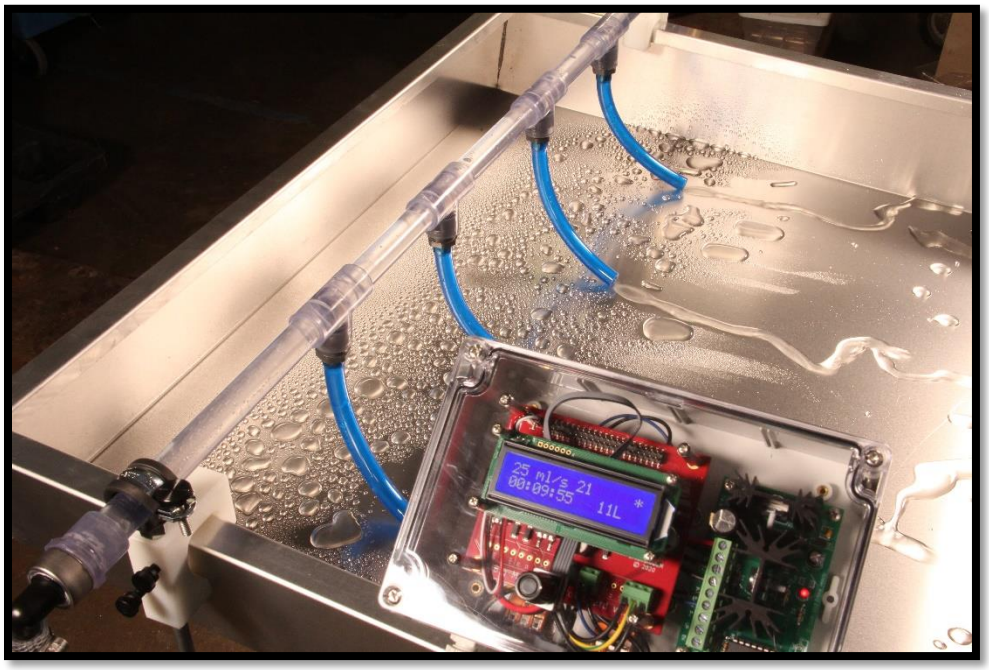
# Emriver Em3/Em4 Groundwater and Rainwater User Manual

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# Introduction

This system allows for injection of subsurface groundwater or above surface rainwater in your stream table. A 60psi pump supplies a spray bar at the upstream end of the box to produce the flow. Extraction filters are installed at the downstream end of the box. The extraction filters connect to tubes that empty into the downstream reservoir. The extraction tubes have valves allowing the user to increase, decrease, or turn off groundwater extraction.

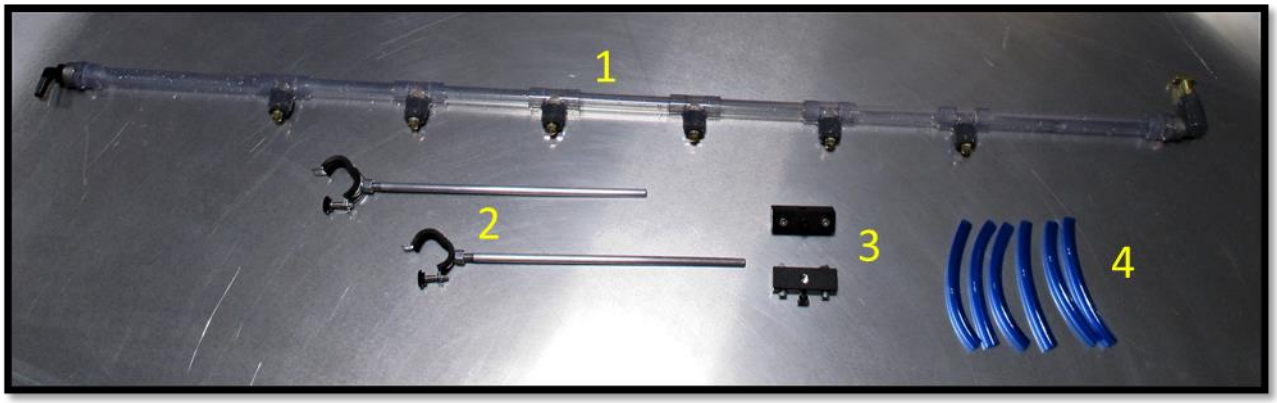
The groundwater system allows simulation of a wider range of landscapes. For example, to model an influent (or losing) stream, the valves can be opened to extract groundwater. The valves can also be closed to show impacts of a gaining stream on stream behavior. Different combinations of groundwater extraction rates in either of the two extraction filters provides the opportunity to study many different stream scenarios.

