

Miami University
Department of Engineering Technology
ENT 498 Senior
Septic Tank Monitoring Device

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Statement of Purpose (Executive Summary)

Ecological Tanks, Inc. is a company based out of Downsville, Louisiana. They are a leading manufacturer of septic treatment systems made of both fiberglass and concrete, and distribute these systems all across the country to other distributors. They have various packages including various components. The components needed are typically predetermined and stated in a septic design, which is based around the specific state code requirements. Some of the components incorporated in these systems are aeration devices, ultraviolet disinfection devices, chlorination devices, and various pumping devices. Each of these devices are powered and operated by complex control panels giving users and installers full control over the components as well as turning on and off components when being maintained.

The Problem

Control Panel's all have somewhat of the same basics internally, but the individual internal components are becoming out of date with the update in technology.

Land Phone Line Requirement:

Some code requirements require a homeowner to have a landline in their home as an aid for the telemetry failsafe mechanism, which will contact a service provider in case of component failure. As technology keeps progressing, as well as the increase in cell phones, more people are starting to eliminate the land phone line from their bundled packages from their internet provider. This causes a problem with systems that require the current telemetry device.

Dose Timer:

The timers currently used in control panel's have push tabs which control the hours a dose pump will operate. They also have small adjustable knobs to operate the minutes. These are not accurate and can only track time down to the minute. This can cause accuracy errors when trying to set dose schedules for the pumps.

Scope & Methodology

Design Objective

The purpose of this project is to utilize both mechanical and electrical engineering principles to design a control panel that incorporates updated internal technology to be user friendly for both installers, technicians, and homeowners. There are two main design objectives for the proposed control panel:

- To connect a digital timer that can be easily set by the installer and has the ability to control the pump cycle for a desired on/ off cycle. This timer must be capable of units down to the seconds.
- To connect a cellular auto dialer that has the ability to track the functionality of internal components such as the compressor, pump, and the UV disinfection device and send an individualized text alert to a designated cellular device when a component is in a fault state.

To perform this project we will require a vast amount of time for research and design. Hours of testing and configuring the septic system control panel will also be done. We have the capability to produce one full scale model of our control panel with the support of Ecological Tanks Inc., however, this design will not be implemented or pursued further due to producer constraints. A small scale model will be used to illustrate how the control panel will function with the entire septic system.

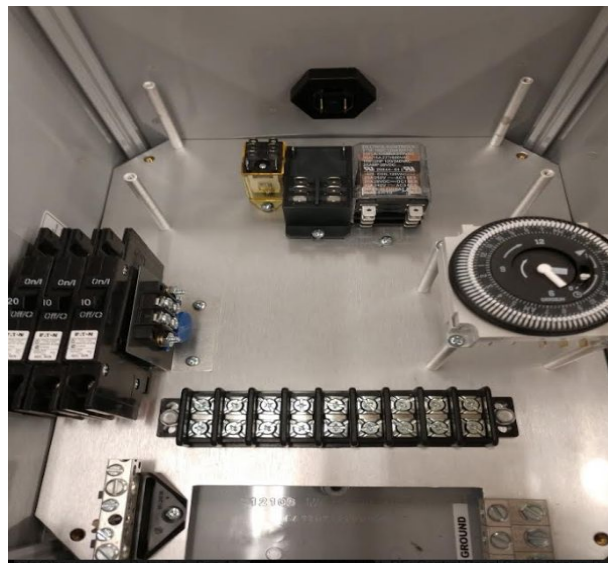
Materials Required

- Ecological Tanks, Inc. 208 Control Panel Chassis
 - Circuit Breaker Switches (Compressor, UV Light, Pump, Alarm)
 - Relays (3)
 - Test Switch
 - Mute switch
 - Alarm Horn
 - Alarm Light
 - Jumper Wires with connectors
- PumpAlarm Control Box (Cellular AutoDialer)
- Altech Universal Digital Multi Timer
- 14-2 (Alarm Panel Supply)
- 12-2 Wire (Control Panel Supply)

Explanation of 208 Control Panel

The Ecological Tanks, Inc. 208 Control Panel is a very complex control panel. This control panel is designed to run and operate all treatment options that Ecological Tanks have to offer in their treatment plants. This panel is not typically advertised as there are more specific panels which have less but more specific capabilities and in some cases can be cheaper, but for the purpose of this project we will use this panel to demonstrate all of the capabilities.

There are two types of systems which are based on how the effluent is dispersed to a soil absorption component: Gravity Feed and Demand/Time Dosed. Each system is equipped with an alarming system to alarm the homeowner and/or service provider when a malfunction has occurred. If the system is gravity fed, the alarm system is alarmed by telemetry (land phone line) and has no way to stop the flow of the effluent from exiting the treatment tank. If the system is time or demand dosed, the system typically does not use telemetry. Typically, when a pump is present an autodialer component is not needed. Those systems are equipped with pump lockout. Pump lockout is a function which will disable the dose pump if any component has failed. The pump would lockout forcing a homeowner to contact a service provider before their tank would back up into their house. For the purpose of this project, we will be utilizing the 208 Control Panel to mesh the two systems (gravity and dosed) together to demonstrate how the new components will operate.



Expected Findings

PumpAlarm

During the production of this control panel, as stated previously, our first main goal is to explore, incorporate and properly program the PumpAlarm component into the 208 control panel so that we can receive alerts by text via cell phone. We have researched and explored various other cellular Auto-Dialer components as well as WiFi linked components for this portion of the project. While there were many pros and cons to each component, the team had settled on the PumpAlarm. With the PumpAlarm, there are multiple pins which can be programmed for monitoring certain components and sending out text alerts through a cellular signal which does not rely on Wifi. When an auto-dialer component relies on WiFi, the system runs the risk of losing connection to the service and there is no way to notify that connection has been lost. Additionally, a service provider would have to come out and reprogram the telemetry or WiFi panel. With the new pump alarm alternative, the pump alarm is hardwired into the panel but also has a battery backup to allow the panel to send out signals even when a power outage has occurred.

This portion took some time as we needed to ensure that each pin was properly wired to receive feedback when a component has failed. When connecting to our relays, we needed to ensure that we were connected to a normally opened pin on each relay. When we connected to a normally closed pin, the pump alarm was always receiving an alarm signal.

Timer

Our second main goal was to incorporate a new timer into the panel which would provide more accuracy while being more user friendly. The team has researched multiple different configurations that can be incorporated in an equivalent amount of space and will also be easier to program. After reviewing manuals and documentation on the Altech Universal Digital Timer, this device is small and compact and appears to be our best option. This device will actually allow more room inside the existing panel and appears to be easily programmed with few buttons and also comes with an LCD screen which allows for this timer to be more user friendly. The LCD screen also allows one to see where the current dose cycle is. With fewer buttons and an LCD for instant feedback on timer settings at a quick glance, the team feels the Altech Universal Digital timer will be our best option.

Panel Overall

During the production of this new panel, the team wanted to become familiar with the construction of a multi-functional panel and the new components while experiencing first hand how user friendly and cost effective these devices may or may not be compared to the older and out of date components. We look forward to finding and resolving any issues during the construction and testing which were not expected during

the design of the control panel. Discovering any new issues with the new components may require us to look into different options to produce a more updated and effective control panel.

Engineering Analysis

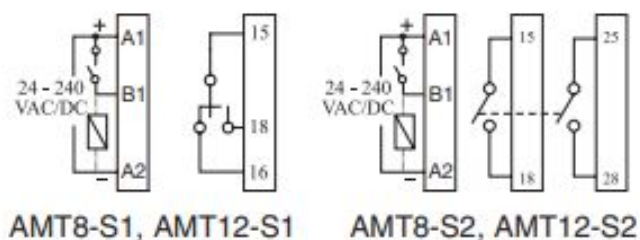
Altech Universal Digital Multi-Timer

The current panels utilize an older style timer that has tabs that are pushed in to set the hourly timing and knobs to adjust the timing in minutes. In many scenarios, we need to set the timer using hours, minutes, and seconds. This can often be tricky when you only have tabs to press and knobs to turn and can also be inconvenient to outside installers or county inspectors. Often when working with these timers in the field, there is a substantial amount of testing to double check the settings of the timer. Adding a two function digital timer into this control panel would help speed up the process for programming and also be more user friendly. We intend to install a timer that is more easily programmed utilizing buttons with a digital screen to view the time setting at a glance.

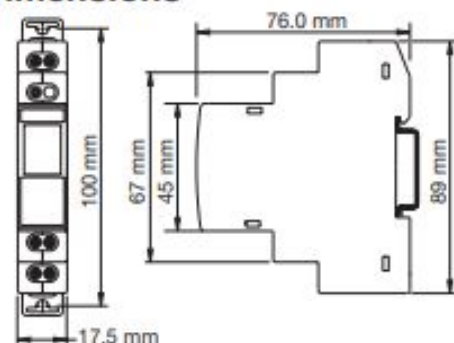
The Universal Digital Multi-Timer from Altech Timers has the ability to be adjusted from 0.1 seconds to 999 hours. There are nine different functioning settings that can be selected to choose different ways to get a power output. There is an LCD display to show current timers and run time information. This timer mounts to standard DIN Rail that will make it easy to add with other components in the panel box to keep it clean. The timer dimensions are 100 x 17.5 x 76 mm. This timer would make it easier and more precise to set timers than the current older tab system.



Connection Diagrams



Dimensions



Cellular Auto Dialer

The current septic control panels utilize a land phone line to send out a dial tone when a component is not functioning properly. This is a problem because the land phone line is becoming obsolete. Due to an increase in cell phone usage and cost, most homeowners have opted out of having a land phone line as part of their internet service provider packages. This adaptation in technology and consumer needs is what obligates Ecological Tanks to provide a more feasible and capable control panel.

For this project we have decided to utilize a cellular auto dialer system known as the Pump Alarm. The Pump Alarm is powered by being hardwired into the system, as well as 4 AA batteries as a backup. Since the system is relatively small (6.7 x 4.9 x 1.9 in) and weighs only 1.1 lbs we can place the system inside the existing panel. This system has also received a NEMA 1 rating, which means it has adequate protection to be used indoors. Unlike currently used panels, this alarm system can be programmed with multiple inputs pins that can monitor multiple components rather than one generic alert. When one of the monitored criteria is outside an acceptable range, the system will send out an individualized cell phone alert to the designated cellular device. This will also reduce the troubleshooting time a service provider would spend trying to diagnose a problem. The Pump Alarm can be easily programmed using any cellular device that is connected to a cellular network.



Pricing / Funding

New Control Panel with New Components Upfront Cost:

● Basic 208 Control Panel	_____	\$600.00
- Control Panel Switches		
- Jumper Wiring		
● 14-2 Alarm Panel Supply	_____	\$10.00
● 12-2 Wire (Control Panel Supply)	_____	\$10.00
● *Pump Alarm Cellular Alarm	_____	\$244.00
● *Altech Universal Digital Multi-Timer	_____	\$52.16
Total	_____	\$916.16

Old Control Panel with Standard Components Upfront Cost:

● Basic 208 Control Panel	_____	\$600.00
- Control Panel Switches		
- Jumper Wiring		
● 14-2 Alarm Panel Supply	_____	\$10.00
● 12-2 Wire (Control Panel Supply)	_____	\$10.00
● Standard Telephone Auto-Dialler	_____	\$160.00
● Standard Dose Timer	_____	\$60.00
Total	_____	\$840.00

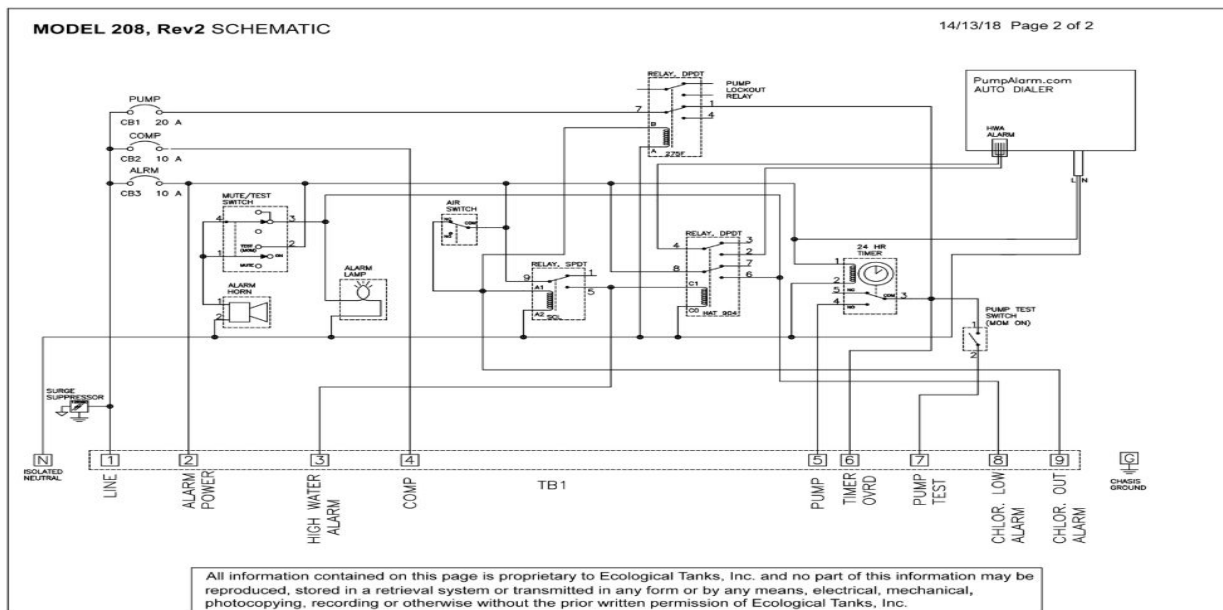
Typically, to operate this control panel, the control panel would require a land phone line. When meeting with customers, their complaint was that most internet providers charge an extra \$60 a month to provide a land phone line and keep it operational. Also when wiring this panel during an installation, the homeowner would be required to contact their provider to have a tech stub out a landline in the appropriate location, which is typically an additional upfront charge of \$120.

To operate the old panel, the customer would spend an additional \$720/year in annual operating costs. With this new alarm box, there is a \$50/year subscription fee to send out the text alerts. The proposal of the new panel would raise the upfront cost by about \$80 but would eliminate \$670/year from the annual operating cost. The additional \$80 would be paid for upfront during the purchase of the system and would then only be required to pay an additional cost of \$50/year to operate the system down the road. This is still better than the \$60/ month fee just to keep a landline operational.

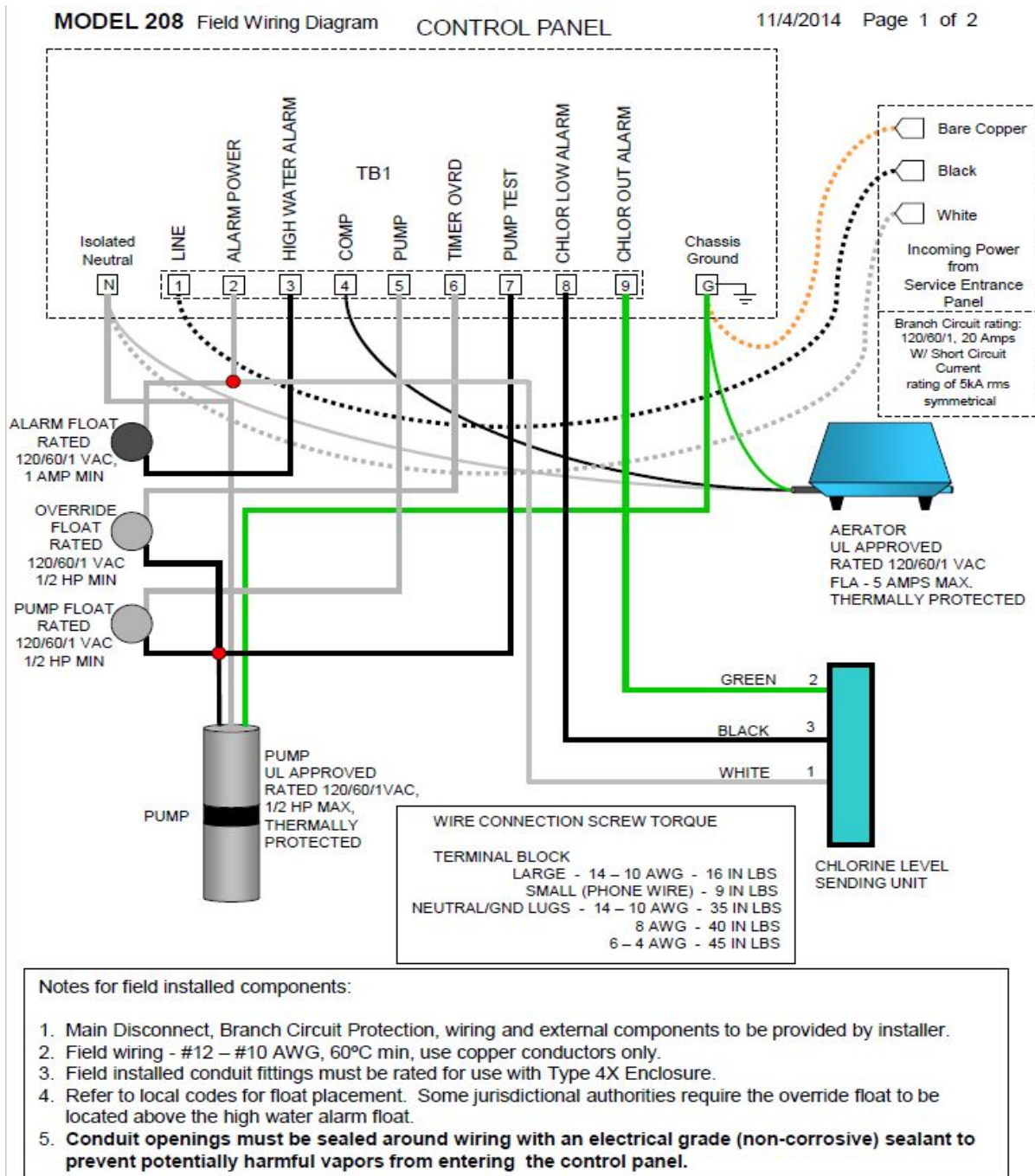
Production

The production of this panel started by obtaining all the material for this control panel. Ecological Tanks Inc. funded this project and provided all the components we needed for this build, minus any wires and connectors. They provided us with all circuit breaker switches, relays, extra toggle switches, alarm floats, along with an aerator motor and the updated cellular auto dialer and digital timer that we have chosen to incorporate.

