MasterScreen™ Reference Manual

PULMAC Systems
Productivity Through Pulp Quality Data

Pulmac Systems International
35 Dorset Street, Ln # 201
Williston, Vermont 0549 5USA
www.Pulmac.com
TEL (802)-223-2663
FAX (802)-223-2664
E-MAIL: info@pulmac.com

Part Number MS7-33-B4
Revision 3.1
November 2019

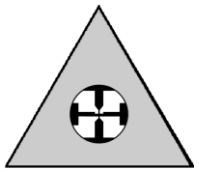
© 2015 - 2019 Pulmac Systems International Inc.

SPECIAL NOTES

This Reference Manual contains three special types of safety instructions that are highlighted so that they will stand out for the manual user. These instructions are labeled WARNING, CAUTION, or TIP.

WARNING
Indicates danger to the operator. Instructions must be followed to avoid possible injury.

CAUTION
Indicates special attention to avoid damage to the equipment.



TIP
Indicates suggested practices and procedures to ensure repeatable test results.

This page is left intentionally blank.

TABLE OF CONTENTS

This page is left intentionally blank.

1. MANAGER GUIDE

1.0 Introduction

1.0.1 Purpose

Congratulations on your acquisition of MasterScreen Technology. Your organization now possesses a tool to monitor and control fiber quality while producing it in the most cost-effective manner. The MasterScreen Testing System will rapidly and repeatably separate contaminants from fiber to comment on any process changes. Ideally you will minimize contaminants within window of quality then optimize operating conditions obtain least amount of contaminants most cost effectively.

This reference manual provides managers, equipment operators, and service Technicians with the background and instructions necessary to put the MasterScreen Testing System to work and to keep it reliably producing rapid and repeatable test results.

1.0.2 Manual Organization

This manual is designed for easy reference by Managers, operators, and service technicians. Part 1 provides information for technology managers. Part 2 for installation, routine maintenance and troubleshooting procedures that ensure continued reliable operation. Part 3 gives a step by step explanation of how to prepare and process samples. It also details recommended daily care and cleaning tasks.

1.0.3 General Description

The MasterScreen Testing System enables users to rapidly and repeatably determine relative pulp quality of a representative sample drawn along the fiber or stock line.

Putting the MasterScreen Testing System to work Requires establishing a routine program to collect, prepare, and process pulp charges to establish base line so that efficiency of contaminant removal, as well as expected variation, can be established.

The steps required to generate rapid and reliable pulp quality data include obtaining a representative pulp sample and disintegrating if required.

Disintegrated pulp is then poured into the MasterScreen Tester for screening. Contaminants are either dried and weighed or a display is generated for scanning or visual analysis.

1.0.4 Training Requirement

Each step in this test method is simple and intuitive. However some basic training, to ensure reliable sample preparation, processing, and equipment maintenance is necessary.

1.1 Testing Goals

MasterScreen™ Testing is applied to board production in accordance with one or more of five testing goals.

1. Troubleshooting: quickly isolate and adjust the controllable variable that is causing pulp quality to move outside the desired target.

2. Diagnosis: Isolate relevant controllable variables, like digester time, refining energy, screening, and cleaning to determine benchmarks along with acceptable variability. (establishing a quality window and most economic recipe to get and stay there)

3. Optimization: Continue to optimize controllable variables in a continuing effort to reduce costs while maintaining acceptable quality pulp for final product quality and operational efficiencies.

4. Control: Maintaining pulp quality within a given quality window as process conditions.

5. Process Innovation: Using deeper process awareness to spur innovation in process design.

1.2 Program Management

1.2.1 Sample Collection

A representative sample should be taken after the Refiner. Normally a sample can only be taken after The cyclone, after wax and resin addition, on the conveyer. Ideally a sample would be taken as close to a single refiner as possible. Testing blended fiber generates test results that are more difficult to interpret.

1.2.2 Fiber Charge Preparation

A known moisture free equivalent of fiber must be measured for accurate test results. To accomplish this as quickly and accurately as possible, it is recommended that:
2 grams air dry is weighed and processed.
(the actual moisture free weight will be calculated using solids content of a second, representative sample.)
Take the two grams of air dry fiber, and place in the mixer with½ liter of hot water and mix for 10-20 seconds.

1.2.3 Screening

The mixed fiber charge is then poured into the activated MasterScreen Tester for fractionation. If properly mixed there should be no floating fiber or any fiber remaining stuck to the feed tank. After 5-6 minutes the coarse fiber/shive fraction will be deposited in either the reject collection cup for weighing or onto a 20.5 cm in diameter filter paper for visual analysis.

1.2.4 Percent Weight

The coarse fiber/shive fraction in the reject collection cup is balled up and removed to place into the speed dryer. After 2 minutes at 150 degrees C, remove the dried ball and place in the moisture balance in weigh mode. Weigh moisture free weight and obtain percent by dividing its weight by the moisture free weight of the original sample. Use the following equation:

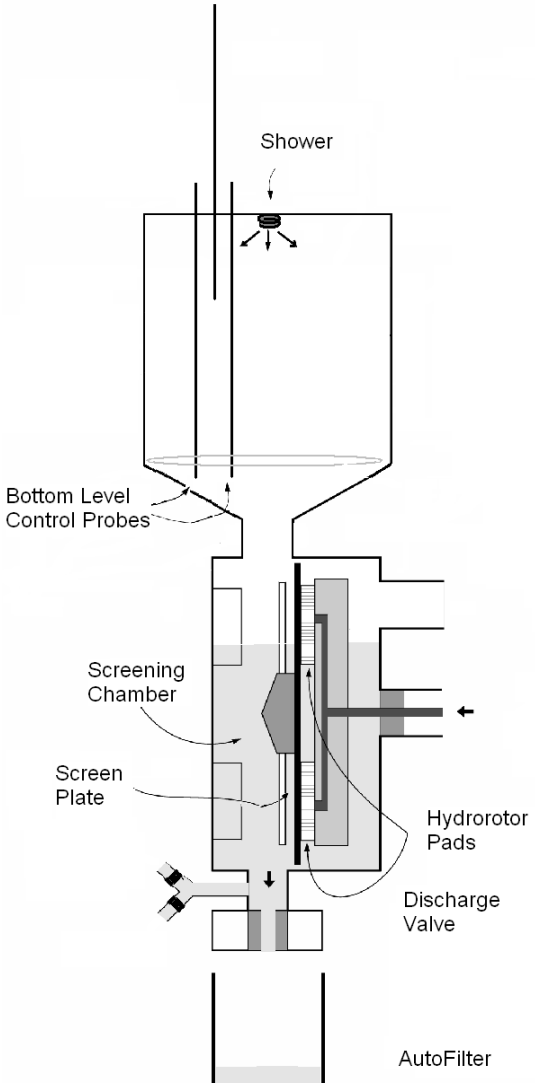
$$\frac{\text{Moisture free weight of rejected coarse fiber/shive fraction}}{\text{Air dry weight sample weight} * \text{percent solids}}$$

1.2.5 Display

Alternatively, the coarse fiber/shive fraction can be deposited on a 22.5cm in diameter black filter paper. This display can be interpreted in a similar manner as the “scoop and look” to see other qualitative characteristics like bark, bird seed, chop, etc. Displays also support the operator confidence in the new test results.

1.2.6 Routine Maintenance

In order to ensure the MasterScreen™ Testing System continues to operate reliably and repeatably, preventative maintenance procedures should be implemented right away. The system should have weekly and monthly cleaning as indicated on the front of the MasterScreen™ Tester. In addition, annual inspection by a factory trained representative Is recommended.



1.2.7 Reference Fiber Program

A reference pulp program serves to monitor operator and test equipment repeatability. Reject percent numbers, of a standard fiber charge drawn from a bag of reference pulp supply, are regularly generated and plotted on a control chart. Any Deviation greater than 5% from the average Indicates that the test procedure is not being Followed precisely enough or the that some Component of the MasterScreen™ Testing System Needs servicing.

Establishing a Reference Fiber Program

1. Obtain 250 grams of fiber.
2. Place 200g in one dark colored plastic zip lock bag and 50g in another.
3. Process this fiber 10 times to establish the average test result and control limits.
4. Generate a control chart and process reference pulp daily to make sure test results fall within the control limits.
5. When the 200g bag is empty, generate a new 200g bag of reference fiber making sure that the same results are being generated on the new fiber as is generated on the remaining 50g bag of fiber.

2. OPERATORS GUIDE

2.1 Safety Precautions

Never attempt to install or repair the Tester with electrical circuitry energized. Ensure power is NOT connected during installation or maintenance operations.

Ensure that all electrical connections are made in accordance with local and national electrical codes.

Never work on the Testing equipment when wearing rings, wrist watches, necklaces, or other types of jewelry that may get caught in mechanical assemblies.

Never connect the Tester modules to the power supply using an electrical extension cord.

Use safety glasses when installing the Tester or performing maintenance operations.

Do not operate the Tester functions or perform installation or maintenance procedures without wearing suitable footwear.

Do not operate the Tester functions or perform installation or maintenance procedures when wearing loose fitting clothing that may get caught in mechanical assemblies.

Maintain the work area surrounding the Tester to avoid hazards due to slips, trips, or falls.

Never operate Tester equipment without all shields and guards in place.

Properly maintain Tester equipment to ensure efficient and safe operation. NEVER use solvents to clean acrylic parts such as Feed Tank, Collection Tube and face plate, or equipment damage will occur. PULMAC recommends mild detergents for this purpose.

Never operate the Tester functions without giving the task your full attention.

