WSB® clean: Operator, Service & Maintenance Manual

Models:

WSB 400	WSB 1250
WSB 500	WSB 1500
WSB 600	WSB 1600
WSB 750	WSB 1800
WSB 1000	

RES-WSB-OSM
Version 1.0

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1 INTRODUCTION

This manual covers the operation and maintenance for all residential WSB® clean models. It is important that you read through this entire manual before providing any service on the system. If you have any questions after reading this document or if you need any further information, please contact a customer service representative at (519) 648-3475

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This manual provides maintenance and service guidelines to ensure proper operation of your WSB® clean system. It does not provide any maintenance/service information on any other components of your treatment system (i.e. disposal bed) or outline any local regulatory requirements.

It is important that you read this manual in it's entirety to ensure that all requirements and details are clearly understood. If there is anything that is unclear or missing contact the manufacturer for clarification before proceeding.

Note: Please ensure that the system has been filled with clear water before starting the system.

Electrical cables and plastic piping are buried close to your treatment system. Please contact your installation contractor or RH2O North America prior to any digging or excavation work in the area surrounding your treatment system. Failure to do so may result in electrical shock causing death or serious bodily injury in addition to expenses to repair any damaged pipes/electrical damage.

2 SAFETY INFORMATION

Please read and follow the precautions listed below, as well as those found throughout this document. If you have any questions regarding the safety or operation of the WSB® clean wastewater treatment system, please contact us at: (519) 648-3475.

➔ **DANGER:**	Always turn off the power to the system before servicing any components. Failure to do so may result in electrical shock causing serious bodily injury or death. All work must conform to local electrical, plumbing and building codes.
➔ **DANGER:**	Electrical equipment in flooded areas presents an electrical hazard. Do not enter a flooded area. Entering a flooded area may result in electrical shock causing death or serious bodily injury.

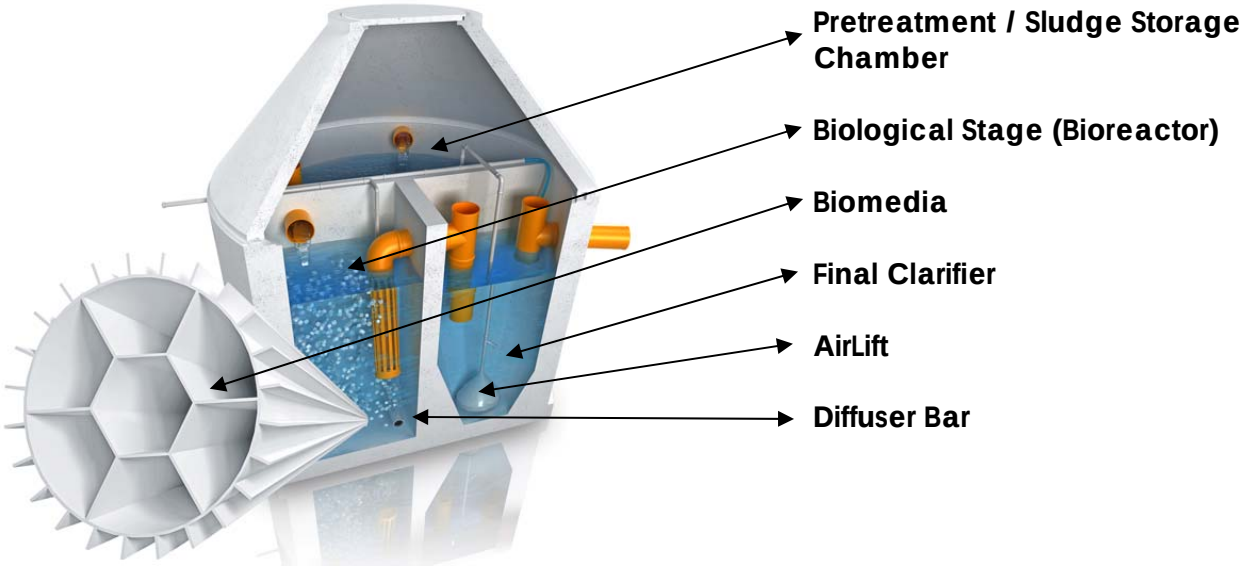
If contact with wastewater occurs, please remove any contaminated clothing and thoroughly wash all body areas and clothing exposed to wastewater with soap and water. To minimize any risk of illness, consult a physician.

Only authorized service personnel are to remove access covers on the WSB® system. Removal by unauthorized personnel may result in death or bodily injury from potentially hazardous gases and waste matter. Please ensure easy access to covers at all times for inspection and/or emergency purposes.

The use of this system when the air blower is not functioning can result in serious problems (i.e. clogging of your disposal bed/abnormal smells) and/or cancellation of the warranty.

3 WSB® CLEAN SYSTEM OPERATION

WSB® Clean is a fully biological wastewater treatment plant designed to treat domestic wastewater. Please refer to the Illustration and details below.



3.1 Pre-Treatment / Sludge Storage Chamber

Incoming wastewater travels by gravity into the pre-treatment tank where coarse particles settle and are stored here along with return sludge from the final clarifier.

3.2 Biological Chamber (Bioreactor)

Pre-processed wastewater from the Pre-Treatment / Sludge Storage chamber is now fed into the biological stage which contains the specially designed plastic carrier media. Microorganisms settle on the media and consume the organic material in the wastewater. Oxygen is needed for the biological cleaning process and is supplied by an air blower and distributed by fine bubble diffusers.

3.3 Final Clarifier

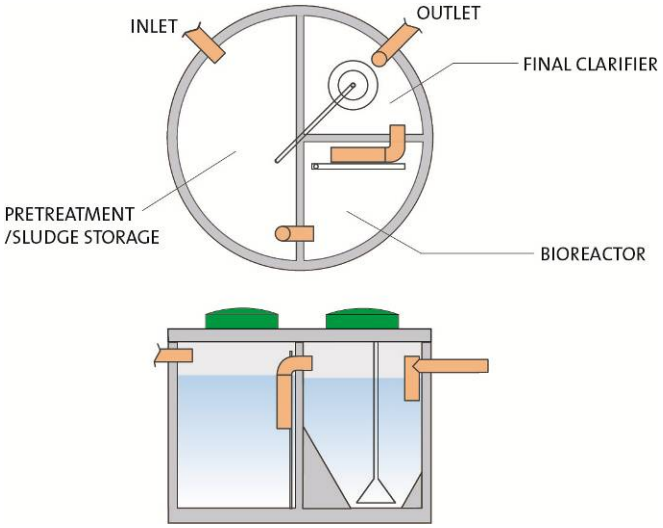
The final clarifier consists of a cone or sloped area in order to collect and transfer any secondary sludge back to the sludge storage. Sludge Return will be accomplished by either an air lift or pump. From the clarifier, the biologically cleaned wastewater is ready to be discharged back into the environment either via gravity flow, or via a pump tank.

3.4 Pump Tank (Optional)

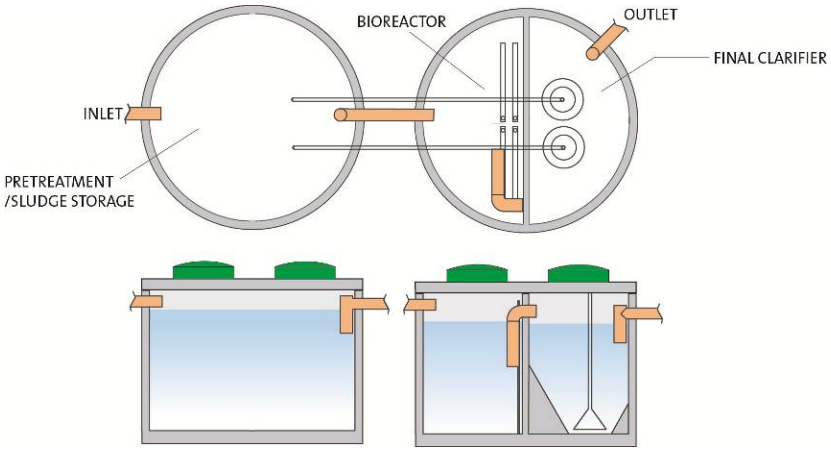
Depending on the type of disposal bed, you may have a pump tank to pressurize the treated effluent or lift the effluent to the bed. The pump tank stores treated effluent from the final clarifier and pumps it to the disposal bed at intervals based on the controller dosing pump settings. The dosing rate for the disposal bed should be determined by the designer of the disposal bed.

3.5 WSB® clean Wastewater Treatment System Layout

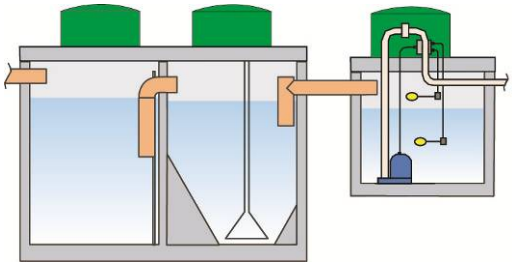
3.5.1 WSB 400 - 1000 – Single Tank Installation



3.5.2 WSB-1250-1800 – Two Tank Installation



3.5.3 Pump Tank – Example Installation



3.6 WSB® System Model Designation

Model Designation	Daily Capacity (L)	Number of Tanks	Pretreatment Capacity	NSF/ANSI 40 Classification
WSB 400	1600	1	2450 L	Class I
WSB 500	2000	1	2450 L	Class I
WSB 600	2500	1	2970 L	Class I
WSB 750	3000	1	2970 L	Class I
WSB 1000	3800	1	3490 L	Class I
WSB 1250	5000	2	5950 L	Class I
WSB 1500	5678	2	6950 L	Class I
WSB 1600	6300	2	6950 L	N/A
WSB 1800	7000	2	6950 L	N/A

Note: Please refer to the system data plate located on the control panel to identify which model you have.

3.7 System Classification

All WSB® Clean models meet the requirements of NSF/ANSI 40 and are certified as Class I treatment systems. Models with design flows larger then 5700 L/day (1500 Gallons/day) do not fall under the NSF / ANSI 40 scope of work but have been verified by NSF as meeting the same design criteria.

3.8 Identification Plate

The identification plate is found on the WSB® control panel. The information on this plate identifies the size of the system and it may be required for responding to any alarms or issues with the system. If an identification plate is not on the control panel, please contact RH2O immediately.

4 WSB® COMPONENT FUNCTIONS / SETTINGS

4.1 Flow Equalization (EQ) / Balancing Pumps (optional)

Flow equalization (balancing) pumps are used only on systems that require a lift station, or flow equalization tanks. The flow EQ pumps are configured to dose the system with the appropriate flows on a daily basis based on the system design criteria.

The flow EQ pumps should be set to evenly deliver/pump the systems rated total daily design flow over a 24 hour period. For example: A system with a total daily design flow of 2400L and a pump with a flow rate of 100L/min, would be set for 1 minute pulse (ON) every 59 minute pause (OFF) cycle. This would evenly distribute the total flows across a 24 hour period.

4.2 Blowers

The blowers function in the WSB® process is to ensure that the floating media is mixed within the bioreactor and to maintain the appropriate dissolved oxygen levels required to sustain the proper bacterial growth on the media.

The minimum dissolved oxygen level at the end of the pause cycle should be 2mg/L.

