CTi

Smart Pump Control Panel User Manual (PMP-1)

Safety Instruction:

At the first step, please read this manual carefully and pay full attention to safety before start using our product. The instructions given in this manual are the safety instructions of the Smart Pump Control Panel (PMP-1). Electrical equipment needs to be installed, operated, serviced and maintained only by qualified person. No responsibility is assumed by CTi Smart Systems for any consequences arising out of the use of this material. A qualified person is one who has skills and knowledge related to the operation construction and installation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Please keep this manual in a safe place for future reference.

Before performing any modifications and operation on the module, be sure to read the manual carefully and confirm the safety.

CONDITIONS OF USE FOR THE PRODUCT

Please follow the wiring diagram for a safe installation. Make sure to shut off any external power supply before wiring. Please check all cables and connection before turn power off. Labels on each port of the module give details of equipment for safe operation. Please examine all labels carefully before installation.

- ⚠ Always use a properly rated voltage sensing device to confirm that all power is off.
- ⚠ Based on the device specification, follow check list after turn module on to be able confirmed module functionality is right.
- ⚠ Do not touch the terminals while the power is on. It may cause electric shocks or malfunctions.
- ⚠ Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.
- ⚠ All terminals should be inaccessible after installation.
- ⚠ WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- ⚠ Dispose of this product as an industrial waste.

1.0 Product Feature Overview:

The smart pump control panel (PMP-1) is a cellular-based programable control, monitor and protection device, it controls a single-phase pump operation based on water level, monitors pump health conditions by sending notifications in different error cases, protects the pump by locking the operation in case of having the same error for three consecutive times, and it keeps the user instantly updated with the system conditions through their cellular devices.

1.1 Applications:

- Storm water
- Sewage
- Rain water reuse

1.2 Features and benefits:

- Automatic pump operation based on water level.
- Automatic failure and error detection.
- Automatic pump locking in case of having an error for three consecutive times.
- Pump health monitoring.
- LCD display for the ease of understanding the operation.
- Able to measure voltage, current, power factor and power consumption.
- Detects sag and swell.
- Cellularly connected to the user cellular device to keep the user instantly updated with the system status.