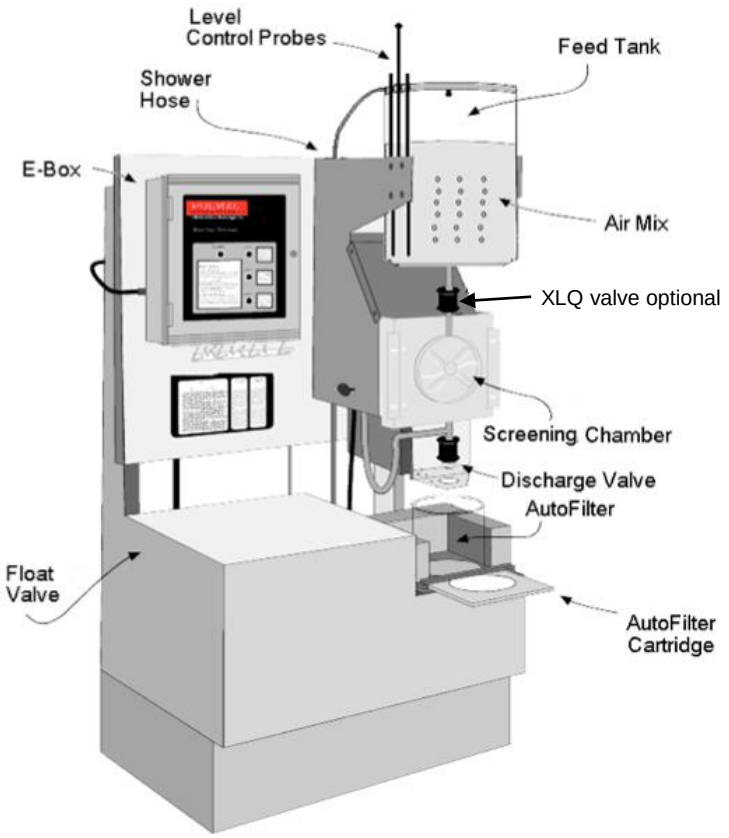
Electrical circuits providing power to the Tester should be breaker and GFI protected.

2.2 General Description

2.2.1 Equipment

The MasterScreen™ Tester is an automated, high flow rate, low consistency screening device that establishes rigidly controlled screening conditions. With its precision laser-cut screen plate, the tester automatically screens and collects coarse fiber and shives for display or weight analysis.

The precision and reliability of the tester has established it as an industry standard for high frequency sample screening.

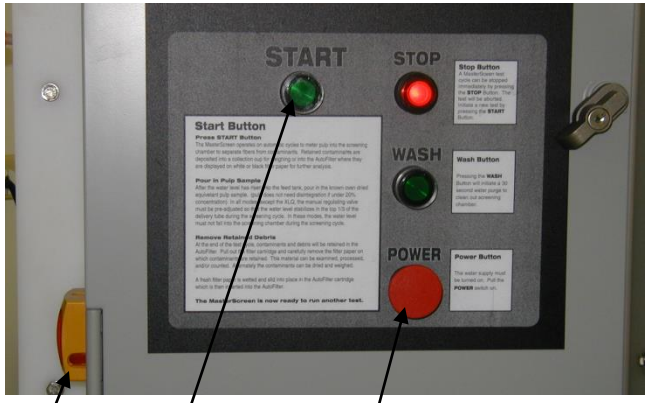


2.3 Operating Test procedures

2.3.1 Test Procedure

The MasterScreen™ Tester incorporates design features that make its operation safe and simple. To run a test perform the following steps:

1. Turn on Master Power Switch and then pull the system Power Mushroom out.
1. Make sure water supply to tester is open.
2. Make sure water storage tank is full.
3. Make sure AutoFilter is enabled and air is supplied to the whole tester.
4. Either load the AutoFilter with filter paper or locate reject collection cup and manually put AutoFilter collection tube down.
5. Press the START button.
6. Wait until water level rises to the bottom level control probes, then pour in sample charge.
7. When test is complete, remove the retained debris from the reject collection cup or slide out the AutoFilter cartridge and remove filter paper with display.
8. Analyze retained debris by weighing, visual analysis, or scanning.



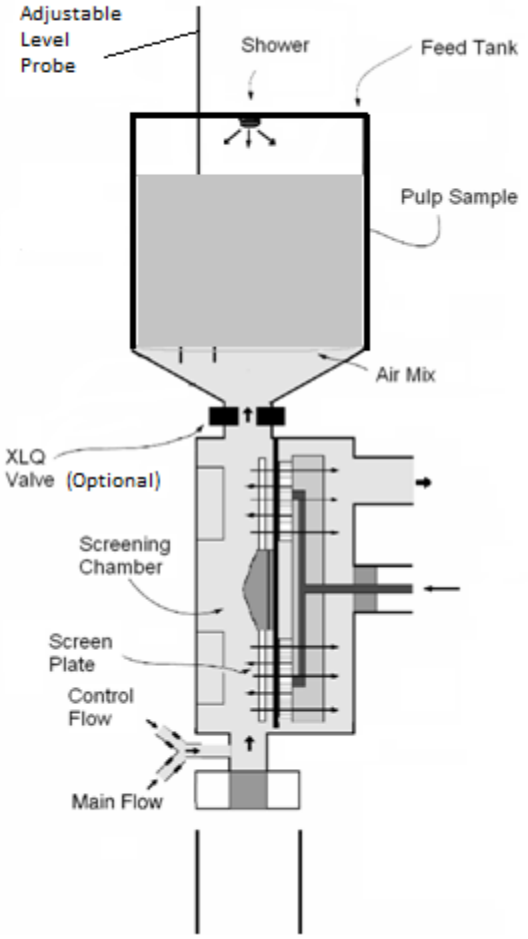
2.4 Operating Description

2.4.1 Test Cycle

The MasterScreen™ Tester will provide fiber quality information, from prepared samples, in a four-sequence test cycle.

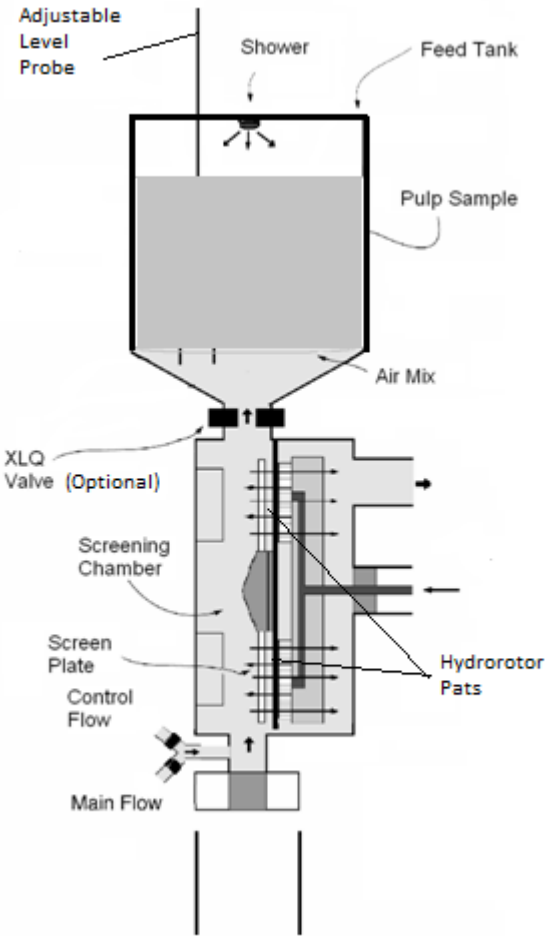
1. Up Flow Mixing

When the Start button is activated, water is pumped from the water storage tank, through the screening chamber, to the feed tank. As the water level rises to the Bottom Level Probes, the sample is poured into the feed tank and the air mix will begin. There is no further need for operator involvement until the test cycle is complete. The water level will continue to rise until it reaches the high-level probe.



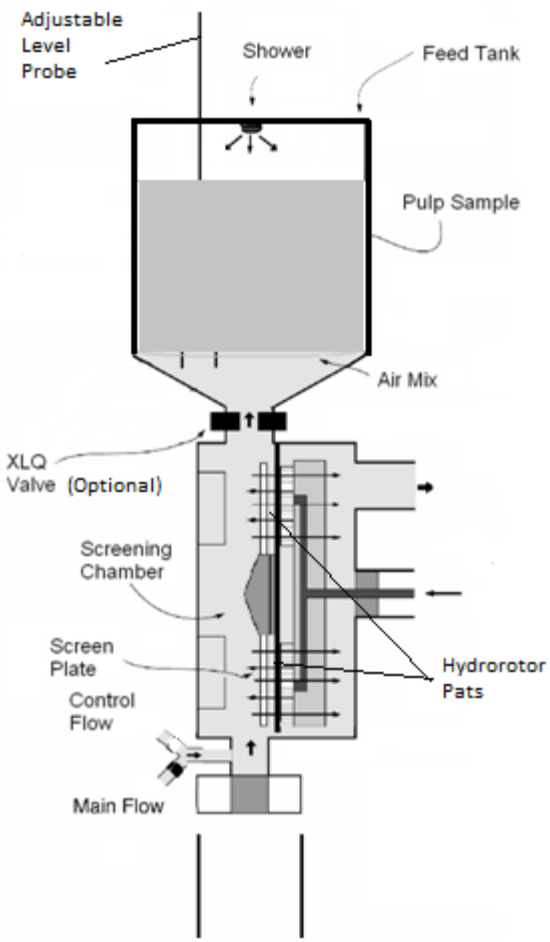
- **Delivery**

Once the high-level probe is activated, delivery begins. The mixed, diluted slurry drops from the feed tank to the screening chamber. The rotating agitator bar disburses fiber flocs. Water back-flushes the screen plate through the hydrorotor pads. Depending on mode, the flow control valve cycles to regulate dilution. The overhead shower washes fiber into the screening chamber from the sides of the feed tank. Delivery ends once the water level reaches the bottom probes.



- **Final Screening**

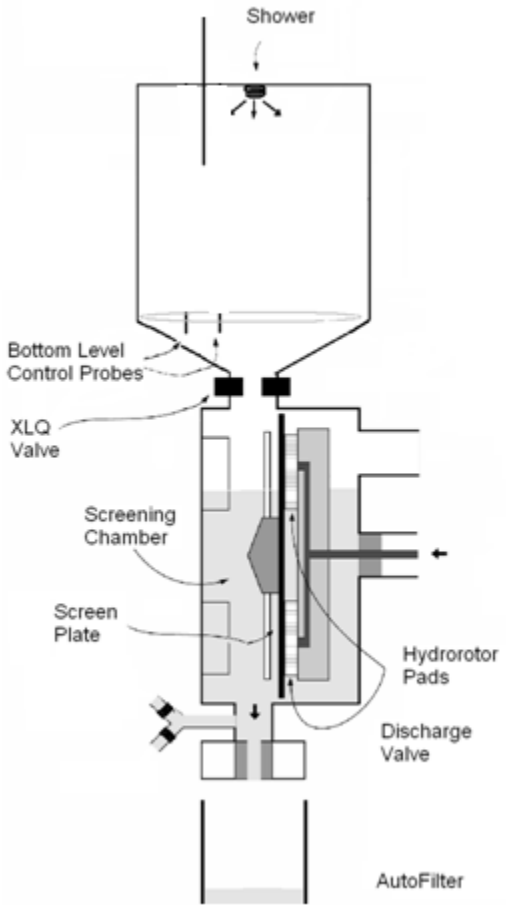
Water continues to back flush through the hydrorotor pads and the flow control valve remains open to maintain a constant water level in the delivery tube between the feed tank and screening chamber. Depending on mode, final screening is between 90-180 seconds.