The default settings for most WSB® home units is 9min ON / 6 Min off during the day and 5 min on/ 25min off during the night. These settings may have to be adjusted based on the size of the system, homeowner water usage and habits, and blower size.

4.3 Sludge Return Pumps

Sludge return pumps are located in the final clarifier(s) and are used to return any sludge build up that may occur within the final clarifier to the pre-treatment / sludge storage chamber. In some systems a sludge return air lift may be used in place of a sludge return pump. The sludge return pumps must remove the sludge at a rate to prevent sludge accumulation from taking place in the clarifier.

For information on runtime settings please see section 17

4.4 Sludge Return Air Lift

The sludge return air lift is an alternate sludge return mechanism that instead of using a physical pump uses air flow and the resulting vacuum to suck any sludge that may have accumulated on the bottom of the final clarifier back to the pre-treatment / sludge storage chamber.

For information on runtime settings please see section 17

4.5 Disposal Bed (Final Effluent) Pumps

In applications where it is not possible for the effluent to flow from the final chamber to the bed via gravity (or due to other regulatory requirements) a pump tank is used. The disposal pumps are located in the pump tank and will pump, based on runtime settings specific to the system design flows and the dosing pump flow rates, the final effluent to the disposal bed. A pump tank actually provides many advantages including more complete dosing of the bed.

The disposal pump settings are based on the total system daily design flow and the size and type of disposal bed receiving the effluent. The actual runtime settings for the disposal bed pumps will be determined by the local regulations, and the engineering design report for the specific site and bed type.

5 MAINTENANCE SCHEDULES

NSF requires that all systems are serviced twice a year for the first 2 years. In addition to the NSF requirements your local regulatory agency may have additional service/maintenance requirements. The WSB® system itself is designed to operate normally with only annual servicing.

IMPORTANT: It is your responsibility as the maintenance provider to ensure compliance with local regulations.

6 MAINTENANCE PROCEDURE

During regular, or unscheduled maintenance, any system changes, observations, and measurements taken shall be recorded by the service provider on the service card or similar document.

6.1 Maintenance Equipment Checklist

Equipment required for inspection and maintenance on a system are:

- Protective Gloves
- Eye protection
- Dissolved oxygen meter
- Sludge Measuring Device (i.e. Sludge Judge®)
- Robertson #2 screw driver
- CFM meter
- Sampler and bottles
- Filters for air blower

6.2 Home/System Owner Inspections

The treatment plant must be checked regularly to ensure that the system is operating properly. The system owner (homeowner), as outlined in the owner's manual, is responsible for performing exterior system visual inspections on a weekly basis and reporting any controller alarm conditions immediately. It is recommended that the system/home owner check for alarms daily.

6.3 Site Inspection

As part of the regular maintenance procedure the following sections outline the site evaluation/inspection that should be performed on a WSB® clean system.

6.3.1 Inspect Lids

Before service begins check all access openings for damage and ensure that the lids are properly sealed/secured onto the tank access opening.

6.3.2 Settled Ground

When entering the site area do a visual scan for any settled ground around the treatment plant. Make sure there is no ground water ponding around the treatment plant area, and make sure proper grading is maintained to direct surface water away from treatment plant.

If it is identified that the ground has settled around the treatment plant or that ponding is evident the homeowner should be instructed to improve the grade around the treatment plant to correct and level the settled areas. This will ensure proper surface water flow away from the treatment plant area and to prevent future ponding.

NOTE: This is a good time to take a smell test to see if there are any odors coming from the treatment plant.

6.4 Gather Effluent Sample

Samples should always be gathered prior to doing any maintenance work on the system. Effluent samples may be taken if required by local regulations, or due to a desire to verify effluent quality.

For detailed instructions on gathering samples see section 8.2

6.5 Bioreactor Inspection

6.5.1 Odors

Before and after removing the lids to the bio-reactor you should do a smell check to tell if the system is working properly. At most you should notice a "mild musty smell". A septic smell will mean the system is not operating properly and changes must be made.

6.5.2 Media Color

After the start up period, the media will turn a light to dark brown colour. This is the bio-film growth and shows a healthy system. On heavier loaded systems it will turn a dark colour and a lighter colour for systems that have a lighter organic load.

NOTE: During start-up, the bio-reactors may foam.

6.5.3 Media Rollover

It will take approximately 2 weeks for the media to properly roll over completely in the bio-reactor. It should be a gentle roll over and cover the complete reactor area. To fast of a rollover will result in a higher suspended solids count in the final clarifier, A slow roll over will not provide the proper cleaning of the media and may leave dead spots in the reactor.

If you notice issues with media rollover refer to section 7.3.

6.5.4 Dissolved Oxygen Level Check

Dissolved Oxygen levels should be measured at the end of a run cycle and at the beginning of a run cycle. Dissolved oxygen should never be below 2 mg/l. A Dissolved Oxygen meter is a tool that shall be used for these measurements.

6.5.5 Blower Pressure /CFM Check

Take the air hose off the blower and attach the cfm meter to see if the blower is working within the blowers design cfm flow rate. Check hose connections and inspect blowers for any external damage or wear.

Check filter (must be replaced at least once per year).

6.5.6 Water/Effluent Color/Texture

When blower is off water should look clear on top of media and there should be a slightly mild musty odor.

6.5.7 Liquid Level

Make sure that liquid levels are at proper levels and that there are no obstructions in the transfer pipes. The water level should under normal operation be at the bottom of the outlet. If it is higher or lower please refer to the trouble shooting guide.

6.6 Final Clarifier Inspection

6.6.1 Odors

The clarifier should have a mild musty odour at most. If the odor is strong please see section 7.2 for troubleshooting procedures.

6.6.2 Floating Sludge

If there is floating sludge in the final clarifier you must check the thickness to see how much is present. If it is very thick and dark brown/black then the sludge return rate should be increased. Atmospheric and temperature changes will cause floatables from time to time and does not necessarily indicate a system problem.

If the floating sludge is very thick and dark brown/black it maybe necessary to schedule more frequent visits to check for increasing float sludge. If you notice that from visit to visit

the floating sludge blanket is increasing in thickness then this is an indication of improper sludge return/removal configuration.

6.6.3 Sludge Level Check

If during the floating sludge check you notice significant levels of floating sludge a sludge level check should also be performed, as below, to check sludge levels on the bottom of the clarifier. A sludge judge® tool should be used for this check.

Sludge levels need to be recorded and checked before the sludge return run cycle, and again at the end of the run cycle. This will determine if the sludge return run cycle is long enough to remove the settled sludge that has accumulated between each run cycle. If there is excessive sludge in the system the sludge return pump or suction air lift run time should be increased to ensure that adequate sludge return is achieved.

For more information on troubleshooting excessive sludge see section 7.2

6.6.4 Water/Effluent Color/Texture

Should generally be clear in color and little to no odor. If this is not the case please refer to the troubleshooting section.

6.6.5 Liquid Level Check

Check to make sure that the water level in the clarifier is at or just below the outlet. This is the proper depth of water during normal operation. If the water level is high or low please refer to the troubleshooting section for possible causes.

6.6.6 High Level Warning Float Check

High warning switch should be checked for proper level and that it is in working order. For details on testing floats please see section 7.2

6.6.7 Electrical Cords

Check any electrical cords for any apparent damage and that they are properly fastened. Any damaged electrical cords should be repaired immediately.

6.6.8 Media Transfer

Make sure no media has transferred from the bio-reactor into the clarifier. If any media has transferred it must be removed and put back into the bio-reactor.

If you identify media transfer please see section 7.2 for possible causes and remedies.

6.7 Pre-Treatment / Sludge Storage Tank Check

6.7.1 Water/Effluent Color/Texture

Normally water in the pre-treatment tank will have a septic smell with a possible scum layer.

6.7.2 Liquid Level Check

Check to make sure liquid levels are at a proper depth and that the inlet from the house has no debris left in the pipe. Under normal operation, water levels should be at the bottom of the outlet from the sludge storage tank.

6.7.3 Sludge Level Check

Using a Sludge Judge device, measure the level of sludge in this section of the tank. Once the level of sludge reaches a 60% depth the homeowner must be notified that this compartment must be emptied, and only this section of the tank is to be pumped.

Generally a system would require pumping from the pre-treatment/sludge storage chamber every 1-3 years.

IMPORTANT: The removal of solids from the pre-treatment / sludge storage chamber must be carried out by a specialized firm. The WSB® system has been designed so that only the pre-treatment chamber requires periodic sludge removal. Sludge levels will be monitored as part of the maintenance agreement and homeowners will be notified when pumping is required. It is the homeowner's responsibility to ensure sludge removal is performed by a certified professional, and in compliance with local regulations, and that all records of service are kept for future reference.

6.7.4 Media Transfer Check

If media has transferred back into this chamber it must be removed and placed back into the bio-reactor. Usually this only happens if flooding occurs in the disposal bed or a blocked pipe to the disposal and liquid backs up into the system.

If you identify media transfer please see section 7.2 for possible causes and remedies.

6.8 Pump Tank Check

6.8.1 High Level Alarm Float Check

High warning switch should be checked for proper level and that it is in working order. The alarm trigger level should be set to allow ample time after alarm the goes off to have a service technician be able to arrive and fix the problem before a back up occurs in the house.

For details on testing floats please see section 7.2

6.8.2 Low Level Pump Float Check

Check the low level float for proper adjustment and that it is in working order. This float switch should be set that it will shut the timer control off while keeping the pump totally submerged under effluent. To check if the float is working pull the float out of the liquid, put it in the inactive position (down), and see if the timer for the pump tank stops running.

6.8.3 Inspect Electrical Cords

Make sure all cords are free from damage and securely fastened. Any damaged cords should be repaired immediately.

6.9 Control Panel Check

6.9.1 Error Reports Check

Read the error reports on the panel and download them or record them manually in a book for record keeping. Review the error reports that occurred since the last maintenance visit and assess their potential causes. Any errors which could be a result of improper use of the system (i.e. flooding alarms, system power loss etc.) should be discussed with the system/home owner and included on the maintenance report.

6.9.2 Settings Check

Check all settings for the system with a laptop computer or manually to ensure they are correct.

6.9.3 Function Test

Run panel through the function test to make sure all equipment is in proper working order.

See section 10.2.3 for details on the function test.

6.9.4 Control Panel Alarms

The Control Panel should be checked for any alarms that may be present during maintenance. Any alarm conditions should be assessed and addressed before maintenance is complete.

6.10 Final Inspection

Before leaving check to make sure all lids are properly sealed and fastened down and leave a service report/indicator for the homeowner.

7 TROUBLESHOOTING

7.1 Effluent Water Quality Targets

When quality of treated effluent is not meeting the criteria as outlined in section 8.1, there are 4 major areas to look for problems.

