geotech

ORS RCM 1000

Remediation Control Module

Installation and Operation Manual

Rev. 4 12/17/02 Part # 999001008

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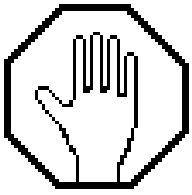
DOCUMENTATION CONVENTIONS

This manual uses the following conventions to present information:

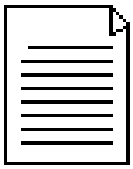
WARNING

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.

Terminology

This section describes the terminology used throughout this manual.

Normally Open Switch (N.O.) – A normally open switch is the one that is open unless or until activated. Once activated the switch closes.

Normally Closed Switch (N.C.) – A normally closed switch is one that is closed unless or until activated. Once activated the switch opens.

COM – This refers to a common ground that acts as a return for a switch or sensor.

Tank Full – A sensor normally used to indicate that a receiving tank is full. This input will normally turn off any upstream pumps or valves.

Conductivity Probe – A sensor that determines the presence of water due to its conductivity. The presence of a non – conductive product (hydrocarbons) will not activate a conductivity probe.

Alarm – An output switch that closes whenever the panel is in an alarm condition. An alarm condition is an activation of any of the auxiliary inputs, an illogical state of the normal inputs, or an activation of the override switch.

Chapter 1: System Description

Function and Theory

This manual contains all the information required to install, operate and maintain an ORS RCM™ 1000 Remediation Control Module. This document includes the specifications and technical background of the ORS RCM™ 1000, as well as detailed field wiring diagrams and troubleshooting procedures.

The ORS RCM™ 1000 is a basic controller designed to provide user friendly installation and years of trouble free operation. At start up, simply wire in the sensor inputs and power, and the ORS RCM™ 1000 installation is complete. There are no switches to set or programming necessary.

The ORS RCM™ 1000 Remediation Control Module is a microprocessor based controller designed for use with Geotech's standard remediation equipment. Each controller contains the necessary inputs and outputs to provide automatic control of a single pump or motor.

The ORS RCM™ 1000 consists of an intelligent controller housed in a NEMA 4 (IP 66) enclosure. The controller accepts five intrinsically safe inputs that can control one mechanical relay output and an auxiliary solid state alarm signal output.

The intrinsically safe inputs are normally tied to a set of level or pressure switches (see the appropriate wiring diagram for more detail). For most applications, three or four inputs will be dedicated for the particular function of the panel, leaving inputs available for the other sensors.

The mechanical relay output controls the motor or pump, while the auxiliary output acts as an alarm that can be tied to an indicator lamp, another contractor, a phone dial – out device or to another panel to cascade alarms. The motor output will directly control up to a 2.5 HP motor @ 240 VAC. If a larger motor is required, the output from the ORS RCM™ 1000 can control a larger, external motor starter. The output provided is a double pole, single throw contact, providing a great deal of flexibility for the user.

The ORS RCM™ 1000 controller has seven indicator lamps that show the state of the five inputs and the two outputs. A hand, Off, Auto (HOA) toggle switch is available to override the motor control.

Theory of Operation

The ORS RCM™ 1000 utilizes a microprocessor based controller coupled with an intrinsically safe interface and a mechanical relay output for the motor control and a solid state output for the alarm. The outputs are controlled by the state of the inputs (with a toggle switch providing the capability to override the inputs), how the output depends on the particular input.

Normal Operation

Two control inputs will cycle the load in response to a high and low level detector. In normal operation, the controlled load will start when the HIGH (N.O.) input closes and continue to run until the LOW (N.C.) input opens. This operation will repeat as long as the level being controlled continues to cycle.

If, during normal operation, either of the control inputs becomes faulty, the alarm will immediately engage. Such a condition would occur when open (indicating a low level). When the offending condition is removed, the alarm will disengage.

Override

During normal operation, the override input is open. If this input closes, the system assumes that the level has exceeded the high or low limits. The alarm will immediately engage and the controlled load will turn off after a five second delay. When the offending condition is removed, the alarm will disengage and the controlled load will remain off until cycled on again.

The five second delay in controlled load shut off will prevent false alarms due to noise spikes in the lines or turbulence in the area of the sensors.

Auxiliary Shutoff Interlocks

In addition to the three inputs above, there are two additional inputs. One is Normally (N.O.) and the other is Normally Closed (N.C.). during normal operation, if the N.O. input closes or the N.C. input opens, the alarm will immediately engage and the controlled load will turn off after a five second delay. When the offending condition is removed, the alarm will shut off and the controlled load will immediately turn back on again.

For proper operation, the NC auxiliary input must be connected to COM if it is not used.

Indicator Lamps

There are five LED indicator lamps that will light whenever the corresponding input switch is closed (regardless of whether the input is N.O. or N.C.). there are an additional two lamps that will indicate whether the controlled load is on or if the alarm is engaged. These seven lamps are useful for system troubleshooting.

Toggle Switch

This is a three position (Hand-Off-Auto) switch used to set the state of the output that controls the controlled load. When the switch is set to Hand, the output will be on regardless of the state of the inputs. When the switch is set to Auto, the input conditions are used to determine the output. The Off position will turn the output off.

Test/Silence Switch

This is a momentary switch used either to silence the alarm output or to activate the controlled load if no alarms are present. In the latter case, the controlled load will activate and remain active as long as this switch is pressed.

Motor Output

The ORS RCM™ 1000 utilizes a mechanical relay that will directly drive up to a 2.5 HP motor at 240 VAC (single phase) or a 1.5 HP motor at 120 VAC. This relay is a double pole, single throw contact whose connections are brought out to a terminal strip for the user's connection points. For larger loads an external relay is controlled by the ORS RCM™ 1000.

It is up to the user to provide the necessary protection for any loads tied to the ORS RCM™. Refer to a licensed electrician for the necessary protection.

Alarm Output

This output is a solid state single pole, single throw switch that is capable of switching approximately 10 amperes. This switch may be used to control an indicator lamp, a dial-out or other signaling device.

Chapter 2: System Installation

Selecting and Configuring the Equipment

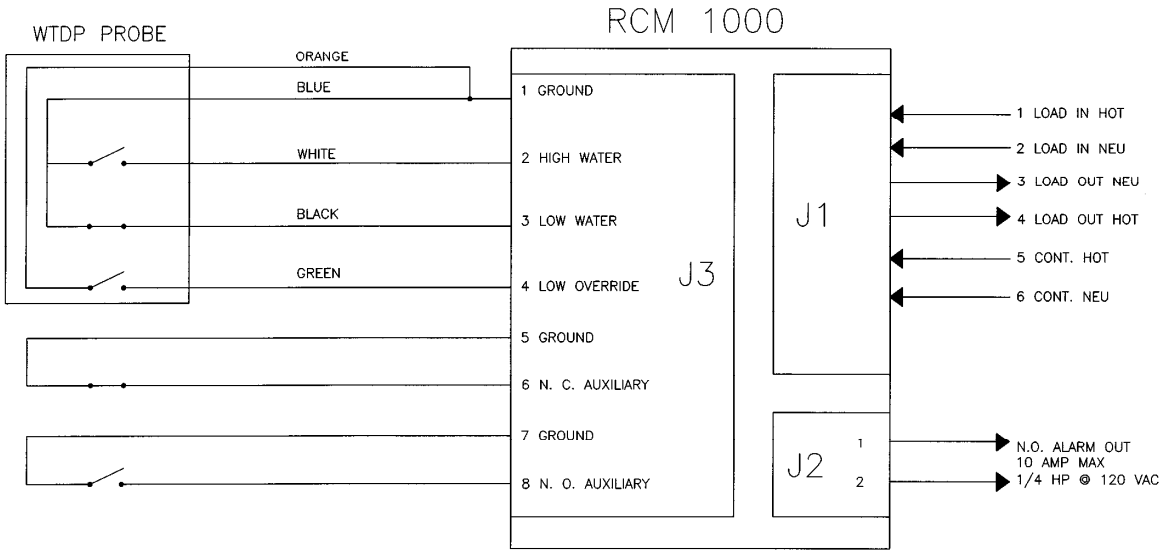
Each ORS RCM™ 1000 is intended to operate one controlled load (motor, pump or blower). In support of typical ORS product configurations, a typical product recovery system may use two ORS RCM™1000 controllers. One to control a water table depression pump and another to control a product pump. In cases where only the water table is to be controlled or only product to be recovered, only one unit is needed.