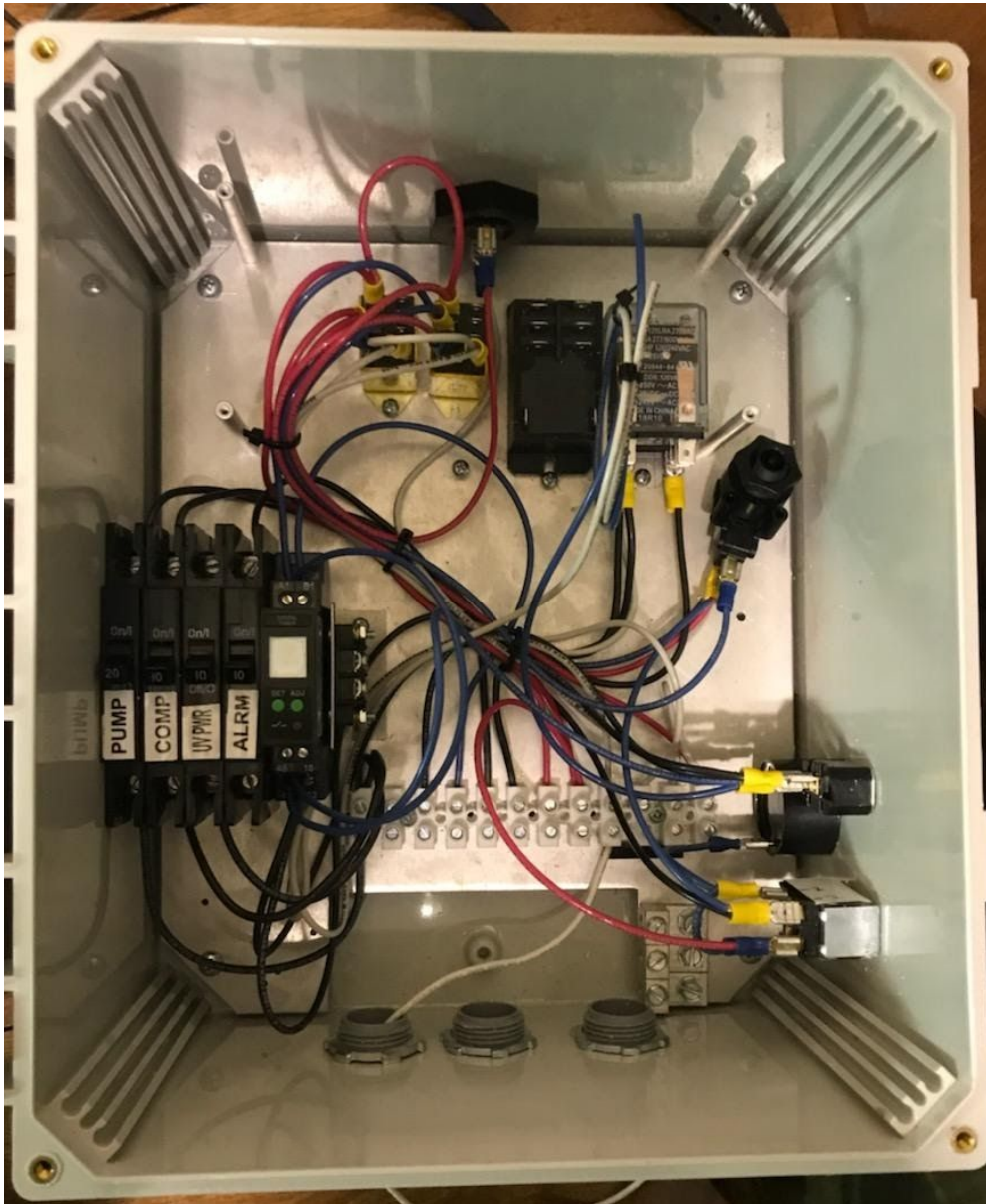
Once all our materials as well as wiring for the panel were obtained, we began by installing the relays, mounting bracket for the circuit breaker switches, and the wire connector terminal strip, on to the control panel mounting board using the stainless steel screws which were provided. We also needed to use a large step-down bit to drill holes for our exterior toggle switches, alarm horn, alarm light and conduit fittings on the bottom of the panel box. We cleaned any shavings out of the box and installed the panel mounting board into the panel. After all components were installed into the panel box, we began the wiring from our inlet power sources to our circuit breaker switches and relays as well as all other internal components following the basic wiring schematic that was provided with our panel (See below). Once the internal portion of the control panel was assembled, we began tying in the external components into the panel and ensured that they were operational. We substituted a light socket with a bulb to represent when the dosing pump would kick on and off. We also substituted toggle switches instead of using actual water level floats. This made it easy for us to test the panel to ensure that it was operational. We were able to simply flip switches to demonstrate how our panel was operating. The actual assembly of this panel, both internal and external assembly, took us approximately 5 hours.



The wiring diagram below is for the basic 208 Model that is used in the field when wiring the control panel. This diagram is used for wiring all external components of the system. The wiring diagram shows the power supply (Black), ground (Green), and neutral (White) connections for each component. Some changes were made to adjust for the new components.



Below is a picture of the final assembly. The photo shows the wiring of all internal components that were wired based on the wiring schematic shown on page 10. All breaker switches were wired to the designated power strip slots as well as each relay to distribute correct power and alarming signals.



Testing and Quality Check

Testing our panel began as soon as assembly was complete. We gave the panel a thorough visual check comparing it to our wiring diagrams to ensure everything was connected properly. It was important to make sure that all wires were stripped minimally to prevent two wires from crossing. A simple cross up of wires could damage the panel and/or trip a breaker switch and cause the circuit to malfunction.

Our first test for the control panel was to ensure that when the panel is powered, the breaker switches are not tripped. If breaker switches have not been tripped, this is an easy check that lets us know all components should be hooked up properly. We will begin to flip breaker switches one by one to ensure that the aeration motor, UV power, and effluent pump (represented by a light) is functioning properly.

The next test will be to check the visual and audio alarm. With all other components off the alarm should sound, which it did. We then flipped the switch off and flipped all other switches on, followed by flipping the alarm switch back on to ensure that while each component is on and functional, the alarm was not on. Then we went through each external component and demonstrated a malfunction to ensure the alarm horn sounded and the alarm light came on. This is important to check before we even begin to check our cellular alarm and will make troubleshooting easier. If our visual and audio alarm is not receiving a fault signal from each component, neither will our cellular alarm.

Alarm Test

The aeration motor is connected to a pressure switch which receives a small amount of pressure from the motor. This switch sends a signal to a relay pin which is either normally open or normally closed. We can either pinch the airline or unplug the airline to reduce the pressure. The lack of pressure usually takes a few seconds before setting off the alarm. This is also a good check to ensure that the pressure switch is not bad, as this has been a problem before when installing panels in the field and is also wired properly.

UV Disinfection Test

For the purpose of this project, we used a toggle switch to control the current for our UV bulb. The reason for this is that exposure of the eyes looking directly at the UV bulb is very dangerous and can damage a person's eyes permanently. Also, if using a regular light bulb, the light bulb would become hot. The purpose of this switch is to easily break the current flow. The panel contains a current sensor to ensure the bulb is working. When the sensor reads that the current is broken, it will trip the alarm by a normally closed relay.

High Water Test

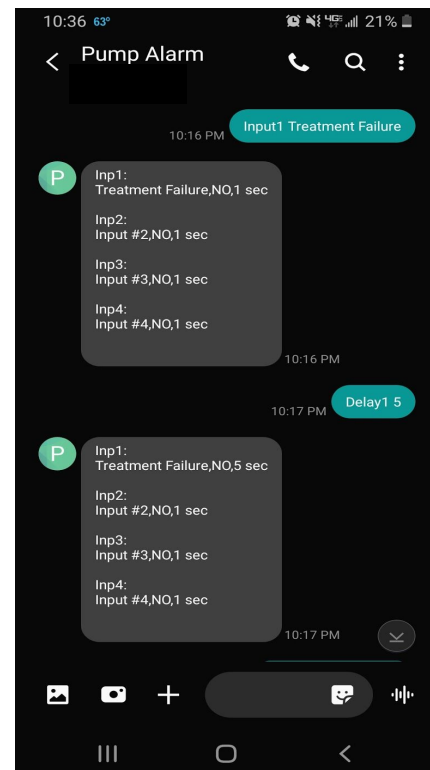
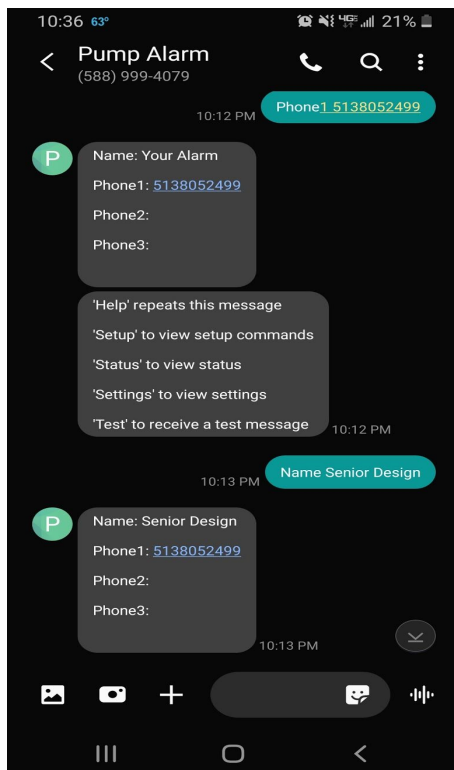
Lastly, we will check our high water alarm. When the alarm float is down, it creates a broken circuit. When the water level in the tank rises and raises the float all the way, the circuit is connected and provides power to the alarm. This is tested by simply raising and lowering the alarm float.

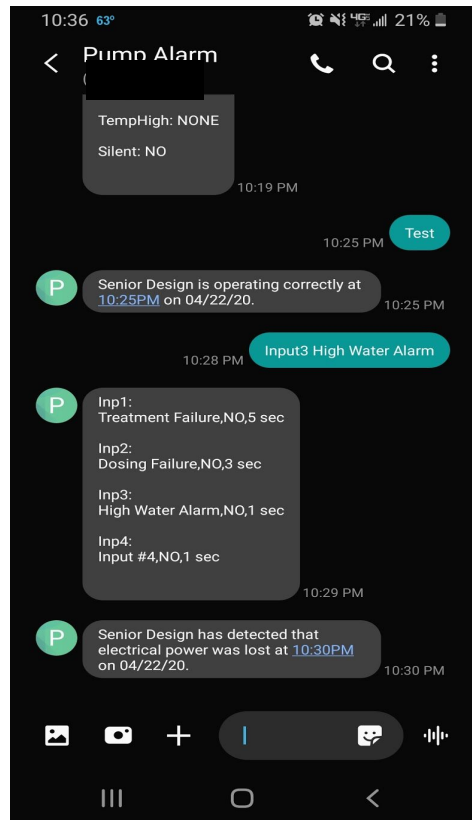
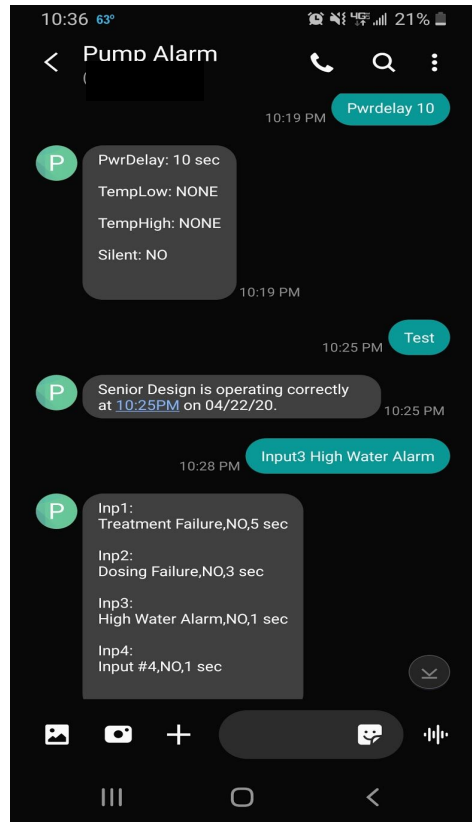
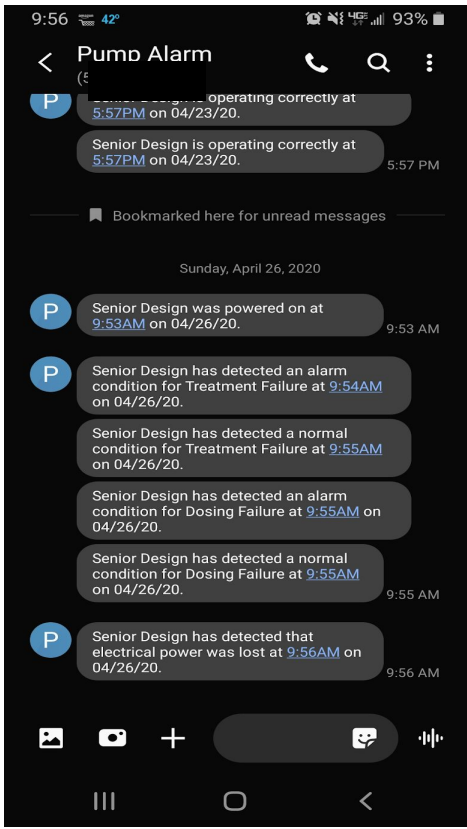
Cellular PumpAlarm

Once each component was tested, ensuring that they are providing an alarming signal, we then programmed the cellular alarm and tested that the alarm is sending out the proper text alerts when the corresponding component has failed.

To start the programming process, we first registered our PumpAlarm online. Once registered, we were given a phone number so that we could text and receive texts from that alarm for programming and failures.

We started by texting the pump alarm, the primary phone number. The PumpAlarm can be programmed to send alerts to up to three different phone numbers. Next, we text the alarm a name. For real world usage, the name could be a customer's name or address the PumpAlarm is located at. Once that was complete, we then text the component and programmed each input pin and the delay times. The delay times are to allow the system to potentially correct itself before sending out an alarm text. Once these were complete, we then went through and re simulated each fault to ensure we were getting the correct texts. View photos below and on the next page of this process.





Altech Digital Timer

We chose to hook up a light bulb to represent our effluent pump, as typical effluent pumps are larger and more expensive. We tested the Altech Digital by programming the timer for various timing combinations. Once the timer was programmed, we tested it while also running a stopwatch to see how accurate the timer settings are. The timer was very accurate. Our main goal was to be able to set the timing to a specific second and we were able to do so.

Conclusion and Recommendations

The team worked closely with Ecological Tanks to obtain all materials and components required for this project as well as getting our design basis. We have been in contact via email with Ringo at Ecological Tanks to obtain all components. Ecological tanks stated early in the design phase that they would be providing the components for this project and will be shipped through UPS ground or Fedex ground. Once the materials arrived, we started immediately on construction of the panel to allow for sufficient testing time. Throughout the testing phase of the project, the team did not run into any major roadblocks and were able to stick with our original design.

During the proposal of this project, the team was prepared for a few different problems which may arise. The first issue that may have arisen is a very common issue when working with the control panels previously. With the numerous components incorporated into the panel, there are many grounds and neutrals inside the panel for each component. A major issue that current installers are having is getting ground and/or neutrals crossed up causing back feeding issues. This leads to signaling the alarm when components are not failing. The solution to this issue was to take our time when constructing the panel to ensure simple mistakes were not made when referencing the wiring schematics. Each ground and neutral wire was properly inserted and tightened down into the corresponding neutral and grounding blocks. Also, to prevent this issue, we designated white wire to represent our neutral wires. During the construction phase, we never ran into this issue.

One smaller issue that the team did end up running into was that between the three relays we used, there are 8 different pins. These pins are either normally opened or normally closed, inlet power or neutrals. Not all pins are used. When wiring the panel, we did get a few wires swapped. The wires we got swapped were the wires going to our normally open and normally closed pins. Our cellular auto dialer box reads normally opened pins. When the pin becomes closed, the cellular auto dialer box becomes in an alarm state. When we initially plugged in the cellular auto dialer box, we had wired it to the normally closed pin of each relay. Because of this, the relay was always alarming the cellular auto dialer box when the components were working.

Another suspected issue that may occur is programming the Cellular Auto-Dialer to a cell phone. We have already run into one issue with the PumpAlarm Component. Currently the pump alarms operate up to 4G. With Verizon's new release of their 5G service, the current PumpAlarms are not compatible. This also brings up the issue with all current PumpAlarms that have currently been installed on current systems. Manufacturers are being forced to replace the current PumpAlarm components with new updated PumpAlarms that are compatible. For the purpose of our project and due to the high demand of newer updated PumpAlarms, we had requested from Ecological Tanks that we obtain an older version of the PumpAlarm. One of our team members

had a 4G AT&T phone that would have been compatible with the older version of the PumpAlarms.

Ecological Tanks ended up sending us the updated version of the panel so this was not an issue. The only issue we ended up running into is during the programming of the box. To program the box, you are required to register and create an account containing a fee of \$50/ year for the subscription. This is a fee and expense that we had not originally taken into consideration. Not only did this put a hindrance on our project, but was something to take into consideration of the usability for the future of homeowners.

The last issue that we suspected we may run into is that the PumpAlarm is intended to monitor liquid levels and temperatures inside a tank. The PumpAlarm contains pins which are to be connected to liquid level floats as well as liquid temperature sensors. These components put out voltages to activate each pin so that the component can send out signals. The existing air pressure sensor and UV light current sensors that come with the control panels also put out voltages to trigger an alarm. When constructing and testing the panel, this did not become an issue. The issue came into play that there are two 2-pin inputs and one 3-pin input. When we designed our panel, we planned to have an input for the pressure switch to monitor the aerator motor, an input for the current switch for the UV bulb, and an input for the high water float. In our design we planned to have three 2-pin inputs and a single 3-pin input. For the purpose of this project we only used the two 2-pin inputs. We originally designed each fault to have its own text alert. When programming the cellular auto dialer when had to split this into a fault in the treatment tank or a fault in the dosing tank.

Moving forward, the company that creates the PumpAlarm, offers a high water float that would operate off of the 3-pin input. This would allow us to use one 2-pin input to monitor the aerator motor and the other 2-pin input to monitor the UV Bulb.