Possible cause	Possible remedy
Check dissolved oxygen levels to insure they are at least 2 mg/l at the end of the pause cycle.	You may have to adjust the blower run time to insure adequate dissolved oxygen is achieved for each run cycle to sustain it through the off cycle to above 2 mg/l. Caution should be taken not to make the pulse ("ON") cycle too long which may cause too much stripping of the bio-film on the media. It may be more effective to reduce the pause ("off")_time to allow for more frequent addition of dissolved oxygen.
Check media roll over when blower is running to insure that adequate pressure is coming from blower.	If too little roll over of media is observed then the likely cause is low pressure from the blower. You should first check your blower filter to make sure it is clean and free from obstructions. You should also check the blower for CFM levels to insure blower is performing within it's specifications. Conduct a filling degree test as per section 7.4
Check the sludge level in the pretreatment sludge storage, and see if there is any unusual grease build up or chemical odours.	If sludge level is greater than 60% of total volume in pretreatment tank it maybe entering the bio-reactor causing problems with the treatment. The homeowner must be advised to call a local pumping company to evacuate the pretreatment/sludge storage compartment. You may also need to test it for fats, oils and greases (F.O.G.) or harmful chemicals if they are detected and have the compartment evacuated to

	remove these. If there is continuous incoming flow maybe there is ground water infiltrating the system and/or water running constantly from house. The homeowner must be notified to check on these issues.
Check to make sure sludge return pump or suction air-lift is operating properly.	If sludge return pump has failed or is plugged it will cause sludge to build up in final clarifier and contaminate the final effluent. A check should be made to insure they are operating properly. If they are operating properly an adjustment of the pulse (ON) and pause (OFF) times may need to be done to get proper removal of settled sludge. See section 7.2
Improper Homeowner Use	See section 11

7.2 Media Transfer

If you observe media in any tanks other than the bio-reactor the following table will help you to identify and address possible causes:

Transfer Location	Possible cause	Possible remedy
Clarifier	Damaged outlet from bio-reactor	Check the outlet pipe and slotted media filter in the bio-reactor and replace if damaged
Pre-Treatment	High water / flooding	Check swing check valve between the pre-treatment sludge storage chamber and the bio-reactor to make sure it is operating properly

7.3 Media Rollover

The following table lists the likely causes of media rollover issues.

Condition	Possible cause	Possible remedy
Insufficient rollover	Blower not running	Verify blower is functioning properly and that no blower lines are clogged or disconnected
	Diffusers blocked or blower line blocked	If the blower is operating within specifications but there is insufficient media rollover, the blower lines are blocked or the diffusers are clogged – check/clean/replace lines and/or diffusers
	Too much media in bio-reactor	Conduct a filling degree test as per section 7.4
Excessive rollover	Too little media in bio-reactor	Conduct a filling degree test as per section 7.4
	Broken air line from diffuser manifold	Check lines and manifold for leaks and repair or replace as necessary
	Incorrectly sized blower	Check blower to ensure it is a proper blower as per the WSB® System suppliers specifications

7.4 Filling Degree Check

To conduct a filling degree test follow the instructions below:

While the blower is running dip a 1L open jar down into the moving media and allow it to fill. Check to see what the percentage of media is versus liquid level. It should be between 40% and 65% filled with media.

If the filling degree is lower or higher than the levels specified please contact the system manufacturer/supplier.

7.5 Excessive sludge

If during the maintenance / inspection tests it is identified that there is excessive sludge, before increasing the pump run times verify that the sludge return pumps are not clogged or restricted and/or that the suction air lift is operating correctly.

Sludge levels need to be recorded and checked before the sludge return run cycle. At the end of the run cycle it should be measured again to insure all sludge has been removed. If not the run time may need to be increased.

If you notice that sludge seems to be floating up prior to the scheduled sludge return pulse (ON) time commencing then shorten the pause (OFF) time as this indicates air has been used up in the sludge and wild denitrification is taking place.

7.5.1 Troubleshooting Sludge Return Pump

To verify the sludge return pump is operating properly:
From the Series 2 Control panel run the function test (see section 10.2.3) and monitor the current draw on the sludge return output to ensure it is within normal operating range.
Check the sludge return line at the pre-treatment tank to ensure appropriate water flow levels when the sludge return pump is on

7.5.2 Troubleshooting Suction Air Lift

If the blower is working properly and the air line is not plugged on a sludge return air-lift device, the solenoid should be checked to see if it is opening properly.

1. Disconnect the air line going to the airlift at the solenoid output
2. Enable the solenoid valve via the series 2 control panel (turn on appropriate output) and ensure that there is air flow through the solenoid.

   If there is no airflow through the solenoid the table below outlines some possible causes and remedies:

Possible cause	Possible remedy
Blower not running	Verify blower is on when the solenoid valve output is on
Hose to inlet of solenoid clogged	Disconnect inlet to solenoid, turn on solenoid and verify air flow
Solenoid failed	If you have verified the blower is running, the output to the solenoid is on, and there is air pressure at the inlet of the solenoid, the solenoid itself may have failed. Replace Solenoid and retest

If there is airflow through the solenoid verify that the sludge return lines are not plugged.

7.6 High Level and Low Level Floats

If during inspection/test or during normal operation it is determined that a float is not operating properly the float needs to be tested. Below are troubleshooting instructions that should be followed in order to verify float operation.

7.6.1 Audible Alarm Float Check:

1. First ensure that the float is connected to the control panel.
2. Ensure that the control panel is configured to alarm on active high or active low condition for the float.
3. Hold the float in the active state; Up is on (active), down is off (inactive) on all floats in the WSB® system.
4. After 10 seconds in the active state the controller should begin to alarm. If you hear an alarm then the float is operating properly.

   NOTE: it is important to make sure the controller is powered and that the alarm buzzer is connected and/or the internal audible alarm is enabled in the controller menu.

5. If you don't hear any alarm after 10-15 seconds it doesn't necessarily mean the float is not working. You must first check the controller to see if an alarm condition is being displayed on the controller interface screen. If you see that an alarm is present on the controller interface screen the float is working. If you did not hear an alarm you need to check the alarm configuration settings.

7.6.2 Continuity Test Float Check:

If the float is not causing an alarm and you have ensured that the controller is configured to detect the alarm you can check the float with a continuity meter.

1. Disconnect the float from the controller input.
2. Place the float in the active state; up is on, and down is off for all floats
3. Place the continuity meter probes across the 2 terminals of the float.
4. If the float is working properly there should be continuity between the terminals when the float is in the active state.
5. Move the float to the inactive state and connect the continuity meter across the terminals again. There should be no continuity with the float in the inactive state.
6. If both of these tests pass the float is working properly and should be reconnected to the controller.
7. If you are not getting an alarm during the Audible Alarm Float Check double check your alarm configuration to make sure that it is setup properly.

   NOTE: If there is a junction box between the controller and the float it may be that there is a connection issue within the junction box. Please check these connections above if the alarm and continuity tests both fail.

7.7 Odors

Insufficient oxygen will result in odours and improper treatment. If you are detecting odours please review the blower configuration settings and test the Dissolved Oxygen levels as per section 6.5.4.

Possible cause	Possible remedy
Hydraulic overloads	Check all toilets for leaks and ensure all taps are turned off
	Check for eaves or sump pumps connected to system or ground water infiltration
Insufficient pressure on blower	Check air filter first , then check the

	blower CFM output to insure it is adequate.
Chemical contaminates	Talk with homeowner about the do's and don'ts and sample incoming for contaminates. If you are unsure but believe the issue is related to chemical contaminants then a test sample should be taken to check for contaminants. See section 11 for do's and don'ts
Fat's Oils and greases	Sample for Fats Oils and Grease and talk with homeowner about proper system operations.
Insufficient Dissolved Oxygen	You may have to adjust the blower run time to insure adequate dissolved oxygen is achieved for each run cycle to sustain it thru the off cycle to above 2 mg/l. Caution should be taken not to make the on cycle too long which may cause too much stripping of the bio-film on the media. It may be more effective to reduce the off time to allow for more frequent addition of dissolved oxygen.

7.8 Controller Alarms

7.8.1 Flooding

Flooding Alarms will occur when the water level in the specific chamber increases above the normal operating level. Causes can vary depending on the chamber of the system in which the flooding alarm is being identified.

Possible cause	Possible remedy
Excessive flow to system	Check all toilets for leaks and ensure all taps are turned off. Check Water Softeners and other similar appliances.
Failed pump in pump tank (for systems with a pump tank only)	Replace pump
Failed or saturated bed	Call service provider
Ground/surface water Infiltration	Check for eaves or sump pumps connected to system

7.8.2 Overcurrent Alarm

On residential systems all pumps except the Disposal Bed pump (current sense optional) have integrated current monitoring. The current sense allows for early detection of pump failure that can lead to flooding alarms, or other issues with proper system operation.

Possible cause	Possible remedy
Failed Pump / Blower	Replace Pump / Blower

Jammed or clogged pump	Inspect pump and impeller for possible obstructions
Blower hose break or connection loss	Inspect blower lines and connections
Max Current Alarm Level on controller set too low.	While the pump / blower is in operation check the current reading on the controller screen. If the pump/blower is operating within its rated specifications for current draw it might be that the max current setting for the output in question was set too low and needs to be adjusted.

7.8.3 Undercurrent Alarm

On residential systems all pumps except the Disposal Bed pump (current sense optional) have integrated current monitoring. The current sense allows for early detection of pump failure that can lead to flooding alarms, or other issues with proper system operation.

Possible cause	Possible remedy
Failed Pump / Blower	Replace Pump / Blower
Breaker or fuse blown	If the pump has a separate fuse or breaker ensure that it has not blown/tripped and that the pump/blower is getting power.
Wiring issue	With all power to the system turned off, inspect electrical wires for the pump at the controller and any junction boxes to ensure no connections have come loose or corroded.
Plugged/clogged diffusers on bio-reactor blower TH	Inspect blower lines for obstructions and change diffuser if they are plugged.
Min Current Alarm Level on controller set too high	While the pump / blower is in operation check the current reading on the controller screen. If the pump/blower is operating within its rated specifications for current draw it might be that the min current setting for the output in question was set too high and needs to be adjusted.

7.8.4 Fuse Failure Alarm

All outputs on the WSB® controller are fused. If there is an overcurrent condition for too long the fuse may blow and result in a fuse blown alarm. Under normal conditions the high current alarm check should prevent the fuse from blowing but there are some conditions in which the fuse may still blow.

Possible cause	Possible remedy
Failed Pump / Blower causing excessive current draw	Replace Pump / Blower
Short circuit	With power off inspect the wiring to the pump to ensure there are no short circuits. This can also be done with a multimeter set to measure resistance (ohms).

7.8.5 Air Pressure Sensor Alarm

WSB® systems with a suction air lift for sludge return are equipped with a solenoid valve to control the air flow to the suction lift. An air pressure sensor line is installed after the solenoid that runs back to the controller to ensure that when the suction air lift is supposed to operate that air flow is present and within acceptable ranges.

Possible cause	Possible remedy
Blower Line rupture or disconnect	Check all air lines to the solenoid and suction air lift
Failed Blower	Verify blower is operating correctly and replace if it has failed
Failed solenoid	Check to ensure that the solenoid is operating correctly and replace if failed
Incorrect Min/Max pressure settings for air pressure sensor	Verify the min and max air pressure sensor settings are set correctly in the controller for the specified blower

8 WATER QUALITY TESTING

8.1 Water Quality Targets

The WSB® clean system has been designed to treat wastewater under normal operating conditions to meet the following effluent criteria:

Parameter	Standard
BOD5	< 15 mg/L
CBOD5	< 10 mg/L
TSS	<10 mg/L

8.2 Water Quality Sampling

It is critical that appropriate procedures are followed when gathering a sample to ensure that accurate water quality testing can be conducted that is truly representative of the treatment plants operation.

Sampling must be taken by a person trained and certified by RH2O North America to ensure the sample gives accurate results in regards to how the system is performing.