1.2 Sequence of operation

At the beginning, three water level sensors must be installed. When the water level reaches the second sensor the pump starts operating (The pump will not work as long as the water level is lower than the second sensor). The pump operation will stop when the water level becomes lower than the first sensor. In case the pump didn't work, and the water level reached the third sensor the panel will send an error massage with a failure alarm. Figure 1.1 shows the sequence of operation. The panel keeps the user instantly updated with the system status, in which it sends the data to the nearest cellular tower, which transmits data to the control center of CTi smart systems, and the control center sends these data over cloud service to the user's cellular device. In case of high voltage or current, or low voltage or current the pump will restart operating for three times, and in the third time if the error continues to happen the pump operation will be locked. The panel will send an error notification to the user. The troubleshooting guide is specified in table 5.1.
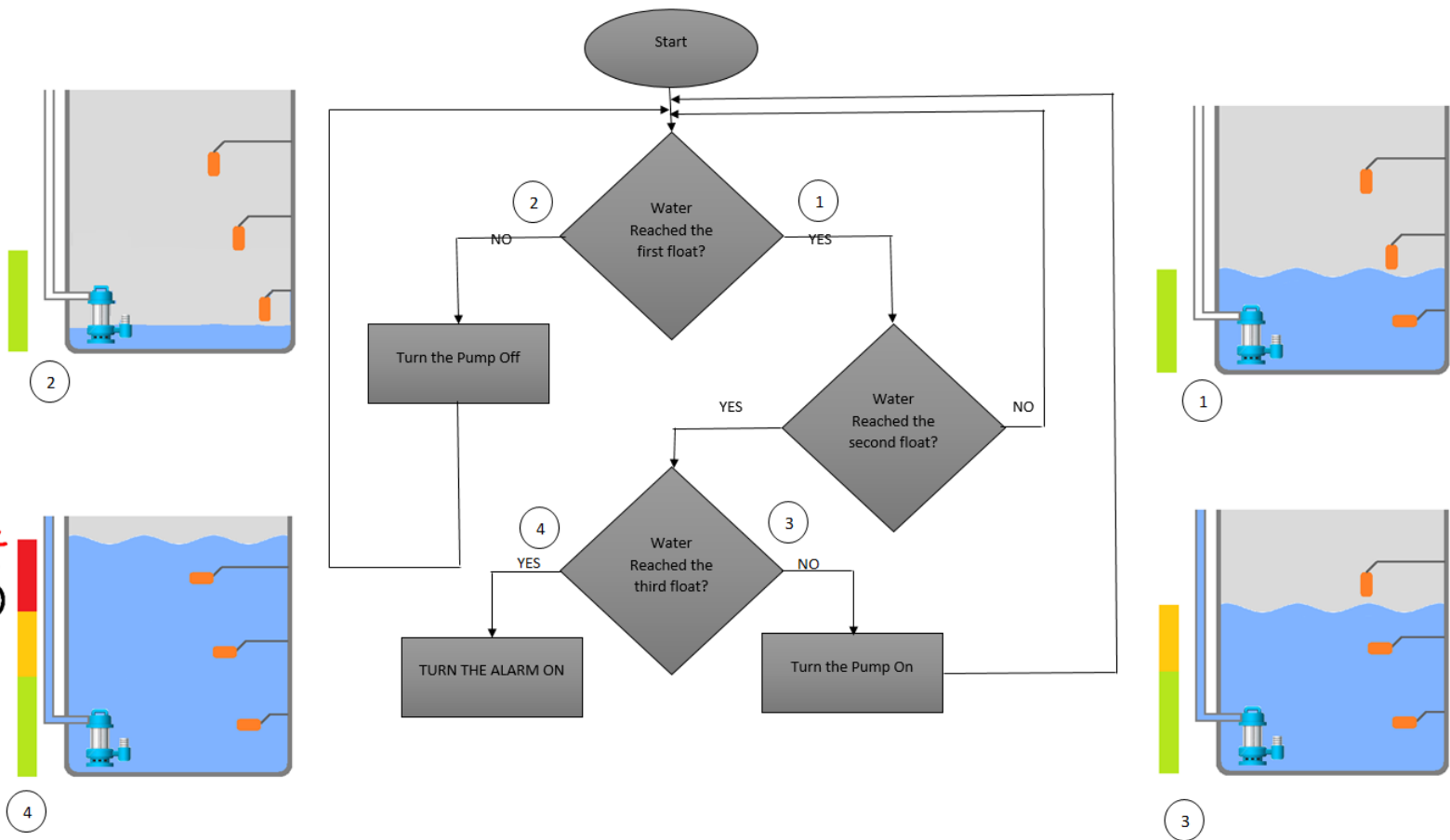
Fig 1.1.Sequance of operation flow chart

2.0 Technical and environmental Specifications:

Panel technical and environmental specifications are shown in table 2.1 and table 2.2

TABLE 2.1: TECHNICAL SPECIFICATIONS

Power Specification	
Rated Input Voltage	220-240V
Rated Input Current	30 A
Frequency	60 HZ
Network Specification	
Baud Rate	1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K,115.2K
Connection Interface/Physical Layer	RS-485, Half Duplex, Optical Isolated

TABLE 2.2: ENVIRONMENTAL SPECIFICATION

Operating Temperature	-40°C to +75°C
Storage Temperature	-40°C to +150°C
Standard	UL 508
Humidity Range	20 - 90% Relative Humidity
Dimension	**12.87*15.69*6.00**

3.0 Installation:

3.1 Safety instructions before installation:

⚠ Make sure to shut off the external power supply before start wiring.

