LO-PRO

Low Profile Air Stripper and Geotech Environmental Control Module

Installation and Operation Manual

Rev. 9/11/2025 Part #10353

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Document Conventions

This uses the following conventions to present information:

WARNING

An exclamation point icon indicates a **WARNING** of a situation or condition that could lead to personal injury or death. You should not proceed until you read and thoroughly understand the **WARNING** message

CAUTION

A raised hand icon indicates **CAUTION** information that relates to a situation or condition that could lead to equipment malfunction or damage. You should not proceed until you read and thoroughly understand the **CAUTION** message.

NOTE

A note icon indicates **NOTE** information. Notes provide additional or supplementary information about an activity or concept.

Abbreviations Used

GECM	Geotech Environmental Control Module
WTDP	Water Table Depression Pump
L.O.	Low Override
H.O.	High Override

Section 1: System Description

Function and Theory

The Low Profile Air Stripper (LO-PRO) is a cost-effective, modular system designed for the efficient removal of volatile organic compounds from groundwater. The LO-PRO is compact, unobtrusive and can be discreetly integrated into any site landscape. The modular construction of the system makes it easily adaptable to changing conditions and requirements. By simply adding or subtracting aeration trays, the LO-PRO can be fine-tuned for different influent concentrations and removal efficiencies. The LO-PRO is available in two different models. Figure 1-1 and Figure 1-2 show examples of the smaller LO-PRO II and larger LO PRO III standard systems. Figure 1-3 and Figure 1-4 are examples of LO-PRO II and LO-PRO III systems with optional equipment components.

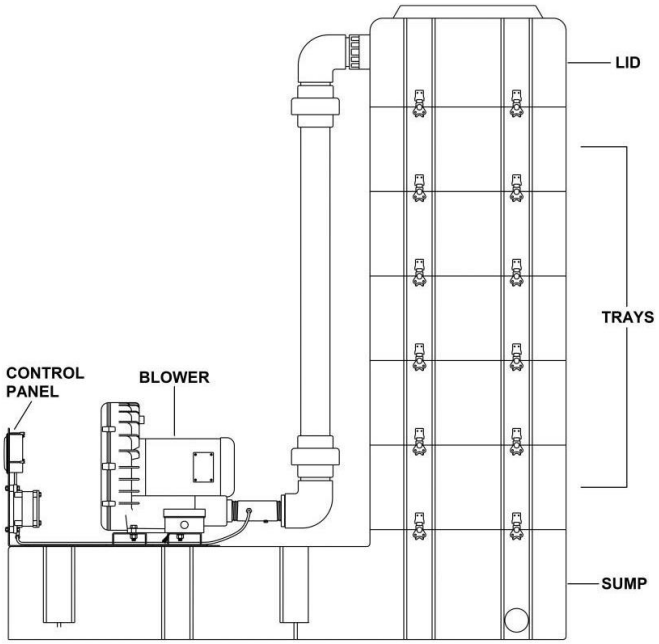


Figure 1-1: *Example of a LO-PRO II with five trays*

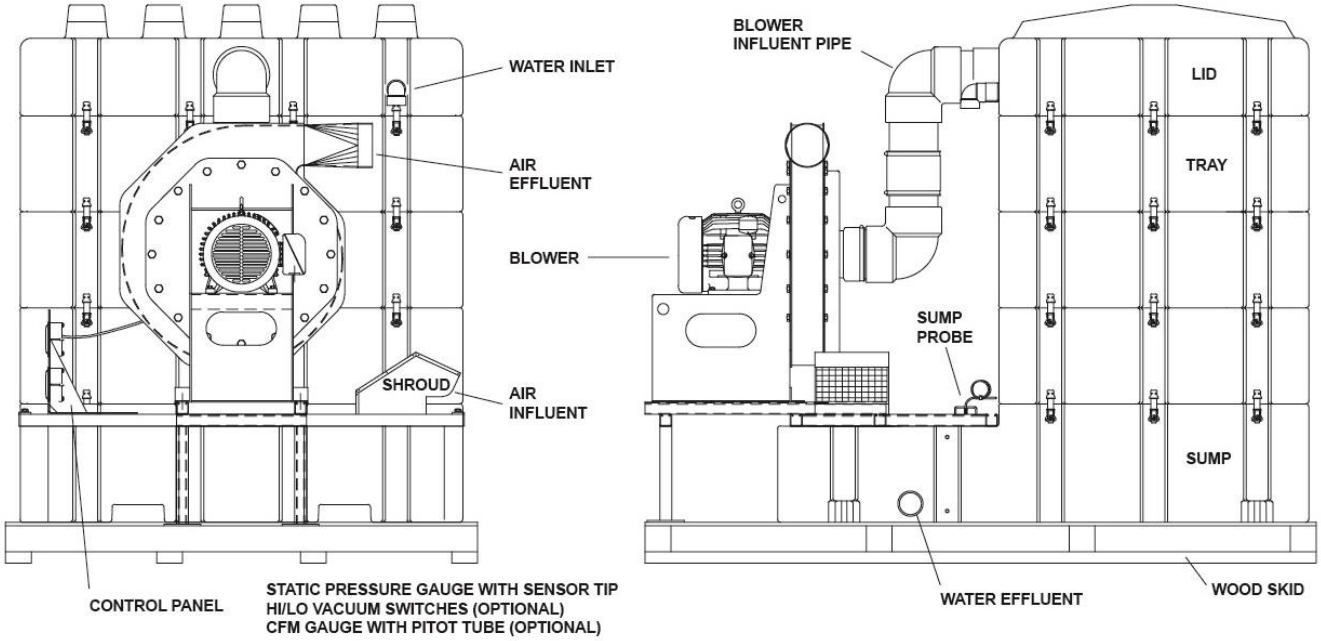


Figure 1-2: *Example of a LO-PRO III with three trays.*

NOTE

The sump capacity is based approximately on the dimensions of the sump to the height of the water high override switch (blue float) of the sump probe. When activated the high override switch will shut off the influent water pump, preventing the sump from over-flowing. During normal operation, the high level switch (orange float) will turn on the effluent transfer pump and empty the sump (of approximately 39 gallons or 148 liters for LO-PRO II and approximately 75 gallons or 284 L for the LO-PRO III) or until the low level switch on the probe is reached. See the probe diagrams in Figure 1-7.

The standard LO-PRO II system consists of a 70 gallon (265 liter) sump with integral floor mounts, five to eight aeration trays with integral gaskets and latches, a lid (cover) with mist eliminator, a 3 or 5HP blower, and a static pressure gauge. The standard LO-PRO III system consists of a 187 gallon (708 L) sump with integral floor mounts, three to five aeration trays with integral gaskets and latches, a lid with mist eliminator, a 10HP blower, and a static pressure gauge. Each aeration tray consists of an alternating, stainless steel bubble plate with attached downcomer for funneling water. The sump, trays and lid are constructed of low density polyethylene. PVC pipe is used for all external plumbing and fittings. Refer to *Section 8: Replacement Parts and Accessories* for a list of parts and optional equipment. See *Section 4:System Maintenance* for more information on unit maintenance and tray orientation.

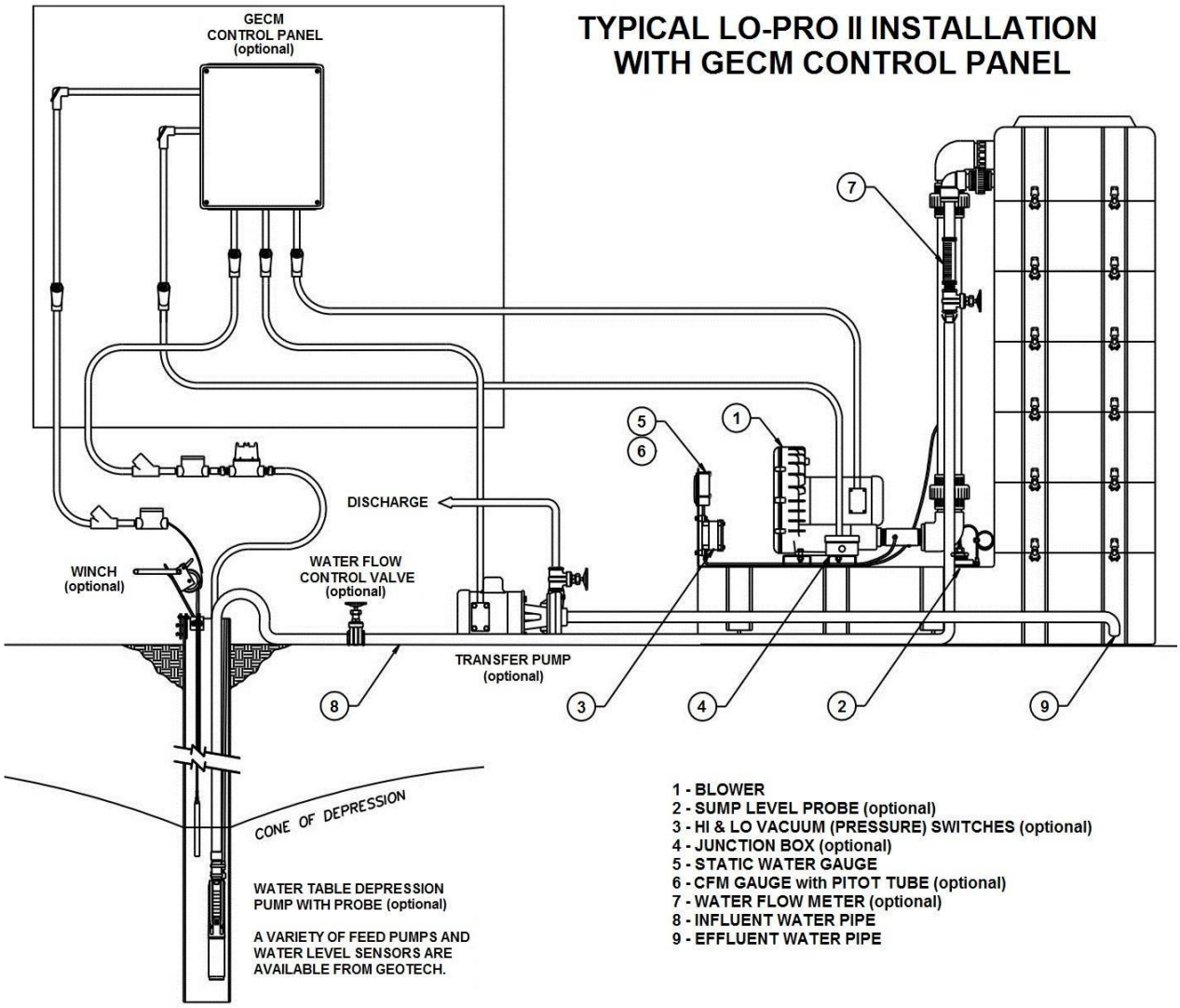


Figure 1-3: *LO-PRO II system deployed with optional GECM, Transfer Pump, and Water Table Depression Pump*

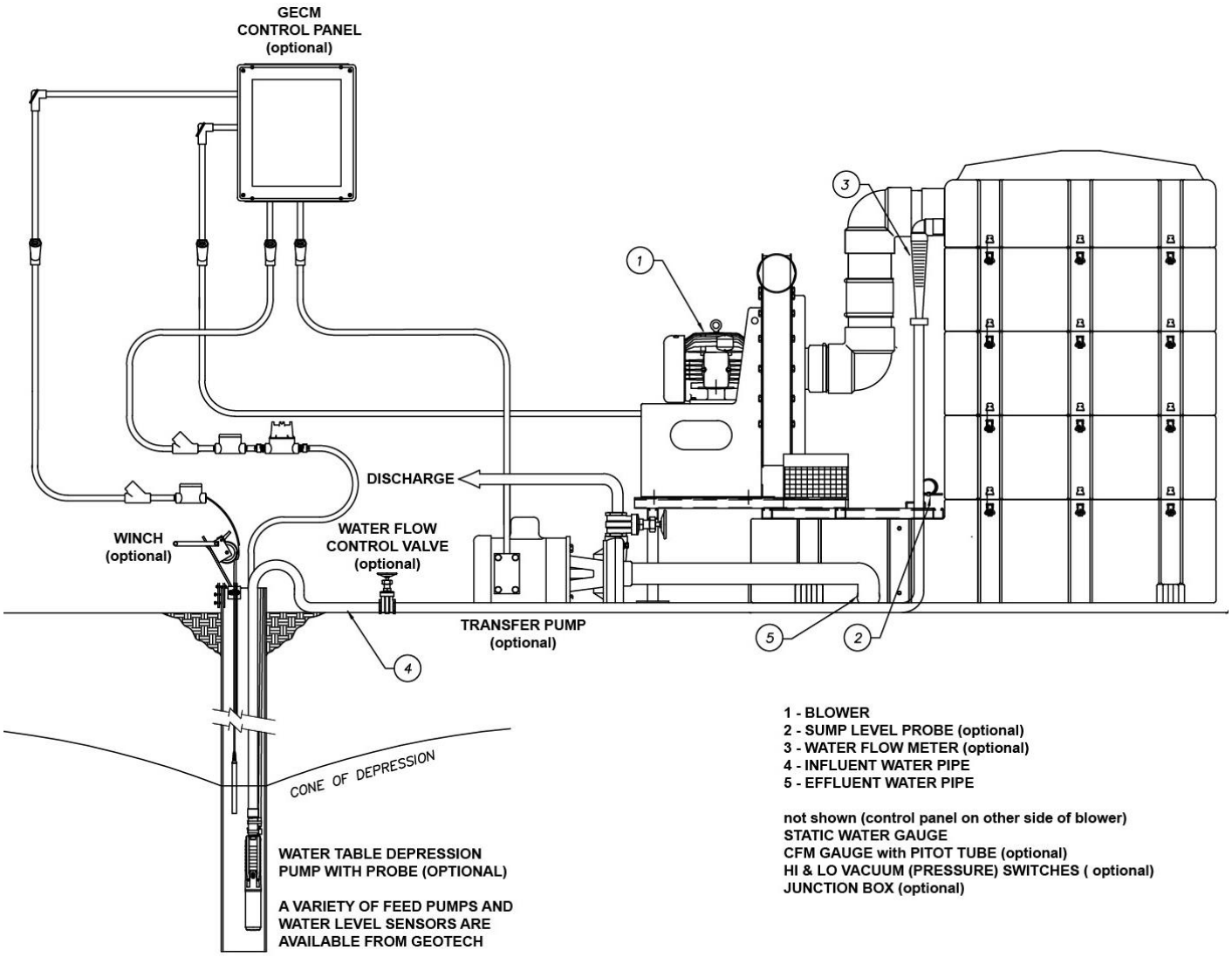


Figure 1-4: *LO-PRO III system deployed with optional GECM, Transfer Pump, and Water Table Depression Pump*

The LO-PRO System

The LO-PRO is a freestanding, integrated system designed to operate under the rigorous demands of continuous duty air stripping but requiring minimal installation and field wiring. Operation of LO-PRO components are controlled with an optional GECM at the remediation site, which can also allow remote monitoring of site activity.

The LO-PRO utilizes most of the equipment options offered by Geotech. Pre-wired and plumbed equipment includes a panel stand that supports the GECM, which contains the system motor starters, protection circuits, and vacuum control accessories. The GECM is also designed to control the effluent transfer pump with input from the sump level probe, as well as the influent pumps and probes when configured accordingly.

Theory of Operation

All air stripping systems take advantage of the fact that many hydrocarbon contaminants such as benzene, toluene and xylene can be volatilized when exposed to an air stream. These systems work by maximizing contact between air and the contaminated water to be treated causing the molecules of volatile contaminants to diffuse from the water into the air, which is then carried away.

Removal Efficiency

Removal efficiency is the difference in contamination level between the influent and effluent water streams. This difference is usually expressed as a percent.

For example, when the influent concentration of BTEX is 3000 ppb (parts per billion) and the effluent concentration is 3 ppb, the removal efficiency for BTEX is 99.9%. Removal efficiency is determined by two major system parameters: air/water ratio and water residence time.

Air/Water Ratio

Air/water ratio is the volume of air being pulled through the system per volume of water being treated. In practical terms, the air/water ratio is the CFM/CMM generated by the blower divided by the influent water flow rate in CFM/ (GPM x .1337) or CMM/ (LPM x 17.92). Looked at in another way, the air/water ratio is a measure of the amount of contact that takes place between air and water at any one moment in time.

Residence Time

Residence time is the length of time a given water molecule remains in the system from the time it enters the top of the air stripper until it falls into the sump. The longer the residence time the greater the potential for removal of volatile contaminants. In conventional packed tower air strippers, residence time is determined by the height of the tower and the water flow rate. In bubble plate air strippers like the LO-PRO, residence time is a function of flow rate and the number of trays being used.

Multiplying the air/water ratio by residence time gives a measure of removal efficiency or the total amount of aeration experienced by a molecule of contaminated water as it passes through the system.

Packed Towers vs. Counter-Flow Aeration

In conventional packed tower air strippers, contaminated water cascades down through a tower filled with packing medium that exposes large surface areas of the water to an up pushing air stream. To obtain high removal efficiencies from such systems, packed towers as tall as 30’ (9 m) or 40’ (12 m) are sometimes required. This is because water residence time per unit packed towers is quite brief. Towers must therefore be tall to allow time for adequate stripping of contaminants.

In contrast, the LO-PRO Air Stripper uses a unique multi-stage counter-flow aeration system that requires no packing medium and yields removal efficiencies of up to 99.99% from a unit that stands less than 9’ (2.7 m) high from top to bottom.

Figure 1-5 and Figure 1-6 contain examples of the flow of air and water within the LO-PRO II and LO-PRO III systems.

Contaminated water enters the LO-PRO at the top and slowly cascades down from tray to tray. While in each tray, the water is aerated by bubbles generated by the bubble plates mounted and sealed between each tray. The multi-stage counter flow design permits long water residence times and high efficiency stripping without the need for a tall, packed tower.