8.2.1 Sampling with a Pump Tank

Always use adequately sized sampling containers. Sampling containers must be prepared and sterilized prior to collection at sampling site.

Create flow through the system by one of the following:

1. Turn on fixtures in home
2. Add water to the pre-treatment tank by using a garden hose or
3. Pumping water back from the pump tank (if applicable)
4. Locate the effluent pipe feeding from the WSB® clean system to the pump tank (in the event of no pump tank being present refer to section below regarding sampling without a pump tank).
5. Carefully place mouth of sampling bottle into the free falling stream of effluent, do not allow the mouth of the sampling bottle to touch the pipe or the wall of the pump tank, depending on how far the pipe protrudes into the chamber

6. Fill sample bottle almost to the top, ensure there is some room for 5-10% expansion during transport

7. Make sure that the lid of the sample jar is not contaminated and that no dust or debris gets inside the sample. If something gets inside, a new sample bottle must be used and another sample taken
8. Cap and label sample.
9. Samples must be stored in a cooler with ice during transport
10. The samples should be dropped off at the accredited laboratory immediately and any necessary paperwork must also be filled (e.g. Chain of Custody).
11. Check with your local laboratory to ensure proper size and labelling of samples are being met to ensure accurate sampling results.

NOTE: The sample should be taken to the laboratory within 24hrs, ideally sooner.

8.2.2 Sampling without a Pump Tank

1. Always use adequately sized sampling containers. Sampling containers must be prepared and sterilized prior to collection at sampling site.
2. Locate the Clarifier section of the WSB® model to be sampled, specifically where the outlet pipe is located.

3. Carefully place the end of the suction hose into the 6" outlet pipe just below the surface of the effluent and make sure the walls of the pipe are not brushed with the hose. Place the other end of the hose in the sample jar and turn on the pump (supplied by RH2O) to suck water from the Clarifier to the sample jar.

NOTE: The sampling pump and hose should be cleaned with a cleaning solution each morning prior to taking samples.

4. Fill sample bottle almost to the top, ensure there is some room for 5-10% expansion during transport

5. Make sure that the lid of the sample jar is not contaminated and that no dust or debris gets inside the sample. If something gets inside, a new sample bottle must be used and another sample taken
6. Cap and label sample.
7. Samples must be stored in a cooler with ice during transport
8. The samples should be dropped off at the accredited laboratory immediately and any necessary paperwork must also be filled (e.g. Chain of Custody).
9. Check with your local laboratory to ensure proper size and labelling of samples are being met to ensure accurate sampling results.

8.3 Lab Test Requirements

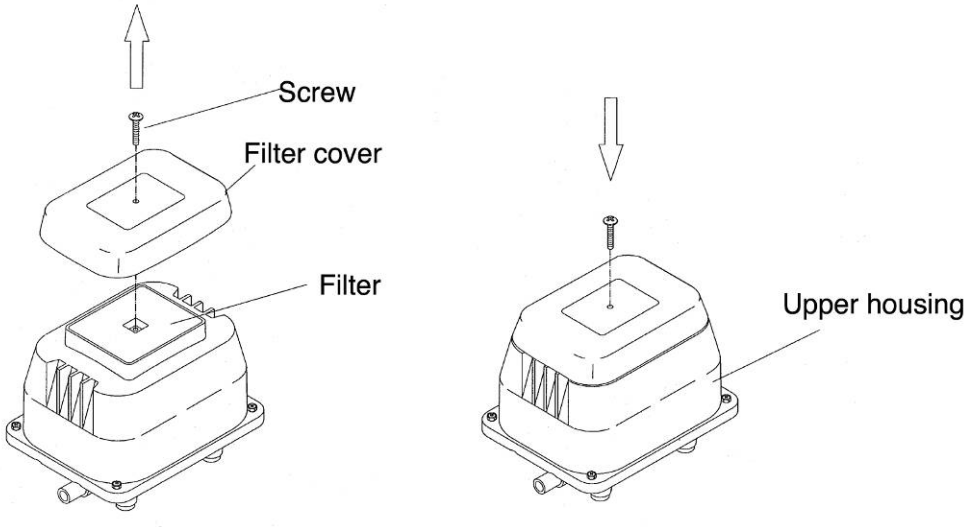
All samples must be tested by an authorized laboratory as per local regulatory requirements.

9 SERVICE PROCEDURES

IMPORTANT: If any equipment or parts are replaced the serial number and model number of the new component must be recorded on the service record and provided to RH2O North America.

9.1 Blower Filter Replacement

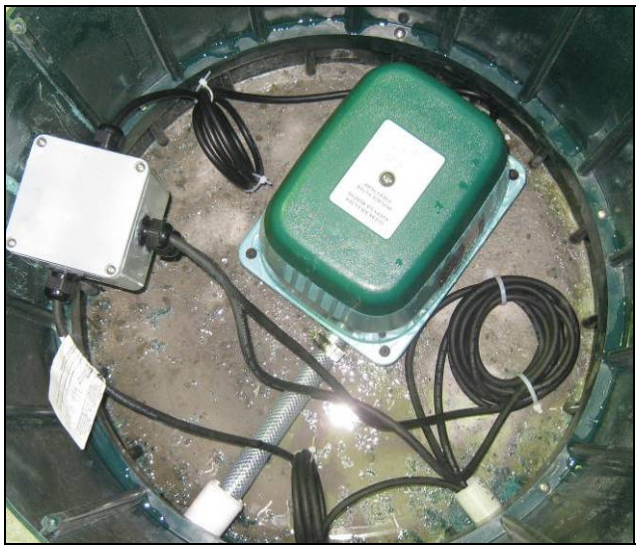
1. Lock out and tag controller power source.
2. Undo the cover screw securing the cover to the pump housing.
3. Remove the cover and filter pad
4. Replace filter pad and cover
5. Secure the cover with the cover screw
6. Restore power and test to assure it is functioning properly.



9.2 Blower Replacement

1. Lock out and tag controller power source
2. Remove air line and power cord and install new approved blower
3. Hook up electrical and air line
4. Restore power and test to assure it is functioning properly

WSB-400 – WSB-1000 (with Airlift)



WSB-1250-WSB-1800 (with sludge return pumps)

9.3 Sludge Return Pump Replacement

1. Lock out and tag controller power source.
2. Undo union and pull out pump via pvc pipe.

   IMPORTANT: Do not lift the pump via the electrical cord.
3. Disconnect the old pump electrical cord from junction box connection and pull through conduit.
4. Feed new pump electrical cord through the conduit from the clarifier to the junction box.
5. Connect electrical in junction box
6. Remove outlet fitting and union from the old pump and put it on the new pump outlet.
7. Put pump back into chamber via the PVC pipe.

   IMPORTANT: Do not lower the pump via the electrical cord.
8. Connect the union on the sludge return pump outlet to the sludge return pump line and connect.
9. Turn on power and test pump for proper operation.
10. Make sure union does not leak.

9.4 Sludge Return Air Lift Replacement

1. Lock out and tag controller power source.
2. Undo union and remove air lift from clarifier.
3. Remove air line connection from old air lift and connect to new air lift.
4. Place new air lift into clarifier.
5. Restore power and test to assure it is functioning properly.
6. Make sure union does not leak while it is operating.

For procedures on testing the sludge return air lift see section 7.5.2

9.5 Sludge Return Air Lift Solenoid Replacement

1. Lock out and tag controller power source.
2. Disconnect inlet and outlet air lines from the solenoid.
3. Remove fittings from old solenoid and do not discard.
4. Install old fittings removed in step above, to the new solenoid.
5. Connect inlet and outlet air lines to new solenoid.
6. Connect new solenoid to AC power
7. Restore power and test to assure it is functioning properly.
8. Make sure air line does not leak while it is operating.

9.6 Pump Tank Disposal Pump Replacement

1. Lock out and tag power source.
2. Undo union connecting pump to disposal bed.
3. Remove existing pump.

   IMPORTANT: Care must be taken to never lift pump by electrical cord or damage to water tightness of cord may happen
4. Remove outlet pipe and union from old pump
5. Install output pipe and union from old pump onto the replacement pump.

   IMPORTANT: If using a different approved replacement pump you must ensure that the outlet pipe/union and new pump result in the same height for proper connection to the existing plumbing when placed in the tank.

6. Place new pump into tank and ensure outlet pipe union mates appropriately with internal pipe union.
7. Restore power and test to assure it is functioning properly.
8. Make sure union has no leaks.

9.7 Float Replacement

1. Lock out and tag power source
2. Remove existing float
3. Take note of location of float weight as it is critical to ensure the weight is located at the exact same position on the new float.
4. Put float weight on new float and install new float in tank
5. Make sure to turn back on power and check float for proper operation.

IMPORTANT: Make sure the float weight is installed at the exact same location as it was on the old float that was just removed. Ensure an excess float cord is wrapped and not left floating in the tank.

9.8 Diffuser Replacement

If a diffuser becomes plugged or damaged it will need replacement. To replace the diffusers:

1. Lock out and tag power source
2. Disconnect the air line from the air drop pipe. This drop pipe is connected to the diffuser air divider.
3. Pull up the air divider with the drop pipe and then remove the damaged air diffuser
4. Replace the diffuser with a new approved diffuser.
5. Place air divider back into proper position
6. Re-attach air line from blower to the air drop pipe
7. Restore power and test to assure it is functioning properly.

NOTE: If the manufacturer of the diffusers recommends cleaning, follow cleaning steps as per their instructions.

9.9 Flow EQ Pump Replacement

1. Lock out and tag power source.
2. Undo union connecting pump to pre-treatment chamber.
3. Remove existing pump.

   IMPORTANT: Care must be taken to never lift pump by electrical cord or damage to water tightness of cord may happen
4. Remove outlet pipe and union from old pump
5. Install output pipe and union from old pup onto the replacement pump.

   IMPORTANT: If using a different approved replacement pump you must ensure that the outlet pipe/union and new pump result in the same height for proper connection to the existing plumbing when placed in the tank.
6. Place new pump into tank and ensure outlet pipe union mates appropriately with internal pipe union.
7. Restore power and test to assure it is functioning properly.
8. Make sure union has no leaks

9.10 Controller Replacement

If controller needs replacement a qualified licensed electrician will need to be called to make this change.

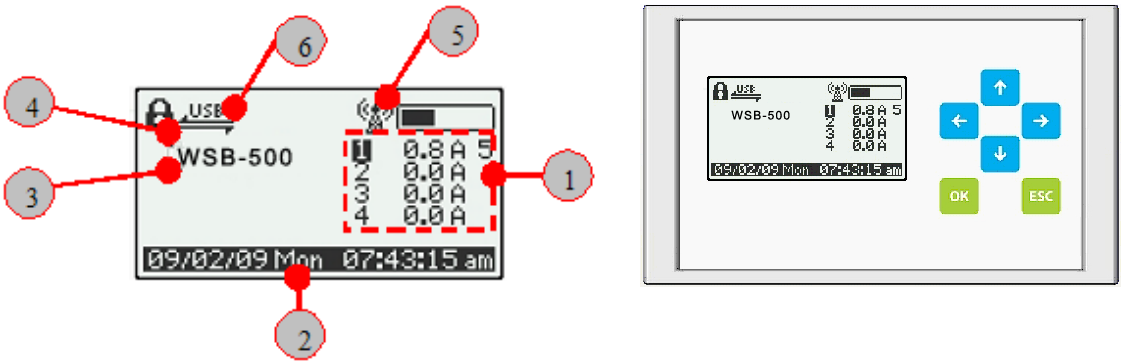
10 CONTROL PANEL OVERVIEW

Installation may only be carried out by a qualified electrician!