Each ORS RCM™ 1000 is capable of directly accepting ORS' probes and recovery equipment, without any additional equipment (other than cabling). The outputs will directly drive up to a 2.5 HP motor at 240 VAC (1.5 HP @ 120 VAC). for larger loads a contractor or starter must be used.

It is up to the user to provide the necessary circuit protection for any loads tied to the ORS RCM™ 1000. Refer to a licensed electrician for the necessary protection.

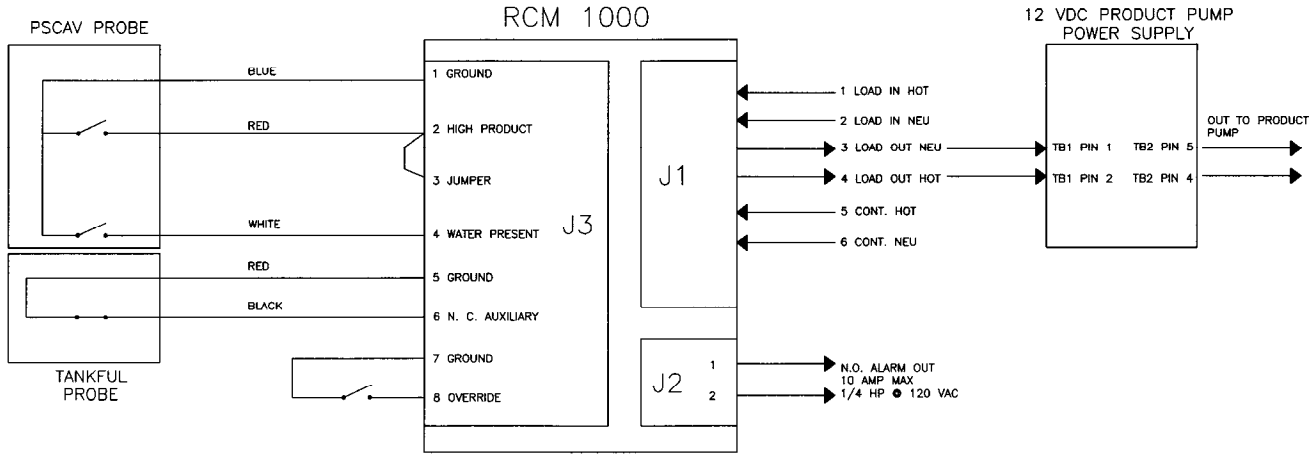
ORS Product Configurations

Water Table Depression Pump

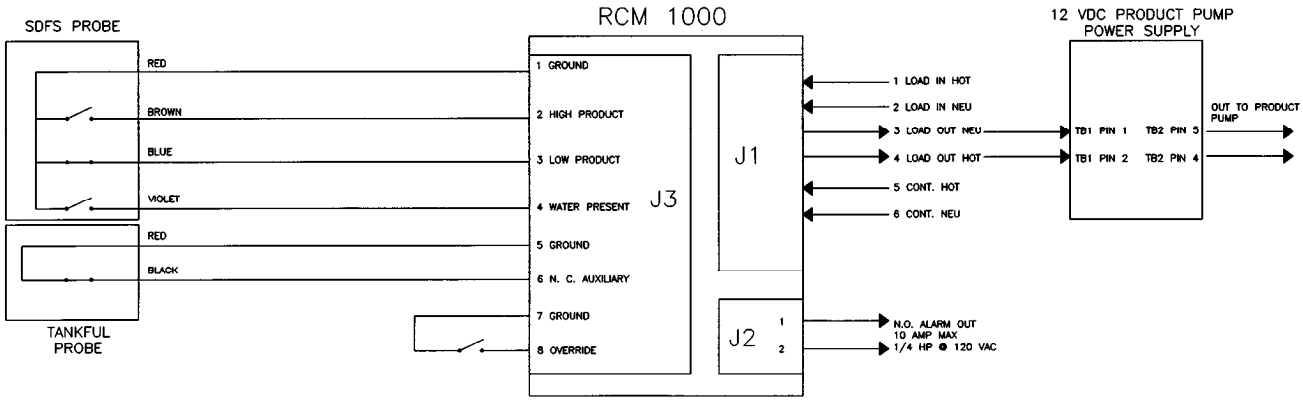


If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

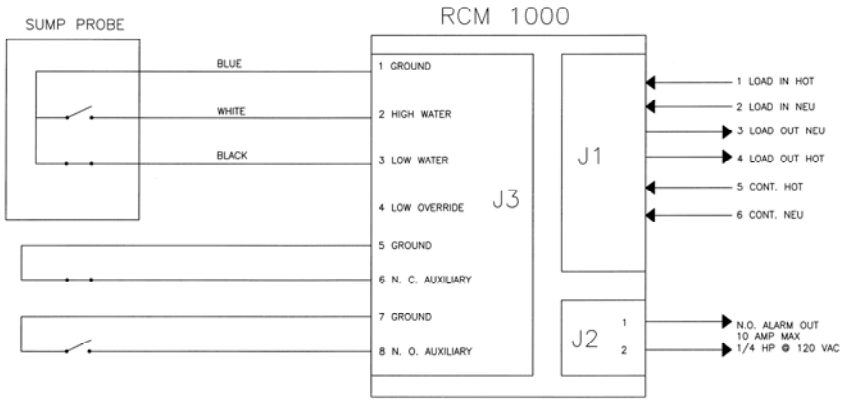
Probe Scavenger™ Product Pump



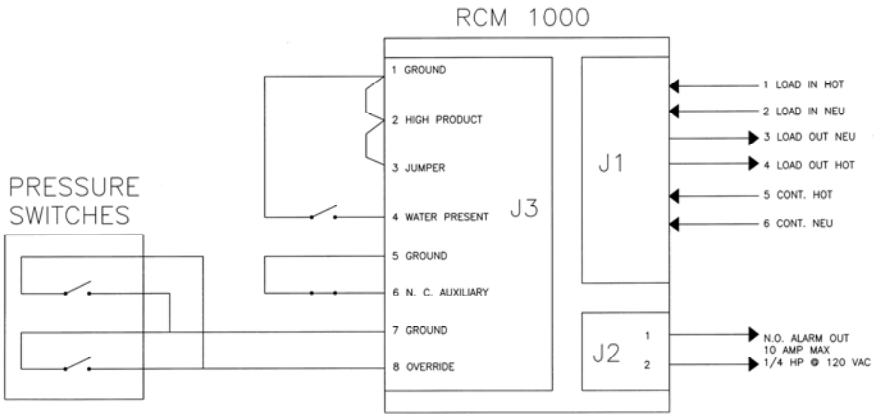
Small Diameter Filter Scavenger™ Product Pump