- **Collection**

The Discharge valve opens to flush retained debris into the reject collection cup or AutoFilter. When the final 30 second flush period is over, the debris in the collection cup is available for weighing or the AutoFilter program takes over.

The AutoFilter collection tube descends and seals, once the water level descends below the bottom probes. After collection stage is completed, air mix is activated, in the AutoFilter collection tube, for 5 seconds. The vacuum is activated to filter water through the filter paper. After 20 seconds the collection tube pops up and the AutoFilter cartridge is made available to slide out for access of the debris display on the filter paper.

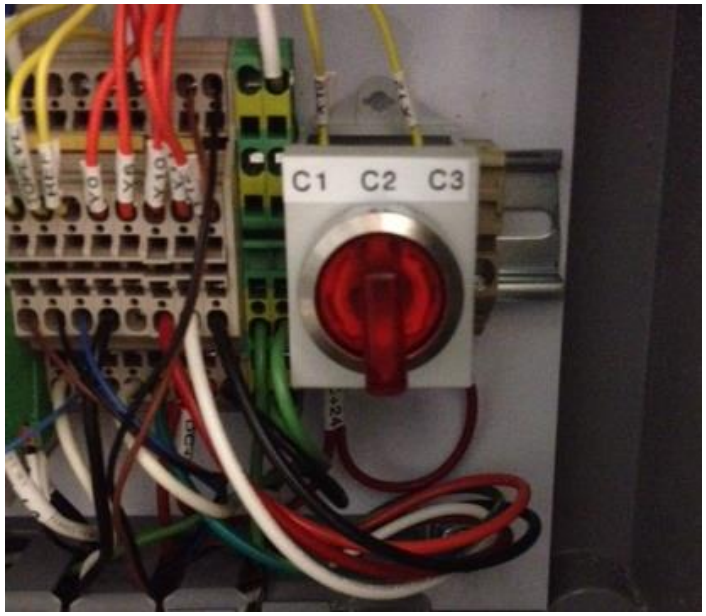


2.5 Operating Settings

2.5.1 Test Cycle Modes

The MasterScreen mode selection is accessed inside the control cabinet. And can be set to one of three modes. This should only be done by qualified personnel:

C1: Shive Analyser Mode
C2: MasterScreen Mode (default)
C3: XLQ (Optional)



2.5.1 Test Cycle Modes

The Pulmac Master Screen test will take between five and fifteen minutes to complete, depending upon sample size and the test cycle that is selected. There are three test options: **Cycle 1** , **Cycle 2**, and **Cycle 3**. Cycle 1 is selected for smaller sample sizes (5 to 20 g ode), Cycle 2 is appropriate for sample sizes of up to 100 g ode and Cycle 3 can also screen samples of up to 100 g ode). Cycle selection will be determined after the appropriate screen plate slit size and sample size have been identified. Screen plate slit size is, to a large extent, determined by the dimensional characteristic of the contaminates whose levels must be monitored. Sample size is determined by the weight necessary to produce repeatable results free of 'good' fiber.

In all cycle options, the test cycle completes in four sequences:

1. **Upflow Mixing,**
2. **Delivery,**
3. **Final Screening, and**
4. **Collection.**

Test Cycle 1

This test cycle is appropriate for smaller sample sizes of up to 20 g ode. It will complete in about five minutes. **The cycle selector switch must be set to Cycle 1 (Shive Analyzer Mode).**

Upflow Mixing : The upflow mixing sequence should complete in about 30 seconds. When the green Start button is pressed, the pump and agitator motors are immediately energized. Water enters the screening chamber from the overhead shower and the hydrorotor. After a brief delay, the control solenoid valve opens followed shortly afterwards by the main solenoid valve. These valves direct water into the screening chamber from below. When the water level rises into the Feed Tank, the operator pours the pulp sample into the Feed Tank. After the water level reaches the adjustable top level sensor, the air mix is activated and the main and control solenoids shut off.

Delivery : With the main and control solenoid valves off, the slurry level descends. The rate of descent will depend on the slurry consistency and the screening characteristic of the pulp combined with screen plate size. When the water level drops past the lower sensors, the air mix shuts off and the control solenoid valve opens.

Test Cycle 1, continued

Final Screening : In preparation for the Collection sequence, the auto filter collection tube (if the auto filter is present) lowers at the start of the Final Screening sequence. The open control solenoid valve allows dilution water to enter the screening chamber. The flow rate is regulated by the flow control needle valve to allow just enough water into the screening chamber to keep the water level constant within the 2 cm length of tygon delivery tube. It is important to keep the water at this level to prevent air from entering the screening chamber during this sequence. During this sequence all remaining accepts quality material passes through the screen (i.e. virtually all material that can pass, will pass through the screen). This sequence lasts 120 seconds.

Collection : The control solenoid valve closes and the discharge valve opens to start the collection sequence. Rejects are washed by the hydrorotor flow and the shower spray out of the screening chamber and into the collection cup, if the auto filter is not being used or the collection tube if it is. If the collection cup is used, Test Cycle 1 ends when the pump and agitator motors shut off. If the auto filter is being used, Test Cycle 1 ends after the collection tube air mix mixes the rejects in the collec- tion tube, the vacuum draws the water out, and the collection tube rises, releasing the auto filter car- tridge for removal and presentation of results.

Test Cycle 2

This test cycle is appropriate for sample sizes of up to 100 gm ode. It will complete in about 8-15minutes. **The cycle selector switch must be set to Cycle 2 (MasterScreen Mode).**

Upflow Mixing : The upflow mixing sequence should complete in about 30 seconds. When the green Start button is pressed, the pump and agitator motors are immediately energized. Water enters the screening chamber from the overhead shower and the hydrorotor. After a brief delay, the control solenoid valve opens followed shortly afterwards by the main solenoid valve. These valves direct water into the screening chamber from below. When the water level rises into the Feed Tank, the operator pours the pulp sample into the Feed Tank. After the water level reaches the adjustable top level sensor, the air mix is activated and the main and control solenoids shut off.

Delivery : After 4 seconds, the control solenoid valve opens for 15 seconds. This loop of closing for 4 seconds and opening for 15 seconds repeats until the slurry descends past the bottom level sensors.

Final Screening: The Final Screening sequence in Cycle 2 is identical to that of Cycle 1.

Collection : The Collection sequence in Cycle 2 is identical to that of Cycle 1.

Test Cycle 3 (XLQ Optional)

This test cycle is used for more difficult screening applications of up to 100G ode. A time based delivery allows 4 seconds of sample to enter the screening chamber at a time, followed by 15 seconds of screening until the entire sample has been delivered into the screening chamber. The delivery sequence in this cycle will complete in 10 to 20 minutes. **The cycle selector switch must be set to Cycle 3 (XLQ Mode).**

Upflow Mixing : The upflow mixing sequence should complete in about 30 seconds. When the green Start button is pressed, the pump and agitator motors are immediately energized. Water enters the screening chamber from the overhead shower and the hydrorotor. After a brief delay, the control and- main solenoid valves open. These valves direct water into the screening chamber from below. The water level rises up into the feed tank and the operator pours in the pulp slurry. After the water level reaches the adjustable top level sensor, the air mix is activated and the control and main solenoid valves shut off.

Delivery : This cycle allows only 4 seconds of sample to enter the screening chamber, for every 15 seconds of screening time. When the control solenoid valve is open, the feed tank and the shower cut-off valves are closed. Four seconds after the top sensor is reached, the control solenoid valve opens for 15 seconds. It then closes again for 4 seconds. This closed for 4 seconds, open for 15 control loop repeats until the lower sensors are reached. Shortly after the water level drops past the lower sensors, the air mix shuts off and the control solenoid valve remains open.

Final Screening: Thereafter, the Final Screening sequence in Cycle 3 is identical to that

2.5.2 Setting High Level Probe

The MasterScreen™ Tester high level probe can be adjusted to optimize the relationship between test time and sample screenabilty.

Lowering the probe will reduce test time. Raising the probe will increase dilution to control threshold pulp concentration in the screening chamber.

Feed Tank

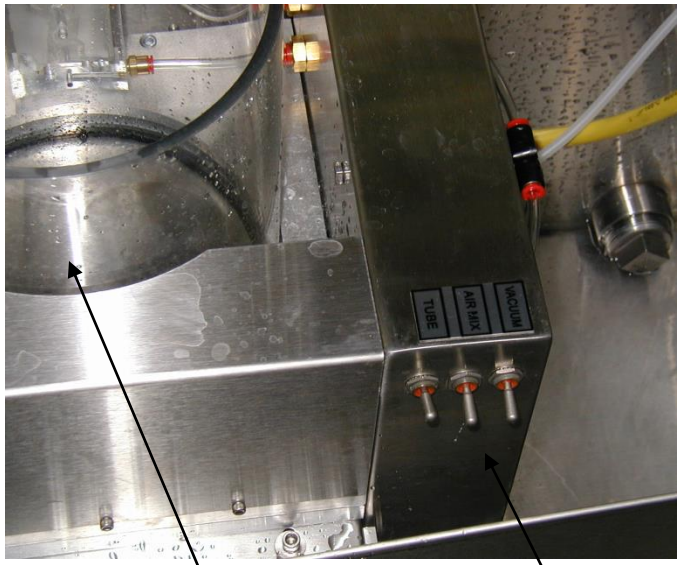
2.6 AutoFilter

2.6.1 Manual Operation

The AutoFilter is controlled automatically when running a test. However it can be used as a general purpose filtering device without running a test. To operate the AutoFilter manually:

1. Slide a wet filter paper into the AutoFilter Cartridge and tap out any air bubbles. Then load into AutoFilter.
2. Activate the Tube Switch to lower the Collection Tube onto the AutoFilter Cartridge and then pour in the slurry.
3. Activate the Air Switch to mix the slurry. After 5-10 seconds, deactivate the Air Switch and let slurry settle for five seconds.
4. Active the Vacuum Switch to draw the water from Collection Tube and deactivate it when filtration is complete.
5. Deactivate the Tube Switch to raise the Collection Tube, then remove the AutoFilter Cartridge.
6. Remove the filter paper, and rinse clean the cartridge before returning it to its location in the AutoFilter.

