

# Geotech Environmental Control Module - Water Table Depression Pump

Installation and Operation Manual





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## Documentation 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.



In order to ensure your WTDP GECM has a long service life and operates properly, adhere to the following cautions and read this manual before use.

- Disconnect from power source when not in use.
- Power input source must not exceed maximum ratings.
- Equipment must be wired to a negative ground system.
- Equipment may not operate properly with excess wiring not supplied by manufacturer.
- Avoid spraying fluid directly at equipment.
- Never submerge equipment.
- Avoid pulling on wires to unplug equipment wiring.
- Avoid using equipment with obvious physical damage.
- To prevent equipment damage, avoid dropping it.

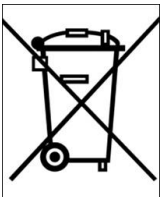


This Geotech product cannot be made dangerous or unsafe as a result of failure due to EMC interference.



**WARNING**

Do not operate this equipment if it has visible signs of significant physical damage other than normal wear and tear.



**Notice for consumers in Europe:**

This symbol indicates that this product is to be collected separately.

The following applies only to users in European countries:

- This product is designated for separate collection at an appropriate collection point. Do not dispose of as household waste.
- For more information, contact the seller or the local authorities in charge of waste management.

# Quick Start Instructions

## Read this section even if you don't read anything else.

The large envelope shipped with your GEOTECH ENVIRONMENTAL CONTROL MODULE (GECM) control panel contains Quick Start Installation and Configuration Instructions. Familiarity with the information in this envelope is absolutely essential for safe and trouble free operation of the GECM control panel.

The GECM Quick Start envelope contains the following instruction sheets:

- A Field Wiring Diagram that shows basic wiring of GECM and probes.
- An Optional Feature Wiring Diagram that shows how to wire network connections, interlocks, and analog sensor(s) to the GECM and other specialized devices.
- A Site Configuration Guide that explains how to lay out your site and define network interlocks.
- A Panel Configuration Guide that explains how to configure individual panels after the GECM network has been laid out.

The information in this supplement is provided to complement the GECM Installation & Operation Manual. Although we highly recommend that all users read the entire Installation & Operation manual, we also recognize that some experienced technicians may desire a quick start summary of essential information.

Please proceed as follows:

1. Refer to the Site Configuration Guide to determine the basic layout of your site.
2. Mount the GECM panel(s) and carry out basic wiring according to the Field Wiring Diagram.
3. Carry out additional site-specific wiring according to the recommendations and examples provided in the Optional Features Wiring Diagram.
4. Configure each panel according to the Panel Configuration Guide.
5. Document the configuration of each panel by filling out the Panel Configuration Sheet included in Appendix A of the GECM manual. Be certain that these sheets are available for reference before calling Geotech for assistance.

Observe all Warning and Cautions included in the GECM manual.

## Abbreviations Used

- GECM = Geotech Environmental Control Module
- L.O. = Low Override
- H.O. = High Override
- HOA = Hand-Off-Auto Switch
- N/C = Normally Closed
- N/O = Normally Open

# Section 1: System Description

## Function and Theory

The GEOTECH ENVIRONMENTAL CONTROL MODULE Water Table Depression Pump Control Panel is a PLC based pump controller designed for use at groundwater remediation sites. The controller is housed within a weather-proof NEMA 4 (IP 66) enclosure and incorporates circuitry to receive (optional) intrinsically safe sensor input from density actuated Water Table Depression Pump (WTDP) probes, Modbus 485, and Analog (4-20mA or 0-10 Volts), for extension into hazardous locations.

Each GECM Control Panel can be operated by itself or networked for remote access and telemetry. Because each panel in the network has alarm inputs, entire remediation sites can be configured to respond appropriately to sensor input received by any panel in the network.

The GECM incorporates a self-test feature that continuously monitors the Pump Status (on or off), panel temperature, and probe integrity whenever the GECM is in operation. An additional self-test routine that runs at panel startup, checks internal program and data memory, serial communications, and the integrity of all panel indicators on the GECM.

The standard GECM is equipped with terminals that allow the panel to interface with a variety of sensors, HOA switch(es), and external interlock devices. 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 is present.

Each standard GECM Water Table Depression Pump Control Panel is designed to run up to three electric submersible pumps.



**Larger motors require larger motor starter.** Variable Frequency Drives are a commonly used option for increased efficiency and optimal control.

Geotech offers an optional web portal (SiteView) to provide graphical representations of the GECM panel as it operates on site. Built in features of this web interface allow the user to generate historical reports, view graphs, and monitor near real-time remediation systems status. SiteView is available for an annual cost when the telemetry package is purchased.

## **User Interfaces**

### Physical

The panel is equipped with HOA switch(es) and indicator lights that show the status of the pump. Refer to System Operation 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.

### 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 SMS and email alerts.



## How the GECM Works

The GECM uses highly flexible PLC based electronics to provide a wide spectrum of capabilities that range from basic pump control to complex and sophisticated multi-panel networking. This built-in versatility allows the GECM to be configured per site to match the unique requirements of any remediation application.

### Basic Pump Control

Figure 1-1 shows a simple water pumping system in which a GECM panel controls the ON/OFF cycling of a pump in response to inputs from a standard Geotech Water Table Depression Pump (WTDP) probe (Figure 2-1). During normal operation, the pump starts when the water level in the well lifts the High/Low Float to the High Switch on the probe. The pump continues to run until the water level falls and drops the High/Low Float to the Low Switch. If the Low Switch fails to shut off the pump, the water level will continue to fall until the Low Override Float falls and disables the pump control circuit. This Low Override feature prevents the pump from running dry or pumping LNAPL, if present.

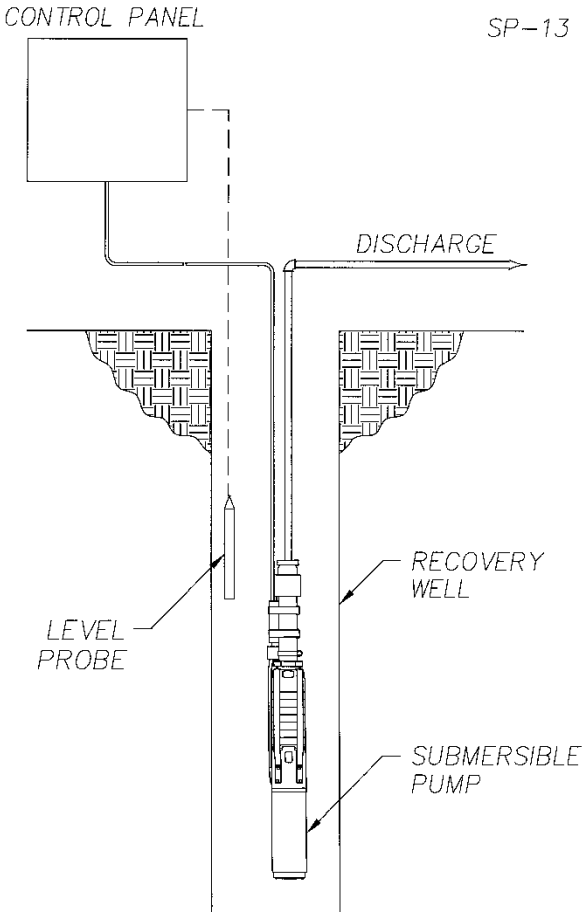


Figure 1-1

## Inputs

### Standard Inputs

Tank Full Probe  
Auxiliary Input (Used to Halt Entire System)  
HOA Switch(es)