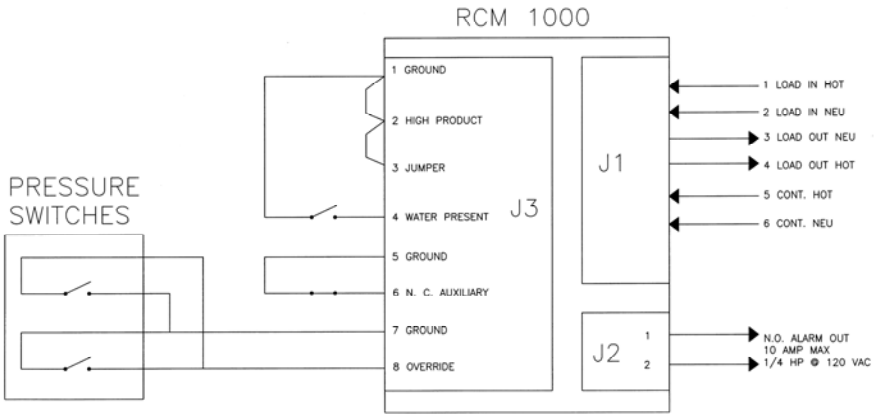
Transfer Pump



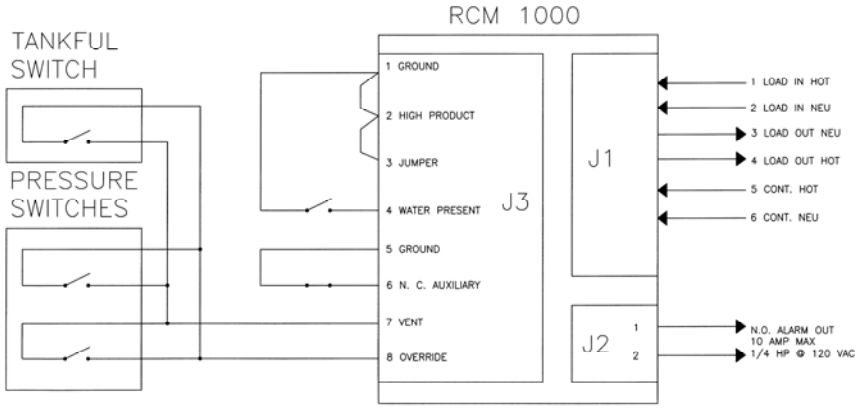
Blower



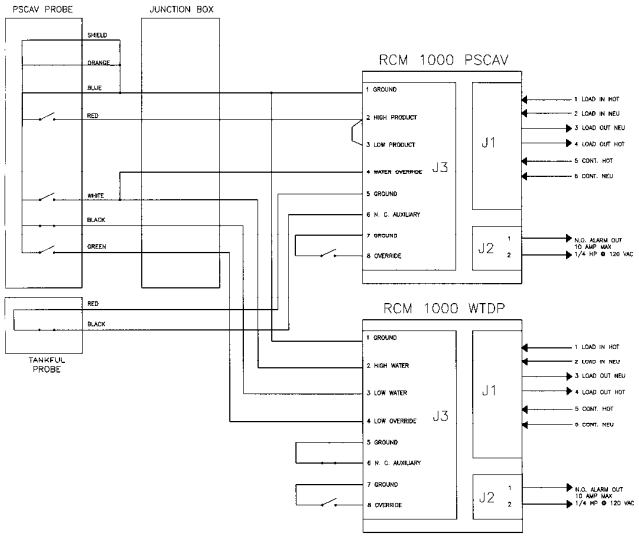
ORS Sparge Blower



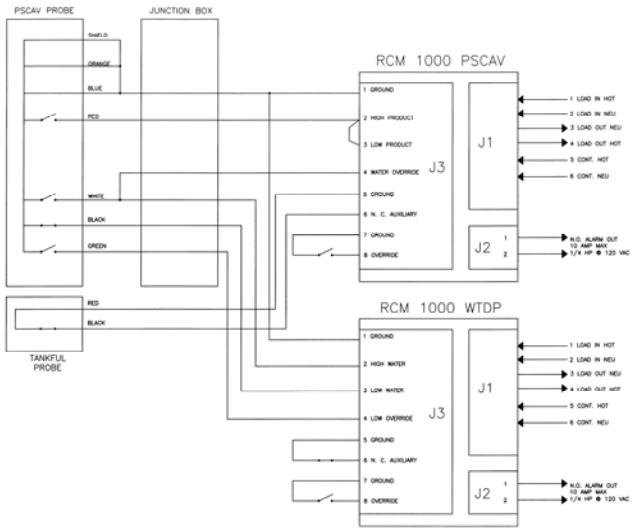
ORS Soil Vent



ORS Small Diameter Filter Scavenger™/Water Pump

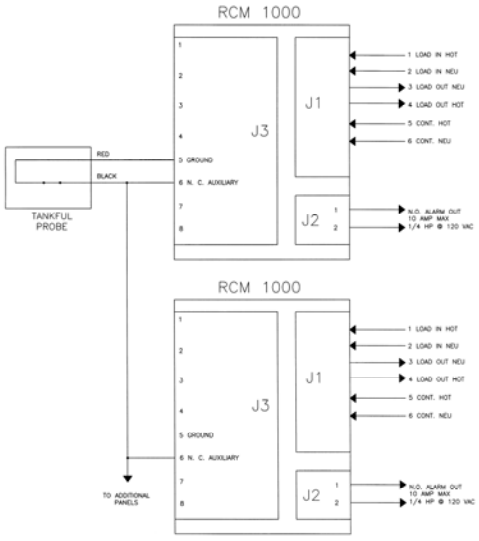


ORS Probe Scavenger™/Water Pump



Connecting Multiple Panels to a Single Tank full Sensor

The drawing below shows a wiring diagram for connecting multiple panels to a single tank full sensor. In this case, terminal 5 acts as a common ground and all of the normally closed inputs (terminal 6) are connected through the tank full sensor. When the tank full sensor opens, indicating a high level, the normally closed inputs will register an alarm, and turn off power to the load motor.



As many panels as necessary can be connected in this way as long as terminal J3-6 is not used for other purposes.

Chapter 3: System Operation

Water Table Depression Pump

The table below shows the standard operation sequence.

Switch Activation	Description
High water switch closes	Pump starts
Low water switch opens	Pump stops
Low override switch closes	Alarm on, pump stops
Low override switch opens	Normal operation resumes
N.O. Aux. switch closes	Alarm on, pump stops
N.O. Aux. switch opens	Normal operation resumes
N.C. Aux. switch closes	Alarm on, pump stops
N.C. Aux. switch opens	Normal operation resumes

Optional Shut offs

The table below shows some common methods used to shut off a Water Table Depression Pump.

