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Installation,
Operation and
Service
Instructions

CULLIGAN®
G2 Series Reverse Osmosis
Water Treatment Systems

Models from November 2008

Culligan®

Attention Culligan Customer:

Your local independently operated Culligan dealer employs trained service and maintenance personnel who are experienced in the installation, function and repair of Culligan equipment. This publication is written specifically for these individuals and is intended for their use.

We encourage Culligan users to learn about Culligan products, but we believe that product knowledge is best obtained by consulting with your Culligan dealer. Untrained individuals who use this manual assume the risk of any resulting property damage or personal injury.

NOTICE Please send any suggestions for improving this manual to productmanuals@culligan.com



WARNING! Electrical shock hazard! Prior to servicing equipment, disconnect power supply to prevent electrical shock.



WARNING! If incorrectly installed, operated, or maintained, this product can cause severe injury. Those who install, operate, or maintain this product should be trained in its proper use, warned of its dangers, and should read the entire manual before attempting to install, operate, or maintain this product. Failure to comply with any warning or caution that results in any damage will void the warranty.



CAUTION! This product is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience or knowledge, unless they have been given supervision or instruction.



CAUTION! Children should be instructed not to play with this appliance.



CAUTION! If the power cord from the transformer to the unit looks or becomes damaged, the cord and transformer should be replaced by a Culligan Service Agent or similarly qualified person in order to avoid a hazard.



WARNING! This device complies with Part 15 of the FCC rules subject to the two following conditions: 1) This device may not cause harmful interference, and 2) This device must accept all interference received, including interference that may cause undesired operation.

This equipment complies with Part 15 of the FCC rules. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



CAUTION! To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cord.

NOTE This system is not intended for use with water that is microbiologically unsafe or of unknown quality without adequate disinfection either before or after the system.

NOTE Check with your public works department for applicable local plumbing and sanitation codes. Follow local codes if they differ from the standards used in this manual. To ensure proper and efficient operation of the Culligan equipment to your full satisfaction, carefully follow the instructions in this manual.

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Installation and Operation Instructions

Culligan® G2 Series Reverse Osmosis Water Treatment Systems Models From November 2008

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Read this Manual First

Before you operate the Culligan® Series G2 reverse osmosis systems, read this manual to become familiar with the device and its capabilities.

Culligan® Series G2 reverse osmosis systems are designed to meet the needs of applications for high quality water. This manual contains important information about the unit, including information needed for installation, operating, and maintenance procedures. A troubleshooting section provides a guide for quick and accurate problem solving.

In order for the water treatment system to continue to provide high quality water, you must develop a thorough understanding of the system and its operation. Review this manual before making any attempt to install, operate, or service the system. Installation or maintenance done on this system by an untrained service person can cause major damage to equipment or property damage.

About this Manual

This manual:

- Familiarizes the operator with the equipment
- Explains installation and setup procedures
- Provides basic programming information
- Explains the various modes of operation
- Gives specifications and troubleshooting information

This publication is based on information available when approved for printing. Continuing design refinements could cause changes that may not be included in this publication.

Safe Practices

Throughout this manual there are paragraphs set off by special headings.

Notice

Notice is used to emphasize installation, operation or maintenance information which is important, but does not present any hazard. For example,

NOTICE The nipple must extend no more than 1 inch above the cover plate.

Caution

Caution is used when failure to follow directions could result in damage to equipment or property. For example,



CAUTION! Disassembly while under water pressure can result in flooding.

Warning

Warning is used to indicate a hazard which could cause injury or death if ignored. For example,



WARNING! Electrical shock hazard! Unplug the unit before removing the timer mechanism or cover plates!

The CAUTION and WARNING paragraphs are not meant to cover all possible conditions and situations that may occur. It must be understood that common sense, caution, and careful attention are conditions which cannot be built into the equipment. These MUST be supplied by the personnel installing, operating, or maintaining the system.

Be sure to check and follow the applicable plumbing codes and ordinances when installing this equipment. Local codes may prohibit the discharge of acid or caustic solutions to drain. An extra solution tank should be used to neutralize the solution before discharging to drain.

Use protective clothing and proper face or eye protection equipment when handling chemicals or power tools.

G2 RO Features

The Culligan G Series Reverse Osmosis systems are the direct result of Culligan's long time experience in membrane applications around the world. From process water for any size business to treating water for an entire city, Culligan has the knowledge and the range of products you need to get the job done.

The Culligan G2 and G2 Plus Reverse Osmosis system is a painted steel skidded system sized to serve many medium-sized applications that require high-quality reverse osmosis water. It is designed with the flexibility to closely match your treatment requirements from 3 to 18 gallons per minute (4,000 to 25,000 gallons per day). Choose from a high efficiency or high production design with horizontal or vertical mounting of the membrane housings. A rich standard feature set with multiple options are available to satisfy virtually any application. Select the right size and choose any options needed to complete your system.

G2/G2 Plus Reverse Osmosis Key Product Features

- Simple System Integration
- Global Product Platform
- Flexible Configurations
- Quick Delivery/Easy Installation
- Exclusive Culligan Advanced Electronics
 - Historical Operating Data
 - Alarm Recognitions
 - US Standard and Metric Readings
 - Remote Monitoring Options
 - Telemetry Options
 - Real Time Clock: tracks date and time; has a five-year battery back up
 - TDS Probe: two TDS probes measure incoming water quality and product water quality
- [G2 Plus] Pressure Transducers (instead of pressure gauges)
- [G2 Plus] Stainless Steel Throttle Valve and Waste Valve
- [G2 Plus] Solenoid Valve (SV3) to allow for Quality Flush

GBE RO Controller (GROC) Features

System Computes Normalized Flow

The system computes normalized flow and can be set to trigger an alarm if the normalized flow drops below a specified limit.

Power Up Mode

The system can be configured to either go to standby mode or to automatically return to making RO water in the event of power loss and restoration.

Storage Tank and Pressure Logic

The system has the ability to monitor high and low level switches in an atmospheric storage tank and a pressure switch in a pressurized storage tank to automatically put the system into standby mode when the tank is full.

Pretreatment Lockout

Allows for single softener or filter pretreatment that can be set to go into regeneration or backwash cycle at low water use periods and have the RO in standby until cycle is completed. RO product water tank would need to be sized correctly based on flow demand if continuous RO product water is required.

GBE Historical Data

The GBE RO Controller stores basic performance data over the lifetime of the membranes as an aid to optimizing RO performance and determining when the membranes need to be cleaned or replaced.

Flush Options

The system offers six different membrane flush modes to improve performance and extend membrane life.

NOTE Quality Flush and Permeate Flush are mutually exclusive features.

Target TDS

The RO system keeps track of the average product water TDS whenever the RO system is operating, mixing lower quality water with product water to meet the average product water TDS.

Communications via Modem

An optional modem and monitoring service can be used to remotely monitor the RO performance over time. This service can also be used to alert the customer and the Culligan dealer in the event that an alarm or error condition occurs.

Wireless Remote Communication

An optional wireless remote can display the current operational status and performance statistics up to 200 feet from the G1 RO system.

PLC Outputs Available

The GBE Controller collects data once per minute and then streams the data to a customer-owned PLC for data collection or monitoring. Customer would have to write code to take text information and convert the data for their data collection system. For more information, see Culligan P/N 01021512 Advanced Communication Manual.

This data, once converted from a text stream, can easily be imported to an excel spreadsheet and the data logged can then be graphed and trended.

Multi-Unit RO

The GBE RO controller supports two multi-unit modes: Two Pass and Duplex-Alternating.

When in two-pass or duplex-alternating mode, the system is configured to support two GBE RO controllers that are connected together using the communication cable (P/N 01016327). One of these boards is set as the master, controlling the operations of the other unit, also known as the slave. The slave unit performs as a sensing device.

- When in Two-Pass RO mode, the primary unit, identified as the master, issues commands to control the secondary unit, identified as the slave.
- The GBE RO controller controller is capable of coordinating the alternating operation of two RO units plumbed in parallel. This operation mode is designed for situations where RO redundancy is desired.

Series G2/G2 Plus Specifications

	G2-2HE	G2-3HE	G2-4HE	G2-5HE	G2-6HE	G2-7HE	G2-8HE	G2-9HE	G2-10HE	
Nominal Capacity, GPD [m ³ /hr]*	4000 [0.63]	5800 [0.91]	7500 [1.18]	9000 [1.42]	10000 [1.58]	13250 [2.09]	15000 [2.37]	17250 [2.72]	19000 [3]	
Dimensional, Series G2 Units	30.5 [775]									
Width, in [mm]	22 [559]									
Depth, in [mm]	31 [787]									
Height, in [mm]	56 [1422]									
Operating Weight, lb [kg]	305 [138]	328 [149]	351 [159]	397 [180]	374 [170]	486 [211]	489 [222]	512 [232]	535 [243]	
Unit Connections	0.75"									
Inlet (NPT)	0.75"									
Product (Tube)	0.5"									
Concentrate (Tube)	0.5"									
Electrical	3 [2.24]									
Motor Horsepower, hp [kW]	2 [1.49]									
Power Requirement (VAC/Hz/phase)	208-230/3/60									
Full Load Current (amp)	6									
Hydraulic - Prefilter	9									
Housing Quantity	1									
Cartridge Quantity, Rating, micron	1, 5									
Cartridge Size, in [mm]	10" [254] or 20" [508]									
Hydraulic - RO	40 [1016]									
RO Housing Quantity	2	3	4	5	6	7	8	9	10	
RO Element Quantity	2	3	4	5	6	7	8	9	10	
RO Element Length - in [mm]	40 [1016]									
RO Array	11	111	1111	11111	111111	1111111	221111	222111	222211	
Product Flow, gpm [L/min]*	2.78 [10.52]	4.03 [15.25]	5.21 [19.72]	6.25 [23.66]	6.94 [26.29]	9.2 [34.82]	10.42 [39.44]	11.98 [45.34]	13.19 [49.92]	
Concentrate Flow, gpm [L/min]*	2.78 [10.52]	2.69 [10.18]	3.47 [13.13]	2.08 [7.87]	2.31 [8.74]	3.07 [11.62]	3.47 [13.13]	3.99 [15.1]	4.4 [16.65]	
Required Inlet Feed Flow, gpm [L/min]	5.56 [21.04]	6.72 [25.44]	8.68 [32.85]	8.33 [31.53]	9.25 [35.01]	12.27 [46.44]	13.89 [52.57]	15.97 [60.45]	17.59 [66.58]	
Pump Flow @ 125 psi, gpm [L/min]	13.5 [51.1]									
Recycle Flow, gpm [L/min]	5.4 [20.44]	4.2 [15.9]	2.3 [8.71]	2.6 [9.84]	1.7 [6.43]	1.5 [5.68]	5.5 [20.82]	4 [15.14]	4 [15.14]	
Maximum Module Feed Pressure, psig [kPa]	150 [1034]									
Nominal Module Feed Pressure, psig [kPa]†	103 [709.7]	107 [737.2]	107 [737.2]	114 [785.5]	112 [771.7]	130 [895.7]	121 [833.7]	119 [819.9]	120 [826.8]	
Maximum Product Pressure, psig [kPa]	47 [323.8]	43 [296.3]	43 [296.3]	36 [248]	38 [261.8]	20 [137.8]	29 [199.8]	31 [213.6]	30 [206.7]	
Inlet Pressure Minimum, dynamic psig [kPa]	20 [137.8]									
Maximum, dynamic psig [kPa]	30 [206.7]									
Operating Temperature, °F [°C]	33-100 [1-38]									
Recovery, %*	75									
Design	50	60							75	
Minimum	33	40							50	
Salt Rejection, Nominal (%)	97-98									

*Approximate initial product flow to an open storage tank based on properly pretreated feed water of 500 ppm TDS as NaCl, 77°F temperature, and silt density index below 3. Productivity will vary depending on feed water and other conditions.

†Calculated using a 0.85 fouling factor

G2 RO Unit Configurations

G2 Reverse Osmosis narrow and wide unit configurations are pictured in Figures 4, 5, 6, and 7. See the parts section for a description of unit components and lists of part numbers.

Series G2/G2 Plus Major Components and Water Connections

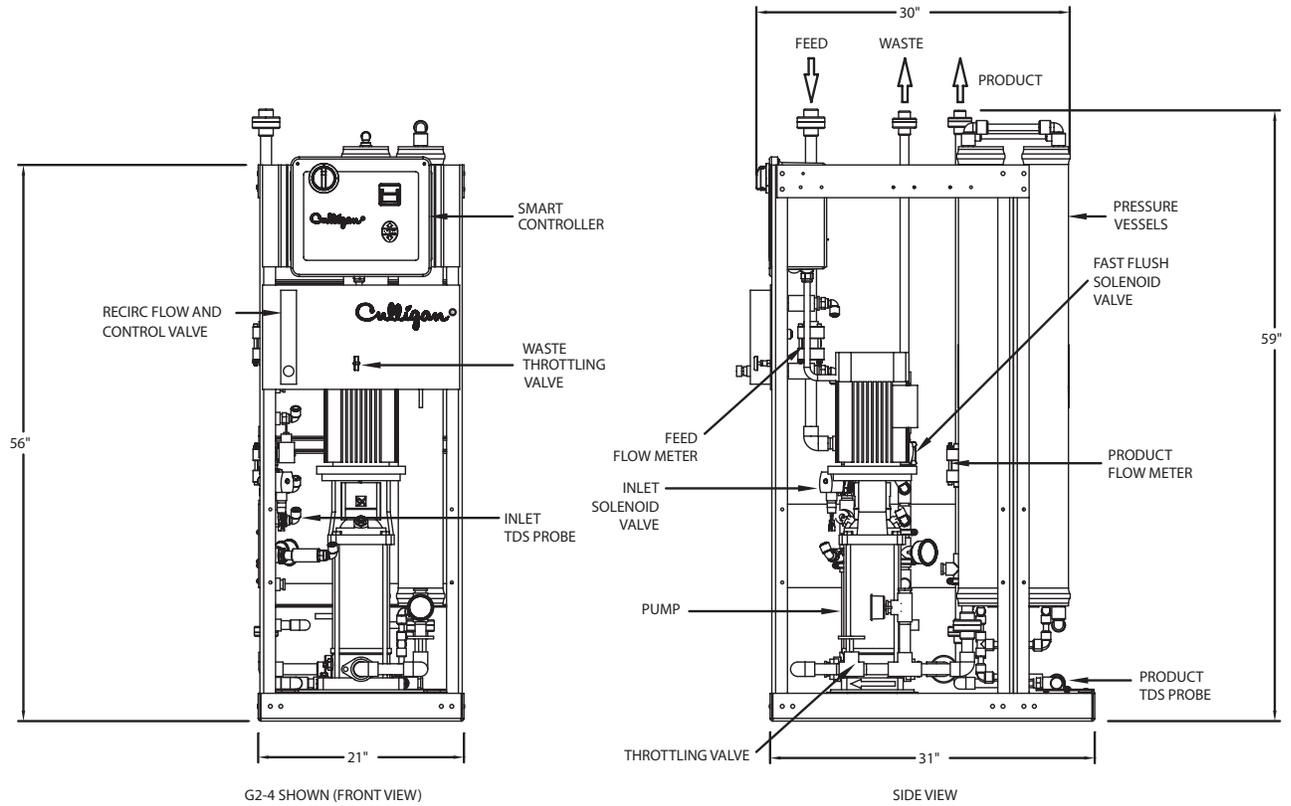


Figure 1. G2 RO 2HE–6HE (narrow), front and side views.

Series G2 (Wide) Major Components and Water Connections

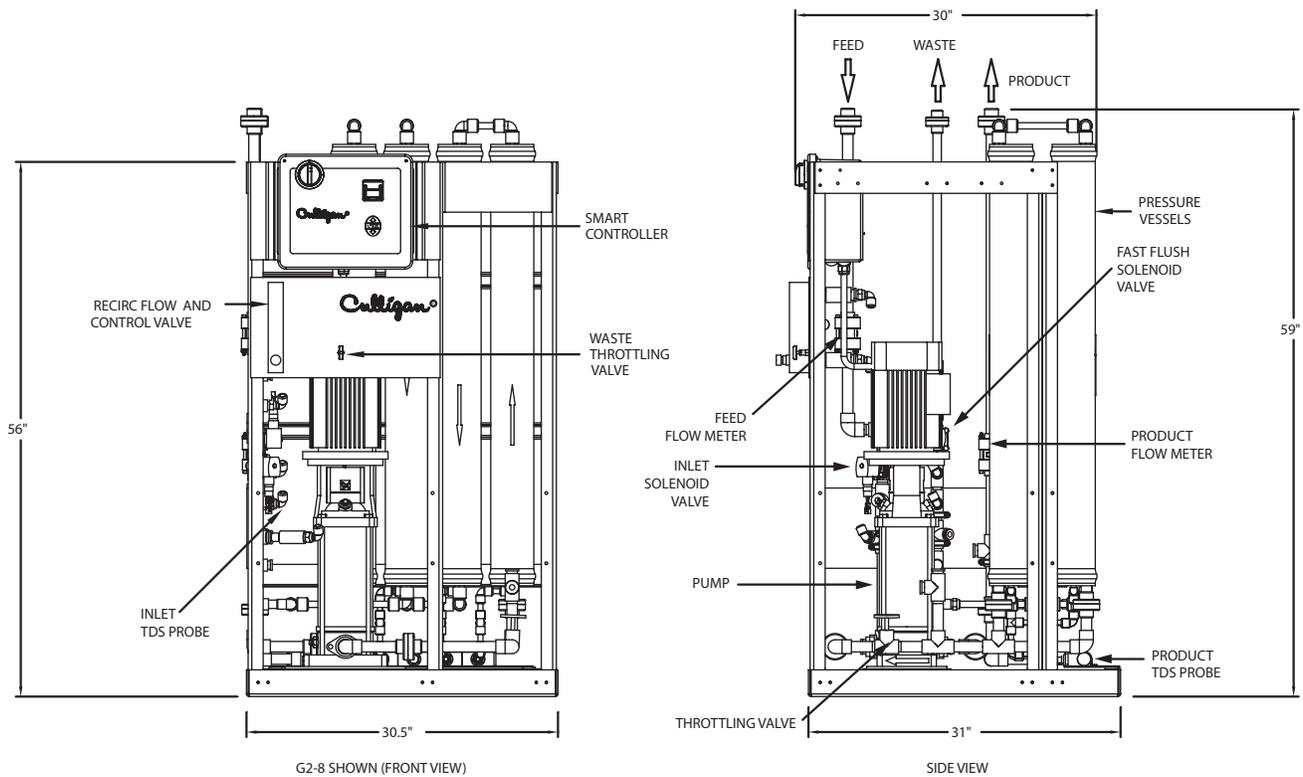


Figure 2. G2 RO 7HE-10HE front view.

Unpacking the G2 RO

This manual, the warranty, and registration card are packed in the control assembly box. Please complete the registration card and mail it promptly.

NOTICE Examine each unit component carefully to check for loose or damaged parts. Report any apparent or concealed shipping damage to the freight carrier immediately.

Installation Materials

To install the system, the following items are required:

- Screwdrivers, including two 0.125" flat blade screwdrivers for wiring or jumper clip removal tool (PN 01006356).
- Level
- Tubing Cutter
- Pipe wrench or channel locks
- Floor mounting hardware
- Adjustable wrench
- Feed water plumbing connection, 3/4" NPT
- Product water plumbing connection, 1/2" or 3/4" NPT
- Concentrate plumbing connection, 1/2" NPT
- Liquid-tight conduit connectors or cord grip connectors (PN 01002525).
- Portable total dissolved solids meter
- Thermometer
- Graduated cylinder, 4000ml
- Clean rags
- Safety glasses

Installation Location

Allocate the appropriate space and locate the unit so that all components are accessible for maintenance and monitoring. The specification data lists the dimensions. Note that these figures do not account for working space around the unit and the space for plumbing connections. The work space requirements for the module assembly is at least four (4) feet of space at the top end of the housings. This will allow for future replacement of RO membrane modules.

For Series G2 units, the steel frame is designed to distribute the operating weight on an even floor space. If the floor is uneven, grout beneath the steel frame feet so that the unit is evenly supported. Secure the base of the frame with four (4) 5/16" diameter bolts.

NOTICE Do NOT use any bolt size smaller than 5/16" diameter.

The unit must be located near a drain able to handle 10–20 gallons per minute (37.9–75.8 liters/min). This is in addition to the flow from any other water treatment equipment.



CAUTION! The system must not be located near any corrosive chemicals which may cause failure of the plastic or metal parts of the unit. In addition, do not locate the unit where the temperature may exceed the feed water temperature limits.

A 230 VAC/60 Hz/three-phase or 208 VAC/60Hz/three-phase grounded power supply with 30 Amp fuse protection and a local disconnect switch is required.



WARNING! The system must be grounded. An improperly grounded unit could cause injury from electrical shock!

Module Preservative Disposal

The module housing contains sodium metabisulfate solution to preserve the RO membranes during shipment. Remove the plugs from all of the ports of the system assembly and discard this solution following state and federal guidelines for chemical disposal.

Mounting the Prefilter

1. Locate the prefilter packed with the main unit.
2. Place the short end of the prefilter bracket on the wall, level the bracket, and mark the wall through the holes.
3. Drill holes in the wall and mount the prefilter bracket with the screws provided.
4. Unscrew the prefilter bowl and remove the filter cartridge.
5. Rinse the bowl and head with water and dry with a clean rag.
6. Attach the prefilter head to the bracket with the screws provided.
7. Lubricate the seal ring with silicone lubricant as required.
8. Remove the paper wrapper from the cartridge, place the cartridge in the bowl, and screw the bowl onto the head.

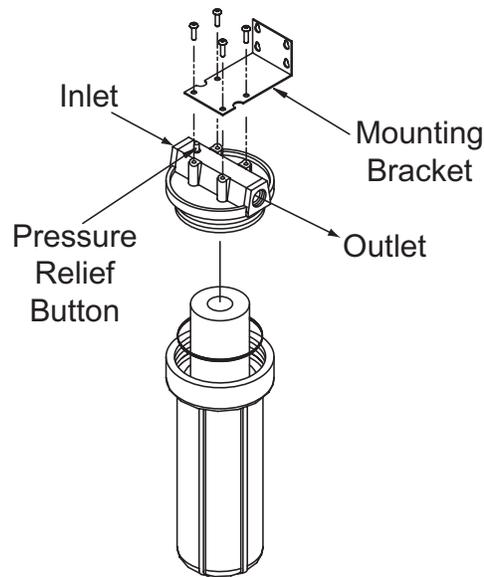


Figure 3. Mounting the Prefilter.

Plumbing Installation

Refer to the hydraulic schematic on page 9 for further information.

Feed Water Connections

Connect pipe or tubing to the Feed water inlet. Observe the following:

1. To minimize pressure loss, use pipe or tubing size at least 1" in diameter.
2. Install a shutoff valve in the inlet plumbing to simplify maintenance and service.
3. If the feed water can be used for a short period, install bypass plumbing around the unit.
4. Install a tee, with shutoff valve on the branch, in the inlet plumbing for drawing in cleaning solution. Install a 1" straight barb hose fitting (part number 01001605) into the shutoff valve, and connect 1" hose of sufficient length to reach a drain. Secure this hose with a hose clamp from the small parts pack.
5. Install a pressure regulator in the inlet plumbing to assure constant pressure and to prevent harmonic vibration. Install a pressure gauge after the regulator.

Concentrate Water Connections

For Series G2 units, connect 1/2" piping to drain from the outlet of the unit.

To prevent siphoning of the water in the unit to drain, raise the concentrate piping above the level of the modules and provide an anti-siphon loop.

NOTE The concentrate outlet union ships with a seal to retain the module preservative. You must remove the seal before attempting to flush the preservative.



WARNING! An air gap must be provided between the end of the concentrate tubing and the drain to prevent back-siphoning of drain contents.

Product Water Connections

For G2-2 through G2-6 units, the 1/2" product line connection is located at the top of the unit. For G2-7 through G2-10 units, the product line is located at the 3/4" connection at the top of the unit.



CAUTION! This unit produces high quality product water. This water can be contaminated by plumbing following the unit or it can corrode the plumbing. Use only plumbing components of inert material that are compatible with the application.

The connection of the main product tubing to service plumbing will depend on how the product water will be stored.



CAUTION! Reverse osmosis elements will fail immediately if pressurized product water is allowed to flow backward into the Series G2 unit.

Pressurized Storage Tank

The product water can be stored in a pressurized storage tank with the reverse osmosis unit controlled by a pressure switch. Use the same components used for direct feed (see Figure 4 on page 10). The pressure switch needs to be wired to the control panel as a float switch (see Figure 55 on page 113 for G2 standard wiring). A pressurized water storage kit is available for the G2 under part number D1013880. Connect the product tubing to a bulkhead fitting at the top of the storage tank such as 01005095 (2-gallon), 01004776 (3-gallon), or 01004765 (9-gallon).

Non-Pressurized Product Water Storage Tank

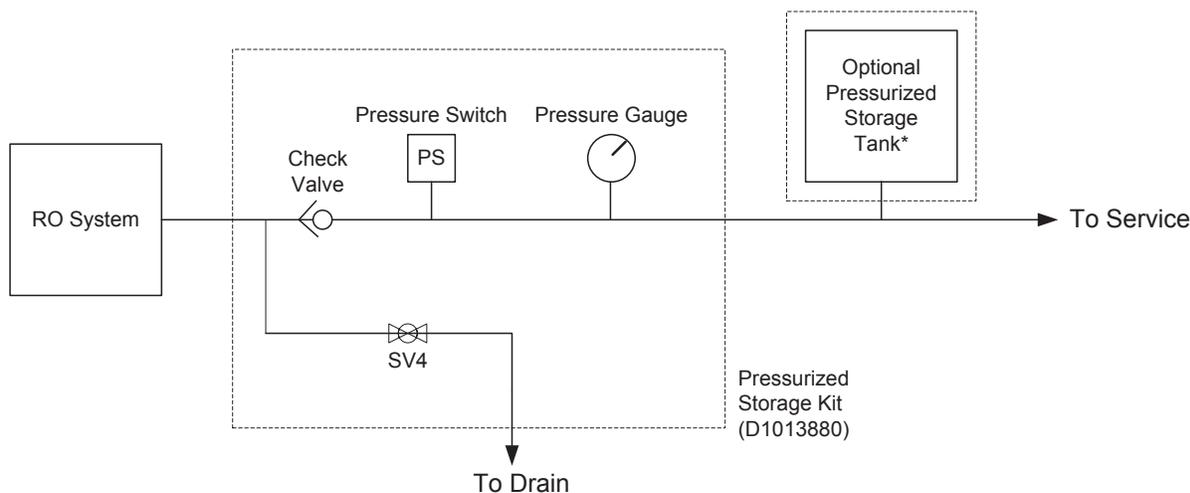
Depending on the type of application, a level control may be required to turn the unit off when the storage tank is full. Install the level control according to the instructions provided with the control. See “Figure 55. GBE RO Controller and Culligan Interface Board basic sub-panel wiring.” on page 113 for electrical connections.

NOTICE If a repressurization pump is used, an additional level control is recommended to prevent the pump from running dry if the storage tank is empty.

To maintain high water quality, a hydrophilic air vent filter, vacuum breaker, pop-off valve, ultraviolet lamp, and pressure relief valve may be required.

Direct Feed

If the product water is to be used directly, without storage, a few precautions are necessary to prevent damage to the elements. Install a pressure gauge, pressure relief valve, and a normally-open (“dump”) solenoid in the product water line as shown in Figure 4, or use pressurized storage kit (D1013880). The pressure gauge will allow the operator to monitor the product water pressure. The relief valve, which should be set to open at 40 psig, will prevent the product water pressure from exceeding 40 psi. The dump solenoid will relieve all pressure when the unit is off.



*Use of Pressurized Storage Tank requires use of Pressurized Storage Kit D1013880. When using D1013880 you must set the float switches to be NORMALLY CLOSED.

Figure 4. Direct feed connection.

Wire the direct feed/pressurized storage solenoid valve in parallel with the motor.

Valve SV4 closes when the RO pump runs; SV4 opens when the pump stops, allowing all membrane back pressure to be relieved.

NOTICE Product back pressure will decrease the net pressure pushing water through the reverse osmosis elements. Therefore, the flow of product water will decrease.

First Time Setup Procedure

If at any time you need to re-run the First Time Setup, refer to “Menu Default—Rerun First Time Setup” on page 13.

After completing the plumbing connections to the water softener, turn on and program the Global RO Controller.

Select Language (English, French, Italian, Spanish)

LANGUAGE
ENGLISH

1. Apply power to the unit. When a new controller is first turned on, the screen displays LANGUAGE. Press   or  and then  to change the value and begin first time setup in your preferred language.

Serial Number

FIRST TIME SETUP
PRESS DOWN ARROW

1. Plug in the wall transformer. When a new controller is first turned on, the screen displays FIRST TIME SETUP. Press the DOWN ARROW button.

S/N:00012345

FWR202LT04
Jan 30 2012

2. The screen displays the serial number and firmware version and date installed for this GROC. Press the DOWN ARROW button to accept this information. The screen displays the first setting, month.

NOTE The S/N, firmware, and date displayed in this manual are examples only.

NOTE If this unit will be installed with a modem, it is required that this electronic serial number be reported to Culligan on the IQR form.

Setting Up Date and Time

SET
MONTH JAN

1. The screen displays the month setting. Press the DOWN ARROW button to accept this information and view the day setting.

SET
MONTH >JAN

2. Press  to select the item. The screen displays a cursor next to the value. This indicates that the value may be changed by pressing the  or  button.

SET
MONTH >FEB

3. Press  to select a new value. The screen displays the new setting value next to the cursor.
4. Press  to select the next available value. You may press  or  to scroll through all available options for this setting.

SET
DAY 1

5. Press  to accept the selected screen value. The controller accepts the new value and displays the next setting.

Other First Time Setup Settings

Screen Display	Range	Procedure
SET DAY 1	1-31	1. The screen displays the day setting. Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the value and see the next setting.
SET YEAR 2012	2010-2040	2. The screen displays the year setting. Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the value and see the next setting.
CLOCK TYPE 12 HR	12 or 24	3. The screen displays the clock type setting. Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the value and see the next setting.
SET HOUR 12PM	12AM-11PM	4. The screen displays the hour setting. Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the value and see the next setting.
SET MINUTES 25	0-59	5. The screen displays the minutes setting. Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the value and see the next setting.
POWERON MODE OFFLINE	Running Offline	6. The screen displays the selected status of the RO when powered on. Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the value and see the next setting.
SYSTEM UNITS US INCH	US INCH METRIC	7. The screen displays the units of measure setting. Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the value and complete the first-time setup.

NOTE This setting does not automatically change to metric if you select a language other than English.

Completed First Time Setup

STARTING JAN-01-12 12:01P	1. When the setup is complete, the circuit board microprocessor automatically calculates the water conditioner capacity. The screen displays the initializing status and the current date and time, and then transitions to the home screen.
RUNNING JAN-01-12 12:01P	2. The screen displays the current state of the RO system (RUNNING or OFFLINE) and the date/time set for the unit. This is the default home screen.

Menu Lockout

It is possible to lock the keypad of the Global RO controller so that users will only have access to the INFORMATION, GO TO RUNNING, and GO TO OFFLINE menu screens.

To lock the system, press and hold  and  for 10 seconds. Repeat this process to unlock the keypad.

NOTE Menu lockout may be completed only from the home screen.

Menu Default—Rerun First Time Setup

Below is the procedure to default the board to factory settings and begin the first time setup.

1. Power down the control.
2. Press and hold  and .
3. Power up the control while continuing to hold  and  for at least five (5) seconds.
4. Release  and . The display should be blank—if not go back to step 1.
5. Power down the control.
6. Power up the control again. The screen lights up for two seconds and then displays the home screen.
7. Follow the first time setup process.

Flow Meters

There are two flow meters on the G1 RO system, the feed flow meter (FM₁) and the product flow meter (FM₂). These flow meters are calibrated at the factory prior to shipping.

$$FM_1 = \frac{(FM_{1_INITIAL}) \times (FFLOW_{DISPLAYED})}{FFLOW_{ACTUAL}}$$

Where

FM₁ INITIAL is the current K factor (set at the factory)

FFLOW_{DISPLAYED} is displayed on the GBE RO controller

FFLOW_{ACTUAL} = (Actual Product Flow) + (Actual Waste), in gallons per minute

$$FM_2 = \frac{(FM_{2_INITIAL}) \times (PFLOW_{DISPLAYED})}{PFLOW_{ACTUAL}}$$

Where

FM₂ INITIAL is the current K factor (set at the factory)

PFLOW_{DISPLAYED} is displayed on the GBE RO controller

PFLOW_{ACTUAL} = (Actual Product), in gallons per minute

1. Verify that the displayed values on the GBE RO controller match the actual values.
2. The measured/calculated flow rates should be verified at the target flow rates. If not, repeat this procedure.

RUNNING
JAN-01-12 12:01P

1. From the default home screen, press . The screen displays the main menu.

1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP

2. Press  to scroll to 4) SETUP.
3. Press  to select the SETUP menu.

2) LANGUAGE
 3) POWERON MODE
 4) FLUSH MODES
 >5) ACCESSORIES

1) WIRELESS REM
 2) MODEM
 >3) FLOW METERS
 4) SWITCH INPTS

4. Press to select 5)ACCESSORIES. The screen displays the accessories menu.

5. Press to select 3)FLOW METERS. The screen displays the flow meter settings.

Flow Meter Settings

Screen Display	Range	Changing the Setting
FLOW METERS INSTALLED	Installed Not Installed	The screen displays the installation status of the flow meter. Press to change the state to installed if a flow meter is installed in the RO system.
FM1 K FACTOR 80.0	0-9999	Press or and then to change the K-Factor to the calculated value for the flow meter FM1 and/or FM2.
RUNNING JAN-01-12 12:01P		6. Press to save the settings and return to the home screen.

3. Once all the desired flows are set, allow the system to run for approximately 30 minutes, and then record the following measurements using the units gauges (U), GROC information screens (G), and your instruments (I):

- a. Feed Flow Rate, gpm (G) _____
- b. Feed Water Temperature, °F (I) _____
- c. Feed Water SDI (I) _____
- d. Feed TDS, ppm (I) _____
- e. Inlet Pressure, psig (U) _____
- f. System (pump outlet) pressure, psig (U) _____
- g. Product TDS, ppm (G) _____
- h. Product Flow, gpm (G) _____ x TCF¹ = _____
- i. Product Temperature, °F (G) _____
- j. Product Pressure, psig (I) _____
- k. Concentrate (waste) flow, gpm (a-h) _____
- l. % Recovery (see page 31) _____
- m. % Rejection (see page 31) _____

¹TCF = Temperature Correction Factor. Refer to Table 1 on page 16 for this value.

NOTICE The Global RO Controller has a feature which records historical data. The initial startup data is kept in the controllers memory. It is still a good idea to record the values on a separate sheet of paper and keep the data near the unit in case of electrical problems.

4. Choose GO TO OFFLINE from the main menu. Connect the product tubing to the service plumbing.
5. Test the operation of the pressure switch by closing the inlet water supply valve. The unit should shut off immediately.



CAUTION! If the unit does not shut off, turn the unit OFF immediately to prevent pump damage. Disconnect electrical power source, then check the wiring and replace the switch, if necessary.

6. Open the inlet water supply valve. The unit should restart.
7. If connected, test the storage tank level control shutdown and the pretreatment lockout function.

Normal Operation

During normal operation, the system usually will start up and shut down based on signals from a level control or pressure switch. Adjust the feed pressure as required (no higher than 150 psig) to maintain a constant product flow. Record the performance data regularly and compare it to the performance on initial start up. If any changes are noticed, the product flow should be normalized to determine if cleaning is required (see Product Flow Calculations in the Service and Maintenance section).

Product Flow Calculations

The product flow rate depends primarily on feed water pressure, product water pressure, and temperature. All 1-Series RO water conditioners have specified nominal flow rates based on approximately 105 psig net pressure and 77°F temperature. However, in most applications the temperature and pressure are lower, so the product flow rate is lower than the nominal flow rate. The actual flow rate must be converted to flow under standard conditions, then compared to the initial performance (also converted to standard conditions) to determine whether the system is still working properly.

To convert the data to standard conditions,

1. Measure the product flow. Example: 1000 ml/min
2. Measure the feed pressure. Example: 120 psig
3. Measure the product pressure. Example: 5 psig
4. Subtract the product pressure from the feed pressure. Example: 115 psig
5. Divide the product flow by the result from step 4. Example: $1000 \div 115 = 8.69$ ml/min/psi
6. Multiply the result from step 5 by 105. Example: $8.69 \times 105 = 913$ ml/min
7. Measure the temperature of the feed water, then determine the temperature correction factor from Table 1. Example: At a temperature of 55°F, the factor is 1.54.

Temp. °F	Temp. °C	Correction Factor	Temp. °F	Temp. °C	Correction Factor
40	4.4	2.12	75	24	1.04
45	6.7	1.90	80	27	0.95
50	10	1.71	85	29	0.86
55	13	1.54	90	32	0.79
60	16	1.39	95	35	0.72
65	18	1.26	100	38	0.66
70	21	1.14			

Table 1. Temperature Correction Factors

8. Multiply the result of step 6 by the temperature correction factor. Example: $913 \text{ ml/min} \times 1.54 = 1406 \text{ ml/min}$.

NOTICE To convert ml/min to gallons per day, multiply by 0.38. For example, $1406 \text{ ml/min} \times 0.38 = 534 \text{ gpd}$.

9. Compare the current standardized flow to the initial standardized flow. If the flow has decreased by 15% or more, it is time to clean the elements.

Example: If the initial standardized flow was 570 gpd, and the current standardized flow is 470 gpd, the flow has decreased by 100 gpd, or 18% ($100/570 = 0.18$). The elements should be cleaned.

10. If the problem cannot be corrected with the troubleshooting guide and assistance is required, please have the following information available when calling the Culligan dealer:
 - Product flow rate
 - Concentrate flow rate
 - Feed pressure
 - Product water quality
 - Feed water quality
 - Feed water temperature
 - Prefilter outlet (and inlet if the optional prefilter inlet gauge was installed)
 - Product pressure

Switch Inputs

Several switch types may be installed in an RO system, including

- Low Pressure Switch
- Pretreatment Lockout Switch
- Float (Level Control) Switch

See “GBE RO Controller and CIB Wiring” on page 113 for a diagram of all three switches.

Low Pressure Switch

The GBE RO Controller is equipped with a low pressure switch to protect the pump from starvation/cavitation. If the inlet pressure switch goes LOW and stays there for at least XX seconds (set at setup/accessories/switch inputs), the pump will turn off. For a positive displacement pump, XX should be specified at 1–5 seconds. The controller keeps track of how many times this happens: if fewer than five times since the most recent of either midnight or the last time the operator manually selected GO TO RUNNING from the main menu, then the system will attempt to restart. If this is the fifth time it has happened, then the system goes to OFFLINE and throws the LOW INLET PRESSURE error condition.

NOTE This five-time counter on the number of restarts allowed resets to zero every night at midnight and every time that the operator selects YES from the Main Menu/Go to Running screen.

The pressure switch is prewired at the factory to the GBE RO controller AUX board POSITION (J1) pins utilizing pins 2 and 4. The switch is factory set to 18 psi. The pressure can be adjusted from 6 psi to 30 psi by turning the knurled ring on the body of switch clockwise to increase the pressure and counter-clockwise to decrease. One revolution is approximately 6.5 psi.

Pretreatment Lockout

The GBE RO controller allows an external contact closure to cause the RO to go into a “pre-treat lockout” condition. If the GBE RO controller state was in any state other than OFFLINE, the state will change to STANDBY as soon as the pretreat lockout is engaged. When pretreat lockout is disengaged, the system will either move to STARTING or stay in STANDBY based upon the status of the float switches and the settings specified at main menu/ setup/ accessories/ switch inputs.

The pretreat lockout can be engaged by either a normally open or normally closed input signal to the pretreat lockout terminals from the main menu/setup/accessories/switched inputs menus. The factory default is that CLOSED will specify pretreat lockout.

Note that the pre-treat lockout input switch must move to, and stay in its new position for a continuous period of at least two (2) seconds for the pretreat lockout to be triggered

Timeclock controlled softeners, such as the Hi-Flo® 3, do not offer pretreatment lockout. If these units are used for pre-treatment, they should be duplexed, or regenerated by a timeclock so that regeneration can occur when the unit is not in operation.

Wiring for Softeners and Filters Using MVP Controller

For these systems, you must add a 24 VAC relay, part number 01016156, to provide the pretreatment contact.

MVP to Relay: Connect a wire from terminal 5 of the relay to the left terminal of P8 (Aux 2) on the MVP circuit board. Connect another wire from terminal 1 of the relay to the right terminal of P8. Refer to Figure 5.

Relay to circuit interface board: Connect a wire from POSITION (J36), PIN 3 terminal on the circuit interface board (CIB) to terminal 3 on the relay. Connect another wire from POSITION (J36), PIN 4 terminal on the CIB to terminal 4 on the relay. Use Wago connectors to connect cables to the circuit interface board

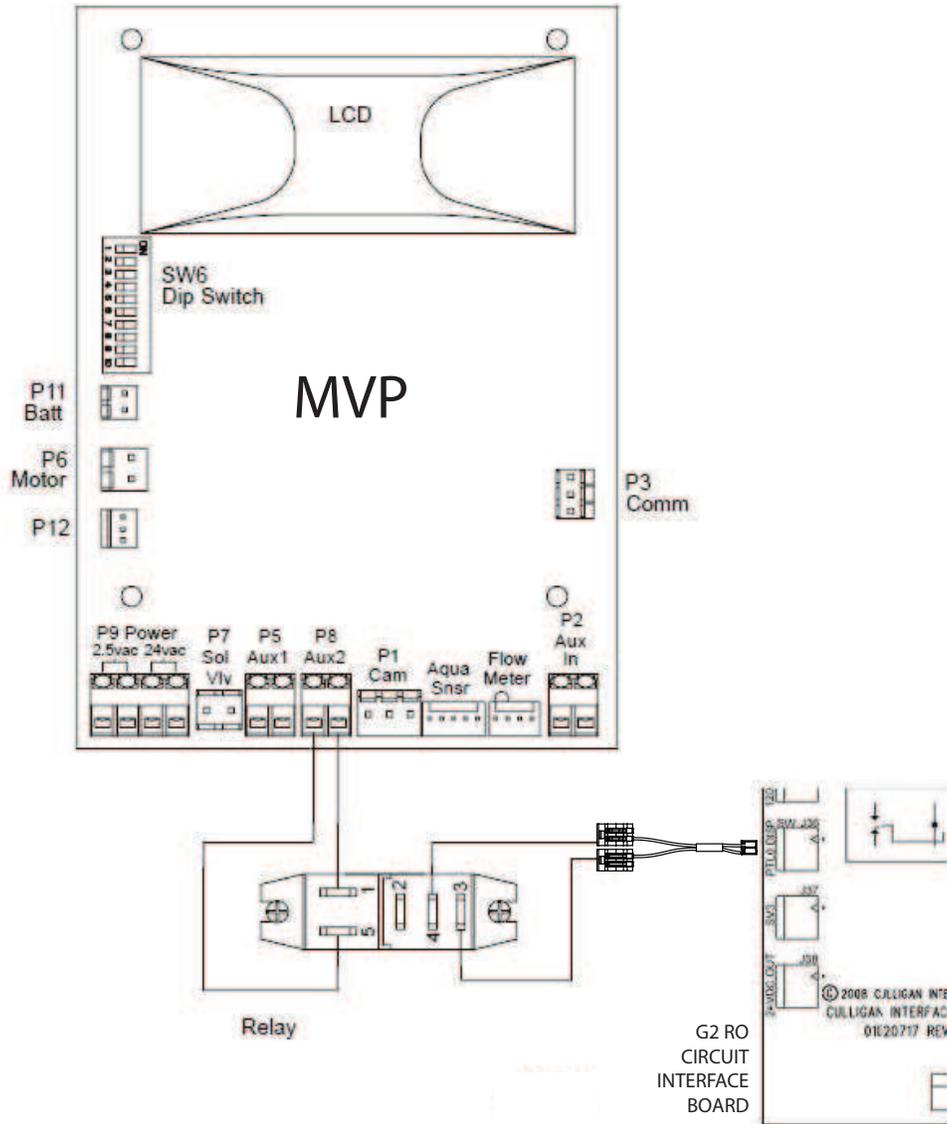


Figure 5. MVP-relay-G2 RO CIB connection.