Overall, the group worked very well with coordinating meeting times and was able to stay on track. The team was able to build a fully functional panel that was successfully able to perform each objective that we had intended the panel to perform.

References

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8. **MySpy Wifi Alarm.** *R.C.WorstCo.* [Online] 2019 <https://www.rcworst.com/myspy-wifi-messenger.html>

Appendix A: Altech Universal Digital Multi Timer

Altech Universal Digital Multi-Timer

Altech's AMT-Series of Universal Digital Multi-Timers comprises 4 models featuring 8 or 18 timer functions to offer highest flexibility in controlling operations. The time range is adjustable from 0.1s to 999h. An LCD display shows current Run time information.

Features

- Multifunctional Timer (8 or 18 Functions)
- Universal Voltage 24–265 VAC/ DC
- Wide Time Range: 0.1s – 999h
- 3 Digit LCD Display for Preset Time and Run Time
- DIN Rail Mounted
- 17.5mm Width

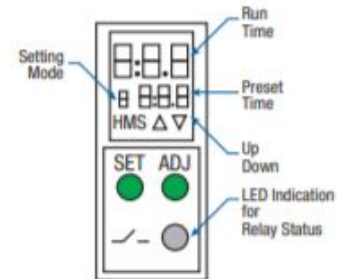


Digital Timers

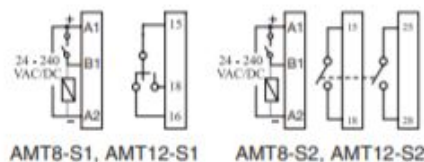
Cat. No.	AMT8-S1	AMT8-D2	AMT12-S1	AMT12-D2
Output Contacts	1 C/O	2 NO	1 C/O	2 NO
No. of Timer Functions	8	8	18	18
Functions / (setting mode)	1) ON Delay [R] 2) Cyclic OFF/ ON [b] 3) Cyclic ON/ OFF [c] 4) Signal ON/ OFF [d] 5) Signal OFF Delay [E] 6) Interval [F] 7) Signal OFF/ ON [G] 8) One Shot Output [H]		1) ON Delay [R] 2) Cyclic OFF/ ON [I] 3) Cyclic ON/ OFF [E] 4) Impulse on Energizing [B] 5) Accumulative Delay on Signal [H] 6) Accumulative Delay on Inverted Signal [S] 7) Accumulative Impulse on Signal [G] 8) Signal ON Delay [7] 9) Inverted Signal ON Delay [B] 10) Signal OFF Delay [B] 11) Impulse ON/ OFF [R] 12) Signal OFF/ ON [b] 13) Leading Edge Impulse 1 [C] 14) Leading Edge Impulse 2 [d] 15) Trailing Edge Impulse 1 [E] 16) Trailing Edge Impulse 2 [F] 17) Delayed Impulse [G] 18) Inverted Signal ON Delay 2 [H]	

Specifications

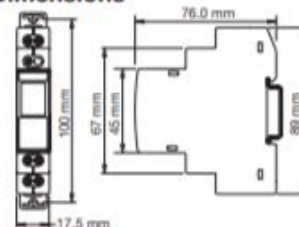
Supply Voltage	24 - 265 VAC/ DC (50, 60Hz)
Power Consumption	10 VA max.
Timing Range	0.1s – 999h
Reset Time	200ms max.
Repeat Accuracy	+0.5%
Output Contact Rating	8A @ 240 VAC/ 24 VDC (resistive)
Electrical Life	10,000 switching cycles
Mechanical Life	2,000,000 switching cycles
AC-15 Rating	Rated Voltage (Ue): 125/ 240V, Rated Current (Ie): 3/1.5A
DC-13 Rating	Rated Voltage (Ue): 125/ 250V, Rated Current (Ie): 2/0.22/0.1A
Operating Temperature	-10°C – +55°C (+14°F – 131°F)
Storage Temperature	-20°C – +65°C (-4°F – 149°F)
Weight	85g (0.14lb.)
Protection Enclosure	IP30
Protection Terminals	IP20
Torque	0.40 Nm (3.5 lb.in.)
Terminal Wire Size	0.3-2.5 mm ² (22-14 AWG)



Connection Diagrams



Dimensions



Scan this QR code for more information.



Appendix B: PumpAlarm Quick Start Guide

Cellular Alarm
Quick Start Installation Guide

PumpAlarm.com

Copyright 2017, PumpAlarm.com, All Rights Reserved



Please scan the image on the right with your smartphone to view our installation video, or simply visit the link below.



www.pumpalarm.com/installation



Need more guidance?

For technical support please call : 1-888-454-5051
Hours: M-F 8a-5p EST

The following items are available to you at pumpalarm.com:

- In Depth User Manual
- Installation Video
- How it Works Video
- Online Store (where you can buy additional units and accessories)

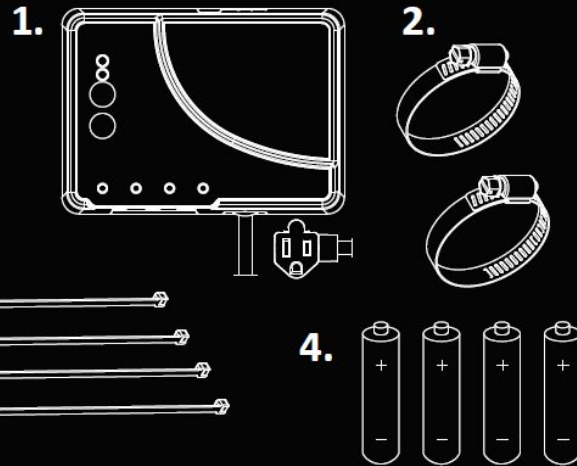
PumpAlarm.com
203 W Morris St.
Indianapolis, IN 46225
888-454-5051

Getting to Know Your Device:

1. **Status Light** - Indicates the cellular status of your unit. Refer to the online manual at pumpalarm.com for a description of the blink patterns.
2. **Low Battery and Temperature Light** - 2 red blinks indicates the backup batteries are low. If the red light is flashing it indicates the batteries are critically low. When the green light is flashing it indicates the Temperature Alarm. Refer to the online manual at pumpalarm.com for a description of the blink patterns.
3. **ON/OFF/MUTE** - Press the button 1 time to mute the device and 1 time to unmute the device. Press and hold for 3 seconds to ON/OFF.
4. **PUSH TO TEST** - Press the button 1 time to test device and receive a text message. Hold the Test Button to configure. Tap the Test Button to test.
5. **Input LEDs: 1 - 2** - LEDs blink when the associated inputs 1 and 2 are triggered.
6. **Input LEDs: 3 - 4** - #3 input LED blinks when the lower float is triggered and #4 blinks when the upper float is triggered.
7. **Sensor Input Connectors** -
 - A. Inputs 1 and 2 are 2-pin, dry contact closure. Can be customized for Normally Open or Normally Closed.
 - B. Inputs 3 and 4 are tied together as a 3-pin, for use with our dual float and sewage float.

Components:

1. Cellular Alarm Unit
2. Hose Clamps (2)
3. Mounting Straps (4)
4. AA Batteries (4)



Optional Sensors :

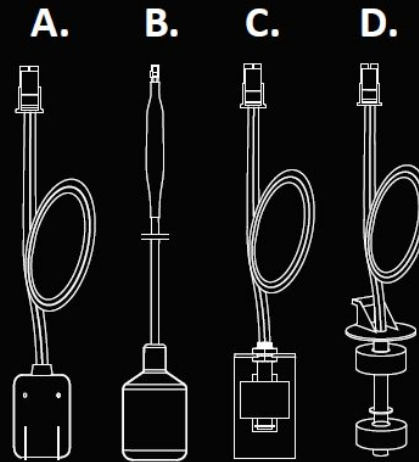
- A. Water Sensor
- B. Tilt Switch
- C. Single Float Switch
- D. Dual Float Switch

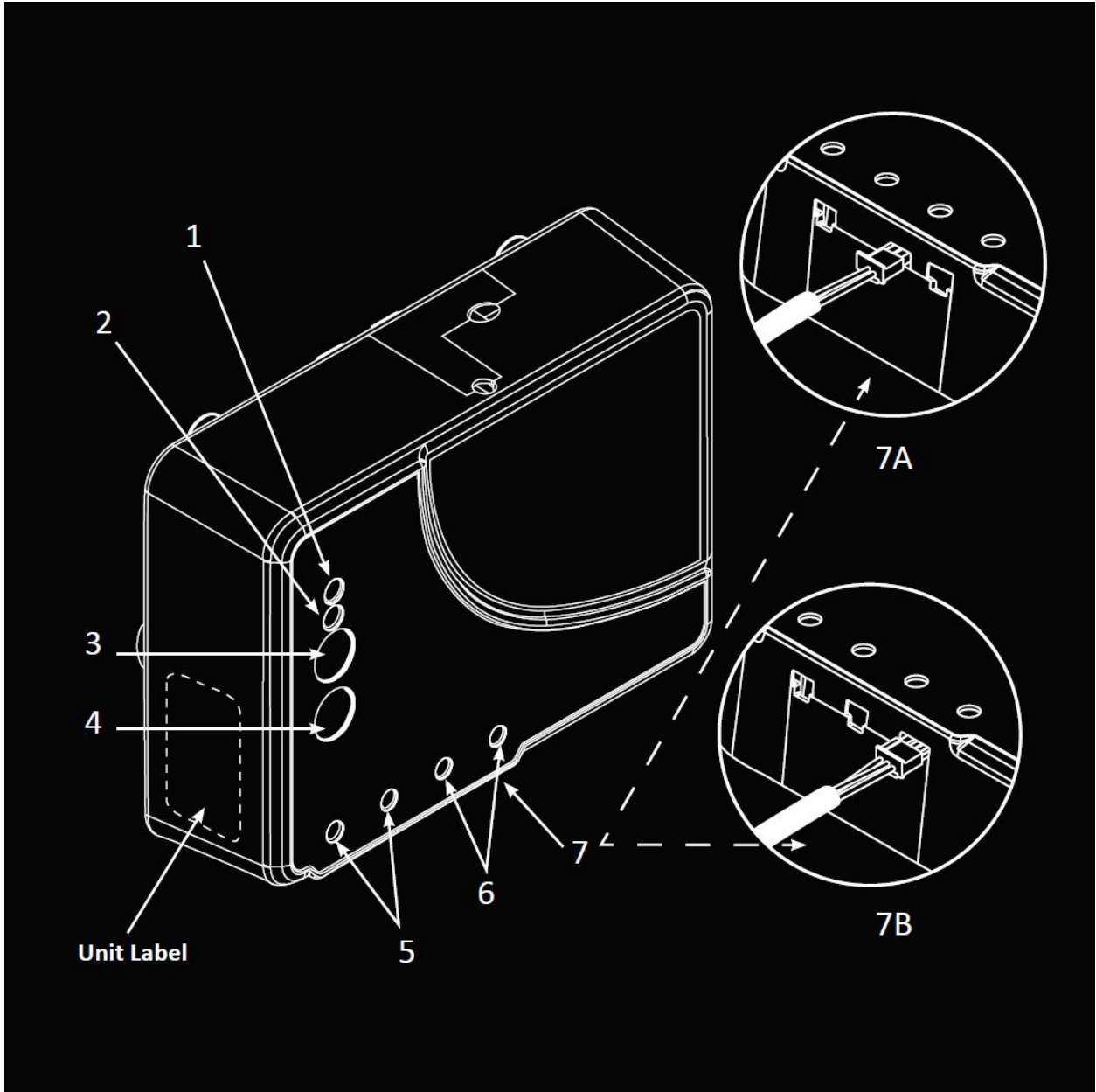
*See PumpAlarm.com for our most up-to-date list of sensors.

Missing or Damaged Components?

Call PumpAlarm.com
888-454-5051
M-F 8:00a-5:00p EST

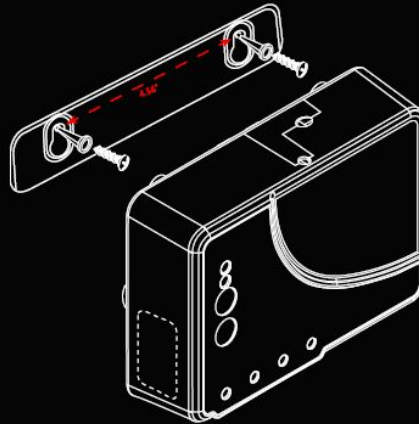
Do not return product to retail location.





Mounting Hardware and Sensors

Mount the Cellular Alarm to a wall or pipe. Use mounting template below. It is the correct dimensions for mounting the product. Mark the points using a pencil, then use a 3/16" drill bit to make your holes. Apply the red anchors, and screws. Place Cellular Alarm on the wall.



Mounting Template



1

Unit Activation and Power On

Please activate your unit. Visit : www.pumpalarm.com/activate. Enter the 6 digit alphanumeric unit number found on the side of the unit. Then your billing information.

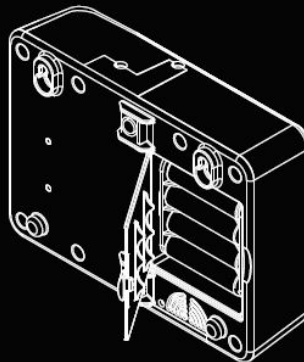
This generates the phone number for your unit as well. Save this phone number as a contact in your phone.



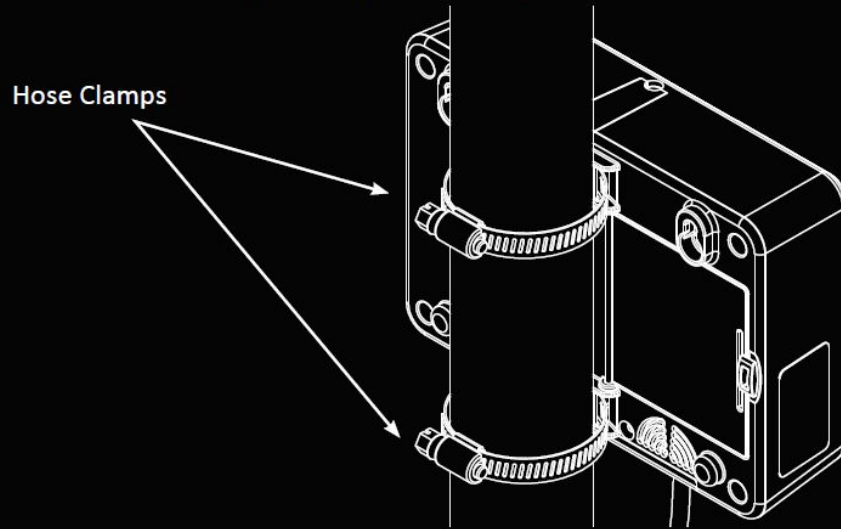
A

Install Batteries

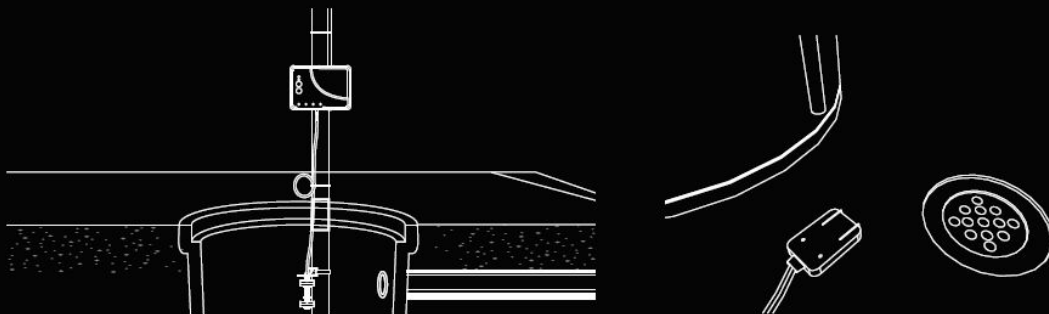
Install (4) AA batteries by opening the battery door on the back of the unit. Align the negative (-) end of the battery to the spring in each holder.



Mount the device to a pipe using the mounting brackets (hose clamps).



Connect your choice of sensor into one of the inputs on the bottom of the unit. We recommend using the float switch, or dual float switch for sump pump applications and the digital water sensor for floor or drain applications.



1

Unit Activation and Power On

Please activate your unit. Visit : www.pumpalarm.com/activate. Enter the 6 digit alphanumeric unit number found on the side of the unit. Then your billing information.

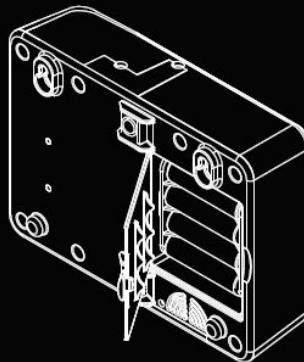
This generates the phone number for your unit as well. Save this phone number as a contact in your phone.



A

Install Batteries

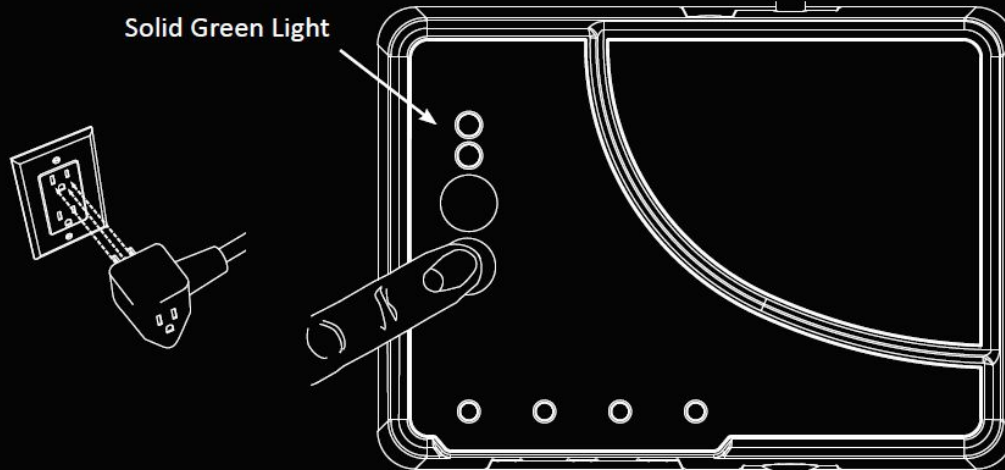
Install (4) AA batteries by opening the battery door on the back of the unit. Align the negative (-) end of the battery to the spring in each holder.