The WSB® clean control panel is preconfigured for standard operation of your wastewater treatment system. The panel comes equipped with a visual and audible alarm to notify you of any mechanical or high water conditions should problems ever arise. The Control panel operates all of the mechanical components of the WSB® system.

The control panel must be protected by a dedicated breaker in the in-house or building as per the installation manual.

10.1 Controller Interface Overview



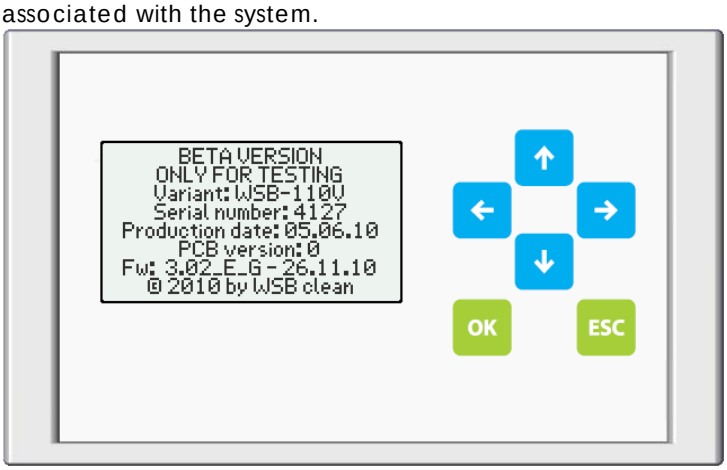
1 Status display of the outputs; display of the actual current consumption of the system
2 Display of the system time and date
3 Display of the operating mode
4 Display showing when the service menu is locked
5 Display of the GSM status with signal strength (remote monitoring)
6 Display showing when the control is connected to a read out device

10.2 The Customer Menu

The Customer Menu is called up by pressing either of the arrow keys . Navigation in the customer menu is also carried out using these keys. The customer menu provides access to the basic information a customer may require access to and is not protected by the system password.

10.2.1 Device Information

The Device Information screen provides an overview of all the revision information associated with the system.

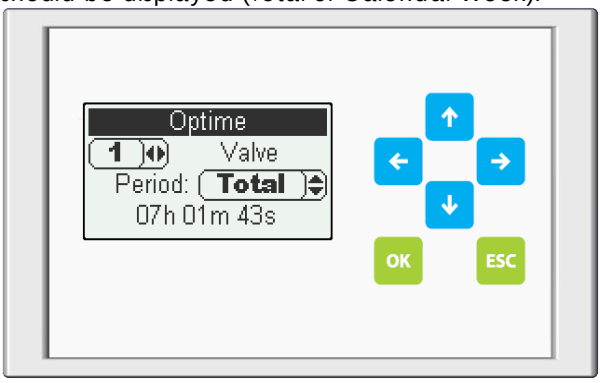


10.2.2 Optime

The optime view allows you to see the operating times for each of the outputs. You can select whether to view the Total operating time for the specified output or the Calendar Week (CW) for each output. Along with each output the Pump Type is also displayed.

The left/right arrow keys allow you to select the output to view.

The up/down arrow keys allow you to set the period in which the operating hours should be displayed (Total or Calendar Week).



10.2.3 Function Test

The function test verifies proper operation of all outputs and also does a battery backup test to determine if the batteries need to be replaced.

The function test will turn on each output separately regardless of the operation time settings or day/night settings etc.

Parameters	Description
Test start	Press OK to initiate the function test
Start delay	Specifies the start delay between actual function testing and pressing the Test Start option.
Pulse duration	Specifies how long each output will be pulsed during testing

10.2.4 Time/ Date

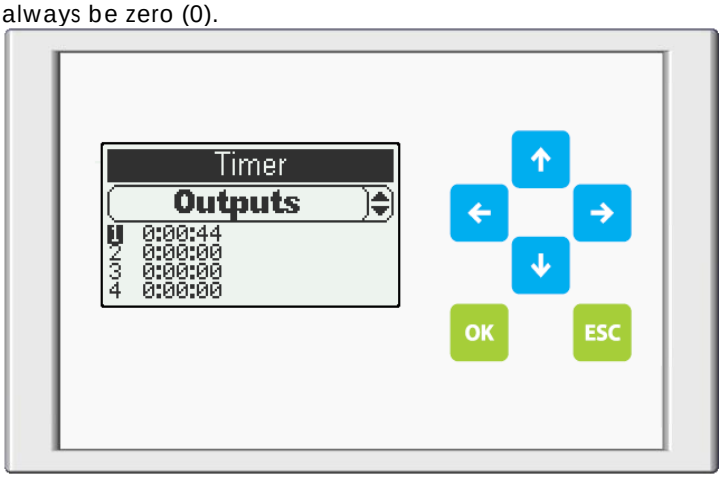
Date/time systems adjustments can be made in this menu point.

Parameters	Description
Date	Allows you to set the current date
Time Format	12 or 24hr format
Time	Allows you to set the current time
Summer Time	Daylight Savings Time enable/disabled

10.2.5 Timer (Display of Output Counters)

Displays the run time counters for all current output configurations. This view allows you to see the state of all outputs (on/off) as well as the pulse/pause counter values for each output.

NOTE: if the output is not configured to use a timer (i.e. Pulse/Pause) the timer value will always be zero (0).



10.2.6 Sludge Removal

The sludge removal maintenance setting allows you to log a sludge removal event into the Error Report. You can select how many days the system will be shut-down for sludge removal and how long Output 3 will subsequently be turned OFF during this process.

10.2.7 Maintenance Menu / Service Menu

The maintenance menu is launched on the OK or ESC key. This menu is protected by a password and may be accessed only by RH2O or its duly authorized representative.

10.2.8 Error Signals and Power Outage Warnings (Alarms)

If an error signal appears on the display and the display blinks, the signal can be cancelled by depressing the **ESC** key for 5 seconds. If the power is out or disconnected, a warning signal will sound after one minute. This signal can also be cancelled by depressing the **ESC key** for 5 seconds. The warning signal will sound for 2 seconds every 2 seconds in the first 10 minutes. After 10 minutes it will sound for 5 seconds every minute. After 1 hour it will sound for 20 seconds every 30 minutes. This is a set timed program and cannot be changed unless accessed remotely by RH2O. The control panel documents and logs all error messages.

10.3 Vacations and extended periods with limited usage

The WSB® clean system has been designed to continue operating properly even with limited or extended periods of no usage. The power can be left on for a vacation and the performance of

the system will not be impacted, even with little or no flow to the system. If the property is only used seasonally, (a winter lodge or only for summer months) and if the time that there would be no flows exceeds 4 consecutive weeks, the power can be shut down to the panel and blower. Once the property is lived in again, the power should be immediately turned back on.

10.4 Controller Specifications & Dimensions

Supply to KL8:	115V AC 60Hz
Input protection:	500mA slow230V class H
Protection for output 1,2,4:	5A slow/230V class H
Protection for output 3,5:	2,5A slow/230V class H
Output voltage at output 1-5:	115V AC 60Hz
Output voltage at KL1+KL2:	5V/DC
Max. current per 5V output:	100mA
Input voltage to KL1+KL2:	5V/DC
Protection class:	Only for indoor use
Height:	185 mm
Width:	215 mm
Depth:	95 mm
Weight:	ca. 1kg

11 CONTROL PANEL CONFIGURATION

The Main Menu is called up by pressing the OK button while on the main status home screen. The main menu is a controlled area of the Series 2 controller and requires a password to enable access (see section 11.5.4). Each of the options in the Main Menu lead to submenus as outlined below.

11.1 "Parameter" Menu

11.1.1 Device Settings

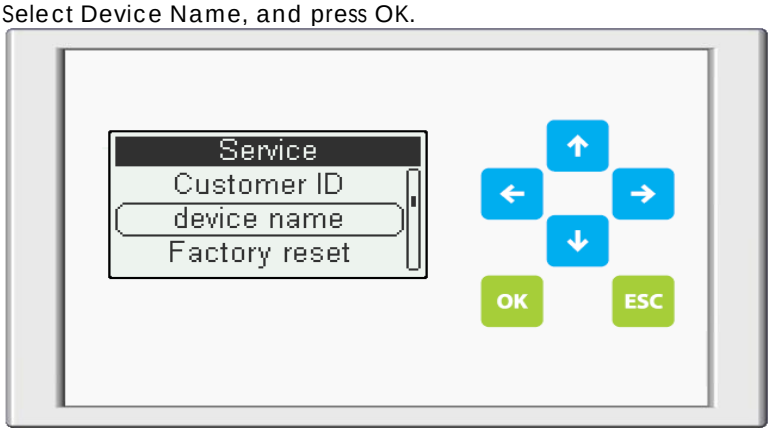
11.1.1.1 Device Name

The Device Name is set by the manufacturer of the system to reflect a specific configuration that is programmed into the Series 2 controller, thus giving it a specific application behavior. If the Device Name is not set by the manufacturer the Device Name displayed on the front panel will be the specific Class type that this controller was designed for at the factory (i.e. Class C/N). However, if the Device Name is programmed even once, the device name displayed will always be based on the Device Name field (even if it is programmed with all blanks = no name).

Below are instructions on how to set the Device Name:

1. From the main status menu press OK to enter the Main Menu.
2. Then select Service and Press OK to enter the Service Menu.

3. Select Device Name, and press OK.



4. Set a unique Device Name using the up and down arrows to scroll through the available characters and symbols and by using the left and right arrows to select the character location. When you are finished press OK.

   NOTE: The Device Name can be a maximum of 13 alpha numeric characters.

11.1.1.2 Mode

The mode allows for selection of the available class types for the controller (i.e. Class C/N, Class C/N + P etc). The default setting is Class C/N for carbon removal and nitrification and is the mode in which the water quality targets are met as per section 8.1.

11.1.1.3 I/O Module

Allows for enabling / disabling of the I/O module. The I/O module is not used on standard residential WSB® clean systems.

NOTE: The I/O module is connected to the Series 2 controller via the Series 2 DB9 serial port, and connector X4 on the I/O module.

11.1.1.4 Expansion Module

Allows you to select and enable the various available expansion modules for use with the Series 2 controller. These include, but are not limited too, GSM, GPRS, LAN, Bluetooth etc.

NOTE: if you enable the GSM or GPRS module additional sub menu items will be available and require configuration.

11.1.2 Outputs

The outputs sub menu allows you to select outputs for configuration (outputs 1-8) as well as settings for redundancy. This is where you would adjust the settings for blowers, pumps, valves etc. that are controlled by the Series 2 controller.

For detailed information on configuration of output parameters please refer to section 12 Series 2 Controller Outputs.

11.1.3 Inputs

The inputs sub menu allows you to configure output independent alarms conditions for a given input. The configuration for a high level alarm in a pump tank, for example, would require that you set the mode to “Flooding” and specify the signal level as “Active High”.

This would cause a controller alarm in the pump tank for the corresponding input if the float is high.