⚠ Check all labels before turn power on.

⚠ Mount the product in appropriate visible place to be able easy monitoring.

⚠ Ground yourself and discharge any static charge.

⚠ Pay close attention to polarity marks and wiring colors.

3.2 Wiring Diagram

Figuers 3.1 and 3.2 show the internal connections of the panel and the input and output terminals .The gray terminal(H1-) is the motor CLS (Capasitive Leakage Sensor) terminal. Black, wight and red terminals are for motor connection .The green terminals are for the ground, and the black terminals (L1,L2) are the input power terminals . F1-,F2- and F3- are the float sensors terminals .
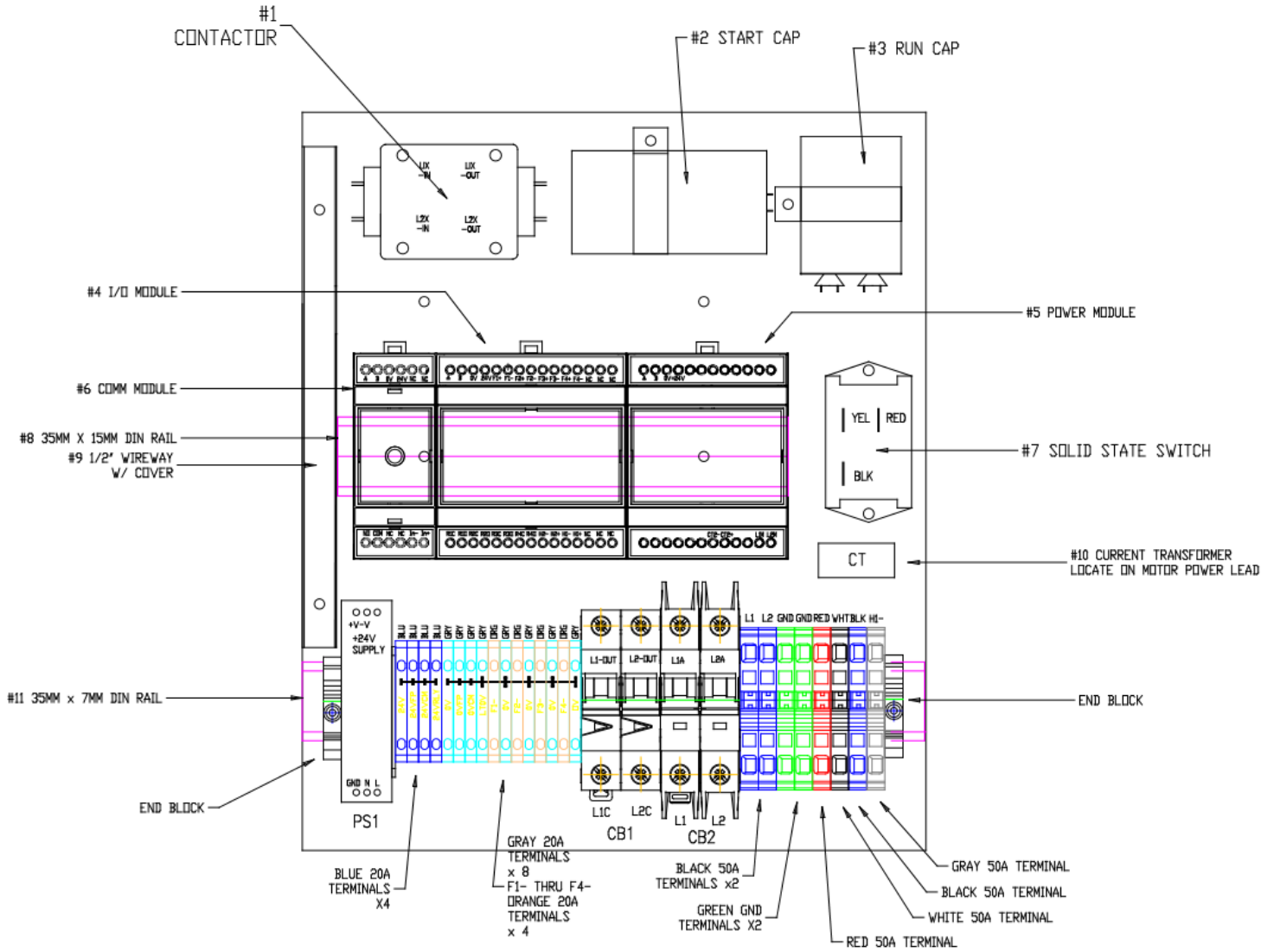
Fig.3.1 Panel Internal Components
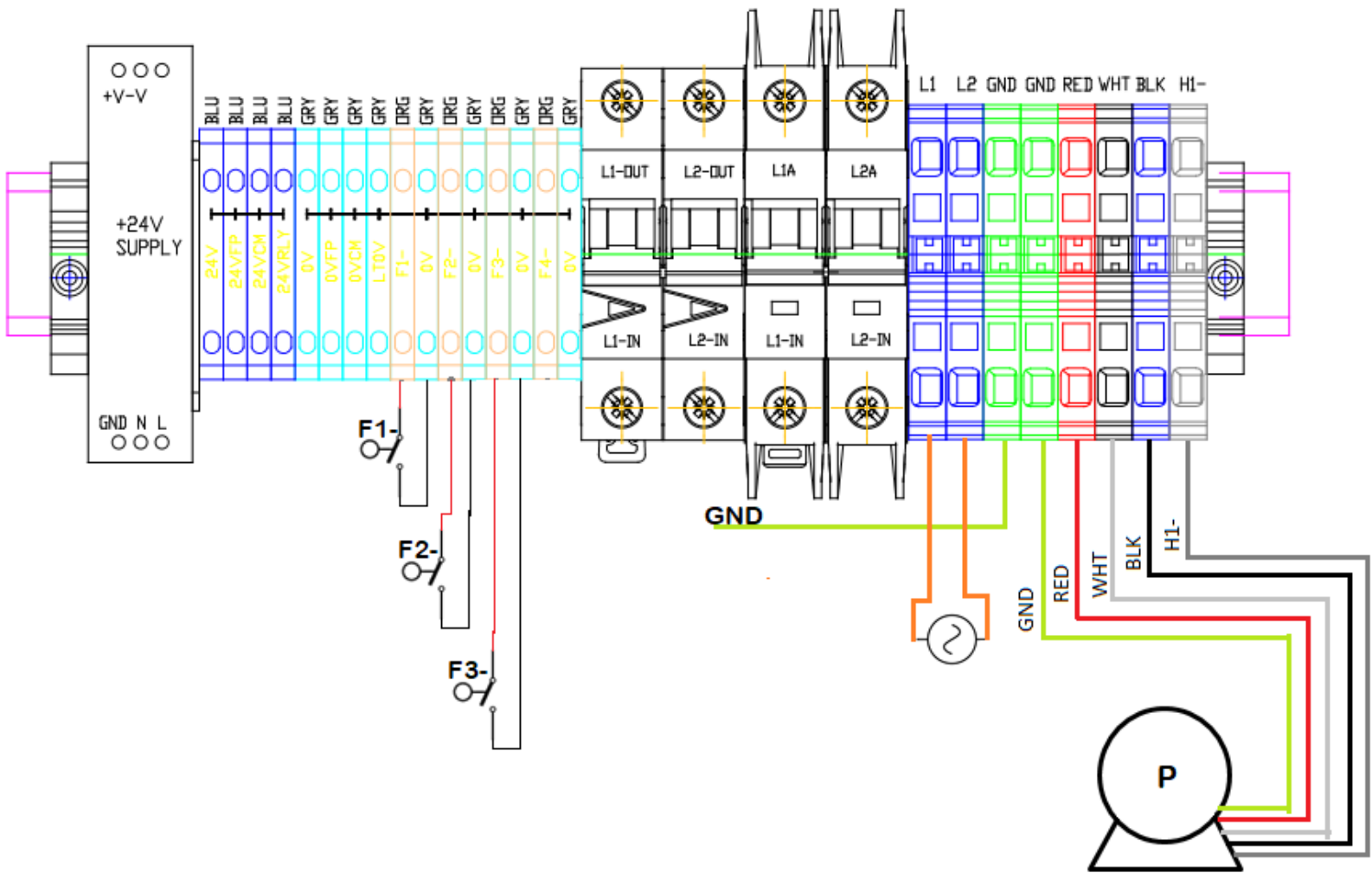
Fig.3.2 Panel Input and Output Terminals
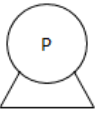
Symbol	Description
	Float Sensor (Normally Opened)
	Water Pump
	AC Power Source