### Required Inputs (Varies based on Hardware Purchased)

\*Float Probe for Well Level  
\*Pressure Transducer for Well Level

*\*Varies based on Hardware Purchased*

### Optional Inputs

Float Probe for Tank Level  
Pressure Transducer for Tank Level  
Flow Rate and Flow Totalizer  
VFD System Status (RS-485)  
Intrinsically safe inputs for monitoring  
Intrinsically safe 0-10 VDC analog inputs with intrinsically safe 4-20 mA analog inputs  
Motor current sensor for monitoring  
Voltage sensor for monitoring  
Temperature sensor for monitoring

## Outputs

### Indicator Lights

- Green light (illuminates when the well pumps are running)
- Yellow light (illuminates when a well alarm is active)
- Red light (illuminates when a well fault has occurred)

### Pump Signal

Tells the pump to start or stop.

### Dry Contact

Form C dry contact outputs capable of handling 100 mA, non-inductive (28VDC max.)  
Auxiliary outputs to drive small AC powered devices (1 AMP max.)  
Motor Contactor Output for up to 75 HP motors  
VFD motor controller for up to 75 HP motors

## Additional Inputs and Outputs

In most applications, your GECM will be integrated into a remediation system that includes additional equipment components. These components (holding tanks, hydrocarbon pumps, oil/water separators, air stripper blowers, sensors, etc.) often must be interfaced to the control panel to optimize system performance and to prevent permit-excursions in the event of a component failure. Figure 1-2 shows another simple remediation system in which a water pump supplies water to a holding tank. Again, the ON/OFF cycling of the pump is controlled by the status of the probe. Use of such external interlock devices (High level shutoff switches, pressure switches, etc.) can be incorporated into the control logic.

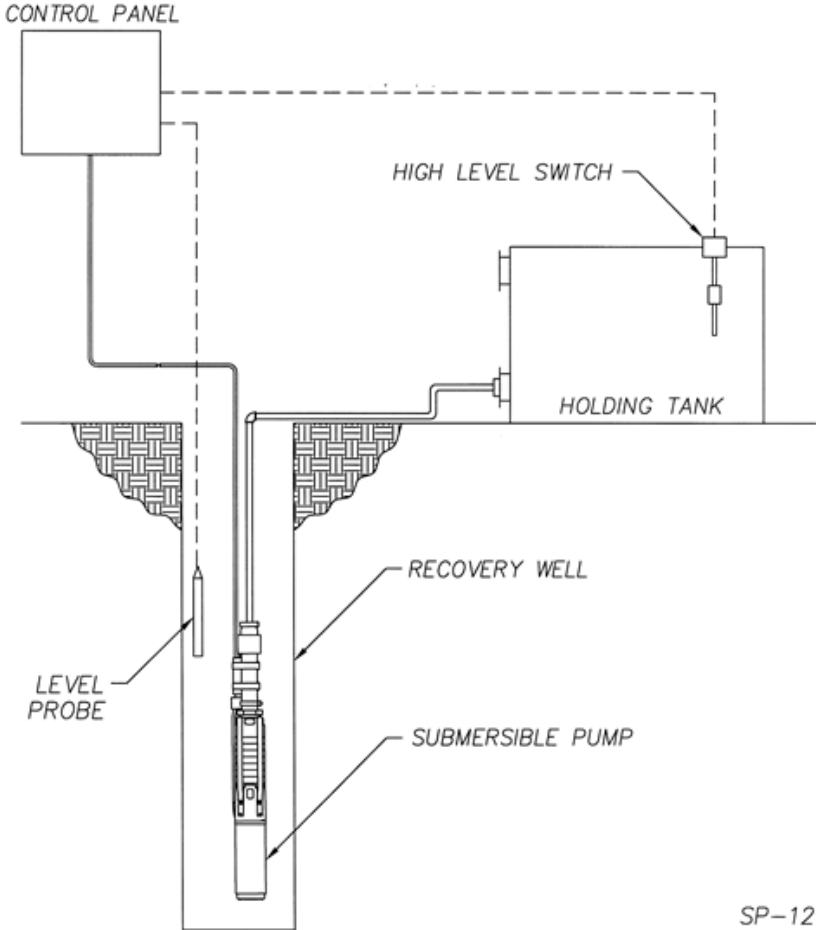
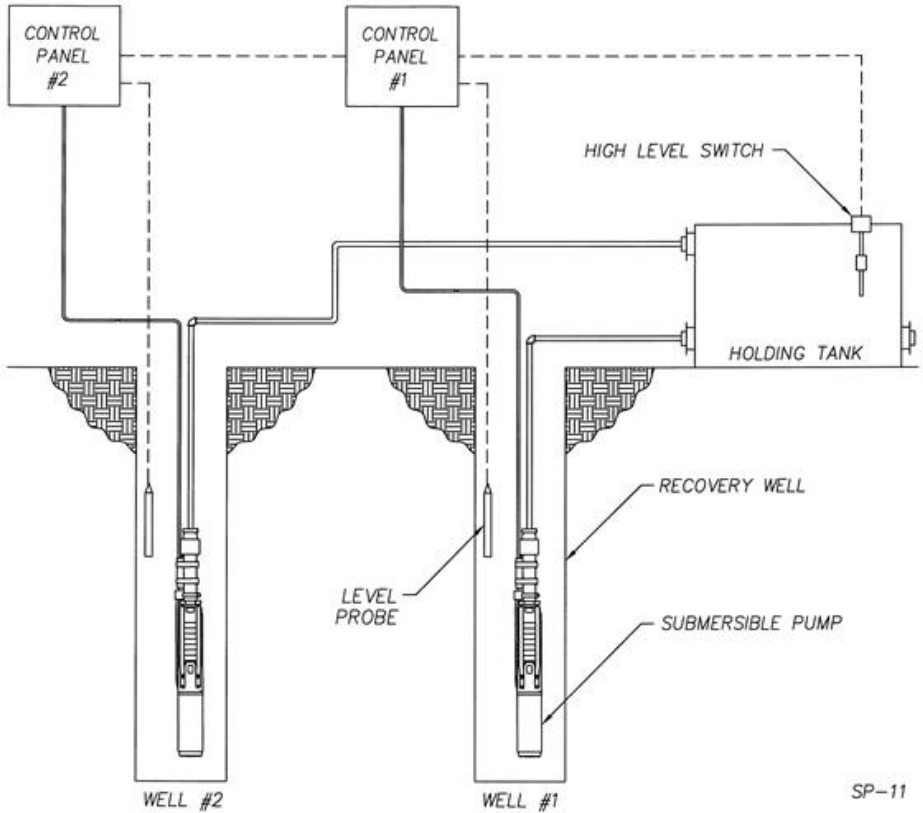


Figure 1-2

## Multi-Panel Networks

When two or more GECM panels are linked together in a network as shown in Figure 1-3, the individual panel PLCs are able to communicate and share information through a wired or wireless network connection. Each panel in a network can be configured to send and/or receive alarm signals to/from each other. In this way, alarms received locally by one panel can be broadcast on the network and used to shut off other panels.