The rainwater system allows for demonstrations of surface erosion, landslide dynamics and comparative impacts of different surface substances, e.g., impermeable parking lots, thick vegetation, rip rap, etc.

# Components

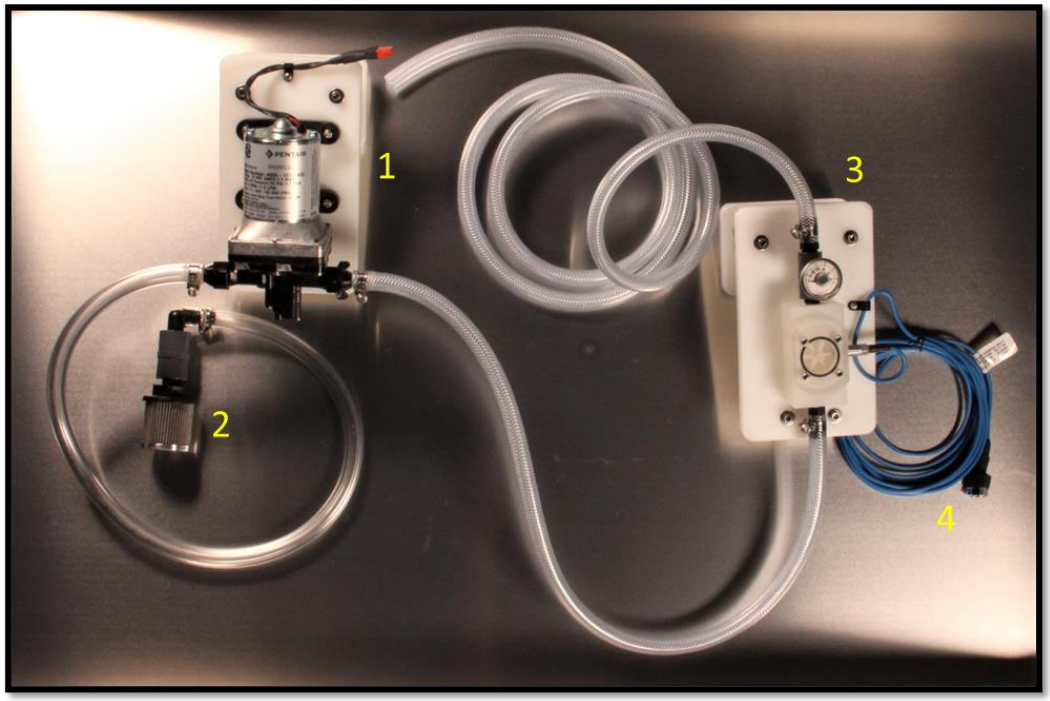
**Spray bar**

1) Spray bar
2) Mounting rods
3) Mounting brackets
4) Groundwater feeder tubes



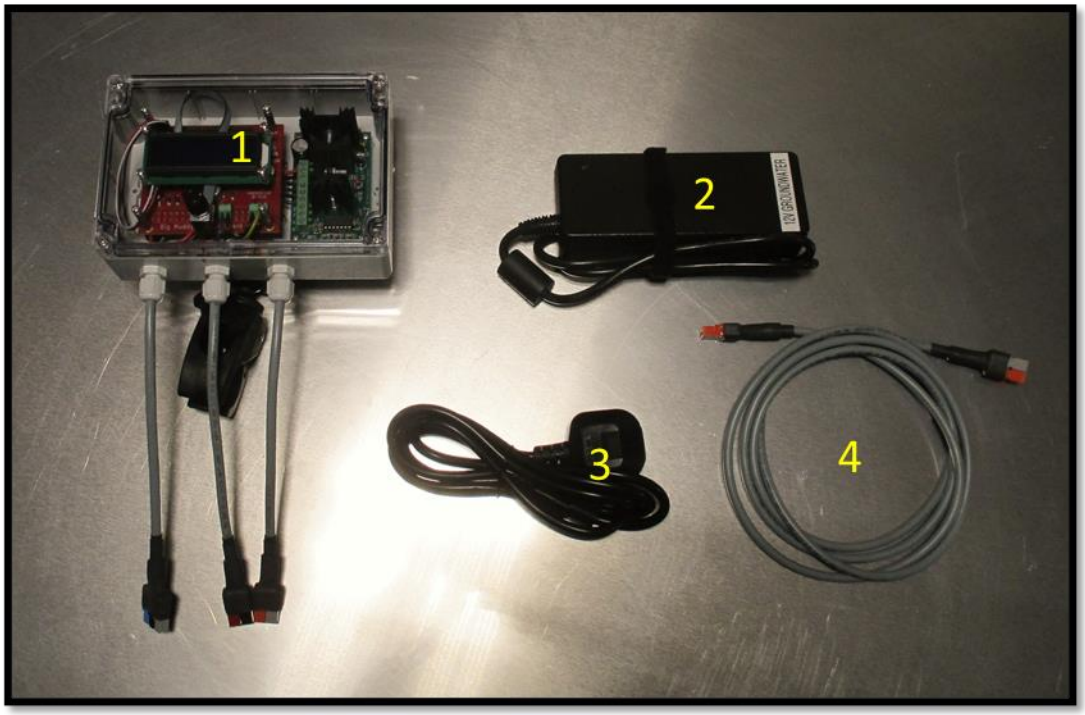

**Pump and Supply Line**

1) Diaphragm pump
2) Intake filter and line
