

Smart Greywater System User Manual

Version 3.5



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1.0 Scope of Users' Manual

The *Smart Greywater System User's Manual* is intended to provide relevant information to the User of the system. This manual provides detailed information about the design, operation, troubleshooting & maintenance of the system. To learn more about the design layout & installation of the system, please refer to the *Smart Greywater System Installer's Manual*.

2.0 Greywater System Features

- **Super Smart:** The most advanced greywater system period
- **Proven Track Record:** 10 years of R & D with hundreds of successful installations
- **Plug & Play Installation:** Greywater Manifold is factory built and pre-tested. Simply connect water, power, and plug in the Greywater Controller
- **Seamless Irrigation Integration:** Operates the same as a traditional irrigation system and is compatible with standard irrigation equipment
- **Smart Controller Compatible:** Works with *all* irrigation controllers, including smart controllers
- **Low Maintenance Requirements:** Only a once a year maintenance visit is required
- **Automatic Makeup Supply:** If no greywater is available in the tank, the system automatically supplies makeup water to the tank
- **Automatic Filter Backflush:** The 100-micron greywater filter is automatically backflushed to prevent clogging.
- **Empty Tank:** User determines how many days greywater can sit in tank before being emptied. Complies with CA 24-hour rule.
- **Water Flow Monitoring:** Water flow rate of irrigation system is displayed on the Controller during irrigation
- **Water-use Monitoring:** The Controller displays how much greywater and makeup water has been used by the irrigation system
- **Full System Alarms:** Receive alarm notifications on the Controller if pumps, valves, or other system equipment is not functioning correctly
- **California Code Ready:** Fully compliant with California Plumbing Code Chapter 15 and Uniform Plumbing Code.
- **Rainwater Ready:** Can incorporate another non-potable source of water (must be configured at time of ordering)

3.0 How It Works

The Smart Greywater System is designed to collect greywater from a house or building, and supply filtered greywater to the landscape drip irrigation system.

3.1 Greywater System Overview

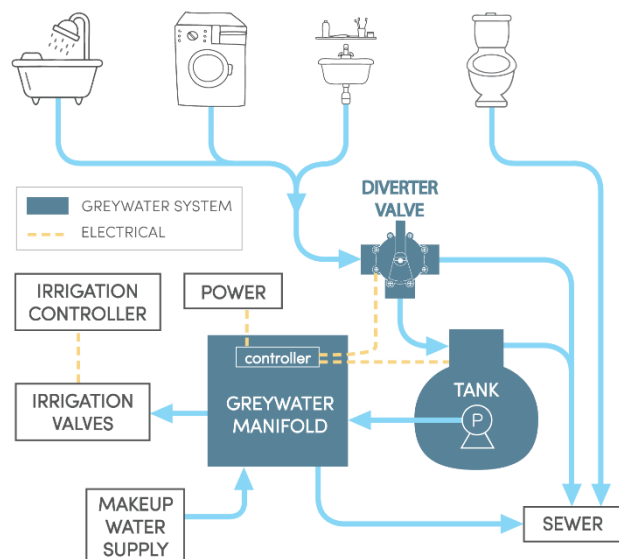


Figure 1

3-Way Diverter Valve

Greywater from showers, laundry and bathroom sinks drain to a 3-way diverter valve. The diverter valve drains to the Greywater Tank, or bypasses the tank and diverts greywater to the sewer. The diverter valve is fitted with an automatic actuator that is operated by a switch on the Greywater Controller. The tank shall be bypassed for the following reasons:

- During times of maintenance or repair see section 13.2
- When irrigation is not required, and the irrigation controller is turned off, see section 9.1 When caustic cleaning products are used in the building, see section 9.2

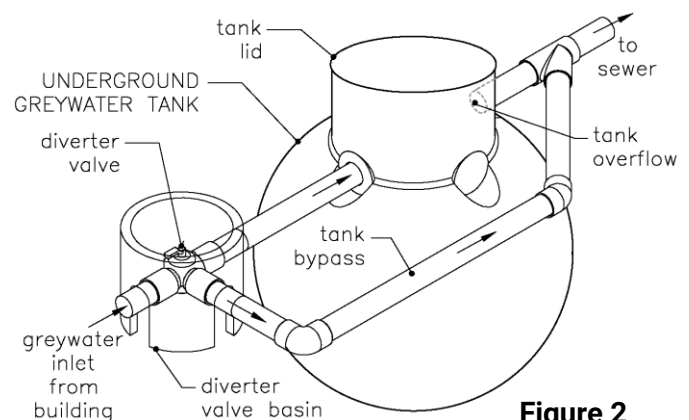


Figure 2

Greywater Tank

Greywater is temporarily stored in an underground tank totaling 250 gallons (figure 3). Greywater entering the tank is filtered through a coarse 1200-micron bag filter. A pump in the tank sends the greywater to the Greywater Manifold. A float switch detects when the tank is empty and makeup water needs to be added.

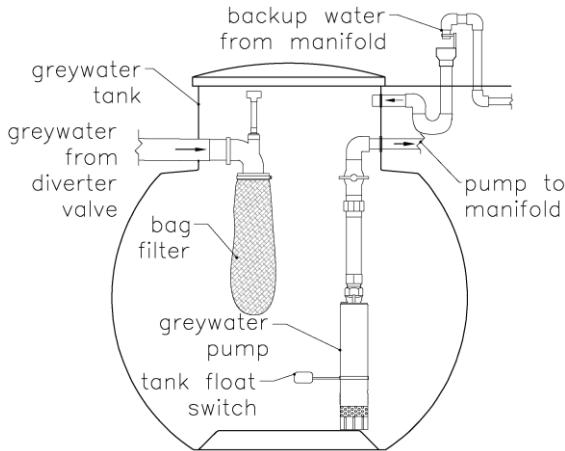


Figure 3

Greywater Manifold

Greywater is pumped to the manifold (figure 4,5) and through an additional 100-micron filter before being supplied to the irrigation system. A Greywater Controller mounted on the manifold automates the greywater system. Greywater/makeup water is supplied to irrigation system at minimum 45 psi at 15 GPM max.