Wiring for Softeners and Filters Using GBE Controller

For these systems, you must add a 24 VAC relay, part number 01016156, to provide the pretreatment contact.

GBE to Relay: Connect a wire from terminal 5 of the relay to the left terminal of Aux 4 on the GBE softener/filter circuit board. Connect another wire from terminal 1 of the relay to the right terminal of Aux 4. Refer to Figure 6.

Relay to GBE RO controller: Connect a wire from POSITION (J36), PIN 3 terminal on the circuit interface board (CIB) to terminal 3 on the relay. Connect another wire from POSITION (J36), PIN 4 terminal on the CIB to terminal 4 on the relay. Use Wago connectors to connect cables to the circuit interface board.

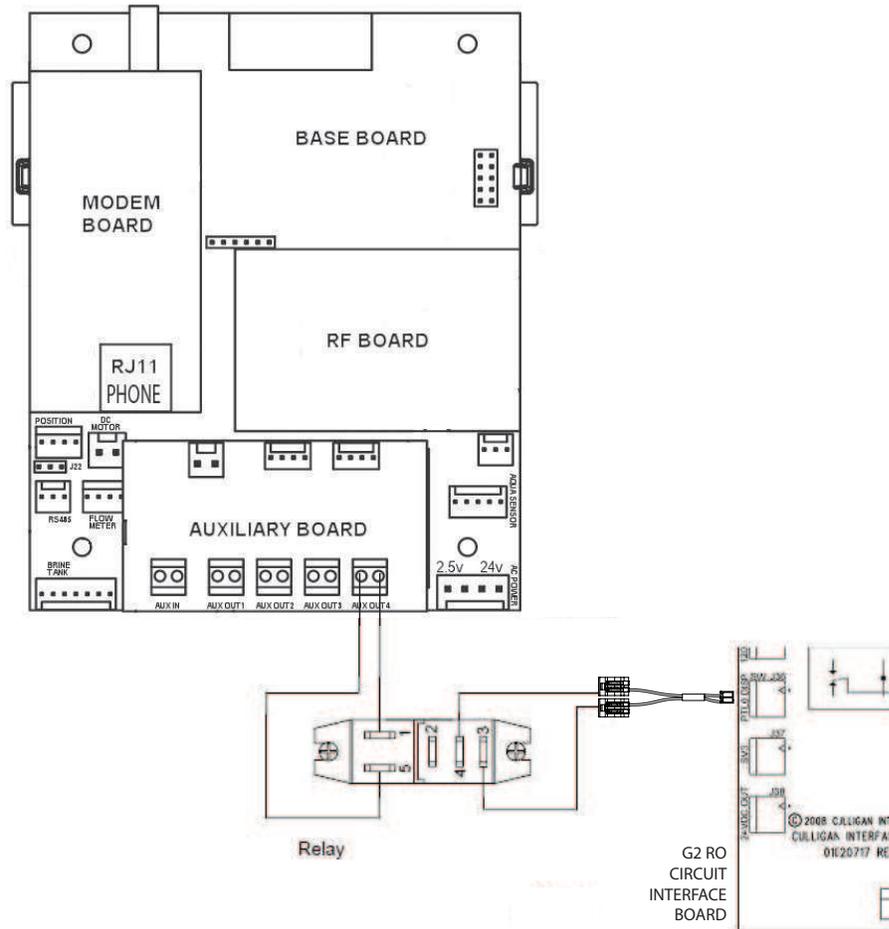


Figure 6. GBE-relay-CIB connection.

Float Level Control

The GBE RO controller provides a Level Control High switch as well as a Level Control Low switch. You can use the Level Control High switch alone, or with the Level Control Low switch.

The Level Control connections are located on the circuit interface board at positions (J18) for high level and (J19) for low level.

These switches can be specified to be either “OPEN WHEN LEVEL IS ABOVE SWITCH” or “CLOSED WHEN LEVEL IS ABOVE SWITCH” when the level of water is above the switches. Both switches must have the same OPEN or CLOSED specification. For example, you can specify (main menu/setup/accessories/switch inputs) that the float switches will be CLOSED when the level of water is above the level of the switches. The system assumes that a float switch is “off” when the water is below the switch and it is on when the state of the switch matches to user specified OPEN or CLOSED condition. Use the GBE RO controller switch accessory kit (PN 01022360) to connect Float Switch and Pretreatment Lockout to the controller board. The kit contains four connectors (01021838) with wire leads. See page 113 for wiring information.

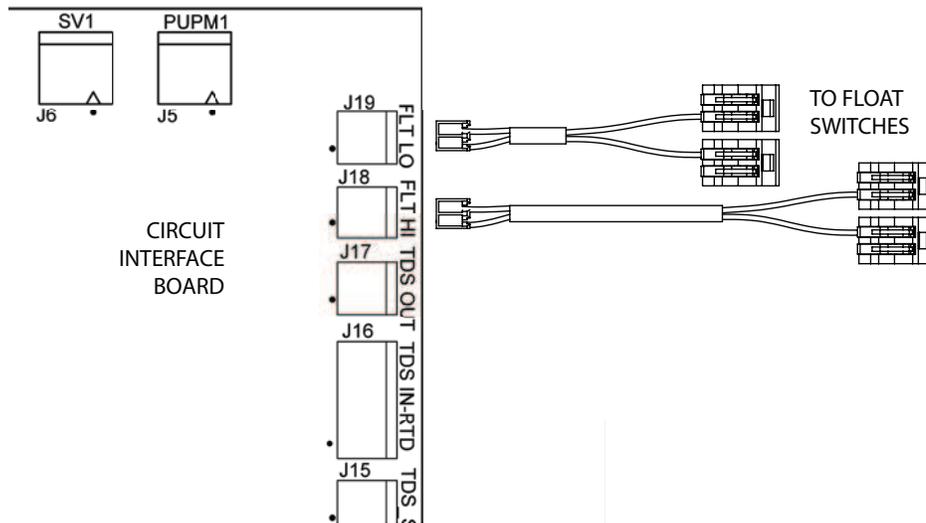


Figure 7. GROC-CIB float switch connection.

Storage Tank Setup When Using Both a High and Low Level Float Switch (Two Floats)

When two floats are used, the behavior of the controller is such that it will switch from RUNNING to STANDBY when the water reaches the upper float switch and it changes state from being off to on. The system will stay in STANDBY until the LOWER float switch transitions from on to off. When this LOWER switch transitions from on to off, the system will switch back into RUNNING unless it is also in Pretreat Lockout at this point in which case it will transition to RUNNING when the Pretreat Lockout disengages.

In order for the system to operate correctly using two float switches, it is necessary to specify a value of 0 (zero) as the Hi Float Restart Delay time (main menu/steup/accessories/switch inputs).

Storage Tank Setup When Using a Single High Level Float Switch

Connect the level control to the FLTHI terminals. The system will switch from RUNNING to STANDBY when the water reaches the upper float switch and it changes state from being off to on. The system will transition back to RUNNING a specified number of minutes after the upper float switch transitions from on back to off. The specified number of minutes to delay must be greater than 0 (zero). If it is specified as zero, then the system will operate as described in the previous paragraph for two-float switches. The delay can be specified in whole minutes up to a maximum of 999 minutes. Note that it is necessary to select this delay carefully, based upon the size of the storage tank and the maximum rate of draw-down on the storage tank in comparison to the maximum rate of producing RO water or it is possible that the storage tank could run dry.

NOTICE Do not apply power to these terminals. Use dry contacts only.

Switch Inputs Programming

```
RUNNING
JAN-01-12 12:01P
```

1. From the default home screen, press . The screen displays the main menu.

```
1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
```

2. Press to scroll to 4) SETUP.

3. Press to select the SETUP menu.

2) LANGUAGE
 3) POWERON MODE
 4) FLUSH MODES
 >5) ACCESSORIES

4. Press to select 5)ACCESSORIES. The screen displays the accessories menu.

1) WIRELESS REM
 2) MODEM
 3) FLOW METERS
 >4) SWITCH INPTS

5. Press to select 4)SWITCH INPTS. The screen displays the switch inputs settings.

Switch Inputs Settings

Screen Display	Range	Changing the Setting
PRESSURE SWITCH NORMALLY OPEN	Normally Open Normally Closed	Used with the inlet pressure switch. Standard pressure switch is normally open. Press or and then to change the state if necessary.
PS Sw Delay: 5 SECONDS	0-9,# each digit	Sets the pressure switch delay time. This is the number of seconds the low pressure must exist before activating the switch. Press or and then to change.
SV1 Delay: 10 SECONDS	0-300	The number of seconds elapsed from the inlet solenoid valve (SV-1) opening until the motor starts. Press or and then to change.
PRETREAT SWITCH NORMALLY OPEN	Normally Open Normally Closed	Used with the inlet pressure switch. Standard pressure switch is normally open. Press or and then to change the state if necessary.
FLOAT SWITCHES NORMALLY OPEN	Normally Open Normally Closed	Used to set whether float switches (level control) are normally open or closed. There are two float switch contacts; they both must be normally open or closed. Press or and then to change the state if necessary.
FS Hi Delay: 0 MINUTES	0-120	Used only when using the float switch high contacts. This sets how long the float switch stays closed after transitioning from high to low level.
RUNNING JAN-01-12 12:01P		6. Press to save the settings and return to the home screen.

GBE RO Controller Program Data

Program Data Input

There are a few items to note that can make programming the Culligan® Global RO Controller easier:

Slew Rates	This term refers to the speed at which the display moves through the input of material. For example, holding down the up arrow key for (5) seconds when inputting minutes for Time of Day will cause the minutes to pass in (10) minute blocks of time. Press the up arrow or down arrow keys for shorter periods (less than 5 seconds) will slow the rate. To move through the programming slowly, do not hold down the up arrow or the down arrow keys.
Beeper	A beeper is available to assist the user by providing an audible tone (about 70 decibels) to signify valid (one beep) and invalid (three beeps) key presses. The beeper can be deactivated in the programming mode. (If error occurs, beep will still sound even if set to "No" programming.)
Programming Mode Timeout	If there is no keypad activity for a one (1) minute period while in the programming mode, the controller will exit the programming mode and return to the main display. Any setting that was changed prior to the control timing out will revert to the original value. Pressing the CHECK MARK button saves the setting.
Program Input Acceptance	For programming information to be accepted, the check mark key must be depressed prior to programming mode timeout.

After the first-time setup has been completed, the RO system will be online (RUNNING) or offline (OFFLINE). You can change the operation status of the system from the main menu on the Global RO Controller.

```
RUNNING
JAN-01-12  12:01A
```

1. This is the home screen. Press any button except **X** to display the main menu.

Go To Running

```
>1)GO TO RUNNING
 2)GO TO OFFLINE
 3)INFORMATION
 4)SETUP
```

2. Press **✓** to select 1)GO TO RUNNING.

```
GO TO RUNNING
NO
```

3. The GROC screen displays the GO TO RUNNING command. Press **✓** **↑** or **↓** and then **✓** to change the value to YES if you want the system to start running (select NO to cancel the command and return to the main menu).

```
STARTING
JAN-01-12  12:01P
STARTUP FLUSH
```

4. The screen displays the status of the unit as it initiates the startup process.

```
RUNNING
JAN-01-12  12:01A
```

5. The home screen displays the operational status (RUNNING).

Go To Offline

```
1)GO TO RUNNING
>2)GO TO OFFLINE
 3)INFORMATION
 4)SETUP
```

1. Press **↓** **✓** to select 1)GO TO OFFLINE.

```
GO TO OFFLINE
NO
```

2. The GROC screen displays the GO TO OFFLINE command. Press **✓** **↑** or **↓** and then **✓** to change the value to YES if you want the system to stop running (select NO to cancel the command and return to the main menu).

```
OFFLINE
JAN-01-12  12:01A
```

3. The screen displays the main menu. Press **X** repeatedly to return to the home screen, which displays the operational status (OFFLINE).

Setup

After completing the first time setup for the RO, you must also complete the system setup for flush modes, accessories, and error limits before completing the initial startup.

Flow Meter K-Factor setting (page 13) is required during setup. All other RO settings are optional depending on the accessories installed. The RO controller does not require any specific setup to run unless accessories are installed or will be installed. RO accessories include:

Accessory	Global RO Controller (GROC) Setting
Flush Valves	Setup—>Flush Modes
Flow Meters	Setup—>Accessories—>Flow Meters
Modem	Setup—>Accessories—>Modem
Wireless Remote, RF Board	Setup—>Accessories—>Wireless Rem—>Channel #
Level Controls	Setup—>Accessories—>Switch Inputs
Repressurization System	Setup—>Accessories—>Switch Inputs
Pretreatment Lockout	Setup—>Accessories—>Switch Inputs
Pressure Transducers (G2, G3 only)	Setup—>Accessories—>Press Gauges

System Setup

Set Up Time/Date

If the unit loses time for some reason, you can use this setting to reset the correct date and time. Please note that if you have a modem installed and connected to the phone line, the unit will check for the correct time each time it calls in.

```
RUNNING
JAN-01-12  12:01P
```

1. From the default home screen, press . The screen displays the main menu.

```
1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
```

2. Press to scroll to 4) SETUP.
3. Press to select the SETUP menu.

```
>1) TIME/DATE
2) LANGUAGE
3) POWERON MODE
4) FLUSH MODES
```

4. Set Time/Date is the first menu item, so press to select 1) SET TIME/DATE. The screen displays the first setting that can be changed.

Time/Date Settings

Screen Display	Range	Procedure
SET MONTH JAN	Jan-Dec	1. The screen displays the month setting. Press or and then to change the value and see the next setting.
SET DAY 1	1-31	2. The screen displays the day setting. Press or and then to change the value and see the next setting.

Screen Display	Range	Procedure
SET YEAR 2012	2010–2040	3. The screen displays the year setting. Press or and then to change the value and see the next setting.
CLOCK TYPE 12 HR	12 or 24	4. The screen displays the clock type setting. Press or and then to change the value and see the next setting.
SET HOUR 12PM	12AM–11PM	5. The screen displays the hour setting. Press or and then to change the value and see the next setting.
SET MINUTES 25	0–59	6. The screen displays the minutes setting. Press or and then to change the value and see the next setting.
DAYLIGHT SAVING YES	YES NO	7. The screen displays whether you observe daylight savings time where the RO unit is installed. Press or and then to change the value and return to the Time/Date menu.
RUNNING JAN-01-12 12:01P		8. Press to return to the home screen.

Set Up Lanuage

Use the language setting to change the displayed language on the RO controller.

NOTE Ensure the units of measure (US, Metric) are appropriate. See page 16 to change if necessary.

RUNNING JAN-01-12 12:01P	1. From the default home screen, press . The screen displays the main menu.
1) GO TO RUNNING 2) GO TO OFFLINE 3) INFORMATION >4) SETUP	2. Press to scroll to 4) SETUP. 3. Press to select the SETUP menu.
1) TIME/DATE >2) LANGUAGE 3) POWERON MODE 4) FLUSH MODES	4. Press to select 2)LANGUAGE. The screen displays the last selected language of the RO controller.

LANGUAGE
ENGLISH

5. Press or and then to change the display to your preferred language.

1) HEURE/DATE
>2) LANGUE
3) EN MARCHE
4) MODES FLUSH

6. The screen displays the setup menu in the selected language of the RO controller.

Set Up Power On Mode

RUNNING
JAN-01-12 12:01P

1. From the default home screen, press . The screen displays the main menu.

1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP

2. Press to scroll to 4) SETUP.
3. Press to select the SETUP menu.

1) TIME/DATE
2) LANGUAGE
>3) POWERON MODE
4) FLUSH MODES

4. Set Time/Date is the first menu item, so press to select 3)POWERON MODE.

POWERON MODE
OFFLINE

5. Press or and then to select Power On Mode options.

RUNNING	The RO system will start whenever power is supplied.
OFFLINE	The RO system will go into standby when power is supplied to the unit.

RUNNING
JAN-01-12 12:01P

6. Press to return to the home screen.

Flush Modes

The GBE RO controller can be programmed to operate up to six different flush modes. Multiple flush modes can be specified and operating at any one time. If any one or more flush modes are calling for flushing to happen at a certain time, the flush will take place. Some flush modes require additional plumbing and components such as solenoid valves.

Startup Flush

In this mode the fast flush solenoid (SV-2) opens for a specified number of minutes each time that the pump turns on.

Standby Flush

In this mode any time that the system state is in STANDBY, the inlet AND fast flush solenoids open for a specified number of minutes every specified number of hours. This is a line-pressure-level flush (ie the pump does NOT turn on during this flush).

Time Trigger Flush

In this mode, any time that the system state is in RUNNING, the fast flush solenoid (SV-2) will open for a specified number of minutes every specified number of hours. Note that the pump is ON during this flush.

Flow Trigger Flush

In this mode, any time that the system state is in RUNNING, the fast flush solenoid (SV-2) will open for a specified number of minutes every specified number of PRODUCT RO water generated. Note that the pump is ON during this flush.

Quality Flush

If this mode is enabled, the product diversion solenoid (SV-3, NOT INCLUDED) is opened as soon as the pump turns on when the RO system is RUNNING. This solenoid will remain open until the measured product TDS drops below the specified quality flush TDS setpoint or until the quality flush time period expires. If the TDS does not drop below the setpoint during this period, the unit will switch to OFFLINE and the “product TDS High” error will be thrown. The Quality Flush solenoid valve is wired to the AUX board on the GBE RO controller at terminal AUX4. The solenoid valve must be 24 VAC.

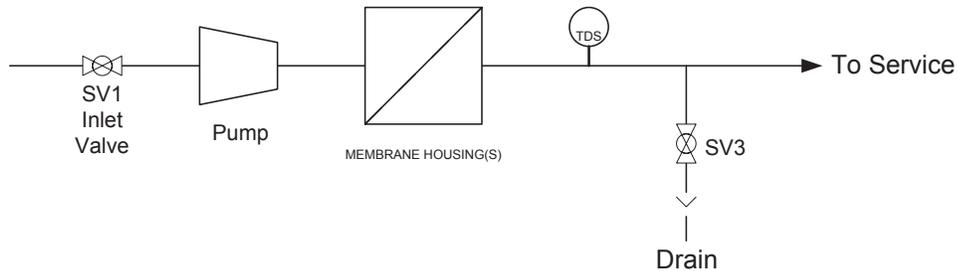


Figure 8. RO quality flush.

At startup, SV1 opens, and then the pump turns on. SV3 opens while the system monitors the product TDS level. The user programs the maximum allowable product TDS and the number of minutes allowed following startup to reach the allowable TDS level. Usually at startup, the TDS level starts high and then drops. If the level drops below the allowable level within the allowed time, then SV3 will close, and the unit is now in service. If the allowable TDS level cannot be reached, the unit will shut down and generate an error message.

Permeate Flush

If this mode is enabled, the permeate flush solenoid (SV-3, NOT INCLUDED) is opened as soon as the pump turns off. This solenoid will remain open until the permeate flush time period expires and permits water from an optional permeate storage tank to flush the membranes. The Permeate Flush solenoid valve is wired to the AUX board on the GBE RO controller at terminal AUX4 (G1). The solenoid valve must be 24 Volt.

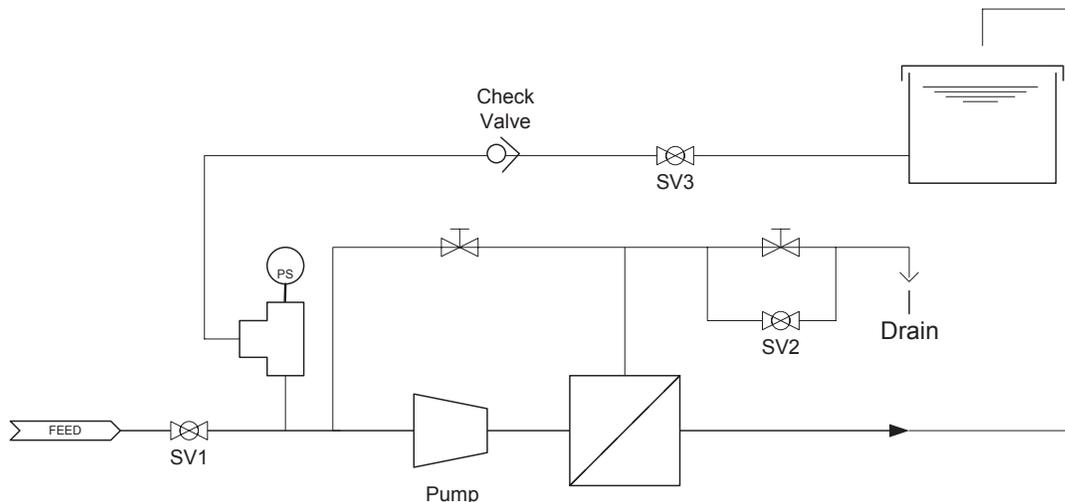


Figure 9. RO permeate flush.

At shutdown, the pump turns off and SV1 closes. Then fast flush solenoid valve SV2 and permeate valve SV3 open for a programmed number of minutes. During this time, RO product water stored either in an elevated atmospheric tank or in a pressurized storage tank floods through the pump and the feed side of the membrane, and then SV2 and SV3 close. This process provides RO-quality water during shutdown on both sides of the membrane to keep the membrane clean. This process also ensures that the RO will provide high quality product water the next time the pump is turned on.

NOTE Quality Flush and Permeate Flush are mutually exclusive.

Flush Mode	RO Pump	Inlet Valve	Waste (Fast) Flush Valve	Product Flush Valve
Start Up	On	Open	Open	Closed
Standby	Off	Open	Open	Closed
Time	On	Open	Open	Closed
Flow	On	Open	Open	Closed
Quality	On	Open	Closed	Open
Permeate	Off	Closed	Open	Open

Table 1. RO pump and valve states during flush modes.

Any time that a Flush is actually taking place while the system state is RUNNING, the system will ignore the following error limits: delivered product TDS high, %recovery low, %recovery high, %reject low, membrane pressure drop, pump feed pressure low. Once the flush ends, the error checking will resume. If the inlet pressure switch reports LOW pressure for at least XX (XX is programmable at 1-30 seconds, at the main menu/setup/accessories/switch inputs menu) continuous seconds, even if this is during or even partially during a flush time, the system will still recognize this instance as an error condition, and it will begin the LOW PRESSURE process.

Flush Mode Setup

RUNNING
JAN-01-12 12:01P

1. From the default home screen, press . The screen displays the main menu.

1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP

2. Press  to scroll to 4) SETUP.
3. Press  to select the SETUP menu.

1) TIME/DATE
2) LANGUAGE
3) POWERON MODE
>4) FLUSH MODES

4. Set Time/Date is the first menu item, so press     to select 4)FLUSH MODES.

Flush Mode Settings

Screen Display	Range	Procedure
>1) STARTUP 2) STANDBY 3) TIME TRIGGER 4) FLOW TRIGGER	Startup Standby Time Trigger Flow Trigger Qual Flush Perm Flush	5. The screen displays the Flush Modes menu. Press  or  to scroll through the menu and then  to select a flush mode setting.
START UP MODE OFF	Off On	6. The screen displays the Start Up Mode setting. This will flush the drain prior to starting the pump. Press   or  and then  to change the value if necessary. This is a line pressure flush.
FLUSH DURATION 3 MINUTES	1–180	7. If startup mode is set to ON, the screen displays the flush duration of the drain. Press   or  and then  to change the value and then return to the Flush Mode menu.
STANDBY MODE OFF	Off On	8. The screen displays the Standby Mode setting. This will flush the drain when the unit is in standby mode. Standby mode may be triggered manually, by a STORAGE TANK FULL error, by a pretreatment lockout command, or other states. This is a low pressure flush. Press   or  and then  to change the value if necessary.
FLUSH DURATION 3 MINUTES	1–180	9. If standby mode is set to ON, the screen displays the flush duration setting. Press   or  and then  to change the value and then display the next setting.
FLUSH EVERY 3 HOURS	1–24	10. If standby mode is set to ON, the screen displays the flush interval setting. Press   or  and then  to change the value and then return to the Flush Mode menu.
TIME TRIG MODE OFF	Off On	11. The screen displays the Time Trigger Mode setting. A flush will be triggered after a specified amount of time has passed. Press   or  and then  to change the value if necessary.
FLUSH DURATION 3 MINUTES	1–180	12. If time trigger mode is set to ON, the screen displays the flush duration setting. Press   or  and then  to change the value and then display the next setting.
FLUSH EVERY 4 HOURS	1–24	13. If time trigger mode is set to ON, the screen displays the flush interval setting. Press   or  and then  to change the value and then return to the Flush Mode menu.

Screen Display	Range	Procedure
FLOW TRIG MODE OFF	Off On	14. The screen displays the Flow Trigger Mode setting. Press or and then to change the value and see the flow trigger mode settings.
FLOW TRIG MODE OFF	Off On	15. The screen displays the Flow Trigger Mode setting. If the system is running, the unit will flush after generating a specified amount of reverse osmosis water. Press or and then to change the value if necessary.
FLUSH DURATION 3 MINUTES	1–180	16. If flow trigger mode is set to ON, the screen displays the flush duration setting. Press or and then to change the value and then display the next setting.
FLUSH EVERY 100 GALLONS	100–1000	17. If flow trigger mode is set to ON, the screen displays the flush interval setting. Press or and then to change the value and then return to the Flush Mode menu.
QUAL FLUSH MODE DISABLE	Disable	18. The screen displays the Quality Flush Mode setting. When the system is running, the system sends all water to drain until a preset quality is reached, at which time the water will flow to the product outlet. This is a high pressure flush (pump is on). The quality flush mode is disabled and can not be changed. Press any button to return to the Flush Mode menu.
PERM FLUSH OFF	Off On	19. The screen displays the Permeate Flush setting. This flush requires an optional solenoid valve and permeate storage tank from where the flush water is drawn. Press or and then to change the value if necessary.
FLUSH DURATION 10 SECONDS	1–180	20. If permeate flush mode is set to ON, the screen displays the flush duration setting. Press or and then to change the value and then display the next setting.
RUNNING JAN-01-12 12:01P		21. Press to return to the home screen.

There are several components of the G1 RO that can be configured from the Accessories manu, including:

- Wireless Remote
- Modem
- Flow Meter
- Pressure and Level Control Switches
- Pressure Gauges
- Total Dissolved Solids Probes
- Error or Status Monitor
- SV3 or Target TDS Monitor

Wireless Remote

1. Select a location for the wireless remote monitor (Figure 10). The location must be near an electrical outlet. If a modem is used in the remote, then the location should also be near a standard RJ-11 type telephone wall jack.



Figure 10. Wireless remote monitor.



CAUTION! Do not touch any surfaces of the circuit board. Electrical static discharges may cause damage to the board. Handle the circuit board by holding only the edges of the circuit board. Keep replacement boards in their special anti-static bags until ready for use. Mishandling of the circuit board will void the warranty.

2. Use the Hole Drilling Template as a guide to drilling two holes to mount the remote monitor. If drilling into wall board, drill two 5/16" diameter holes and insert the plastic drywall anchors into the holes securing them with the two #10 screws provided. If drilling into a solid surface, drill two 7/32" holes into the surface and screw the two #10 screws into the holes. In either case, leave a gap of approximately 3/32" between the head of the screw and the wall.
3. (Optional) If a modem is to be installed into the remote monitor, refer to page 39 for installation and setup.
4. Connect the power cord to the bottom of the remote monitor. If a modem is to be used in the remote, plug a standard telephone extension cord into the bottom of the remote monitor.
5. Hang the remote monitor on the two screws.
6. Disconnect power to the RO unit. Open the control and connect the RF board into the controller circuit board. Make sure the RF board is fully seated into all of the sockets (see Figure 11). Reconnect power.

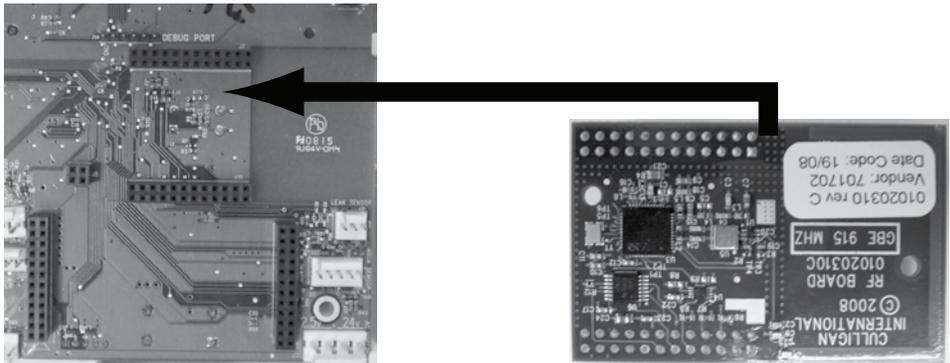


Figure 11. RF board location on GROC board.

7. Install RF board into unit controller. Line up pins in RF board and press firmly into black connectors. Note orientation of RF board (see Figure 11).
8. Follow the directions on the next page to program BOTH the main and remote monitor units to communicate with each other. If modem has been installed in the remote, it is also necessary to follow the directions in the next section of this manual to configure the main controller to use the modem in the remote.

Wireless Remote Setup

Begin the wireless setup using the wireless remote device.

```
RUNNING
JAN-01-12 12:01P
```

1. From the default home screen, press . The screen displays the main menu.

```
1) INFORMATION
>2) SETUP
3) DIAGNOSTICS
```

2. Press to select 2)SETUP.

```
>1) RF SETUP
2) MODEM SETUP
```

3. Press to select 1)RF SETUP.

Wireless Remote Settings

Screen Display	Range	Changing the Setting
CHANNEL # 1	1-254	Press or and then to select the channel number of the control valve. The CHANNEL # for the RO controller must be the same as the CHANNEL # for the Remote Display.
RF FREQUENCY 915 Mhz	433, 869, or 915	Use this setting to select the correct radio frequency. Do not change the RF frequency for North America installations.
RUNNING JAN-01-12 12:01P		4. Press to save the settings and return to the home screen.

GBE-Wireless Communication Setup

Now set up the RO controller to communicate with the wireless remote.

```
RUNNING
JAN-01-12  12:01P
```

```
1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
```

```
2) LANGUAGE
3) POWERON MODE
4) FLUSH MODES
>5) ACCESSORIES
```

```
>1) WIRELESS REM
2) MODEM
3) FLOW METERS
4) SWITCH INPTS
```

```
REMOTE DISPLAY
NOT INSTALLED
```

```
CHANNEL #
>1
```

```
RF FREQUENCY
915 Mhz
```

```
RUNNING
JAN-01-12  12:01P
```

1. From the default home screen, press . The screen displays the main menu.
2. Press  to scroll to 4) SETUP.
3. Press  to select the SETUP menu.
4. Press  to select 5)ACCESSORIES. The screen displays the accessories menu.
5. Press  to select 5)ACCESSORIES. The screen displays the accessories menu.
6. Press  or  and then  to change the state to INSTALLED.
7. Press  or  and then  to select the channel number of the control valve. The CHANNEL # for the RO controller must be the same as the CHANNEL # for the Remote Display.
8. Use this setting to select the correct radio frequency. Do not change the RF frequency for North America installations..
9. Press  to save the settings and return to the home screen.

Check Signal Strength Between the GBE RO Controller and Remote

Check the signal strength once the RO controller and wireless remote are set up.

```
RUNNING
JAN-01-12  12:01P
```

```
1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
```

```
3) POWERON MODE
4) FLUSH MODES
5) ACCESSORIES
>6) DIAGNOSTICS
```

```
>1) TST WIRELESS
2) TESTPHONELIN
3) USE DATA PORT
4) TEST APP
```

```
WIRELESS TEST
0 / 188
RSSI=5
```

```
RUNNING
JAN-01-12  12:01P
```

1. From the default home screen, press . The screen displays the main menu.

2. Press  to scroll to 4) SETUP.

3. Press  to select the SETUP menu.

4. Press       to select 6)DIAGNOSTICS.

5. Press  to select 1)TST WIRELESS. The screen displays the wireless test screen.

The screen displays the test number and total number of attempts and the received signal strength indicator (RSSI). The system will continue to test the signal strength until you press any button to return to the diagnostics menu.

The signal strength indicator (RSSI) will show a value of between 0 and 8. If the RSSI is at least 4, then the installation is complete. If the SSI drops below 4, then it may be necessary to select an alternate location for the wireless remote.

6. Press    to save the settings and return to the home screen.

Modem

NOTE The modem can be installed into either the back of the RO controller or the back of the remote control board. The functionality of the modem is the same in either installation.

NOTE Use of the modem kit requires a one-year subscription to either a Level 1 or Level 2 Telecom package. Self-service registration is available at www.myculligan.com.

1. Before installing the modem into the back of the RO Controller board or the back of the remote, the RO Controller circuit board or the remote must first be powered off.
2. When handling all circuit boards, take care to only touch the edges of the circuit boards—not the metal pins. The electronics on all circuit boards can be damaged by static electricity.
3. Make sure all of the pins at all four connectors are aligned between the modem board and the main controller board. Make sure that the modem board is fully seated into all four sockets.
4. When all connections have been made restore power.
5. Connect the modem to the telephone line by plugging a standard RJ-11 phone extension cord into the modem board.

NOTE The GBE RO Controller is designed to plug into an analog telephone line (standard residential phone line). This includes phone lines connected to most residential VoIP (voice over Internet) phone systems and to residential DSL phone systems. If you are connecting the RO to a DSL phone system, follow the DSL provider recommended method to connect standard phones to the DSL service. Many systems recommend or require the use of DSL line filters between the phone jack and the device.

NOTE Try to place the RO Controller or Remote Display near a telephone jack. A splitter might be needed if the jack is already in use.

Installing on the GBE RO Controller Board

Open the controller cover and locate the modem connection on the back of the board (see Figure 12). Insert line modem board (part number 01020307) into the socket on the back of the board. Make sure that all of the pins in all four connectors are aligned and make sure the modem is fully seated into all of the sockets.

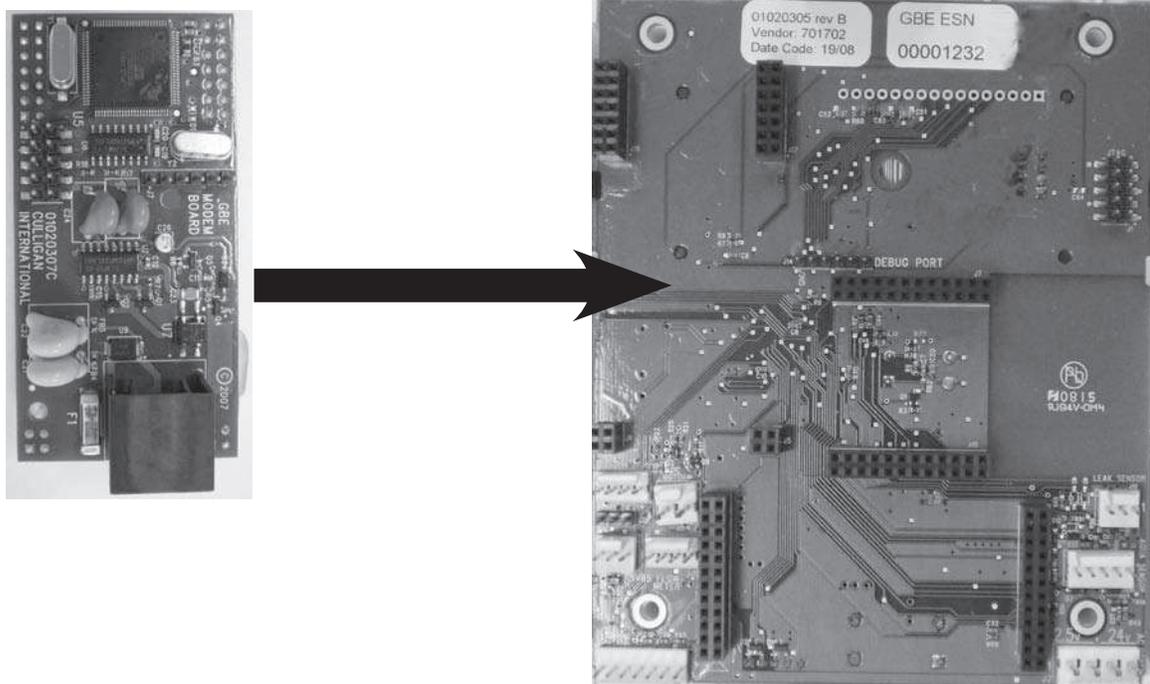


Figure 12. Back of GROC board.

Installing In the Remote

Open the remote monitor housing by removing the two screws and squeezing the sides of the monitor housing slightly. Insert the modem board (P/N 01020307) into the socket on the back of the remote board (see Figure 13). Make sure that all of the pins in all four connectors are aligned and make sure the modem is fully seated into all of the sockets. Snap the two halves of the remote housing back together using light finger pressure and insert the two screws.

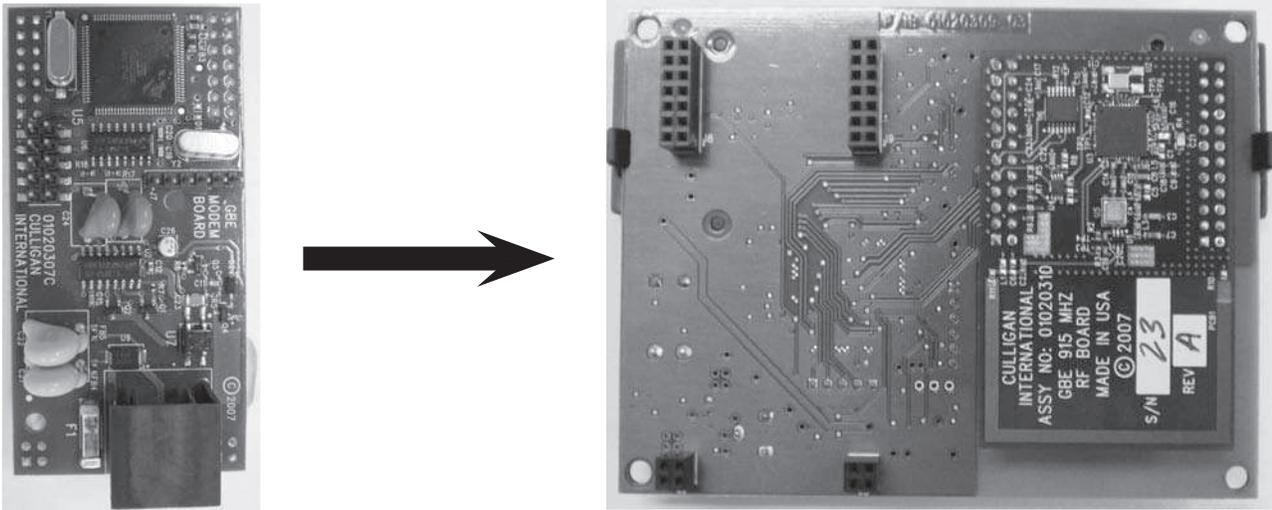


Figure 13. Modem installed on back of remote board.

GBE RO Controller Modem Setup

```
RUNNING
JAN-01-12 12:01P
```

```
1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
```

```
2) LANGUAGE
3) POWERON MODE
4) FLUSH MODES
>5) ACCESSORIES
```

```
1) WIRELESS REM
>2) MODEM
3) FLOW METERS
4) SWITCH INPTS
```

1. From the default home screen, press . The screen displays the main menu.

2. Press to scroll to 4) SETUP.

3. Press to select the SETUP menu.

4. Press to select 5)ACCESSORIES. The screen displays the accessories menu.

5. Press to select 2)MODEM. The screen displays the modem settings.

GROC Modem Settings

Screen Display	Range	Changing the Setting																
TELEPHONE MODEM INSTALLED	Installed, Not Installed	Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to select INSTALLED if a telephone modem is installed inside the Smart Controller.																
MODEM CONNECTION LANDLINE	LandLine CellModem	Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the Modem connection setting. See the note on the previous page about analog and digital phone lines.																
MODEM LOCATION IN MAIN CONTROL	In Main Control In Remote	Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to change the Modem Location setting. Change this setting only if a modem is installed.																
TIME ZONE GMT +00:00	0 to +12 or -12	<p>Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to specify the time zone of the RO Controller location with respect to Greenwich Mean Time (GMT).</p> <p>When using a modem, the controller will occasionally access the Internet to synchronize the date and time. In order to do this correctly, the control must be told which time zone it is installed in. The time zone is specified as so many hours ahead or behind GMT time. The GMT offset for some common cities is listed below:</p> <table border="1" data-bbox="630 1066 1260 1381"> <thead> <tr> <th colspan="2">GMT Offset</th> </tr> </thead> <tbody> <tr> <td>New York</td> <td>-5:00 (and anywhere in EST)</td> </tr> <tr> <td>Chicago</td> <td>-6:00 (CST)</td> </tr> <tr> <td>Denver</td> <td>-7:00 (MST)</td> </tr> <tr> <td>Los Angeles</td> <td>-8:00 (PST)</td> </tr> <tr> <td>London</td> <td>0:00</td> </tr> <tr> <td>Paris</td> <td>0:00</td> </tr> <tr> <td>Rome</td> <td>+1:00</td> </tr> </tbody> </table>	GMT Offset		New York	-5:00 (and anywhere in EST)	Chicago	-6:00 (CST)	Denver	-7:00 (MST)	Los Angeles	-8:00 (PST)	London	0:00	Paris	0:00	Rome	+1:00
GMT Offset																		
New York	-5:00 (and anywhere in EST)																	
Chicago	-6:00 (CST)																	
Denver	-7:00 (MST)																	
Los Angeles	-8:00 (PST)																	
London	0:00																	
Paris	0:00																	
Rome	+1:00																	
CALL FREQUENCY DAILY	Daily On Error Daily&Error Monthly & Error	Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to specify the frequency of the RO controller sending data via modem.																
CALL TIME 4:30AM	12:00AM– 11:30PM	Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to specify when the RO controller sends data via modem. The time changes in increments of 30 minutes.																

Screen Display	Range	Changing the Setting
DATA PHONE # >18884137028	15 digits	Press to change the Data Phone Number setting. Press or and then to increase or decrease each digit of the Data phone number and move to the next digit. Press when the correct Data phone # is displayed. It is necessary to provide a telephone number to be called by the unit. Typically, it is desired that the unit call a local access number. These local access numbers, for nearly every area code around the globe, can be found from the My Culligan website at http://www.myculligan.com/technical/tech_ref-gbe-boards.asp . The unit can also be programmed with the default toll-free access number. Use a local number whenever possible.
DEALER ID 00000000	8 digits	Press to change the Dealer ID setting. Press or and then to increase or decrease each digit of the Dealer ID and select the next digit. Press when the correct Dealer ID is displayed. The Dealer ID is your dealership's account number.
RUNNING JAN-01-12 12:01P	6.	Press to save the settings and return to the home screen.

Test Modem

This menu attempts to send a test message. The screen indicates whether or not this process is successful. Sending a test message will also update the time and date on the Smart Controller to the correct time. If the modem is installed on the main controller (as opposed to installed in the remote control) then this testing process will also check to see if there is an updated version of firmware available on the Culligan servers.

After conducting a phone line test, it is important to verify that the new time and date settings on the controller are correct. If the new time setting has the incorrect value for the hours it is likely that the time zone setting on the control is incorrect. The time zone setting found under the Main Menu / Setup / Accessories / Modem screen is displayed in the format of GMT +/- X hours. See "GBE RO Controller Modem Setup" on page 36.