Shut off device	Description
Sump Probe	Attach the orange and green leads from the sump probe to J3-7 and J3-8, respectively, on the ORS RCM™ 1000
Air Stripper High/Low Pressure Switch	Attach the two leads from the high or low pressure switch to J3-7 and J3-8, respectively, on the RCM™ 1000
Tank Full Probe	Attach the red and black leads from the tank full probe to J3-5 and J3-6, respectively, on the RCM™ 1000

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™ 1000, configure them in parallel. If attaching more than one item to the N.C. inputs J3-5 and J3-6 on the ORS RCM™ 1000, configure them in series.

Probe Scavenger™ Product Pump

The table below shows the standard operation sequence

Switch Activation	Description
High product switch closes	Pump starts after delay time
High product switch opens	Pump stops
Water present switch closes	Alarm on, pump stops
Water present switch opens	Normal operation resumes
Tank Full switch opens	Alarm on, pump stops
Tank Full switch closes	Normal operation resumes

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™ 1000, configure them in parallel. It attaching more than one item to the N.C. inputs J3-5 and J3-6 on the ORS RCM™ 1000, configure them in series. If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

Small Diameter Filter Scavenger™ Product Pump

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™ 1000, configure them in parallel. If attaching more than one item to the N.C. inputs J3-5 and J3-6 on the RCM™ 1000, configure them in series. If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

The table below shows the standard operation sequence.

Switch Activation	Description
High product switch closes	Pump starts
High product switch opens	Pump stops
Water present switch closes	Alarm on, pump stops
Water present switch opens	Normal operation resumes
Tank Full switch opens	Alarm on, pump stops
Tank Full switch closes	Normal operation resumes

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™, configure then in parallel. If attaching more than one item to the N.C. inputs J3-5 and J3-6 on the ORS RCM™ 1000, configure then in series. If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

Transfer Pump

The table below shows the standard operation sequence.

Switch Activation	Description
High water switch closes	Pump starts
Low water switch opens	Pump stops
N.O. Aux. switch closes	Alarm on, pump stops
N.O. Aux. switch opens	Normal operation resumes
N.C. Aux. switch opens	Alarm on, pump stops
N.C. Aux. switch closes	Normal operation resumes

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™ 1000, configure them in parallel. If attaching more than one item to the N.C. inputs J3-5 and J3-6 on the ORS RCM™ 1000, configure them in series. If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

Blower

The table below shows the standard operation sequence.

Switch Activation	Description
High pressure switch closes	Alarm on, blower stops
High pressure switch opens	Normal operation resumes
Low pressure switch closes	Alarm on, blower stops
Low pressure switch opens	Normal operation resumes

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™ 1000, configure them in parallel. If attaching more than one item to the N.C. inputs J3-5 and J3-6 on the ORS RCM™ 1000, configure them in series. If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

When starting a blower, utilizing a low pressure switch for an alarm, the controller may go into alarm at start up. If this occurs the system can be started in the Hand mode and switched to Auto once fully operational. The controller must remain in Hand at least as long as the setting on the timer, if present.

ORS Sparge Blower

The table below shows the standard operation sequence.

Switch Activation	Description
High pressure switch closes	Alarm on, blower stops
High pressure switch opens	Normal operation resumes
Low pressure switch closes	Alarm on, blower stops
Low pressure switch opens	Normal operation resumes

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™ 1000, configure them in parallel. If attaching more than one item to the N.C. inputs J3-5 and J3-6 on the ORS RCM™ 1000, configure them in series. If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

When starting a blower, utilizing a low pressure switch for an alarm, the controller may go into alarm at start up. If this occurs the system can be started in the Hand mode and switched to Auto once fully operational. The controller must remain on Hand at least as long as the setting on the timer, if present.

Soil Vent

The table below shows the standard operation sequence.

Switch Activation	Description
High pressure switch closes	Alarm on, blower stops
High pressure switch opens	Normal operation resumes
Low pressure switch closes	Alarm on, blower stops
Low pressure switch opens	Normal operation resumes
High level switch closes	Alarm on, blower stops
High level switch opens	Normal operation resumes

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™ 1000, configure them in parallel. If attaching more than one item to the N.C. inputs J3-5 and J3-6 on the ORS RCM™ 1000, configure them in series. If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

When starting a blower, utilizing a low pressure switch for an alarm, the controller may go into alarm at startup. If this occurs the system can be started in the "Hand" mode and switched to "Auto" once fully operational. The controller must remain in "Hand" at least as long as the setting on the timer if present.

ORS Small Diameter Filter Scavenger™/Water Pump

The table below shows the standard operation sequence for the ORS Filter Scavenger™ Pump.

Switch Activation	Description
High product switch closes	Pump starts
Low product switch opens	Pump stops
Water present switch closes	Alarm on, pump stops
Water present switch opens	Normal operation resumes
Tank Full switch opens	Alarm on, pump stops
Tank Full switch closes	Normal operation resumes

The table below shows the standard operation sequence for the Water Table Depression Pump.

Switch Activation	Description
High water switch closes	Pump starts
Low water switch opens	Pump stops
Low override switch closes	Alarm on, pump stops
Low override switch opens	Normal operation resumes
N.O. Aux. switch closes	Alarm on, pump stops
N.O. Aux. switch opens	Normal operation resumes
N.C. Aux. switch opens	Alarm on, pump stops
N.C. Aux. switch closes	Normal operation resumes

If attaching more than one item to the N.O. inputs J3-7 and J3-8 on the ORS RCM™ 1000, configure them in parallel. If attaching more than one item to N.C. inputs J3-5 and J3-6 on the ORS RCM™ 1000, configure them in series. If the N.C. Auxiliary input is not used, terminals J3-5 and J3-6 must be jumpered together.