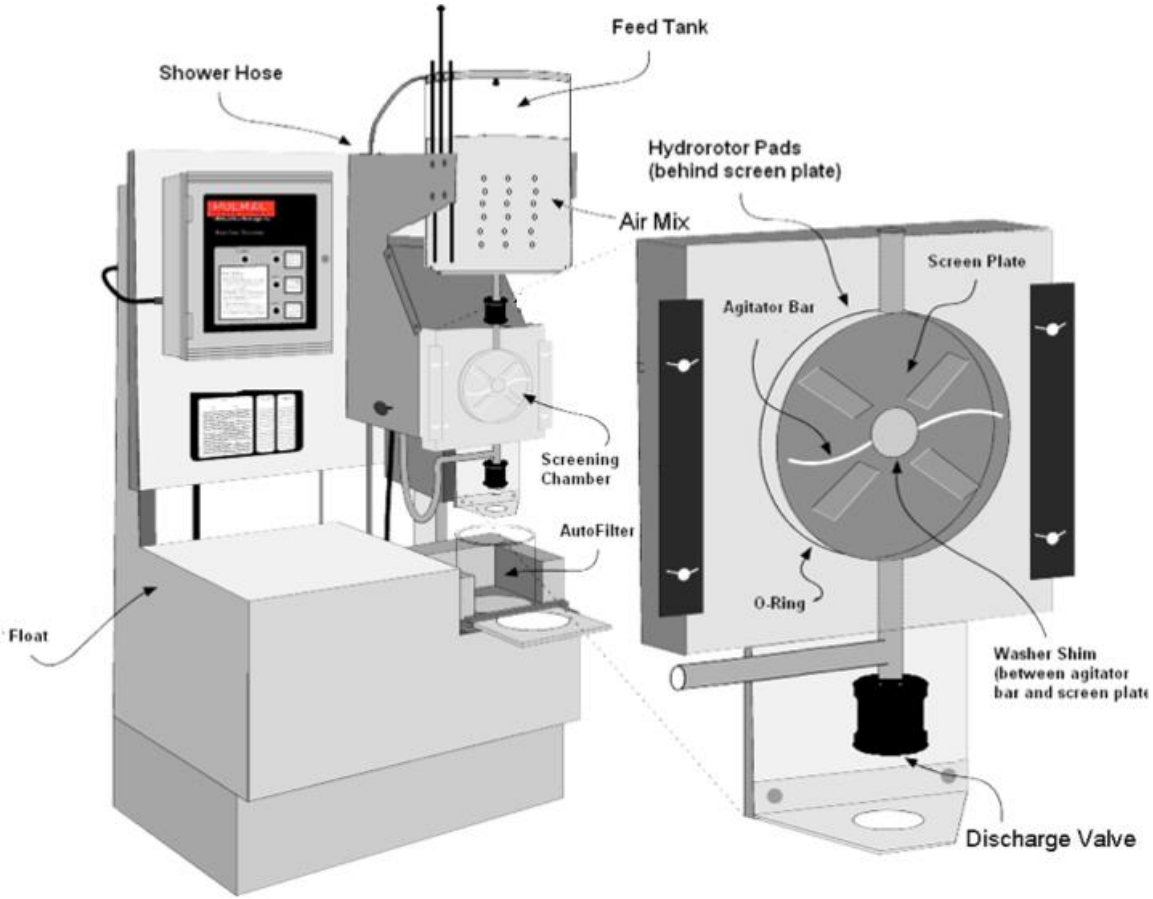
AutoFilter



Collection Tube

Override Switches

3. SERVICE GUIDE



3.0 Safety Precautions

Do not install or repair the MasterScreen Tester or components with electrical circuitry energized. Ensure power is not connected during installation or maintenance operations.

Ensure that all electrical connections are made in accordance with local and national electrical codes.

Never connect the MasterScreen™ Tester to the power supply using an electrical extension cord.

Use safety glasses when installing the MasterScreen™ Tester, or performing maintenance operations.

Do not operate the MasterScreen™ Tester or perform installation or maintenance procedures without wearing suitable footwear.

Do not operate the MasterScreen™ Tester or perform installation or maintenance when wearing loose fitting clothing that may get caught in mechanical assemblies.

Maintain the work area surrounding the MasterScreen™ Tester to avoid hazards due to slips, trips, or falls. Rubber or grated mats are recommended.

Never operate the MasterScreen™ Tester without all shields and guards in place.

Properly maintain the MasterScreen™ Tester to ensure efficient and safe operation. Never use solvents to clean acrylic parts or equipment damage will occur.

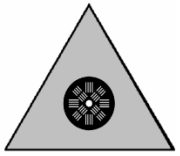
Never operate the MasterScreen™ Tester without giving the task your full attention.

SPECIAL SYMBOLS

The MasterScreen™ Testing System Reference Manual contains three special types of safety instructions that are highlighted so that they will stand out for the manual user. These instructions are labeled WARNING, CAUTION, or TIP.

WARNING
Indicates danger to the operator. Instructions must be followed to avoid possible injury.

CAUTION
Indicates special attention to avoid damage to the equipment.



TIP
Indicates suggested practices and procedures to ensure repeatable test results.

3.1 Installation Instructions

Before installing the MasterScreen™ Testing System, a proper site must be selected that considers the Following environment, space, and service requirements.

A. Environment

The MasterScreen™ Testing System must be located in an environment free of corrosive gases. Electronics are protected by a rain-tight NEMA type 4X enclosure.

B. Space Requirements

Tester H78” x W37” x D33” (200 x 95 x 85cm)

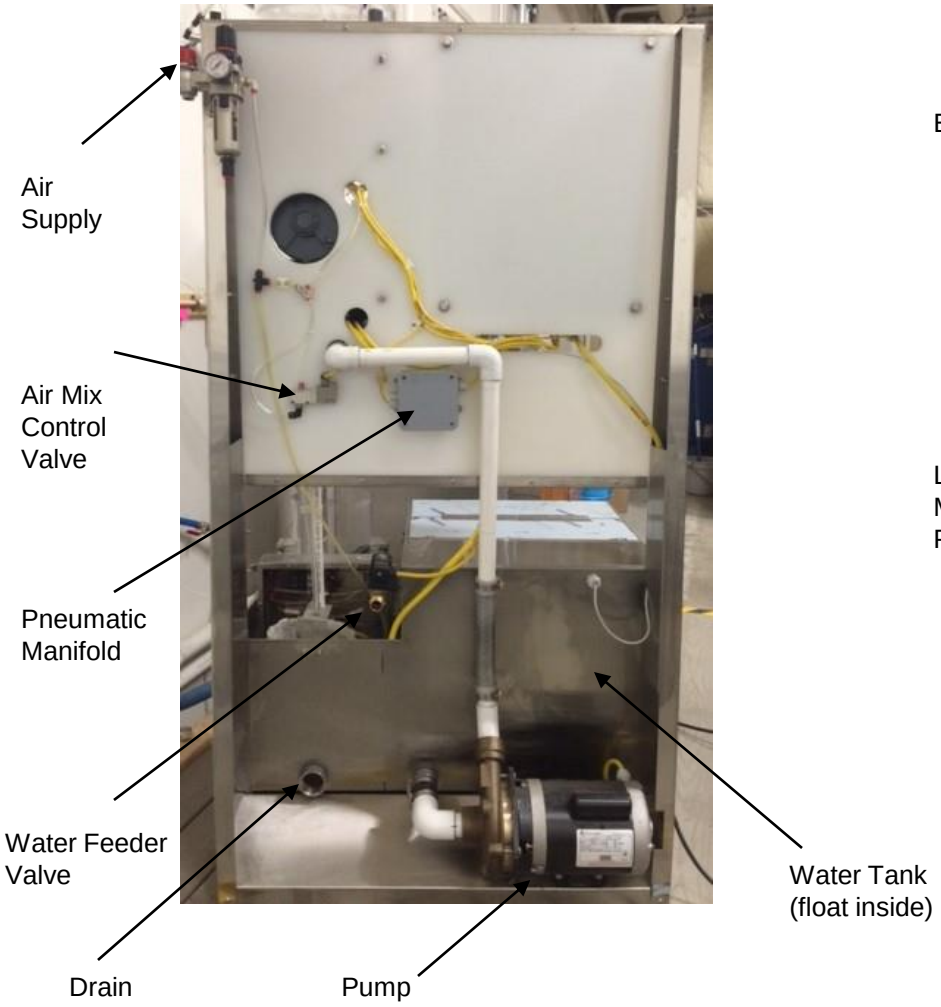
C. Service Requirements

1. Water – 25 micron filtered, potable water, 8 gallons/min (32 liters/min). Cannot be demineralized or distilled as conductivity level sensors may not function properly. Water supply requires a ¾ “ NPT mail fitting.

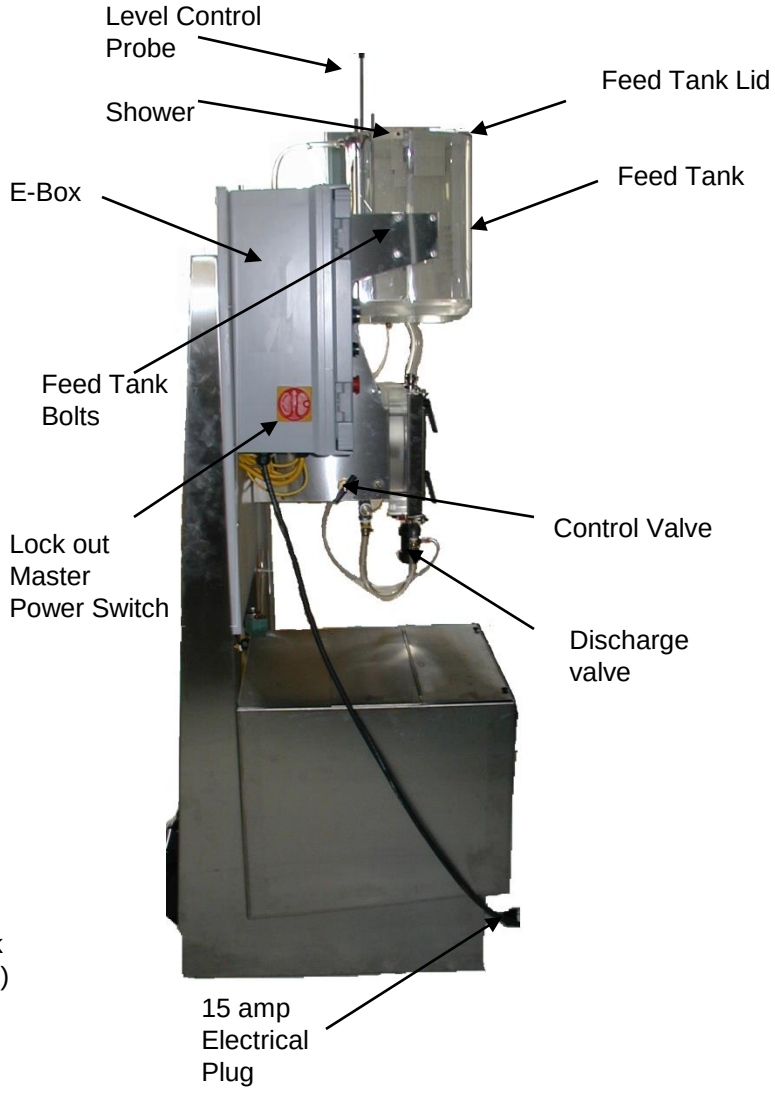
2. Electricity – dedicated 20-amp circuit for 120V 50/60hz or 10 amp for 220V 50/60hz. No extension cord.