**Figure 1-3**

In Figure 1-3, each of the two pumps is independently controlled by its own WTDP probe so that the rate of the water flow into the holding tank is a function of the recharge rates of the recovery wells. When the holding tank becomes full, the High level switch sends an alarm/fault to Panel #1. Panel #1 then shuts off and broadcasts the alarm/fault to Panel #2.

### Network Management

For network control to be enabled, it is necessary to install telemetry hardware on every panel. Step-by-step procedures for configuring your GECM Control Panel are provided in Section 3: of this manual.

## Section 2: System Installation



The GEOTECH ENVIRONMENTAL CONTROL MODULE Water Table Depression Pump Controller must be deployed in a non-hazardous location and all conduit runs from the well head to the panel must conform to the National Electrical Code (NEC)



Before deploying the GECM

1. Is the electrical service at the site properly sized for this panel and does it conform to NEC and local codes?
2. Are the electrical characteristics of your pumps compatible with those of the panel?

### Inspection

Inspect all equipment upon arrival. Check the contents of the packing crate against the itemized order list. If any items are missing or damaged, make note of this on the shipping papers and immediately notify Geotech Environmental Equipment, Inc. at 800-833-7958 OR (303) 320-4764.

### Panel Installation

#### Mount Panel

The GECM enclosure is supplied with mounting tabs that attached to each corner. Separate instructions are included with the mounting tab hardware packaging. Ensure that the support framework is sufficiently robust to bear the control panel's weight and is firmly anchored. In case the panel is located in an exposed area, take into account the effects of lateral wind force, sunlight exposure, as well as protection from rain and snow.



Do not use nails to attach the panel, as a misdirected hammer blow could damage the enclosure.



All wiring must be carried out by a qualified electrician and be in accordance with state and local codes. See the following sections for panel grounding procedures.

#### Install Chassis Ground

Before beginning panel hookup procedures, run a wire from the panel chassis ground lug to a good earth ground such as the circuit breaker panel enclosure. The ground lug is located on the chassis behind the panel dead front (See the GECM wiring diagram included with your system).



Before installing wires, or touching exposed portions of the panel circuit board, safely discharge any static electricity from your body by touching or otherwise grounding yourself to the panel chassis.



To maintain the NEMA 4 weatherproof characteristics of your panel after wiring has been completed, seal all wiring access ports with weatherproof conduit tubs.

### Wire Incoming Power

Run power wires through the port at the bottom of the enclosure and attach to the terminal strip on the chassis. Attach the power leads to terminals L1 and L2. In 115VAC systems, wire power leads to the “HOT” and “NEUTRAL” terminals. Attach the ground wire to the grounding lug next to the terminal strip. Check tightness of terminal screws.



Do not run power wires within 2 inches of low voltage control wires or terminals.

### **Wire Pump**

Run the pump power wires through the port at the bottom of the enclosure. Attach the pump leads to terminals T1 (Neutral for 115VAC) and T2 (Hot for 115VAC). Attach the ground wire to the chassis grounding lug next to the terminal block. Check tightness of terminal screws. See wiring diagram.



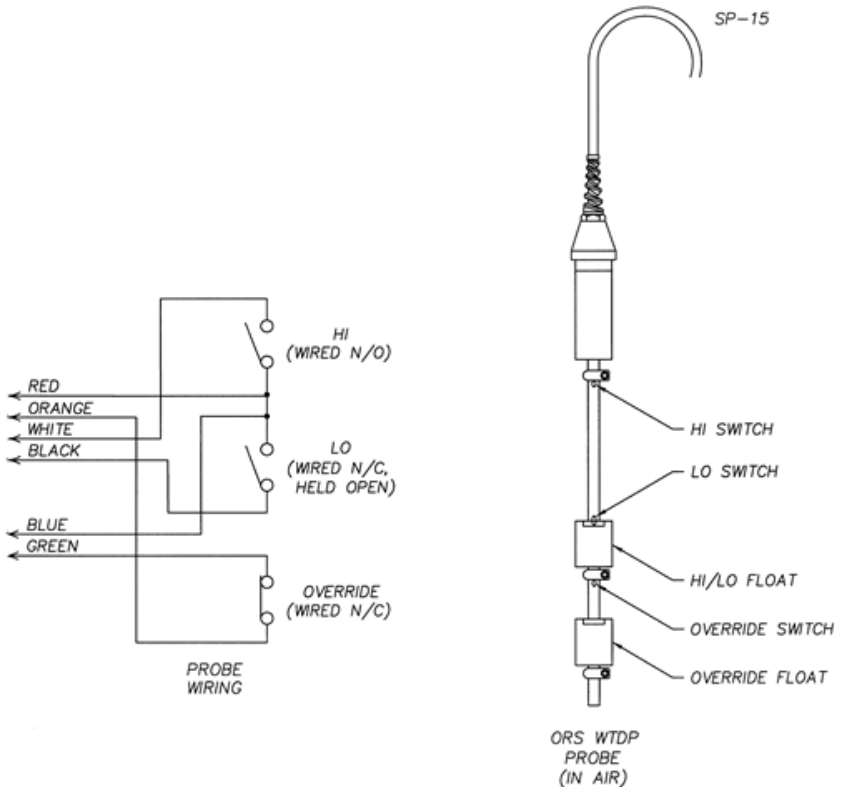
Refer to your water pump manual and heed all relevant Warnings and Cautions.

## Wire Probe

The GECM Water Table Depression Pump Control Panel is designed for use with a standard density actuated WTDP probe (Figure 2-1). This probe uses three separate switches (High, Low & Low Override) to monitor the water level in the well. The High and Low switches control the normal ON/OFF cycling of the pump while the Low Override Switch shuts off the pump in the event of a control system failure.

For custom level settings, an extended High to Low split probe is available (Figure 2-2). This allows the user to manually adjust the hysteretic control by moving the High Switch onto a separate probe.