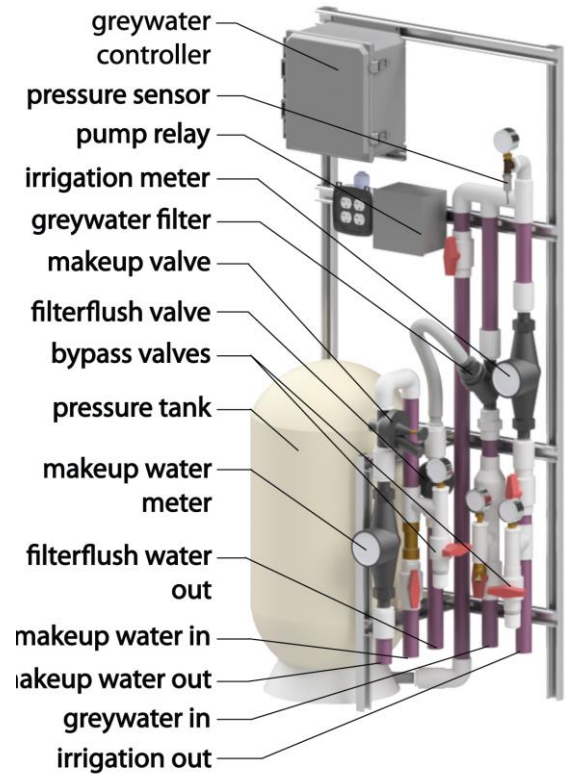


Figure 5 Greywater Manifold

3.2 Greywater Manifold

Greywater Controller (figure 4,5)

The greywater controller is connected to all the valves, sensors and the pump and automates the entire greywater system.

Greywater Filter (figure 4,5)

Greywater is filtered through a 100-micron filter at the Manifold. The filter is automatically backflush based upon how many gallons has been filtered. The filter backflush water is sent to the sewer.

Makeup Valve (figure 4,5)

If the greywater tank is empty, the greywater Controller opens the makeup valve to fill the greywater tank to ensure a minimum amount of water is always available for the pump.

Water Meters (figure 4,5)

Water meters on the irrigation supply and makeup supply track how much greywater and makeup water is used by the system and displays the information on the controller LCD screen. When the irrigation system is running, the current flow rate of water being supplied to irrigation is displayed on the LCD screen.

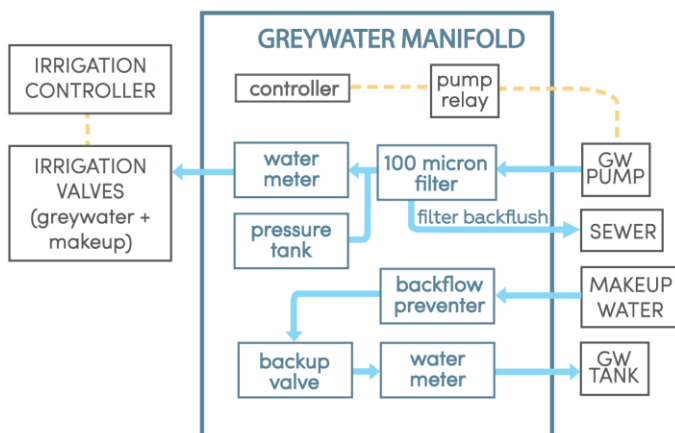


Figure 4

3.3 Greywater System Bypass

The bypass valves and flexible bypass hose are used to directly pressurize the mainline with makeup water. The bypass valves are normally closed when the greywater system is operational. The greywater bypass shall be used for the following reasons:

- The greywater system installation (tank, pump, ect.) is not complete but the irrigation system requires water.
- The greywater system is malfunctioning (pump or manifold) and makeup water needs to be supplied to the irrigation system while the greywater system is fixed.

! NOTE The makeup supply has a dual check valve to prevent greywater from entering the potable makeup water supply (fig.6 #5). This valve is only intended for temporary emergency connections and is not intended to protect the potable water supply from greywater for extended periods!

! NOTE Do not leave the bypass valves and bypass hose permanently connected! The greywater bypass is only meant for temporary emergency connections!

Turning on greywater bypass (fig. 6)

1. Unscrew the 1" cap on the bypass valve and screw on the flexible bypass hose that comes with the Manifold
2. Unscrew the 1" cap on the other bypass valve and screw on the flexible bypass hose.
3. Close the hand valve on the irrigation supply pipe.
4. Open both bypass valves to send makeup water directly to the irrigation system.
5. The dual check valve prevents temporary backflow of greywater into the makeup water supply.

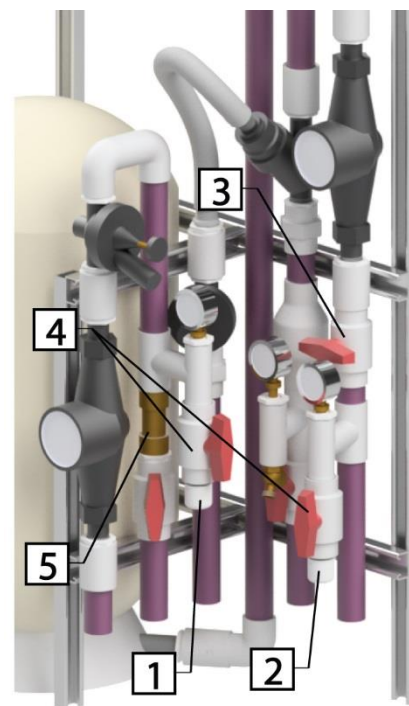


Figure 6

3.4 Acceptable Greywater Sources

- Showers/baths, bathroom sinks and laundry are all acceptable sources of greywater.
- Toilets and kitchen/bar sinks are considered blackwater and should not drain to the greywater system.
- We recommend not collecting from garage utility sinks as these sinks often receive paint, cleaners, and other chemicals which should be diverted from the greywater system

4.0 Working With the Irrigation System

The greywater system is designed to integrate seamlessly with existing irrigation system technology. Unlike other greywater systems on the market, the Smart System does not require proprietary controllers, valves or drip equipment to be used for the irrigation system.

The System supplies a constant pressure of 45-65 psi at a maximum flow of 15 GPM to the drip irrigation system. If a single zone exceeds 15 GPM, divide the zone into 2 zones.

4.1 Irrigation Controller Compatibility

The Smart Greywater System is compatible with all brands of irrigation controllers include smart controllers.