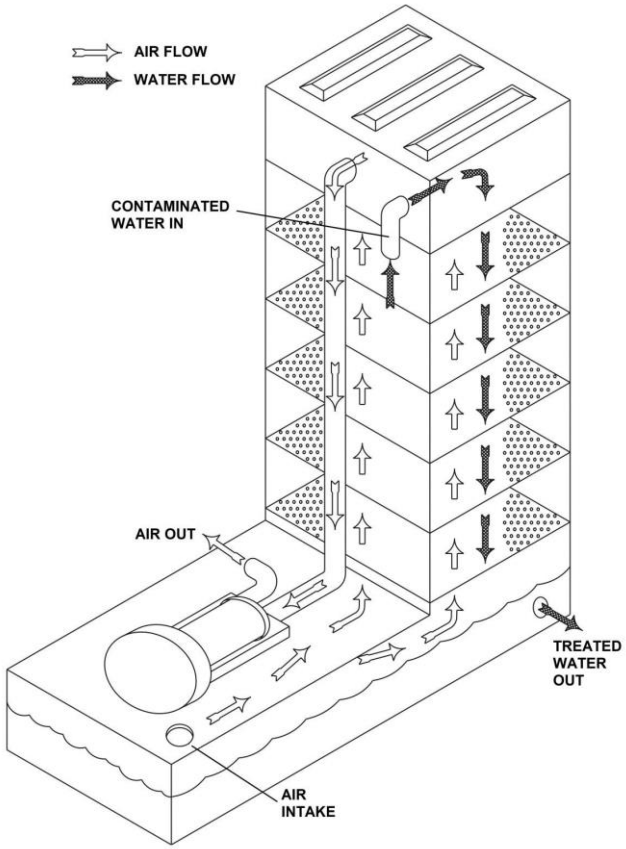


Figure 1-5: *Process Flow Diagram of the LO-PRO II Air Stripper*

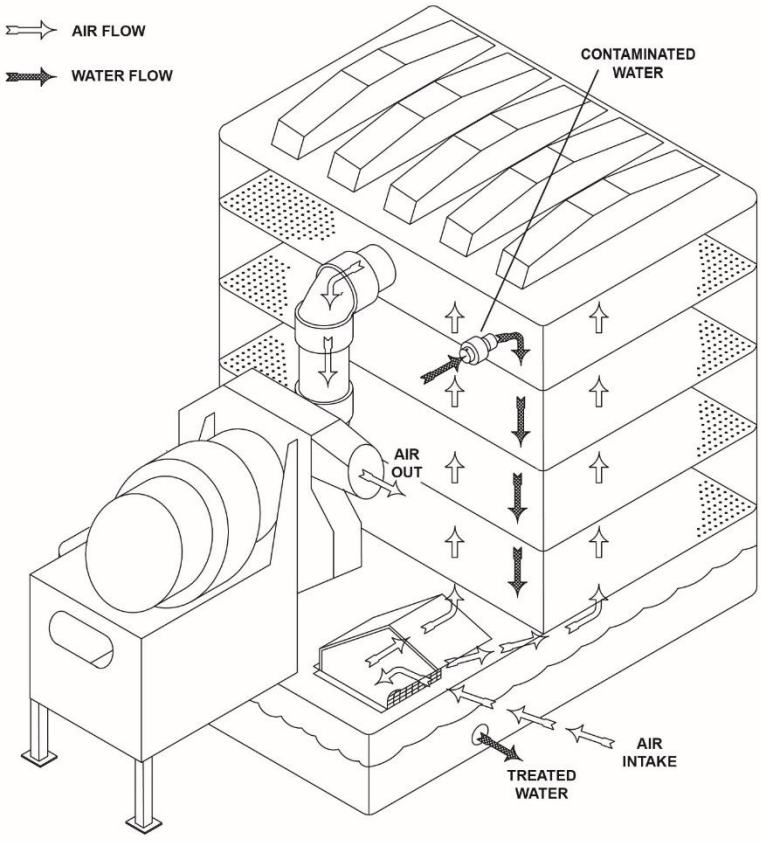


Figure 1-6: *Process Flow Diagram of the LO-PRO III Air Stripper*

System Components

Blower

The standard LO-PRO II uses a regenerative blower and the standard LO-PRO III uses a centrifugal blower to draw air through the bubble plates. The blower is mounted on a metal baseboard for the LO-PRO II or a steel frame for the LO-PRO III, that also supports the following instrumentation: a standard static pressure gauge, the optional high and low vacuum (pressure) switches, and the optional CFM Gauge with filter. Explosion proof blowers are available for use in Class 1, Div. 1, Group C & D hazardous locations.

NOTE

The optional GECM is equipped with thermal overload connections when this feature is provided by the blower manufacturer.

Aeration Trays

The trays are constructed of LDPE and are molded for vertical stacking on top of the sump. They are secured to one another and to the sump by quarter turn fasteners. Flexible gaskets on the mating surfaces assure an air and watertight fit between trays. The stainless steel bubble plates are designed to be sandwiched between successive trays. This provides for easy removal efficiencies and can be adjusted by changing the number of trays used with the system. The trays are 23” (58 cm) deep, 27” (69 cm) wide, and 10” (25 cm) high for the LO-PRO II and 42" (107 cm) long, 60" (152 cm) wide, and 13" (33 cm) high for the LO-PRO III.

NOTE

Alterations to LO-PRO tray configurations will require changes to the bubble plate orientation and possibly the blower type. Consult with a Geotech Sales representative prior to modifying your existing unit.

Lid (or Cover)

The lid contains the polypropylene mist eliminator and fits on the top of the LO-PRO unit. Constructed of LDPE, the cover is equipped with fittings for attachment of the influent water and effluent air plumbing.

Static Pressure Gauge

A static pressure gauge is provided to measure the difference between ambient air pressure and the pressure generated inside the system. The gauge reads in inches of water column and is connected by poly tubing to a static sensor tip mounted in the blower influent air pipe.

Sump

The LO-PRO II sump is 66” (168 cm) long, 27” (69 cm) wide and 13” (33 cm) high. The LO-PRO III sump is 72” (183 cm) long, 60” (152 cm) wide and 16” (41 cm) high. The sump is constructed of low density polyethylene (LDPE). It serves both to collect treated water and to support the aeration trays, blower assembly, and panel stands. Also molded into the exterior of the sump is an air intake hole, a threaded hole for the optional sump probe, and threaded holes for NPT fittings to attach water effluent pipe.

Sump Probe

The LO-PRO sump probe (Figure 1-7) monitors the water level within the sump and provides sensor input to the optional GECM.

The probe is density actuated and uses separate floats to control feed and transfer pumps. The bottom float controls operation of the optional transfer pump by actuating high and low switches located on the probe shaft (see Figure 1-7). The pump starts when the high/low level float rises to the high switch and continues to run until the water level drops the float to the low switch. The 5 inch (13 cm) high/low range on the LO-PRO II probe results approximately to a 39 gallon (148 liter) working sump capacity for the LO-PRO II. The 4” (10 cm) high/low range on the LO-PRO III probe results approximately to a 75 gallon (284 L) working sump capacity for the LO-PRO III.

The top float actuates the high override switch. If the sump should become full, the rising water level will lift this float and shut off the feed pump.

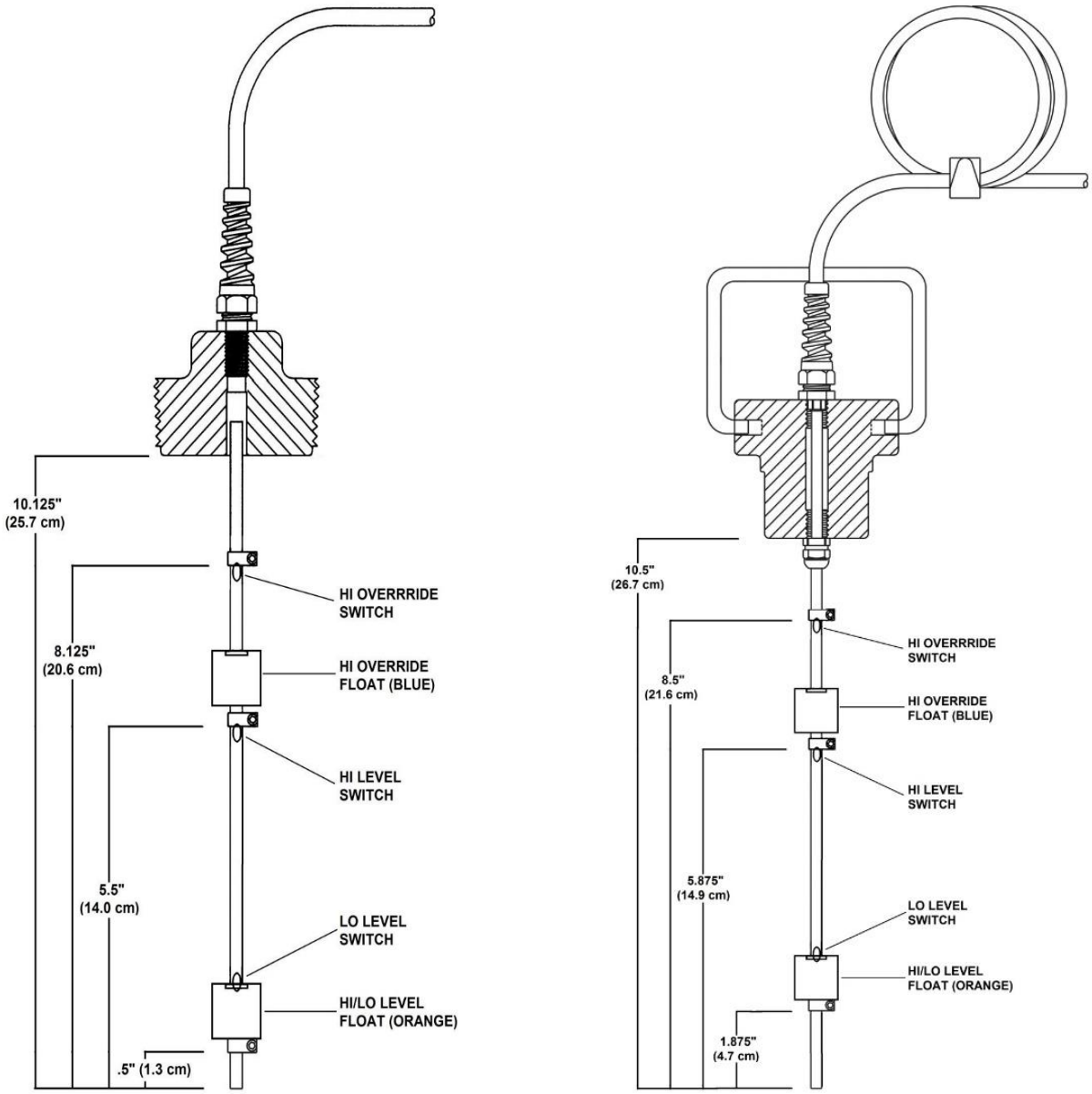


Figure 1-7: *LO-PRO II (Left) and LO-PRO III (Right) Sump Probes*

High and Low Vacuum (Negative Pressure) Switches

High and low vacuum switches are available to monitor the vacuum generated by the blower. In the event of a blower shutdown, the low vacuum switch signals the control panel to shut off the feed pump, thereby preventing untreated water from passing through the system.

If bubble plate fouling or water entrainment causes the vacuum in the system to rise, the preset high vacuum switch will signal the control panel to shut off the blower. This will reduce the possibility of water being pulled into the blower. At the same time, the low vacuum switch will initiate when the blower stops causing the feed pump to shut down also, thereby preventing untreated water from passing through the system.

High and low vacuum switches are mounted to the lower backside of the black control panel so that they can be easily placed in line with the poly tubing from the static pressure gauge before connecting to the static sensor tip in the influent blower piping. Blue switch cabling will then connect to the optional junction box from which connection to a GECM or other control source can be made.

See *Section 4:System Maintenance* for more information on the high and low vacuum switches and their operation.

Tank Full Probe

An optional probe may be used to shut off the appropriate devices for the system when the customer supplied recovery and/or holding tank becomes full. This tank full probe is a single float activated level sensor installed in the top of the recovery and/or holding tank. When the float rises to the top of its travel the GECM will shut down all systems.

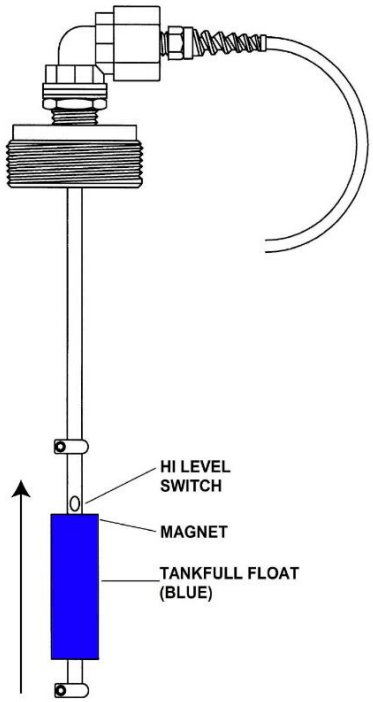


Figure 1-8: *Tank Full Probe*

Optional Components

Although the standard LO-PRO can be plumbed, wired and operated as delivered, the benefits of the system can be greatly enhanced by the addition of the optional accessories described in the following pages. Figure 1-3 and Figure 1-4 show typical water treatment installations using a fully optioned LO-PRO II and LO-PRO III.

CFM (Air Flow) Gauge

The optional cubic feet per minute (CFM) gauge, with pitot tube, air filter and poly tubing, measures the volume of air passing through the LO-PRO system. The gauge is equipped with an air filter to prevent moisture from accumulating in the gauge. CFM gauges are matched to the specifications of the blower and LO-PRO assembly. If this option is included, the pitot tube is factory installed at a specific point along the effluent pipe between the blower and lid to ensure a correct flow reading on the gauge. Consult Geotech Sales when installing a CFM assembly.

Water Flow Meter

An optional water flow meter is available for mounting to the influent water connection on the LO-PRO lid. The standard flow meter, also known as a rotameter, is a clear plastic flow meter with a weighted float that allows the operator to view water flow rate at the site. Other water flow measurement and monitoring options include flow totalizer with digital display of both gallons pumped and water flow rate; and remote monitoring is

available. Geotech provides partial plumbing on the lid, with a 2” (5cm) PVC slip fit union, so that a flow meter can be easily attached.

Effluent Transfer Pump

Transfer pumps are surface mounted centrifugal pumps designed to move water from the sump of the LO-PRO to a drain, storm sewer or secondary treatment system. Transfer pumps can also be controlled with the GECM. See Figure 1-3 and Figure 1-4 for diagrams of typical LO-PRO II and LO-PRO III installations showing feed lines and transfer pump.

Water Table Depression Pump (WTDP)

The WTDP pumps water into the system’s lid. The pump’s operation is controlled by the WTDP probe provided with the system.

WTDP Level Probe

The WTDP probe controls the influent water. The pump (WTDP) starts when the high/low level float rises to the high switch and continues to run until the water level drops the float to the low switch. If a probe fault causes the pump to continue running, the override float will fall and turn off the pump.

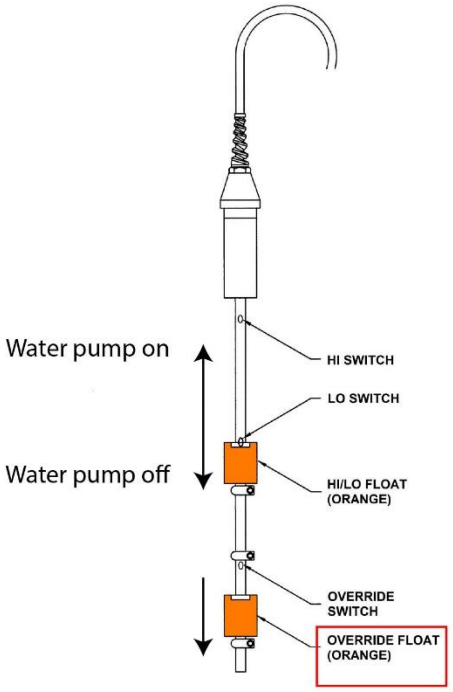


Figure 1-9: *WTDP Probe*

Geotech Environmental Control Module (GECM)

The Geotech Environmental Control Module is an industrial control panel designed for use at groundwater remediation sites. The controller is housed within a weather-proof NEMA 4 (IP 66) enclosure. It incorporates circuitry to receive sensor inputs from density actuated Float Probes, Modbus 485, and analog (4-20mA and/or 0-10 Volts) sensors. The GECM is designed for installation in an unclassified location, with Intrinsically Safe (IS) circuit extensions into hazardous (classified) locations.

The GECM has also been designed for ease of use and installation and can accommodate a wide variety of equipment control needs. A variety of equipment combinations can be controlled from just one control panel. A basic panel is capable of controlling up to 8 devices from 24 IS probe inputs. Devices can vary from small signal relays to 75 HP motor starters. This equipment should be installed in accordance with NEC NFPA 70.

Figure 1-10: *Geotech Environmental Control Module (GECM)*

A GECM field wiring diagram is also included with each unit. The GECM field wiring diagram illustrates the internal layout of the GECM and contains wiring information pertinent to device installation and troubleshooting.

A dry contact is provided to the user as a means to shut down the entire system. An auxiliary output toggles the state of a form C relay when any system fault or alarm is present.

The panel is equipped with HOA switch(es) and indicator lights that show the status of the pump. Refer to *Appendix A: GECM Logic Statements* for details of panel operation.

Dashboard

The dashboard provides an overview of the system status and detailed information on alarms and faults. In addition, the dashboard allows the user to monitor, control, and configure the system while in close proximity to the GECM. The dashboard can be accessed through a local Wi-Fi connection using any web browser. The necessary Wi-Fi network credentials are located inside the control cabinet. QR codes are provided for ease of access. The integrated touchscreen on the PLC can also display the dashboard. Use login using username: **geotech** password: **env**.

SiteView – Remote Monitoring and Control

A modem and associated hardware/software included with the telemetry option allow the user to communicate with the GECM panel remotely via the Internet using a web browser.

Basic features of SiteView include:

1. A summary of near real-time site condition information.
2. History graphs of user selected parameters within a user defined timeframe.
3. Time-stamped telemetry data downloads of user selected parameters within a user defined timeframe.
4. User configurable text messages and email alerts.

Section 2: System Installation

WARNING

The LO-PRO must be installed, operated and maintained according to the procedures described in this manual. Failure to follow these procedures or to observe the Warnings and Cautions included in this manual may result in personal injury and will void the Standard Equipment Limited Warranty.

WARNING

The standard LO-PRO system is designed for installation and operation in a non-hazardous, non-classified location with intrinsically safe extension into a hazardous classified location. Geotech does not determine classification of a location. Check government regulations regarding hazardous area locations prior to installing your system.

CAUTION

Classification of location is subject to local jurisdiction enforcement of NFPA regulations. All installations should be performed in accordance with the National Electric Code (NEC) Handbook. Before deploying the LO-PRO, confirm that the electrical service at the site is properly sized for the blower and/or optional GECM Control Panel, and that it conforms to NEC and local codes.

Unpacking

Unpack the LO-PRO shipping crates. Depending on the height of the unit, the system components are generally shipped on two separate pallets. One pallet contains the sump with the bottom tray and blower already installed. The sump will be bolted to this pallet prior to shipment. The second pallet will contain the remaining trays and all plumbing.