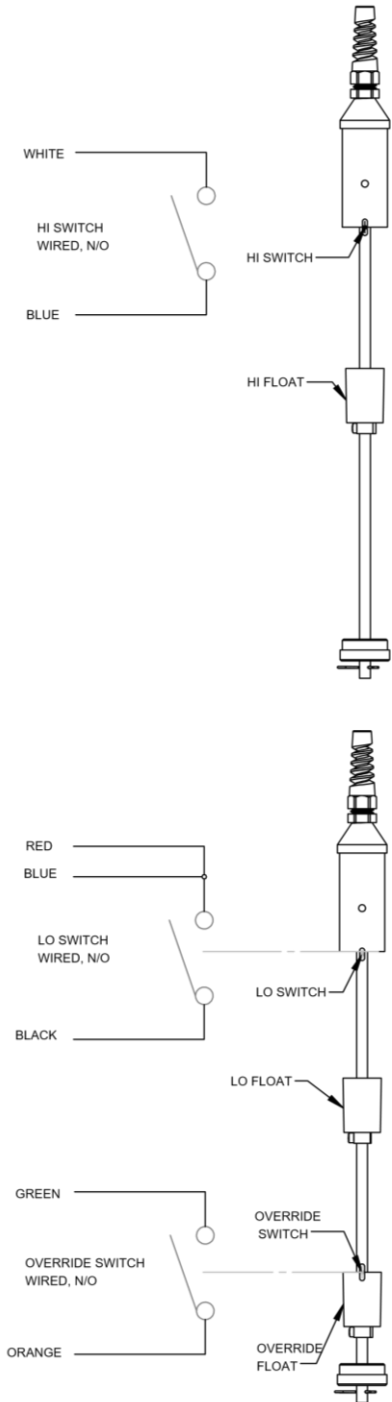
Run the probe cable through the access port on the side of the enclosure and attach its leads to terminal strips as shown on the wiring diagram provided with your system. The wiring of the WTDP probe switches is shown in Figure 2-1.



**Figure 2-1:** Standard Density Actuated WTDP Probe



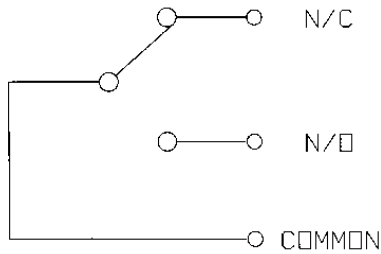




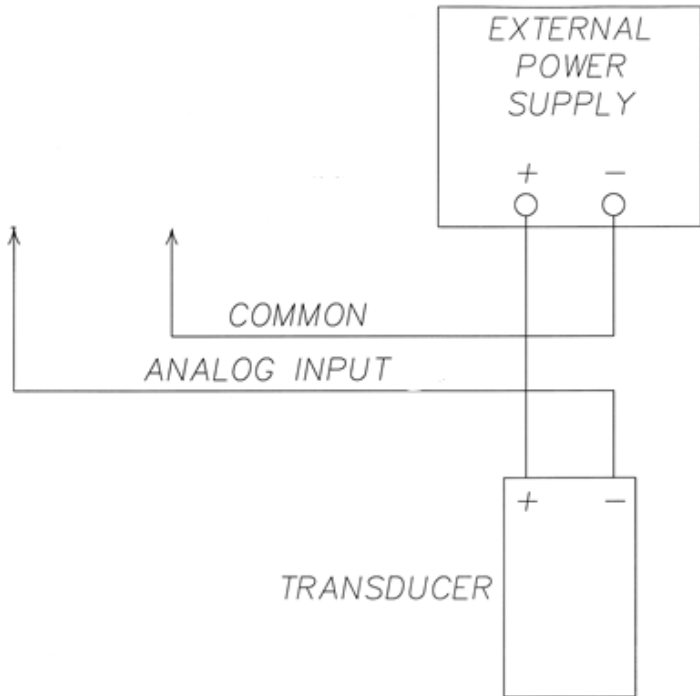
**Figure 2-2:** Extended High to Low WTDP Probe

## Wire Auxiliary Outputs

The GECM features Normally Open and Normally Closed 10A (600V max) Form C relay outputs that can be used to trigger a wide variety of external devices (e.g. relays, visual indicators, buzzers, and security system alarms).



**Figure 2-3**



**Figure 2-4**



In lightning prone areas, have your electrician install a power line lightning arrester. Contact your power company for further information.

## Section 3: System Operation

### System Pre-Check Procedures

Before deploying the pump and probe in the well, carry out the following pre-check procedures to familiarize yourself with the controls and confirm correct operation. You will need a bucket of water approximately 12" (29 cm) deep for probe checkout procedures.

1. Refer to the wiring diagrams and check all wiring connections to the panel.
2. With the HOA switch in the OFF position, switch the main power breaker or power switch ON (user supplied)
3. Briefly turn the HOA switch to HAND. The pump should start



Do not run the pump dry for more than a few seconds.

4. Return the HOA switch to OFF and completely submerge the probe in the bucket of water.
5. Turn the HOA switch to AUTO. The pump should start.
6. Lift the probe out of the bucket. Ensure the pump stops.
7. Turn the main power breaker or power switch off.

Once the above pre-check procedures have been completed, the GECM control panel is ready for operation. Deploy the pump and probe at the desired level in the well and carry out the startup procedures listed below.



The pump intake should be positioned at least 5' (1.5 m) below the level of drawdown. This will minimize intake of contaminated water. To prevent false OVERRIDE signals, suspend the probe at least 3' (1 m) above the pump intake.

### Panel Startup

1. With the HOA switch in the OFF position, turn on the main power.
2. After the panel has gone through its self-test procedure, turn the HOA switch to AUTO: The pump should start and begin cycling on and off as the water level rises and falls in the well.
3. With the water pump running on AUTO, reduce the rate cycling to a minimum by adjusting the pump gate valve.

Refer to the specifications provided with your pump and confirm that the volume of water passing through it is sufficient for adequate cooling.

## Panel Controls

Each well's pump is controlled with a HOA. The HOA has three switch states:

- **HAND:** A momentary switch that activates the pump, regardless of signal inputs.
- **OFF:** The pump will not run, regardless of signal inputs.
- **AUTO:** Activates and deactivates the pump in accordance with sensor inputs and system logic. Logic for AUTO operation is detailed below.

### AUTO

In the AUTO position, ON/OFF switching of the pump is controlled by sensor inputs from the level sensing probes. The green well light is illuminated when the well pump is running. For GECMs with float probes, the pump starts when the probe's High/Low Float is in the High position. The pump will continue to run until the float falls to the Low position. This cycle will continue unless an alarm or fault condition prevents pumping. If difficulties are encountered during or after startup, refer to the troubleshooting procedures in Section 5: of this manual.

## Faults and Alarms

Alarms are temporary conditions which prevent the affected pump from operating. Alarms illuminate the respective pump's yellow 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. The user must reset the affected HOA before it will resume normal operation. Faults illuminate the affected pump's red light. In order to reset a fault for a pump, the respective HOA must be set to the "OFF" position.

## Dashboard

The dashboard interface may be accessed on any web browser from your Wi-Fi enabled device using the login credentials provided on the QR codes located inside the control panel cover. The dashboard displays the status of the overall system as well as that of each sub-system. Additionally, the dashboard gives users detailed information on alarms and faults. The dashboard also displays the cumulative operating time for each pump on a digital hour (Hobbs) meter.

## SiteView Access

Remote monitoring and control may be accessed via any web browser by logging onto SiteView. You will receive an email with instructions to access your online account portal. If you forget your login credentials you may click *forgot password* from the main login page. Geotech Sales and Customer service cannot access your account credentials. You must reset your account through the website.

## Float Probes

Each sub-system may be equipped with a float probe. All float probes share these three states:

- High: Fluid level High – Start pumping
- Mid: Fluid level Mid – No change to pumping status
- Low: Fluid level Low – Stop pumping.

If a sub-system is equipped with a float probe, the pump will begin when the probe is in the High state, and will continue to pump until it is in the Low state. Float probes have either a L.O. or H.O. float which will latch a fault when activated.