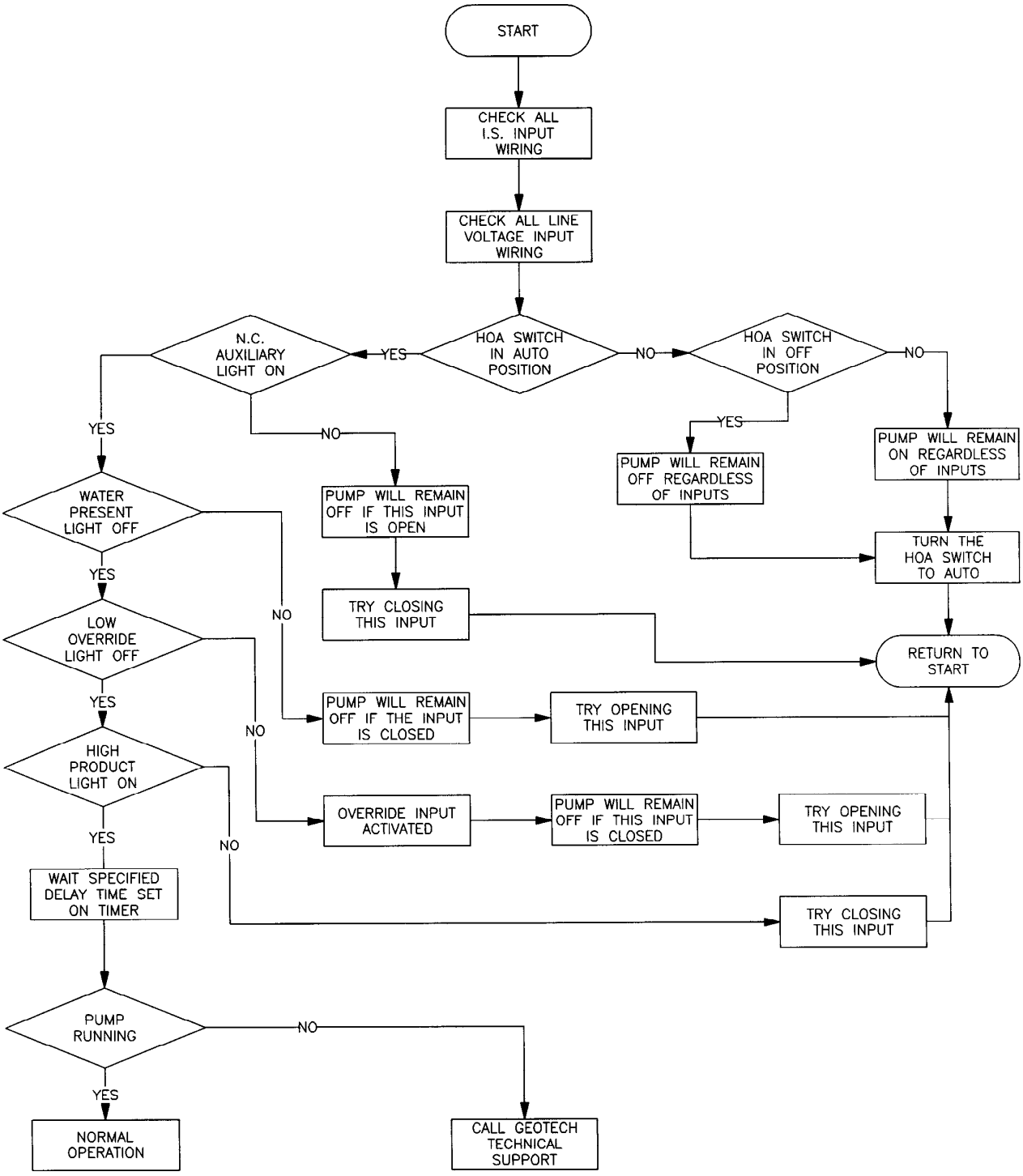
Chapter 4: System Maintenance

No maintenance is needed on the ORS RCM 1000 other than keeping it dust free.