B

Power Device On

Plug the device into a 110V A/C outlet to power your unit on. Once the status light turns solid green, press and hold the “Push to Test/Hold to Configure” button for 3 seconds. Unit will chirp twice and status light will blink red & green. This will get the unit ready to receive text messages from your cell phone. In the next step, you will configure the unit by sending it text message commands.



Caller ID and Configuration Mode

If no phone numbers are configured in the unit, it will accept commands from any phone number. Once a phone number is configured in the unit, only commands from phone numbers configured in the unit will be processed.

The unit can be placed in Config Mode by pressing and holding the Mute button until the status light (top light) changes to red/green blinking. This allows the device to accept commands from any phone.

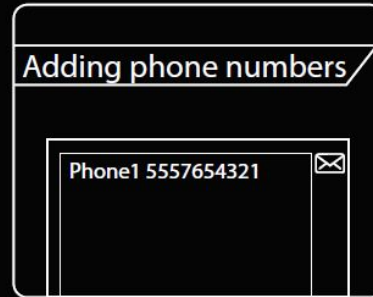
2

Setting up Contact Phone Numbers

phoneX space [Phone Number]

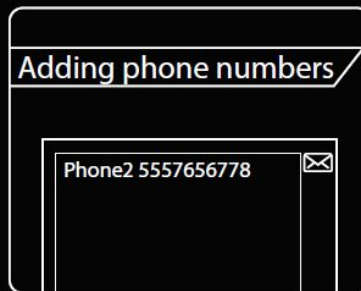
Using your mobile phone, create and send a text message to your device. X is either 1, 2, or 3 for which phone number slot you would like to fill.

For your main number, which is phone1, you will send the following message; replacing 5557654321 with your mobile phone number.



A

If you want text messages sent to additional phones, repeat this process. Your device can hold up to three phone numbers.

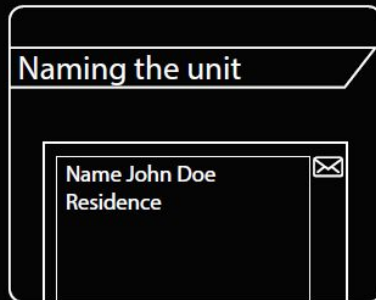


- B** If successful, the unit will chirp twice and you will receive a text message to the phone number you just entered. See online manual if this step is not successful.



3 Name Unit
name space [Unit Name]

Name your unit by sending the following message, replace John Doe Residence with the name you'd like to use, up to 20 characters long:



A

If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



5

Setting Up Your Temperature Alarm

If the temperature falls below the low threshold a “low temp condition” message is sent. If the temperature rises above the high threshold a “high temp conditon” message is sent. When the temperature returns to the range between the low and high thresholds, a “normal temp condition” is sent. The temperature sensor has an accuracy of +/- 5 °F.

There are two (2) degrees of hysteresis required to return to normal. Example: if the low threshold is 30°F, the temperature must go up to 32°F before it is considered to have returned to normal.

A

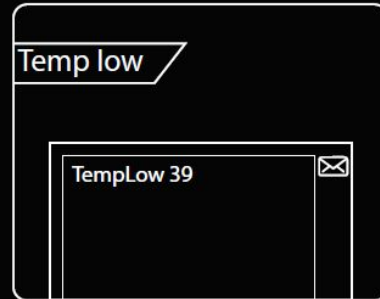
Configuring Low Temp

`tempLow space [°F]`

Send the unit a message with the following command. The 39 below should be replaced with the degrees F that you wish to have an alarm trigger.

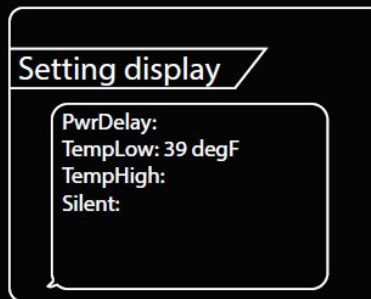
Use as a Heating System Alarm

We recommend setting your low temperature threshold to around 48°F and if away from the property, keep your thermostat at least 6°F warmer than you set the low threshold to account for accuracy of sensor.



B

If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.

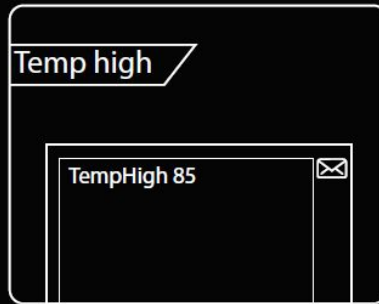


C

Configuring High Temp

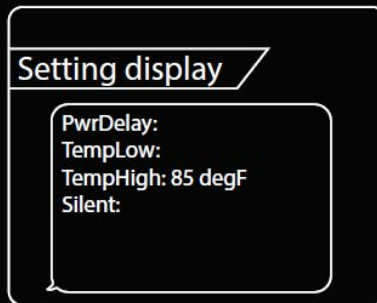
temphigh space [°F]

Send the unit a message with the following command. The 85 below should be replaced with the degrees F that you wish to have a high temp trigger.



D

If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



E

Clearing Temperature

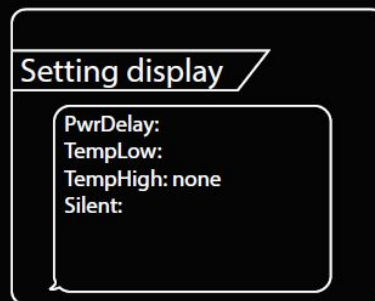
temp low space none -OR-
temp high space none

You may want to remove the temperature alarm functionality. You can remove the high and low thresholds individually by sending either of the commands above.



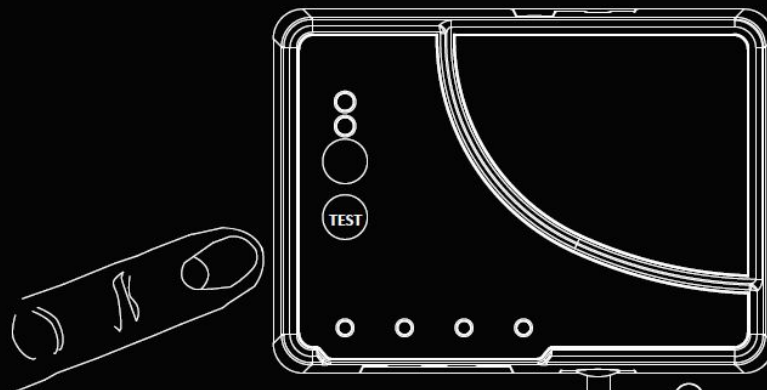
F

If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.

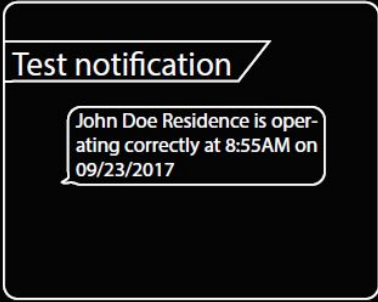


6 Testing Your Unit

Basic configuration is now complete. Press the "TEST" button on the front of the device to invoke a text message.



A If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



Basic Setup is Now Complete!

If you received your test notification, then basic setup of your unit is complete. On the following pages, we have included setup instructions for the more advanced features your unit has to offer. These include customizing individual inputs, power outage delays and silencing your device.

Customizing Inputs

To allow for maximum flexibility in your particular application, we give you the ability to customize every part of the input alert. We briefly discuss below and go into greater detail on how to complete the setup in the following steps.

Input Names

By default inputs are labeled generically in notification messages from the device. i.e. input #1, input #2, etc. You have the ability to give the input a more descriptive name, i.e. sewage sensor.

Input Alert Delay

Your device allows adjustment of the time delay on input alarm triggers and on power outage detection. It will wait the specified amount of time (in seconds) before sounding the alarm and sending out text message alerts. The power outage detection is a silent alert, meaning only text messages are sent when an outage is detected after the specified time delay, there is no sounder.

Contact Closure Type

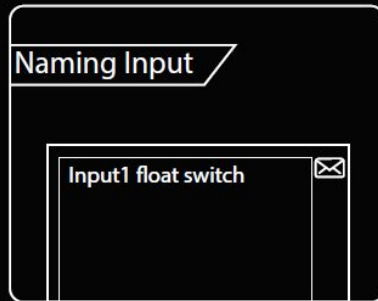
Your device allows the adjustment of contact closure types, either Normally Open or Normally Closed. The device defaults to Normally Open for all 4 inputs. All inputs are dry contact, meaning they require non-powered sensors and can detect only an open or a closed contact.

7

Setting Up Your Custom Input Name

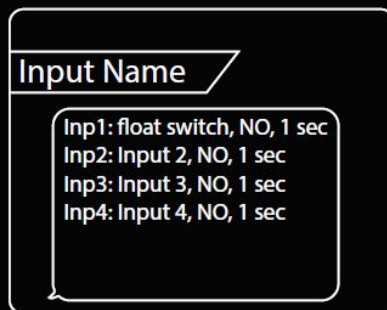
`inputX space [input name]`

You can give the input a more descriptive name. Where the X is replaced with the input number 1, 2, 3, or 4, and the [input name] is replaced with your descriptive name.



A

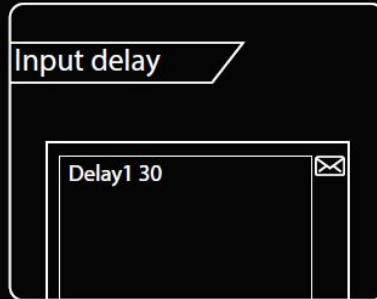
If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



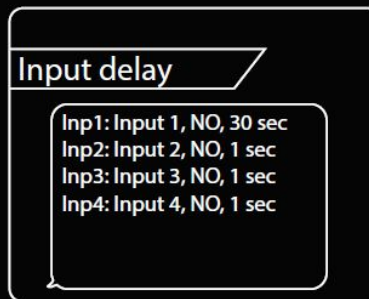
8 Setting Up Input Alert Delay

delayX space [Seconds]

Your device allows customization of the time delay on input alarm triggers. X is either 1, 2, 3, or 4 for the specific input you're trying to update.



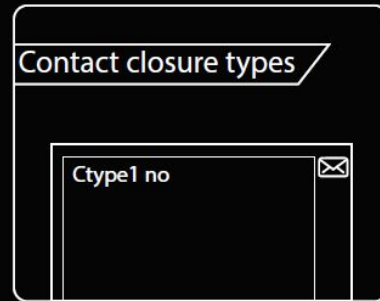
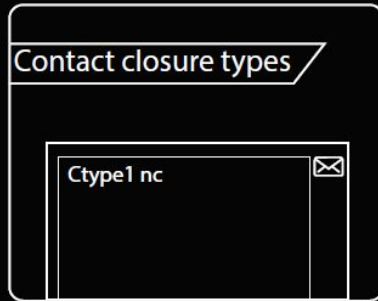
A If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



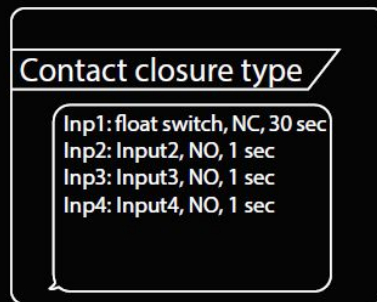
9 Setting Up Contact Closure type

ctypeX^{space}nc -OR-
ctypeX^{space}no

Your device allows the adjustment of contact closure types, either Normally Open (no) or Normally Closed (nc). X is either 1, 2, 3, or 4.



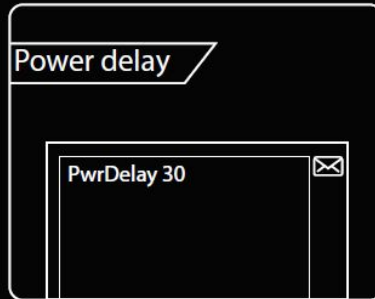
A If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



10 Setting Up Power Outage Alarm Delay

`pwrdelay space [Secs]`


Your device allows customization of the time delay on power outage detection. Send a message to your device with the following command. Replace 30 with the timeframe (in seconds) in which you want the power to be out before an alert message is sent.



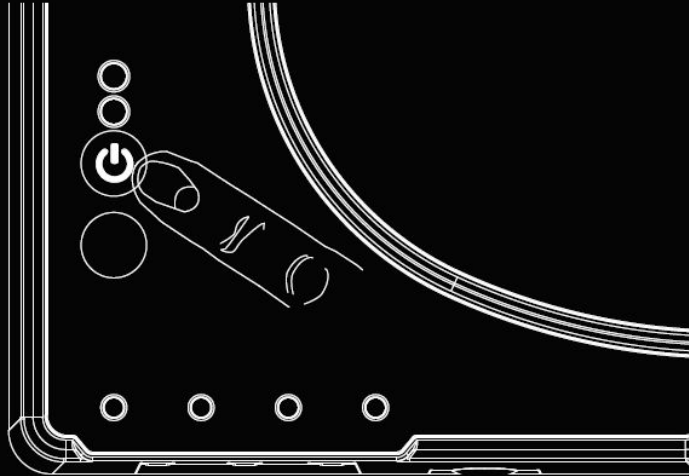
- B** If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



Silencing Alarms

Tapping the Power/Mute  button silences the sounder for low battery chirps and all alarm conditions. When muted the LED status light will change from solid green to flashing orange and back to solid green. Mute mode is automatically canceled after 2 hours or if an alarm state change occurs.

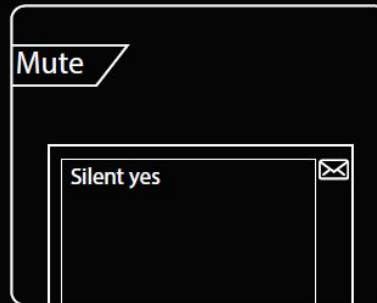
Tap the Power / Mute button momentarily and release to silence sounder. Hold for longer than 3 sec and your device will power off instead of mute.



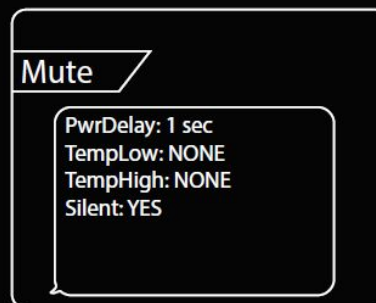
Silencing Alarms via Text Message

`silent space yes`

You can also mute your device remotely from your phone. Send the unit a message with the following command:



If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



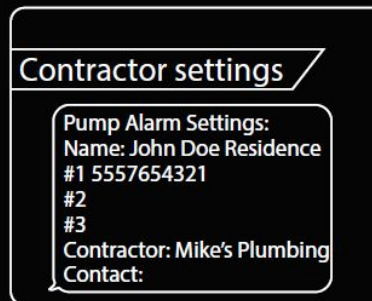
Optional Contractor Setup

contractor space [Contractor name]

Your unit allows you to configure a contractor name with associated contact information. When configured, your unit appends this information to the end of alarm notifications (input alarms and power loss) so you know who to call in an emergency. To configure the contractor name, text the unit using the following format:



If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



Setting Contractor Phone Number

contact space [10 digit contractor number]

To configure the contractor's contact phone number, text the unit using the following format:



If successful, the unit will chirp twice and you will receive a text message with the current settings. See online manual if this step is not successful.



Full List of Commands

X below is either 1,2,3, or 4; dependent on what input you're trying to update. The unit will always respond with a double beep and a response message correct command was received. It responds with a triple beep if it did not understand the command and will not beep if message was sent but never received.

Command	Example	Description
settings		Returns the current settings of the device in 3 separate messages.
status		Returns the current status of the device.
help		Requests a help message with a list of most used commands.
setup		Requests a series of three messages that contain most used setup commands.
phoneX [Phone Number]	phone1 5558882233 sets phone #1 to 5558882233	Configures phone numbers in the unit, up to 3. X is either 1, 2, or 3; dependent on what number you're trying to configure.
inputX [Input Name]	input1 Flood Sensor sets input #1 to "Flood Sensor"	Names the input, up to 20 characters. Default is "Input #X." X is either 1,2,3, or 4; dependent on what input you're trying to rename.
ctypeX [no/nc]	ctype1 nc sets contact closure type of input #1 to normally closed	Configures the contact type for the input (nc = normally closed, no = normally open). Default state is no. X is either 1,2,3, or 4; dependent on what input you're trying to update.
delayX [Seconds]	delay1 60 sets delay of input #1 to 60s.	Sets delay time for input alarm in seconds from 0 - 9999. Default delay is 0 seconds for each input, meaning they trigger instantaneously. X is either 1,2,3, or 4; dependent on what input you're trying to update.

Command	Example	Description
pwrdelay [Seconds]	pwrdelay 30 device won't send a message unless power is out for at least 30s	Sets power lost message delay in seconds from 0 - 999. Default power delay is 5 seconds. Meaning power must be out for at least 5 seconds before a text message notification is sent.
name [Device Name]	name Jones Alarm sets name of device to Jones Alarm	Names the device up to 20 characters. Default name is "Your Alarm".
test		Sends a test message to all phone numbers configured in the unit.
silent [yes/no]	silent yes sets input alarm so that it will not a beeper.	Enables or disables silent mode. When enabled, unit will not beep when input triggers. Defaults to no. Cannot be overridden locally, text only feature.
templow [°F]	templow 48 sets low temperature threshold to 48°F.	Sets low temp alarm threshold in °F.
temphigh [°F]	temphigh 99 sets high temperature threshold to 99°F.	Sets high temp alarm threshold in °F.
templow none		Clears low temperature alarm threshold.
temphigh none		Clears high temperature alarm threshold.
contractor [Name]	contractor Acme Plumbing	Sets the contractor name to append to end of alarm messages, up to 20 characters.
contact [Contact Number]	contact 5558001000	Sets the contractor phone number to append to end of alarm messages, up to 14 characters.
sponsor [Sponsor Name]	sponsor Acme Insurance	Sets the sponsor name to append to end of alarm messages, up to 25 characters. Contractor settings override sponsor messages.

Audible Alarms

Your unit will warn you when there is a problem detected. Use the chart below to determine your audible alarms.