NOTE

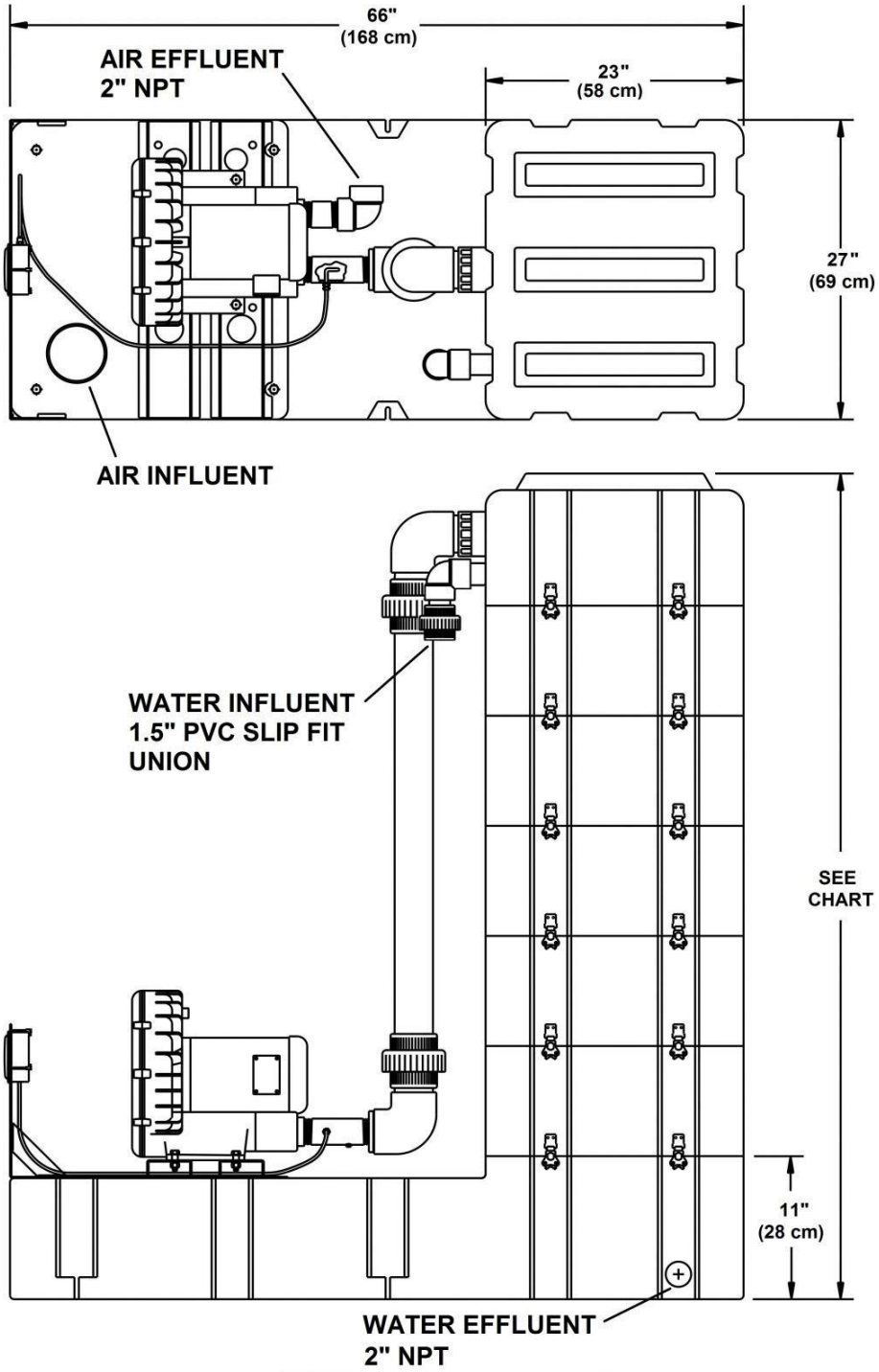
If the total height of the unit with pallet does not exceed the maximum shipping height of the transport truck, then the unit will be shipped completely assembled.

Inspection

Inspect all equipment upon arrival. Check the contents of the packing crates against the Sales Order and the System Specification Sheet included with this manual. If any items are missing or damaged, make note of this on the shipping papers and immediately notify Geotech Environmental Equipment, Inc. in Denver, Colorado, USA at (800) 833-7958 or (303) 320-4764.

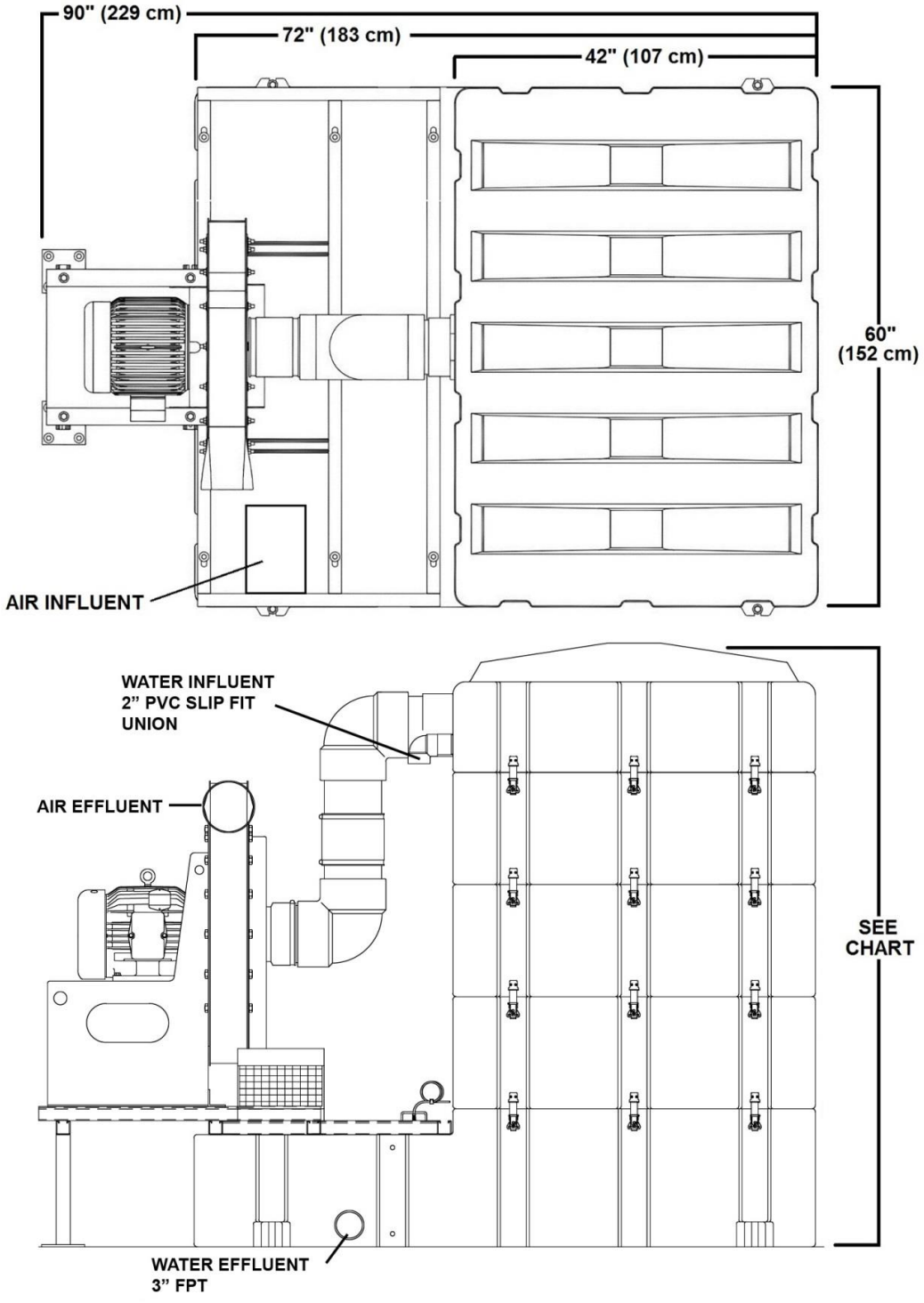
Deployment

Throughout the following installation procedures, refer to Figure 1-3 and Figure 2-1 for the LO- PRO II; Figure 1-4 and Figure 2-2 for the LO-PRO III; and when applicable, the GECM field wiring diagram.



TOTAL TRAY STACK HEIGHT					
TRAY QTY.	4	5	6	7	8
10" (26 cm) TRAYS	65"/165 cm	75"/190 cm	85"/216 cm	95"/241 cm	105"/267 cm

Figure 2-1: *LO-PRO II plumbing hookup diagram of influent/effluent fitting locations*



TOTAL TRAY STACK HEIGHT				
TRAY QTY.	2	3	4	5
13" (33 CM) TRAYS	57"/145 cm	70"/178 cm	83"/211 cm	96"/244 cm

Figure 2-2: *LO-PRO III plumbing hookup diagram of influent/effluent fitting locations*

Mount the Sump

Place the shipping pallet with sump on a flat level surface capable of supporting the entire system when filled with water. The filled weight of the sump is approximately 552 lbs. (251 kg) for the LO-PRO II and 1,525 lbs. (693 kg) for the LO-PRO III, while each LO-PRO II aeration tray weighs approximately 38 lbs. (17 kg) and each LO-PRO III aeration tray weighs 128 lbs. (58 kg) when full. Given the additional weight of the blower and other system components, the total weight of an average LO-PRO II 5-tray system is approximately 1,050 lbs. (507 kg). The total weight of an average LO-PRO III 3-tray system is 2,100 lbs. (955 kg).

CAUTION

Leveling the sump is important because the LO-PRO will function properly only if the tray stack is plumb.

Stacking the Trays

The sump will be shipped with the first (bottom) tray (along with bubble plate and downcomer) pre-mounted and properly oriented. Depending on the height of the unit, the system may be completely assembled and ready to go upon arrival.

Carefully record the orientation of the bubble plate that is mounted between the sump and the first tray. Each bubble plate has a transfer duct (or downcomer) attached. The remaining trays are then stacked so that the positioning of these downcomers alternate from one side of the bubble plate baffle to the other. Tray orientation will be correct upon receipt, but it is good to record the orientation should the unit be disassembled for cleaning.

The key to proper tray stacking is as follows: If the unit has an even number of trays, not counting the lid, then the first bubble plate is to be placed with the downcomer towards the front (or blower side) of the unit. If there is an odd number of trays, then start the downcomer towards the back.

Trays are to be stacked individually to ensure that each baffle seats into the groove provided in the next higher tray support. Stack the remaining trays and bubble plates on top of the sump and place the lid onto the top tray.

The baffle on the bubble plate is to face upward and to the right (as you look at the unit from the blower side). The baffle is then seated into the slot of the next tray. The objective of alternating the bubble plates is to evenly distribute the flow of water through the system and to end up with the top bubble plate’s downcomer placed towards the back of the unit. When the lid is attached the influent water connection will not pour directly into an open downcomer, bypassing the first bubble plate. A bubble plate is not installed between the top tray and lid.

There are two kinds of bubble plates on the LO-PRO II. One is used for placing the downcomer towards the front and one for the back. If adding trays to your system, ensure that Geotech sends the correct tray assembly to keep the alternating sequence correct. The bubble plate used on the LO-PRO III is universal and can be flipped over to place the downcomer towards the front or back. Trays can be added or removed and the bubble plates re-arranged accordingly. The first downcomer installed to the sump on either LO-PRO model is taller than the rest and has an open bottom. The remaining downcomers are shorter with slots in the bottom.

Ensure all trays are aligned before locking the clamps in place.

Install the Lid

Verify that the internal plumbing on the lid is set at a 45° angle to the outside (or towards the water catch basin) when the lid is in place. The basin is for catching the influent water stream. Ensure the lid is aligned to the top tray before locking the clamps in place.

For the LO-PRO III you will also need to verify that the water catch basin is secured to the front, right side of the last tray with two screws. The mist eliminator will already be strapped to the lid from the factory.

Install Plumbing

1. If not connected, install the blower influent pipe between the 3” unions (LO-PRO II) or 6” flexible couplings (LO-PRO III) on the lid and blower.

2. Connect the influent water line, and optional flow meter, to the 1.5” (LO-PRO II) or 2” (LO-PRO III) slip fit union or adapter on the lid.

3. Run an effluent water pipe from the sump to a suitable receptacle or to a transfer pump for discharge to another location.
   - Two 2” (LO-PRO II) or 3” (LO-PRO III) FPT ports are provided on the sump for attachment of an effluent water pipe.
   - These ports are located on opposite sides of the sump.
   - Check local codes before plumbing effluent pipe.

Air Intake

The LO-PRO III comes with a screened air intake shroud. A mating flange can be installed when necessary to run ducting to an external air source.

Connect Exhaust

Attach an exhaust pipe to the 2” (LO-PRO II) or 3” (LO-PRO III) FPT “Air Out” opening on the back of the blower assembly. Route exhaust air to a separate collector or as required by local codes.

Wiring

CAUTION

All wiring must be carried out by a qualified electrician and be in accordance with government codes.

Install GECM

Refer to *Appendix B: GECM Installation***.** Even though the GECM electronics are enclosed within a NEMA 4 rated weatherproof box, it is advised that you place your GECM within a sheltered area, protecting the unit from direct exposure to water and sunlight.

WARNING

Power must be disconnected and locked out at the panel or services before any installation procedures are attempted.

Wire Blower

The LO-PRO II is equipped with a blower, usually 3HP or 5HP that can be wired directly to single phase power (115V or 230V) or to three phase power via a motor starter. The LO-PRO III is normally equipped with a 10HP, TEFC, 230/460 VAC, 3-Phase blower. If not wired directly, the LO-PRO blower can also be operated and controlled with the optional GECM.

WARNING

When the blower is wired directly to a local power source, thermal overload protection (when accompanying the blower electrical) needs to be properly wired to the motor starter by a qualified electrician.

Because each GECM is unique to the system(s) they operate, Geotech provides the customer with a GECM Field Wiring Diagram showing all wiring connections between the GECM and the system. The GECM is equipped with latching overload protection that will prevent the blower motor from restarting until the panel control switch is manually reset.

Wire Sump Probe & Vacuum Switches

If your LO-PRO is equipped with the sump probe and high/low vacuum switches, the leads from these components will be wired into a junction box mounted to the system control panel. The customer must wire from the junction box to the control panel (Figure 2-3) or as shown in the GECM Field Wiring Diagram.

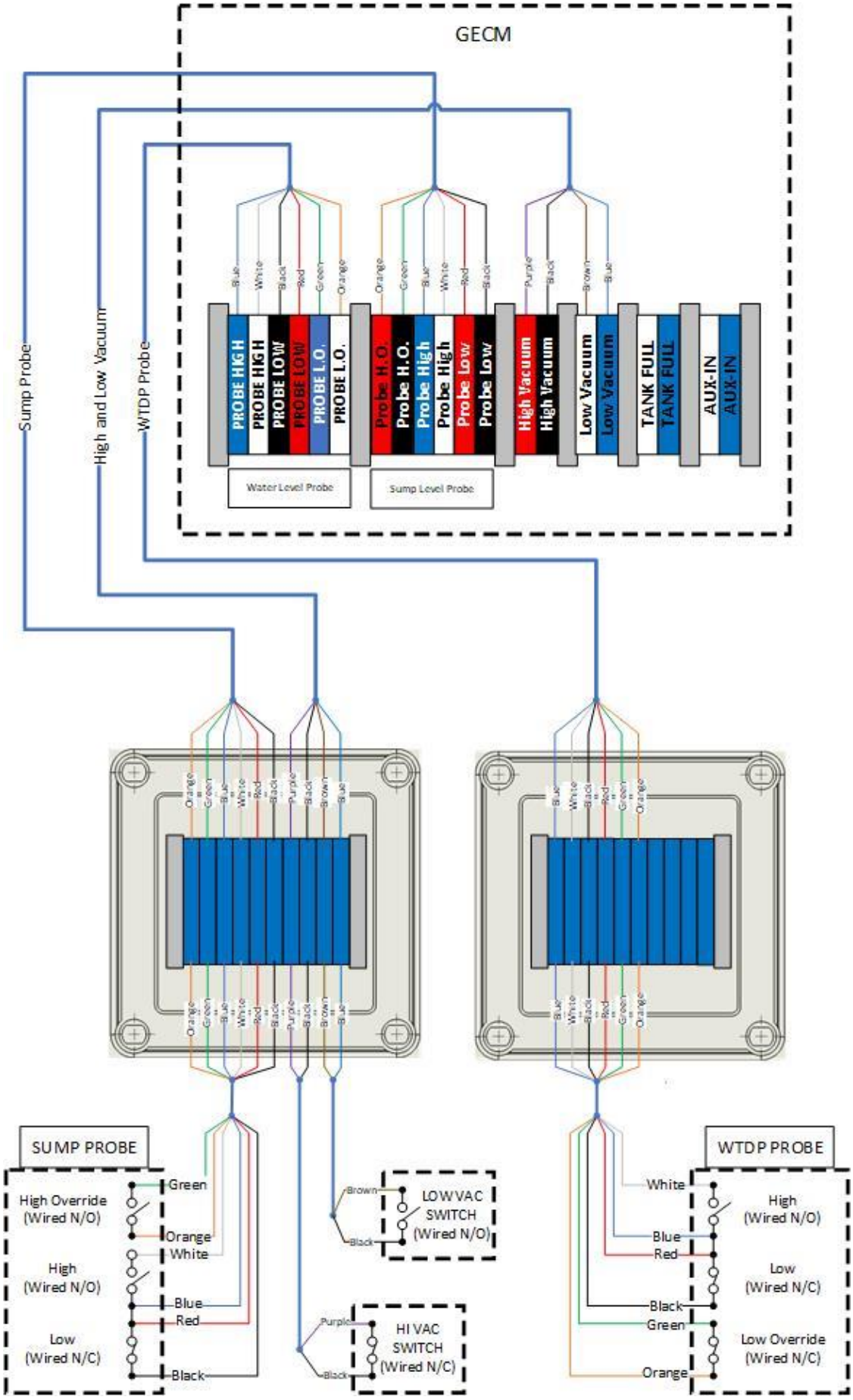


Figure 2-3: *Wiring diagram for the LO-PRO II sump probe and high/low vacuum switches.*

Connect CFM Gauge

If your system is equipped with the CFM gauge, use the flexible poly tubing provided to connect the gauge to the pitot tube. Both the gauge and the pitot tube are equipped with push-in fittings. When cutting and fitting the flexible tubes, ensure that they are not cut so short as to cause binding or kinking. Tubing should gently hang between both points and away from the blower body.