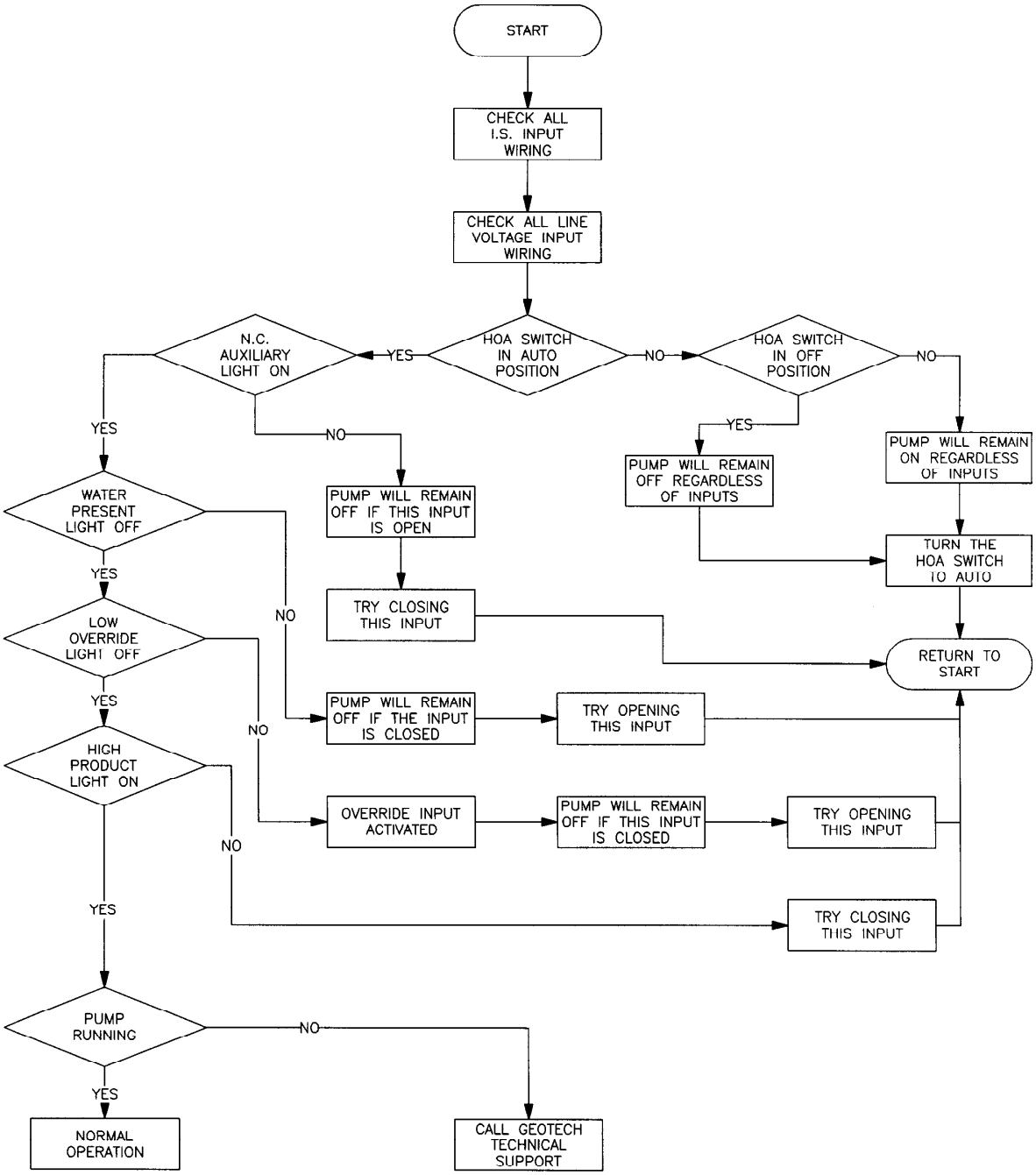
Chapter 5: System Troubleshooting

Water Table Depression Pump Control

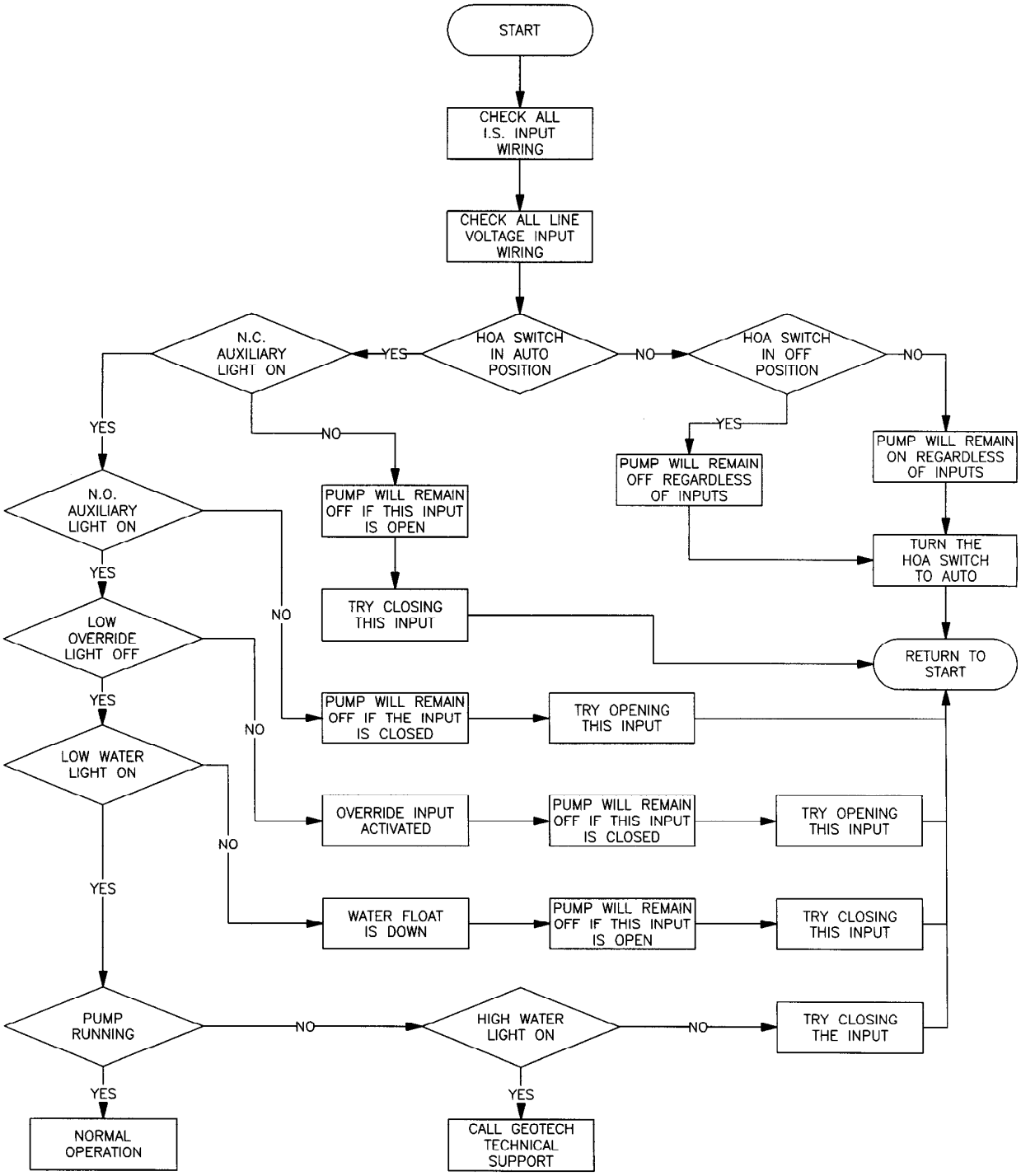
ORS Probe Scavenger™ Product Pump Control



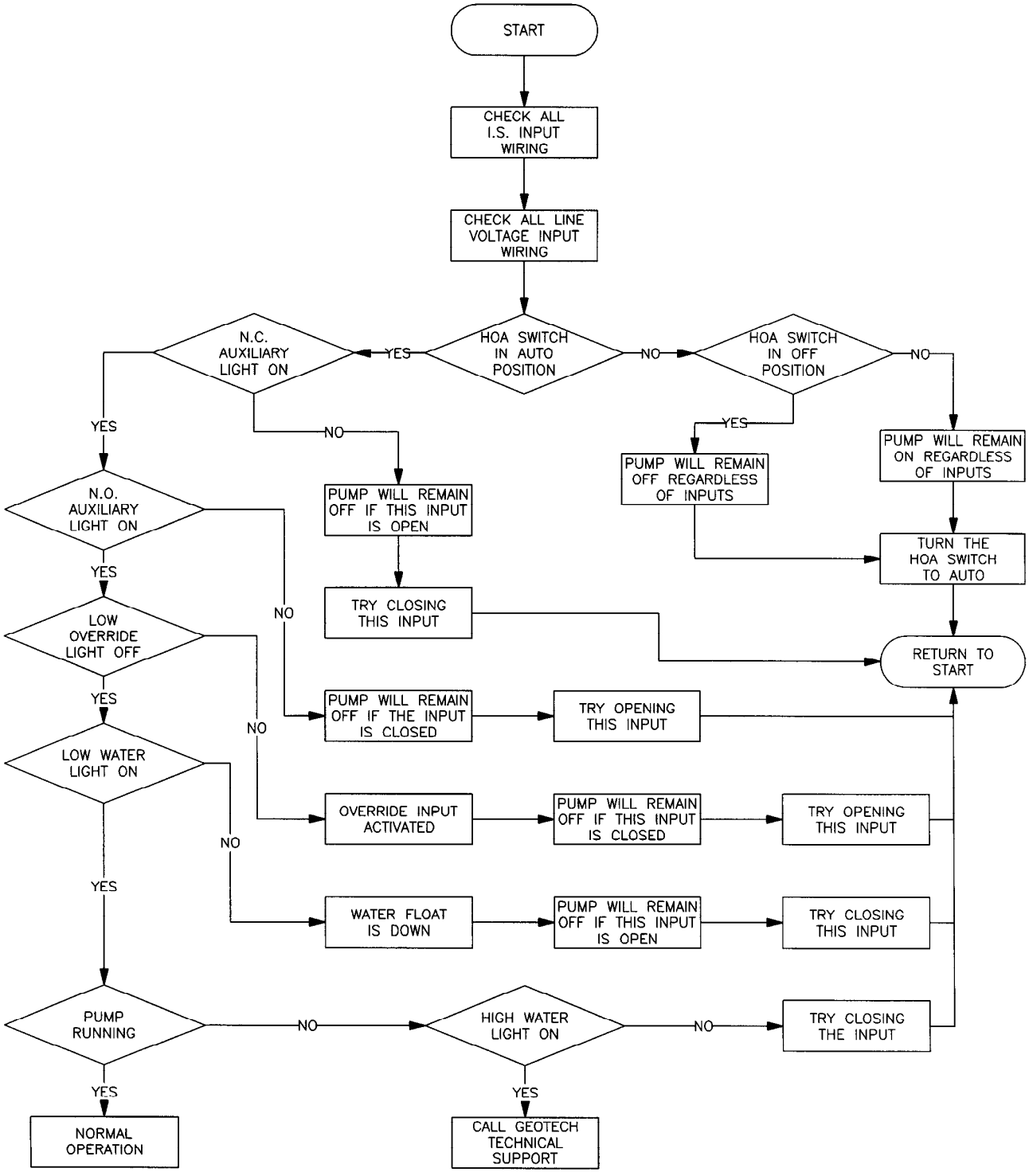
ORS Filter Scavenger™ Product Pump Control