Alert	Event Type
(1) 1sec Beep on/off toggle	Input alarm activated
(1) 1sec Beep	Power on (after activation)
(1) 1/4sec Beep Every 30S	Battery low or critically low
(1) 1sec Beep	Push to test
(2) Chirps	Successful programming
(5) Chirps	Cellular service or transmission error
(3) 1/4 Second Beeps	Incorrect or unsuccessful programming error

Signal Strength Guide

Where Signal is	Status	Corrective Action(s)
-40 dB to -99 dB	OK	None
-100 dB to -113 dB	WEAK	Make sure device is not near foundation wall or an area that can restrict cellular signal. Move to another location where better cellular signal is available.
> -113 dB	NONE	The device is not able to send or receive alert messages. Move device to a location that can connect with the cellular towers.

In some cases it will be necessary to note the signal strength/reception in your basement to install or activate the device. Below are the ranges of cellular signal strength you may encounter (in dB) during setup. If there is a problem connecting to the network, or the device will not stay connected, refer to the chart below to diagnose the problem.

Recommended signal range for optimal performance should be between -40 dB and -99 dB.

Led Blinking Patterns

Your unit will warn you when there is a problem detected. Use the chart below to determine your notifications and LED blink patterns.

Definitions:

Flashing - LED will turn on very briefly and then it turns off for two seconds.

Blinking - LED will toggle On/Off every second.

Network LED

Green Flashing	Sleeping because running on battery backup power
Green Blinking	Not ready, attempting to connect to cellular network
Green Solid	Ready
Red Solid	Cellular signal not present
Red Blinking Fast	An error occurred
Green to Orange Flashing	Unit is in Mute Mode

Battery / Temp LED

Off	Batteries normal
Flashing Red	Batteries low or critically low
Flashing Green Once	Low temperature detected
Flashing Green Twice	High temperature detected

Input LED

Off	Input in normal condition
Blinking	Input in alarm condition

The following safety and use information and Limited Warranty applies to products sold by PumpAlarm.com, LLC ("PumpAlarm.com") to you the end-user ("You") on www.pumpalarm.com namely a sump pump alarm with text notification capability, related accessories such as sensors (collectively "Products"), and cellular service, which is required in order for the alarm to send notification text messages ("Services" collectively with Products "Products and Services").

Product Safety and Use Information

IMPORTANT: Use only approved and recommended batteries and power adapter with your Products. Routinely check the batteries in Products; failure to routinely check the batteries may result in the failure of Products to function during a loss of power. Routinely check the strength of the cellular signal to Products and/or perform tests to check the text notification capability of the Products.

WARNING: Products use electricity in the presence of water, therefore your safety and the safety of others depends upon you thoroughly reading and understanding the Installation Guide. If you have questions or do not understand the information presented in the Installation Guide, please call 1-888-454-5051. Be sure that electrical cords used are not frayed or placed in a location where they can pose a danger. To reduce the risk of fire, electric shock, injury or death, always disconnect all sources of electrical power before servicing or cleaning; do not touch the electrical terminals or controls with wet hands; and do not tilt, jolt or tip Products while powered-on. Never disassemble Products. Never allow children to use Products.

CAUTION: Products are cellular devices and must be activated before use. Please visit www.pumpalarm.com to activate your Products. You must have a cellular device in which to communicate with Products. Cellular service for the Products must be renewed or purchased once the free period of cellular service expires. PumpAlarm.com utilizes automatic bill pay as a convenience to its customers and to ensure continuity of cellular service. PumpAlarm.com will notify you before cellular service is to be renewed and before the credit card you provided during activation is charged. If PumpAlarm.com is not able to successfully bill for the cellular service, PumpAlarm.com has the right to immediately disconnect cellular service to your Products and your Products will no longer send text notifications.

CAUTION: Do not expose Products to rain, snow or extreme temperatures. Products are not for outdoor use.

CAUTION: Products and Services are intended for residential use only and were designed and tested for residential purposes. Seller's Products and Services are convenience items and are not intended to be a substitute for normal maintenance and proper upkeep of equipment or property that Products and Services are monitoring. Seller's Products and Services are convenience items and are not intended to monitor equipment, products or other items which are vital, necessary, and/or have life-or-death consequences.

NOTE: Upon delivery inspect contents immediately and file claim with delivery carrier for any damage. PumpAlarm.com recommends saving the original box and packing material. You are responsible for damage to Products if returned to PumpAlarm.com improperly packed.

NOTE: PumpAlarm.com's primary method for contacting you is via email. Please add us as a contact to ensure delivery of these emails. Please promptly update your email address with us if it changes.

Limited Warranty

PumpAlarm.com, LLC ("PumpAlarm.com") warrants to You that Products will be free from defects in materials and workmanship under normal use and service for six (6) months from the purchase date. A claim under this Limited Warranty must be presented during the Limited Warranty period and within thirty (30) days after any covered condition has occurred. A claim under this Limited Warranty shall be satisfied by either, in PumpAlarm.com's sole discretion, repairing or replacing the Products and/or part. Replacement Products may be new or reconditioned.

To make a claim under this Limited Warranty, PumpAlarm.com must first issue You a Returned Material Authorization (RMA) number. This number can be obtained by calling PumpAlarm.com and a copy will be provided by email. A copy of the RMA must be included with any materials shipped to PumpAlarm.com. The entirety of Products must be sent back to PumpAlarm.com (unless specifically listed otherwise on the RMA form) and properly packaged to ensure against damage during shipping. If PumpAlarm.com determines that the claim is covered by this Limited Warranty, PumpAlarm.com will either, in its sole discretion, repair or replace the Products and/or part. Any damages not covered under this Limited Warranty will not be repaired until a written purchase order is received.

The Limited Warranty period shall not be extended by the replacement or repair of Products or parts under this Limited Warranty but the remaining Limited Warranty period shall continue in effect and be applicable to the replaced or repaired Products or parts under conditions of the Limited Warranty. Payment for cellular service covers only cellular transmission fees and in no way extends any portion of this Limited Warranty. This fee does not include out-of-warranty service or repair.

The cellular service provided in conjunction with the purchase and use of Products and Services is not guaranteed, and PumpAlarm.com cannot and does not guarantee or represent that cellular service will be available in Your area nor that cellular service will be continuous and uninterrupted in Your area. It is Your responsibility to determine if cellular coverage is available in Your area and to monitor the warning light on Products and Services to determine the cellular signal strength to Products and Services. You should contact PumpAlarm.com for assistance if needed. If cellular service is not available in Your area, then Your sole remedy is to return Products and Services as provided for in PumpAlarm.com's Return Policy as found at www.pumpalarm.com/return-policy. As such, PumpAlarm.com is not liable for any causes of action, losses or damages of any kind whatsoever arising out of mistakes, omissions, interruptions, errors, or defects in the provision of cellular service and failures or defects in the cellular network.

Upon expiration of the Limited Warranty period, all liability of PumpAlarm.com shall be terminated. This Limited Warranty does not apply in the following cases: failure to follow installation and operating instructions, misuse, alteration, abuse, accident or tampering, and repair by anyone other than PumpAlarm.com.

THIS LIMITED WARRANTY IS EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, OBLIGATIONS OR LIABILITIES, WHETHER WRITTEN, ORAL, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE. IN NO CASE SHALL PUMPALARM.COM BE LIABLE TO ANYONE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF THIS WARRANTY OR ANY OTHER WARRANTIES WHATSOEVER. This Limited Warranty gives specific legal rights. You may have other rights, which vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so that the above limitation of exclusion may not apply to you. You, the individual user, should take care to determine prior to use whether Products and Services are suitable, adequate or safe for the use intended. Since individual applications are subject to great variation, PumpAlarm.com makes no representation or warranty as to suitability or fitness of Products and Services for any specific application.

PumpAlarm.com makes no representation that Products and Services will reduce any risk of property loss or personal injury or prolong the life of any equipment or other property; or that Products and Services will in all cases provide adequate warning and protection. You understand that Products and Services if properly installed and maintained may only reduce the risk of property loss or other loss but Products and Services are not an insurance or a guarantee that there will be no property loss or other loss as a result. CONSEQUENTLY, PUMPALARM.COM SHALL HAVE NO LIABILITY FOR ANY PROPERTY DAMAGE, PERSONAL INJURY OR OTHER LOSS BASED ON A CLAIM THE PRODUCTS AND SERVICES FAILED TO GIVE WARNING. However, if PumpAlarm.com is held liable, whether directly or indirectly, for any loss or damage arising under this Limited warranty or otherwise, PumpAlarm.com's liability shall be limited to the purchase price of Products and Services purchased and paid for by You, which shall be the complete and exclusive remedy against PumpAlarm.com.

PumpAlarm.com

**PumpAlarm.com
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Indianapolis, IN 46225
888-454-5051**

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Appendix C: MySpy WiFi Messenger

MySpy® WiFi Messenger Alarm System

Easy-to-install indoor alarm system with WiFi connectivity, remote notification, battery backup, and auto reset.

The MySpy® WiFi Messenger system monitors and reports any residential alarm condition (contact closure), including sump high water level (float switch), or under/over temperature alarms. When the contact closes, the alarm notifies the user locally (audible and visual alarm) and remotely via SMS text messages and/or emails over a WiFi or Ethernet network to a smartphone, tablet or computer. The horn can be silenced when the alarm is active, but the alarm light remains on until the condition is cleared. Once the condition is cleared, the alarm will automatically reset.

No cellular connection needed (no monthly fees), but it is necessary for the home owner to have a reliable WiFi network and connection to the internet for this alarm to send remote notifications. Text message notifications can be sent to a cell phone with an active SMS service.



FEATURES

- NEMA 1 enclosure rated for indoor use.
- Automatic alarm reset.
- Red "alarm" light, green "power on" light, blue "network status" light, alarm "test" switch, horn "silence" switch, and WiFi Protected Setup (WPS) connection button.
- WiFi connectivity for remote alarm reporting
 - WiFi Protected Setup (WPS) push-button connect feature for simplified connection.
 - Manual WiFi setup done through Ethernet connection.
- Ethernet connectivity for remote alarm reporting - for cabled connection to router or modem (cable not included).
- Notifies the user via text and/or email notifications of the following conditions: Alarm, Power Lost, Power Restored, Low Battery, and Alarm Offline.
NOTE: Installation of an Uninterruptible Power Supply (UPS) on internet modem and wireless router is recommended. The internet connection must be maintained to receive notifications.
- Notifies up to 4 contacts (2 text and 2 email contacts).
- Alarm horn sounds at 87 decibels at 10 feet (3 meters).
- Can be used with any switching mechanism rated to include 1 amp, 9 VDC load.
- If primary power fails, the alarm system continues to work locally due to battery backup feature. (battery not included.)
NOTE: A Power Lost notification will be sent when entering battery backup mode, but other email and text notifications will not be sent in this mode.
- Complete package includes standard SJE SignalMaster® control switch with 15 feet (4.57 meters) of cable and mounting clamp.
- Switching mechanism operates on low voltage and is isolated from the power line to reduce the possibility of shock.
- Auxiliary alarm contacts for easy attachment of remote devices
- Low battery chirp.
- Easy access battery compartment.
- External terminal block for easy float switch installation.
- CSA Certified.
- Five-year limited warranty.



OPTIONS

When ordered with the alarm, this system is available with:

- Alternate float switch models for high or low level warning.
- Splice kit.

SEE BACKSIDE FOR ORDERING INFORMATION.
SEE PRICE BOOK FOR LIST PRICE.

SPECIFICATIONS

VOLTAGE FOR 120 VAC MODEL:

Primary: 120 VAC, 60 Hz, 2.4 watts max. (alarm condition)
Secondary: 9 VDC

BATTERY BACKUP POWER: 9 VDC

ALARM ENCLOSURE: 6 x 4 x 2.25 inch (15.24 x 10.16 x 5.71 cm), NEMA 1 plastic.

ALARM HORN: 87 decibels at 10 feet (3 meters)

AUXILIARY ALARM CONTACTS

Voltage: 120 VAC
Current: 0.5 amps maximum N/O
0.5 amps maximum N/C

POWER CORD: 6 foot (1.8 meter)

FLOAT SWITCH CONNECTION TERMINAL:

For float switch connection only. Do not apply power. (Voltage across terminals is 8-9 VDC).

FLOAT SWITCH: SJE SignalMaster® control switch with mounting clamp

Cable: 15 feet (4.57 meters), flexible 18 gauge, 2 conductor (UL) SJOW, water-resistant (CPE)

Float: 2.74 inch diameter x 4.83 inch long (7.0 cm x 12.3 cm), high impact, corrosion resistant polypropylene housing for use in sewage and water up to 140°F (60°C)

WiFi: Connect using push-button WiFi Protected Setup (WPS) or manually by using Ethernet connection (ethernet cable not provided). WPA2 security required on wireless router.

ETHERNET: Requires an ethernet connection (ethernet cable not provided).

NOTE: Cellular WiFi hotspots are not recommended for use with this WiFi alarm, as intermittent or unreliable notification service can result.



SJE RHOMBUS.

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www.sjerhombus.com

D.1

MySpy® WiFi Messenger Alarm System

Easy-to-install liquid level alarm system with WiFi connectivity, remote notification, auto-reset, and battery backup features for indoor use.

ORDERING INFORMATION

120 VAC		Shipping Weight
Part #	Description	
1043586	MSWF-01H (120 VAC w/15' SJE SignalMaster® High Level)	2.73 lbs.
1043655	MSWF-01L (120 VAC w/15' SJE SignalMaster® Low Level)	2.73 lbs.
1043656	MSWF-01H (120 VAC w/15' Sensor Float® High Level)	2.81 lbs.
1043657	MSWF-01X (120 VAC no float)	1.44 lbs.

H = High Level L = Low Level X = No Float

MASTER CARTON holds 16 boxed units.
SEE PRICE BOOK FOR LIST PRICE.

OPTIONS

CONTROL SWITCH OPTIONS
The MySpy® WiFi Messenger alarm system comes standard with a 15ft **SJE SignalMaster®** control switch with mounting clamp. Other float switches are available. See control switch section of the catalog.

To determine the price of alarm with an alternate float, add the price of the part number with "no float" to the price of the float switch.

SPECIFICATIONS

VOLTAGE FOR 120 VAC MODEL:

Primary: 120 VAC, 50/60 Hz, 2.4 watts max. (alarm condition)

Secondary: 9 VDC

BATTERY BACKUP POWER: 9 VDC

ALARM ENCLOSURE: 6 x 4 x 2.25 inches (15.24 x 10.16 x 5.71 cm),
NEMA 1 plastic

ALARM HORN: 87 decibels at 10 feet (3 meters)

AUXILIARY ALARM CONTACTS: 120 VAC, 0.5 amps max N/O,
0.5 amp max N/C

POWER CORD: 6 foot (1.8 meter)

FLOAT SWITCH CONNECTION TERMINAL: for float switch connection only
(voltage across terminals is 8-9 VDC)

FLOAT SWITCH: SJE SignalMaster® control switch with mounting clamp

CABLE: 15 feet (4.57 meters), flexible 18 gauge, 2 conductor (UL)
SJOW, water resistant (CPE)

FLOAT: 2.74 inch diameter x 4.83 inch long (7.0 cm x 12.3 cm), high
impact, corrosion resistant polypropylene housing for use in sewage
and water up to 140°F (60°C)

WIFI: Connect using push-button WiFi Protected Setup (WPS) or manually
by using Ethernet connection (ethernet cable not provided).

ETHERNET: Requires an ethernet connection (ethernet cable not provided).
WPA2 security required on wireless router.

NOTE: Cellular WiFi hotspots are not recommended for use with this WiFi
alarm, as intermittent or unreliable notification service can result.

Call or fax your order!
1-888-DIAL-SJE (1-888-342-5753) / Fax 218-847-4617

*Product offering and pricing are subject to change without notice.
Please visit www.sjerhombus.com for the most current information.*



SJE RHOMBUS.

www.sjerhombus.com
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D.2

MYSPY™ WiFi Messenger Alarm

Installation Instructions / Instrucciones de instalación / Instructions d'installation

English

The MYSpy™ WiFi Messenger Alarm system monitors and reports any residential alarm condition (contact closure), including high water level (float switch), or under/over temperature alarms. When the contact closes, the alarm notifies the user locally (audible and visual alarm) and remotely via SMS text messages and/or emails over a WiFi or Ethernet network to a smart phone, tablet or computer.

The horn can be silenced when the alarm is active, but the alarm light remains on until the condition is cleared. Once the condition is cleared, the alarm will automatically reset.

No cellular connection needed (no monthly fees), but it is necessary for the home owner to have a reliable WiFi network and connection to the internet for this alarm to send remote notifications. Text message notifications can be sent to a cell phone with an active SMS service.

Español

El sistema MYSpy™ WiFi Messenger monitorea y reporta cualquier condición de alarma en aplicaciones residenciales (cierre de contacto), incluyendo alarmas de nivel alto de agua en sumideros (interruptor a flote) o alarmas de sobrecalentamiento o bajas temperaturas. Cuando el contacto se cierra, la alarma notifica al usuario localmente (alarma sonora y visual) y a distancia, por SMS y/o correo electrónico a través del red WiFi o Ethernet, por un smartphone, una tableta o un ordenador. La alarma sonora puede ser desactivada cuando la alarma se encuentra activa, pero la luz de la alarma queda encendida hasta que se restablece la condición de alarma. La alarma se restablece automáticamente una vez que la condición de alarma es resuelta. No es necesaria una conexión celular (no pagos mensuales), pero la vivienda debe tener una red fiable de WiFi y conexión a internet para que la alarma pueda enviar notificaciones remotas. Las notificaciones por mensaje de texto pueden ser recibidas en un teléfono móvil con servicio de texto SMS.

Français

Le système MYSpy™ WiFi Messenger surveille et signale toute condition d'alarme résidentielle (fermeture de contact) y compris les alarmes de haut niveau d'eau dans le puits (interrupteur à flotteur), ou les alarmes de surchauffe ou de basse température. Lorsque le contact se ferme, l'alarme avertit l'utilisateur localement (alarme sonore et visuelle) et à distance, par SMS et/ou courriel à travers le réseau WiFi ou Ethernet, vers un smartphone, une tablette ou un ordinateur. L'alarme sonore peut être désactivée lors d'une alarme, mais le voyant reste allumé tant que le problème n'est pas résolu. Une fois résolu, l'alarme se réarme automatiquement. Aucune connexion cellulaire n'est nécessaire (pas de frais mensuels), néanmoins le propriétaire de la maison doit disposer d'un réseau WiFi et d'une connexion fiable à Internet pour permettre à cette alarme d'envoyer des notifications à distance. Les notifications par SMS peuvent être reçues sur un téléphone portable avec un service de messages SMS.