3) Flow meter and pressure gauge
4) Sensor connector for controller



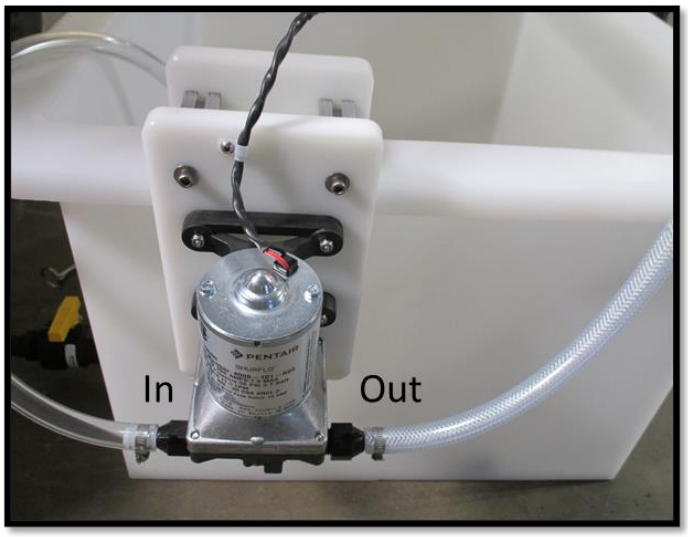
**Controller and Electrical**

1) Flow controller
2) 12V 8A DC Power Supply
3) 6’ Power cord
4) Pump power extension cord

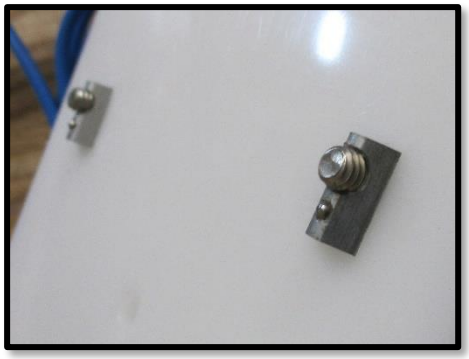


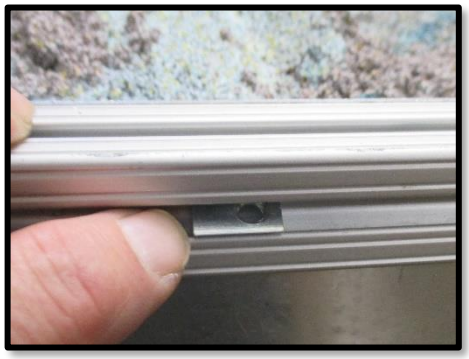
# System Setup

Hang the pump on the lip of the upstream reservoir and submerge the intake hose and filter. The braided hose will be connected in the following steps.