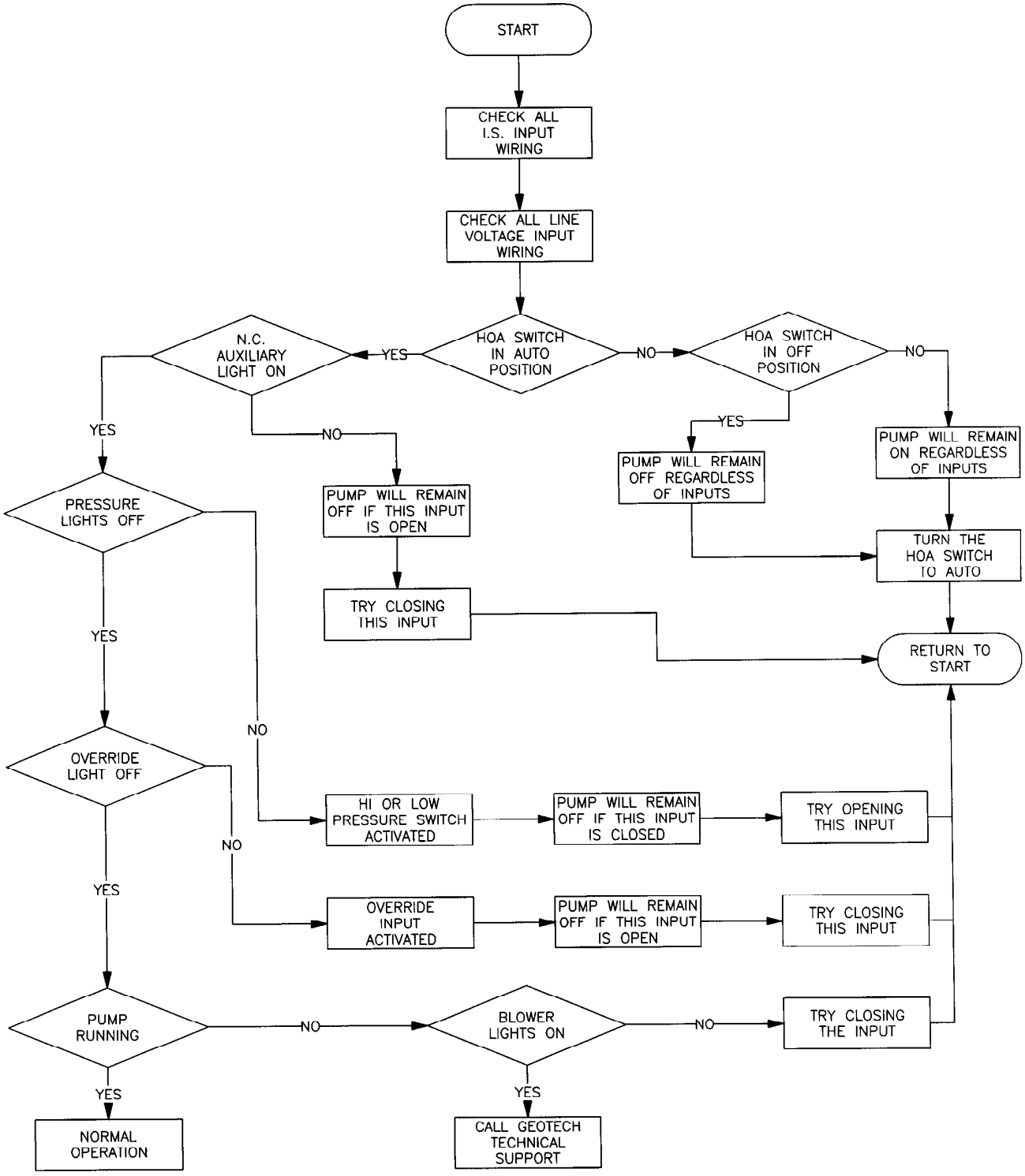
Sump Transfer Pump Control



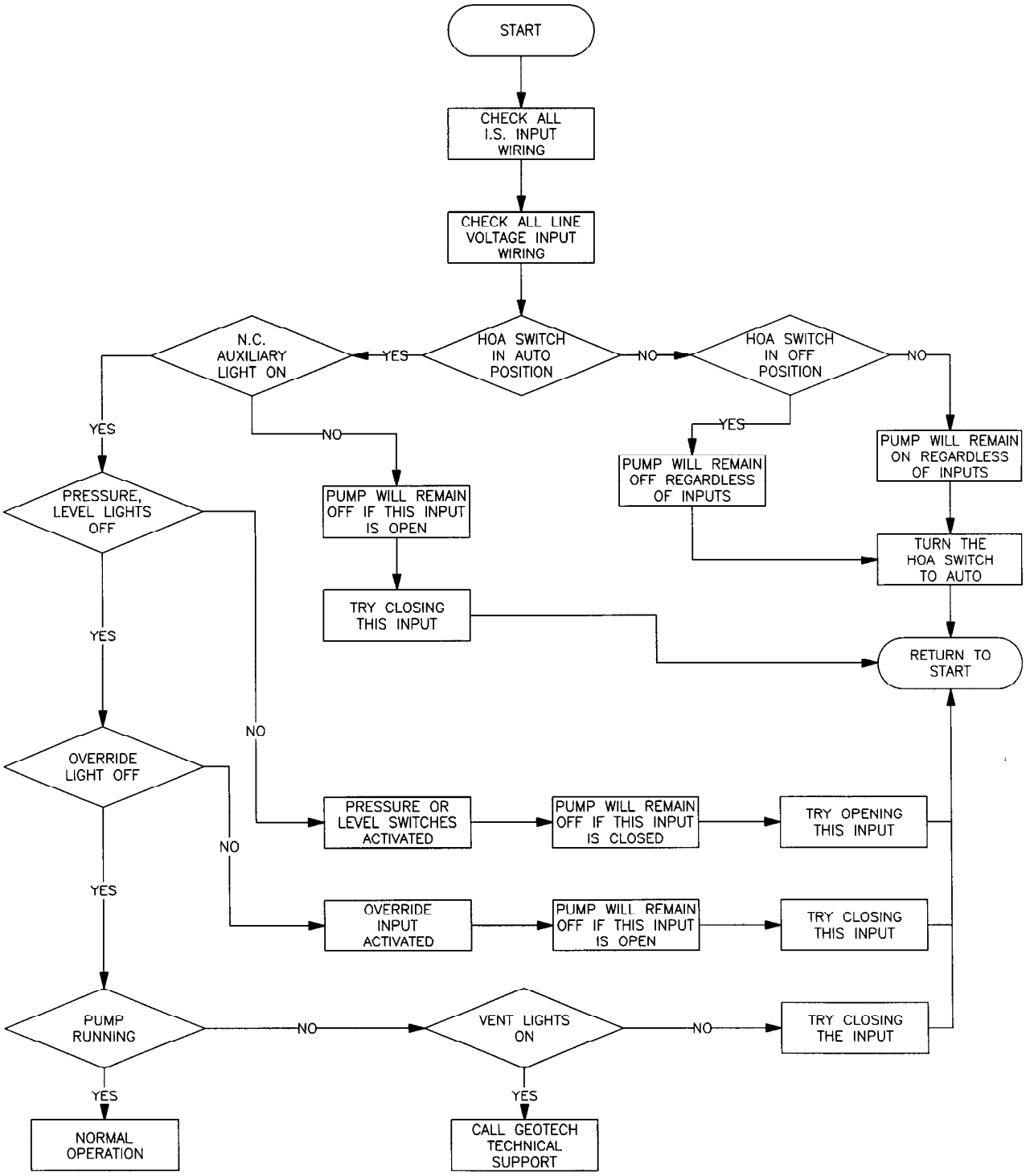
Blower Control



Sparge Blower Control



Soil Vent Blower Control



Refer to the troubleshooting of Water Table Depression Pump and ORS Small Diameter Filter Scavenger™ for dual system troubleshooting ORS.

Refer to the troubleshooting Water Table Depression Pump and Probe Scavenger™ Product Pump for dual system troubleshooting.