3. Waste Drain – must handle discharged fiber. Minimum of 1 ½” NPT male fitting . Must discharge to floor drain.

4. Compressed Air – 10 CFM at a minimum of 60 psi (4.5 l/sec @ 4 bar) Air supply requires a ¼” NPT male fitting.



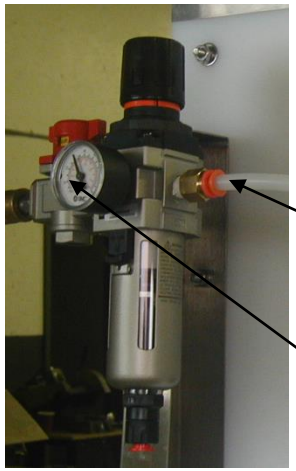
Rear View



Left Side View

3.1.1 Installation Instructions

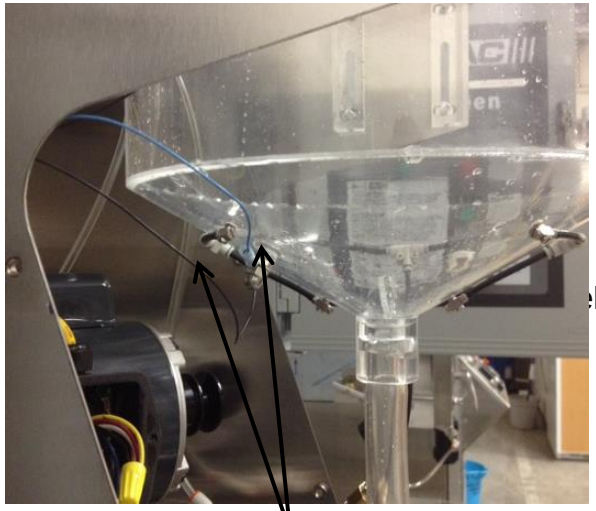
1. Remove Water Tank cover and take out box with accessories.
2. Make sure Water Tank is clean and no packing material or other foreign material remains.
3. Put back and secure Water Tank Cover
4. Install the Air Filter/Regulator to back, upper, right side as shown in picture on preceding page.
   a. Secure using supplied fittings.
   b. Connect tube from manifold to regulator
   c. Connect compressed air (4 bar minimum) to the ¼" NPT fitting on the shut-off valve.
   d. Set regulator to 50 psi.
5. Install Feed Tank using the 8 bolts supplied. Orient so the probes are to the back.
   a. Tighten bolts until lock washers are compressed.
   b. Attach shower hose to barb and tighten hose clamp
   c. Attach the bottom probe ring terminals to the two lower feed tank connectors. Attach the upper level Probe spade terminal to the upper probe set screw.
   d. Adjust ithe upper control probe to appropriate setting.



Manifold to regulator tube

Air regulator gauge

Feed Tank

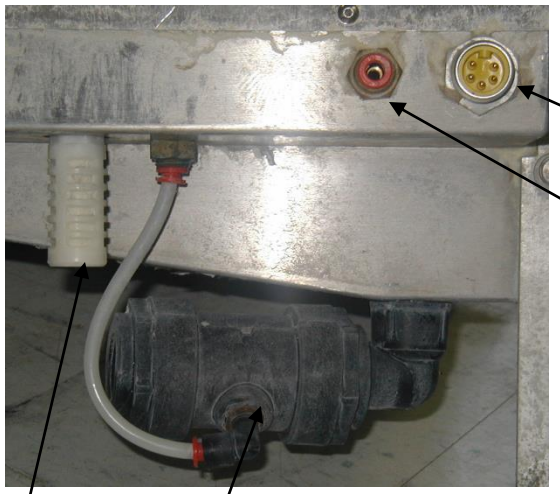


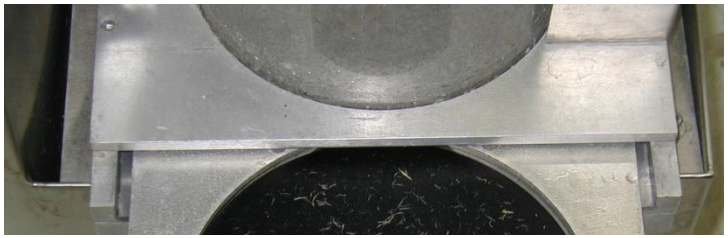
lectrical

Level Control
Electrical connection

6. Remove the tape on the top of the face plate (just below feed tank) and connect the delivery tube to the Feed Tank and the screening chamber. Both connections are slide fits.
7. Connect the green wire to the middle probe connection and the black and white or Brown and blue wires to the left and right side.
8. Make sure AutoFilter is properly set in waste tank such that front is over the front lip and yellow quick connect control cable and air tube are secured in the back.
9. Connect filtered potable water supply that is capable of delivering at least 32 liters/minute to the ¾" female NPT fitting on the water feeder valve that is located at the back of the Water Tank.
10. Connect the provided standard electrical plug directly to appropriate electricity. (depending on model. DO NOT use and extension cord.
11. Wedge supplied mixer below the electrical box until rubber feet are compressed.

Back of AutoFilter





AutoFilter in Waste Tank

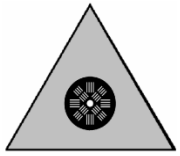
12. When installation is complete, ensure water supply, compressed air valves are open and that either the collection cup or AutoFilter cartridge is in place. Ensure the water tank is full and the appropriate mode is selected. No run a test run using without running sample.

    a. Turn on the Master Power and System Power switches, then press the start button.

    b. Wait until the water level reaches the level sensor probe then make sure the rising water stops l there.

    c. When the water level falls below the bottom level sensors, adjust the Flow Control valve so that during the Screening Sequence, the water level stabilizes half-way up the Delivery Tube and allow the test to complete.

DO NOT use an electrical extension cable to connect to a power source. Use a dedicated circuit.



The system test procedure should be repeated if the supply water temperature changes significantly or another slot sized screen plate is used.

Make sure Water Tank is full before starting a test.

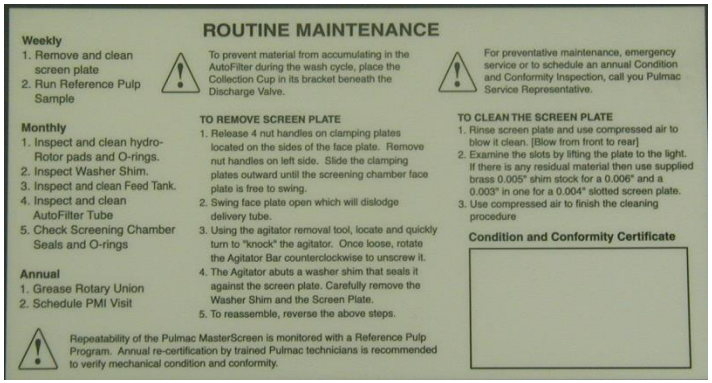
3.2 Routine Maintenance

Properly implemented routine maintenance procedures will ensure reliable equipment operation for long periods of time without the need of additional servicing.

3.2.1 Routine Maintenance Schedule

Under normal working condition, the MasterScreen Tester will require no daily maintenance beyond cleaning if necessary.

The table on Page 49 provides the recommended routine maintenance schedule. These procedures are designed to ensure continuous optimal performance of the Tester on a three-shift basis.



ROUTINE MAINTENANCE

Weekly
1. Remove and clean screen plate
2. Run Reference Pulp Sample

Monthly
1. Inspect and clean hydro-Rotor pads and O-rings.
2. Inspect Washer Shim.
3. Inspect and clean Feed Tank.
4. Inspect and clean AutoFilter Tube
5. Check Screening Chamber Seals and O-rings

Annual
1. Grease Rotary Union
2. Schedule PMI Visit

To prevent material from accumulating in the AutoFilter during the wash cycle, place the Collection Cup in its bracket beneath the Discharge Valve.

TO REMOVE SCREEN PLATE
1. Release 4 nut handles on clamping plates located on the sides of the face plate. Remove nut handles on left side. Slide the clamping plates outward until the screening chamber face plate is free to swing.
2. Swing face plate open which will dislodge delivery tube.
3. Using the agitator removal tool, locate and quickly turn to "knock" the agitator. Once loose, rotate the Agitator Bar counterclockwise to unscrew it.
4. The Agitator abuts a washer shim that seals it against the screen plate. Carefully remove the Washer Shim and the Screen Plate.
5. To reassemble, reverse the above steps.

Repeatability of the Pulmac MasterScreen is monitored with a Reference Pulp Program. Annual re-certification by trained Pulmac technicians is recommended to verify mechanical condition and conformity.

For preventative maintenance, emergency service or to schedule an annual Condition and Conformity Inspection, call you Pulmac Service Representative.