RUNNING JAN-01-12 12:01P	1.	From the HOME screen, press to view the main menu.
1) GO TO RUNNING 2) GO TO OFFLINE 3) INFORMATION >4) SETUP	2.	Press to scroll to 4) SETUP.
3) POWERON MODE 4) FLUSH MODES 5) ACCESSORIES >6) DIAGNOSTICS	3.	Press to select the SETUP menu.
1) TST WIRELESS >2) TESTPHONELIN 3) USE DATA PORT 4) TEST APP	4.	Press to select 6)DIAGNOSTICS .
	5.	Press to select 2)TESTPHONELIN . The screen displays the modem test screen.

```

MODEM TEST
Emailing now
Please Wait ...

```

6. Press to begin testing the modem telephone line. The screen displays the status of the test before displaying the results. Do not press any buttons before the test is complete or the controller will return to the Diagnostics menu.

Possible Results

```

MODEM TEST ERROR
NO TONE!!

```

```

MODEM TEST
NOT POSSIBLE NOW
TRY LATER!

```

```

MODEM EMAIL
SUCCESS

```

```

MODEM TEST
TIME
SET SUCCESS

```

Modem Setup From Remote Display

This setup is completed using the wireless remote device.

```

RUNNING
JAN-01-12  12:01P

```

1. From the default home screen, press . The screen displays the main menu.

```

1) INFORMATION
>2) SETUP
3) DIAGNOSTICS

```

2. Press to select 2)SETUP.

```

1) RF SETUP
>2) MODEM SETUP

```

3. From the Setup menu, press to select 2)MODEM SETUP. The screen displays the modem settings. Use these to set up the communication between the wireless remote and the Culligan servers.

GBE RO Controller Modem Settings (on Remote)

Screen Display	Range	Changing the Setting
TELEPHONE MODEM NOT INSTALLED	Installed Not Installed	The screen displays the installation status of the modem. Press to change the state to installed if a telephone modem is installed inside the RO remote display.
CALL FREQUENCY DAILY	Daily On Error Daily&Error Monthly & Error	Press or and then to specify the frequency of the RO controller sending data via modem.
DATA PHONE # 18884137028	0-9,# each digit	The screen displays the data phone number, up to fifteen digits. Press or and then to change each digit of the phone number. When the final digit is entered press to accept the entire phone number.
1) RF SETUP >2) MODEM SETUP	1-2	The screen displays the setup menu. Press to save the settings and display the home screen.

Pressure Gauges

NOTE This setting is used only in a G2 Plus and G3 RO system.

The RO system may include pressure gauges, installed in pairs.

RUNNING JAN-01-12 12:01P	1. From the default home screen, press . The screen displays the main menu.
1) GO TO RUNNING 2) GO TO OFFLINE 3) INFORMATION >4) SETUP	2. Press to scroll to 4) SETUP. 3. Press to select the SETUP menu.
2) LANGUAGE 3) POWERON MODE 4) FLUSH MODES >5) ACCESSORIES	4. Press to select 5)ACCESSORIES. The screen displays the accessories menu.
2) MODEM 3) FLOW METERS 4) SWITCH INPTS >5) PRESS GAUGES	5. Press to select 5)PRESS GAUGES. The screen displays the pressure gauges settings menu.
>1) PG INSTALL 2) CAL PG1? 3) CAL PG2?	6. Press to select 1)PG INSTALL. The screen displays the pressure gauges settings menu.

Pressure Gauges Settings

NOTE The settings are the same for pressure gauge 1 (PG1) and pressure gauge 2 (PG2).

Screen Display	Range	Changing the Setting
PRESS GAUGES NO	Yes No	Press or and then to select YES if a pair of pressure gauges is installed.
CAL PG1? NO	Yes No	Press or and then to change the settings for the span and calibrate offset used by the pressure gauges.
PG1 OFFSET 0 PSI	-100-100	If you are calibrating the pressure gauge, press or and then to set the offset pressure used by this sensor.

Screen Display	Range	Changing the Setting
PG1 CAL FACTOR 16.6 mVolts/PSI	0-1000	Press <input checked="" type="checkbox"/> <input type="checkbox"/> or <input type="checkbox"/> and then <input checked="" type="checkbox"/> to set the span of the pressure gauge sensor.
RUNNING JAN-01-12 12:01P		7. Press <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> to save the settings and return to the home screen.

TDS Programming

The Global RO Controller uses two TDS probes to measure the product water. The probes are connected to the circuit interface board at terminals J16 (Feed Water TDS) and J17 (Product TDS). The probes are factory installed and calibrated.

If the measured TDS levels exceed the maximum allowed in the product water (see "Table 1. Temperature Correction Factors" on page 16), the RO controller displays an error condition (see "HIGH TDS OUT (TH)" on page 63).

RUNNING JAN-01-12 12:01P

1. From the default home screen, press . The screen displays the main menu.

1) GO TO RUNNING 2) GO TO OFFLINE 3) INFORMATION >4) SETUP

2. Press to scroll to 4) SETUP.
3. Press to select the SETUP menu.

2) LANGUAGE 3) POWERON MODE 4) FLUSH MODES >5) ACCESSORIES

4. Press to select 5)ACCESSORIES. The screen displays the accessories menu.

3) FLOW METERS 4) SWITCH INPTS 5) PRESS GAUGES >6) TDS

5. Press to select 4)SWITCH INPTS. The screen displays the switch inputs settings.

TDS Probe Settings

Screen Display	Range	Changing the Setting
TDS PROBE: NONE	None Product Both	For the G1 RO, there is only one TDS probe, so the correct setting is PRODUCT. For the G2 and G3 RO, the correct setting is BOTH. Press <input checked="" type="checkbox"/> <input type="checkbox"/> or <input type="checkbox"/> and then <input checked="" type="checkbox"/> to change the state if necessary.
ACTUAL TDS OUT 0 PPM	0-6000 (TDS1) 0-200 (TDS2)	Disconnect the TDS probe from the RO plumbing and submerge it into a solution of known TDS. Press <input type="checkbox"/> or <input type="checkbox"/> to enter the actual TDS value.

Screen Display	Range	Changing the Setting
TEMP OFFSET 0 F	-50-50	Use this value to make minor corrections to the displayed temperature value. For example if you use a handheld temperature device that shows the water temperature two degrees warmer, change this value to 2 to compensate.
TEMP COMP VALUE: 0.025	N/A	Please do not change this value unless you are told to do so by Culligan Rosemont. This value changes the slope used to interpret the temperature.
RUNNING JAN-01-12 12:01P		6. Press X X X to save the settings and return to the home screen.

Alarm Outputs

Alarm Relay Board

The GBE RO controller board offers support for the Culligan Alarm Relay board (PN 01022238). See Figure 14. To use the alarm relay board, install it onto the back of the GBE RO controller board. See Figure 15.

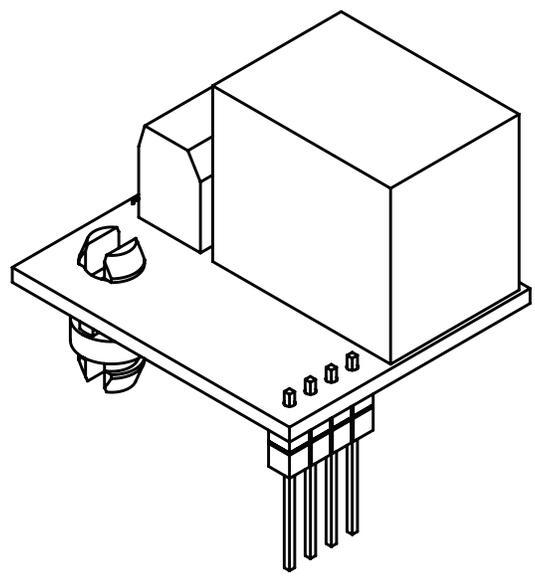


Figure 14. Alarm Relay board.

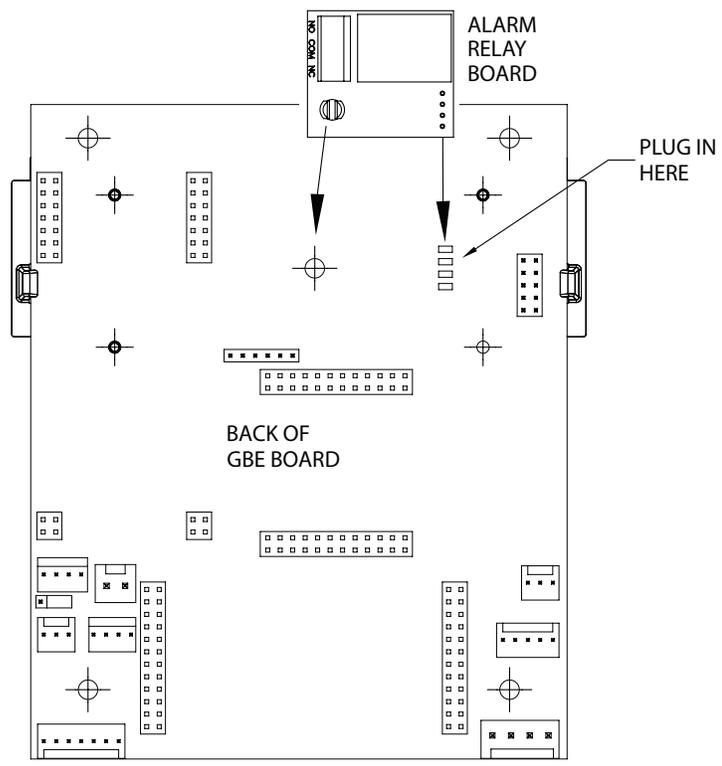


Figure 15. Alarm Relay board install to GROC.

The alarm relay board is plugged into the GBE RO controller board alarm relay socket. When Error Status is selected on the GBE RO controller, this relay will be in the Normally Open position when the controller board has power on AND there are no errors present (i.e. "Problem Found" is not showing on the Home screen.) The relay will be in the Normally Closed Position when the controller is either powered OFF or there is an error present on the controller board.

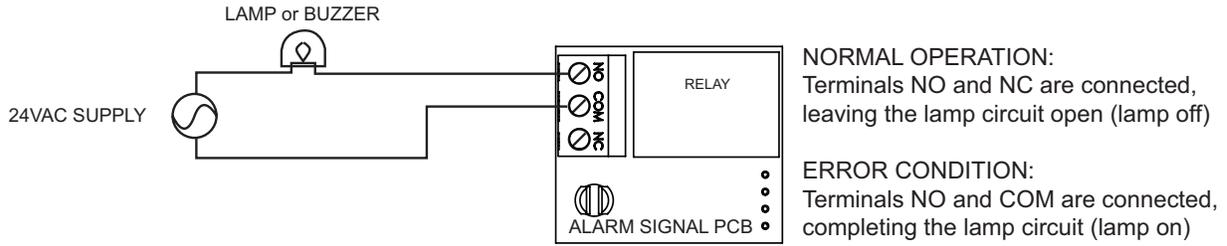


Figure 16. Example of customer wiring to the GROC Alarm Signal Output

Alarm Connection to CIB

The Culligan interface board (CIB) offers support for alarm notification. The alarm is attached to the CIB at Pin J8. See Figure 17.

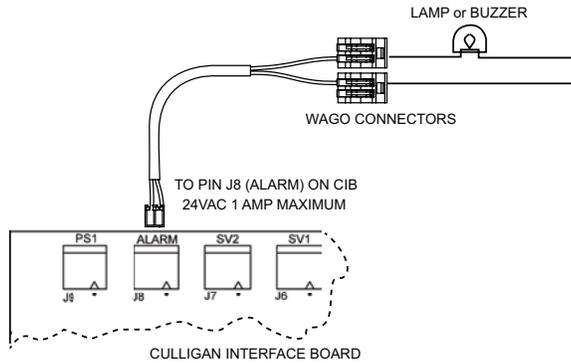


Figure 17. Example of customer wiring between the CIB and the Alarm Signal Output

```

RUNNING
JAN-01-12  12:01P
  
```

```

1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
  
```

```

2) LANGUAGE
3) POWERON MODE
4) FLUSH MODES
>5) ACCESSORIES
  
```

```

4) SWITCH INPTS
5) PRESS GAUGES
6) TDS
>7) RELAY MODE
  
```

1. From the default home screen, press . The screen displays the main menu.

2. Press to scroll to 4) SETUP.

3. Press to select the SETUP menu.

4. Press to select 5) ACCESSORIES. The screen displays the accessories menu.

5. Press to select 4) SWITCH INPTS. The screen displays the switch inputs settings.

Relay Mode Settings

Screen Display	Range	Changing the Setting
RELAY MODE: ERROR STATUS	Error Status Network Pulsed Output	Select Error Status to use board as an alarm relay. See below for more information. Network selection is not used. Select Pulsed Output to use the relay to control a chemical feed pump. Press <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> or <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> and then <input checked="" type="checkbox"/> to change the state if necessary.
FLOW TRIGGER 25 Gals	1–9999	When using this relay to turn a chemical feed pump on and off, specify the number of gallons of product water produced after the relay is turned on. Press <input type="checkbox"/> <input type="checkbox"/> or <input type="checkbox"/> <input type="checkbox"/> to enter the actual TDS value.

GROC Alarm Signal Output

The GBE RO controller Alarm Signal Output is provided through three screw terminals located on the alarm relay board. These terminals provide a pair of dry contacts rated at 30VDC x 10A. One dry contact is open and one is closed at all times as defined in Table 2 below.

When GBE RO Controller is...	Contact A (screw terminals NO & NC)	Contact B (screw terminals NO & COM)
Operating Normally	Continuity	Open circuit
In “Error Condition” or when the GBE RO controller is not powered on	Open circuit	Continuity

Table 2. GBE RO controller dry contact configurations in normal and error conditions.

A simple error alarm can be constructed by routing a customer supplied power source thru the Alarm Signal Output contact terminals NO and NC as shown in Figure 16. The indicating light will be ON any time that the GBE RO controller is either not powered on, or if it is in an “error condition.” Alternatively, the Alarm Signal Output contact terminals can be wired to a customer supplied PLC or SCADA system to provide an indication to the customer of the status of the GBE RO controller-controlled equipment.

Multiple Unit ROs

The GBE RO controller supports two multi-unit modes: Two Pass and Alternating.

When in two-pass or alternating mode, the system is configured to support two GBE RO controllers that are connected together using the communication cable (P/N 01016327). See Figure 18. One of these boards is set as the master, controlling the operations of the other unit, also known as the slave. The slave unit performs as a sensing device.

Two-Pass RO

When in Two-Pass RO mode, the primary unit, identified as the master, issues commands to control the secondary unit, identified as the slave.

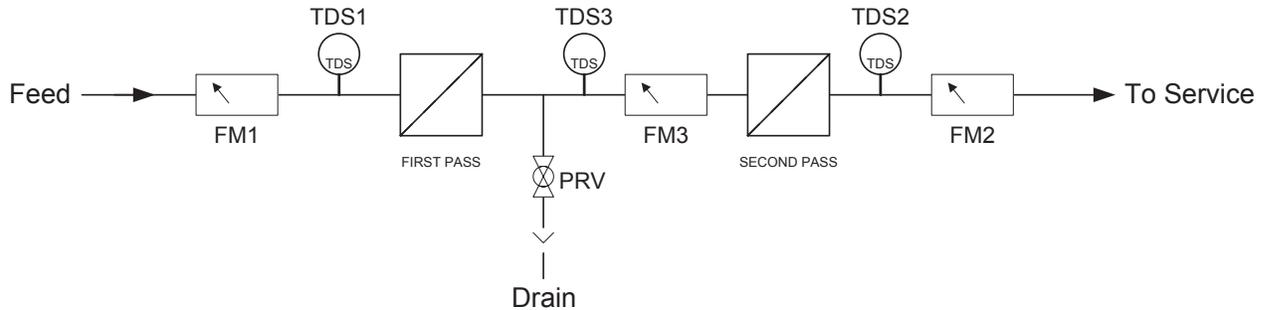


Figure 18. Two-pass RO process.

RO Model	Total Recovery, %	Total Rejection, %	Permeate Flow (GPM)	Permeate Flow (GPD)	Starting TDS (PPM)	Final TDS (PPM)
G2-10-8	56.25	99.83	9.90	14,256	500	0.84
G2-9-7	56.25	99.88	9.00	12,960		0.58
G2-8-6	56.26	99.88	7.81	11,246		0.58
G2-7-5	56.27	99.89	6.89	9,922		0.53
G2-7-4	45.01	99.93	5.51	7,934		0.37
G2-6-3	45.02	99.90	4.16	5,990		0.48
G2-5-3	45.02	99.90	3.75	5,400		0.51
G2-4-2	30.00	99.95	2.63	3,787		0.26

Table 3. Two-pass RO arrays.

NOTE The G2 built-in TDS probes can not measure accurately below 3 PPM. If final water quality will be below 3 PPM, use an external conductivity probe designed for high quality water measurement.

Two-Pass RO Start Up Sequence

When configured for two-pass RO, the master unit runs a start up sequence described as follows:

- The SV1 on the GBE master opens
- The system waits for the amount of time set on the master as “SV1 Delay”
- If the pressure-switch-1 shows that pressure is present, then the GBE master turns on the pump for the first unit.
- The system waits for the amount of seconds set on the master as the “PASS 2 DELAY”.
- If the pressure-switch-2 shows that pressure is present at pressure-switch-2 then the master sends an operation command to the slave unit that turns on the second pass pump.

The master will turn off the slave’s motor output any time it detects that one of the inlet pressure switches is off for more than the specified “PS SW DELAY”. After the slave unit pump turns off, the master will wait three (3) seconds and then turn off the master pump. The units follow the same procedure if operating conditions trigger the PTLO or the Tank Full switches.

Setting	Measuring Device	Configuration
Feed Flow FFLOW	FM1	Wired to inlet flow meter on the master GBE
Product Flow PFLOW	FM2	Wired to product flow meter on the slave GBE
Intermediate Flow IFLOW	FM3	Wired to product flow meter on the master GBE
% Recovery	$= (FM2/FM1) \times 100\%$	
Feed TDS	TDS1	Wired to feed TDS on the master GBE
Product TDS	TDS2	Wired to product TDS on the slave GBE
Intermediate TDS	TDS3	Wired to product TDS on the master GBE
% Rejection	$= (1.0 - (TDS2/TDS1)) \times 100\%$	

Table 4. Two-Pass RO instrumentation.

Duplex-Alternating RO Mode

The GBE RO controller is capable of coordinating the alternating operation of two RO units plumbed in parallel. This operation mode is designed for situations where RO redundancy is desired. As long as both RO units remain functional, the controllers will direct one of the units, called "Unit A," to be in the "ready-to-run" mode for a one hour block of time beginning at the top of the hour. During that one hour block, Unit A will produce RO water as long as the storage tank is NOT full and as long as there is no pre-treatment-lockout condition in effect. During this first hour, Unit B will be in standby mode. At the beginning of the next hour, control switches to Unit B and Unit A will switch to Standby. During that second hour, Unit B will produce RO water as long as the storage tank is NOT full, and as long as there is no pre-treatment-lockout condition in effect. The units will continue to switch over control at the top of each hour indefinitely.

For example, the master RO pumps on even hours (12:00 to 1:00, 2:00 to 3:00, 4:00 to 5:00, etc.), and the slave RO pumps on odd hours (1:00 to 2:00, 3:00 to 4:00, 5:00 to 6:00, etc.).

If at any time while in duplex-alternating mode either Unit A or Unit B stops functioning, or enters an "error state" (for example if the product TDS exceeds the maximum allowable product TDS level) then the other unit will take over operation and will continue to operate as a single stand-alone mode until an operator clears the error on the first unit.

If at any time while in duplex-alternating mode the two units lose communication with each other (for example if the communication cable is cut or becomes unplugged), then both units will switch into single stand-alone mode until communications are re-established and an operator instructs the units to return to duplex alternating mode using the GROC menu screens.

In Alternating-Mode, each RO unit has its own GROC controller. A standard communication cable (PN 01016327) is used to connect the two GROC controllers together as shown in Figure 19 and the units are plumbed as shown in Figure 20. It is necessary that each RO unit have its own independent storage tank level (or pressure) switch and that, if a pre-treatment lockout system is to be used, that each RO have its own independent dry contact closure signal from the pre-treatment system wired to the individual GROC controllers.

When either unit is the "running" unit, it operates as a single unit.

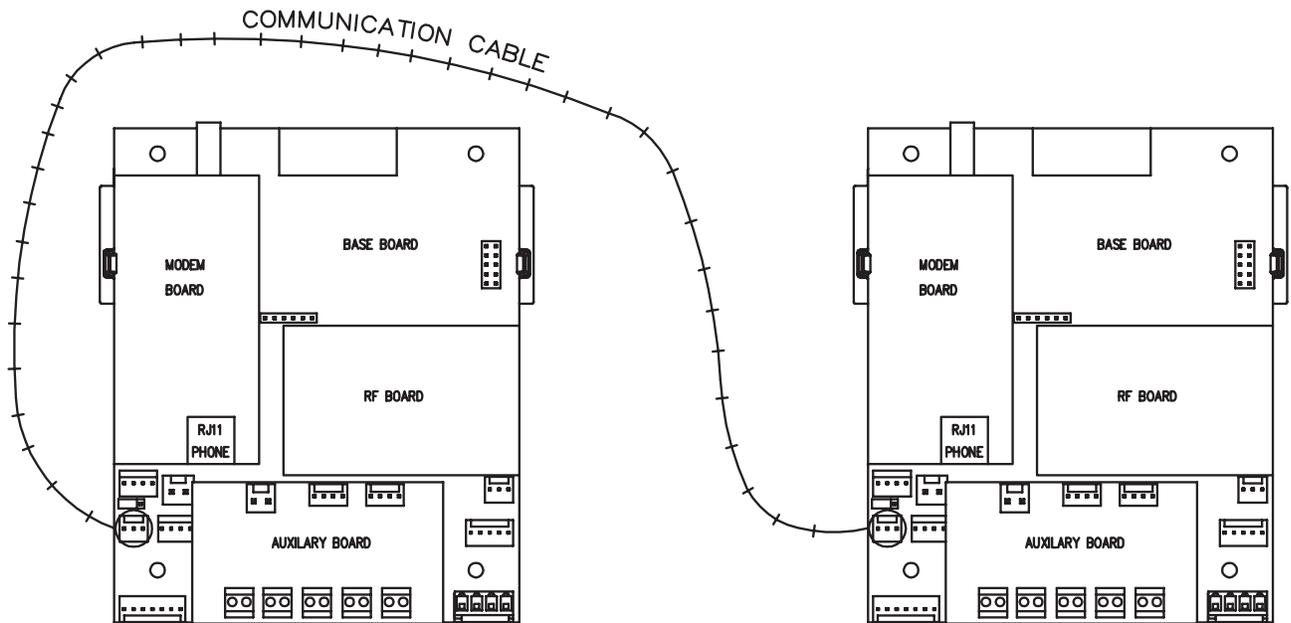


Figure 19. Wiring for two-pass and alternating mode.

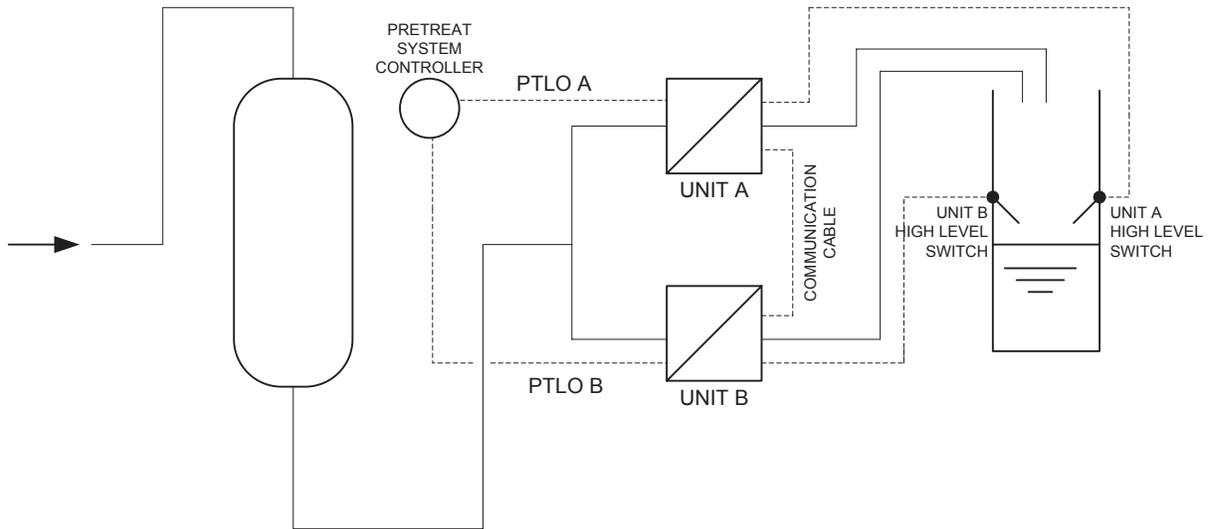


Figure 20. RO duplex alternating plumbing.

Multi-RO Unit Settings

RUNNING
JAN-01-12 12:01P

1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP

2) LANGUAGE
3) POWERON MODE
4) FLUSH MODES
>5) ACCESSORIES

5) PRESS GAUGES
6) TDS
7) RELAY MODE
>8) MULT UNIT RO

1. From the default home screen, press . The screen displays the main menu.

2. Press to scroll to 4) SETUP.

3. Press to select the SETUP menu.

4. Press to select 5)ACCESSORIES. The screen displays the accessories menu.

5. Press to select 8)MULT UNIT RO. The screen displays the multiple unit RO settings.

Screen Display	Range	Changing the Setting
MULTI UNIT RO SINGLE	Single Two Pass RO Alternating	Press or and then to select the RO system configuration.
MUL UNIT RO ROLE MASTER	Master Slave	If you select Two-Pass RO or Alternating, press or and then to select MASTER if the selected RO will control the functions of the entire RO system. Select SLAVE if the selected RO will be controlled by the master RO.
TWO PASS DELAY 20 SECONDS	0-999	If you select Two-Pass RO, press or and then to specify the duration the RO system waits to initiate the two-pass RO function at the slave unit after system conditions trigger two-pass reverse osmosis.

SV3 (Solenoid Valve) Mode/TDS Target

Solenoid valve SV3 is physically connected to the mini-aux board AUX4. When connected to AUX4, the TDS probe is set up as PRODUCT.

NOTE Unlike SV1 and SV2, which operate at line voltage (115VAC for G1, 220VAC for M2), SV3 must be a 24VAC solenoid valve such as P/N 01021310.

SV3 has three possible modes of operation: quality flush, permeate flush, and TDS target.

Quality Flush

Solenoid valve SV3 is open whenever the RO system is in Quality Flush mode. This is the default SV3 mode.

Permeate Flush

Solenoid valve SV3 is open whenever the RO system is in Permeate Flush mode.

TDS Target

Target TDS: The RO system keeps track of the average product water TDS whenever the RO system is operating, mixing lower quality water with product water to meet the average product water TDS. The average TDS measurements of the RO product water are taken once per second, over an interval specified by the "TDS Target Time." The controller opens and closes valve SV3 every few seconds in order to produce product water with a TDS level near the programmed value.

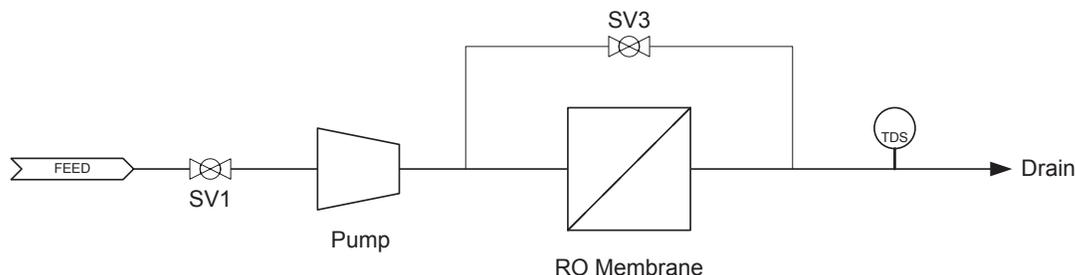


Figure 21. Target TDS.

RUNNING
JAN-01-12 12:01P

1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP

2) LANGUAGE
3) POWERON MODE
4) FLUSH MODES
>5) ACCESSORIES

6) TDS
7) RELAY MODE
8) MULT UNIT RO
>9) SV3

1. From the default home screen, press . The screen displays the main menu.
2. Press to scroll to 4) SETUP.
3. Press to select the SETUP menu.
4. Press to select 5) ACCESSORIES. The screen displays the accessories menu.
5. Press to select 9) SV3. The screen displays the solenoid valve SV3 settings.

SV3 Settings

Screen Display	Range	Changing the Setting
SET SV3 MODE TDS TARGET	TDS Target Flush Modes	Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to select whether SV3 will be used to maintain a target TDS or used with quality flush mode.
TDS TARGET VALUE 100 PPM	0–500	If TDS Target is selected, press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to specify the target TDS of the product water delivered by the RO system.
TDS TARGET TIME 5 MINUTES	5–60	Press <input checked="" type="checkbox"/> <input type="up"/> or <input type="down"/> and then <input checked="" type="checkbox"/> to specify the time allowed to open solenoid valve SV3 to meet the target TDS. If the target TDS is not met by the end of the TDS target time, the RO system will generate the error “PRODUCT TDS TOO HIGH” and go out of service.

Setting Error Limits

Limits can be set for various operating parameters. If these limits are exceeded, the GBE RO Controller will trigger an error message and shut down the RO system. User intervention is required to restart the RO system. If the modem option is installed, this error will be transmitted when the system calls in.

```
RUNNING
JAN-01-12  12:01P
```

```
1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
```

```
4) FLUSH MODES
5) ACCESSORIES
6) DIAGNOSTICS
>7) ERROR LIMITS
```

1. From the default home screen, press . The screen displays the main menu.
2. Press to scroll to 4) SETUP.
3. Press to select the SETUP menu.
4. Press to select 7) ERROR LIMITS.

Error Limits Settings

Press or and then to change the value if necessary.

Screen Display	Range	Procedure
<pre>MAX PRESSDIF 250 PSI</pre>	0-1000	This is the differential across the membranes. In most cases the default value does not need to be changed. The pressure differential affects the amount of water the system can produce. Water quality will drop off at a higher pressure differential, as scale builds up on modules and possibly causes irreversible membrane fouling.
<pre>MIN REJECT % 20%</pre>	0-100	As the modules age and start to scale, rejection will decrease. Set this to the minimum acceptable rejection.
<pre>MAX RECOVER% 90%</pre>	0-100	The system's recovery changes as operating parameters fluctuate and membranes age. Set this value to the maximum allowable recovery. As the recovery increases, product quality decreases (TDS increases).
<pre>MIN RECOVER% 10%</pre>	0-100	Set this to trigger an alarm if the recovery falls below the setting. A very low recovery can indicate membrane fouling or a mis-adjusted system.
<pre>MAX IN TEMP 120F</pre>	0-200	This is the maximum allowable temperature for the system.
<pre>MIN IN TEMP 33F</pre>	33-100	This is the minimum allowable temperature for the system.

MX FEEDPRESS 250 PSI	0-1000	The membrane/housing combination is rated at a maximum 300 psi; the system has an optimal operating range. For high efficiency systems, the feed pressure should not exceed 160 psi. For high productivity systems, the feed pressure should not exceed 200 psi.
MINFEEDPRESS 50 PSI	0-1000	The minimum allowable feed pressure for the system.
MAX TDS OUT 250 PPM	1-500	Select the highest total dissolved solids in the product water (lowest product quality) accepted by the G1 or M2 RO. Product water that exceeds the maximum TDS level will trigger an error condition, HIGH TDS OUT (see page 63).
MX FEEDPRESS 250 PSI	0-1000	The membrane/housing combination is rated at a maximum 300 psi; the system has an optimal operating range. For high efficiency systems, the feed pressure should not exceed 160 psi. For high productivity systems, the feed pressure should not exceed 200 psi.
MINFEEDPRESS 50 PSI	0-1000	The minimum allowable feed pressure for the system.
MAX PUMPTIME 0 Hours/Day	0-23	Specify the maximum number of hours per day that the pump is to run. If the value is set to 0 then this feature is ignored. If the value is non-zero then each day (at the time of the daily email) the system checks to see if, within the past 24 hours, the pump run time has exceeded the specified number of hours. If the number of hours HAS EXCEEDED the specified limit, the system will continue to operate, but the error flag corresponding to the maximum number of pump hours per day will be sent in the email message and the message "Max Pump hrs/day" will show along with the "Problem Found" message on the home screen.
MIN N FLOW 0.00 GPM	0-250	Specify the minimum flow rate in gallons per minute at a normalized temperature of 77°. If the flow rate drops below the minimum, the GROC will display an error limit message.
NOTE If the MIN N FLOW value is left at zero, this error level will be ignored, and it will not be displayed in the Information screen.		
STD PRESSURE 120 PSI	1-1000	If the minimum normalized flow setting is specified (any number other than zero), then specify the standard pressure across the membranes at the normalized temperature of 77° (p1-p2)/2
RUNNING JAN-01-12 12:01P QUAL FLUSH	5.	Press X X to return to the home screen. The screen displays any additional modes in progress that are triggered by an error state. For example, the RO system will have a quality flush if TDS exceeds the Max TDS Out.

General Guidelines

No attempts should be made to operate the system before thoroughly reading this manual. It is also recommended that the operator utilize the system flow diagrams to follow the flows of feed, reject, and product water through the plant. All valves and instrumentation should also be located and identified before attempting operation.

Chemical Handling

Operation of the RO system necessitates the handling of a variety of chemicals. All of the chemicals are safe when properly handled. However, severe injury could result from misuse of water treatment chemicals. Some guidance for safe handling of the chemicals is included in this manual where that chemical usage is discussed. For a complete guide to proper handling of each specific chemical, the chemical manufacturer or supplier should be consulted. Material Safety Data Sheets for chemicals can be found at the back of this manual in the Appendices section.

Cautions

- a. Do not operate the RO system unless the pretreatment system is properly functioning. Operation without the pretreatment system will result in irreversible fouling of the RO membranes.
- b. Several alarm circuits have been provided in the system to protect various components of the system. Operation of the system while the alarm circuits have been circumvented could result in damage to those components for which the alarm circuits provide protection.
- c. The pretreatment system and all low pressure piping have been designed for a maximum operating pressure of 100 psi. This pressure should not be exceeded.
- d. The maximum feed water temperature of 45°C (113°F) should not be exceeded.
- e. The feed water to the RO system must be CHLORINE FREE. Chlorine will cause irreversible damage to the RO modules. If chlorine is present in the water feed, contact your Culligan representative for assistance.
- f. Dry operation or operation of any of the pumps in the system against a closed discharge or closed inlet should be avoided, since severe damage to the pump could result.
- g. Operating the system at any length of time with a closed reject line will cause severe damage to the modules.
- h. If the unit is to be shut down for more than two days, the unit must be operated for at least 30 minutes each day, or the RO modules should be treated with a biocide to control bacteria growth.
- i. This unit is capable of producing water of highest quality which can be contaminated by corrosion products, bacteria, or other impurities originating in the plumbing system beyond this unit. Therefore, it shall be the responsibility of the purchaser to install a suitably designed plumbing system and appropriate disinfection compatible with the intended use of the water.
- j. The RO modules must be protected from extremes of temperature. The maximum operating temperature is 45°C (113°F). The maximum storage temperature is 25°C (77°F). The modules must also be protected from freezing. Do not store them below 0°C (32°F).

Reverse Osmosis Unit Startup

NOTICE Do not attempt to operate the system before reading this manual thoroughly.

Use the Process and Instrumentation Diagram to trace the flows of feed, waste, and product water through the plant. Locate and identify all valves and instrumentation before attempting operation.

Chemical Safety

Operation of the RO system may require the handling of a variety of chemicals. All chemicals are safe when properly handled. However, severe injury could result from misuse of water treatment chemicals. Some guidance for safe handling of the chemicals is included in this manual where that chemical usage is discussed. For a complete guide to proper handling of each specific chemical, consult the chemical manufacturer or supplier.

Electrical Power

1. Turn the ON/OFF selector switch to the OFF position.

Plumbing

1. Disconnect the Permeate line to the Permeate Storage Tank and Divert product water to drain during initial start up and testing of the system.
2. Run a permanent waste line to drain for use during operation.

Valve Positions

1. Inspect the product water sampling valves. Close all of the sample valves.
2. Open the manual water supply valve ahead of any pretreatment equipment.

NOTICE Supply water must not exceed 100°F.

3. Close the prefilter drain valve.

Check RO Pump Motor Rotation

1. Open the pump throttle valve (HCV-1) halfway open. Open the HCV-2 waste control valve halfway open.
2. Turn the main electrical supply ON.

NOTICE For normal operation, this unit is designed with a time delay to open the inlet valve SV-1 for ten (10) seconds before activating the high pressure RO pump. This feature allows water to enter and pressurize the unit and purge any air that has accumulated in the system before the pump is activated.

Initial Startup Procedure

Refer to the flow schematic on page 57 for valve and gauge locations.

1. Direct the product water tubing to drain.
2. Open the feed water supply valve.
3. Open the system pressure control valve (HCV-1), concentrate control valve (HCV-2), and system recycle valve (HCV-3) fully counterclockwise.
4. Select Go to Running from the menu to turn the system on. Note the inlet water pressure.



CAUTION! If the pump chatters loudly, it is starving for water (cavitating). Turn the unit OFF immediately to prevent pump damage. Correct the low pressure condition before proceeding.

5. Verify correct motor rotation as indicated by the arrow on top of the motor. If the motor is rotating in the wrong direction, the power wiring needs to be changed.
6. Set the customer supplied inlet pressure regulator (installed ahead of the prefilter) so that the inlet pressure is between 15 and 40 psig.
7. Some fittings may have loosened during shipment. Check for leaks at all tube fittings and threaded joints.
8. Allow the unit to run so that the shipping solution (sodium metabisulfate and glycerin) is flushed from the system (approximately 30 minutes). Test the concentrate water for sulfite and continue to flush until no sulfite is detected.
9. After all the shipping solution has been flushed, you can proceed to set the required product flow.
10. Slowly close the system pressure control valve (HCV-1) until the feed pressure is approximately 125 psig, or until the desired product flow rate is attained. Pressure increase should not exceed 10 psi per second. The concentrate control valve (HCV-2) must also be adjusted to attain desired flow. Care must be taken not to

exceed the design recovery value for the unit listed in the Specifications table on page 11. Check again for leaks. Check, and adjust if necessary, the recirculation valve on the rotometer.



CAUTION! As the concentrate flow is reduced, the system pressure will increase. Open the system pressure control valve as required to prevent the system pressure from exceeding 150 psi (1033 kPa). Excessive pressure will damage the pump and might cause property damage.

NOTICE

Depending on the feed water quality, it may be possible to operate the unit with a lower concentrate flow rate that would decrease operating costs. Refer to the printout from the Culligan® CAAP® (Computer Aided Application Program) software, which indicates maximum allowable recovery. If a printout is not available, contact the Culligan dealer.



CAUTION! DO NOT exceed 150 psi (1033 kPa) or the pump may be damaged. The fittings and tubing may also fail and might cause property damage.

NOTICE

By adjusting the feed pressure as low as possible to meet the application requirement, the service life of the pump and RO elements will be optimized. The system should run continuously, rather than go through frequent start/stop cycles.

11. Once all the desired flows are set, allow the system to run for approximately 30 minutes. Then record the following measurements:

- a. Inlet Feed Pressure (psig) _____
- b. Feed water temperature (°F) _____
- c. Feed water TDS (ppm) _____
- d. Feed water SDI _____
- e. System (pump outlet) pressure (psig) _____
- f. Concentrate (waste) flow (gpm) _____ x TCF¹ = _____
- g. Product flow (gpm) _____ x TCF = _____
- h. Product TDS (ppm) _____
- i. Product pressure (psig) _____
- j. Product back pressure (psig) _____
- k. % Recovery (see page 6) _____
- l. % Rejection (see page 120) _____

¹TCF = Temperature Correction Factor. Refer to Table 5 on page 52 for this value.

12. Test the operation of the pressure switch by slowly closing the inlet water supply valve. The unit should shut off after a short time delay.



CAUTION! If the unit does not shut off, turn the unit OFF immediately to prevent pump damage. Disconnect electrical power source, then check the wiring and replace the switch, if necessary.

- 13. Open the inlet water supply valve. Select GO TO OFFLINE and then GO TO RUNNING. The unit should reset and restart.
- 14. If connected, test the storage tank level control shutdown and the pretreatment lockout function.
- 15. Turn the power off. Connect the product tubing to the service plumbing. The system is now ready for normal operation.

NOTICE The controller has a feature that records historical data. The initial startup data is kept in the memory of the controller. The values recorded at start up will be extremely important for determining system performance at a later date. Maintain a backup record of the data on a separate sheet of paper and keep the data near the unit in case of electrical problems.

Normal Operation

During normal operation, the system usually will start up and shut down based on signals from a level control or pressure switch. Adjust the feed pressure (no higher than 150 psig) as required to maintain a constant product flow. Record the performance data regularly and compare it to the performance on initial start up. If any changes are noticed, the product flow should be normalized to determine if cleaning is required (see Product Flow Calculations in the Service and Maintenance section).

Product Flow Calculations

The Global RO Controller has the ability to calculate the normalized flows for the system. Although this is done for you automatically, it is worthwhile knowing how they are calculated. The product flow rate depends primarily on feed water pressure, product water pressure, and temperature. All RO units have specified nominal flow rates based on 200 psig net pressure and 77°F temperature. However, in most applications the temperature and pressure are lower, so the product flow rate is lower than the nominal flow rate. The actual flow rate must be converted to flow under standard conditions, then compared to the initial performance (also converted to standard conditions) to determine whether the system is still working properly. To convert the data to standard conditions,

1. Measure the product flow. Example: 1.25 gal/min
2. Measure the feed pressure. Example: 125 psig
3. Measure the product pressure. Example: 35 psig
4. Subtract the product pressure from the feed pressure. Example: $125 - 35 = 90$ psig
5. Divide the product flow by the result from step 4. Example: $1.25 / 90 = 0.014$ gal/min/psi
6. Multiply the result from step 5 by the result from step 2. Example: $0.014 \times 125 = 1.75$ gal/min
7. Measure the temperature of the feed water, then determine the temperature correction factor from Table 2.
Example: At a temperature of 55°F, the factor is 1.54.

Temp. °F	Temp. °C	Correction Factor	Temp. °F	Temp. °C	Correction Factor
40	4.4	2.12	75	24	1.04
45	6.7	1.90	80	27	0.95
50	10	1.71	85	29	0.86
55	13	1.54	90	32	0.79
60	16	1.39	95	35	0.72
65	18	1.26	100	38	0.66
70	21	1.14			

Table 2. Temperature Correction Factors

8. Multiply the result of step 6 by the temperature correction factor.
Example: $1.75 \text{ gal/min} \times 1.54 = 2.69 \text{ gal/min}$.

NOTICE To convert from gal/min to gallons per day, multiply by 1440.
For example, $2.69 \text{ gal/min} \times 1440 = 3873 \text{ gpd}$.

9. Compare the current standardized flow to the initial standardized flow. If the flow has decreased by 10 percent or more, it is time to clean the elements.

Example: If the initial standardized flow was 4653 gpd, and the current standardized flow is 3873 gpd, the flow has decreased by 780 gpd, or 17% ($780 / 4653 = 0.17$). The elements should be cleaned.

10. Check individual module housings where the quality and quantity of the product water is questionable. It may be that only one module is malfunctioning. In all cases where modules are questionable, it is very important to check all the O-ring seals for leaks.

NOTICE Leaks past any O-rings on an element will result in poor product quality.

11. If the problem cannot be corrected with the troubleshooting guide and assistance is required, please have the following information available when calling the Culligan dealer:
 - Product flow rate
 - Concentrate flow rate
 - Feed pressure
 - Product water quality
 - Feed water quality
 - Feed water temperature
 - Prefilter inlet and outlet
 - Product pressure

Pretreatment System Checkout

Check SDI

The first step of the pretreatment process will depend on the outcome of a Silt Density Index Test. The Silt Density Index is a test that gives an indication of the plugging rate of a 0.45 micron filter paper by colloidal material in the water supply.