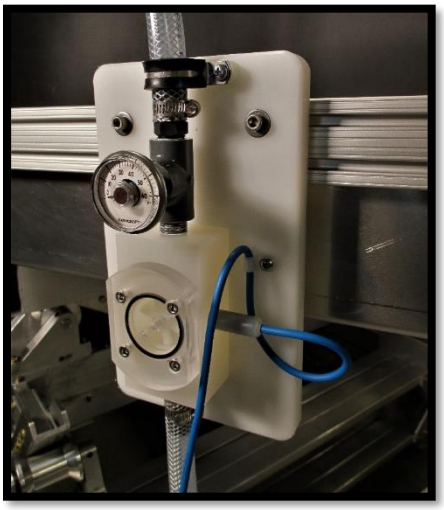



Remove the two t-slot fasteners from the back of the Paddle Wheel plate and insert them into the rail at the upstream end of your model.

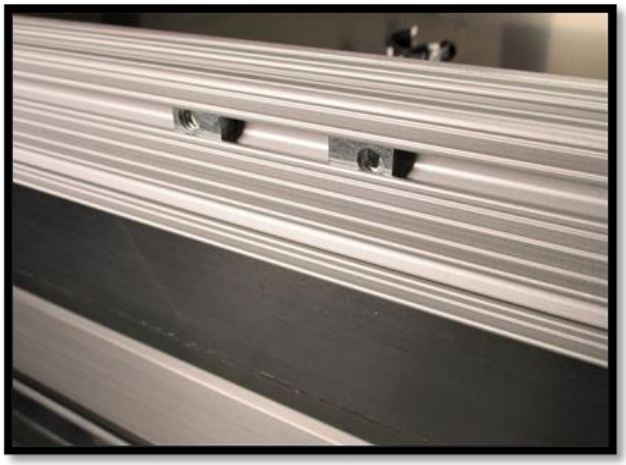




Mount the paddle wheel assembly to the rail of the model by threading the two socket head screws into the t-slot nuts. A hex key is included to tighten the screws. Connect the braided hose on the inlet (bottom) side of the paddlewheel to the pump. Don’t over-tighten the swivel connector.



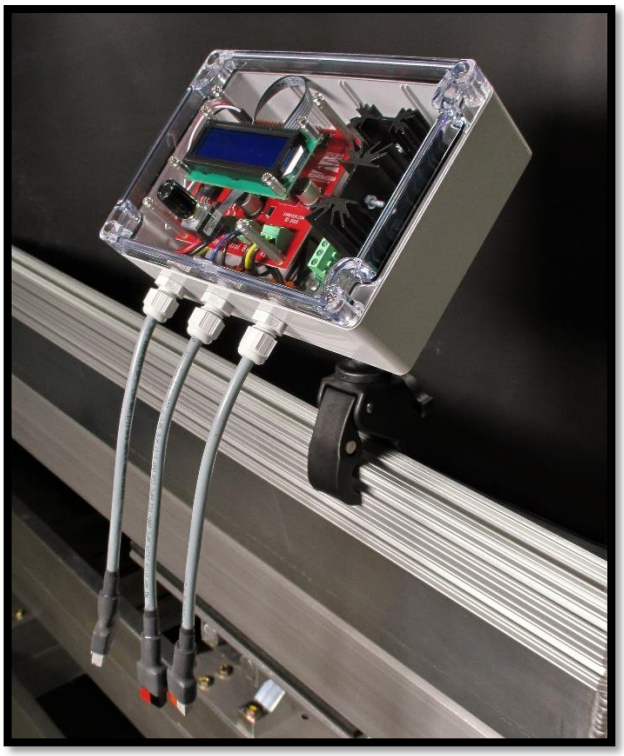
Similarly, attach the spray bar mounting brackets to the rails of the upstream end of the box. Insert the mounting rods into the vertical holes in the brackets and secure with the thumb screws.



Place the spray bar in the clamps, with the black elbow fitting on the same side of the box as the pump and flow meter. Fold the clamps down over the tubing and finger-tighten the thumb screws.