TO CLEAN THE SCREEN PLATE
1. Rinse screen plate and use compressed air to blow it clean. [Blow from front to rear]
2. Examine the slots by lifting the plate to the light. If there is any residual material then use supplied brass 0.005" shim stock for a 0.006" and a 0.003" in one for a 0.004" slotted screen plate.
3. Use compressed air to finish the cleaning procedure

Condition and Conformity Certificate

MasterScreen™ Tester Routine Maintenance Schedule

Task	Frequency	Description
1*	Daily	Inspect and wash screening chamber
2*	Daily	Inspect and clean collection cup
3**	Weekly	Run Standard Reference Fiber
4	Weekly	Remove, inspect, clean screen plate, hydro rotor pads, and washer shim
5	Quarterly	Clean Feed Tank
6	Quarterly	Clean Autofilter Assembly
7	Annually	Check Motor Belt
8	Annually	Grease Rotary Union

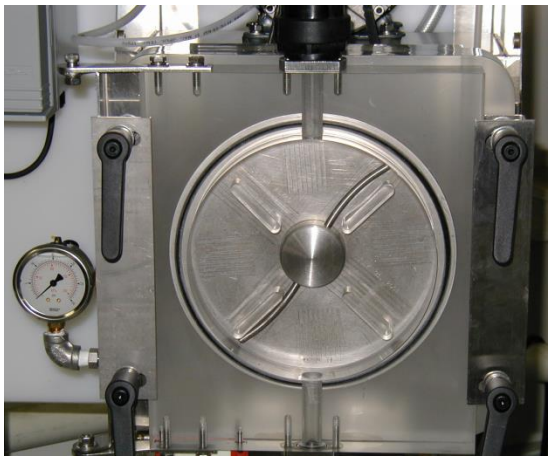
** Basic routine maintenance tasks where no disassembly required.*

*** Test of standard fiber charge drawn from reference pulp supply to confirm equipment calibration*

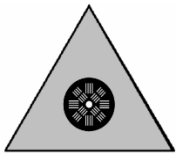
3.2.2 Routine Maintenance Procedures

Task 1: Inspect and wash Screening Chamber

Visually inspect Screening Chamber. Any residual fibers that cling to chamber can be easily observed and flushed out by pushing the Wash Button.



Screening Chamber



Place the collection cup in position beneath the discharge valve to keep debris out of AutoFilter.

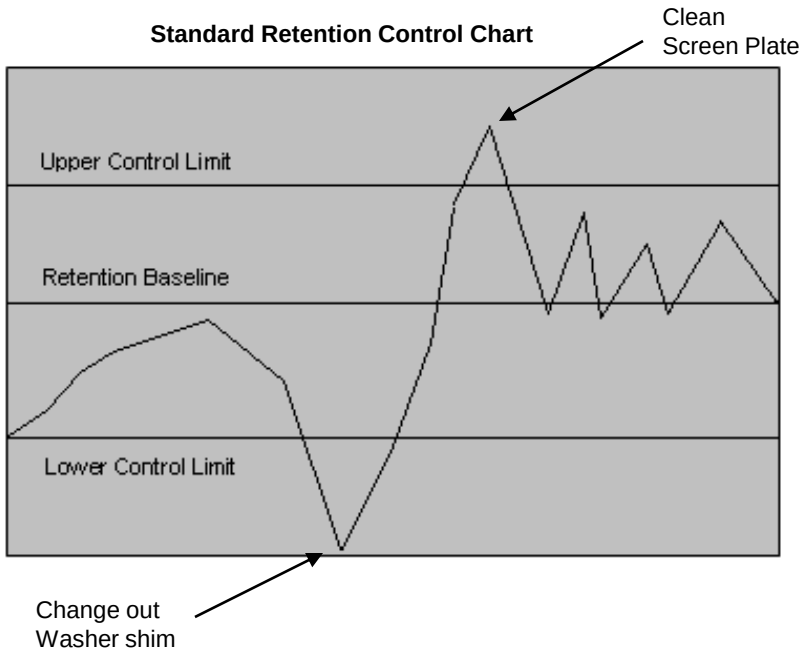
3.2.2 Routine Maintenance Procedures

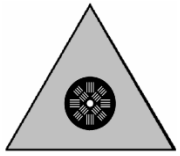
Task 3: Run Standard Reference Pulp

Occasionally equipment wear or accumulated fiber will interfere with the MasterScreen™ Tester's repeatable screening action. Standard retention control testing of a reference pulp will indicate when equipment needs service attention.

Locate a supply of reference fiber and put into a dark plastic bag. Run 5 tests of two-gram charges. Make sure all data falls within +/-5% of the average. If not, review test procedures to locate cause of instability. If so, set up a control chart using the average and +/-5% ss control limits.

The standard retention test should be run at least once a week on a regular basis and whenever a process test is questioned.





Make sure that sample preparation is performed meticulously or observed variation cannot be associated with instrument maintenance issues.

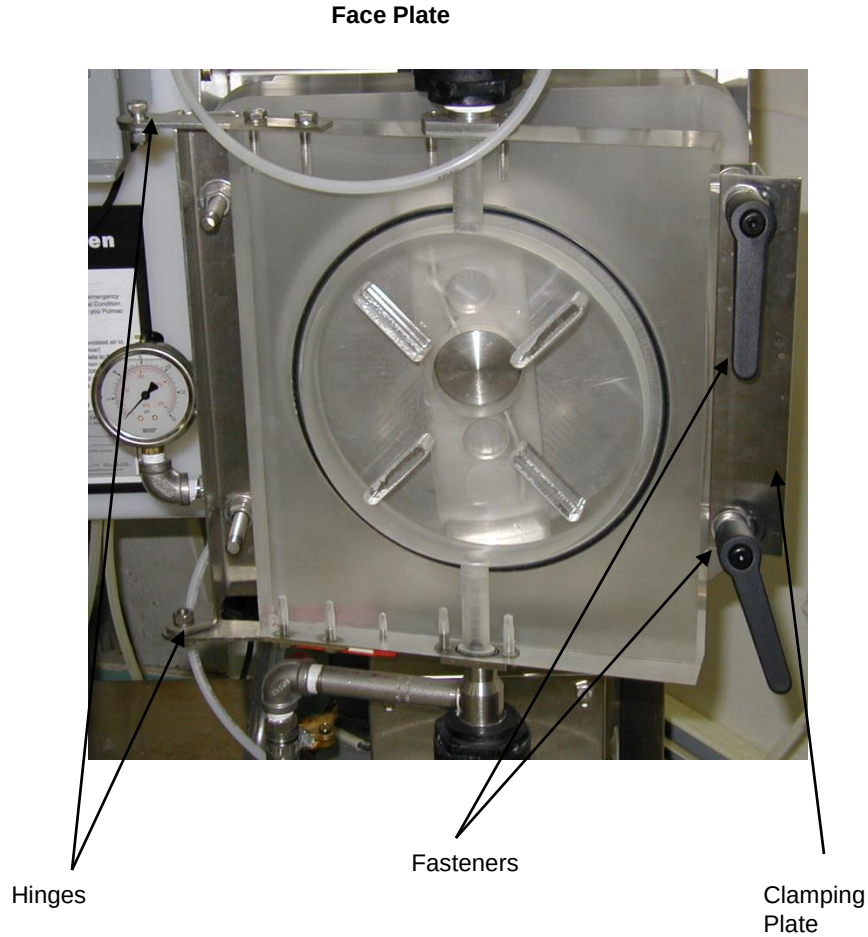
3.2.2 Routine Maintenance Procedures

Task 4: Inspect and clean screen plate

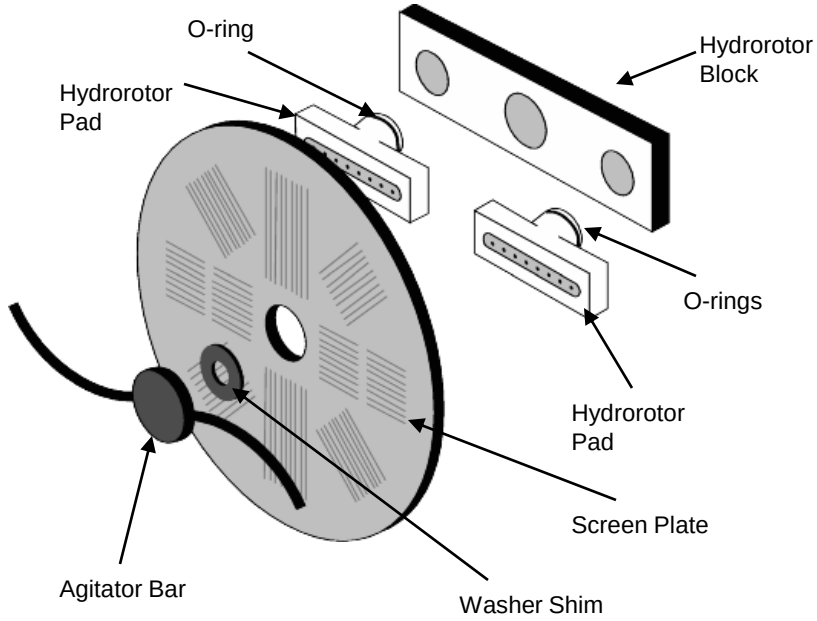
The screen plate should be removed and cleaned periodically, depending on use. As long as the screen plate, washer shim, and hydro rotor pads are regularly and properly cleaned, and the water flow rates delivered by the pump are constant, the MasterScreen™ Tester will perform repeatably and dependably. A screen plate will normally stay within tolerance from two to five years before the slots are enlarged and need to be replaced.

To clean the screen plate, perform the following steps:

1. Release the four fasteners on the Face Plate. Undo the left side and remove the clamping plate. Loosen the right side and slide clamping plate outward until the screening chamber face plate is free to swing open.
2. Bend and pull the flexible delivery tube upwards out of the insert where it is connected at the top to the Face plate.



3. Swing the face plate open on its hinges.
4. Using the Agitator Bar removal tool, rotate the Agitator Bar counterclockwise to unscrew it.
5. The Agitator Bar abuts a Washer Shim which seals it against the screen plate. Carefully remove the Washer Shim and the Screen plate. Clean the agitator bar and washer shim and inspect the screen plate for flatness on a flat surface. (Place on both sides and check for “dishing”)
6 Use compresses air to blow slots from the front side. For more stubborn plugs, use the appropriate thickness brass shim that is supplied.
7. If there is small corrosion spots, use a plastic scotch brite type cleaning pad to remove.
8. Check Hydrorotor pads by first pulling them out. They are friction fit and are easily removed for inspection and cleaning. Inspect the o-ring on the step of each pad for nicks and cracks. Inspect the entire contact surface of the pads for wear, scratches, or cracks. Using a probe, remove any particles lodged in the small holes or embedded in the pad surface. Use compressed air to blow the pads out. Reinstall pads, making sure they are snug but can easily slide in and out. Replace worn or damages pads.
9. Make sure washer shim is not worn. It should have no fiber behind it when it is removed. It should compress ¼ to ¾ of a turn before the agitator bar bottoms out on its thread. Less than a ¼ turn means Its worn and needs replacing and more than ¾ of a turn means too thick a washer shim is being used.
10. Replace screen and face plate by reversing steps 1-5. Use Agitator Bar removal tool to “lock” the Agitator Bar in place.