## Pressure Transducers

In GECMs equipped with transducers, the ON/OFF switching of the pump is controlled by user defined hysteric set points. The set points can be managed using the dashboard and/or SiteView.

## Auxiliary-Input

A dry contact is provided to the user as a means to shut down the entire system. When the dry contact is opened, all sub-systems will latch a fault, red lights will illuminate, and SiteView and the dashboard will show Aux-In fault. In order to resume operation, the dry contact must be returned to closed, and all HOAs need to be reset by placing them in the “OFF” position.



**NOTE:** The Aux-In dry contact can be closed with a jumper wire in the event the user chooses to not make use of the auxiliary-input.

## Auxiliary-Output

A form C dry contact relay assembly is incorporated into the GECM panel. If any latched faults exist, the dry contact will change state sending an output signal (normally closed to open, or normally open to closed) to alert the user of the presence of a fault.

## Section 4: System Maintenance

The GECM is designed for trouble free operation with minimal maintenance required. The following simple maintenance tasks should be carried out at the specified intervals.

### Vacuum Enclosure

At yearly intervals, the insides of the enclosure should be vacuumed to remove accumulated dust.

### Clean Probes

It is essential that the probe shafts and floats be cleaned on a regular basis. Use detergent, warm water and a soft brush. The required frequency of cleanings is highly site specific and must be determined by the user.



Failure to clean the probe will result in fouling that could cause a system malfunction.

### Pump Winterization

1. Place HOA switch in **OFF** position
2. Remove pump from well
3. Purge pump with fresh water by placing HOA switch in **HAND** position
4. Set PLC power switch to **OFF** (switch behind touch-screen)
5. Turn Off DC disconnect for battery charging
6. Disconnect batteries (order of operations matters)
7. Turn Off DC disconnect for Invertek VFD
8. Store pump in dry storage area

### Pressure Transducer Winterization

1. Remove Pressure Transducer from Well
2. Rinse with Fresh Water
3. Store Pressure Transducer in Dry Storage Area

## Section 5: System Troubleshooting



Do not attempt any troubleshooting procedures other than those listed in this section.

### Getting Help

There are no field replaceable components inside the GECM enclosure. If the troubleshooting procedures in this chapter indicate a component failure, call Geotech Environmental Equipment, Inc. after documenting the problem as outlined below:

Read the entire manual and become thoroughly familiar with all system components and troubleshooting procedures.

Prepare a written list of all problems encountered while operating the equipment.

### Service Location

Geotech Service personnel are trained on all aspects of Geotech equipment and are dedicated to helping you maximize the efficiency and cost effectiveness of your GECM Control Panel. For technical support of Geotech products, contact Geotech as below:

Geotech Environmental Equipment, Inc.  
2650 East 40th Avenue  
Denver, CO 80205  
800-833-7958  
OR: 303-320-4764  
[www.geotechenv.com](http://www.geotechenv.com)

### Basic Troubleshooting Procedures

The GECM is equipped with self-diagnostic features and can be ordered with optional telemetry capabilities. These features make the GECM significantly easier to troubleshoot than conventional control panels. Whenever the GECM is in operation, the PLC monitors the function of all critical system components. When an operational fault is detected, the user is alerted by one or more of the panel's indicator lights, the dashboard, and/or SiteView.

Using a volt meter to verify power is connected to the GECM is the most common troubleshooting procedure. If unfamiliar with using a volt meter to verify power is connected, consult with an electrician.

## Pump Troubleshooting

To determine if the pump is faulty, you can “bump” the pump motor by momentarily turning the HOA switch to the HAND position. If the pump does not run, the pump is likely faulty.



Do not run the pump dry for more than a few seconds.

## **Clearing Faults**

When a fault occurs, a system reset is required. A reset can be accomplished by placing the HOA of the affected sub-system in the “OFF” position.

A probe fault may be caused by any of the following:

- One or more disconnected probe wires
- Damaged probe
- Probe wired incorrectly
- Float Out-of-Order Fault
  - e.g.: If the H.O. signal and the Low signal are both true at the same time

Any of the conditions above will cause the respective system’s red light to illuminate. The dashboard and SiteView will also reflect a probe fault for the affected pump.



## Section 6: System Specifications

Refer to Figure 6-1 for a panel layout diagram showing dimensions and wiring access points.

### Mechanical

Main enclosure: NEMA 4X (IP66)

Enclosure material: Fiberglass reinforced plastic with Lexan window.

External height: 18" (45.7 cm)

External width: 16" (40.7 cm)

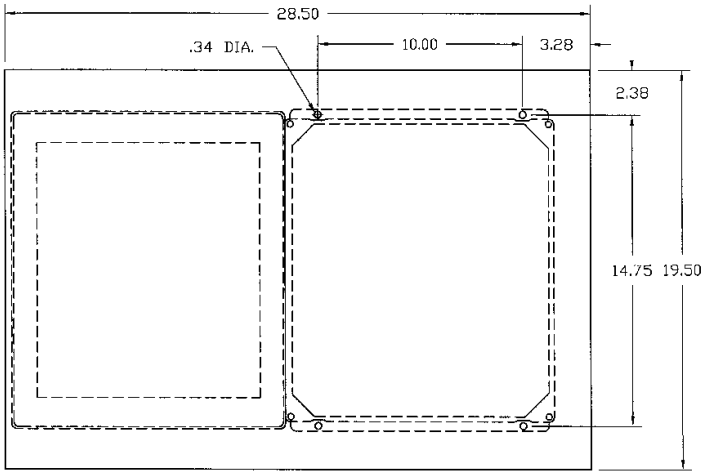
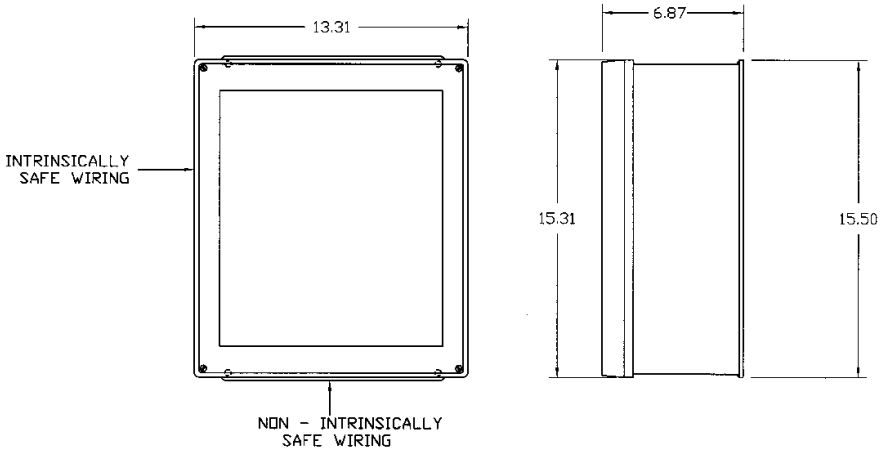
External depth: 10" (25.4 cm)

Weight: 15 to 45 lbs (6.8 to 20 kgs) (depending on installed options)

Power wiring access:	Bottom of enclosure.
Intrinsically safe wiring access (optional):	Left side of enclosure.
Non-intrinsically safe wiring access:	Bottom of enclosure.