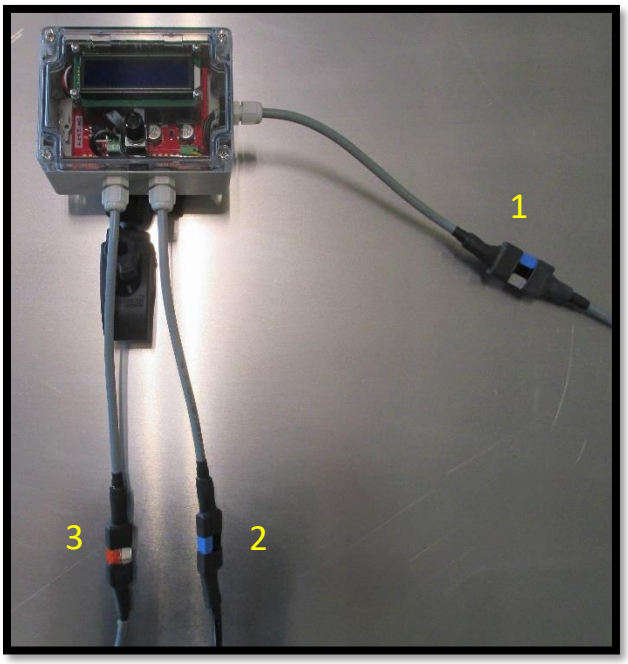
Attach the hose from the flow meter outlet (top) to the spray bar. The swivel connector on the hose is self-sealing, and need only be finger tight.

Attach the controller to the rail of the box using the mounting claw.



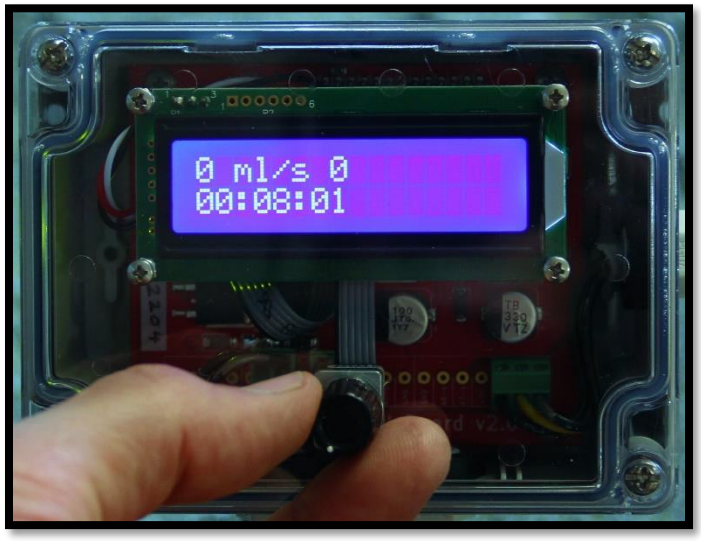
Make electrical connections to the controller:

1) Connect the gray, black, and blue plug from the flow meter.
2) Connect the blue and black plug to the 12V Power supply.
3) Use the 6-foot jumper cable to connect the red and gray plugs to the pump.

