up with Pressure Gauges with the supplied 20 feet (6 meters) of 1/4" (6.35 mm) O.D. nylon tubing:

Step	from Outlet of	to Inlet of
1.	Feed Pump [6] Pressure Pick Up Tee	Inlet Compound Vacuum/Pressure Gauge [5] located at the Prefilter [13 & 14] bracket' pressure gauge -30-0-60
2.	Inline Pressure Pick-Up Tee [8]	Pressure Switch Manifold [9] located at the Prefilter [13 & 14] bracket
3.	Pressure Switch Manifold [9]	Prefilter Inlet Pressure Gauge [12] located at the Control Panel top pressure gauge 0-300 PSI
4.	Inline Pressure Pick-Up Tee [15]	Prefilter Outlet Pressure Gauge [16] located at the Control Panel bottom pressure gauge 0-300 PSI

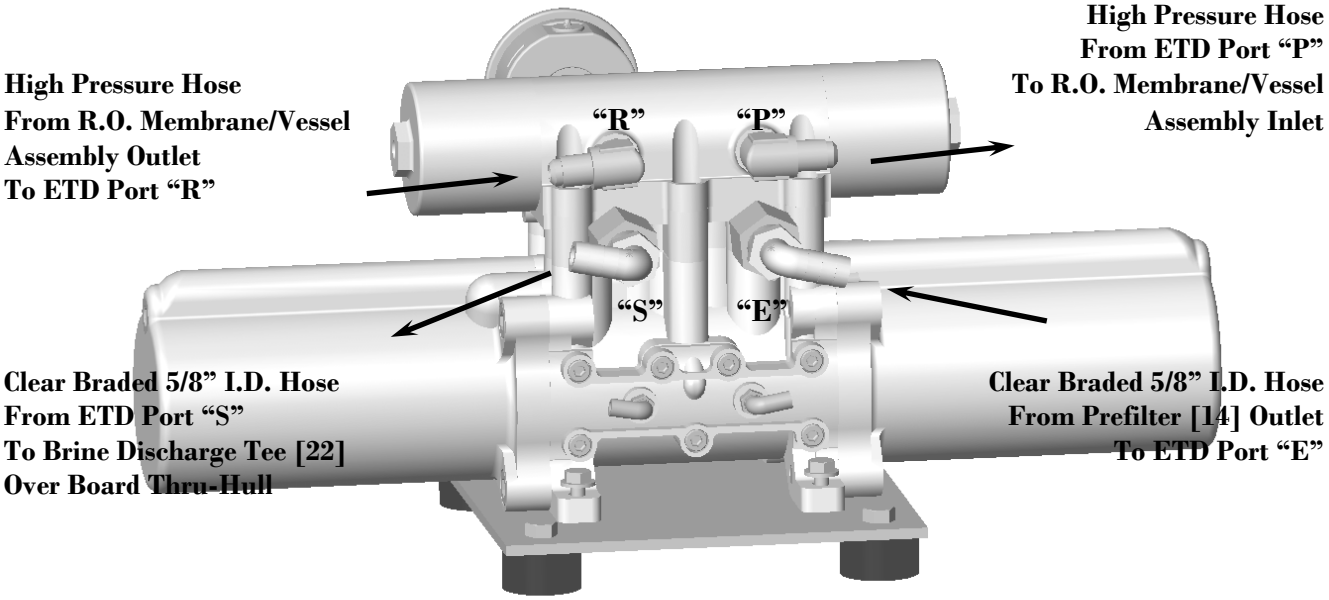
5. Connect High Pressure Hoses to and from the R.O. Membrane Pressure Vessel and the ETD using the two (2) supplied High Pressure Hoses. Refer to illustrations below.

Step	from Outlet of	to Inlet of
1.	ETD [17] Port "P" Pressure Outlet	R.O. Membrane Pressure Vessel [20]
2.	R.O. Membrane Pressure Vessel [20]	ETD [17] Port "R" Pressure Return

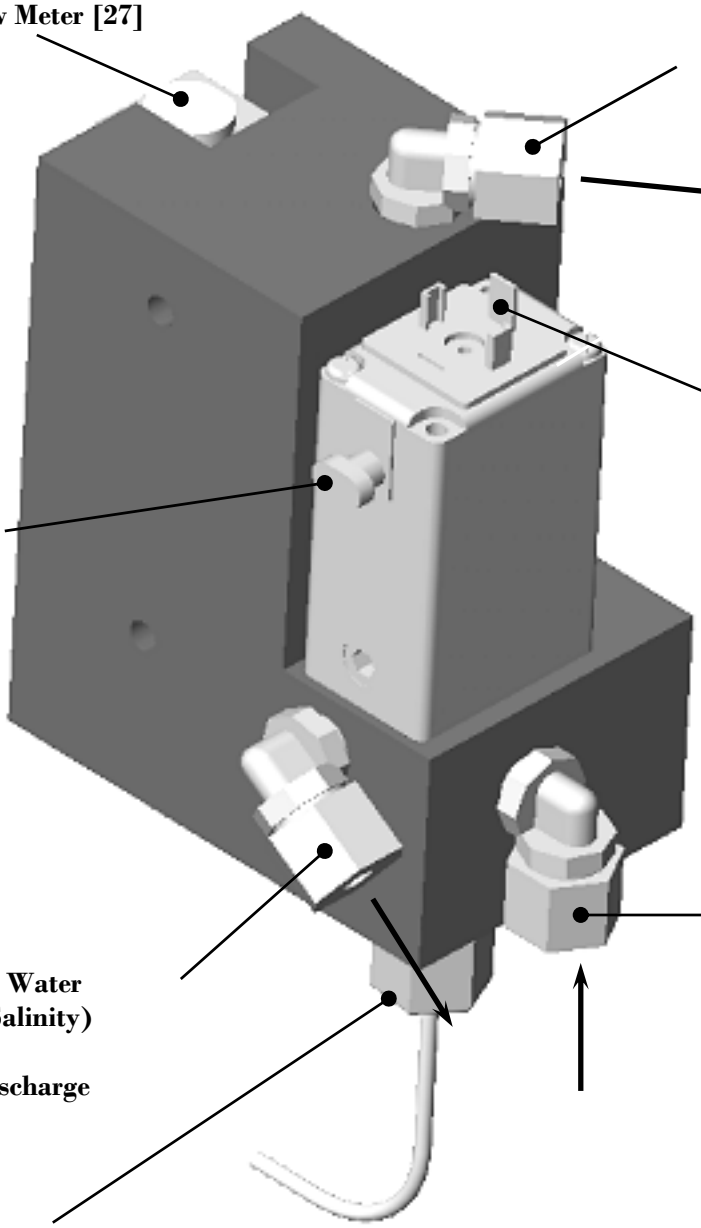
MEMBRANE/VESSEL ASSEMBLY [20] CONNECTIONS:



ENERGY TRANSFER DEVICE (ETD) [17] CONNECTIONS



PRODUCT WATER MANIFOLD [24] CONNECTIONS:



H. Electrical Connections Refer To Section 8 of this Owner's Manual

UV LIGHT INSTALLATION

The SP Series UV unit is shipped with the UV lamp, quartz sleeve, fittings, and O-rings and need to be assembled before the UV unit can be used.

1. Install the UV unit in a sheltered, well ventilated area.
2. Install the UV unit as close as possible to the point-of-use to avoid potential contamination discharge from pipes, fittings, etc.
3. The UV unit should be mounted on stable support to avoid straining or warping. Allow sufficient clearance around the unit for servicing.
4. Verify the location is free from vibration.
5. All UV units are rated for maximum operating pressure at 50psig (8.24 bar).
6. The UV unit must be properly grounded for safe and proper operation. Failure to properly ground the UV unit automatically voids all unit warranty.
7. Line voltage must be within 10.56V to 16.50V. Voltage outside the range will compromise the performance of the UV unit.

Plumbing Requirements

All piping, tubes and hoses leading to the UV unit connection points must be leak-free before the UV unit can be installed.

NOTE! The UV unit may be installed horizontally or vertically. For vertical installation, make sure the inlet port is positioned at the bottom.

Installation Procedure

NOTE! Do not assemble or install damaged parts. Quartz sleeve and UV lamp are fragile and must be handled with care.

Install Fittings

Perform this procedure to prepare the UV unit for installation.

1. Inspect each port and fitting to ensure threads are free of dirt, burrs, and excessive nicks. If threads are badly nicked, replace the fitting.
2. Wrap ¼" wide PTFE tape 2 to 3 turns counter-clockwise around the male threads of the ¼" fitting. Do not wrap tape around the first thread.
3. Screw the fitting into cylinder ports to finger tight position to achieve desired alignment.
4. Do not back-off fitting. Do not over-tighten fitting. Over-tightening could strip the fitting threads and cause leak.

Install Quartz Sleeve

Perform this procedure only when water piping for UV unit is in place and ready for service.

1. Visually inspect quartz sleeve for cracks and damages.
2. Remove the four screws holding the ballast box cover and remove the cover.

3. Remove the rubber boot and pull out the 4-point lamp connector.
4. Remove the compression nuts.
5. Insert the close-end of the quartz sleeve into the cylinder through the ballast box pass-thru.
6. Allowing ½" of the quartz sleeve to expose on the viewport pass-thru.
7. Lubricate the tips of the quartz sleeve with clean water and insert new O-ring. Ensure the O-ring has all-round contact with the cylinder pass-thru.
8. Tighten the compression nut while making sure the nut does not contact the quartz sleeve. Adjust O-ring position as necessary. The compression nut should be snug and tight, not over-torque.
9. Repeat Step 7 & 8 on the ballast box compression nut.

Connect Plumbing

Tube or hose ends must be cut squared and clean; must have no rough edges. The quick fit elbow fitting has a C-clamp that will lock the tube in place once inserted.

1. Insert the supply pipe into one cylinder port and label the port "Inlet".
2. Insert the temporary pipe into the other cylinder port to direct water into a container.
3. Slowly fill the cylinder with water and flush cylinder for 1 minute.
4. Remove temporary pipe and insert the return pipe into the cylinder port and label the port "Outlet".
5. Slowly pressurize the UV unit by filling the cylinder with water while checking for leaks.
6. If leaks are found on the compression nuts, depressurize the unit and slightly tighten the leaking compression nut.
7. Retest until a leak-free installation is verified.
8. Once UV unit is leak-free, the quartz sleeve installation is complete and the UV lamp can be installed.

NOTE! To remove tube from fitting, first remove the C-clamp then push fitting sleeve down. Once the fitting sleeve is down, pull the tube out of the fitting.

Install Ultraviolet Lamp

Perform this procedure only after the quartz sleeve installation and leak-tests are completed successfully

1. Connect the UV lamp to the 4-point receptacle. If the lamp is not installed properly, lamp breakage will occur.
2. Insert lamp into quartz sleeve through compression nut pass-thu.
3. Install rubber boot over compression nut.
4. Connect unit power cable to power source.
5. Tighten the 4 screws to secure ballast box cover.
6. Turn ON the power to the unit.
7. Verify UV lamp operation from the viewport.
8. Allow one minute for the UV lamp to warm up prior to flowing water through the UV unit.

CAUTION! Use the viewport to verify the proper operation of the UV lamp.

CAUTION! Rapid successive cycling of the power to the ballast can cause premature failure of the unit.

CAUTION! Prior to energizing the lamp, make sure there is no water leaking from the quartz sleeve compression nuts.

Mounting the Unit

Once the UV unit is assembled and tested successfully, it can be mounted onto its permanent operational location. The unit must be mounted in a manner that will prevent excessive vibration and warping which will damage the quartz sleeve.

Operational Guidelines

a) Release the pressure in the UV treatment chamber before breaking the compression nut seals.

b) Disconnect all power to the UV unit before servicing.

c) Do not allow the inlet water temperature to drop below 35ºF (2ºC).

d) Do not allow the flow rate to exceed 2 GPM.

e) Do not cycle the UV unit more than 3 "ON/OFF" cycles in a 24-hour period.

f) Ensure all plumbing connections are tightly sealed before applying pressure.

g) Before connecting the return tube, flush the unit to rinse out any debris left from the installation process.

WARNING! UV LIGHT EXPOSURE CAN SEVERELY BURN AND DAMAGE EYES AND SKIN.

WARNING! DO NOT look at the blue UV light. DO NOT operate the UV lamp outside of the UV treatment chamber.

CAUTION! The unit operates on high voltage and must be serviced by qualified personnel only.

CAUTION! Standard flow rate are based on water temperature 35ºF to 100ºF. If the inlet water temperature exceeds 100ºF (38ºC), please contact your local CSR.

CAUTION! Cycling more than 3 cycles will reduce the end-of-life (EOL) output and/or cause premature lamp failure.

Section 3

New System First Time Start Up Commissioning

Notes: _____

SYSTEM COMMISSIONING NOTES

The Commissioning instructions must be carried out for initial start-up of a NEW system. For every day use starting procedures, refer to Chapter 4, Operation.

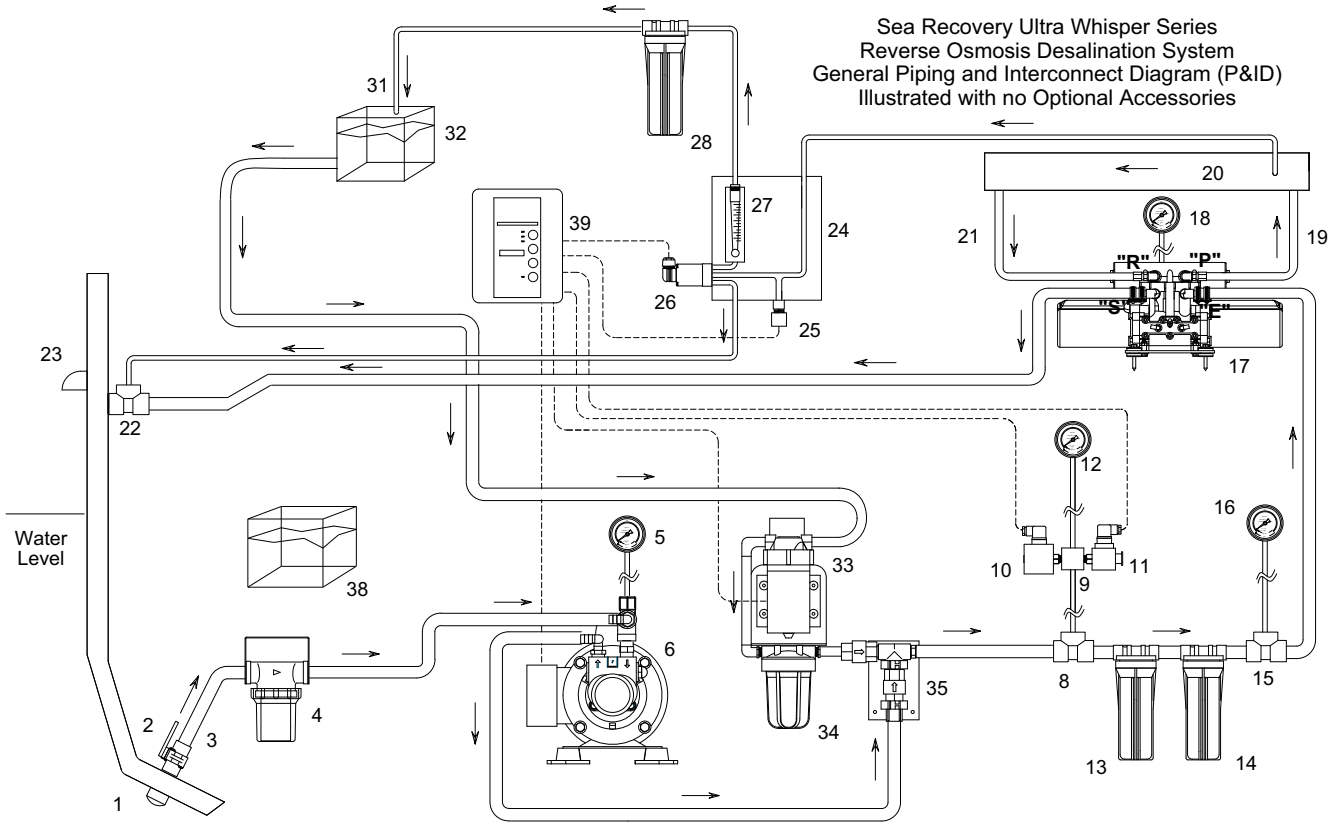
Failure to follow these instructions exactly leads to system failure, and causes damage to the components. Read this section and other appropriate sections of the manual in order to gain familiarity with the requirements of the system and functions of each component.

PIPING AND INTERCONNECT DIAGRAM ILLUSTRATED WITH NO OPTIONAL ACCESSORIES:

ALL STANDARD COMPONENTS AND ALL OPTIONAL ACCESSORIES.

** Denotes items supplied by installer
*** Denotes optional equipment

1. Inlet Thru Hull Fitting Forward Facing Scoop
2. Sea Cock Valve **
3. Feed Water Connector
4. Sea Strainer
5. Feed Pump Inlet Compound Vacuum/Pressure Gauge -30-0-60
6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
20. R.O. Membrane Element & Pressure Vessel
21. High Pressure Hose
22. Brine Discharge Tee Connector
23. Thru Hull Discharge Fitting **
24. Product Water Manifold
25. Temperature Compensated Salinity Probe
26. 3-Way Product Water Diversion Valve Electric Solenoid Actuated
27. Flow Meter, Product Water
28. Charcoal Filter
29. pH Neutralizer Filter***
30. Ultra Violet Sterilizer***
31. Potable Water Storage Tank Tube Connector
32. Potable Water Storage Tank**
33. Fresh Water Flush Pump
    included with the Fresh Water Flush Assembly
34. Fresh Water Flush Carbon Filter
    included with the Fresh Water Flush Assembly
35. Fresh Water Flush Check Valve
    included with the Fresh Water Flush Assembly
36. Inlet Rinse Clean Valve ***
37. Discharge Rinse Clean Valve ***
38. Rinse/Clean Solution Container **
39. Salinity Controller
40. Remote Controller ***
41. Soft Start***



PIPING AND INTERCONNECT DIAGRAM ILLUSTRATED WITH ALL OPTIONAL ACCESSORIES:

ALL STANDARD COMPONENTS AND ALL OPTIONAL ACCESSORIES.

** Denotes items supplied by installer
*** Denotes optional equipment

1. Inlet Thru Hull Fitting Forward Facing Scoop
2. Sea Cock Valve **
3. Feed Water Connector
4. Sea Strainer
5. Feed Pump Inlet Compound Vacuum/Pressure Gauge -30-0-60
6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
20. R.O. Membrane Element & Pressure Vessel
21. High Pressure Hose
22. Brine Discharge Tee Connector
23. Thru Hull Discharge Fitting **
24. Product Water Manifold
25. Temperature Compensated Salinity Probe
26. 3-Way Product Water Diversion Valve Electric Solenoid Actuated
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28. Charcoal Filter
29. pH Neutralizer Filter***
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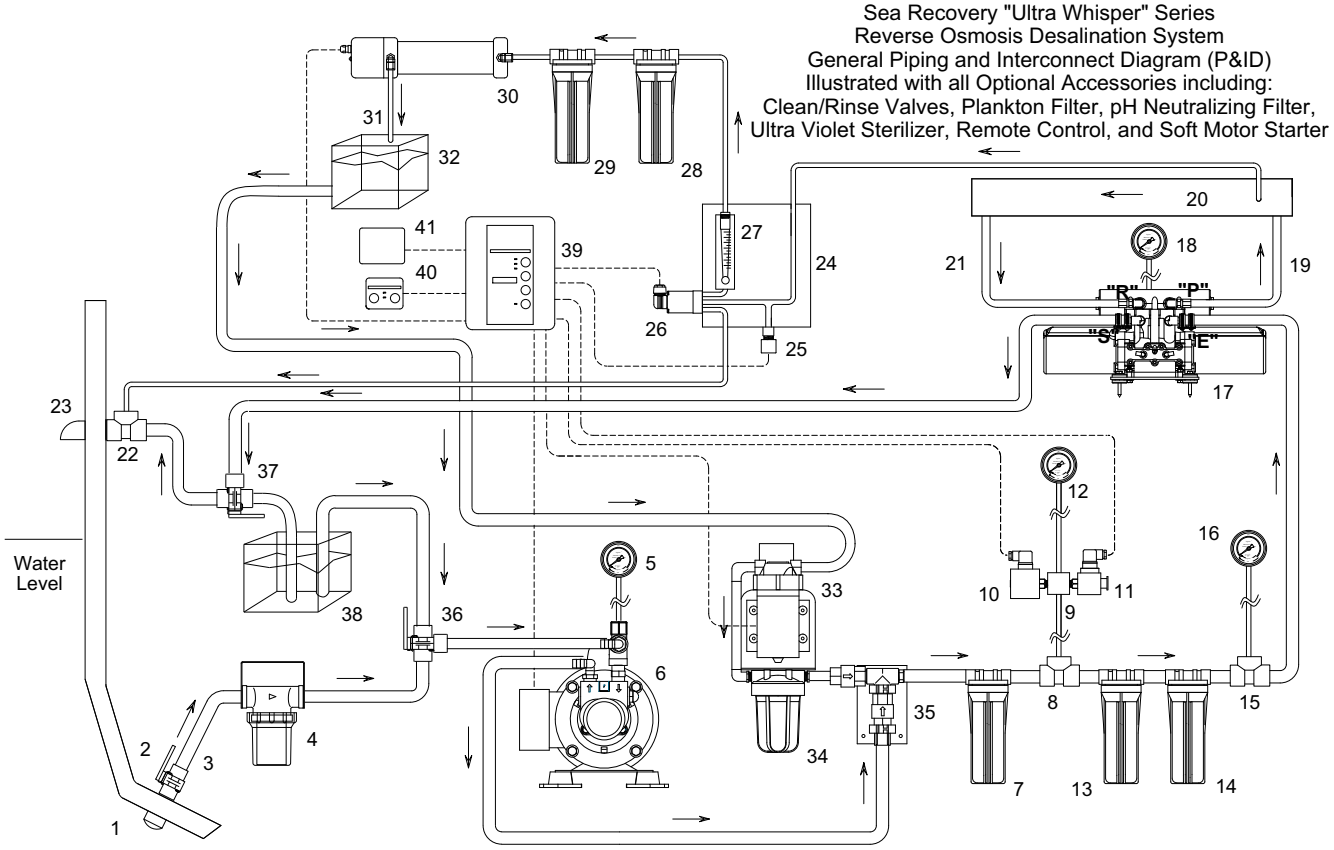


START-UP PROCEDURE OF A NEW Ultra Whisper System:

1. Ensure that the installation has been properly performed as per the instructions in Section 2 of this Owners Manual.

2. Ensure that the tube shipping plug has been removed from the Potable Water outlet port of the Water Control Manifold (Compact System) or from the R.O. Membrane/Vessel Product Water Port [20] (Modular System) and that all 1/4" and 3/8" product water tubes are connected, refer to Section 2 of this Owners Manual.

3. Reverse Osmosis Element: **CAUTION**: Some systems are shipped WITHOUT the Reverse Osmosis Membrane Element. This is to accommodate, for example, Boat Builders that install the system well in advance of commissioning the boat and the Sea Recovery System.

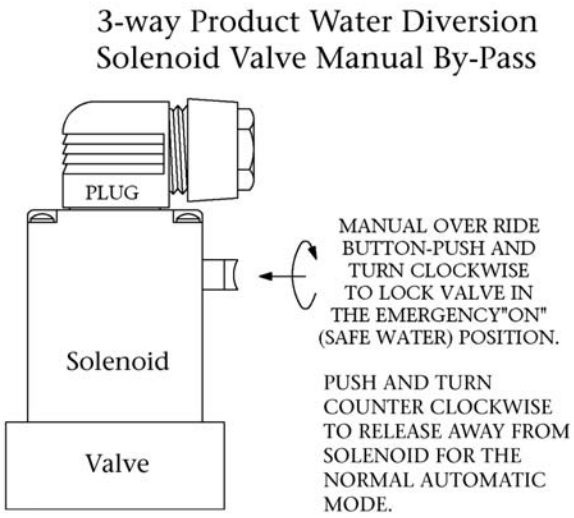
Sea Recovery	Rancho Dominguez, California 90220 U.S.A. Tel: 1-310-637-3400 ¦ Fax: 1-310-637-3430 Email: sales@searecovery.com
SERIAL NO:	**2036330**
FLOW: -->	**BRINE INLET END**
DATE:	**February 15, 2005**

If the Reverse Osmosis Membrane Element has been installed there will be a Reverse Osmosis Membrane Element Serial Number tag, illustrated above, attached to the R.O. Membrane/Vessel Assembly [20]. Find this Serial Number tag adhered to the R.O. Membrane/Vessel Assembly [20] to ensure that the R.O. Membrane Element has been installed.

If the R.O. Membrane Element Serial Number tag is missing or does not contain a serial number and date then immediately contact the company that sold the system to you, or Sea Recovery. Provide Sea Recovery with the System Serial Number and Model Number of this Ultra Whisper System.

WARNING: DO NOT attempt to operate the system without a Reverse Osmosis Membrane Element installed in the system else extensive damage will result.

4. Ensure that the manual By-Pass lever located on the side of the 3-Way Product Water Solenoid Diversion Valve [26] is positioned outward (away from the coil body).



5. Check each hose and tube connection to the System to ensure that the installer has properly connected and properly routed each hose and tube. Ensure that there are no kinks or blockages in any of the hoses or tubes leading to and from the Ultra Whisper System. Improper routing and any blockage in any line causes damage to the system. ***Do not rely on the installer's word, check it yourself.***

6. Make sure that the Electrical Power Source, boats circuit breaker, to the System is switched "OFF".

7. Open the front panel of the Main Power Enclosure. Check all electrical and electronic connections for proper wiring and attachment. Refer to the wiring diagrams in Section 8 of this manual.

8. Ensure that the Installer has used the proper sized Power Wire and Feed Pump wire. Refer to Section 8 of this Manual.

9. Close the Main Power Enclosure front panel.

10. Open the Sea Cock Valve [2].

11. Open any auxiliary Valve within the incoming Feed Line; Outgoing Brine Discharge Line; and Outgoing Product Water Line.

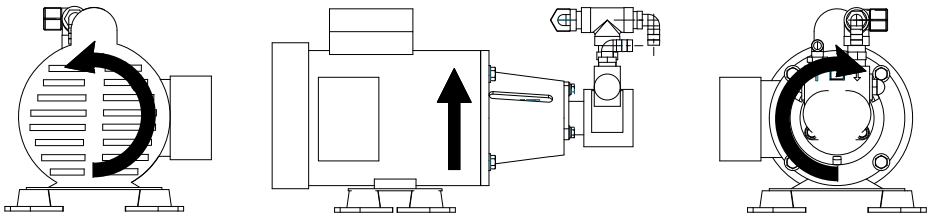
    WARNING: Any auxiliary Valve in these lines damages the Sea Recovery System if left closed during starting and or operation of the System.

12. If the optional Clean Rinse Valves [36 & 37] are installed ensure that they are positioned properly for normal operation. Refer to the Piping & Interconnect Diagram at the beginning of this Section 3.

13. Switch the Electrical Power Source to the "ON" position, boats circuit breaker.

14. FEED WATER PUMP [6] **MOTOR ROTATIONAL CHECK**: Ask an assistant to view the fan section of the Feed Water Pump Motor [6] while you "Jog" this electric motor.

FEED WATER PUMP AND MOTOR ROTATION



COUNTER CLOCKWISE WHEN VIEWING THE REAR (FAN END) OF THE MOTOR

CLOCKWISE WHEN VIEWING THE FRONT OF THE PUMP

Press the "Start" switch, and then immediately after the Feed Water Pump starts press the "Stop" switch. Ensure that the Feed Water Pump Electric Motor turned in the proper rotation as per the illustration above.

If the motor turned in the wrong direction, refer to the wiring diagrams in Section 8 to correct. To change rotation in **DC systems** reverse polarity to the electric motor by interchanging the positive and negative power leads to the motor. Then check the rotation again to ensure proper rotation.

WARNING: The feed water pump is a very close tolerance vane pump. It requires water for lubrication. Operating this pump dry will damage it within 30 seconds. Prime the system with water up to the feed water pump inlet to ensure that it is wet prior to starting.

15. To start the system press the "Start" Switch.

    If the system automatically shuts off immediately or if after 20 seconds of operation, this may be due to a system fault. Look at the Touch Pad to confirm whether a fault has occurred. If the "High/Low Pressure" Fault Lamp is illuminated ensure that the System Feed Line is primed and that there is no air in the Feed Water Line. Press the Fault Reset button on the touchpad and restart the system. Initial New System Commissioning may require priming of the Feed Water up to the Feed Pump [6] Inlet and through the prefiltration section in order to build sufficient feed water pressure to maintain operation.

    HIGH/LOW PRESSURE FAULT LAMP EXPLANATION:

a. **LOW PRESSURE FAULT:**

The Low Pressure Switch [10] is a Normally Open Switch that closes at 40 PSI or greater pressure. The Low Pressure Switch must receive minimum 40 PSI line pressure in order for it to "close" and maintain operation of the System. The Low Pressure Switch monitors the Feed Water Line Pressure from the outlet of the Feed Pump [6] and signals the Electronic Controller if there is a low pressure condition in the Feed Line prior to or at the Feed Pump [6].

When the line pressure at the Feed Pump [6] Inlet experiences an abnormal vacuum, or the Feed Pump [6] is unable to develop an Outlet Pressure of more than 40 PSI into the Prefiltration components, the "High/Low Pressure" lamp illuminates intermittently, blinks. If the condition does not correct itself, or is not corrected by the operator, the system automatically shuts down after 20 seconds and the "High/Low Pressure" lamp illuminates, steady. Refer to the Trouble Shooting Section of this Manual.

b. HIGH PRESSURE FAULT:

The High Pressure Switch [11] stops the system if the pressure at the Feed Pump Outlet exceeds 190 PSI. This protects the Prefiltration components from excessive pressure.

The High Pressure Switch is a Normally Closed Switch and will Open to immediately shut the System off at 190 PSI. Refer to the Trouble Shooting Section of this Manual.

16. With no abnormalities, immediately after starting the Ultra Whisper System pressure will automatically increase to normal operating range. The ETD [17] will increase pressure to a point at which the System produces the specified amount of Product Water. The table below lists approximate expected pressures that a new system should develop when operating in typical sea water of 35,000 PPM TDS at 77° F / 25° C.

PRODUCTION, OPERATING PRESSURE, AND OPERATING POWER CONSUMPTION:

The Fresh Water Production (Product Water) of the Sea Recovery Ultra Whisper is a constant percentage of the Feed Water Flow, regardless of feed water temperature, salinity, or the condition of the membrane.

The Ultra Whisper System does not require manual pressure adjustment. The System automatically adjusts operating pressure to produce a specific and pre set Product Water flow.

The table below illustrates the amount of Feed Water and the recovered amount of Product Water for each System:

Model	Supply Power	Hourly Feed Pump Flow GPH /LPH	Constant ETD Recovery Percentage	Daily Product Water Production GPD / LPD	Hourly Product Water Production GPH /LPH
UW 200	**DC & 60 Hz AC**	**100 / 379**	**9%**	**216 / 818**	9 / 34
	50 Hz AC	**104.2 / 394**	**9%**	**224 / 848**	9.3 / 35.3
UW 300	**DC & 60 Hz AC**	**140 / 530**	**9%**	**298 / 1128**	12.4 / 47
	50 Hz AC	**137.5 / 520**	**9%**	**297 / 1124**	12.4 / 46.8
UW 400	**DC & 60 Hz AC**	**140 / 530**	**12%**	**403 / 1526**	16.8 / 63.6
	50 Hz AC	**137.5 / 520**	**12%**	**396 / 1499**	16.5 / 62.5
UW 500	**DC & 60 Hz AC**	**190 / 719**	**12%**	**547 / 2071**	22.8 / 86.3
	50 Hz AC	**179.2 / 678**	**12%**	**516 / 1953**	21.5 / 81.4
UW 600	**DC & 60 Hz AC**	**215 / 814**	**12%**	**619 / 2343**	25.8 / 97.6
	50 Hz AC	**208.3 / 788**	**12%**	**600 / 2271**	25 / 94.6

The above values will vary with the actual cycles (Hz) that is supplied to the System or in the case of Direct Current (12 VDC or 24 VDC) powered Systems the values will vary with the actual voltage that is supplied to the System. This is to say, the lower the Hz from the 50 or 60 Hz norm the less the amount of Feed Water and resulting decrease in Product Water. Inversely, the higher the Hz from the 50 or 60 Hz norm the greater the amount of Feed Water and resulting increase in Product Water. As for Direct Current powered Systems, the lower the voltage from the 12 or 24 VDC norm the less the amount of Feed Water and resulting decrease in Product Water. Inversely, the higher the voltage from the 12 or 24 VDC norm the greater the amount of Feed Water and resulting increase in Product Water.

PRESSURE CHANGES:

The System Operating Pressure (the pressure applied to the R.O. Membrane Element) varies with the Feed Water Temperature, the Feed Water Salinity, and the condition of the R.O. Membrane Element. The System Design Specifications are based on Feed Water Temperature of 77° F / 25° C, and a Feed Water Salinity of 35,000 PPM-TDS (parts per million-total dissolved solids). Each R.O. Membrane Element can vary +/- 15% which will cause the final Operating Pressure to decrease or increase accordingly. However, assuming the "perfect R.O. Membrane", at this temperature and salinity the system will operate at the standard system pressure listed within the Specifications at the beginning of this Owner's Manual.

If the Feed Water Salinity increases or if the Feed Water Temperature decreases the System Operating Pressure will increase. Inversely, if the Feed Water Salinity decreases or if the Feed Water Temperature increases the System Operating Pressure will decrease. Further more, if the R.O. Membrane Element is new or old and fouled the System Operating Pressure Automatically decreases or increases accordingly to over come the R.O. Membrane Element condition.

Operating Amperage and Operating Pressure Will Increase if:
- the Feed Water Temperature is Lower than 77º Fahrenheit / 25º Celsius.
- the Feed Water Salinity is Greater than 35,000 PPM TDS (3.5% Total Dissolved Solids)
- the R.O. Membrane Element becomes fouled
- the R.O. Membrane Element is new and on the minus 15% side of the specifications

Operating Amperage and Operating Pressure Will Decrease if:
- the Feed Water Temperature is Higher than 77º Fahrenheit / 25º Celsius.
- the Feed Water Salinity is Less than 35,000 PPM TDS (3.5% Total Dissolved Solids)
- the R.O. Membrane Element is new and on the plus 15% side of the specifications

By monitoring Feed Water Salinity, Temperature, and resulting System Operating Pressure it is possible to measure and monitor the fouling of the R.O. Membrane Element over time and use.

As the feed water vane pump becomes worn from normal use it will loose flow and ability to build up pressure. A reduction in product water production could be caused by insufficient pressure and or flow from the feed water pump. Should the feed water pump become worn resulting in reduced pressure and or flow it may be returned to Sea Recovery for re-build or replacement. Because of the specific matching requirements of the wear parts and tight tolerance it is not practical to repair in the field.

SYSTEM PRESSURES: Seawater @ 35,000 PPM & 77° F / 25º C. Refer to Conversion Charts & Cross Reference Information in Section 8 of this manual

	Feed Water Pump Nominal Discharge Pressure into ETD				**Nominal Operating Pressure Developed by ETD at R.O. Membrane Element**			
Model	**PSI**	**BAR**	**Kg/cm²**	**kPa**	**PSI**	**BAR**	**Kg/cm²**	**kPa**
Ultra Whisper 200	100	6.9	7.03	690	620	42.75	43.59	4275
Ultra Whisper 300	150	10.34	10.55	1034	590	40.68	41.48	4068
Ultra Whisper 400	135	9.31	9.49	931	590	40.68	41.48	4068
Ultra Whisper 500	150	10.34	10.55	1034	650	44.82	45.70	4482
Ultra Whisper 600	175	12.07	12.30	1207	680	46.89	47.81	4689

17. If any abnormality develops, stop the System and correct the problem.

18. Although the System is producing "product water", the "product water" may not be "potable" for up to 30 minutes. New R.O. Membrane Elements require operating time to flush storage chemical from the product water channel. Daily operation requires operating time to flush dissolved solids from the product water channel. The operating time required to flush the product water channel is normal for Reverse Osmosis systems. The "Water Quality" Lamp illuminates "red" if the Product Water is Unpotable and "green" if the Product Water is Potable.

    The salinity of the Product Water diminishes gradually and is measured by the Salinity Probe [25]. When the salinity of the Product Water has diminished to the factory setting the Salinity Controller [39] will energize the "green" Water Quality Lamp and the 3-Way Product Water Diversion Valve [26]. At that instant, Product Water will be routed to the Charcoal Filter [28], pH Neutralizer [29] and U.V. Sterilizer [30] onward to the Potable Water Storage Tank [32].

19. Check for:
    a. A constant feed water flow.
    b. A consistent system pressure.
    c. Leaks in the system.
    d. Unusual noises or other occurrences.

20. Fill out completely the "NEW SYSTEM INITIAL READINGS" form at the end of this Section 3.

21. Prior to Stopping the System determine if the System will be stored for a period of time or if it will be turned over to the owner and operated regularly. Failure to properly flush and or store the System will lead to premature fouling, or drying out of the R.O. Membrane Element which is not covered by the Sea Recovery Warranty, and is the liability of the person commissioning the System.

    a. If the System will be operated within the next two weeks no action is necessary. **However, if the System will be exposed to freezing temperatures refer to Section 5 of this Manual for Winterizing procedures. Freezing temperatures will cause extensive damage if the System is not properly protected.**

    b. If the System will not be operated within the next two weeks perform a fresh water flush. If the Sea Recovery Automatic Fresh Water Flush [33 - 35] is installed ensure that the Potable Water Storage Tank [32] has potable water for the Fresh Water Flush to utilize in rinsing the System. If the System does not include an automatic Fresh Water Flush then perform a manual fresh water flush of the System, refer to Section 5 of this Manual.

    c. If the System will not be operated within the next 2 months or longer perform a Long Term Storage operation. Refer to Section 5 of this Manual.

22. Stop the System by pressing the Stop Switch Once. If the Fresh Water Flush assembly is installed, the Fresh Water Flush Lamp will Illuminate intermittently, blinking, for 90 minutes. This time delay is to allow the ETD to dissipate its pressure. After the 90 minute wait period the Fresh Water Flush Automatic cycle will begin as indicated by a steady, non blinking, illumination of the Fresh water Flush Lamp.

    The Fresh Water Flush Pump is equipped with a pressure switch that will cycle the pump on and off. If the pump's outlet pressure is below 45 PSI the pump will operate; when the pump's outlet pressure is above 45 PSI the pump will stop. The Fresh Water Flush Pump will cycle on and off during the Fresh Water Flush cycle. This is normal and to be expected.

    The Fresh Water Flush Cycle will last for approximately 10 minutes. The 10 minute Cycle is adjustable from 6 to 13 minutes. After the Fresh Water Flush Cycle is complete, the Fresh Water Flush Lamp will illuminate intermittently, blink, in the stand-by mode. Every 7 days the Fresh Water Flush Rinse Cycle will repeat automatically.

If the Stop Switch is pressed Twice the Automatic Fresh Water Flush cycle will be cancelled and the Fresh Water Flush Lamp will not be illuminated.

4. Close the Inlet Sea Cock Valve [2]. This is a safeguard for vessel installations.

5. If the Fresh Water Flush is installed and activated do not interrupt power. If the Fresh Water Flush is not installed or is not activated Turn off the electrical power source (circuit breaker) to the system. This eliminates the chance of inadvertently starting the system. If the power source has been turned off the Fresh Water Flush will not cycle every seven days.

Refer to Section 5 for proper Storage procedures. Section 5 describes the proper storage of the system for various time intervals, and gives procedures for winterizing the System during Freezing Temperature conditions.

Sea Recovery Ultra Whisper
NEW SYSTEM INITIAL READINGS

At the time of commissioning the NEW System record the following information after one hour of continuous proper operation of the System.

Retain this form in the Owner's Manual for future reference and troubleshooting. This information is valuable to the servicing technicians in providing technical support to the owner and future operators of the Ultra Whisper System. Provide this information to service technicians when requesting technical assistance.

Serial Number: _____

Check Model Number:

Ultra Whisper Compact _____ 200; _____ 300; _____ 400; _____ 500; or _____ 600

Ultra Whisper Modular _____ 200; _____ 300; _____ 400; _____ 500; or _____ 600

Name of Operator: _____ Date: _____

Installer Information:

Company _____

Street Address _____

City, State _____

Country, postal code _____

Telephone number _____

Name of Installer _____

System Power: _____ Volts AC, _____ Hz or _____ Volts DC

Feed Water Temperature: _____ ° Fahrenheit or _____ ° Celsius

Hour Meter Reading: _____ Hours

PRESSURE GAUGE READINGS:

Feed Pump Inlet Vacuum/Pressure Gauge [5] Reading: ____ - In Hg, or ____ PSI, or ____ Kg/Cm^2

Prefilter Inlet Pressure Gauge [11] Reading: ____ PSI, ____ Bar, ____KPa, or _____ Kg/Cm^2

ETD Inlet Pressure Gauge [15] Reading: ____ PSI, ____ Bar, ____KPa, or ____ Kg/Cm^2

R.O. Membrane/Vessel Assy Outlet Pressure Gauge [17] Reading: ____ PSI, ____ Bar, _____KPa, or ____ Kg/Cm

WATER FLOW METER READINGS:

Product Water Flow Meter [25]: _____ US Gallons Per Hour, or _____ Liters Per Hour

WATER QUALITY:

Feed Water Salinity: _____ ppm or Location of use: _____

Product Water Salinity: _____ ppm

Unusual occurrences or noises: _____

_____

Section 4

Daily Operation Instructions

Notes: _____

PIPING AND INTERCONNECT DIAGRAM ILLUSTRATED WITH NO OPTIONAL ACCESSORIES:

ALL STANDARD COMPONENTS AND ALL OPTIONAL ACCESSORIES.

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5. Feed Pump Inlet Compound Vacuum/Pressure Gauge -30-0-60
6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
20. R.O. Membrane Element & Pressure Vessel
21. High Pressure Hose
22. Brine Discharge Tee Connector
23. Thru Hull Discharge Fitting **
24. Product Water Manifold
25. Temperature Compensated Salinity Probe
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28. Charcoal Filter
29. pH Neutralizer Filter***
30. Ultra Violet Sterilizer***
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32. Potable Water Storage Tank**
33. Fresh Water Flush Pump
    included with the Fresh Water Flush Assembly
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    included with the Fresh Water Flush Assembly
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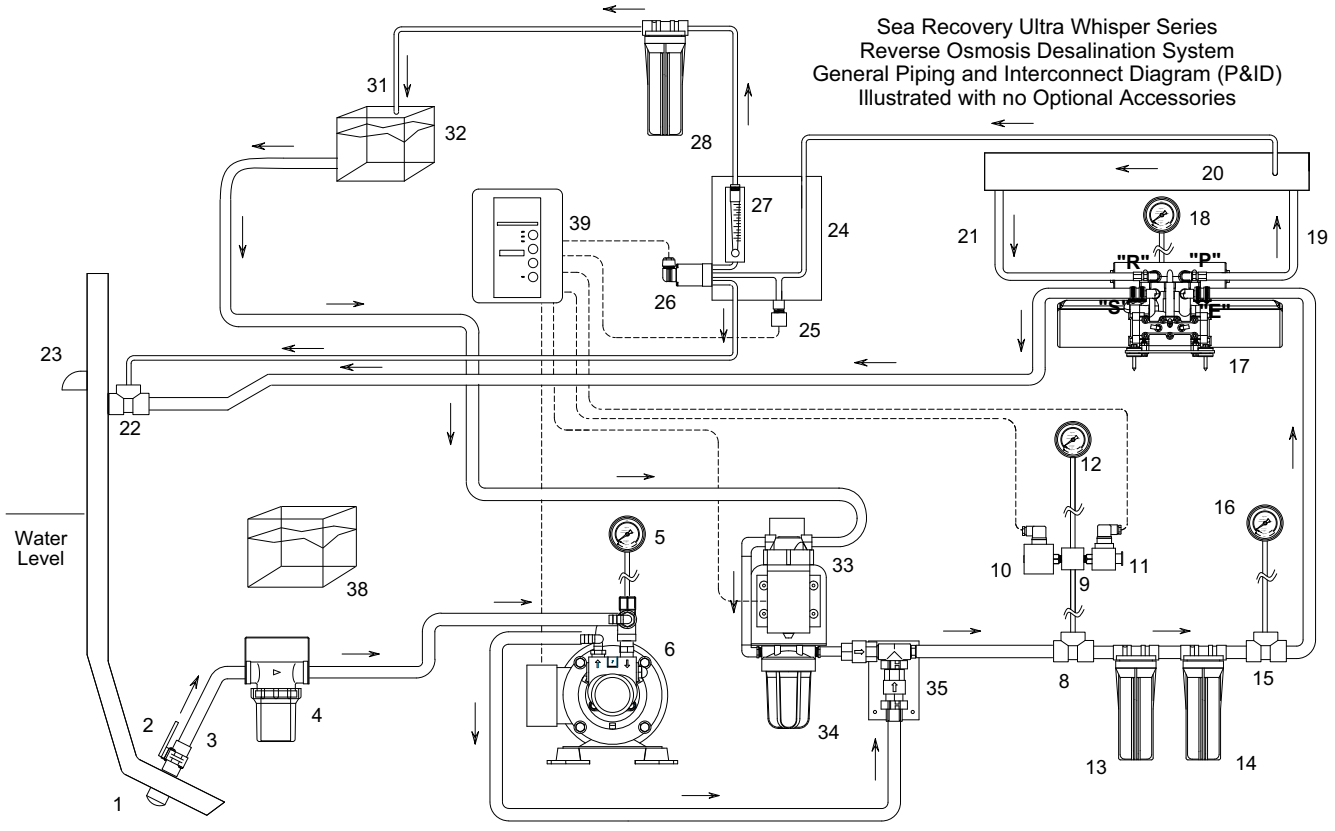

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6. Feed Pump
7. Plankton Filter ***
8. Inline Tee Pressure Pick-Up
9. Pressure Switch Manifold
10. Low Pressure Switch
11. High Pressure Switch
12. Pre-Filter Inlet Pressure Gauge 0-300 PSI
13. Pre-Filter 25 mμ
14. Pre-Filter 5 mμ
15. Inline Tee Pressure Pick-Up
16. Pre-Filter Outlet Pressure Gauge 0-300 PSI
17. Energy Transfer Device (ETD)
18. High Pressure Gauge 0-300 PSI
19. High Pressure Hose
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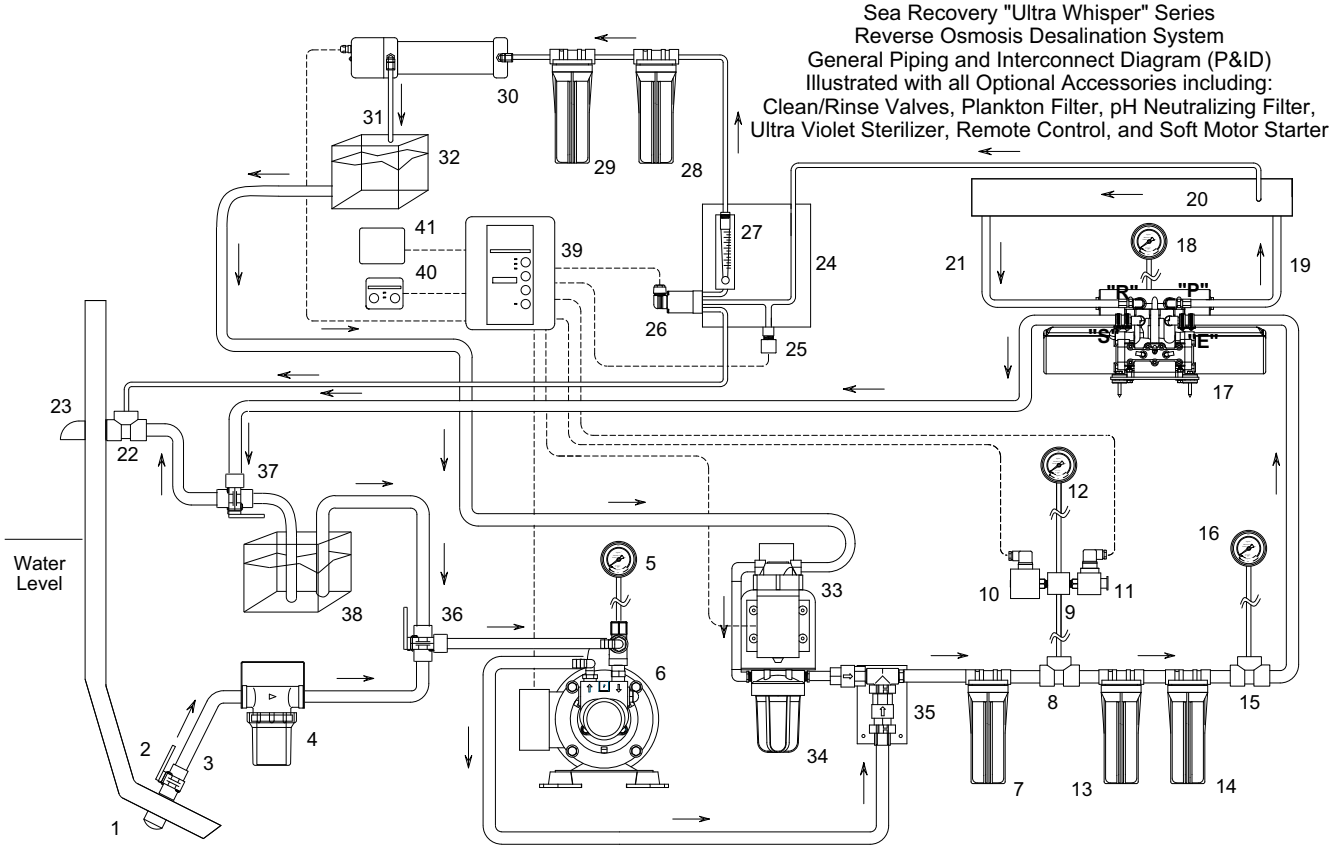


START-UP PROCEDURE OF AN Ultra Whisper System:

1. Open any auxiliary Valve within the incoming Feed Line; Outgoing Brine Discharge Line; and Outgoing Product Water Line.

   WARNING: Any auxiliary Valve in these lines damages the Sea Recovery System if left closed during starting and or operation of the System.

   CAUTION: In temperatures below 32° F/ 0° C, the fresh water will freeze and damage the components filled with fresh water. Do not operate the System in below freezing Feed Water temperatures.

2. If the optional Clean Rinse Valves [36 & 37] are installed ensure that they are positioned properly for normal operation. Refer to the Piping & Interconnect Diagram at the beginning of this Section.

3. Open the Sea Cock Valve [2].

4. Switch the Electrical Power Source to the "ON" position, boats circuit breaker.

WARNING: The feed water pump is a very close tolerance vane pump. It requires water for lubrication. Operating this pump dry will damage it within 30 seconds. If feed water has drained from the pump, prime the system with water up to the feed water pump inlet to ensure that it is wet prior to starting.

5. To start the system press the "Start" Switch.

   If the system automatically shuts off immediately or if after 20 seconds of operation, this may be due to a system fault. Look at the Touch Pad to confirm whether a fault has occurred. If the "High/Low Pressure" Fault Lamp is illuminated ensure that the System Feed Line is primed and that there is no air in the Feed Water Line. Press the Fault Reset button on the touchpad and restart the system. If the System fails to Start or fails to remain in operation refer to Section 6 Troubleshooting.

6. With no abnormalities, immediately after starting the Ultra Whisper System pressure will automatically increase to normal operating range. Refer to Temperature and Salinity Charts in the Final Section of this Manual.

7. If any abnormality develops, Stop the System and correct the problem.

8. Although the System is producing "product water", the "product water" may not be "potable" for up to 30 minutes. The "Water Quality" Lamp illuminates "red" if the Product Water is Unpotable and "green" if the Product Water is Potable.

   The salinity of the Product Water diminishes gradually and is measured by the Salinity Probe [25]. When the salinity of the Product Water has diminished to the factory setting the Salinity Controller [39] will energize the "green" Water Quality Lamp and the 3-Way Product Water Diversion Valve [26]. At that instant, Product Water will be routed to the Charcoal Filter [28], pH Neutralizer [29], U.V. Sterilizer [30] and onward to the Potable Water Storage Tank [32].

9. Check for:

   a. A constant feed water flow.
   b. A consistent system pressure.
   c. Leaks in the system.
   d. Unusual noises or other occurrences.

PRODUCTION, OPERATING PRESSURE, AND OPERATING POWER CONSUMPTION:

The Fresh Water Production (Product Water) of the Sea Recovery Ultra Whisper is a constant percentage of the Feed Water Flow, regardless of feed water temperature, salinity, or the condition of the membrane.

The Ultra Whisper System does not require manual pressure adjustment. The System automatically adjusts operating pressure to produce a specific and pre set Product Water flow.

The table below illustrates the amount of Feed Water and the recovered amount of Product Water for each System:

Model	Supply Power	Hourly Feed Pump Flow GPH /LPH	Constant ETD Recovery Percentage	Daily Product Water Production GPD / LPD	Hourly Product Water Production GPH /LPH
UW 200	**DC & 60 Hz AC**	**100 / 379**	**9%**	**216 / 818**	9 / 34
	50 Hz AC	**104.2 / 394**	**9%**	**224 / 848**	9.3 / 35.3
UW 300	**DC & 60 Hz AC**	**140 / 530**	**9%**	**298 / 1128**	12.4 / 47
	50 Hz AC	**137.5 / 520**	**9%**	**297 / 1124**	12.4 / 46.8
UW 400	**DC & 60 Hz AC**	**140 / 530**	**12%**	**403 / 1526**	16.8 / 63.6
	50 Hz AC	**137.5 / 520**	**12%**	**396 / 1499**	16.5 / 62.5
UW 500	**DC & 60 Hz AC**	**190 / 719**	**12%**	**547 / 2071**	22.8 / 86.3
	50 Hz AC	**179.2 / 678**	**12%**	**516 / 1953**	21.5 / 81.4
UW 600	**DC & 60 Hz AC**	**215 / 814**	**12%**	**619 / 2343**	25.8 / 97.6
	50 Hz AC	**208.3 / 788**	**12%**	**600 / 2271**	25 / 94.6

The above values will vary with the actual cycles (Hz) that is supplied to the System or in the case of Direct Current (12 VDC or 24 VDC) powered Systems the values will vary with the actual voltage that is supplied to the System. This is to say, the lower the Hz from the 50 or 60 Hz norm the less the amount of Feed Water and resulting decrease in Product Water. Inversely, the higher the Hz from the 50 or 60 Hz norm the greater the amount of Feed Water and resulting increase in Product Water. As for Direct Current powered Systems, the lower the voltage from the 12 or 24 VDC norm the less the amount of Feed Water and resulting decrease in Product Water. Inversely, the higher the voltage from the 12 or 24 VDC norm the greater the amount of Feed Water and resulting increase in Product Water.

PRESSURE CHANGES:

The System Operating Pressure (the pressure applied to the R.O. Membrane Element) varies with the Feed Water Temperature, the Feed Water Salinity, and the condition of the R.O. Membrane Element. The System Design Specifications are based on Feed Water Temperature of 77° F / 25° C, and a Feed Water Salinity of 35,000 PPM-TDS (parts per million-total dissolved solids). Each R.O. Membrane Element can vary +/- 15% which will cause the final Operating Pressure to decrease or increase accordingly. However, assuming the "perfect R.O. Membrane", at this temperature and salinity the system will operate at the standard system pressure listed within the Specifications in Section 0.

If the Feed Water Salinity increases or if the Feed Water Temperature decreases the System Operating Pressure will increase. Inversely, if the Feed Water Salinity decreases or if the Feed Water Temperature increases the System Operating Pressure will decrease. Further more, if the R.O. Membrane Element is new or old and fouled the System Operating Pressure Automatically decreases or increases accordingly to over come the R.O. Membrane Element condition.

Operating Amperage and Operating Pressure Will Increase if:
- the Feed Water Temperature is Lower than 77º Fahrenheit / 25º Celsius.
- the Feed Water Salinity is Greater than 35,000 PPM TDS (3.5% Total Dissolved Solids)
- the R.O. Membrane Element becomes fouled
- the R.O. Membrane Element is new and on the minus 15% side of the specifications

Operating Amperage and Operating Pressure Will Decrease if:
- the Feed Water Temperature is Higher than 77º Fahrenheit / 25º Celsius.
- the Feed Water Salinity is Less than 35,000 PPM TDS (3.5% Total Dissolved Solids)
- the R.O. Membrane Element is new and on the plus 15% side of the specifications

By monitoring Feed Water Salinity, Temperature, and resulting System Operating Pressure it is possible to measure and monitor the fouling of the R.O. Membrane Element over time and use.

As the feed water vane pump becomes worn from normal use it will loose flow and ability to build up pressure. A reduction in product water production could be caused by insufficient pressure and or flow from the feed water pump. Should the feed water pump become worn resulting in reduced pressure and or flow it may be returned to Sea Recovery for re-build or replacement. Because of the specific matching requirements of the wear parts and tight tolerance it is not practical to repair in the field.

SYSTEM PRESSURES: Seawater @ 35,000 PPM & 77° F / 25º C. Refer to Conversion Charts & Cross Reference Information in Section 8 of this manual

	Feed Water Pump Nominal Discharge Pressure into ETD				**Nominal Operating Pressure Developed by ETD at R.O. Membrane Element**			
Model	**PSI**	**BAR**	**Kg/cm²**	**kPa**	**PSI**	**BAR**	**Kg/cm²**	**kPa**
Ultra Whisper 200	100	6.9	7.03	690	620	42.75	43.59	4275
Ultra Whisper 300	150	10.34	10.55	1034	590	40.68	41.48	4068
Ultra Whisper 400	135	9.31	9.49	931	590	40.68	41.48	4068
Ultra Whisper 500	150	10.34	10.55	1034	650	44.82	45.70	4482
Ultra Whisper 600	175	12.07	12.30	1207	680	46.89	47.81	4689

SHUT DOWN PROCEDURE of an Ultra Whisper System:

1. Prior to Stopping the System, make a copy of and fill out completely the "Sea Recovery Ultra Whisper DAILY OPERATION LOG SYSTEM READINGS" form, located at the end of this Section, and retain the filled in copy for future reference.

   Observe and compare the performance of the system to the previously recorded Daily Operation Log System Readings. This allows the operator to monitor performance and spot deviations or deficiencies when they occur.

2. Additionally, prior to Stopping the System determine if the System will be stored for a period of time or if it will be operated again soon. Failure to properly flush and or store the System will lead to premature fouling, or drying out

of the R.O. Membrane Element which is not covered by the Sea Recovery Warranty, and is the liability of the operator of the System.

a. If the System will be operated within the next two weeks no action is necessary. **However, if the System will be exposed to freezing temperatures refer to Section 5 of this Manual for Winterizing procedures. Freezing temperatures will cause extensive damage if the System is not properly protected.**

b. If the System will not be operated within the next two weeks perform a fresh water flush. If the Sea Recovery Automatic Fresh Water Flush [33 - 35] is installed ensure that the Potable Water Storage Tank [32] has fresh, potable, water for the Fresh Water Flush to utilize in rinsing the System. If the System does not include an automatic Fresh Water Flush perform a manual fresh water flush of the System, refer to Section 5 of this Manual. **Furthermore, if the System will be exposed to freezing temperatures refer to Section 5 of this Manual for Winterizing procedures. Freezing temperatures will cause extensive damage if the System is not properly protected.**

c. If the System will not be operated within the next month or longer perform a Long Term Storage operation. Refer to Section 5 of this Manual. **Furthermore, if the System will be exposed to freezing temperatures refer to Section 5 of this Manual for Winterizing procedures. Freezing temperatures will cause extensive damage if the System is not properly protected.**

3. Stop the System by pressing the Stop Switch Once. If the Fresh Water Flush assembly is installed, the Fresh Water Flush Lamp will Illuminate intermittently, blinking, for 90 minutes. This time delay is to allow the ETD to dissipate its pressure. After the 90 minute wait period the Fresh Water Flush Automatic cycle will begin as indicated by a steady, non blinking, illumination of the Fresh water Flush Lamp.

   The Fresh Water Flush Pump is equipped with a pressure switch that will cycle the pump on and off. If the pump's outlet pressure is below 45 PSI the pump will operate; when the pump's outlet pressure is above 45 PSI the pump will stop. The Fresh Water Flush Pump will cycle on and off during the Fresh Water Flush cycle. This is normal and to be expected.

   The Fresh Water Flush Cycle will last for approximately 10 minutes. The 10 minute Cycle is adjustable from 6 to 13 minutes. After the Fresh Water Flush Cycle is complete, the Fresh Water Flush Lamp will illuminate intermittently, blink, in the stand-by mode. Every 7 days the Fresh Water Flush Rinse Cycle will repeat automatically.

   If the Stop Switch is pressed Twice the Automatic Fresh Water Flush cycle will be cancelled and the Fresh Water Flush Lamp will not be illuminated.

4. Close the Inlet Sea Cock Valve [2]. This is a safeguard for vessel installations.

5. If the Fresh Water Flush is installed and activated do not interrupt power. If the Fresh Water Flush is not installed or is not activated Turn off the electrical power source (circuit breaker) to the system. This eliminates the chance of inadvertently starting the system. If the power source has been turned off the Fresh Water Flush will not cycle every seven days.

Refer to Section 5 for proper Storage procedures. Section 5 describes the proper storage of the system for various time intervals, and gives procedures for winterizing the System during Freezing Temperature conditions.

Sea Recovery Ultra Whisper
DAILY OPERATION LOG SYSTEM READINGS

Make copies of this blank form. At each shut down of the Sea Recovery Ultra Whisper System record the following information. Retain these daily logs of the System performance for future reference and troubleshooting.

This information is valuable to the servicing technicians in providing technical support to the owner and future operators of the System. Provide this information to service technicians when requesting technical assistance.

Serial Number: _____

Check Model Number:

Ultra Whisper Compact _____ 200; _____ 300; _____ 400; _____ 500; or _____ 600

Ultra Whisper Modular _____ 200; _____ 300; _____ 400; _____ 500; or _____ 600

Name of Operator: _____ Date: _____

Installer Information:

Company _____

Street Address _____

City, State _____

Country, postal code _____

Telephone number _____

Name of Installer _____

System Power: _____ Volts AC, _____ Hz or _____ Volts DC

Feed Water Temperature: _____ ° Fahrenheit or _____ ° Celsius

Hour Meter Reading: _____ Hours

PRESSURE GAUGE READINGS:

Feed Pump Inlet Vacuum/Pressure Gauge [5] Reading: ____ - In Hg, or ____ PSI, or ____ Kg/Cm^2

Prefilter Inlet Pressure Gauge [9] Reading: ____ PSI, ____ Bar, ____KPa, or _____ Kg/Cm^2

ETD Inlet Pressure Gauge [13] Reading: ____ PSI, ____ Bar, ____KPa, or ____ Kg/Cm^2

R.O. Membrane/Vessel Assy Outlet Pressure Gauge [18] Reading: ____ PSI, ____ Bar, _____KPa, or ____ Kg/Cm

WATER FLOW METER READINGS:

Product Water Flow Meter: _____ US Gallons Per Hour, or _____ Liters Per Hour

WATER QUALITY:

Feed Water Salinity: _____ ppm or Location of use: _____

Product Water Salinity: _____ ppm

Unusual occurrences or noises: _____

_____

Notes: _____

Sea Recovery Ultra Whisper
DAILY OPERATION LOG SYSTEM READINGS

Make copies of this blank form. At each shut down of the Sea Recovery Ultra Whisper System record the following information. Retain these daily logs of the System performance for future reference and troubleshooting.

This information is valuable to the servicing technicians in providing technical support to the owner and future operators of the System. Provide this information to service technicians when requesting technical assistance.

Serial Number: _____

Check Model Number:

Ultra Whisper Compact _____ 200; _____ 300; _____ 400; _____ 500; or _____ 600

Ultra Whisper Modular _____ 200; _____ 300; _____ 400; _____ 500; or _____ 600

Name of Operator: _____ Date: _____

Installer Information:

Company _____

Street Address _____

City, State _____

Country, postal code _____

Telephone number _____

Name of Installer _____

System Power: _____ Volts AC, _____ Hz or _____ Volts DC

Feed Water Temperature: _____ ° Fahrenheit or _____ ° Celsius

Hour Meter Reading: _____ Hours

PRESSURE GAUGE READINGS:

Feed Pump Inlet Vacuum/Pressure Gauge [5] Reading: ____ - In Hg, or ____ PSI, or ____ Kg/Cm^2

Prefilter Inlet Pressure Gauge [9] Reading: ____ PSI, ____ Bar, ____KPa, or _____ Kg/Cm^2

ETD Inlet Pressure Gauge [13] Reading: ____ PSI, ____ Bar, ____KPa, or ____ Kg/Cm^2

R.O. Membrane/Vessel Assy Outlet Pressure Gauge [18] Reading: ____ PSI, ____ Bar, _____KPa, or ____ Kg/Cm

WATER FLOW METER READINGS:

Product Water Flow Meter: _____ US Gallons Per Hour, or _____ Liters Per Hour

WATER QUALITY:

Feed Water Salinity: _____ ppm or Location of use: _____

Product Water Salinity: _____ ppm

Unusual occurrences or noises: _____

_____

Notes: _____

Section 5

System Storage
&
R.O. Membrane Element Cleaning

Notes: _____

System Storage and Cleaning

A. MEMBRANE ELEMENT HANDLING & SYSTEM STORAGE CAUTIONS:

1. **TEMPERATURE:** Never store the R.O. Membrane Element or Membrane/Vessel Assembly in direct sunlight. Never expose the R.O. Membrane Element or Membrane/Vessel Assembly to storage temperatures above 120° F / 50 C or below 32° F / 0 C. High temperatures cause up to 40% loss of production from the R.O. membrane element. This damage is irreversible. Freezing temperatures cause mechanical damage to the system and irreversible damage to the R.O. membrane element.

2. **DRYING OUT:** Never allow the R.O. membrane element to dry out, as 40% production loss occurs. This Membrane damage may be irreversible. Some, but not all production may be restored by saturating the R.O. Membrane Element in product water for several days and then operating the System using product water feed into the system for a continuous 48 hour period. The R.O. membrane element must remain wet at all times.

3. **BIOLOGICAL FOULING:** Protect the R.O. membrane element from biological fouling. Production loss occurs if the element becomes fouled by biological slimes. Some, but not all production may be restored after cleaning.

4. **CHEMICAL FOULING:** Never expose the R.O. Membrane Element to chemicals other than those supplied by Sea Recovery. Use caution when operating the System in harbors that may be polluted with chemicals, oil, or fuel. Chemical attack to the R.O. Membrane Element may damage the element beyond repair.