### Site Requirements

Door clearance for full 180° door opening:	20" (50.7cm) wide x 30" (76.2 cm) in front of and to left of enclosure
Enclosure footprint for wall mounting:	18.94" (48.11 cm) wide x 14" (35.56 cm) high
Modem:	Requires cellular service
Wi-Fi:	802.11b/g/n Wi-Fi 4



TYPICAL MOUNTING CONFIGURATION  
SHOWN WITH COVER OPEN

Figure 6-1

## **Section 7: System Schematics**

See drawing package included with each system. For copies contact Geotech and reference the order number labeled on the inside of you control panel.

## Section 8: Parts and Accessories

1*	Controls Single Pump						
2*	Controls Two Pumps						
3*	Controls Three Pumps						
Number of Pumps	Voltage and Phase(s)	1	115V 1.5HP(5.8A)				
		2	230V 1 $\phi$ ~3.0HP(10.5A)				
		3	230V 3 $\phi$ ~7.5HP(24A)				
		4	460V~15HP (24A)				
	VFD or MS	M	Motor Starter				
		V	VFD				
	Well Level Control	F	Well Level Controlled with WTDP Float				
		T**	Well Level Controlled with Transducer (Sold Separately)				
		N	No Tank Level Monitoring (Still Supports Tank Full Probe)				
		F	Tank Level Monitored with Float				
	Tank Level	T**	Tank Level Monitored with Transducer				
		Flow and Totalizer	N	No Flow Rate Monitor nor Flow Totalizer			
			F***	Flow Rate Monitor and Flow Totalizer			
		Remote or Local	R****	Control & Monitor Site Remotely via Cloud (Includes Local Controls)			
	L		Local Control and Monitoring Only				
	2*	3	M	F	N	N	R****

Figure 8-1

## ENCLOSURE

Description	Part #
LATCH, LOCKABLE, GEKM,	16110046
HOLE PLUG, LOCKING, 1-3/32" ID,	19053084
LATCH, CATCH, GLS FIBER,	10565

## CONDUIT

CONN, HUB, 3/4" CONDUIT, AL,	PPP019022
NIPPLE, AL, .75X3",	PPM031023
CONDUIT, FITTING 3/4" STRAIGHT, LIQUID TIGHT	10514
SEAL, CONDUIT, .75" HUB, Y TYPE, KILLARK	00170

## DEAD FRONT

HOA SWITCH,	16110042
LIGHT, INDICATING, YELLOW, 12VDC, 22MM	16091395
LIGHT, INDICATING, GREEN, 12VDC, 22MM	16091351
LIGHT, INDICATING, RED, 12VDC, 22MM	16091350
INDICATOR LIGHT, YELLOW, GEKM,	16110043
INDICATOR LIGHT, RED, GEKM,	16110088
INDICATOR LIGHT, GREEN, GEKM,	16110112
KNOB, 1/4-20, GRIP KNURLED, GEKM,	16110038
LATCH, KEEPER, GLASS FIBER,	10564
PLUG, SNAP IN, BLACK, 7/8", FOR PANELS	19053425

## POWER GRID

FUSE HOLDER,COVER FOR SVE, FGF2,TRANSFORMER	16090188
FUSE HOLDER ASSEMBLY,	2010029
FUSE,1A,250V,SLO-BLO,	PPE011026
FUSE,.5A,250V,SLO-BLO,	PPE011016

## MOTOR STARTER / VFD

MOTOR STARTER,12-16A,230V,3PH, 115V COIL	16110062
MOTOR STARTER,10-16A,115V,1PH, 115V COIL	16110048
VFD,1.5HP,110-115V,NEMA4, INV	11201378
VFD,3HP,200-240V,NEMA4X, INV	11201379
VFD,7.5HP,240V,3PH,24A, ODE-3-320240-3F4-B	16110294
VFD,15HP,480V,3PH,24A, ODE-3-340240-3F4B	16110295

## ADDITIONAL PARTS

Description	Part #
ASSY,WINCH,HEAVY DUTY,110FT 2500LB MAX	2030001
PROBE,SM.DIA.,DENS,100',2005	56120009
PROBE,SM.DIA.,DENS,25',2005	56120010
PROBE,SM.DIA.,DENS,50',2005	56120013
JUNCTION BOX,SIGNAL	2390065
JUNCTION BOX,XP	2390066
MANUAL,GECM,WTDP	16110239

## ACCESSORIES

Description	Part #
SWITCH, ELCTROMECHANICAL, EMERGENCY STOP, NO/NC	19600042
METER, HOUR, 115V, 50/60, GECM	16110045
RELAY,12VDC,30A,DPDT,	12050521
RELAY, 110V, DPDT, 10AMP	PPE014090
RELAY, 230V, DPDT, 10AMP	PPE014091

\*GECM base unit does not include motor starters. Motor starters and power supply relays must be specified per system.

## Appendix A: Panel Configuration Sheet

This Appendix consists of an GECM Panel Configuration Sheet to be used to record the final configuration of your GECM panel.

### GECM Configuration Sheet

Date: \_\_\_\_\_

Panel Type: \_\_\_\_\_

Panel Network Address: \_\_\_\_\_

## Appendix B: Glossary

### Address

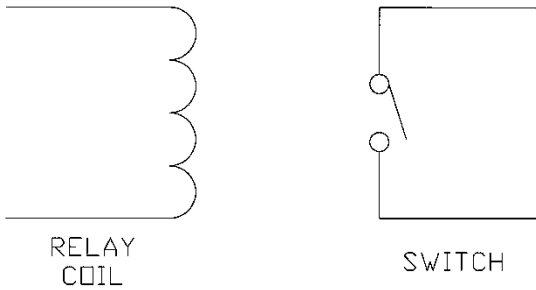
An identifying number assigned to each panel in a network. The master panel always receives the address "0". Slaves are numbered from "1" to a maximum value of "15". During network operation, the Master panel polls the Slaves in ascending numerical order.

### Dry Contact

An electrical switch that is isolated from any source of electrical energy. In the diagram below, the dry contacts are acted upon by a relay coil that is isolated from the switch.

### Fault

A shutoff signal generated by an interlock device wired to a GECM panel.



### Form C Contacts

A set of electrical contacts that has both Normally Open and Normally Closed poles as shown in the diagram below. See definitions of Normally Open and Normally Closed also included in this Glossary.

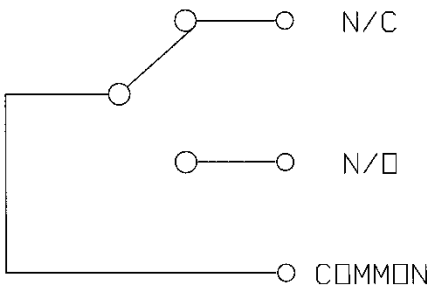


Figure 2-3

## ***IP 66***

Enclosure intended for outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure. The International Electrotechnical Commission (IEC) equivalent to a rating of NEMA 4.