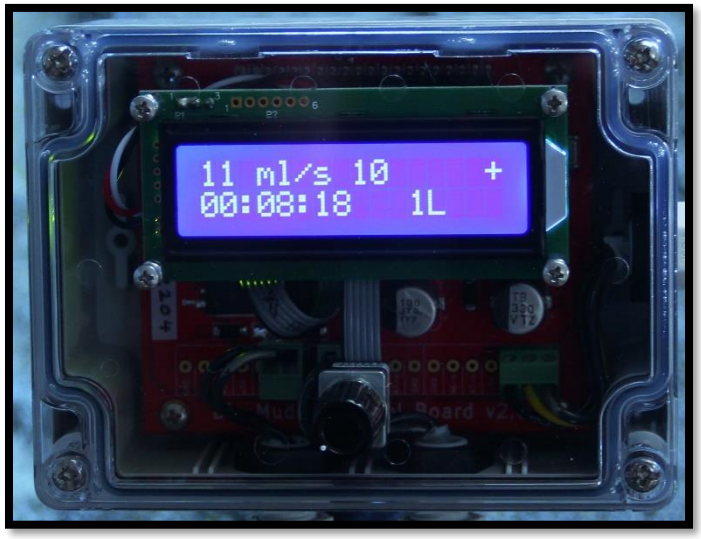



# System Operation

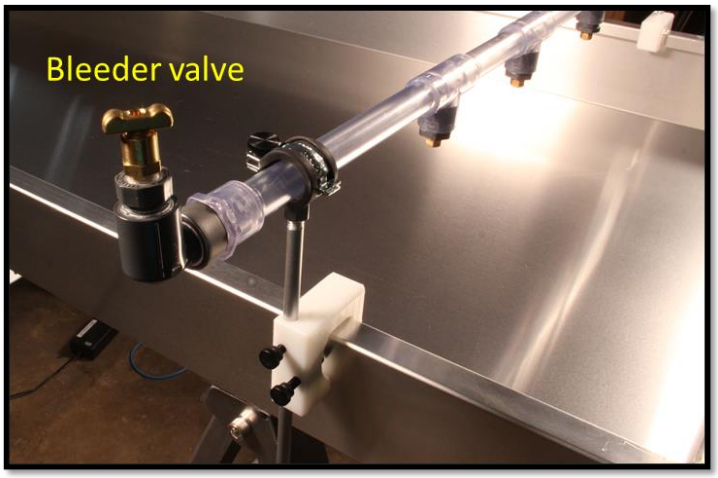
Plug the power supply into the Ground Fault Circuit Interrupter (GFCI) and plug the GFCI into a wall outlet.  When power is supplied to the controller, the LED screen will be illuminated blue. Turn the knob clockwise to begin flow.




Press the knob to reset the desired groundwater flow to 0 ml/s.
The number in the top left is the desired flow and can be adjusted by the operator.
The number in the top right is the actual flow and is reported by the paddlewheel sensor.
Below is the cumulative run time and water flow of the instrument.
When flow is detected by the paddle wheel, a flashing icon (* and +) will display in the upper right. If there is no signal from the paddle wheel, the pump will continue to ramp up to its maximum rate. If this happens, check to make sure the blue-black-gray electrical connection is secure between the paddle wheel and the controller and that water is supplied to the pump intake.



When starting the system for the first time, or after having been drained, there will be significant air in the line. To purge the system of air, open the brass bleeder valve on the end of the spray bar a quarter turn until it no longer sputters and the large air bubbles are removed from the tube.



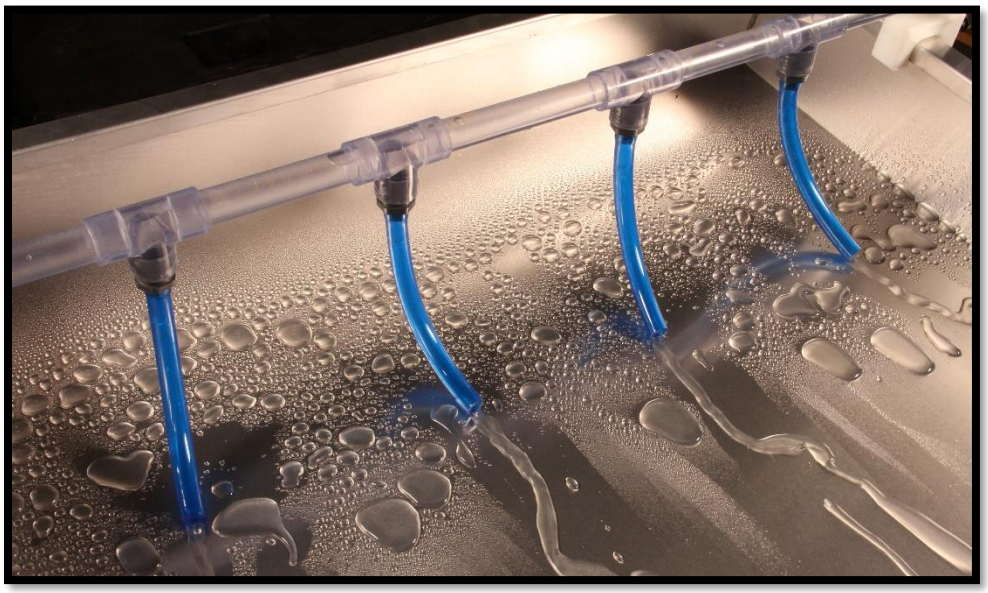

Angling the spray bar up to the bleeder valve will help work the air out. Place a cup or graduated cylinder under the bleeder valve to catch the water.