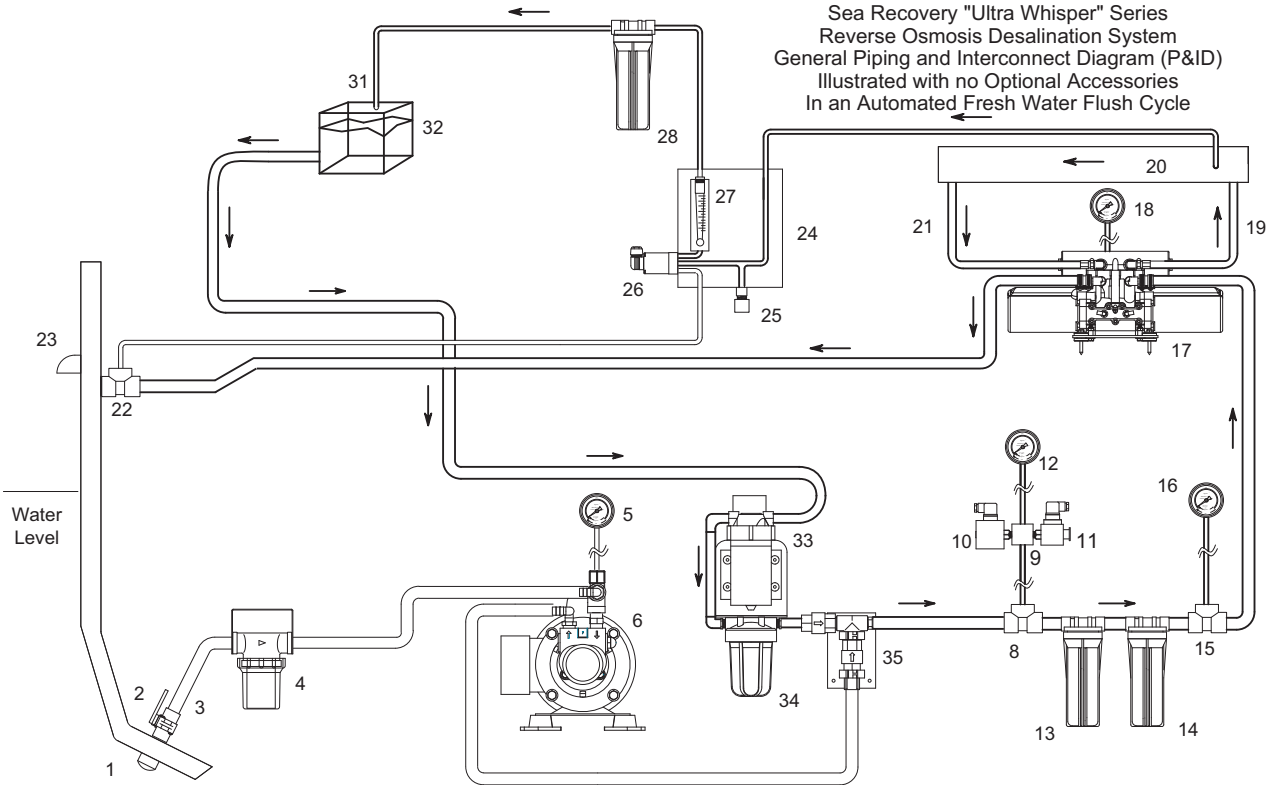
5. **STORAGE:** Simply operating the system does not protect the R.O. Membrane Element from production loss due to biological fouling. During short-term shutdowns the system must be rinsed as explained in the following pages. During long-term shutdowns the system must be rinsed as well as chemically treated as explained later in this chapter.

6. **NEW SYSTEM STORAGE:** Do not install the membrane and store the system for longer than 3 months prior to actual use. If storage of the new system is longer than 3 months the system must be rinsed with fresh water and stored with fresh storage solution every 3 months, otherwise biological fouling and or drying out damages the R.O. Membrane Element.

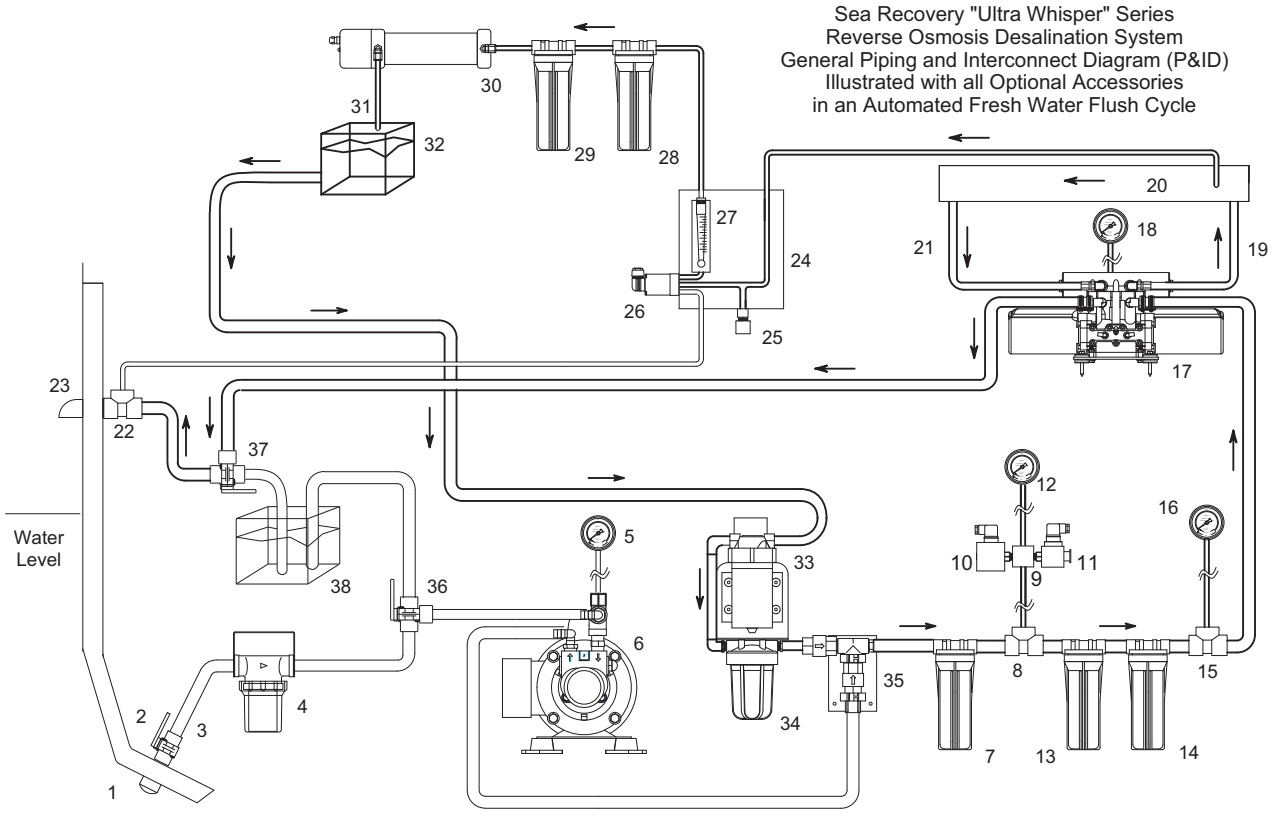
On the following three page are drawings that illustrate the flow of water in a “Once Through Rinse”, “Closed Loop”, “Once Through Winterizing Rinse”, and “R.O. Membrane Element Cleaning Closed Loop”. These drawings will be referred to within the instructions following the diagrams for Rinsing, Winterizing, and Membrane Cleaning procedures.

"Automated Fresh Water Flush" automatically rinses the system with fresh water for short term non use in NON freezing temperatures.

ILLUSTRATED BELOW WITH NO OPTIONAL ACCESSORIES:

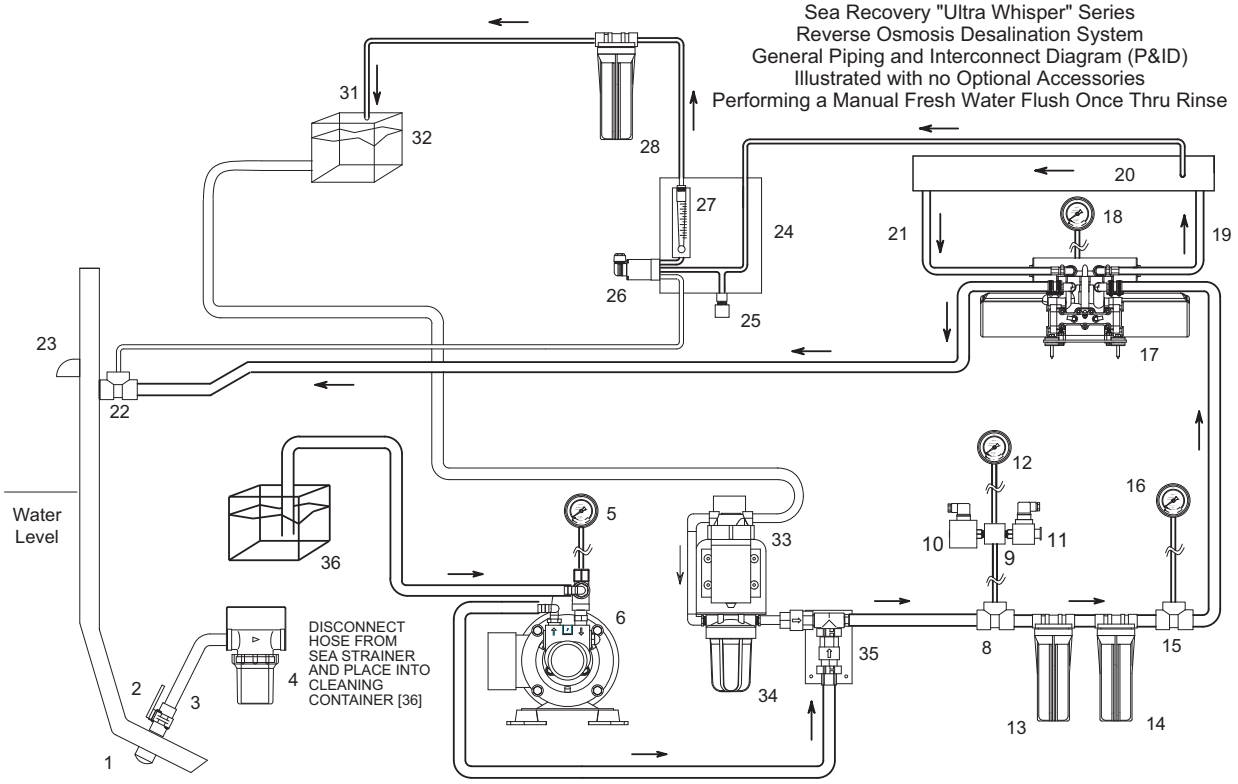


ILLUSTRATED BELOW WITH ALL OPTIONAL ACCESSORIES:

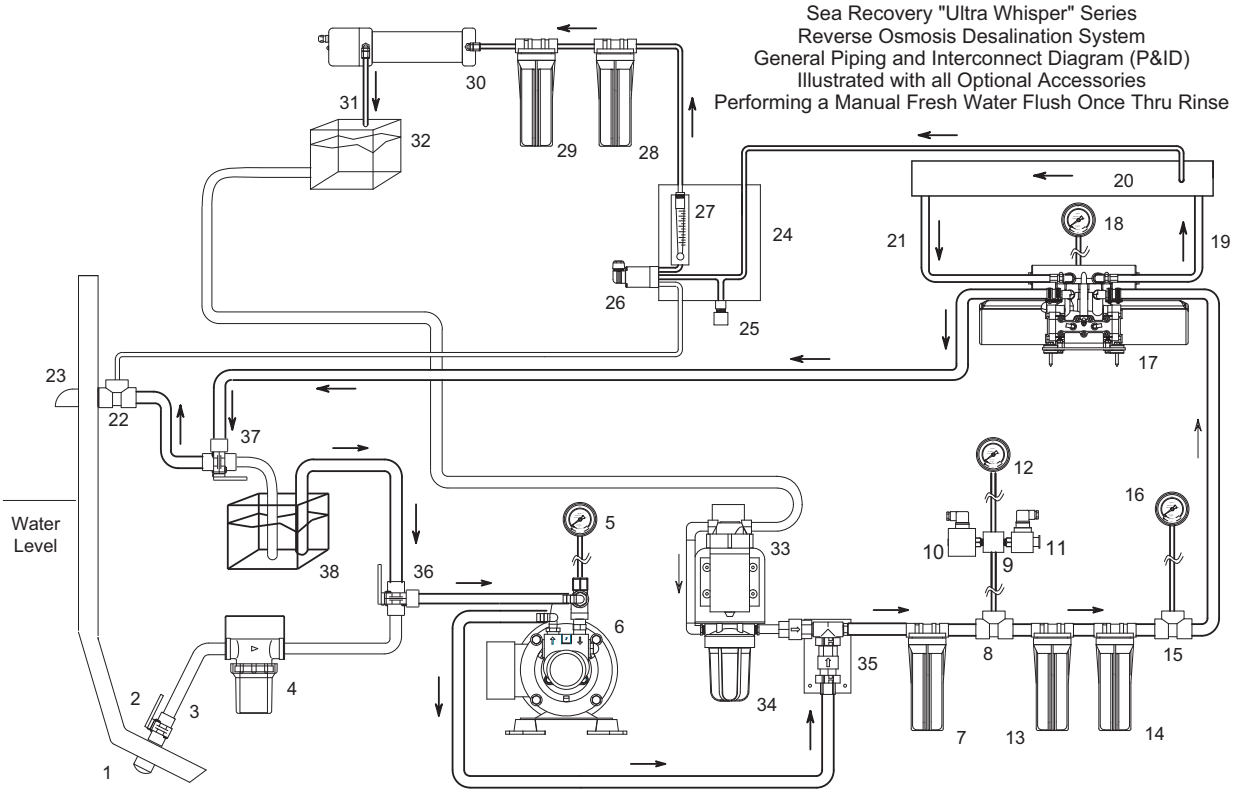


"Manual Once Through Rinse" is performed to rinse the system with fresh water for short term non use in NON freezing temperatures if the Automatic Fresh Water Flush is not installed or if manual flushing is preferred.

ILLUSTRATED BELOW WITH NO OPTIONAL ACCESSORIES:

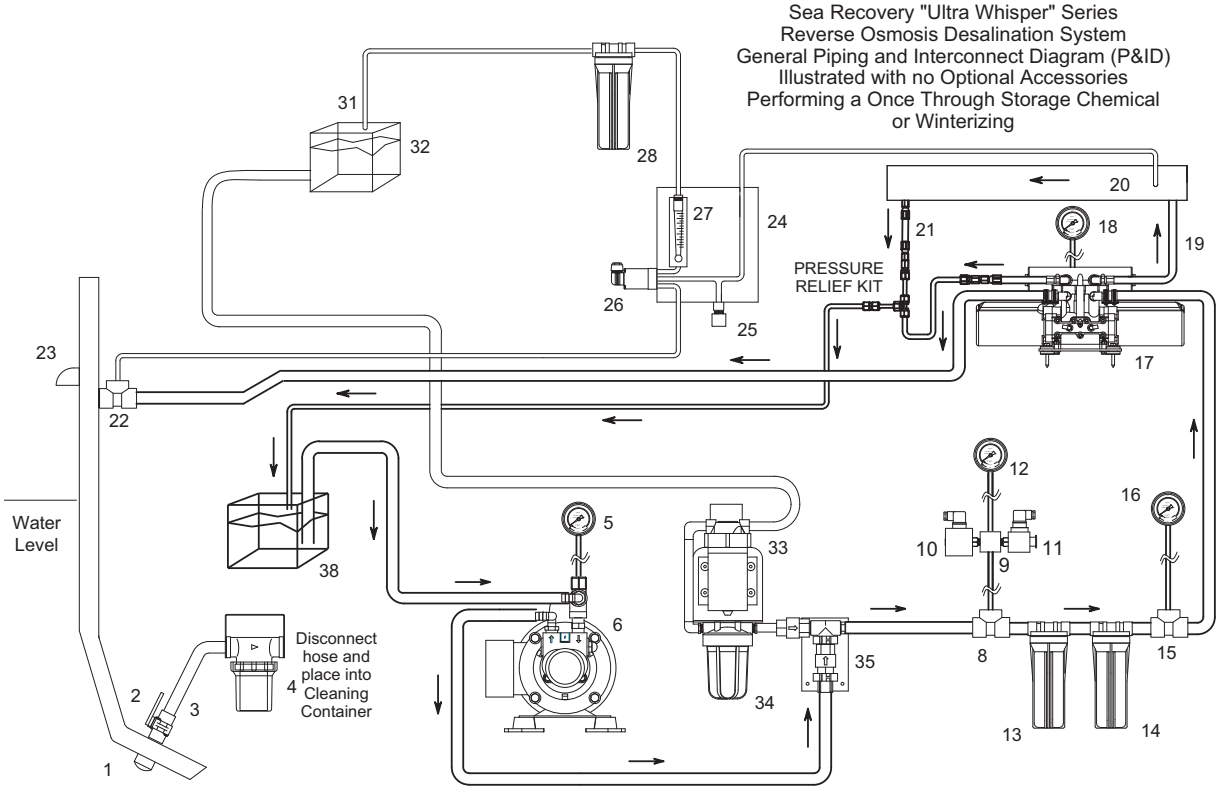


ILLUSTRATED BELOW WITH ALL OPTIONAL ACCESSORIES:

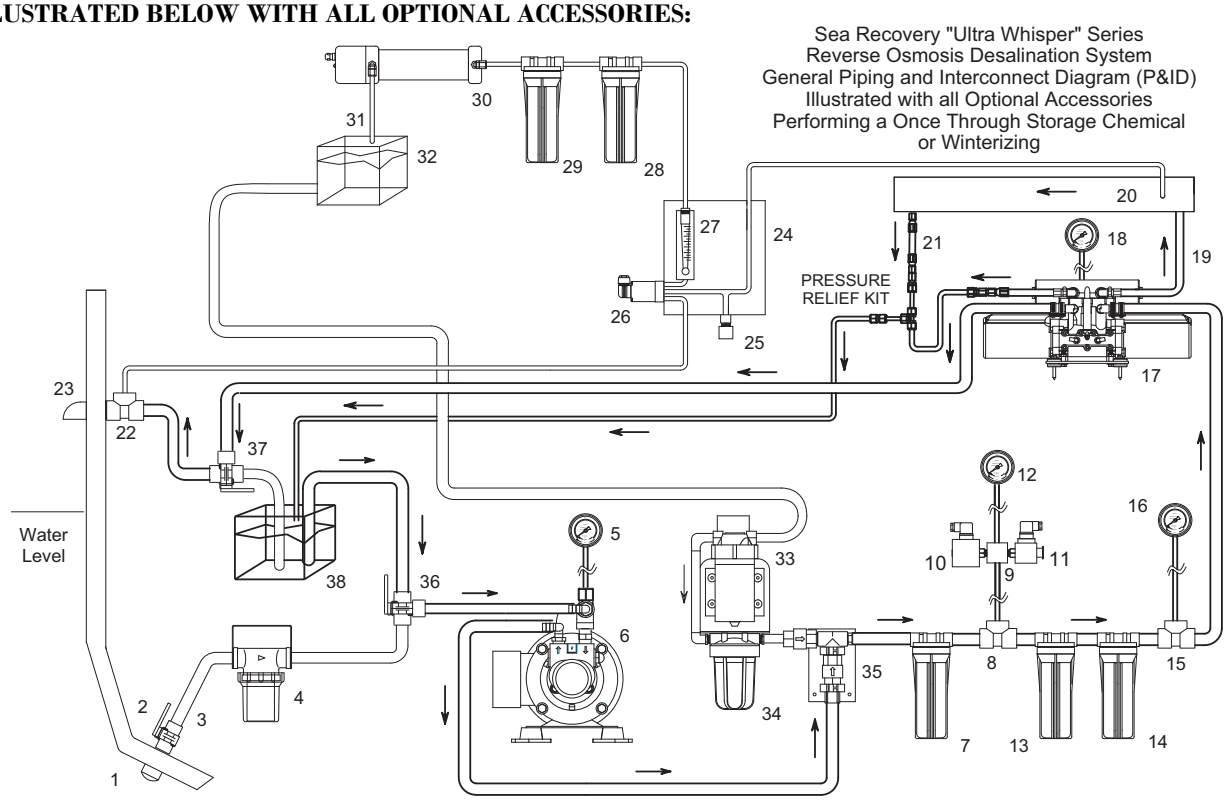


"Manual Once Through Rinse with Storage Chemical and or Winterizing Chemical" with Pressure Relief Tube Kit installed is used to rinse the System with Storage Chemical for short term non use, and to winterize the system during non use in Freezing Temperatures.

ILLUSTRATED BELOW WITH NO OPTIONAL ACCESSORIES:

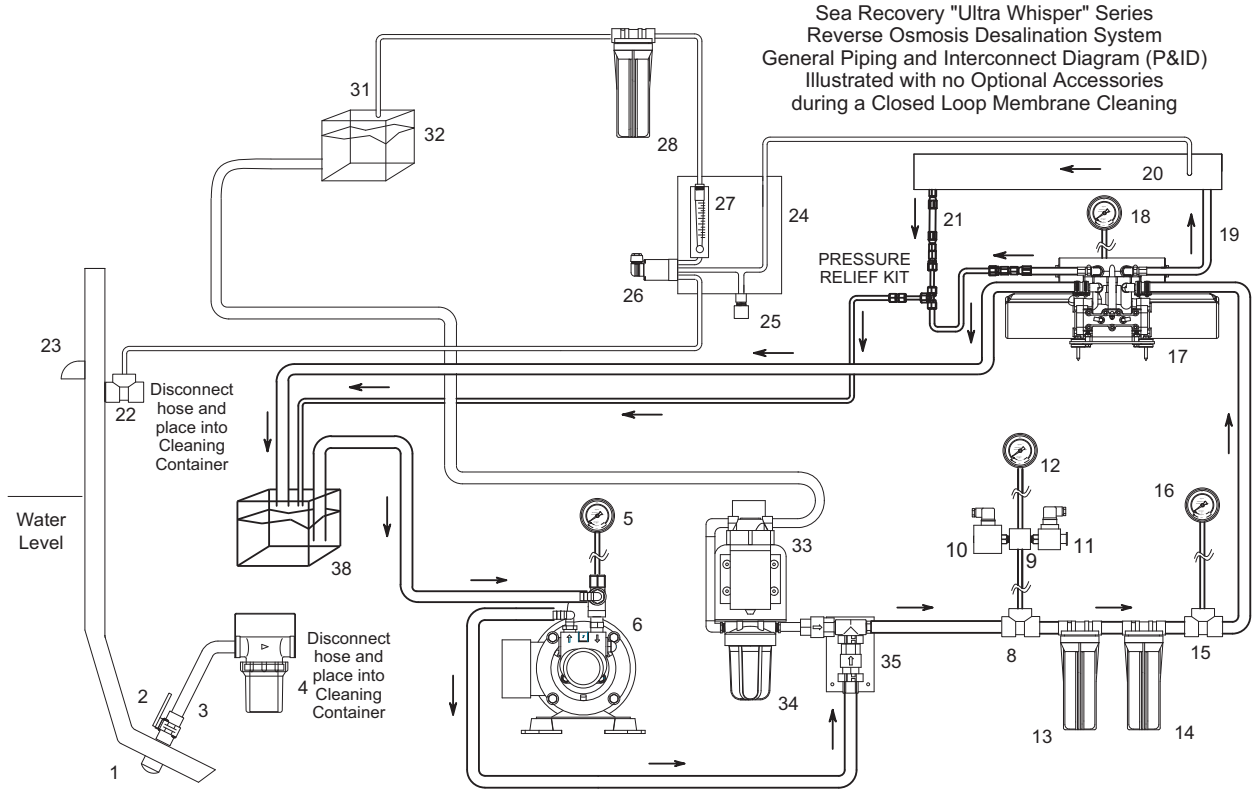


ILLUSTRATED BELOW WITH ALL OPTIONAL ACCESSORIES:

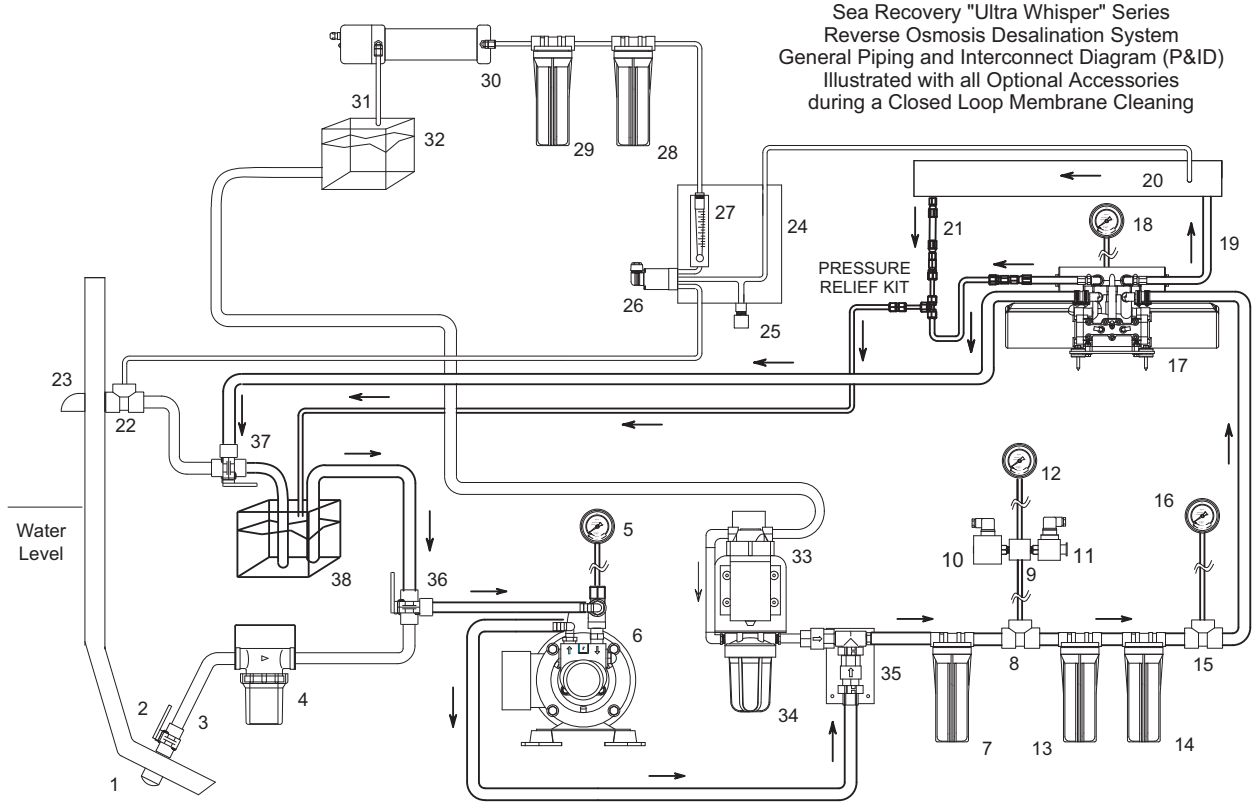


"Manual Closed Loop Recirculation for R.O. Membrane Cleaning Chemical" with Pressure Relief Tube Kit installed for cleaning of the R.O. Membrane Element.

ILLUSTRATED BELOW WITH NO OPTIONAL ACCESSORIES:



ILLUSTRATED BELOW WITH NO OPTIONAL ACCESSORIES:



5.2 CONFIGURING THE SYSTEM:

A. AUTOMATIC Fresh WATER FLUSH: If the Automatic Fresh Water Flush Accessory is installed, after a 90 minute delay, the Ultra Whisper is flushed with Fresh Water automatically each time the system is stopped after operation. The Ultra Whisper may also be flushed with Fresh Water simply by pressing the FWF switch at the Touch Pad.

Refer to the two diagrams illustrated on page 4 of this section.

1. The illustrations on page 4 of this section illustrate the water flow when the Ultra Whisper is performing an Automated Fresh Water Flush, if the included Fresh Water Flush Accessory is installed.

B. MANUAL FRESH WATER FLUSH: If the Automated Fresh Water Flush Accessory is not installed, or if a manual Fresh Water Flush is preferred, when the instructions within this section state "configure for Once Through Rinse", to Rinse the System with Fresh Water for Short Term non use in non freezing temperatures, proceed as follows:

Refer to the two diagrams illustrated on page 5 of this section.

1. Configure the Suction line for a Once Through process.

   a. Close the Sea Cock Valve [2].

   b. If the Optional Rinse/Clean Inlet Valve [36] is not installed disconnect the hose from the outlet line of the Sea Strainer [4] and place it in the Rinse/Clean Solution Container [38] or bucket.

      or

      If the Optional Rinse/Clean Inlet Valve [36] is installed, position it to draw water from the Rinse/Clean Container [38].

2. Configure the Brine Discharge line for a Once Through process.

   a. Connect the Brine Discharge Line from the System to the Thru-Hull over board discharge fitting [22], this is the normal connection for normal operation.

      Or

      If the System is equipped with an Optional Discharge Rinse/Clean Outlet Valve [37] position this valve to discharge through the Brine Discharge Connector [22], this is the normal connection for normal operation.

C. ONCE THROUGH DE-PRESSURIZED RINSE: When the instructions within this section state "configure for Once Through De-pressurized Rinse" used for once through flushing of Storage Chemical, Winterizing Chemical, or rinse between R.O. Membrane Cleaning proceed as follows:

Refer to the two diagrams illustrated on page 6 of this section.

1. In order to relieve pressure during the Once Through Winterizing Rinse process the Pressure Relief Tube Kit must be installed.

   a. Disconnect only one end of the High Pressure Hose [21] MVA Outlet/Energy Transfer Device Return either from the R.O. Membrane/Vessel Assembly [20] Outlet (Brine Discharge end) or from the ETD [17] Return Port "R" (which ever is easier to access).

   b. Connect the Product Relief Tube Kit to the loose end of the High Pressure Hose [21] and to the exposed fitting on the R.O. Membrane/Vessel Assembly [20] Outlet or the ETD [17] Return Port "R" fitting (which ever fitting the High Pressure Hose [21] was disconnected from).

   c. Route the 1/4 inch O.D. Tube from the Pressure Relief Tube Kit into the Rinse/Clean Solution Container [38] or bucket.

2. Configure the Suction line for a Once Through process.

   a. Close the Sea Cock Valve [2].

   b. Disconnect the outlet line from the Sea Strainer [4] and place it in the Rinse/Clean Solution Container [38].

      Or

      If the System is equipped with an Optional Inlet Rinse/Clean Valve [36] between the Sea

Strainer [4] and Feed Pump [6] then position this valve to draw from the Rinse/Clean Solution Container [38].

3. Configure the Brine Discharge line for a Once Through process.

   a. Connect the Brine Discharge Line from the System to the Thru-Hull over board discharge fitting [22], this is the normal connection for normal operation.

      Or

      If the System is equipped with an Optional Discharge Rinse/Clean Outlet Valve [37] position this valve to discharge through the Brine Discharge Connector [22], this is the normal connection for normal operation.

D. When the instructions within this section state "configure for R.O. Membrane Element Cleaning Closed Loop" proceed as follows:

Refer to the two diagrams illustrated on page 7 of this section.

1. In order to relieve pressure during the Closed Loop process the Product Relief Tube Kit must be installed.

   a. Disconnect only one end of the High Pressure Hose [21] MVA Outlet/Energy Transfer Device Return either from the R.O. Membrane/Vessel Assembly [20] Outlet (Brine Discharge end) or from the ETD [17] Return Port "R" (which ever is easier to access).

   b. Connect the Product Relief Tube Kit to the loose end of the High Pressure Hose [21] and to the exposed fitting on the R.O. Membrane/Vessel Assembly [20] Outlet or the ETD [17] Return Port "R" fitting (which ever fitting the High Pressure Hose [21] was disconnected from).

   c. Route the 1/4 inch O.D. Tube from the Pressure Relief Tube Kit into the Rinse/Clean Solution Container [38] or bucket.

2. Configure the Suction line for a Closed Loop process.

   a. Close the Sea Cock Valve [2].

   b. Disconnect the outlet line from the Sea Strainer [4] and place it in the Rinse/Clean Solution Container [38].

      Or

      If the System is equipped with an Optional Inlet Rinse/Clean Valve [36] between the Sea Strainer [4] and Feed Pump [6] then position this valve to draw from the Rinse/Clean Solution Container [38].

3. Configure the Brine Discharge line for a Closed Loop process.

   a. Disconnect the Brine Discharge Line from the Thru-Hull over board discharge fitting [22] and place it in the Rinse/Clean Solution Container [38].

      Or

      If the System is equipped with an Optional Discharge Clean/Rinse 3-way ball valve [37] position this valve to return to the Rinse/Clean Solution Container [38].

5.3 SHORT-TERM SHUTDOWN:

A short-term shutdown is defined as a period of time in which the System is not utilized for up to four weeks. An effective short-term protection for the system and R.O. membrane element is a Fresh Water Rinse of the entire system with fresh water (product water from the system). This prolongs the system life by minimizing electrolysis and retarding biological growth.

NOTE: If the System is equipped with an automatic Fresh Water Flush [33 - 35] then it is not necessary to read this chapter 5.3. The Automatic Fresh Water Flush rinses the System every 7 days automatically. However, see "Winterizing and Freezing" note below.

WINTERIZING AND FREEZING TEMPERATURE STORAGE NOTE: If the system is exposed to freezing temperatures perform a Manual Fresh Water Rinse as described below and follow the included winterizing instructions.

MANUAL FRESH WATER RINSE PROCEDURE: Follow the directions below if the System is not equipped with an Automatic Fresh Water Flush System [33 - 35], or if the system will be subjected to freezing temperatures during non use.

This procedure displaces the system feed water with fresh water and allows a short-term shutdown for up to four weeks. Five gallons (19 liters) of fresh product or potable water is required for the fresh water rinse. These instructions also explain how to Winterize the System. One gallon (3.8 liters of Food Grade Propylene Glycol will be required to Winterize the System.

1. Configure the System for a "**Once Through Rinse"** as illustrated in the drawings on page 4 of this Section, and as described in item 5.2.A on page 8 of this Section.

2. Clean the Sea Strainer [4] Mesh Screen.

3. Clean the Plankton Filter Element [7].

4. Clean (hose off) or replace the 25 and 5 micron Prefilter Elements [13 & 14] with new 25 and 5 micron Sea Recovery Pre-filtration Elements.

5. Fill the Rinse/Clean Solution Container [38] or a 5-gallon container with clean, fresh water.

6. Press the "Start" switch. The fresh water rinses the system and discharges out through the Thru Hull Discharge Fitting [22].

7. Just prior to depleting the rinse water from the Rinse/Clean Solution Container [38] stop the system by pressing the Stop switch.

8. If the System will NOT be exposed to freezing temperatures reconfigure the Suction Line for normal operation. If the system will be exposed to freezing temperatures during non use skip this step and go to step 9 below.

   a. Leave the Sea Cock Valve [2] closed.

   b. Reconnect the Sea Strainer [4] outlet line to the Outlet of the Sea Strainer, or reposition the Inlet Clean Rinse Valve [36] to the normal operating position.

IN NON FREEZING TEMPERATURES THE SYSTEM MAY NOW BE LEFT UNATTENDED FOR SEVERAL WEEKS. A GUIDE WOULD BE 4 WEEKS IN WARM CLIMATES AND 8 WEEKS IN COLD CLIMATES.

HOWEVER, IF THE SYSTEM WILL BE EXPOSED TO FREEZING TEMPERATURES CONTINUE WITH THE FOLLOWING PROCEDURES:

9. If the System will be exposed to Freezing Temperatures during non use of the System, configure the System for a "Once Through De-pressurized Rinse" using the Product Relief Tube Kit as illustrated on page 6 of this section and as described in item 5.2.C page 8 and 9 of this section "**ONCE THROUGH DE-PRESSURIZED RINSE".**

10. Again, fill the Rinse/Clean Solution Container [38] or a 5-gallon bucket with 4 gallons (15 liters) of clean, fresh water. Add twenty percent (1 gallon / 3.8 liters) food grade propylene glycol to the Storage Chemical Solution. This prevents the water in the system from freezing.

11. Press the "Start" switch. The Winterizing Solution rinses the system and discharges out to waste [22].

12. Just prior to depleting the Winterizing Solution from the Rinse/Clean Solution Container [38] Stop the System by pressing the "Stop" switch twice (2 times) in order to Stop the System as well as deactivate the Fresh Water Flush Cycle.

Ensure that the "Fresh Water Flush" lamp is NOT illuminated.

13. Reconfigure the System for normal operation:

    a. Leave the Sea Cock Valve [2] closed.

    b. Reconnect the Sea Strainer [4] outlet line to the Outlet of the Sea Strainer, or reposition the Inlet Clean Rinse Valve [36] to the normal operating position.

    c. Remove the Product Relief Tube Kit

    d. Reconnect the High Pressure Hose [21]

14. The Sea Strainer [4], and Post Filtration Section [28 - 30] have not received Winterizing Solution in this process. The water must be drained from the respective components.

    a. Remove the Sea Strainer bowl from the Sea Strainer [4] and drain the Feed Water from it. Replace the Sea Strainer bowl back onto the Sea Strainer [4].

    b. Remove the Charcoal Filter bowl from the Charcoal Filter [28] and drain the Product Water from it. Replace the Charcoal Filter Bowl back onto the Charcoal Filter.

    c. Remove the pH Neutralizer Filter bowl from the pH Neutralizer Filter [29] and drain the Product Water from it. Replace the pH Neutralizer Bowl back onto the pH Neutralizer Filter.

    d. Disconnect the Top and Bottom tube fittings from the Ultra Violet Sterilizer [30] and drain the Product Water from the U.V. Sterilizer chamber. Reconnect the Top and Bottom tube fittings back onto the U.V. Sterilizer.

    e. Disconnect the Fresh Water Line from the Potable Water Storage Tank to the Fresh Water Flush Pump [33] or if a valve is installed in this line Close it to isolate the potable water line from the Fresh Water Flush Pump.

    f. Remove the Fresh Water Flush Charcoal Filter [34] bowl and drain it. Replace the Fresh Water Flush Charcoal Filter bowl back onto the Fresh Water Flush Charcoal Filter.

IN FREEZING TEMPERATURES THE SYSTEM MAY NOW BE LEFT UNATTENDED DURING THE FREEZING TEMPERATURE SEASON. AFTER THE SEASON THE SYSTEM SHOULD BE RINSED WITH STORAGE CHEMICAL IF IT WILL NOT BE OPERATED. SEE LONG TERM SHUT DOWN ITEM 5.4 BELOW.

5.4 LONG TERM SHUTDOWN:

A Long Term or Prolonged Shutdown is a period in which the system is not used for longer than three to four months, depending on conditions. For this interval, the system should first be rinsed with fresh water, then stored with System and Membrane Element Storage Chemical (SRC SC). This chemical inhibits bacterial growth while maintaining the high flux and salt rejection of the R.O. Membrane Element. The Long Term Shutdown procedure requires 10 gallons (38 liters) of potable water. Follow the directions listed below.

WINTERIZING AND FREEZING TEMPERATURE STORAGE NOTE: If the system will be exposed to freezing temperatures during non use have ready (1 gallon / 3.8 liters) food grade glycerin (propylene glycol) and follow instructions to add it to the Storage Chemical Solution. This prevents the water in the system from freezing.

1. Configure the System for a **"Once Through De-pressurized Rinse"** using the Product Relief Tube Kit as illustrated on page 6 of this section and as described in item 5.2.C page 8 and 9 of this section.

2. Close the Inlet Sea Cock Valve [2].

3. Clean the Sea Strainer [4] Mesh Screen.

4. Clean the Plankton Filter Element [7].

5. Replace the Pre-filtration Cartridges [13 & 14] with new 25 and 5 micron Sea Recovery Pre-filtration Elements.

6. Fill the Rinse/Clean Solution Container [38] with non-chlorinated product water.

7. Start the system. The rinse water rinses the entire system and discharging to waste [22].

8. Just prior to depleting the rinse water from the Rinse/Clean Solution Container [38] stop the system by pressing the stop switch twice to stop the System and also to abort the Fresh Water Flush Cycle.

9. Once again, fill the Rinse/Clean Solution Container [38] with non-chlorinated product water.

11. Add **ONLY 4 ounces (1/6 th of the container)** of SRC SC Storage Chemical to the water in the Rinse/Clean Solution Container [38].

12. Mix and thoroughly dissolve the solution in the Rinse/Clean Solution Container [38].

13. If the system will be exposed to freezing temperatures use add 1 gallon (4 liters) food grade glycerin (propylene glycol) to the Storage Solution Mixture. This prevents the System from damage in freezing temperatures.

14. Operate the system by pressing the "Start" Switch. The Storage Chemical Solution flows from the container, through the System, and out the brine discharge thru hull fitting [22]

15. Discard any remaining Winterizing Solution in a safe, environmentally friendly, and legal manner.

16. Reconfigure the System for normal operation:

   a. Leave the Sea Cock Valve [2] closed.

   b. Reconnect the Sea Strainer [4] outlet line to the Outlet of the Sea Strainer, or reposition the Inlet Rinse/Clean Valve [36] to the normal operating position.

   c. Remove the Product Relief Tube Kit

   d. Reconnect the High Pressure Hose [21]

18. The Sea Strainer [4] and Post Filtration Section have not received Storage and Winterizing Solution in this process. The water must be drained from the respective components.

   a. Remove the Sea Strainer bowl from the Sea Strainer [4] and drain the Feed Water from it. Replace the Sea Strainer bowl back onto the Sea Strainer [4].

   b. Remove the Charcoal Filter bowl from the Charcoal Filter [28], clean the inside of the bowl, and replace the element with a new Sea Recovery Charcoal Filter Element.

   c. Remove the pH Neutralizer Filter bowl from the pH Neutralizer Filter [29], drain the Product Water from it and clean the inside of the bowl. Replace the pH Neutralizer Bowl back onto the pH Neutralizer Filter.

d. Disconnect the Top and Bottom tube fittings from the Ultra Violet Sterilizer [30] and drain the Product Water from the U.V. Sterilizer chamber. Reconnect the Top and Bottom tube fittings back onto the U.V. Sterilizer.

e. Disconnect the Fresh Water Line from the Potable Water Storage Tank to the Fresh Water Flush Pump [33] or if a valve is installed in this line Close it to isolate the potable water line from the Fresh Water Flush Pump.

f. Remove the Fresh Water Flush Charcoal Filter [34] bowl, drain and clean the inside of the bowl. Replace the Fresh Water Flush Charcoal Filter element with a new Sea Recovery Fresh Water Flush Charcoal Filter Element, and replace the bowl with new element back onto the housing.

The System may now be left unattended for up to 3 to 6 months. With ideal conditions including a relatively new R.O. Membrane Element, a clean system prior to storage, cool temperatures, and no leakage of storage chemical within the system, it provides protection for up to 6 months. Adverse conditions may provide less protection. Evaluate these factors before determining the proper interval between repeated rinsing and storage periods.

5.5 R.O. MEMBRANE ELEMENT CLEANING PROCEDURES

Do not arbitrarily clean the R.O. Membrane in a NEW System. If a New System experiences low production or high salinity then the System should be operated for up to 48 hours ***continuously*** to clear and saturate the R.O. Membrane Element Product Water Channel. If a new system still experiences low production and or high salinity after 48 hours of **continual operation** then contact the factory.

The membrane element requires cleaning from time to time. Biological growth and salt accumulation eventually make replacement necessary. The frequency of required cleaning depends on the amount of production loss and salt rejection loss resulting from normal use and exposure to Feed Water. In order to properly assess performance changes, it is important to maintain daily log readings for comparison.

During performance comparisons, Feed Water Temp, Feed Water Salinity, and System Operating Pressure must be taken into consideration and compensated for. After compensations, a 10% decline in productivity (GPH Flow) and/or a 10% increase in salt passage indicate that the R.O. Membrane Element may requires cleaning.

If Production rate has dropped dramatically since the last time the system was used, this may be due to drying out of the R.O. Membrane Element and/or fouling during storage. If the system has not been used for several months and the production rate has dropped dramatically since the last time used, try operating the system for 48 or more continuous hours to saturate the Product Water Channel within the R.O. Membrane Element.

If Production rate drops dramatically from one day to the next, this may be due to chemical attack which is not cleanable. Sewage chemicals or petroleum products cause irreparable damage to the R.O. Membrane Element.

A dramatic increase in product water production from one day to the next may be the result of a mechanical failure such as a broken o-ring or damaged R.O. Membrane Element.

5.5.1 R.O. MEMBRANE ELEMENT CLEANING WATER AND CHEMICAL REQUIREMENTS:

1. The Sea Recovery cleaning compounds are designed to clean in a closed loop configuration moderate fouling from the R.O. membrane element. If the R.O. Membrane Element is excessively fouled and in-field cleaning is not successful, the R.O. Membrane Element may be returned to Sea Recovery or to one of Sea Recovery's many Service Dealers for Professional chemical cleaning. If your membrane requires professional cleaning, please contact Sea Recovery for a Return Authorization Number, price quotation and return instructions. Note: Very heavily fouled R.O. Membrane Elements may be more cost effective to replace rather than clean as the cleaning process will take several hours of labor, chemical cost, and packaging & shipping charges to and from the factory.

2. **SRC MCC-1**, Membrane Cleaning Compound "# 1" is an alkaline cleaner designed to clean biological fouling and slight oil fouling from the R.O. Membrane Element. Biological fouling is usually the first cause of the R.O. Membrane Element fouling. The system is constantly exposed to seawater and biological growth. If exposed to seawater and left to sit, the R.O. Membrane Element becomes fouled even with no actual system use. This fouling is minimized with fresh water rinsing whenever the system is not in use.

3. **SRC MCC-2,** Membrane Cleaning Compound "# 2" is an acid cleaner designed to clean calcium carbonate and other mineral deposits from the R.O. Membrane Element. Mineral fouling is a slow process, which takes place during use of the system. Therefore, if the System has relatively few hours of use yet shows signs of R.O. Membrane Element fouling then that fouling is likely biological fouling. If the System has several thousand hours of use then there may be some mineral fouling combined with biological fouling.

4. **SRC MCC-3,** Membrane Cleaning Compound "# 3" is used for iron fouling. It is not included in the SRC Membrane Cleaning Chemical kit. If the Systems' R.O. membrane element is fouled with rust from iron piping then SRC CC-3 may be used for effective removal of light or moderate rust fouling. Heavily rust fouled RO Membranes may not be recoverable as rust not only fouls

the Membrane Element but also damages the membrane surface.

CAUTION: DO NOT MIX DIFFERENT CLEANING CHEMICALS TOGETHER. DO NOT USE DIFFERENT CLEANING CHEMICALS TOGETHER AT THE SAME TIME. MIX THE CLEANING CHEMICALS SEPARATELY AND USE THEM SEPARATELY.

5.5.2 R.O. MEMBRANE ELEMENT CLEANING INSTRUCTIONS:

Product Water Required, in U.S. Gallons, for Cleaning of the R.O. Membrane Element:

Chemical	Rinse water required	Cleaning water required	Second Rinse water required	Final Rinse water required	Total water required
CC-1	5	5	5	5	20
CC-2	5	5	5	5	20
CC-3	5	5	5	5	20

1. Configure the System for a **"Once Through De-pressurized Rinse"** using the Product Relief Tube Kit as illustrated on page 6 of this section and as described in item 5.2.C page 8 and 9 of this section.

2. Close the Inlet Sea Cock Valve [2].

3. Clean the Sea Strainer [4] Mesh Screen.

4. Clean the Plankton Filter Element [7].

5. Replace the Pre-filtration Cartridges [13 & 14] with new 25 and 5 micron Sea Recovery Pre-filtration Elements.

6. Fill the Rinse/Clean Solution Container [38] with non-chlorinated product water.

7. Start the system. The rinse water rinses the entire system and discharging to waste [22].

8. Just prior to depleting the rinse water from the Rinse/Clean Solution Container [38] stop the system by pressing the stop switch twice to stop the System and also to abort the Fresh Water Flush Cycle.

9. Once again, fill the Rinse/Clean Solution Container [38] with non-chlorinated product water.

10. Add to the product water in the Rinse/Clean Solution Container [38] one container (plastic bottle 1.5 lbs) of Sea Recovery Membrane Element Cleaning Compound SRC MCC 1, SRC MCC 2, or SRC MCC 3 (only one chemical as appropriate for the type of cleaning desired). **DO NOT ADD ANY OTHER CHEMICAL. DO NOT MIX MORE THAN ONE CHEMICAL TO THE WATER.**

11. Mix and thoroughly dissolve the solution in the Rinse/Clean Solution Container [38].

12. Configure the System for a **"R.O. Membrane Element Cleaning Closed Loop".** Refer to illustrations on page 7 of this section as described on page 9 of this section.

    Disconnect the brine discharge line from the brine discharge tee [22] and place it into the storage/cleaning container [38].

    or

    If the Clean/Rinse Outlet Valve [37] is installed position it to return to the storage cleaning container [38].

13. Operate the system by pressing the "Start" Switch. The membrane cleaning solution flows from the container, through the System, and back into the container [38] in a closed loop configuration.

14. After approximately one hour of circulation, stop the system by pressing the Stop Switch twice which will also disable the Fresh Water Flush Cycle.

15. Discard the Cleaning Chemical Solution in a safe, environmentally friendly, and legal manner.

16. To closed loop rinse the Cleaning Chemical from the System, again Fill the Rinse/Clean Solution Container [38] or bucket with 5 gallons of non chlorinated product water.

17. Operate the system by pressing the "Start" Switch. The rinse water flows from the container, through the System, and back into the container in a Closed Loop configuration.

18. After approximately 15 minutes of circulation, stop the system by pressing the Stop Switch twice which will also disable the Fresh Water Flush Cycle.

19. Discard the rinse water in a safe, environmentally friendly, and legal manner.

20. Perform a final rinse. Reconfigure the System for a ONCE THROUGH DE-PRESSURIZED RINSE. Refer to illustrations on page 6 and as described in item "C" on page 8 & 9 of this Section.

    Reconnect the brine discharge line to the brine discharge tee [22].

    or

    If the Clean/Rinse Outlet Valve [37] is installed position it to discharge out towards the brine discharge connector [22].

21. One final time, fill the Rinse/Clean Solution Container [38] with non-chlorinated product water.

22. Start the system. The rinse water rinses the entire system and discharging to waste [22].

23. Just prior to depleting the rinse water from the Rinse/Clean Solution Container [38] stop the system by pressing the stop switch once to initiate the Automated Fresh Water Flush cycle every 7 days. Press the Stop switch twice to abort the Automated Fresh Water Flush cycle.

24. Reconfigure the System for normal operation:

    a. Reconnect the Sea Strainer [4] outlet line, or reposition the Inlet Rinse/Clean Valve [36] to normal operation position

    b. Remove the Product Relief Tube Kit

    c. Reconnect the High Pressure Hose [21]

The System may now be operated or left unattended for up to 4 to 8 weeks. If the System will be stored without use for longer than 8 weeks refer to Long Term Storage Procedures explained in item 5.4 pages 12 & 13 of this section.

If the System will be stored in Freezing Temperatures refer to Short Term Storage Procedures item 5.3 in this section, or Long Term Storage Procedures item 5.4, as appropriate to Winterize the System.

Section 6

Troubleshooting of Abnormalities

Notes: _____

Troubleshooting

As one can imagine, in providing technical support the more information given to the technician by the operator the easier it becomes to assist the operator and quickly determine the problem.

Please, if you call any of our service dealers or Sea Recovery be prepared to provide sufficient information that will allow us to help you trouble shoot your system. Also, when you call please provide the System full Model Number, Operating Voltage, and Serial Number. This information is very important to us and allows us to look up our manufacturing and quality control records on your specific system. Without this information we may be unable to help you and at the very least helping you will be time consuming and in some cases we may give you inaccurate information if we are not sure of your exact model number, operating voltage, and serial number.

There may be more than one cause of a problem. In the following guide, when there is more than one cause of a problem, the causes are listed in the most likely to occur order. The tests given are designed to determine whether or not the cause of the problem is the correct one. When diagnosing the causes of a problem in this case, eliminate the listed causes one by one until the correct cause is found. Then the appropriate remedy is performed. Diagnosing and correcting the various occurrences in this manner makes troubleshooting easier and less time consuming.

The operator or technician may see the problem from one or more different symptoms. For example, the operator may see that a pressure gauge reading is different from normal, where as another operator may see that the Product Water Flow is different from normal. Both abnormalities could be from the same cause. Therefore, more than one different symptom or abnormality may require the same corresponding correction.

Troubleshooting and subsequent correction or repair will require understanding of:

- Electrical Circuits
- Electronic Circuits
- Electric Motors
- Hydraulic Systems
- Liquid Pressures and Flows
- Piping and Plumbing
- Electro Mechanical Systems
- Mechanical knowledge and skills
- Operational understanding of the ETD [16]

Do not attempt troubleshooting and or subsequent correction or repair if you are not familiar with or are not proficient in, or are not prepared to address the above fields of expertise.

CAUTION: ELECTRICAL SHOCK HAZARD. A Volt / Ohm Meter will be necessary for some troubleshooting and subsequent corrective actions. The following procedures expose the technician to High Voltage and electrical shock hazard. Only attempt this if you are a qualified electrician and only if surrounding conditions are safe.

TROUBLE SHOOTING BY PRESSURE GAUGE READINGS.

Vacuum / Pressure -30 - 0 - 60

Low Pressure 0-300 PSI

High Pressure 0-1500 PSI

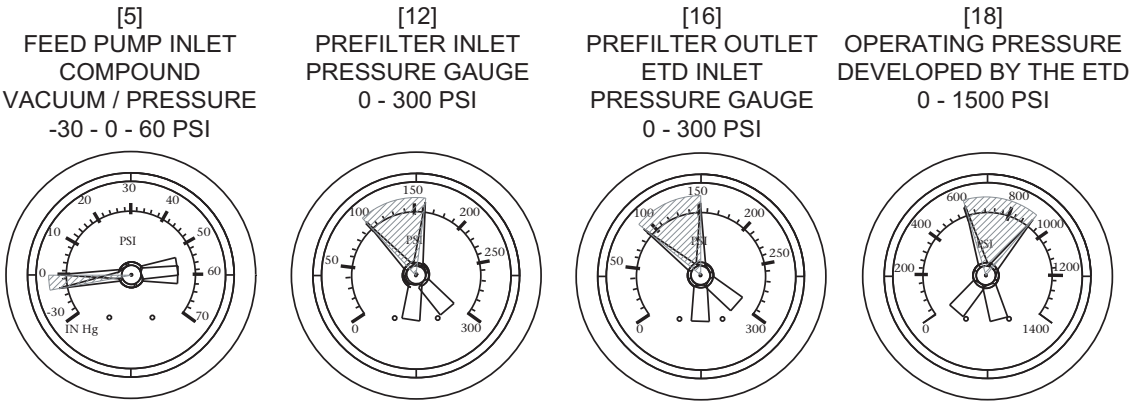
System Shuts Off due to Low Pressure

System Shuts off due to High Pressure

1. TROUBLE SHOOTING BY PRESSURE GAUGE READINGS.

SYSTEM NORMAL PRESSURE GAUGE READINGS:

If the System has been installed properly and there are no abnormalities during operation in typical seawater then the Pressure Gauge Readings should be similar to the below illustration:



[5] Feed Pump Inlet Compound Vacuum/Pressure Gauge is at 0 (zero) pressure or slightly into the Vacuum range -5 In Hg. This indicates that there is no blockage in the suction portion of the Feed Line: No blockage at the inlet thru-hull fitting [1], inlet seacock valve [2], sea strainer mesh screen [4].

[12] Prefilter Inlet Pressure Gauge is reading approximately 100 to 160 PSI (depending on specific model, refer to New System Readings in the Commissioning Section of this Manual). This indicates that the Feed Pump [6] is performing normally, and that there is no blockage prior to it or after it.

[16] Prefilter Outlet Pressure Gauge is reading 90 to 150 PSI (depending on specific model, refer to New System Readings in the Commissioning Section of this Manual). This indicates that the Prefilter Elements are clean with only a 10 PSI drop in pressure across the Prefilters.

[18] High Pressure (R.O. Membrane Outlet & ETD Return Port "R") is reading 590 to 680 PSI (depending on specific model, refer to New System Readings in the Commissioning Section of this Manual). This indicates that the ETD [17] is performing properly.

HIGH/LOW PRESSURE FAULT LAMP:

During Operation, if the System experiences a LOW PRESSURE condition the "High/Low Pressure" Fault Lamp will Illuminate intermittently (blinking on and off) for 20 seconds prior to the System shutting itself off, and the "High/Low Pressure" Fault Lamp will remain Illuminated after the System has shut off. See LOW PRESSURE ABNORMALITIES Troubleshooting.

During Operation, if the System experiences a HIGH PRESSURE condition the "High/Low Pressure" Fault Lamp will Illuminate and immediately the System will shut off with no "blinking lamp" delay, and the "High/Low Pressure" Fault Lamp will remain Illuminated after the System has shut off. See HIGH PRESSURE ABNORMALITIES Troubleshooting.

A. LOW PRESSURE ABNORMALITIES:

Have patience when diagnosing a Low Pressure condition and please read this carefully: Debris may plug up the Prefilter Elements causing the system to shut down. After shut down that same debris may loosen or settle off of the Prefilter Elements and down into the Prefilter Housing bowl. Re-starting of the system may initially give normal Pressure Gauge readings. However, after a short period of time, 5 to 20 minutes, the debris will stir up, pack back onto the Prefilter Elements and once again clog the them causing the System to shut down due to low pressure. Therefore, if the system shuts down after a few minutes of starting, re-start the system and observe the Pressure Gauges during this time interval to determine if clogged Prefilter Elements are the reason for shut down.

Another cause may be a plastic bag or other debris attached to the thru-hull inlet fitting that after several minutes of operation finds it's way over the Inlet Thru Hull Fitting then drops away when the system shuts down, only to reappear when the system is again restarted.

Air can also enter the suction portion of the Feed Line causing the Feed Pump to loose pressure and flow. This can be difficult to detect and will only appear when the line is under a vacuum condition caused by a blockage in the line prior to the air leak. Air may also enter the feed line through the Inlet Thru-Hull [1] fitting from under the boat when the boat is under way.

Low Pressure Abnormality 1.

SYSTEM SHUTS DOWN DURING OPERATION OR 20 SECONDS AFTER STARTING AND THE HIGH/LOW PRESSURE FAULT LAMP IS ILLUMINATED AFTER SHUTTING DOWN.

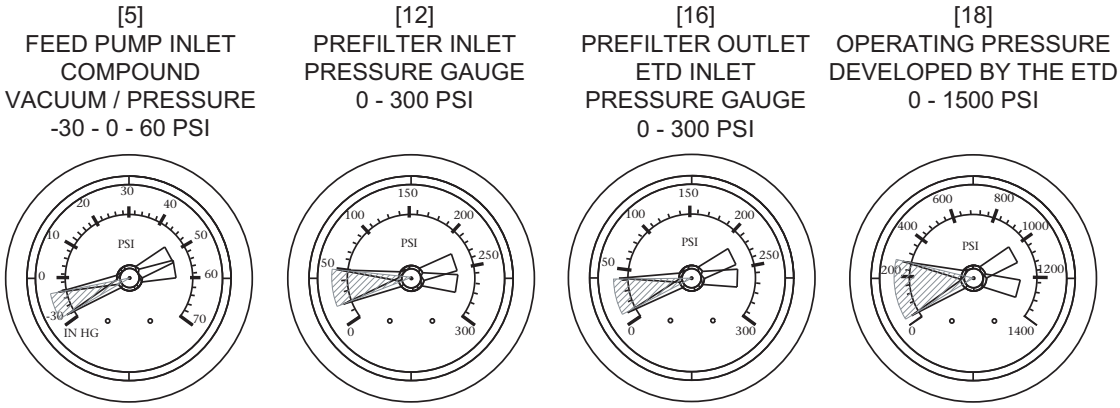
Properly Position Valves

a) Ensure that the Sea Cock Valve [2] is fully open.
b) Ensure that the Inlet Rinse Clean Valve [36], if installed, is positioned towards the Sea Strainer [4] normal operating position.

a. POSSIBLE CAUSE: BLOCKAGE IN THE SUCTION LINE.

1) Press Reset Fault Switch to reset and turn off the "High/Low Pressure" Fault Lamp.
2). Start the System

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers a heavy Vacuum reading greater than -10 In Hg as illustrated below which indicates there is a blockage at or prior to the Inlet of the Feed Pump [6]. Correct the condition as described below: The System will shut down when the blockage in the suction line causes the Prefilter Inlet Pressure Gauge [12] to drop below 40 PSI.



1). Clean or replace the Sea Strainer [4] mesh screen.

2). Clean debris attached to or sucked up within the Inlet Thru Hull Fitting [1] (plastic bag, cloth rag, sea weed, marine growth, fitting installation caulking, new boat shipping cover or tape, casting slag over the opening, etc.).

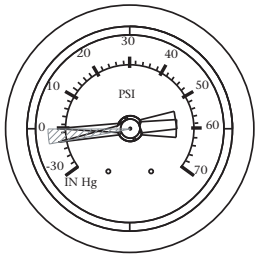
b. POSSIBLE CAUSE: DIRTY AND PLUGGED PLANKTON FILTER [7] ELEMENT.

1) Press Reset Fault Switch to reset and turn off the "High/Low Pressure" Fault Lamp.
2). Start the System

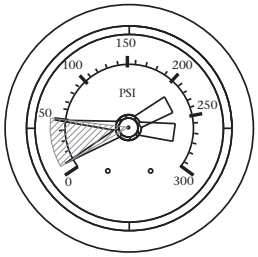
IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers normal (near or at 0 [zero] PSI, yet the Prefilter Inlet Pressure Gauge [12], Outlet Prefilter Pressure Gauge [16], and Operating Pressure Gauge [18] all register lower than normal this would indicate that the Plankton Filter [7] (if installed) is dirty and requires cleaning.

This could also indicate that the feed water pump requires servicing. If the internal components of the feed water pump have been cavitated or worn from abrasive particles in the feed water the pump will lose its ability to maintain pressure and flow. Refer to Feed Water Pump troubleshooting later in this section.

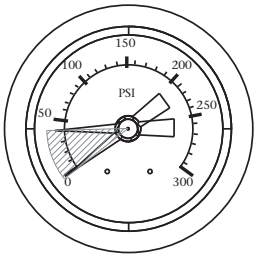
[5]
FEED PUMP INLET
COMPOUND
VACUUM / PRESSURE
-30 - 0 - 60 PSI



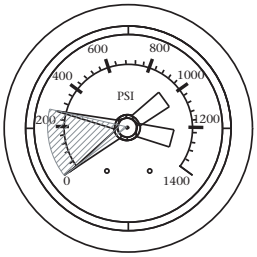
[12]
PREFILTER INLET
PRESSURE GAUGE
0 - 300 PSI



[16]
PREFILTER OUTLET
ETD INLET
PRESSURE GAUGE
0 - 300 PSI



[18]
OPERATING PRESSURE
DEVELOPED BY THE ETD
0 - 1500 PSI



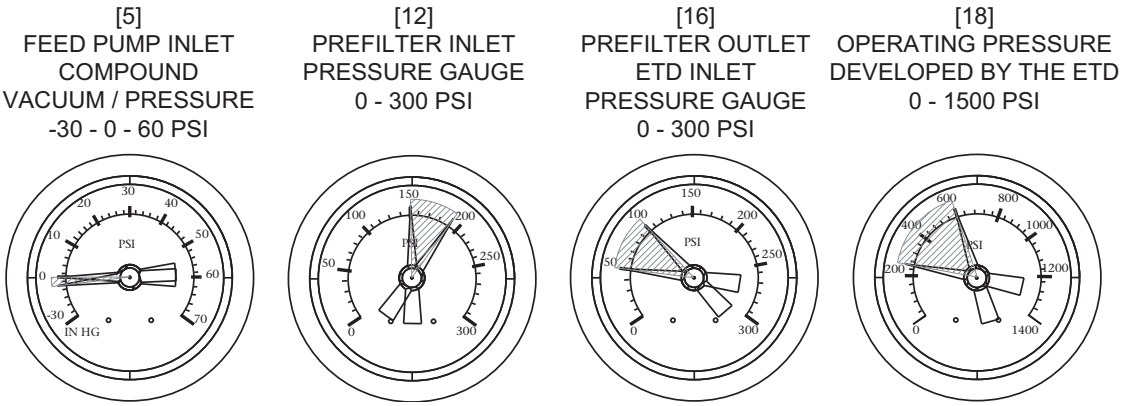
1. Clean the Plankton Filter Element [7]. Attempt to operate the system. If condition continues go to step 2 below.

2. Feed Water Pump is worn due to cavitation or fine particle debris and suspended solids abrasion and requires re-building. Refer to Feed Water Pump troubleshooting later in this section.

c. POSSIBLE CAUSE: DIRTY AND PLUGGED PREFILTER [13 & 14] ELEMENTS.

1) Press Reset Fault Switch to reset and turn off the "High/Low Pressure" Fault Lamp.
2). Start the System

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers normal (near or at 0 [zero] PSI, yet the Prefilter Inlet Pressure Gauge [12] registers higher than normal while the Prefilter Outlet Pressure Gauge [16] and Operating Pressure Gauge [18] registers lower than normal this would indicate that the Prefilter Elements [13 & 14] are dirty and require replacement. The System will shut down when the Prefilter Elements become so dirty that the Prefilter Inlet Pressure Gauge [12] reaches 190 PSI.



1. Clean the Plankton Filter Element [7].

2. Replace the 25 and 5 micron Prefilter Elements [13 & 14] with new Sea Recovery Prefilter Elements.

WARNING: Do not use third party prefilter elements, use only Sea Recovery Prefilter Elements. Third party prefilter elements on the market do not properly fit, the seams fall apart, they will allow by-pass resulting in premature fouling of the R.O. Membrane Element and this will void the Sea Recovery Warranty.

CAUTION: Do not use "string wound" or "fiber" prefilter elements. These type of elements are designed for the Photographic Film Developing industry. When used in sea water they will plug up rapidly in 1/10th or less the time causing frequent shut down of the system and very frequent changing resulting in very high cost of maintenance and time consuming frustration.

d. POSSIBLE CAUSE: AIR SUCTION LEAK AT OR PRIOR TO THE FEED PUMP [6] INLET, ANYWHERE BETWEEN THE INLET THRU HULL FITTING [1] AND THE INLET OF THE FEED PUMP [6].

1) Press Reset Fault Switch to reset and turn off the "High/Low Pressure" Fault Lamp.
2). Start the System

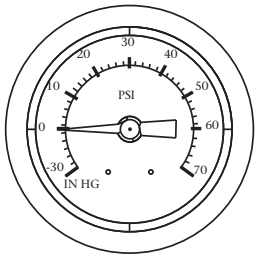
IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers 0 (zero) PSI and the other 3 pressure gauges [12, 16, & 18} register far below normal this may indicate that air is entering the Suction portion of the Feed Line. Air can only enter the feed line in the Suction portion of the line which is at or prior to the Inlet of the Feed Pump [6]. Air may also be entering the feed line from the bottom of the boat through the Inlet Thru-Hull scoop while the boat is under way.