Figure (3.3) shows the panel internal wiring diagram.
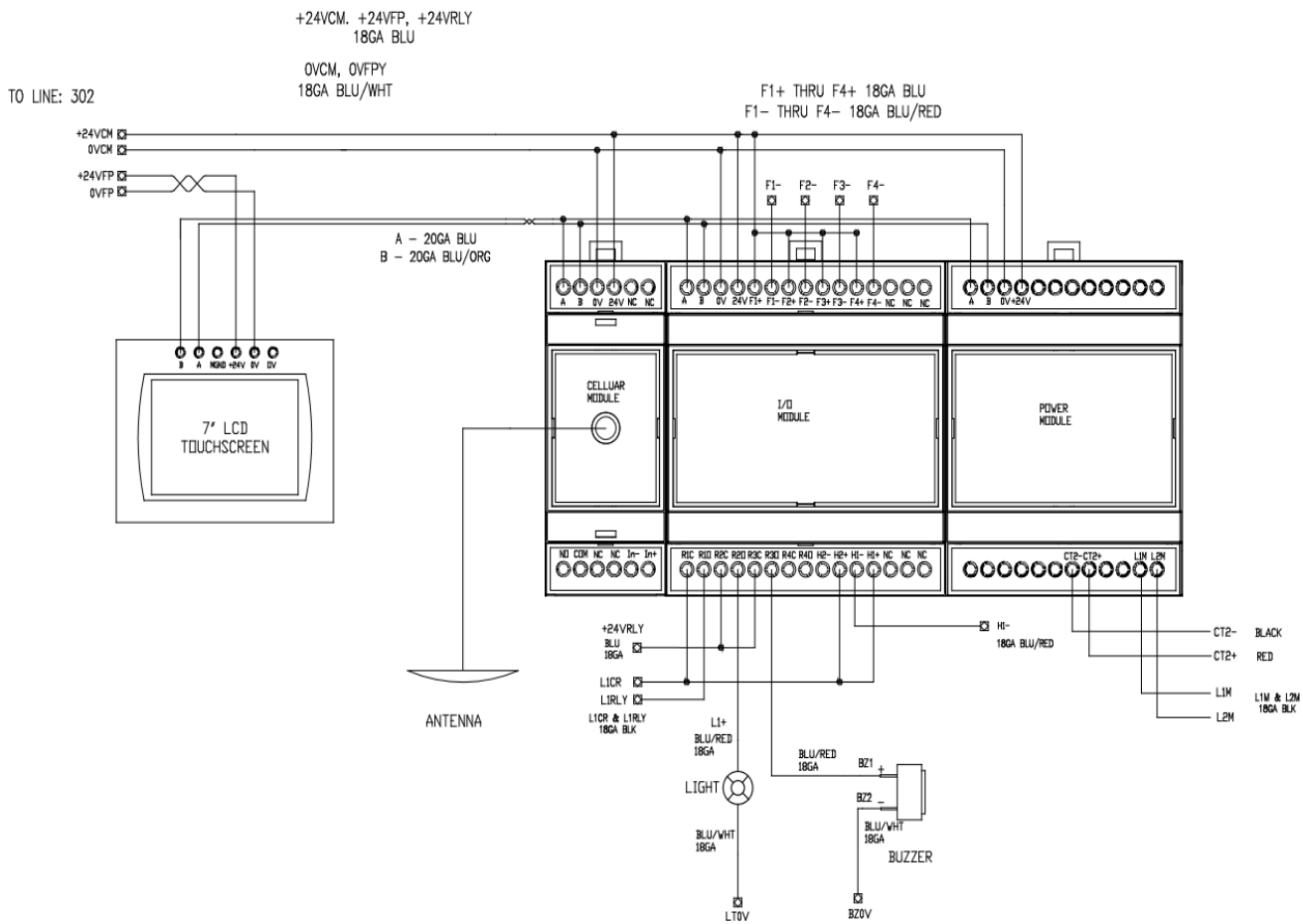
Fig.3.3 Internal Wiring Diagram