This rate is correlated to the fouling (plugging) potential of the reverse osmosis membrane surface. A Silt Density Index Test (fouling tendency test) will perform on a daily basis by the plant operator. If SDI value exceeds 5.0 after the cartridge filter of the RO unit, backwash the depth filter or check the cartridge filters.

Perform a Silt Density Index Test at the SDI sample point.

If the SDI is greater than 5.0, additional filtration will be required. Contact your Culligan dealer to discuss the situation. The RO unit requires the feed water SDI to be less than 5.0.

Normal Operation Procedures for Pretreatment

During normal operation, monitoring the pretreatment system's pressure gauge readings and SDI levels is usually all that is required.

1. An SDI test should be performed at the cartridge filter outlet sample point a minimum of once every 24 hours. Perform more frequent tests if the feed water feed is highly turbid. If the SDI is greater than 5.0, or if the SDI filter pad is discolored, the cartridges should be replaced and the SDI test should be repeated. If test results are still unacceptable, contact the Culligan dealer.
2. Record feed water pressure readings at least once every day at the following sample points: RO unit inlet, and pump suction. These readings will be useful in monitoring loading of the cartridge filters.

Operating Parameters

The parameters necessary for the operation of your RO unit are listed in the Equipment Specifications sheet(s) at the front of this section. If you operate outside these parameters, Culligan International cannot be responsible for any potential, irreversible damage that might occur. Check the feed water supply for the system periodically to determine whether its analysis has changed. If the analysis has changed, consult with Culligan International, Northbrook, Illinois to see how design parameters are affected.

Pretreatment

The RO system design is based on properly pre-treated feedwater and water temperature. The correct pretreatment required for each system can only be determined by having a complete water analysis of the raw water such as that performed by the Culligan Analytical Laboratory. The following pre-treatment methods may be required for your system:

- Filtration – If Applicable
Required filtration may include activated carbon, multi-media depth filter or both. The RO system incorporates a 5 micron cartridge filter as described below.
- Reverse Osmosis Cartridge Prefilter
The pressurized, pretreated feed water passes through the 5-micron cartridge filter. The cartridge filter for this unit consists of polypropylene elements. This filter not only serves to remove particles greater than 5 micron, but also allows for mixing of any previously injected chemical(s).

NOTE Change the filter elements when a 10 - 15-psi pressure differential is detected across the filter. Monitor RO PREFILTER INLET PRESSURE (PI-1) and RO PREFILTER OUTLET PRESSURE (PI-2) to determine the pressure differential

Extended Shut Down Procedure

If you shut down the RO for any length of time, you must flush the unit with feed water to prevent scaling of the membranes.

You should operate the unit at least 30 minutes a day to prevent bacteria growth.

If the unit is to be shut down for a duration longer than two days, we recommend cleaning and disinfecting the membranes and then using a preservative such as sodium metabisulfite. This is necessary in order to prevent biological growth. Consult your local Culligan dealer for more information.

System Operating Information

At any time, you can view the system operation information. The information includes settings and performance data.

```
>1)GO TO RUNNING
2)GO TO OFFLINE
3)INFORMATION
4)SETUP
```

1. Press    to select 3)INFORMATION.

Information Settings

NOTE When you display any Information screen, it will stay on the display until changed by the operator.

Screen Display	Range	Procedure
FFLOW 0.00 PGM DFLOW 0.00 GPM PFLOW 0.00 GPM RECOVERY 0.0 %	0.00-??	The screen displays Feed Flow, Reject Flow(waste), Product Flow, and Recovery. Flow Meters must be installed for this screen to display values. If the RO is offline/not running, the screen displays FLOW METERS DISABLE.
TDS PPM TDS IN = 1075 TDS OUT = 192 % REJ = 82	0.00-??	G2/G3 only: this screen shows the TDS of the incoming and product water as well as the percent rejected. The TDS sensors must be installed for this screen to display values. If the RO is offline/not running, the screen displays TDS DISABLE.
TDS AVERAGE 0 PPM	0-999	When SV3 is selected, the RO controller information screen displays the TDS average in ppm. This should be the average TDS-out value over the last 10 cycles of "TDS Target Time."
RECOVERY 0.0%	0-??	Alternate information screen showing recovery, rejection, product flow and product TDS.
PFLOW 0.00 GPM TDS OUT = 169	0.00-?? 0-999	If the RO is offline/not running, the screen displays FM OR TDS DISABLE.
ACTUAL NFLOW: 0.00 GPM	0.00-??	This is the normalized product flow (flow at 77°F) NOTE: This value is displayed only if the Min NFlow Error limit is greater than zero.
P IN 122 PSI P OUT 124 PSI dP -2 PSI		Incoming (G2 Plus and G3 only) pressure and waste pressure are shown and the pressure differential (dP) is calculated. The screen displays DISABLE if no pressure gauges are connected. If the RO is offline/not running, the screen displays PRESS GAUGES DISABLE.
Actual Temp: 91 F		The screen displays the temperature of the product water.
PS1 = OPEN PTLO = OPEN FS HI = OPEN FS LO = OPEN		Indicates whether the pressure switch, pretreatment lockout, high float switch or low float switch is open or closed (if installed).

Screen Display	Range	Procedure
TOTAL FEED WATER 0 GALLONS		Displays the total number of incoming untreated water gallons since the unit was put into service.
TOTAL PROD WATER 0 GALLONS		Displays the total number of product water gallons since the unit was put into service.
PUMPING TIME 0 HOURS		Displays the total number of hours the unit has been in service (running) since the unit was put into service.
ERROR: 1 Water Press Low JAN-01-12 12:01P		The screen displays the last one to five errors flagged by the unit. If no errors are flagged the display reads NONE.
FWR202LT04 Jan 30 2012 S/N:00000000		The screen displays the firmware version, firmware installation date, and the GROC board serial number.
HISTORICAL DATA JAN 01 REJ=97% REC=50 DP = 77 PSI	100-1000	<p>The GROC has a built in data logging feature which takes a "snapshot" at the start of each month. The first time each month that the system has been in a "RUNNING" state for a continuous 10 minute block of time, the system will save the current values of:</p> <ul style="list-style-type: none"> Totalized gallons since new Current % recovery Current % rejection Current Product TDS Current water temperature <p>This data is stored on the local GROC board. The snapshots from the first three months are always stored with the most recent 24-month snapshots. This historical data is available even if the modem option is not used. If the historical data has been cleared, the screen displays NONE.</p>
CLEAR HIST DATA? NO	Yes No	<p>Press  to change setting to Yes, which clears historical data from the screen. Press  again; the program returns to the main menu.</p> <p>Erase this data ONLY when replacing the membranes.</p>

Service and Maintenance

Serial Numbers

The Culligan RO units have a serial number located directly behind the electronic controller on the side panel. Do not remove or destroy these serial number labels.

They must be referenced if you require repairs or parts replacement under warranty.

Troubleshooting

Problem	Probable Cause	Solution
1. Unit is set to Go to Running but unit does not start.	A. No power to unit.	A. Check circuit breaker.
	B. Low feed pressure.	B. Correct low pressure condition.
	C. Inlet solenoid failure	C. Replace solenoid
	D. Prefilter fouled.	D. Replace cartridge
2. Unit running but not holding high pressure.	A. Pump malfunction.	A. Replace pump.
	B. System pressure control valve malfunction.	B. Replace valve.
	C. Concentrate flow too high.	C. Check and adjust concentrate flow, replace tubing on A.
	D. Product flow too high.	D. Test modules.
3. Unit running but poor quality (less than 95% rejection)	A. Low pump pressure.	A. See 2.
	B. Module failure.	B. Replace modules. Check product line over pressurization.
	C. Concentrate throttling valve open.	C. Throttle valve down.
	D. Poor seal on endcap.	D. Check o-rings inside endcap. Replace o-rings if necessary.
4. Low quantity of product water.	A.-D. Same as 3.	A.-D. Same as 3.
	E. Cold water.	E. Install additional modules.
5. Excessive noise.	A. Air in the plumbing.	A. Check fittings for leaks. Purge air from system.
	B. Misaligned pump.	B. Remove pump and check for bearing wear.
	C. Harmonic vibration.	C. Install a pressure regulator ahead of the prefilter.
	D. Low feed pressure.	D. Increase feed pressure above 20 psig.
6. Inadequate product pressure (direct feed systems)	A. Low quantity of product water.	A. See 4.
	B. Demand for product water exceeds unit capacity.	B. Install additional modules.

Error Codes

When the G Series RO Controller encounters an error, the screen displays a message. Press  to scroll to the error message.

<p>STANDBY JAN-01-12 1:55P No Remote Signal</p>

These error conditions initiate an alert that is sent to the dealership if the telemetry (modem) options are set up, and then the RO will shut down. User intervention is required to restart the RO. See “Installing the Modem” on page 70 for information about setting up this feature. Additional fees apply.

NOTE The error text might differ from what is displayed on your unit.

Error Text	Error Description
WATER PRESSURE LOW (LP)	The inlet pressure falls below the value set in MIN FEED PRESS for X seconds. The inlet pressure source should be checked if this error occurs. This message requires the optional pressure transducer kit.
REJECTION RATE LOW (RJ)	The rejection rate goes below the value set in MIN REJECT %. This indicates the membranes should be cleaned.
WATER TEMPERATURE HIGH	The temperature is above specification level.
WATER TEMPERATURE LOW	The temperature is below specification level.
HIGH TDS OUT (TH)	The product TDS goes above the value set in MAX TDS OUT. This indicates that the membranes may be getting fouled and are losing their rejection capability.
PUMP PRESSURE LOW (PL)	The pressure to the first array of membranes falls below the value set for MAX FEED PRESS. This message requires the optional pressure transducer kit.
PUMP PRESSURE HIGH	The pressure to the first array of membranes is above the value set for MAX FEED PRESS. This message requires the optional pressure transducer kit.
QUALITY FLUSH	The system did not complete a quality flush operation.
FEED QUALITY LOW	The measured level of inlet water is below specification level.
MEMBRANE PRESSURE DROP (MP)	The pressure drop across the membrane exceeds the value set in MAX PRESSURE DIF. This usually indicates the membranes are scaling. This message requires the optional pressure transducer kit.
RECOVERY RATE HIGH (RH)	The recovery percentage goes above the value set in MAX RECOVERY %. This could indicate a change in water chemistry, temperature, or accidental setting change.

Error Text	Error Description
RECOVERY RATE LOW (RL)	The recovery percentage goes below the value set in MIN RECOVERY %. This could indicate a change in water chemistry, temperature, accidental setting change, or that the membrane is fouling.
MAX PUMP TIME	The pumping time has reached the specified limit.
NO REMOTE SIGNAL (NR)	The system and the wireless remote lose contact. An optional wireless remote must be installed to see this message.
NO DIAL TONE	The wireless remote is not indicating a dialup connection. An optional wireless remote must be installed to see this message.
LOW BATTERY	The battery strength is below specification level.

Table 3. Error code definitions.

Diagnostics

```
RUNNING
JAN-01-12  12:01P
```

1. From the default home screen, press . The screen displays the main menu.

```
1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
```

2. Press to scroll to 4) SETUP.
3. Press to select the SETUP menu.

```
3) POWERON MODE
4) FLUSH MODES
5) ACCESSORIES
>6) DIAGNOSTICS
```

4. Press to select 6)DIAGNOSTICS. The screen displays the diagnostics menu.

```
>1) TST WIRELESS
2) TESTPHONELIN
3) USE DATA PORT
4) TEST APP
```

5. The screen displays the diagnostics menu.

Test Wireless Remote

```
>1) TST WIRELESS
2) TESTPHONELIN
3) USE DATA PORT
4) TEST APP
```

6. Press to select 1)TST WIRELESS. The screen displays the wireless test screen.

```
WIRELESS TEST
0 / 188
RSSI=5
```

7. The screen displays the test number and total number of attempts and the received signal strength indicator (RSSI). The system will continue to test the signal strength until you press any button to return to the diagnostics menu.

The signal strength indicator (RSSI) will show a value of between 0 and 8. If the RSSI is at least 4, then the installation is complete. If the SSI drops below 4, then it may be necessary to select an alternate location for the wireless remote.

Test Wireless Remote

```
1) TST WIRELESS
>2) TESTPHONELIN
3) USE DATA PORT
4) TEST APP
```

8. Press to select 2)TESTPHONELIN. The screen displays the modem test screen.

```
MODEM TEST
Emailing now
Please Wait ...
```

9. Press to begin testing the modem telephone line. The screen displays the status of the test before displaying the results. Do not press any buttons before the test is complete or the controller will return to the Diagnostics menu.

Possible Results

```
MODEM TEST ERROR
NO TONE!!
```

```
MODEM TEST
NOT POSSIBLE NOW
TRY LATER!
```

```
MODEM EMAIL
SUCCESS
```

```
MODEM TEST
TIME
SET SUCCESS
```

Use Data Port

```
1) TST WIRELESS
2) TESTPHONELIN
>3) USE DATA PORT
4) TEST APP
```

10. Press    to select **3)USE DATA PORT**. The screen displays the data report status screen.

```
MINI REPORT
Sending ...
```

11. Press  to to send the mini report.

```
MINI REPORT
Sent!
```

12. The RO controller displays the message delivery status. Press  to exit the screen. See Appendix A regarding report data.

Test Wireless Remote

```
1) TST WIRELESS
2) TESTPHONELIN
3) USE DATA PORT
>4) TEST APP
```

13. Press     to select **4)TEST APP**. This diagnostic is used only for factory testing.

```
TEST APP
OFF
```

This diagnostic is used only for factory testing.

Calibration

Calibrating the Flow Meters

The flow meter(s) on the RO systems are calibrated by means of a K-Factor. This value is set at the factory and should not need to be changed, even if the flow sensor is replaced.

Should it become necessary to recalibrate or reenter the K-Factor, you can use one of the two methods below. An example of this would be when replacing the circuit board.

Method A	Method B
<p>This method involves resetting the K-Factor to the factory setting. Every unit shipped has a data sheet in the controller which lists the factory settings for that unit. This sheet will list the K-Factor setting(s) for the unit. Simply reenter the value(s).</p> <p>If the data sheet is not available, contact Culligan and provide the unit serial number. The values will be looked up.</p>	<p>If method A is not possible, then the meter can be calibrated with an external calibrated flow meter or a bucket and stopwatch. If Method B becomes absolutely necessary, please consult a Technical Service Advisor from Culligan Rosemont.</p>

Calibrating the TDS Probe

The probes can be easily field calibrated using a calibrated handheld TDS meter. Disconnect the probe from the RO plumbing and submerge it into a solution of known TDS. Enter the ACTUAL TDS value at main menu / setup / accessories/ TDS.

Prefilter Cartridge Replacement

The prefilter cartridges should be changed when the pressure drop across the prefilter increases by 15 psi (103 kPa). Refer to the diagram in the installation section.



CAUTION! The pressure after the prefilter should not be less than 15 psi (103 kPa), or the pump might be damaged.

Replacing the Prefilter Cartridge

1. Turn the unit OFF, then shut off the inlet water supply.
2. Unscrew the filter bowl.
3. Remove the old cartridge.
4. Clean the filter bowl with a damp cloth, rinse thoroughly.
5. Remove the wrappers from a new cartridge (10" PN 00403232, 20" PN 01000222). Install the cartridge in the bowl, making sure it seats in the bottom of the bowl.
6. Check the O-ring seal for dryness and cuts. Replace the seal if necessary and use silicone lube as needed.



CAUTION! Do not use petroleum-based lubricants, which destroy the synthetic rubber seal.

7. Screw the filter bowl back onto the filter head.
8. Turn on the inlet water supply.

Membrane Replacement

Replace an element that has been damaged or cannot be cleaned. (Refer to Figure 30).

1. Turn off the system. Allow pressure to be completely relieved. Turn main feed line to RO off.
2. Remove retaining clips from both ends of all vessels.
3. Remove end caps from all vessels, with the tubing remaining in place. Note placement the caps to assure re-installation in the same orientation.
4. Remove the RO element from the housing. Note orientation of membranes to assure re-installation in same orientation. Brine seal will be facing the incoming feed to the vessel. Flow direction is indicated by the arrow on the outside of the membrane vessel.
5. Check the o-ring seals on the element and end plug, and the element brine seal for damage. If an O-ring is cut or crimped, it may have caused high flow and poor quality. Replace the O-rings and retest before replacing the entire element.
6. Remove a new element from its plastic bag. Lightly lubricate the O-rings with a silicone-based lubricant or use a mixture of 70% glycerin and 30% water.



CAUTION! DO NOT use a petroleum-based lubricant, because it will damage the synthetic rubber and the membrane.

7. Make sure the brine seal is located in the direction of the incoming feed to that vessel according to the flow arrow and the original membrane orientation.
8. Lubricate the O-ring on the end plugs with a silicone-based lubricant or use a mixture of 70% glycerin and 30% water. Re-install the end plugs in to the vessels same as the original orientation. Reinstall the retaining clips.

9. Refer to the “Initial Startup” section for information on flushing the shipping solution from the new elements.

NOTE Do not forget to record the new values for flow, pressure, temperature, and TDS.

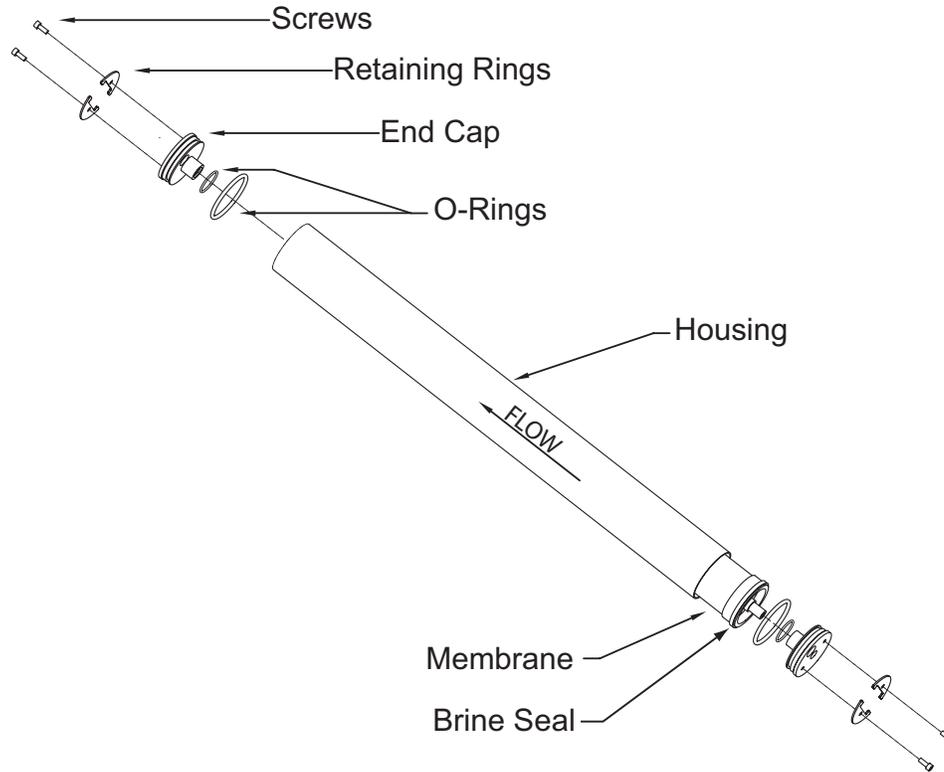


Figure 22. G Series membrane.

Pump Replacement

The pump should be replaced when it cannot develop the pressure required to maintain the appropriate pressure. The most common cause of pump failure is inadequate pressure to the pump inlet. Therefore, correct any low inlet pressure problem before replacing the pump to prevent damage to the new pump. Replace the pump when it cannot develop the pressure required to maintain the desired product flow rate, up to the maximum pump pressure of 225 psig.

To replace the pump:

1. Turn the unit OFF, then shut off the inlet water supply.
2. Remove the tubing from the pump inlet and outlet.
3. While holding the bottom of the pump with one hand, loosen the screw on the coupling band securing the pump to the motor. The pump will drop down. Remove the coupling band.
4. Examine the pump shaft. If it is broken or rounded, remove the old shaft and install a replacement shaft, PN 01000331. Examine the slot in the motor. If the slot is damaged, replace the motor.
5. Remove the plumbing fittings from the old pump, apply fresh Teflon tape, and install the fittings in the new pump. (Skip this step if replacing only the shaft.)
6. Place the coupling band over the shaft end of the new pump. Insert the pump shaft into the slot in the motor.
7. Observe the alignment of the pump against the motor, making certain the pump and motor flanges are in complete contact and are not skewed.
8. Make sure the clamp is fully seated around the entire circumference of the pump and motor flanges. Tighten the coupling screw fully, then loosen the screw 1/4 to 1/2 turn.

9. Rotate the pump so that the inlet and outlet ports point to the right. Verify that the pump is still aligned properly to the motor.



CAUTION! If the pump is not properly aligned, the pump bearings will wear prematurely.

10. Tighten the coupling screw using 15 to 30 inch-pounds of torque, then attach the inlet and outlet.

Motor Replacement

1. Disconnect the pump from the motor as outlined in steps 1-4 in pump replacement section.
2. Disconnect the motor cord from the old motor.
3. Remove the pump and motor assembly from the mounting bracket by removing the four (4) nuts, lock-washers and washers, holding the motor onto the motor mounts.
4. Mount the new motor onto the motor mounts and secure with nuts and washers.
5. Wire the motor cord connections to the new motor as indicated on the wiring schematic on the motor label for 110 volt operation.
6. Reinstall the pump, fittings and tubing following steps 7 through 10 as outlined in the pump replacement section.

NOTICE Some replacement motors may be prewired for 220 Volt operation at shipment. Refer to wiring schematic on the motor label and verify that the motor is wired for 110 Volt operation.

Sanitizing Modules

The modules may need sanitizing if either of the following conditions exist:

- The RO system is subject to biofouling and the operator wants to reduce the cleaning frequency.
- The water treatment application limits the microbial count in the product water.



CAUTION! The bottom of the tank must be higher than the pump on the RO unit to prevent cavitation of the pump when solution is drawn from the tank.

NOTICE Replace the prefilter cartridges if they are discolored by iron.

The frequency of sanitization will depend on the frequency of biofouling or excess microbial counts. Once the frequency of the problem has been determined, sanitization can be scheduled for preventative maintenance. To sanitize the system, obtain a tank which will hold the sanitizing solution volume.

NOTE When cleaning the 1-series RO units that use brass pumps and solenoid valves, do not use a cleaning agent with a pH below 5.0.



CAUTION! Always use caution when handling any chemical. Refer to the material safety data sheet for recommendations in the safe handling of this chemical. The MSDS is available from the manufacturer of the chemical. Use the proper protective safety equipment.



CAUTION! Local codes may prohibit the discharge of hazardous materials to drain. If necessary, an extra tank can be used to neutralize the solutions before discharge to drain.

Prepare Equipment for Sanitizing

1. Prepare the cleaning solution (see Table 4 and Table 5) with permeate water for a five-gallon solution.
2. Choose **OFFLINE** from the product status menu.
3. Disconnect the product line from service and direct the line into a drain.
4. Turn off the inlet water supply.

Max Temp 45°C (113°F) pH Range	Max Temp 35°C (95°F) pH Range	Max Temp 25°C (77°F) pH Range
5–10.5	5–12	5–13

Table 4. pH range and temperature limits during cleaning.

Cleaner Foulant	0.1% (W) NaOH and pH 12, 35°C max. or 1% (W) Na₄EDTA and pH 12, 35°C max.	0.1% (W) NaOH and pH 12, 35°C max. or 0.025% (W) Na-DSS and pH 12, 35°C max.	1.0% (W) Na₂S₂O₄, 25°C and pH 5
Inorganic Salts (e.g. CaCO ₃)			Preferred
Sulfate Scales (CaSO ₄)	Preferred		
Metal Oxides (Iron)			Preferred
Inorganic Col-loids (Silt)		Preferred	
Silica	Alternative	Preferred	
Biofilms	Alternative	Preferred	
Organic	Alternative	Preferred	

Table 5. Cleaning solutions.

Service the Filter and Tubing

1. Remove the sediment filter from the cartridge.
2. Install the bowl without the filter.
3. Connect the tubing from the solution bucket to the feed flowmeter.
4. Change the pressure switch setting from NORMALLY OPEN to NORMALLY CLOSED. See “Pressure Gauges Settings” on page 40.
5. Disconnect the concentrate tubing from the membrane to the motor panel and direct the tubing to the drain.

Draw the Sanitizing Solution Through the Unit

1. Choose GO TO RUNNING from the main menu to turn on the unit
2. Allow about half of the sanitizing solution to be drawn through the system.



CAUTION! If the unit vibrates severely, the pump may be cavitating. Turn the power switch OFF. Raise the bucket to ensure adequate pressure to the pump.

3. Choose GO TO OFFLINE from the main menu.
4. Allow the unit to sit undisturbed for at least two hours.

NOTICE If the unit is going to be left unused for up to three months, allow the solution to remain in the unit. If the unit will remain unused for longer than three months, sanitize the unit every three months.

Flush the Unit

1. Connect the inlet water supply.
2. Choose GO TO RUNNING from the main menu.
3. Slowly close the recirculation and drain valves until the system operating pressure increases to normal pressure.

NOTE Increase the pressure no faster than 5 psi per second.

4. Allow the unit to run for at least 30 minutes. Check the product water until the pH for the concentrate and product remains stable for five (5) minutes and the TDS is greater than 95 percent rejection.
5. Choose GO TO OFFLINE from the main menu.
6. Connect the concentrate tubing from the membrane to the motor panel.
7. Reconnect the product tubing to the service line. Install the new sediment filter.
8. Change the pressure switch setting to NORMALLY OPEN.

The system is now ready for use.

Testing

If the product flow calculations or NFLOW values show a loss of flow, or the product quality has become poor, one or more elements will require cleaning or replacement. Because poor performance might be due to only one element, test the product flow and quality from individual housings.

To test each element:

1. Disconnect the product tubing from the housing to be tested.
2. Choose GO TO RUNNING from the main menu.
3. Measure the product flow and TDS from the test element.
4. Choose GO TO OFFLINE from the main menu.
5. Reinstall the tubing.
6. Continue testing the elements as needed to determine which should be cleaned or replaced.

Cleaning

During the operation of any reverse osmosis system, dissolved solids and particulate matter are concentrated inside the module element. If these contaminants are present in relatively low concentrations, the concentrate flow from the system flushes them to drain. In most cases, water pretreatment such as filters and softeners will prevent the deposit of these contaminants.

When these deposits occur, there will be a decrease in the product water flow and quality. When these symptoms become excessive, the modules must be cleaned before they are permanently damaged.

To determine when cleaning is needed, compare the current system performance to the performance of the system when the reverse osmosis elements were new. Use Table 5 to obtain data and compare the performance of the system, “new” and “now” (record the data in pencil).

Test Data	Feed		Product		Concentrate	
	New	Now	New	Now	New	Now
Flow (gpm)						
TDS (ppm)						
Pressure (psi)						
Temp. (°F)						

Table 6. System performance—new vs. present.

NOTICE If new data is not available, use the specifications listed earlier in these instructions. However, keep in mind that the new elements may have exceeded these specifications, so performance may have decreased even if the unit still exceeds specifications.

In addition to differences in product flow and quality (TDS), determine whether there were any changes in concentrate water flow, feed water TDS, feed water temperature and feed or product pressures. Changes in these values provide clues to indicate the cause of any problems with the product water.

If there were changes in feed water temperature or pressure, the product water flow rates will have to be converted to flow rates under standard conditions (77° F and 200 psig) in order for any comparison to be valid. Refer to the Product Flow Calculation section to calculate flow rates under standard conditions, then compare the converted values. A decrease in the product water flow may have been due only to a decrease in temperature or pressure, in which case cleaning would not be indicated.

If any change in the performance of the elements was not due to a change in operating conditions, it may be time to clean the elements. In general clean the elements:

1. When the product flow rate decreases by 10% (or when the feed pressure must be increased by 10% to maintain the same product flow), or
2. When the percent of rejection decreases below specification.

NOTICE Because strong chemicals are used to clean the elements, maintenance cleaning is not recommended. If the elements need to be cleaned frequently (more than twice a year), the pretreatment may be inadequate. Obtain a current water analysis and test the Silt Density Index and the Total Chlorine level of the water on-site to review what changes in pretreatment may be needed.

When cleaning is required, the type of material which is fouling the element should be identified, if possible. Refer to Table 7 to determine the possible causes of the performance change.

Percent Rejection	Flow		
	Low	Normal	High
Low	Hardness Scale	Hardness Scale (light) or Iron	Membrane Damage
High	Silt or Biofouling	—	Membrane Damage (light)

Table 7. Performance change possible causes.

For example, if the product flow is low but the percent rejection is normal, the likely causes of the problem are silt or biofouling. Please note that if the product flow rate has increased (with no increase in temperature or pressure) the likely reason is damage to the membrane, which cannot be repaired by cleaning.

Once the foulant has been identified, choose the recommended cleaning chemical(s) from Table 8.

Membrane Problem	Cleaning Chemical
Hardness Scale	Hydrochloric acid, phosphoric acid
Iron	Hydrochloric acid, phosphoric acid
Silt	Phosphoric acid and sodium hydroxide
Biofouling	Phosphoric acid and sodium hydroxide

Table 8. Recommended membrane cleaning chemicals.

Because phosphoric acid can be used by itself or in combination with sodium hydroxide to clean almost all types of foulants, it is generally recommended over hydrochloric acid when choosing a “stock” acid.

NOTICE Some municipal surface water supplies are treated with alum. Aluminum fouling results in low flow and, occasionally, in low rejection. If aluminum fouling is suspected, use only hydrochloric acid.

Use a pH meter to prepare acid and caustic solutions, and to monitor pH changes as the solutions react with any foulants.

Materials required:

1. Solution tank (50 gallon capacity, minimum), to prepare and store the chemical solution.
2. Tank stand, to elevate solution tank to level above pump.
3. Tubing 1/2” O.D. to connect cleaning adapter ahead of Pre-filter.
4. A pH meter.
5. A pre-filter cartridge (PN 00955004).

Before proceeding record the “NOW” values in Table 6.

Prepare the Equipment for Cleaning

1. Choose GO TO OFFLINE from the main menu.
2. Place the solution tank on the tank stand. Connect the tubing to the cleaning adapter then place the other end of the tubing at the bottom of the solution tank.

NOTICE The tubing length should be as short as possible to prevent excessive pressure drop. Cut the tubing as required to minimize the length.

3. Remove the product tubing from the service connection and place the end in the solution tank. The concentrate tubing should still be directed to drain.
4. Replace the Pre-filter cartridge.
5. Choose GO TO RUNNING from the main menu.
6. Fill the tank with 30-40 gallons of RO product water.



CAUTION! DO NOT turn on the RO system unless water can flow from the product and waste lines.

NOTE Soft water is an acceptable substitute for RO water. When the solution tank is filled, direct the product tubing to drain. Next, open the pump system pressure control valve until the system pressure is approximately 50 psig.

7. Choose GO TO OFFLINE from the main menu. Remove wires from terminals 3 and 4 (Pressure switch) and install a jumper wire across those two terminals.
8. Open the cleaning valve to allow feed water to displace air in the cleaning tubing, then close the inlet water shutoff valve.

Clean the Tank

1. Choose GO TO RUNNING from the main menu.



CAUTION! If the pump is noisy, cavitation is occurring and the pump will be damaged. Turn the power switch OFF and check for any obstructions to flow. Reduce the pump pressure as required to prevent cavitation.

2. Record the pump pressure and measure the product water flow at low pressure. This flow will be used to estimate if cleaning has been successful. Turn the power switch to OFF.
3. Add enough acid to the solution tank until the pH is between 2.0 and 2.5.

NOTE If the foulant to be removed is silt or a biofilm, use phosphoric acid.



WARNING! Acid and Sodium Hydroxide are strong chemicals that must be handled carefully to avoid injury. Wear protective clothing and have a source of water nearby to flush any spills.



CAUTION! Local codes may prohibit the discharge of acid and caustic solutions to drain. If necessary, an extra tank can be used to neutralize the solutions before discharging to drain.

4. Choose GO TO RUNNING from the main menu. After approximately 5 gallons have been drawn from the solution tank, Choose GO TO OFFLINE from the main menu.
5. Allow elements to soak for 15 minutes. Choose GO TO RUNNING from the main menu. Draw another 5 gallons from the solution tank. Choose GO TO OFFLINE from the main menu.

6. Remove the end of concentrate tubing from the drain and place it in the solution tank.
7. Choose GO TO RUNNING from the main menu. Allow the acid solution to circulate for 30 minutes. During recirculation, monitor the pH of the solution. If the pH rises above 3.0, add acid to reduce the pH to 2.0.



CAUTION! The temperature of the chemical solution will rise as it is recirculated. If the temperature exceeds 95°F, turn the power switch to OFF and allow the solution to cool to prevent damage to the RO elements.

NOTE A plastic gallon jug filled with ice may be placed in the solution to cool it.

8. When 30 minutes have passed, adjust the system pressure to the pressure recorded in Step 9. Measure the product flow rate, then compare this flow to the flow recorded in Step 9. If cleaning is successful a noticeably higher product flow should now be observed.
9. Choose GO TO OFFLINE from the main menu. If the cleaning was for removal of hardness scale or iron only, go to "Finish Cleaning Procedure".

Clean Silt or Biofouling

1. If the cleaning was for silt or biofouling, take a 250 ml sample of phosphoric acid solution and carefully add sodium hydroxide until the pH is at least 12. If the solution turns cloudy, it contains hardness and/or iron. Discard the contaminated acid and prepare a fresh 30 gallons of phosphoric acid solution. Add sodium hydroxide to the phosphoric acid solution. The pH of the solution should be increased to 11.0-11.5.

NOTE The result is an alkaline solution of tri-sodium phosphate (TSP), a common ingredient in detergents.

2. If the solution remains clear, then direct the concentrate tubing to drain, then choose GO TO RUNNING from the main menu. Check that the unit is drawing chemical solution.



CAUTION! If the pump is noisy, cavitation is occurring and the pump will be damaged. Choose GO TO OFFLINE from the main menu and check for any obstructions to flow. Reduce the pump pressure as required to prevent cavitation..

3. After approximately 5 gallons have been drawn from the solution tank, choose GO TO OFFLINE from the main menu.
4. Allow the elements to soak for 15 minutes. Turn the power switch to ON. Draw another 5 gallons from the solution tank. Choose GO TO OFFLINE from the main menu.
5. Remove the end of concentrate tubing from the drain and place it in the solution tank. Choose GO TO RUNNING from the main menu. Allow the alkaline solution to circulate for 30 minutes. During recirculation monitor the pH of the solution. If the pH drops below 10.0 add sodium hydroxide to increase the pH to 11.5.

NOTE If the caustic solution becomes dark brown (like coffee), it probably is saturated with organic material. Discard the solution and prepare a fresh batch of phosphoric acid and sodium hydroxide.

For more accurate testing, use a Hach Model DE-2 detergent test kit or equivalent to ensure that the product water is less than 0.05 ppm detergent.

A plastic gallon jug filled with ice may be placed in the solution tank to cool the solution.



CAUTION! The temperature of the chemical solution will rise as it is recirculated. If the temperature exceeds 95°F, choose GO TO OFFLINE from the main menu and allow the solution to cool to prevent damage to the RO elements.

Finish Cleaning Procedure

1. When 30 minutes have passed, adjust the system pressure to the pressure recorded during low pressure. Measure the product flow rate, then compare this flow to the flow recorded during low pressure. If cleaning is successful a noticeably higher product flow should now be observed.
2. Choose GO TO OFFLINE from the main menu. Remove the concentrate and product tubing from the solution tank and direct them both to drain. Choose GO TO RUNNING from the main menu to draw most of the remaining cleaning solution from the tank.



CAUTION! Do not allow the unit to draw air from the tank, or the pump will be damaged.

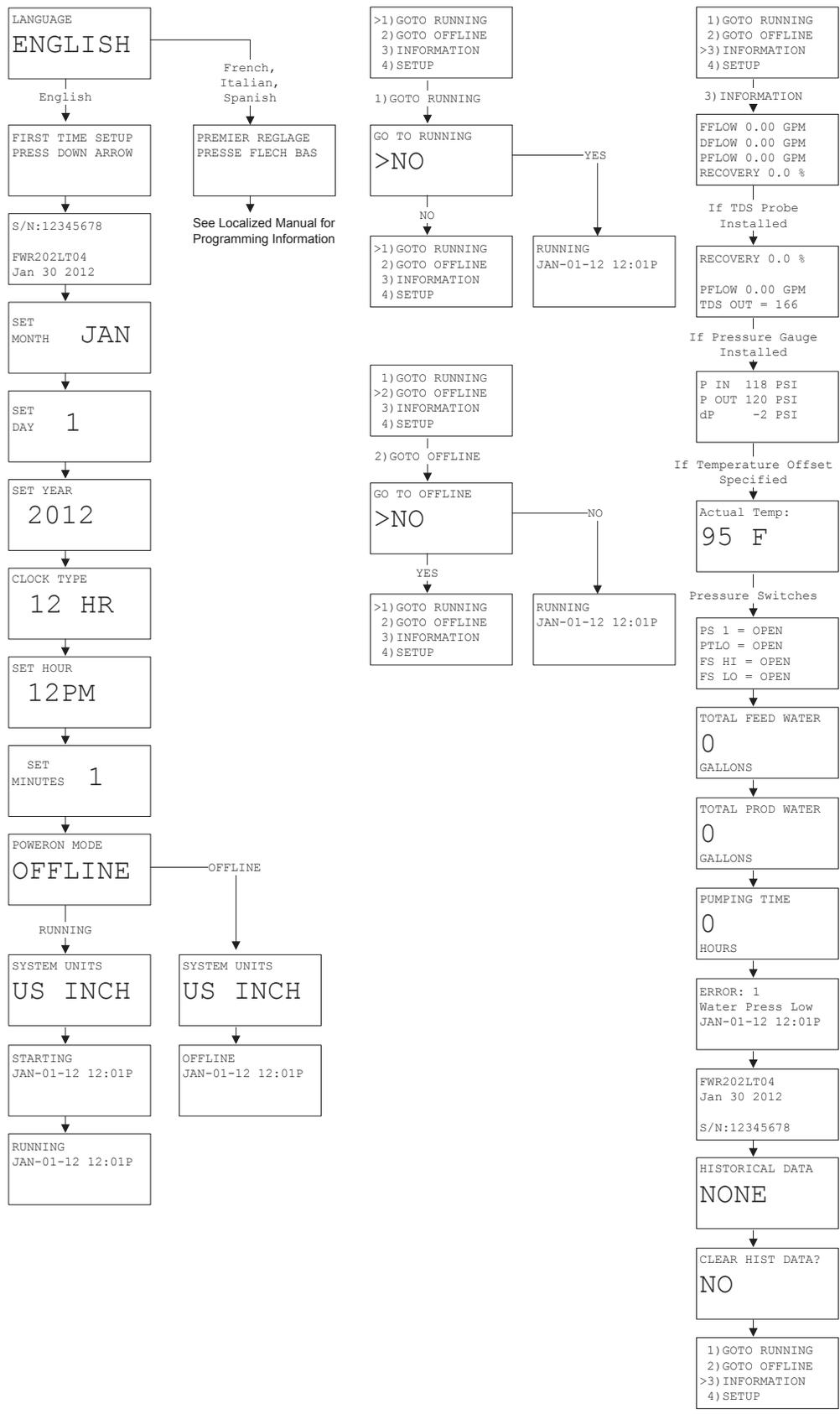
3. Choose GO TO OFFLINE from the main menu. Close the cleaning valve, reconnect the wires to the pressure switch, then open the feed water valve.
4. Choose GO TO RUNNING from the main menu and flush the cleaning solution from the unit for 30 minutes or until the pH levels of the concentrate water and the product water remain constant.

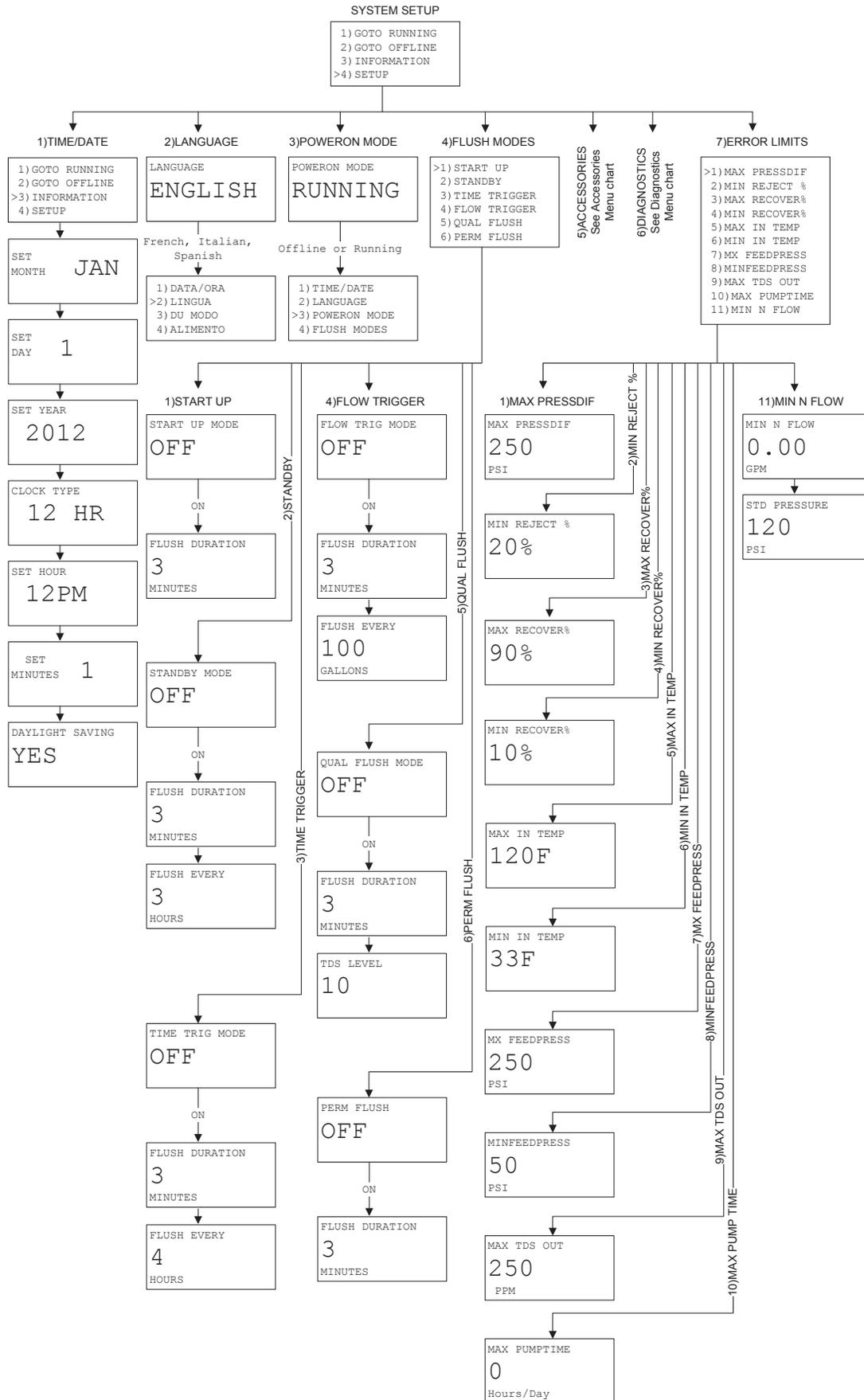


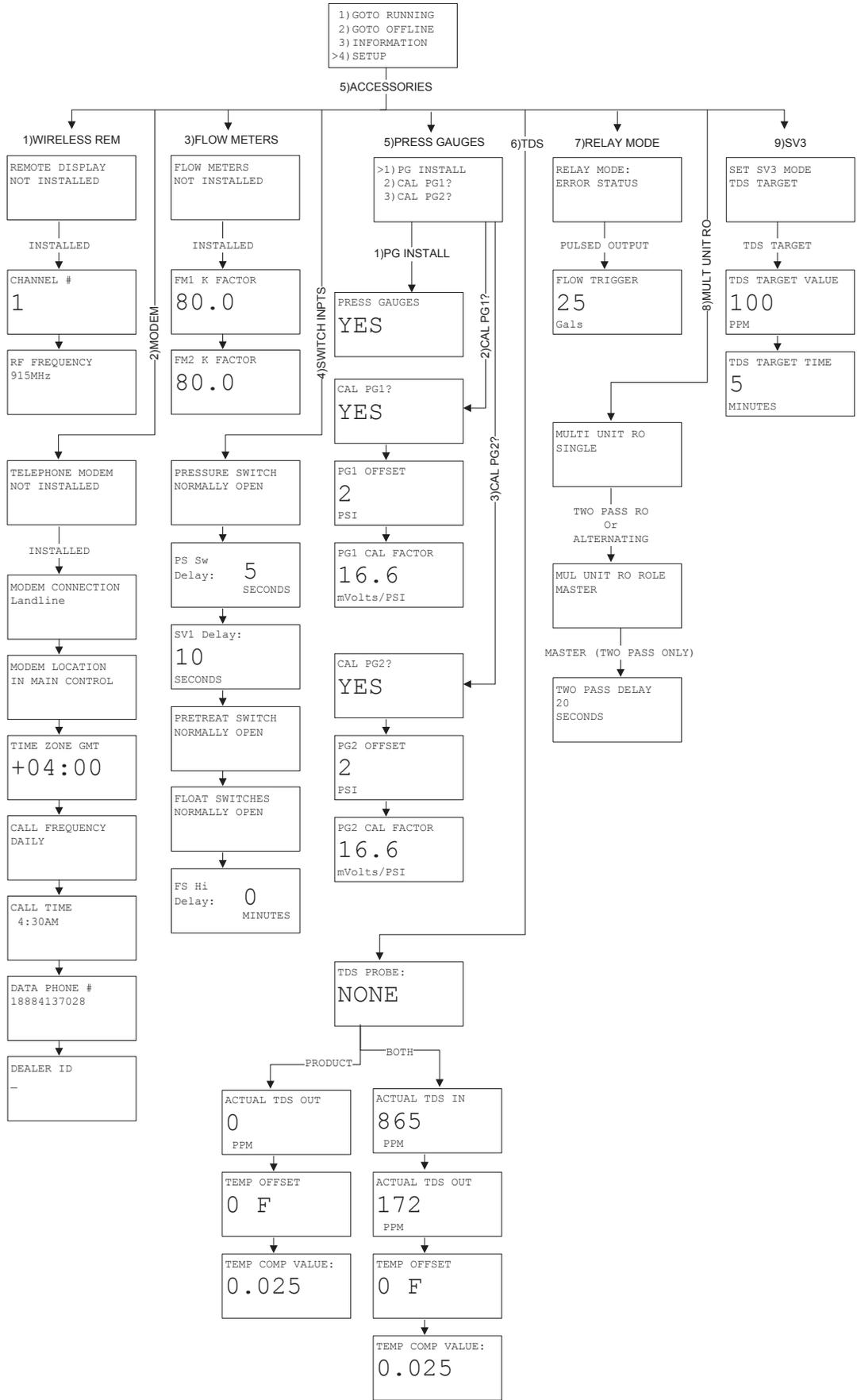
CAUTION! Soft water must be used to flush the caustic solution, or hardness will precipitate. If soft water is not available, use temporary portable exchange softener tanks.