Chapter 6: System Specifications

Site Requirements

Door clearance for full 180 degree door opening: 20” (50.8cm) wide x 17” (43.2cm) high to left of enclosure.

Enclosure footprint for wall mounting:	12 ¼” (31.1cm) wide x 15 ½” (39.4cm) high.
Line voltage:	115VAC (+/- 20%), 50/60Hz, 1-phase for controller.
Load power:	115VAC or 240VAC
Power consumption:	10 Watts, not including motor power or contactor coils.

Operating environment

Operating temperature:	-40°F (-40°C) to 130°F (54°C).
Humidity:	8% to 85%, non-condensing.

Inputs

(5) Intrinsically safe inputs for pump control.

Outputs

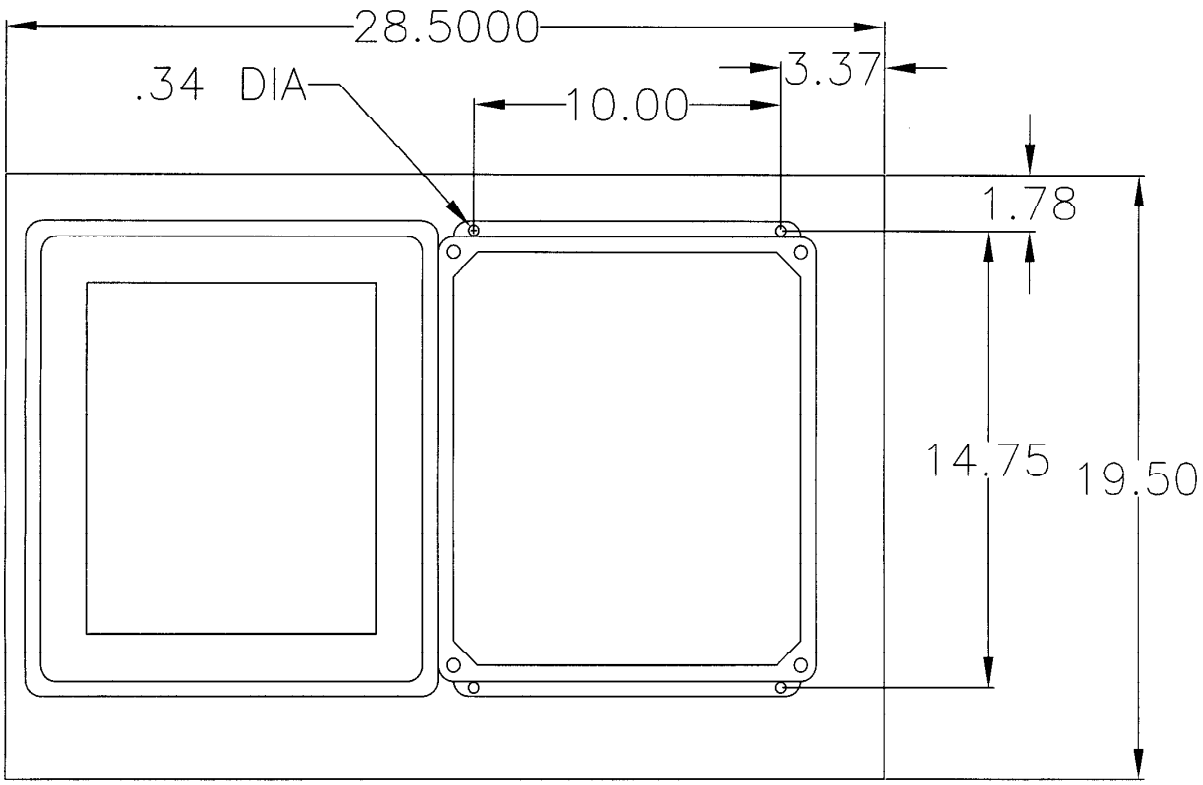
(1) Motor supply output capable of 1HP @ 120VAC, 2.5 HP @ 240VAC single phase.
(1) N.O. alarm output capable of 10 Amp Max. ¼ HP @ 120 VAC.

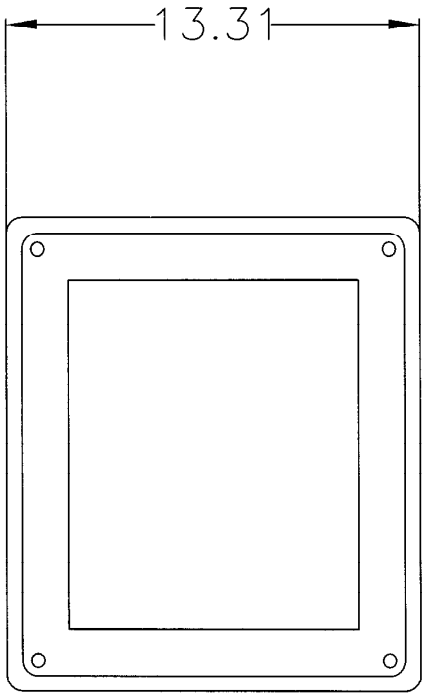
Enclosure

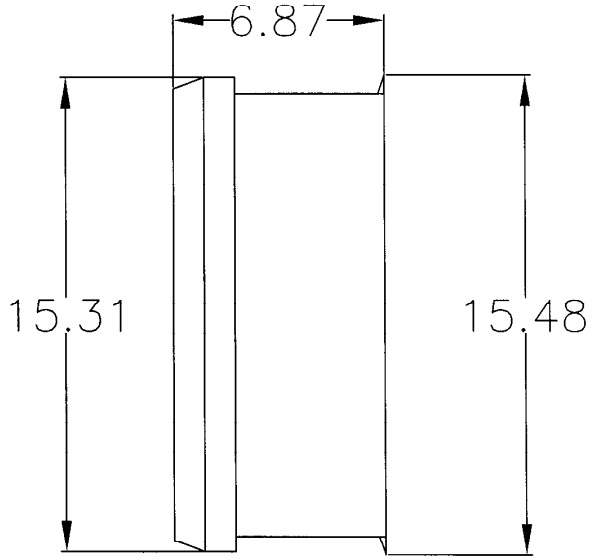
Height:	14” (35.5cm)
Width:	12” (30.5cm)
Depth:	6” (15.2cm)
Rating	NEMA 4, IP 66
Material:	Fiberglass reinforced plastic.
Power wiring access:	Top left side of enclosure.
Intrinsically Safe wiring access:	Bottom of enclosure.

To prevent damage to controller and maintain a NEMA 4 classification, do not drill holes in top of fixture.

Chapter 7: System Schematic







Chapter 8: Replacement Parts List

Part Number	Part Description
10119	Relay, 120 V
10175	Enclosure (14.75 x 12.75 x 16387)
PPE014065	Relay, 120 V, 50 / 60Hz (for use with SDFS panel)
310032	RCM 1000 Controller
310031	Timer: on delay (for use with P/Scav and Blower panels)
999001008	Operation Manual

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 the 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-lazer (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	PCB Contamination (since penetone may also remove paint, it is a good idea to spot-test before use)
Liquinox	Contaminated pumps
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)
Zep	General purpose cleaning
Alconox	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. Also, sand-blasting exposes personnel to silica, a carcinogen.

Freon is known to be particularly effective for the cleansing of PCB's 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 analyses indicate 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 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.

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 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 OR 1-800-275-5325.

Model Number: _____

Serial Number: _____

Date: _____

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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