Figures 3.4, 3.5 and 3.6 show the dimensions of the control panel .
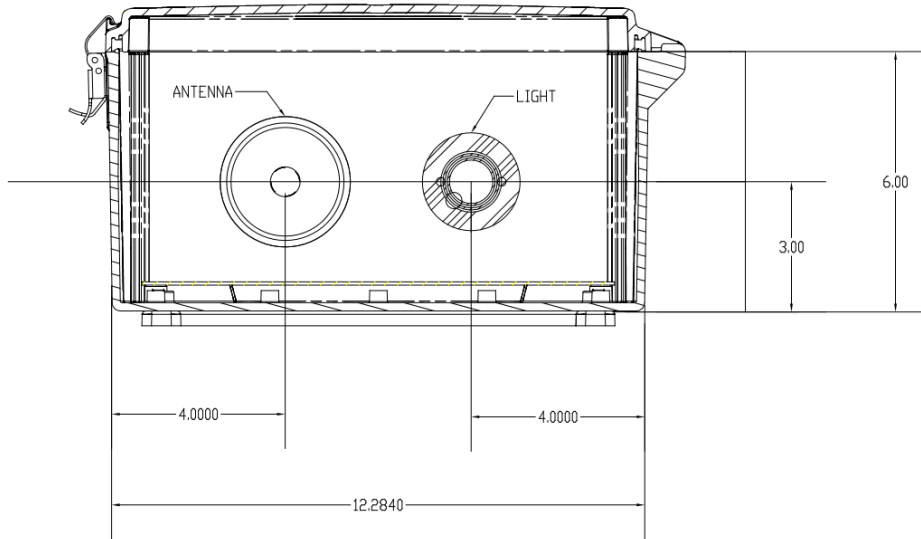
Fig 3.4 Panel Top View