This could also indicate that the feed water pump requires servicing. If the internal components of the feed water pump have been cavitated or worn from abrasive particles in the feed water the pump will lose its ability to maintain pressure and flow. Refer to Feed Water Pump troubleshooting later in this section.

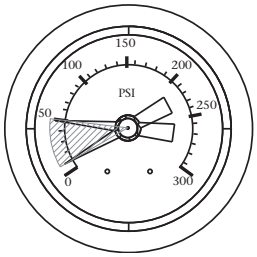
The feed water pump [6] is capable of and will pull a vacuum to purge the air and prime itself if the outlet of the feed pump [6] is not "blocked". However, the ETD [17] does cause resistance which acts as a "blockage" at the outlet of the feed pump. With air inside the feed pump it can not purge itself easily due to the restriction at its outlet which is caused by the ETD. This situation will correct itself over several minutes as the feed pump slowly purges the air.

To purge any trapped air loosen the black tube fitting nut at pressure gauge 5 and 12. After the air is purged finger tighten the black tube fitting nut.

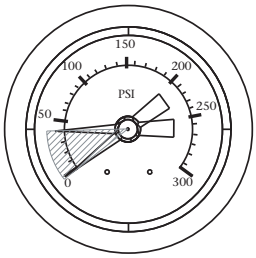
[5] FEED PUMP INLET COMPOUND VACUUM / PRESSURE -30 - 0 - 60 PSI



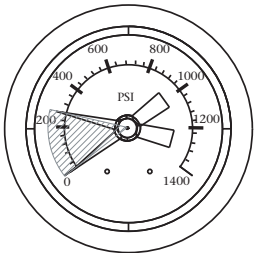
[12] PREFILTER INLET PRESSURE GAUGE 0 - 300 PSI



[16] PREFILTER OUTLET ETD INLET PRESSURE GAUGE 0 - 300 PSI

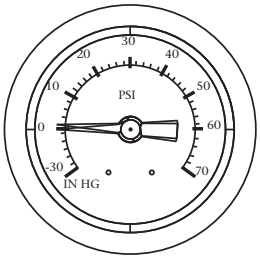


[18] OPERATING PRESSURE DEVELOPED BY THE ETD 0 - 1500 PSI

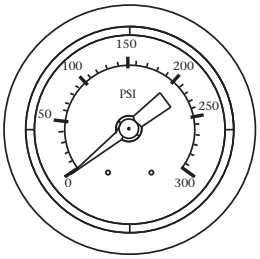


OR

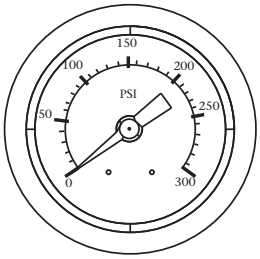
[5] FEED PUMP INLET COMPOUND VACUUM / PRESSURE -30 - 0 - 60 PSI



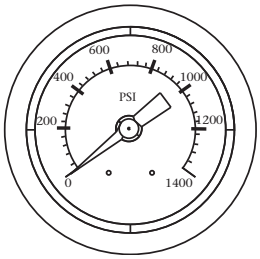
[12] PREFILTER INLET PRESSURE GAUGE 0 - 300 PSI



[16] PREFILTER OUTLET ETD INLET PRESSURE GAUGE 0 - 300 PSI



[18] OPERATING PRESSURE DEVELOPED BY THE ETD 0 - 1500 PSI



1. While the Feed Pump [6] is in operation, hold a flash light behind the feed line clear braded suction hose and look for any air entering this line. Air can enter from a hose connection, threaded connection, loose valve packing gland. Air can also enter the Sea Strainer due to a missing, displaced, or damaged O-ring.

2. Correct the air suction leak appropriately to ensure that the Feed Pump receives a constant supply of air free feed water.

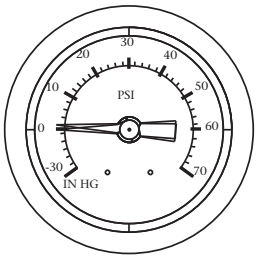
3. If air continually enters the system from the Inlet Thru-Hull [1] fitting evaluate the location of the fitting and move it to a location on the hull that remains in constant contact with water.

e. POSSIBLE CAUSE: FEED PUMP ELECTRIC MOTOR IS NOT OPERATING OR THE FEED PUMP WETTED END IS EXTENSIVELY DAMAGED.

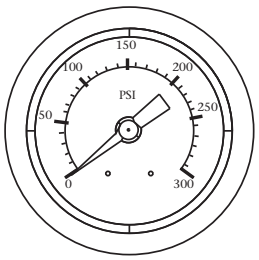
1) Press Reset Fault Switch to reset and turn off the "High/Low Pressure" Fault Lamp.
2). Start the System

IF Similar symptoms as an air suction leak, all 4 (four) Pressure Gauges [5, 12, 16, & 18] are not registering any pressure at all this would indicate that either the Feed Pump Electric Motor is not operating or that there is extensive damage to the Feed Pump wetted end. See Feed Pump Maintenance and Repair later in this Section.

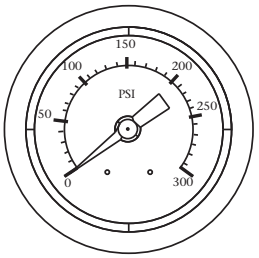
[5]
FEED PUMP INLET
COMPOUND
VACUUM / PRESSURE
-30 - 0 - 60 PSI



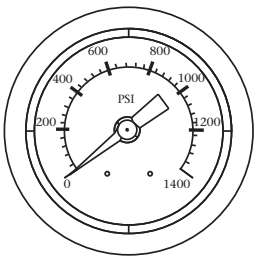
[12]
PREFILTER INLET
PRESSURE GAUGE
0 - 300 PSI



[16]
PREFILTER OUTLET
ETD INLET
PRESSURE GAUGE
0 - 300 PSI



[18]
OPERATING PRESSURE
DEVELOPED BY THE ETD
0 - 1500 PSI



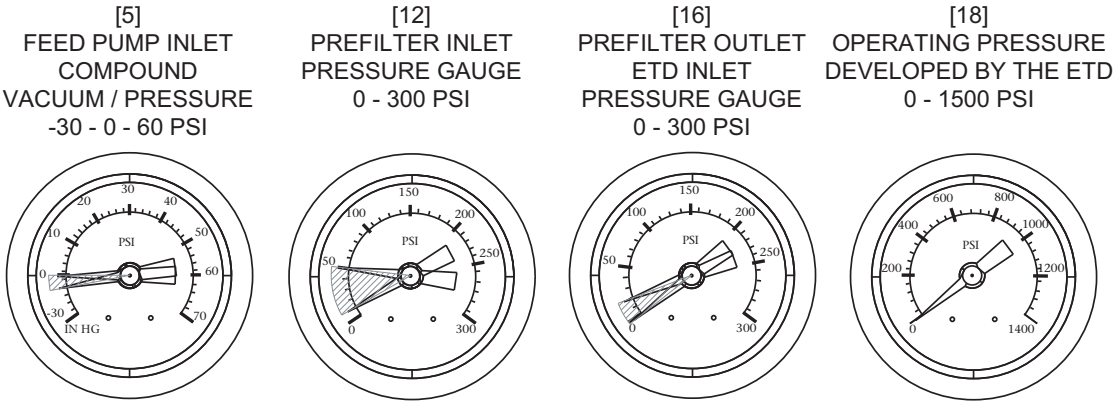
1. Check the Feed Water Pump to ensure that the electric motor is operating. If not trouble shoot the electric motor and the electrical power circuit supplying the electric motor.

2. If the Electric Motor is operating the problem may be within the Feed Pump Wetted End.

f. POSSIBLE CAUSE: HIGH PRESSURE SEALS WITHIN THE ETD HIGH PRESSURE CHAMBER ARE WORN OR HAVE SLIPPED OUT OF THEIR PROPER POSITION.

1) Press Reset Fault Switch to reset and turn off the "High/Low Pressure" Fault Lamp.
2). Start the System

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers normal at zero to slight vacuum, the Prefilter Inlet Pressure Gauge [12] registers far below normal, the Prefilter Outlet Pressure Gauge [16] registers far below normal pressure, and the High Pressure Gauge [18] does not register at all this would indicate that the High Pressure Seals within the ETD require replacement. See ETD Troubleshooting later in this Section.



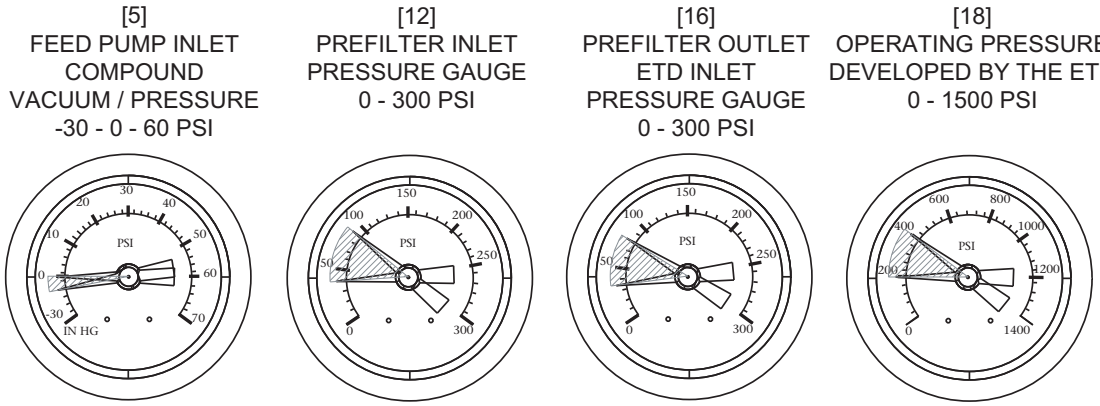
1. While the System is operating check the Brine Discharge Line and look for a steady stream, non pulsating stream, of Feed Water coming out of the Brine Discharge Thru Hull Fitting [23]. If there is a steady stream, without pulsations, of Feed Water discharging over board to waste then refer to ETD Troubleshooting later in this section.

Low Pressure Abnormality 2.

SYSTEM REMAINS IN OPERATION HOWEVER ALL PRESSURE GAUGE READINGS ARE LOW AND THE SYSTEM IS PRODUCING THE SPECIFIED AMOUNT OF POTABLE PRODUCT WATER.

a. POSSIBLE CAUSE IS LOW SALINITY FEED WATER AND OR HIGH TEMPERATURE FEED WATER.

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers normal, the Prefilter Inlet and Outlet Pressure Gauges [12 & 16] register lower than normal, and the High Pressure Gauge [18] registers lower than normal.



1). The System may be operating and reacting normal in relationship to the Feed Water Salinity and Temperature. Refer to the Salinity, Temperature and Operating Pressure Charts in Section 10 of this manual.

B. HIGH PRESSURE ABNORMALITIES:

High Pressure Abnormalities, excessive or higher than normal pressure at the R.O. Membrane Element as registered on the High Pressure Gauge [18], can be caused by Low Temperature Feed Water, High Salinity Feed Water, Fouled R.O. Membrane Element, a blockage in the Brine Discharge Line, and or a blockage in the Product Water Line.

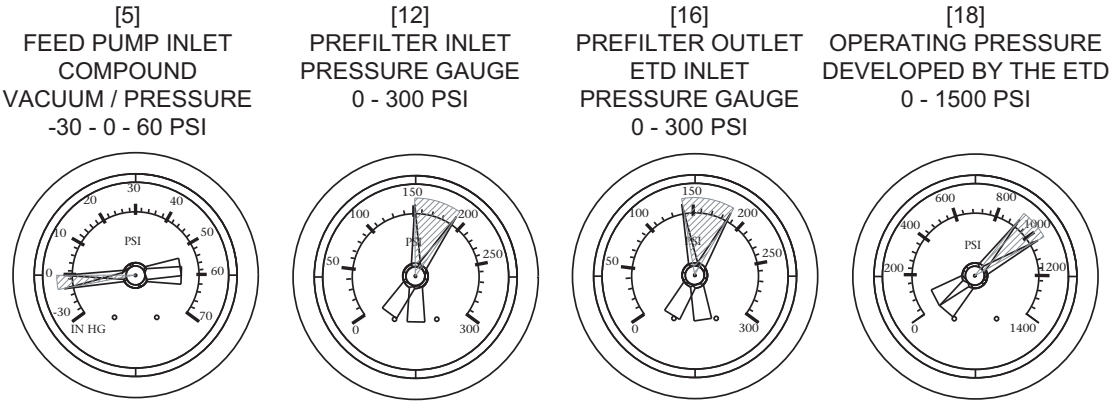
Abnormality 1.

SYSTEM SHUTS DOWN DURING OPERATION OR IMMEDIATELY AFTER STARTING AND THE HIGH/LOW PRESSURE FAULT LAMP IS ILLUMINATED. THE HIGH/LOW PRESSURE FAULT LAMP DID NOT ILLUMINATE INTERMITTENTLY (DID NOT BLINK) FOR 20 SECONDS PRIOR TO THE SYSTEM SHUTTING DOWN.

Properly Position Valves

a) Ensure that the Sea Cock Valve [2] is fully open.
b) Ensure that the Inlet Rinse Clean Valve [36], if installed, is positioned towards the Sea Strainer [4] normal operating position.
c) Ensure that the Discharge Rinse Clean Valve [37], if installed, is positioned towards the Sea Brine Discharge Fitting [22] normal operating position.
d) Ensure that any valve in the Brine Discharge Line or at the Thru Hull Discharge Fitting [22] is full OPEN.
e) Ensure that any valve in the Product Water Line is full OPEN.
f) Ensure that there are no kinks or other blockages in the Brine Discharge Line and or the Product Water Line.

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers Normal with slight vacuum or 0 (zero) PSI, the Prefilter Inlet Pressure Gauge [12] registers higher than normal, the Prefilter Outlet Pressure Gauge [16] registers higher than normal, and the Operating Pressure Gauge [18] also registers higher than normal. This would indicate that the ETD is attempting to overcome a "restriction" of Product Water Flow caused by one or more of the reasons stated above (Low Temperature Feed Water, High Salinity Feed Water, Fouled R.O. Membrane Element, a blockage in the Brine Discharge Line, and or a blockage in the Product Water Line).



a. POSSIBLE CAUSE: LOW TEMPERATURE FEED WATER.

1) The System may be operating and reacting normal in relationship to the Feed Water Salinity and Temperature. Refer to the Salinity, Temperature and Operating Pressure Charts in Section 10 of this manual to ensure that the System is being operated within the Feed Water Temperature limits stated, and or that the resulting operating pressure is at the expected pressure according to the charts.

b. POSSIBLE CAUSE: HIGH SALINITY FEED WATER.

1) The System may be operating and reacting normal in relationship to the Feed Water Salinity and Temperature. Refer to the Salinity, Temperature and Operating Pressure Charts in Section 10 of this manual to ensure that the System is being operated within the Feed Water Salinity limits stated, and or that the resulting operating pressure is at the expected pressure according to the charts.

c. POSSIBLE CAUSE: FOULED R.O. MEMBRANE ELEMENT

1) Refer to the Charts in Section 10 of this manual. Project the expected operating pressure with the given Feed Water Temperature and Salinity to determine if the System is operating within expected limits. If the operating pressure is greater than the expected limits this could indicate that the R.O. Membrane Element may have a moderate degree of fouling and may require cleaning.

   This would be applicable only to a used system, used R.O. Membrane Element. If the system is new and just being operated for the first time the R.O. Membrane Element may have dried out if the system has been sitting unused for an extended period of time from the date of shipment. Contact Sea Recovery to determine shipment date and delay in installation if applicable.

2) Refer to System Storage & R.O. Membrane Element Cleaning Section 5 of this manual.

d. POSSIBLE CAUSE: BLOCKAGE IN THE BRINE DISCHARGE LINE

Any restriction or blockage in the Brine Discharge Line will cause excessive operating pressure.

1) Ensure that the Discharge Rinse Clean Valve [37], if installed, is positioned towards the Brine Discharge fitting [22].normal operating position.

2) Ensure that any valve in the Brine Discharge Line or at the Thru Hull Discharge Fitting [22] is full OPEN.

3) Ensure that there are no kinks or other blockages in the Brine Discharge Line.

e. POSSIBLE CAUSE: BLOCKAGE IN THE PRODUCT WATER LINE

Any restriction or blockage in the Product Water Line will cause excessive operating pressure.

1) Ensure that any valve in the Product Water Line is full OPEN.

2) Ensure that there are no kinks or other blockages in the Product Water Line.

C. HIGH PRESSURE or LOW PRESSURE ABNORMALITIES DUE TO A MISMATCH OF COMPONENTS:

a. POSSIBLE CAUSE: MISMATCHING OF THE FEED PUMP [6], ETD [17], OR R.O. MEMBRANE ELEMENT [20].

The Ultra Whisper System is designed to recover as Product Water a fixed percentage of the Feed Water. The System self adjusts the operating pressure in order to maintain a constant and set Product Water Flow. Therefore, the System should never experience greater than or less than normal Product Water Flow, unless there is a failure or abnormality.

Three components must be properly matched in order to attain acceptable operating pressure limits and resulting Product Water Production Limits. The ETD [17], the Reverse Osmosis Membrane Element [20], and the Feed Pump [6] Output Flow of water must all be matched. Upon leaving Sea Recovery's factory at the time of shipment these components have been matched and tested together as a System.

If the initial Sea Recovery customer (Distributor, Dealer, or Boat Builder) has mistakenly interchanged one or more of these components, from other Systems in their stock, this will cause a mismatch resulting in insufficient operating pressure, insufficient product water flow, excessive operating pressure, or excessive product water flow. If one or more of these components has recently been replaced it may have been replaced with the incorrect component.

If the System is NEW and being operated for the first time, or if one or more of the above mentioned components has recently been replaced, check to ensure that the three components are properly matched. Refer to the following two pages.

ETD: If the ETD [17] has been improperly changed to a HIGHER size code from "B-22" to "B-25" Product Water Flow will increase along with higher than normal operating pressure. The High Pressure Switch [11] will eventually signal the System to shut down due to excess pressure at the Prefilter Inlet Pressure Gauge [12].

If the ETD [17] has been improperly changed to a LOWER size code from "B-25" to "B-22" Product Water Flow will decrease along with lower than normal operating pressure and poor Product Water Quality.

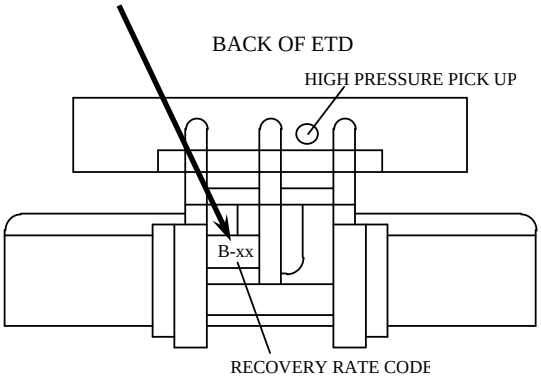
FEED PUMP: If the Feed Pump [6] has been improperly changed to a HIGHER size code (ie from 100 GPH to 140 GPH, etc.) Product Water Flow will increase along with higher than normal operating pressure. The High Pressure Switch [11] will eventually signal the System to shut down due to excess pressure at the Prefilter Inlet Pressure Gauge [12].

If the Feed Pump [6] has been improperly changed to a LOWER size code (ie from 190 GPH to 125 GPH, etc.) Product Water Flow will decrease along with lower than normal operating pressure and poor Product Water Quality.

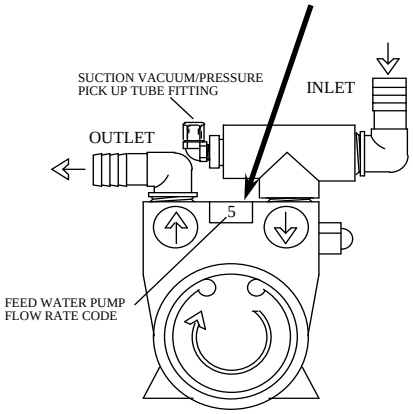
R.O. MEMBRANE ELEMENT: If the R.O. Membrane Element has been improperly changed to a HIGHER size code from "A" to "B", or "C" or from "B" to "C" then Product Water Flow will not change and the operating pressure will decrease resulting in poor Product Water Quality.

If the R.O. Membrane Element has been improperly changed to a LOWER size code from "B" to "A", or from "C" to "B" or "A" then Product Water Flow will not change but the operating pressure will increase. The High Pressure Switch [11] will eventually signal the System to shut down due to excess pressure at the Prefilter Inlet Pressure Gauge [12].

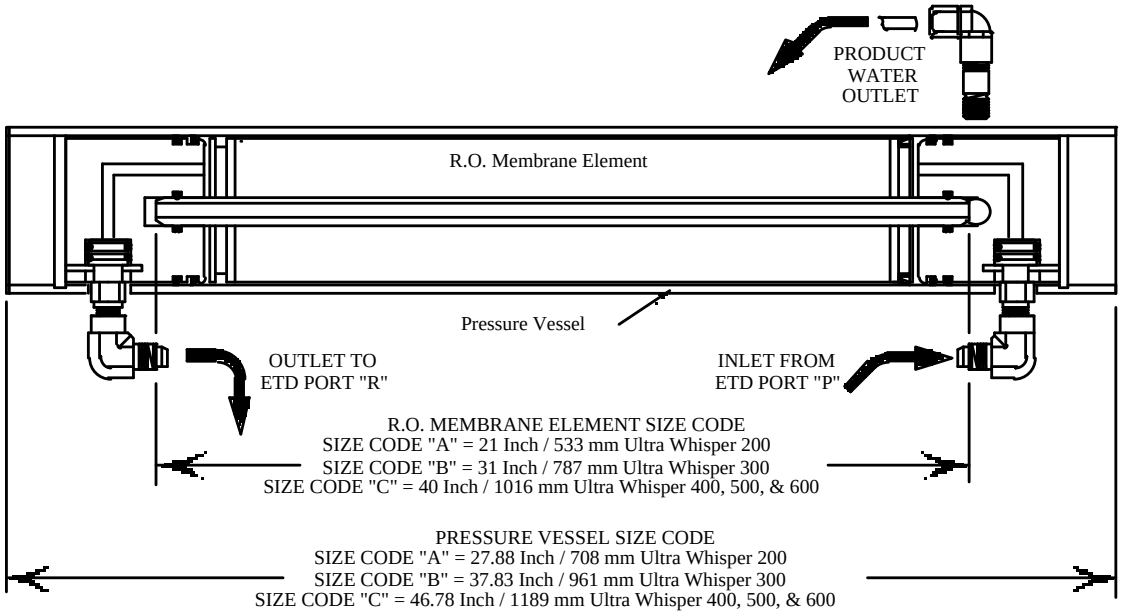
ETD [17] SIZE CODE LOCATION:



FEED PUMP [6] SIZE CODE LOCATION:



R.O. MEMBRANE ELEMENT [20] SIZE CODE AND PRESSURE VESSEL SIZE CODE IN RELATIONSHIP TO LENGTH:



ULTRA WHISPER SIZE CODES OF THE FEED PUMP, ETD, R.O. MEMBRANE ELEMENT, AND PRESSURE VESSEL IN RELATIONSHIP TO THE GALLON PER DAY PRODUCTION OF THE SPECIFIC ULTRA WHISPER:

If any of these components are miss-matched the System will not function properly. Either the Operating Pressure and Amperage Draw will be higher than specified causing damage to one or more of these components, or the operating pressure will be too low resulting in decreased product water quantity and poor product water quality.

12 VDC, 24 VDC & 60 Hz powered Systems

Ultra Whisper Model GPD / LPD	Ultra Whisper Production	Feed Pump Size Code	Feed Pump Flow GPH /LPH	ETD Size Code	ETD Recovery Percentage Size Code	R.O. Membrane Element	Pressure Vessel Size Code
UW 200	**216 / 818**	**10**	**100 / 379**	**B-22**	**9 %**	**A**	**A**
UW 300	**298 / 1128**	**15**	**140 / 530**	**B-22**	**9 %**	**B**	**B**
UW 400	**403 / 1526**	**15**	**140 / 530**	**B-25**	**12 %**	**C**	**C**
UW 500	**547 / 2071**	**16**	**190 / 719**	**B-25**	**12 %**	**C**	**C**
UW 600	**619 / 2343**	**17**	**215 / 814**	**B-25**	**12 %**	**C**	**C**

50 Hz powered Systems

Ultra Whisper Model GPD / LPD	Ultra Whisper Production	Feed Pump Size Code	Feed Pump Flow GPH / LPH	ETD Size Code	ETD Recovery Percentage Size Code	R.O. Membrane Element	Pressure Vessel Size Code
UW 200	**224 / 848**	**35**	**104.2 / 394**	**B-22**	**9 %**	**A**	**A**
UW 300	**297 / 1124**	**36**	**137.5 / 520**	**B-22**	**9 %**	**B**	**B**
UW 400	**396 / 1499**	**36**	**137.5 / 520**	**B-25**	**12 %**	**C**	**C**
UW 500	**516 / 1953**	**17**	**179.2 / 678**	**B-25**	**12 %**	**C**	**C**
UW 600	**600 / 2271**	**18**	**208.3 / 788**	**B-25**	**12 %**	**C**	**C**

TROUBLE SHOOTING PRODUCT WATER ABNORMALITIES

Insufficient Product Water Flow

Excessive Product Water Flow

Poor Quality Product Water

(also refer to Electrical Troubleshooting of the
Salinity Probe and 3-Way Product Water Solenoid Diversion Valve)

A. PRODUCT WATER FLOW OR QUALITY ABNORMALITIES:

The production of the System (Product Water Flow) and the Quality of the Product Water (high Quality indicates low salinity; low quality indicates high salinity) are dependent upon the proper amount of Feed Water Flow and Operating Pressure at the R.O. Membrane Element. Product Water Flow or Quality abnormalities can be the result of Pressure Abnormalities described on the previous pages, which are repeated below.

Production abnormalities can also be the result of worn seals, worn o-rings, cracks or damage at sealing surfaces, or a fouled R.O. Membrane Element.

Quality abnormalities can also be the result of worn seals, worn o-rings, cracks or damage at sealing surfaces, or a fouled R.O. Membrane Element, Feed Water Temperature, and or Feed Water Salinity.

Lower Than Normal Product Water Flow:

A Blockage in the Suction Line, resulting in a heavy Vacuum reading at the Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] will cause the Feed Pump [6] to cavitate resulting in a reduction of Feed Water Flow and Feed Pump Outlet Pressure. The Ultra Whisper System is designed to recover as Product Water a set percentage of the Feed Water. Therefore, if the Feed Pump flow decreases, due to cavitation, then the Product Water Flow will decrease accordingly.

Likewise, a Blockage in the Prefiltration, resulting in an excessive pressure reading at the Prefilter Inlet Pressure Gauge [12] will restrict the Feed Pump Water Flow and Feed Water Pressure at the Outlet of the Prefilters. Again, the Ultra Whisper System is designed to recover as Product Water a set percentage of the Feed Water. Therefore, if the Feed Pump flow decreases, due to a blockage at the Prefiltration, then the Product Water Flow will decrease accordingly.

A decrease in Product Water Flow can also be caused by a fouled R.O. Membrane Element. However, as the R.O. Membrane Element becomes fouled the Prefilter Inlet Pressure Gauge [12], the Prefilter Outlet Pressure Gauge [16], and the High Pressure Gauge [18] will all register higher than normal pressure as the System self adjusts to overcome the fouling. The High Pressure Switch [11] will eventually signal the System to shut down due to excess pressure at the Prefilter Inlet Pressure Gauge [12] when pressure increases to 190 PSI.

Miss-matching of System Components as explained on pages 16 - 18 of this section can cause lower or higher than normal product water flow.

Lower than normal Feed Water Temperature causes the R.O. Membrane to require greater operating pressure in order to maintain the normal Product Water production. The Ultra Whisper System self adjusts by increasing the operating pressure to compensate for lower than normal Feed Water Temperature.

A blockage in the Product Water Line will cause lower than normal Product Water Flow. The Ultra Whisper System will attempt to self adjust the operating pressure to over come the drop in Product Water Flow caused by a blockage in the Product Water Line. The High Pressure Switch [11] will eventually signal the System to shut down due to excess pressure at the Prefilter Inlet Pressure Gauge [12] when this pressure increases to 190 PSI.

Higher Than Normal Product Water Flow:

Miss-matching of System Components as explained on pages 16 - 18 of this section can cause higher than normal product water flow accompanied by increased operating pressure. The High Pressure Switch [11] will eventually signal the System to shut down due to excess pressure greater than 190 PSI at the Prefilter Inlet Pressure Gauge [12].

A worn or broken Product Water O-ring at the End Plug, inside the High Pressure Vessel [20], will allow Feed Water to by-pass into the Product Water to produce a greater than normal amount of Product Water. The

resulting mixture of Product Water and Feed Water will be of low quality, high in salinity. This will also show up as lower than normal operating pressure at the operating pressure gauge [18].

A crack in the End Plug between the Feed Water Port and Product Water Port, or a rough surface at the Product Water O-ring will also allow Feed Water to by-pass into the Product Water causing the Product Water Flow to increase. The resulting mixture of Product Water and Feed Water will be of low quality, high in salinity. This will also show up as lower than normal operating pressure at the operating pressure gauge [18].

Higher than normal Feed Water Temperature causes the R.O. Membrane to require less operating pressure in order to maintain the normal Product Water production. The Ultra Whisper System self adjusts by decreasing the operating pressure to compensate for higher than normal Feed Water Temperature. Product Water Quality will decrease, increase in salinity, as the operating pressure is decreased to compensate for the higher than normal Feed Water Temperature.

Low Product Water Quality (increase of salt content in the product water):

Miss-matching of System Components as explained on pages 16 - 18 of this section can cause lower than normal operating pressure resulting in low quality Product Water.

A worn or broken Product Water O-ring at the End Plug, inside the High Pressure Vessel, will allow Feed Water to by-pass into the Product Water. The resulting mixture of Product Water and Feed Water will be of low quality, high in salinity. This will also show up as lower than normal operating pressure at the operating pressure gauge [18].

A crack in the End Plug between the Feed Water Port and Product Water Port, or a rough surface at the Product Water O-ring will also allow Feed Water to by-pass into the Product Water. The resulting mixture of Product Water and Feed Water will be of low quality, high in salinity. This will also show up as lower than normal operating pressure at the operating pressure gauge [18].

Higher than normal Feed Water Temperature causes the R.O. Membrane to require less operating pressure in order to maintain the normal Product Water production. The Ultra Whisper System self adjusts by decreasing the operating pressure to compensate for higher than normal Feed Water Temperature. Product Water Quality will decrease, increase in salinity, as the operating pressure is decreased to compensate for the higher than normal Feed Water Temperature.

A Fouled R.O. Membrane Element will produce poor quality Product Water because the R.O. Membrane Element allows a constant passage of dissolved solids, salt and other minerals. The water molecules passing through the R.O. Membrane Element dilute the constant amount of dissolved solids. Therefore, the greater the amount of water passage the lower the concentration, lower percentage, of dissolved solids. As the R.O. Membrane Element becomes fouled less water passes through it to dilute the constant dissolved solids passage. This results in poor quality Product Water. The Ultra Whisper System self adjusts the operating pressure to over come the fouling. Eventually the High Pressure Switch [11] will signal the System to shut off due to excessive operating pressure above 190 PSI.

Abnormality 1.
SYSTEM PRODUCTION, PRODUCT WATER FLOW, IS LOWER THAN NORMAL.

Properly Position Valves

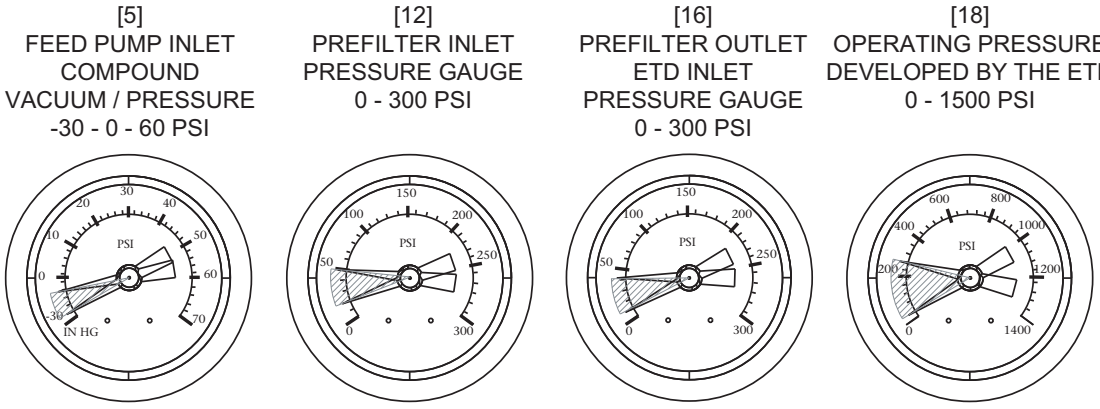
- **a) Ensure that the Sea Cock Valve [2] is fully open.**
- **b) Ensure that the Inlet Rinse Clean Valve [36], if installed, is positioned towards the Sea Strainer [4] normal operating position.**
- **c) Ensure that the Discharge Rinse Clean Valve [37], if installed, is positioned towards the Brine Discharge Connection [22] normal operating position.**
- **d) Ensure that any valve in the Brine Discharge Line or at the Thru Hull Discharge Fitting [22] is full OPEN.**
- **e) Ensure that any valve in the Product Water Line is full OPEN.**
- **f) Ensure that there are no kinks or other blockages in the Brine Discharge Line and or the Product Water Line.**

a. POSSIBLE CAUSE: BLOCKAGE IN THE SUCTION LINE.

1) If the "High/Low Pressure" Fault Lamp is illuminated, Press Reset Fault Switch.

2). Start the System

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers a heavy Vacuum reading greater than -10 In Hg as illustrated below which indicates there is a blockage at or prior to the Inlet of the Feed Pump [6]. This will cause low Feed Water flow and in turn low Product Water flow. Correct the condition as described below: The System will shut down when the blockage in the suction line causes the Prefilter Inlet Pressure Gauge [12] to drop below 40 PSI.



1). Clean or replace the Sea Strainer [4] mesh screen.

2). Clean debris attached to or sucked up within the Inlet Thru Hull Fitting [1] (plastic bag, cloth rag, sea weed, marine growth, fitting installation caulking, new boat shipping cover or tape, casting slag over the opening, etc.).

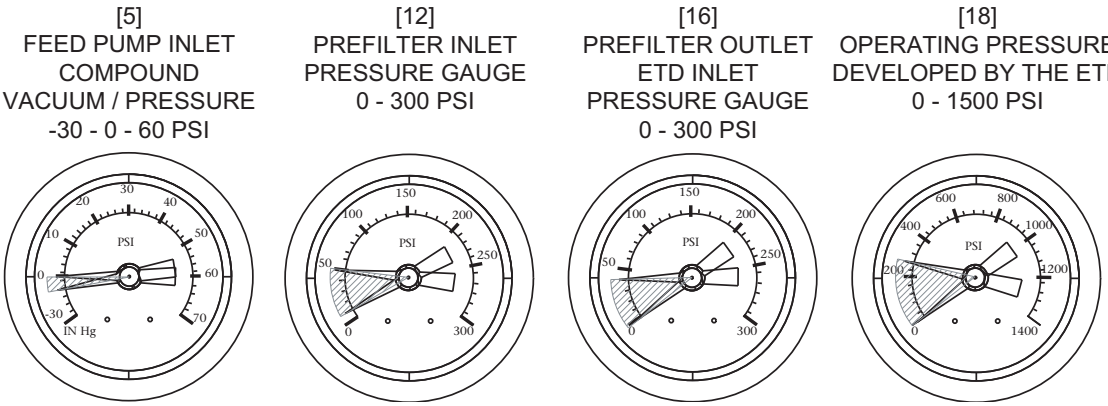
b. POSSIBLE CAUSE: DIRTY AND PLUGGED PLANKTON FILTER [7] ELEMENT.

1) Press Reset Fault Switch to reset and turn off the "High/Low Pressure" Fault Lamp.

2). Start the System

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers normal (near or at 0 [zero] PSI, yet the Prefilter Inlet Pressure Gauge [12], Outlet Prefilter Pressure Gauge [16], and Operating Pressure Gauge [18] all register lower than normal this would indicate that the Plankton Filter [7] (if installed) is dirty and requires cleaning.

This could also indicate that the feed water pump requires servicing. If the internal components of the feed water pump have been cavitated or worn from abrasive particles in the feed water the pump will lose its ability to maintain pressure and flow. Refer to Feed Water Pump troubleshooting later in this section.



1. Clean the Plankton Filter Element [7]. Attempt to operate the system. If condition continues go to step 2 below.

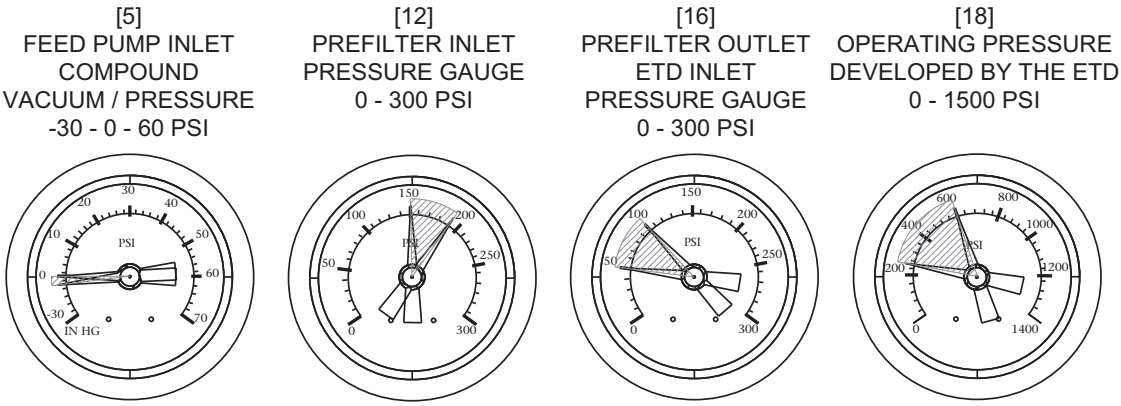
2. Feed Water Pump is worn due to cavitation or fine particle debris and suspended solids abrasion and requires re-building. Refer to Feed Water Pump troubleshooting later in this section.

c. POSSIBLE CAUSE: BLOCKAGE IN THE PREFILTRATION.

1) If the "High/Low Pressure" Fault Lamp is illuminated, Press Reset Fault Switch.

2). Start the System

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers normal (near or at 0 [zero] PSI, yet the Prefilter Inlet Pressure Gauge [12] registers higher than normal while the Prefilter Outlet Pressure Gauge [16] and Operating Pressure Gauge [18] registers lower than normal this would indicate that the Prefilter Elements [13 & 14] are dirty and require replacement. This will cause low Feed Water flow and in turn low Product Water flow. The High Pressure Switch [11] will open causing the System to shut down when the Prefilter Elements become so dirty that the Prefilter Inlet Pressure Gauge [12] reaches 190 PSI. Correct the condition as described below:



1. Clean the Plankton Filter Element [7]

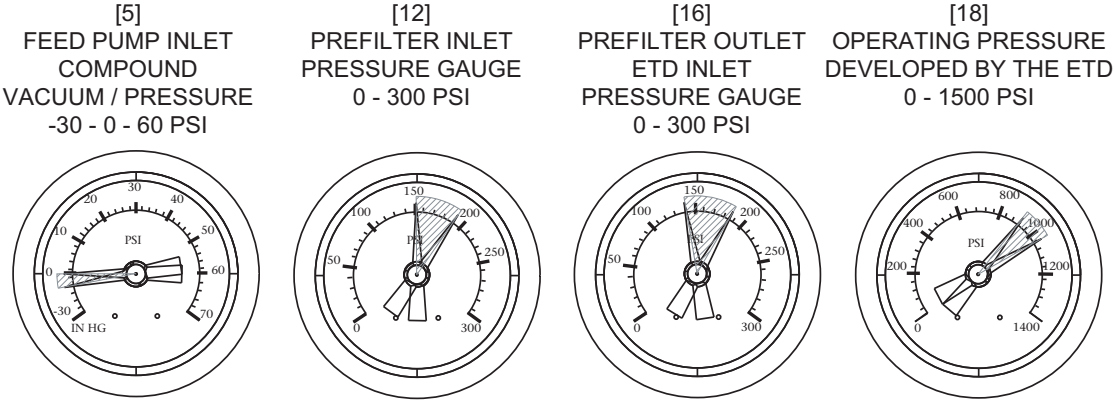
2. Replace the 25 and 5 micron Prefilter Elements [13 & 14] with new Sea Recovery Prefilter Elements.

WARNING: Do not use third party prefilter elements, use only Sea Recovery Prefilter Elements. Third party prefilter elements on the market do not properly fit, the seams fall apart, they will allow by-pass resulting in premature fouling of the R.O. Membrane Element and this will void the Sea Recovery Warranty.

WARNING: Do not use "string wound" or "fiber" prefilter elements. These type of elements are designed for the Photographic Film Developing industry. When used in sea water they will plug up rapidly in 1/10th or less the time causing frequent shut down of the system and very frequent changing resulting in very high cost of maintenance and time consuming frustration.

d. POSSIBLE CAUSES: LOW TEMPERATURE FEED WATER; HIGH SALINITY FEED WATER; FOULED R.O. MEMBRANE ELEMENT; BLOCKAGE IN THE PRODUCT WATER LINE

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers Normal with slight vacuum or 0 (zero) PSI, and the remaining 3 pressure gauges, Prefilter Inlet Pressure Gauge [12], Prefilter Outlet Pressure Gauge [16], and Operating Pressure Gauge [18] all register higher than normal this would indicate that the ETD is attempting to overcome a "restriction" of Product Water Flow caused by one or more of the reasons stated above (Low Temperature Feed Water, High Salinity Feed Water, Fouled R.O. Membrane Element, Blockage in the Product Water Line). This will cause higher than normal operating pressure, low Feed Water flow, and in turn low Product Water flow. As the System self adjusts to overcome the "restriction", the High Pressure Switch [11] will eventually signal the System to shut down due to excess pressure at the Prefilter Inlet Pressure Gauge [12].



a. POSSIBLE CAUSE: LOW TEMPERATURE FEED WATER.

1) Low Temperature Feed Water will lower the R.O. Membrane Element production of Product Water. The Ultra Whisper System will automatically compensate for the low production due to low temperature feed water by increasing the operating pressure. The System may be operating and reacting normal in relationship to the Feed Water Salinity and Temperature. Refer to the Salinity, Temperature and Operating Pressure Charts in Section 10 of this manual to ensure that the System is being operated within the Feed Water Temperature limits stated, and or that the resulting operating pressure is at the expected pressure according to the charts.

b. POSSIBLE CAUSE: HIGH SALINITY FEED WATER.

1) High Salinity Feed Water will lower the R.O. Membrane Element production of Product Water. The Ultra Whisper System will automatically compensate for the low production due to high salinity feed water by increasing the operating pressure. The System may be operating and reacting normal in relationship to the Feed Water Salinity and Temperature. Refer to the Salinity, Temperature and Operating Pressure Charts in Section 10 of this manual to ensure that the System is being operated within the Feed Water Salinity limits stated, and or that the resulting operating pressure is at the expected pressure according to the charts.

c. POSSIBLE CAUSE: FOULED R.O. MEMBRANE ELEMENT

1) As the R.O. Membrane Element becomes fouled due to normal use and exposure to the Feed Water greater pressure will be required to produce the normal quantity of Product Water. Refer to the Charts in Section 10 of this manual. Project the expected operating pressure with the given Feed Water Temperature and Salinity to determine if the System is operating within expected limits. If the

operating pressure is greater than the expected limits this could indicate that the R.O. Membrane Element may have a moderate degree of fouling and may require cleaning.

2) Refer to System Storage & R.O. Membrane Element Cleaning Section 5 of this manual.

d. POSSIBLE CAUSE: BLOCKAGE IN THE PRODUCT WATER LINE

1) Any restriction or blockage in the Product Water will result in low Product Water production. However, the Ultra Whisper System will attempt to over come the restriction by automatically increasing operating pressure.

2) Ensure that any valve in the Product Water Line is full OPEN.

3) Ensure that there are no kinks or other blockages in the Product Water Line.

4) Check the 3-way Product Water Solenoid Diversion Valve [26] to ensure that it is properly adjusted and not causing restrictions. Refer to section 7 of this manual to adjust the diversion valve if it is causing a restriction.

Abnormality 2.

SYSTEM PRODUCTION, PRODUCT WATER FLOW, IS HIGHER THAN NORMAL.

The Ultra Whisper System self adjusts the operating pressure, up or down accordingly, to produce the specified amount of Product Water. Therefore, the System should never produce more Product Water than specified unless one or more of the following has occurred:

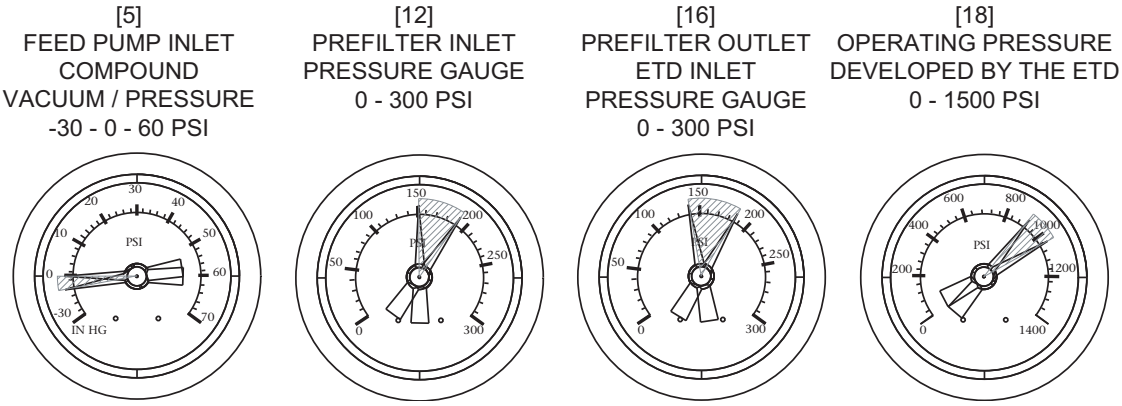
a. There is a blockage in the Brine Discharge Line causing Brine Water by-pass into the Product Water

b. The 3-way Product Water Diversion Solenoid Valve is not properly adjusted

c. There is bypassing of the Feed Water into the Product Water due to a broken or worn Product Water O-ring, a crack or imperfection in the High Pressure Vessel End Plug, or the R.O. Membrane Element is damaged.

d. The System components have been mismatched

IF The Feed Pump Inlet Compound Vacuum/Pressure Gauge [5] registers Normal with slight vacuum or 0 (zero) PSI, and the other 3 pressure gauges (Prefilter Inlet Pressure Gauge [12], Prefilter Outlet Pressure Gauge [16], and Operating Pressure Gauge [18]) all register higher than normal this would indicate that there could be a blockage in the Brine Discharge Line causing the excessive pressure readings and by-passing of Brine Water into the Product Water through the 3-way Product Water Solenoid Diversion Valve resulting in excess Product Water Flow.

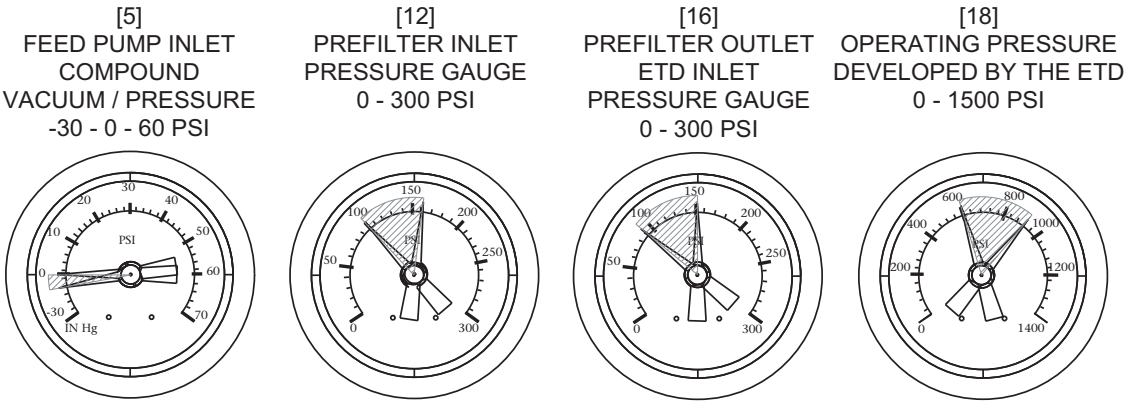


a. POSSIBLE CAUSE: BLOCKAGE IN THE BRINE DISCHARGE LINE

2) Ensure that any valve in the Brine Discharge Line or at the Thru Hull Discharge Fitting [22] is full OPEN.

3) Ensure that there are no kinks or other blockages in the Brine Discharge Line.

IF The Pressure Gauges are all reading normal yet there is excessive Product Water Flow this could be caused by an improper adjustment of the 3-way Product Water Diversion Solenoid Valve. If the 3-way Product Water Diversion Solenoid Valve seats are improperly adjusted Brine Water can mix with Product Water. The Product Water will be salty tasting.



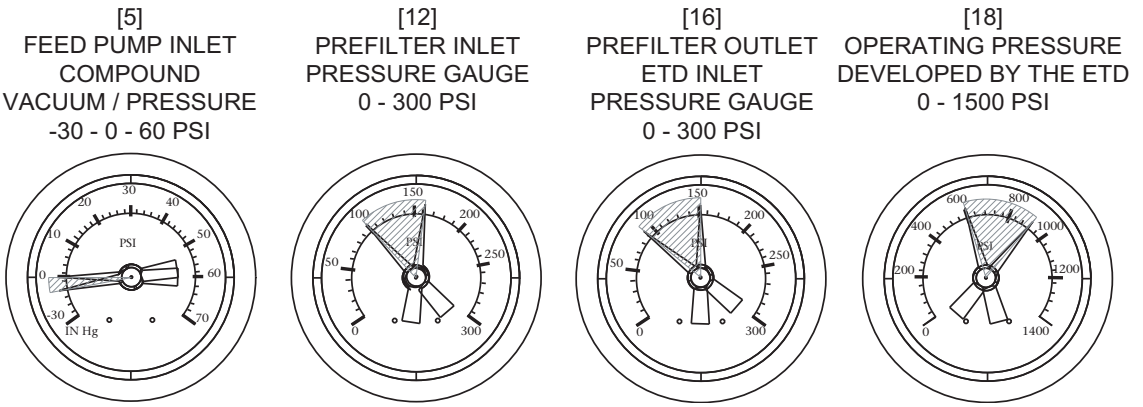
b. POSSIBLE CAUSE: 3-way Product Water Diversion Solenoid Valve [26] is out of adjustment.

1) Check the salinity of the Product Water after the product water manifold and prior to the Charcoal Filter [28] using a hand held TDS meter, or taste the Product Water to determine if it is salty, above 1000 PPM TDS.

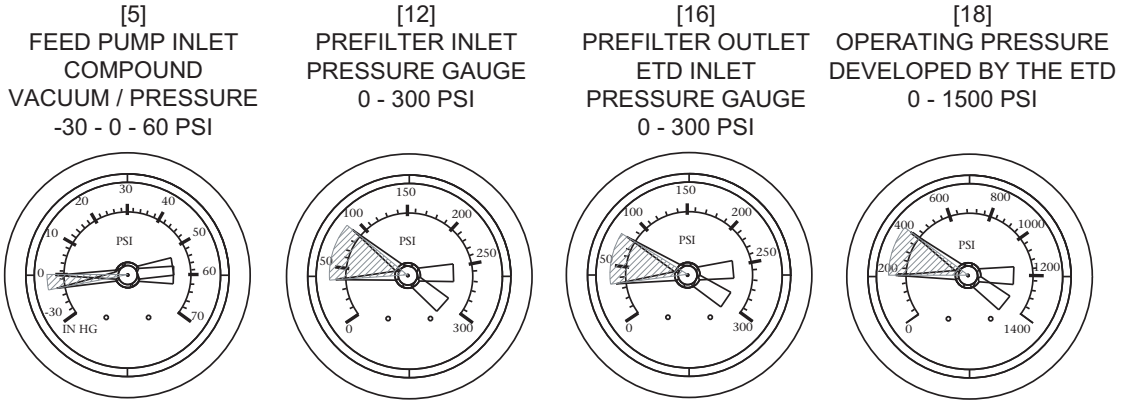
2) If the Product Water salinity is greater than 1000 PPM TDS and is flowing greater than normal, check the 3-way Product Water Solenoid Diversion Valve [26] to ensure that it is properly adjusted and not allowing bypass between the "good" and "bad" product water ports. Refer to section 7 of this manual.

c. POSSIBLE CAUSE: There is by-passing of the Feed Water into the Product Water due to a broken or worn Product Water O-ring, a crack or imperfection in the High Pressure Vessel End Plug, or the R.O. Membrane Element is damaged. Depending on the amount of by-pass the pressure gauges may read normal or may read lower than normal.

normal reading of pressure gauges:



or abnormally low reading of pressure gauges:



1) Check the condition of the two Product Water O-Rings located inside each of the two High Pressure Vessel End Plugs. Replace the O-rings if worn, flattened, or broken.

2) Check the High Pressure Vessel End Plugs for any signs of a crack between the Product Port and the High Pressure Port. Replace the End Plug if cracked.

3) Check the High Pressure Vessel End Plugs for any signs of irregular machining of the Product Water O-ring grooves. Replace the end plug if the machined surface at the Product Water O-ring groove shows signs of irregularities or imperfections.

4) Check the Product Water Tube ends of the R.O. Membrane Element. Look for imperfections where the Product Water O-ring rests on the tube ends. Look for signs of cracks on the Product Water Tube ends. Replace the R.O. Membrane Element if imperfections or cracks are present. Note: If the Product Water Tube is cracked or broken at either end of the R.O. Membrane Element this is caused by excessive pressure due to a blockage in the Product Water Line.

d. POSSIBLE CAUSE: EXCESSIVE WATER FLOW, or EXCESSIVE PERCENTAGE OF RECOVERY.

Three components must be properly matched in order to attain acceptable operating pressure limits and resulting Product Water Production Limits. The ETD [17], the Reverse Osmosis Membrane Element [20], and the Feed Pump [6] Output Flow of water must all be matched. Upon leaving Sea Recovery's factory at the time of shipment these components have been matched and tested together.

If the initial Sea Recovery customer (Distributor, Dealer, or Boat Builder) has mistakenly interchanged one or more of these components this will cause a mismatch resulting in insufficient operating pressure, insufficient product water flow, excessive operating pressure, or excessive product water flow. If one or more of these components has recently been replaced it may have been replaced with the incorrect component.

If the System is NEW and being operated for the first time, or if the one or more of the above mentioned components has recently been replaced, check to ensure that the three components are properly matched. Refer to pages 16 - 18 in this section.

TROUBLE SHOOTING

ELECTRONIC

&

ELECTRICAL

ABNORMALITIES

CAUTION: ELECTRICAL SHOCK HAZARD
A Volt / Ohm Meter will be necessary. The following procedures expose the technician to High Voltage and electrical shock hazard. Only attempt this if you are a qualified electrician and only if surrounding conditions are safe.

A. ELECTRICAL AND ELECTRONIC ABNORMALITIES:

Often times the operator or technician may assume or be confused in thinking that a problem with the Ultra Whisper operation is due to an Electrical or Electronic Abnormality when in fact the cause of the operational abnormality may be due to simple lack of maintenance such as a plugged Prefilter Element. For example, the system continually shuts down; the operator thinks there is an electrical problem or pressure switch problem; in fact the prefilter is plugged up and the pressure switch is protecting the System by shutting the system down as it is designed to do.

Always check and compare against normal the Pressure Gauge readings prior to assuming that the System has an electrical or electronic abnormality.

ELECTRICAL verses ELECTRONIC abnormalities:

ELECTRICAL refers to the High Voltage or Power Voltage that supplies the Ultra Whisper System.

ELECTRONIC refers to the Low Voltage and Electronic Circuitry that controls the System.

Prior to Troubleshooting Properly Position Valves

a) Ensure that the Sea Cock Valve [2] is fully open.

b) Ensure that the Inlet Rinse Clean Valve [36], if installed, is positioned towards the Sea Strainer [4] normal operating position.

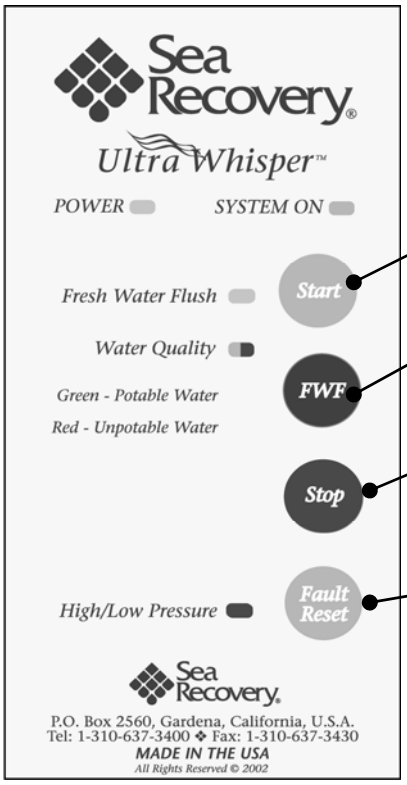
c) Ensure that the Discharge Rinse Clean Valve [37], if installed, is positioned towards the Brine Discharge fitting [22] normal operating position.

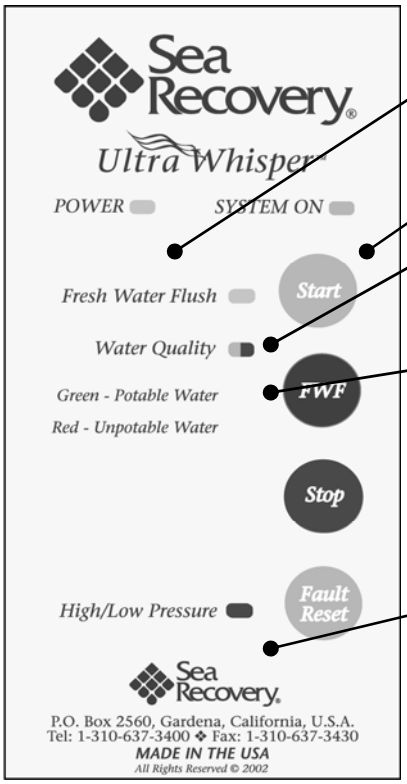
d) Ensure that any valve in the Brine Discharge Line or at the Thru Hull Discharge Fitting [22] is full OPEN.

e) Ensure that any valve in the Product Water Line is full OPEN.

f) Ensure that there are no kinks or other blockages in the Brine Discharge Line and or the Product Water Line.

CAUTION: ELECTRICAL SHOCK HAZARD. A Volt / Ohm Meter will be necessary for some troubleshooting and subsequent corrective actions. The following procedures expose the technician to High Voltage and electrical shock hazard. Only attempt this if you are a qualified electrician and only if surrounding conditions are safe.





TOUCH PAD CONTROL DESCRIPTIONS:

SWITCHES

START: This switch initiates the start cycle of the Feed Pump [6] and the System.

FRESH WATER FLUSH: This switch initiates the Fresh Water Flush Cycle. When pressed, the Fresh Water Flush Cycle begins and the Fresh Water Flush lamp illuminates steady green.

STOP: This switch stops all of the system functions when pressed. Each time the system is stopped, the Fresh Water Flush system is initiated as indicated by a steady illumination of the Fresh Water Flush lamp. The Fresh Water Flush cycle is aborted by pressing the Stop switch a second time.

FAULT RESET: This switch resets the High/Low Pressure fault and allows the system to start.

INDICATION LAMPS:

Power: This indicator is illuminated when power is supplied to the controller. This indicates that the main power breaker has been switched on.

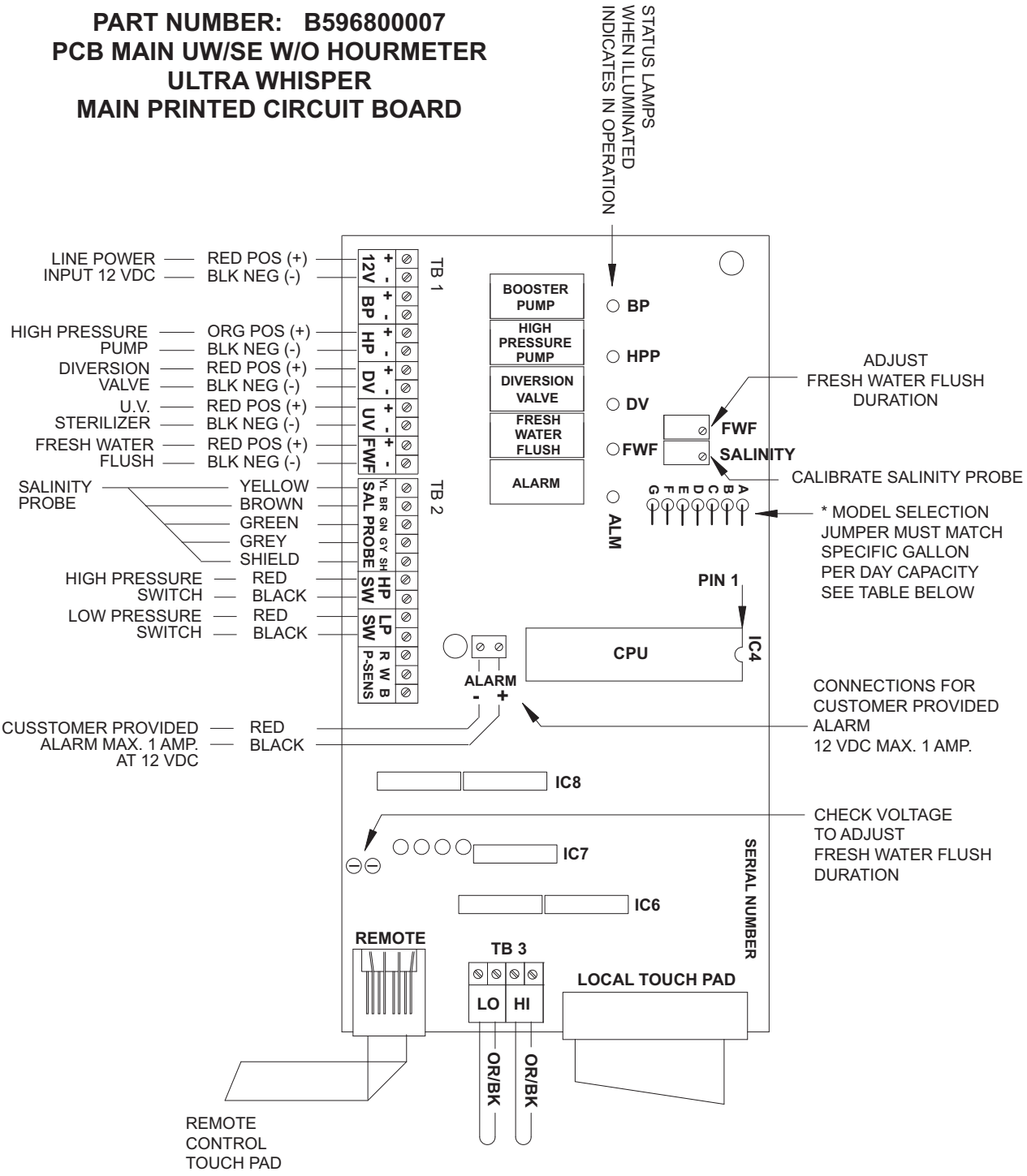
System On: This lamp illuminates when the System has been Started and is operating.

Fresh Water Flush: This lamp illuminates continually during the Fresh Water Flushing operation. When the Fresh Water Flush is in the stand-by mode, in between the ten-minute flushing cycle that repeats automatically every seven days, the lamp illuminates intermittently on and off (blinks).

Product Water Quality: This lamp indicates the quality of the water being produced by the system. A red illumination indicates that the System is producing "un-potable" product water that is being discharged over board. A green lamp illuminates when the system is producing safe water (potable water) that is being diverted to the potable water storage tank.

High/Low Pressure: The High/Low pressure fault lamp illuminates when the system shuts down due to either a low-pressure condition, or a high-pressure condition. During operation if the Low Pressure Switch senses a low-pressure condition, this lamp blinks for twenty seconds, and then the system shuts down and the lamp remains illuminated until the Fault Reset Switch is pressed. If the High Pressure Switch senses a high pressure condition during operation the system will shut down immediately and the lamp will illuminate until the Fault Reset Switch is pressed.

PART NUMBER: B596800007
PCB MAIN UW/SE W/O HOURMETER
ULTRA WHISPER
MAIN PRINTED CIRCUIT BOARD



*** MODEL SELECTION JUMPER TABLE:**

MODEL	JUMPERS						
	A	B	C	D	E	F	G
ULTRA WHISPER 200	CUT	---	---	CUT	---	---	---
ULTRA WHISPER 300	---	CUT	---	CUT	---	---	---
ULTRA WHISPER 400	---	CUT	---	CUT	---	---	---
ULTRA WHISPER 500	CUT	CUT	---	CUT	---	---	---
ULTRA WHISPER 600	CUT	CUT	---	CUT	---	---	---

CUT = CUT WIRE LEAD FROM RESISTOR
--- = DO NOT CUT WIRE LEAD

ELECTRICAL SEQUENCE:

POWER APPLIED TO THE SYSTEM

RESULTS IN

"POWER" lamp illuminated at the Touch Pad

"START" SWITCH PRESSED

RESULTS IN:

"POWER" lamp illuminated at the Touch Pad
"HPP" green lamp illuminated at the Main Printed Circuit Board
12 VDC present at the Main Printed Circuit Board Terminal Strip "TB1" position "HP"
12 VDC present at the Feed Pump Contactor coil
System voltage transfer across the Feed Pump Contactor terminals to the Feed Pump motor
Feed Pump motor starts and system is operational
"SYSTEM ON" lamp illuminated at the Touch Pad
Salinity of Product water is monitored
If product water salinity is greater than the factory set point "Water Quality" red LED illuminates
If product water salinity is lower than the factory set point "Water Quality" green LED illuminates
"DV" green lamp illuminated at the Main Printed Circuit Board (if the "Water Quality" green LED is illuminated at the Touch Pad.
12 VDC present at Main Printed Circuit Board "TB1" position "DV"
12 VDC present at 3-Way Product Water Diversion Valve coil
3-Way Product Water Diversion Valve actuates and diverts potable water to the Post Filtration
12 VDC present at Main Printed Circuit Board "TB1" position "UV"
12 VDC present at Ultra Violet Sterilizer
Ultra Violet Sterilizer illuminates (is functioning).