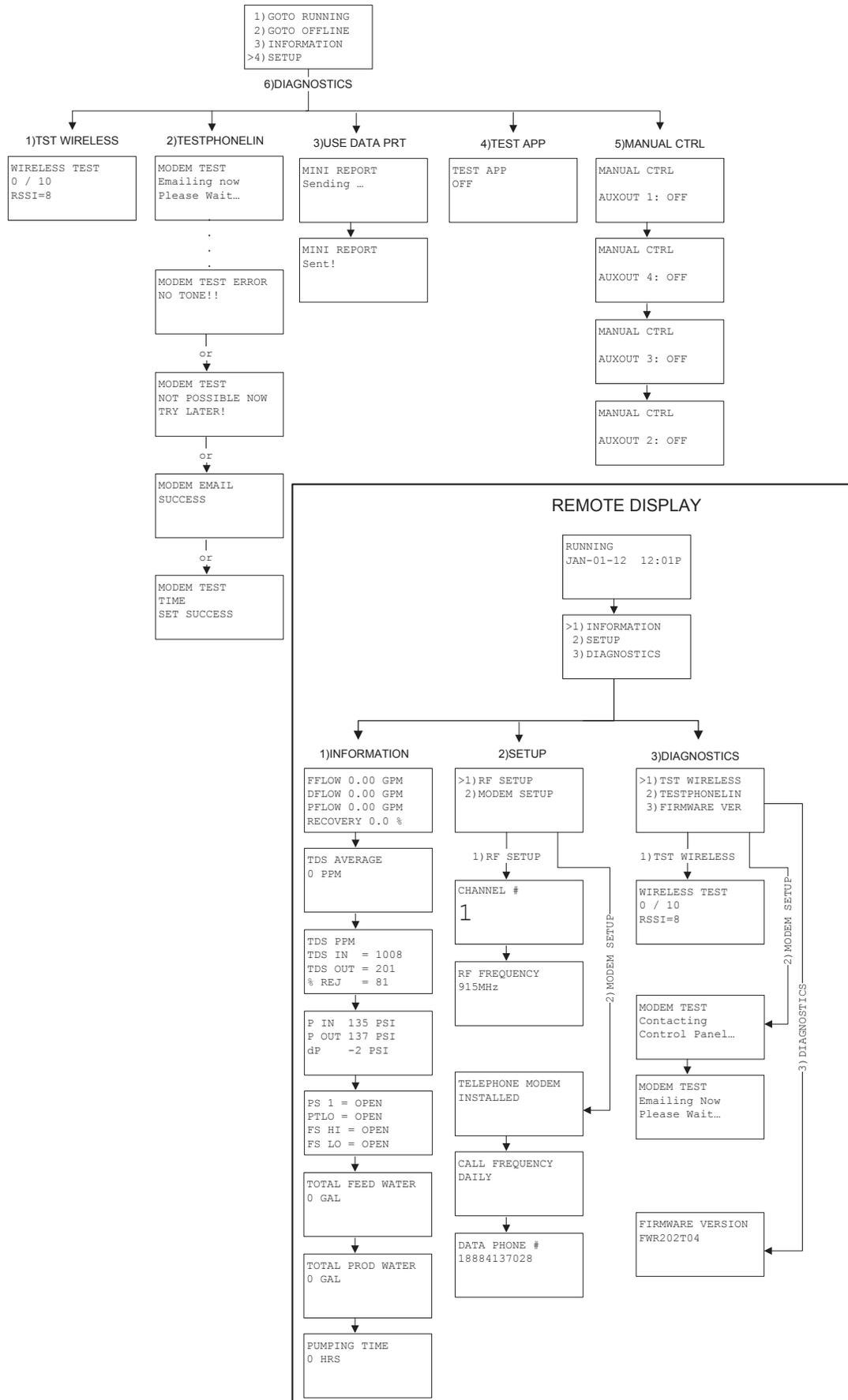
5. Adjust the system pressure to the normal value. Measure all flows, TDS levels, pressures, and temperature. Compare these values with the “new” and “now” values to determine if cleaning has been successful. If cleaning has not been successful, contact the service department at Culligan International Company for suggestions on alternate cleaning chemicals. If cleaning has been successful, note which chemicals were effective. Use the same chemical(s) when the unit is cleaned again.
6. Replace the Pre-filter cartridge.
7. After cleaning and rinsing have been completed, connect the product tubing to the service line. Remove the jumper installed and reconnect the pressure switch. Rinse the cleaning tank and tubing with fresh water.

GBE RO Controller Menu Structure









G2 RO Parts Diagrams and Lists

G2 RO Replacement Parts List

Item	Description	Part Number									
		G2-2	G2-3	G2-4	G2-5	G2-6	G2-7	G2-8	G2-9	G2-10	
—	RO System, G2	01021298	01021299	01021300	01021301	01021302	01021303	01021304	01021305	01021306	
1	Controller, G Series	01021291									
2	Valve, Needle, ½" Brass	01021539									
3	Rotameter, 1–10 GPM	01021538									
4	Pump, Grundfos CRI	01021232					01021232	01021235			
5	Housing, Filter, Wave Cyber FRP 4" End Port	01021540 (2)	01021540 (3)	01021540 (4)	01021540 (5)	01021540 (6)	01021540 (7)	01021540 (8)	01021540 (9)	01021540 (10)	
6	Element RO 4" DIA x 40"	01008007 (2)	01008007 (3)	01008007 (4)	01008007 (5)	01008007 (6)	01008007 (7)	01008007 (8)	01008007 (9)	01008007 (10)	
7	Piping Feed Subassy	01021404									
8	Piping Feed Pressurized Narrow Subassembly	01021405									
8	Piping Feed Pressurized Wide Subassembly						01021556	01021406			
9	Piping Concentrate Subassembly	01021403									
10	Piping Product Narrow Subassembly	01021407									
10	Piping Product Wide Subassembly						01021408				
11	Housing, 10"BB HFPP w/ PR ¾"	01018049									
11	Housing, 20"BB HFPP w/ PR ¾"						01028050				
12	Cartridge Filter, 5 Micron, 10" Big Blue	00403232									
12	Cartridge Filter, 5 Micron, 20" Big Blue						01000222				
—	Small Parts Kit, G2 RO	TBD									

G2 RO

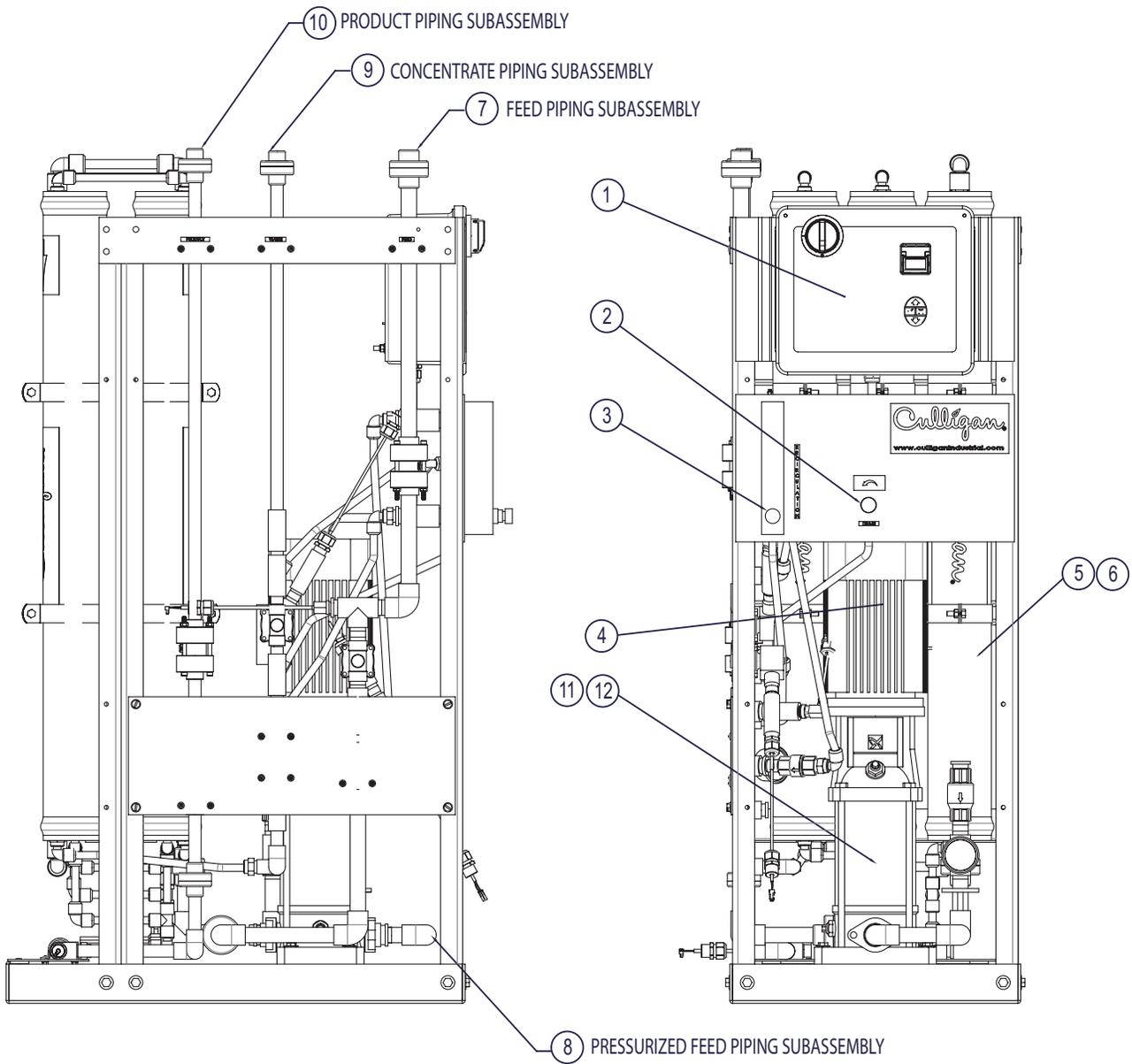


Figure 23. G2 front and side views.

G2 Plus RO Replacement Parts List

Item	Description	Part Number									
		G2-2 Plus	G2-3 Plus	G2-4 Plus	G2-5 Plus	G2-6 Plus	G2-7 Plus	G2-8 Plus	G2-9 Plus	G2-10 Plus	
—	RO System, G2	01021806	01021807	01021808	01021809	01021810	01021811	01021812	01021813	01021814	
1	Controller, G Series	01021291									
2	Valve, Needle, SS, 1/2 NPTI	01021729									
3	Rotameter, 1–10 GPM	01021538									
4	Pump, Grundfos CRI	01021232					01021234 ¹	01021235			
5	Housing, Filter, Wave Cyber FRP 4" End Port	01021540 (2)	01021540 (3)	01021540 (4)	01021540 (5)	01021540 (6)	01021540 (7)	01021540 (8)	01021540 (9)	01021540 (10)	
6	Element RO 4" DIA x 40"	01008007 (2)	01008007 (3)	01008007 (4)	01008007 (5)	01008007 (6)	01008007 (7)	01008007 (8)	01008007 (9)	01008007 (10)	
7	Piping Feed Subassy	01021404									
8	Piping Feed Pressurized Narrow Subassembly	01021803									
8	Piping Feed Pressurized Wide Subassembly						01021805	01021804			
9	Piping Concentrate Subassembly	01021801									
10	Piping Product Narrow Subassembly	01021409									
10	Piping Product Wide Subassembly						01021802				
11	Housing, 10"BB HFPP w/ PR 3/4"	01018049									
11	Housing, 20"BB HFPP w/ PR 3/4"						01028050				
12	Cartridge Filter, 5 Micron, 10" Big Blue	00403232									
12	Cartridge Filter, 5 Micron, 20" Big Blue						01000222				
—	Small Parts Kit, G2 Plus RO	TBD									

G2 Plus RO

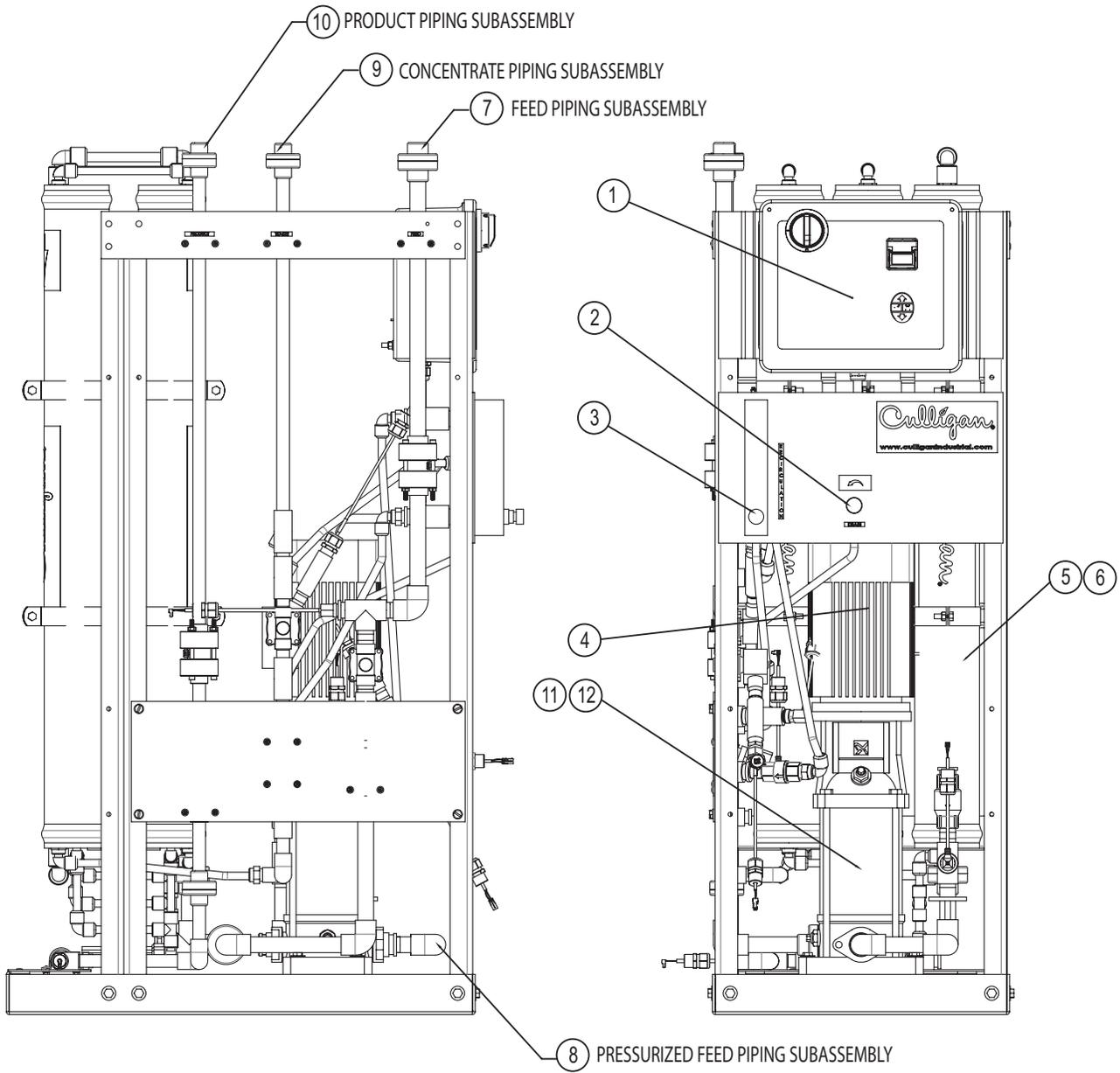


Figure 24. G2 Plus front and side views.

Series G2 Sub-Assemblies

Feed Piping Sub-Assembly

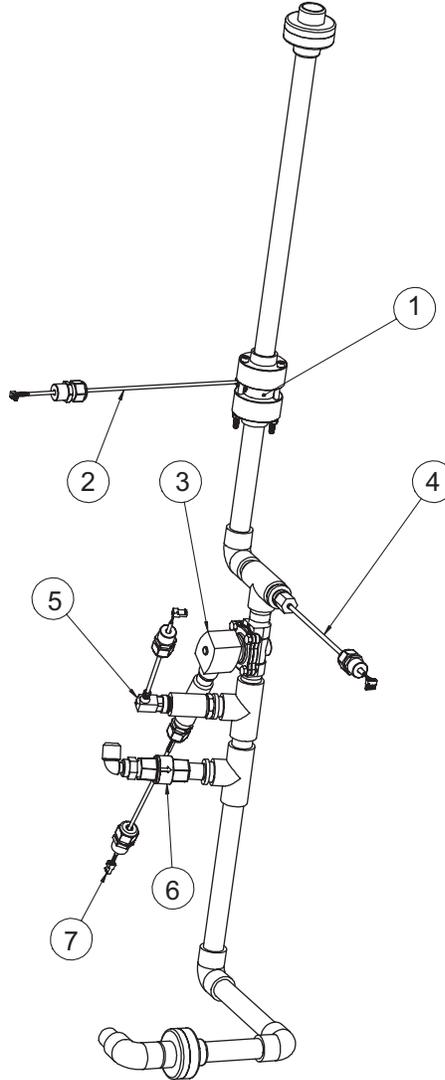


Figure 25. G2 feed piping sub-assembly.

Item	Part No.	Description	Qty
—	01021404	Piping Feed Subassembly	1
1	01021877	Meter Assembly, 1"	1
2	01021896	Flow Meter Wire Harness	1
3	01023167	Wiring Harness, Solenoid Valve, 3/4" NPT	1
4	01021876	Sensor, TDS with 5-Position Connector	1
5	01021907	Pressure Switch Assembly	1
6	01021543	Check Valve	1
7	01021320	36" Pressure Switch Extender	1
—	01021378	3/4" NPT Sol Valve Cable Assembly	1

G2 Pressurized Feed Piping Sub-Assembly

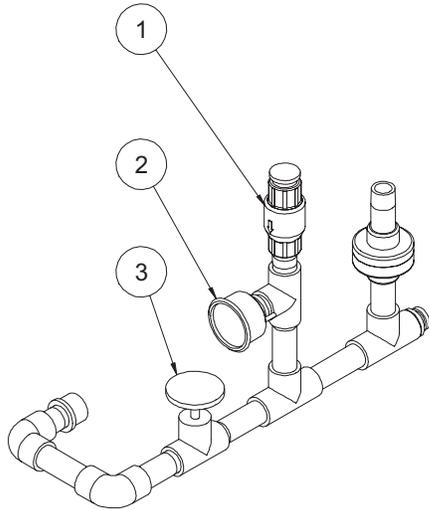


Figure 26. G2-2-G2-6 pressurized feed piping subassembly.

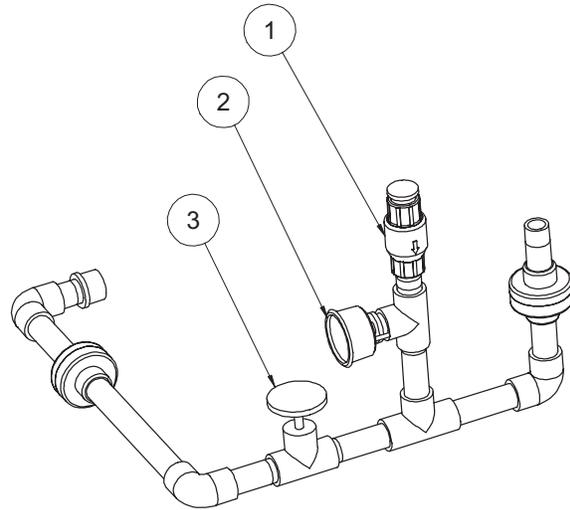


Figure 27. G2-7 pressurized feed piping subassembly.

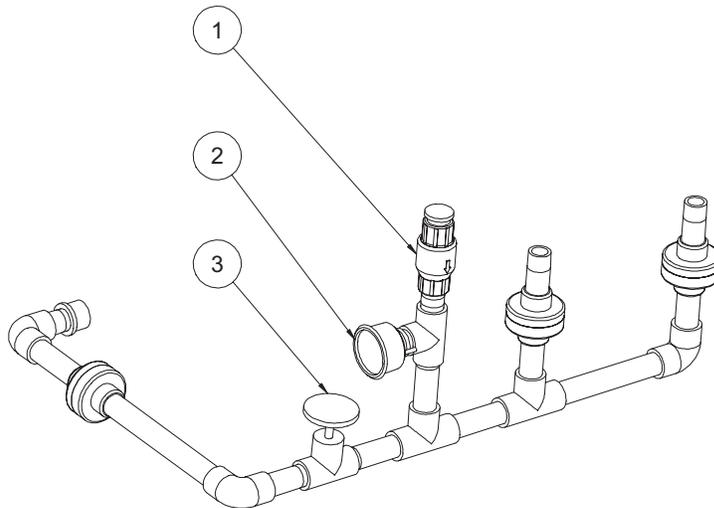


Figure 28. G2-8-10 pressurized feed piping subassembly.

Item	Part No.	Description	Quantity
—	01021405	Piping Feed, Pressurized, Narrow, Subassembly	1
—	01021556	Piping Feed, Pressurized, G2-7, Subassembly	1
—	01021406	Piping Feed, Pressurized, Wide, Subassembly	1
1	01021723	CHECK VALVE, 3/4"	1
2	01007604	Pressure Gauge, 0-300 PSI, 2½", ¼" CBM, Filled, SS	1
3	01021544	3/4" Globe Valve, PVC	1

G2 Plus Pressurized Feed Piping Sub-Assembly

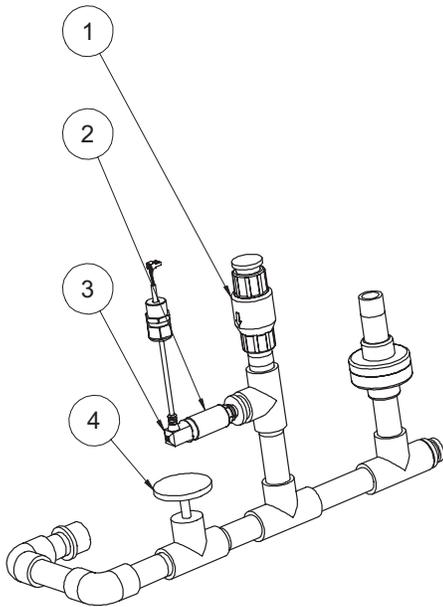


Figure 29. G2-2-G2-6 Plus feed piping subassembly.

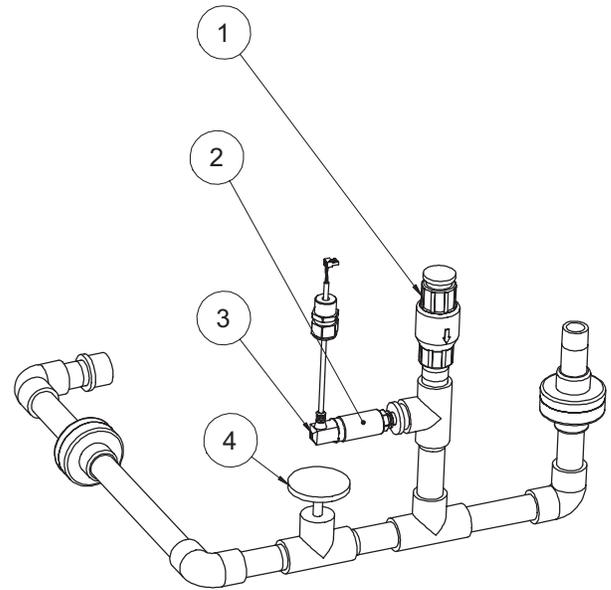


Figure 30.

G2-7 Plus feed piping subassembly.

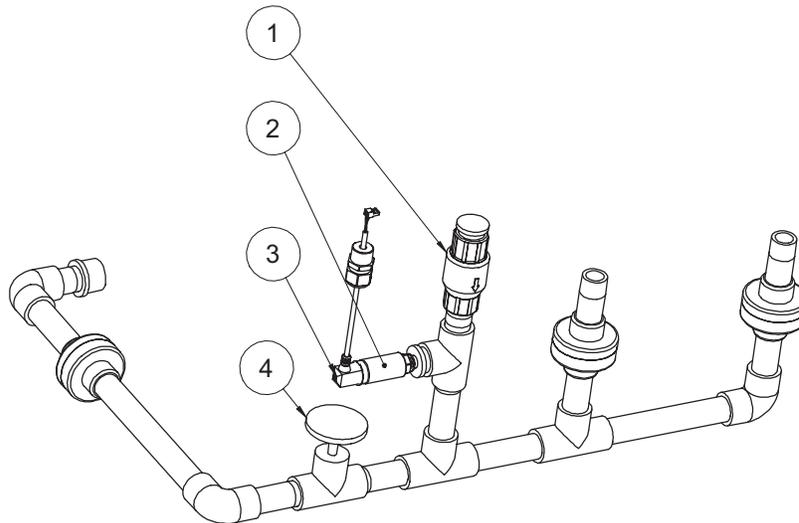


Figure 31.

G2-8-10 Plus feed piping subassembly.

Item	Part No.	Description	Quantity
—	01021803	Piping Feed, Pressurized, Plus, Narrow, Subassembly	1
—	01021805	Piping Feed, Pressurized, G2-7 Plus, Subassembly	1
—	01021804	Piping Feed, Pressurized, Plus, Wide, Subassembly	1
1	01021723	CHECK VALVE, 3/4"	1
2	01021169	Transducer, 10–300 PSI, Plus Units only	1
3	01021846	Cable, Transducer, 88" Length	1
4	01021411	3/4" Globe Valve, SS, Plus Units	1

G2 Concentrate Piping Sub-Assembly

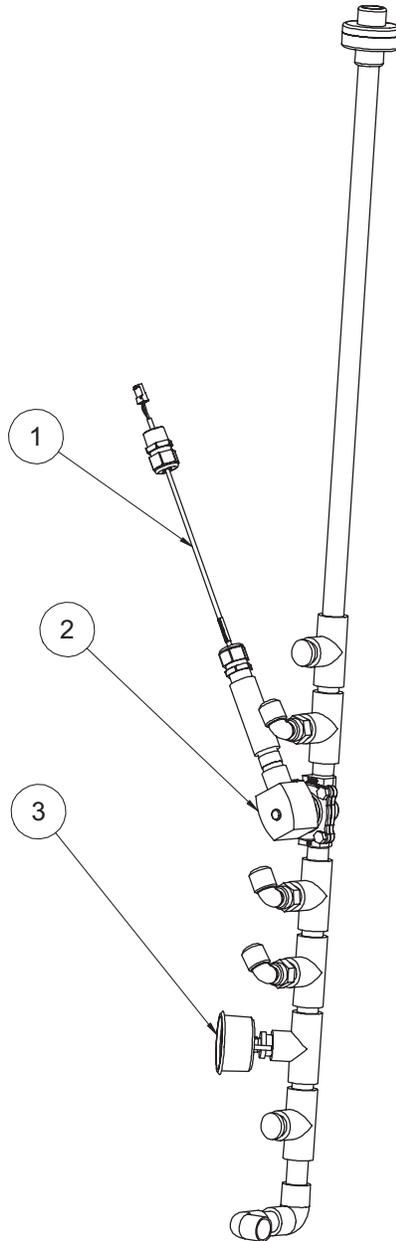


Figure 32. G2 concentrate piping sub-assembly.

Item	Part No.	Description	Quantity
—	01021403	Piping, Concentrate, Subassembly	1
1	01021314	Cable Extender, 48"L, Solenoid Valve	1
2	01021368	Wiring Harness, Solenoid Valve, 1/2" NPT	1
3	01007604	Gauge, 2 1/2", 1/4" CBM, 0–300 PSI	1

G2 Plus Concentrate Piping Sub-Assembly

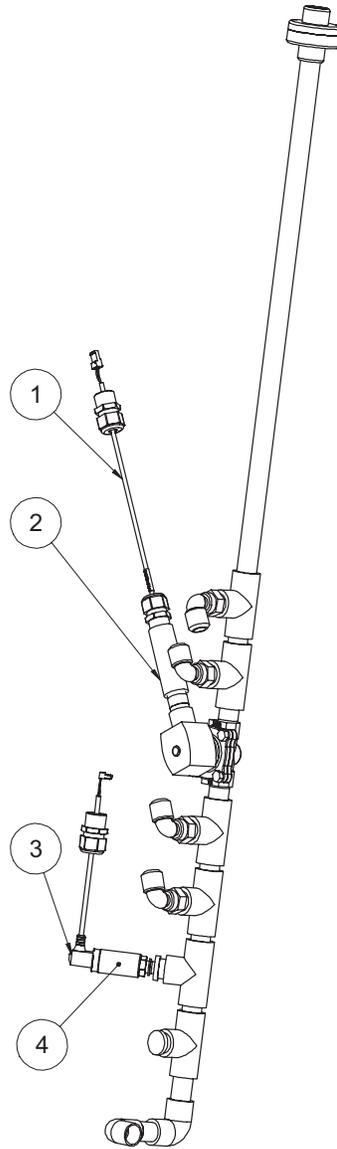


Figure 33. G2 Plus concentrate piping sub-assembly.

Item	Part No.	Description	Quantity
—	01021801	Piping, Concentrate, QF, Subassembly	1
1	01021314	Cable Extender, 48"L, Solenoid Valve	1
2	01021368	Wiring Harness, Solenoid Valve, 1/2" NPT	1
3	01021847	Cable, Pressure Transducer, 65"L	1
4	01021169	Pressure Transducer, 0–300 psi	1

Concentrate Recirculation Meter and Waste Valve

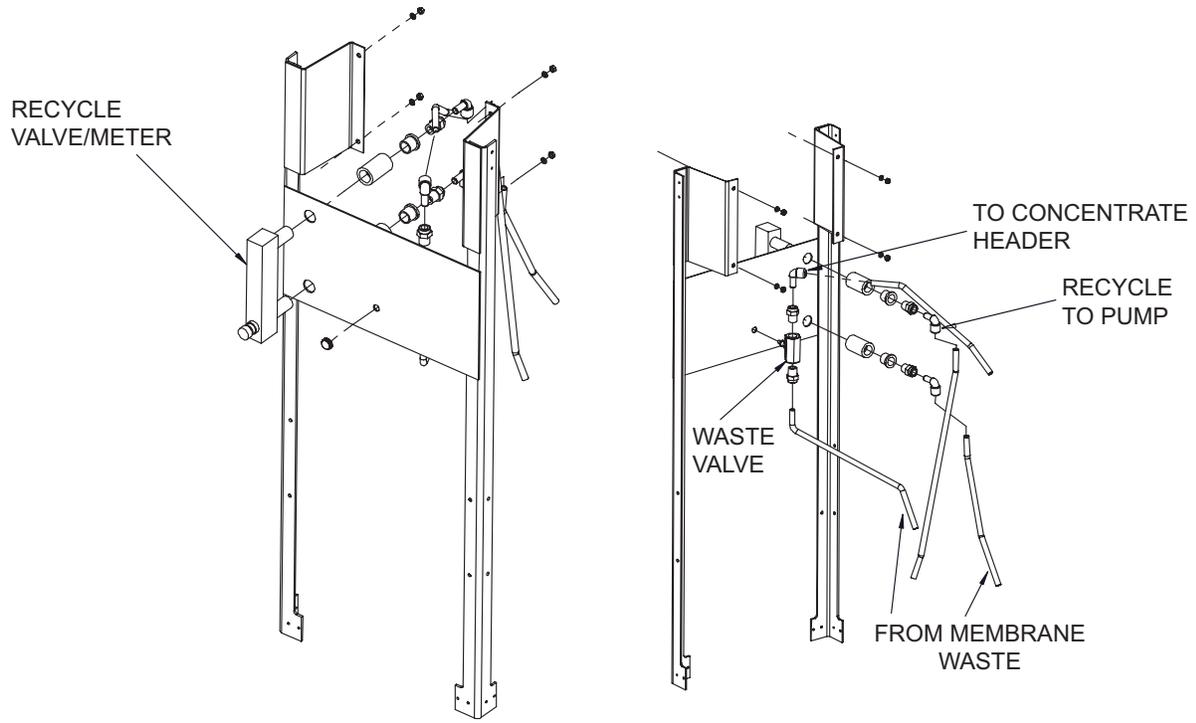


Figure 34. G2 concentrate recirculation meter and waste valve, as assembled.

Item	Part No.	Description	Quantity
—	01021538	Rotameter, 1–10 GPM (Recirculation Meter)	1
—	01021539	Valve, Needle, ½" Brass (Waste Valve), G2 Units	1
—	01021729	Valve, Needle, SS, ½ NPTI, G2 Plus Units	1

G2 Product Piping Sub-Assembly

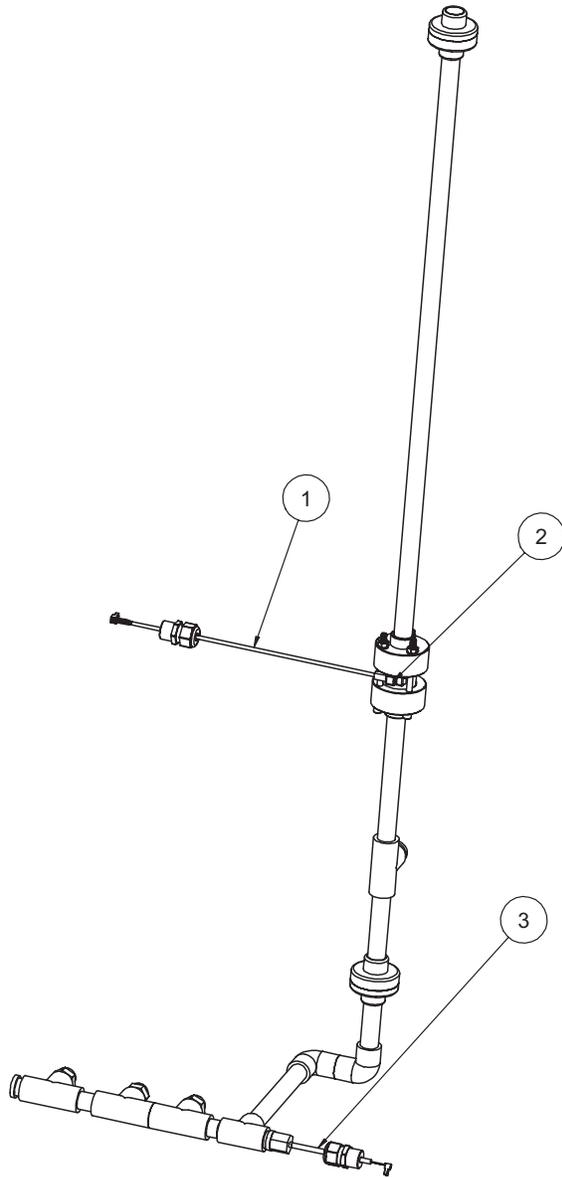


Figure 35. G2-2-6 product piping subassembly.

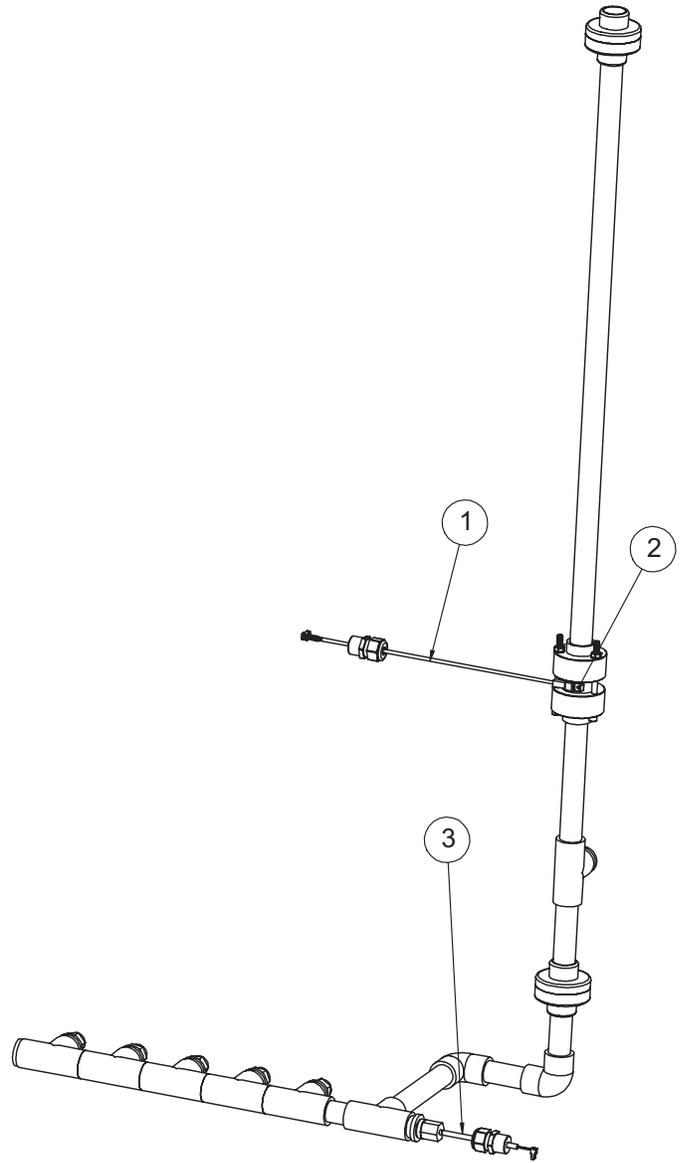


Figure 36. G2-7-10 product piping subassembly.

Item	Part No.	Description	Quantity
—	01021407	Piping, Product, Narrow, Subassembly	1
—	01021408	Piping, Product, Wide, Subassembly	1
1	01021897	Flow Meter Wire Harness	1
2	01021877	Meter Assembly, 1"	1
3	01021901	Sensor, TDS, 2-Position Connector	1

G2 Plus Product Piping Sub-Assembly

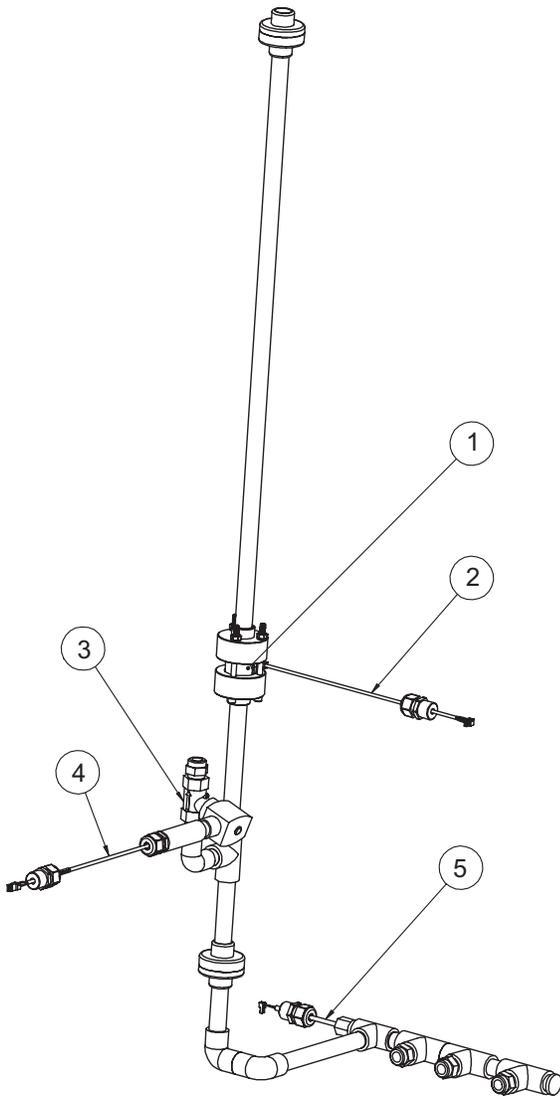


Figure 37. G2-2-6 Plus product piping sub-assembly.