4.2 Irrigating Non-Greywater Zones

Some zones of irrigation shall never be supplied by greywater due to code restrictions or health and safety concerns. All non-greywater zones shall be supplied by a secondary mainline which supplies only makeup water (figure 7). Makeup water can be potable domestic water, well water or another water source. Specific non-greywater zones include:

- **Spray Irrigation:** Greywater cannot be sprayed through the air. All greywater shall be applied through sub-surface drip irrigation (or other method) buried 2" deep under soil or mulch, per CA code requirements.
- **Pots on Hardscape:** Greywater cannot drain through pots and puddle on patios where it is accessible to humans or pets.
- **Root Crop Vegetables:** Greywater cannot come into direct physical contact with the edible portions of plants. Greywater can irrigate vegetables and fruit trees where the edible portions are above ground.
- **Green roofs/shallow planters:** Greywater cannot enter the stormwater drainage system. Any shallow planted areas which are collected into a subsurface drainage system cannot be irrigated with greywater.

4.3 Hose Bibs

Because greywater is non-potable, hose bibs should not be installed on the non-potable mainline where children may access the water.



NOTE

Hose-bibs shall be installed on the secondary mainline only (figure 7) or installed directly off the makeup water supply

4.4 Plant Greywater Tolerance

Greywater tends to be alkaline (pH 7.5-8.5) due to cleaning products and detergents in the greywater. Most plants thrive in greywater, including drought tolerant/native West Coast plants which grow in alkaline soils. Acid loving plants (rhododendrons, azaleas, etc.) will need additional compost & acid fertilizers to maintain more acidic soil after many years of greywater irrigation

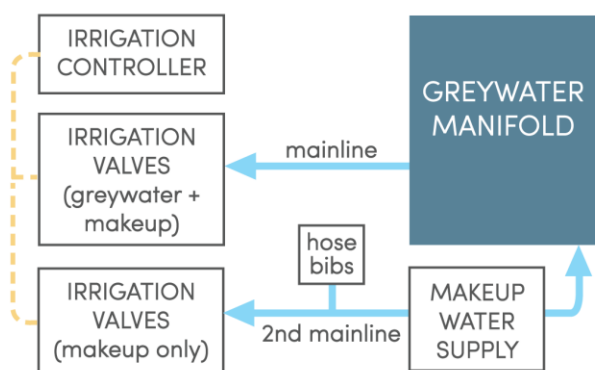


Figure 7

4.5 Other Irrigation Considerations

Irrigation Valves, Filters, Pressure Reducers & Piping

Standard irrigation valves may be used with the greywater system. 100-micron drip filters shall be installed on irrigation valves as is typical. Pressure reducers shall be installed on irrigation valves as is typical.



NOTE Install purple piping, valve boxes, and purple tags on irrigation valves to indicate a non-potable irrigation system

Dripperlines, bubblers, ect.

All greywater must be dispersed subsurface 2" below soil or mulch. We recommend using *Geoflow Wasteflow* dripperline or *Netafim Bioline* which is made specifically for greywater/blackwater dispersal. If these products are not available then standard recycled water dripperline from any of the large manufactures (Netafim, Hunter, Rainbird, ect.) are satisfactory. Bubblers may be used if they are located below ground in a small valve boxes.



NOTE Greywater shall be applied through subsurface methods only (drip, bubblers, ect) and shall never be sprayed through the air

5.0 Optimizing the Irrigation Program

The greywater tank can hold a maximum of 250 gallons of greywater before the tank overflows to the sewer and greywater wasted. To reduce waste of greywater, the irrigation system should use the greywater before the tank overflows.

5.1 Ideal Irrigation Program

The ideal irrigation program would spread the irrigation run times throughout the week and avoid watering all zones on a single day. The following is an example of an ideal schedule:

Ideal Irrigation Schedule			
Program	Zones	Day to Irrigate	Water needs
A	1-4	Monday	Low
B	5-9	Wednesday	Low
C	10-13	Thurs, Saturday	Medium
D	14-18	Tues, Friday, Sunday	High

In the above irrigation schedule, the irrigation system is running every day of the week and the greywater produced during the day will be used in the irrigation system the next day. This will minimize the chance of the tank filling up and overflowing.

5.2 Non-ideal Irrigation Program

A non-ideal irrigation program would have all the zones run on just a few days of the week:

Non-Ideal Irrigation Schedule			
Program	Zones	Day to Irrigate	Water needs
A	1-13	Monday	Low
B	15-18	Monday, Friday	Medium
C	none	-	-
D	none	-	-

In the above irrigation schedule, the greywater tank will be filling on Tuesday & Wednesday and may start overflowing on Thursday before the next irrigation cycle occurs on Friday, wasting greywater.

5.3 Smart Controllers: Tips & Tricks

Some smart controllers do not allow the user to set the watering days for the zones (the controller determines the intervals between watering). To avoid the controller lumping all zones on one day we recommend using the controllers Zone Delay or Watering Window feature.

Zone Delay

Many irrigation controllers have a Zone Delay function which allows the user to enter a time delay between the end of one irrigation zone watering and the start of the another. This will spread out the irrigation throughout the day and allow the greywater tank to fill between irrigation zone cycles. Many controllers allow a Zone Delay of 4 to 6 hours between zones


Controller Program Without Zone Delay		
Zones	Zone Run Time, minutes	Total time to irrigate all zones, days
1-18	30	0.4 days

If the Smart controller is programmed with a 4-hour delay, then the watering will be spread out, and allow the greywater tank to fill up between zones:

Controller Program With 4-hour Zone Delay		
Zones	Zone Run Time, minutes	Total time to irrigate all zones, days
1-18	30	3.2 days

Watering Window

Many irrigation controllers allow a Watering Window to be set which limits the total time of irrigation that can occur during the day. By setting a Water Window of just a few hours a day, the Smart Controller is forced to spread out the irrigation throughout the week.

 **NOTE** Do not set the Watering Window too small or the Controller will not be able to water all the zones adequately.

6.0 Greywater Controller Overview

The Greywater Controller (figure 8) is mounted on the Greywater Manifold and provides full automation and control of the greywater system. All sensors, control valves and pump relay on the Manifold are factory pre-wired to the controller. Inside the weatherproof enclosure, the Controller has a keypad with display.

6.1 Controller Components

Controller Door:

A Controller quick guide & troubleshooting guide are attached to the interior of the door.

Keypad LCD Display:

The screen shows details about the system and provides the user with data and alarm feedback.

Transform/outlet:

A plug-in transformer supplies 24VAC power to all control valves and pump relay. The green LED light on transformer is lit when the transformer is receiving power from the outlet.

Input/Output Terminal Board:

All the wires from the sensors, control valves & pump relays connect here.

Cable Access Openings:

All cables and wires come through two cord grip glands mounted on the bottom of the Controller.