CAUTION

The tubes must be installed as shown in Figure 2-4. Run tubes through the holes in place on the blower support channels.

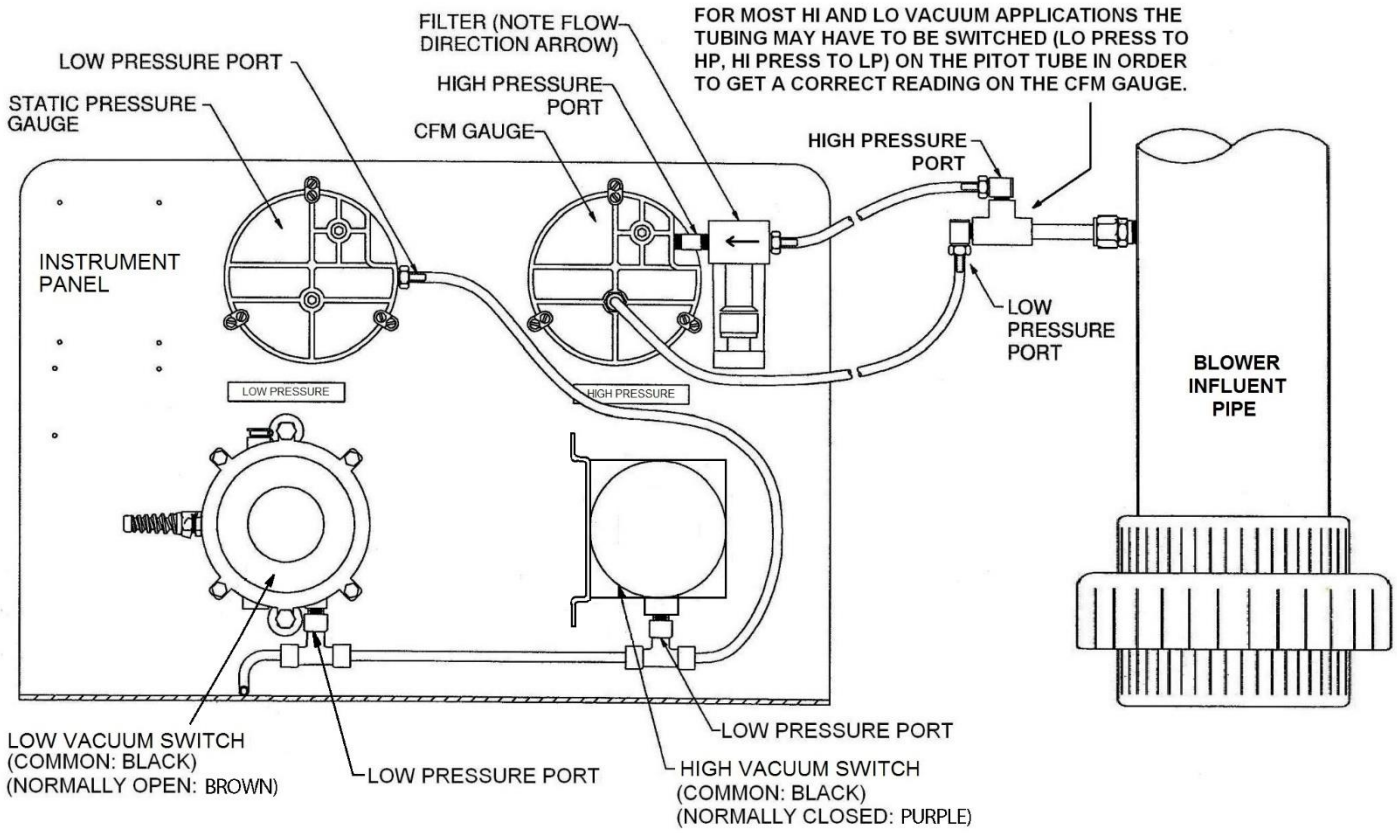


Figure 2-4: *Air lines and Pitot tube connection to the CFM gauge*

NOTE

Not all CFM gauges are designed to work with all pitot tubes. Readings can be off when mismatched. Consult Geotech for the correct application. Tubing connections between the CFM gauge and pitot tube may need to be reversed for proper function. Ensure that both levers on the pitot tube are open.

Install Flow Meter (optional)

If your system includes a flow meter, it must be installed in-line with the influent water source and in a vertical plane to ensure accuracy. Thread tape all fittings and hand tighten the connections. Over tightening can crack the flow meter.

Install Transfer Pump (optional)

To install a transfer pump with the LO-PRO, refer to the separate GECM Field Wiring Diagram and to the paperwork provided with the transfer pump. Refer to Figure 1-3 and Figure 1-4 for examples of a LO-PRO II and LO-PRO III installed with a transfer pump. Effluent connections at the pump can be made off the valve assembly at the top of the transfer pump. Plumbing considerations are dependent upon the site configuration.

Section 3: System Operation

Refer to *Appendix A: GECM Logic Statements* for a detailed description of the GECM's logic

Startup

Once installation has been completed the LO-PRO is ready for startup. Proceed as follows:

1. Double check all electrical and plumbing connections.

2. Close the water flow control valve (if present).

3. Start blower and check air flow direction (blower rotation).
   - If using three phase power a qualified electrician will need to adjust the leads.

4. With the water flow control valve slightly open, start the feed pump.

5. Slowly open the water flow control valve until the desired flow rate is obtained.

NOTE

If you are using a transfer pump and GECM, turn the HOA to AUTO before starting the feed pump. The transfer pump, in conjunction with the sump probe, will start when sufficient processed water has accumulated in the LO-PRO sump.

Operation

Once startup has been achieved, LO-PRO systems equipped with the optional GECM, sump probe and vacuum switches will function as shown in the system Process & Instrumentation Diagram (Figure 7-1).

On LO-PRO III systems, make sure to secure blower blast gate position with the wing screw to ensure the appropriate amp draw at startup.

Sump Probe

The optional controls enhance the efficiency and safety of the LO-PRO system by coordinating the function of the blower, the feed pump and the transfer pump.

The sump probe monitors the water level in the LO-PRO sump and signals the transfer pump (via the control panel) to switch the pump on and off in response to changes in water level. The probe also has a high override sensor that can shut off the feed pump if the water level in the sump rises too high and threatens to flood the blower.

High Vacuum (Pressure) Switch

If bubble plate fouling or water buildup in the trays causes the total system vacuum to rise over a predetermined limit, the high vacuum switch will shut off the blower. This will prevent water from reaching the blower. For the LO-PRO II this limit is approximately 30" (7.5 kPa) of water column for blowers up to 3 HP and 40" (10 kPa) for blowers up to 5 HP blowers. For the LO-PRO III this limit is approximately 30" (7.5 kPa) of water column.

Low Vacuum (Pressure) Switch

Should the LO-PRO experience a power failure to the blower or have part of the vacuum tubing line cut, the system pressure will automatically fall below 1” to 2” (.3 to .5 kPa) of water column and the low vacuum switch will shut off the LO-PRO control panel and feed pump. This will prevent untreated water from passing through the LO-PRO system.

Faults and Alarms

Alarms are temporary conditions which prevent the affected pump from operating. Alarms illuminate the yellow light on the GECM control panel. When the condition alleviates, the system will resume normal operation. Alarms include:

- Remote Switch Off
- Operational Timer
- Blower Off

Faults are latching conditions that require the user to inspect and resolve the problem. The user must reset the affected HOA switch before it will resume normal operation. Faults illuminate the red light on the GECM control panel. To reset a fault for a sub-system, the respective HOA switch must be set to the “OFF” position.

NOTE

If water intrusion into the blower piping is suspected, remove the drain plug and empty the piping of all water before starting the blower. The drain plug is located below the blower influent pipe outside the blower assembly.

Section 4: System Maintenance

Cleaning the LO-PRO Unit

The LO-PRO is designed for trouble free operation with minimal maintenance required. The modular design of the system permits easy disassembly for inspection and cleaning.

CAUTION

Material removed from the LO-PRO bubble plates during cleaning should be collected and disposed of in accordance with government codes. It is the customer's responsibility to determine if minerals deposited by the groundwater must be treated as hazardous waste.

WARNING

Always wear eye protection, gloves and proper clothing when performing maintenance procedures. Geotech recommends that the appropriate personal protective equipment for cleaning LO-PRO trays should be at USEPA Level D Protection modified with splash protection as follows:

Hard hat with splash shield
Splashguard goggles
Waterproof coveralls
Waterproof gloves
Waterproof boots

At sites where toxic chemicals are present in the water being treated, upgraded Personal Protective Equipment (PPE) (e.g. air purifying respirator, chemical resistant gloves, etc.) may be required.

Sump, Tray, and Lid Cleaning Procedure

NOTE

When performing regular maintenance, be careful not to damage the gaskets by placing or sliding the lid or trays on the ground or rough surface. A set of gaskets is glued to each tray and should be cleaned separately with a soft cloth. Replacement gasket kits can be obtained from Geotech.

The most common maintenance that may be needed on a regular basis will be the cleaning of the bubble plates. If the holes in the bubble plates begin to clog due to buildup of organic or inorganic material in the water, the high vacuum switch will repeatedly shut down the system. When this happens, it is recommended that the aeration trays, bubble plates and downcomers be disassembled and cleaned as follows:

1. Numerically mark the outside of the trays so that re-assembly will be easy.
   - Do this for each bubble plate also so that the orientation can be properly restored when reassembled.
   - When necessary, use the instructions outlined in *Section 2: System Installation "Stacking the Trays"*.

2. Disconnect the 3" (LO-PRO II) or 6" (LO-PRO III) PVC pipe from the lid union and blower union.
   - Visually inspect the interior for debris and clean as needed.

3. Disconnect the union for the influent water connection.
   - If using a flow meter, you may want to clean it while it is off the system.

4. Remove the lid. Then, remove the mist eliminator in the lid.

5. Clean the lid and mist eliminator with hot, soapy water.

6. Inspect the internal PVC plumbing for any obstructions.

NOTE

Degreasers such as phosphate free detergent or Geotech Field Equipment Cleaner can also be used in breaking up hydrocarbon build up on the interior parts.

7. Remove the trays and bubble plates.

8. Clean all parts using a brush with hot, soapy water.

9. Rinse thoroughly.
   - As you remove and clean each tray and bubble plate, set them aside in a row for easier reassembly.

10. With the trays off the sump, it is recommended that the interior of the sump be inspected and accumulated debris removed.
    - This will also prevent any clogging of the transfer pump.

11. Inspect the screen to the influent air hole at the black control panel and remove any debris from the screen.

Mist Eliminator Maintenance

Clean the polypropylene mist eliminator on a regular basis. The required frequency of cleaning should be evaluated on a site by site basis, as frequency of cleaning is dependent on water chemistry and other factors. Figure 4-1 shows the location of the mist eliminator and retention hardware in a LO-PRO III.

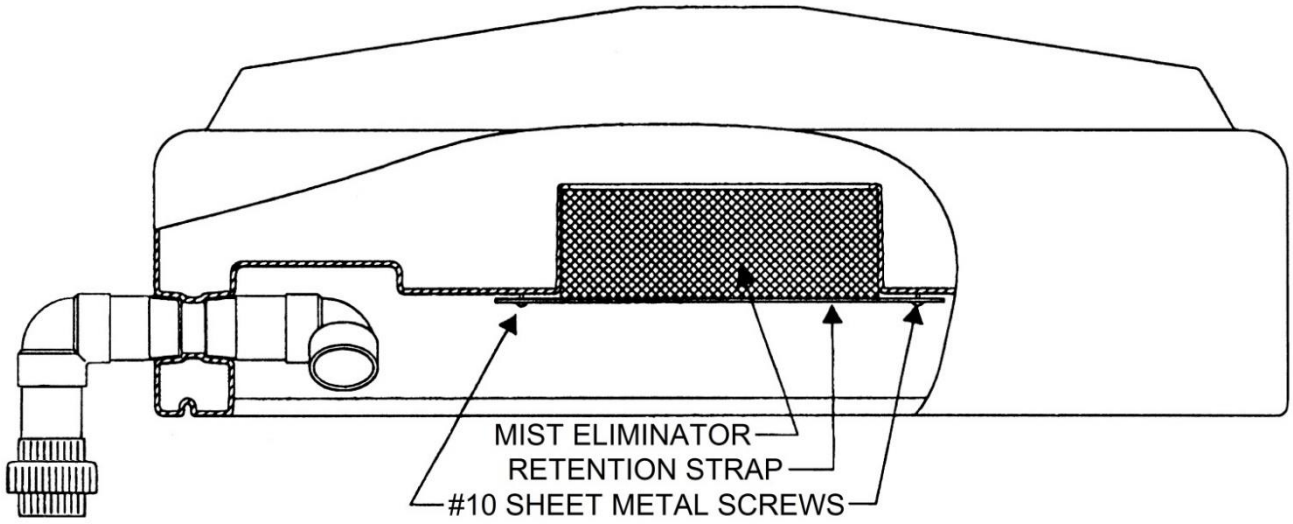


Figure 4-1: *The LO-PRO III mist eliminator*

1. Loosen the retaining clips and lift the entire lid assembly (cover) from the LO-PRO.

2. If working on a LO-PRO III, remove the four (4) #10 sheet metal screws that secure the retention straps.

3. Pull the mist eliminator from the lid assembly.

4. Tap the mist eliminator against a sturdy surface to dislodge any large particles that are trapped within the mesh.
    - When possible, completely soak the mesh and frame in a degreaser such as phosphate free type cleaner or Simple Green.

5. Rinse the mist eliminator with clean water and allow it to dry.

6. Replace the mist eliminator in the lid assembly.

7. Check and clean the influent water catch basin in the top tray.

8. Replace the lid assembly and tighten the retaining clips.

Reassembling the Trays and Lid

CAUTION

When reassembling the LO-PRO be sure the gaskets are clean and have no tears or gaps to eliminate any potential air leaks between trays.

NOTE

Refer to the instructions outlined in Section 2: System Installation, “Stacking the Trays”, in conjunction with this section when re-assembling the LO-PRO trays.

Trays and bubble plates (with downcomers) need to be restacked to the sump in the order they were removed. Orientation of the bubble plates is critical also in that the downcomers attached need to alternate from front to back. One downcomer (the one attached to the bubble plate for the sump) is longer than the rest and must go with the first bubble plate. Figure 4-2 and Figure 4-4 show the two kinds of downcomers and bubble plates that come with the LO-PRO II system. Figure 4-3 shows the two kinds of downcomers used on the LO-PRO III system. See *Section 8: Replacement Parts and Accessories* for a listing of part numbers.

Figure 4-2: *LO-PRO II Downcomers*

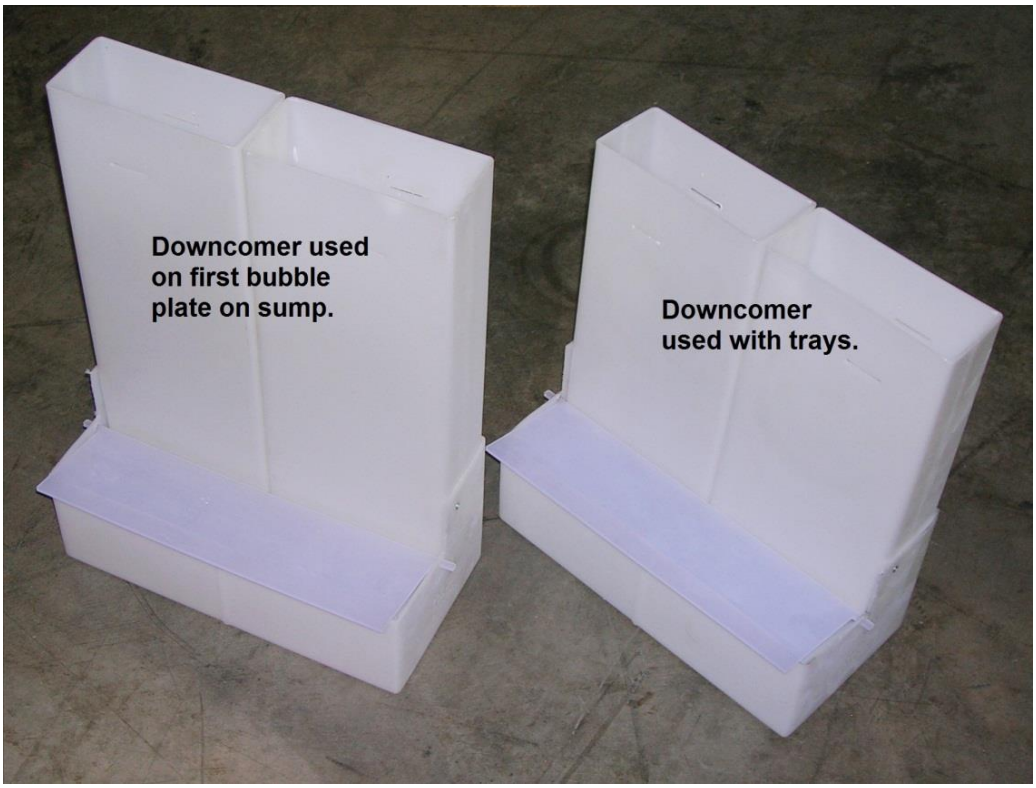


Figure 4-3: *LO-PRO III Downcomers*

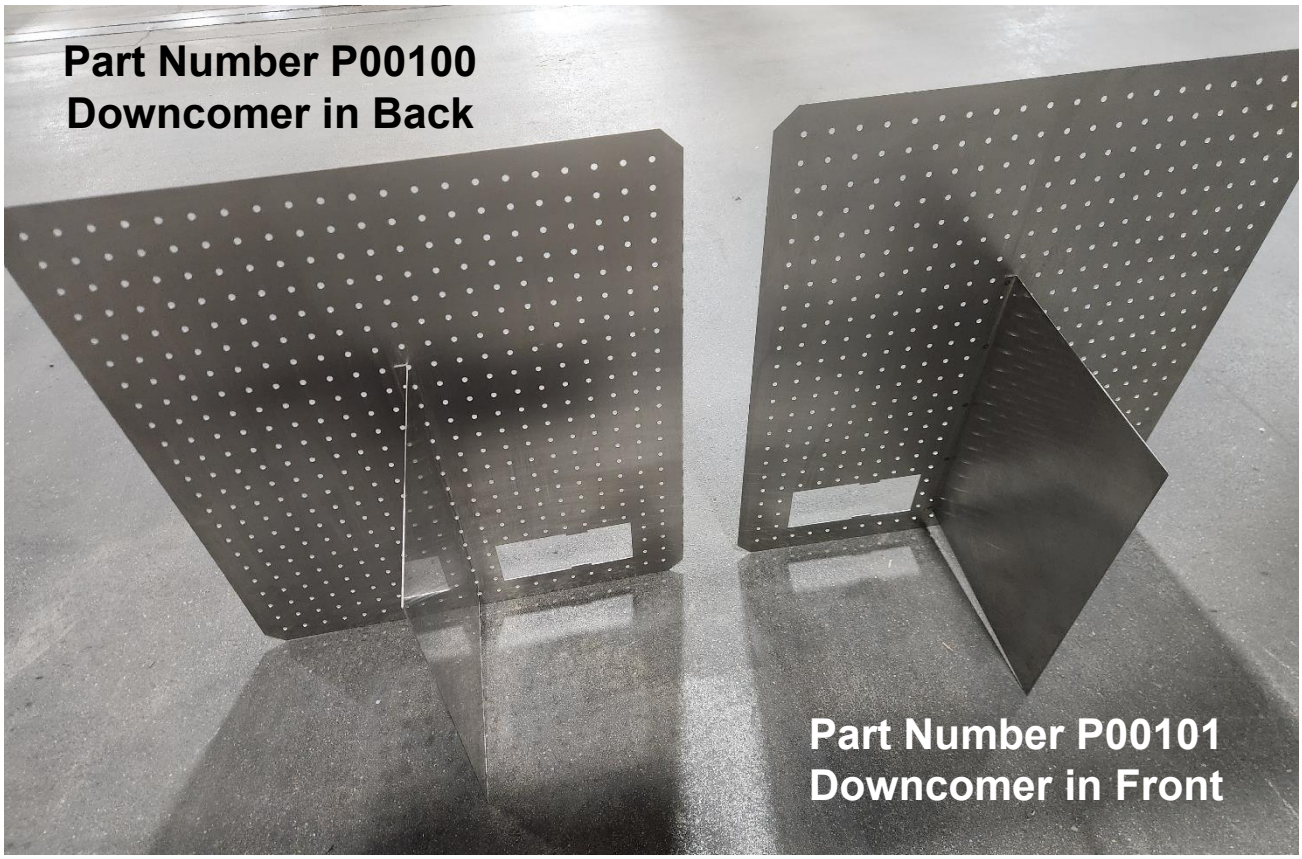


Figure 4-4: *LO-PRO II Bubble Plates*

LO-PRO II bubble plates also have a vertical wall, or baffle, in the center, which when installed correctly, will lock into the inner molded groove of the next tray to be stacked. This will help you with the reassembly. Should your bubble plates get mixed up during the cleaning process, it is important to understand where to place the downcomer opening for the first bubble plate – either towards the front or to the back. This is determined as follows:

If the LO-PRO II has an even amount of trays (4, 6, 8), place the first downcomer toward the front (or blower side) of the unit and to the right side of the sump (as shown in Figure 4-5). If the LO-PRO II has an odd amount of trays (5, 7) place the first downcomer towards the back. Then alternate the bubble plate openings and downcomers front to back.

To determine whether to place the downcomer for the first bubble plate on the LO-PRO III toward the front or the back, note the following:

If the LO-PRO III has an even amount of trays (4), place the first downcomer toward the front (or blower side) of the unit and to the right side of the sump (as shown in Figure 4-6). If the LO-PRO III has an odd amount of trays (3, 5), place the first downcomer towards the back. Then alternate the bubble plate openings and downcomers front to back.

When attaching the lid on any LO-PRO there will be no downcomer below the water influent plumbing.

CAUTION

Never stack downcomers over one another. All bubble plates and downcomers are to alternate front to back, with the top bubble plate downcomer in back.

Figure 4-5: *First Bubble Plate on LO-PRO II Sump*

Figure 4-6: *First Bubble Plate on LO-PRO III Sump*

As you stack each tray, look at the alignment from all sides before completely latching the tray into place.

Finally, attach the lid. Verify that the mist eliminator is clean and pressed all the way into the center hole inside the lid. Set the internal plumbing of the lid to a 45 degree angle from the corner, then place the lid on, center it, and latch it into place.

Clean Sump Probe

On a regular schedule, remove and wash the sump probe in phosphate free detergent and hot water. This will prevent fouling that could lead to failure of the probe. The required frequency of cleaning is dependent upon water chemistry, temperature and other factors that must be evaluated on a site by site basis.

Drain Vacuum (Pressure) Switches

The high and low vacuum switches should be drained on a regular basis. This is particularly important in applications where excessive condensation may cause a buildup of moisture within the switch. To drain the switch, rotate the vent drain plug (underneath) one turn in a clockwise direction and then return the plug to its original position. See Figure 4-7.

Drain CFM Gauge Air Filter

The filter on the CFM gauge should be checked on a regular basis and drained if necessary. Drain the filter by turning the drain screw (underneath) in a clockwise direction (when viewed from the bottom of the filter.) Close the drain by turning the screw counterclockwise. See Figure 4-7.

Check Tubing

Regularly check the condition of the FEP tubing going from CFM gauge to pitot tube and between the static pressure gauge, vacuum switches and static sensor tip in the influent piping. A cut, kink, or loose tubing connection can cause operational problems with the LO-PRO. See Figure 4-7.

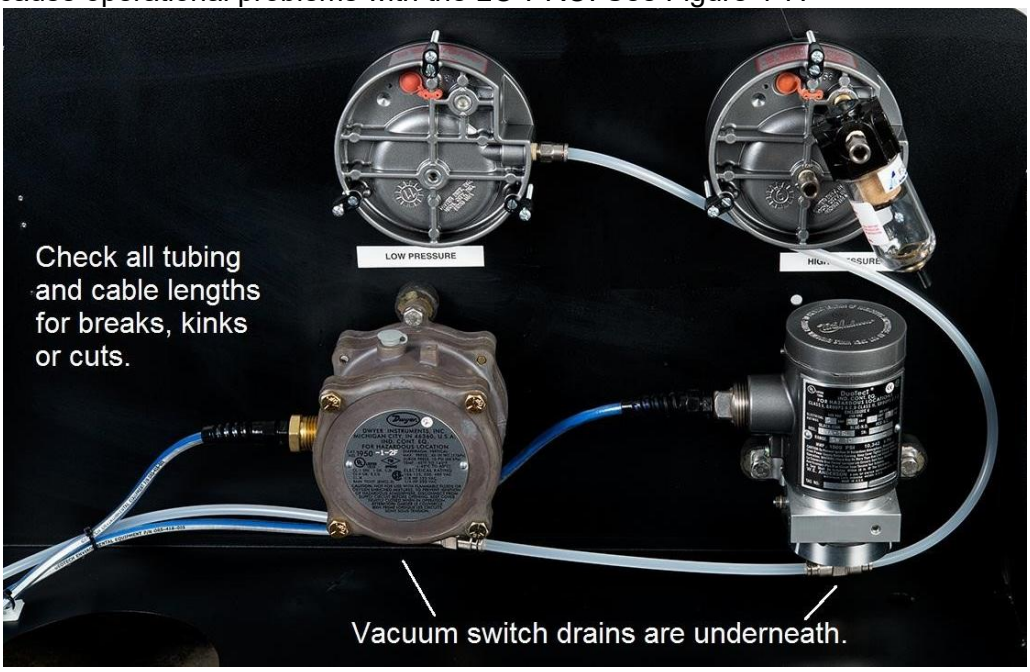


Figure 4-7: *Static Sensor Tubing between gauges and switches (CFM gauge tubing not shown)*

Operation of the High/Low Vacuum Switches

Though the high and low vacuum switches are called out as "pressure" switches, and can be used as such, their application with LO-PRO systems are to be used as “vacuum” (negative pressure) switches. When you see the word "pressure", assume "vacuum" unless the step is defining a physical port on the switch itself, in which case the word "pressure" is used.

LO-PRO “High Vacuum” (pressure) switch

The high vacuum switch used is always wired for "normally closed". The switch will remain closed until you adjust the vacuum setting screw to have the switch “open” at a specific vacuum (negative pressure) reading (in inches) on the static pressure gauge. This is achieved by turning the set screw clockwise (CW) for a higher setting, counterclockwise (CCW) for a lower setting. When this setting is reached, the electrical contact will “open”, breaking the circuit (and in most applications, shut the system down).

LO-PRO “Low Vacuum” (pressure) switch

The low vacuum switch used is always wired for "normally open". Once a measurable amount of vacuum (1”/.3 kPa to 2”/.5 kPa or greater negative pressure) builds up within the unit, the switch will close and remain closed until you adjust the vacuum setting screw to have the switch “open” at a specific lower vacuum. This is achieved by turning the set screw CW for a higher setting, CCW for a lower setting. The GECM is preset to allow enough time for this switch to close as the unit is powered up. The electrical contact will “open” when the lower vacuum setting is reached, breaking the circuit.

- It’s called a pressure switch, but it all depends on how you plumb it to the system. The “High Pressure” port is used for positive pressure readings, the “Low Pressure” port is used for vacuum (negative pressure) readings.
- All switches are wired to be physically “closed” without pressure (vacuum) applied, except for the low pressure switch (which is wired “normally open” and immediately closes with the first sign of vacuum (negative pressure).
- The blower is basically “sucking” air through the LO-PRO system, thus the “vacuum” reference.

High Vacuum Switch Setting

High vacuum switches are pre-set at the factory to not exceed 30” (7.5 kPa) static pressure on 3HP and 10HP blowers, or 40” (10 kPa) on 5HP blowers. The purpose of this setting is to shut down the system and prevent drawing excessive current in the blower (in case of clogging to the influent air path) while maximizing contact between the air and the contaminated water to be treated, as described in *Section 1: System Description*. Before proceeding with an adjustment, read the literature that came with the switch from the manufacturer. When adjusting your high vacuum switch, use the following steps either to verify the current setting, or to make an adjustment to the high vacuum switch (such as after replacing a faulty switch):

1. Turn off the blower.

2. Turn off the influent water to the lid.

3. Disconnect the 3” (LO-PRO II) or 6” (LO-PRO III) PVC influent pipe from the lid union only and tilt the pipe outward, clearing the union.

4. At the junction box remove the black and purple wires for the switch and attach an ohm meter to the ends of each wire.
   - The ohm meter will show a “closed” circuit with the blower off.

NOTE

If drawing excessive current is a concern, then it may be necessary to have an electrician open the blower motor electrical box and attach an amp probe to a power leg to verify that the name plate amps are not exceeded while adjusting the system to 30" (7.5 kPa) or 40" (10 kPa) for the LO-PRO II and 30" (7.5 kPa) or 35" (8.7 kPa) for the LO-PRO III.

5. Place a jumper on the circuit for the high vacuum switch at the junction box so that the GECM (if supplied) will not turn the system off during the test.

6. Take the appropriate steps for your LO-PRO model below.

    a. For a LO-PRO II, Turn on the blower.
    b. For a LO-PRO III, adjust the blast gate to halfway, then turn on the blower. Once the blower is on, adjust the blast gate at open flow so that the amp reading is just one (1) value under the nameplate amps specified on the blower, then lock the blast gate in place.

7. Proceed with one of the following options:

<u>Option 1 - Verifying the current setting of an existing high vacuum switch</u>

1. With the blower running, gradually cover the 3" (LO-PRO II) or 6" (LO-PRO III) inlet pipe with a hard flat object and monitor the increase in vacuum on the static pressure gauge.
    - DO NOT use your hand to cover the inlet pipe.
    - Keep an eye on the amp reading while doing so.
    - When the ohm meter shows "open" the inches shown on the gauge will be your current setting.
    - If the ohm meter does not show an "open" after reaching the correct inch setting or upon reaching the name plate high amps, then the switch is either set too high, or the switch is stuck (a stuck switch needs to be replaced).

2. Adjust the switch by turning the set range screw on top CCW for less inches, CW for more inches.
    - The switch will be set when the circuit "opens" at the correct inch setting **without drawing excessive current in the blower.**

Some LO-PRO III systems may not reach the maximum inch setting specified for the horsepower of the blower. If so, set the switch for the highest setting you can get minus 2" (.5 kPa). For example, if the maximum reached is 27" (6.7 kPa), then set the high vacuum switch to open at 25" (6.2 kPa).

3. Turn the blower off and restore all electrical connections.

4. If you have a GECM, turn the unit back on and cover the inlet pipe to verify that the GECM will turn off the system with the high vacuum setting (this will activate after 5 seconds.)
    - DO NOT adjust with pressure on the switch.

5. Re-connect the inlet pipe and restore the system for operation.

<u>Option 2 - Adjusting the setting for a new high vacuum switch</u>

1. Turn the set screw all the way CCW.
    - The switch will show "closed" on the meter.

2. With the blower running, gradually cover the 3" (LO-PRO II) or 6" (LO-PRO III) inlet pipe with a hard flat object until the static pressure gauge reaches the desired inches you want to set it at

- DO NOT let the amps exceed the blower specifications.
- DO NOT cover the inlet pipe with your hand.

3. With the switch all the way CCW, the meter should already show an “open” circuit.

4. Leave the cover in place on the inlet pipe.

5. Using a flathead screwdriver, turn the set screw CW until the switch “closes”.
   - This will “ballpark” the adjustment.

6. Turn the set screw back a few turns and continue to “fine-tune” the switch by removing and **slowly covering** the inlet pipe to verify the current setting.

7. Repeat and adjust the set screw as necessary.
   - The switch will be set when the circuit “opens” at the correct inch setting **without drawing excessive current in the blower.**

8. Turn the blower off and restore all electrical connections.

9. If you have a GECM, turn the unit back on and cover the inlet pipe to verify that the GECM will turn off the system with the high vacuum setting (this will activate after 5 seconds.)

10. Re-connect the inlet pipe and restore the system for operation.

Fan/Motor Maintenance (LO-PRO III Only)

Lubricate fan or motor bearings to the manufacturer’s recommendations. Lubrication recommendations are included with the packet attached to the fan. Should the packet be missing, the following will apply:

HP Range	Standard Duty 8 Hr./Day	Severe Duty 24 Hr./Day Dirty Dusty	Extreme Duty Very Dirty High Ambients
10-40 HP	3 Years	1 Year	4 Months

Recommended motor greases:

- Polyrex EM – Exxon Oil Co.
- SRI #2 – Chevron Oil Co.

Do not over-grease the bearings. This is especially true if the bearings are not visible. Most bearing failures occur due to over-greasing than under-greasing. It is best to give the bearing a small drop of grease (using the previous table) while the system is warmed up and at a standstill.

Transfer Pump

If your system includes an optional transfer pump, the following routine maintenance tasks will help to ensure continuous service from the pump. Read the manufacturer supplied user manual before proceeding.

- Check the flow rate weekly to ensure that the cycling frequency is minimized.
- Inspect hoses and wiring quarterly for cracks, cuts, or abrasions.

Section 5: System Troubleshooting

WARNING

These procedures are meant to be carried out by personnel qualified to work on electrical circuitry. If in doubt, obtain the services of a qualified electrician.

Getting Help

If the troubleshooting procedures in this section indicate a component failure, document the problem (as outlined below), then contact Geotech Sales for technical support.

Read the entire manual and become thoroughly familiar with all system components, system operation, and troubleshooting procedures. Prepare a written list of all problems encountered while operating the equipment.

Geotech service personnel are trained on all aspects of the LO-PRO equipment line and are dedicated to helping you maximize the efficiency and cost effectiveness of your LO-PRO system. Contact Geotech Sales for technical support of Geotech products.

Service Location

For technical support of Geotech products contact us at the address listed below:

Geotech Environmental Equipment
2650 East 40th Avenue
Denver, CO 80205
Toll Free Phone: 800-833-7958
Commercial Phone: 303-320-4764

Troubleshooting Procedures

The troubleshooting procedures outlined in this section assume that your LO-PRO is controlled by an optional GECM and is equipped with the sump probe, vacuum (pressure) switches and optional water flow gauge. Troubleshooting procedures for LO-PRO systems without these optional controls are appended at the end of this section.

NOTE

If the LO-PRO is operated by a GECM, then additional system information can be found on the dashboard. If equipped with Wi-Fi, login using the provided QR Codes. Otherwise, login using username: **geotech** password: **env**.

The following troubleshooting guide contains potential problems with possible causes and recommended solutions. Before initiating troubleshooting, become familiar with proper installation and startup procedures as explained in Section 2: System Installation and Section 3: System Operation of this manual.

Problem: Blower not running

1st Cause: Loss of power to the blower.

1. Check for status on GECM.
    - If blank, check fuses and wiring connections.
2. Check for tripped motor starter due to high amps.
3. Check for thermal overload on blower motor.

Solution:

1. Have qualified electrician inspect the electrical system.
2. Verify amp settings on motor starter is correctly set for the blower motor specs.
3. If there is power to the system and the GECM is not functional, contact Geotech Sales for technical support.
4. Verify that blast gate has not opened all the way causing excessive current draw.

2nd Cause: The high vacuum switch has shut down the blower for one of the following reasons:

1. Obstruction at the air intake portal.
2. Water build-up (entrainment) within the aeration trays.
3. Foaming in the trays or fouling of the bubble plates.
4. High or low vacuum switch out of adjustment (read section *Section 1: System Description* – "High and Low Vacuum (Negative Pressure) Switches").
5. Static sensor tubing line has been cut causing a low vacuum fault.

Solution:

1. Check for water discharge at the blower effluent. If water is found, skip to Step 2. If water is not found, check the high vacuum switch as follows:

    a) Disconnect the 3" (LO-PRO II) or 6" (LO-PRO III) PVC blower influent pipe at the union on the lid.

    b) Turn the blower control switch to OFF then back to AUTO to restart the blower. With the blower running, gradually cover the 3" (LO-PRO II) or 6" (LO-PRO III) inlet pipe with a hard flat object (not your hand) and monitor the increase in vacuum on the static pressure gauge.
        - LO-PRO II systems with 1 1/2, 2, or 3 HP blowers should shut down at approximately 30" (7.7 kPa) water column (WC) or less, while 5 HP blowers should shut down at approximately 40" (10 kPa) WC.
        - LO-PRO III systems should shut down at approximately 30" (7.5 kPa) water column (WC) or less.
        - If the blower fails to run or shuts off prematurely, refer to *Section 4: System Maintenance* and verify the adjustment of the high vacuum switch.
        - If adjustment is not possible, the switch may be defective. Call Geotech Sales at 800-833-7958 or (303) 320-4764 for assistance.

2. If water is found in the blower piping, proceed as follows:

    a) Confirm that the water flow rate is below 20 GPM (76 LPM) on the LO-PRO II or below 60 GPM (227 LPM) on the LO-PRO III.

- If the flow rate conforms to specification, check for a stuck float in the optional water flow gauge.

b) If the gauge is functioning properly and the flow rate is correctly set, remove the lid from the top of the tray stack and confirm that the water distribution nozzle is directed into the influent reservoir and not pointing upward.

c) If the nozzle is properly positioned, disassemble the tray stack and check for fouling of the bubble plates.