The height of the spray bar can be adjusted by loosening the black thumbscrews on the mounting brackets, sliding the aluminum rod up or down and retightening the screw. The screws only need to be tight enough to hold the rod in position. Do not over-tighten.

# Rainwater/Groundwater Simulation

To use the system as a rainwater simulator, simply raise the spray bar to a desired height over your sediment and start the flow. The system can be used simultaneously with the stream flow, or on its own. Experiment with different landscapes, surface permeability, slope and compaction.

To use the system as a ground simulator, first attach the blue injection tubes to the brass nozzles.



Submerge the tubes into the media and start the flow. Experiment with different placements of the groundwater inputs to the system by moving the spray bar up and down the box.

If your stream table is equipped with extraction filters, the rate of discharge can be adjusted using the ball valved under the box. Make sure the hoses are placed into the reservoir.



If no water moves through the drain when the valve is open, you can clean the groundwater table filters using a nylon brush and water. **Do not use a brush with metal bristles.**

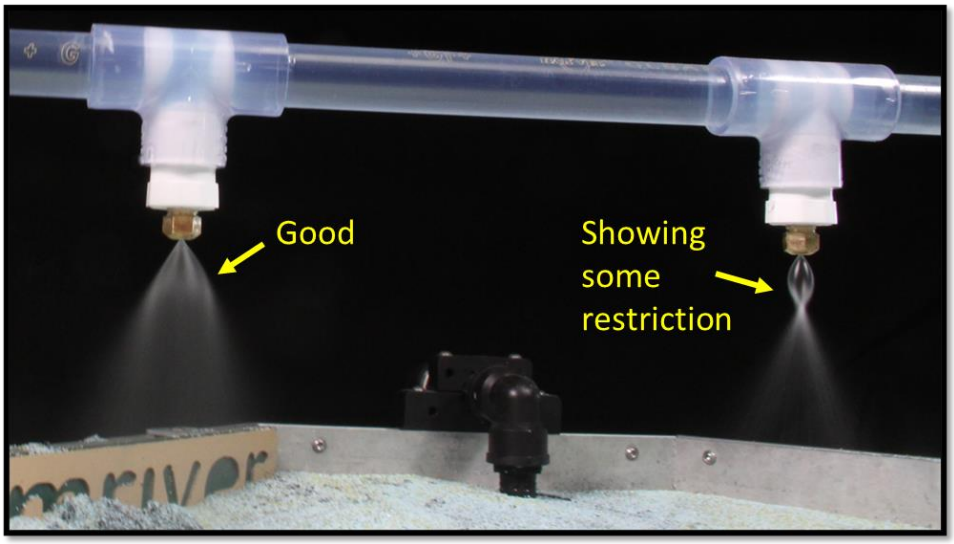
# Troubleshooting

**No power to controller**

If the LCD display is not illuminated, check all connections to make sure the contacts are clean and firmly coupled. Check the LED on the 12V power supply. If it is not illuminated, there is no power coming from the outlet. Check cable connection and GFCI. Reset GFCI if necessary. If none of these can remedy the problem, call us at 618-529-7423.

**Uneven/Sputtering Flow**

The spray from the brass nozzle should form an even cone.




If there is restriction, turn off the flow at the controller and release pressure in the spray bar by opening the brass bleeder valve. Use a 7/16” wrench to remove the brass nozzle. Gently wipe or rinse any residue from the screen filter. Run the pump briefly to flush out the spray bar. Reinstall the brass valve in the PVC fitting, being careful not to over-tighten.


**Pump stops working**

If the pump does not operate, check that there is power to the controller and connections are firm between the extension cable and the pump and controller.

If power is supplied to the pump, and it makes noise or vibrates, but there is no flow, check to make sure the intake filter is clear and fully submerged in water, and look for restrictions or trapped air in the lines.
If the pump stops after having functioned properly, and still has proper power, feel the housing on the pump to see whether it feels hot. There is a thermal fuse on the pump that will shut off when overheating. This can occur when the spray nozzles are clogged, or there is some other restriction in the output tubing that causes back pressure on the diaphragm pump. To remedy this, disconnect power to the controller and pump and allow the pump to cool down. While disconnected, clean the flow nozzles as described above. When the pump is cool to the touch, restart the system.

If you have questions with setup or operations, please visit our website, emriver.com, or call 618-529-7423.