Diverter Valve Switch

The diverter valve switch remotely operates the 3-way diverter valve

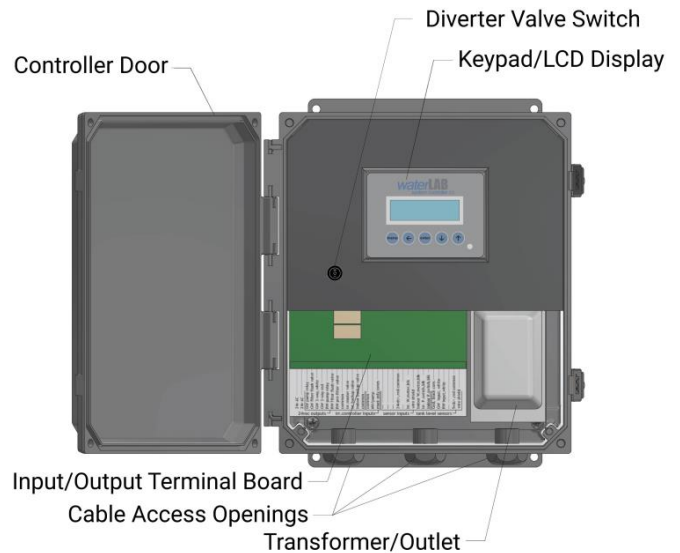


Figure 8

6.2 Greywater Controller Interface

The Controller is operated using the keypad buttons located on the controller interface (figure 9).

- Press the menu button on the keypad to display the menu options (operation mode, flow totals & advanced program).
- Press the up or down arrow key to move the blinking cursor to a new line (figure 10)
- Press the enter key to select an option
- Press the back key to return to a previous menu option
- A menu title on the top line of the LCD screen lets you know the current menu option you are on (figure 10)

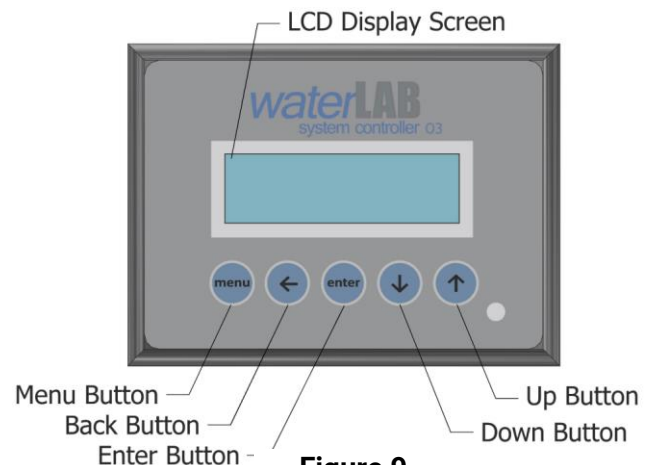


Figure 9

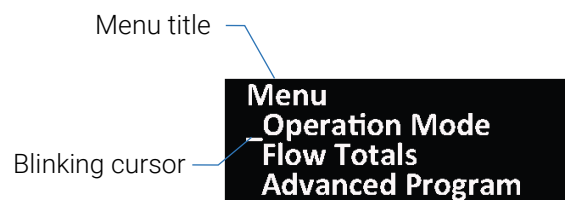


Figure 10

6.3 Default LCD Screen

When first viewing the Controller, the Default Screen will be displayed. The Default Screen provides current system status and alarm notifications. If the user has not pressed a key for 2 minutes, the LCD screen will return to the Default Screen.

Default Screen:

The default display screen notifies the user that the greywater system is online but no irrigation is occurring.

GW System Online

Status Notifications:

When the greywater Controller is actively performing a function, status notifications will be displayed on the screen.

- **Irrigation On:** When the irrigation system is using water (water flowing through meter), the current flow rate to the irrigation system is displayed with an irrigation notification.

GW System Online

Irrigation: 7.8 GPM

- **Greywater Pump on:** When the greywater pump is on, the current flow rate to the irrigation system is displayed with a pump notification.

GW Pump On...

Irrigation: 7.8 GPM

- **Makeup Water on:** When makeup water is being added to the greywater tank, the current flow to the tank is displayed with a makeup notification.

GW Pump On...

Makeup On: 15.3 GPM

- **Filterflush On:** When the greywater filter is being automatically backflushed, the LCD will display the current progress of the Filterflush function.

GW Pump On...

Filterflush on ...

Alarm Notifications:

When certain abnormal conditions exist, alarm notifications will be displayed on the screen and actions may be taken by the Controller to remedy the alarm condition. See section 11.0 for full descriptions of Controller alarms.

GW System Offline

GW Pump Fail Alarm

7.0 Greywater System Startup

7.1 System Startup

Once the greywater system has been installed, it is important to pre-test the system to make sure that all the equipment has been installed & is functioning correctly. If the system has not been pre-tested, please refer to the *Smart Greywater System Installer's Manual* section 5.0 to startup & test the system.



NOTE

The Greywater Controller comes pre-programmed and no additional programming by the user is needed to startup or test the system

7.2 Recommended Programming

The following advanced program values may need to be modified to better adjust Greywater Controller performance to match the irrigation system.

Set High Flow Rate: see section 8.3

Set Flow Delay: see section 8.3

8.0 Greywater Controller Operation

Please refer to the Controller Menu Flow Chart: Appendix A for a graphical overview to help navigate through the controller’s menu options.

8.1 Operation Mode

The Operation Mode allows the user full control of the system to test different components (pumps and valves) and bypass system functions (greywater pump, filterflush, empty tank.)

```
Menu
  Operation Mode
  Flow Totals
  Advanced Program
```

After pressing the enter button on the Operation Mode line the user has the option to select Greywater System or Valves

```
MENU: Operation Mode
  Greywater System
  Valves
```

MODE: GREYWATER SYSTEM


After pressing the enter button on Greywater System the user can select between the different modes: ON, OFF or AUTOMATIC.

```
MODE: GW System
Pump:          auto
Filterflush:   auto
Empty Tank:    off
```

Pump - Default AUTO

Set to OFF position if the greywater system needs to be bypassed (turned offline) and the pump will not work automatically.

Set to ON to turn greywater pump on for testing purposes

 **NOTE** The pump should not be left permanently in the ON position!

Filterflush - Default AUTO

Set to ON to perform a manual Filterflush of the greywater irrigation filter. After the manual Filterflush is over, the controller will reset the mode back to AUTO.