3.2.2 Routine Maintenance Procedures

Task 5: Clean Feed Tank

1. Remove Feed Tank from frame by removing level control probe wires, air mix tube, shower hose, and 8 fasteners.
2. Wash with mild detergent and sponge or soft brush.
3. Apply supplied coating by doing a pre-wash, waiting for 5 minutes and rubbing in coating with soft cloth. Alternatively coat with acrylic wax.
4. Clean probes of any coating independent of feed tank.
5. Re-attached feed tank, making sure green wire is in the middle of level control fasteners.

Use ONLY mild detergent or soap to clean feed tank and collection tube. NEVER use alcohol or acetone based solvents.

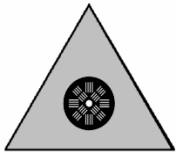
Ensure that no polish or wax enters screening chamber or AutoFilter assembly and that air mix holes remain clear.

Feed Tank

3.2.2 Routine Maintenance Procedures

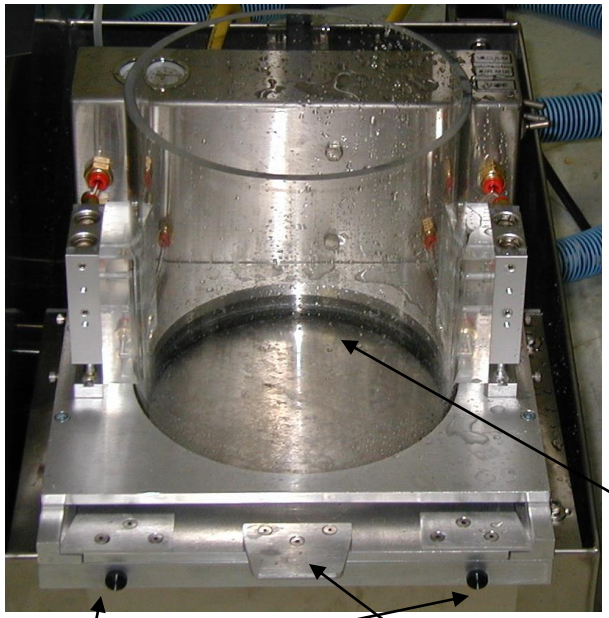
Task 6: Clean AutoFilter Assembly

1. Shut off compressed air supply and turn off Master power switch.
2. Remove collection cup bracket.
3. Unplug control cable and air tube on the back.
4. Remove AutoFilter cartridge and loose the two thumbscrews on front of AutoFilter.
5. Remove support screen from AutoFilter by rotating it forward. (You may need to remove support screen)
6. Wash collection tube, support screen and AutoFilter cartridge with mild detergent and a sponge and rinse well.
7. Apply supplied coating or wax to the collection tube.
8. Replace AutoFilter by reversing steps 1-5.



Do not plug the air holes with wax or coating when cleaning the collection tube.

Auto Filter Assembly



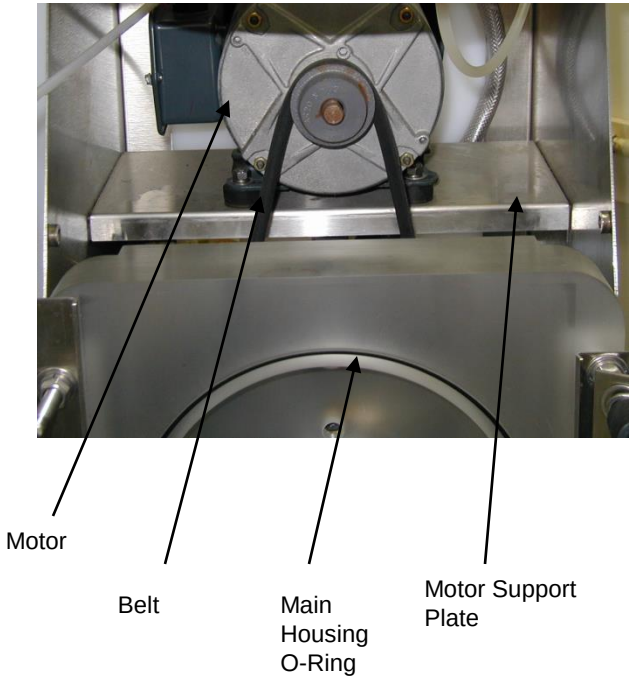
3.2.2 Routine Maintenance Procedures

Task 7: Check Motor Belt, O-Rings and Gaskets

When Feed Tank is being cleaned, removed motor guard to get access to motor. Visually inspect belt for cracks and nicks. Check that belt tension is appropriate. If there are any cracks or debris or if the belt appears glazed or shiny, replace it.

Check O-rings on the face plate and main housing for Cracks and nicks.

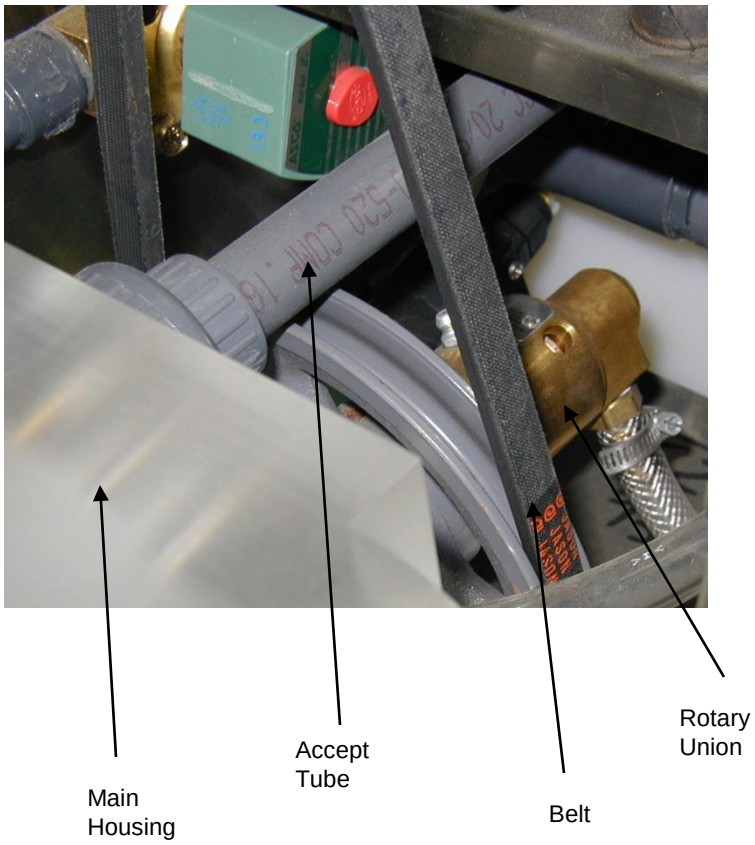
Check gasket on AutoFilter collection tube and o-ring outside the AutoFilter support plate.



3.2.2 Routine Maintenance Procedures

Task 8: Grease Rotary Union

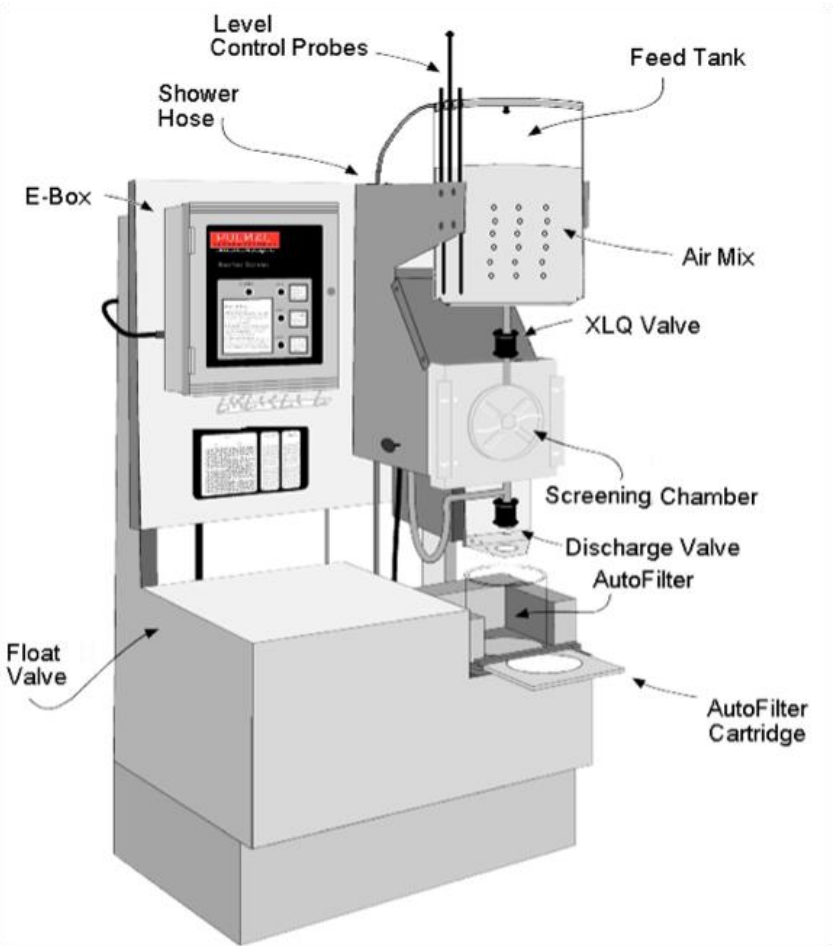
When checking motor belt, take the opportunity to grease the rotary union using grease nipple.



3.3 Troubleshooting

If problems are encountered, consult the following troubleshooting guide to determine the recommended corrective action. If the troubleshooting guide does not help, consult original installer of equipment.

You may reach us directly by calling:
+1.802.223.2663
Or e-mailing at:
info@pulmac.com



STEP	DESCRIPTION / ACTION
1.	**What is the nature of the problem?** If there is no power or there is an intermittent power loss go to step 2 If the level control is malfunctioning, go to step 3 If the AutoFilter is malfunctioning go to step 4 If the Standard Retention Number is too high, go to step 5 If the Standard Retiontion Number is too low, go to step 6 If air is observed in the Screening Chamber, go to step 7
2.	**Turn power on. Is DC Power LED Green? If yes go to step 2a.** **If No check:** Are both the main and system power switches on? Is appropriate current being supplied to the Electrical Box? Is there voltage at the power switch and the PLC?
2a.	**Is the PLC Run LED on? If yes go to step 2b.** **If No check:** Is mode selection blank? If yes then program has been lost.