Unlike a cut-off alarm in an output Pulse/Pause configuration the Input menu is where inputs are configured for generic alarm indications that are not specific to any output. Care should be taken not to configure an input in this menu which has also been configured as a cut-off in an output configuration unless you are certain this is the behavior you want.

These inputs only cause an external visual and audible alarm via output 5 as well as an error to be placed into the error log as per the selected Mode. Additionally, if the controller has a GPRS, Ethernet, or similar remote monitoring device and email, or SMS message (or appropriate remote communications mechanism) will be used to provide a remote notification of the alarm condition.

Parameters	Description
Mode	Select the desired mode. See section 11.1.3.1
Signal Level	Specifies the signal condition that must be met by the input for the specified Mode to be recognized and an alarm generated.

NOTE: you cannot set more than one input with the same input alarm mode.

11.1.3.1 Input Modes

The following table explains the available Input Modes and there behaviors:

Parameters	Description
Off	Input monitoring is off
Tank Monitoring / Tank Empty	Causes a tank monitoring error to be written to the error log. The specific condition for Tank Monitoring is dependant on the specific installation and configuration.
Flooding 1	Causes a flooding error to be written to the error log. Flooding errors are typically used to indicate a high water level in a specific tank.
Motor Safety Switch	Causes a motor safety swtich error to be written to the error log.
Flooding 2	Causes a flooding error to be written to the error log. Flooding errors are typically used to indicate a high water level in a specific tank.

IMPORTANT: Do not set more than one input to the same "Mode" as they will conflict with each other.

For additional information on inputs please refer to section 14 Series 2 Controller Inputs.

11.1.4 Other Settings

The other settings sub menu allows access to a number of additional sub menu's for advanced operation of the Series 2 controller.

11.1.4.1 Function Test

Allows for configuration of the Function Test features. See section 10.2.3 for more information.

11.1.4.2 Error Report – Acoustic Output (Audible Internal Alarm)

Allows for enabling / disabling of the audible alarm which will sound each time an error occurs on the series 2 controllers. If the acoustic output is off the controller will still generate an audible alarm if the controller loses power (as long as the external battery is connected and has power). The on/off control of the acoustic output is only for alarm fault conditions.

NOTE: This does not disable the external alarm output (output 5). If an error condition is present on the controller output 5 will always pulse to cause an audible/visual alarm if connected.

11.1.4.3 Air Pressure

Allows you to specify the minimum and maximum air pressure readings for the onboard air pressure sensor. You are also able to configure the reference output associated with the air pressure sensor.

For more information see section 16

11.1.4.4 Valve Output Reference

The valve output reference specifies the output on the series 2 controller that will turn on when the valve turns. The valve output reference can be configured to any available output on the series 2 controller. As an example, this feature would be used to turn on a blower connected to output 1 for a sludge return air lift operating on output 3.

For more information see section 12.4.1

11.1.4.5 Run Bit

The Series 2 Controller has a configurable parameter called the Run Bit. The Run Bit allows the user to start and stop the output logic state machine by setting it to either ON (FW running) or OFF (firmware not running). The purpose of the Run Bit is to allow the user to stop the FW output logic state machine thus allowing multiple changes to the output configuration settings to be made using the Series 2 interface panel without having each minor change take effect as each parameter is set individually. This way you can configure all outputs and all associated parameters, based on the Mode selected for each output without having the settings take effect immediately. When you have completed setting all the output and input settings if you turn the Run Bit back ON the FW will start all outputs just as would occur on a system start-up.

NOTE: If you set the Run Bit to OFF all timers are reset and all outputs are turned off. This prevents any outputs which may have been on at the time the Run Bit was set to OFF, from staying on.

IMPORTANT: The run bit will NOT reset itself if you forget to turn it back on. You must either cycle power on the controller or manually turn the run bit back on to ensure the controller is once again running.

11.2 "Optime" (Operation Time) Menu

The optime menu provides access to additional operation time features not available in the customer menu. These include:

Parameters	Description
Show	Same as the optime view available in the customer menu. See section 10.2.2
Delete (Total)	Allows you to delete all optime information
Delete (CW)	Allows you to delete the Current Week (CW) optime information

11.3 "Reports" Menu

The reports menu allows you to view and/or delete all report information stored on the series 2 controller. This information is very valuable in detecting issues and tracking errors that have occurred on the controller.

11.4 "Service" Menu

The service menu contains a number of sub menus providing access to more advanced service features not available via the customer menu as outlined in the following sections.

11.4.1 Device Information

See section 10.2.1

11.4.2 Customer ID

The Customer ID field allows for a way to uniquely identify a controller installation with a specific customer. This is set by the manufacturer and should never be changed.

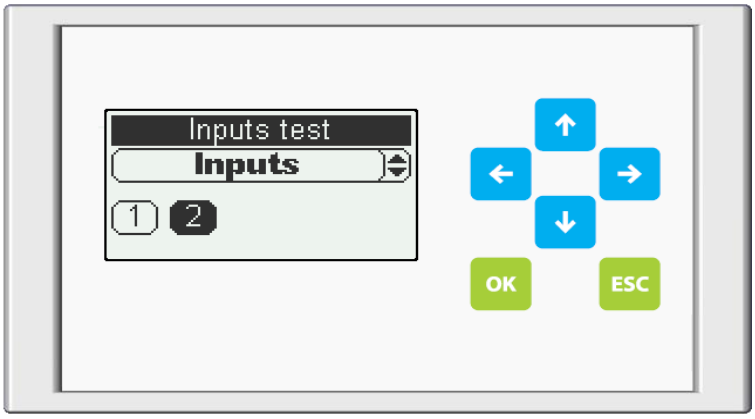
If the Customer ID is set, it will be included in all Email and SMS messages sent by the controller GPRS/GSM remote monitoring features to further assist in identifying the controller that generated the SMS or Email message

11.4.3 Factory Reset

Allows you to reset the controller to factory defaults.

11.4.4 Input Test

The input test allows you to view the status of the various inputs on the series 2 controller. You can activate and deactivate the inputs connected to the controller and confirm proper operation of these triggers by visually monitoring the graphics available.



In addition by using the up and down arrow keys you can view the state of all fuses (black background = Fuse OK), as well as the current reading on the air pressure sensor.

11.4.5 Function Test

See section 10.2.3

11.4.6 Timer

See section 10.2.5

11.5 "Settings" Menu

The settings menu provides access to advanced settings not available through the customer menu.

11.5.1 Language

Allows you to specify the display language.

11.5.2 Date / Time

See section 10.2.4

11.5.3 Display

Allows for configuration of various display features such as the illumination/backlight triggers, brightness control and contrast control.

11.5.4 Password

The password submenu allows you to change the access password required to enter the advanced configuration menu options available for the series 2 controller. Essentially, the password protects all configuration options except those available from the Customer Menu.

CAUTION: Setting a password of 000000 will disable password access and allow anyone to access all configuration parameters. This should be used with extreme caution.

IMPORTANT: Write your new password down and keep it in a safe place so you don't loose it.

11.5.4.1 Forgot The Password?

If you forget the password for a controller the password can be reset. Please contact RH2O.

11.5.4.2 Locking the Controller

If you have entered your password and do not want to leave the interface unlocked until the automatic internal password lock timer expires and requires password entry again hold the ESC key for 2 seconds to force password protection and lock the controller interface.

12 SERIES 2 CONTROLLER OUTPUTS

The following sections provide detailed technical and configuration information on the inputs and outputs available on the Series 2 controller.

12.1 Outputs 1-4

The series 2 controller has 4 primary AC outputs; Outputs 1, 2, 3, and 4.

The outputs are designed for control of 115V power as supplied on the main controller input connector. The controller has a maximum total current rating of 20A.

The output current ratings are identified in the table below:

Output	Max Current (A)	Voltage
1	5	115V
2	5	115V
3	2.5	115V
4	5	115V

12.2 Output 5 – Alarm Output

The Alarm Output allows for connection of 115V buzzers and lights which will pulse when an alarm condition is present on the Series 2 controller.

The alarm output rating is identified below:

Output	Max Current (A)	Voltage
5	2.5A	115V

12.3 Output Modes

12.3.1 Off

Specified output is off.

NOTE: If another output is configured as a "Valve" and references this output it will turn on when the valve is on regardless of output mode setting.

12.3.2 Pulse/Pause

Pulse/Pause mode allows the user to configure ON (pulse) and OFF (pause) times for the specified output. The pulse/pause mode allows you to specify a daytime period and a nighttime period so that different pulse/pause settings can be used based on expected changes during the daytime and/or nighttime. In addition a cutoff signal source can be used as protection for the output so that if, for example, the water level is too low the current pulse/pause cycle will be stopped and reset and will only re-start when the cutoff signal source has indicated the input condition that stopped the cycle is no longer present.

NOTE: If another output is configured as a "Valve" and references this output it will turn on when the valve is on regardless of output mode setting.

Parameters	Description
Pump Type	See section 12.4
Min Current	Sets the minimum current alarm level for the output
Max Current	Sets the maximum current alarm level for the output
	If set to 0 the max current monitoring is disabled
	When setting current for Contactor 50A the current value increment is 1A. There are no decimal values for the 50A contactor setting.
Day Start	Specifies the daytime period start time **NOTE:** Set Day Start = Day Stop and no daytime operation period exists so the day pulse and pause settings do not execute
Day Stop	Specifies the daytime period end time **NOTE:** Set Day Start = Day Stop and no daytime operation period exists so the day pulse and pause settings do not execute
Day Pulse	Specifies the daytime pulse/ON period
Day Pause	Specifies the daytime pause/OFF period
Night Start	Specifies the night time period start time **NOTE:** Set Night Start = Night Stop and no night time operation period exists so the day pulse and pause settings do not execute
Night Stop	Specifies the night time period end time **NOTE:** Set Night Start = Night Stop and no night time operation period exists so the day pulse and pause settings do not execute
Night Pulse	Specifies the night time pulse/ON period
Night Pause	Specifies the night time pause/OFF period
Week Program	Specifies the days of the week the Pulse/Pause program is active. This allows you to turn off the pulse/pause program (both daytime and night time periods)
Initial State	The initial state parameter allows you to specify if a cycle should start in the pulse or pause state.
Cutoff Source	Allows you to specify an input source as an override to the existing pulse/pause configuration. NOTE: if the Cutoff Source is activated the pulse/pause cycle is stopped, the pulse/pause times reset, and will restart when the cut-off source deactivates
Cutoff Level	Specifies if the cut-off source is activated by a high level or a low level on the Cutoff Source input.

Per Cycle Duplex	Output reference for per cycle duplex configuration with redundancy

NOTE: Daytime settings will override nighttime settings if they overlap.

12.3.2.1 Pulse/Pause Per Cycle Duplex with Redundancy

In some applications it is important to have duplex/alternating outputs that operate on a per cycle basis. If this is required it can be configured very easily by simply selecting the second output, from the "Duplex Output" parameter list, to be used as the duplex slave output to the currently configured pulse/pause output. When using per cycle duplex redundancy is automatically built in, therefore, it is not necessary for you to setup master/slave redundancy from the menu as you would if using per day cycling.

12.3.3 Permanent On

The specified output is always on.

12.4 Pump Types

The pump types selection allows you to select common pump types from a list. If the pump you are using is available within the list the min and max current settings will automatically be set for that specific pump model.