Set to OFF position if the Filterflush function needs to be turned off so it does not work automatically.

Empty Tank – Default AUTO

The greywater tank is emptied (pumped out) to the sewer (through the filterflush valve) to prevent the tank water from turning septic, according to the day interval set in Advanced Program, see section 8.4.

Set to ON position to immediately empty the tank. After the manual Empty Tank is over the controller will reset the mode back to AUTO.

Set to OFF position to prevent the tank from being emptied automatically.

MODE: VALVES


After pressing the enter button on Valves the user can select between the different modes: ON, OFF or AUTOMATIC.

```
MODE: Valves
Makeup:      auto
Filterflush: auto
```

Makeup – Default AUTO

Set to ON position to turn on and test the makeup valve.


Set to OFF position if makeup valve needs to be turned off so it does not work automatically.

 **NOTE** The makeup valve should not be left in the ON position!

Filterflush - Default AUTO

Set to ON position to turn on and test the filterflush valve.

Set to OFF position if filterflush valve needs to be turned off so it does not work automatically.

 **NOTE** The filterflush valve should not be left in the ON position!

8.2 Flow Totals

All water-use information of the system can be accessed in the Flow Totals menu option.

```
Menu
  Operation Mode
  _Flow Totals
  _Advanced Program
```

Press ENTER on FLOW TOTALS to access the Flow Totals screen for irrigation. Press Enter again.

Greywater – Total gallons of Greywater used for irrigation since the system has started.

Makeup – Total gallons of Makeup water used for irrigation since the system has started.

```
Total Irrigat. Gal.
Greywater = 14680
Makeup    = 1670
```

8.3 Advanced Program

The Advanced Program provides additional higher-level programming functions.

```
Menu
  Operation Mode
  Flow Totals
  _Advanced Program
```

Press ENTER on ADVANCED PROGRAM to enter the advanced program menu. Choose between Flow Delay, Flow Rate or Empty Tank.

```
MENU: Adv. Progrm.
  _Flow Delay
  _Flow Rate
  Empty Tank
```

Flow Delay - *Default 60 seconds*

When an irrigation cycle first starts, no flow alarms will be called during the flow delay period to allow for fluctuations in initial flow. For large irrigation systems, this value may need to be increased. See section 10.1

```
PROGRAM: Flow Delay
Flow Delay: 60
           in seconds
```

High Flow Rate – *Default: High = 15 gpm*

HIGH FLOW - A high flow alarm is triggered for flows greater than the high flow rate. See section 10.1

```
PROGRAM: Flow Rate
High Flow Rate: 15
                In GPM
```

Empty Tank – *Default 7 days*

Enter how many days greywater will be allowed to sit in the tank before the tank is pumped out to the sewer, to prevent the greywater from going septic. CA code requires the interval to be 1 day, however we recommend a longer interval so that the greywater can be used most effectively. Longer intervals will not cause damage to the greywater system or plants.

```
PROGRAM: Empty Tank
Day Interval: 7
```

Pressure Sensor – *Default Cut In: 47 psi*

Default Cut Out: 67 psi

CUT IN POINT – Set the low pressure at which the greywater pump will turn on. Do not change from default with consulting manufacturer

CUT OUT POINT – Set the high pressure at which the greywater pump will turn off. Do not change from default without consulting manufacturer.

```
PROGRAM: Press.Sensor
Cut In Point: 47
Cut Out Point: 67
                In PSI
```

9.0 Turning Greywater System On & Off

At certain times the user may need to bypass or turn on /off the greywater system. When the greywater system is turned off, any remaining greywater in the tank will be emptied (pumped) out of the tank and directed to the sewer via the filterflush valve. The tank will be emptied based upon the day interval set in the Advanced Program, see section 8.3 Empty Tank.

9.1 Turning On/Off Seasonally

At certain times of the year rainfall may supply the landscape with the necessary water and no irrigation water is needed. When the irrigation controller is turned off at these times, the greywater should be diverted from the tank to the sewer.

Diverting Greywater to Sewer

The 3-way diverter valve should be turned to divert all the greywater to the sewer so that no more greywater flows into the tank. To turn the diverter valve:

1. Locate the diverter valve switch down on the face plate of the Greywater Controller (figure 11).
2. Press the switch down in the direction of the label "greywater to sewer".

Diverting Greywater To Tank

The 3-way diverter valve should be turned to divert all the greywater to the tank. To turn the diverter valve:

1. Locate the divert valve switch on the face plate of the Greywater Controller (figure 11).
2. Press the switch down in the direction of the label "greywater to tank".

9.2 Caustic Cleaning Products

When certain caustic cleaners are being used in the house, the greywater should be diverted to the sewer. Follow instructions in section 9.1 to divert to sewer. See section 14.0 for more information on cleaning products.

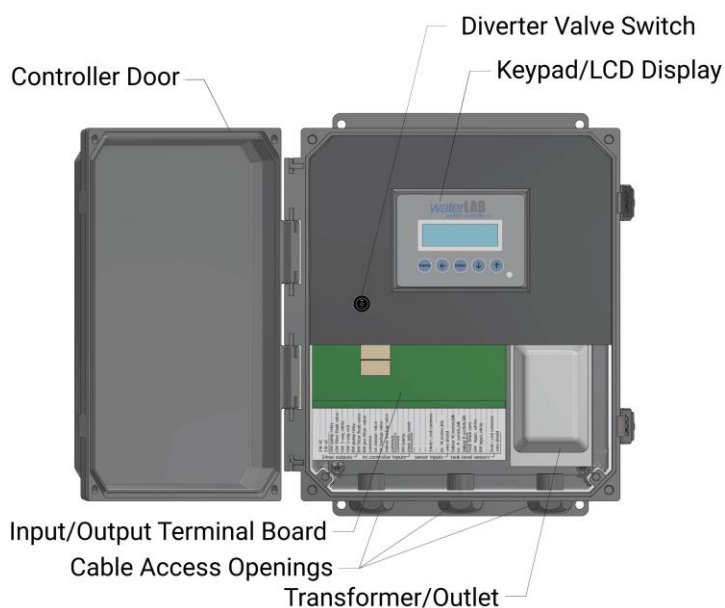


Figure 11

10.0 System Monitoring

The Smart greywater system monitors both pressure and water flow in the Manifold piping. The Controller triggers alarms if pressure and flow are outside of the normal range. In addition, water-use of the system is tracked to allow the user to gauge the overall performance of the system.