3. If the plates are fouled, clean according to the instructions outlined in *Section 4:System Maintenance* of this manual.

If the plates are not fouled, the water chemistry at your site may be causing foaming in the LO-PRO. Call Geotech at 1(800) 833-7958 or (303) 320-4764 for assistance.

NOTE

If the blower has taken on water, the pitot tube and static tip must be cleaned before the system can be restarted. Remove the pitot tube and static tip from the plumbing and use compressed air to blow any water from the tubes and air lines. Drain any liquid from the lines and vacuum switches.

CAUTION

Never blow compressed air directly into the gauges or vacuum switches as this may damage them.

Problem: Blower not running (system vacuum indicator showing)

Cause: The low vacuum switch has shut down the blower for one of the following reasons:

1. Incorrect motor rotation.
2. Obstruction at the blower effluent.
3. Severed poly tubing or disconnected tubing at static sensor.

Solution:

1. Change the electrical leads on the motor to correct rotation.
2. Clear obstructions from discharge line.
3. Inspect poly tubing for cuts or kinks.

Problem: Blower not running (thermal overload)

Cause: Shutdown caused by a blower thermal overload.

Thermal overloads are usually caused by exceeding the full load amps setting on the adjustable thermal overload circuit. Proceed as follows:

Shut down all 3-phase power before opening any enclosure. Follow proper lockout/tag out procedures.

WARNING

Solution:

1. Confirm that the amp draw has not been exceeded. Refer to the blower motor nameplate for proper power supply requirements and adjust setting on the thermal overload circuit inside the motor starter enclosure.
2. Check for high ambient heat levels.
3. Check for minimum air flow requirement stamped on blower.

To restart the blower after thermal overload: Allow the motor to cool. Place the blower HOA switch in the **OFF** position and then return the HOA to **AUTO.**

NOTE

Overheating can also be caused by an old or worn motor or insufficient cool air flow over the exterior of the motor.

Problem: Low removal efficiency

Cause: Reduced contaminant removal efficiency can be caused by a number of factors, some of which are listed as follows:

1. Verify sizing program vs. actual influent contaminant levels.
2. Water flow rates are improperly adjusted.
3. Bubble plates fouled.
4. Tower out of plumb.
5. Low water temperature.
6. Foaming in trays.
7. Free or suspended product in influent water.
8. Clogged mist eliminator.

Solution:

1. Confirm water flow rate is below 20 GPM (76 LPM) for LO-PRO II and 60 GPM (227 LPM) for LO-PRO III.
2. Confirm that the tray tower is plumb.
3. Clean mist eliminator using procedures outlined in *Section 4:System Maintenance*.
4. Check for fouling of the bubble plates. Clean per procedure in *Section 4:System Maintenance*.
5. Confirm that water temperatures have not deviated markedly from design parameters.
6. Check for water entrainment caused by foaming. If foaming is suspected, call Geotech for assistance.
7. At sites where contaminant is diesel or other heavy oil, check for presence of sheen in the LO-PRO sump. If sheen is present, call Geotech for assistance.

Problem: Influent pump will not run

Cause: The influent pump is controlled both by its own control circuitry and by input from the LO-PRO sump probe.

The feed pump will not run unless:

1. Sufficient water is present in recovery well.
2. The LO-PRO blower is running.
3. Power is present at feed pump control panel.

Solution: If these three prerequisites are met and the pump still will not run, proceed as follows:

1. Check the water level in the LO-PRO sump.
   - If the water level is high, determine why the sump is not draining.
   - Look for a faulty transfer pump, a clogged sump discharge fitting or a fouled sump probe (high-low float stuck down).
   - If the water level is not high, check for a fouled sump probe (high override float stuck up).

2. Check for a fouled feed pump probe or an electrical fault inside the feed pump control panel. Refer to the troubleshooting procedures provided with the feed pump.

Problem: Effluent transfer pump will not run

Cause: The effluent transfer pump is controlled by either a GECM or its own control circuitry, and by input from the LO-PRO sump probe.

The effluent pump will not run unless:

1. Sufficient water is present in the sump.
2. Power is present at the effluent pump control panel.
3. Sump probe floats are not stuck.

Solution: If these prerequisites are met and the pump still will not run, check for a fouled sump probe or have a qualified electrician inspect the pump wiring and motor starter.

Problem: CFM gauge not reading or pegged out

Cause:

1. Tubing has been swapped or is cut or kinked.
2. Valve handle(s) on pitot tube are closed.
3. Pitot tube has been turned in pipe.

Solution:

1. Replace bad tubing.
2. If gauge needle is all the way to the left or right, swap the tubing at the pitot tube.
3. Ensure both valve levers on the pitot tube are set to open.
4. Sensor holes on pitot tube need to be in-line with the effluent air flow. Adjust pitot tube as needed.

Additional Troubleshooting Procedures

The following procedures can be used to troubleshoot LO-PRO systems that are not equipped with optional GECM controls.

Exercise extreme caution when working with blowers and motor starters. Always follow all site lockout/tag out procedures.

WARNING

Problem: Blower not running

Cause:

1. Tripped circuit breaker at service.
2. Blower shut down by thermal overload.

Solution:

1. Reset breaker and determine reason for excessive current draw (see below).
2. Determine cause of thermal overload by proceeding as follows:

Thermal overloads can result from bubble plate fouling or foaming in the trays. Fouling or foaming causes the blower to exceed its vacuum limits (30”/7.5 kPa to 40”/10 kPa of water for LO-PRO II and 30”/7.5 kPa to 35”/8.7 kPa of water for LO-PRO III) and eventually results in overheating and thermal overload shutdown. Thermal overloads can also be caused by high ambient temperatures around the blower.

Heavy vacuum demands caused by bubble plate fouling or foaming will cause blowers to heat up and draw excessive current. This will eventually cause the thermal overload circuit breaker at the service, motor starter, or blower to blow.

Proceed as follows to eliminate the cause of the blower shutdown:

1. Disassemble the tray stack and check bubble plates for fouling. If the plates are fouled, clean as instructed in *Section 4:System Maintenance*.
2. If the plates are not fouled, check for water buildup (entrainment) caused by foaming.
   - LO-PRO II: To do this, turn off the influent water supply and remove the drain plug at the bottom of the 2” portion of the blower influent pipe.
   - LO-PRO III: To do this, turn off the influent water supply and remove the bottom of the effluent 6” (15cm) pipe from the back of the blower.
   - If water is found, chemicals at your site are causing foaming inside the LO-PRO. Call Geotech for assistance.

GECM Troubleshooting

Use this section, in conjunction with the display definitions found in *Appendix A: GECM Logic Statements,* to troubleshoot any occurring system problems.

NOTE

To Reset a fault the affected HOA switch must be placed in the “OFF” position and then returned to the “AUTO” position. If the fault condition has been resolved the faulted sub-system will resume normal operation.

Problem: GECM does not turn on

Cause: No power to the GECM PLC

Solution:

1. Check all incoming wire connections.
2. Check fuses and breakers at power source. Fuses can also be found on the GECM's transformer. These can blow from a voltage spike or incorrect voltage applied to the GECM.

Problem: Water Pump Will Not Run

Cause:

1. An alarm is active preventing the pump from operating. The yellow light is illuminated.
2. A latching fault is active shutting down the LO-PRO and preventing the system from operating. The red light is illuminated.
3. The GECM or probe are wired incorrectly.
4. The probe is faulty or damaged.

Solution:

1. Check device status at GECM or dashboard. Alarms will resume normal operation when condition causing them alleviates. Refer to *Appendix A: GECM Logic Statements* to resolve faults.
2. Check for motor starter thermal overload trip.
3. Check wire connections into and out of motor starter.
4. Check WTDP probe wiring to GECM.
5. Check WTDP probe floats move freely and verify probe level indications on the Dashboard.

Section 6: System Specifications

This page lists all the standard components and optional accessories included with your LO-PRO II Air Stripper. Geotech part numbers for the optional equipment listed can be found in Section 8.

Blower Model: _____

Blower horsepower: 3 HP ____, 5 HP ____, 10 HP ____, Other ____

GECM (optional)* _____

*When used with the GECM, the LO-PRO II must be equipped with high and low vacuum switches and a sump probe.

____High Vacuum Switch ____Low Vacuum Switch

____Sump Probe ____Transfer Pump

____CFM Gauge ____Junction Box

____Flow Meter

LO-PRO II Dimensions
Length: 66” (168 cm)
Width: 27” (69 cm)

LO-PRO III Dimensions
Length: 72” (183 cm)
Width: 60” (152 cm)

Number of trays: _____
Height: _____
(see *Section 2: System Installation*)

Materials of Construction

Sump, Trays, and Lid:	Linear Low Density Polyethylene
Bubble Plates:	Stainless Steel
Influent and Effluent Plumbing:	PVC

Performance

Water Flow Rate (LO-PRO II):	1-20 GPM (4-76 LPM)
Water Flow Rate (LO-PRO III):	1-60 GPM (4-227 LPM)
Removal Efficiency:	Up to 99.99% for BTEX
Air Flow Rate:	Blower Efficiency Dependent

LO-PRO II Blower

Type:	Regenerative blower (TEFC: for use in Class 1, Div. 2 locations)
Flow Rate:	Up to 330 CFM (9.3 CMM)
Voltage:	115/230 or 230 or 208-230 or 208-230/460 or 230/460
Phase:	60 Hz, single or three phase
Horsepower:	3 – 5

LO-PRO III Blower

Type:	Centrifugal blower (TEFC: for use in Class 1, Div. 2 locations)
Flow Rate:	Up to 1100 CFM (31 CMM)
Voltage:	208-230/460
Phase:	Three
Horsepower:	10

Environmental

Max Operating Temperature: 122°F (50°C)

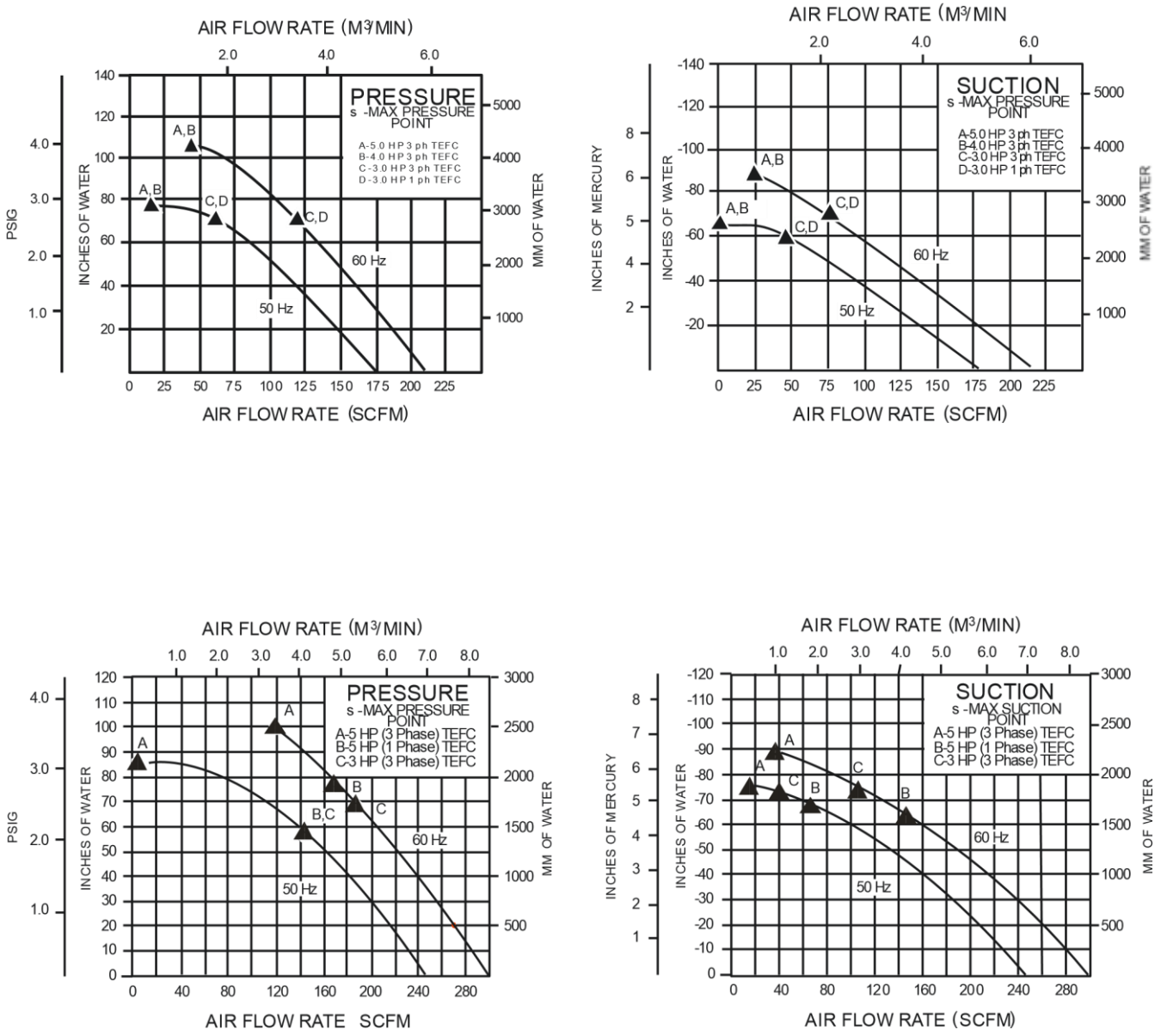
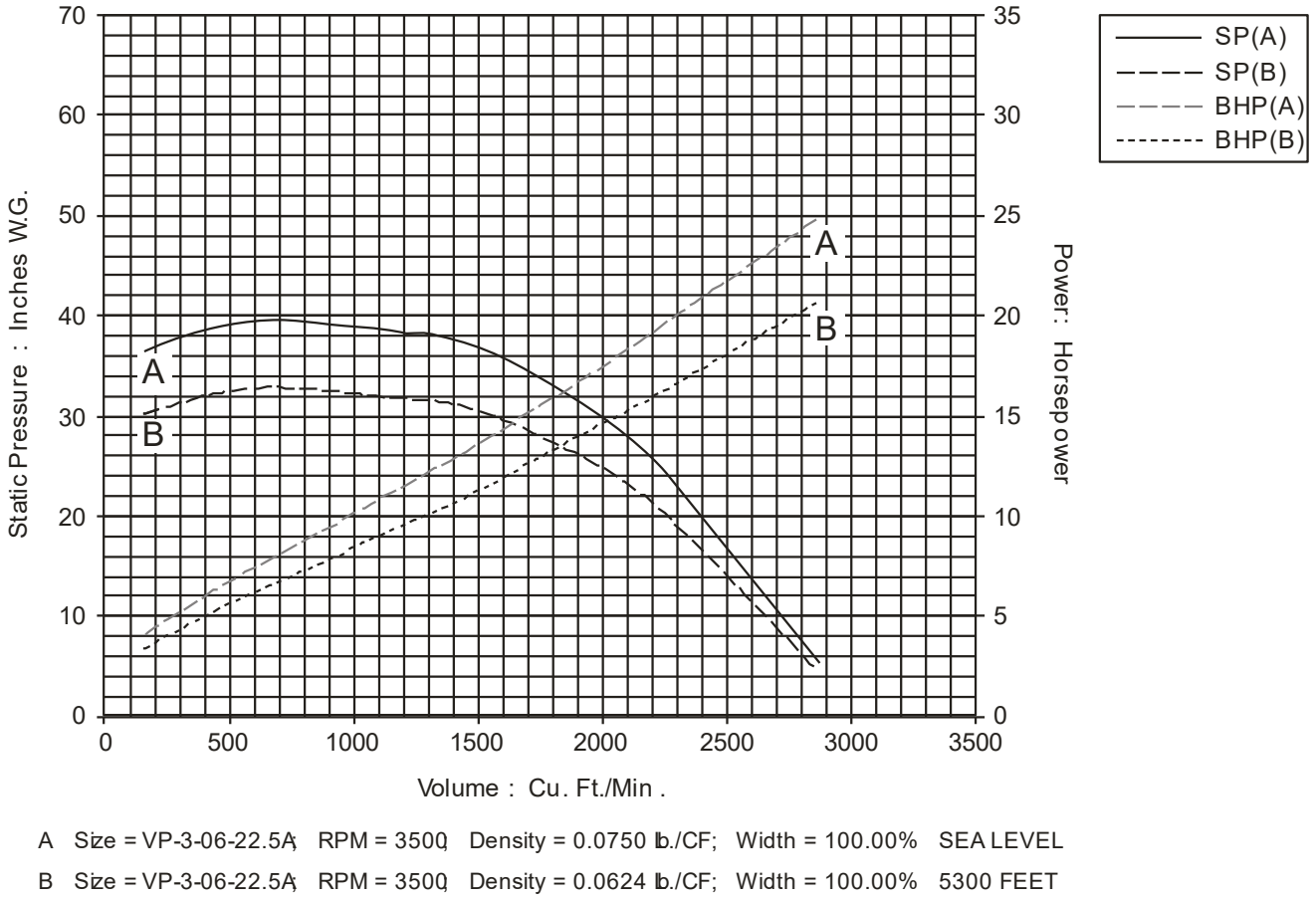


Figure 6-1: *LO-PRO II Blower Performance Curves*

LO-PRO III PERFORMANCE DATA						
SCFM	SP	RPM	BHP	TEMP	ALT	DENSITY
1100	38.5	3500		70	0	0.0750

LO-PRO III MOTOR DATA						
HP	FRAM	RPM	VOLTS	PHASE	HZ	ENCL
10	215T	3500	208 OR 230/460	3	60	TEFC
10	215T	3500	208 OR 230/460	3	60	XPRF



A Size = VP-3-06-22.5A; RPM = 3500; Density = 0.0750 lb./CF; Width = 100.00% SEA LEVEL

B Size = VP-3-06-22.5A; RPM = 3500; Density = 0.0624 lb./CF; Width = 100.00% 5300 FEET

Figure 6-2: *LO-PRO III 10 HP Blower Performance Curve*

LO-PRO Wiring Diagrams

All LO-PRO systems using a GECM will have a GECM field wiring diagram provided, detailing all wire connections to the unit. This diagram can be updated or replaced as needed by Geotech.

Without the use of a GECM, the on-site electrician will need to wire the blower motor to an appropriate motor starter and power service. The wiring from the LO-PRO junction box (containing the wiring from the vacuum switches and sump probe) along with the motor thermals, must be integrated as a system shutdown component to the motor starter circuit in order to terminate power in the event of equipment failure.