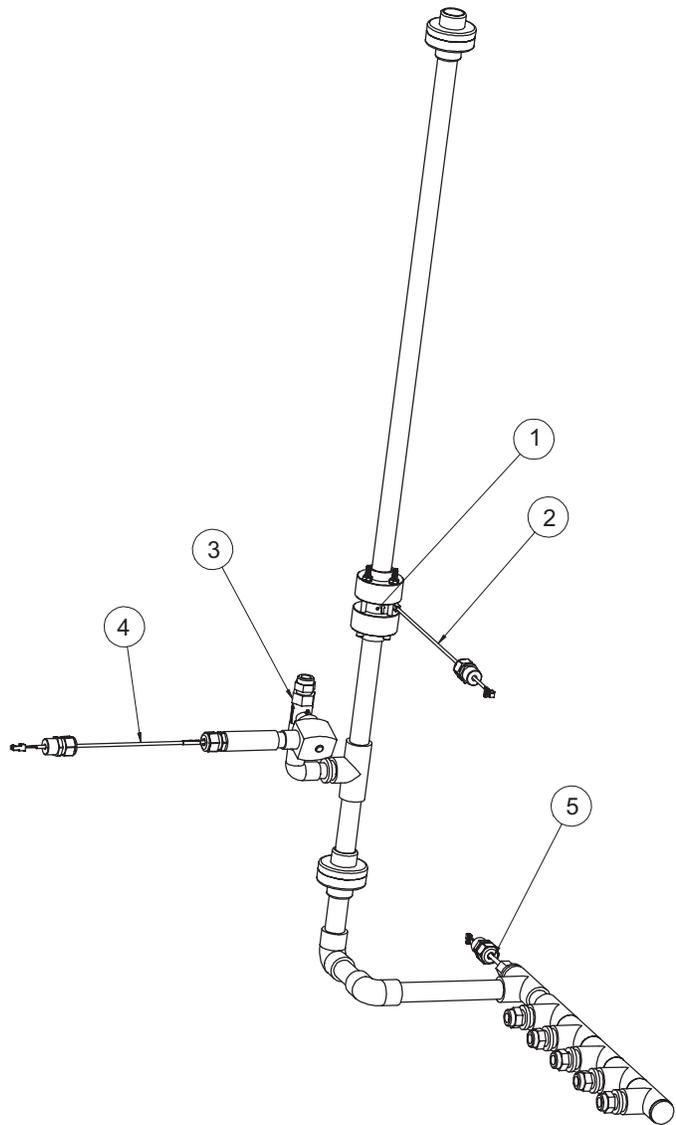


Figure 38. G2-7-10 Plus product piping subassembly.

Item	Part No.	Description	Quantity
—	01021409	Piping, Product, QF, Narrow, Subassembly	1
—	01021802	Piping, Product, QF, Wide, Subassembly	1
1	01021877	Meter Assembly, 1"	1
2	01021897	Flow Meter Wire Harness	1
3	01021935	Wiring Harness, Solenoid Valve, 1/2" NPT	1
4	01021315	Cable Extender, 55"L, Product Solenoid Valve	1
5	01021901	Sensor, TDS, 2-Position Connector	1

Flow Meter Sub-Assembly

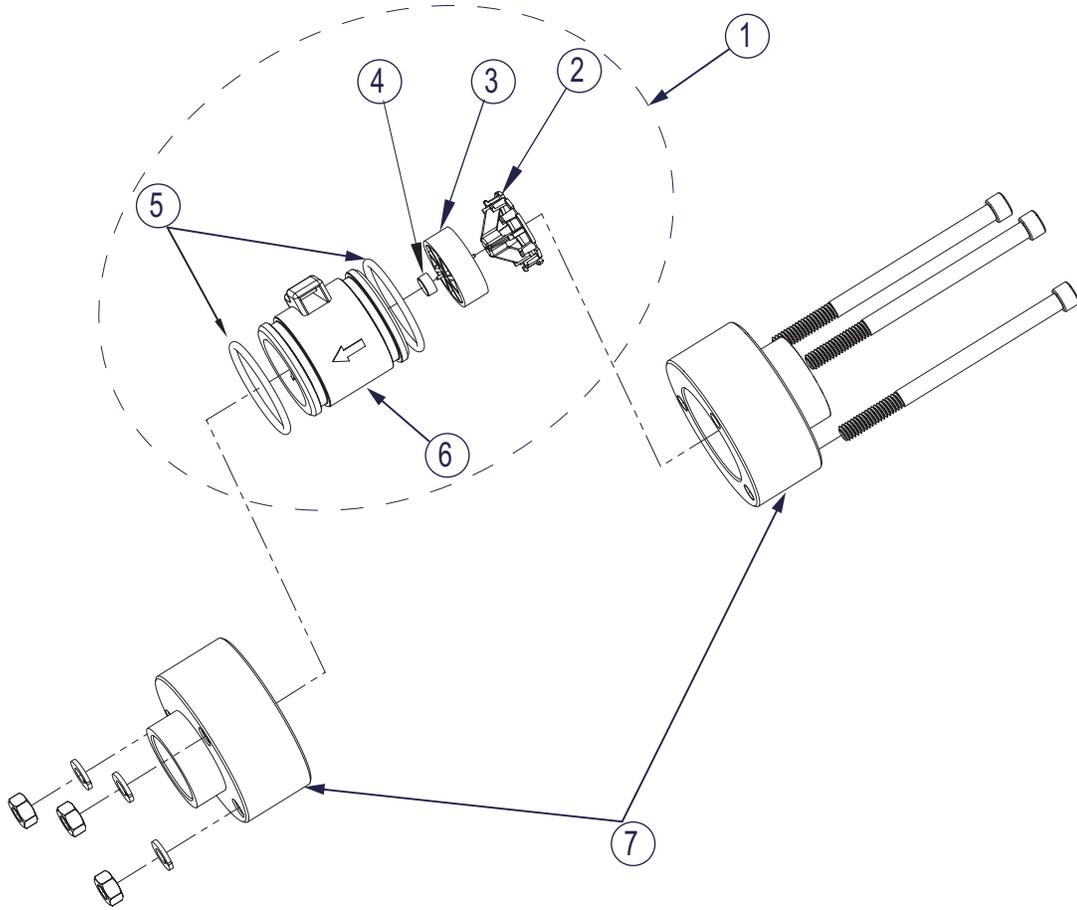


Figure 39. G2 Flow meter sub-assembly, narrow and wide.

Item	Part No.	Description	Quantity
1	01021877	Meter Assembly, 1"	
2	—	RETAINER, SNAP-IN, 1" METER	1
3	—	IMPELLER FLOW METER 1.5"	1
4	—	BEARING, 1" FLOW METER	1
5	01009099	O-RING, ARP#126, EPDM	2
6	—	Body, 1" Flowmeter	1
7	01021400	Flow Meter, Housing Adapter, 1/2" Slip (G2 and G2 Plus Narrow)	2
7	01021324	Flow Meter, Housing Adapter, 3/4" Slip (G2 and G2 Plus Wide)	2

Membrane Vessel

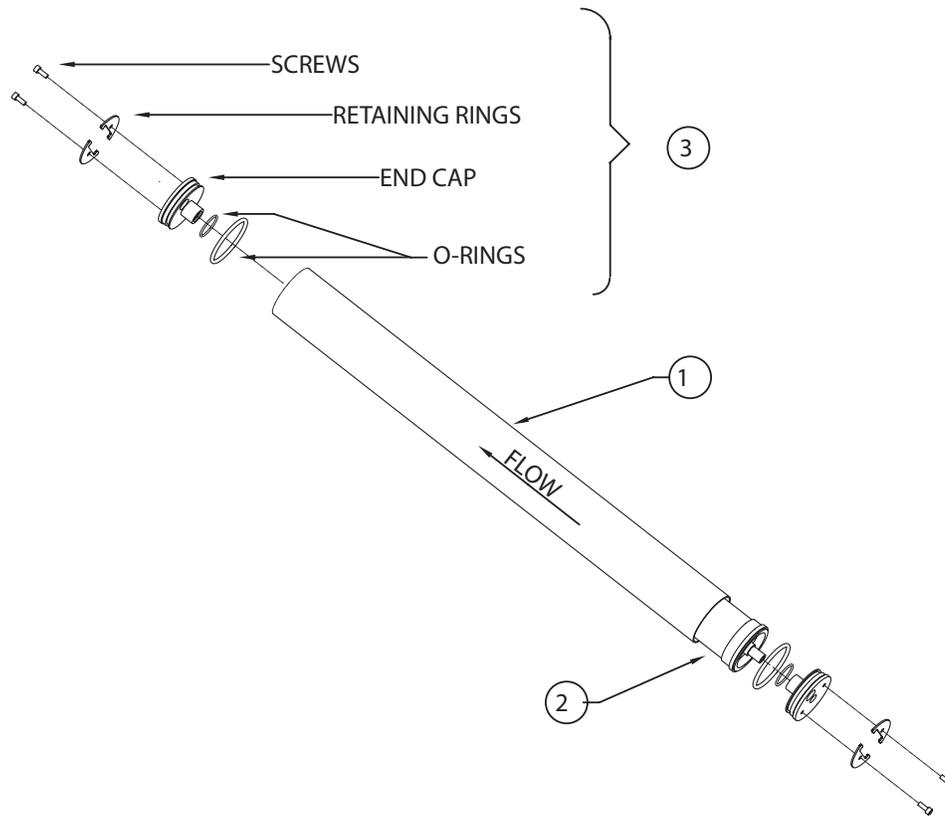


Figure 40. G2 membrane vessel.

Item	Part No.	Description	G2-2E	G2-3E	G2-4E	G2-5E	G2-6E
2	01008007	RO Membrane, 4x40				1	2
1	01021540	Housing, Filter, Wave Cyber FRP 4" End Port				1	2
	01021397	Clamps, RO Housings, 4"	4	6	8	2	4
3	01023073	End Plug Assy 4"				2	4
	01023074	O-Ring Kit 4"					

¹Housing assemblies do not include membranes.

G2-2 Module Plumbing

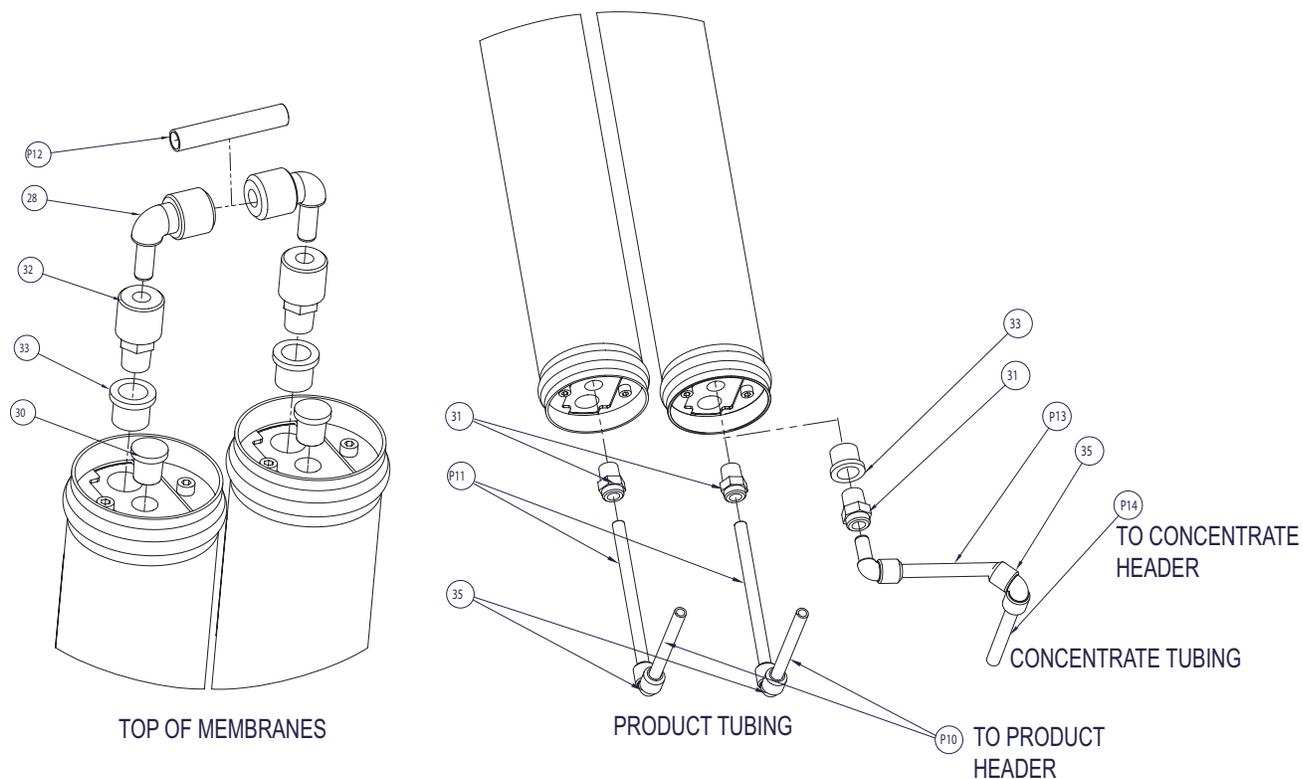


Figure 41. G2-2 module plumbing.

Item	Part No.	Description	Quantity
28	-	Fitting,PEX,Stem Elbow,1/2"	2
29	-	Fitting,Stem Elbow,1/2Tx1/2Stem,PI	4
30	-	PLUG,1/2",THREADED,PVC SCH.80	2
31	-	Fitting,Male Connector,1/2Tx1/2NPTE,PI	8
32	-	Fitting,PEX,Male Connector,1/2"	2
33	-	Bushing,3/4x1/2,TxT,PVC Sch.80	5
35	-	Fitting,Union Elbow,1/2T,PI	2
P10-11,P13-18	00901801	Tubing,1/2",PE,Natural	-
P12	01021090	Pipe,PEX,1/2"	-

G2-3 Module Plumbing

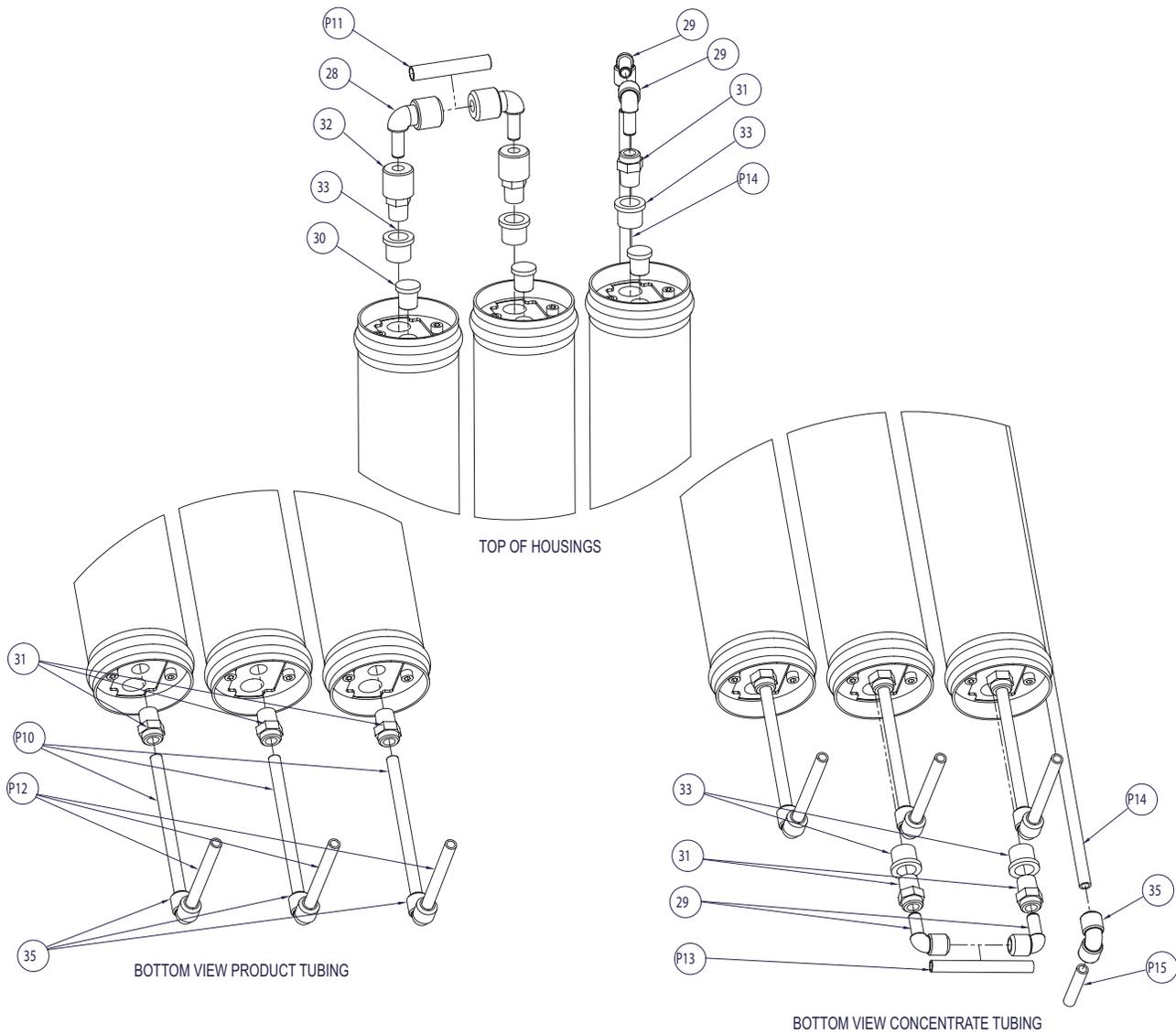


Figure 42. G2-3 module plumbing.

Item	Part No.	Description	Quantity
28	-	Fitting,PEX,Stem Elbow,1/2"	2
29	-	Fitting,Stem Elbow,1/2Tx1/2Stem,PI	8
30	-	PLUG,1/2",THREADED,PVC SCH.80	3
31	-	Fitting,Male Connector,1/2Tx1/2NPTE,PI	11
32	-	Fitting,PEX,Male Connector,1/2"	2
33	-	Bushing,3/4x1/2,TxT,PVC Sch.80	7
35	-	Fitting,Union Elbow,1/2T,PI	3
P10, P12-P15	901801	Tubing,1/2",PE,Natural	-
P-11	01021090	Pipe,PEX,1/2"	-

G2-4 Module Plumbing

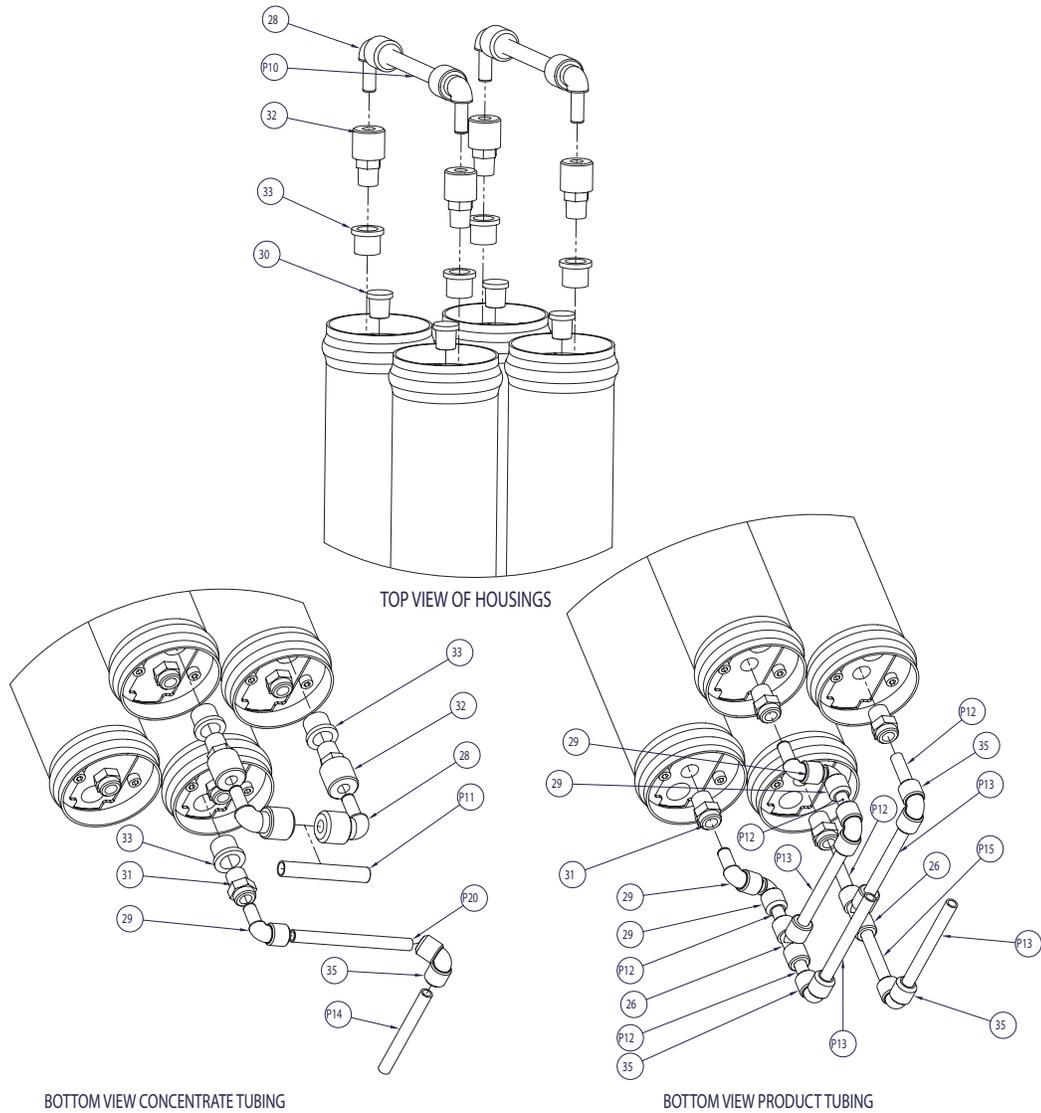


Figure 43. G2-4 module plumbing.

Item	Part No.	Description	Quantity
26	-	Fitting, Union Tee, 1/2T, PI	2
28	-	Fitting, PEX, Stem Elbow, 1/2"	4
29	-	Fitting, Stem Elbow, 1/2Tx1/2Stem, PI	5
30	-	PLUG, 1/2", THREADED, PVC SCH.80	4
31	-	Fitting, Male Connector, 1/2Tx1/2NPTE, PI	12
32	-	Fitting, PEX, Male Connector, 1/2"	4
33	-	Bushing, 3/4x1/2, TxT, PVC Sch.80	9
35	-	Fitting, Union Elbow, 1/2T, PI	4
P12-20	00901801	Tubing, 1/2", PE, Natural	-
P10-11	01021090	Pipe, PEX, 1/2"	-

G2-5 Module Plumbing

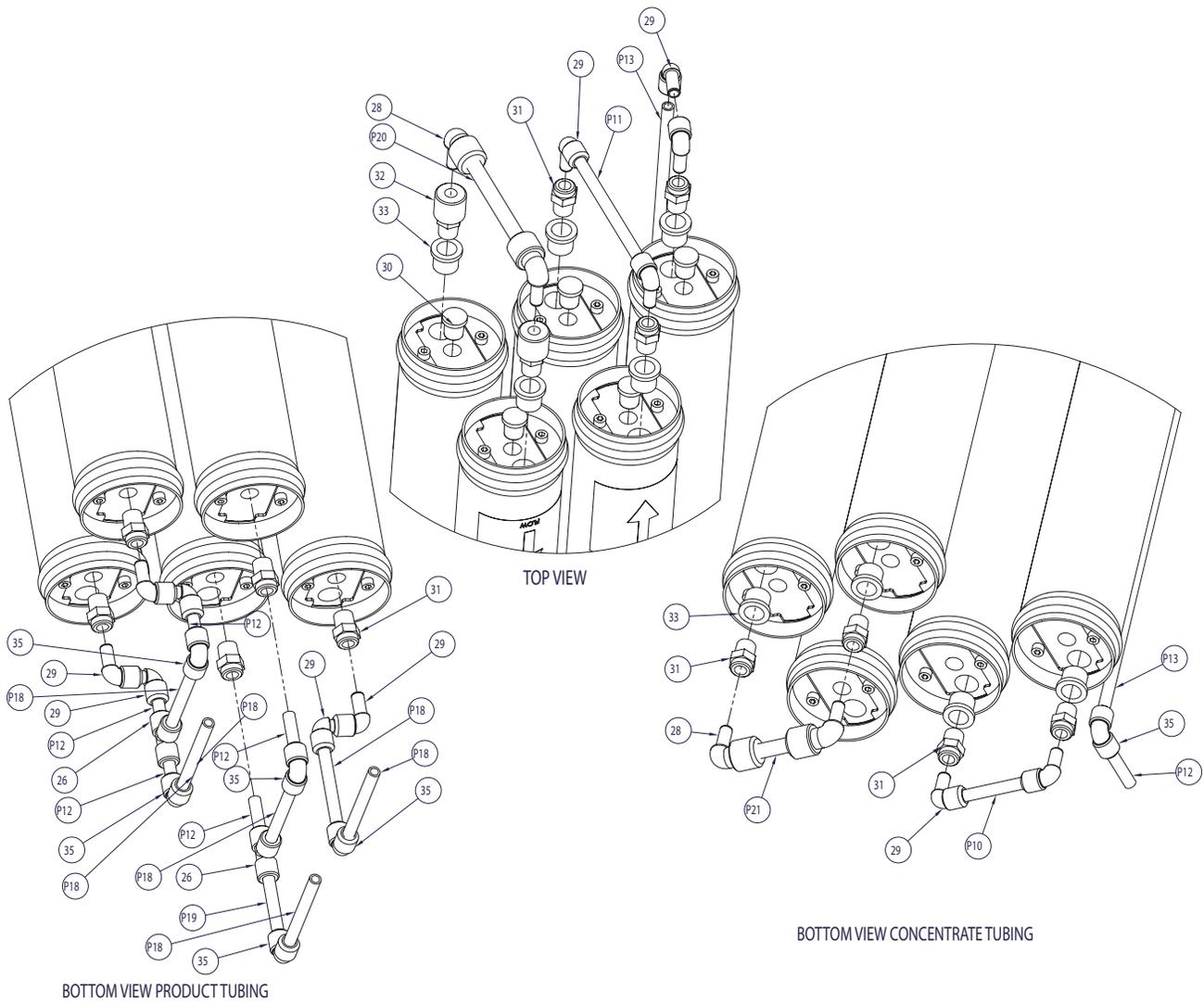


Figure 44. G2-5 module plumbing.

Item	Part No.	Description	Quantity
26	-	Fitting, Union Tee, 1/2T, PI	2
28	-	Fitting, PEX, Stem Elbow, 1/2"	4
29	-	Fitting, Stem Elbow, 1/2Tx1/2Stem, PI	10
30	-	PLUG, 1/2", THREADED, PVC SCH.80	5
31	-	Fitting, Male Connector, 1/2Tx1/2NPTE, PI	14
32	-	Fitting, PEX, Male Connector, 1/2"	4
33	-	Bushing, 3/4x1/2, TxT, PVC Sch.80	16
35	-	Fitting, Union Elbow, 1/2T, PI	5
P10-19	00901801	Tubing, 1/2", PE, Natural	-
P20-21	01021090	Pipe, PEX, 1/2"	-

G2-6 Module Plumbing

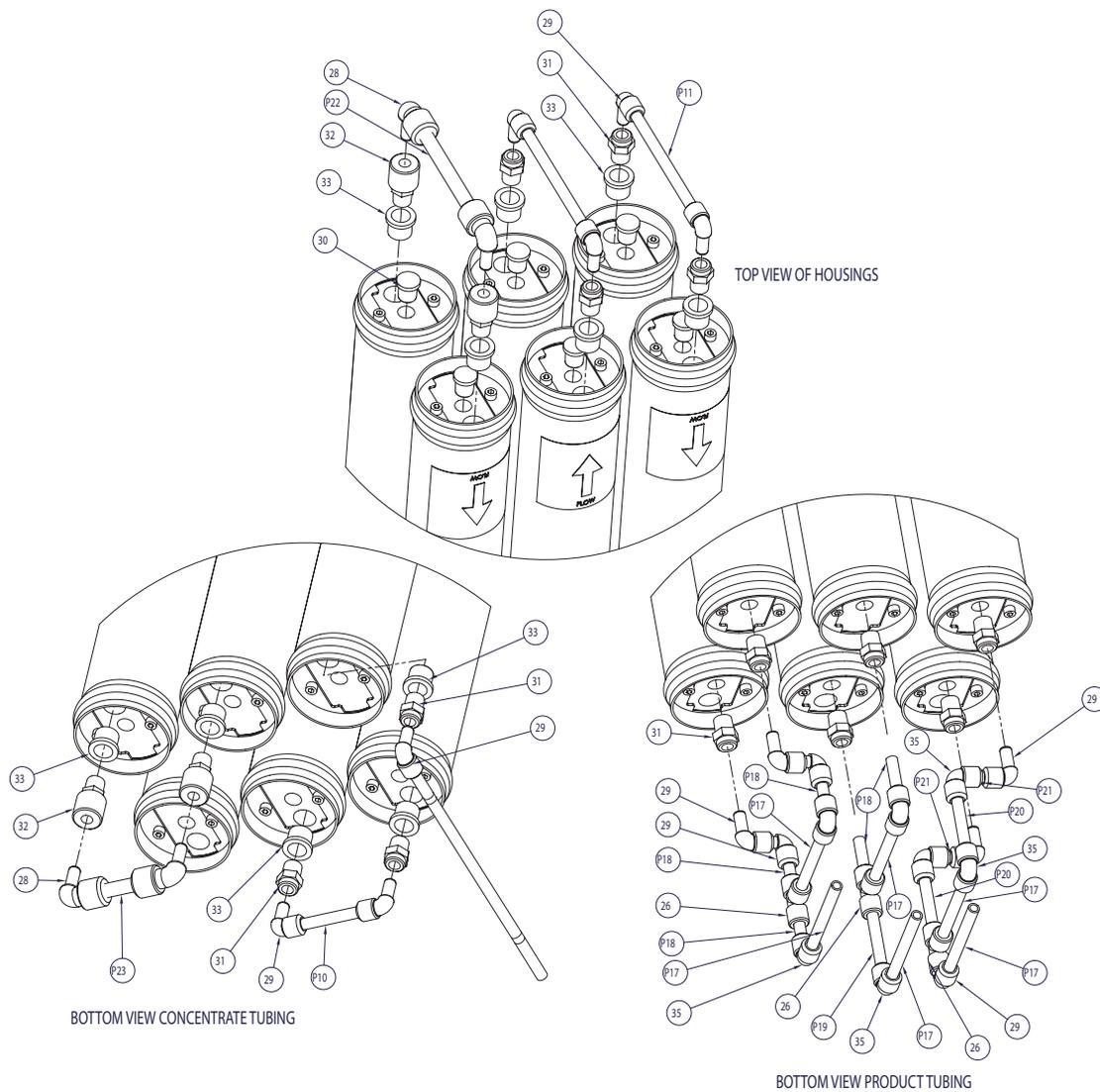


Figure 45. G2-6 module plumbing.

Item	Part No.	Description	Quantity
26	-	Fitting,Union Tee,1/2T,PI	3
28	-	Fitting,PEX,Stem Elbow,1/2"	4
29	-	Fitting,Stem Elbow,1/2Tx1/2Stem,PI	9
30	-	PLUG,1/2",THREADED,PVC SCH.80	6
31	-	Fitting,Male Connector,1/2Tx1/2NPTE,PI	19
32	-	Fitting,PEX,Male Connector,1/2"	4
33	-	Bushing,3/4x1/2,TxT,PVC Sch.80	13
35	-	Fitting,Union Elbow,1/2T,PI	6
P10-21	00901801	Tubing,1/2",PE,Natural	-
P22,23	01021090	Pipe,PEX,1/2"	-

G2-7 Module Plumbing

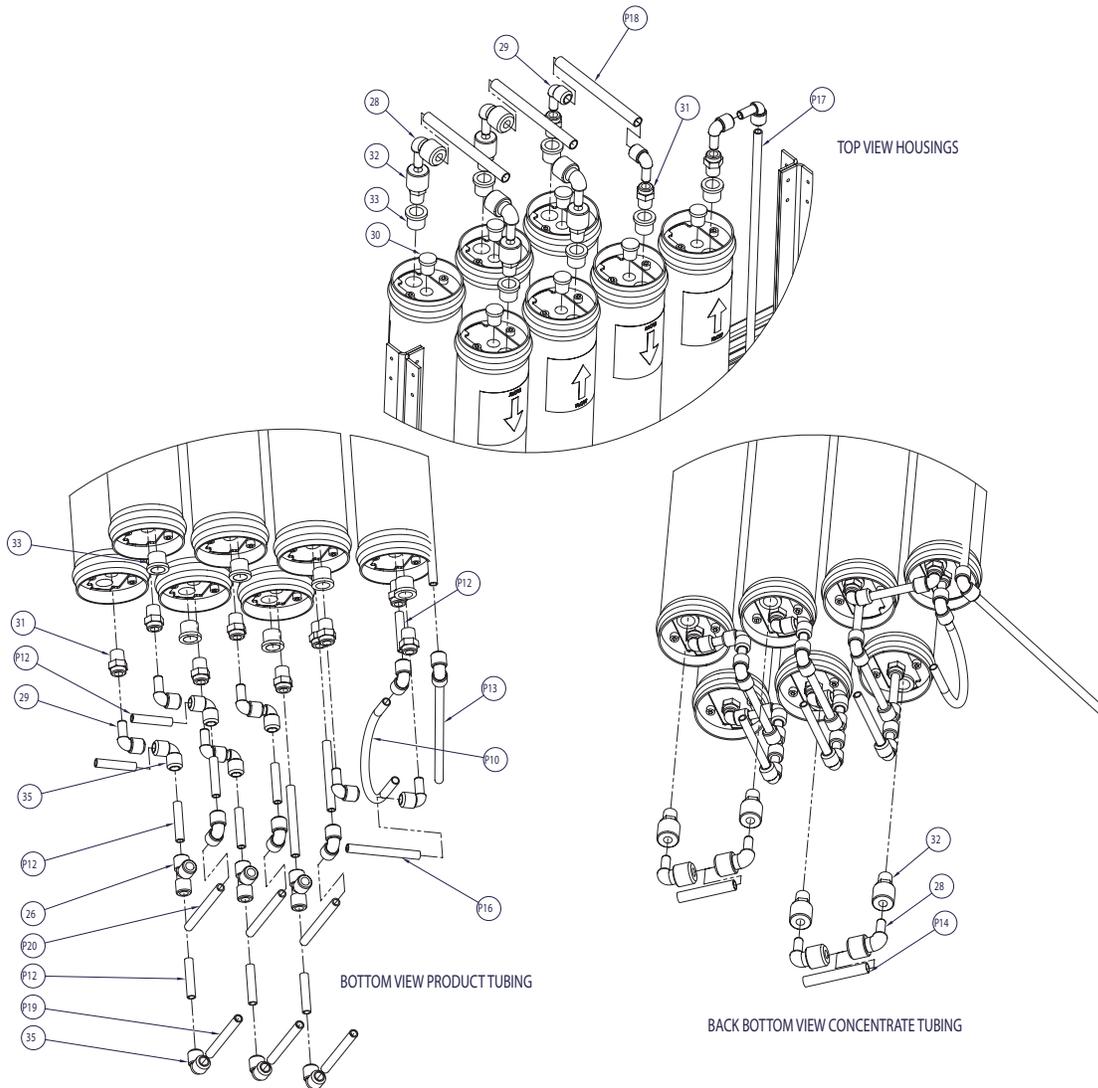


Figure 46. G2-7 module plumbing.

Item	Part No.	Description	Qty.
26	-	Fitting, Union Tee, 1/2T, PI	3
28	-	Fitting, PEX, Stem Elbow, 1/2"	8
29	-	Fitting, Stem Elbow, 1/2Tx1/2Stem, PI	9
30	-	PLUG, 1/2", THREADED, PVC SCH.80	7
31	-	Fitting, Male Connector, 1/2Tx1/2NPTE, PI	17
32	-	Fitting, PEX, Male Connector, 1/2"	8
33	-	Bushing, 3/4x1/2, TxT, PVC Sch.80	15
35	-	Fitting, Union Elbow, 1/2T, PI	8
P10,12-13,15-17,19-24	00901801	Tubing, 1/2", PE, Natural	-
P11,14,18	01021090	Pipe, PEX, 1/2"	-

G2-8 Module Plumbing

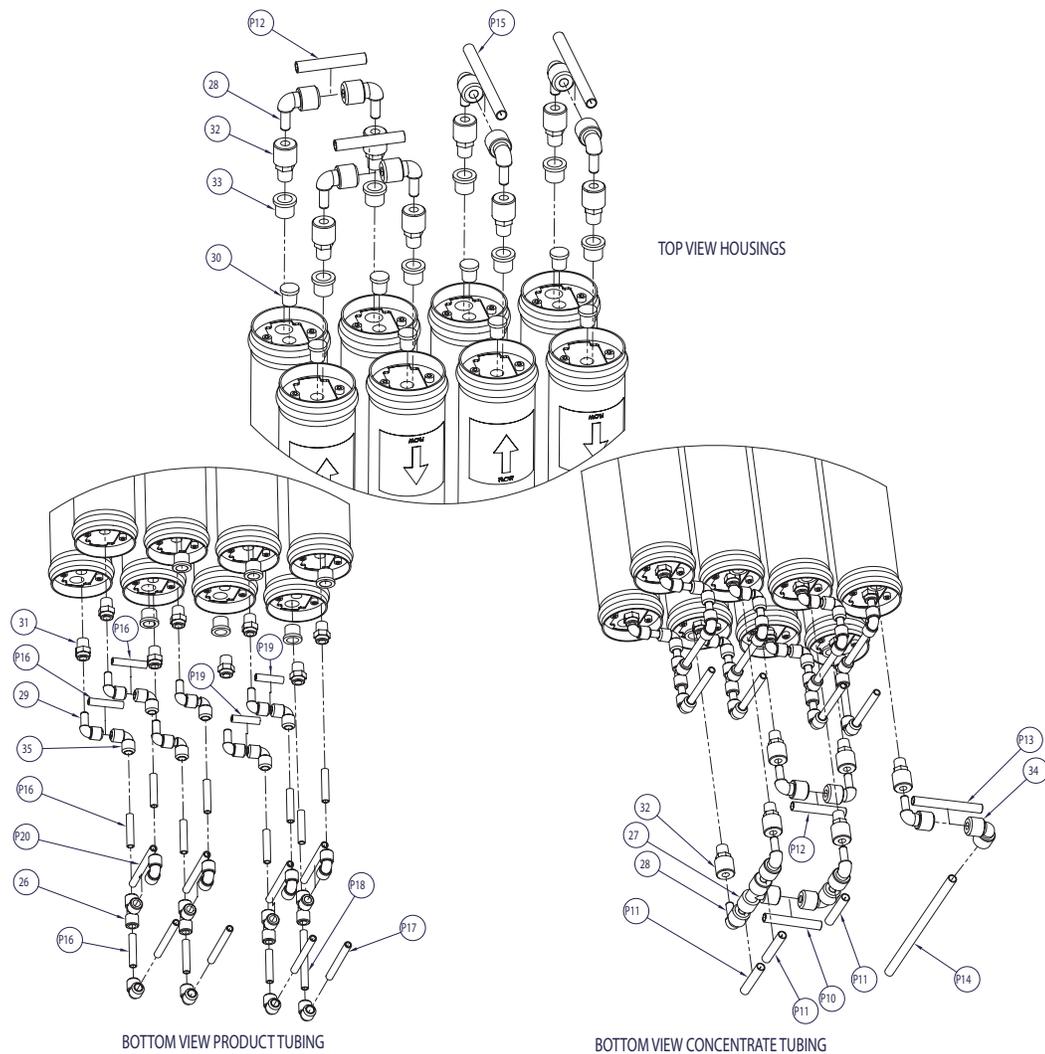


Figure 47. G2-8 module plumbing.

Item	Part No.	Description	Qty.
26	-	Fitting, Union Tee, 1/2T, PI	4
27	-	Fitting, PEX, Union Tee, 1/2"	1
28	-	Fitting, PEX, Stem Elbow, 1/2"	12
29	-	Fitting, Stem Elbow, 1/2Tx1/2Stem, PI	11
30	-	PLUG, 1/2", THREADED, PVC SCH.80	8
31	-	Fitting, Male Connector, 1/2Tx1/2NPTE, PI	12
32	-	Fitting, PEX, Male Connector, 1/2"	15
33	-	Bushing, 3/4x1/2, TxT, PVC Sch.80	16
34	-	Fitting, PEX, Union Elbow, 1/2"	2
35	-	Fitting, Union Elbow, 1/2T, PI	10
P16-24	00901801	Tubing, 1/2", PE, Natural	-
P10-15	01021090	Pipe, PEX, 1/2"	-

G2-9 Module Plumbing

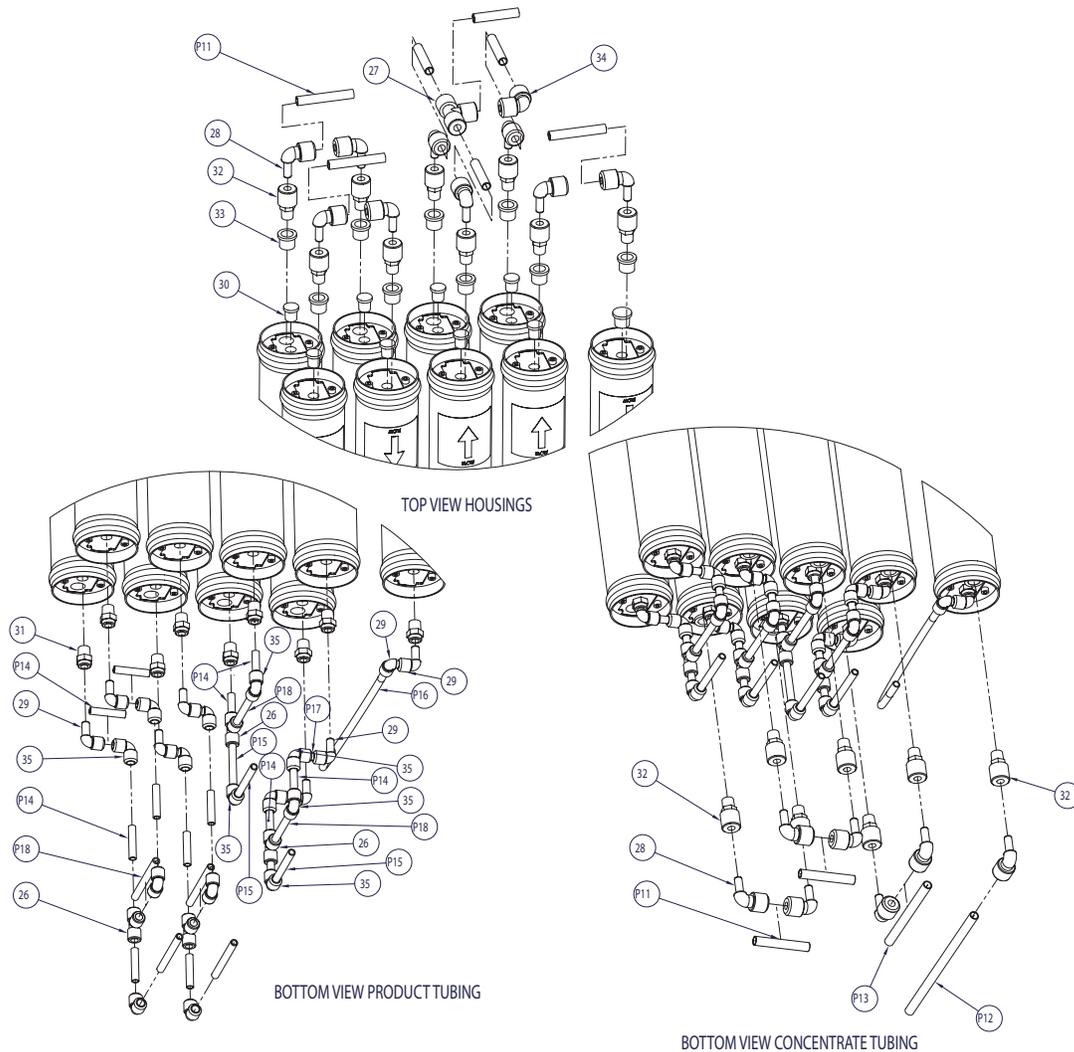


Figure 48. G2-9 sub-assemblies.