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 E-mail: customer.service@sje-rhombus.com
 Customer Service Hours: Monday - Friday, 7 A.M. to 6 P.M. Central Time

SJE-RHOMBUS' FIVE-YEAR LIMITED WARRANTY

SJE-RHOMBUS warrants to the original consumer that this product shall be free of manufacturing defects for five years after the date of consumer purchase. During that time period and subject to the conditions set forth below, SJE-RHOMBUS will repair or replace, at the discretion of SJE-RHOMBUS, any component which proves to be defective due to defective materials or workmanship of SJE-RHOMBUS.

ELECTRICAL WARNING AND SERVICE: THIS PRODUCT MUST BE REFORMED BY A LICENSED ELECTRICIAN. ELECTRICAL WARNING AND SERVICE OF THIS PRODUCT: (A) damage due to lightning or conditions beyond the control of SJE-RHOMBUS; (B) to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with printed instructions provided; (C) no failures resulting from abuse, misuse, accident, or negligence; (D) to units which are not installed in accordance with applicable local codes, ordinances, or accepted trade practices; and (E) to units repaired and/or modified without prior authorization from SJE-RHOMBUS.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. We do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

TO OBTAIN WARRANTY SERVICE: The consumer shall assume all responsibility and expense for removal, reinstallation, and freight. Any item to be repaired or replaced under this warranty must be returned to SJE-RHOMBUS, or such place as designated by SJE-RHOMBUS.

ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS ARE LIMITED TO THE EXTENT OF THIS WRITTEN WARRANTY. SJE-RHOMBUS SHALL NOT, IN ANY MANNER, BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES AS A RESULT OF A BREACH OF THIS WRITTEN WARRANTY OR ANY IMPLIED WARRANTY.

GARANTÍA LIMITADA DE CINCO AÑOS DE SJE-RHOMBUS

SJE-RHOMBUS garantiza al consumidor original que este producto estará libre de defectos de manufactura por un periodo de cinco años a partir de la fecha de compra. Durante ese periodo de tiempo, y sujeta a las condiciones expuestas más abajo, SJE-RHOMBUS reparará o reemplazará para el consumidor original cualquier pieza que resulte ser defectuosa a causa de los materiales o a obra de mano de SJE-RHOMBUS.

EL CABLEADO ELÉCTRICO Y EL MANTENIMIENTO DE ESTE PRODUCTO DEBEN SER EFECTUADOS POR UN ELECTRICISTA AUTORIZADO.

ESTA GARANTÍA NO CUBRE: (A) daños ocasionados por rayos o relámpagos o por situaciones fuera del control de SJE-RHOMBUS; (B) defectos o malfuncionamientos resultantes de instalación, hacer funcionar o dar mantenimiento al sistema o seguir las instrucciones impresas suministradas; (C) fallos resultantes de abuso, mal uso, accidentes o negligencia; (D) los sistemas que no sean instalados de acuerdo a normas locales, los reglamentos o la metodología técnica aceptada; y (E) los sistemas que sean reparados o modificados sin contar con la previa autorización de SJE-RHOMBUS.

En algunos estados se prohíben las limitaciones con respecto al plazo de la garantía implícita; por tanto, es posible que la anterior limitación no sea aplicable en su caso. En algunos estados no se permite la exclusión o limitación de daños incidentales o consecuentes; por tanto, es posible que la anterior limitación o exclusión no sea aplicable en su caso. Esta garantía le otorga derechos legales específicos; es posible además que le correspondan otros derechos que varían de un estado a otro.

PARA OBTENER SERVICIO CUBIERTO POR LA GARANTÍA: El consumidor deberá asumir toda la responsabilidad y los gastos de desinstalación, reinstalación y flete. Cualquier elemento que requiera reparación o debe reemplazarse en virtud de esta garantía, debe devolverse a SJE-RHOMBUS o al lugar que SJE-RHOMBUS designe.

CUALQUIER GARANTÍA IMPLÍCITA DE COMERCIABILIDAD O IDONEIDAD QUEDA LIMITADA AL PERÍODO DE TIEMPO CUBIERTO POR ESTA GARANTÍA ESCRITA. BAJO NINGUNA CIRCUNSTANCIA, SJE-RHOMBUS SERÁ RESPONSABLE DE DAÑOS INCIDENTALES O CONSECUENTES DE CUALQUIER TIPO QUE RESULTEN DEL INCUMPLIMIENTO DE ESTA GARANTÍA ESCRITA O DE CUALQUIER GARANTÍA IMPLÍCITA.

GARANTIE LIMITÉE DE CINQ ANS SJE-RHOMBUS

Notre garantie limitée de cinq ans couvre les défauts de fabrication qui surviennent pendant la durée de la garantie. Durant cette période et sous réserve des conditions décrites ci-dessus, SJE-RHOMBUS réparera ou remplacera, à la discrétion de SJE-RHOMBUS, tout composant qui s'avère défectueux en raison d'une défaillance des matériaux ou de la main-d'œuvre de SJE-RHOMBUS.

LE BRANCHEMENT ÉLECTRIQUE ET L'ENTRETIEN DE CE PRODUIT DOIVENT ÊTRE EFFECTUÉS PAR UN ÉLECTRICIEN CERTIFIÉ.

CEtte GARANTIE NE S'APPLIQUE PAS: (A) aux dommages dus à la foudre ou à des conditions indépendantes de la volonté de SJE-RHOMBUS; (B) à des abus, ou à des utilisations abusives d'une installation non conforme, de non-respect des instructions écrites d'installation ou d'entretien de l'appareil; (C) à des défaillances résultant d'abus, de mauvaise utilisation, d'accident, ou de négligence; (D) aux systèmes qui ne sont pas installés conformément aux codes et règlements locaux applicables ou pratiques du métier acceptées; et (E) aux appareils réparés et/ou modifiés sans l'autorisation préalable de SJE-RHOMBUS.

Certains États ne permettent pas de limitations sur la durée d'une garantie implicite. La limitation ci-dessus peut ainsi ne pas s'appliquer à vous. Certains États ne permettent pas l'exclusion ou la limitation des dommages consécutifs ou incidentaux. La limitation ou l'exclusion ci-dessus peuvent ainsi ne pas s'appliquer à vous. Cette garantie vous confère des droits légaux spécifiques. Vous pouvez avoir d'autres droits qui varient d'un État à l'autre.

POUR OBTENIR LE SERVICE DE GARANTIE: Le consommateur devra assumer toute responsabilité et frais pour l'enlèvement, la réinstallation et le transport de l'appareil. Tout composant devant être réparé ou remplacé en vertu de cette garantie doit être retourné à SJE-RHOMBUS, ou tout endroit désigné par SJE-RHOMBUS.

TOUTE GARANTIE IMPLÍCITE DE QUALITÉ MARCHANDE OU D'IDONEITÉ À UN USAGE PARTICULIER EST LIMITÉE À LA DURÉE DE CETTE GARANTIE ÉCRITE. SJE-RHOMBUS NE POURRA PAS OBLIGER NI MANÈRE ÊTRE TENU RESPONSABLE DE DAÑOS INCIDENTALES O CONSECUENTES DE CUALQUIER TIPO QUE RESULTEN DEL INCUMPLIMIENTO DE ESTA GARANTÍA ESCRITA O DE CUALQUIER GARANTÍA IMPLÍCITA.

Electrical Warnings / Advertencias eléctricas / Avertissements électriques

Failure to follow these precautions could result in serious injury or death. Replace the float switch immediately if cable becomes damaged or severed. Keep these instructions with warranty after installation. This product must be installed in accordance with National Electric Code, ANSI/NFPA 70 so as to prevent moisture from entering or accumulating within horns, conduit bodies, fittings, float housing, or cable.

WARNING

ELECTRICAL SHOCK HAZARD

Electrical shock hazard exists when working on or installing this product. An qualified person must install and service this product according to applicable electrical codes and practices.

WARNING

EXPLOSION OR FIRE HAZARD

Do not use this product with flammable liquids, gases, or vapors in hazardous locations as defined by the National Fire Protection Code, ANSI/NFPA 70.

De no tomar estas precauciones, pueden ocasionarse lesiones serias o mortales. Reemplace el interruptor de flotador de inmediato si el cable está dañado o partido. Después de la instalación, guardar estas instrucciones junto con la garantía. Este producto debe ser instalado siguiendo el Código Eléctrico Nacional de EE.UU., ANSI/NFPA 70, para evitar la entrada o acumulación de humedad en cajas de conexión, conductos, accesorios, la caja del indicador de nivel (flotador) o el cable.

AVVERTENZA

RISCHIO DI SCOSSE ELETTRICHE

Pericolo di scosse elettriche esiste quando si lavora su o si installa questo prodotto. Solo un professionista qualificato deve installare e manutenere questo prodotto secondo i regolamenti elettrici applicabili.

AVVERTENZA

RISCHIO DI INCENDIO O ESPLOSIONE

Non utilizzare questo prodotto con liquidi infiammabili, gas o vapori in luoghi pericolosi come quelli definiti dal Codice Nazionale di Sicurezza Elettrica, ANSI/NFPA 70.

Suivre scrupuleusement ces précautions pour éviter les risques de blessures graves voire mortelles. Remplacer immédiatement l'interrupteur à flotteur si le câble du commutateur est endommagé ou brisé. Conservez ces instructions avec la garantie. Ce produit doit être installé conformément au code électrique des États-Unis (NEC/ANSI/NFPA 70) de sorte à empêcher l'humidité de s'infiltrer ou d'accumuler dans les boîtiers, corps de conduit, raccords, logements de flotteur ou câbles.

AVVERTENZA

DANGER OF SHOCK ELECTRIC

Pericolo di scosse elettriche esiste quando si lavora su o si installa questo prodotto. Solo un professionista qualificato deve installare e manutenere questo prodotto secondo i regolamenti elettrici applicabili.

AVVERTENZA

RISCHIO D'INCENDIO O ESPLOSIONE

Non utilizzare questo prodotto con liquidi infiammabili, gas o vapori in luoghi pericolosi come quelli definiti dal Codice Nazionale di Sicurezza Elettrica, ANSI/NFPA 70.

Items Needed / Elementos necesarios / Éléments nécessaires

Included with alarm Incluso con el alarma / Inclusé avec l'alarme	Included with optional float switch Incluso con el interruptor de flotador optional Inclusé avec interrupteur à flotteur optional										
<p>Not included / No incluido / Pas inclus</p>	<p>Specifications / Especificaciones / Spécifications</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Primary Power / Alimentación primaria / Alimentation primaire</td> <td>120 VAC, 60 Hz</td> </tr> <tr> <td>Auxiliary Contacts / Contactos auxiliares / Contacts auxiliaires</td> <td>120 VAC, 0.5 amp</td> </tr> <tr> <td>Float Switch Supply Voltage / Tensión de alimentación del interruptor de flotador / Tension d'alimentation de l'interrupteur à flotteur</td> <td>9 VDC</td> </tr> <tr> <td>Battery / Batería / Batterie</td> <td>9 VDC, Alkaline / Alcalinas / Alcalines</td> </tr> <tr> <td>Enclosure / Caja / Boîtier</td> <td>Type 1/Type 1 / Type 1/Boîtier/Boîtier</td> </tr> </table>	Primary Power / Alimentación primaria / Alimentation primaire	120 VAC, 60 Hz	Auxiliary Contacts / Contactos auxiliares / Contacts auxiliaires	120 VAC, 0.5 amp	Float Switch Supply Voltage / Tensión de alimentación del interruptor de flotador / Tension d'alimentation de l'interrupteur à flotteur	9 VDC	Battery / Batería / Batterie	9 VDC, Alkaline / Alcalinas / Alcalines	Enclosure / Caja / Boîtier	Type 1/Type 1 / Type 1/Boîtier/Boîtier
Primary Power / Alimentación primaria / Alimentation primaire	120 VAC, 60 Hz										
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Battery / Batería / Batterie	9 VDC, Alkaline / Alcalinas / Alcalines										
Enclosure / Caja / Boîtier	Type 1/Type 1 / Type 1/Boîtier/Boîtier										

1 Mount using the keyhole on the back of the unit.
 Montar usando el tipo de cerradura en la parte posterior de la unidad.
 Fixer en utilisant le trou de serrure situé à l'arrière du boîtier.

4 Connect float switch, install battery, and secure power cord to wall outlet.
 Conectar el interruptor de flotador, instalar la batería y asegurar el cable eléctrico al tomacorriente de pared.
 Connecter l'interrupteur à flotteur, installer la batterie, puis fixer le câble d'alimentation à la prise électrique murale.

2 Install float at desired activation level.
 Instalar el flotador al nivel de activación deseado.
 Installer le flotteur à niveau d'activation souhaité.

activation level
nivel de activación
niveau d'activation

5 Restore power and check alarm operation after installation.
 Restablecer la alimentación y verificar el funcionamiento de la alarma después de la instalación.
 Rétablir l'alimentation et vérifier le fonctionnement de l'alarme après installation.

WARNING

Alarm Off
Alarma desactivada
Alarme désactivée

ADVERTENCIA

Alarm On
Alarma activada
Alarme activée

3 If Auxiliary Contacts will be used, remove back, determine location, and drill hole in enclosure for connector and wiring.
 Si se usaran contactos auxiliares, retirar la tapa posterior, determinar la ubicación y taladrar un agujero en la caja para el conector y el cableado.
 Si des contacts auxiliaires sont utilisés, retirer la partie arrière, localiser et percer un trou dans le boîtier pour le connecteur et le câblage.

6 Replace battery every 12 months and after an AC power failure.
 Reemplazar la batería cada 12 meses y después de cada interrupción de la alimentación CA.
 Remplacer la batterie tous les 12 mois et après chaque panne d'alimentation CA.

7 Test alarm weekly to insure proper operation.
 Probar la alarma semanalmente para comprobar su buen funcionamiento.
 Tester l'alarme toutes les semaines pour assurer le bon fonctionnement de l'appareil.

Reference the MySpy™ WiFi Messenger Alarm Quick Start Guide to setup the alarm notifications via email and/or text messaging.
 Remítase a la Guía de consulta rápida de la alarma MySpy™ WiFi Messenger para configurar las notificaciones de alarma vía correo electrónico y/o mensajes de texto.
 Se reporter au Guide de démarrage rapide de l'Alarme MySpy™ WiFi Messenger pour configurer les notifications d'alarme via e-mail et/ou SMS.

Meeting Journal
Department of Engineering Technology
ENT 497 - Senior Design Project
Project Title:

	Present
Advisor:	<input type="checkbox"/>
Student: Brian Meerman:	<input checked="" type="checkbox"/>
Student: Christian Guffey	<input checked="" type="checkbox"/>
Student: Cameron	<input checked="" type="checkbox"/>
Student:	<input type="checkbox"/>

Meeting Date:	9/10/2019
Meeting Location	Via Group Chat

Topics Discussed
Potential Component to incorporate into the control panel
Proposal to Ecological tanks
Various ideas for presentational purposes

Responsibilities/ Actions Taken
Creating a proposal email to Ecological tanks for funding or support.
Researching how to connect to WiFi
Researched programmable Timers

Next Meeting Date: _____ **Location:** _____



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	9/26/2019
Meeting Location	Video Group Call

Topics Discussed

Reach out to Ecological Tanks for wiring schematics for panel.

Cost analysis for different auto dialer options.

Continue working on proposal.

Responsibilities/ Actions Taken

Gantt Chart

Constant contact with ecological tanks.

Proposal (Due 10/17/2019)

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date: 10/3/2019

Meeting Location Video Group Call

Topics Discussed

Make final decision for panel alert system.
Discuss current wiring schematic options.
Obtain more wiring schematics from Ecological tanks.
Continue working on proposal

Responsibilities/ Actions Taken

Gantt Chart
Constant contact with ecological tanks.
Proposal (Due 10/17/2019)

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date: 10/10/2019

Meeting Location: Video Group Call

Topics Discussed

Finish proposal.

Pump alarm may be an issue due to back order.

Discuss alternate options for the pump alarm.

Possibly go ahead and order available alternate alarm to avoid a back order issue.

Responsibilities/ Actions Taken

Finish proposal due 10/17/2019

Contact Ecological tanks.

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date: 10/17/2019

Meeting Location Video Group Call

Topics Discussed

Finish proposal.

Choose alternate option to the pump alarm.

Make sure digital timer is available.

Discussed using a group members cell phone or a temporary cell phone.

Find drawing to illustrate how a septic system functions.

Responsibilities/ Actions Taken

Finish proposal due 10/17/2019

Have everyone proof read proposal to finalize.

Contact Ecological tanks.

Next Meeting Date:

Location:

Meeting Journal
Department of Engineering Technology
ENT 497 - Senior Design Project
Project Title:

	Present
Advisor:	<input type="checkbox"/>
Student: Brian Meermans	<input checked="" type="checkbox"/>
Student: Christian Guffey	<input checked="" type="checkbox"/>
Student: Cameron Calhoun	<input checked="" type="checkbox"/>
Student:	<input type="checkbox"/>

Meeting Date: 10/24/2019
Meeting Location: Video Group Call

Topics Discussed
 Resubmit Proposal
 Discuss best testing methods
 Begin acquiring project materials
 Discuss presentation methods

Responsibilities/ Actions Taken
 Contact Ecological Tanks
 Work on Proposal resubmission

Next Meeting Date: **Location:**



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date: 10/31/2019

Meeting Location: Video Group Call

Topics Discussed

Continue working on Proposal resubmission.
 Make sure Ecological Tanks can hold onto a Pump Alarm.
 Go over Pump Alarm configuration again.