"STOP" SWITCH PRESSED

RESULTS IN:

"POWER" lamp illuminated at the Touch Pad
"HPP" green lamp NOT illuminated at the Main Printed Circuit Board
12 VDC NOT present at the Main Printed Circuit Board Terminal Strip "TB1" position "HP"
12 VDC NOT present at the Feed Pump Contactor coil
System voltage NOT transferred across the Feed Pump Contactor terminals to the Feed Pump motor
Feed Pump motor is NOT operational
"SYSTEM ON" lamp NOT illuminated at the Touch Pad
Salinity of Product water is NOT monitored and "Water Quality" LED NOT illuminated
"DV" green lamp NOT illuminated at the Main Printed Circuit Board
12 VDC NOT present at Main Printed Circuit Board "TB1" position "DV"
12 VDC NOT present at 3-Way Product Water Diversion Valve coil
3-Way Product Water Diversion Valve NOT actuated
12 VDC NOT present at Main Printed Circuit Board "TB1" position "UV"
12 VDC NOT present at Ultra Violet Sterilizer
Ultra Violet Sterilizer NOT illuminates (is NOT functioning).

IF STOP SWITCH WAS PRESSED TWICE THE FRESH WATER FLUSH CYCLE WILL NOT BE ACTIVATED.

IF STOP SWITCH WAS PRESSED ONCE:

If Fresh Water Flush Option is installed
"FWF" green lamp on Main Printed Circuit Board flashes (illuminates on and off) for 90 minutes
"Fresh Water Flush" amber lamp on Touch Pad flashes for 90 minutes
After 90 minutes "FWF" green lamp on Main Printed Circuit Board illuminates steady for 6 to 25 minutes during the Fresh Water Flush process
"Fresh Water Flush" amber lamp illuminates steady for 6 to 25 minutes during the Fresh Water Flush process

If power is not interrupted, after the 6 to 25 minute Fresh Water Flush process "FWF" green lamp on Main Printed Circuit Board flashes for 7 days

"Fresh Water Flush" amber lamp on Touch Pad flashes for 7 days

After 7 days "FWF" green lamp on Main Printed Circuit Board illuminates steady for 6 to 25 minutes during the Fresh Water Flush process

"Fresh Water Flush" amber lamp illuminates steady for 6 to 25 minutes during the Fresh Water Flush process etc.

If the System Stop Switch is pressed, or if power is interrupted the "FWF" green lamp on the Main Printed Circuit Board turns off, the "Fresh Water Flush" amber lamp on the Touch Pad turns off, and the Fresh Water Flush process will not initiate.

"FWF" SWITCH PRESSED WHEN SYSTEM IS NOT IN OPERATION BUT POWER TO THE SYSTEM IS PRESENT.

RESULTS IN:

"POWER" lamp illuminated at the Touch Pad

"FWF" green lamp on Main Printed Circuit Board illuminates steady for 6 to 25 minutes during the Fresh Water Flush process

"Fresh Water Flush" amber lamp illuminates steady for 6 to 25 minutes during the Fresh Water Flush process

After the 6 to 25 minute Fresh Water Flush process "FWF" green lamp on Main Printed Circuit Board flashes for 7 days

"Fresh Water Flush" amber lamp on Touch Pad flashes for 7 days

After 7 days "FWF" green lamp on Main Printed Circuit Board illuminates steady for 6 to 25 minutes during the Fresh Water Flush process

"Fresh Water Flush" amber lamp illuminates steady for 6 to 25 minutes during the Fresh Water Flush process etc.

If the System Stop Switch is pressed, or if power is interrupted the "FWF" green lamp on the Main Printed Circuit Board turns off, the "Fresh Water Flush" amber lamp on the Touch Pad turns off, and the Fresh Water Flush process will not initiate.

"FAULT RESET" SWITCH PRESSED

RESULTS IN:

"POWER" lamp illuminated at the Touch Pad

If the system shut down due to a high or low pressure condition at the time of shut down the "High/Low Pressure" red lamp on the Touch Pad illuminates

Press the "FAULT RESET" switch to turn this lamp off.

Correct the cause of the High or Low pressure condition.

SYMPTOM 1: Supply Power is applied to the Ultra Whisper System but the "Power" lamp at the Touch Pad is not illuminated.

Confirm that 12 VDC is present at the main printed circuit board TB 1 12V + and -.

POSSIBLE CAUSES:

- Blown Fuse on the 12 VDC supply power (Alternating Current Systems Only)
- Power Cable has a break and Power is not present at the System
- Loose wire, check wires, refer to wiring diagram in section 8
- Loose connector between Main Printed Circuit Board and Touch Pad
- Damaged Touch Pad
- Damaged Main Printed Circuit Board

SYMPTOM 2: The "Power" lamp at the Touch Pad is illuminated. When the Start Switch is pressed the Feed Water Pump Lamp blinks once (illuminates for a fraction of a second) and the Feed Pump does not Start.

POSSIBLE CAUSES:

When the Start switch was pressed, if the "System On" lamp at the Touch Pad blinked (illuminated for a split second) and the Feed Pump did not start this is caused by high current drain from the Feed Pump Electric Motor at the instant it receives power. Electric motors consume high current and require full voltage in order to "excite" the windings within the motor allowing rotation of the armature. Once the armature is rotating at full RPM the current drops to normal. High current drain when the Feed Pump Electric Motor attempts to start is normal, and if the installation and supply power are correct, voltage will hold and the System will start. However, if the power supply is weak or if the power wires are too thin then this will cause voltage to drop resulting in the loss of power to the electronic circuit. This loss of voltage or low voltage condition is the result of one or more of the following:

- Low voltage from the source due to a weak source such as a low battery in need of charging, an inadequate power supply such as an undersized inverter, low dock power, an undersized generator, or undersized power wires.
- Only one battery is supplying power to the System (12 or 24 VDC System) and the battery bank current rating is not high enough to deliver adequate power at the instant the electric motor attempts to start, or the Battery is weak or in need of charging.
- Power wires from the source to the Ultra Whisper are of insufficient gauge (thickness) to deliver the required current and voltage to the electric motor during its starting phase.

Determine the "weak link" in the power being supplied to the system and correct it.

SYMPTOM 3: The "Power lamp" at the Touch Pad is illuminated, yet when the Start Switch is pressed NOTHING happens. The "Power" lamp at the Touch Pad is illuminated, but none of the other lamps on the Touch Pad are illuminated, the "System On" lamp at the Touch Pad did not blink when the Start Switch was pressed, and the Feed Pump Motor did not start.

POSSIBLE CAUSE:

- Loose wire, check wires using wiring diagram
- Loose connector between Main Printed Circuit Board and Touch Pad
- Damaged Touch Pad Start Switch
- Damaged Main Printed Circuit Board
- Damaged Feed Pump Contactor
- Damaged Feed Pump Electric Motor

SYMPTOM 4: SYSTEM SHUTS DOWN DURING OPERATION AND THE "High/Low Pressure" lamp is illuminated after the System shut down.

POSSIBLE CAUSE:

- System shut down by the Low Pressure Switch [10]
- System shut down by the High Pressure Switch [11]

Press the "Fault Reset" switch at the Touch Pad, restart the system, monitor the pressure gauges to determine what corrective action is needed as outlined in the previous pages of this section.

SYMPTOM 5: SYSTEM SHUT DOWN DURING OPERATION. THE "HIGH/LOW PRESSURE" LAMP AT THE TOUCH PAD IS NOT ILLUMINATED. THE "POWER" LAMP AT THE TOUCH PAD IS ILLUMINATED.

POSSIBLE CAUSE:

- Interruption of power from the power source
- Loose wire, check wires using wiring diagram
- Someone pressed the "Stop" switch at the Touch Pad or at the Remote Control Touch Pad.

SYMPTOM 6: ULTRA VIOLET STERILIZER LAMP FLICKERS OR DOES NOT ILLUMINATE WHEN THE "WATER QUALITY" LAMP IS ILLUMINATED GREEN.

POSSIBLE CAUSE:

- U.V. lamp requires replacement
- U.V. electronic circuit requires replacement

SYMPTOM 7: "WATER QUALITY" LAMP ON TOUCH PAD DOES NOT CHANGE FROM RED TO GREEN AFTER 30 MINUTES OF NORMAL SYSTEM OPERATION.

POSSIBLE CAUSE:

- Newly Installed System: R.O. Membrane Element has not been installed
- Older System: R.O. Membrane Element requires cleaning or replacement
- Worn product water O-ring within the R.O. Membrane/Vessel Assembly
- Salinity Probe requires cleaning and or calibration

SYMPTOM 8: "FRESH WATER FLUSH" LAMP ON TOUCH PAD WAS BLINKING AFTER THE LAST NORMAL SHUT DOWN BUT IS NO LONGER BLINKING.

POSSIBLE CAUSE:

- Interruption of power from the power source
- Someone pressed the "Stop" switch at the Touch Pad or at the Remote Control Touch Pad.

SYMPTOM 9: THE "WATER QUALITY" LAMP ON THE TOUCH PAD IS ILLUMINATED GREEN DURING NORMAL OPERATION HOWEVER THE 3-WAY PRODUCT WATER DIVERSION VALVE DOES NOT DIVERT POTABLE WATER TO THE POST FILTRATION SECTION AND ON TO THE POTABLE WATER STORAGE TANK.

- Loose wire, check wires from the Main Printed Circuit Board to the 3-Way Product Water Diversion Valve using wiring diagram
- The Control Printed Circuit Board may not be delivering 12 VDC to the solenoid.
- The 3-Way Product Water Diversion Valve coil over heated and burnt out caused by high current due to over adjustment of the water port orifice. The 3-way Product Water Diversion Valve may have a damaged solenoid coil.

Section 7

Maintenance
&
Repair

Notes: _____

Maintenance & Repair

Are you repair competent?

Troubleshooting and subsequent correction or repair will require understanding of:

- Electrical Circuits
- Electronic Circuits
- Electric Motors
- Hydraulic Systems
- Liquid Pressures and Flows
- Electro Mechanical Systems
- Mechanical knowledge and skills
- Full understanding of this Owner's Manual

Do not attempt troubleshooting and or subsequent correction or repair if you are not familiar with or are not proficient in the above fields of expertise.

CAUTION, DO NOT PERFORM MAINTENANCE UNLESS:

1. The System Feed Water Sea Cock Valve [2] is closed.
2. The system main electrical disconnect switch is switched **"OFF"**, **LOCKED**, and **TAGGED**.
3. Section 9, "EXPLODED PARTS VIEWS" of the USERS MANUAL is available.

CAUTION: ELECTRICAL SHOCK HAZARD. A Volt / Ohm Meter will be necessary. The following procedures expose the technician to High Voltage and electrical shock hazard. Only attempt this if you are a qualified electrician and only if surrounding conditions are safe.

OPERATOR MAINTENANCE INTERVALS

The frequency of required maintenance is dependent on the regularity of usage, the condition of the intake water (the location of use), the length of time the system is exposed to water, the total running time, and in some cases the manner in which the Ultra Whisper System is installed. Because of these factors, it is virtually impossible to comprise an exact timetable for required maintenance. The following maintenance timetable is an estimate of the time intervals at which maintenance may be required on the various systems components. This is based upon factual data compiled from Sea Recovery installations around the world. However, this schedule must be adjusted to each individual system depending upon the variables listed.

COMPONENT	MAINTENANCE REQUIRED	TIME INTERVAL INTERMITTENT DUTY
Sea Strainer	Inspect & Clean Screen & Housing	weekly
Plankton Filter	Inspect & Clean Element	weekly
Pre-filter	Replace elements	When System shuts down from Prefilter Inlet High Pressure
Feed Pump	Replace or Rebuild Pump head	When specified flow or required pressure drops by 10% of normal
Energy Transfer Device	Replace Seals	1,000 hours or when worn
R. O. Membrane	Clean Element	When fouled. Refer to troubleshooting and membrane cleaning procedures
Salinity Probe	Clean Probes	Annually
Charcoal Filter	Replace Element	3 months
U.V. Sterilizer	Replace lamp & Clean quartz sleeve	2 years
Fresh Water Flush	Replace Carbon Element Charcoal Briquette	3 months

Other _____

Other _____

Other _____

Other _____

Other _____

Other _____

Δ

Feed Pump Maintenance and Repair

NOTE! THIS SECTION APPLIES TO SYSTEMS WITH A TRIPLEX PUMP ONLY.

FAILURE SIGNS AND POSSIBLE CAUSES

1. Pulsations at the Feed Gauge are caused by (check low pressure gauge for pulsations):
   - Worn or broken Valve
   - Worn or broken Valve Spring
   - Worn or broken Valve Seat
   - Debris in Valve Chamber
2. Water Leak between the Feed Pump Manifold and Rear Section caused by:
   - Worn Seals or Seals damaged due to running dry.
3. Flow drops dramatically when attempting to pressurize and there is no flow at the Product Flow Meter. This is caused by:
   - Worn Seals
   - Seals damaged due to running dry
   - Broken Valve
   - Broken Valve Spring
   - Debris in Valve Chamber

FEED PUMP SERVICING

A. Disassembly of the Discharge Valve Assemblies:
Tools required: 3/8" Drive Ratchet; 6 mm Hex Socket; O-Ring Pick; Two slotted screwdrivers, Torque Wrench; Needle Noise Pliers.

1. Only one valve kit is required to repair all of the valves in one pump. The Valve Kit includes new valve O-Rings, valve seats, valves, and springs.
2. Disconnect all plumbing.
3. Remove the six socket head screws from the manifold. Remove the outer screws first, then the inner screws.
4. Using a soft mallet, tap the back side of the Discharge Manifold from alternate sides to maintain alignment and avoid damage to the plungers
5. Grasp the Discharge Manifold from the underside and gradually lift manifold while you pull away from the Crankcase.
6. The Adapter/Spacers may stay with either the Discharge or Inlet Manifold. By inserting two opposing screwdrivers between Spacer and manifold, you can easily pry them out of the Discharge Manifold. If they stay in the Inlet Manifold, gently work them up and down as you pull away from the Inlet Manifold.
7. The Valve Assemblies are in the Discharge Manifold ports and will fall out when manifold is turned over. A complete valve assembly includes: Retainer, Spring, Valve and Seat.

B Disassembly of the Seal Assembly:

Tools Required: 3/8" Drive Ratchet; 5mm Hex Socket; Packing Extractor; and Colette.

1. Remove the Inlet Valve Assembly from the exposed plunger rod ends, including Cotter pin, Nut, Washer, Spring, Spacer and Inlet Valve.

2. Grasp the Inlet Manifold from the front and underside and pull to remove from Plunger Rods.

3. Carefully examine backside of Low Pressure Seal before removing from manifold as it will be damaged during removal. If worn, insert screwdriver into I.D. of seal and pry out. Exercise caution to avoid damage to the Inlet Manifold.

4. Press ceramic Plunger with thumb or soft tool from backside of Inlet Manifold. (The High Pressure Seal may stay with the plungers or remain in the Inlet Manifold. If on the plungers, slide off by hand. If in the manifold, use a reverse pair of pliers to remove.)

5. Remove Seal Retainers from Crankcase by grasping tab with pliers and pulling out.

6. Examine Crankcase Oil Seal to determine if Crankcase servicing is needed.

7. Examine Ceramic Plunger, Low Pressure Seals, V-Packings for scoring, cracks and wear and replace.

C. Reassembly of Seal Assembly:

1. Examine Seal Retainers and replace if worn or damaged. Install on Plunger Rod and press into Crankcase **with tab out**.

2. Place Inlet Manifold on work surface with **Crankcase Side up**.

3. Lubricate new Low Pressure Seals and press into position with **garter spring down**. Be certain the seal is seated squarely on the shoulder on the inlet manifold chamber.

4. Place the inlet Manifold on work surface with **Crankcase side down** (Larger ID ports up).

5. Carefully examine the Plungers for scoring or cracks and replace if worn.

6. Lubricate Ceramic Plungers and new High Pressure Seals. Press the plunger into the seal and position seal in middle of plunger.

NOTE! Place the deeper recessed end of the plunger into the seal from the metal back side.

7. Insert the Plungers into the manifold ports. Press into position using the **larger I.D. end of Discharge Valve Spacer**. Examine the O-Ring and Back-up-ring under the Sleeve for cuts or wear and replace. Examine the Barrier Slinger for wear and replace as needed. Install the Barrier Slinger with the concave side facing away from the Crankcase. Lubricate the Plunger Rod O-Ring to avoid cutting during installation. Install the Back-up-ring first then the O-Ring into the groove on the Plunger Rod. Install the Sleeve with the tapered end facing out. Gently press towards the Plunger Rod shoulder until flush with the Barrier Slinger.

8. Carefully install Inlet Manifold over Plunger Rod ends and slowly press into Crankcase.

9. Examine Inlet Valve and replace if worn. **Inlet valves cannot be reversed if worn**. The SS Inlet Valves may be lapped if not badly worn. Install the SS Inlet Valves with **square edges towards the plungers** (round edges towards the discharge). Install the Nylon Inlet Valve with **ridged side towards the discharge**.

10. Examine Spacers for wear and replace as needed. Install Spacer on each Plunger Rod with **smaller O.D. towards inlet valve.**

11. Examine Springs for damage or fatigue and replace as needed. Place on Plunger Rods.

12. Install Washers next with **concave side towards Inlet Manifold**.

13. Install Nuts and torque to 55 in. lbs./ 4.6 ft. lbs./ 6.2 Newton meters.

14. **Always install new Cotter pins** and turn ends to secure in position.

D. Reassembly of the Discharge Valve Assembly:

1. Examine Adapter Spacer O-Rings and replace if worn. Lubricate and install O-Rings and Back-up-Rings on **both front and rear of the Adapter Spacer**.

2. Examine the Valve Retainers for scale build up or wear and install into each Discharge Manifold port with tab down into the manifold chamber.

3. Replace worn or damaged Springs and place into Retainers.

4. Examine Valve and Seats for pitting, grooves, or wear and replace as needed.

5. Place Valves over Springs with **concave side down**.

6. Place Valve Seats on Valves with **concave side down**.

7. Lubricate O.D. of Adapter/Spacer and insert smaller I.D. into Discharge Manifold ports. Snap into position. Exercise caution not to cut or pinch O-Rings.

8. Carefully guide Discharge Manifold with Spacers over Plunger Rod ends and press into Inlet Manifold.

9. Replace Socket Head Screws and torque to 115 in. lbs./ 9.4 ft. lbs./ 13 Newton meters.

10. If oil was not changed, be sure oil is at the proper level on the sight gauge.

Torque sequence for tightening the manifold:

3	1	5
X	X	X
X	X	X
6	2	4

MAINTENANCE & REPAIR

Weekly Quick Check: The following steps ensure that potential problems are resolved preventing major repairs:

1. Inspect all fasteners for tightness including brackets, screws, nuts, and bolts. Pay special attention to the Feed Water Pump [6] and its Electric Motor since they are subject to vibration.
2. Ensure that Sea Strainer [4] & Plankton Filter [7], if either are installed, are clean and do not restrict flow.
3. Clean any salt water or salt deposits from the system with fresh water.
4. Check for fluid leaks; water from anywhere in the system.
5. Check all tubing and high-pressure hoses for wear and abrasion. The hoses should not contact heated or abrasive surfaces.

Individual Component Maintenance & Repair

1. **Inlet Thru Hull Fitting [1]:** Non Sea Recovery component. Keep the Inlet Thru Hull Fitting free and clear of debris and marine growth. If the Inlet Thru Hull Fitting is clogged, this results in a low feed pressure condition, which causes the System to shut off. A clogged inlet thru hull fitting will also cause cavitation damage to the Feed Pump [6].

2. **Inlet Sea Cock Valve [2]:** Non Sea Recovery component. The packing gland and connections of the Inlet Sea Cock Valve must be tight and must properly seal. Clean the valve cavity of debris or replace the seal and seat, or the entire valve, as required. This section is under a vacuum condition while operating the System. Loose fittings or a worn seal will allow air to enter the Sea Recovery System causing continual shut down due to subsequent low feed water pressure.

3. **Sea Strainer [4]:** Keep the mesh screen free and clear of debris. When the mesh screen is clogged, it results in a low-pressure condition causing system shut off. A clogged Sea Strainer also causes cavitation damage to the Feed Pump [6]. This section is under a vacuum condition while operating the System. If the Sea Strainer's bowl is loose or if the O-ring seal is worn or not properly seated air will enter the System causing continual shut down due to subsequent low feed water pressure.

   To clean the Sea Strainer:
   a. Remove the bowl by turning it counter-clockwise.
   b. Remove the Mesh Screen from the bowl.
   c. Clean the Mesh Screen or replace it with a new one.
   d. Remove the flat sealing gasket from the bowl and take care to not damage it.
   e. Wipe the sealing gasket with a damp cloth. Lubricate it sparingly with petroleum free "O" ring lubricant.
   f. Place the seal back onto the bowl. Seat the mesh screen back into the bowl.
   g. Screw the lid on clockwise. *Hand-tighten only enough to seal water in and air out*. Over tightening will cause an air leak and or the bowl to crack at the threads.

4. **Pressure Gauges [5, 12, 16, 18]:** If a pressure gauge fails to register the orifice may be corroded with debris. Use a thin wire or small diameter (1/64th" / 0.4 mm) drill bit to dislodge any debris trapped within the pressure port orifice. If clearing the orifice does not bring the gauge to normal operation then replace the gauge.

5. **Feed Water Pump[6]:** The Feed Water Pump is a precision fitted vane pump that relies on a very tight tolerance in order to maintain flow and pressure. This pump is not field repairable. Should the pump develop a seal leak or fail to maintain specified flow or pressure return it to Sea Recovery for repair or replacement. Remove the Pump from the Motor, Bell Housing, and Flex Coupler and return only the Feed Water Pump head. Contact Sea Recovery Technical Services Department for a Material Return Authorization, shipping address, and shipping instructions.

6. **Low Pressure Switch [10]:** The Low Pressure Switch contains one N.O. (Normally Open) contact. As the Feed Water Pump builds pressure on the Pre-filtration Section, the Low Pressure Switch closes at 40 PSI. When pressure decreases below 40 PSI the Low Pressure Switch opens and shuts the system off. Adjustment of the Low Pressure Switch is not recommended.

   If in field adjustment is absolutely necessary:
   1. Stop the Ultra Whisper system.
   2. Remove the cap located in the center top of the pressure switch to expose the calibration screw.
   3. Adjust the calibration screw, maximum 1/8th turn (45 degrees) at a time, clockwise to increase and counter clockwise to decrease the set point.
   4. Restart the system and check the setting by slowly closing the Inlet Sea cock Valve while observing the Low Pressure Gauge at the instant the Hi/Low Pressure Lamp at the Touch Pad begins to illuminate and flash.
   5. Repeat as necessary to calibrate the switch.
   6. Replace the Switch if calibration is not successful.

7. **High Pressure Switch [11]:** The High Pressure switch keeps the system in operation when the Feed Pump [6] outlet pressure is below 190 PSI. If the Feed Pump outlet pressure increases to 190 PSI the High Pressure Switch shuts the System off. In field, adjustment of the High Pressure Switch is not recommended.

   If adjustment is absolutely necessary:
   a. Start the System.
   b. Remove the sealing cap located on the top of the pressure switch to expose the calibration screw.
   c. Using a 3/16" hex wrench, gently adjust the calibration screw, maximum 1/8th turn (45 degrees) at a time. Turn the screw clockwise to increase the trip point and counter clockwise to decrease the trip point as appropriate.
   d. Once the High Pressure Switch is properly set replace the adjustment screw cover.

8. **Plankton Filter [7]** Element Cleaning:
   1. Unscrew the bowl counter clockwise.
   2. Remove the Plankton Filter Element from the bowl.
   3. Remove the O-Ring from the top of the bowl and take care to not damage it.
   4. Clean the mesh screen filter element with a bristle brush and water spray.
   5. Wipe the O-Ring with a damp cloth.
   6. Lubricate the O-Ring lightly using a sparingly amount of petroleum free O-Ring lubricant.
   7. Place the O-Ring back onto the bowl.
   8. Insert the cleaned, or a new, plankton filter element into the bowl.
   9. Screw the bowl on clockwise hand snug to seal the O-Ring, do not use a wrench or other tool to tighten, do not over tighten. Over tightening will damage the threads in the bowl or housing and over tightening will cause removal to be difficult.

9. **Pre-filter [13 & 14] Element Replacement:** The Prefilter Pleated Cartridge Element may be cleaned with water spray once or twice. After cleaning the expected life will be reduced in half. Attempts to clean the element more than twice will result in a very short life and will result in damage to the element rendering it useless. Change the element after the first or second cleaning. Clean or replace the element when plugged to the extent that the System shuts down due to excessive Feed Water Pump Outlet / Prefilter Inlet Pressure [12], greater than 190 PSI.

   CAUTION: Do not use third party prefilter elements, use only Sea Recovery Prefilter Elements. Third party prefilter elements on the market do not properly fit, the seams fall apart, they will allow by-pass and will allow the R.O. Membrane Element to foul prematurely. Use of third party prefilter elements will void any and all Sea Recovery warranty to the High Pressure Pump, the ETD, and the R.O. Membrane Element. Many similar looking filter elements are of the improper micron rating, incorrect material, do not seal properly, and some do not have a support tube which will cause the element to collapse.

   IMPORTANT: Do not use "string wound" or "fiber" prefilter elements. These type of elements are designed for the Photographic Film Developing industry. When used in sea water they will plug up rapidly in 1/10th or less

the time causing frequent shut down of the system and very frequent changing which will also lead to very high cost of maintenance. Use of String Wound or Fiber type elements will only lead to user frustration and very high maintenance costs. Use of third party prefilter elements will void any and all Sea Recovery warranty to the High Pressure Pump, the ETD, and the R.O. Membrane Element.

To Clean or replace the Prefilter Element:

1. Unscrew the bowl counter clockwise.
2. Remove the Prefilter Pleated Cartridge Element from the bowl.
3. Remove the O-Ring from the top of the bowl and take care to not damage it.
4. Replace the Prefilter Pleated Cartridge Element with a new Sea Recovery element.
5. Wipe the O-Ring with a damp cloth.
6. Lubricate the O-Ring lightly using a sparingly amount of petroleum free O-Ring lubricant.
7. Place the O-Ring back onto the bowl.
8. Insert the new Prefilter Pleated Cartridge Element into the bowl.
9. Screw the bowl on clockwise hand snug to seal the O-Ring, do not use a wrench or other tool to tighten, do not over tighten. Over tightening will damage the threads in the bowl or housing and over tightening will cause removal to be difficult.

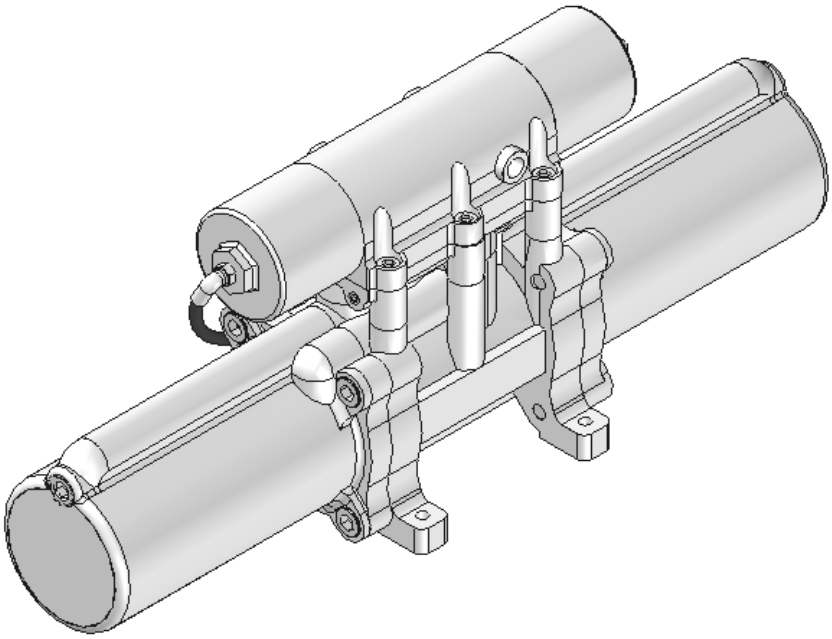
10. Energy Transfer Device (ETD):

Repair Procedures

Energy Transfer Device (ETD)

Pump for the

UltraWhisper™
with EfficientSea™ Technology



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Repair Process for the *ETD* Pump
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Repair #2: Resurface sliding control panel
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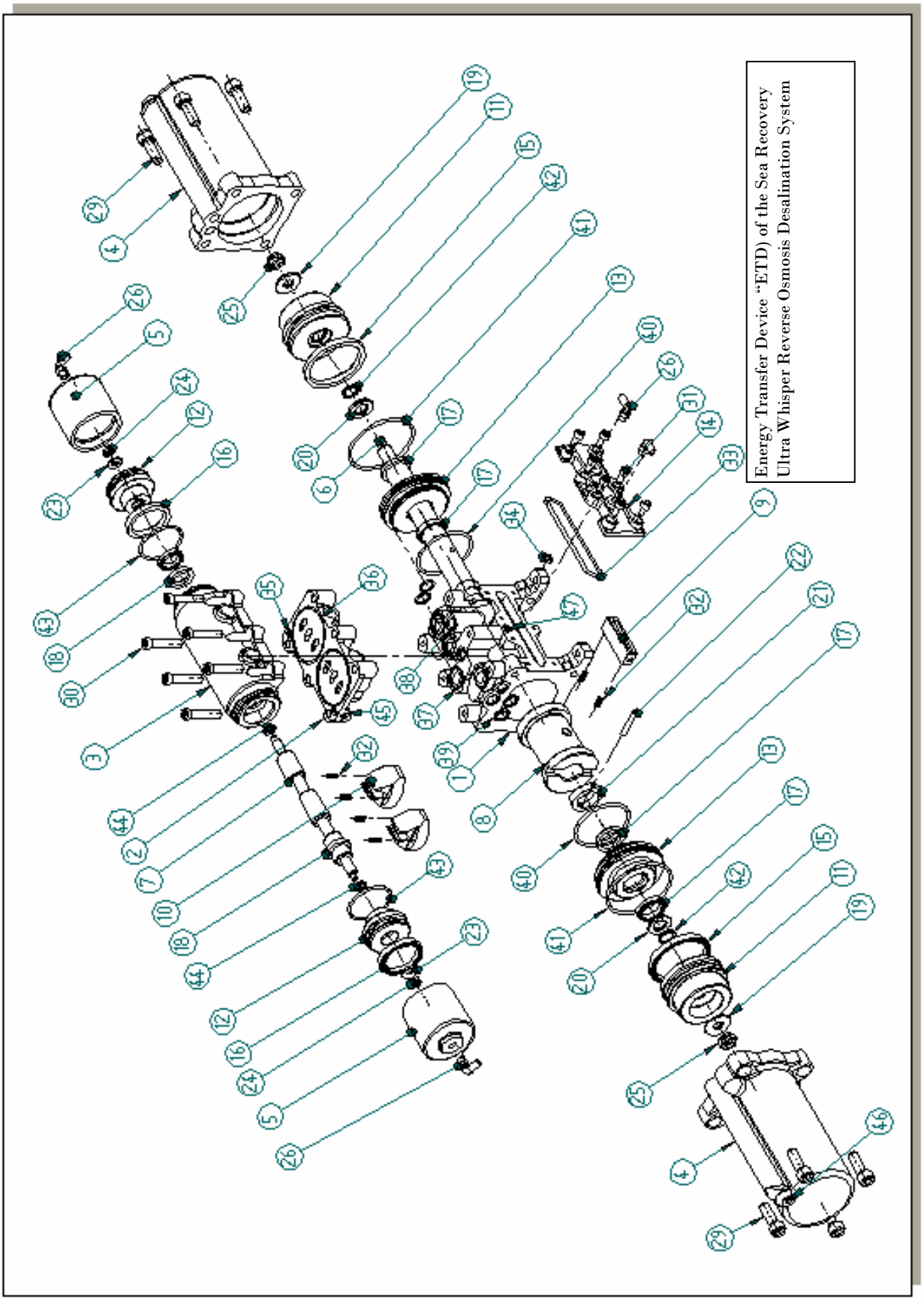
Repair #4: Change the Pump O-ring Kit

Plan of maintenance
Pump Maintenance Plan

Components of the ETD Pump

Item #	*Definition*	Quantity
1	Central body	1
2	Distribution plate	1
3	Distribution body	1
4	Cylinder	2
5	Distribution stopper	2
6	Shaft ϕ 25[1] mm or 22 mm	1
7	Shaft of the Distributor	1
8	Central Sliding Panel	1
9	Sliding Control Panel	1
10	Sliding Distributor Panel	2
11	Piston	2
12	Distributor Piston	2
13	Intermediate Cap	2
14	Spacer	1
15	Seal 60/70 x 6 mm	2
16	Seal 40/50 x 6,3 mm	2
17	Seal 25[1]/30 x 5 mm	4
18	Seal 20/28 x 5 mm	3
19	Washer ϕ 10 DIN 9021	2
20	Washer ϕ 14 DIN 125	2
21	Washer/Spacer	1
22	Pin ϕ5 x 35 mm	1
23	Socket-pan ϕ 6 DIN 9021	2
24	Lock Nut M6	2
25	Lock Nut M10	2
26	Elbow 90° R □" pipe ϕ 6mm	4
29	Allen Screw M10 x 30 mm	8
30	Allen Screw M 8 x 40 mm	6
31	Allen Screw M6 x 12 mm	7
32	Spring	6
33	O-ring ϕ 77 x 3,5 mm	1
34	O-ring ϕ 7 x 2 mm	1
35	O-ring ϕ 5 x 2 mm	2
36	O-ring ϕ 57 x 2 mm	2
37	O-ring ϕ 21 x 2 mm	4
38, 39	O-ring ϕ 13 x 2 mm	6
40	O-ring ϕ 59 x 3 mm	2
41	O-ring ϕ 69 x 3,5 mm	2
42	O-ring ϕ 15 x 2 mm	2
43	O-ring ϕ 45 x 2,5 mm	2
44	O-ring ϕ 10 x 2 mm	2
45	Allen Head Screw M8 x 5 mm	2
46	Hexagonal Plug □" Gas x 10 mm	2
47	Orifice of ϕ 2 mm – Hexagonal M6 x 6 mm	1
48	Blue Polyamide Tubing 4 x 6 x 175 mm	2

[1] It depends on the diameter of the shaft of the pump


Energy Transfer Device "ETD) of the Sea Recovery
Ultra Whisper Reverse Osmosis Desalination System

Problem Diagnosis of the *ETD* Pump

This Chapter is a practical guide for the detection and correction of problems that may cause malfunction of the ETD Pump.

A malfunctioning symptom of the pump can be caused by various reasons. Each reason requires one or more inspections to identify the reason for the malfunction. Upon inspection when the source of the problem has been confirmed, the solution is provided on the following table.

There can be more than one reason for a problem. Once the reason for the malfunction is diagnosed, the solution is noted for the malfunction.

Table of Problem Diagnosis for the *ETD* Pump

Symptom	Possible Reasons	Check/Inspect	Solution
1. The High pressure of the ETD is far below the normal condition, the ETD does not increase the pressure from the Feed Pump and the ETD is new with only a few hours of operation.	1. The ETD is functioning incorrectly, resulting from pressure loss on the inside of the ETD due to the wear of the rubbing elements.	Ensure that the Feed Pump is delivering the proper volume flow to the *ETD*.	1. The sliding panel seats of the distributor (Item #10), needs to be resurfaced as detailed in Repair #1 page 13 of this section. 2. The Sliding Control Panel of (Item #9) is worn/damaged, and needs to be resurfaced or replaced, as detailed in Repair #2 page 16 of this section.
2. The High pressure of the ETD is far below the normal condition, and the ETD has approximately 500 hours of operative functioning.	1. The ETD is functioning incorrectly, resulting from pressure loss on the inside of the ETD due to the wear of the rubbing elements.	Ensure that the Feed Pump is delivering the proper volume flow to the *ETD*.	The seals of the ETD are damaged and need to be changed and or replaced, proceed as detailed in Repair #4 on page 20 of this section.
3. The ETD is not cycling and the Feed Pump pressure into the ETD is far above normal.	1. The orifice (Item #47) of the ETD is plugged. 2. The ETD is *"stuck", that is to say* the Sliding Distributor Panels of (Item #10) are not moving. *" Not flushing the pump after its use causes this type of problem."*	Verify that the sliding distributor panels can move. Inspect the ETD for imperfections in the interior chambers of the distribution body, and verify that the orifice (Item #47) is not plugged.	Clean the orifice (Item #47) of the ETD, as explained in Repair #3 page 19 of this section. 1. To clean the rubbing surface of the distribution plate (Item #2) with the Sliding Distributor Panels of (Item #10), as detailed in Repair #1 on page 13 of this section. 2. The seats of the Sliding Distributor Panels of (Item #10), need to be resurfaced as detailed in Repair #1 on page 13 of this section.
3. The ETD starts but the Low pressure rises excessively.	1. The orifice (Item #47) of the pump is partially plugged.	Verify that the movement of the pistons of the distributor (Item #12) is slow and incomplete.	Clean the orifice (Item #47) of the ETD, as explained in Repair #3 page 19 of this section.

Symptom	Possible Reasons	Check/Inspect	Solution
4. The High Pressure gauge indicates a de-pressurizing reading, the pressure varies erratically with each cycle.	1. Loss of pressure to the Sliding Distributor Panels (Item #10).	Visual inspection of the sliding distributor panels.	The seats of the Sliding Distributor Panels of (Item #10) need to be resurfaced as detailed in Repair #1 on page 13 of this section.
	2. Loss of pressure to the Sliding Control Panel (Item #9).	Visual inspection of the sliding control panel.	The closing face of the Sliding Control Panel (Item #9) needs to be resurfaced as detailed in Repair #2 on page 16 of this section.
	3. Loss of pressure due to the wear of the seals.	It is necessary to dismantle all the o-rings and seals of the ETD and inspect them to verify their condition. There may be one that is worn or damaged.	The seals of the ETD are damaged and need to be replaced, proceed as detailed in Repair #4 on page 20 of this section.
5. Water loss occurs in the ETD during operation.	1. Water is leaking externally from the ETD.	Observe if the ETD is leaking from a pipe fitting or fastener.	1. Remove the item leaking 2. Clean the surfaces to remove any dust. 3. Apply Loctite 542 in the thread that needs to be sealed 4. Reconnect the item and allow the sealer to dry.
	2. An o-ring is dislodged or damaged.	Dismantle the worn or damaged item where water loss has been noted and inspect if there is a o-ring damaged or out of its seat	Change or replace the o-ring.

Repair Process for the ETD Pump

Before proceeding to the disassembly and repair of the ETD, it is suitable to have an idea of the problem causing the ETD malfunction. Diagnose the problem from the information in the tables on pages 11 and 12 above..

> Misuse of the ETD causes premature breakdowns. Intensive premature wear will result if the prefiltration is not maintained properly.

Replacing the worn or damaged items generally solves the problems caused by loss of pressure due to the wear of the rubbing elements.

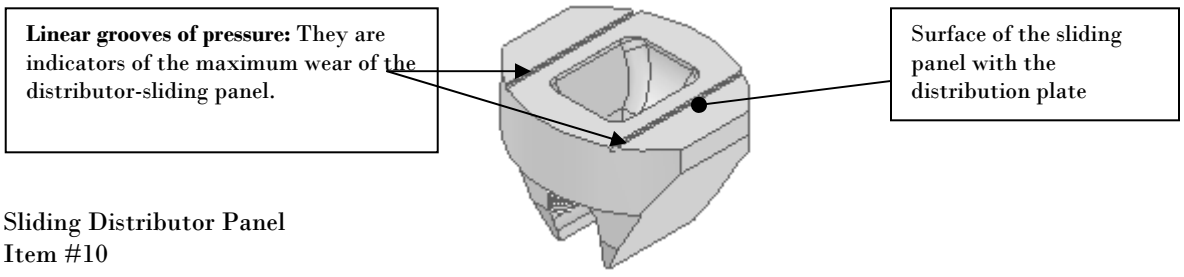
General Repair Guide of ETD

- Verify the malfunctioning of the ETD and try to locate the breakdown or reason that caused the malfunctioning from the information provided in pages 11 and 12 above.
- If the breakdown is not located, then proceed by dismantling the whole ETD in the following manner.
  1. Dismantle all the o-rings and seals of the ETD, inspecting each item for excessive wear, which could cause the malfunctioning of the ETD.
  2. Verify the wear or deterioration of the internal components of the ETD.
  3. Clean all the components of the ETD.
  4. Install all new o-rings and seals.
  5. Resurface and clean the surface of the rubbing valves (Sliding Distribution Panel Item #10) and the Sliding Control Panel (Item #9) of the ETD. (Repair #1 and #2).
  6. Change the components that have excessive wear.
  7. Verify that the shaft of the distributor (Item #7) and the shaft of the central body (Item #6) do not have deep scrape marks present that could accelerate the wear of the seals that they contact.
  8. If the examined shafts have deep scrape marks or deformations they must be replaced.
  9. Reassemble the ETD.
  10. Inspect the ETD to verify it is functioning, observing if the breakdown has been resolved.

Repair #1: Polish the Sliding Distributor Panels of (Item #10)

The Sliding Distributor Panels (Item #10) are pressed against the surface of the distribution plate (Item #2) and are forced to move axially, rubbing against the above-mentioned surface. This repetitive axial displacement can wear or scrape the surfaces in contact, especially that of the sliding distributor panel. This wear can cause leakage or bypass between the low pressure and high pressure chambers within the ETD.

The worn sliding panels can be replaced or resurfaced. Both options provide the same results and solve the problems associated with the wear of the sliding panels.



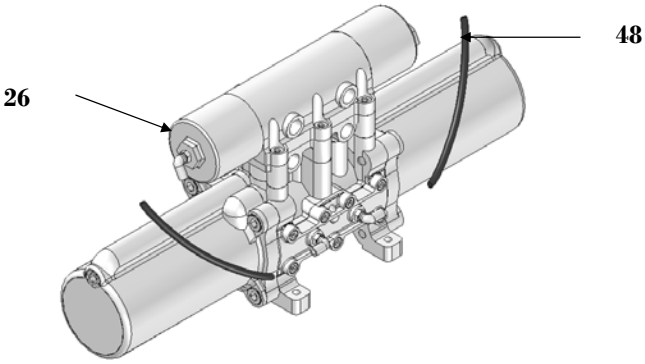
Sliding Distributor Panel
Item #10

Required Tools: WetDry Sandpaper #400, Industrial scrub type "Scotch Brite", Allen Key 6 mm, Fixed Flat Key 12-13.

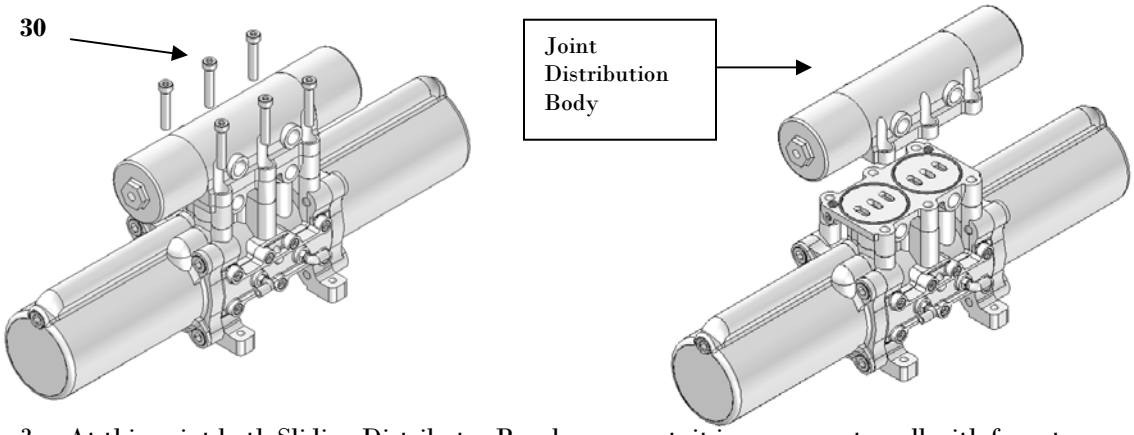
Procedure to resurface the Sliding Distributor Panels

NOTE: Drain the ETD of feed water prior to dismantling.

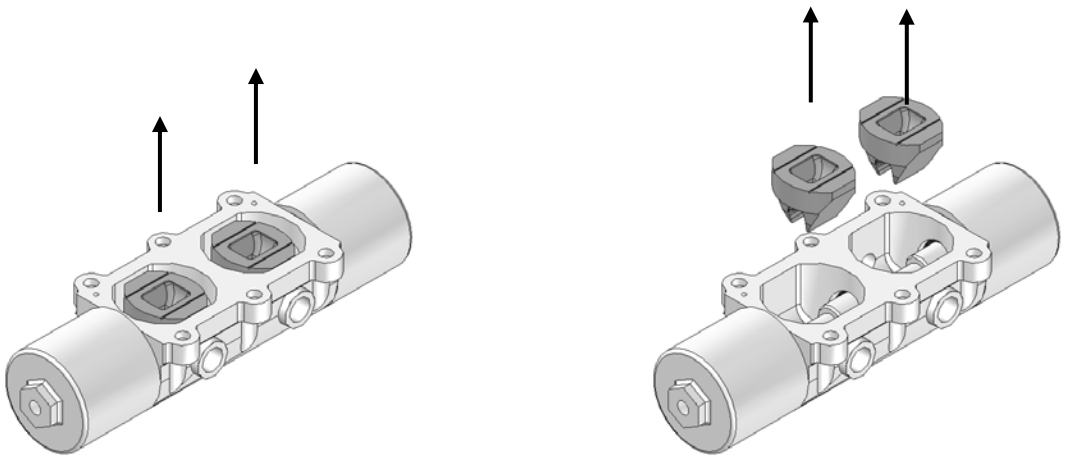
1. Loosen both elbows (item #26) that hold both plastic tubes (Item #48) to be able to undo the connection between these two components.



2. Loosen the six allen screws M8x40 (Item #30) that hold the joint distribution body and separate the set from the rest of the ETD.

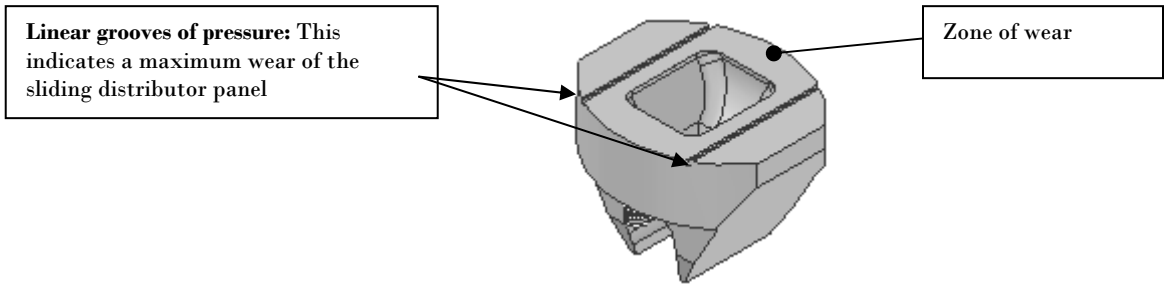


3. At this point both Sliding Distributor Panels are apart, it is necessary to pull with force to separate them from the distribution body joint. Make sure the springs (Item #32) do not come out of their housing.



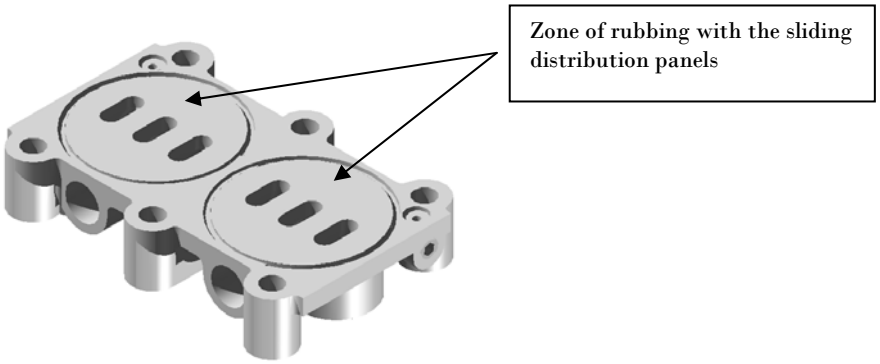
Procedure to resurface the Sliding Distributor Panels *continued*

4. Inspect the surface of the sliding panel. Observe the surface of the sliding panel located between both linear grooves of pressure. This is the zone with the most wear. The sandpaper should be placed on a completely flat surface. Gently rub the sliding panel against the sandpaper until it is flat and has a clean flat surface free of scratches. If the face of the sliding panel is resurfaced without any scratches, and the linear grooves of pressure have disappeared, this indicates that the wear on the sliding panel was excessive and the sliding panel must be replaced. Both linear grooves of pressure are very important and must be cleaned of any debris. Repeat this operation on each of the distributor sliding panels.



5. If the surface of the distribution plate (Element #2) where the sliding panels move back and forth show signs of wear, that surface must be polished and cleaned. Use an industrial scrub on the flat surface and rub the entire face of the distribution plate. Performing this task eliminates the majority of the scratched and worn area. If a scratched or worn area is still present, repeat this operation using very fine grit sandpaper in place of the scrub until there is a smooth surface with no scratches or worn area. If the scratches were very deep, a new distribution plate will need to be mounted. Clean the distribution plate before mounting it in the ETD.

Distribution plate
Item **#2**

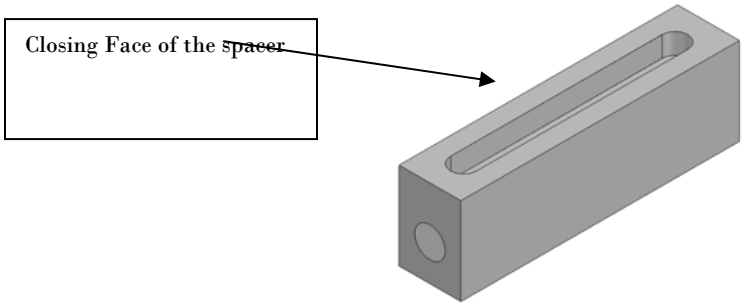


6. Mount the repaired components. Make sure all the o-rings of the distribution plate are in their housings. Mount the Sliding Distributor Panels of the housings, simply push the sliding panels until they touch the shaft of the distributor and disassemble. Before mounting the sliding panels, inspect the condition of the springs (Item #32), if the springs are broken or worn, mount four new springs. Tighten the allen screws (Item #30) and reconnect the blue polyamide tubes with the elbows (Item #26) of the distribution body joint. Mount the ETD in the system and verify that it works correctly.

Repair #2: Polish the Sliding Control Panel (Item #9)

The Sliding Control Panel (Item #9) is made up of special polymer. It is pressed against the interior surface of the spacer (Item #14) and forced to move axially rubbing with the aforementioned surface. This repetitive axial displacement can wear or scratch the surfaces in contact, especially that of the control sliding panel. This wear can cause a defective closing between these two elements producing pressure breaks in the functioning of the ETD.

A malfunctioning sliding panel can be replaced or resurfaced and cleaned to restore a smooth surface. Both options provide the same results and solve the problems associated with the wear of the sliding distributor panel.

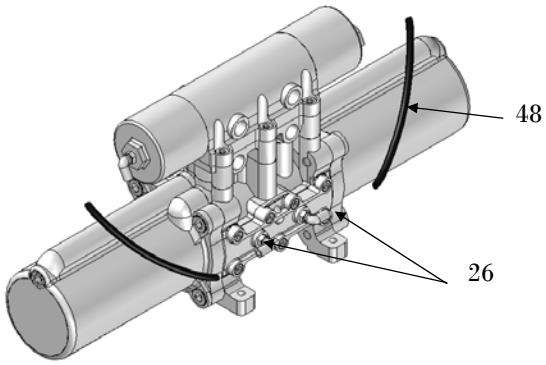


Sliding Control Panel
Item #9

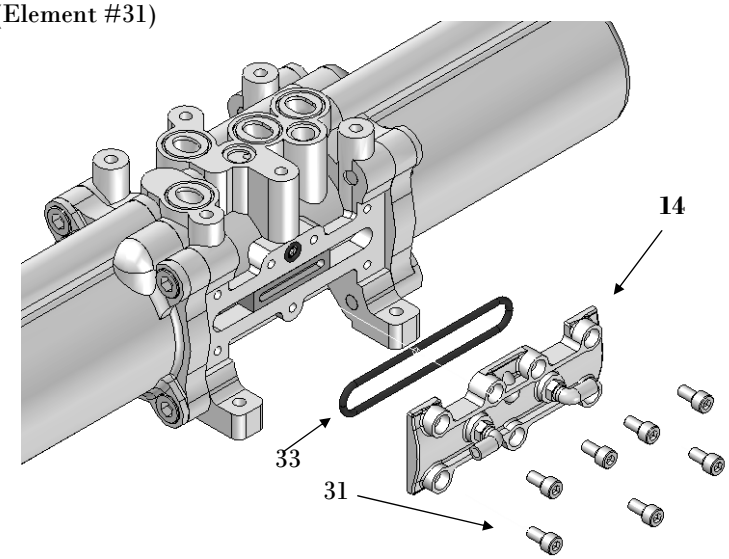
Tools Necessary for repair:
WetDry Sandpaper #400.
Industrial scrub type *"Scotch Brite"*
Allen Key 5 mm.
Fixed flat key 12-13.

Procedure to Continue resurfacing the Control Sliding Panel
NOTE: Empty the water in the ETD before disassembling it.

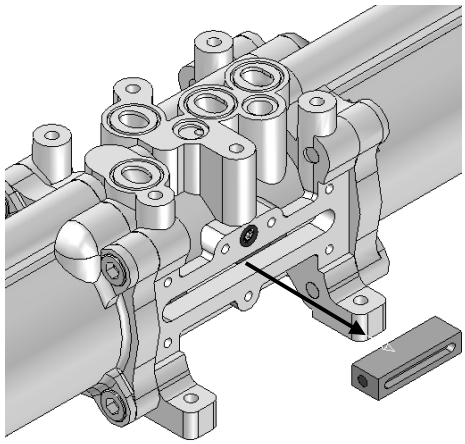
1. Loosen both elbows (Item #26) that hold both blue polyamide tubes (Item #48) to be able to undo the union between these two elements.



2. Remove the seven allen screws M6 x 12 mm(Element #31) that attach the spacer (Item #14) as it appears in the figure.

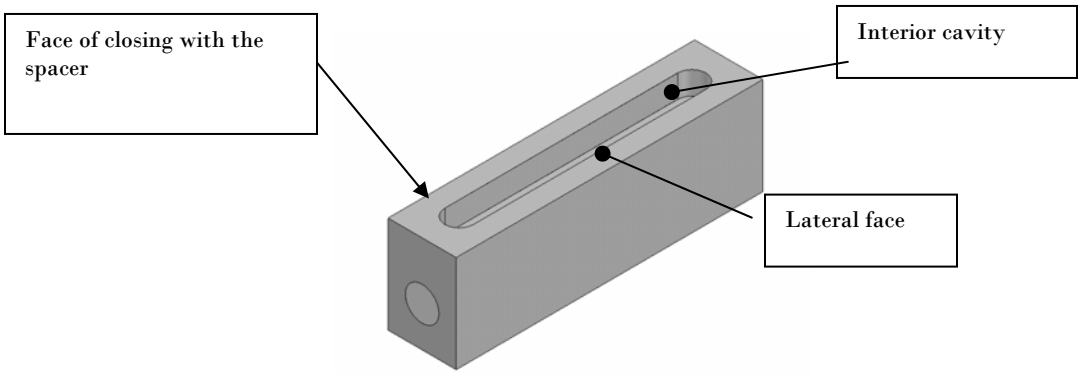


3. Remove the Sliding Control Panel from its housing. It simply pulls out.

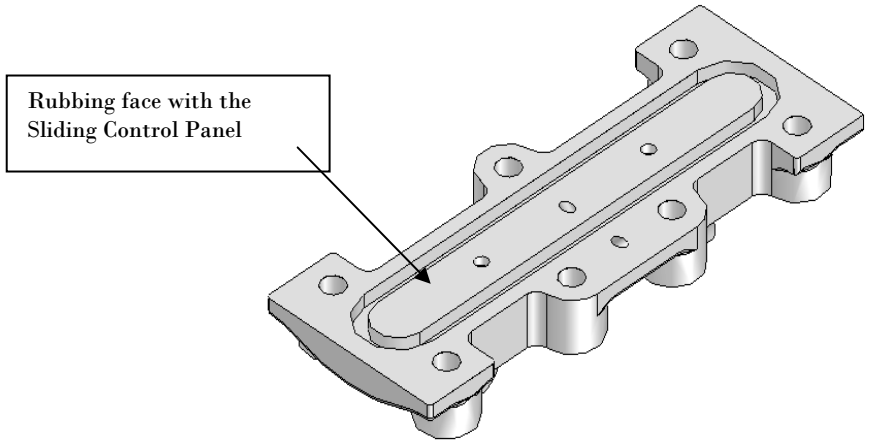


Procedure to Continue resurfacing the Control Sliding Panel *continued*

4. Inspect the sliding control panel, specifically the face of closing with the spacer. This face cannot have visible grated rinds. If anomalies of this type are seen, these surfaces need to be resurfaced. If the closing face is extensively worn-out in its interior cavity and has a depth lower than 2 mm, the Sliding Control Panel needs to be replaced. To resurface the closing face of the sliding control panel, place the sandpaper on a completely flat surface. Rub the sliding panel's face against the sandpaper until the surface is completely smooth. Before assembling, inspect the lateral faces of the sliding control panel. They must not have heavy wear. If you observe heavy wear, the Sliding Control Panel may need to be replaced. Verify that the springs in the Sliding Control Panel are in good condition otherwise they will need to be replaced.



5. If the face of the spacer (Item #14) shows signs of wear, it must be resurfaced smooth. For resurfacing and smoothing, place the industrial scrub on a flat surface and rub the entire face of the spacer against the scrub. This will remove the majority of the scrapes. If scratches remain, repeat this task changing the scrub with very fine sandpaper until the scratches are eliminated. If the scratches were very deep, mount a new spacer. Clean the spacer before mounting it in the ETD. Verify that the O-Ring (Item #33) is in good condition and is set properly in its housing.



Spacer
Item #14

6. Mount the repaired components. Make sure that the O-rings (Items #33 and 34) are in their housings. Mount the Sliding Control Panel in its housing, simply push the Sliding Control Panel inward. Tighten the seven allen screws (Item #31) and then connect the blue polyamide tubes with the elbows (Item #26) of the spacer. Mount the ETD in the system and verify that it works correctly.

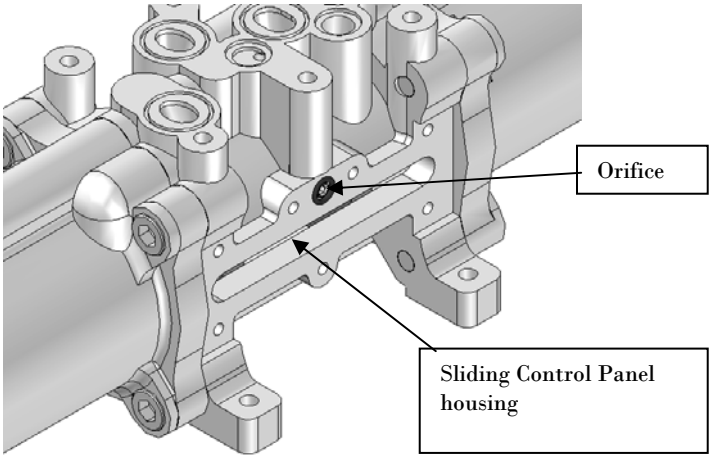
Repair #3: Cleaning the orifice (Item #47)

The orifice (Item #47) is a hexagonal spike M6 x 6 mm, which has a machined hole 2 millimeters in diameter. Water circulates across this hole to Low pressure. If the ETD is not flushed properly, a filter is defective, or for another reason that causes dirt to come into the machined hole of the orifice, this may partially or completely plug the orifice. This causes malfunctioning of the ETD, which, in case of a total obstruction of the orifice, causes an instantaneous stop in the flow of water in the interior of the ETD. This stoppage of the water flow in the interior of the pump causes a sudden increase in feed pressure.

Necessary tools for repair: Fixed flat key 12-13, Allen Key of 5 mm, Allen Key of 3 mm, Thin wire (smaller than 2 mm in diameter)

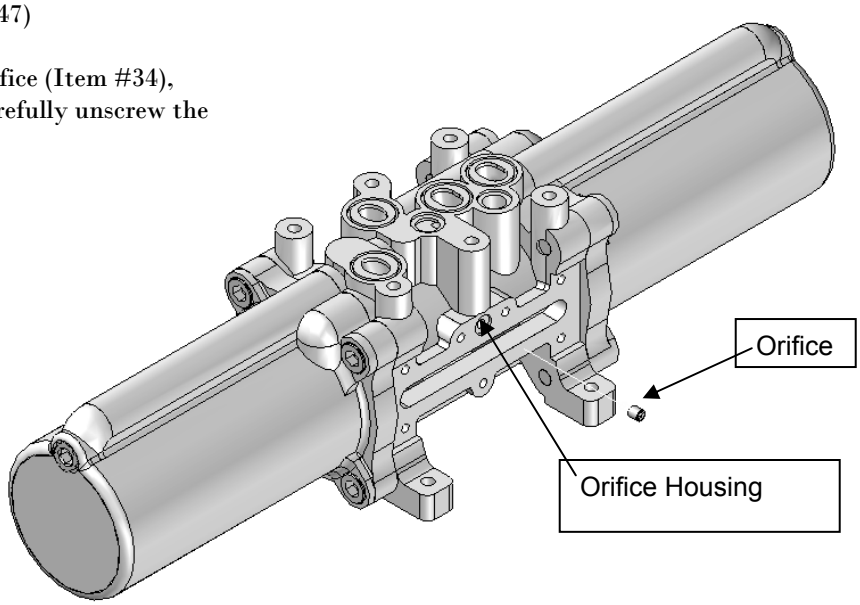
Procedure to clean the orifice:
NOTE: Empty any feed water from the ETD before disassembling it.

1. Repair #3 is similar to Repair #2 " *resurfacing the sliding control panel"*. Perform tasks in Paragraphs #1 and 2 of the aforementioned repair.



Repair #3: Cleaning the orifice (Item #47)

2. Remove the O-Ring of the Orifice (Item #34), and with a 3 mm allen key, carefully unscrew the orifice from its housing.



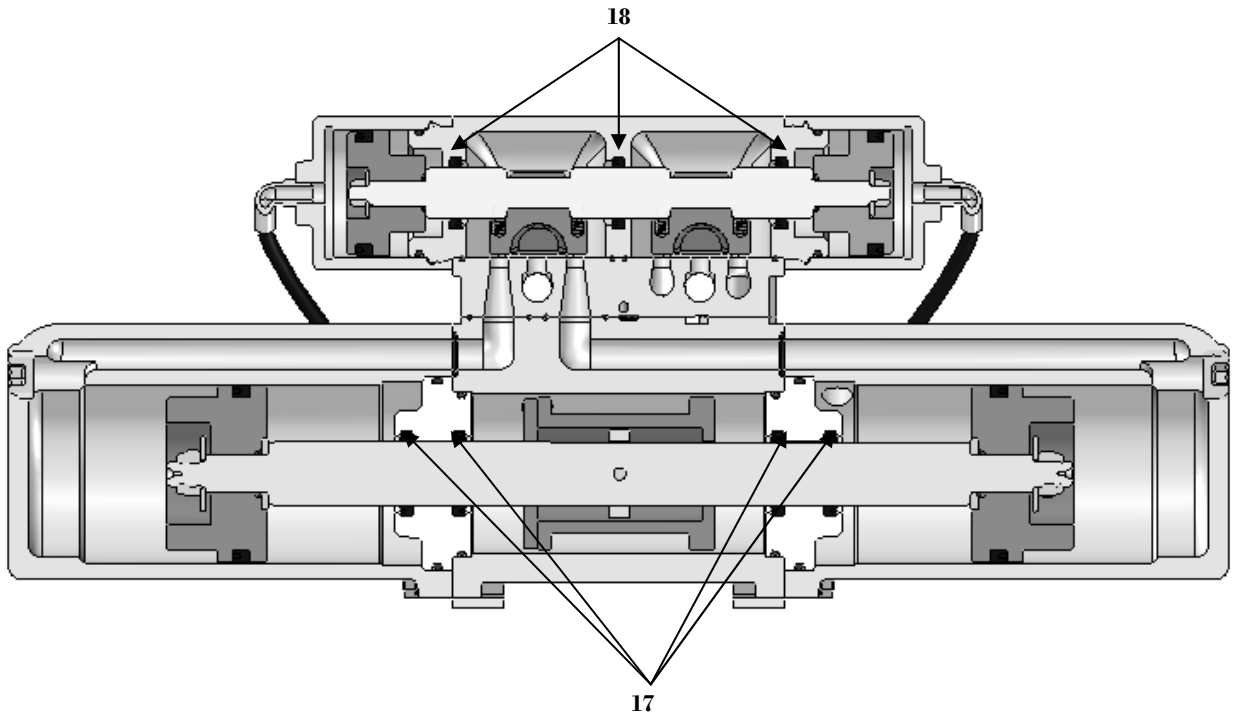
3. Use a thin wire smaller than 2 mm in diameter to clean the interior of the orifice until you leave the orifice free of impurities. There cannot be any impurities or dust in the orifice housing. If there are any impurities or dust, clean the orifice, otherwise it will plug up.
   Mount the orifice in the housing.
   Mount the O-Ring (Item #34).
   Take this opportunity to inspect the condition of the sliding control panel, it is recommended to perform Repair #2 *" resurfacing the sliding control panel"*, at this point.
   Mount the components that were disassembled.
   Mount the pump in the system and verify that it works correctly.

Repair #4: Change the O-ring Kit of the ETD

This is the most common repair in ETDs that have been operated for 500 hours, due to the inevitable wear of the seals. The seal kit is available from Sea Recovery pre-packaged with all the proper o-rings and seals as appropriate for the ETD.
When you replace a seal of the ETD, it is recommended to change all the seals.
If the ETD seals are worn, the ETD will have loss of pressure problems.
The o-rings do not wear as much as the seals do. However, because of their low cost, it is recommended to replace them along with the seals.
To replace the seal kit of the ETD, the ETD must be dismantled completely. Use the Assembly Drawing as a reference. Proceed with the following:

- Empty the water from the interior of the ETD.
- Disassemble the ETD completely.
- Inspect for damaged o-rings or worn seals.
- The shaft of the distributor (Item #7) and the surface of the shaft of the central body (Item #6) should be free of scrapes or deformations that will prematurely wear the seals. These surfaces must be highly polished. If these surfaces are damaged, it is necessary to mount new shafts.
- Verify that the interior surface of both cylinders (Item #4) and both distributor stoppers (Item #5) are polished, if scratches or deformations are present, they cause loss of pressure and will wear the seals. If this problem is evident, new seals are needed.
- Thoroughly clean all the components of the ETD.

Note the location inside the pump where the seals wear more often, which are #17 and #18. The wear of these elements become critical after approximately 1000 hours of operation.



Maintenance Plan for *ETD* Pump

The following maintenance table details the proper maintenance required for the ETD in order to ensure optimal functioning.