Geotech can also build unit specific start boxes for use with the LO-PRO, transfer pump, and accessories. Contact Geotech for more information on system requirements.

LO-PRO Specifications and Test Form

LO-PRO serial number:	
Blower model:	
Blower serial number:	
Nameplate volts:	
Nameplate amps:	
Horsepower:	
Phase:	
Voltage unit was tested with:	
Number of trays on unit:	
Amp draw at open flow:	
(L1) amps:	
(L2) amps:	
(L3) amps:	
CFM at open flow (detached from lid):	
System vacuum (inches of water) at open flow:	
System vacuum (inches of water) at max amps:	
High vacuum switch set to (inches of water):	
Amp draw at high vacuum setting:	
(L1) amps:	
(L2) amps:	
(L3) amps:	
Low vacuum switch set to (inches of water):	
Ambient air temp at time of test (°F):	
Air open flow output temp after 1 hour (°F):	

Transfer Pump Specifications

Pump model:	
Pump serial number:	
Nameplate volts:	
Nameplate amps:	
Horsepower:	
Phase:	
Operational voltage unit is wired for:	

Section 7: System Schematic

Because the LO-PRO is designed with the flexibility to cover a wide variety of applications, many different system configurations are possible. The system specification sheet for your LO-PRO can be found in *Section 6: System Specifications*. System dimensions and locations of influent/effluent water and air hookups are provided in Figure 1-3 , Figure 1-4, Figure 2-1, and Figure 2-2. Figure 7-1 contains the Process & Instrumentation Diagram (P&ID) for a standard LO-PRO II with optional controls. Though Figure 7-1 only shows a LO-PRO II, the same flow applies to the LO-PRO III.

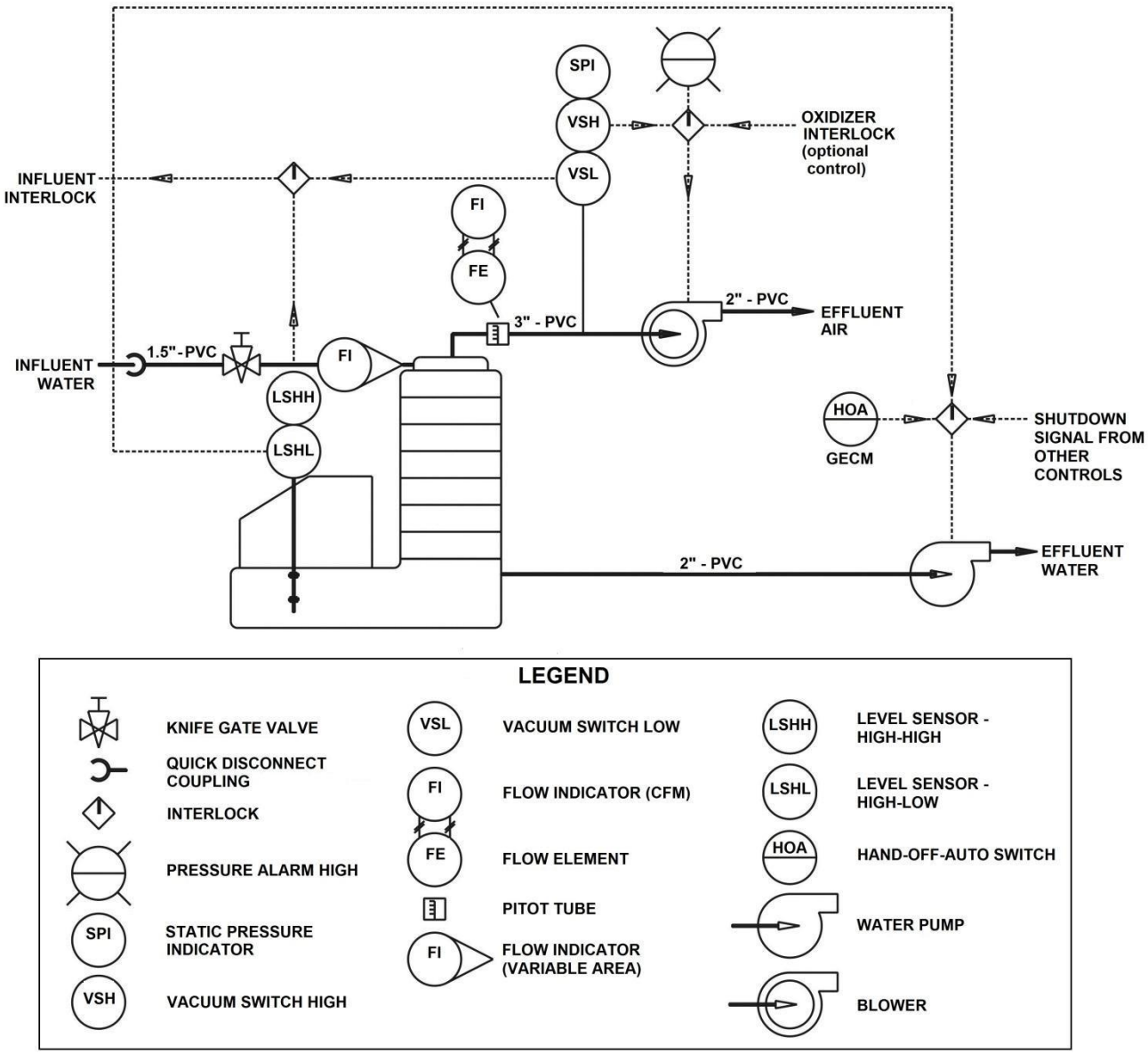


Figure 7-1: *The LO-PRO II Air Stripper P & ID showing optional controls and accessories*

Section 8: Replacement Parts and Accessories

Air Stripper Options

LO-PRO II, 4 TRAY SYSTEM	86080001
LO-PRO II, 5 TRAY SYSTEM	86080002
LO-PRO II, 6 TRAY SYSTEM	86080003
LO-PRO II, 7 TRAY SYSTEM	86080004
LO-PRO II, 8 TRAY SYSTEM	86080005
LO-PRO III, 3 TRAY SYSTEM	1450002
LO-PRO III, 4 TRAY SYSTEM	1450003
LO-PRO III, 5 TRAY SYSTEM	86140000

Blower Assemblies

ASSY, BLOWER, LP2, 3HP, 230V, 1PH, TEFC	56080004
ASSY, BLOWER, LP2, 3HP, 230V, 1PH, XP	2109015
ASSY, BLOWER, LP2, 3HP, 230V, 3PH, XP	56080008
ASSY, BLOWER, LP2, 3HP, 230V, 3PH, TEFC	2109013
ASSY, BLOWER, LP2, 5HP, 230V, 3PH, TEFC	2109014
ASSY, BLOWER, LP2, 5HP, 230V, 1PH, TEFC	2109019
ASSY, BLOWER, LP2, 5HP, 230V, 1PH, XP	2941993-01
ASSY, BLOWER/PL, NO BLOWER	2109021
ASSY, BLOWER, LP3, 10HP, 208/230/460V, 3PH, TEFC	2459021
ASSY, BLOWER, LP3, 10HP, 230/460V, 3PH, XP	2459013
ASSY, BLOWER, LP3, 10HP, 208V, 3PH, XP	2459020
ASSY, BLOWER, LP3, 10HP, 380V, 3PH, 50HZ, TEFC	56140005

GECM for Air Stripper

GECM, AIR STRIPPER, 2 MOTOR STARTER, 16AMP, 115/230/460V CONTACTOR, 115V COIL	86110011
GECM, AIR STRIPPER, 3 MOTOR STARTER, 16AMP, 115/230/460V CONTACTOR, 115V COIL	86110005
PANEL, WITH LEGS, LOPRO II, MOUNTING, GECM	56080003
PANEL, WITH LEGS, LOPRO III, MOUNTING, GECM	2459009

Interface Options

GECM,INTERFACE,CELLULAR TELEMETRY, WIFI INTERFACE ALSO INCLUDED	56110013
GECM, INTERFACE, LOCAL WIFI	56110012
SITEVIEW TELEMETRY ANNUAL CHARGE, 12 MONTHS WEB INTERFACE ACCESS	12350067
AIRFLOW w/ TELEMETRY, LOPRO II, CFM READINGS	56110015
AIRFLOW w/ TELEMETRY, LOPRO III, CFM READINGS	56110016
WATERFLOW w/ TELEMETRY, 1.5”, LOPRO II, FLOW RATE & TOTALIZED FLOW READINGS	56110017
WATERFLOW w/ TELEMETRY, 2”, LOPRO III, FLOW RATE & TOTALIZED FLOW READINGS	56110018

Transfer Pump Options

ASSY, TRANSFER, PUMP, 0.5HP, 115/230V, 3PH, XP	1182001
ASSY, TRANSFER PUMP, 2HP, 230V, 3PH, TEFC	2450021

LO-PRO II Replacement Parts

TANK, SUMP, 27” X 66” X 13” HIGH	P00129
TRAY, INSERT, 27” X 23” X 10” HIGH	P00130
GASKET, NEOPRENE, LO-PRO II, 2 PIECES	PPM019007
BUBBLE PLATE, 10” BAFFLE, CW	P00100
BUBBLE PLATE, 10” BAFFLW, CCW	P00101
DOWN COMER, 13” X 6.19”, LO-PRO II	2100057
DOWN COMER, 10.75” X 6.19”, LO-PRO II	2100055
PIN, STABLIZER, FOR LO-PRO TRAY	10376
LID, 27 X 23 X 12” HIGH	10251
MIST ELIMINATOR, 9” DIAMETER X 4” THICK, POLY	10252

LO-PRO II Bubble Plate Assemblies

BUBBLE PLATE ASSY, 10”, CW	2100060
BUBBLE PLATE ASSY, 10”, CCW	2100061
BUBBLE PLATE ASSY, BOTTOM, 10”, CW	2100064
BUBBLE PLATE ASSY, BOTTOM, 10”, CCW	2100065

LO-PRO III Replacement Parts

TANK, SUMP, 72” X 60” X 16” HIGH	10263
TRAY, 42” X 60” X 13” HIGH	10262
GASKET, NEOPRENE, LO-PRO III, 3 PIECES	PPM019008
BUBBLE PLATE, SS4, 38.50” X 56.25”	10284
DOWN COMER ASSY, SUMP LOPRO III	2450012
DOWN COMER ASSY, POLYPRO, LOPRO III	2450000
PIN, STABLIZER, FOR LO-PRO TRAY	10376
LID, 42” X 60” X 155” HIGH	10261
MIST ELIMINATOR, 12” X 32” X 4” THICK	10872
STRAP, MIST ELIMINATOR, RETENTION	10695
ASSY, BASIN, TOP TRAY	2450005

Instrumentation Accessories

PANEL, MOUNTING, LOPRO II GAUGE	56080002
PANEL, MOUNTING, LOPRO III, GAUGE	56140002
SWITCH, DIFF PRESS, 0.4-1.6” WC, XP, AIR/NON COMBUSTIBLE GAS	PPE080006
SWITCH, DIFF PRESS, 10-180” WC, ALUM BODY, SPDT, WIRE CONN	16090265
ASSY, SHUT DOWN, LOW PRESSURE	2100074
ASSY, SHUT DOWN, HIGH PRESSURE	2100075
GAUGE, MAG, DIFF, 0-50” WC, 0-12KP	PPP082023
STATIC TIP ASSY FOR LO-PRO II, III	56080006
GAUGE, FLOW, 0-225 CFM, 0-3” WC, CUSTOM	PPP082020
GAUGE, FLOW, 0-325 CFM, 7.97” WC, CUSTOM	10506
GAUGE, FLOW, 0-1000 CFM & M3/MIN	10715
CFM GAUGE ASSY, 0-325 CFM	2109011
SENSOR, INLINE FLOW, 3”, 1/8FNPT, 200PSIG, 200F	PPP099005
SENSOR, INLINE FLOW, 6”, 1/8FNPT, 200PSIG, 200F	10631
FILTER, AIR, .125” NPT, 20 CFM	10315

JUNCTION BOX, SIGNAL	2390065
CABLE, 28AWG, 8 COND, URETH	ORS418005
FERRULE WIRE, COPPER, 26-22AWG	10032
PROBE, SUMP, DENSITY, LO PRO II	2100076
PROBE, DENSITY, HIHI/HI/LO, 10FT CABLE, LO PRO III	2450014
SUMP, LARGE DIAMETER	

Air Line

TEE, 1/8” NPT X 1/4” TUBE	PPP105002
QCK CNCT, NCKL, 1/4 X 1/8” MPT, PUSH/PULL	PPP103001
TUBING, FEP, .170 X 1/4, FT, FEP	87050509

LO-PRO II Replacement Blowers

BLOWER, 3HP, 230/460V, 3PH, TEFC	10740
BLOWER, 3HP, 230/460V, 3PH, XP	PPM133035
BLOWER, 3HP, 230V, 1PH, XP	P00294
BLOWER, 3HP, 230V, 1PH, TEFC	16090068
BLOWER, 5HP, 230/460V, 3PH, TEFC	10741
BLOWER, 5HP, 230/460V, 3PH, XP	PPM133017
BLOWER, 5HP, 230V, 1PH, XP	10701

LO-PRO III Replacement Blowers

BLOWER, 10HP, 208/230/460/3PH, TEFC	10871
BLOWER, 10HP, 230/460V, 3PH, 60HZ XP	10874
BLOWER, 10HP, 380V, 3PH, 50HZ, TEFC	16140001

LO-PRO II Replacement Transfer Pump

TRANSFER PUMP, 0.5HP, 115/230, 1PH, XP	10141

LO-PRO III Replacement Transfer Pump

TRANSFER PUMP, 2HP, 230V, 3PH, TEFC	10665

Other Accessories

PIPE, PVC80, 1.5”, GRAY, CLEAN, NO PRINT	PPP035002
PIPE, PVC80, 6", GRAY, CLEAN, NO PRINT	PPP035033
PIPE, PVC80, 2"	PPP035001
ELBOW, PVC80, 6", SXS	10592
COUPLING,FLEXIBLE,6"x6"	10593
UNION, PVC80, 1.5”, SXS	PPP053003
UNION, PVC80, 2”, SXS	PPP035004
UNION, PVC80, 3”, SXS	PPP053012
FRAME, BLOWER TO SUMP, PAINTED, LP3	10655
FRAME, BLOWER, VERTICLE, PAINTED, LP3	10627
SHROUD, AIR INTAKE, LP3	10611
LATCH, BRS, HARDWARE KIT, LO-PRO, 1/4 TURN	10736
MANUAL, LO-PRO	10353

Appendix A: GECM Logic Statements

There are three basic LO-PRO configurations that include the GECM. They are: LO-PRO with effluent pump, LO-PRO with WTDP, and LO-PRO with both effluent pump and WTDP. Below is a brief summary of the system and components involved with each GECM configuration. Following, are a list of general faults and alarms. Faults and alarms applicable to all setups are listed first. Faults and alarms specific to the effluent or WTDP pumps are listed subsequently.

Low Profile (LO-PRO) Air Stripper with Effluent Transfer Pump

System Overview

A Geotech Low Profile Air Stripper (LO-PRO II) system consists of a vacuum pump/blower, inlet and outlet plumbing with vacuum gauges and corresponding switches, multiple aeration trays with integral gaskets and latches, a sump, a lid (cover) with mist eliminator. A transfer pump pumps effluent fluid from the sump according to the sump probe. The Geotech Environmental Control Module (GECM) provides automated control for the LO-PRO's devices and switches.

GECM Control Panel Components

- (2) Hand/Off/Auto switches (1 for Blower, 1 for Transfer Pump)
- (2) Motor starters with thermal overload protection (1 for Blower, 1 for Transfer Pump)
- Dry contact for indicating the presence of faults and/or alarms and for controlling influent water pump

GECM Control Indicator Components

- Integrated Touch Screen on PLC
- (2) Green Run Lights (1 for Blower, 1 for Transfer Pump)
- (1) Yellow Alarm Light
- (1) Red Fault Light

Low Profile (LO-PRO) Air Stripper with Influent Water Table Depression Pump (WTDP)

System Overview

A Geotech Low Profile Air Stripper (LO-PRO II) system consists of a vacuum pump/blower, inlet and outlet plumbing with vacuum gauges and corresponding switches, multiple aeration trays with integral gaskets and latches, a sump, a lid (cover) with mist eliminator. A WTDP pumps water into the system and is operated by the WTDP probe provided with the system. Effluent water is gravity fed out of the LO-PRO sump. The Geotech Environmental Control Module (GECM) provides automated control for the LO-PRO's devices and switches.

GECM Control Panel Components

- (2) Hand/Off/Auto switches (1 for Blower, 1 for WTDP)
- (2) Motor starters with thermal overload protection (1 for Blower, 1 for WTDP)
- Dry contact for indicating the presence of faults and/or alarms

GECM Control Indicator Components

- Integrated Touch Screen on PLC
- (2) Green Run Lights (1 for Blower, 1 for WTDP)
- (1) Yellow Alarm Light
- (1) Red Fault Light

Low Profile (LO-PRO) with Effluent Transfer Pump and Influent Water Table Depression Pump (WTDP)

System Overview

A Geotech Low Profile Air Stripper (LO-PRO II) system consists of a vacuum pump/blower, inlet and outlet plumbing with vacuum gauges and corresponding switches, multiple aeration trays with integral gaskets and latches, a sump, a lid (cover) with mist eliminator. A WTDP pumps water into the system and is operated by the WTDP probe provided with the system. A transfer pump pumps effluent fluid from the sump according to the sump probe. The Geotech Environmental Control Module (GECM) provides automated control for the LO-PRO's devices and switches.

GECM Control Panel Components

- (3) Hand/Off/Auto switches (1 for Blower, 1 for Transfer Pump, 1 for WTDP)
- (3) Motor starters with thermal overload protection (1 for Blower, 1 for Transfer Pump, 1 for WTDP)
- Thermal overload motor coil protection (when applicable)
- Dry contact for indicating the presence of faults and/or alarms

GECM Control Indicator Components

- Integrated Touch Screen on PLC
- (3) Green Run Lights (1 for Blower, 1 for Transfer Pump, 1 for WTDP)
- (1) Yellow Alarm Light
- (1) Red Fault Light

General Alarms and Faults

Alarms are temporary conditions which prevent the system from operating. Alarms illuminate the GECM's yellow alarm light. When the condition alleviates, the system will resume normal operation.

Faults are latching conditions that require the user to inspect and resolve the problem. When a fault occurs, the Aux-Out dry contact will toggle states to shut off the influent water pump, and illuminate the GECM's red fault light. The user must reset the affected HOA switch before it will resume normal operation. To reset a fault, the respective HOA switch must be set to the "OFF" position.