Responsibilities/ Actions Taken

Finish Proposal resubmission
 Contact Ecological Tanks

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[]
Student: Cameron Calhot	[x]
Student:	[]

Meeting Date: November
Meeting Location:

<u>Topics Discussed</u>	
Proposal from criticism	
Power point Ethics	

<u>Responsibilities/ Actions Taken</u>	
Working on Power point hw Ethics	All Members
Finetune Proposal from criticism	All Members

Next Meeting Date:	Location:
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Meeting Journal
Department of Engineering Technology
ENT 497 - Senior Design Project
Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	11/14/2019
Meeting Location	Video Group Call

Topics Discussed

Rework gantt chart
Submit finished proposal resubmission
Ethics powerpoint/summary

Responsibilities/ Actions Taken

Contact Ecological Tanks
Continue putting final report together

Next Meeting Date:

Location:



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Meeting Journal
Department of Engineering Technology
ENT 497 - Senior Design Project
Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	11/21/2019
Meeting Location	Video Group Call

Topics Discussed
Proposal has been approved
Format final report

Responsibilities/ Actions Taken
Contact Ecological Tanks
Work on final report
Work on final presentation

Next Meeting Date:	Location:
---------------------------	------------------



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Meeting Journal
Department of Engineering Technology
ENT 497 - Senior Design Project
Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	11/27/2019
Meeting Location	Video Group Call

Topics Discussed
Proposal has been approved
Continue working on final report
Continue working on final presentation
Begin assembly over break

Responsibilities/ Actions Taken
Contact Ecological Tanks
continue working on final report
Continue working on final presentation

Next Meeting Date:	Location:
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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date: 12/5/2019

Meeting Location: Video Group Call

Topics Discussed
 Proposal has been approved
 Finish final report
 Finish final presentation
 Practice presentation before class
 Begin assembly over break

Responsibilities/ Actions Taken
 Contact Ecological Tanks
 Finish working on final report
 Finish final presentation

Next Meeting Date: **Location:**



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date: 12/12/2019

Meeting Location: Video Group Call

Topics Discussed

Proposal has been approved
 Finish final report
 Practice final presentation
 Begin assembly over break

Responsibilities/ Actions Taken

Contact Ecological Tanks
 Finish working on final report
 Finish changes to final presentation

Next Meeting Date: **Location:**



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[X]
Student: Brian Meermans	X
Student: Christain Guffey	X
Student: Cameron Calhoun	X
Student:	[]

Meeting Date:	30-Jan
Meeting Location	Middletown

Topics Discussed

Talked about when we are going to start physically working on the panel and check out Gantt chart.
Emailed Eco Tanks about clarification on a switch we have.

Responsibilities/ Actions Taken

Email - Christain

Meeting about free time. - Group

Next Meeting Date **6-Feb**

Location Middletown



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	2/6/2020
Meeting Location	Video Group Call

Topics Discussed

Begin assembly of main panel this weekend.
Continue adding information to final report.
Figure out visual aids for panel components.

Responsibilities/ Actions Taken

Acquired spare wire in multiple different gauge sizes. (12,14,16,18)
Acquire female connectors for wire to relay connection.

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	2/13/2020
Meeting Location	Video Group Call

Topics Discussed

Finish assembly of control panel.

Figure out visual aids for final presentation.

Continue adding information to final report.

Responsibilities/ Actions Taken

Finish wiring external panel components. (internal wiring completed)

Test panel to make sure components are functional.

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	2/27/2020
Meeting Location	Video Group Call

Topics Discussed

Finish assembly of control panel.
Use a light bulb to demonstrate pump (On/Off).
Begin adding test results to the final report.
Program cellular auto dialer.

Responsibilities/ Actions Taken

External components wired and powered.
Checked to ensure that Visual Alarm does work.

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date: 3/5/2020

Meeting Location Video Group Call

Topics Discussed

Finish assembly of control panel.
Install light bulb to demonstrate pump (On/Off).
Continue adding test results to the final report
Finish programming cellular auto dialer.

Responsibilities/ Actions Taken

External components wired and powered.

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	3/12/2020
Meeting Location:	Video Group Call

Topics Discussed

Install/test light bulb to demonstrate pump (On/Off).
Find a way around pump alarm subscription.
Finish programming cellular auto dialer.
Continue adding test results to final report.

Responsibilities/ Actions Taken

External components wired and powered.
All components assembled.
Test all components.
Reached out to pump alarm company about subscription.

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	3/19/2020
Meeting Location:	Video Group Call

Topics Discussed

Light bulb test was a success to demonstrate pump.
Component testing was also a success.
Find a way around pump alarm subscription.
Finish programming cellular auto dialer.
Continue adding test results to final report.

Responsibilities/ Actions Taken

Test all components.
Reached out to pump alarm company about subscription. (waiting to hear back)

Next Meeting Date:

Location:



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Meeting Journal

Department of Engineering Technology

ENT 497 - Senior Design Project

Project Title:

	Present
Advisor:	[]
Student: Brian Meermans	[x]
Student: Christian Guffey	[x]
Student: Cameron Calhoun	[x]
Student:	[]

Meeting Date:	4/2/2020
Meeting Location:	Video Group Call

Topics Discussed

Finish programming cellular auto dialer.
Continue adding test results to final report.
Continue adding results to powerpoint presentation.
Finish poster for extra credit.

Responsibilities/ Actions Taken

Test all components.
Reached out to pump alarm company about subscription. (waiting to hear back)

Next Meeting Date:

Location:

Septic Tank Monitoring Device

Team Members:
Christian Guffey
Brian Meermans
Cameron Calhoun

Septic Tank



Control Panel

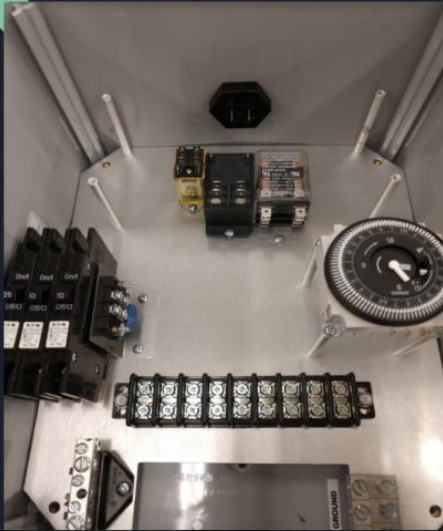




Background

- ❖ Household Septic Treatment Systems (HSTS) are operated and monitored by complex control panels.
 - Panels operate and monitor Aeration motors, UV lights and various other components.
 - Contain timers and counters for effluent dose pumps.
 - Contain failsafe mechanisms (Telemetry or Pump Lockout), which is required by Ohio code regulations as well as other states across the country.
 - Panels (Mounted on house or tank) are linked to an alarm panel (Mounted on house).

Basic Components (Outdated)



The Problem

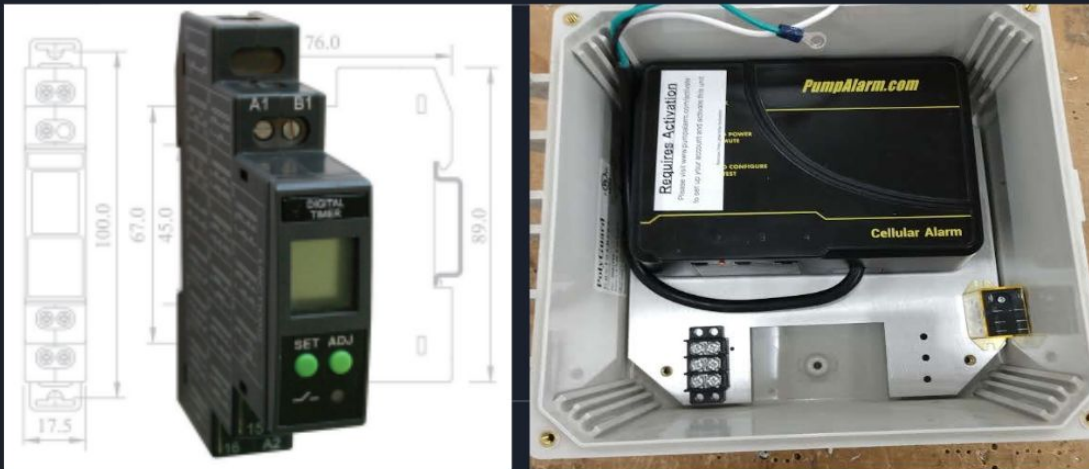


- ❖ **Telemetry Auto-Dialer (Failsafe)**
 - A land phone line is required.
 - Land Phone line is out of date due to usage of cell phones.
 - Many homeowners do not include phone lines in their bundling package and its an extra cost per month.
- ❖ **Timers**
 - Timers are not as accurate as required by health departments.
 - Timers use tabs and knobs only accurate for hours and minutes.
 - We need a way to accurately dial in our timers to the second for pumping cycles.
 - Timers can be complicated to set.

Objective

- ❖ Replace the Telemetry device with a Cellular Auto-Dialer.
 - Cellular Auto-Dialer will eliminate the land phone line.
 - Cellular Auto-Dialer can dial out to multiple phones to notify a failure.
 - Can display address and homeowner name through text alerts.
 - Bonus: Will notify a service provider as to which component in the system has failed.
- ❖ Replace the tab timer with a digital timer.
 - Increase dose timing accuracy.
 - Can program time down to seconds.
 - Can program for different dosing cycle settings.
 - Decrease the amount of time taken to program dose time settings.

New Components

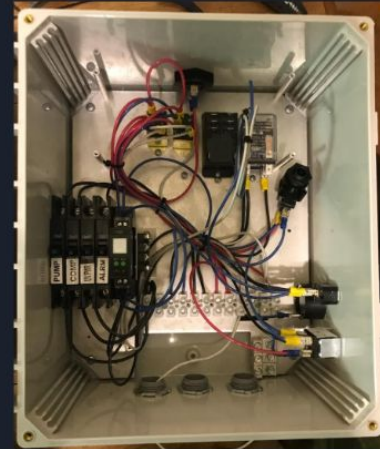


Materials Cost Analysis (Cont.)

New Panel

- ❖ Basic 208 Control Panel (\$600.00)
 - Control Panel Switches
 - Jumper Wires
 - Sensors
- ❖ 14-2 Alarm Power Supply Wire (\$10.00)
- ❖ 12-2 Control Panel Supply Wire (\$10.00)
- ❖ Pump Alarm Cellular Alarm (\$244.00)
- ❖ Altech Universal Digital Multi-Timer (\$52.16)
- ❖ Total (\$916.16)

Pump alarm service (\$50) per year



Cost Analysis of the New panel vs. Old

- ❖ Price of old panel is \$840.00
- ❖ Price of old panel annual operational cost is roughly \$720/year
- ❖ Price of new panel is \$916.16
- ❖ Price of new panel annual operational cost is roughly \$50/year
- ❖ New panel is about \$76.00 more upfront, but comes with a much cheaper annual operation cost.
- ❖ New panel will save homeowners money down the road by not paying so much annually
- ❖ Systems fail once every few years. Reducing the annual operational cost reduces the financial burden on homeowners while accomplishing the same goals



Budget

Ecological Tanks funding

- ❖ 208 Control Panel (\$600.00)
 - Toggle switches, relays, sensors, connection boards, hardware
- ❖ Pump Alarm Cellular Alarm (\$244.00)
- ❖ Altech Universal Digital Multi-Timer (\$52.16)
- ❖ Aeration Pump (\$400.00)
- ❖ Total (\$1296.16)

Funded by our group

- ❖ 14-2 Alarm Power Supply Wire (\$10.00)
- ❖ 12-2 Control Panel Supply Wire (\$10.00)
- ❖ Wire nuts (\$8.00)
- ❖ Cellular Alarm subscription (\$50)
- ❖ Total (\$78.00)



Expected Findings

- ❖ Ensure the control panel is functioning properly.
- ❖ To receive text alerts which correlate with component failure.
- ❖ To become familiar with setting On/Off dose times easily and accurately.

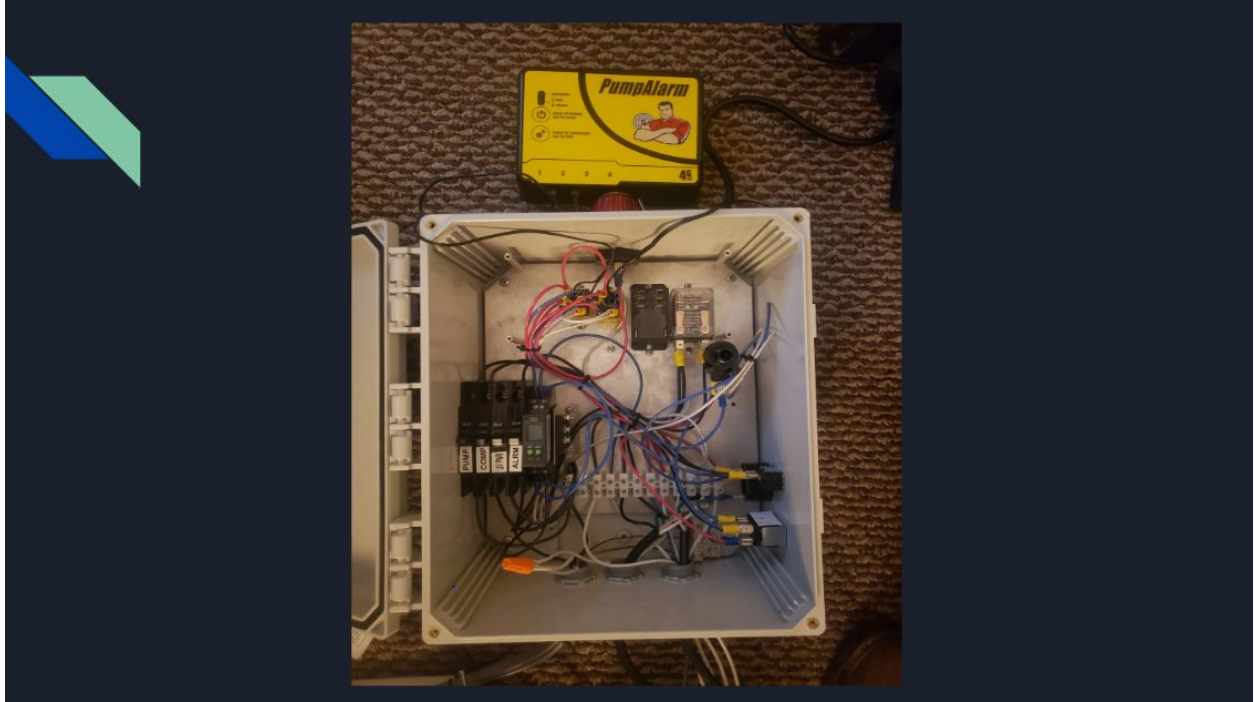
Engineering Analysis

- ❖ House breakers for hookup (not required for our demonstration model)
 - 15 Amp breaker in house supplies 14-2 Alarm Power
 - 20 Amp breaker in house supplies 12-2 Panel Power
- ❖ 110/120 VAC/DC will need supplied to panel to operate all components.
- ❖ Panel breakers for component feed
 - 20 Amp for Pump feed
 - 10 Amp for UV Power Feed
 - 10 Amp for Compressor Power Feed
 - 10 Amp for Alarm Power Feed
- ❖ All wires running from panel to components intended for alarming signals shall be 14 gauge wire.
- ❖ All wires running from panel to components intended to supply power should be 12 gauge wire.
- ❖ If any component breaker is flipped off while the Alarm breaker is on, the alarm will sound and signal a fault.

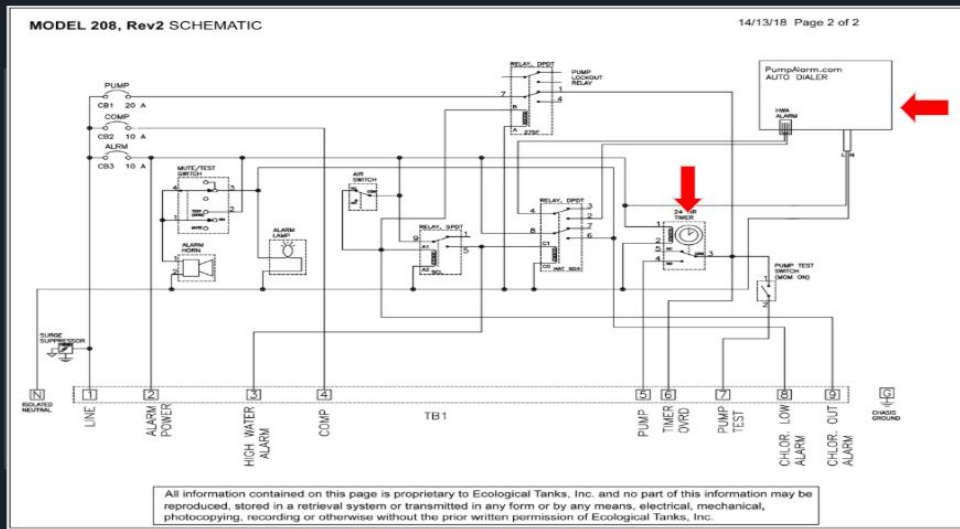
Assembly

- ❖ Two Phase Assembly approach
- ❖ Phase 1
 - Construct basic panel with all internals and new pump timer
 - Wire each Hot, Neutral, and Ground for input power and all external components
 - Wire up all alarm sensors to relays
 - Test
- ❖ Phase 2 (Incorporate PumpAlarm)
 - Connect signal wires to run from relays to inputs of PumpAlarm
 - Connect Hot, Neutral, and Ground for PumpAlarm
 - Register and Program PumpAlarm
 - Test Panel

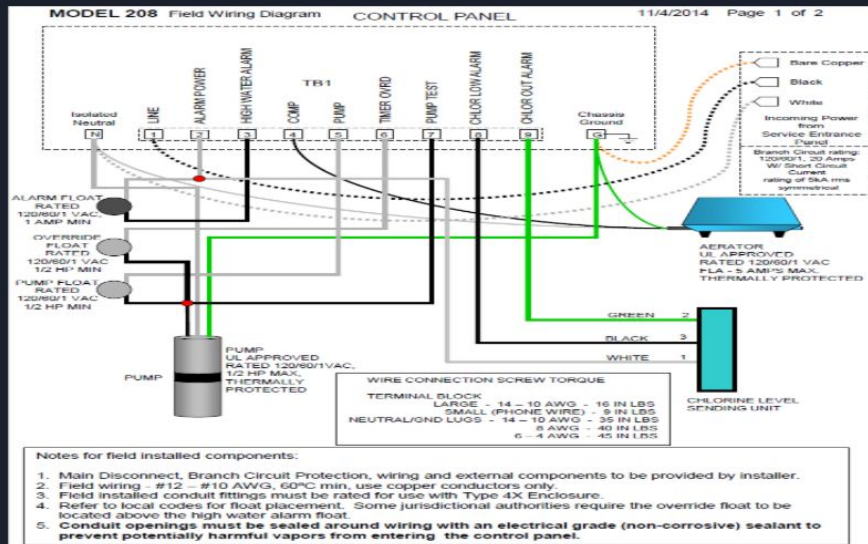




Internal Component Hook Up

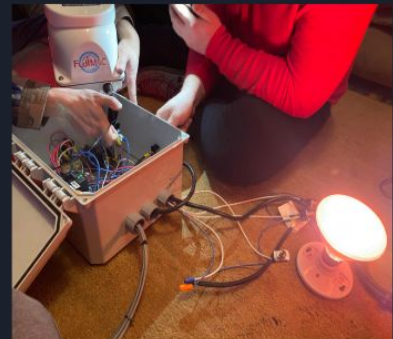


External Component Hook Up



Testing the Panel (Phase 1)

- ❖ Visual check making sure all connections are good.
- ❖ Power control panel then check if any breakers trip.
- ❖ Operate mini circuit
 - Ensure aerator is powered
 - Ensure Light (representing dose pump) is on
 - Switch UV light (toggle switch) to on position
 - Ensure High Water Alarm is down
- ❖ Check the visual alarm before testing the new pump alarm.
 - Does lack of Airflow trip alarm?
 - Does toggle for UV trip alarm when switched to off?
 - Does float up for High water trip alarm?