Nº	**Hours of Operation**	**Items to Inspect**
1	500	• Change the seal kit of the ETD (Repair #4). • Resurface Sliding Distributor Panels (Repair #1) Sliding Control Panel (Repair #2) Polish (with industrial scrub *"scotch brite"* type*)* superficial marks on the surface such as: 1. Cylinders (Item #4) 2. Distributor Shaft (Item #7) 3. Shaft (Item #6) 4. Distributor Stoppers (Item #5) 5. Spacer (Item #14, Item #2) 6. Distributor Plate (Item #2, Repair #1) • Visually verify that the surfaces do not have deep scratches across. If surfaces are scratched, they could produce water leaks or accelerate the wear of the components with those they are in contact with (seals, sliding panels, etc.)
2	3000	• Repeat the 500 hours ETD maintenance giving special attention to wear on the surfaces specified in the previous paragraph: • Verify the condition of the following components and replace them if worn: 1. Sliding Distributor Panels (Item #10) 2. Sliding Control Panel (Item #9) 3. Distributor pistons (Item #12) 4. Pistons (Item #11) 5. Central sliding panel (Item #8)
3	4500	• Repeat the 500 hours maintenance giving special attention to the wear of the surfaces specified in the previous paragraph. • Change the following Items: 1. Sliding Distributor panel (Item #10) 2. Sliding Control Panel (Item #9) 3. Distributor pistons (Item #12) 4. Pistons (Item #11) 5. Central sliding panel (Item #8) • Thoroughly inspect the wear on the shaft of the distributor (Item #7) and in the shaft (Item #6). Replace any elements, which have excessive wear.
4	6000	• At 6000 hours of pump operation, repeat maintenance from point 1 to point 4 of this table.

11. High Pressure Hose [19 & 21]:

- For safety reasons, the High Pressure Hoses should not be repaired. If a High Pressure Hose is worn, damaged, or leaks replace it with a Sea Recovery supplied High Pressure Hose specifically designed for the Ultra Whisper System.

12. Reverse Osmosis Membrane Element [20] Replacement:

NOTES:

- Replace all Brine and Product Water O-Rings attached to the End Plugs within the High Pressure Vessel Assembly each time the Reverse Osmosis Membrane Element is removed or replaced. Ensure these O-Rings are on hand prior to repair.
- Membranes are only installed and removed from the INLET end of the High Pressure Vessel.

Tools Required:

5/16" Allen wrench
regular pliers
Needle-Nose Pliers

1. Disconnect the High Pressure Hose from each end of the High Pressure Vessel Assembly.

2. Using a 5/16" Allen wrench remove the 3 each Socket Head Cap Screws from the three-piece Segment Rings located at each end of the Pressure Vessel.

3. Push inward on the End Plug and Remove the three-piece segment ring from one end, repeat for the other end.

4. Remove the Port Retainer from each end.

5. Remove the High Pressure Port from each end.

6. Remove the product water tube from the respective end.

7. Insert all three of the Socket Head Cap Screws back into the End Plug. These screws are used as a grip to remove the End Plug.

8. Grasp one or more of the Socket Head Cap Screws with a pair of pliers and pull slowly outward to remove the End Plug. There is some resistance due to the two Brine O-Rings exerting friction against the Vessel wall. With the End Plug removed from the High Pressure Vessel, the Reverse Osmosis Membrane Element is visible.

9. Remove and discard the brine O-rings from each of the End Plugs.

10. Remove and discard the Product Water O-rings from each of the End Plugs.

11. Clean the end plugs with a cloth and inspect each for any sign of wear, cracks, or damage.

12. Sparingly, lightly, lubricate with petroleum free O-ring lubricant:
    4 NEW Brine O-Rings and 2 new Product Water O-Rings

13. Place the NEW Product Water O-Rings into the product port inner O-Ring groove in each of the End Plugs.

14. Place the NEW Brine O-Rings onto the outer Brine O-Ring grooves of each of the End Plugs.

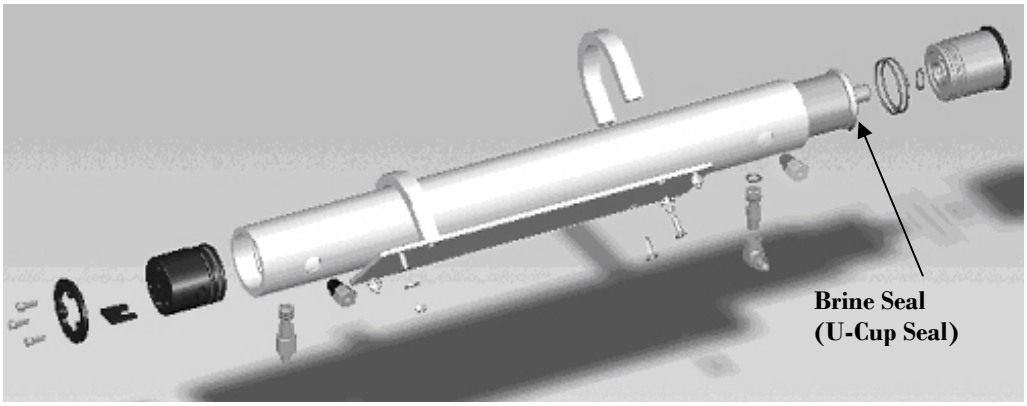
15. Removal of the R.O. Membrane Element from the Pressure Vessel. **CAUTION:** At each end of the Reverse Osmosis Membrane Element is a Product Water Tube approximately ¾" diameter by 1" long. The outside diameter surface of this product water tube is a sealing surface, which isolates the Product Water from the Feed Water. The surface of the Product Water Tube must be scratch free. Never use pliers or other grabbing tools on the Product Water Tube. Do not drop the R.O. Membrane onto a hard surface as the Product Water Tube may be damaged.

    With your fingers grasp the Product Water Tube attached to the R.O. Membrane Element from the INLET end of the Pressure Vessel and pull outward. If resistance is met then cup the INLET end of the High Pressure Vessel with one hand and shake downward to dislodge the R.O. Membrane Element.

16. Run a rag through the High Pressure Vessel to remove any biological film or debris from the High Pressure Vessel.

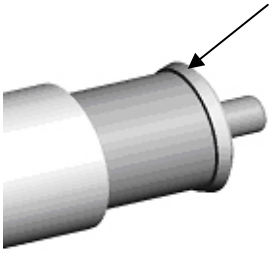
17. A new Sea Recovery R.O. Membrane Element comes complete with a "U" cup Brine Seal at one end of the Element. **This Brine Seal must be positioned at the INLET end of the Pressure Vessel.**

OUTLET End	**INLET End**
Feed Water Entry End	Brine Discharge End
R.O. Membrane Element Brine Seal End	no brine seal on this end



Install a new R.O. Membrane Element with attached "U" cup Brine Seal into the Pressure Vessel. Place the end of the R.O. Membrane Element that DOES NOT have the Brine Seal attached into the INLET end of the Pressure Vessel and slide it into the Pressure Vessel. (Insert the down stream end [end without a brine seal] of the Reverse Osmosis Membrane Element into the upstream inlet end of the High Pressure Vessel.)

Inlet end of Pressure Vessel
Brine Seal (U-Cup Seal)
End of R.O. Membrane Element



18. Slide the Membrane Element into the High Pressure Vessel, past the brine seal, until the Membrane Element product water tube is 4 inches past the end lip of the High Pressure Vessel.

19. Insert the End Plug with new attached O-Rings into the High Pressure Vessel while aligning the High Pressure Port and Product Water Port to the respective holes in the High Pressure Vessel. Continue pushing inward on the End Plug just past the Segment Ring Groove in the Pressure Vessel. Ensure that the Ports of the End Plug are aligned with the Port Holes of the High Pressure Vessel.

20. Insert the High Pressure Port Fitting with attached O-Rings into the High Pressure Port.

21. Replace the Port Retainer.

22. Insert the three-piece Segment Ring Set into the Segment Ring Groove of the High Pressure Vessel. Align the Segment Ring Set with the tapped holes in the End Plug for insertion of the three Socket Head Cap Screws. Attach the three Socket Head Cap Screws and tighten.

23. Connect the High Pressure Hoses to the respective fitting on the Pressure Vessel.

13. Brine Discharge Thru Hull Fitting [22]: Non Sea Recovery component. Keep the Brine Discharge Thru Hull Fitting free and clear of debris and corrosion.

14. Salinity Probe [25]: The salinity probe requires cleaning once a year.

Salinity Probe Cleaning:

a. Unscrew the black tube fitting nut below the probe to disconnect it from the control manifold.

b. Using a cotton swab, or similiar soft material, wetted with clean water scrub the probe electrodes s to remove any built up debris. DO NOT BEND THE ELECTRODES. Thoroughly dry the probe area.

c. Inspect the probe electrodes for any physical damage. If corrossion, pitting, or deformation exists replace the probe.

d. Temporarily plug the open port of the Salanity Probe tube fitting so that no water will expel from the hole. Press the "START" switch and wait for at least 10 seconds.

If the Salinity Probe is exposed to only air and the electrodes are clean and dry, the "WATER QUALITY" LED should illuminate green. With the "WATER QUALITY" LED illuminated green the product water is diverted to the potable product water port of the 3-way solenoid diversion valve and on to the post filtration.

If the "WATER QUALITY" LED does NOT illuminate green while the system is still in operation disconnect all probe wires from the main printed circuit board. At this point, if the "WATER QUALITY" LED now illuminates green, with the probe wires disconnected, then replace the damaged or non functional Salinity Probe with a new one.

e. Press the "STOP" Switch.

Salinity Probe Calibration:

f. Emerge the entire Salanity Probe into 1,000 PPM TDS Test Solution for 15 minutes to stabilize the temperature.

g. Suspend the probe in the test solution. Do not allow the plastic guides or probes to touch the sides or bottom of the test solution container.

h. Press the "START" Switch. Wait for minimum 10 seconds.

i. Locate the "SAL" adjustment potentiometer at the Main Printed Circuit Board. This is a multi-turn pot which has 20 turns end to end.

j. Rotate the "SAL" pot adjustment 2 full turns counter clockwise. Allow a 5 second pause between each full turn (each 360 degree rotation). Repeat this until the "WATER QUALITY" LED illuminates green.

k. Rotate the adjustment clockwise 90 degrees (1/4 turn) at a time until the "WATER QUALITY" LED illuminates red.

l. Press the "STOP" Switch.

m. Remove the temporary plug from the salinity probe tube connector.

n. Remount the salinity probe into its tube connector.

o. Operate the system to check for leaks and proper functioning.

15. Charcoal Filter [28]: A sulfurous (rotten egg) smell from the product water requires the replacement of the Charcoal Element. Otherwise, the Charcoal Element should be replaced every 3 to 4 months. It is not cleanable.

To replace the Charcoal Filter Element:

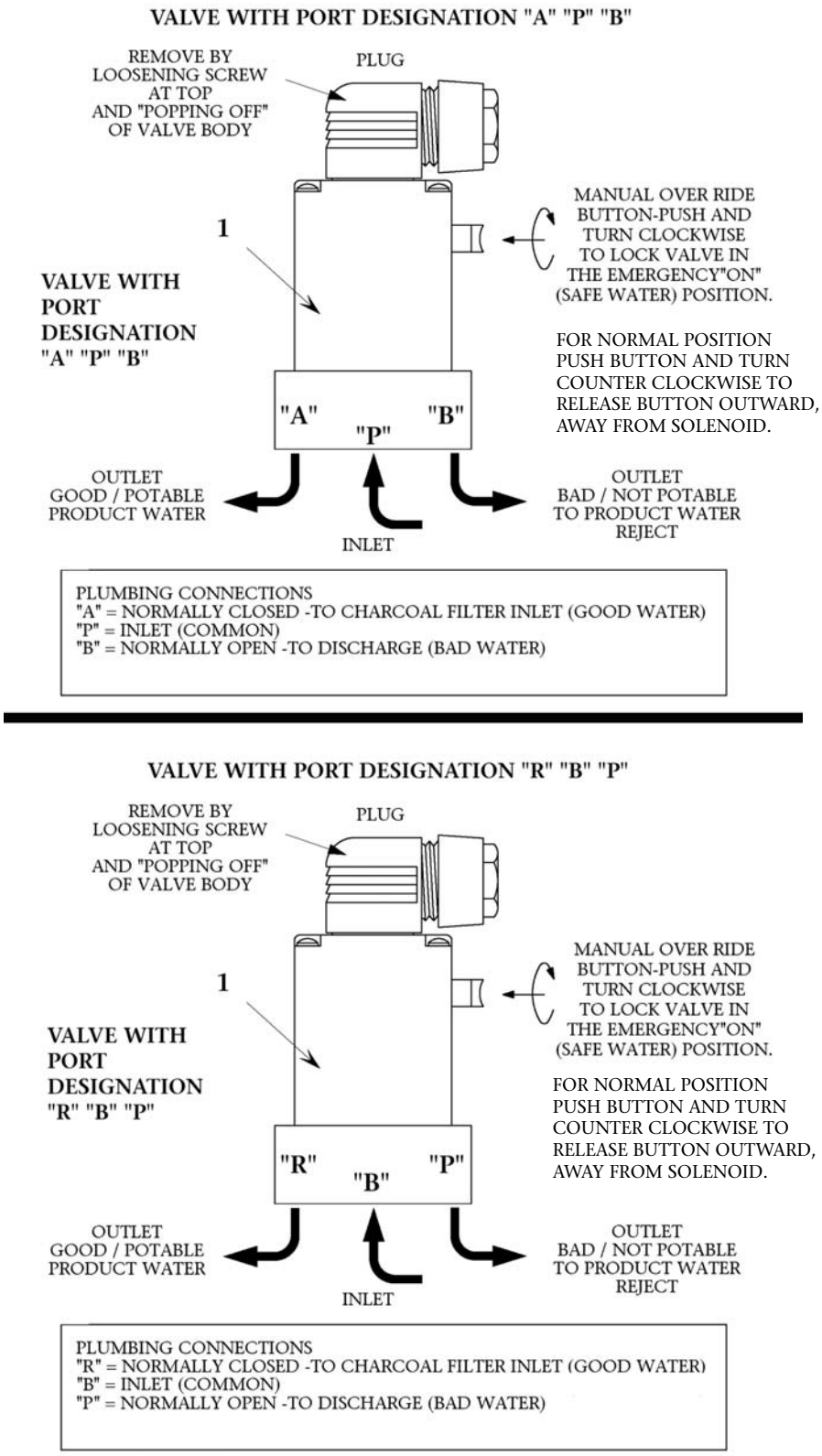
1. Unscrew the bowl counter clockwise.
2. Remove the Charcoal Filter Element from the bowl.
3. Remove the O-Ring from the top of the bowl and take care to not damage it.
4. Replace the Charcoal Filter Element with a new Sea Recovery element.
5. Wipe the O-Ring with a damp cloth.
6. Lubricate the O-Ring lightly using a sparingly amount of petroleum free O-Ring lubricant.
7. Place the O-Ring back onto the bowl.
8. Insert the new, Sea Recovery Charcoal Filter Element into the bowl.
9. Screw the bowl on clockwise.
10. Hand snug to seal the O-Ring, do not use a wrench or other tool to tighten, do not over tighten. Over tightening will damage the threads in the bowl or housing and over tightening will cause removal to be difficult.

16. pH Neutralizing Filter Cartridge replacement [29]

To replace the Prefilter Element:

1. Unscrew the bowl counter clockwise.
2. Remove the pH Neutralizing Element from the bowl.
3. Remove the O-Ring from the top of the bowl and take care to not damage it.
4. Replace the pH Neutralizing Element with a new Sea Recovery element.
5. Wipe the O-Ring with a damp cloth.
6. Lubricate the O-Ring lightly using a sparingly amount of petroleum free O-Ring lubricant.
7. Place the O-Ring back onto the bowl.
8. Insert the new pH Neutralizing Element into the bowl.
9. Screw the bowl on clockwise hand snug to seal the O-Ring, do not use a wrench or other tool to tighten, do not over tighten. Over tightening may damage the threads in the bowl or housing and over tightening will cause removal to be difficult.

17. 3-way Product Water Diversion Solenoid Valve [26]:



a. Over under or over tightening of the valve's plunger adjustments, located inside the valve body ports, can cause by-passing of brine water to product water.

1) Remove Diversion Valve from the System and adjust ports.

2) Position the manual over ride button OUTWARD to normal position by first pushing the button inward and rotating it counter clockwise allowing it to spring outward away from the coil body.

3) With your mouth blow into port "P", air should expel from port "B" which is the "normally open" or "bad water" port.

4) If it is extremely difficult to expel air from port "B" or if no air expels from port "B" then port "B" requires adjustment.

5) Again blow into port "P" while plugging port "B" with a finger tip. No air should expel from port "A".

6) If air expels from port "A" then port "A" requires adjustment.

7) Position the manual over ride button INWARD to manual over ride position by pushing the button inward and rotating it clockwise allowing it to lock inward close to the coil body.

8) With your mouth blow into port "P", air should expel from port "A" which is the "normally closed" or "good water" port.

9) If it is extremely difficult to expel air from port "A" or if no air expels from port "A" then port "A" requires adjustment.

10) Again blow into port "P" while plugging port "A" with a finger tip. No air should expel from port "B".

11) If air expels from port "B" then port "B" requires adjustment.

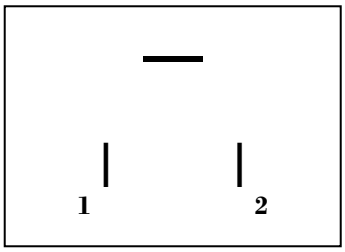
b. Solenoid Valve Coil Check:

1) The 3-way Product Diversion Valve Solenoid operates from 12 VDC. To check the condition of the Diversion Valve solenoid coil:

a) While System is operating and while the "safe water" lamp on the Touch Pad is illuminated green, remove the din connector from the valve's coil. Using a Volt meter set to DC check the voltage at the din connector terminals.

b) If 12 VDC is present at the din connector terminals then the control circuit is operating normally but the 3-way Diversion Valve Coil may be defective. Check the solenoid coil continuity.

c) Using an Ohm meter measure the continuity of the solenoid coil as shown below.



Measure the DC resistance between pins 1 & 2.
Proper resistance reading is approx. 12 to 15 Ω.

d) If an open circuit exists, or if the resistance is much greater than or less than 12 to 15 Ω.then replace the solenoid coil or the entire valve.

e) If 12 VDC is not present at the din connector terminals then the cable connections may be loose, the cable may be broken, or the control circuit may be defective. Check these components.

f) Check for 12 VDC at the connection points of the Diversion Valve Solenoid Coil on the Control Printed Circuit Board terminals.

g) If 12 VDC is present while System is operating and while the "safe water" lamp on the Touch Pad is illuminated green, then the Diversion Valve cable is loose at one of the connections or the cable is defective.

h) If there is no voltage present while System is operating and while the "safe water" lamp on the Touch Pad is illuminated green, then troubleshoot the Control Printed Circuit Board.

18. Ultraviolet Sterilizer [30]: The UV Sterilizer lamp emits a low frequency form of light. This light degrades and looses intensity and ability to sterilize biological matter over approximately 4,000 hours of use. Therefore, the lamp may remain lit, but requires replacement every 4000-8000 hrs. Refer to Page 34 of this section for maintenance details.

CAUTION: Make sure that system power is turned off before beginning sterilizer maintenance. Ultra Violet light is harmful to eyes and skin.

WARNING: High Voltage is generated from the Ultra Violet power supply and applied to the Ultra Violet Lamp.

Lamp Replacement:

a. Remove the four screws on the ballast box and remove lid.

b. Remove the rubber boot and carefully pull lamp out of the quartz sleeve.

c. Replace the lamp. During lamp replacement clean the quartz sleeve as well. The quartz sleeve should be crystal clear and if it has discolored, it must be cleaned or replaced.

Quartz Sleeve Cleaning:

a. Remove the four screws on the ballast box and remove lid.

b. Remove the rubber boot and carefully pull lamp out of the quartz sleeve.

c. Unscrew and remove the two compression nuts (ballst box and view port).

d. Remove the O-ring on the view port side only.

e. With care pull the quartz sleeve out from the ballast box side.

f. Clean the quartz tube with water and a bottlebrush without moving the O-ring . Dry with a soft cloth. Handle the quartz sleeve carefully.

Reassembly:

a. Replace old O-rings with new O-rings.

b. Insert the quartz sleeve (close-end first) through the ballast box passthru until O-ring contact passthru. Screw on the ballast box compression nut. Insert view port O-ring and screw on view port compression nut..

c. Attach a new U.V. Lamp into the plug.

d. Slide the lamp into the Quartz Sleeve and install rubber boot over the compression nut.

e. Replace the three 1/4-20 cap head screws.

19. Fresh Water Flush [33, 34, 35]: The Charcoal Element in the Fresh Water Flush should be replaced every 3 months.

The Fresh Water Flush will Automatically flush the System with Fresh Water every 7 days. The duration of the flush can be adjusted to last from 5 to 27 minutes.

Fresh Water Flush Duration Adjustment:

a. Open the Electrical Control Box to expose the Control Printed Circuit Board.

b. Apply Supply Power from the Power Source to the System.

c. Using a Volt meter set to DC Volts measure the D.C. Voltage across the Fresh Water Flush Duration Voltage pins located on the Control Printed Circuit Board.

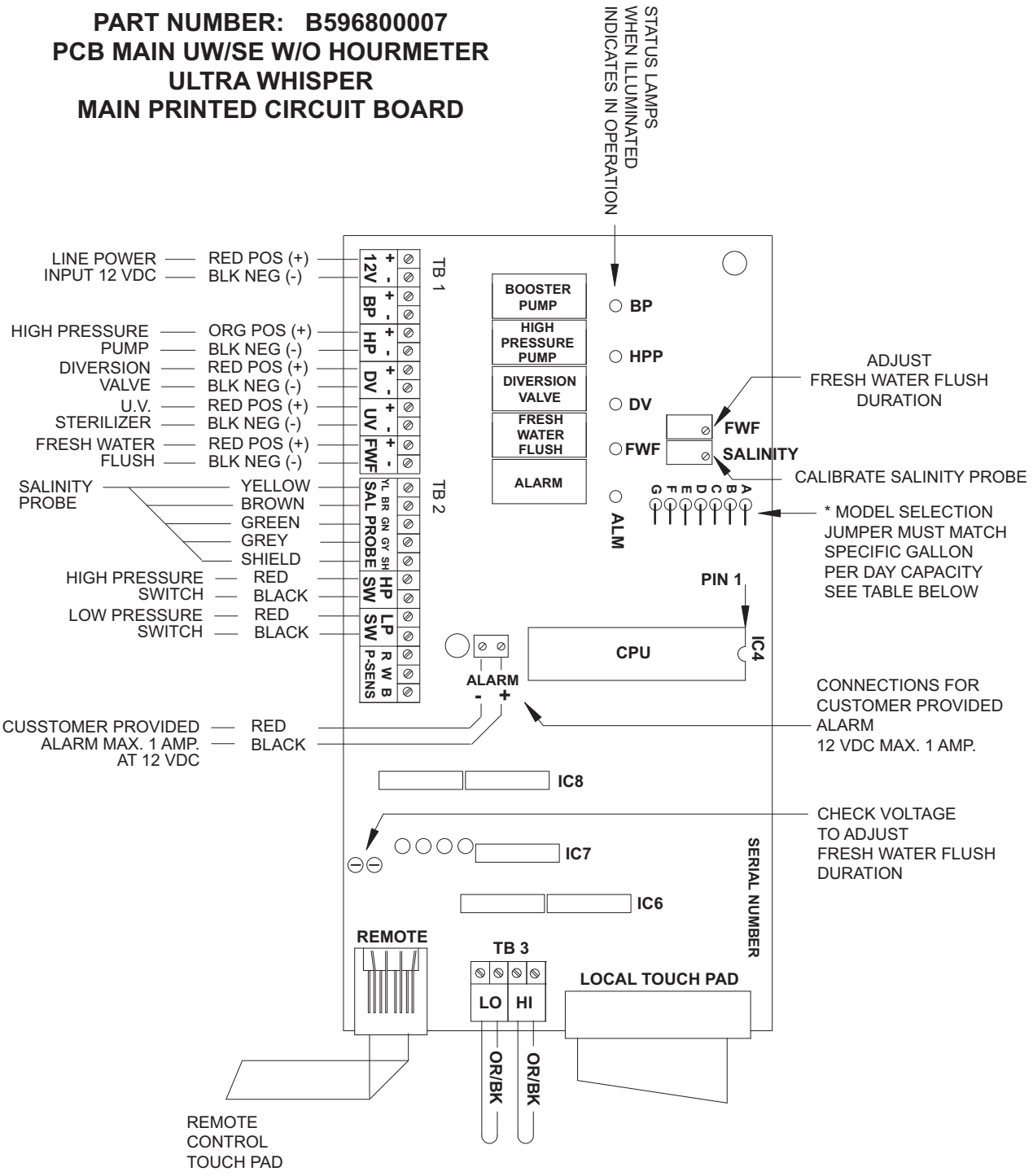
d. While measuring the D.C. Voltage across the Fresh Water Flush Duration Voltage pins adjust the Fresh Water Flush Duration pot to correspond the voltage to the time duration in the table below. (for example, if you want the Fresh Water Flush duration to be 13 minutes then adjust the pot to give 2.0 VDC across the pins.):

Duration of Fresh Water Flush Minutes:	5	7	10	13	17	20	24	27
Corresponding D.C. Voltage Measured:	0.75	1.0	1.5	2.0	2.5	3.0	3.5	4.0

e. Press the Reset Switch on the Control Printed Circuit Board.

f. Reassemble the Controller Enclosure.

PART NUMBER: B596800007
PCB MAIN UW/SE W/O HOURMETER
ULTRA WHISPER
MAIN PRINTED CIRCUIT BOARD



*** MODEL SELECTION JUMPER TABLE:**

MODEL	JUMPERS						
	A	B	C	D	E	F	G
ULTRA WHISPER 200	CUT	---	---	CUT	---	---	---
ULTRA WHISPER 300	---	CUT	---	CUT	---	---	---
ULTRA WHISPER 400	---	CUT	---	CUT	---	---	---
ULTRA WHISPER 500	CUT	CUT	---	CUT	---	---	---
ULTRA WHISPER 600	CUT	CUT	---	CUT	---	---	---

CUT = CUT WIRE LEAD FROM RESISTOR
--- = DO NOT CUT WIRE LEAD

UV LIGHT MAINTENANCE

Follow the preventative maintenance procedures to maximize the efficiency, reliable, and longevity of the UV unit.

Refer to Table 1 Periodic Maintenance Table for recommended maintenance schedule.

- **WARNING!** The most important consideration is operator safety. The following directly relates to operator safety. All personnel must review and comply with the following.

⚠ **CAUTION!** Operators must observe Safety Requirements at all times

Safety Requirements

The following safety requirements are mandatory. Failure to comply can cause injuries and/or damages to the UV unit.

1. Never look directly at the blue ultraviolet lamp when it's "ON". Never operate the ultraviolet lamp outside the stainless steel cabinet. UV light exposure can severely burn and damage eyes and skin.
2. Properly ground the UV unit. Failure to properly ground the UN unit can cause severe electrical shock hazard.
3. Provide watertight piping and compression nut seals. Failure to provide watertight seals can cause damage to electrical components or cause electrical shock hazard.
4. Disconnect power before servicing the UV unit. The UV lamp and electrical components operate with high voltage electrical power. Do not attempt to service the UV unit without first disconnecting the power source. Shut off the source of power at the main panel breaker and use appropriate tag-out or lock-out procedures to prevent accidental power-up.
5. Only qualified service personnel should perform services to the UV unit.
6. Remove pressure before servicing the UV unit.
7. Never operate the UV unit for more than 30 minutes without water flow. Elevated water temperature can damage the UV unit.
8. Do not exceed 3 "Start/Stop" cycles per 24-hour period. Exceeding 3 cycles will subjected the lamp filament to excessive thermal stress leading to premature failure of the UV lamp.

Unit Maintenance

The exterior surfaces of the UV unit should be kept clean and dry. In most cases it may be necessary to clean the exterior of the unit once a month. Use soft cloth and soapy water, or any commercial stainless steel cleaner.

Interior of the ballast box should be inspected for debris. Any debris should be removed using vacuum.

Quartz Sleeve

Debris and other matter in the water will settle onto the quartz sleeve and eventually block the ultraviolet rays from penetrating into the water. It is necessary to determine a cleaning schedule for the quartz sleeve. The frequency will depend on the specific type of water being processed and the duty cycle of the unit.

Inspect the quartz sleeve 30 days after initial installation to assess the amount of contamination collected over the 30-day period. Use the finding to determine a reasonable schedule and frequency for periodic cleaning.

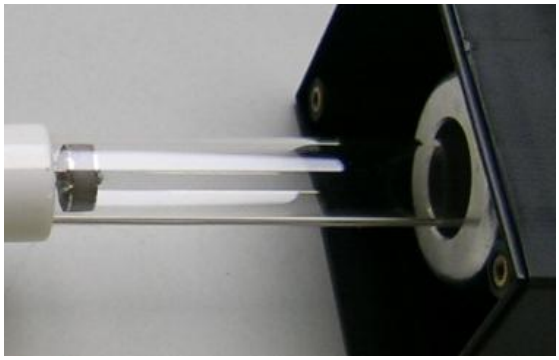
Clean-In-Place (CIP) cleaning is sometimes effective in removing debris from the quartz sleeve. Conduct a CIP cleaning test to determine its effectiveness. If CIP cleaning is not effective, then a manual cleaning or replacement is required.

When the quartz sleeve is due for cleaning, use the following procedures.

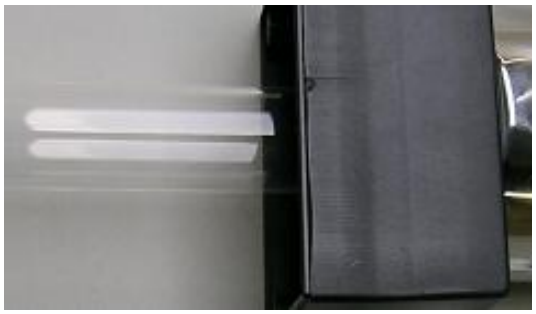
1. Turn off the water source to the UV unit.

2. Disconnect the power source to the UV unit.
3. Drain the UV treatment chamber.
4. Remove the ballast box cover.

5. Remove rubber boot and carefully pull out the UV lamp through the compression nut pass-thru.



6. Use a channel lock to remove the compression nuts.
7. Remove the Quartz Sleeve carefully.



8. Wash the Quartz Sleeve with mild soapy water and rinse in clean hot water.

If dirt remains after rinsing, the quartz sleeve should be replaced. Contact your local CSR to order a replacement.

> **NOTE!** Failure to perform quartz sleeve maintenance may reduce the efficiency of the UV light to adequately treat water in the treatment chamber.

Checking for Leaks

Visual inspect the UV unit exterior for signs of leakage. The cause of any leakage must be located and repaired.

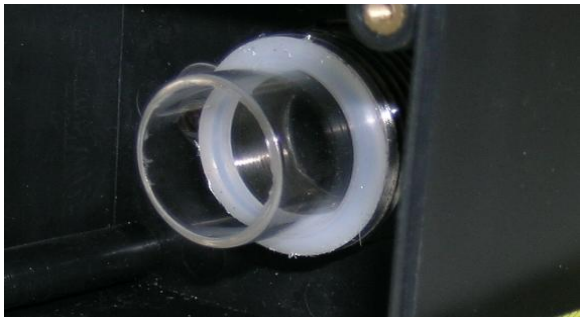
If a leakage is detected, perform the following.

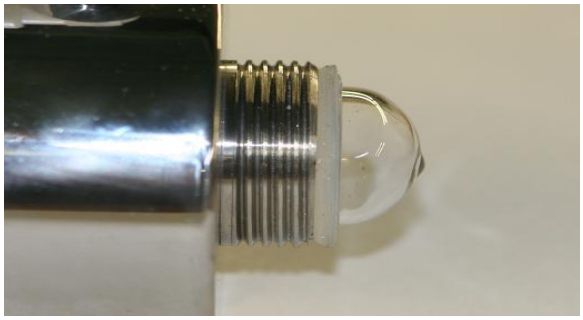
1. Shut off all electrical power. Shut off the source of power at the main panel breaker and use appropriate tag-out procedures to prevent accidental power-up.
2. Depressurize the UV unit.
3. Remove ballast box cover and remove the rubber boot.
4. Locate which end of the quartz sleeve is leaking.

Repairing Leaks

If both ends of the quartz sleeve are leaking, perform the following on both ends.

1. Use a channel lock to loosen and remove the compression nut.
2. Remove the quartz sleeve O-ring without pulling the quartz sleeve out.





3. Lubricate the quartz sleeve tip with clean water and place new O-ring. Ensure the O-ring has all-round contact with the cylinder pass-thru.
4. Replace and tighten the compression nut.
5. Refill the treatment chamber and verify a leak-free condition.

Measuring Performance

Every UV unit must be tested periodically to verify its efficiency. Regardless of the intended application or any optional equipment provided with the UV unit, the most accurate procedure is the Post-UV Analysis. The Post-UV Test must be performed in accordance with standard testing methods, see Section 0 below.

Verifying Lamp Operation

The UV lamp is "ON" when the blue light is emitting thru the viewport.

Obtaining Water Samples

Vast majority of unsatisfactory Post-UV Test results are directly related to the improper sample-taking techniques. Although several commercial sample collection apparatuses are available, the proper manufacturer's sample procedures must be followed.

NOTE! Sea Recovery recommends a valve with a discharge orifice not to exceed ¼" (6mm).

Sampling Procedure

Use sterile sample bottles obtained from reliable laboratory that has been autoclaved and kept in plastic bag for this procedure.

1. Use temporary tube to direct water from UV unit to container or drainage.
2. Pressurize the UV unit and flush unit with sample valve fully opened for 3.5 minutes. After flushing for 3.5 minutes, reduce valve opening to 50% and flush for 3 minutes.
3. Open the sample bottle and keep the inside of the cap facing down.
4. Fill the sample bottle and avoid breathing directly into the bottle or touching the inside of the bottle, cap, or neck.
5. Immediately cover and secure the cap after filling the sample bottle.
6. Label the sample bottle and place in a clean plastic bag.
7. Take sample bottle to the laboratory for plating as soon as possible.

NOTE! Sample processing must begin within 3 hours after sample collection and must comply with accepted standard methods.

Periodic Maintenance Table

The table below represents the recommended Periodic Maintenance (PM) for the SP Series UV Unit.

Description	Init.	Daily	Mn	Ann.	Other
Quartz Sleeve Cleaning	x				
Quartz Sleeve Replacement*	x				
Operating Condition	x				
Unit Cleaning	x		x		
Leak Inspection	x	x	x		
UV Lamp Inspection	x	x	x		
UV Lamp Replacement-SP-1				x	4,400 hrs
UV Lamp Replacement-SP-2				x	8,000 hrs

Table 1 Periodic Maintenance Table

* Quartz Sleeve replacement will occur more frequently for systems operating with continuous high flow rate or low water quality water, and less frequently for systems operating with low flow rate or high water quality.

Replacement Parts List

Part	Part No.
Stainless Steel Cylinder	40000300CV
UV Lamp	40000100CV
Quartz Sleeve	40000400CV
Compression Nut	40001400CV
O-ring	40001300CV

Table 2 Replacement Parts List

UV Unit Specifications

Type	12 VDC Operating UV Sterilizer for 2 gallon per minute of water flow
Ballast Type	Solid State
Bulb Type	16 Watts Single Ended
Bulb Life	8000 Hours minimum
Materials	Body: SS304; Ballast Box: PVC
Power Cord	4 meters 2 conductors
Weight	500g Body

Table 3 General Specifications

Temperature Range	Operating: +3ºC to +40ºC; Dry Storage: -25ºC to +85ºC

Table 4 Environmental Specifications

Operating Voltage Range	10.56V minimum; 16.50V maximum
Current	1.45A maximum @ Standard Test Voltage
UV Dosage	22mJ/cm^2 @ 254nm

Table 5 Electrical Specifications

Operating Pressure	50psi
Inlet/Outlet Ports	¼" NPT Female
Flow Rate	2 gpm
Disinfection Rate	99%

Table 6 Mechanical Specifications

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Section 8

Electrical Information

Electrical Requirements

Electrical Specifications

Electrical Wire Sizes

Electrical Diagrams

Notes: _____

A. ELECTRICAL CONNECTIONS

CAUTION: ELECTRICAL SHOCK HAZARD. A Volt / Ohm Meter will be necessary. The following procedures expose the technician to High Voltage and electrical shock hazard. Only attempt this if you are a qualified electrician and only if surrounding conditions are safe.

CAUTION: Always allow slack in electrical cables. Allow the cable to enter or leave from the strain relief in a straight manner for several inches to ensure proper connection, to relieve stress to the cable and fitting, and to allow ease of detachment and reattachment for maintenance or replacement. If electrical cables are pulled tight causing them to bend at the strain relief they will pull out of the strain relief causing a dangerous electrical shock condition, the wire may break, and the strain relief will loose its water tight integrity.

CAUTION: Review the "Check Off Q.C. Sheet" that accompanied this Owners Manual and the Invoice that accompanied this Ultra Whisper System to ensure that it has been configured from Sea Recovery for the appropriate and proper DC Voltage or AC Voltage, Cycles, and Phase.

- **A 12 VDC System will NOT function from 24 VDC Power.**
- **A 24 VDC System will NOT function from 12 VDC Power.**
- **An AC 50 Hz System will operate at higher than normal pressure and will over heat the Feed Pump Motor if connected to a 60 Hz power source.**
- **An AC 60 Hz System will operate at lower than normal pressure, will produce 17% less product water than specified, and the product water will be high in salt content if connected to a 50 Hz power source.**

1. Remove the Front cover from the system controller to access the Main Terminal Strip and Printed Circuit Board.

   REFER TO APPROPRIATE WIRING DIAGRAM IN THIS SECTION

   REFER TO APPROPRIATE WIRING SIZE LISTED IN THIS SECTION

   REFER TO APPROPRIATE CIRCUIT BREAKER SIZE LISTED IN THIS SECTION

   NOTE: System Configuration, Optional Accessories present, and the specific model all are contributing factors to the amount of electrical connections required during installation. The following items are listed but may either not be present (Optional Accessory not ordered) or may already be connected. Track each electrical wire to ensure proper connection. (*** = Optional Accessory)

2. Ultra Whisper System Required Electrical Connections:
   Feed Pump Electric Motor [6]
   Low Pressure Switch [10]
   High Pressure Switch [11]
   Fresh Water Flush Pump Electric Motor [33]
   3-way Product Water Diversion Solenoid Valve [26]
   *** U.V. Sterilizer [30]
   *** Remote Controller [40]
   *** Soft Start [41]
   Electrical Power to the System

B. ELECTRICAL NOTES:

1. **Properly sized Power Cables: CAUTION:** DO NOT USE ROMEX TYPE SOLID CORE WIRE. SOLID CORE WIRE CAN EASILY BREAK AND WILL NOT FIT OR SEAL INTO THE SUPPLIED STRAIN RELIEFS USE ROUND JACKETED STRANDED WIRE PREFERABLY WITH AN OUTER JACKET DESIGNATION OF SJO OR SIMILAR COMPATIBLE WITH MARINE USE AND AN OILY ENVIRONMENT. FOR DC OPERATION FINE STRAND WIRE, SIMILAR TO BATTERY CABLE, IS PREFERRED FOR MINIMAL RESISTANCE, MINIMAL VOLTAGE DROP, AND EASE OF ROUTING (EASILY FORMED AND BENT).

Recommended Power Wire Size to System and Power Wire Size to Feed Pump:

Ultra Whisper 200, 300, & 400:

Operating Voltage	**Maximum Load Amperage**	**Recommended Minimum Wire Size Length of run 20 Ft / 6 meter**	**Length of run 40 Ft / 12 meter**
12 VDC	28 Ampere	6 AWG / 13 mm^2	4 AWG / 19 mm^2
24 VDC	13.4 Ampere	8 AWG / 8 mm^2	6 AWG / 13 mm^2
115 VAC	6.6 Ampere	12 AWG / 3 mm^2	10 AWG / 5 mm^2
230 VAC	3.5 Ampere	12 AWG / 3 mm^2	12 AWG / 3 mm^2

Ultra Whisper 500 & 600:

Operating Voltage	**Maximum Load Amperage**	**Recommended Minimum Wire Size Length of run 20 Ft / 6 meter**	**Length of run 40 Ft / 12 meter**
24 VDC	20 Ampere	6 AWG / 13 mm^2	4 AWG / 19 mm^2
115- VAC	8.6 Ampere	12 AWG / 3 mm^2	10 AWG / 5 mm^2
230 VAC	4.3 Ampere	12 AWG / 3 mm^2	12 AWG / 3 mm^2

2. **Recommended Circuit Breaker Amperage Rating:**

12 & 24 VDC	**UW 200, UW 300, & UW 400 12V / 24V**	**UW 500 & UW 600 24V**
Recommended Circuit Breaker	40 Ampere / 15 Ampere	25 Ampere

115 & 230 VAC 60 Hz	**UW 200, UW 300, & UW 400 115V / 230V**	**UW 500 & UW 600 115V / 230V**
Recommended Circuit Breaker	10 Ampere / 5 Ampere	10 Ampere / 5 Ampere

110 & 220 VAC 50 Hz	**UW 200 UW 300 110V / 220V**	**UW 400 UW 500 UW 600 110V / 220V**
Recommended Circuit Breaker	10 Ampere / 5 Ampere	10 Ampere / 5 Ampere

3. **An electrical power source** Refer to Electrical Specifications at the beginning of this Owner's Manual.

C. ELECTRICAL REQUIREMENTS & INFORMATION:

1. Amperage Notes:

Alternating Current powered Systems: During start up, the current of the Feed Water Pump [6] Alternating Current Electric Motor surges to "Locked Rotor" or "Starting Amps" amperage for a fraction of a second after which the Electric Motor begins to rotate. After the Electric Motor achieves full RPM rotation the current drops to normal running load. This process will take less than 1/2 second.

Therefore, the maximum surge current that the power source must be able to deliver equals the Feed Water Pump Electric Motor starting amperage listed in the Specification Section of this manual. If the AC Power Source (AC Generator or Dock Power) is insufficient the Ultra Whisper Electric Motor will not gain the full RPM speed needed for it to switch to running amperage mode, will consume "starting amps" amperage continually, and will either trip the power source circuit breaker or overheat and short out. Similar results will occur if the Frequency (Hz or Cycles) drop below the minimum requirement which will occur from a weak AC Generator that slows down when a load is applied to it. This is an installation problem (insufficient power supply), it is not an Ultra Whisper problem.

Direct Current powered Systems: During start up, the current of the Feed Water Pump [6] Direct Current Electric Motor draws high amperage for a fraction of a second after which the Electric Motor begins to rotate. After the Electric Motor achieves full RPM rotation the current drops to normal running load. This process will take less than 1/2 second.

Therefore, the battery bank power source must be fully charged and of sufficient amperage storage capacity to provide and maintain the full voltage (12 VDC or 24 VDC as appropriate) at the instant of starting the Feed Water Pump Electric Motor. If the battery bank power is insufficient the Ultra Whisper electronic circuit may "drop out" due to power loss before the Electric Motor even begins to rotate. This is an installation problem (insufficient power supply), it is not an Ultra Whisper problem. Low DC voltage to the Feed Pump electric motor will also be caused by insufficient diameter power cables connected from the battery bank, through the boat's circuit breaker, and on to the Ultra Whisper controller.

2. POWER SOURCE REQUIREMENTS:

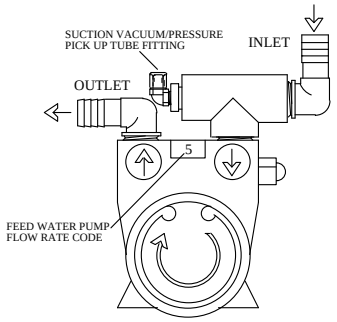
Check line voltage and frequency to ensure that it agrees with the system nameplate. Grounding and circuit protection should be done in accordance with National Electrical Code. See connection diagram on nameplate of motor or refer to the diagrams within this manual.

Voltage	HZ (AC)	Min. HZ	Max. HZ	Min. Voltage	Max. Voltage
DC Systems					
12 VDC	N/A	N/A	N/A	11 VDC	15 VDC
24 VDC	N/A	N/A	N/A	22 VDC	30 VDC
AC Systems					
120 VAC	60 HZ	58 Hz	62 Hz	108 VAC	132 VAC
230 VAC	60 HZ	58 Hz	62 Hz	207 VAC	253 VAC
100 VAC	50 HZ	48 Hz	52 Hz	90 VAC	110 VAC
220 VAC	50 HZ	48 Hz	52 Hz	198 VAC	242 VAC

3. MOTOR ROTATION:

A.C. Systems: Refer to Feed Water Pump Electric Motor nameplate for wiring connections and rotation notations.

DC Systems: The Feed Water Pump DC Electric Motor rotation is polarity sensitive. If rotation is incorrect, check incoming polarity and individual motor wiring. Jog the motor by pressing the Start Switch and then quickly thereafter pressing the Stop switch. Interchange Positive and Negative power lead wires **at the Electric Motor** if rotation is reversed.



D. FEED WATER PUMP MOTOR ELECTRICAL SPECIFICATIONS:

12 & 24 VDC	**UW 200 12V / 24V**	**UW 300 12V / 24V**	**UW 400 12V / 24V**	**UW 500 24V**	**UW 600 24V**
Nominal Operating Amps	16 / 8	24 / 12	24 / 12	24	26
Maximum Motor Amps	28 / 13.4	28 / 13.4	28 / 13.4	20	20
Horse Power	.3	.3	.3	.5	.5
Recommended Circuit Breaker	30 / 15	30 / 15	30 / 15	25	25
Minimum Size Power Wire AWG	6 / 8	6 / 8	6 / 8	6	6
Minimum Size Power Wire mm^2	13 / 8	13 / 8	13 / 8	13	13
115 & 230 VAC 60 Hz	**UW 200 115V / 230V**	**UW 300 115V / 230V**	**UW 400 115V / 230V**	**UW 500 115V / 230V**	**UW 600 115V / 230V**
Nominal Operating Amps	5 / 2.5	5.3 / 2.7	5.3 / 2.7	7.2 / 3.6	7.5 / 3.7
Maximum Motor Amps	6.6 / 3.5	6.6 / 3.5	6.6 / 3.5	8.6 / 4.3	8.6 / 4.3
Starting Amps	25 / 12.5	25 / 12.5	25 / 12.5	46 / 23	46 / 23
Horse Power	.3	.3	.3	.5	.5
Recommended Circuit Breaker	10 / 5	10 / 5	10 / 5	10 / 5	10 / 5
Minimum Size Power Wire AWG	12	12	12	12	12
Minimum Size Power Wire mm^2	3	3	3	3	3
110 & 220 VAC 50 Hz	**UW 200 110V / 220V**	**UW 300 110V / 220V**	**UW 400 110V / 220V**	**UW 500 110V / 220V**	**UW 600 110V / 220V**
Nominal Operating Amps	4.8 / 2.4	5.1 / 2.5	5.1 / 2.5	7 / 3.5	7.3 / 3.6
Maximum Motor Amps	5.2 / 2.6	5.2 / 2.6	5.2 / 2.6	7.4 / 3.7	7.4 / 3.7
Starting Amps	26 / 13	26 / 13	26 / 13	44 / 22	44 / 22
Horse Power	.3	.3	.3	.5	.5
Recommended Circuit Breaker	10 / 5	10 / 5	10 / 5	10 / 5	10 / 5
Minimum Size Power Wire AWG	12	12	12	12	12
Minimum Size Power Wire mm^2	3	3	3	3	3

NOTE:

Nominal Operating Amperage Will Increase if:

- the Feed Water Temperature is Lower than 77º Fahrenheit / 25º Celsius.
- the Feed Water Salinity is Greater than 35,000 PPM TDS (3.5% Total Dissolved Solids)
- the R.O. Membrane Element becomes fouled
- the R.O. Membrane Element is new and on the minus 15% side of the specifications

Nominal Operating Amperage Will Decrease if:

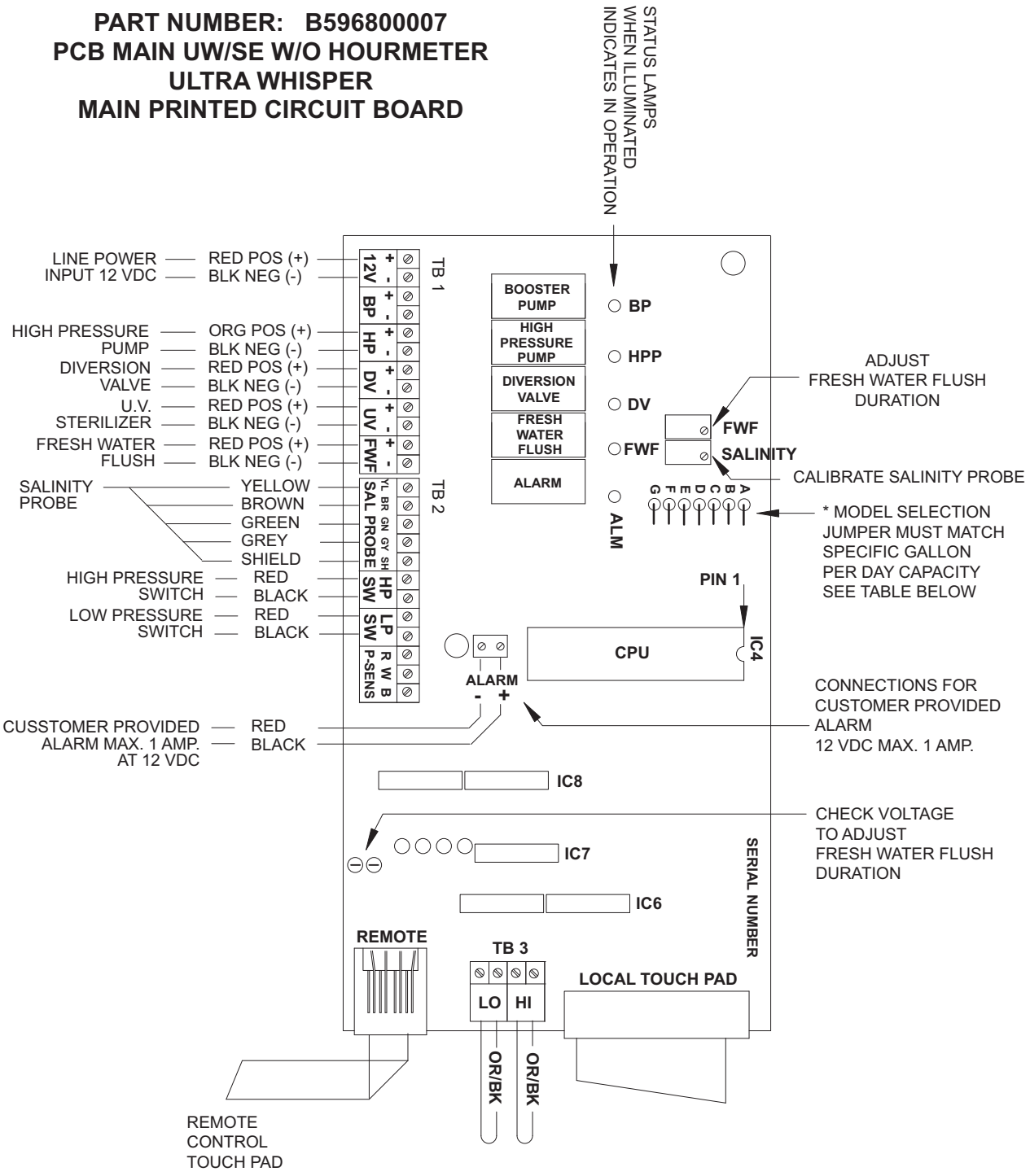
- the Feed Water Temperature is Higher than 77º Fahrenheit / 25º Celsius.
- the Feed Water Salinity is Less than 35,000 PPM TDS (3.5% Total Dissolved Solids)
- the R.O. Membrane Element is new and on the plus 15% side of the specifications

Wire Size Cross Reference American Wire Gauge (AWG) vs. Metric Wire Sizes

AWG	Diameter Inch	Square Inch (In^2)	Diameter Millimeters	Square Millimeters (mm^2)
0000	0.4600	0.1661	11.6840	107.1649
000	0.4096	0.1317	10.4038	84.9683
00	0.3648	0.1045	9.2659	67.3980
0	0.3249	0.0829	8.2525	53.4609
1	0.2893	0.0657	7.3482	42.3871
2	0.2576	0.0521	6.5430	33.6069
3	0.2294	0.0413	5.8268	26.6516
4	0.2043	0.0328	5.1892	21.1385
6	0.1620	0.0206	4.1148	13.2913
8	0.1285	0.0130	3.2639	8.3626
10	0.1019	0.0082	2.5883	5.2588
12	0.0808	0.0051	2.0523	3.3064
14	0.0641	0.0032	1.6281	2.0809
16	0.0508	0.0020	1.2903	1.3070
18	0.0403	0.0013	1.0236	0.8225
20	0.0320	0.0008	0.8128	0.5186
22	0.0254	0.0005	0.6452	0.3267

American Wire Gauge			Metric Wire Gauge		Metric Wire
AWG	dia inch	sq. inch	dia mm	sq mm	Size mm^2
0000	0.4600	0.1661	11.6840	107.1649	**100**
000	0.4096	0.1317	10.4038	84.9683	**85**
00	0.3648	0.1045	9.2659	67.3980	**65**
0	0.3249	0.0829	8.2525	53.4609	**50**
1	0.2893	0.0657	7.3482	42.3871	**40**
2	0.2576	0.0521	6.5430	33.6069	**32**
3	0.2294	0.0413	5.8268	26.6516	**32**
4	0.2043	0.0328	5.1892	21.1385	**19**
6	0.1620	0.0206	4.1148	13.2913	**13**
8	0.1285	0.0130	3.2639	8.3626	**8**
10	0.1019	0.0082	2.5883	5.2588	**5**
12	0.0808	0.0051	2.0523	3.3064	**3**
14	0.0641	0.0032	1.6281	2.0809	**2**
16	0.0508	0.0020	1.2903	1.3070	**1**
18	0.0403	0.0013	1.0236	0.8225	**0.8**
20	0.0320	0.0008	0.8128	0.5186	**0.5**
22	0.0254	0.0005	0.6452	0.3267	**0.35**

PART NUMBER: B596800007
PCB MAIN UW/SE W/O HOURMETER
ULTRA WHISPER
MAIN PRINTED CIRCUIT BOARD



*** MODEL SELECTION JUMPER TABLE:**

MODEL	JUMPERS						
	A	B	C	D	E	F	G
ULTRA WHISPER 200	CUT	---	---	CUT	---	---	---
ULTRA WHISPER 300	---	CUT	---	CUT	---	---	---
ULTRA WHISPER 400	---	CUT	---	CUT	---	---	---
ULTRA WHISPER 500	CUT	CUT	---	CUT	---	---	---
ULTRA WHISPER 600	CUT	CUT	---	CUT	---	---	---

CUT = CUT WIRE LEAD FROM RESISTOR
--- = DO NOT CUT WIRE LEAD

WIRING DIAGRAMS

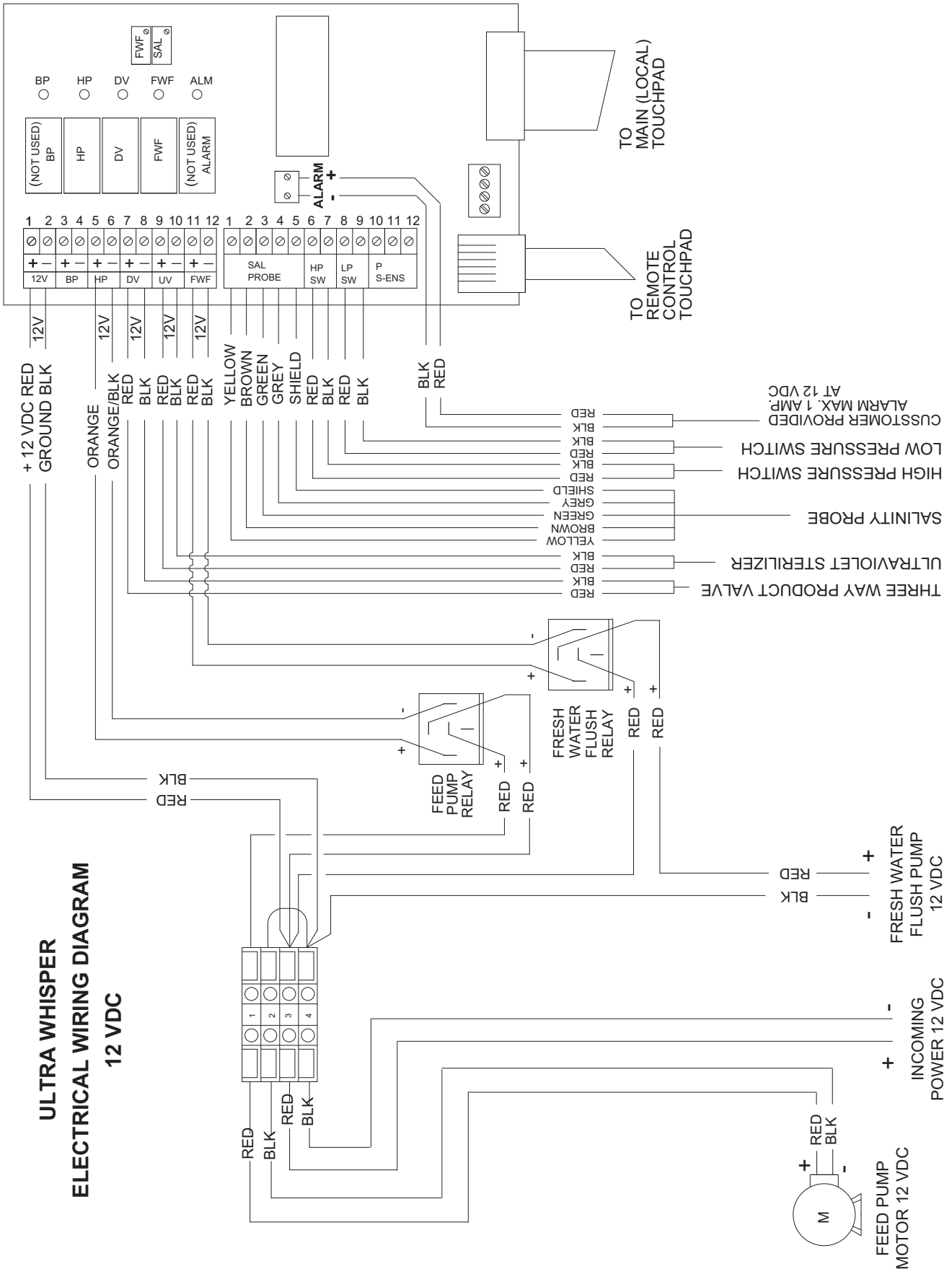
12 VDC

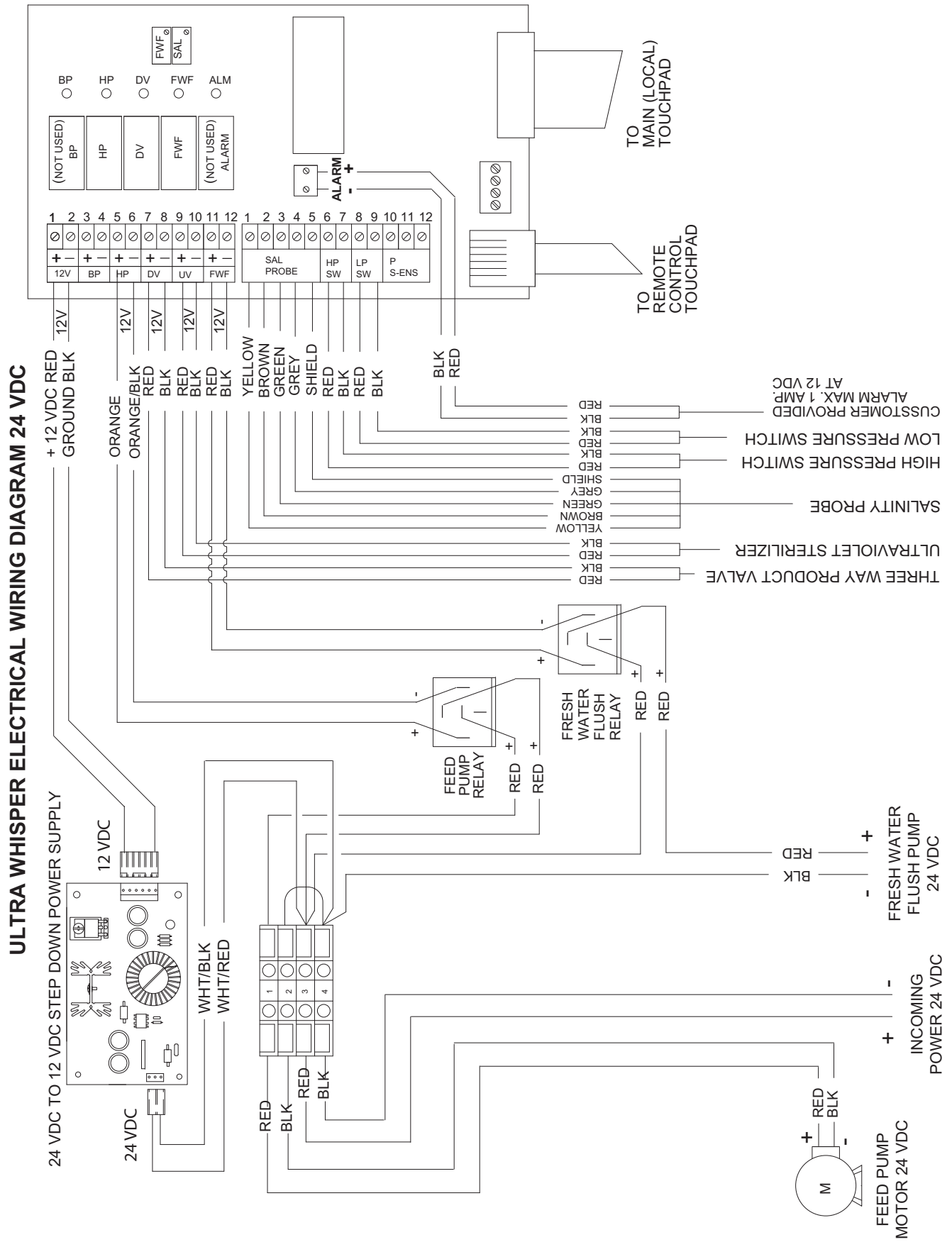
24 VDC

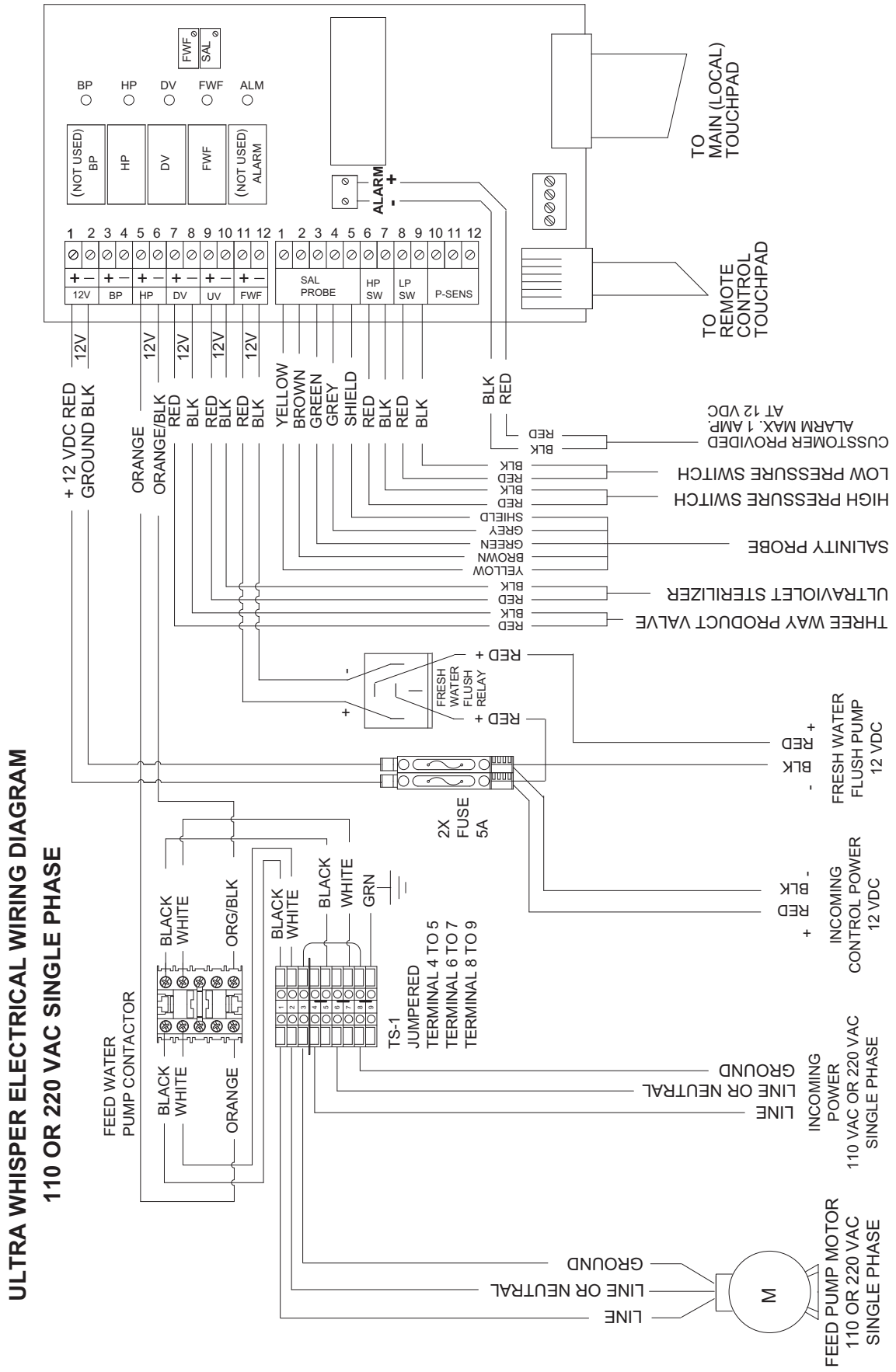
AND

110/220 VAC, 50 Hz, Single Phase
115/230 VAC, 60Hz, Single Phase

Refer to the appropriate individual wiring diagram applicable to the specific model and power set up of your system on the following pages.