10.1 Water Flow Monitoring

The Controller is connected to the water meter on the Manifold and displays the current flow rate of the water supplied to the irrigation system. The minimum flow rate displayed by the Controller is 1 GPM. The normal operating range of the greywater pump is 0-15 GPM.

The flow rate of the makeup supplied into the greywater tank is also monitored, with the flow rate displayed on the controller LCD screen. The makeup flow rate should always be greater than the highest flow irrigation zone in the landscape. The makeup flow rate is initially set to around 17 GPM during the system System Testing procedure by the system installer, see *Smart Greywater System Installer's Manual* section 5.4.

High Flow Rate – default 15 GPM

The Controller's default High Flow Rate is set at 15 GPM. Flow rates higher than 15 GPM are considered outside of the normal operating range of the greywater system as the greywater filter's maximum operating flow is 15 GPM. A high flow alarm will be triggered for flows above the High Flow Rate.

The High Flow Rate may be lowered to provide an alarm notification when the highest flow rate of the irrigation system is exceeded. To determine what the High Flow Rate should be set at:

1. Run all irrigation zones for at least 2 minutes and observe the flow rates on the Controller LCD screen to determine the irrigation zone with the highest flow.
2. Set the High Flow Rate to 3 GPM above the zone with the highest flow. See section 8.3 Advanced Program for changing the high flow rate.

Flow Delay Period – default 60 seconds

When the irrigation Controller first begins an irrigation cycle or waters a new zone, the flow rate can vary drastically until the mainline and lateral lines for the irrigation zone have completely pressurized. To prevent nuisance high flow alarms, flow alarms will not be triggered until the flow delay period has ended. The GPM on the LCD will blink during the flow delay period. The default flow delay period is set to 60 seconds. For large irrigation systems, this value may need to be increased. See section 8.3 Advanced Program for changing the flow delay period.

10.2 Water-Use Monitoring

The Controller tracks how much greywater and makeup water has been supplied to the irrigation system since it was installed. These flow totals can be viewed on the LCD display of the Controller. The water meter dial has an analog display that shows how much total water (greywater & makeup water) has flown through the water meters. If water has flown through the meter while the Controller is not powered, the flow totals shown on the Controller may be different than the water meters.

10.3 Pressure Monitoring

A pressure sensor is installed on the Manifold piping to monitor the pressure of the greywater system. The normal operating pressure of the greywater system is 47-67 PSI. This pressure range is set in the Advanced Program section 8.3. If the pressure drops below 5 psi the low pressure set point, then alarms may be triggered depending upon the flow rate of the system, see section 11.0 Controller Alarms.

11.0 Greywater Controller Alarms

When certain abnormal conditions exist, alarm notifications will be displayed on the screen and actions may be taken by the Controller to remedy the alarm condition.

Alarm Triggers

Both water pressure and flow are monitored when the irrigation system is running. The “Normal” operating range for the greywater pump is initially set at water flow between 0 and 15 GPM and water pressure above 45 PSI. If water pressure and flow begin to fluctuate outside of the normal range, certain alarms will be triggered. Please see section 10.1 for further description of alarms based upon water flow.

Action Taken

When alarms are triggered, the Controller will automatically take certain actions based upon the type

of alarm. Some alarms will shut off the greywater pump to prevent equipment damage. All alarms will be displayed on the LCD screen with associated audible beeping to inform the user that an alarm issue needs to be addressed. See Table 1 below.

Alarm Reset:

All alarms may be reset by pressing the ENTER button on the controller keypad. An alarm can also automatically reset themselves if the alarm trigger condition returns to the normal operating range. See Table 1 below.

Remote Alarm Code:

If the optional Smart Water-use monitoring has been installed, the data logger will display a numerical alarm code on the remote dashboard corresponding to the alarm. See Table 1 below.

11.1 Controller Alarms Table

GREYWATER CONTROLLER ALARMS: Table 1				
Alarm on Screen	Trigger	Action Taken	Alarm Reset	Remote Alarm Code
Pump Fail	Flow = 0 GPM and pressure < 20 psi after Flow Delay Period*	-alarm on screen -beeping notification -shutoff pump	Controller will re-test pump every 4 hours and reset alarm, or press ENTER on keypad	3
Makeup Flow Alarm	If flow through irrigation meter is greater than through the makeup meter for Flow Delay Period	-alarm on screen -beeping notification	Press ENTER on keypad	6
Makeup Fail Alarm	Flow = 0 GPM for Flow Delay Period	-alarm on screen -beeping notification	Press ENTER on keypad	9
Leak Alarm	If greywater pump has turned on/off 3 times with no flow registering within 6 hours	-alarm on screen -beeping notification	Press ENTER on keypad	12
High Flow Zone Alarm	Flow >15 GPM after Flow Delay period	-alarm on screen -beeping notification	Press ENTER on keypad	15
Filterflush Alarm	Flow < 15 PGM and pressure <45 psi <u>after</u> automatic filter flush occurs	-alarm on screen -beeping notification	Press ENTER on keypad	21

Pressure Sensor Irrigation Alarm	The controller is not receiving a signal from the pressure sensor	-alarm on screen -beeping notification -shutoff pump	After 10 minutes ,or press ENTER on keypad	24
Excessive Flow Alarm	Water Meter has continuously run for more than 8 hours	-alarm on screen -beeping notification	press ENTER on keypad	30
Pump on Alarm	Pump has been manually turned ON in "Operation Mode"	-alarm on screen -beeping notification	Pump turned to AUTO in OPERATION MODE	36
Valve on Alarm	A valve has been manually turned ON in "Operation Mode"	-alarm on screen -beeping notification	Valve turned to AUTO in OPERATION MODE	39
Tank Level Sensor Alarm	Tank Level Sensor is malfunctioning	-alarm on screen -beeping notification	After 10 minutes, or press ENTER on keypad	42

* time delay before flow alarms are triggered, see section 10.1

12.0 Troubleshooting the Greywater System

Below is the troubleshooting guide for the greywater system. For alarms or problems that may have multiple causes, we suggest starting with the top cause and working your way down the list, as they are arranged in order of ease to diagnose and repair.