## ***Latching***

A fault that, once engaged, requires a manual reset to clear. An alarm is non-latching, and will clear automatically when the condition that caused the alarm either spontaneously corrects itself or is corrected by operator intervention.

## ***PLC***

A computer that is capable of executing programmed instructions for input and output operations.

## ***NEC***

The NEC (National Electrical Code) is a collection of electrical safety standards compiled by the National Fire Protection Association.

## ***NEMA 4***

Enclosure intended for outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure. (See IP 66).

## ***Normally Closed***

A Switch that is closed when not acted upon. See Figure 2-1 for an example of a Normally Closed switch that is held open by a magnet embedded in a probe float. When the magnet is moved, the switch closes.

## ***Normally Open***

A switch that is open when not acted upon.



## Appendix C – Submersible Water Pumps

Refer to the installation and operation manuals included with your pump and motor. The following pages will include cable and motor specifications as well as start box schematics.

Motor Rating		AWG Copper Wire Size												
Volts	HP	14	12	10	8	6	4	3	2	1	0	00	000	0000
115	1/3	130	210	340	540	840	1300	1610	1960	2390	2910	3540	4210	5060
	1/2	100	160	250	390	620	960	1190	1460	1780	2160	2630	3140	3770
230	1/3	550	880	1390	2190	3400	5250	6520	7960	9690	11770			
	1/2	400	650	1020	1610	2510	3880	4810	5880	7170	8720			
	3/4	300	480	760	1200	1870	2890	3580	4370	5330	6470	7870		
	1	250	400	630	990	1540	2380	2960	3610	4410	5360	6520		
	1 1/2	190	310	480	770	1200	1870	2320	2850	3500	4280	5240		
	2	150	250	390	620	970	1530	1910	2360	2930	3620	4480		
	3	120*	190	300	470	750	1190	1490	1850	2320	2890	3610		
	5	0	0	180*	280	450	710	890	1110	1390	1740	2170	2680	
7 1/2	0	0	0	200*	310	490	610	750	930	1140	1410	1720		
10	0	0	0	0	250*	390	490	600	750	930	1160	1430	1760	
15	0	0	0	0	170*	270*	340	430	530	660	820	1020	1260	

**Table C-1:** Two or Three Wire Cable, 60 Hz (Service Entrance to Motor – Maximum Length in Feet)

Lengths without the asterisk (\*) meet the U.S. National Electrical Code ampacity for either individual conductors or jacketed 60°C cable. Lengths marked \* meet the NEC ampacity only for individual conductor 60°C cable in free air or water, not in conduit. If cable rated other than 60°C is used lengths remain unchanged, but the minimum size acceptable for each rating must be based on the NEC Table column for that temperature cable.



Flat molded cable is considered to be jacketed cable.

Maximum lengths shown maintain motor voltage at 95% of service entrance voltage, running at maximum nameplate amperes. If service entrance voltage will be at least motor nameplate voltage under normal load conditions, 50% additional length is permissible for all sizes. This table is based on copper wire. If aluminum wire is to be used, it must be two sizes larger.

Example: If the table calls for 12AWG copper wire, 10AWG aluminum wire would be required.

The portion of the total cable length which is between the supply and single phase control box with line contactor should not exceed 25% of the total maximum allowable, to ensure reliable contactor operation. Single-phase control boxes without line contactors may be connected at any point in the total cable length.

Lengths represent a 5% voltage drop. If 3% is required, multiply by .6 for maximum feet. Contact manufacturer for 75°C or 90°C cable lengths.



The portion of the total cable between the service entrance and a 3Ø motor starter should not exceed 25% of the total maximum length to assure reliable started **operation**.



Use of smaller than recommended cable voids warranty, can cause failure of the motor to start and operate properly, and may cause cable overheating.

Motor Rating		AWG Copper Wire Size													MCM Copper Wire Size							
Volts	HP	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500			
200V 60 Hz Three Phase Three Wire	1/2	710	1140	1800	2840	4420																
	3/4	510	810	1280	2030	3160																
	1	430	690	1080	1710	2670	4140	5140														
	1 1/2	310	500	790	1260	1960	3050	3780														
	2	240	390	610	970	1520	2360	2940	3610	4430	5420											
	3	180	290	270	740	1160	1810	2250	2760	3390	4130											
	5	110*	170	280	440	690	1080	1350	1660	2040	2490	3050	3670	4440	6030							
	7 1/2	0	0	0	200	310	490	770	960	1180	1450	1770	2170	2600	3150	3560						
	10	0	0	0	0	230*	370	570	720	880	1090	1330	1640	1970	2390	2720	3100	3480	3800	4420		
	15	0	0	0	0	160*	250*	390	490	600	740	910	1110	1340	1630	1850	2100	2350	2570	2980		
	20	0	0	0	0	0	190*	300*	380	460	570	700	860	1050	1270	1440	1650	1850	2020	2360		
	25	0	0	0	0	0	0	240*	300*	370*	460	570	700	840	1030	1170	1330	1500	1640	1900		
	30	0	0	0	0	0	0	250*	310*	380*	470	580	700	850	970	1110	1250	1360	1590			
	230V 60 Hz Three Phase Three Wire	1/2	930	1490	2350	3700	5760	8910														
3/4		670	1080	1700	2580	4190	6490	8060	9860													
1		560	910	1430	2260	3520	5460	8780	8290													
1 1/2		420	670	1060	1670	2610	4050	6030	6160	7530	9170											
2		320	510	810	1280	2010	3130	3890	4770	5860	7170	8780										
3		240	390	620	990	1540	2400	2980	3660	4480	5470	6690	8020	9680								
5		140*	230	370	590	920	1430	1790	2190	2690	3290	4030	4850	5870	6650	7560	8460	9220				
7 1/2		0	0	160*	260	420	650	1020	1470	1560	1920	2340	2870	3440	4160	4710	5340	5970	6500	7510		
10		0	0	0	190*	310	490	760	950	1170	1440	1760	2160	2610	3160	3590	4100	4600	5020	5840		
15		0	0	0	0	210*	330	520	650	800	980	1200	1470	1780	2150	2440	2780	3110	3400	3640		
20		0	0	0	0	0	250*	400	500	610	760	930	1140	1380	1680	1910	2180	2450	2680	3120		
25		0	0	0	0	0	0	320*	400	500	610	750	920	1120	1360	1540	1760	1980	2160	2520		
30		0	0	0	0	0	0	260*	330*	410*	510	620	760	930	1130	1280	1470	1650	1800	2110		
460V 60 Hz Three Phase Three Wire		1/2	5770	6620	9460																	
	3/4	2730	4350	6850																		
	1	2300	3670	5770	9070																	
	1 1/2	1700	2710	4240	6730																	
	2	1300	2070	3240	5150	8050																
	3	1000	1600	2520	3970	6200																
	5	590	950	1500	2360	3700	5750															
	7 1/2	420	680	1070	1690	2640	4100	5100	6260	7680												
	10	310	500	790	1250	1960	3050	3800	4680	5750	7050											
	15	0	340*	540	850	1340	2090	2600	3200	3930	4810	5900	7110									
	20	0	0	410*	650	1030	1610	2000	2470	3040	3730	4580	5530									
	25	0	0	0	530*	830	1300	1620	1990	2450	3010	3700	4470	5430								
	30	0	0	0	430*	680	1070	1330	1640	2030	2490	3060	3700	4500	5130	5860						
	40	0	0	0	0	500*	490	980	1210	1490	1830	2250	2710	3290	3730	4250						
50	0	0	0	0	0	640*	800	980	1210	1480	1810	2190	2650	3010	3420	3830	4180	4850				
60	0	0	0	0	0	540*	670*	830*	1020	1250	1540	1850	2240	2540	2890	3240	3540	4100				
75	0	0	0	0	0	0	680*	840*	1030	1260	1520	1850	2100	2400	2700	2950	3440					
100	0	0	0	0	0	0	0	0	620*	760*	940*	1130	1380	1560	1790	2010	2190	2550				
125	0	0	0	0	0	0	0	0	0	740*	890*	1080*	1220	1390	1560	1700	1960					
150	0	0	0	0	0	0	0	0	0	0	760*	920*	1050*	1190*	1340	1460	1690					
175	0	0	0	0	0	0	0	0	0	0	810*	930*	1060*	1190*	1300	1510						
200	0	0	0	0	0	0	0	0	0	0	0	0	810*	920*	1030*	1130*	1310					