NOTE: It is still recommended to verify the min and max current settings even when selecting a pump from the list. Sometimes the manufacturer may change pump designs which can affect actual current ratings.

12.4.1 Valve

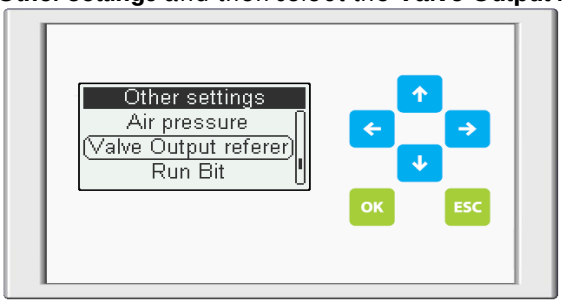
Valve is a special pump type that is most commonly selected when a solenoid valve is used to control flow to an output. This might be for the purpose of controlling either the flow of air or water.

NOTE: In all Series 2 FW versions 3.00 and earlier when a valve turns on output 1 is also automatically turned on. This behavior is fixed and cannot be changed. The assumption is made that if you are using a solenoid it is to control flow and that output 1 has the primary pump (air or water) that will cause the flow to occur.

12.4.1.1 Valve Behavior

The reference output that is turned on when a valve turns on can be configured to any available output on the series 2 controller. It is not longer fixed to only control output 1.

To change the Valve Output Reference from the Main Menu select **Parameter**, then select **Other Settings** and then select the **Valve Output Reference** option:



From the list you can select any available Series 2 output as the reference output. In addition to this outputs individual settings (i.e. pulse/pause, parallel relay, etc.) this output will turn on if any output configured with a Mode Type of Valve is also on.

NOTE: To maintain compatibility in FW upgrades to existing controllers the default setting is always output 1.

Add contactor pump types

12.5 Min. Current and Max. Current

The min. and max current fields allow you to specify the current draw range for a given output. If the current load is less than the min current or greater than the max current an alarm error will be generated.

13 OUTPUT DUPLEX / REDUNDANCY FEATURES

It is often desirable to have more than one pump available for critical pumping/supply applications. For example: If you have a single dosing pump and it fails the water level will continue to rise in the tank until someone is able to fix the pump or water supply to the tank can be stopped. In some situations it is impossible to get onsite quick enough (i.e. remote installations) and/or stop the flow of water to the system (i.e. multi-unit residential environments).

As a result it is possible to use redundancy to setup a duplex pump configuration if you are using the Pulse/Pause mode.

There are 2 ways in which you can configure a duplex system in the Pulse/Pause modes.

13.1 Per Day Duplex Cycling with Redundancy

In a duplex configuration most commonly you configure 2 outputs for 2 identical pumps. You then configure each pump with the same configuration settings (i.e. mode, pulse/pause settings etc.) and then configure the weekday settings so that the 2 pumps alternate on a daily basis.

For example: pump 1 is on Monday, Wednesday, Friday, and Sunday and pump 2 is on Tuesday, Thursday, and Saturday.

Then from the Redundancy menu you select the Master pump (i.e. output 1, or whatever output the primary pump is on) and the Slave pump (i.e. output 2, or whatever output the secondary pump is on).

If either of the pumps fail due to a blown fuse or an over/undercurrent error the controller will automatically use the remaining good pump on all days activated in both the pumps weekday settings. Continuing with our example if pump 2 failed then pump 1 would run the pulse/pause cycles on all days of the week until pump 2 could be fixed and the error condition eliminated.

13.2 Per Cycle Duplex with Redundancy

Sometimes cycling pumps on a daily basis does not meet some of the requirements of a given application. Take for example a treatment system in which there are two beds. The duplex pumps, each one connected to a separate bed, should dose each bed evenly each day. It is not desirable that one pump operates on one day and the other pump on the next because only one bed will be dosed each day.

In this case it is more desirable to have per cycle duplex in which the pumps alternate on every pulse/pause cycle. In this configuration both beds are dosed evenly through-out the day, every day.

To configure per cycle duplex is very simple. In the pulse pause settings for the first output to be used in the duplex configuration set the Duplex Output parameter to the output to be used for the 2nd pump and save the settings. Then confirm the pump type, min current, max current etc. are properly configured for both outputs and you are done. There is no need to setup the Redundancy as was done in the per day duplex configuration. Redundancy is automatically built into the per cycle duplex functionality.

For more information see section 12.3.2.1

14 SERIES 2 CONTROLLER INPUTS

14.1 Inputs 1 and 2

The Series 2 controller has 2 digital inputs which can be used for floats or any digital switch compatible with the 5V operating level provided by the input terminals.

Name	Input Type	Connector Terminals	Description
Input 1	Digital	KL2-1	5VDC Output
		KL2-2	5VDC Input
Input 2	Digital	KL1-1	5VDC Output
		KL1-2	5VDC Input

15 ERROR CODES

Error Code	Description	Error Code	Description
0	iNo Reports	39	eFC error
1	ePower breakdown	40	eSecurity Time High Load
2	eOutput 1: Fuse defective	41	eDry run filtration phase
3	eOutput 2: Fuse defective	42	eMax. pressure exceeded
4	eOutput 3: Fuse defective	43	eMax. temperature exceeded
5	eOutput 4: Fuse defective	44	eExt. EEPROM defective
6	eOutput 5: Fuse defective	45	eMax. depression exceeded
7	eOutput 6: Fuse defective	46	eGSM module error
8	eOutput 7: Fuse defective	47	iSystem startup
9	eOutput 8: Fuse defective	48	eMax filling time exceeded
10	eOutput 1: Undercurrent	49 - 64	Reserved
11	eOutput 2: Undercurrent	65	eReserved
12	eOutput 3: Undercurrent	66	iReports deleted
13	eOutput 4: Undercurrent	67	iFirmware updated
14	eOutput 5: Undercurrent	68	wWDT error
15	eOutput 6: Undercurrent	69	wDate/Time not set
16	eOutput 7: Undercurrent	70	iFactory reset
17	eOutput 8: Undercurrent	71	iDaylight saving time on
18	eOutput 1: Overcurrent	72	iDaylight saving time off

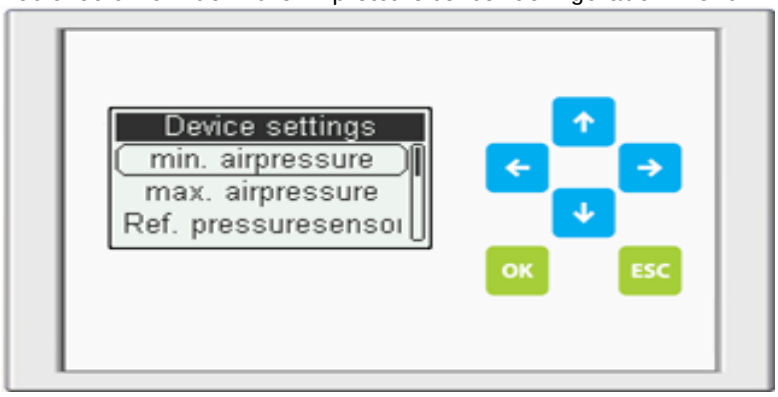
19	eOutput 2: Overcurrent	73	iClass D enabled
20	eOutput 3: Overcurrent	74	iClass D disabled
21	eOutput 4: Overcurrent	75	iMan. vacation mode enabled
22	eOutput 5: Overcurrent	76	iMan. vacation mode disabled
23	eOutput 6: Overcurrent	77	iMan. vacation mode started
24	eOutput 7: Overcurrent	78	iMan. vacation mode stopped
25	eOutput 8: Overcurrent	79	iAut. vacation mode started
26	eRTC defective	80	iAut. vacation mode stopped
27	eInt. EEPROM defective	81	iADAB started
28	eTank is empty	82	iClass HP enabled
29	eFlooding	83	iClass HP disabled
30	eMotor protection switch	84	wDry run backflush phase
31	eWrong polarity	85	iService mode (Manual)
32	eNo SIM-Card	86	iService mode (USB)
33	eSIM-Card locked	87	iService mode (Remote)
34	ePIN invalid	88	iInitiation mode started
35	eGSM module not available	89	iInitiation mode stopped
36	eGSM send error	90	iSludge removal started
37	eIO module not available	91	iSludge removal stopped
38	eFC not running	92	iError eliminated

16 CONFIGURING THE AIR PRESSURE SENSOR OUTPUT ERROR

The onboard air pressure sensor can be used to detect possible failures on air pressure lines from blowers and/or from valves connected to blowers. In this way it is possible to detect failures of the blower and/or any valves after which the air pressure sensor is connected.

To configure the air pressure sensor:

From the Main Menu select: Parameter, OK, Other Settings, OK, Air Pressure, OK.
You should now be in the Airpressure sensor configuration menu



Select the Min. Airpressure setting and click OK to set the minimum air pressure that is acceptable.

IMPORTANT: The air pressure values are in mbar, not PSI. To convert mbar to PSI just multiple the mBar number by 0. 0145037738.

IMPORTANT: If the Min. Airpressure value is very large you can press the up arrow button to reset the parameter to zero (0).

IMPORTANT: The onboard air pressue sensor has a max pressure capability of 500 mbar (7.25PSI).

Select Max. Airpressure seting and click OK to set the maximum air pressure that is acceptable.

IMPORTANT: The air pressure values are in mbar, not PSI. To convert mbar to PSI just multiple the mBar number by 0. 0145037738.

IMPORTANT: If the Max. Airpressure value is very large you can press the up arrow button to reset the parameter to zero (0).

IMPORTANT: The onboard air pressue sensor has a max pressure capability of 500 mbar (7.25PSI).

Select Ref. Pressuresensor to select the output which is associated with the min/max pressure levels being monitoring by the onboard pressure sensor. This reference output will be turned off if the min or max airpressure settings are exceeded. This behavior is identical to the min/max current parameters you have used for output current error detection.

17 WSB® SYSTEM RUNTIME PARAMETER SETTING GUIDELINES

The total desired flow rates, and operation times are provided below for some common blower models and sludge return pump flows. The WSB® system settings must be adapted to the specific blowers and/or pumps used on any given installation. However, the settings below are provided as an example to illustrate the required aeration and sludge removal requirements for the various WSB® models. If a different blower or pump is used calculations must be performed to ensure that the required aeration or sludge return flows are met based on the specific blower/pump specifications.