Testing the Panel (Phase 2)

- ❖ Check each connect for circuit power and alarm signals are properly connect to pump alarm box.
- ❖ Ensure PumpAlarm Box has power
- ❖ Simulate each fault as stated from the previous slide.
 - Was PumpAlarm box setting off visual and audio alarms?
- ❖ Program PumpAlarm Box
 - Was designated cell phone receiving text alerts corresponding to each fault?

Programming of Pump Alarm

The image displays five sequential screenshots of a smartphone interface for programming a 'Pump Alarm' system. Each screenshot shows a text message conversation with a phone number (581-4079) and various configuration steps:

- Screenshot 1:** Shows the initial setup with fields for 'Name: Your Alarm', 'Phone1: 511-1399', 'Phone2:', and 'Phone3:'. A help message is also visible.
- Screenshot 2:** Shows the configuration of 'Input1: Treatment Failure' with a delay of 'NO,1 sec' and four other input fields (Inp2 to Inp4) set to 'NO,1 sec'.
- Screenshot 3:** Shows the configuration of 'PwrDelay: 10 sec' and other settings like 'TempLow: NONE', 'TempHigh: NONE', and 'Silent: NO'. A 'Delay 5' button is also visible.
- Screenshot 4:** Shows the configuration of 'Input3: High Water Alarm' with a delay of 'NO,5 sec' and other input fields (Inp1, Inp2, Inp4) set to 'NO,1 sec'.
- Screenshot 5:** Shows the configuration of 'Input4: High Water Alarm' with a delay of 'NO,1 sec' and other input fields (Inp1, Inp2, Inp3) set to 'NO,5 sec'.

Test messages are shown in the final two screenshots, such as 'Senior Design is operating correctly at 10:25PM on 04/22/20.' and 'Senior Design has detected that electrical power was lost at 10:30PM on 04/22/20.'




Issues During Construction and Testing

- ❖ The aeration pump that was an equivalent of the typically used pump didn't have the 1/4" sensor airline to feed our pressure sensor.
 - Would need to use a Tee to supply both air pressure sensor as well as air tube (which would be located inside treatment tanks)
- ❖ PumpAlarm needs to be registered online with a credit card. PumpAlarm requires a yearly subscription fee.
 - In a real world setting, a service provider could incorporate this cost into the yearly service contract for a homeowner, so that the fee is still covered at the expense of the homeowner.
- ❖ Had to flip some connection from relays to PumpAlarm. PumpAlarm reads normally opened input and is triggered when relay is switched to the closed position.



Conclusions and Recommendations

- ❖ Overall, the panel was a success. It did exactly what we intended it to do.
- ❖ We were able to simulate faults in a system and receive text alerts on our phone.
 - For future production and development, we recommend using a standard three pin High water alarm so that it connects properly to the PumpAlarm box. For the purpose of the project, the PumpAlarm box was programmed to simulate a Fault in Treatment Tank or Dose Tank, instead of alerts for each individual component.
- ❖ Dose timer worked as we intended it to. The dose timer was very easy to program and very accurate compared to current timers being used.



Gantt Chart Overview

❖ Completed

- Proposal 05 / Sep / 19 - 17 / Oct / 19
- Talk to ECOLOGICAL Tanks about Funding 12 / Sep / 19 - 12 / Dec / 19
- Choose timer and pump alarm 12 / Sep / 19 - 01 / Oct / 19
- Obtain wire schematic 02 / Dec / 19 - 09 / Dec / 19
- Choose cellular device to receive alert 02 / Dec / 19 - 09 / Dec / 19
- Report for Fall 05 / Sep / 19 - 12 / Dec / 19
- Order Panel 02 / Dec / 19 - 05 / Jan / 20
- Order Alarm 02 / Dec / 19 - 08 / Jan / 20
- Order timer 02 / Dec / 19 - 10 / Jan / 20
- Complete Panel 01 / Jan / 19 - 17 / Feb / 20



Gantt Chart Overview (Cont.)

❖ Completed

- Construct control Panel 01 / Jan / 20 - 12 / Feb / 20
- Test panel 12 / Feb / 20 - 18 / Mar / 20
- Assemble display for Presentation 01 / Jan / 20 - 07 / May / 20
- Presentation Poster 01 / Jan / 20 - 07 / May / 20
- Spring Report 01 / Jan / 20 - 16 / May / 20



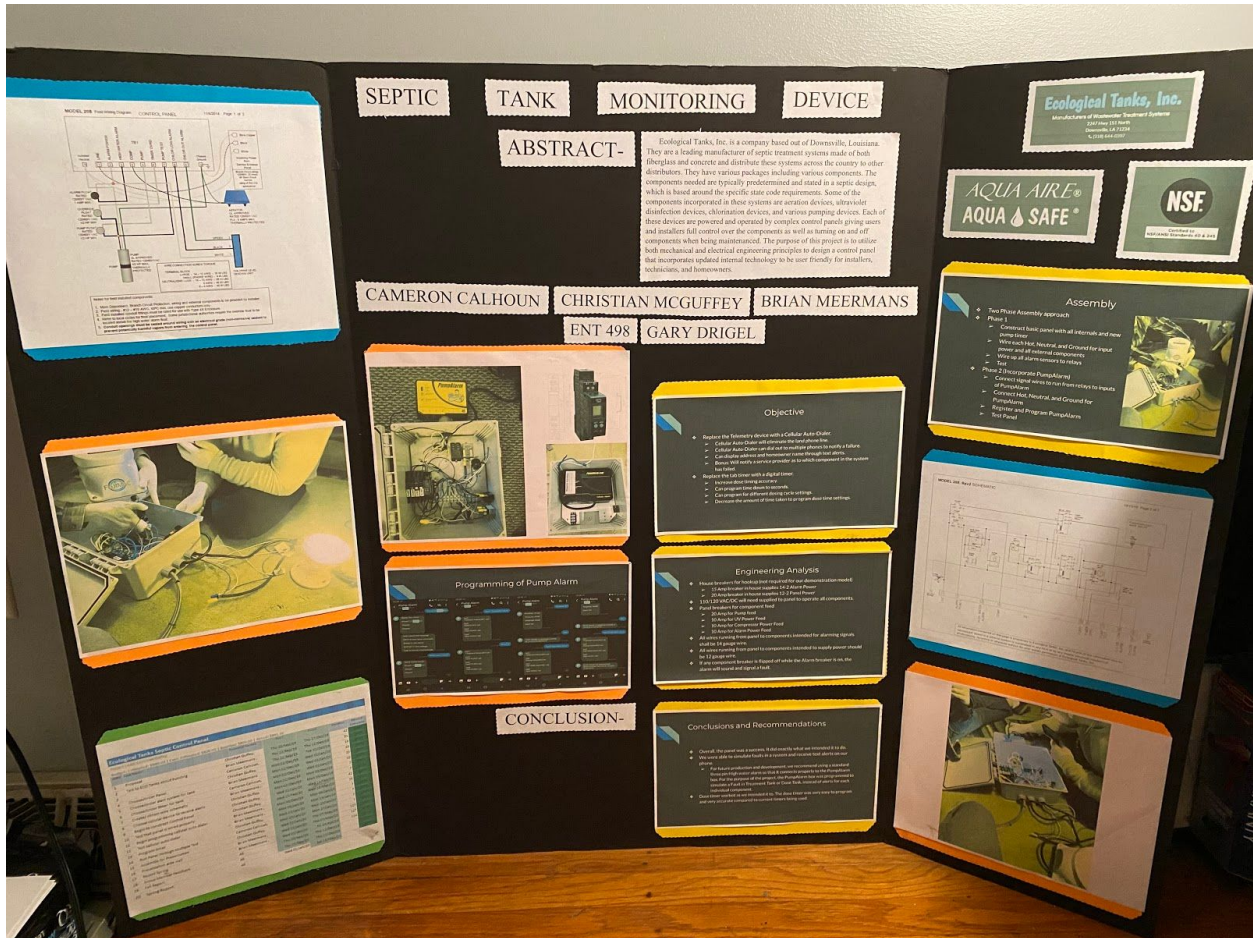
References

1. **Ringo, Tyler.** *Ecological Tanks.* [email] Contact from Sept. 27, 2019 to Date.
2. **Ecological Tanks.** *Manufacturer of Waste Water Treatment Systems* [Website] <https://etiaquasafe.com/>
3. **Smallwood, Mike.** *Smallwood Septic Solutions.* [interview during our research] October 10, 2019
4. **Pierson, Joe.** *Septic Solutions Supply.* [assistance during our research] 2019. Ecological Tanks Dealer and service provider
5. **PumpAlarm.** [Online] 2019. <https://store.pumpalarm.com/sump-pump-alarm-p/s-pba-sump-kit.htm>
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Christian Guffey

May 6, 2020

ENT 498 Reflective Essay

The ENT 497-498 class has been an eye opener for me. Playing the role of a project manager and advisor, I have faced some challenges and learned many valuable lessons for the future. The whole concept of a senior capstone is as close to real world challenges as a college course may get and from the beginning of this project it quickly became overwhelming. Being the advisor of this project, I quickly came face to face with challenges such as coming up with a project that had a real world purpose, delegating tasks to each group member, and observing each group members strength and

weaknesses to help with completing various tasks for our research, project design, and assembling the prototype.

This project started with just my team members Brian, Cameron and I coming up with a product to design based on both of our knowledge and experience. We came up with our control panel idea and hit the ground running from there. The design started off slow but picked up as we gained knowledge and completed our research. I had reached out to a manufacturer that I have had previous work history with to help get the ball rolling. Ecological Tanks helped point us in the right direction as well as provide us with additional information that was vital to the design of our control panel. While I still had a lot to learn about the configuration and functionality of these control panels, I was able to pick it up quickly and help Brian and Cameron get up to speed.

Our project was heavy on the electrical side of engineering. I have spent a lot of time in my college studies covering electrical circuits material. Brian and Cameron are more on the mechanical side of engineering based on their studies. While they both have basic electrical knowledge from some prior electrical classes I was faced with the task of getting the team up to speed on any electrical knowledge that they may not have had. I feel that this project mostly relied on the earlier electrical course and not so much on the more in depth electrical course, therefore, I feel Brian and Cameron had a solid basic understanding of the project.

The biggest change for me in this course was trying to keep tasks on schedule while working remotely during the pandemic of COVID-19. Every step of the way it was important to collaborate with the team to determine the material we needed to complete and how we would tackle each task. Most of the construction of our project was completed before the pandemic. The project construction was completed collectively as a team. Once the construction phase was complete, we each divided and conquered the report and powerpoint. Recognizing each member strengths and weaknesses was key to the success of this project.

Another issue I faced was that I do not work well with teams. I personally like having control over my own work and completing the task at hand on my own. I struggled with the urge to micromanage. I have learned to trust and let other team members complete tasks and not carry the weight of a project on my own. I have also learned that there is more than one way to complete a task. I learned very quickly to take other team members inputs into consideration and work collectively as a group.

Lastly, this course has also taught me the importance of engineering ethics. Engineering ethics played a large role in the design of our project. The design of this project was based around similar ideas of other existing control panels. In this project we proposed to take a basic control panel that is currently in use and replace some of the components with more updated and technological advanced components. Knowing this, we had to make sure we were giving credit to each source that we were getting ideas from. Another ethical portion of this project was making sure that our scope would benefit a customer. The whole purpose of this project was to design a panel that is more

beneficial for an installer/ service provider and more cost effective for a homeowner. We didn't want to design something that would cost a homeowner more money in the long run. The proposal of this panel is based around saving service providers time and money when installing and servicing, as well as saving a homeowner money in the long run.

Overall, throughout the course of the project I feel as though I gained a lot as a leader. I feel I was a lot stronger of a leader for my team and was more successful as well than in the previous semester. From helping my teams to understand the scope of the project while ensuring each member was understanding the logic behind each aspect, distributing tasks evenly so that due dates were met and each person had equal contribution, and making sure tasks were fully completed, I learned how to work with people of different work ethics and to make the most out of each members skills. I strongly feel that collectively as a team, we were able to successfully put our heads together and design and build a fully functional panel that could be used in a real-world application. The panel not only was fully functional but was also cost effective and more user friendly for both homeowners and service providers.

Brian Meermans

Professor Drigel

Senior Design

May 7, 2020

Reflective essay

Senior design has definitely opened my eyes and helped structure how much work goes into making a quality project happen in a timely manner. Project management class helped lay the groundwork to completing this project. Our project with ecological tanks was less of a mechanical engineering project and more of an electrical engineering project. This was a little out of my comfort zone because I didn't really have the knowledge of electrical outside of my dc circuits class and my 191 physics class, but with engineering I have learned to be used to being out of my comfort zone and kinda like the feeling I get from it. This class made me think critically to evaluate a problem and find a solution with my knowledge from my past engineering courses taken at Miami. Most engineering classes have complex problems but do not have these open ended problems and give use to work on real work problems. This was really exciting to do. With most classes they are just a small part of a problem to understand the concept and understand the material. But this class brings it all together.

My Team members are Christian Guffey and Cameron Calhoun, We completed the task at hand with minor hiccups. As a whole I think we did a great job. The general skills of computers, theory, and electronics were very good with this group. We all had good knowledge on most but if we were confused or stuck we had a great company to help us with questions.

Christian was a great partner; he was our project manager and was our main connection to ecological tanks. He was a very reliable team member and didn't have to be asked or reminded to do his work. Christian and I worked very well together and made great progress on the project working together. His background knowledge of the project while working in the field with it was vital to how smooth this project went and was completed for this first semester of 497 and will be an easy transition to 498 in the spring. Christian did quality work and in a timely manner.

Cameron Calhoun was the second group member. Cameron did a better job this semester keeping up with the journals and worked on the presentation poster for the extra credit. He was more responsive this semester than last asking questions when he wasn't sure on things.

Cameron Calhoun

ENT 498 Senior Design Reflective Essay

Professor Gary Drigel

ENT 498 Senior Design was a positive learning experience for me. This course makes you use your entire collection of knowledge gained throughout your time in the Engineering program. Students are required to use calculations for design, establish communication between group

members and their professor, manage time to have their project completed before their deadline, and also be ready and able to present their project to an audience of their peers. The way this course is setup and executed is a good way for students to culminate everything they have learned as engineers and put it all into practice. Most of the paperwork was completed in ENT 497 such as our proposal, funding, and the beginning of our project report; so ENT 498 was more focused on acquiring all of our parts, assembling our control panel, and testing our panel to make sure all the components were working properly.

Before we acquired our parts to build the panel, we spent hours looking at wiring schematics and finding out the best way to wire our panel so that it could function as we needed it to. Having some experience in circuits and reading schematics helped with this task tremendously. During winter break we were able to acquire almost all the parts needed to assemble our panel so as soon as spring semester began, we were ready to build our panel. We were able to get our panel wired without any real problems to the system. This was a big step for us because with a properly working panel we could then incorporate the new components into the system. We did not have to solder any connections inside of our panel but that would not have been a difficult task thanks to our experience in labs throughout the curriculum. We then programmed our timer and pumpalarm to test the panel and make sure it was working to our specifications. I was personally in charge of programming the timer which was simple due to the ease of use and LED display on the timer itself. The technical side of this senior design course definitely helped polish my skills as an engineer before going into the industry. I am a firm believer that having that technical experience will help not only me, but all students get ahead in the field.

Working in a group can sometimes be difficult and stressful but I think my groupmates and I were able to work well together and make sure we were making progress with every area of the project. We started a group message thread at the beginning of the year for ENT 497, so we kept that same group message thread for ENT 498. This let us keep in constant contact with one another and let each other know when we could meet as a group or even when we were working on the project. We did not have any character clashes within our group that made it hard for us to

communicate or work together which is huge in a group project. I feel like we were all able to get along and find some things in common with each other. We met as a group outside of the classroom a few times but with our google shared drive documents and message thread we only needed to meet when physically working on the panel. Since we had already purchased a poster for senior presentations, we decided that it would not hurt to go ahead and finish our visual aid for this project for extra credit.

Learning how to manage time and multiple different tasks while undergoing a project like this was very beneficial. Since this project was so labor intensive there would be no way to get it done without some sort of schedule or Gantt Chart to let you know if your project is on schedule. In this course we had to give weekly updates to Professor Drigel to let him know where we were in our project builds. This is the same thing we would do in the field but in that case, we would be reporting to some sort of boss or supervisor. I feel like my group was able to follow our Gantt Chart and stay on top of our timelines to get everything done in a timely manner.

The end of the year was a little different as far as time management due to the COVID-19 Pandemic that occurred during the spring semester. A stay at home order was passed by the governor of Ohio cancelling pretty much all school activities. Due to this we were unable to meet with our class and professor during this time and were forced to find new forms of communication with one another. We spent the last half of the semester meeting with our professor using Webex conferencing that was setup once a week. Luckily, we had already assembled and tested our panel before the virus so all we really needed to finish was our final presentation and our final poster. This pandemic was very inconvenient for the end of our semester because it actually cancelled our senior presentation day and we had to then use google meet to record our presentations and turn them in. It was different recording our presentation instead of actually presenting it because I was in my bedroom while trying to record and I was not used to presenting in that environment. Figuring out how to work and record our presentation with google meet was kind of troubling at first but we were able to figure it out and get our presentation recorded. ENT 498 was a completely positive experience for me and I would

definitely recommend that every engineering student at Miami pass through this course to test and polish their skills before being released into the world.