Table C-2a: 3-Phase Cable, 60 Hz (Service Entrance to Motor – Maximum Length in Feet)

Motor Rating		AWG Copper Wire Size											MCM Copper Wire Size								
Volts	HP	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500		
460V 60 Hz Three Phase Three Wire	1/2	3770	6020	9460																	
	3/4	2730	4350	6850																	
	1	2300	3670	5770	9070																
	1 1/2	1700	2710	4240	6730																
	2	1300	2070	3240	5150	8050															
	3	1000	1600	2520	3970	6200															
	5	590	950	1500	2360	3700	5750														
	7 1/2	420	680	1070	1690	2640	4100	5100	6260	7680											
	10	310	500	790	1250	1960	3050	3800	4680	5750	7050										
	15	0	340*	540	850	1340	2090	2600	3200	3930	4810	5900	7110								
	20	0	0	410*	650	1030	1610	2000	2470	3040	3730	4580	5530								
	25	0	0	0	530*	830	1300	1620	1990	2450	3010	3700	4470	5430							
	30	0	0	0	430*	680	1070	1330	1640	2030	2490	3060	3700	4500	5130	5860					
	40	0	0	0	0	500*	490	980	1210	1490	1830	2250	2710	3290	3730	4250					
	50	0	0	0	0	640*	800	980	1210	1480	1810	2190	2650	3010	3420	3830	4180	4850			
	60	0	0	0	0	0	540*	670*	830*	1020	1250	1540	1850	2240	2540	2890	3240	3540	4100		
	75	0	0	0	0	0	0	0	680*	840*	1030	1260	1520	1850	2100	2400	2700	2950	3440		
	100	0	0	0	0	0	0	0	0	620*	760*	940*	1130	1380	1560	1790	2010	2190	2550		
125	0	0	0	0	0	0	0	0	0	740*	890*	1000*	1220	1390	1560	1700	1960				
150	0	0	0	0	0	0	0	0	0	0	870*	920*	1050*	1190*	1340	1460	1690				
175	0	0	0	0	0	0	0	0	0	0	0	810*	930*	1060*	1190*	1300	1510				
200	0	0	0	0	0	0	0	0	0	0	0	0	0	810*	920*	1030*	1130*	1310			
575V 60 Hz Three Phase Three Wire	1/2	5900	9410																		
	3/4	4270	6810																		
	1	3630	5800	9120																	
	1 1/2	2620	44180	6580																	
	2	2030	3250	5110	8060																
	3	1580	2530	3980	6270																
	5	920	1480	2330	3680	5750															
	7 1/2	660	1060	1680	2650	4150															
	10	490	750	1240	1950	3060	4770	5940													
	15	330*	530	850	1340	2090	3260	4060													
	20	0	410*	650	1030	1610	2520	3140	3860	4760	5830										
	25	0	0	520*	830	1300	2030	2530	3110	3840	4710										
	30	0	0	430*	680	1070	1670	2080	2560	3160	3880	4770	5780	7030	8000						
	40	0	0	0	500*	790	1240	1540	1900	2330	2860	3510	4230	5140	5830						
	50	0	0	0	0	640*	1000	1250	1540	1890	2310	2840	3420	4140	4700	5340	5990	6530	7580		
	60	0	0	0	0	0	850*	1060	1300	1600	1960	2400	2890	3500	3970	4520	5070	5530	6410		
	75	0	0	0	0	0	690*	860*	1060*	1310	1600	1970	2380	2890	3290	3750	4220	4610	5370		
	100	0	0	0	0	0	0	0	790*	970*	1190*	1460	1770	2150	2440	2790	3140	3430	3990		
125	0	0	0	0	0	0	0	0	770*	950*	1160*	1400	1690	1920	2180	2440	2650	3070			
150	0	0	0	0	0	0	0	0	800*	990*	1190*	1440	1630	1860	2080	2270	2640				
175	0	0	0	0	0	0	0	0	0	870*	1050*	1270*	1450*	1650	1860	2030	2360				
200	0	0	0	0	0	0	0	0	0	0	920*	1110*	1260*	1440*	1620	1760	2050				
460V-60 Hz Three Phase Six Wire	150	0	0	0	0	0	0	0	510*	630*	770*	950	1140	1380	1570	1790	2000	2180	2530		
	175	0	0	0	0	0	0	0	0	550*	680*	830*	1000	1220	1390	1580	1780	1950	2270		
	200	0	0	0	0	0	0	0	0	0	590*	730*	880*	1070	1210	1380	1550	1690	1970		
575V-60 Hz Three Phase Six Wire	150	0	0	0	0	0	0	650*	800*	990*	1210	1480	1780	2160	2450	2790	3120	3410	3950		
	175	0	0	0	0	0	0	0	700*	860*	1060	1300	1570	1910	2170	2480	2780	3040	3540		
	200	0	0	0	0	0	0	0	0	760*	930*	1140	1370	1670	1890	2160	2420	2640	3070		

**Table C-2b:** Three Phase Cable, 60 Hz (Service Entrance to Motor – Maximum Length in Feet) (continued)

## Decontamination Procedures

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

<u>Solution</u>	<u>Effective Against</u>
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.

<u>Solution</u>	<u>Effective Against</u>
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 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 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.

<b>Revision History</b>		
<b>Project #</b>	<b>Description</b>	<b>Date</b>
1795	Release, StellaR	12/16/2019
M2251	Rolled back to previous version on manual PN: 10260. Updated to include SiteView, and other changes focused on the GECM. – JL & GR	7/21/2023
M2251	Added Part Number Configurator to Parts and Accessories Section. Added Part Number Configurator and updated part numbers in table. –ZM	9/14/2023
M2251	Cleaned up manual to fix incorrect statements and more accurately describe system. – GR & ZM	11/28/2023
M2363	Added WTDP Extended High to Low Probes – GR	12/15/2023

## 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 the equipment for a fee, which will be applied to the repair order invoice.



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