ULTRA WHISPER
ELECTRICAL WIRING DIAGRAM
12 VDC
BP
HP
DV
FWF
ALM
FWF
SAL
(NOT USED) BP
HP
DV
FWF
(NOT USED) ALARM
ALARM
1 2 3 4 5 6 7 8 9 10 11 12
12V
BP
HP
DV
UV
FWF
SAL PROBE
HP SW
LP SW
P S-ENS
TO MAIN (LOCAL) TOUCHPAD
TO REMOTE CONTROL TOUCHPAD
+ 12 VDC RED
GROUND BLK
ORANGE
ORANGE/BLK
RED
BLK
YELLOW
BROWN
GREEN
GREY
SHIELD
CUSSTOMER PROVIDED
ALARM MAX. 1 AMP.
AT 12 VDC
HIGH PRESSURE SWITCH
LOW PRESSURE SWITCH
SALINITY PROBE
ULTRAVIOLET STERILIZER
THREE WAY PRODUCT VALVE
FRESH WATER FLUSH RELAY
FEED PUMP RELAY
FRESH WATER FLUSH PUMP 12 VDC
INCOMING POWER 12 VDC
FEED PUMP MOTOR 12 VDC
M


ULTRA WHISPER ELECTRICAL WIRING DIAGRAM 24 VDC
BP
HP
DV
FWF
ALM
FWF
SAL
(NOT USED) BP
HP
DV
FWF
(NOT USED) ALARM
ALARM
+
-
1 2 3 4 5 6 7 8 9 10 11 12
12V
BP
HP
DV
UV
FWF
SAL PROBE
HP SW
LP SW
P S-ENS
TO MAIN (LOCAL) TOUCHPAD
TO REMOTE CONTROL TOUCHPAD
+ 12 VDC RED
GROUND BLK
ORANGE
ORANGE/BLK
RED
BLK
RED
BLK
RED
BLK
YELLOW
BROWN
GREEN
GREY
SHIELD
RED
BLK
RED
BLK
BLK
RED
CUSSTOMER PROVIDED
ALARM MAX. 1 AMP.
AT 12 VDC
HIGH PRESSURE SWITCH
LOW PRESSURE SWITCH
SALINITY PROBE
ULTRAVIOLET STERILIZER
THREE WAY PRODUCT VALVE
FRESH WATER FLUSH RELAY
FEED PUMP RELAY
12 VDC
24 VDC TO 12 VDC STEP DOWN POWER SUPPLY
24 VDC
WHT/BLK
WHT/RED
RED
BLK
RED
BLK
FRESH WATER FLUSH PUMP 24 VDC
INCOMING POWER 24 VDC
FEED PUMP MOTOR 24 VDC
M


ULTRA WHISPER ELECTRICAL WIRING DIAGRAM
110 OR 220 VAC SINGLE PHASE
BP
HP
DV
FWF
ALM
FWF
SAL
(NOT USED) BP
HP
DV
FWF
(NOT USED) ALARM
ALARM
+
-
1 2 3 4 5 6 7 8 9 10 11 12
12V
BP
HP
DV
UV
FWF
SAL PROBE
HP SW
LP SW
P-SENS
TO MAIN (LOCAL) TOUCHPAD
TO REMOTE CONTROL TOUCHPAD
+ 12 VDC RED
GROUND BLK
ORANGE
ORANGE/BLK
RED
BLK
RED
BLK
RED
BLK
YELLOW
BROWN
GREEN
GREY
SHIELD
RED
BLK
RED
BLK
BLK
RED
CUSSTOMER PROVIDED
ALARM MAX. 1 AMP.
AT 12 VDC
HIGH PRESSURE SWITCH
LOW PRESSURE SWITCH
SALINITY PROBE
ULTRAVIOLET STERILIZER
THREE WAY PRODUCT VALVE
FRESH WATER FLUSH RELAY
RED +
FRESH WATER FLUSH PUMP 12 VDC
INCOMING CONTROL POWER 12 VDC
2X FUSE 5A
FEED WATER PUMP CONTACTOR
BLACK
WHITE
ORG/BLK
GRN
TS-1
JUMPERED
TERMINAL 4 TO 5
TERMINAL 6 TO 7
TERMINAL 8 TO 9
INCOMING POWER 110 VAC OR 220 VAC SINGLE PHASE
LINE
LINE OR NEUTRAL
GROUND
FEED PUMP MOTOR 110 OR 220 VAC SINGLE PHASE
M

Section 9

Exploded Parts Views

Sub-section 9 - A pages 3 - 31

Exploded Parts Views

Common to both the Compact & Modular Style

Sub-section 9 - B pages 33 - 41

Exploded Parts Views

For the Compact Style Only

Sub-section 9 - C pages 43 - 49

Exploded Parts Views

For the Modular Style Only

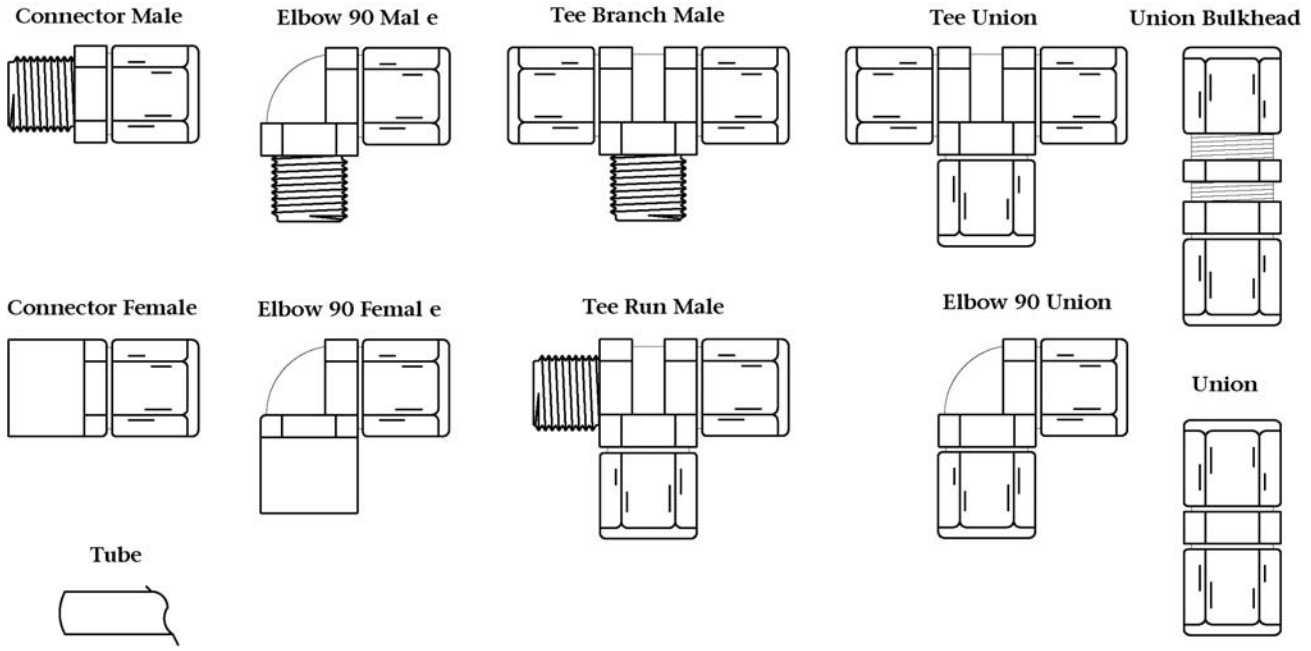
Notes: _____

Sub-section 9 - A pages 3 - 37

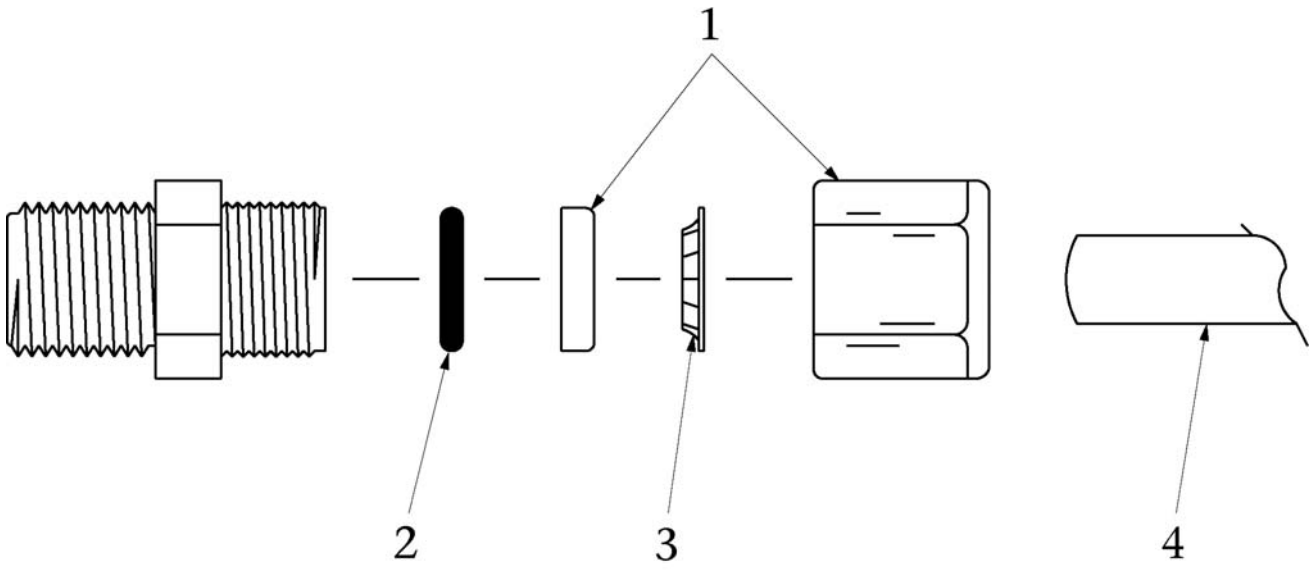
Exploded Parts Views

Common to both the Compact & Modular Style

AVAILABLE TUBE FITTINGS



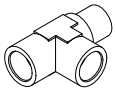
Specify Tube Size	and	Specify Pipe Size	and	Specify Male or Female	
1/4" O.D.		1/4		MNPT	FNPT
3/8" O.D.		3/8		MNPT	FNPT
1/2" O.D.		1/2		MNPT	FNPT
5/8" O.D.		3/4		MNPT	FNPT



Body **O-Ring** **Spacer** **Grab Ring** **Nut** **Tube**

INSTALLATION KIT & OWNERS MANUAL

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-17	**B001380001**	**INSTALLATION KIT UW/SE**		
1	0101422583	TEE 1/2 FT X 1/2 FT X 1/2 FT P	EACH	3
2	0101292383	RB 1/2 MT X 1/4 FT PVC	EACH	3
3	0204020869	ELB90 1/4 TUBE X 1/4 MPT PLAST	EACH	2
4	0101013783	ELB90 3/4 FPT X 3/4 FPT PVC	EACH	1
5	0101653683	ADAP 3/4 MPT X 1/2 BARB PVC	EACH	1
6	0101072583	ELB90 1/2 MPT X 1/2 BARB PVC	EACH	1
7	05181434AA	HOSE CLAMP 3/4" SS	EACH	12
8	0339076100	HOSE CLEAR BRAID 5/8" HD	FEET	30
9	0312121969	TUBE 1/4 BLACK	FEET	50
10	0204090869	CONN 1/4 TUBE X 1/4 MPT PLASTI	EACH	1
11	061182143024	SC LAG 1/4 X 1 1/2 SS	EACH	4
12	2132021600	RUBBER MOUNT GROMMET 1 1/4 OD	EACH	4
13	0101652583	ADAP 1/2 MPT X 1/2 BARB PVC	EACH	4
14	0204091769	CONN 3/8 TUBE X 1/4 MPT PLASTI	EACH	1
15	0312123569	TUBE 3/8 BLACK	FEET	50
16	0204021769	ELB90 3/8 TUBE X 1/4 MPT PLAST	EACH	1
17	B651380001	OWNERS MANUAL ULTRA WHISPER	EACH	1


1

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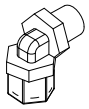
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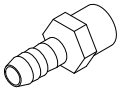
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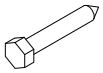
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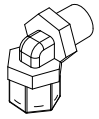
12

13

14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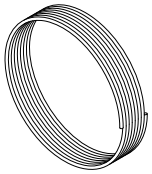
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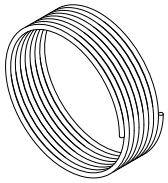
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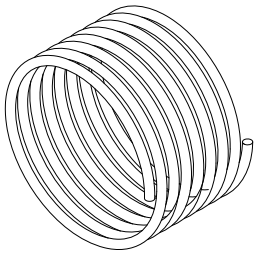
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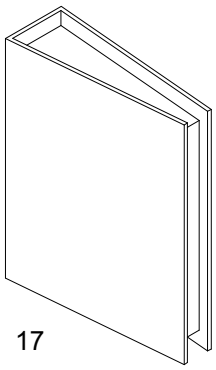
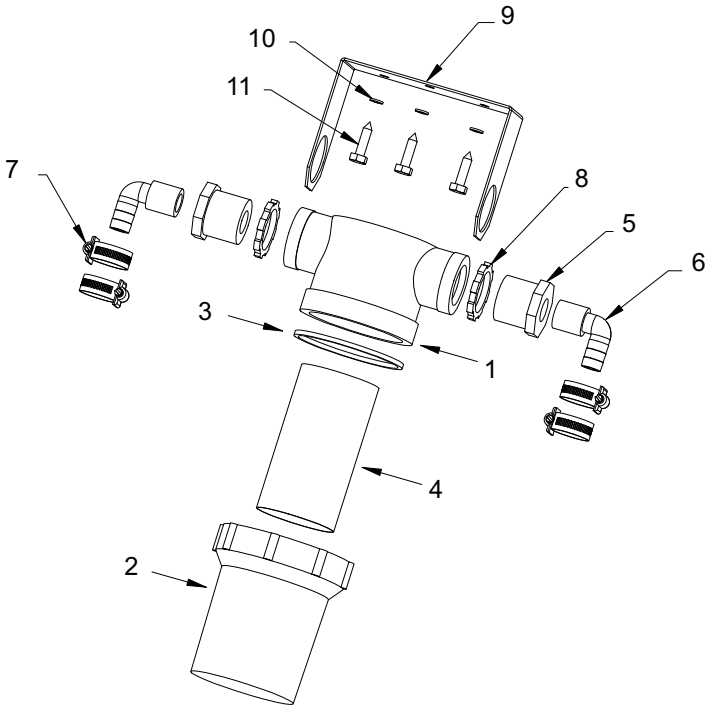
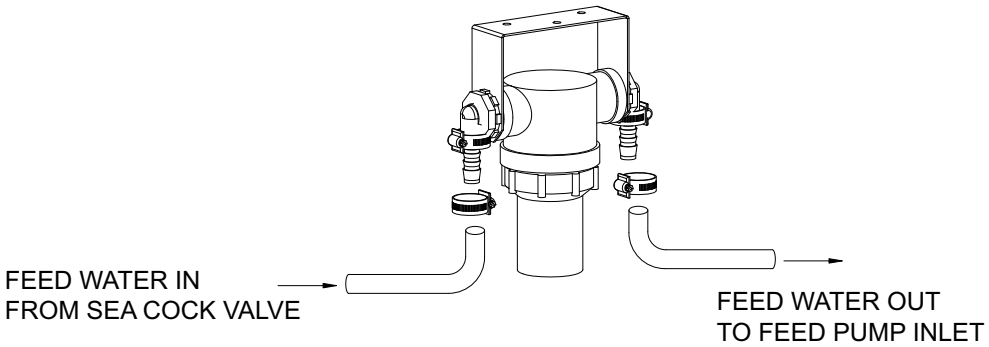

17

SEA STRAINER ASSEMBLY FOR FEED WATER PUMP PROTECTION

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1 - 11	B006380001	SEA STRAINER		
1-4	0412061278	SEA STRAINER 1" NYLON	EACH	1
1		LID SEA STRAINER 1" NYLON		
2		BOWL SEA STRAINER 1" NYLON		
3	2614100178	O-RING SEA STRAINER 1" NYLON		
4	0804702578	MESH SCREEN SEA STRAINER 1" NYLON		
5	20200402010	BRACKET SEA STRAINER AS	EACH	1
6	063200084000	NUT LOCK 1" STEEL	EACH	2
7	0101294283	RB 1 MT X 1/2 FT PVC	EACH	2
8	0101072583	ELB90 1/2 MPT X 1/2 BARB PVC	EACH	2
9	05181434AA	HOSE CLAMP 3/4" SS	EACH	4
10	061172143016	SC HEX "A" 1/4 X 1 SS	EACH	3
11	061080043000	FLAT WASHER 1/4" SS	EACH	3

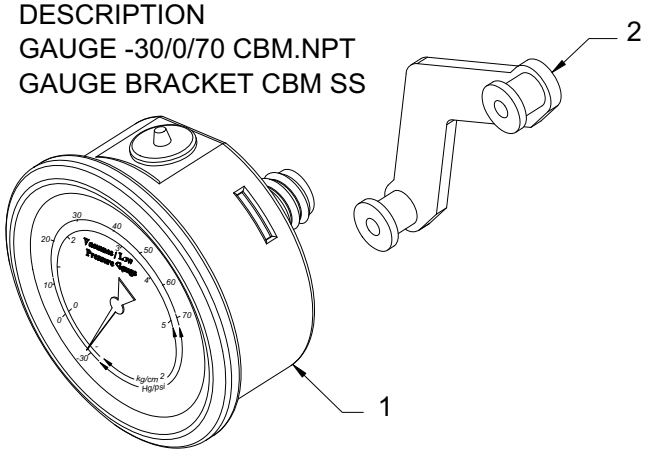




PRESSURE GAUGES

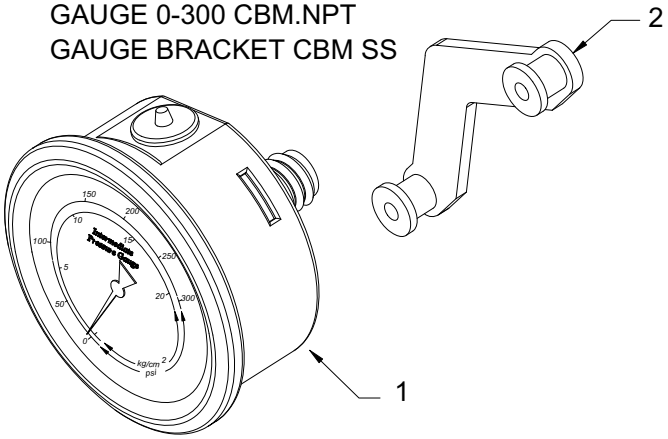
COMPOUND VACUUM / PRESSURE GAUGE -30/0/70

ITEM	PART NUMBER	DESCRIPTION
1	10181522CC	GAUGE -30/0/70 CBM.NPT
2	05180851CC	GAUGE BRACKET CBM SS



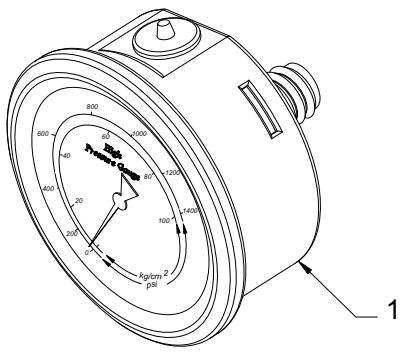
PRESSURE GAUGE 0 - 300

ITEM	PART NUMBER	DESCRIPTION
1	10181510CC	GAUGE 0-300 CBM.NPT
2	05180851CC	GAUGE BRACKET CBM SS



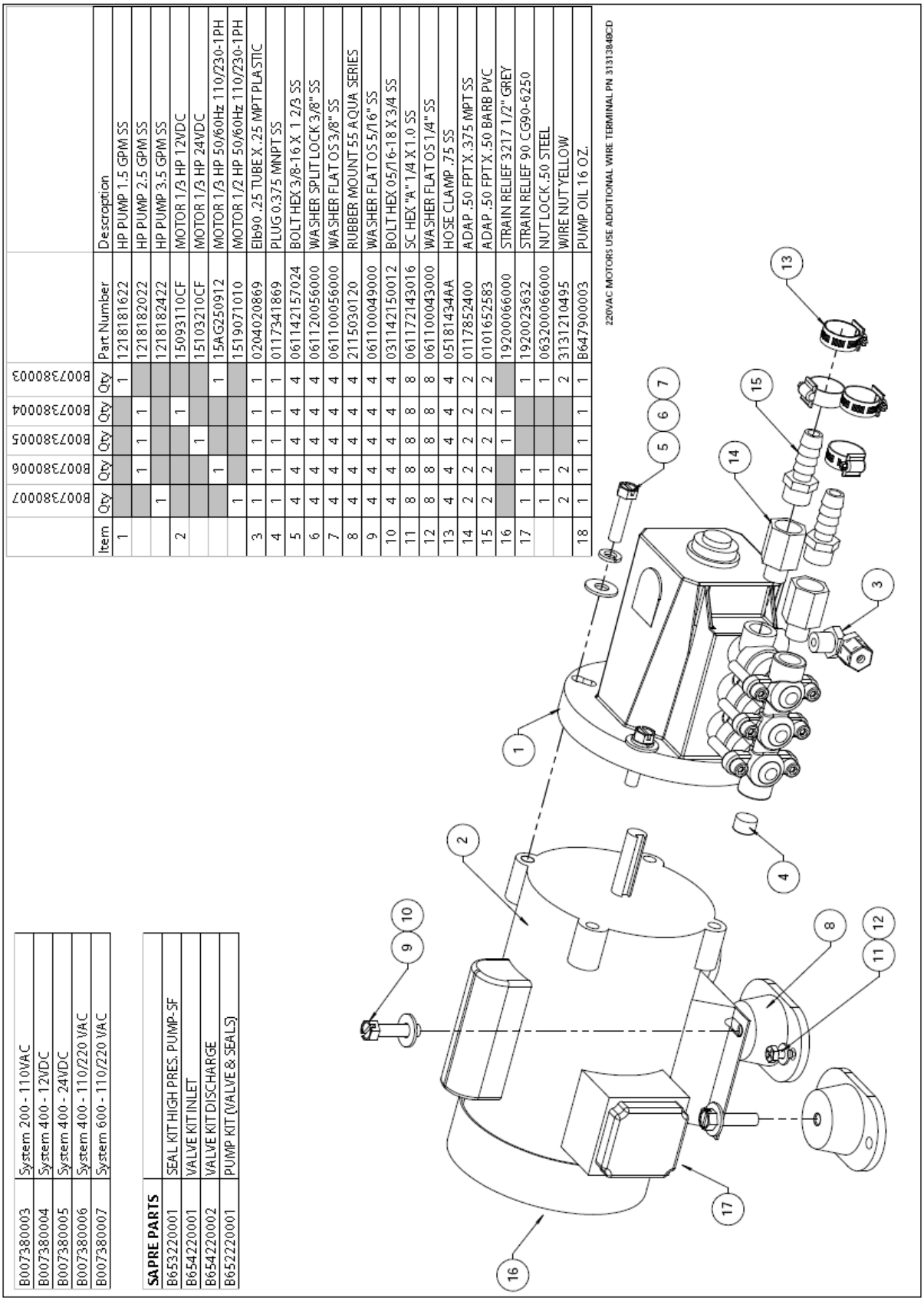
HIGH PRESSURE GAUGE 0 - 1400

ITEM	PART NUMBER	DESCRIPTION
1	10181524CC	GAUGE 0-1400 CBM.NPT



Δ

B00738000X FEED WATER PUMP ASSEMBLY
ULTRA WHISPER 200-600



Item	Qty	B007380007	B007380006	B007380005	B007380004	B007380003	Part Number	Description
1						1	1218181622	HP PUMP 1.5 GPM SS
			1	1	1		1218182022	HP PUMP 2.5 GPM SS
	1						1218182422	HP PUMP 3.5 GPM SS
2					1		15093110CF	MOTOR 1/3 HP 12VDC
				1			15103210CF	MOTOR 1/3 HP 24VDC
			1			1	15AG250912	MOTOR 1/3 HP 50/60Hz 110/230-1PH
	1						1519071010	MOTOR 1/2 HP 50/60Hz 110/230-1PH
3	1	1	1	1	1	1	0204020869	Elb90 .25 TUBE X .25 MPT PLASTIC
4	1	1	1	1	1	1	01173441869	PLUG 0.375 MNPT SS
5	4	4	4	4	4	4	061142157024	BOLT HEX 3/8-16 X 1 2/3 SS
6	4	4	4	4	4	4	061120056000	WASHER SPLIT LOCK 3/8" SS
7	4	4	4	4	4	4	061100056000	WASHER FLAT OS 3/8" SS
8	4	4	4	4	4	4	2115030120	RUBBER MOUNT 55 AQUA SERIES
9	4	4	4	4	4	4	061100049000	WASHER FLAT OS 5/16" SS
10	4	4	4	4	4	4	031142150012	BOLT HEX 05/16-18 X 3/4 SS
11	8	8	8	8	8	8	061172143016	SC HEX "A" 1/4 X 1.0 SS
12	8	8	8	8	8	8	061100043000	WASHER FLAT OS 1/4" SS
13	4	4	4	4	4	4	05181434AA	HOSE CLAMP .75 SS
14	2	2	2	2	2	2	0117852400	ADAP .50 FPT X .375 MPT SS
15	2	2	2	2	2	2	0101652583	ADAP .50 FPT X .50 BARB PVC
16				1	1		19200066000	STRAIN RELIEF 3217 1/2" GREY
17	1	1	1			1	19200723632	STRAIN RELIEF 90 CG90-6250
	1	1	1			1	063200066000	NUT LOCK .50 STEEL
	2	2				2	3131210495	WIRE NUT YELLOW
18	1	1	1	1	1	1	B647900003	PUMP OIL 16 OZ.

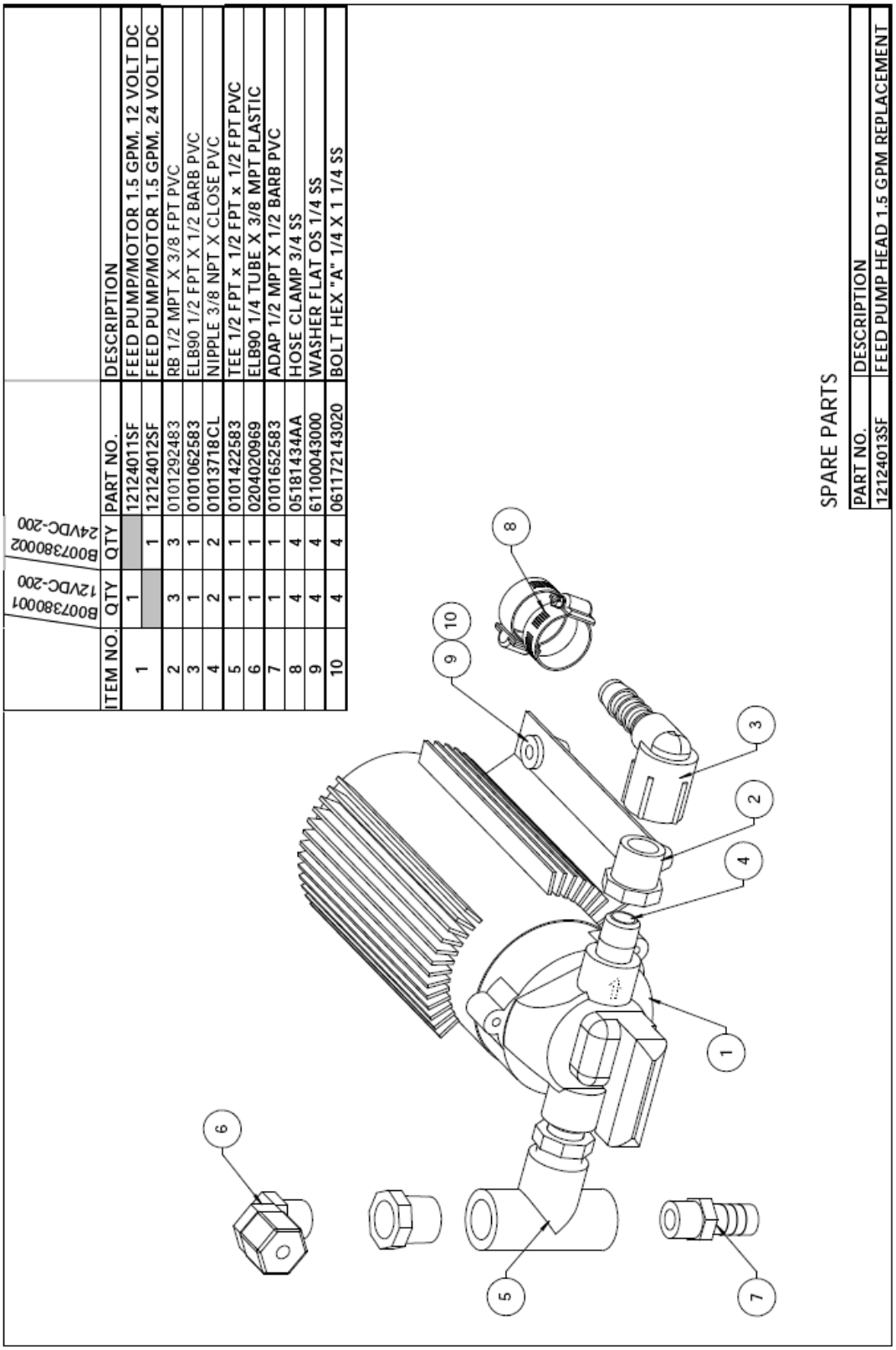
220VAC MOTORS USE ADDITIONAL WIRE TERMINAL PN 3131384BCD

B007380003	System 200 - 110VAC
B007380004	System 400 - 12VDC
B007380005	System 400 - 24VDC
B007380006	System 400 - 110/220 VAC
B007380007	System 600 - 110/220 VAC

SAPRE PARTS	
B653220001	SEAL KIT HIGH PRES. PUMP-SF
B654220001	VALVE KIT INLET
B654220002	VALVE KIT DISCHARGE
B652220001	PUMP KIT (VALVE & SEALS)

FEED WATER PUMP (pump only)

NOTE: The Ultra Whisper Feed Water Pump is not "in field repairable". This illustration in this section is shown for qualified Sea Recovery Technicians.



ITEM NO.	B007380001 12VDC-200 QTY	B007380002 24VDC-200 QTY	PART NO.	DESCRIPTION
1	1		12124011SF	FEED PUMP/MOTOR 1.5 GPM, 12 VOLT DC
		1	12124012SF	FEED PUMP/MOTOR 1.5 GPM, 24 VOLT DC
2	3	3	0101292483	RB 1/2 MPT X 3/8 FPT PVC
3	1	1	0101062583	ELB90 1/2 FPT X 1/2 BARB PVC
4	2	2	01013718CL	NIPPLE 3/8 NPT X CLOSE PVC
5	1	1	0101422583	TEE 1/2 FPT x 1/2 FPT x 1/2 FPT PVC
6	1	1	0204020969	ELB90 1/4 TUBE X 3/8 MPT PLASTIC
7	1	1	0101652583	ADAP 1/2 MPT X 1/2 BARB PVC
8	4	4	05181434AA	HOSE CLAMP 3/4 SS
9	4	4	61100043000	WASHER FLAT OS 1/4 SS
10	4	4	061172143020	BOLT HEX "A" 1/4 X 1 1/4 SS

SPARE PARTS

PART NO.	DESCRIPTION
12124013SF	FEED PUMP HEAD 1.5 GPM REPLACEMENT

B00738000X FEED PUMP 1.5 GPM UWSE 200

12 VDC:

Seafari Escape 200 Compact & Modular 12 VDC
Part Number: 12124011SF
Description: Feed Pump 1.5GPM 12VDC

Seafari Escape 300 Compact & Modular 12 VDC
Seafari Escape 400 Compact & Modular 12 VDC
Part Number: 1218182022
Description: HP PUMP 2.5GPM SS

24 VDC:

Seafari Escape 200 Compact & Modular 24 VDC
Part Number: 12124012SF
Description: Feed Pump 1.5GPM 24VDC

Seafari Escape 300 Compact & Modular 24 VDC
Seafari Escape 400 Compact & Modular 24 VDC
Part Number: 1218182022
Description: HP PUMP 2.5GPM SS

Seafari Escape 500 Compact & Modular 24 VDC
Part Number: 1218182422
Description: HP PUMP 3.5GPM SS

Seafari Escape 600 Compact & Modular 24 VDC
Part Number: 1218182422
Description: HP PUMP 3.5GPM SS

115 /230 VAC 60 hz:

Seafari Escape 200 Compact & Modular 115/230 VAC 60 Hz
Part Number: 1218181622
Description: HP PUMP 1.5GPM SS

115 /230 VAC 60 hz continued:

Seafari Escape 300 Compact & Modular 115/230 VAC 60 Hz
Seafari Escape 400 Compact & Modular 115/230 VAC 60 Hz
Part Number: 1218182022
Description: HP PUMP 2.5GPM SS

Seafari Escape 500 Compact & Modular 115/230 VAC 60 Hz
Part Number: 1218182422
Description: HP PUMP 3.5GPM SS

Seafari Escape 600 Compact & Modular 115/230 VAC 60 Hz
Part Number: 1218182422
Description: HP PUMP 3.5GPM SS

110 / 220 VAC 50 Hz:

Seafari Escape 200 Compact & Modular 110/220 VAC 50 Hz
Part Number: 1218181622
Description: HP PUMP 1.5GPM SS

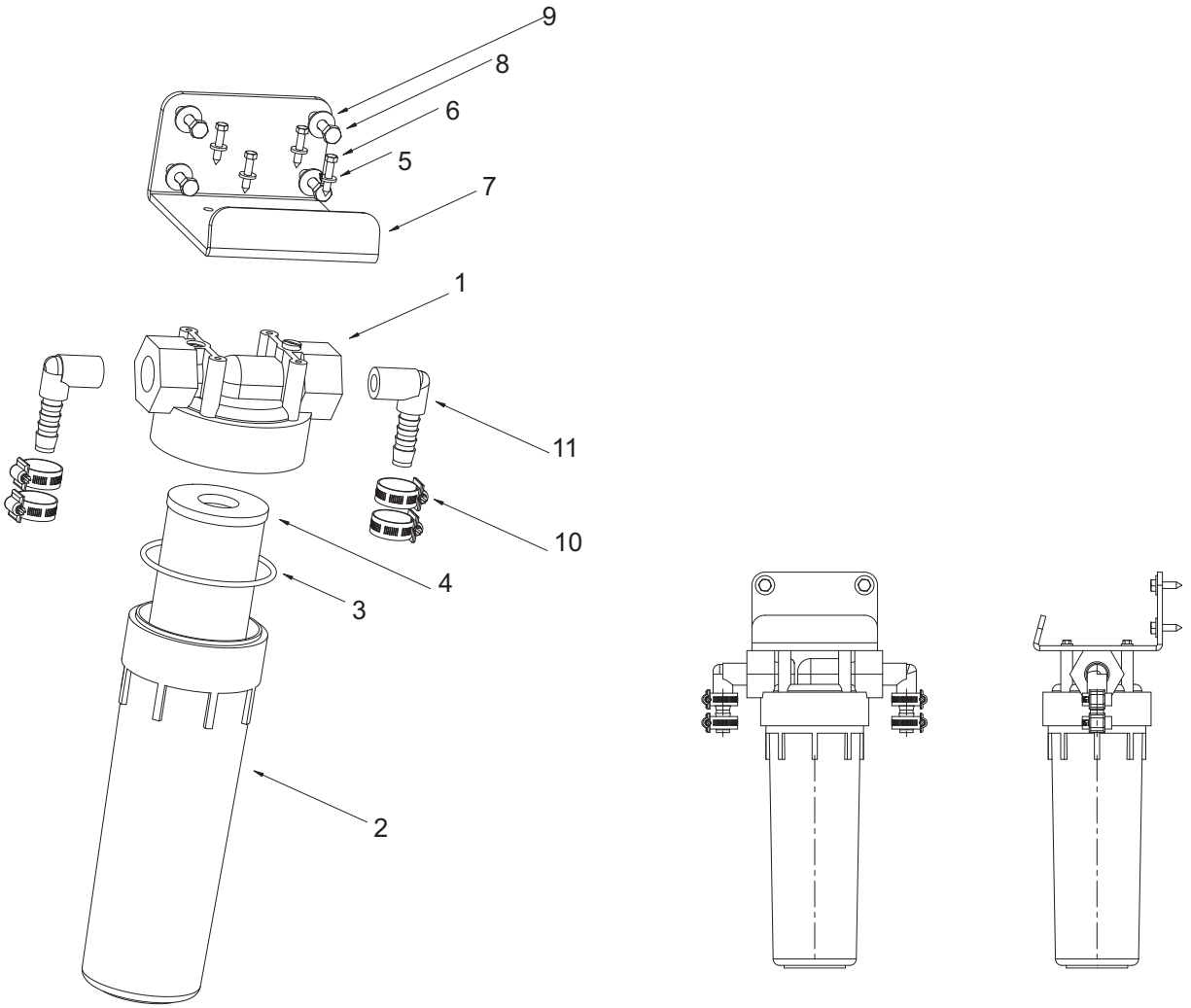
Seafari Escape 300 Compact & Modular 110/220 VAC 50 Hz
Seafari Escape 400 Compact & Modular 110/220 VAC 50 Hz
Part Number: 1218182022
Description: HP PUMP 2.5GPM SS

Seafari Escape 500 Compact & Modular 110/220 VAC 50 Hz
Part Number: 1218182422
Description: HP PUMP 3.5GPM SS

Seafari Escape 600 Compact & Modular 110/220 VAC 50 Hz
Part Number: 1218182422
Description: HP PUMP 3.5GPM SS

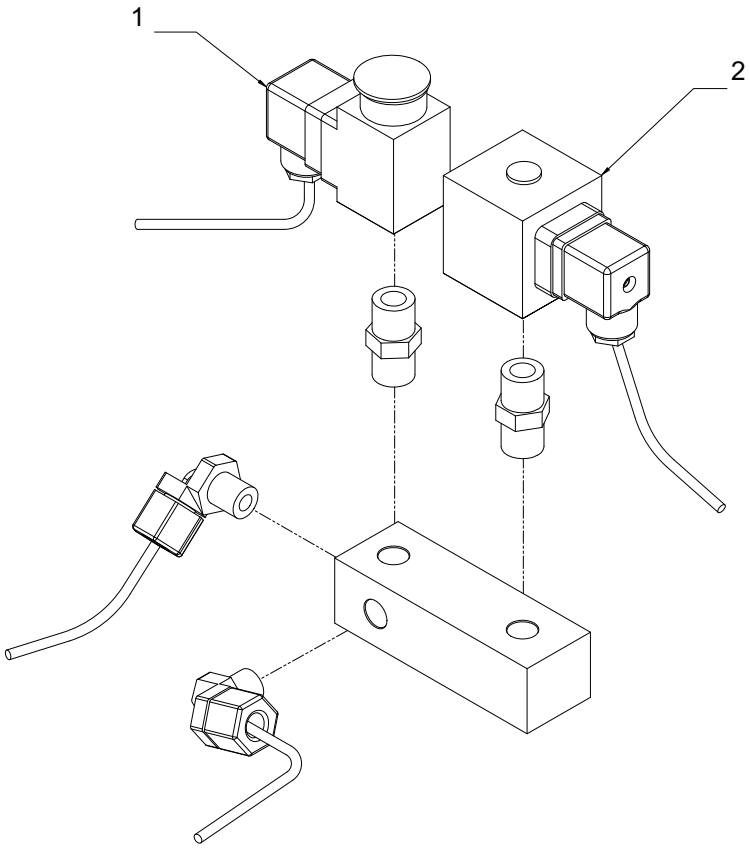
PLANKTON FILTER ASSEMPLY FOR THE ULTRA WHISPER

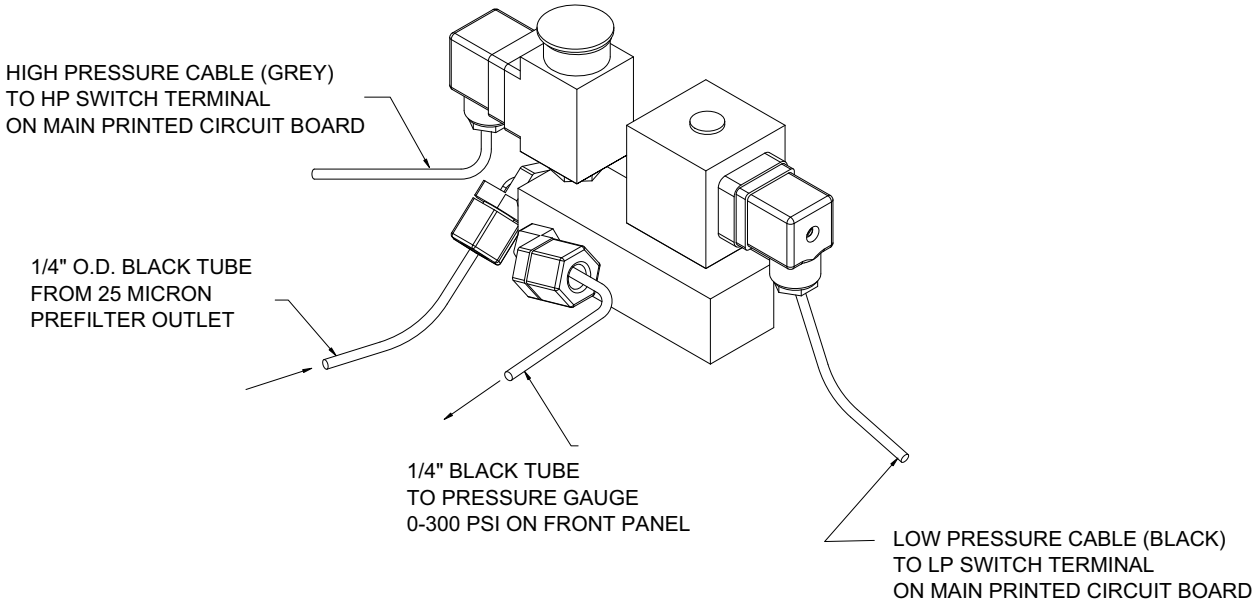
ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-12	**B008220001**	**PLANKTON FILTER ASSEMBLY UW-SE**		
1-3	07650209ST	FILTER HOUSING/LID AQUA ER	EACH	1
1		LID PREFILTER HOUSING UW-SE		
2		BOWL PREFILTER HOUSING UW-SE		
3	2614018800	O-RING 236 PREFILTER UW		
4	0805823578	ELEMENT PLANKTON	EACH	1
5	065080028000	WASHER FLAT #10 NYLON	EACH	4
6	061170628016	SC PHIL PAN "A" 10 X 1 SS	EACH	4
7	2020043810	BRACKET PLANKTON FILTER UW/SE	EACH	1
8	061172143016	SC HEX "A" 1/4 X 1" SS	EACH	4
9	061100043000	WASHER FLAT OS 1/4" SS	EACH	4
10	05181434AA	HOSE CLAMP 3/4" SS	EACH	4
11	0101072583	ELB90 1/2 MPT X 1/2 BARB PVC	EACH	2



HIGH PRESSURE SWITCH AND LOW PRESSURE SWITCH

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1	2301021558	SWITCH PRESS DEC 15-35 PSI	EACH	1
2	2321021658	SWITCH PRESS INC 100-225 PSI	EACH	1

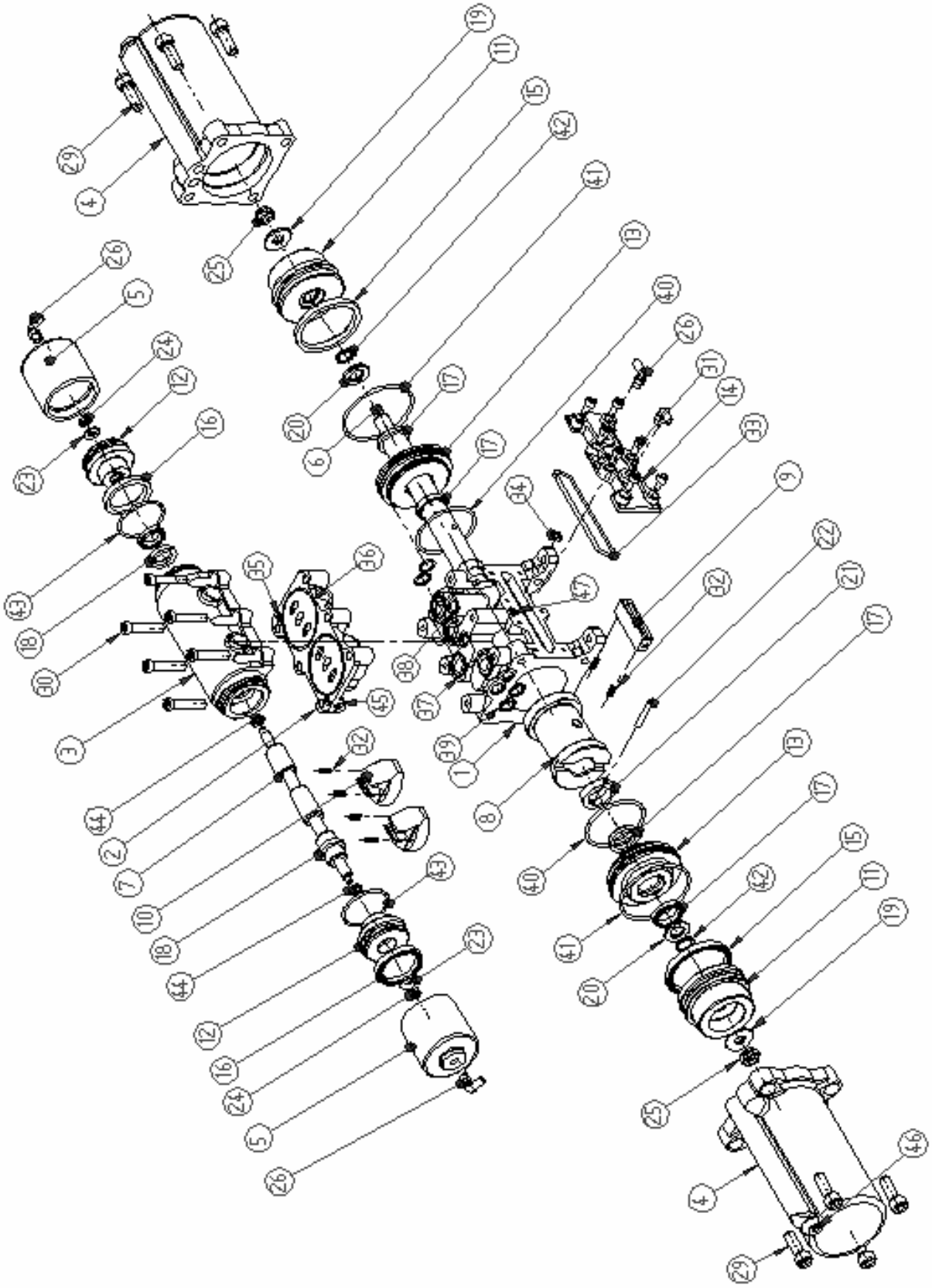




ENERGY TRANSFER DEVICE (ETD)

Item	Part Number	Qty	U/M	Description
1-48	**12182501EC**	1	Each	**HP PUMP ETD-22 for the Ultra Whisper 200 & 300**
1-48	**12182504EC**	1	Each	**HP PUMP ETD-25 for the Ultra Whisper 400, 500, & 600**
1		1	Each	Central body
2		1	Each	Distribution plate
3		1	Each	Distribution body
4		2	Each	Cylinder
5		2	Each	Distribution stopper
6		1	Each	Shaft ϕ 22mm** (for Ultra Whisper 200 & 300)
6		1	Each	Shaft ϕ 25mm** (for Ultra Whisper 400, 500 & 600)
7		1	Each	Shaft of the Distributor
8		1	Each	Central Sliding Panel
9		1	Each	Sliding Control Panel
10		2	Each	Sliding Distributor Panel
11		2	Each	Piston
12		2	Each	Distributor Piston
13		2	Each	Intermediate Cap
14		1	Each	Spacer
15		2	Each	Seal 60/70 x 6 mm
16		2	Each	Seal 40/50 x 6,3 mm
17		4	Each	Seal 25/30 x 5 mm
18		3	Each	Seal 20/28 x 5 mm
19		2	Each	Washer ϕ 10 DIN 9021
20		2	Each	Washer ϕ 14 DIN 125
21		1	Each	Washer/Spacer
22		1	Each	Pin ϕ5 x 35 mm
23		2	Each	Socket-pan ϕ 6 DIN 9021
24		2	Each	Lock Nut M6
25		2	Each	Lock Nut M10
26		4	Each	Elbow 90º R pipe ϕ 6mm
27				
28				
29		8	Each	Allen Screw M10 x 30 mm
30		6	Each	Allen Screw M 8 x 40 mm
31		7	Each	Allen Screw M6 x 12 mm
32		6	Each	Spring
33		1	Each	O-ring ϕ 77 x 3,5 mm
34		1	Each	O-ring ϕ 7 x 2 mm
35		2	Each	O-ring ϕ 5 x 2 mm
36		2	Each	O-ring ϕ 57 x 2 mm
37		4	Each	O-ring ϕ 21 x 2 mm
38 & 39		6	Each	O-ring ϕ 13 x 2 mm
40		2	Each	O-ring ϕ 59 x 3 mm
41		2	Each	O-ring ϕ 69 x 3,5 mm
42		2	Each	O-ring ϕ 15 x 2 mm
43		2	Each	O-ring ϕ 45 x 2,5 mm
44		2	Each	O-ring ϕ 10 x 2 mm
45		2	Each	Allen Head Screw M8 x 5 mm
46		2	Each	Hexagonal Plug Gas x 10 mm
47		1	Each	Orifice of ϕ 2 mm – Hexagonal M6 x 6 mm
48		2	Each	Blue Polyamide Tubing 4 x 6 x 175 mm

** Size depends on the diameter of the shaft of the pump

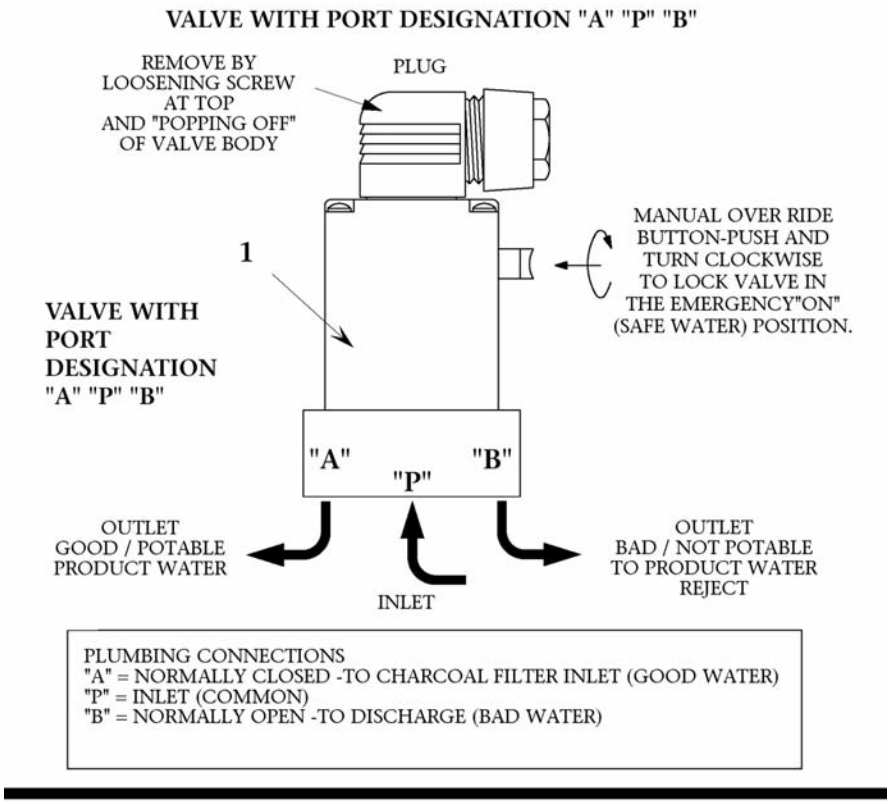


3-WAY PRODUCT WATER DIVERSION SOLENOID VALVE

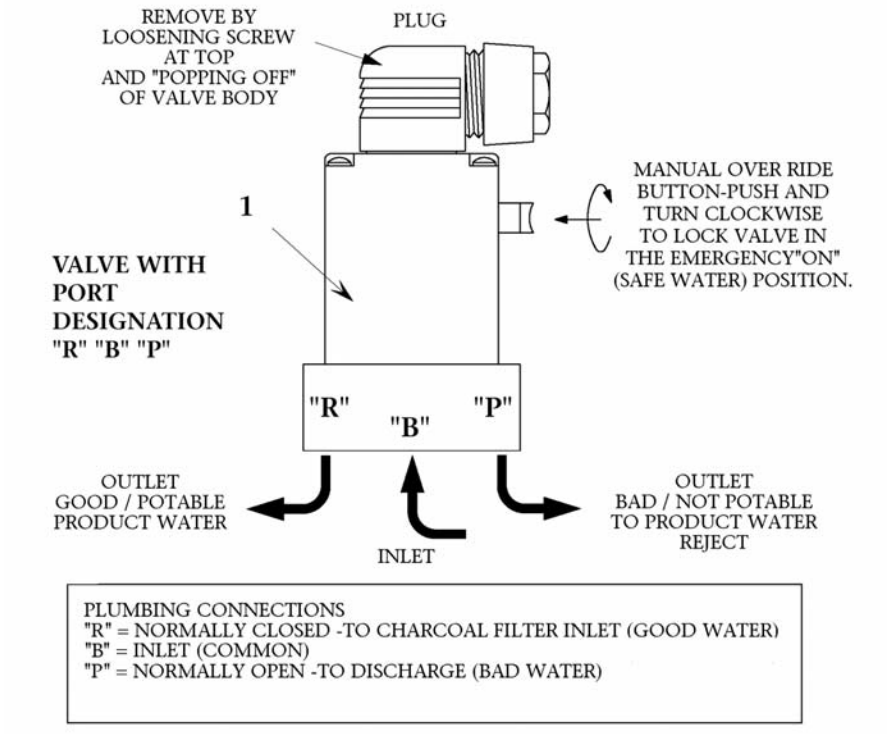
(P/N: 1401096100 Description: VALVE SOLENOID 12VDC CSOF)

PORT DESIGNATION & DESCRIPTION (WATER FLOW)

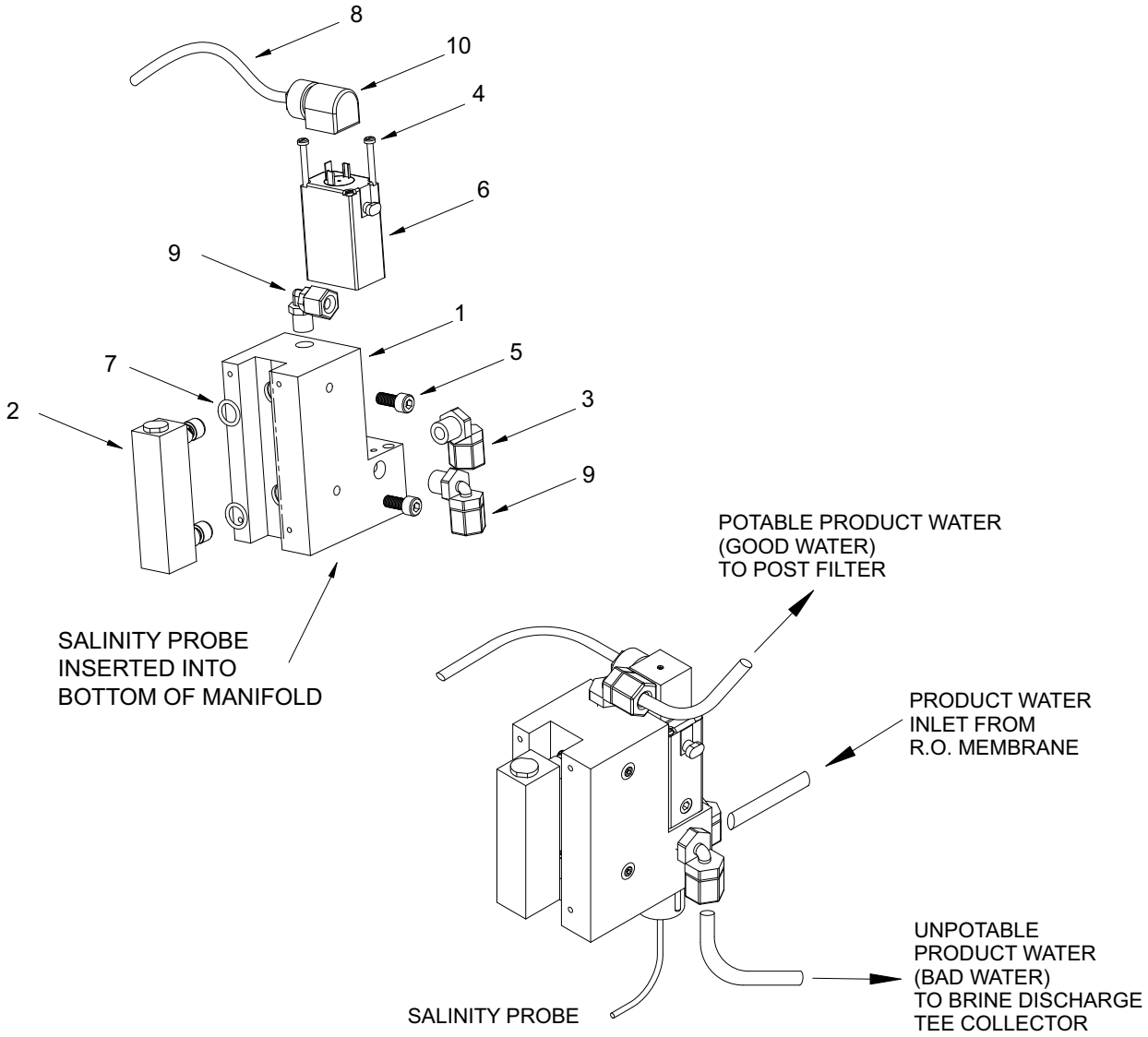
VALVE WITH PORT DESIGNATION "A" "P" "B"



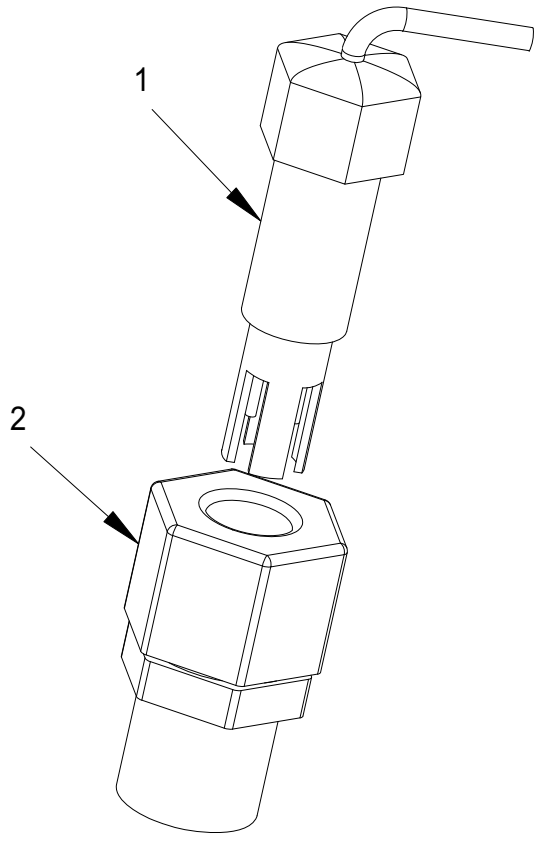
VALVE WITH PORT DESIGNATION "R" "B" "P"



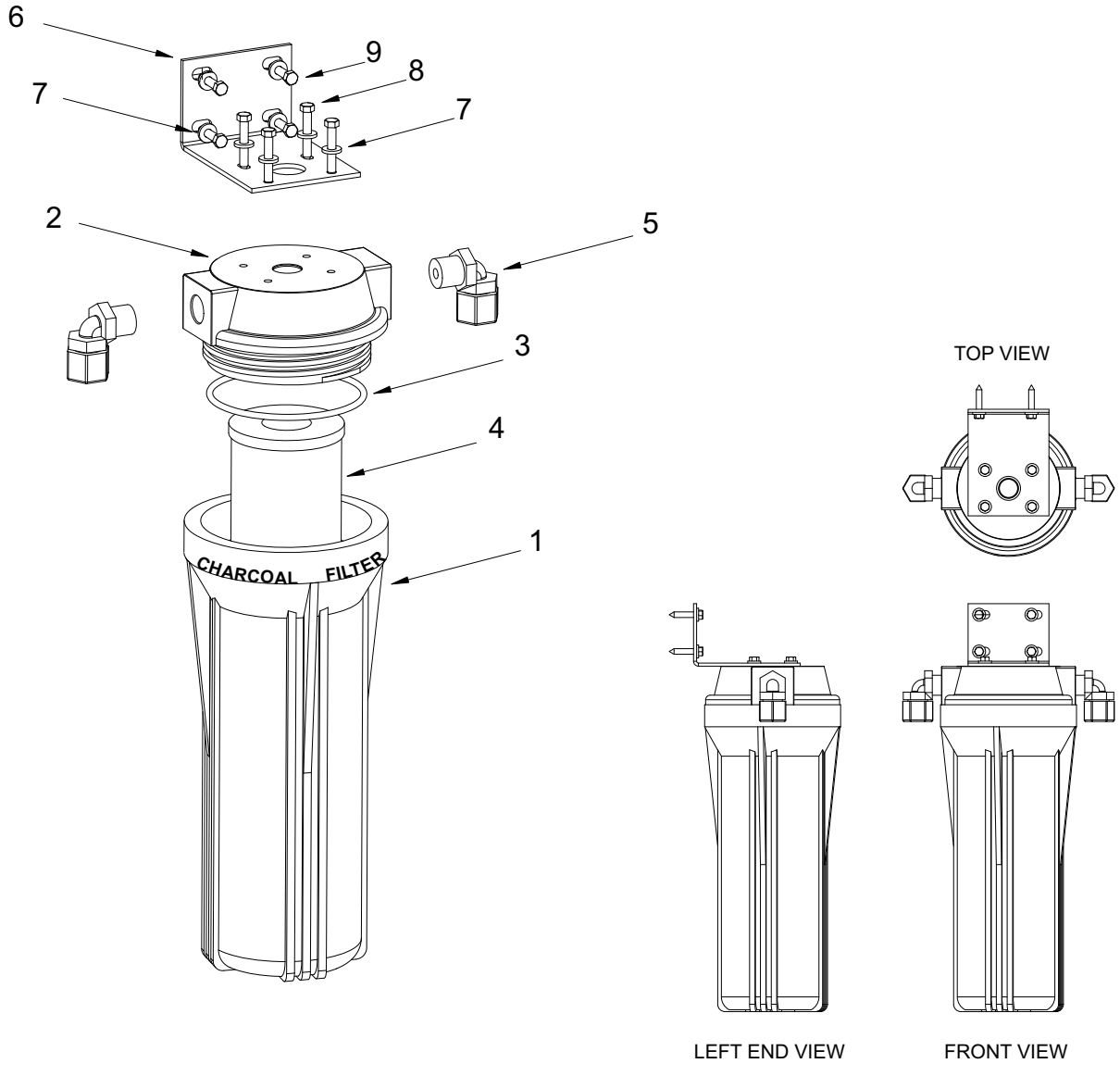
ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-10	**B502380001**	**MANIFOLD PROD ASSY UW/SE**		
1	5333380200	MANIFOLD PRODUCT UW/SE	EACH	1
2	1105320253	FLOW METER 4-40 GPH	EACH	1
3	0204020869	ELB90 1/4 TUBE X 1/4 MPT PLAST	EACH	1
4	061160526048	SC SLOT FILLISTER 8/32 X 3 SS	EACH	2
5	569031012A	SCREW SOC 6-32 X 3/4	EACH	2
6	1401096100	VALVE SOLENOID 12VDC CSOF	EACH	1
7	2614014600	O-RING 113 PLUG PRODUCT AW/FM	EACH	2
8	4942220809	WIRE 18 GA 2 COND. BLUE FLEX C	FEET	4.75
9	0204021769	ELB90 3/8 TUBE X 1/4 MPT PLAST	EACH	2
10	3131680100	PLUG (CONNECTOR) DIN 4 COND	EACH	1
	B511080003	**SALINITY PROBE ASSY 2002**		
	0204092969	CONN 5/8 TUBE X 1/2 MPT PLASTI	EACH	1
	31314203HA	SALINITY PROBE W/ TEMP SENSOR	EACH	1



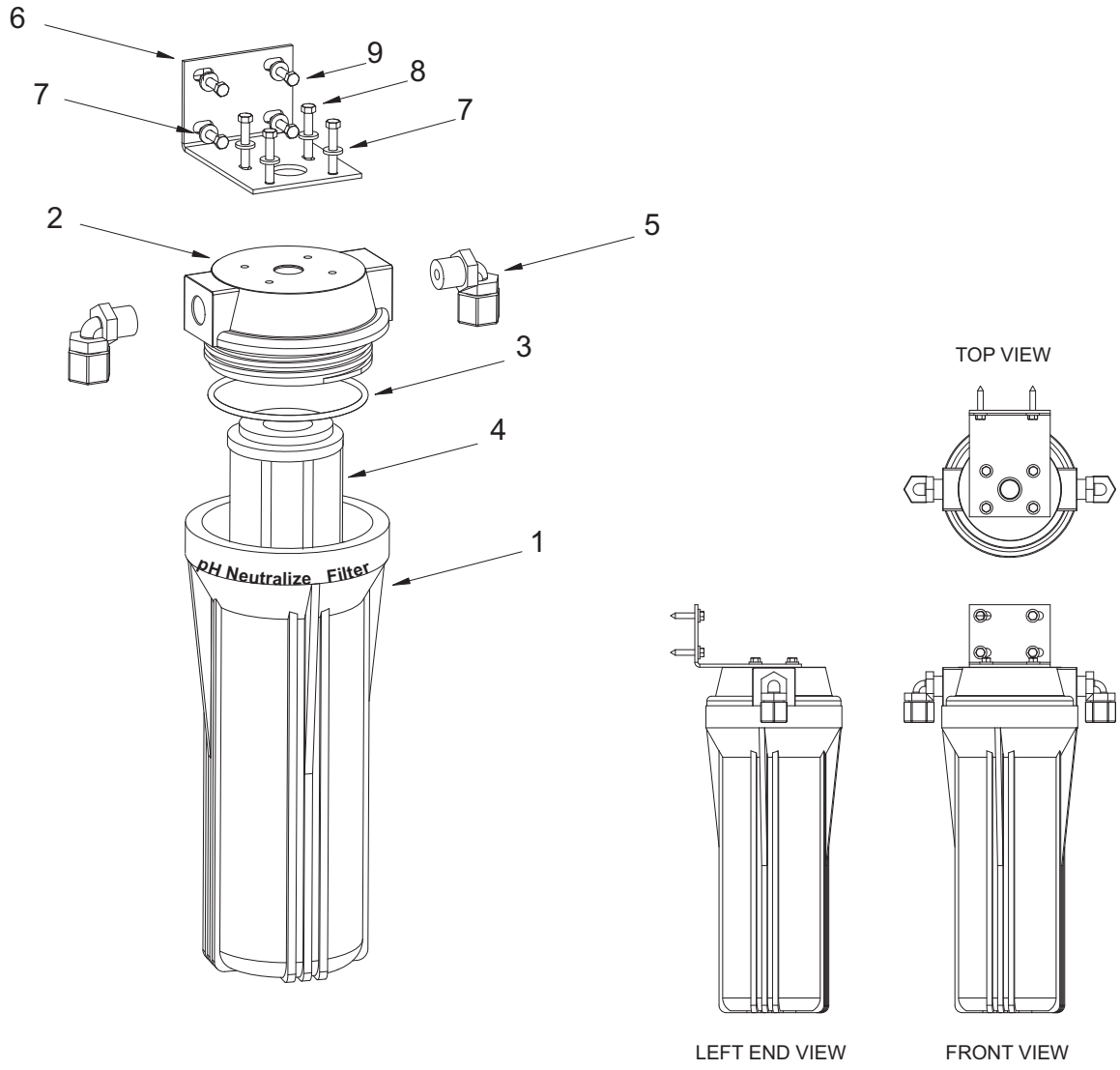
ITEM	PART NUMBER	DESCRIPTION	QTY	U/M
1-2	B51108001	SALINITY PROBE ASSY AQM	1	EACH
1	31314203HA	SALINITY PROBE W-TEMP SENSOR	1	EACH
2	0204092569	CONN 1/2 TUBE X 1/2 MNPT PLASTIC	1	EACH



ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-	**B521220002**	**CHARCOAL FILTER ASSY 170/350 /UW**		
1-3	0713020573	FILTER HOUSING/LID 3/8 X 10	EACH	1
1		BOWL PREFILTER HOUSING 10"		
2		LID PREFILTER HOUSING 10"		
3	2614010473	O-RING PREFILTER 10"		
4	0803004773	ELEMENT CHARCOAL 10"	EACH	1
5	0204020969	ELB90 1/4 TUBE X 3/8 MPT PLAST	EACH	2
	0204021869	ELB90 3/8 TUBE X 3/8 MPT PLAST	EACH	2
6	20200402100	BRACKET PREFILTER/CHRCL/PLNKTN	EACH	1
7	065080028000	WASHER FLAT #10 NYLON	EACH	8
8	061170628016	SC PHIL PAN "A" 10 X 1 SS	EACH	4
9	061170628020	SC PHIL PAN "A" 10 X 1 1/4 SS	EACH	4
10	2234014560	LABEL CHARCOAL ELEMENT	EACH	1

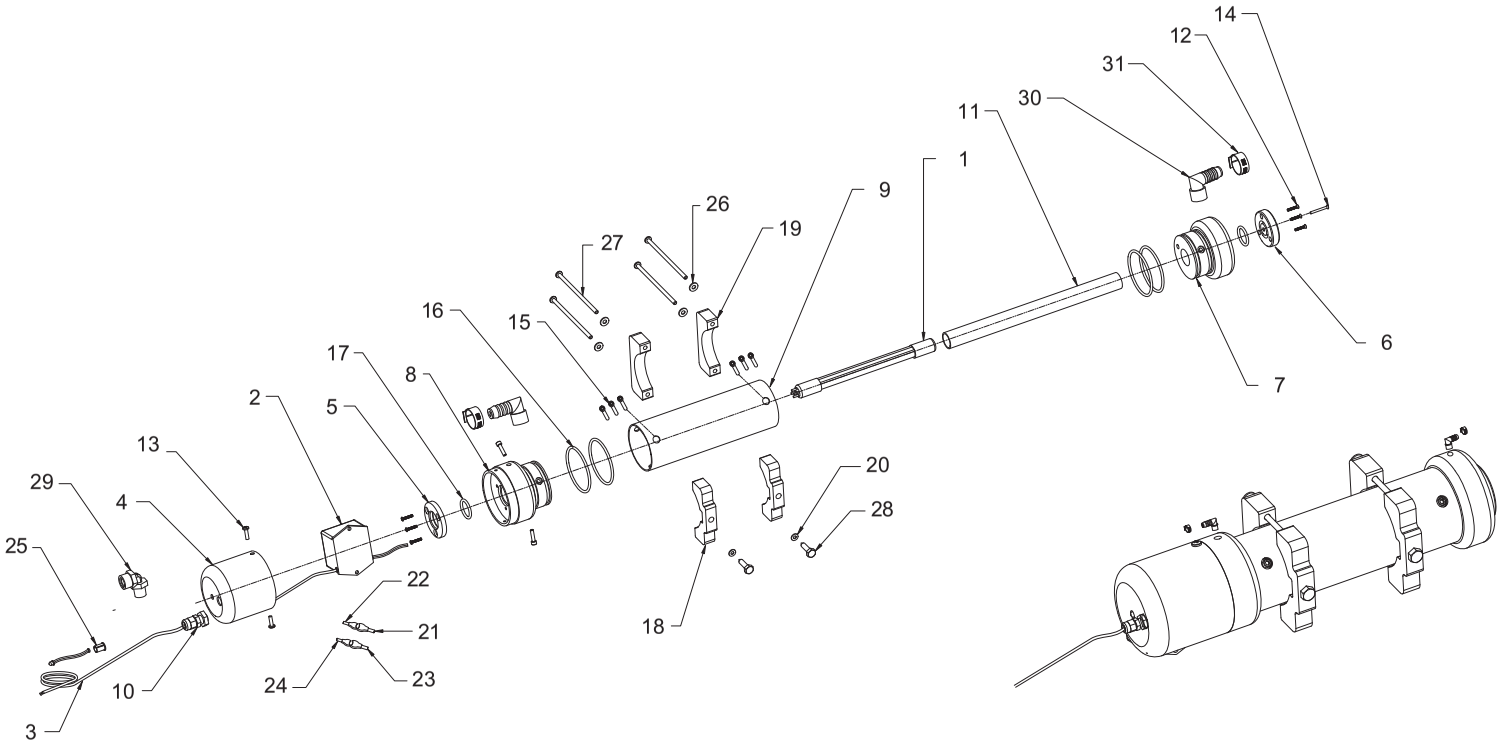


ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-	**B561080002**	**pH NEUTRALIZER FILTER ASSY 170/350 /UW**		
		Formerly p/n H2521210001		
1-3	0713020573	FILTER HOUSING/LID 3/8 X 10	EACH	1
1		BOWL PREFILTER HOUSING 10"		
2		LID PREFILTER HOUSING 10"		
3	2614010473	O-RING PREFILTER 10"		
4	08251950AS	ELEMENT PH 9 3/4"	EACH	1
5	0204020969	ELB90 1/4 TUBE X 3/8 MPT PLAST	EACH	2
	0204021869	ELB90 3/8 TUBE X 3/8 MPT PLAST	EACH	2
6	20200402100	BRACKET PREFILTER/CHRCL/PLNKTN	EACH	1
7	065080028000	WASHER FLAT #10 NYLON	EACH	8
8	061170628016	SC PHIL PAN "A" 10 X 1 SS	EACH	4
9	061170628020	SC PHIL PAN "A" 10 X 1 1/4 SS	EACH	4
10		LABEL CHARCOAL ELEMENT	EACH	1



ITEM	PART NUIMBER	DESCRIPTION	QTY	U/M
1-33	B52680000B	UV STERILIZER 1 GPM 12VDC		
1	4000010400	LAMP UV AW >4/20/99	1	EA
2	4000021400	BALLAST 12VDC-4C AW	1	EA
3	4942220810	WIRE 18 GA 2 COND. PURPLE FLEX	6	FT
4	4000160100	CAP ELETRICAL U.V. STLR	1	EA
5	4000100200	BUSHING TOP END U.V. STLR	1	EA
6	4000100300	BUSHING BTTM END U.V. STLR	1	EA
7	2401522200	END PLUG BTTM U.V.	1	EA
8	2401532200	END PLUG TOP U.V.	1	EA
9	2417202200	VESSEL U.V.STERILIZER	1	EA
10	1904010643	STRAIN RELIEF 3444 BLK	2	EA
11	4000040400	QUARTZ SLEEVE UV AW4/99	1	EA
12	061161130016	SC PHIL OVAL 10-24 X 1" SS	6	EA
13	061160630008	SC PHIL PAN 10-24 X 1/2" SS	2	EA
14	061161130020	SC PHIL OVAL 10-24 X 1 1/4" SS	1	EA
15	061162345004	SC SOC CAP 1/4-20 X 1/4" SS	6	EA
16	2614010200	O-RING 227 SEAL 2 1/2"	4	EA
17	2614019000	O-RING 212 QUARTZ SLEEVE UVAW	2	EA

ITEM	PART NUIMBER	DESCRIPTION	QTY	U/M
18	20010418002A	BRACKET MNT SADDLE UV/AW BTTM	2	EA
19	20010418001A	BRACKET MNT SADDLE UV/AW TOP	2	EA
20	061100043000	WASHER FLAT OS 1/4" SS	2	EA
21	3131383600	TERMINAL MALE DISC RED 18AWG	1	EA
22	3131383700	TERMINAL FEMALE DISC RED 18AWG	1	EA
23	3131383500	TERMINAL MALE DISC BLUE 14AWG	1	EA
24	3131383400	TERMINAL FEM DISC BLUE 14AWG	1	EA
25	3131290400	MOUNTING CLIP LED	1	EA
26	065080028000	WASHER FLAT #10 NYLON	4	EA
27	061160630048	SC PHIL PAN 10-24 X 3" SS	4	EA
28	061182143024	SC LAG 1/4" X 1 1/2" SS	2	EA
29	2614112000	GROMMET (CABLE) .125-.187 1238	1	EA
30	0254011000	ELB90 1/4" MPT X 1/2" BARB NY	2	EA
31	05181432AA	HOSE CLAMP 1/2"	2	EA
32	061142145020	BOLT HEX 1/4-20 X 1 1/4" SS	2	EA
33	065070045000	NUT LOCKING 1/4-20 FLANGED NYL	2	EA
34	0204021769	ELB90 3/8 TUBE X 1/4 MPT PLAST	2	EA
35	0204020869	ELB90 1/4 TUBE X 1/4 MPT PLAST	2	EA

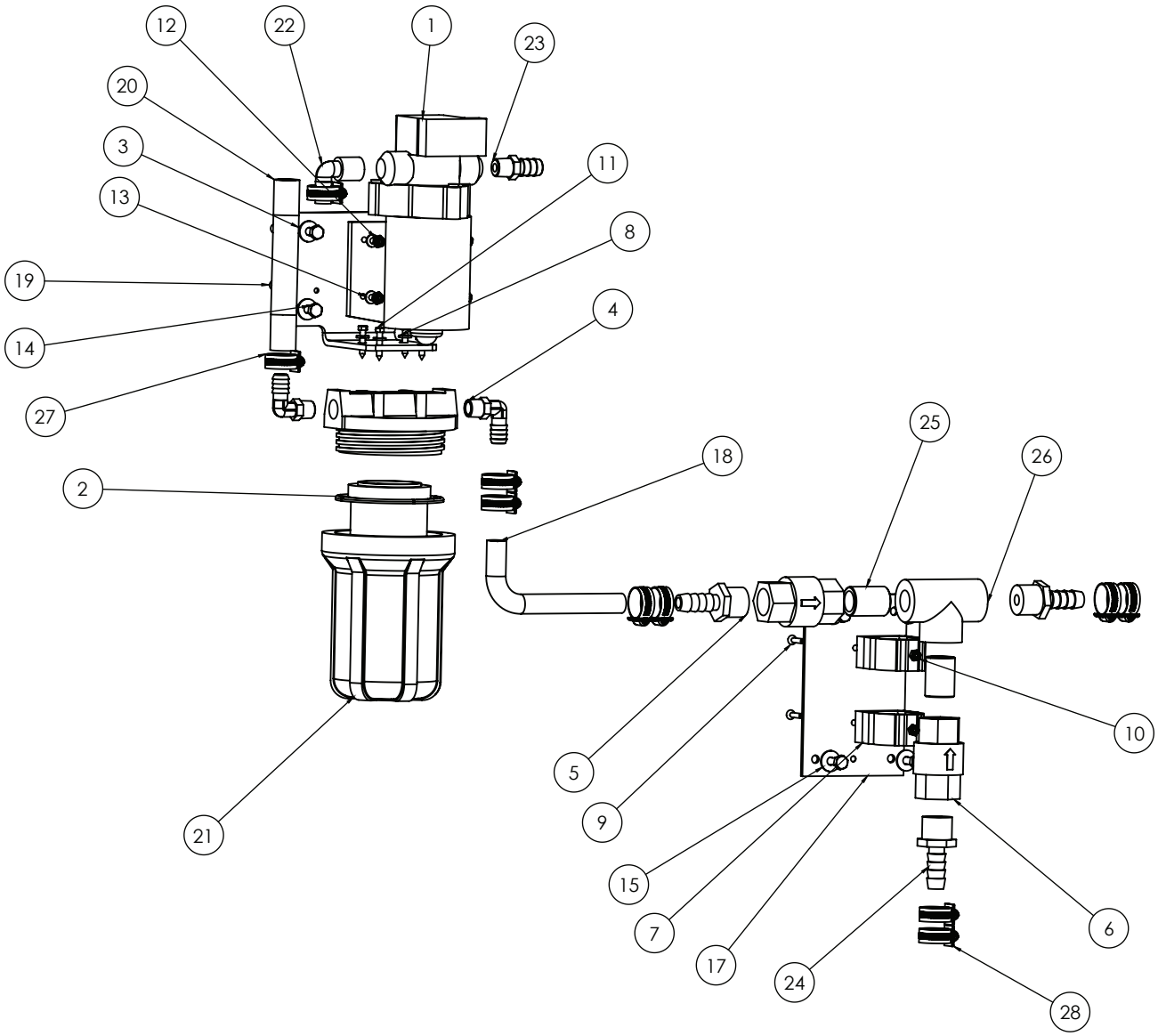


FRESH WATER FLUSH ASSY B598000005

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1	12124015SF	FWF PUMP-MOTOR 12VDC	EACH	1
2	0803004473	ELEMENT CARBON BRIQUETTE 5.0in	EACH	1
3	2017043812	BRACKET FWF UW/SE	EACH	1
4	0112071900	ELB90 3/8 X 1/2 BARB NYLON	EACH	2
5	0112653600	ADAP 3/4 MPT X 1/2 BARB NYLON	EACH	1
6	14012118AR	VALVE CHECK 3/4" FPT WITH VITO	EACH	2
7	0501164500	PIPE SUPPORT 1 1/4"	EACH	2
8	065080028000	WASHER FLAT #10 NYLON	EACH	4
9	061161626012	SC PHIL FLAT 8-32 X 3/4 SS	EACH	2
10	061060026000	NUT HEX 8-32 W/INSERT SS	EACH	2
11	061170628016	SC PHIL PAN "A" 10 X 1 SS	EACH	4
12	061060031000	NUT HEX 10-32 W/INSERT SS	EACH	4
13	061080028000	WASHER FLAT #10 SS	EACH	4
14	061172143016	SC HEX "A" 1/4 X 1 SS	EACH	8
15	061100043000	WASHER FLAT OS 1/4"SS	EACH	8
16	0339076100	HOSE CLEAR BRAID .625 HD	EACH	1
17	2020040002	BRACKET CHECK VALVE FWF	EACH	1
18	0328065066	HOSE CLEAR BRAID 1/2"	EACH	1
19	061161631020	SC PHIL FLAT #10-32 x 1.25 SS	EACH	4
20	0339076100	HOSE CLEAR BRAID .625 HD	EACH	1
21	0713020173	FILTER HOUSING-LID .375 X 5.0	EACH	1
22	01129900SF	ELB90 .50 STRAIGHT X .50 BARB	EACH	2
23	01129925SF	ADAPTER .50 STRAIGHT X .50 BARB	EACH	1
24	0101653683	ADAP .75 MNPT X .50 BARB PVC	EACH	2
25	01013737CL	NIPPLE 3/4 NPT X CLOSE PVC "S	EACH	2
26	0101423783	TEE 3/4 FT X 3/4 FT X 3/4 FT P	EACH	1
27	05181432AA	HOSE CLAMP 1/2" SS	EACH	6
28	05181434AA	HOSE CLAMP 3/4" SS	EACH	4

Refer to illustration on next page

FRESH WATER FLUSH ASSY B598000005 - Illustration



FRESH WATER FLUSH 24V B598000007

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1	12124015SF	FWF PUMP-MOTOR 24VDC	EACH	1
2	0713020173	FILTER HOUSING-LID .375 X 5.0	EACH	1
3	0803004473	ELEMENT CARBON BRIQUETTE 5.0in	EACH	1
4	2017043812	BRACKET FWF UW/SE	EACH	1
5	2020040002	BRACKET CHECK VALVE FWF	EACH	1
6	0112071900	ELB90 3/8 X 1/2 BARB NYLON	EACH	2
7	0112653600	ADAP 3/4 MPT X 1/2 BARB NYLON	EACH	1
8	01129925SF	ADAPTER .50 STRAIGHT X .50 BARB	EACH	1
9	14012118AR	VALVE CHECK 3/4" FPT WITH VITO	EACH	2
10	0101653683	ADAP .75 MNPT X .50 BARB PVC	EACH	1
11	0501164500	PIPE SUPPORT 1 1/4"	EACH	2
12	065080028000	WASHER FLAT #10 NYLON	EACH	4
13	061161626012	SC PHIL FLAT 8-32 X 3/4 SS	EACH	2
14	061060026000	NUT HEX 8-32 W/INSERT SS	EACH	2
15	061170628016	SC PHIL PAN "A" 10 X 1 SS	EACH	4
16	061161631020	SC PHIL FLAT #10-32 x 1.25 SS	EACH	4
17	061060031000	NUT HEX 10-32 W/INSERT SS	EACH	4
18	061080028000	WASHER FLAT #10 SS	EACH	4
19	061172143016	SC HEX "A" 1/4 X 1 SS	EACH	8
20	061100043000	WASHER FLAT OS 1/4"SS	EACH	8
21	0339076100	HOSE CLEAR BRAID .625 HD	EACH	1
22	01129900SF	ELB90 .50 STRAIGHT X .50 BARB	EACH	2
23	01013737CL	NIPPLE 3/4 NPT X CLOSE PVC "S	EACH	3
24	0101423783	TEE 3/4 FT X 3/4 FT X 3/4 FT P	EACH	1
25	05181432AA	HOSE CLAMP 1/2" SS	EACH	6
26	061080023000	WASHER FLAT #8 SS	EACH	2
27	0101073783	ELB90 3/4 MPT X 3/4 BARB PVC	EACH	1
28	0101013783	ELB90 3/4 FPT X 3/4 FPT PVC	EACH	1

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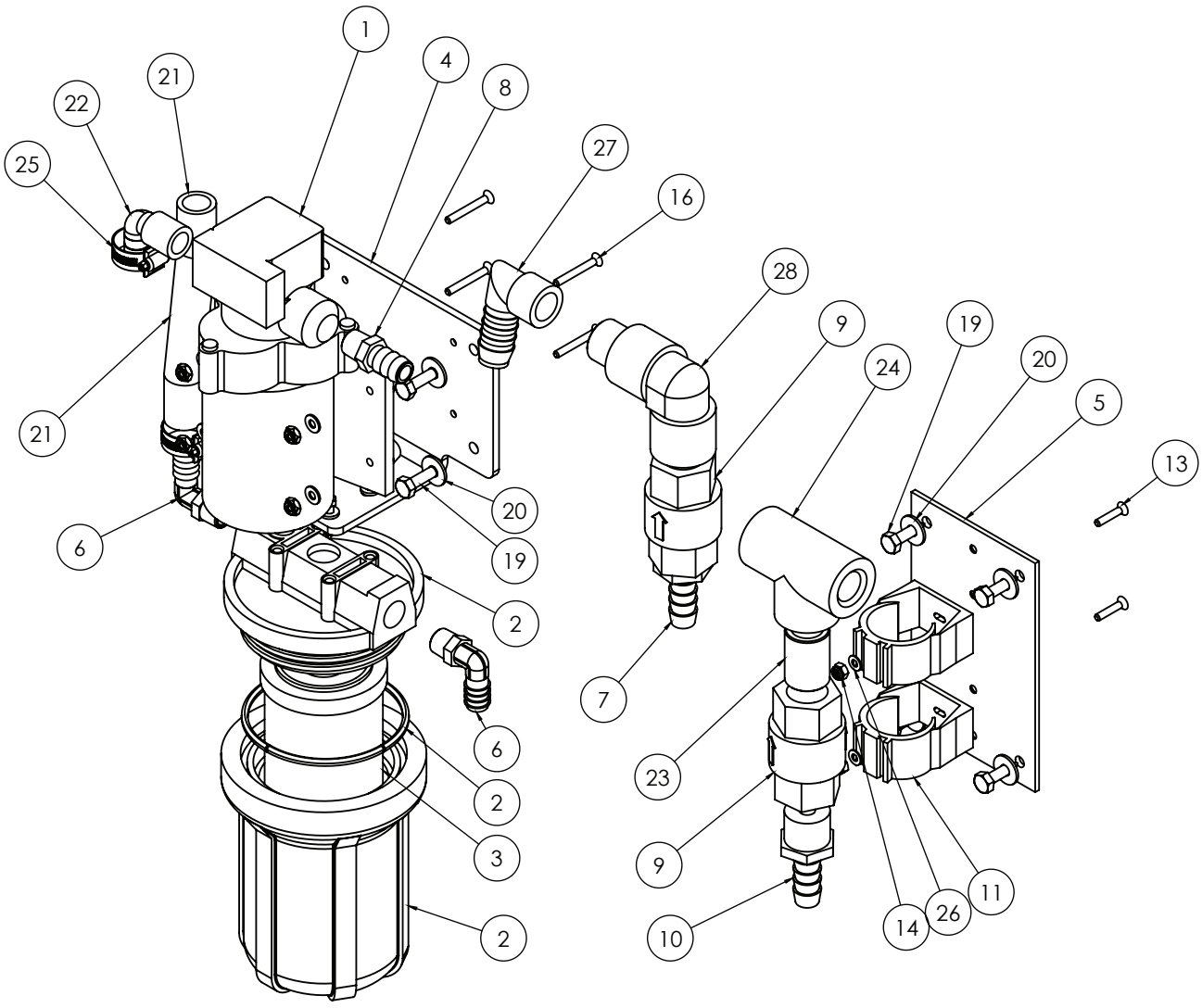
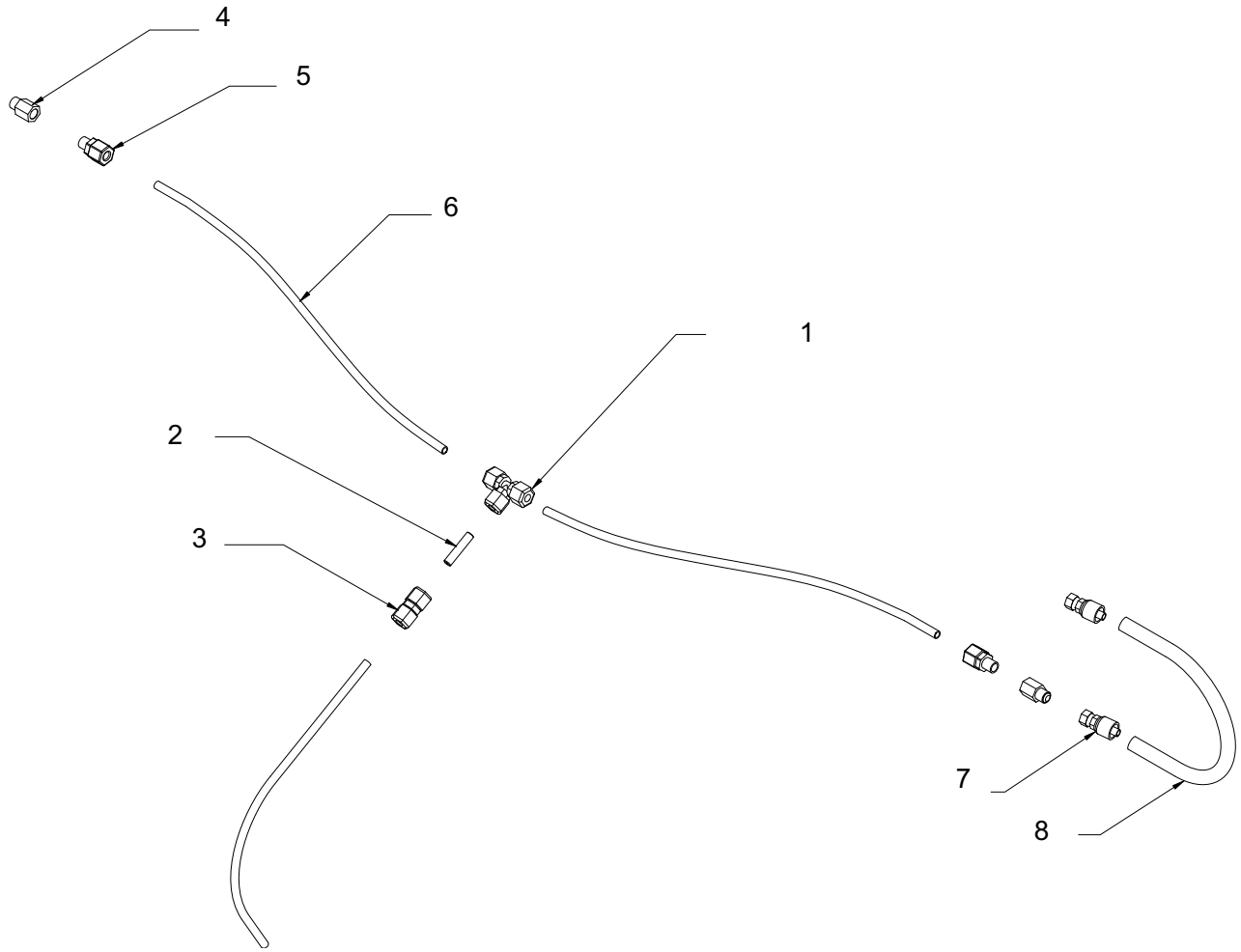
FRESH WATER FLUSH 24V B598000007 - Illustration

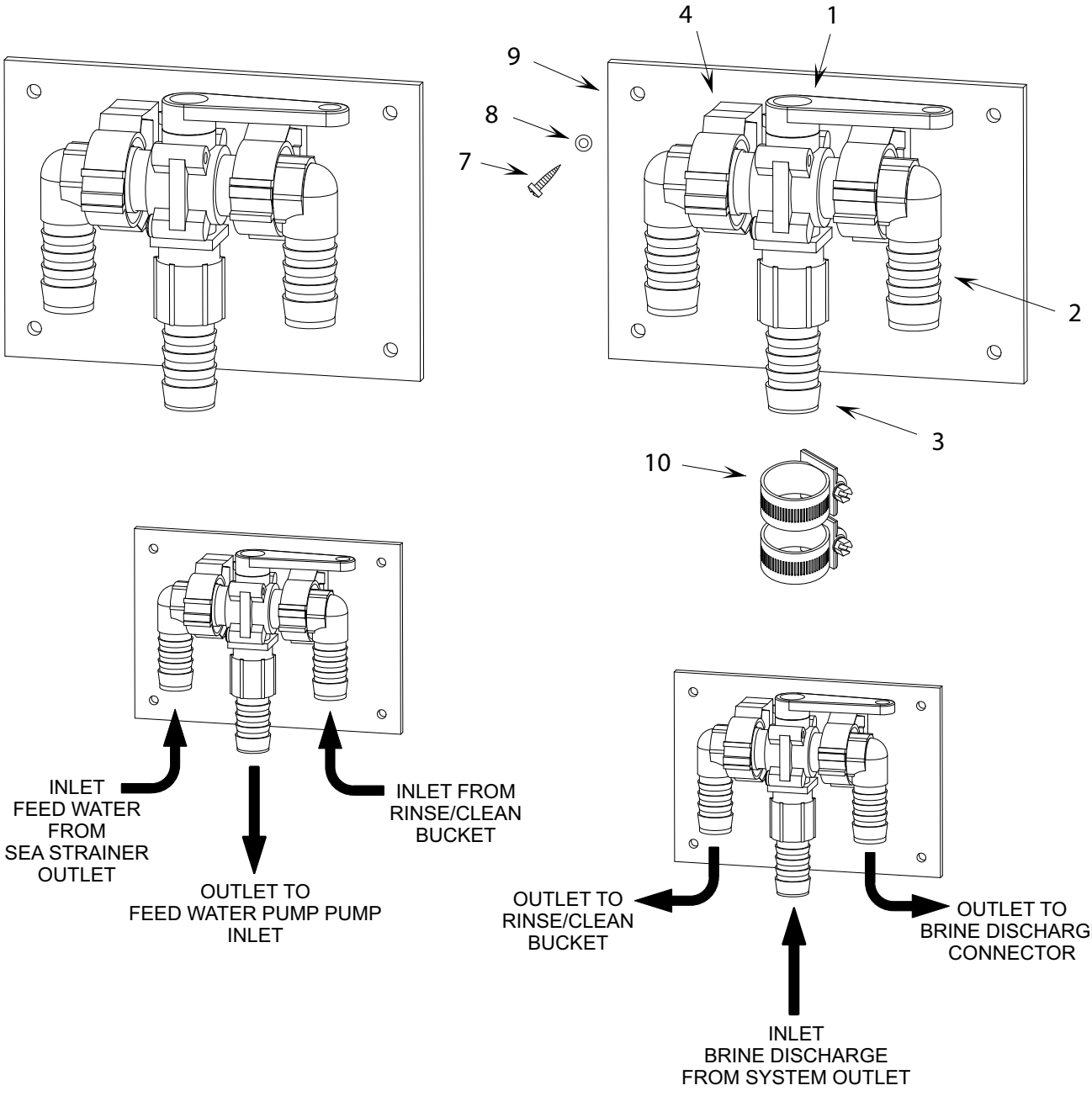


KIT USED FOR RELIEVING PRESSURE DURING THE CLEANING, STORAGE, AND OR WINTERIZING PROCESS.

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-8	**B591380001**	**CLEANING AND STORAGE KIT UW**		
1	0204241869	UNION TEE 3/8 TU X 3/8 TU X 3/8	EACH	1
2	0328708500	TUBE ORIFICE #45 X 3/8 OD PVC	EACH	1
3	0204211869	UNION CONN 3/8 TUBE X 3/8 TUBE	EACH	1
4	1321121769	CONN -6 FLARE X 1/4 FPT BRASS	EACH	2
5	0204091769	CONN 3/8 TUBE X 1/4 MPT PLASTI	EACH	2
6	0312123569	TUBE 3/8 BLACK	FEET	14
7	1316482001	SWIVEL FITTIN-6 TTC STEEL	EACH	2
8	2432160669	HOSE HP -6 P	FEET	1.4



ITEM	PART NUMBER	DESCRIPTION	QTY	U/M
1-11	**B591120001**	**CLEAN AND RINSE KIT AQM**		
1	14011334AR	VALVE 3-WAY BALL 3/4" MPT 2	EA	
2	0101063783	ELB90 3/4" FPT X 3/4" BARB PVC	4	EA
3	0101613783	ADAP 3/4" FPT X 3/4" BARB PVC	2	EA
4	0501164200	PIPE SUPPORT 1 1/8"	4	EA
5	061060026000	NUT HEX 8-32 W/INSERT SS	4	EA
6	061161626012	SC PHIL FLAT 8-32 X 3/4" SS	4	EA
7	061170628016	SC PHIL PAN "A" 10 X 1" SS	8	EA
8	065080028000	WASHER FLAT #10 NYLON	8	EA
9	20200404040	BRACKET CLEAN & RINSE KIT AS	2	EA
10	05181434AA	HOSE CLAMP 3/4" SS	12	EA
11	0328066666	HOSE CLEAR BRAID 3/4"	20	FT

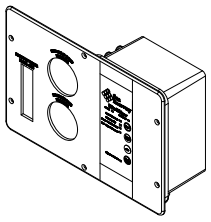


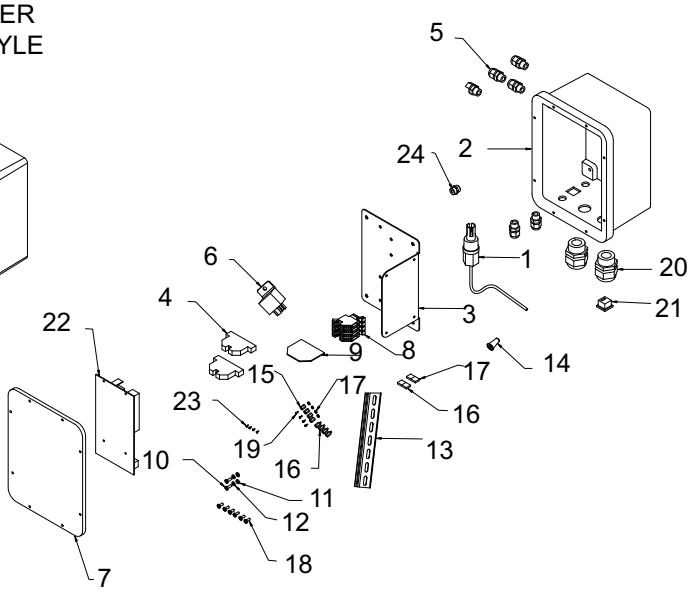
ULTRA WHISPER ELECTRICAL CONTROLLER 12 VDC

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-24	**B595380012**	**CONTROLLER UW/SE 12VDC**		
1	B511080003	SALINITY PROBE ASSY 2002	EACH	1
2	31312238AB	ENCLOSURE UW/SE	EACH	1
3	3131232200	CHASSIS PLATE AW 170	EACH	1
4	31311601BY	END BRACKET DIN (AW>2000)	EACH	2
5	1904010643	STRAIN RELIEF 3444 BLK	EACH	6
6	3131110600	RELAY 1 FORM A (1PST-N.O.) 12V	EACH	2
7	26351500AB	GASKET ENCLOSURE - AS	EACH	2
8	31311522BY	DIN TERMINAL (GRAY) 6 AWG	EACH	4
9	31311613BY	DIN END COVER	EACH	1
10	061160631006	SC PHIL PAN 10-32 X 3/8 SS	EACH	2
11	061080028000	WASHER FLAT #10 SS	EACH	2
12	061120028000	WASHER SPLIT LOCK #10 SS	EACH	2
13	3131170147	CHANNEL DIN 35 MM RAIL	INCH	3.25
14	3131384900	TERMINAL CONN FERRULE 20AWG WH	EACH	15
15	067262820008	STANDOFF 6-32 X 1/2 F X F	EACH	4
16	067272720004	STANDOFF 6-32 X 1/4 M X F	EACH	4
17	061120018000	WASHER SPLIT LOCK #6 SS	EACH	4
18	061160631005	SC PHIL PAN 10-32 X 5/16 SS	EACH	6
19	061162020008	SC PHIL FLAT 6-32 X 1/2 SS	EACH	4
20	1904010043	STRAIN RELIEF 3217 1/2"" GREY	EACH	2
21	1904019243	STRAIN RELIEF 1834	EACH	1
22	B596800007	PCB MAIN UW/SE W/O HOURMETER	EACH	1
23	061160620005	SC PHIL PAN 6-32 X 1/4 SPECIAL	EACH	4
24	0101642583	ADAP 1/2 MPT X 1/2 SL PVC	EACH	1

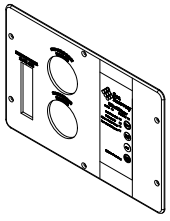
ULTRA WHISPER
COMPACT STYLE

ULTRA WHISPER
MODULAR STYLE





ULTRA WHISPER
COMPACT STYLE
CONTROLLER LID
FACE PLATE



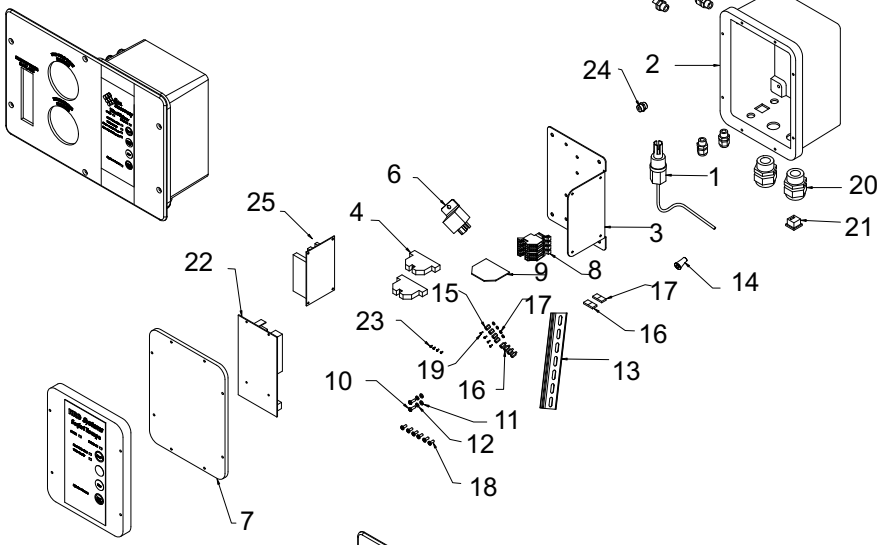
ULTRA WHISPER
MODULAR STYLE
CONTROLLER LID
FACE PLATE

ULTRA WHISPER ELECTRICAL CONTROLLER 24 VDC

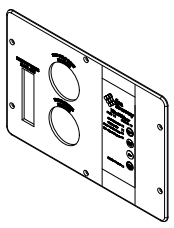
ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-25	**B595380024**	**CONTROLLER UW/SE 24VDC**		
1	B511080003	SALINITY PROBE ASSY 2002	EACH	1
2	31312238AB	ENCLOSURE UW/SE	EACH	1
3	3131232200	CHASSIS PLATE AW 170	EACH	1
4	31311601BY	END BRACKET DIN (AW>2000)	EACH	2
5	1904010643	STRAIN RELIEF 3444 BLK	EACH	6
6	3131110600	RELAY 1 FORM A (1PST-N.O.) 12V	EACH	2
7	26351500AB	GASKET ENCLOSURE - AS	EACH	2
8	31311522BY	DIN TERMINAL (GRAY) 6 AWG	EACH	4
9	31311613BY	DIN END COVER	EACH	1
10	061160631006	SC PHIL PAN 10-32 X 3/8 SS	EACH	2
11	061080028000	WASHER FLAT #10 SS	EACH	2
12	061120028000	WASHER SPLIT LOCK #10 SS	EACH	2
13	3131170147	CHANNEL DIN 35 MM RAIL	INCH	3.25
14	3131384900	TERMINAL CONN FERRULE 20AWG WH	EACH	15
15	067262820008	STANDOFF 6-32 X 1/2 F X F	EACH	4
16	067272720004	STANDOFF 6-32 X 1/4 M X F	EACH	4
17	061120018000	WASHER SPLIT LOCK #6 SS	EACH	4
18	061160631005	SC PHIL PAN 10-32 X 5/16 SS	EACH	6
19	061162020008	SC PHIL FLAT 6-32 X 1/2 SS	EACH	4
20	1904010043	STRAIN RELIEF 3217 1/2"" GREY	EACH	2
21	1904019243	STRAIN RELIEF 1834	EACH	1
22	B596800007	PCB MAIN UW/SE W/O HOURMETER	EACH	1
23	061160620005	SC PHIL PAN 6-32 X 1/4 SPECIAL	EACH	4
24	0101642583	ADAP 1/2 MPT X 1/2 SL PVC	EACH	1
25	B596220020	PCB STEPDOWN AW 170	EACH	1

ULTRA WHISPER
COMPACT STYLE

ULTRA WHISPER
MODULAR STYLE



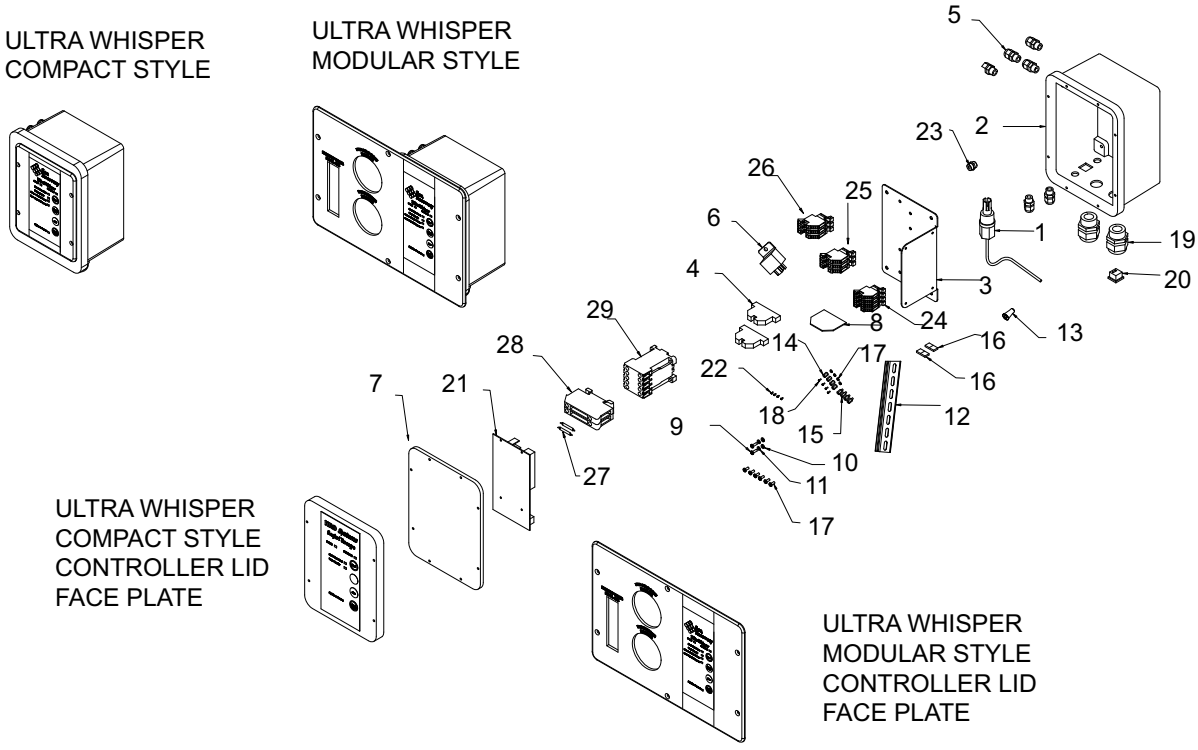
ULTRA WHISPER
COMPACT STYLE
CONTROLLER LID
FACE PLATE



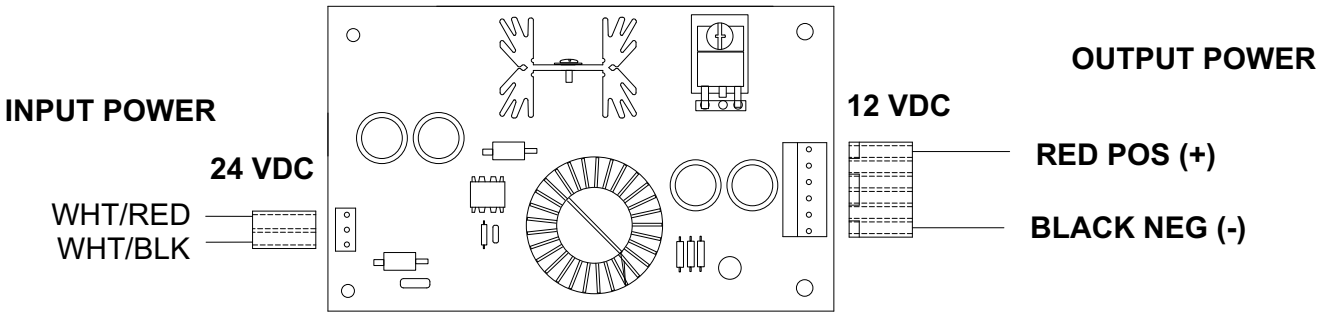
ULTRA WHISPER
MODULAR STYLE
CONTROLLER LID
FACE PLATE

ULTRA WHISPER ELECTRICAL CONTROLLER 110-230 VAC 50/60 Hz SINGLE PHASE

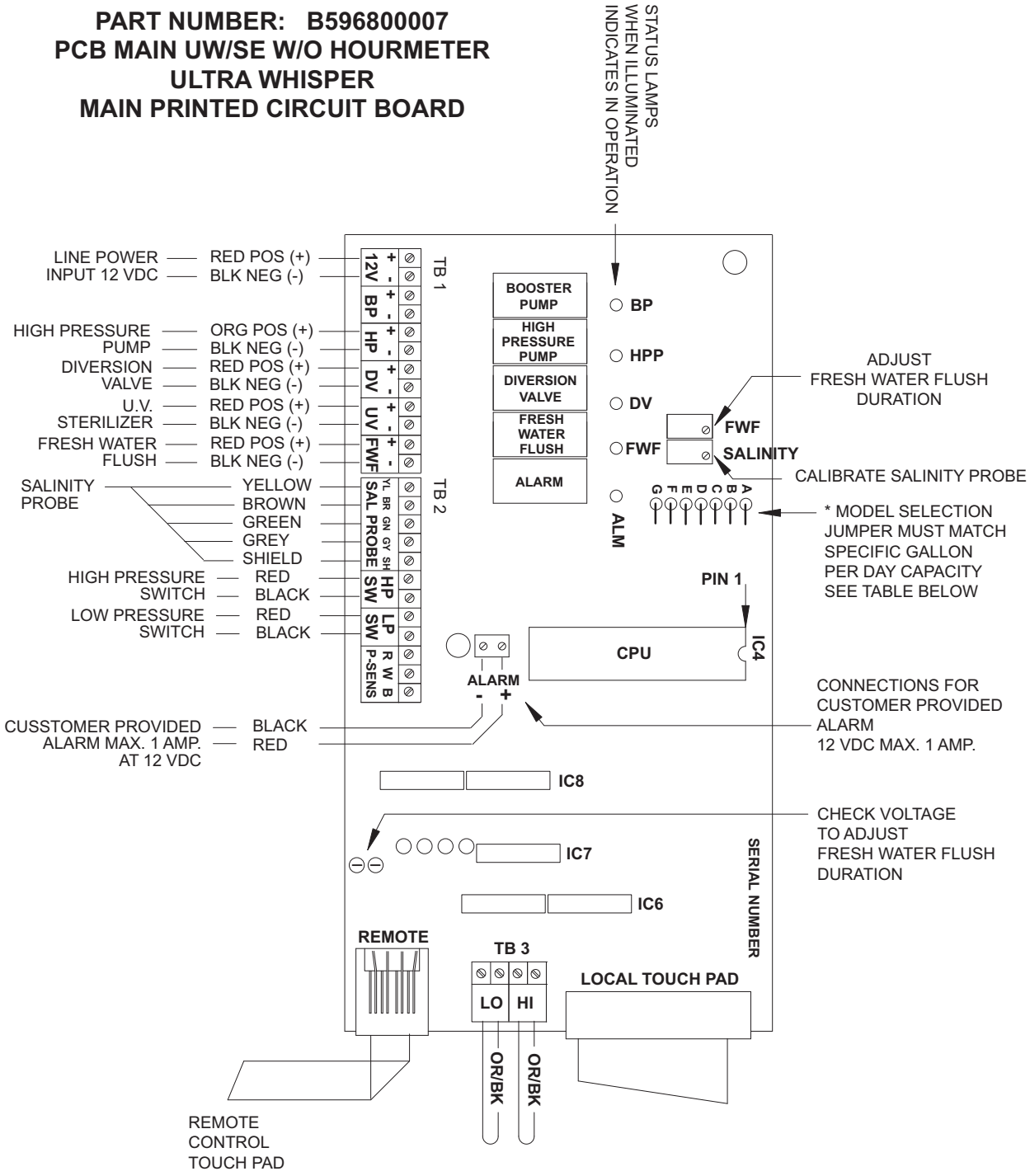
ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-29	**B595380007**	**CONTROLLER UW/SE 110/220 VAC**		
1	B511080003	SALINITY PROBE ASSY 2002	EACH	1
2	31312238AB	ENCLOSURE UW/SE	EACH	1
3	3131232200	CHASSIS PLATE AW 170	EACH	1
4	31311601BY	END BRACKET DIN (AW>2000)	EACH	2
5	1904010643	STRAIN RELIEF 3444 BLK	EACH	6
6	3131110600	RELAY 1 FORM A (1PST-N.O.) 12V	EACH	2
7	26351500AB	GASKET ENCLOSURE - AS	EACH	2
8	31311613BY	DIN END COVER	EACH	1
9	061160631006	SC PHIL PAN 10-32 X 3/8 SS	EACH	2
10	061080028000	WASHER FLAT #10 SS	EACH	2
11	061120028000	WASHER SPLIT LOCK #10 SS	EACH	2
12	3131170147	CHANNEL DIN 35 MM RAIL	INCH	7.25
13	3131384900	TERMINAL CONN FERRULE 20AWG WH	EACH	15
14	067262820008	STANDOFF 6-32 X 1/2 F X F	EACH	4
15	067272720004	STANDOFF 6-32 X 1/4 M X F	EACH	4
16	061120018000	WASHER SPLIT LOCK #6 SS	EACH	4
17	061160631005	SC PHIL PAN 10-32 X 5/16 SS	EACH	6
18	061162020008	SC PHIL FLAT 6-32 X 1/2 SS	EACH	4
19	1904010043	STRAIN RELIEF 3217 1/2"" GREY	EACH	2
20	1904019243	STRAIN RELIEF 1834	EACH	1
21	B596800007	PCB MAIN UW/SE W/O HOURMETER	EACH	1
22	061160620005	SC PHIL PAN 6-32 X 1/4 SPECIAL	EACH	4
23	0101642583	ADAP 1/2 MPT X 1/2 SL PVC	EACH	1
24	31311501BY	TERMINAL BLOCK DIN BLACK	EACH	3
25	31311505BY	TERMINAL BLOCK DIN GREY	EACH	3
26	31311504BY	TERMINAL BLOCK DIN GREEN	EACH	3
27	3131301800	FUSE 2A FAST BLOW 5X20MM	EACH	2
	3131301400	FUSE 5A NORMAL BLOW	EACH	2
28	3131310400	FUSE HOLDER DIN TERMINAL	EACH	2
29	31310110BF	CONTACTOR 9A AUX AW>12/99 12VD	EACH	



P/N B596220020
STEP DOWN POWER SUPPLY
PRINTED CIRCUIT BOARD
24 VDC INPUT TO 12 VDC OUTPUT



PART NUMBER: B596800007
PCB MAIN UW/SE W/O HOURMETER
ULTRA WHISPER
MAIN PRINTED CIRCUIT BOARD



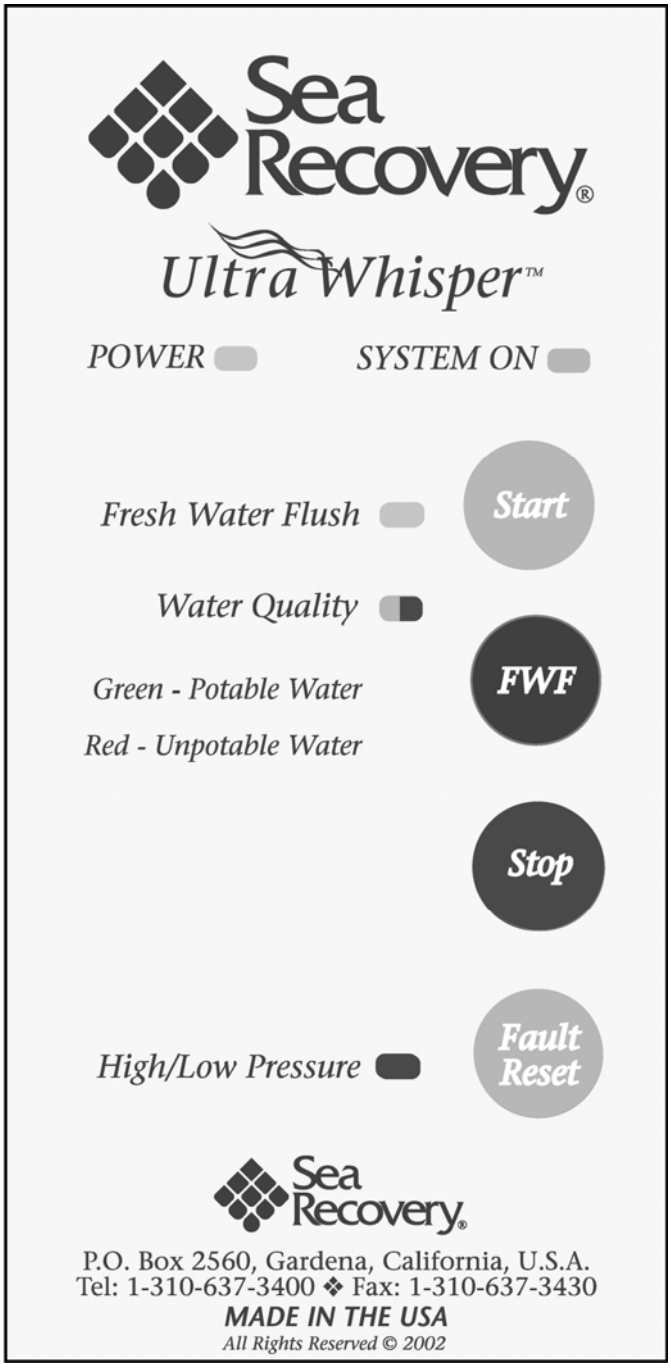
*** MODEL SELECTION JUMPER TABLE:**

MODEL	JUMPERS						
	A	B	C	D	E	F	G
ULTRA WHISPER 200	CUT	---	---	CUT	---	---	---
ULTRA WHISPER 300	---	CUT	---	CUT	---	---	---
ULTRA WHISPER 400	---	CUT	---	CUT	---	---	---
ULTRA WHISPER 500	CUT	CUT	---	CUT	---	---	---
ULTRA WHISPER 600	CUT	CUT	---	CUT	---	---	---

CUT = CUT WIRE LEAD FROM RESISTOR
--- = DO NOT CUT WIRE LEAD

TOUCH PAD

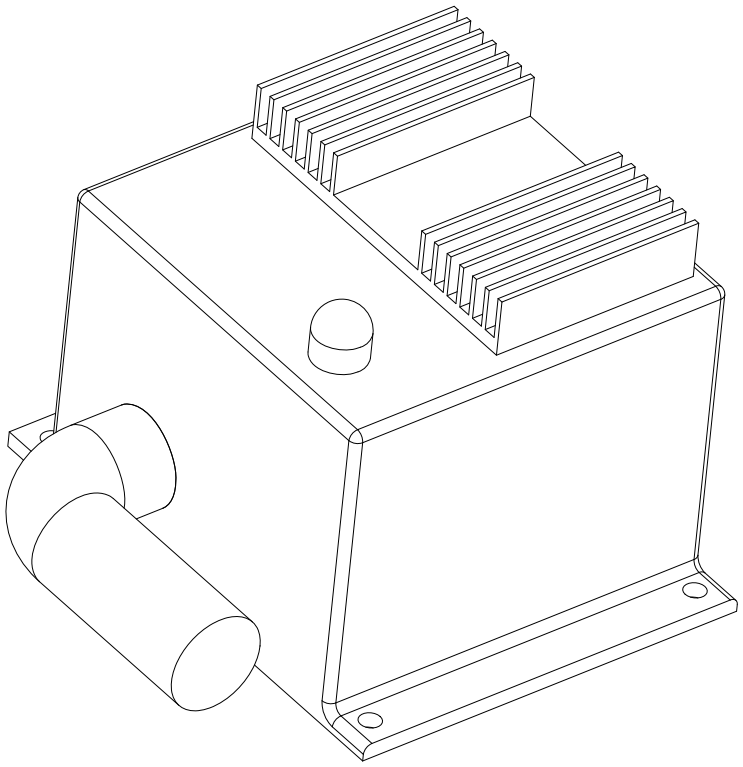
Item	Part Number	Qty	U/M	Description
	31315611W	**1**	**EACH**	**TOUCH PAD ULTRA WHISPER**



REMOTE CONTROL [37]

Item	Part Number	Qty	U/M	Description
	B611220003	1	Each	REMOTE 170 AW/UW
	31315606WE	1	EACH	TOUCH PAD REMOTE AW 170
	4900283104	77	FEET	CABLE MULTIST 8 CON WHITE
	3131100900	2	EACH	PLUG RJ45

ITEM	PART NUMBER	DESCRIPTION	QTY	U/M
1	B596800006	SOFT START ASSY AW	1	EACH



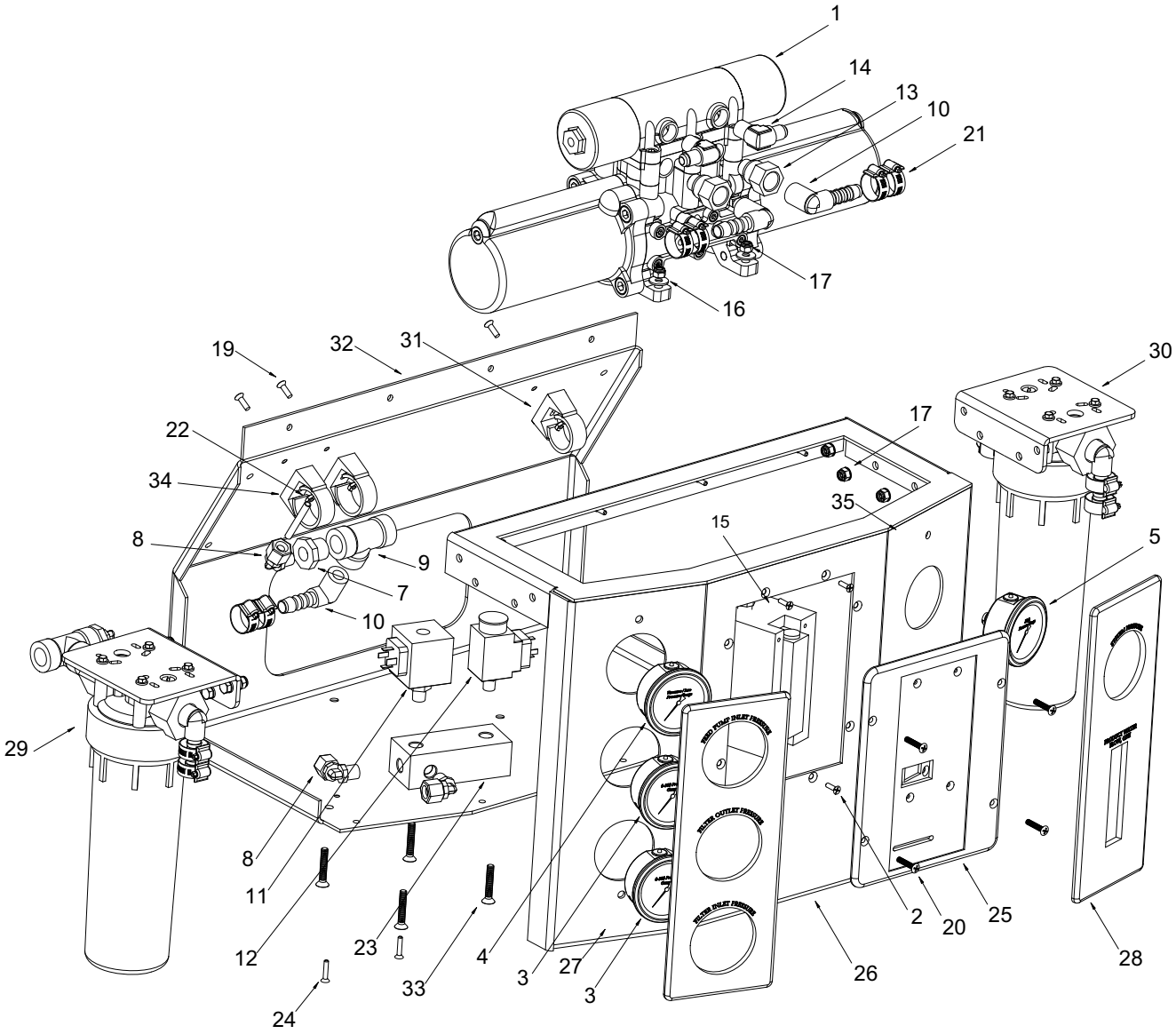
Sub-section 9 - B pages 33 - 41

Exploded Parts Views

For the Compact Style Only

REFER TO ILLUSTRATION ON PAGE 39 TO THE RIGHT

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1 - 34	**B589380008**	**FRAME ASSY UWC-22-200**		
		Frame Assembly for Ultra Whisper Compact 200 & 300		
1	12182501EC	HP PUMP ETD-22	EACH	1
1 - 34	**B589380009**	**FRAME ASSY UWC-25-4&600 EACH**		
		Frame Assembly for Ultra Whisper Compact 400, 500, and 600		
1	12182504EC	HP PUMP ETD-25	EACH	1
2	061161630008	SC PHIL FLAT 10-24 X 1/2 SS	EACH	16
3	10181510CC	GAUGE 0-300 CBM.NPT	EACH	2
4	10181522CC	GAUGE -30/0/70 CBM.NPT	EACH	1
5	10181524CC	GAUGE 0-1400 CBM.NPT	EACH	1
6	05180851CC	GAUGE BRACKET CBM SS	EACH	4
7	0101292383	RB 1/2 MT X 1/4 FT PVC	EACH	1
8	0204020869	ELB90 1/4 TUBE X 1/4 MPT PLAST	EACH	3
9	0101422583	TEE 1/2 FT X 1/2 FT X 1/2 FT P	EACH	1
10	0101072583	ELB90 1/2 MPT X 1/2 BARB PVC	EACH	3
11	2301021558	SWITCH PRESS DEC 15-35 PSI	EACH	1
12	2321021658	SWITCH PRESS INC 100-225 PSI	EACH	1
13	0117661900	ADAP 3/8 MBSP X 1/2 FPT SS	EACH	2
14	1317071700	ELB90 -6 FLARE X 3/8 MBSPP SS	EACH	2
15	B502380001	MANIFOLD PROD ASSY UW/SE	EACH	1
16	061100043000	WASHER FLAT OS 1/4" SS	EACH	4
17	061060045000	NUT HEX 1/4-20 W/INSERT SS	EACH	8
18	0101652583	ADAP 1/2 MPT X 1/2 BARB PVC	EACH	1
19	061161130010	SC PHIL OVAL 10-24 X 5/8 SS	EACH	3
20	061161130016	SC PHIL OVAL 10-24 X 1 SS	EACH	4
21	05181434AA	HOSE CLAMP 3/4" SS	EACH	8
22	061010030000	NUT HEX 10-24 SS	EACH	3
23	5301381000	MANIFOLD HIGH/LOW PRESS UW/SE	EACH	1
24	061161630012	SC PHIL FLAT 10-24 X 3/4 SS	EACH	2
25	3131222300	ENCLOSURE LID 170 UW/SE	EACH	1
26	2020023801	FRAME FRONT UW/SE COMPACT	EACH	1
27	2020053821	PANEL FRONT LEFT UWC/SEC	EACH	1
28	2020053822	PANEL FRONT RIGHT UWC/SEC	EACH	1
29	B107380002	PREFILTER ASSY UW/SE 2/4/6 25	EACH	1
30	B107380001	PREFILTER ASSY UW/SE 2/4/6 05	EACH	1
31	0501164900	PIPE SUPPORT 3/4"	EACH	1
32	2020023802	FRAME REAR UW/SE COMPACT	EACH	1
33	061161845020	SC ALLEN FLAT 1/4-20 X 1 1/4 S	EACH	4
34	0501164400	PIPE SUPPORT 1"	EACH	2
	0217010887	ELB90 1/4 TUBE X 1/4 FPT SS	EACH	1
	0217410100	INSERT 1/4 TUBE SS	EACH	4
	0339076100	HOSE CLEAR BRAID 5/8"" HD	FEET	4
	0204010869	ELB90 1/4 TUBE X 1/4 FPT PLAST	EACH	3
	0312121969	TUBE 1/4 BLACK	FEET	3
	0312181769	TUBE 1/4" BLACK SEMI-RIGID NYL	FEET	3
	0217500600	ELB90 1/4 TUBE X 1/8 MPT SS	EACH	4
	0217030800	ELB90 1/4 TUBE X 1/4 MBSP SS	EACH	1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PREFILTRATION CARTRIDGE FILTER ELEMENT WARNING:

Do not use third party Prefiltration Elements (Plankton Filter Elements, Prefilter Elements, Commercial Prefilter Elements, or Oil/Water Separator Elements). Use only Sea Recovery supplied Prefiltration Elements. Third party prefiltration elements on the market do not properly fit into the Sea Recovery Filter Housings, the seams fall apart, and they will allow by-pass resulting in **EXTENSIVE AND EXPENSIVE DAMAGE TO THE HIGH PRESSURE PUMP AS WELL AS PREMATURE FOULING OF THE R.O. MEMBRANE ELEMENT.**

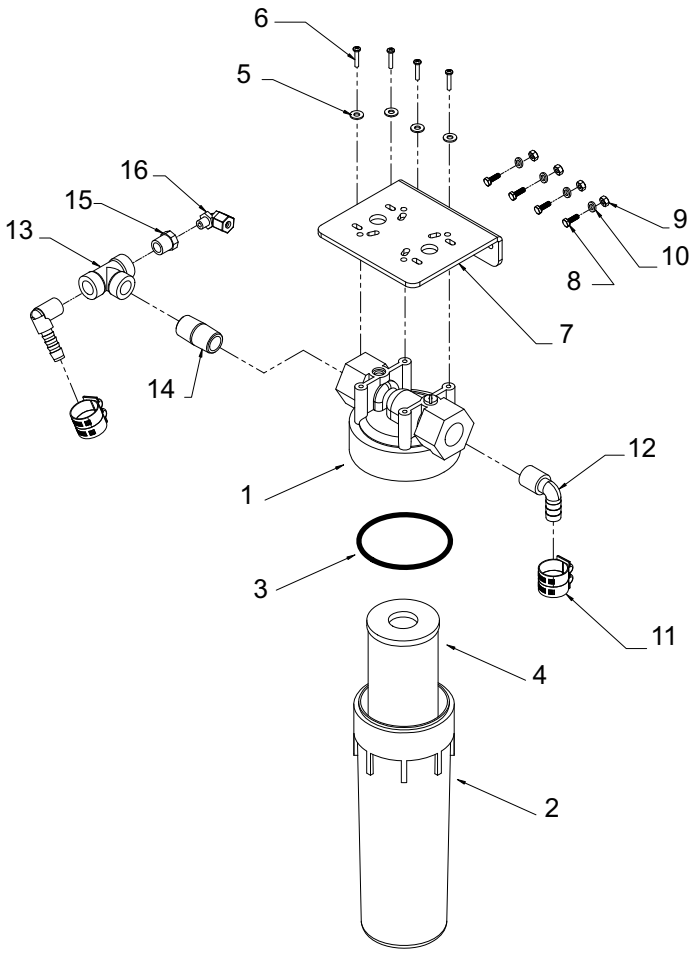
Damage caused to the Sea Recovery High Pressure Pump, R.O. Membrane Element, or any other component from the use of third party, non Sea Recovery supplied, filter elements is the responsibility and liability of the operator and is not covered by the Sea Recovery Warranty.