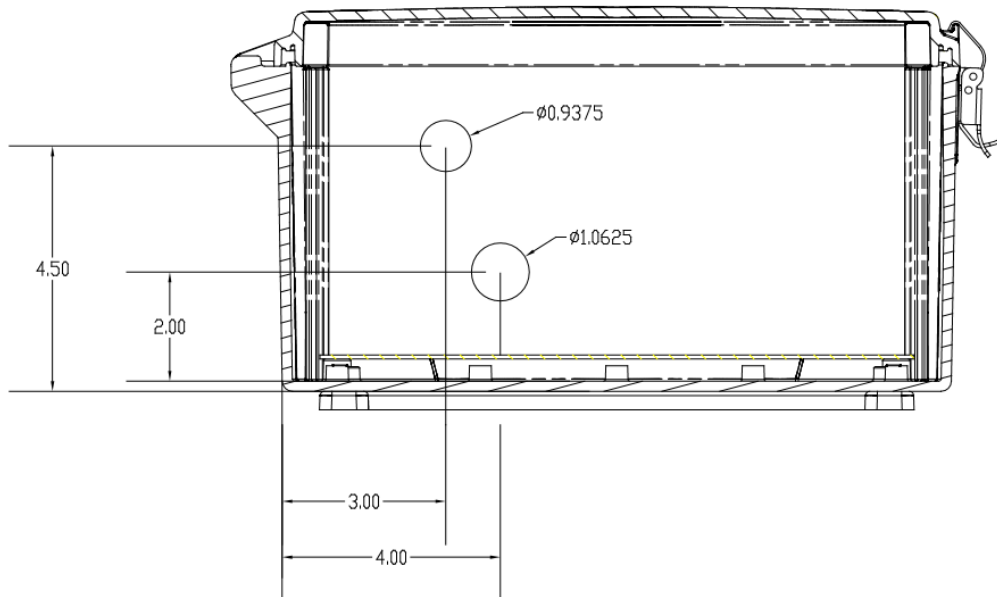
Fig3.5 Panel Bottom View
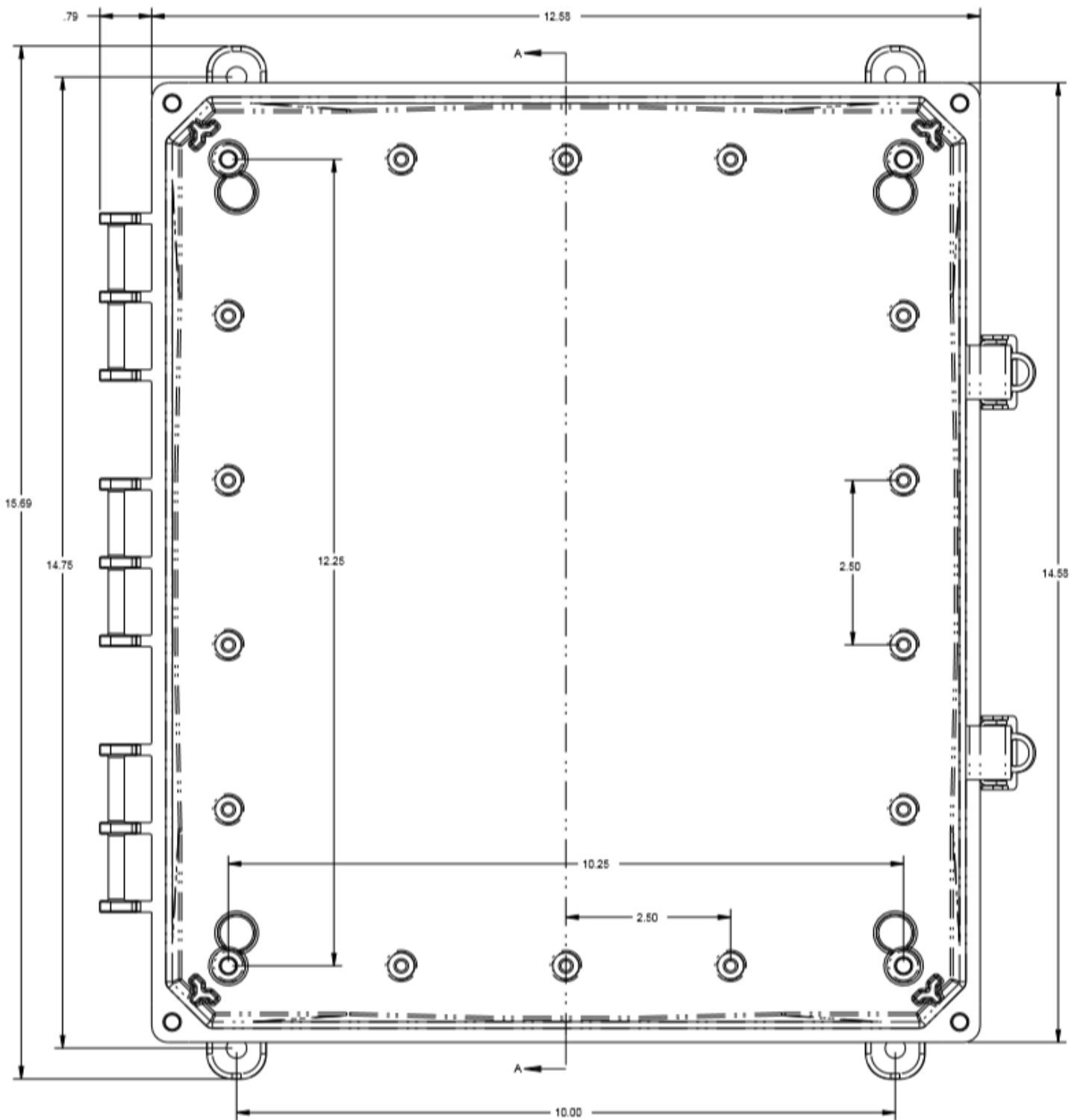
Fig.3.6 Panel Front View