12.1 General Troubleshooting

GENERAL TROUBLESHOOTING: Table 2		
PROBLEM	CAUSES	SOLUTION
Greywater tank not filling up	Diverter valve bypassing greywater tank and sending to sewer	Turn diverter valve to tank using switch at greywater Controller
	Diverter valve malfunctioning	Troubleshoot diverter valve actuator. Refer to section 12.4
Low pressure in irrigation zones	An alarm is present on greywater Controller indicating a problem	Check greywater Controller for alarms and follow troubleshooting procedure for Controller, see section 12.2
	A problem exists with the irrigation system independent of the greywater system (drip filter clogged, irrigation valve closed, ect.)	Check pressure gauge on greywater manifold "irrigation supply" pipe. If pressure is above 45 psi then a problem exists with the irrigation system, not the greywater system

12.2 Greywater Controller Troubleshooting



NOTE

When trying to diagnose the cause of a problem, we suggest shutting off the Irrigation Controller and turning on the faulty part manually using the Greywater Controller to isolate the part. To turn a system part on manually please refer to section 8.2 Operation Mode.

GREYWATER CONTROLLER TROUBLESHOOTING: Table 3		
PROBLEM	CAUSES	SOLUTION
No display on GW Controller	No AC power to GW Controller	Plug in Controller to outlet. Fix power supply at outlet.
Pump Fail Alarm on Controller	Shut-off valve is closed on supply pipe from pump on Manifold	Open all hand shutoff valves on manifold. Leave Bypass Valves closed
	Transformer in GW Controller not working	Green light on transformer confirms transformer is working. Replace transformer if green light is not lit.
	Tank float switch malfunction	Float switch is stuck in up position or installed too low on pump and pump is drawing air
	Faulty wiring from GW Controller to pump relay	Turn on greywater pump manually, use multi-meter to confirm 24vac power at pump relay terminals. Repair faulty wiring
	Pump relay is malfunctioning	Turn on pump. If pump relay does not give a loud “clunk”, and relay contacts depress, then replace relay.
	Faulty wiring from pump relay to pump	Turn on pump. Use multi-meter to confirm 120vac power in pump junction box in GW tank. Repair faulty wiring
	Pump is malfunctioning	Replace pump.
Pump Fail Alarm and Makeup Fail Alarm on Controller	See Makeup Fail Alarm below	
Makeup Fail Alarm on Controller	Hand shut-off valve is closed	Open hand shutoff valve on manifold for makeup supply.
	Makeup valve flow stem is closed	Open valve flow stem by turning counter-clockwise
	Faulty Makeup Valve	Follow “Troubleshooting valve procedure” at end of table
	Makeup water meter wiring is faulty	Use multi-meter to confirm wire continuity from Water Meter to GW Controller input. Repair faulty wiring
	Reed Switch mounted on Water Meter is faulty	Replace Reed Switch

CONTROLLER TROUBLESHOOTING: Table 3 continued		
PROBLEM	CAUSES	SOLUTION
Makeup Flow Alarm on Controller	Makeup flow is less than irrigation flow	Increase flow through makeup valve by turning flow stem on makeup valve clockwise
High Flow Zone Alarm on Controller	Irrigation zone is sized too large for maximum greywater supply of 15 GPM.	Divide zone into two smaller zones.
	Pipe leak/break in irrigation zone or mainline	Repair leak/break
Filter Flush Alarm on Controller	Filter Flush Valve has been manually left open	Manually close the Filter Flush Valve by twisting the solenoid lever clockwise in the "off" direction.
	Faulty Filter Flush Valve	Follow "Troubleshooting valve procedure" at end of table
	Greywater filter is still clogged even after automatic backflush of filter.	Hand clean the Greywater Filter.
Leak Alarm on Controller	A small leak (<1 GPM) is occurring in the irrigation system	Confirm leak by watching the Irrigation Water Meter trickle indicator moving while irrigation controller is not running. Fix leak
	Water Meter wiring is faulty	Use multi-meter to confirm wire continuity from Water Meter to GW Controller input. Repair faulty wiring
Pressure Sensor Alarm on Controller	Pressure Sensor wiring is faulty	Use multi-meter to confirm wire continuity from Pressure Sensor to GW Controller input. Repair faulty wiring
	Pressure Sensor is faulty	Replace pressure sensor
Excessive Flow Alarm on Controller	A leak (>1 GPM) is occurring in the irrigation system	Confirm leak by watching the Irrigation Water Meter trickle indicator moving while irrigation controller is not running. Fix leak
Do not leave pump on on Controller	Pump has been manually turned on in OPERATION MODE in menu	After testing pump, turn pump back to AUTO mode in the OPERATION MODE menu
Do not leave valve on on Controller	Valve has been manually turned on in OPERATION MODE in menu	After testing valve, turn valve back to AUTO mode in the OPERATION MODE menu
Tank Level Sensor Alarm on Controller	Tank Sensor wiring is faulty	Use multi-meter to confirm wire continuity from Tank Sensor to GW Controller input. Repair faulty wiring
	Tank Sensor is faulty	Replace tank sensor

12.3 Solenoid Valve Troubleshooting Procedure

SOLENOID VALVE TROUBLESHOOTING PROCEDURE: Table 4		
Troubleshooting solenoid valve procedure	Flow control stem on valve is partially closed	The Filterflush Valve on manifold shall have its flow control stems open all the way. Turn stem counter-clockwise until it stops.
	Faulty wiring from GW Controller to Valve	Turn on valve manually using GW Controller. Use multi-meter to confirm 24vac power at valve. Repair faulty wiring
	Valve is stuck open	Open and clean debris off solenoid plunger and diaphragm seal. Replace valve interior if not able to repair.
	Solenoid on valve is faulty	Repair or replace solenoid on valve.

12.4 Diverter Valve Troubleshooting

DIVERTER VALVE TROUBLESHOOTING: Table 5		
PROBLEM	CAUSES	SOLUTION
Diverter valve actuator not turning at all with switch at Controller	No power to actuator, transformer not working.	Green light on transformer confirms transformer is working. Replace transformer if green light is not lit.
	Switch on end of diverter valve is set to "off"	Flip switch on diverter valve to either "On 1" or "On 2" position.
	Faulty wiring from actuator to Controller	Use multi-meter to confirm wire continuity from switch to actuator. Repair faulty wiring
	Diverter valve is faulty	Repair or replace valve.
Actuator turning wrong direction (diverting to sewer when should be diverting to tank, or vice versa)	Switch on diverter valve is in wrong position	Flip switch on diverter valve from "On 1" to "On 2" position, or vice versa
Actuator is not stopping in correct position over pipes	The actuator cams have not been set correctly	Refer to <i>Smart Greywater System Installer's Manual</i> for instructions on setting valve cams.