17.1 Blower Settings (Output 1)

Model	Litres Per Day (L/day)	output 1						
		aeration		day operation		night operation		operation
				06:00 -	23:59	00:00	05:59	per week
		Blower	Qty	pulse	pause	pulse	pause	
		[type]	[-]	[Min]	[Min]	[Min]	[Min]	[h]
WSB 400	1600	HP-100	1	8.8	6.3	7.5	22.5	84
WSB 500	2000	HP-100	1	9.5	5.5	7.5	22.5	90
WSB 600	2500	HP-120	1	8.0	7.0	7.5	22.5	78
WSB 750	3000	HP-120	1	9.0	5.5	8.0	22.5	89
WSB 1000	3800	HP-150	1	9.0	6.0	7.5	22.5	86
WSB 1250	5000	HP-200	1	9.5	5.5	7.5	22.5	90
WSB 1500	5678	HP-150	2	7.5	7.5	7.5	22.5	74
WSB 1600	6300	HP-150	2	7.5	7.5	7.5	22.5	74
WSB 1800	7000	HP-150	2	8.0	7.0	8.0	23.0	78

17.2 Sludge Return Settings (Output 2)

Model	Litres Per Day (L/day)	output 2 - PUMP					output 2 - AIR LIFT				
		Sludge Removal		operation time		Removal	Sludge Removal		operation time		Removal
				6:00	23:59	per day			6:00	23:59	per day
		Pump	Qty	pulse	pause		valve	Qty	pulse	pause	
		[L/min]	[-]	[sec]	[Min]	[L/d]	[L/min]	[-]	[sec]	[Min]	[L/d]
WSB 400	1600	144	1	7	60	315	12	1	22	15	317
WSB 500	2000	144	1	9	60	379	12	1	26	15	374
WSB 600	2500	144	1	12	60	505	12	1	35	15	504
WSB 750	3000	144	1	13	60	568	12	1	39	15	562
WSB 1000	3800	144	1	18	60	757	12	1	53	15	763
WSB 1250	5000	144	1	11.0	60.0	475	n/a	n/a	n/a	n/a	n/a
WSB 1500	5678	144	1	13.0	60.0	562	n/a	n/a	n/a	n/a	n/a
WSB 1600	6300	144	1	13.0	60.0	562	n/a	n/a	n/a	n/a	n/a
WSB 1800	7000	144	1	11.5	60.0	497	n/a	n/a	n/a	n/a	n/a

17.3 Sludge Return Settings (Output 4)

Model	Litres Per Day (L/day)	Output 4 - Pump				
		Sludge Removal		operation time		Removal
				6:00	23:59	per day
		Pump	Qty	pulse	pause	
		[L/min]	[-]	[sec]	[Min]	[L/d]
WSB 400	1600	n/a	n/a	n/a	n/a	n/a
WSB 500	2000	n/a	n/a	n/a	n/a	n/a
WSB 600	2500	n/a	n/a	n/a	n/a	n/a
WSB 750	3000	n/a	n/a	n/a	n/a	n/a
WSB 1000	3800	n/a	n/a	n/a	n/a	n/a
WSB 1250	5000	144	1	11.0	60.0	475
WSB 1500	5678	144	1	13.0	60.0	562
WSB 1600	6300	144	1	13.0	60.0	562
WSB 1800	7000	144	1	11.5	60.0	497

17.4 WSB® Phosphorus Precipitation Parameter Settings

For systems which require phosphorus precipitation the followings settings provide the guideline for desired daily dosing. Again, the specific pump model must be considered to ensure the daily dosing is achieved based on each chemical pump models stroke and flow characteristics.

NOTE: These numbers assume that the pump is operating in automatic mode (not controlled by external pulse logic) and the stroke length and ml/Stroke and Stroke Length configuration has been set to achieve the desired total daily dosing as outlined below.

Model	phosphorus precipitation		operation time		Dosing
			06:00 -	23:59	per day
	Chem Pump	Qty	pulse	pause	
	[type]	[-]	[sec]	[Min]	[mL/d]
WSB 400	Concept plus	1	11	30	134
WSB 500	Concept plus	1	13	30	161
WSB 600	Concept plus	1	18	30	214
WSB 750	Concept plus	1	20	30	241
WSB 1000	Concept plus	1	27	30	321
WSB 1250	Concept plus	1	33	30	401
WSB 1500	Concept plus	1	40	30	482
WSB 1600	Concept plus	1	47	30	562
WSB 1800	Concept plus	1	54	30	642

18 IMPORTANT OPERATING INSTRUCTIONS

To ensure the best performance of your WSB® clean wastewater treatment system:
We recommend the following Do's and Don'ts

18.1 Harmful Chemicals

Do Not: Use or discard any of the following products in the sinks or toilets of your residence:

- Caustic products used to unclog pipes (Mr. PlummerTM Dr. Plummer™, Drano Liquid™, etc.)
- Petroleum based products, paints, solvents etc.
- Pesticides
- Back Wash of a water softener system
- Large quantities of bleaching products
- Oil and grease (engine, cooking, etc.)
- Wax and resins
- Septic tank treatment products
- All non-biodegradable objects (cigarette buts, sanitary napkins, pads etc.)

18.2 Do Not

Please respect manufacturer's recommendations for usage of domestic cleaning products and follow the do's and don'ts outlined below to ensure proper operation of your system.

Failure to follow these guidelines can result in failure of your system:

- Do not use automatic toilet cleaners
- Do not use a waste disposal unit in the sink (in-sink-erator)
- Do not connect downspouts or storm drains or allow surface water to drain into the system
- Do not enter an access riser – gases can be deadly and lack of oxygen could be fatal
- Do not use special additives designed to 'increase the performance of your system'
- Do not plant trees or shrubs too close to the system lids or disposal bed
- Do not leave interior faucets on to reduce chances of freezing – use insulation to ensure freezing cannot occur
- Do not bury your access openings (lids)
- Do not drive over or near your system or bed

➔ **WARNING:**	Only authorized service personnel are to remove access covers on the WSB® system. Removal by unauthorized personnel may result in death or bodily injury from potentially hazardous gases and waste matter. Please ensure easy access to covers at all times for inspection and/or emergency

18.3 Best Practices

The following Best Practices are very important to ensuring proper operation of your system. Following these requirements will help to ensure years of hastle free operation of your WSB System

DO:

- Familiarize yourself with the location of your system and controls
- As a reference, keep a copy of the layout of your system
- Ensure water is diverted away from your disposal bed
- Budget to pump your tank on a regular basis (recommended between 2-5 years)
- Repair any leaking plumbing fixtures as soon as possible
- Replace old toilets with low flush or dual flush toilets
- Clean the lint filter on the washing machine on a regular basis
- Keep the access lids accessible and brought to grade at all times
- File the system maintenance cards (and service calls) to help keep accurate records
- Try to reduce the amount of wastewater that your system needs to treat (install high efficiency water saving products wherever possible)
- Use your garbage can to dispose of substances that can be harmful to your treatment system
- Collect grease in a container and dispose with your trash
- Conserve water and repair leaky toilets in order to not hydraulically overload your system

19 WSB® CLEAN SYSTEM SERVICE POLICY

All WSB® lean NSF/ANSI Standard 40, Class 1 certified wastewater treatment systems have an initial 2 year service agreement (two calls per year) included with the system's initial purchase price. To find out who the service provider for your system is please refer to the labels on the main control panel.

19.1 Extended Service Policy

An Extended Service Policy is available and may be purchased through RH2O North America. The extended service policy will provide you with the same piece of mind as the initial service policy included with the system and will ensure that your system is properly maintained and serviced in the event of a failure.

20 LIMITED WARRANTY

1. Preamble
RH2O North America Inc. (hereinafter called "RH2O") is proud to offer its customers with the following warranty. For the purposes of this Warranty Certificate, the term "Customer" shall mean the person(s) who are the owner(s) of the property where a WSB® clean system is installed and the term "Successors" means any other person entitled to exercise the customer's rights.

2. Nature of the Warranty
The purchase of a WSB® clean system includes a free inspection of all components during the first year following installation by an authorized representative of RH2O. All of the WSB® clean system components are warranted for a period of two years from the installation date. RH2O warrants the non-deterioration of its media for a period of twenty years, from the installation date. Components repaired or replaced under the two year warranty will be covered under warranty up to the end of the original two year warranty period.

3. Notification Obligations
The WSB® clean system includes an alarm system which works in conjunction with the control panel for the system. The control panel detects any problems related to the system and will sound the alarm. If the alarm goes off, the customer must immediately contact RH2O by written notification. The customer must also notify RH2O of any apparent anomaly, irregularity, and/or malfunction of the WSB® clean system. Failure to due do so within a reasonable timeframe may result in this Warranty Certificate becoming null and void. The Customer must provide access to the system at all times to RH2O or its representative.

4. Exclusions
The following damages or problems are excluded from the Warranty:

(a) Any damage or problem caused by an unexpected event or "Act-of-God", such as, and without limiting the generality of the foregoing: earthquakes, floods, hurricanes, landslides, explosions
(b) Any damage or problem caused by the fault or act of a third party;
(c) Any damage or problem arising from any modification, correction or addition carried out by a person not authorized by RH2O or without its approval;
(d) Any damage or problem, if it is proven that the WSB® clean system was not used according to the terms and conditions stipulated in the Owners Manual;
(e) Any damage or problem, if it is proven that the system was not used and maintained in compliance with the existing regulations;
(f) Any damage or problem, caused by fault or action of the Customer or the Customer's Successors including, but without limiting the generality of the foregoing, refusal to allow access to the system for inspection purposes.

5. Particular Exclusions
It is further expressly understood that the Customer may not carry out or cause to be carried out any repair, maintenance and/or verification of the purchased WSB® clean system, or attempt to carry out any work whatsoever or to apply any corrective measures whatsoever to the aforementioned systems (except for periodic pumping of the sludge) without written consent from RH2O. Failure to do so

may result in this warranty becoming null and void.

6. Indemnities and Damages
The liability and obligations of RH2O under this Warranty Certificate for corrective measures and/or means of correcting any problems, of which it is duly advised, shall be limited to the replacement of any component of the WSB® clean system, in compliance with sections 3 and 4 herein.

7. Damage Limitations
RH2O may in no way be held liable for any other damage sustained by the Customer. RH2O compensation or indemnification obligation shall be limited to the provisions under section 6 of this Warranty Certificate. RH2O does not assume any liability for personal injury or property damage caused by the use or misuse of the WSB® clean system. RH2O shall not, in any event, be liable for special, incidental, indirect, or consequential damages. RH2O liability shall, in all instances, be limited to the provisions under section 6 of this Warranty Certificate and will end upon expiration of the applicable Warranty Certification period.

8. Ownership Transfer
In the event of transfer of ownership, sale, reassignment or disposition in any other way of the Customer's property to a third party, this Warranty Certificate shall continue to apply on the express condition that the new owner confirms in writing to RH2O that he is the new owner of the property, is cognizant of the Warranty Certificate and accepts its terms and conditions. The Customer agrees to forward, to the buyer or the buyers successors, the Warranty Certificate, as well as the Owner's Manual. The Customer's Successors must complete the Ownership

Transfer Form and return it to RH2O in order for the ownership transfer to be complete and the Warranty Certificate to be valid.

9. Inspection
The Customer or the Customer's Successors shall allow RH2O or its duly authorized representative to perform all necessary monitoring and/or inspection measures, when deemed necessary, for the assessment and validly of this Warranty Certificate. If the Customer or Customers Successors notify RH2O of an alleged defect or malfunction of the WSB® clean and that after inspection, it is found that no such defect or malfunction is revealed, or, that the warranty is excluded or doesn't apply, a minimum charge of $100.00 plus direct expenses will be invoiced for the cost of such inspection.

10. Interpretation
The terms of this Warranty Certificate shall be interpreted and governed by the law in force in the Province of Ontario and the provisions of this Warranty.

11. Priority of the Warranty Certificate
This warranty supersedes any contract or understanding, written or verbal, entered into between the Customer and RH2O. In case of any contradiction between this warranty and other documents issued by RH2O, this warranty shall prevail.

12. Jurisdiction
The parties acknowledge that any litigation regarding the present Warranty Certificate must be introduced in the judicial district of Toronto, Ontario.

NOTES