Item	Part No.	Description	Qty.
26	-	Fitting, Union Tee, 1/2T, PI	4
27	-	Fitting, PEX, Union Tee, 1/2"	1
28	-	Fitting, PEX, Stem Elbow, 1/2"	16
29	-	Fitting, Stem Elbow, 1/2Tx1/2Stem, PI	11
30	-	PLUG, 1/2", THREADED, PVC SCH.80	9
31	-	Fitting, Male Connector, 1/2Tx1/2NPTE, PI	13
32	-	Fitting, PEX, Male Connector, 1/2"	17
33	-	Bushing, 3/4x1/2, TxT, PVC Sch.80	18
34	-	Fitting, PEX, Union Elbow, 1/2"	1
35	-	Fitting, Union Elbow, 1/2T, PI	9
P14-22	00901801	Tubing, 1/2", PE, Natural	-
P10-13	01021090	Pipe, PEX, 1/2"	-

G2-10 Module Plumbing

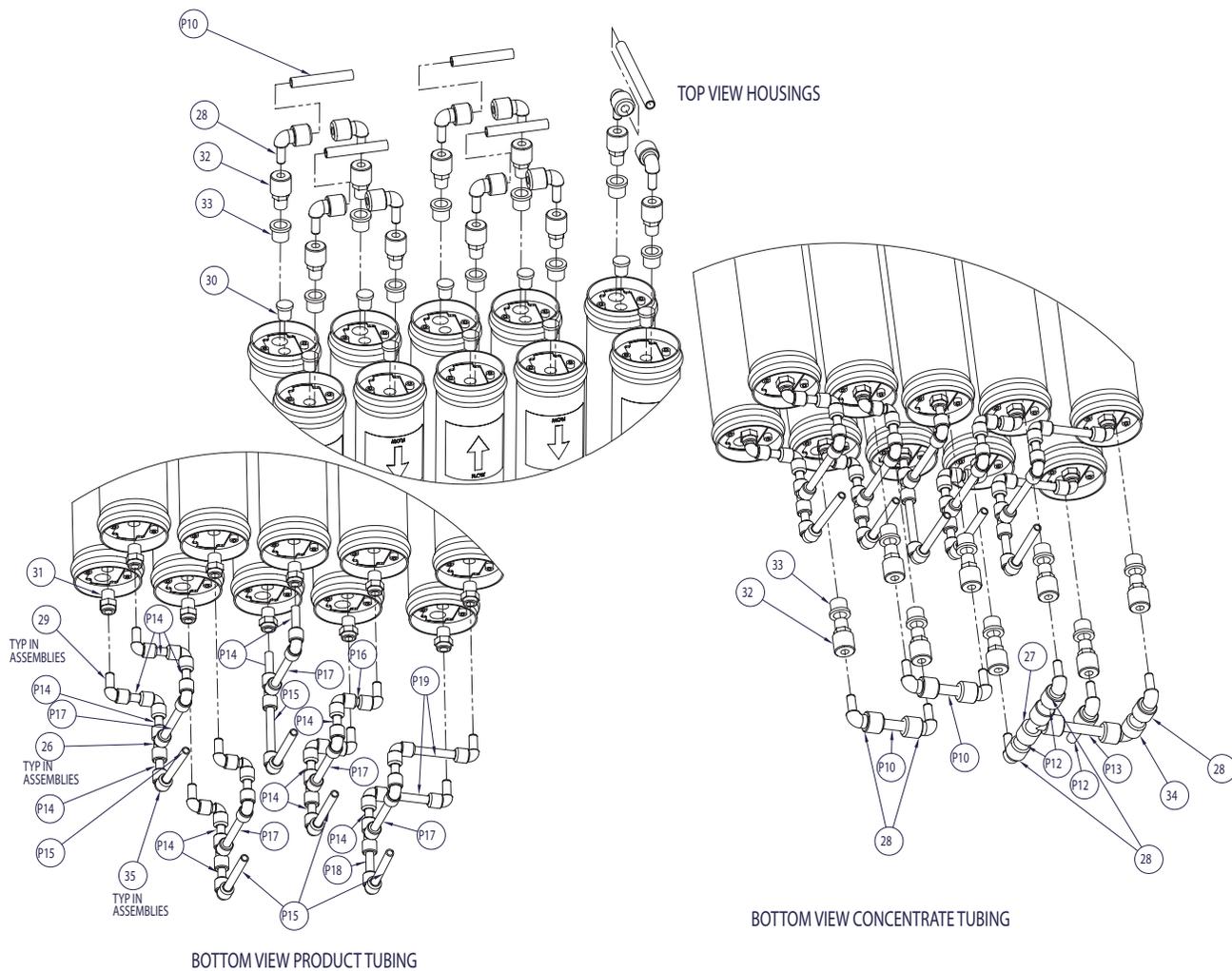


Figure 49. G2-10 module plumbing.

Item	Part No.	Description	Qty.
26	-	Fitting,Union Tee,1/2T,PI	5
27	-	Fitting,PEX,Union Tee,1/2"	1
28	-	Fitting,PEX,Stem Elbow,1/2"	18
29	-	Fitting,Stem Elbow,1/2Tx1/2Stem,PI	11
30	-	PLUG,1/2",THREADED,PVC SCH.80	10
31	-	Fitting,Male Connector,1/2Tx1/2NPTE,PI	14
32	-	Fitting,PEX,Male Connector,1/2"	19
33	-	Bushing,3/4x1/2,TxT,PVC Sch.80	20
34	-	Fitting,PEX,Union Elbow,1/2"	1
35	-	Fitting,Union Elbow,1/2T,PI	10
P14-23	00901801	Tubing,1/2",PE,Natural	-
P10-13	01021090	Pipe,PEX,1/2"	-

Controller Sub-Assembly

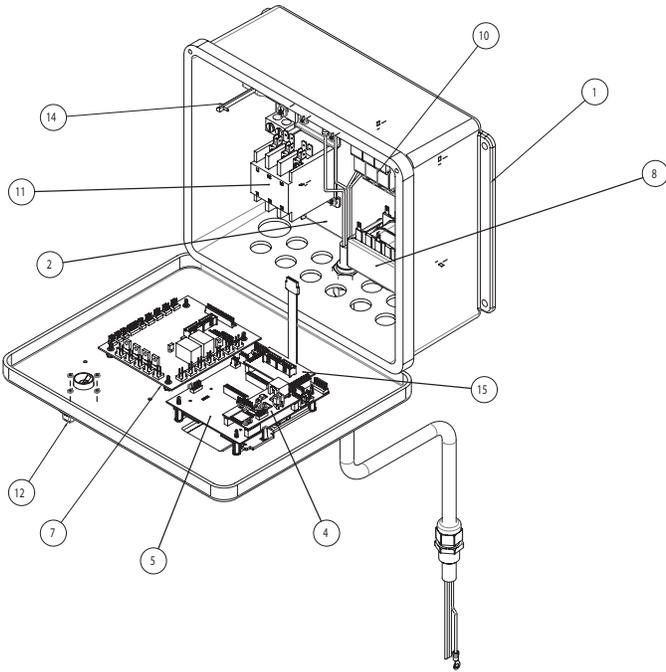


Figure 50. Controller box assembly.

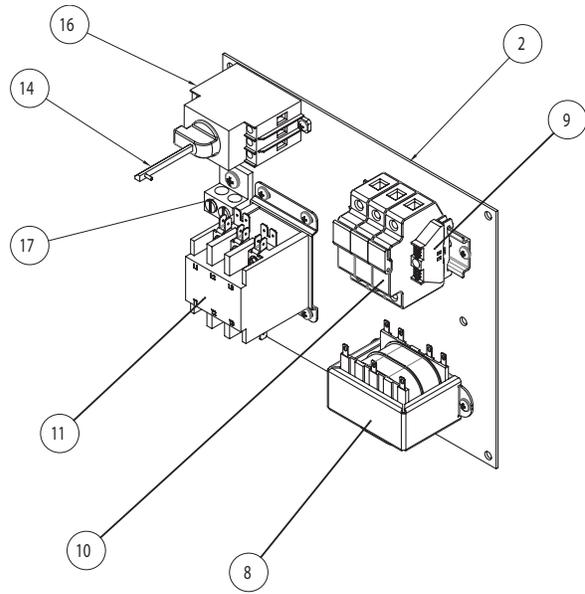


Figure 51. Controller subpanel assembly.

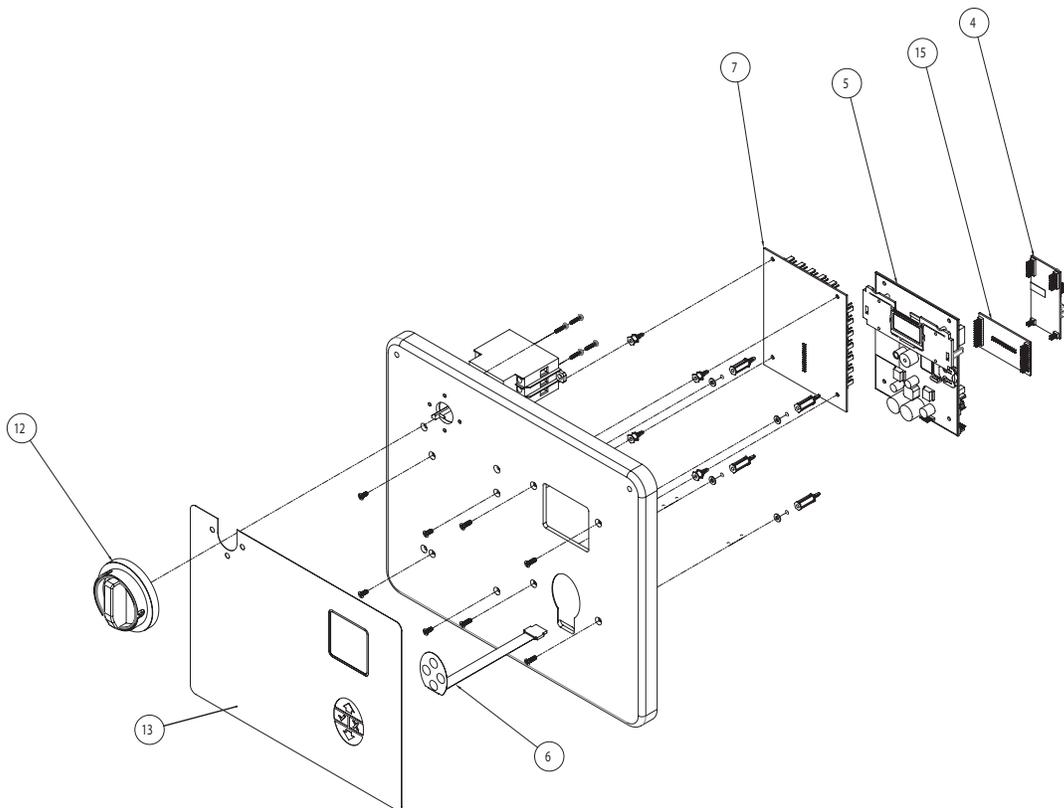


Figure 52. Controller Sub-Assembly.

Item	Part No.	Description	Qty.
1	01021237	G Series RO Controller Box	1
2	01021238	SUBPANEL, ENCLOSURE, ELECTRICAL MOUNTING 10"x12"	1
3	01021504	Din Rail, Aluminum, 3.937"	1
4	01020307	MODEM BOARD	1
5	01021527	Circuit Board,Main GBE,Commercial RO	1
6	01020498	Membrane Keypad,Oval w/Connector	1
7	01020717	Culligan Interface Board	1
8	01021171	Transformer,Frame Mount,230 – 24V	1
9	01021173	Terminal Block,End Block	2
10	01021175	Fuse Block,DIN Rail Mount	1
11	01021197	Contactora,Definite Purpose,3 Pole	1
12	01021262	Switch,Disconnect,Door Handle	1
13	01021241	Decal,G Series RO Enclosure	1
14	01021261	SHAFT, DISCONNECT SWITCH	1
15	01021267	CIB CONNECTOR PCB	1
16	01021263	Switch,Disconnect	1
17	01022240	GROUND LUG, ALUMINUM, DUAL WIRE	1

Remote Display Assembly

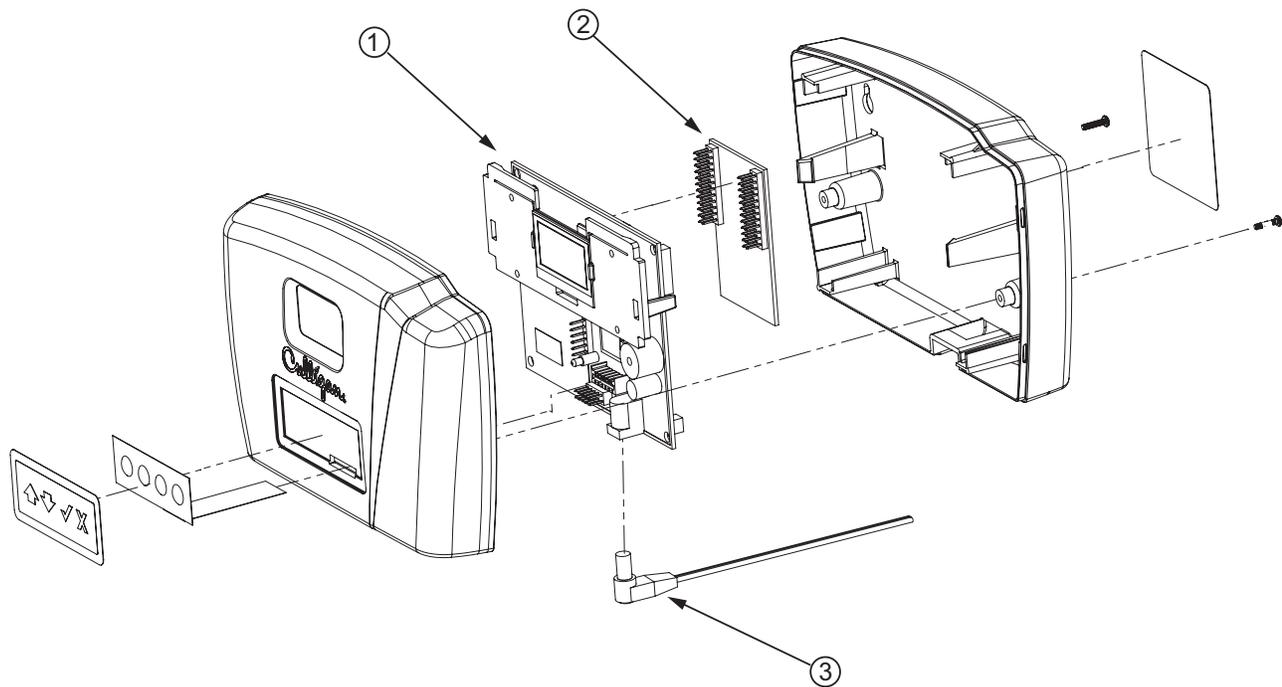
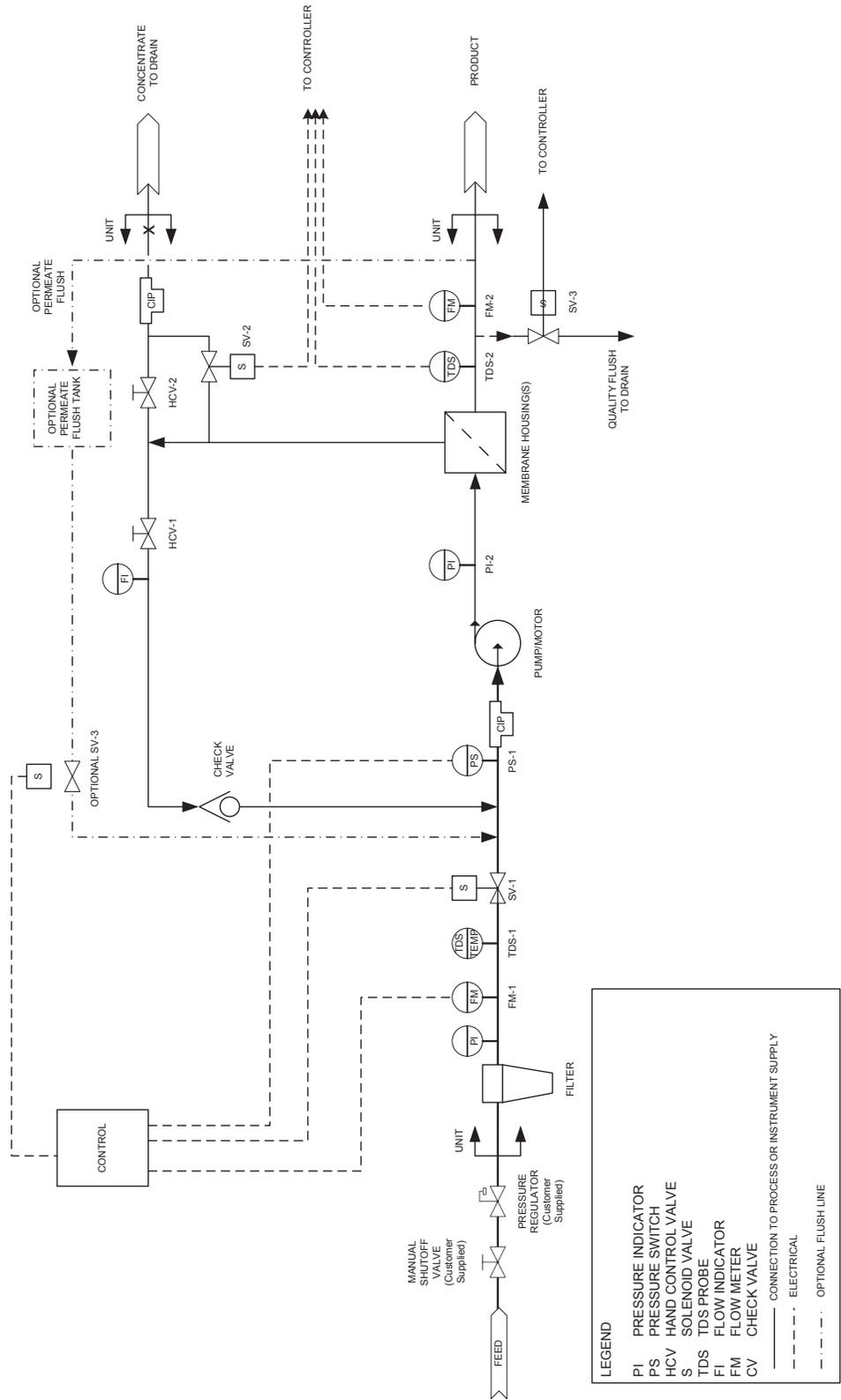


Figure 53. Remote display assembly.

Remote Display Assembly Parts List

Item No.	Part No.	Description
	01021586	Remote Display Assembly, RO - 915 MHz
1	01021590	Circuit Board, Remote Display, RO
1	01025686	Circuit Board, Remote 01021590, English, Replacement
1	01025683	Circuit Board, Remote 01025680, French, Replacement
1	01025684	Circuit Board, Remote 01025681, Italian, Replacement
1	01025685	Circuit Board, Remote 01025682, Spanish, Replacement
2	01020310	Circuit Board, RF, GBE, 915 MHz
2	01020582	Circuit Board, RF, GBE, 869 MHz
3	01020611	Power Supply, Switching, Wall Mount, 100VAC-240VAC
3	01025146	Power Supply, Switching, Wall Mount, EU Version

Series G2 Plus Process Flow Diagram



Component Identification

Hydraulic Component Summary

Use the Flow Diagram, General Layout drawings, and RO Parts Drawings as guides to understand the components involved.

Feed Line Components

- System Automatic Inlet Valve (SV-1)—Feed water enters the RO system through a normally closed diaphragm valve. When the system is off, a closed inlet valve prevents water from flowing through the system at line pressure.
- RO Prefilter (F-1)—The prefilter removes particles as small as 5 microns. The filter housing contains 5-micron elements that are 40 inches long. To measure the pressure drop through the filters, there are two pressure gauges (PI-1 and PI-2) located before and after the housings. Change the filter when the pressure drop across the filters increases by 10–15 psig.
- Feed Water TDS Probe (TDS-1)—The conductivity element measures the amount of dissolved solids in the feed stream and sends a signal to the control panel. This measurement can be compared with the product water conductivity to determine unit efficiency.
- Feed Water Flow Meter (FS-1)—A flow meter displays the raw water flow rate.
- Low Pressure Switch (PS-1)—A low inlet pressure can cause permanent damage to the high-pressure pump. When a low-pressure condition exists the entire system will shut down. The low-pressure switch is set to shut the system off at 10 psig. Once the unit is shut down due to low pressure, the operator must correct the problem and manually restart the unit.
- High Pressure Pump and Motor—The pump brings the treated feed water to the appropriate operating pressure to the RO modules. Pressure gauges before and after the pump (PI-2 and PI-3) indicate the pump feed pressure and the pump discharge pressure. The pressure gauge (PI-3) monitors the performance of the pump.
- Throttling Valve (HCV-1) and Membrane Feed Pressure Gauge (PI-3)—The module feed pressure is controlled by a needle valve located after the high-pressure pump discharge. Pressure gauge (PI-3) indicates the membrane feed pressure respectively.
- RO Module Assembly—The RO housings each contain 4-inch thin film composite spiral wound RO elements. The pressurized feed water enters the membrane vessel and flows through the channels between the spiral windings of the first spiral wound membrane. Some of the feed water permeates through the membrane and travels a spiral path to the product water collection tube at the center of the membrane. The remaining feed continues through the spiral layers, the length of the membrane. The product from each housing exits from the common product tube in the membrane vessel. The feed water becomes more concentrated as it passes through each membrane and exits from the membrane vessel as brine.
- RO Operation—Element housings are oriented in a cascade fashion called an “array.” See Equipment Specifications at the front of the manual for your array. Waste water from the first set (as used here “set” can be one, two, or three housings) of parallel housings becomes the feed water for the next set of parallel housings, and so on. Finally, the concentrate from the third set of parallel housings becomes feed water to the last set of parallel housings. All housings share a common header to collect all the product water.

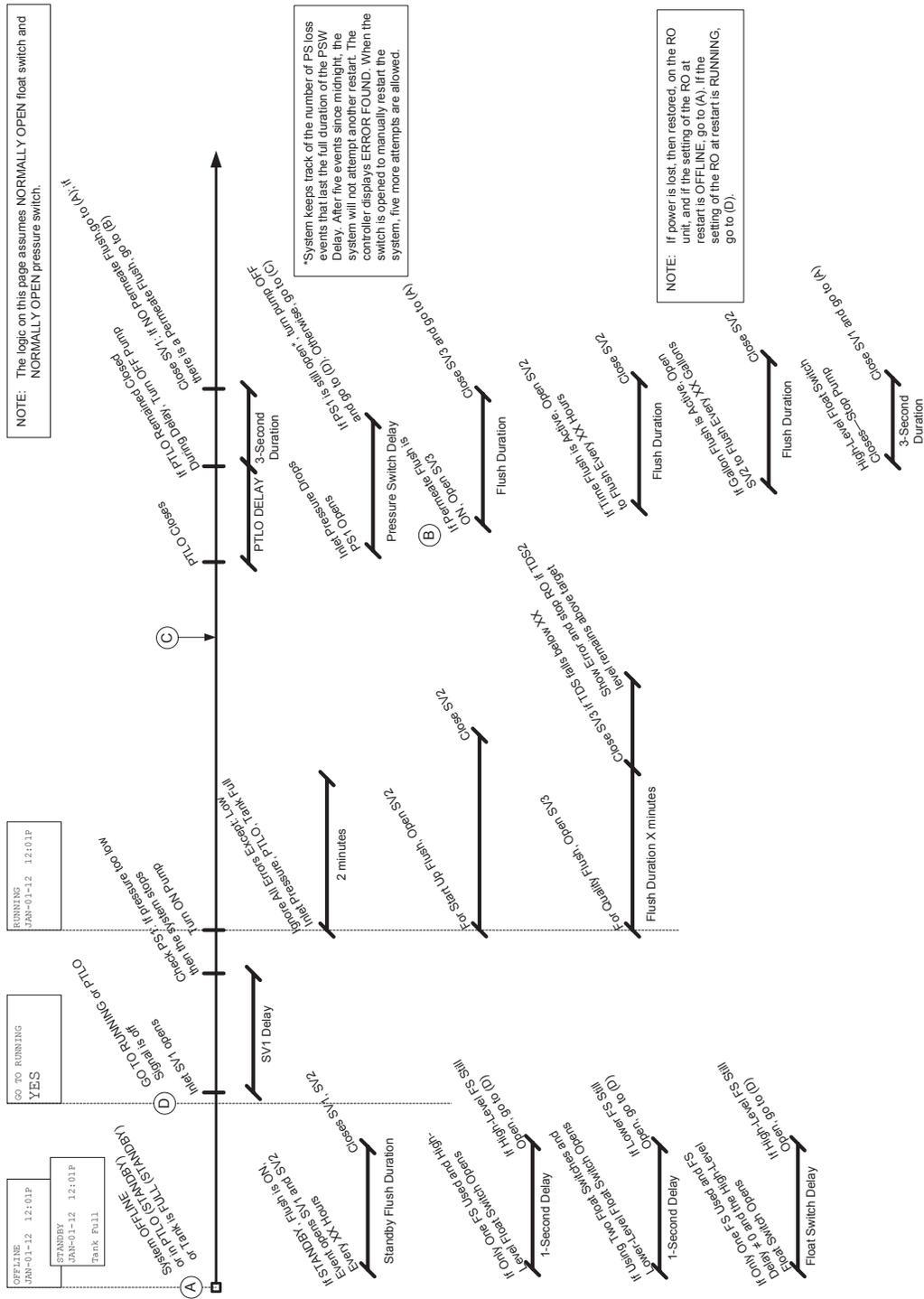
Waste Water Components

- Waste Water Control Valve (HCV-2) and Waste Pressure Gauge (PI-4)—A needle valve located on membrane concentrate header aids in regulating the operating pressure and flows of the unit by providing back pressure to the modules. Pressure Gauge PI-4 shows the module concentrate pressure as water leaves the element housings.
- Recirculation Water Control Valve (HCV-3)—A needle valve/rota meter located on membrane concentrate header aids in recirculating water back to the pump inlet to improve unit efficiency and indicates recirculation flow rate.

Product Water Components

- Product Water TDS Probe (TDS-2)—The conductivity element measures the amount of dissolved solids in the product stream and sends a signal to the conductivity controller on the control panel. This measurement can be compared with the feed water conductivity to determine unit efficiency. This probe also measures temperature.
- Product Flow Meter (FS-2)—A flow meter displays the product flow rate leaving the system.

Time Flow Diagram



G2 RO Electrical Installation



CAUTION! Observe the precautions listed below before electrical installation of the GBE RO controller. Failure to do so may cause permanent damage to the controller.

Electrical Installation of G2 RO Controller

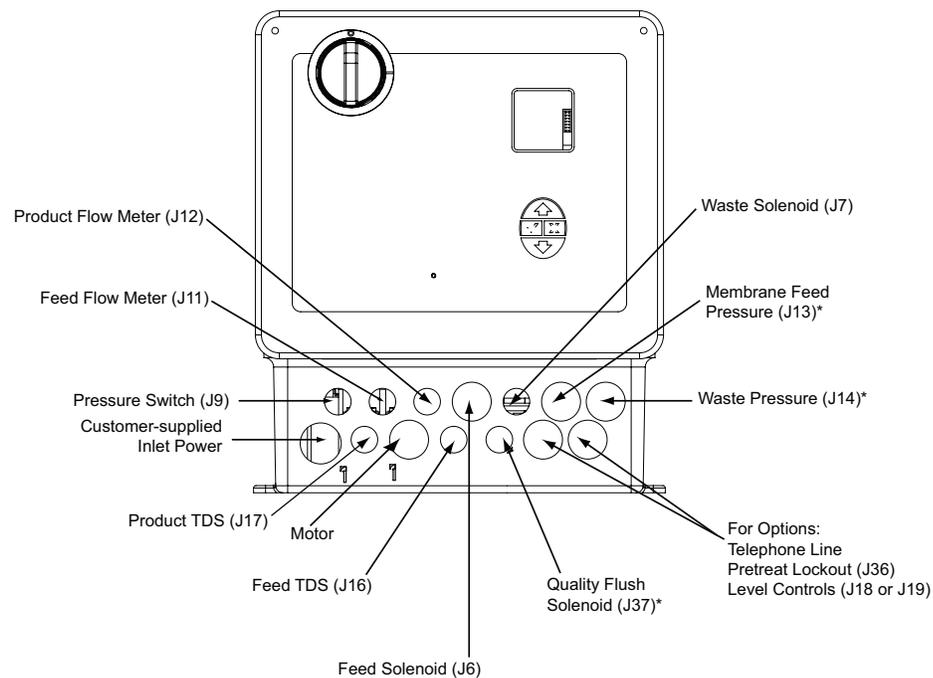
Pre-Installation Recommendations

- Follow the local electrical code requirements.
- Be sure electrical power is off and disconnected at the source before completing any wiring/cabling connections.
- DO NOT include the controller wiring cables in any conduit or raceway containing other 120-volt or higher circuits.
- Maintain a distance of at least 10 feet between the controller and any electrical distribution panels, raceways carrying 300 volts or more.
- Use the cabling provided. Failure to do so may affect performance of the controller adversely.

Series G2 Electrical Installation

To open the control panel, first rotate the disconnect switch clockwise to open position. Next, loosen the two screws and carefully open the cover by rotating it down.

Series G2 Controller



*Indicates "Plus" units only.

Figure 54. G2 controller connections.

Connecting Power to G2 RO Controller

1. Insert the power cable into the control panel.



2. Connect the wires to the disconnect switch as indicated on the unit wiring diagram (see “Figure 55. GBE RO Controller and Culligan Interface Board basic sub-panel wiring.” on page 113).



NOTE Wires must be in orientation indicated on the motor for proper motor rotation.

3. Plug in the power cable to 208V or 230V 3-phase service.



4. Turn power to control box to the On position. The display should light up. Complete the controller programming before performing the initial start-up—see “Setup” on page 24.



GBE RO Controller and CIB Wiring

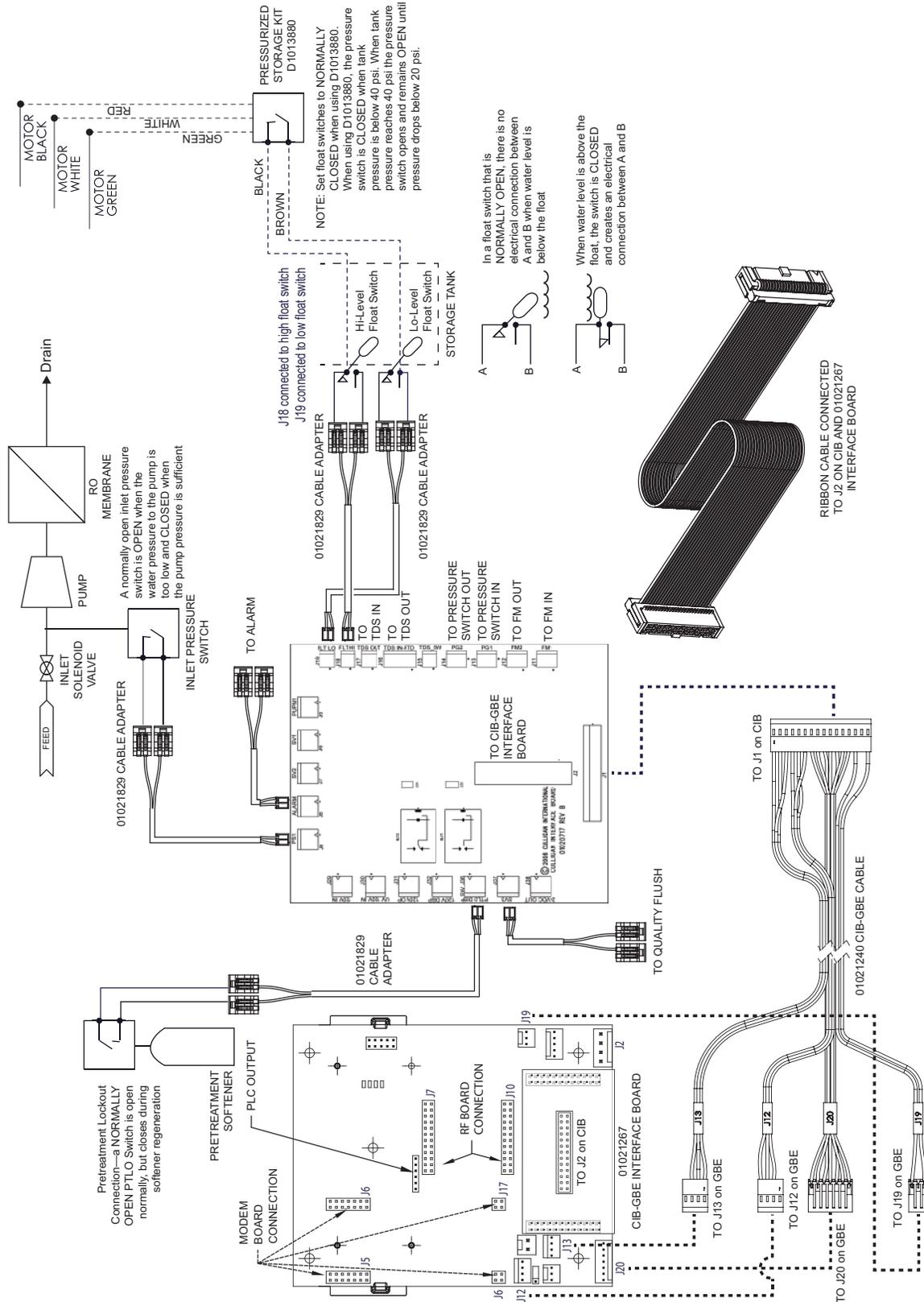


Figure 55. GBE RO Controller and Culligan Interface Board basic sub-panel wiring.

GROC Board Layout

Global RO Controller (GROC) Circuit Board Layout—Front and Back

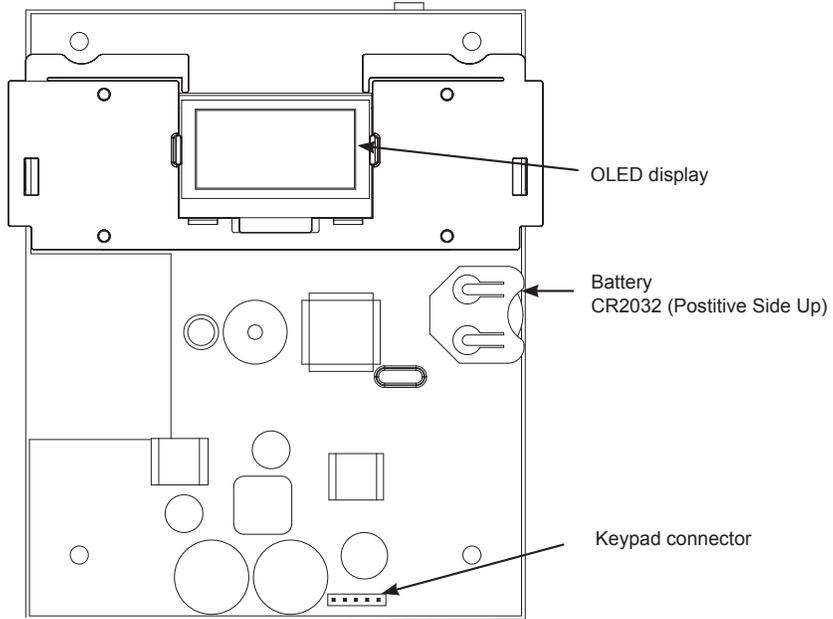


Figure 56. G Series GROC circuit board layout—front

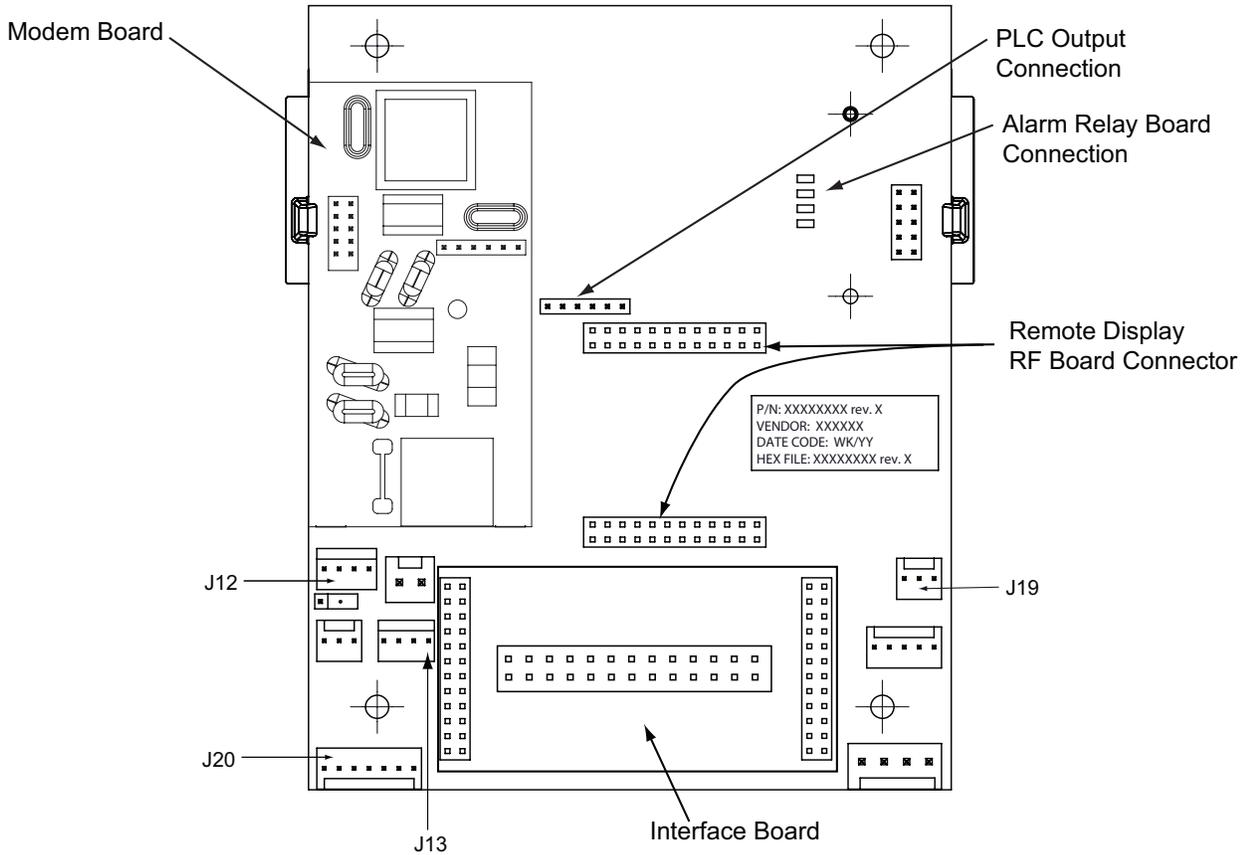


Figure 57. G Series GROC circuit board layout—back

GROC CIB Connector Board Layout

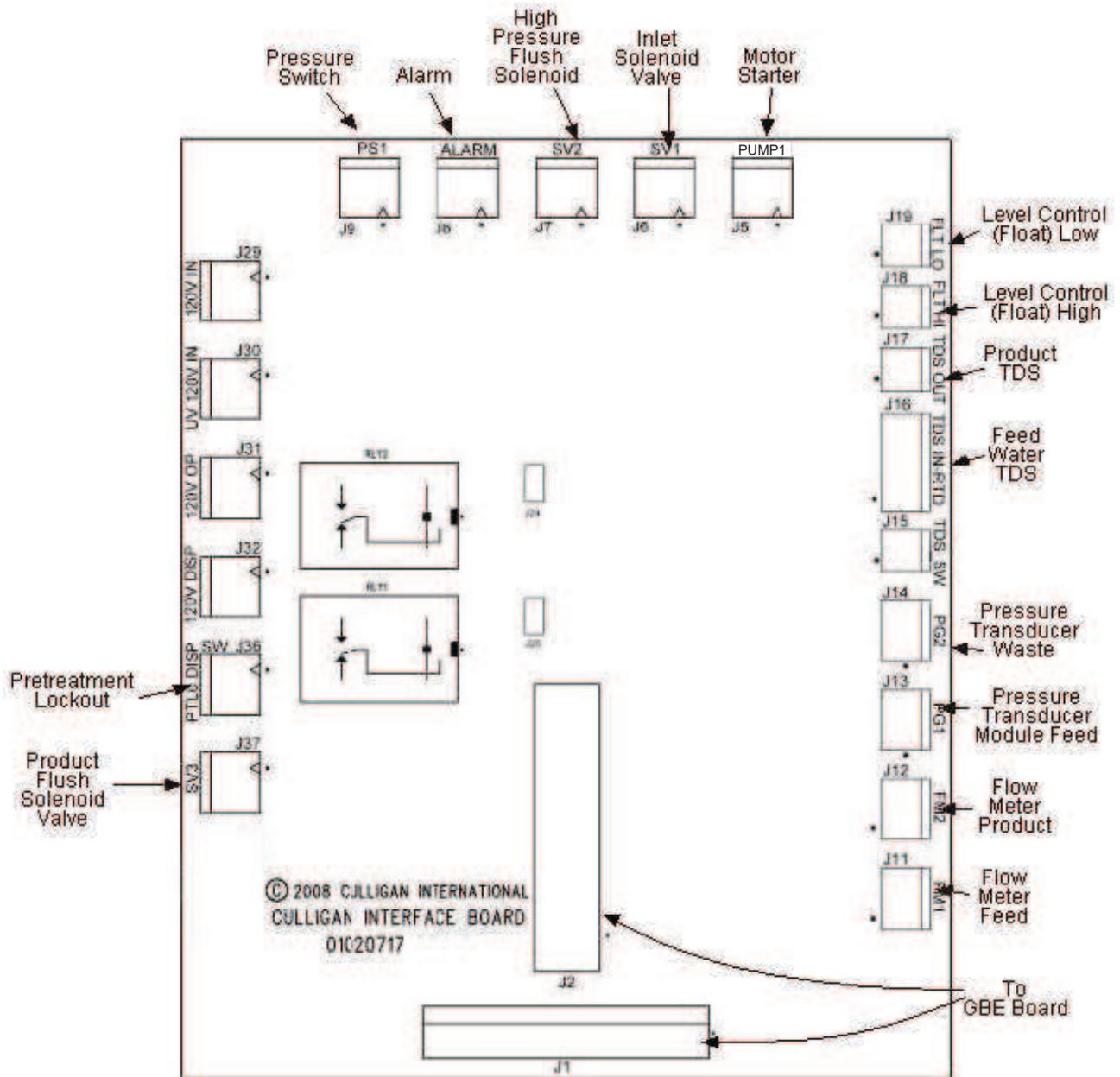


Figure 58. GROC CIB connector board layout

Remote Display Template

Remote Display Template

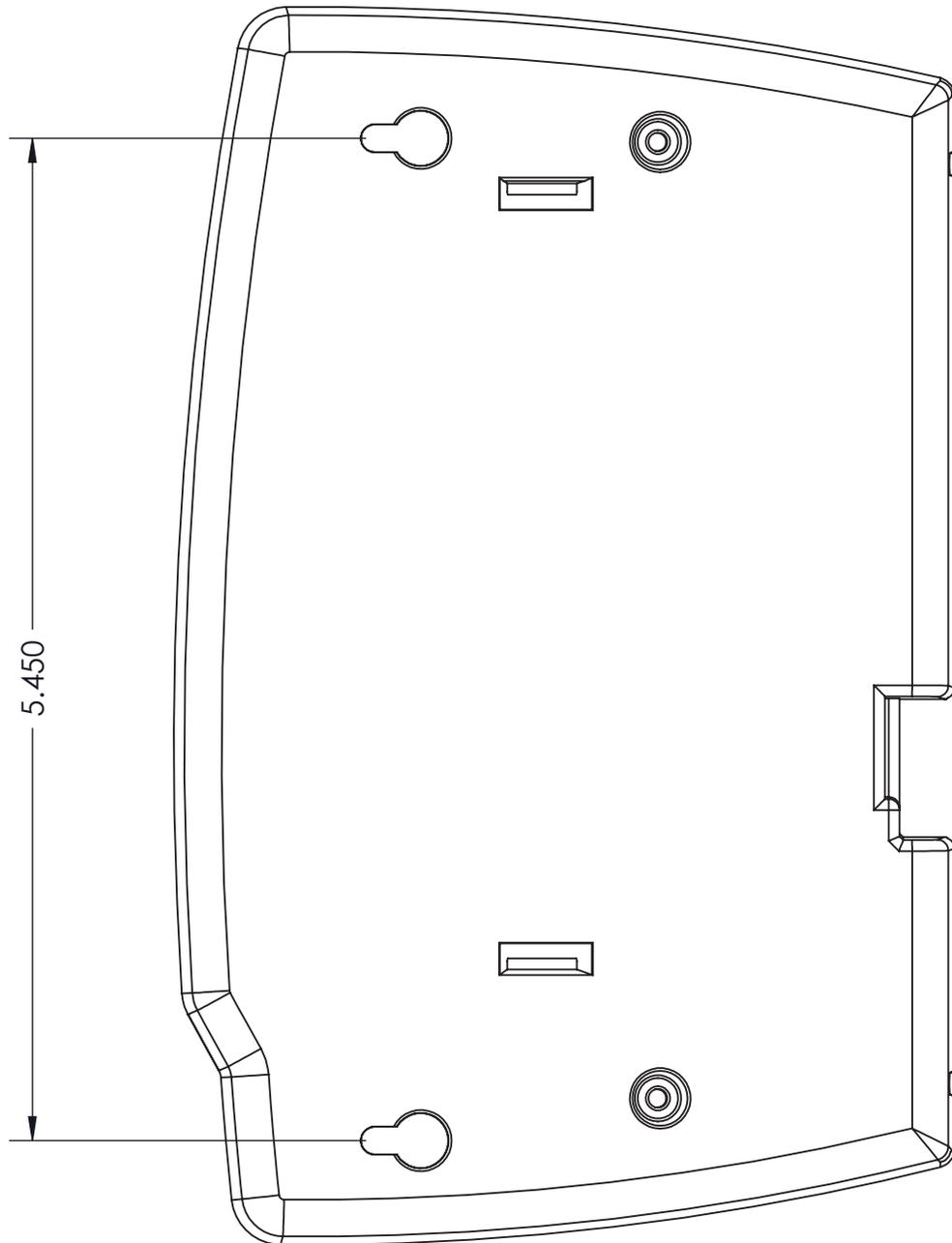


Figure 59. Hole drilling template

Appendix A G2 RO International

G2 RO International Specifications

	G2-2HE	G2-4HE	G2-6HE	G2-8HE	G2-10HE
Nominal Capacity, GPD [m ³ /hr]*	4000 [0.63]	7500 [1.18]	10000 [1.58]	15000 [2.37]	19000 [3.0]
Dimensions, Series G1 Units					
Width - in [mm]	22.0 [559]			30.5 [775]	
Depth - in [mm]	31.0 [787]				
Height - in [mm]	56.0 [1422]				
Operating Weight, lb [kg]	305 [138]	351 [159]	374 [170]	489 [222]	535 [243]
Unit Connections					
Inlet (Tube) - mm	10				
Product (Tube) - mm	10				
Concentrate (Tube) - mm	10				
Electrical					
Motor Horsepower, hp [kW]	2.0 [1.49]			3.0 [2.24]	
Power Requirement (VAC/phase/Hz)	208–230/3/60 or 380–415/3/50				
Full Load Current, amp (@115V)	6			9	
Hydraulic - Prefilter					
Housing Quantity	1				
Cartridge Rating, micron	1, 5				
Cartridge Size, in. [mm]	10 [254] or 20 [508]				
Hydraulic - RO					
RO Housing Quantity	2	4	6	8	10
RO Element Quantity	2	4	6	8	10
RO Element Length, in. [mm]	40 [1016]				
RO Array	11	1111	111111	221111	222211
Product Flow, gpm [L/min]*	2.78 [10.52]	5.21 [19.72]	6.94 [26.29]	10.42 [39.44]	13.19 [49.92]
Concentrate Flow, gpm [L/min]*	2.78 [10.52]	3.47 [13.13]	2.31 [8.74]	3.47 [13.13]	4.4 [16.65]
Required Inlet Feed Flow, gpm [L/min]	5.56 [21.04]	8.68 [32.85]	9.25 [35.01]	13.89 [52.57]	17.59 [66.58]
Pump Flow @ 150 psi, gpm [L/min]	13.5 [51.1]			17.5 [66.2]	
Recycle Flow, gpm [L/min]	5.4 [20.44]	2.3 [8.71]	1.7 [6.43]	5.5 [20.82]	4.0 [15.14]
Maximum Module Feed Pressure, psig [kPa]	150 [1034]				
Nominal Module Feed Pressure, psig [kPa]†	103 [709.7]	107 [737.2]	112 [771.7]	121 [833.7]	120 [826.8]
Max. Product Pressure, psig [kPa]	47 [323.8]	43 [296.3]	38 [261.8]	29 [199.8]	30 [206.7]
Inlet Pressure Min., dynamic psig [kPa]	20 [137.8]				
Maximum, dynamic, psig [kPa]	30 [206.7]				
Operating Temp, °F [°C]	33-100 [1-38]				
Recovery (%)*					
Design	50	60	75		
Minimum	33	40	50		
Salt Rejection, Nominal (%)	97–98				

*Nominal capacity based on new RO membranes operating on a properly pretreated feed water of 500 ppm TDS as NaCl, 77 °F (25 °C), Silt Density Index (SDI) below 3, and supplying water to atmosphere. Productivity will vary depending on the actual feed water quality and temperature.