13.0 Maintaining the System

The Smart Greywater System is designed to be as maintenance free as possible. We do recommend an annual maintenance check to make sure the system is performing as designed.

13.1 Maintenance Overview

GREYWATER SYSTEM MAINTENANCE OVERVIEW: Table 6		
ITEM	ACTIVITY	FREQUENCY
General System Check	View Greywater Controller LCD screen for alarms. If alarms are present, the Controller will issue a beeping sound and alarm will display on screen.	Upon observation of beeping sound from controller
Tank bag filter	Remove and replace with a new bag filter.	Annually to start. Every 1-2 years thereafter.
Tank sediment removal	Remove tank sediment	Annually to start. Every 2-3 years thereafter.
Greywater Filter	Clean filter screen on greywater filter	When filterflush alarm is present on Controller LCD screen

13.2 Tank Maintenance

Replacing Tank Bag Filter (fig. 12)

The bag filter inside the tank captures large particles of lint, hair and other debris flowing into the greywater tank. For a typical family of 4 the bag filter will need to be replaced once every 1-2 years. We suggest inspecting the bag filter once a year for the first couple of years and replacing if needed.

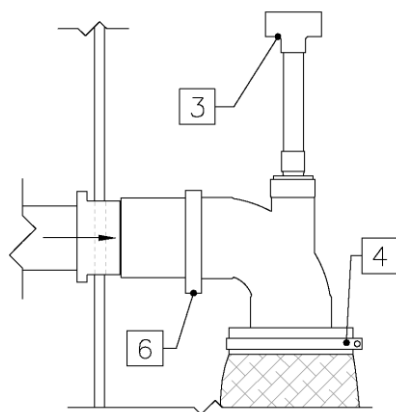


Figure 12

1. Flip the diverter valve switch on the greywater Controller to divert greywater to the sewer.
2. Remove the screws in the tank lid that secure the lid to the tank.
3. Lift the bag filter assembly off the sliding disconnect and out of the tank using the T-handle
4. Undo the hose clamp that secures the bag filter to the assembly. Dispose of bag filter in trash.
5. Secure new bag filter to the assembly using the hose clamp.
6. Reinsert the assembly onto the sliding disconnect in the tank.
7. Secure lid of the tank and flip the diverter valve switch back to the greywater tank.

Removing Tank Sediment

Fine sediment and sludge accumulates on the bottom of the greywater tank. This should be cleaned out once every 2-3 years so that the sediment/sludge does not enter the pump intake and cause damage to the pump. We suggest inspecting the sediment layer once a year for the first couple of years and clean if needed.

13.3 Manifold Maintenance

Cleaning Greywater Filter (fig. 13)

The greywater filter removes debris larger than 100 microns. This filter is automatically backflushed with water in the pressure tank and does not require regular maintenance. A filter flush alarm on the Controller LCD screen will notify the user if the greywater filter needs a manual cleaning. To clean the greywater filter:

1. Unplug the Greywater Controller from the outlet.
2. Connect a hose to the 1" MIPT on the bypass valve
3. Open the bypass valve to drain water out of the manifold.
4. Unscrew the flexible hose from the end of the filter
5. Unscrew the black filter housing and remove the internal screen filter.
6. Spray inside screen with a hose. Scrub with hard nylon brush inside of filter screen if necessary. The filter is clean when light can be seen through filter screen.
7. Reinsert filter screen and screw on filter housing hand tighten filter housing. Do not use wrench to tighten filter housing!
8. Reinstall the flexible hose.
9. Disconnect hose from bypass valve and close bypass valve.
Plug in Controller. The manifold will pressurize.
Test for leaks.

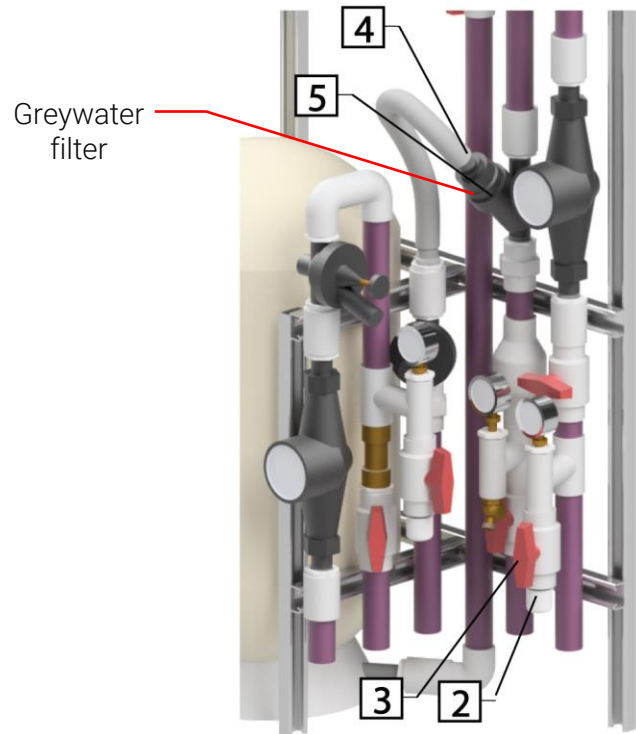


Figure 13

14.0 Greywater Cleaning Products

Shampoos and Conditioners

Typical shampoos and conditioners are dilute and will not cause harm to soils and plants.

Hand Soaps

Liquid soaps are preferable to bar soaps which can increase the alkalinity of greywater. **Avoid anti-bacterial soaps** as they will kill the beneficial soil bacteria and seriously degrade the biodiversity of the soil.

General Cleaners

Choose products which are non-toxic and biodegradable. If caustic cleaners are used, turn the 3-way valve to divert the greywater to the sewer while in use.

- **Chlorine based products:** If used occasionally (once in a load of laundry) diluted chlorine will not damage your soils or plants. If large amounts of bleach are used for cleaning at a single time, the 3-way diverter valve should be turned to divert the greywater to the sewer
- **Bleach alternatives (hydrogen peroxide):** Hydrogen peroxide (i.e. Oxiclean) is an earth friendly product which breaks down into water and oxygen and is a great alternative to chlorine-based bleaches for cleaning and laundry.

Laundry Detergent

It is important to choose a liquid laundry detergent which has a low salt and boron content. Adding salt to your soil degrades the soil structure over time. Example brands recommended are Oasis,,ECOS, Vaska, Trader Joes liquid, Puretergent, and BioPac.

15.0 Appendix A: Controller Menu Flow Chart