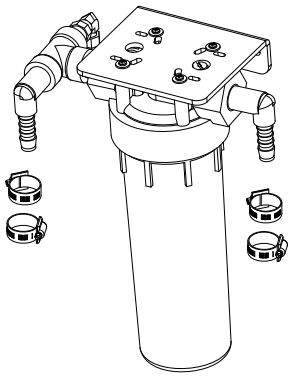
FILTER ELEMENT CAUTION:

Do not use "string wound" or "fiber" type prefilter elements. These type of elements are designed for the Photographic Film Developing industry. When used in sea water they will plug up rapidly in 1/10th or less the time causing frequent shut down of the system and very frequent changing resulting in very high cost of maintenance.

25 MICRON PREFILTER FOR THE ULTRA WHISPER COMPACT

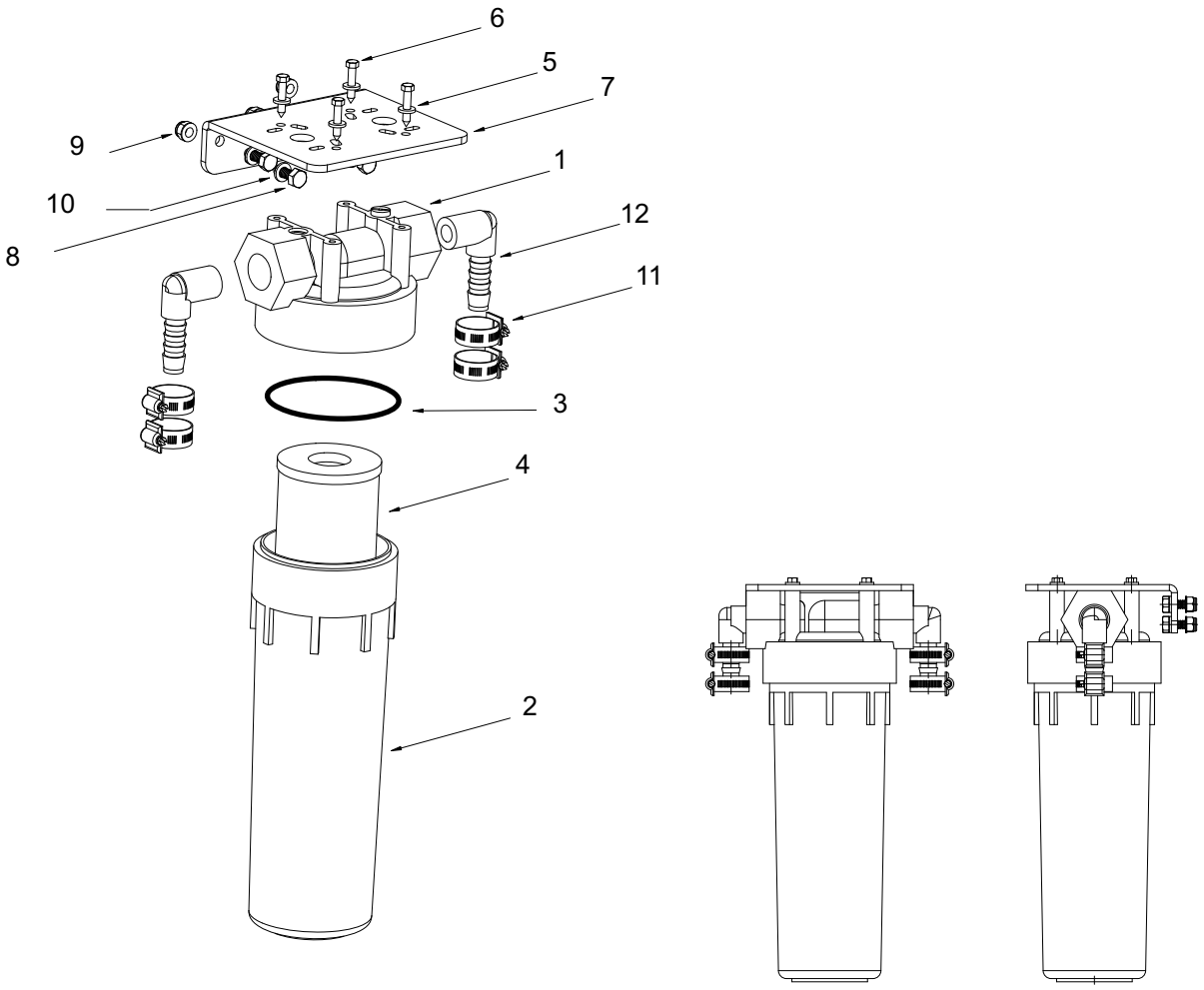
ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-16	**B107380002**	**PREFILTER ASSY UW/SE 2/4/6 25 EACH**		
1-3	07650209ST	FILTER HOUSING/LID AQUA ER	EACH	1
1		LID PREFILTER HOUSING UW-SE		
2		BOWL PREFILTER HOUSING UW-SE		
3	2614018800	O-RING 236 PREFILTER UW		
4	0801130257	ELEMENT PREFILTER 10/25	EACH	1
5	065080028000	WASHER FLAT #10 NYLON	EACH	4
6	061170628016	SC PHIL PAN "A" 10 X 1 SS	EACH	4
7	2020043811	BRACKET UW/SE FRAME MULTI	EACH	1
8	061142145012	BOLT HEX 1/4-20 X 3/4 SS	EACH	4
9	065070045000	NUT LOCKING 1/4-20 FLANGED NYL	EACH	4
10	061080043000	WASHER FLAT 1/4" SS	EACH	4
11	05181434AA	HOSE CLAMP 3/4" SS	EACH	4
12	0101072583	ELB90 1/2 MPT X 1/2 BARB PVC	EACH	2
13	0101422583	TEE 1/2 FT X 1/2 FT X 1/2 FT P	EACH	1
14	01013725CL	NIPPLE 1/2 NPT X CLOSE PVC	EACH	1
15	0101292383	RB 1/2 MT X 1/4 FT PVC	EACH	1
16	0204020869	ELB90 1/4 TUBE X 1/4 MPT PLAST	EACH	1





5 MICRON PREFILTER FOR THE ULTRA WHISPER COMPACT

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-12	**B107380001000**	**PREFILTER ASSY UW/SE 2/4/6 05**		
1-3	07650209ST	FILTER HOUSING/LID AQUA ER	EACH	1
1		LID PREFILTER HOUSING UW-SE		
2		BOWL PREFILTER HOUSING UW-SE		
3	2614018800	O-RING 236 PREFILTER UW		
4	0801060157	ELEMENT PREFILTER 10/05	EACH	1
5	065080028000	WASHER FLAT #10 NYLON	EACH	4
6	061170628016	SC PHIL PAN "A" 10 X 1 SS	EACH	4
7	2020043811	BRACKET UW/SE FRAME MULTI	EACH	1
8	061142145012	BOLT HEX 1/4-20 X 3/4 SS	EACH	4
9	065070045000	NUT LOCKING 1/4-20 FLANGED NYL	EACH	4
10	061080043000	WASHER FLAT 1/4" SS	EACH	4
11	05181434AA	HOSE CLAMP 3/4" SS	EACH	4
12	0101072583	ELB90 1/2 MPT X 1/2 BARB PVC	EACH	2

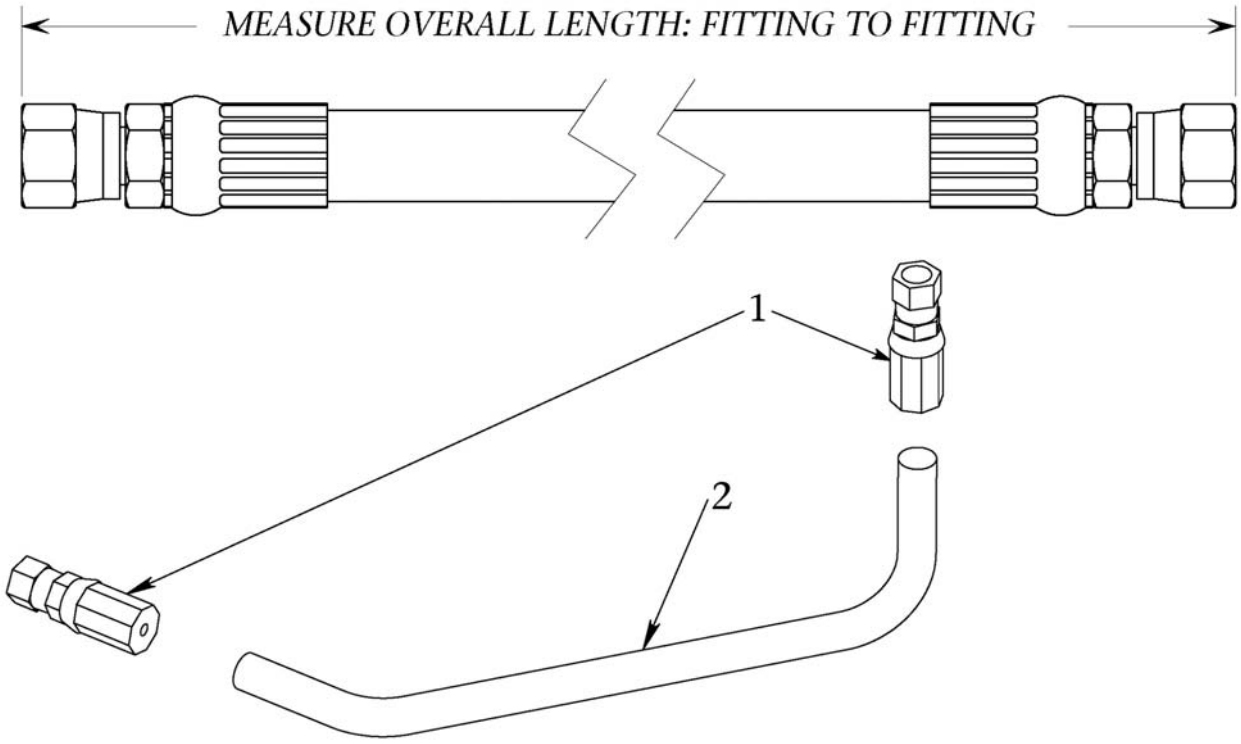


High Pressure Hoses

Connecting the outlet of the ETD port "P" to the Inlet of the Membrane/Vessel Assembly and the Outlet of the Membrane/Vessel Assembly to the Return Inlet port "R" of the ETD

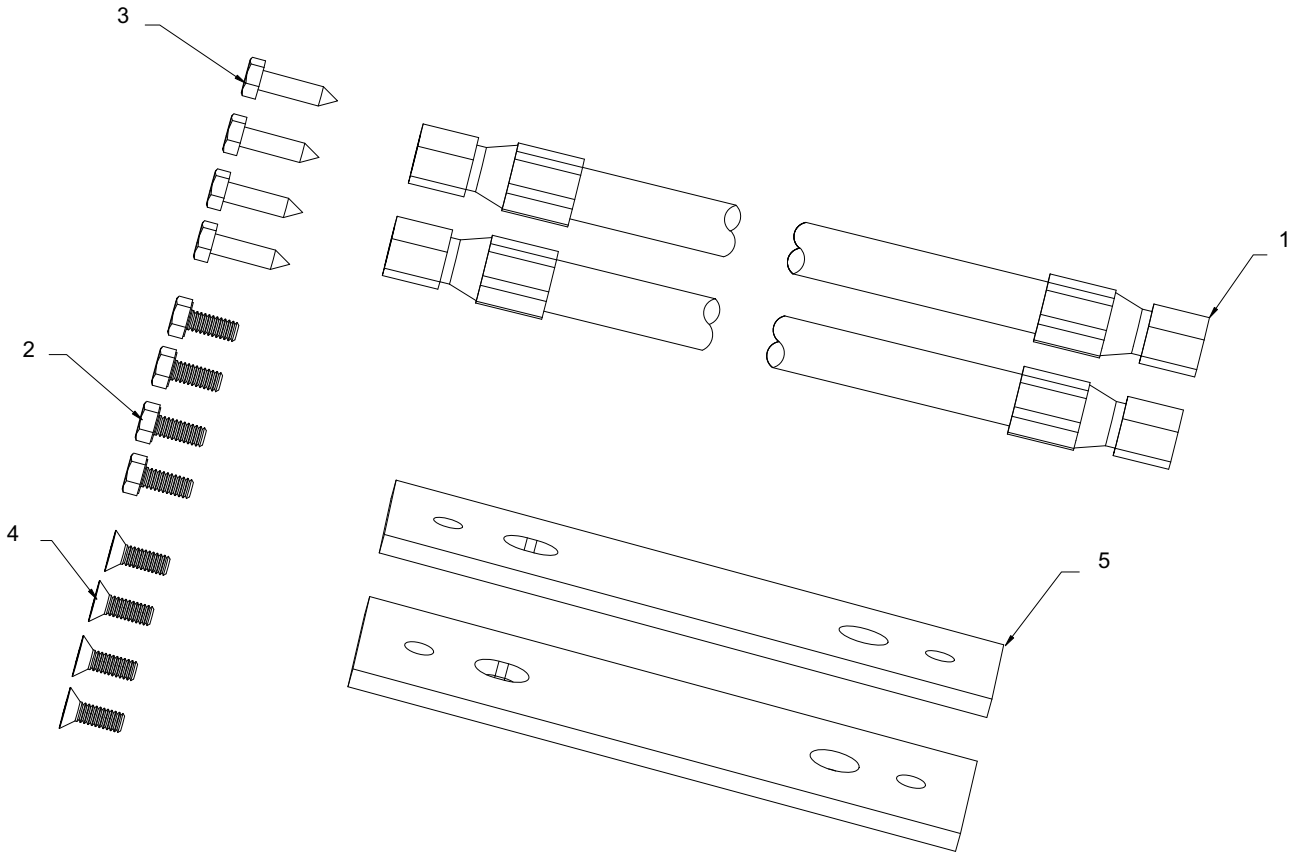
PART NUMBER	DESCRIPTION	U/M	QTY
	FOR THE ULTRA WHISPER COMPACT 200:		
B390380002	HOSE HP ASSY UWC 200	EACH	2
	FOR THE ULTRA WHISPER COMPACT 300:		
B390380003	HOSE HP ASSY UWC 400	EACH	2
	FOR THE ULTRA WHISPER COMPACT 400, 500, & 600:		
B390380004	HOSE HP ASSY UWC 600	EACH	2
	TO REMOTE THE R.O. MEMBRANE VESSEL FROM THE COMPACT SYSTEM, 2 EACH 6 FOOT LONG H.P. HOSES.:		
B390380004	HOSE HP ASSY UWC 600	EACH	2

Note: Special lengths may be ordered from Sea Recovery. The end fittings on the High Pressure Hose are crimped into place using a special crimp machine. The High Pressure Hose is not repairable. If damaged replace the High Pressure Hose with a Sea Recovery supplied high pressure hose assembly.

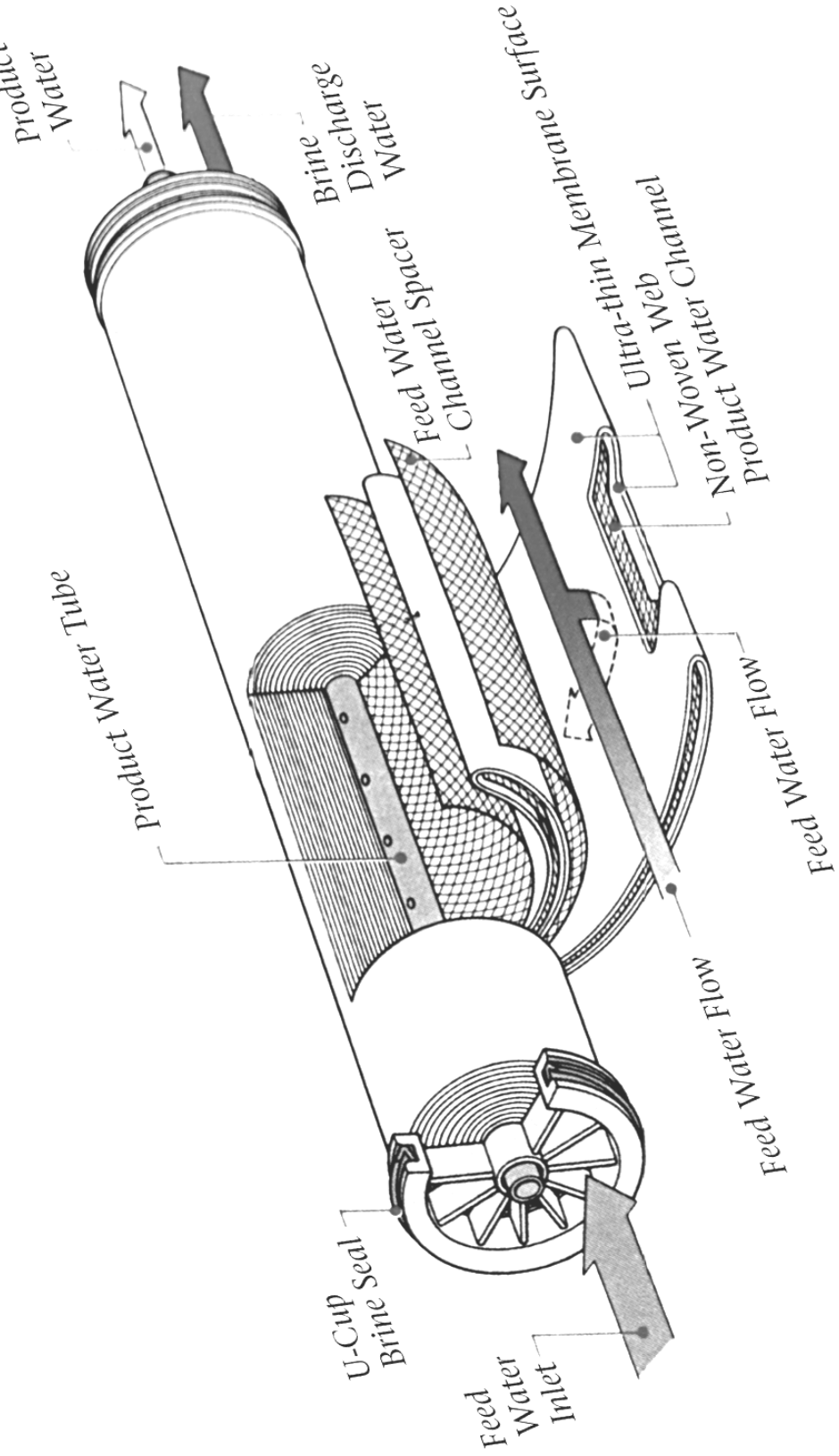


KIT FOR REMOTE MOUNTING OF THE ULTRA WHISPER COMPACT STYLE
R.O. MEMBRANE & VESSEL ASSEMBLY

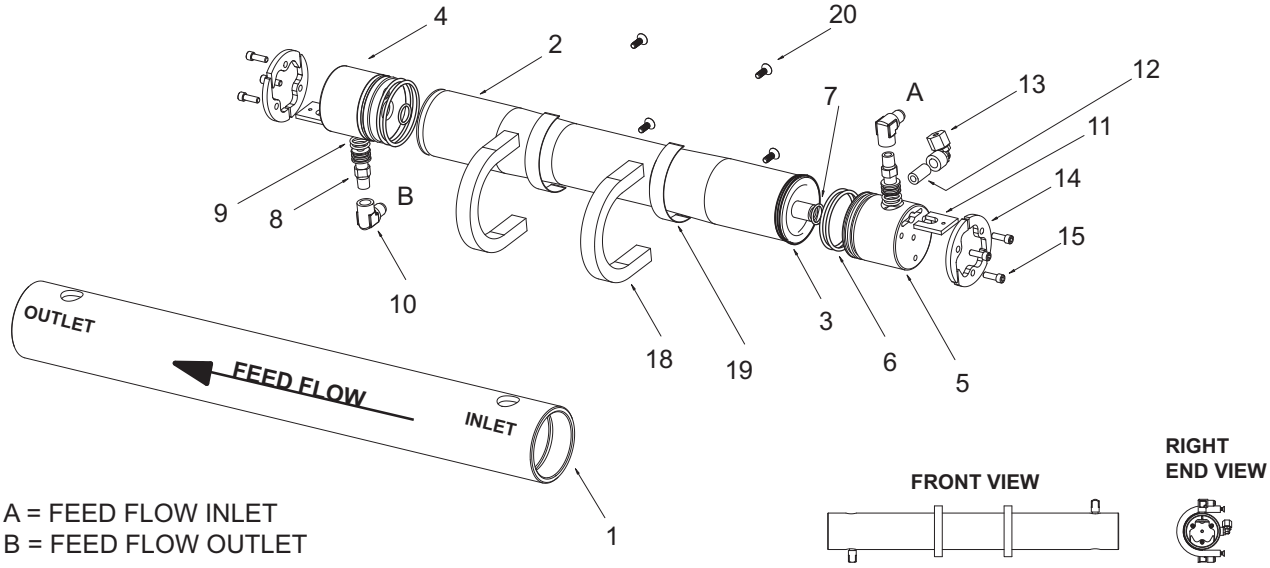
ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1	B390380001	HOSE HP ASSY UW/SE MODULAR 6 FEET LONG / 1,828mm LONG	EACH	2
	SPECIAL LENGTHS MAY BE ORDERED FROM THE FACTORY			
2	061142145012	BOLT HEX 1/4-20 X 3/4 SS	EACH	4
3	061172143016	SC HEX "A" 1/4 X 1 SS	EACH	4
4	061161845012	SC ALLEN FLAT 1/4-20 X 3/4 SS	EACH	4
5	0520051900	MVA RACK UW/SE	EACH	2



ANATOMY OF A SPIRAL WOUND REVERSE OSMOSIS MEMBRANE ELEMENT



ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
MEMBRANE AND VESSEL ASSEMBLY FOR ULTRA WHISPER 200 COMPACT STYLE				
1-20	**B196380007**	**MEMBRANE VESSEL ASSY 200 UWC**		
1	2408132500	VESSEL HIGH PRESSURE 450GPD AW	EACH	1
2	2724011233	MEMBRANE 450GPD AW WITH BRINE SEAL	EACH	1
3	2614050433	BRINE SEAL 3"		
MEMBRANE AND VESSEL ASSEMBLY FOR ULTRA WHISPER 300 COMPACT STYLE				
1-20	**B196380008**	**MEMBRANE VESSEL ASSY 400 UWC**		
1	2408132500-01	VESSEL HIGH PRESSURE 700GPD AW	EACH	1
2	2724011333	MEMBRANE 700GPD AW WITH BRINE SEAL	EACH	1
3	2614050433	BRINE SEAL 3"		
MEMBRANE AND VESSEL ASSEMBLY FOR ULTRA WHISPER 400, 500 & 600 COMPACT STYLE				
1-20	**B196380009*STD1**	**MEMBRANE VESSEL ASSY 600 UWC**		
1	2408132500-02	VESSEL HIGH PRESSURE 900GPD AW	EACH	1
2	2724011433	MEMBRANE 900GPD AW WITH BRINE SEAL	EACH	1
3	2614050433	BRINE SEAL 3"		
4	2453502400	END PLUG SINGLE 3" AW	EACH	1
5	2453512400	END PLUG DUAL 3" AW	EACH	1
6	2614014900	O-RING 230 BRINE 3" END PLUG	EACH	4
7	2614010100	O-RING 116 PRODUCT AS/AW	EACH	2
8	0117410800	NIPPLE HP MVA AW	EACH	2
9	2614017900	O-RING 115 INTERCONNECT AW	EACH	4
10	1317011769	ELB90 -6 x1/4 FPTSS	EACH	2
11	0520210600	RETAINER PORT MVA AW	EACH	2
12	0101370815	NIPPLE 1/4 NPT X 1 1/2 PVC	EACH	1
13	0204010869	ELB90 1/4 TUBE X 1/4 FPT PLAST	EACH	1
14	20201030000	SEGMENT RING AW (SET)	EACH	2
15	061162345012	SC SOC CAP 1/4-20 X 3/4 SS	EACH	6
16	2234011260	LABEL INLET(SRC BLUE)	EACH	1
17	2234011360	LABEL OUTLET (SRC BLUE)	EACH	1
18	05202401GR	BRACKET MVA (AL) U CLAMP AW	EACH	2
19	2632180526	DECOFELT 1/16 X 1 BLK ADH BACK	FEET	0.3
20	061161845012	SC ALLEN FLAT 1/4-20 X 3/4 SS	EACH	4



Sub-section 9 - C pages 43 - 49

Exploded Parts Views

For the Modular Style Only

PREFILTRATION CARTRIDGE FILTER ELEMENT WARNING:

Do not use third party Prefiltration Elements (Plankton Filter Elements, Prefilter Elements, Commercial Prefilter Elements, or Oil/Water Separator Elements). Use only Sea Recovery supplied Prefiltration Elements. Third party prefiltration elements on the market do not properly fit into the Sea Recovery Filter Housings, the seams fall apart, and they will allow by-pass resulting in **EXTENSIVE AND EXPENSIVE DAMAGE TO THE HIGH PRESSURE PUMP AS WELL AS PREMATURE FOULING OF THE R.O. MEMBRANE ELEMENT.**

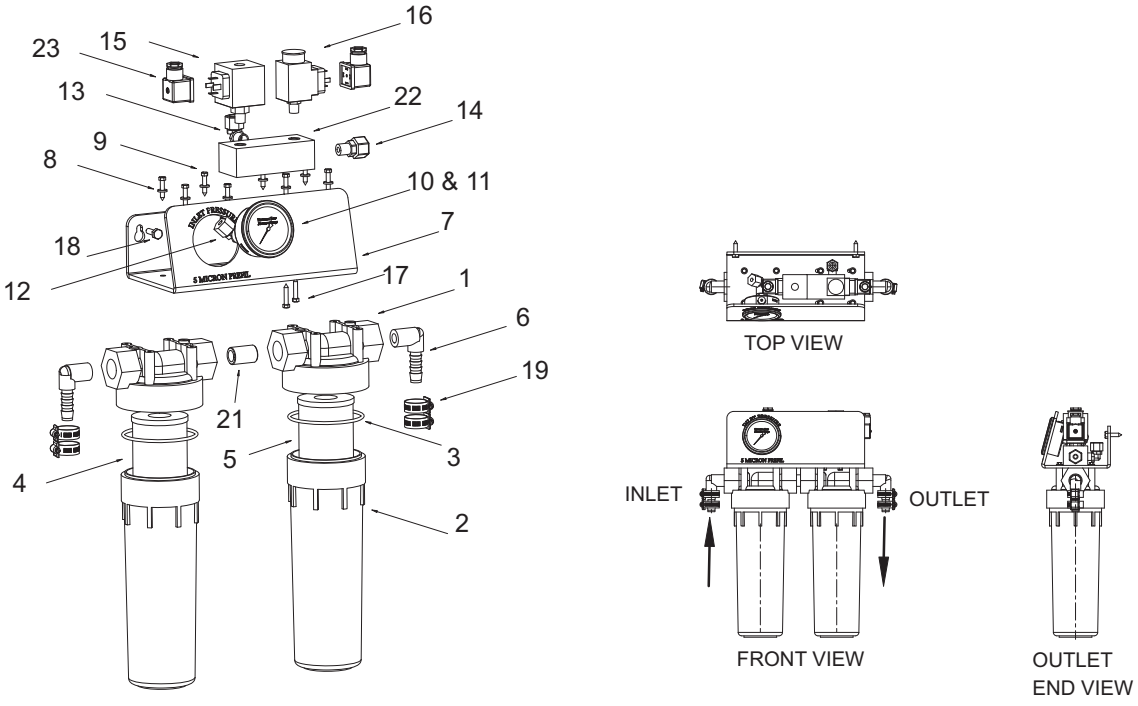
Damage caused to the Sea Recovery High Pressure Pump, R.O. Membrane Element, or any other component from the use of third party, non Sea Recovery supplied, filter elements is the responsibility and liability of the operator and is not covered by the Sea Recovery Warranty.

FILTER ELEMENT CAUTION:

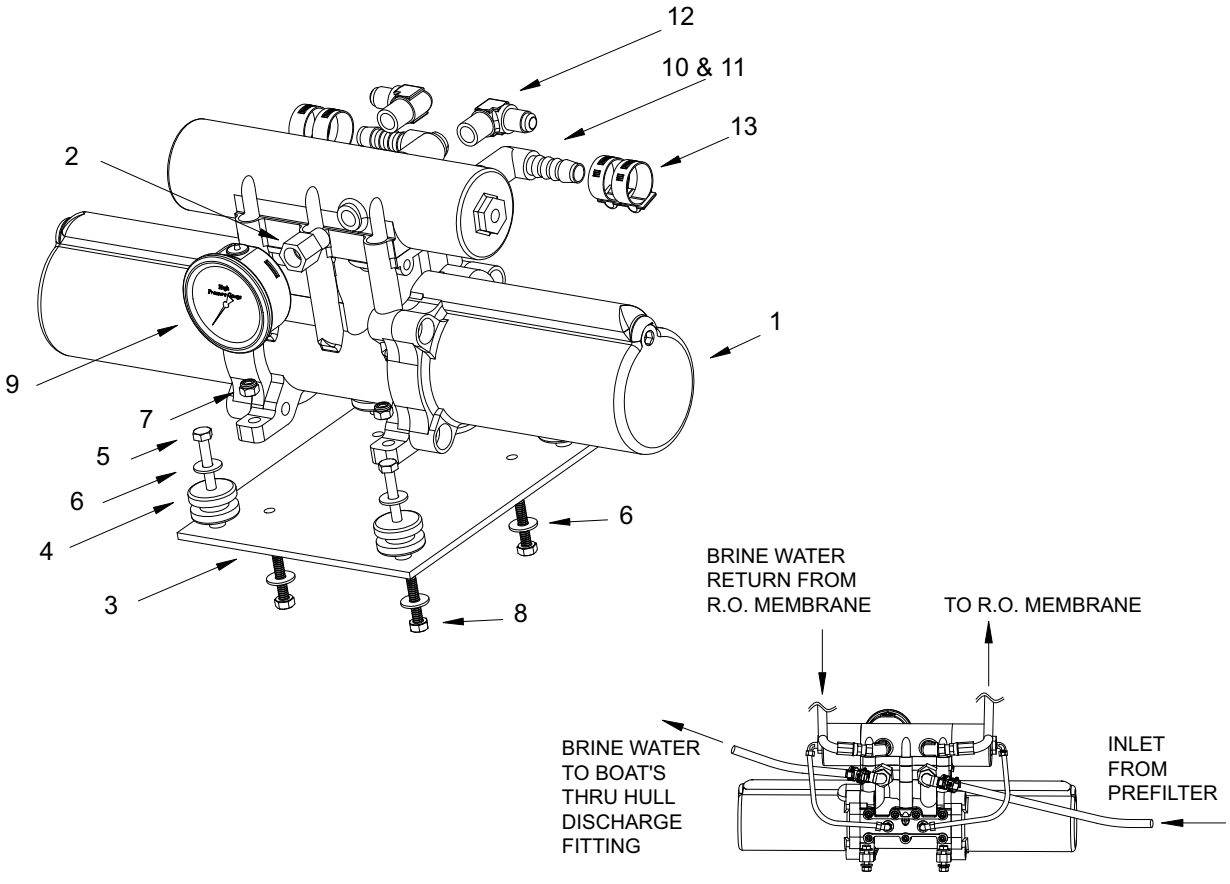
Do not use "string wound" or "fiber" type prefilter elements. These type of elements are designed for the Photographic Film Developing industry. When used in sea water they will plug up rapidly in 1/10th or less the time causing frequent shut down of the system and very frequent changing resulting in very high cost of maintenance.

DUAL PREFILTER ASSEMBLY FOR ULTRA WHISPER COMPACT

ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-23	**B107380004**	**PREFILTER ASSY UW/SE M4-600**		
1-3	07650209ST	FILTER HOUSING/LID AQUA ER	EACH	2
1		LID PREFILTER UW-SE		
2		BOWL PREFILTER UW-SE		
3	2614018800	O-RING 236 PREFILTER UW		
4	0801130257	ELEMENT PREFILTER 10/25	EACH	1
5	0801060157	ELEMENT PREFILTER 10/05	EACH	1
6	0101072583	ELB90 1/2 MPT X 1/2 BARB PVC	EACH	2
7	2020043809	BRACKET PREFILTER UW	EACH	1
8	065080028000	WASHER FLAT #10 NYLON	EACH	8
9	061170628016	SC PHIL PAN "A" 10 X 1 SS	EACH	10
10	10181522CC	GAUGE -30/0/70 CBM.NPT	EACH	1
11	05180851CC	GAUGE BRACKET CBM SS	EACH	1
12	0204010869	ELB90 1/4 TUBE X 1/4 FPT PLAST	EACH	1
13	0204020869	ELB90 1/4 TUBE X 1/4 MPT PLAST	EACH	1
14	0204090869	CONN 1/4 TUBE X 1/4 MPT PLASTI	EACH	1
15	2301021558	SWITCH PRESS DEC 15-35 PSI	EACH	1
16	2321021658	SWITCH PRESS INC 100-225 PSI	EACH	1
17	061160630012	SC PHIL PAN 10-24 X 3/4 SS	EACH	2
18	061172143016	SC HEX "A" 1/4 X 1 SS	EACH	2
19	05181434AA	HOSE CLAMP 3/4" SS	EACH	4
20	4910210721	WIRE 20 GA 2 COND. GREY FLEX C	FEET	15
21	01013725CL	NIPPLE 1/2 NPT X CLOSE PVC	EACH	1
22	5301381000	MANIFOLD HIGH/LOW PRESS UW/SE	EACH	1
23	3131680100	PLUG (CONNECTOR) DIN 4 COND	EACH	2



ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
ENERGY TRANSFER DEVICE FOR THE ULTRA WHISPER MODULAR STYLE 200 & 300 GALLON PER DAY MODEL				
1-13	**B153380001**	**ETD ASSY UW/SE M200**		
1	**12182501EC**	**HP PUMP ETD-22**	**EACH**	**1**
ENERGY TRANSFER DEVICE FOR THE ULTRA WHISPER MODULAR STYLE 400, 500 & 600 GALLON PER DAY MODEL				
1-13	**B153380002**	**ETD ASSY UW/SE M400/600**		
1	**12182504EC**	**HP PUMP ETD-25**	**EACH**	**1**
2	0117660800	ADAP 1/4 MBSPP X 1/4 FPT SS	EACH	1
3	2020053813	PANEL ECO PUMP MOUNTING	EACH	1
4	2132021600	RUBBER MOUNT GROMMET 1 1/4 OD	EACH	4
5	061182143032	SC LAG 1/4 X 2 SS	EACH	4
6	061100043000	WASHER FLAT OS 1/4"SS	EACH	8
7	061060045000	NUT HEX 1/4-20 W/INSERT SS	EACH	4
8	061142145020	BOLT HEX 1/4-20 X 1 1/4 SS	EACH	4
9	10181524CC	GAUGE 0-1400 CBM.NPT	EACH	1
10	0117661900	ADAP 3/8 MBSP X 1/2 FPT SS	EACH	2
11	0101072583	ELB90 1/2 MPT X 1/2 BARB PVC	EACH	2
12	1317071700	ELB90 -6 FLARE X 3/8 MBSPP SS	EACH	2
13	05181434AA	HOSE CLAMP 3/4" SS	EACH	4



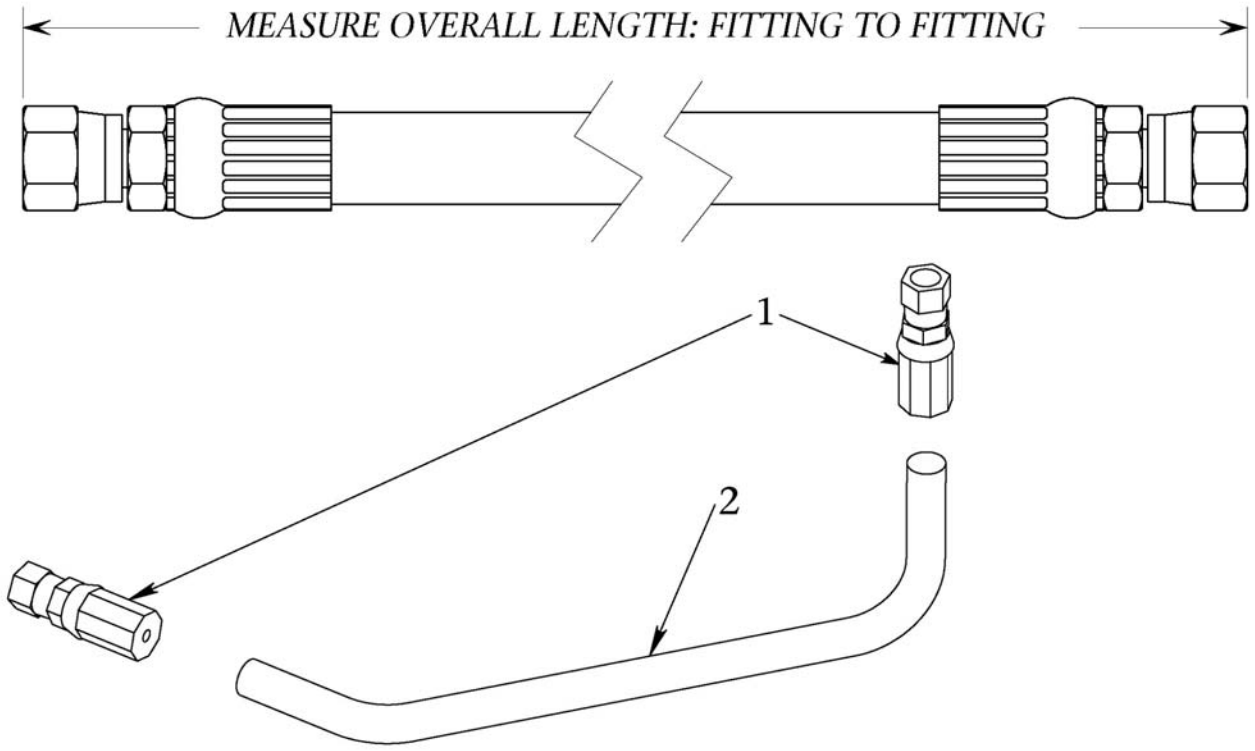
High Pressure Hoses

Connecting the outlet of the ETD port "P" to the Inlet of the Membrane/Vessel Assembly and the Outlet of the Membrane/Vessel Assembly to the Return Inlet port "R" of the ETD

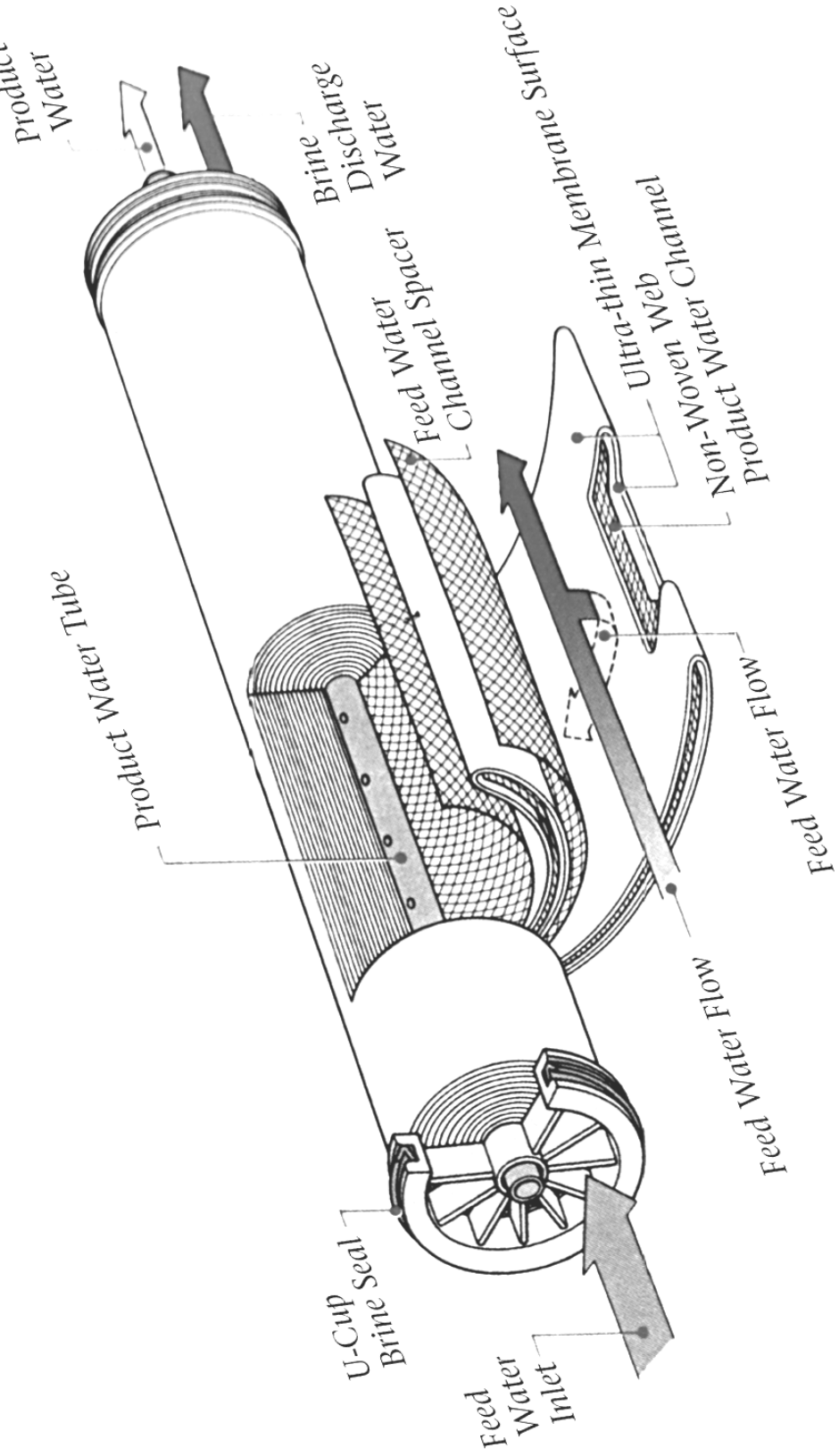
Ultra Whisper 200 Modular
Ultra Whisper 300 Modular
Ultra Whisper 400 Modular
Ultra Whisper 500 Modular
Ultra Whisper 600 Modular

Item	Part Number	Qty	U/M	Description
	B390380001	**2**	**EACH**	**HOSE HP ASSY UWC 200 (6 Ft long)**

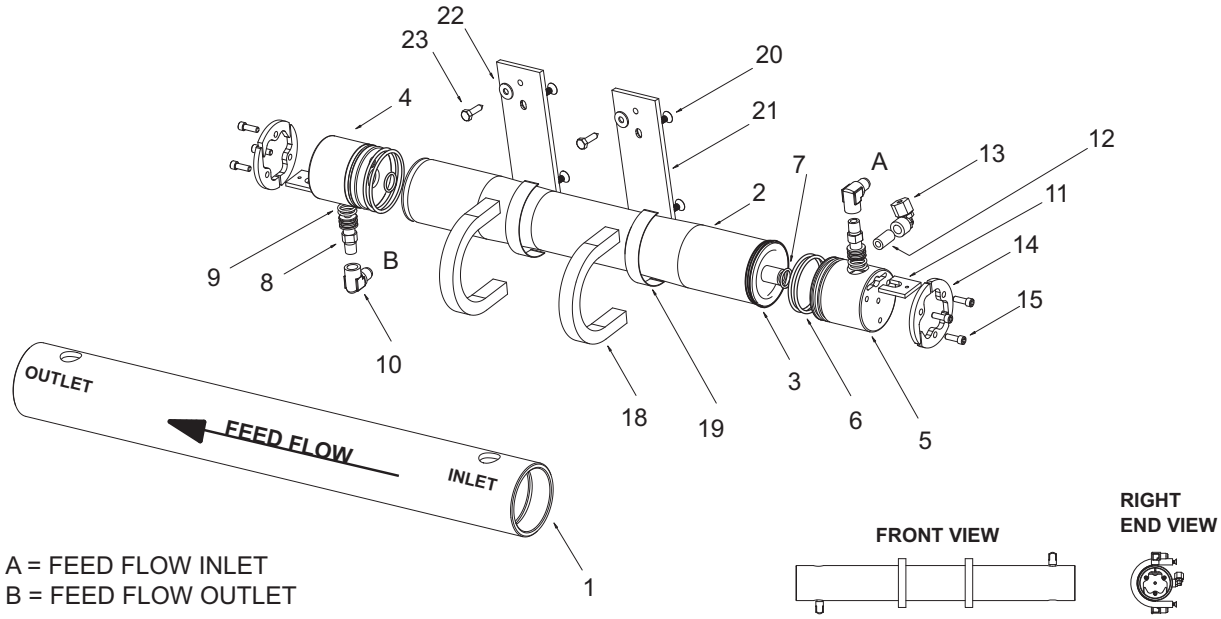
Note: Special lengths may be ordered from Sea Recovery. The end fittings on the High Pressure Hose are crimped into place using a special crimp machine. The High Pressure Hose is not repairable. If damaged replace the High Pressure Hose with a Sea Recovery supplied high pressure hose assembly.



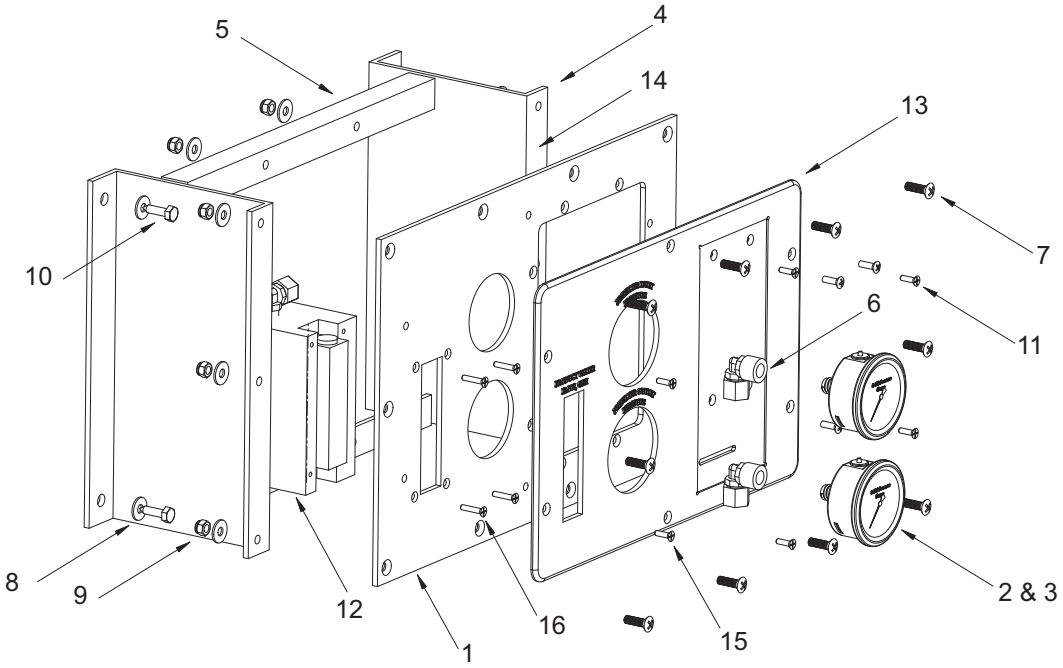
ANATOMY OF A SPIRAL WOUND REVERSE OSMOSIS MEMBRANE ELEMENT

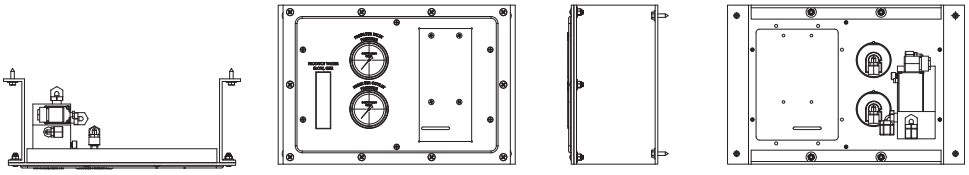


ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
MEMBRANE AND VESSEL ASSEMBLY FOR ULTRA WHISPER 200 MODULAR STYLE				
1-23	**B196380001**	**MEMBRANE VESSEL ASSY 200 UWM**		
1	2408132500	VESSEL HIGH PRESSURE 450GPD AW	EACH	1
2	2724011233	MEMBRANE 450GPD AW WITH BRINE SEAL	EACH	1
3	2614050433	BRINE SEAL 3"		
MEMBRANE AND VESSEL ASSEMBLY FOR ULTRA WHISPER 300 MODULAR STYLE				
1-23	**B196380002**	**MEMBRANE VESSEL ASSY 400 UWM**		
1	2408132500-01	VESSEL HIGH PRESSURE 700GPD AW	EACH	1
2	2724011333	MEMBRANE 700GPD AW WITH BRINE SEAL	EACH	1
3	2614050433	BRINE SEAL 3"		
MEMBRANE AND VESSEL ASSEMBLY FOR ULTRA WHISPER 400, 500 & 600 MODULAR STYLE				
1-23	**B196380003*STD1**	**MEMBRANE VESSEL ASSY 600 UWM**		
1	2408132500-02	VESSEL HIGH PRESSURE 900GPD AW	EACH	1
2	2724011433	MEMBRANE 900GPD AW WITH BRINE SEAL	EACH	1
3	2614050433	BRINE SEAL 3"		
4	2453502400	END PLUG SINGLE 3" AW	EACH	1
5	2453512400	END PLUG DUAL 3" AW	EACH	1
6	2614014900	O-RING 230 BRINE 3" END PLUG	EACH	4
7	2614010100	O-RING 116 PRODUCT AS/AW	EACH	2
8	0117410800	NIPPLE HP MVA AW	EACH	2
9	2614017900	O-RING 115 INTERCONNECT AW	EACH	4
10	1317011769	ELB90 -6 x1/4 FPTSS	EACH	2
11	0520210600	RETAINER PORT MVA AW	EACH	2
12	0101370815	NIPPLE 1/4 NPT X 1 1/2 PVC	EACH	1
13	0204010869	ELB90 1/4 TUBE X 1/4 FPT PLAST	EACH	1
14	20201030000	SEGMENT RING AW (SET)	EACH	2
15	061162345012	SC SOC CAP 1/4-20 X 3/4 SS	EACH	6
16	2234011260	LABEL INLET(SRC BLUE)	EACH	1
17	2234011360	LABEL OUTLET (SRC BLUE)	EACH	1
18	05202401GR	BRACKET MVA (AL) U CLAMP AW	EACH	2
19	2632180526	DECOFELT 1/16 X 1 BLK ADH BACK	FEET	0.3
20	061161845012	SC ALLEN FLAT 1/4-20 X 3/4 SS	EACH	4
21	0520051900	MVA RACK, UW/SE	EACH	2
22	061100043000	WASHER FLAT OS 1/4" SS	EACH	4
23	061172143016	SC HEX "A" 1/4 X 1 SS	EACH	4



ITEM	PART NUMBER	DESCRIPTION	U/M	QTY
1-16	B594380001	FRONT PANEL ASSY UW/SE		
1	2020053817	PANEL FRONT UW/SE MODULAR	EACH	1
2	10181510CC	GAUGE 0-300 CBM.NPT	EACH	2
3 5	05180851CC	GAUGE BRACKET CBM SS	EACH	2
4 3	2020043801	BRACKET PANEL SUPPORT UW	EACH	2
5 4	2020043805	BRACKET PANEL RAILS AQUA ER	EACH	2
6	0204010869	ELB90 1/4 TUBE X 1/4 FPT PLAST	EACH	2
7	061161145014	SC PHIL OVAL 1/4-20 X 7/8 SS	EACH	10
8	061100043000	WASHER FLAT OS 1/4" SS	EACH	14
9	061060045000	NUT HEX 1/4-20 W/INSERT SS	EACH	10
10	061172143016	SC HEX "A" 1/4 X 1 SS	EACH	4
11	2 061161130010	SC PHIL OVAL 10-24 X 5/8 SS	EACH	4
12	B502380001	MANIFOLD PROD ASSY UW/SE	EACH	1
13	3131223900	ENCLOSURE LID AQUA ER	EACH	1
14	2632180526	DECOFELT 1/16 X 1 BLK ADH BACK	FEET	4
15	061161630008	SC PHIL FLAT 10-24 X 1/2 SS	EACH	6
16	061161630012	SC PHIL FLAT 10-24 X 3/4 SS	EACH	4





SECTION 10

CONVERSION CHARTS

&

INFORMATION TABLES

NOTES: _____

MICRON / INCH / MESH

COMPARISON MEASUREMENTS

MICRON	INCH	INCH	MESH (opening)
1	.00003937	.0070	100
5	.00019685	.0075	90
10	.00039370	.0075	80
15	.00059055	.0078	70
20	.00078740	.0110	60
25	.00098425	.0130	50
30	.00118110	.0180	40
40	.00157480	.0260	30
50	.00196850	.0410	20
75	.00295275	.0850	10
100	.00393700	.1770	5
200	.00787400	.9370	1

TEMPERATURES CELSIUS vs FAHRENHEIT

CONVERSION CHART

□F	□C	□F	□C
0	-32	122	50
32	0	131	55
41	5	140	60
50	10	149	65
59	15	158	70
68	20	167	75
78	25	176	80
86	30	185	85
95	35	194	90
104	40	203	95
113	45	212	100

□CELSIUS = 0.556 (□F -32)

□FAHRENHEIT = (1.8□C) +32

WITH THE GIVEN FEED WATER TEMPERATURE AND SALINITY THIS CHART PROJECTS THE EXPECTED NEW R.O. MEMBRANE OPERATING PRESSURE IN PSI & PRODUCT WATER QUALITY IN PPM

Ultra Whisper 200 operating from 12 VDC, 24 VDC, or Alternating Current 60 Hz

		Feed 28,000 PPM		Feed 35,000 PPM		Feed 38,000 PPM		Feed 45,000 PPM		Feed 55,000 PPM	
Temp C	Temp F	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM
35	95	493	515	599	644	645	699	758	829	927	1013
30	86	502	449	608	562	652	610	765	723	933	884
25	77	515	391	620	488	665	530	772	628	942	768
20	68	533	330	636	413	682	448	791	531	953	644
15	59	557	278	659	347	704	377	812	446	975	546
10	50	588	232	689	290	734	315	840	373	1003	456
5	41	627	193	728	240	772	261	878	309	1039	378
0	32	673	161	773	202	817	219	922	260	1082	318

Ultra Whisper 200 operating from Alternating Current 50 Hz

35	95	498	496	605	620	652	674	765	798	936	976
30	86	508	433	614	541	657	588	773	696	942	851
25	77	522	376	629	470	673	510	778	605	952	739
20	68	591	318	645	397	691	432	801	511	967	625
15	59	566	267	670	334	715	363	824	430	988	526
10	50	599	223	701	279	746	303	854	359	1017	439
5	41	640	185	742	231	786	251	893	298	1056	364
0	32	688	155	789	194	834	211	940	250	1102	306

Ultra Whisper 300 operating from 12 VDC, 24 VDC, or Alternating Current 60 Hz

		Feed 28,000 PPM		Feed 35,000 PPM		Feed 38,000 PPM		FEED 45,000 PPM		Feed 55,000 PPM	
Temp C	Temp F	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM
35	95	472	537	569	671	619	728	727	863	889	1055
30	86	480	468	581	585	626	635	731	753	893	920
25	77	491	406	591	508	636	552	741	653	896	799
20	68	507	343	607	429	650	466	754	552	912	675
15	59	529	288	627	360	670	391	773	464	929	567
10	50	556	241	653	301	696	327	798	387	952	473
5	41	592	199	688	249	730	271	831	321	984	392
0	32	633	167	728	209	770	227	870	269	1022	329

Ultra Whisper 300 operating from Alternating Current 50 Hz

35	95	469	545	568	682	617	740	724	877	886	1072
30	86	478	476	579	594	623	746	729	765	890	935
25	77	488	412	589	516	633	561	738	664	894	812
20	68	504	349	604	436	647	474	751	561	908	686
15	59	525	293	623	366	666	398	769	471	924	576
10	50	552	244	649	306	692	332	793	393	947	481
5	41	587	203	683	253	725	275	826	326	978	399
0	32	627	170	727	209	764	231	864	274	1015	335

Ultra Whisper 400 operating from 12 VDC, 24 VDC, or Alternating Current 60 Hz

Feed 28,000 PPM		Feed 35,000 PPM		Feed 38,000 PPM		Feed 45 ,000 PPM		Feed 55,000 PPM	
ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM
474	566	578	708	623	769	733	911	897	1113
482	494	584	619	630	671	738	794	900	971
492	429	594	536	639	582	744	690	906	843
508	362	609	453	653	492	758	583	912	713
528	304	628	381	671	413	776	490	933	599
535	254	653	318	696	345	799	409	955	500
589	210	686	263	729	286	831	339	985	414
629	177	725	221	767	240	869	284	1022	348

Ultra Whisper 400 operating from Alternating Current 50 Hz

472	576	576	720	621	782	730	926	894	1132
480	502	578	628	627	682	735	808	897	988
490	436	591	545	636	592	742	701	903	857
505	368	605	461	649	500	755	593	910	725
525	309	624	387	668	420	772	498	928	609
551	258	649	323	692	351	795	415	950	508
584	214	681	268	724	291	826	344	979	421
623	180	719	225	761	244	862	289	1015	354

Ultra Whisper 500 operating from 12 VDC, 24 VDC, or Alternating Current 60 Hz

		Feed 28,000 PPM		Feed 35,000 PPM		Feed 38,000 PPM		FEED 45,000 PPM		Feed 55,000 PPM	
Temp C	Temp F	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM
35	95	516	425	624	532	672	577	786	684	960	836
30	86	529	371	636	464	683	503	797	596	969	729
25	77	546	322	652	402	699	437	811	518	982	633
20	68	569	272	675	340	721	369	832	437	1002	535
15	59	600	228	704	286	750	310	860	367	1029	444
10	50	639	190	743	238	788	259	897	307	1064	375
5	41	689	158	792	197	837	214	946	254	1112	311
0	32	747	132	849	166	894	180	1003	213	1168	261

Ultra Whisper 500 operating from Alternating Current 50 Hz

35	95	507	450	614	562	659	610	775	723	946	884
30	86	519	392	625	490	672	532	780	631	954	771
25	77	534	340	639	425	686	462	797	547	965	669
20	68	556	287	660	359	706	390	816	462	983	565
15	59	584	241	687	302	733	328	842	388	1008	475
10	50	620	201	723	252	768	274	876	324	1040	396
5	41	667	167	769	209	813	227	920	269	1084	329
0	32	721	140	822	175	866	190	973	226	1135	276

Ultra Whisper 600 operating from 12 VDC, 24 VDC, or Alternating Current 60 Hz

Feed 28,000 PPM		Feed 35,000 PPM		Feed 38,000 PPM		Feed 45 ,000 PPM		Feed 55,000 PPM	
ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM	ETD PSI	Product PPM
537	380	647	475	695	516	810	611	990	747
552	331	661	414	709	450	825	533	996	652
572	287	680	359	728	390	843	462	1020	565
600	243	709	304	755	330	869	391	1044	478
635	209	742	255	789	277	903	328	1076	401
681	170	787	213	834	231	947	274	1119	335
740	141	845	176	892	192	1004	227	1176	278
807	118	912	149	958	161	1070	191	1242	233

Ultra Whisper 600 operating from Alternating Current 50 Hz

531	391	641	498	688	531	805	629	982	769
546	341	655	726	703	463	818	548	991	671
565	296	673	370	720	402	835	476	1009	582
592	250	699	313	746	339	859	402	1033	492
626	210	732	262	779	285	891	338	1063	413
670	175	775	219	821	238	933	282	1105	345
726	145	831	182	877	197	988	234	1159	286
791	122	895	152	941	166	1052	196	1221	240

WATER COMPARISON CHART

GALLONS / VOLUME / WEIGHT

U.S. GALLON	CUBIC FEET	CUBIC YARD	CUBIC METER	TON SHORT	TON METRIC
1	0.13	0.005	0.004	0.004	0.004
5	0.67	0.025	0.019	0.021	0.019
10	1.34	0.050	0.038	0.041	0.038
25	3.34	0.129	0.10	0.104	0.094
50	6.68	0.248	0.19	0.208	0.189
100	13.37	0.50	0.38	0.42	0.38
200	26.74	0.99	0.76	0.83	0.76
300	40.10	1.49	1.14	1.25	1.13
400	53.47	1.98	1.51	1.67	1.51
500	66.84	2.48	1.89	2.08	1.89
600	80.21	2.97	2.27	2.50	2.27
700	93.58	3.47	2.65	2.92	2.65
800	106.94	3.96	3.03	3.33	3.02
900	120.31	4.46	3.41	3.75	3.40
1,000	133.68	4.95	3.79	4.17	3.78
2,500	334.20	12.38	9.46	10.41	9.45
5,000	668.40	24.76	18.93	20.83	18.89
7,500	1002.60	37.13	28.39	31.24	28.34
10,000	1336.81	49.51	37.85	41.65	37.79
25,000	3342.00	123.80	94.60	104.10	94.50
50,000	6684.00	247.60	189.30	208.30	188.90
75,000	100.6.00	371.30	283.90	312.40	283.40
100,000	13368.06	495.11	378.54	416.50	377.85

1 U.S. GALLON	=	231. CU. INCH
1 U.S. GALLON OF WATER	=	8.33 LBS.
1 SHORT TON	=	2000 LBS.
1 METRIC TON	=	2204.6 LBS.
1 CU. INCH OF WATER	=	0.0360 LBS.
1 CU. FOOT OF WATER	=	62.4 LBS.
1 IMPERIAL GALLON OF WATER	=	10.0 LBS.
1 GALLON	=	3.7854 LITERS
1 CUBIC METER	=	1000 LITERS
1 CUBIC METER	=	264 GALLONS

PPM CONVERSION CHART

SPECIFIC CONDUCTANCE IN MICROMHOS	SPECIFIC RESISTANCE IN OHMS	DISSOLVED SOLIDS P.P.M.	RESISTANCE* MHOS	OHMS	P.P.M.
.0385	26,000,000	NONE	250.0	4,000	125
.0556	18,000,000	.02777	256.4	3,900	128
.0625	16,000,000	.03125	263.2	3,800	132
.0714	14,000,000	.03571	270.3	3,700	135
.0833	12,000,000	.04166	277.8	3,600	139
.1	10,000,000	.05	285.7	3,500	143
.125	8,000,000	.0625	294.1	3,400	147
.167	6,000,000	.08333	303.0	3,300	152
.2	5,000,000	.1	312.0	3,200	156
.25	4,000,000	.125	322.5	3,100	161
.5	2,000,000	.25	333.3	3,000	166
1	1,000,000	.5	344.8	2,900	172
2	500,000	1	357.0	2,800	179
4	250,000	2	370.4	2,700	185
6	166,666	3	384.6	2,600	192
8	125,000	4	400.0	2,500	200
10	100,000	5	416.6	2,400	208
12	83,333	6	434.8	2,300	217
14	71,428	7	454.5	2,200	227
16	62,500	8	476.2	2,100	238
18	55,555	9	500.0	2,000	250
20	50,000	10	526.3	1,900	263
22	45,454	11	555.5	1,800	278
24	41,666	12	588.2	1,700	294
26	38,461	13	625.0	1,600	312
28	35,714	14	666.6	1,500	333
30	33,333	15	714.2	1,400	357
40	25,000	20	769.2	1,300	384
50	20,000	25	833.3	1,200	416
60	16,666	30	909.0	1,000	500
70	14,286	35	1,000	1,000	500
80	12,500	40	1,111	900	555
100	10,000	50	1,250	800	625
120	8,333	60	1,428	700	714
140	7,142	70	1,666	600	833
160	6,250	80	2,000	500	1,000
180	5,555	90	2,500	400	1,250
200	5,000	100	3,333	300	1,667
			5,000	200	2,500
			10,000	100	5,000

*Approximate dissolved solids expressed as Calcium Carbonate (CaC03)

PRESSURE COMPARISON

psi	Kg/cm^2	"Hg Vacuum	bar	kPa	atmosphere
1	0.0704	2.036	0.0689	6.895	0.0681
14.22	1	28.96	0.981	98.07	0.968
0.4912	0.0345	1	0.0339	3.386	0.03342
14.504	1.02	29.53	1	100	0.987
0.14504	0.0102	0.295	0.01	1	0.00987
14.7	1.033	29.92	1.013	101.3	1

METRIC / U.S. CUSTOMARY UNIT EQUIVALENTS

multiply:		by:		to get or multiply:		by:		to get:
LINEAR								
inch	x	25.4	=	millimeters(mm)	x	0.03937	=	inch
feet	x	0.3048	=	meters(m)	x	3.281	=	feet
yard	x	0.9144	=	meters(m)	x	1.0936	=	yard
mile	x	1.6093	=	kilometers(km)	x	0.6214	=	mile
inch	x	2.54	=	centimeters(cm)	x	0.3937	=	inch
VOLUME								
fluid oz	x	29.57	=	milliliters (ml)	x	0.03381	=	fluid oz
U.S. quart	x	0.94635	=	liters(l)	x	1.0567	=	quarts
U.S. gallon	x	3.7854	=	liters(l)	x	0.2642	=	gallons
$feet^3$	x	28.317	=	liters	x	0.03531	=	$feet^3$
$feet^3$	x	0.02832	=	$meters^3$	x	35.315	=	$feet^3$
$yard^3$	x	0.7646	=	$meters^3$	x	1.3080	=	$yard^3$
MASS								
ounces	x	28.35	=	grams(g)	x	0.03527	=	ounces
pounds	x	0.4536	=	kilograms (kg)	x	2.2046	=	pounds
tons (2000lb)	x	907.18	=	kilograms (kg)	x	0.001102	=	tons
tons (2000lb)	x	0.90718	=	metric tons(t)	x	1.1023	=	tons

WIRE SIZE CROSS REFERENCE CHART:

American Wire Gauge			**Metric Wire Gauge**		**Metric Wire**
AWG	dia inch	sq. inch	dia mm	sq mm	**Size mm²**
0000	0.4600	0.1661	11.6840	107.1649	**100**
000	0.4096	0.1317	10.4038	84.9683	**85**
00	0.3648	0.1045	9.2659	67.3980	**65**
0	0.3249	0.0829	8.2525	53.4609	**50**
1	0.2893	0.0657	7.3482	42.3871	**40**
2	0.2576	0.0521	6.5430	33.6069	**32**
3	0.2294	0.0413	5.8268	26.6516	**32**
4	0.2043	0.0328	5.1892	21.1385	**19**
6	0.1620	0.0206	4.1148	13.2913	**13**
8	0.1285	0.0130	3.2639	8.3626	**8**
10	0.1019	0.0082	2.5883	5.2588	**5**
12	0.0808	0.0051	2.0523	3.3064	**3**
14	0.0641	0.0032	1.6281	2.0809	**2**
16	0.0508	0.0020	1.2903	1.3070	**1**
18	0.0403	0.0013	1.0236	0.8225	**.8**
20	0.0320	0.0008	0.8128	0.5186	**.5**
22	0.0254	0.0005	0.6452	0.3267	**.35**