Aux-In Fault

An Aux-In fault can integrate with other site specific systems to shut down the **entire** system. The Aux-In fault can be triggered by opening a normally closed switch. SiteView and the dashboard will indicate an "**Aux-In**" fault condition and the red fault light will illuminate.

Blower Off Alarm

The vacuum pump/blower is equipped with a Hand/Off/Auto Switch. When the Switch is in the "**OFF**" position the blower will not operate and therefore no air will pass through the trays. SiteView and the dashboard will indicate a "**Blower Off**" alarm condition and the yellow alarm light will illuminate.

Blower Thermal Overload Fault

Some blowers are equipped with thermal overload wiring hookups. In the event of a thermal overload the blower will send a signal to the GECM. The **entire** system will shut down. SiteView and the dashboard will indicate a "**Blwr Thrm Ovrld**" fault and the red fault light will illuminate.

Tank Full Fault

An optional probe may be used to shut off the system when the customer supplied recovery and/or holding tank becomes full. This tank full probe is a single float activated level sensor installed in the top of the recovery and/or holding tank (Figure 1-8). When the float rises to the top of its travel. The **entire** system will shut down. SiteView and the dashboard will indicate a "**Tank Full**" fault condition and the red fault light will illuminate.

Vacuum Faults

In the event of a high or low vacuum condition in the LO-PRO trays, the respective high or low vacuum switch will activate sending a signal to the GECM. The LO-PRO blower will shut down, but the transfer pump will continue to operate until the floats return to the bottom of their travel, emptying the sump. SiteView and the dashboard will indicate the appropriate "**High Vacuum**" or "**Low Vacuum**" fault and the red fault light will illuminate.

GECMs with Effluent Transfer Pumps

Sump Probe

The LO-PRO Sump Probe is equipped with two floats that rise and fall with the water level in the sump. The bottom float controls operation of the transfer pump by actuating high and low switches on the probe shaft. The pump starts when the float rises to the high switch and continues to run until the water level drops the float to the low switch. See **Error! Reference source not found.**

Sump High Override Fault

If both floats on the sump probe rise to the top of their travel, a high-high switch will actuate. The blower will shut down, but the transfer pump will continue to operate until all floats reach the bottom of their travel, emptying the sump. SiteView and the dashboard will indicate a "**Sump Probe H.O.**" fault condition and the red fault light will illuminate.

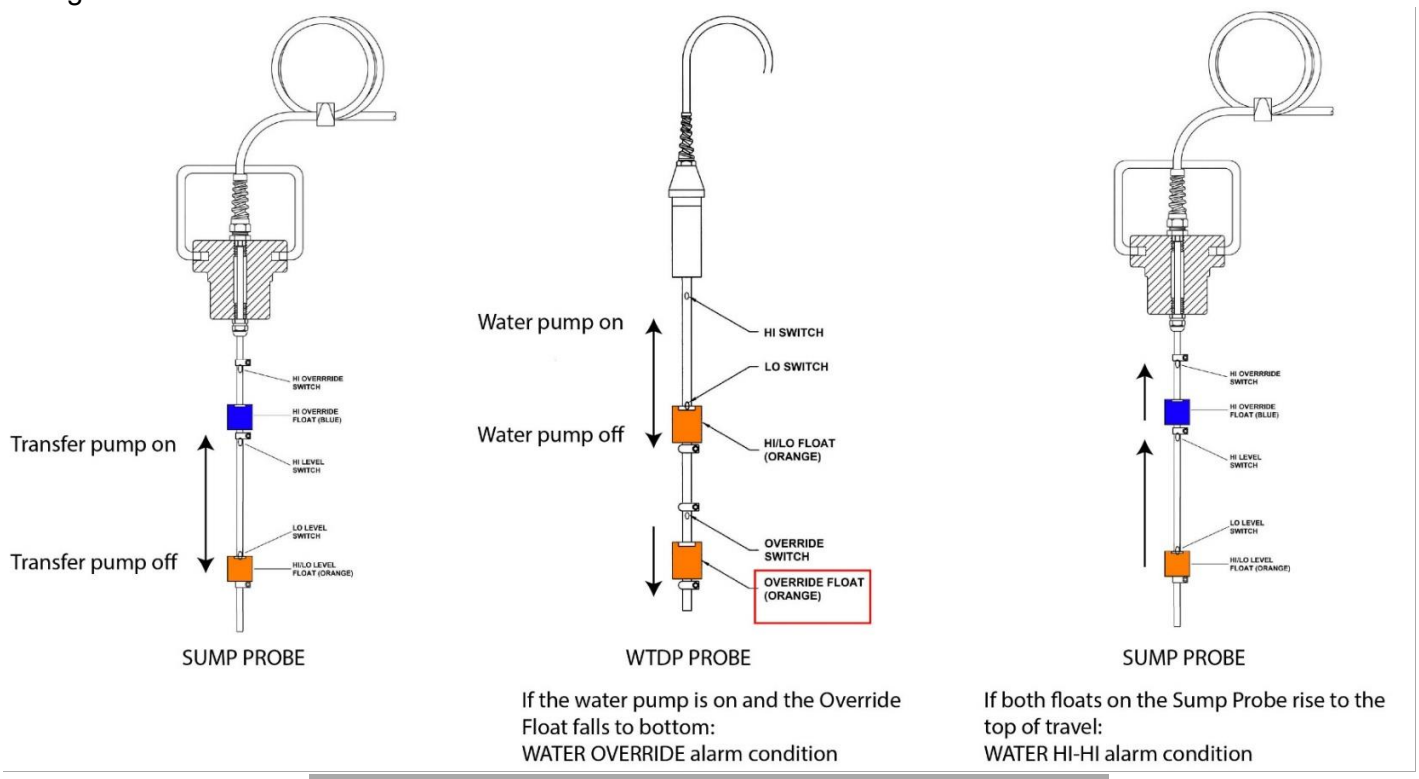


Figure A-2: Alarm Conditions for LOPRO with Influent WTDP

Sump Probe Fault

A probe fault can occur in the sump probe when:

- There is non-sequential movement of the floats and switches
- The probe is installed to the GECM incorrectly
- There's a break in the wiring
- There's a break in the probe itself

A probe fault will shut down the **entire** system. SiteView and the dashboard will indicate a "**Sump Probe**" and the red fault light will illuminate.

Sump Thermal Overload Fault

Some transfer pumps are equipped with thermal overload wiring hookups. In the event of a thermal overload the pump will send a signal to the GECM. The **entire** system will shut down. SiteView and the dashboard will indicate a "**Sump Therm Ovrld**" fault and all the red fault light will illuminate.

GECMs with WTDPs

WTDP Probe

The WTDP is controlled by the water high/low switches actuated by the WTDP probe high/low float and the low override float. The water pump turns on when the high/low float rises to the top of its travel. The pump continues to run until the high/low float falls to the bottom of its travel. See Figure 1-9.

WTDP Low Override Fault

If a probe fault causes the pump to continue running, the override float will fall and turn off the pump and the blower. If there is a transfer pump, it will continue to operate until the sump float reaches the bottom of its travel, emptying the sump. SiteView and the dashboard will indicate a "**WTDP L.O.**" fault and the red fault light will illuminate.

WTDP Probe Fault

A probe fault can occur in the WTDP probe when:

- There is non-sequential movement of the floats and switches
- The probe is installed to the GECM incorrectly
- There's a break in the wiring
- There's a break in the probe itself

A probe fault will shut down the **entire** system. SiteView and the dashboard will indicate "**WTDP Probe**" and the red fault light will illuminate.

Notes

- A dry contact form-c relay assembly is incorporated into the GECM panel. Upon any of the above mentioned fault or alarm conditions, the dry contact will change state (normally closed to open, or normally open to closed) to alert any customer supplied equipment of an abnormal condition.

- The blower, WTDP, and transfer pump are controlled by HOA switches. Each HOA switch is labeled to show which device it controls. HOA switches must be in the AUTO position for the devices to run autonomously. At any time, if a switch is placed in the HAND position, power will be applied to the respective device.

- While only some blowers and transfer pumps have integrated thermal overload conditions, please note all motor starters inside the GECM are equipped with thermal overload protection.

Appendix B: GECM Installation

Inspection

Inspect all components for physical damage. Installing and operating damaged equipment is dangerous and should not be performed. Verify that all components have arrived as per the Sales Order or packing list.

GECM Panel Installation

Even though the GECM electronics are enclosed within a NEMA 4 rated weatherproof box, it is advised that you place your GECM within a sheltered area, protecting the unit from direct exposure to water and sunlight.

Input Power Guidelines

All wiring must be carried out by a qualified electrician and be in accordance with state and local codes. Conduit runs must conform to current U.S. National Electrical Code (NEC). Do not run any power wires within 2 inches (5 cm) of intrinsically safe (IS) wires or terminals (NEC Article 508 for relevant codes.) All equipment and controls are to be installed in accordance with Article 430 and 504 of the NEC.

See also the GECM Field Wiring Diagram for specific connections to the PLC. Geotech provides a detailed Field Wiring Diagram with every GECM built. Copies of these diagrams can be obtained from Geotech when needed.

Access Ports and Conduit Hubs

To facilitate wiring, Geotech installs access ports and conduit hubs to the GECM enclosures that are hard mounted to the system being manufactured, i.e., a LO-PRO or SVE. A GECM enclosure will not have this wiring option when built and shipped separately.

Install Chassis Ground

Before beginning the panel hookup procedures, run a wire from the bottom ground lug on the GECM back panel to a good earth ground, i.e., the circuit breaker panel enclosure.

Install IS Ground

Connect IS ground wires to the upper ground lug on the GECM back panel.

Wire Main Power

The GECM is built to run with single phase 115VAC or 230VAC. Incoming power leads are normally connected to either a terminal strip or fused disconnect labeled HOT and NEUTRAL (for 115VAC) or L1, L2 and L3 (for 230VAC and/or three phase applications). When a fused disconnect is installed for 3-Phase power to the motor starters, Geotech will complete all wiring on the GECM side of the components.

The following wiring descriptions are for standard GECM configurations. In conjunction with the GECM Field Wiring Diagram, always refer to the system diagrams and labels found within the device User Manuals, including those diagrams provided with custom built panels.

Install Incoming Power to Motor Starters

Most motor driven devices controlled by the GECM (LO-PRO, SVE, Sparge, WTDP, Transfer Pump) require the use of a motor starter. Motor starters are installed to the back panel when the GECM is built. Run main power for the individual motor starters through the bottom of the enclosure. Each motor starter is labeled for the device they support. Single phase power leads are wired to terminals L1 and L2. Three phase power leads are attached to terminals L1, L2, and L3. Attach all ground wires to the ground lug at the bottom of the panel.

CAUTION

DO NOT run power wires within two inches of IS wiring or terminals.

Installing Blower Thermals

The GECM incorporates thermal overload protection for those motors which have it. When a motor manufacturer provides thermal overload protection there will typically be two additional wires within the motor's electrical box labeled "J". These wires will run through the same port used for the motor power and are connected to a terminal strip labeled THERMALS.

Installing an 115VAC/230VAC to 12VDC Power Supply

Power requirements and control are dependent upon the GECM and are probe activated.

The GECM back panel will contain labeled relays or terminal strips (labeled PRODUCT PUMP) from which hot leads will be connected. These leads will then go to a designated power supply box and be converted to 12VDC for product pump operation.

NOTE

Power supply boxes should be installed as near to the well as possible to reduce DC line loss in the cable connecting the product pump to the box.

Use the GECM Field Wiring Diagram to complete all wire connections between the GECM and the power supply box.

IS Wiring Installation Guidelines

The GECM incorporates circuitry for IS circuit extensions into hazardous locations. All IS wiring must be at least 2" (5cm) from all other non-IS wiring.

It is recommended that you use only Geotech supplied probe cable (P/N ORS418005) for IS wiring and Geotech supplied IS float probes with jacketed cable. The maximum length of a Geotech probe cable that can be connected to IS circuitry is 500 ft. (152 m).

Appendix C: Decontamination Procedures

Some common decontamination solutions are listed below along with the contaminants they are effective against.

Solution	Effective Against
Water	Short-chain hydrocarbons, inorganic compounds, salts, some organic acids, other polar compounds.
Dilute Acids	Basic (caustic or alkaline) compounds, amines, hydrazines.
Dilute Bases	Acidic compounds, phenols, thiols, some nitro- and sulfonic compounds.
Organic solvents	Non-polar compounds (such as some organic compounds)

The use of organic solvents is not recommended because:

1) organic solvents can permeate and/or degrade protective clothing and
2) they are generally toxic and may result in unnecessary employee exposure to hazardous chemicals.

When in doubt, use a dish washing liquid detergent. As a decontamination solution, it is readily available, is the safest of all the above, and is usually strong enough if used generously.

The use of steam can also be effective for decontamination. A water-laser (pressurized water) is exceptionally valuable.

The following substances are noted for their particular efficiency in removing certain contaminants or for decontaminating certain types of equipment.

Solution	Effective Against
Penetone	Polychlorinated biphenyls (PCB) contamination (since penetone may also remove paint, it is a good idea to spot-test before use)
Phosphate free detergent	Contaminated pumps General-purpose cleaning
Ivory liquid	Oils
Diluted HTH	Cyanides
Radiac	Low level radioactivity
Isopropanol	Biological agents (should not be used on rubber products since it will break down rubber)
Hexane	Certain types of lab or sampling equipment (use of hexane is discouraged due to its flammability and toxicity)
All-purpose degreaser	General purpose cleaning

Decontamination Solutions to Avoid

Some decontamination solutions should be avoided because of their toxicity, flammability, or harmful effects to the environment. Halogenated hydrocarbons, such as carbon tetrachloride, should not be used because of their toxicity, possible incompatibility, and some because of their flammability.

Organic decontamination solutions should not be used on personal protective equipment (PPE) because they may degrade the rubber or other materials comprising the PPE.

Mercurials are sometimes used for sterilization. They should be avoided because of their toxicity.

Chemical leaching, polymerization, and halogen stripping should all be avoided because of possible complications during decontamination.

Sand-blasting, a method of physical removal, should be avoided because the sand used on the contaminated object usually needs to be disposed of as hazardous waste, a very costly proposition. In addition, sand-blasting exposes personnel to silica, a carcinogen.

Freon is known to be particularly effective for the cleansing of polychlorinated biphenyls (PCBs) but its effect on the ozone layer is extremely harmful. Its use is discouraged.

Strong acids or bases should not be used when cleaning metals and gaskets or tools or other equipment because of the possibility of corrosion.

Disposal of Decontamination Solutions and Waste Water

All solutions and water used for decontamination must be collected. If lab analysis indicates that the water and/or solutions exceed allowable contamination levels, they must be treated as hazardous waste. Alternatively, the solutions and water may be treated on-site to lower the contamination levels and render them non-hazardous.

Containers such as 55 gallon (208 liter) drums should be available for storage of wastes.

Spent decontamination solutions can be collected by using heavy-duty plastic sheets, visqueen sheets, kiddie pools, or if needed, a larger containment basin. The decontamination of equipment must be performed on the sheets or in the basins. They could be placed on a slight angle so that the spent decontamination solutions drain into a collection basin or drum.

Recommended Supplies for Decontamination of Personnel, Clothing and Equipment

The list below contains recommendations for supplies which would be on hand for the decontamination of personnel, clothing and equipment. Depending on the site activities, not all of these items may be needed. Alternatively, some additional items not listed here may be required.

- Drop cloths of plastic or other suitable material, such as visqueen, for heavily contaminated equipment.
- Disposal collection containers, such as drums or suitably lined trash cans for disposable clothing and heavily contaminated personal protective clothing or equipment to be discarded.
- Lined box with adsorbent for wiping or rinsing off gross contaminants and liquid contaminants.

- Wash tubs of sufficient size to enable workers to place booted foot in and wash off contaminants (without a drain or with a drain connected to a collection tank or appropriate treatment system).
- Rinse tubs of sufficient size to enable workers to place booted foot in and wash off contaminants (without a drain or with a drain connected to a collection tank or appropriate treatment system).
- Wash solutions selected to wash off and reduce the hazards associated with the contaminated wash and rinse solutions.
- Rinse solution (usually water) to remove contaminants and contaminated wash solutions.
- Long-handled, soft-bristled brushes to help wash and rinse off contaminants.
- Lockers and cabinets for storage of decontaminated clothing and equipment.
- Storage containers for contaminated wash and rinse solutions.
- Plastic sheeting, sealed pads with drains, or other appropriate method for containing and collecting contaminated wash and rinse water spilled during decontamination.
- Shower facilities for full body wash or at a minimum, personal wash sinks (with drains connected to a collection tank or appropriate treatment system).
- Soap or wash solution, wash cloths and towels.
- Clean clothing and personal item storage lockers and/or closets.

REVISION HISTORY		
Project #	**Description**	**Date**
1553	Added GECM to user manual, updates to price page, and other minor edits – StellaR	12/18/2018
1553	Added updated logic statement – StellaR	4/24/2019
EDCF# 3521	Updated PNs 00129 and 00130 to P00129 and P00130. Removed fax number - GR	6/17/2025
M2530	Revised Manual to reflect PLC-based GECM. Merged with LO-PRO III manual (PN10609). Removed 15HP blowers. – ZM, GR, & KK	9/11/2025

The Warranty

For a period of one (1) year from date of first sale, product is warranted to be free from defects in materials and workmanship. Geotech agrees to repair or replace, at Geotech's option, the portion proving defective, or at our option to refund the purchase price thereof. Geotech will have no warranty obligation if the product is subjected to abnormal operating conditions, accident, abuse, misuse, unauthorized modification, alteration, repair, or replacement of wear parts. User assumes all other risk, if any, including the risk of injury, loss, or damage, direct or consequential, arising out of the use, misuse, or inability to use this product. User agrees to use, maintain and install product in accordance with recommendations and instructions. User is responsible for transportation charges connected to the repair or replacement of product under this warranty.

Equipment Return Policy

A Return Material Authorization number (RMA #) is required prior to return of any equipment to our facilities, please call our 800 number for appropriate location. An RMA # will be issued upon receipt of your request to return equipment, which should include reasons for the return. Your return shipment to us must have this RMA # clearly marked on the outside of the package. Proof of date of purchase is required for processing of all warranty requests.

This policy applies to both equipment sales and repair orders.

FOR A RETURN MATERIAL AUTHORIZATION,
PLEASE CALL OUR SERVICE DEPARTMENT AT 1-800-833-7958

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Equipment Decontamination

Prior to return, all equipment must be thoroughly cleaned and decontaminated. Please make note on RMA form, the use of equipment, contaminants equipment was exposed to, and decontamination solutions/methods used.

Geotech reserves the right to refuse any equipment not properly decontaminated. Geotech may also choose to decontaminate equipment for a fee, which will be applied to the repair order invoice.

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