STEP	DESCRIPTION / ACTION
2b.	**Does the start button begin the test cycle?** **If yes go to Step 2c. If no check:** Are circuit breakers tripped? Is there voltage at the start switch? Are the connections made between the switches and PLC?
2c.	**Does the test run to normal completion?** **If yes, problem is resolved. If not, go to Step 2d.**
2d.	**Are either of the circuit breakers tripped?** **If yes, go to step 2e. If not check:** Is the electrical connection to the contactor made?
2e.	**Check:** Inspect for mechanical binding of: - Rotary Union - Mean Housing Bearing - Pump - Agitator motor - Agitator bar from too high pulp concentration in screening chamber Check voltage to motor and pump.

STEP	DESCRIPTION / ACTION
3.	**Does the water level rise above the Feed Tank and overflow?** **If yes, go to step 3b. If no, go to step 3a.**
3a.	Does the water level cycle up and down in the Feed tank? If yes, go to sep 3a(1). If no, go to step 3a(2)
3b.	**Does the Red LLC LED activate when water reaches the level control probe?** **If yes, go to step 3b(1). If no, check:** The level control and probe connections Cycle the power switch to ensure its correct functioning
3b. (1)	**Does the Red LLC LED go off when the water level reaches the bottom level control probes?** The level control and probe connections Cycle the power switch to ensure its correct functioning

STEP	DESCRIPTION / ACTION
3a. (1)	**Is the manual regulating valve open too much?** **If yes re-adjust it. If no check:** The main solenoid valve for functioning The regulating & control valves for functioning
3a. (2)	**Does the unit run continuously?** **If yes, go to step 3a (3). If no, go to step 3a (4).**
3a. (3)	**Is there bridging between water level probes?** **If yes, clean and/or repair. If no check:** Are the connections between the sensors and LLC made? Are the connections between the LLC and PLC made? Reseat the LLC
3a. (4)	**Is the water level maintained in the delivery tube?** **If yes, go to step 3a(5). If no check:** Is the regulating valve open enough? Is the water level in the supply tank low? Is the pump delivering adequate flow? Are Hydrorotor pads properly aligned on shaft?
3a.(5)	**Does water flow out of overflow in supply tank?** **If no, the problem is not water level control. If yes, check:** Is the float properly set and free from its own cord? Is the water feeder valve funtioning properly?

STEP	DESCRIPTION / ACTION
4.	**Does the collection tube open before all water is drained?** **If yes, check:** Is there fiber in display? (if so lower sample size, increase screen plate size, or change mode to add more water.) Is filter paper high porosity?
5.	**If the standard Retention numbers are too high check:** Screen plate for blockages Hydrorotor pads for wear and free movement in blocks Proper flow rates Sample size Water supply Sample preparation procedure
6.	**If the Standard Retention number is too low check:** Screen plate for wear (dishing or slot size) Washer shim for wear (see Appendix III) O-rings in face plate and main housing Sample preparation procedure
7.	**If excessive air bubbles are observed in the screening chamber:** Inadequate water supply Level control probes are not acting properly Flow control valve or regulator stuck in off position. Main solenoid stuck in off position Stuck or imporperly working float valve Mechanical seal needs replacing Air leaking through bearing housing or rotary union.

*Cycle 2 is active only if X/10 and X/12 are not. Does not light when active

Appendix I

PLC Input/Output

Inputs:		Outputs:	
X/0	Pump Circuit Breaker	Y/0	Main Solenoid
X/1	Agitator Circuit Breaker	Y/1	Control Solenoid
X/2	Start Switch	Y/2	Pump/Agitator/Starter Light
X/3	Stop Switch	Y/3	Stop Switch
X/4	Wash Switch	Y/4	Wash Switch
X/5	Top Water Level	Y/5	Discharge Valve
X/6	Door Lock	Y/6	FeedTank/Shower Cut-off
X/7	AutoFilter	Y/7	Air Mix
X/10	Cycle 1	Y/10	AutoFilter Tube
X/11	Cycle 2 *	Y/11	AutoFilter Air
X/12	Cycle 3	Y/12	AutoFilter Vacuum

*Cycle 2 is active only if X/10 and X/12 are not. Does not light when active

Appendix II

PLC Control Sequence

Power Up
Power, Static State
Y: No Outputs
X: 0,1,6,7
Start Button - Upflow
Y: 1,2, 0 (delayed)
X: 0,1,6,7
Delivery
LLC: On
Y: 2,7 1 (cycle OFF 4 seconds ON15-20 seconds
X: 0,1,5,6,7
Screening
LLC: Off
Y: 1,2
X: 0,1,6,7

Wash
Y: 2,5,10
X: 0,1,6,7
AutoFilter
Y:10 Then 11 (air mix), then 12(vacuum)
X: 0,1,6,7
Test Finished
Power, Static State
Y: No Outputs
X: 0,1,6,7

Appendix III

Determining Washer Shim Thickness

Washer Shims are sized from .060” to .090” at .005 increments. If shim size is unknown, normally Pulmac can find the appropriate shim size in their database. However, if the information is not available then the following are instructions of how to measure for washer shim thickness. Before a measurement can be taken determine if the Screen Plate is flat. Place the screen plate on a flat tabletop and make sure it is stable on both sides. If it wobbles, then it is dished and needs to be worked on before measuring for shim thickness.

To determine correct Washer Shim Thickness:

1. Install the screen plate and agitator bar without the Washer Shim in place.
2. Screw the agitator bar onto shift until it bottoms out.
3. Hold the screen plate tight against the hydrorotor pads and, using feeler gauges, take three measurements of the gap between the Agitator Bar hub and the screen plate.
4. The correct Washer shim size will equal the average of the three gap measurements plus 0.025” rounded to the nearest five thousandths.

Clearance		Thickness Tolerance			Nominal Shim Thickness
mm	in				
0.75	0.030	0.050	to	0.060	0.600
0.85	0.033	0.053	to	0.063	0.060
0.95	0.035	0.055	to	0.065	0.060
1.00	0.040	0.060	to	0.070	0.065
1.10	0.043	0.063	to	0.073	0.070
1.20	0.045	0.065	to	0.075	0.070
1.30	0.059	0.070	to	0.080	0.075
1.40	0.055	0.075	to	0.085	0.080
1.50	0.060	0.080	to	0.090	0.085
1.60	0.063	0.083	to	0.093	0.090

Appendix IV

B4 MasterScreen™ Basic Spare Parts

PART #	DESCRIPTION
AF3-15	Air Filter Regulator
AF3-20	Air Supply Shut-Off Valve
AF3-15-B	Air Supply Pressure Gauge
SA3-11	Spray Nozzle
SA5-15*	Pinch Valve Seals (set of 2)
SA5-05	Hydrorotor Blocks, brass (set of 2)
SA7-26*	Hydrorotor Pads (set of 2)
SA4-07*	Main Housing O-Ring
SA4-08*	Face Plate O-Ring,
MS4-71	Agitator Spinner Removal Tool
MS7-100	Screening Chamber Door Proximity Sensor
MS7-101	Screening Chamber Door Magnet Actuator Sensor
SA3-03	Screening Chamber Water Flow Valve
XLQ-09	Screening Chamber Discharge Switch
NXLQ-99	Screening Chamber Discharge Switch, Non-XLQ
SA5-24	Reject Collection Cup
SA3-06	Pinch Valve, Discharge

PART #	DESCRIPTION
Bearing Housing Subassembly	
SA4-09	Bearing housing
SA4-10	Retainer Ring
SA4-13	Ball Bearing
SA4-14*	Mechanical Seal
SA7-30	Agitator Spinner & Shaft
SA5-11	Small Pulley
SA5-16	Rotary Union
SA1-09	Float Switch
SA6-32	Pump, 120/240 V, 50/60 Hz
SA5-08-060*	Washer shim, 0.060"
SA5-08-065*	Washer shim, 0.065"
SA5-08-070*	Washer shim, 0.070"
SA5-08-075*	Washer shim, 0.075"
SA5-08-080*	Washer shim, 0.080"
SA5-08-085*	Washer shim, 0.085"
SA5-08-090*	Washer shim, 0.090"
SA5-08-095*	Washer shim, 0.095"

*Items available at a discounted rate if purchased as a kit MS7-32-SP (select 1 size of washer shim)

B4 MasterScreen with AutoFilter Spare Parts

PART #	DESCRIPTION
FQT3-24-B	Solenoid Valve
AF3-01	Vacuum Ejector
SS5-130*	Silencer
SA3-06	Pinch Valve
AF3-35	Toggle Switch
AF1-12*	Collection Tube Gasket
AF1-30*	AutoFilter O-Ring
AF1-10	Support Plate
AF1-09	Support Plate Screen
SS5-190	Flow Control Valve
SS8-010	White Filter Paper, 20.5cm
SS8-1000	Black Filter Paper 20.5cm
AF1-11	AutoFilter Cartridge Assembly
AF1-07	Cartridge Plate
AF1-08-SVC	Cartridge Ring & Screen Assembly

*Items available at a discounted rate if purchased as a kit MS7-34-SP (to include * items from Basic list)

B4 MasterScreen™ with XLQ Spare Parts

PART #	DESCRIPTION
SA3-06-R	XLQ Pinch Valve (feed tank to screening chamber)
MS3-11	XLQ Pinch Valve
XLQ-30	XLQ Pressure Gauge

B4 MasterScreen™ 120V Spare Parts

PART #	DESCRIPTION
ELC-012-B4	120V Liquid Level Control

B4 MasterScreen™ 240V Spare Parts

PART #	DESCRIPTION
ELC-010	240V Liquid Level Control

B4 MasterScreen™ 60Hz Spare Parts

PART #	DESCRIPTION
SA5-01	50/60Hz Motor
SA5-10	60Hz Pulley
SA5-12	60Hz Belt

B4 MasterScreen™ 50Hz Spare Parts

PART #	DESCRIPTION
SA5-01	50/60Hz Motor
SA6-12	50Hz Pulley
SA6-13	50Hz Belt

B4 MasterScreen™ Screen Plates

PART #	DESCRIPTION
SP-003	Screen plate, .003"
SP-004	Screen plate, .004"
SP-006	Screen plate, .006"
SP-008	Screen plate, .008"
SP-010	Screen plate, .010"
SP-012	Screen Plate, .012"
SP-014	Screen Plate, .014"
SP-018	Screen plate, .018"
SP-100-MIC	Screen plate - 100 micron
SP-125-MIC	Screen plate - 125 micron
SP-150-MIC	Screen plate - 150 micron

Appendix V

AutoFilter Pneumatic Schematic