†Calculated using a 0.85 fouling factor

G2 Plus RO International Specifications

	G2-2 Plus	G2-4 Plus	G2-6 Plus	G2-8 Plus	G2-10 Plus
Nominal Capacity, GPD [m ³ /hr]*	4000 [0.63]	7500 [1.18]	10000 [1.58]	15000 [2.37]	19000 [3.0]
Dimensions, Series G1 Units					
Width - in [mm]	22.0 [559]			30.5 [775]	
Depth - in [mm]	31.0 [787]				
Height - in [mm]	56.0 [1422]				
Operating Weight, lb [kg]	305 [138]	351 [159]	374 [170]	489 [222]	535 [243]
Unit Connections					
Inlet (Tube) - mm	10				
Product (Tube) - mm	10				
Concentrate (Tube) - mm	10				
Electrical					
Motor Horsepower, hp [kW]	2.0 [1.49]			3.0 [2.24]	
Power Requirement (VAC/phase/Hz)	208–230/3/60 or 380–415/3/50				
Full Load Current, amp (@115V)	6			9	
Hydraulic - Prefilter					
Housing Quantity	1				
Cartridge Rating, micron	1, 5				
Cartridge Size, in. [mm]	10 [254] or 20 [508]				
Hydraulic - RO					
RO Housing Quantity	2	4	6	8	10
RO Element Quantity	2	4	6	8	10
RO Element Length, in. [mm]	40 [1016]				
RO Array	11	1111	111111	221111	222211
Product Flow, gpm [L/min]*	2.78 [10.52]	5.21 [19.72]	6.94 [26.29]	10.42 [39.44]	13.19 [49.92]
Concentrate Flow, gpm [L/min]*	2.78 [10.52]	3.47 [13.13]	2.31 [8.74]	3.47 [13.13]	4.4 [16.65]
Required Inlet Feed Flow, gpm [L/min]	5.56 [21.04]	8.68 [32.85]	9.25 [35.01]	13.89 [52.57]	17.59 [66.58]
Pump Flow @ 150 psi, gpm [L/min]	13.5 [51.1]			17.5 [66.2]	
Recycle Flow, gpm [L/min]	5.4 [20.44]	2.3 [8.71]	1.7 [6.43]	5.5 [20.82]	4.0 [15.14]
Maximum Module Feed Pressure, psig [kPa]	150 [1034]				
Nominal Module Feed Pressure, psig [kPa]†	103 [709.7]	107 [737.2]	112 [771.7]	121 [833.7]	120 [826.8]
Max. Product Pressure, psig [kPa]	47 [323.8]	43 [296.3]	38 [261.8]	29 [199.8]	30 [206.7]
Inlet Pressure Min., dynamic psig [kPa]	20 [137.8]				
Maximum, dynamic, psig [kPa]	30 [206.7]				
Operating Temp, °F [°C]	33-100 [1-38]				
Recovery (%)*					
Design	50	60	75		
Minimum	33	40	50		
Salt Rejection, Nominal (%)	97–98				

*Nominal capacity based on new RO membranes operating on a properly pretreated feed water of 500 ppm TDS as NaCl, 77 °F (25 °C), Silt Density Index (SDI) below 3, and supplying water to atmosphere. Productivity will vary depending on the actual feed water quality and temperature.

†Calculated using a 0.85 fouling factor

G2/G2 Plus RO 220V International Parts List

Item	Description	Part Number				
		G2-2	G2-4	G2-6	G2-8	G2-10
—	RO System, G2, 220V	01023860	01023862	01023864	01023866	01023868
—	RO System, G2 Plus, 220V	01023869	01023871	01023873	01023875	01023877
INLET						
103	Pressure Gauge, 0–160 PSI, 2 1/2", 1/4" LM	A1314042				
100	Prefilter	01018049				
101	Cartridge, 5 micron, 1 ea.	00403232				
23	Flow Meter Sensor	01021325				
22	TDS Probe with Cable	01021876				
3	Inlet Valve with Cable	01021378				
	Low Pressure Switch with Cable	01021907				
4	Pump with Motor	01021232			01021235	
	Motor	TBD				
6	Valve	01021544				
14	Pressure Transducer1 with Cable	01021169				
16	Gauge, 0–300 PSI, CBM	01007604				
5	Housing, Filter, Wave Cyber, FRP, 4", End Port	01021540				
6	Filter Housing Hanger Assembly	01024540				
21	Membrane, 4"x40"	01008007 (2)	01008007 (4)	01008007 (6)	01008007 (8)	01008007 (10)
PRODUCT						
26	TDS Probe	01021901				
25	Flow Meter Sensor	01021325				
WASTE						
	Gauge, 0–300 PSI, CBM	01007604				
3	Rotameter	01021538				
2	Needle Valve	01021539				
	Check Valve	01021543				
24	Fast Flush Solenoid Valve	01021381				
CONTROLLER						
1	Global RO Controller (GROC)	01021291				
REMOTE DISPLAY ASSEMBLY						
	Remote Display Assy, RO - 915 MHz	01021586				
	Remote Display Assy, RO - 869 MHz, English (EU)	D1025674				
	Remote Display Assy, RO - 869 MHz, Italian (EU)	D1025675				
	Remote Display Assy, RO - 869 MHz, Spanish (EU)	D1025676				
	Remote Display Assy, RO - 869 MHz, French (EU)	D1025677				

Appendix B Basic Principles

Reverse Osmosis

In order to understand reverse osmosis, we must first define osmosis. Osmosis is the passage of a liquid through a semi-permeable membrane. A semi-permeable membrane is a membrane which allows one component of a solution to pass through it and not the others. In osmosis, there is a tendency for a liquid to go from an area of less concentration to an area of more concentration through a semi-permeable membrane. Figure 1 shows the osmotic process.

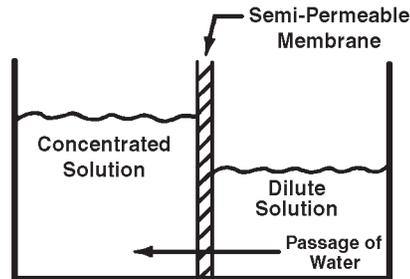


Figure 60. Osmotic process.

If pressure is applied to the concentrated solution, reverse osmosis will take place. The pressure causes a flow through the semi-permeable membrane into the dilute solution. The semi-permeable membrane acts as a barrier to ions and does not allow them to pass through into the dilute solution. When applied to water, this means that the product water has a reduced total dissolved solids content as a result of the passage of water molecules through the membrane while the mineral ions are rejected. See Figure 2.

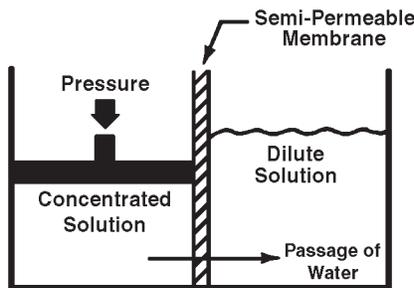


Figure 61. Effect of pressure on reverse osmosis.

NOTE Numbers used in these examples may not reflect those of your unit.

Rejection and Recovery

Feed water entering the system is split into two streams, a product stream and a concentrate stream. See Figure 62.

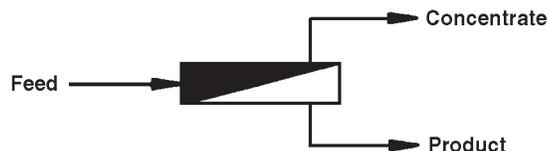


Figure 62. Feed water product stream and concentrate stream.

During the process of reverse osmosis, some of the water has its dissolved solids content reduced by approximately 96%. This high quality product water is sent to service.

The rest of the feed water contains the dissolved solids removed from the product water, in addition to the dissolved solids already present in the feed water. This concentrate water is sent to drain.

The amount of total dissolved solids rejected by the system is expressed as a percentage. A 90% rejection means that 90% of the dissolved solids have been removed from the feed water by the system. To calculate the percent rejection, use the following equation:

$$\frac{(\text{Feed TDS} - \text{Product TDS})}{(\text{Feed TDS})} \times 100 = \% \text{ Rejection}$$

Where Feed TDS is the total dissolved solids content of the water going into the system, and Product TDS is the total dissolved solids content of the high quality product water.

For example, if the Feed TDS is 600 ppm and the Product TDS is 24 ppm,

$$\frac{600-24}{600} \times 100 = 96\% \text{ Rejection}$$

The amount of high quality water recovered for use as a percentage of the water fed into the reverse osmosis system is called percent recovery. Use the following equation to calculate percent recovery:

$$\frac{\text{Product Water Flow Rate}}{\text{Feed Water Flow Rate}} \times 100 = \% \text{ Recovery}$$

NOTICE The feed water flow rate is equal to the product water flow rate plus the concentrate water flow rate, both of which are easily measured.

For example, if the product flow is 0.7 pm (gallons per minute) and the concentrate flow is 0.55 gpm,

$$\frac{0.7}{(0.7 + 0.55)} \times 100 = 56\% \text{ Recovery}$$



CAUTION! An understanding of rejection/recovery percentages and temperature compensation is essential for monitoring and evaluating the performance or condition of the reverse osmosis system. **DO NOT** operate the system before becoming familiar with these concepts.

Temperature Compensation

As the feed water temperature decreases so will the product water production. The rated product flow (gallons per minute, gpm) as shown for the various models on page 4 is based upon the feed water temperature equal to 77° F.

RO Operating Factors

Changes in these factors will have an effect on system operation. Several operating factors influence the performance of an RO module. Table 9 shows the effect of these factors when all other conditions remain the same.

Table 9. RO Operating Factors

Factor	Action	Productivity	Product Quality
Applied Pressure	Raise	Increase	Increase
	Lower	Decrease	Decrease
Feed Temperature	Raise	Increase	Decrease
	Lower	Decrease	Increase
Feed SDI	Raise	Decrease	Decrease
	Lower	Increase	Increase
Percent Conversion	Raise	Decrease	Decrease
	Lower	Increase	Increase
Product Pressure	Raise	Decrease	Decrease
	Lower	Increase	Increase

NOTICE The effect on product quality is generally a very small change compared to the change observed in productivity. For example, capacity decreases approximately 13% for every 9oF (5oC) temperature decrease. Under the same conditions, product quality will only improve by a few ppm.

Feed Water Limits

Before starting the installation, verify that the feed water meets the limits shown in Table 10, and that a water softener is used for pretreatment.

Property	Minimum	Maximum
Turbidity (NTU)	0.0	1.0
pH*	6	11
Chlorine (ppm)	0.0	0.1
Total Dissolved Solids (ppm)	50	2500
Temperature (°F)	33	100
Silt Density Index	0.0	5.0
Iron (ppm)	0.0	1.0

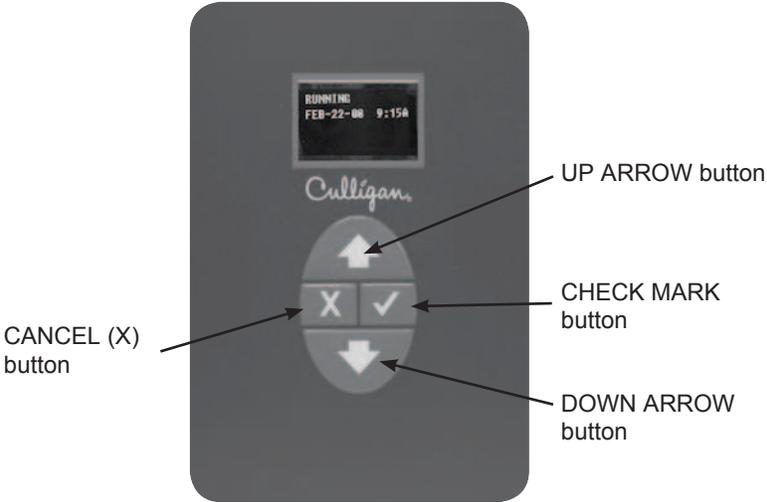
Table 10. Feed water limits.

*Short term cleaning is acceptable for pH ranges between 2.0/12.0. Additional treatment is required when chloramines are present and the pH levels exceed 9.0.

NOTICE In some applications, a water softener is not required. Consult an independently operated Culligan dealer for further information on these special applications.

Appendix C Menu and Key Navigation

Key Pad Familiarization



UP ARROW button: scrolls up the menu



DOWN ARROW button: scrolls down the menu



CHECK MARK button: selects the highlighted option, opens a new screen, or accepts a changed setting



CANCEL or EXIT button: returns to the previous screen or cancels a changed setting



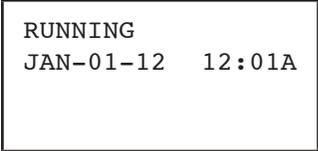
Controller



Remote

NOTE Hold down the or button to quickly scroll through the setting without repeatedly pressing the button.

CAUTION! Use the and only to scroll through the menu settings. Do not use to perform scrolling. Improper use of might cause the controller to reset certain functions.



1. This is the home screen. Press any button except to display the main menu.

>1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
4) SETUP

START UP MODE
OFF

START UP MODE
>OFF

START UP MODE
>ON

START UP MODE
>OFF

START UP MODE
OFF

STANDBY MODE
OFF

>1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
4) SETUP

RUNNING
JAN-01-12 12:01A

2. This is the main menu. The pointer (>) shows where you are in the menu. Press  or  to scroll through the menu. The selection cursor scrolls down to the next line or displays the next screen.
3. From a menu screen, press  to select the item next to the cursor. The GROC screen displays the selected setting or information.
4. The GROC screen displays a setting title at the top of the screen and then the setting value. Here we see the current value for the Startup Flush screen is OFF.
5. Press  to turn on the cursor symbol next to the setting value. The cursor indicates that you can change the current value using  or .
6. Press  once. The screen displays the new setting value next to the cursor.
7. Press  again. The screen displays the next available setting value.
8. You may press  or  to scroll through all of the available options for the screen.
9. Press  to accept the selected screen value. The cursor next to the value is removed.
10. If other settings are available, press  to advance to the next displayed setting.
11. Press  to exit from the setting. The GROC screen displays the parent menu.
12. Press  repeatedly to return to the home screen.

Appendix D Quick Programming Guide

Quick Programming Guide—First Time Setup with Modem in Controller

Press to select a setting. Press or to change the setting. Press to save. Press to exit from a menu.

Select Language

LANGUAGE
ENGLISH

Select the controller language.

FIRST TIME SETUP
PRESS DOWN ARROW

From the FTS screen, press to scroll to the date/time settings.

Set Up Date

SET MONTH
JAN

Set the Month, Day, and Year.

SET DAY
1

SET YEAR
2012

Set Up Clock Type and Time

CLOCK TYPE
12 HR

Select either a 12-hour clock (12:00A–11:59P) or 24-hour clock (00:00–23:59)

SET HOUR
12 PM

NOTE 24-hour clock format does not require AM or PM

SET MINUTES
1

Set Up System Status at Startup

POWERON MODE
RUNNING

Select the system status at startup—offline or running. You can change status after setup.

Set Up Units of Measure/Initialize System

SYSTEM UNITS
US INCH

Select METRIC for units outside the United States.

RUNNING
JAN-01-12 12:01P

The “home” screen displays the RUNNING or OFFLINE status of the RO system.

Install Modem

1)GOTO RUNNING
2)GOTO OFFLINE
3)INFORMATION
>4)SETUP

Press to scroll to 4)SETUP and press for setup menu.

2)LANGUAGE
3)POWERON MODE
4)FLUSH MODES
>5)ACCESSORIES

Select 5)ACCESSORIES.

1)WIRELESS REM
>2)MODEM
3)FLOW METERS
4)SWITCH INPUTS

Select 2)MODEM.

TELEPHONE MODEM
NOT INSTALLED

Change the setting to **INSTALLED**.

MODEM CONNECTION
Landline

Select either landline or cell (mobile) phone modem.

MODEM LOCATION
IN MAIN CONTROL

Press to leave setting as is (modem in main control).

TIME ZONE GMT
+04:00

Select the time zone (based on Greenwich Mean Time) where the GROC is located.

CALL FREQUENCY
DAILY

Select to send data either at a regularly scheduled time, when an error occurs, or both.

CALL TIME
4:30AM

Select the time when you want the controller to send data.

DATA PHONE #
18884137028

Dial in to a LOCAL phone number when possible. See myCulligan.com for numbers.

DEALER ID
1234567_

Enter your dealer identification number (up to eight digits).

Press to save the settings and return to the home screen.

First Time Setup with Quality Flush and High Level Float Switch

Press **✓** to select a setting. Press **↑** or **↓** to change the setting. Press **✓** to save. Press **X** to exit from a menu.

Select Language

LANGUAGE
ENGLISH

Select the controller language.

FIRST TIME SETUP
PRESS DOWN ARROW

From the FTS screen, press **↓** to scroll to the date/time settings.

Set Up Date

SET MONTH JAN

Set the Month, Day, and Year.

SET DAY 1

SET YEAR 2012

Set Up Clock Type and Time

CLOCK TYPE
12 HR

Select either a 12-hour clock (12:00A–11:59P) or 24-hour clock (00:00–23:59)

SET HOUR
12 PM

NOTE 24-hour clock format does not require AM or PM

SET MINUTES 1

Set Up System Status at Startup

POWERON MODE
OFFLINE

Select the system status at startup—offline or running. You can change status after setup.

Set Up Units of Measure/Initialize System

SYSTEM UNITS
US INCH

Select METRIC for units outside the United States.

RUNNING
JAN-01-12 12:01P

The “home” screen displays the RUNNING or OFFLINE status of the RO system.

Set Up Flush Modes

1)GOTO RUNNING
2)GOTO OFFLINE
3)INFORMATION
>4)SETUP

Press **↓** to scroll to **4)SETUP** and press **✓** for setup menu.

1)TIME/DATE
2)LANGUAGE
3)POWERON MODE
>4)FLUSH MODES

Select **4)FLUSH MODES**.

2)STANDBY
3)TIME TRIGGER
4)FLOW TRIGGER
>5)QUAL FLUSH

Select **5)QUAL FLUSH**.

QUAL FLUSH MODE
ON

Change the setting to **ON**.

FLUSH DURATION
3
MINUTES

Select the flush duration.

TDS LEVEL
10

Select the TDS level that will trigger a quality flush.

Set Up Float Switches

2)LANGUAGE
3)POWERON MODE
4)FLUSH MODES
>5)ACCESSORIES

From the **SETUP** menu, select **5)ACCESSORIES**.

1)WIRELESS REM
2)MODEM
3)FLOW METERS
>4)SWITCH INPUTS

Select **4)SWITCH INPUTS**.

FLOAT SWITCHES
NORMALLY OPEN

Scroll to the **FLOAT SWITCHES** setting; select **NORMALLY OPEN**.

FS Hi Delay 10
MINUTES

Select how long the float switch stays closed after transitioning from high to low level.

Press **X X X** to save the settings and return to the home screen.

First Time Setup with Wireless Remote, High and Low Float Switches

Press **✓** to select a setting. Press **↑** or **↓** to change the setting. Press **✓** to save. Press **X** to exit from a menu.

Select Language

LANGUAGE
ENGLISH

Select the controller language.

FIRST TIME SETUP
PRESS DOWN ARROW

From the FTS screen, press **↓** to scroll to the date/time settings.

Set Up Date

SET MONTH **JAN**

Set the Month, Day, and Year.

SET DAY **1**

SET YEAR
2012

Set Up Clock Type and Time

CLOCK TYPE
12 HR

Select either a 12-hour clock (12:00A–11:59P) or 24-hour clock (00:00–23:59)

SET HOUR
12 PM

NOTE 24-hour clock format does not require AM or PM

SET MINUTES **1**

Set Up System Status at Startup

POWERON MODE
OFFLINE

Select the system status at startup—offline or running. You can change status after setup.

Set Up Units of Measure/Initialize System

SYSTEM UNITS
US INCH

Select METRIC for units outside the United States.

RUNNING
JAN-01-12 12:01P

The “home” screen displays the RUNNING or OFFLINE status of the RO system.

Set Up GROC-Remote Communication

>1) WIRELESS REM
2) MODEM
3) FLOW METERS
4) SWITCH INPUTS

From the main menu, select **4) SETUP → 5) ACCESSORIES → 1) WIRELESS REM.**

WIRELESS REM
NOT INSTALLED

Change the setting to **INSTALLED.**

CHANNEL #
1

Select the channel to communicate between the remote and the RO controller.

RF FREQUENCY
915MHz

Select the radio frequency: 915MHz for North America, 869 or 933 in other locations.

Set Up Float Switches

2) LANGUAGE
3) POWERON MODE
4) FLUSH MODES
>5) ACCESSORIES

From the **SETUP** menu, select **5) ACCESSORIES.**

1) WIRELESS REM
2) MODEM
3) FLOW METERS
>4) SWITCH INPUTS

Select **4) SWITCH INPUTS.**

FLOAT SWITCHES
NORMALLY OPEN

Scroll to the **FLOAT SWITCHES** setting; select **NORMALLY OPEN.**

FS Hi Delay **10**
MINUTES

Select how long the float switch stays closed after transitioning from high to low level.

Press **X X X** to save the settings and return to the home screen.

Set Up GROC-Remote Communication

>1) RF SETUP
2) MODEM SETUP

From the main menu, select **2) SETUP → 1) RF SETUP.**

CHANNEL #
1

Select the SAME channel to communicate that is set on the RO controller.

RF FREQUENCY
915MHz

Select the radio frequency: 915MHz for North America, 869 or 933 in other locations.

Quick Programming Chart—First Time Setup with Flow Trigger Flush

Press to select a setting. Press or to change the setting. Press to save. Press to exit from a menu.

Select Language

LANGUAGE
ENGLISH

Select the controller language.

FIRST TIME SETUP
PRESS DOWN ARROW

From the FTS screen, press to scroll to the date/time settings.

Set Up Date

SET MONTH JAN

Set the Month, Day, and Year.

SET DAY 1

SET YEAR 2012

Set Up Clock Type and Time

CLOCK TYPE
12 HR

Select either a 12-hour clock (12:00A–11:59P) or 24-hour clock (00:00–23:59)

SET HOUR
12 PM

NOTE 24-hour clock format does not require AM or PM

SET MINUTES 1

Set Up System Status at Startup

POWERON MODE
OFFLINE

Select the system status at startup—offline or running. You can change status after setup.

Set Up Units of Measure/Initialize System

SYSTEM UNITS
US INCH

Select METRIC for units outside the United States.

RUNNING
JAN-01-12 12:01P

The “home” screen displays the RUNNING or OFFLINE status of the RO system.

Set Up Flush Modes

1)GOTO RUNNING
2)GOTO OFFLINE
3)INFORMATION
>4)SETUP

Press to scroll to 4)SETUP and press for setup menu.

1)TIME/DATE
2)LANGUAGE
3)POWERON MODE
>4)FLUSH MODES

Select 4)FLUSH MODES.

1)START UP
2)STANDBY
3)TIME TRIGGER
>4)FLOW TRIGGER

Select 4)FLOW TRIGGER.

FLOW TRIG MODE
ON

Change the setting to ON.

FLUSH DURATION
20
MINUTES

Select the flush duration.

FLUSH EVERY
1000
GALLONS

Select the TDS level that will trigger a quality flush.

Press to save the settings and return to the home screen.

Appendix E Data Port Output

Culligan GBE RO Controller—Data Port Output

The GBE RO controller is used to control commercial RO systems.

This controller has the ability to provide status messages to customer equipment using RS-232 and RS-485 communication protocols. These protocols are commonly used to send information from the GBE RO controller to either a customer's PC or to a building management system or programmable logic controller (PLC). The information is one-way; the GBE RO controller can send this information out, but the GBE RO controller cannot receive or respond to any commands sent into the communication port. The GBE RO controller sends a status message every ten minutes. The information is sent as a short text (ASCII), comma-separated string of letters and numbers such as CULL,009.30,004.60,1,050,096,0,0,0005 0202,00000, 000,10231027.

Reverse Osmosis System Report from GBE RO Controller

The format of the status message is: CULL,A,B,C,D,E,F,G,H,I,J,K,L,M

Example: CULL,009.30,004.60,1,050,096,0,0,00050202,00000,00000,00000,000,000,000,1023111027

Where the values for the fields A thru J are as follows:

A = current membrane feed-flow rate in gallons per minute (9.3 means 9.3 gpm)

B = current flow rate in gallons per minute

C = Current Operational Status (1=running, 2=standby, 3=offline, 4=error)

D = Current recovery percentage (050 means 50% recovery)

E = Current reject percentage (096 means 96% rejection)

F = Storage Tank Hi-Level Float Switch (0=open/water is below the float switch, 1=closed/water is above the float switch)

G = Storage Tank Lo-Level Float Switch (0=open, 1=closed)

H = Total gallons of delivered product water since new (50202 means 50202 gallons)

I = 1st Error Code present, if any

J = TDS out

K = Temperature

L = Normalized Flow

M = Date and Time. i.e. 102320111027 is Oct 23 2011 (102311) at 10:27 am (1027). Time is in 24 hr format.

Electrical Connections

The Culligan Data Cable Connector is terminated with a D-sub9 style female termination. The customer must provide the following pin connections:

Pin	Function
3 (Input)	TD (data coming FROM the G Series RO Controller board)
2 (Output)	RD (this line is required even though no data is sent TO the GROC board)
7 (Input)	RTS
8 (Output)	CTS
5 (Signal gnd)	GND

The GBE RO controller sends data at the following rates:

Bits Per Second: 9600

Data Bits: 8

Parity: None

Stop Bits: 1

Flow Control: None

The following data cable styles are available from Culligan (cables for Modbus, BACNET, and Profibus are also available from your Culligan dealer):

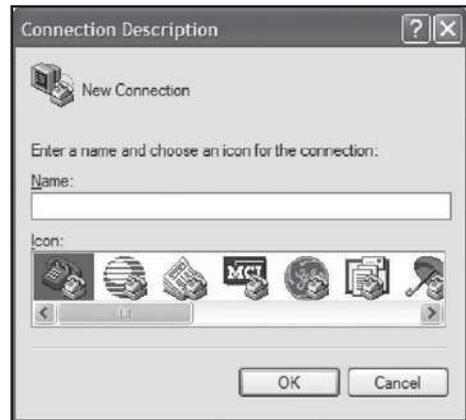
Cable Part No.	Description
01021507	9-pin female RS-232 output
01021508	9-pin female RS-485 output
01021509	USB style output cable—comes with CD-ROM which includes device drivers for Microsoft® Windows® 2000, XP, Vista, and 7 operating systems

Test the Data Port

Once your cables are set up, you can test your connection using the Windows® Hyperterminal program. This program is generally found under Start/All Programs/Accessories/Communications/Hyperterminal.

Name the New Connection

1. When you open Hyperterminal you will be prompted to create a name for the connection. Enter any name.
2. Click on an icon that represents your connection.
3. Click on the OK button.



Set the COM Properties

1. Select a COM port. From the “Connect Using” drop down list, pick the COM port with the highest number and click OK.



2. Now set the properties for this COM port as shown.



3. Click OK. The Hyperterminal is ready to accept data.

Send a Test Message from the GBE RO Controller

```
RUNNING
JAN-01-12  12:01P
```

```
1) GO TO RUNNING
2) GO TO OFFLINE
3) INFORMATION
>4) SETUP
```

```
3) POWERON MODE
4) FLUSH MODES
5) ACCESSORIES
>6) DIAGNOSTICS
```

```
1) TST WIRELESS
2) TESTPHONELIN
>3) USE DATA PORT
4) TEST APP
```

```
MINI REPORT
Sending ...
```

```
MINI REPORT
Sent!
```

1. From the default home screen, press . The screen displays the main menu.

2. Press  to scroll to 4) SETUP.

3. Press  to select the SETUP menu.

4. Press  to select 6)DIAGNOSTICS. The screen displays the diagnostics menu.

5. Press  to select 3)USE DATA PORT. The screen displays the data report status screen.

6. Press  to to send the mini report.

7. The GBE RO controller displays the message delivery status. Press  to exit the screen. See Appendix A regarding report data.

*** MINI REPORT ***

FM1 = 0.00
FM2 = 0.00
PI-PO = 0
Operational Status = OFFLINE
Recovery Rate = 0.0 %
Rejection Rate = 76 %
Float Switch Hi = active
Float Switch Low = active
Total FM1 = 0
Total pump on = 0 hrs
Units = Inch
FM1 Meter Factor = 80.0
FM2 Meter Factor = 80.0
Max press dif limit = 250
Min reject % limit = 20 %
Max recovery % limit = 90 %
Min recovery % limit = 10 %
Max IN temp limit = 120
Min IN temp limit = 33
Max feed pressure limit = 250
Min feed pressure limit = 50
Max TDS Out limit = 250
Max pump time hrs/day limit = 0
Min NORM flow limit = 0
NORM flow std pressure limit = 120
Startup flush = OFF --
Standby flush = OFF --
Time trigger flush = OFF -- --
Flow trigger flush = OFF -- --
Quality flush = ON 3 10
Permeate flush = OFF --
TDS probe = both

*** Historical Data ***

Month = JAN
Year = 2012
Rejection = 0 %
Recovery = 0.0
PI-PO = 0
NFlow = 0.0
Total Water = 0
Product PPM = 0

Figure 63. Data report from GBE RO Controller.

If you do not see the report, check your settings and make sure the cables are firmly connected. If you still don't see the report, try some of the other COM ports.

The status message on the screen is updated every minute and will look similar to this:

CULL,009.30,004.60,1,050,096,0,0,00050202,00000,00000,00000,000,000,000,1023111027

This message was described at the beginning of this Appendix.

Appendix F Programming Log

Use this section to record the program settings for this system. Circle or enter the observed value. Make additional copies to keep on file near the installation and with your local Culligan dealer.

Program Date: _____ Installer: _____ Site Location: _____

Record GROC ESN: _____ Firmware Version: _____

Language

Language	English/French/ Italian/Spanish	
----------	------------------------------------	--

Time and Date

Month		
Day		
Year		
Clock Type	12 Hr/24 Hr	
Hour		
Minutes		
Daylight Saving	Yes/No	

Power On Mode

Power On Mode	Running/Standby	
---------------	-----------------	--

System Units

System Units	US Inch/Metric	
--------------	----------------	--

Flush Modes

Startup Mode	Off/On	
Flush Duration		
Standby Mode	Off/On	
Flush Duration		
Flush Every		
Time Trigger	Off/On	
Flush Duration		
Flush Every		
Flow Trigger	Off/On	
Flush Duration		
Flush Every		
Quality Flush	Off/On	
Flush Duration		
TDS Level		
Permeate Flush	Off/On	
Flush Duration		

Accessories

Wireless Remote		
Remote Display	Installed/Not Installed	
Channel #		
RF Frequency	915/869/433	
Modem		
Telephone Modem	Installed/Not Installed	
Modem Connection	Landline/CellModem	
Modem Location	In Main Control/ In Remote	
Time Zone GMT		
Call Frequency		
Call Time		
Data Phone #		
Dealer ID		
Flow Meters	Installed/Not Installed	
FM1 K Factor		
FM2 K Factor		
Switch Inputs		
Pressure Switch	Open/Closed	
PW SW Delay		
SV1 Delay		
Pretreat Switch	Open/Closed	
Float Switches	Open/Closed	
FS Hi Delay		
Pressure Gauges		
PG Install		
Press Gauges	Yes/No	
Calibrate PG1	Yes/No	
PG1 Offset		
PG1 Cal Factor		
Calibrate PG2	Yes/No	
PG2 Offset		
PG2 Cal Factor		
TDS		
TDS Probe	None/Product/Both	
Actual TDS In		G2/G3 Only
Actual TDS Out		
Temp Offset		
Temp Comp Value		
Relay Mode	Off/Error Status/ Network	
Flow Trigger		Pulsed Output Only

Accessories, cont.

Multi Unit RO	Single/Two-Pass RO/ Alternating	
Multi Unit RO Role	Master/Slave	
Two Pass Delay		2-Pass Master Only
SV3		
Set SV3 Mode	Flush Modes/ TDS Target	
TDS Target Value		TDS Target Only
TDS Target Time		TDS Target Only

Error Limits

Max Pressure Diff		
Min Rejection %		
Max Recovery %		
Min Recovery %		
Max In Temp	°F/°C	
Min In Temp	°F/°C	
Max Feed Pressure		
Min Feed Pressure		
Max TDS Out		
Max Pump Time		
Min Normalized Flow		
Std Pressure		

On Remote Display

RF Setup		
Channel #		
Radio Frequency	915/869/433	
Telephone Modem	Not Installed/Installed	
Call Frequency	Daily/On Error/ Daily&Error/ Monthly&Error	
Data Phone #		

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Programming Log

Use this section to record the program settings for this system. Circle or enter the observed value. Make additional copies to keep on file near the installation and with your local Culligan dealer.

Program Date: _____ Installer: _____ Site Location: _____

Record GROC ESN: _____ Firmware Version: _____

Language

Language	English/French/ Italian/Spanish	
----------	------------------------------------	--

Time and Date

Month		
Day		
Year		
Clock Type	12 Hr/24 Hr	
Hour		
Minutes		
Daylight Saving	Yes/No	

Power On Mode

Power On Mode	Running/Standby	
---------------	-----------------	--

System Units

System Units	US Inch/Metric	
--------------	----------------	--

Flush Modes

Startup Mode	Off/On	
Flush Duration		
Standby Mode	Off/On	
Flush Duration		
Flush Every		
Time Trigger	Off/On	
Flush Duration		
Flush Every		
Flow Trigger	Off/On	
Flush Duration		
Flush Every		
Quality Flush	Off/On	
Flush Duration		
TDS Level		
Permeate Flush	Off/On	
Flush Duration		

Accessories

Wireless Remote		
Remote Display	Installed/Not Installed	
Channel #		
RF Frequency	915/869/433	
Modem		
Telephone Modem	Installed/Not Installed	
Modem Connection	Landline/CellModem	
Modem Location	In Main Control/ In Remote	
Time Zone GMT		
Call Frequency		
Call Time		
Data Phone #		
Dealer ID		
Flow Meters	Installed/Not Installed	
FM1 K Factor		
FM2 K Factor		
Switch Inputs		
Pressure Switch	Open/Closed	
PW SW Delay		
SV1 Delay		
Pretreat Switch	Open/Closed	
Float Switches	Open/Closed	
FS Hi Delay		
Pressure Gauges		
PG Install		
Press Gauges	Yes/No	
Calibrate PG1	Yes/No	
PG1 Offset		
PG1 Cal Factor		
Calibrate PG2	Yes/No	
PG2 Offset		
PG2 Cal Factor		
TDS		
TDS Probe	None/Product/Both	
Actual TDS In		G2/G3 Only
Actual TDS Out		
Temp Offset		
Temp Comp Value		
Relay Mode	Off/Error Status/ Network	
Flow Trigger		Pulsed Output Only

Accessories, cont.

Mult Unit RO	Single/Two-Pass RO/ Alternating	
Multi Unit RO Role	Master/Slave	
Two Pass Delay		2-Pass Master Only
SV3		
Set SV3 Mode	Flush Modes/ TDS Target	
TDS Target Value		TDS Target Only
TDS Target Time		TDS Target Only

Error Limits

Max Pressure Diff		
Min Rejection %		
Max Recovery %		
Min Recovery %		
Max In Temp	°F/°C	
Min In Temp	°F/°C	
Max Feed Pressure		
Min Feed Pressure		
Max TDS Out		
Max Pump Time		
Min Normalized Flow		
Std Pressure		

On Remote Display

RF Setup		
Channel #		
Radio Frequency	915/869/433	
Telephone Modem	Not Installed/Installed	
Call Frequency	Daily/On Error/ Daily&Error/ Monthly&Error	
Data Phone #		

Programming Log

Use this section to record the program settings for this system. Circle or enter the observed value. Make additional copies to keep on file near the installation and with your local Culligan dealer.

Program Date: _____ Installer: _____ Site Location: _____

Record GROC ESN: _____ Firmware Version: _____

Language

Language	English/French/ Italian/Spanish	
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Time and Date

Month		
Day		
Year		
Clock Type	12 Hr/24 Hr	
Hour		
Minutes		
Daylight Saving	Yes/No	

Power On Mode

Power On Mode	Running/Standby	
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System Units

System Units	US Inch/Metric	
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Flush Modes

Startup Mode	Off/On	
Flush Duration		
Standby Mode	Off/On	
Flush Duration		
Flush Every		
Time Trigger	Off/On	
Flush Duration		
Flush Every		
Flow Trigger	Off/On	
Flush Duration		
Flush Every		
Quality Flush	Off/On	
Flush Duration		
TDS Level		
Permeate Flush	Off/On	
Flush Duration		

Accessories

Wireless Remote		
Remote Display	Installed/Not Installed	
Channel #		
RF Frequency	915/869/433	
Modem		
Telephone Modem	Installed/Not Installed	
Modem Connection	Landline/Cell/Modem	
Modem Location	In Main Control/ In Remote	
Time Zone GMT		
Call Frequency		
Call Time		
Data Phone #		
Dealer ID		
Flow Meters	Installed/Not Installed	
FM1 K Factor		
FM2 K Factor		
Switch Inputs		
Pressure Switch	Open/Closed	
PW SW Delay		
SV1 Delay		
Pretreat Switch	Open/Closed	
Float Switches	Open/Closed	
FS Hi Delay		
Pressure Gauges		
PG Install		
Press Gauges	Yes/No	
Calibrate PG1	Yes/No	
PG1 Offset		
PG1 Cal Factor		
Calibrate PG2	Yes/No	
PG2 Offset		
PG2 Cal Factor		
TDS		
TDS Probe	None/Product/Both	
Actual TDS In		G2/G3 Only
Actual TDS Out		
Temp Offset		
Temp Comp Value		
Relay Mode	Off/Error Status/ Network	
Flow Trigger		Pulsed Output Only

Accessories, cont.

Mult Unit RO	Single/Two-Pass RO/ Alternating	
Multi Unit RO Role	Master/Slave	
Two Pass Delay		2-Pass Master Only
SV3		
Set SV3 Mode	Flush Modes/ TDS Target	
TDS Target Value		TDS Target Only
TDS Target Time		TDS Target Only

Error Limits

Max Pressure Diff		
Min Rejection %		
Max Recovery %		
Min Recovery %		
Max In Temp	°F/°C	
Min In Temp	°F/°C	
Max Feed Pressure		
Min Feed Pressure		
Max TDS Out		
Max Pump Time		
Min Normalized Flow		
Std Pressure		

On Remote Display

RF Setup		
Channel #		
Radio Frequency	915/869/433	
Telephone Modem	Not Installed/Installed	
Call Frequency	Daily/On Error/ Daily&Error/ Monthly&Error	
Data Phone #		