4.0 Operation

The first thing that should be done after installation is the panel setup using its LCD. Figure 4.1 shows the panel LCD. Each screen has its own detailed explanation below.

Fig.4.1 The Panel LCD.
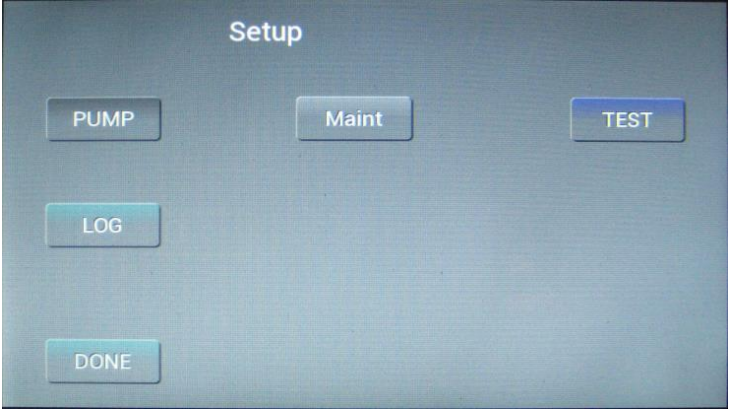
Boot Screen

The boot screen will be displayed while the system is doing its first initialization. The progress bar will be displayed and updated while the Display is being initialized.

Setup Screen

The setup screen is the main navigation screen for the system. The setup screen has four options which are shown and specified in table 4.1
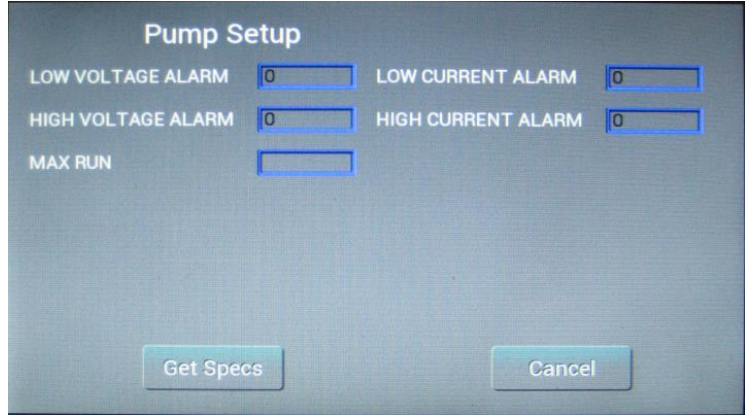
TABLE 4.1: SETUP SCREEN LIST

TEST	used to test the system hardware operation	
PUMP	Enter the pump information and operating parameters	
Maint	Perform system maintenance operations	
Done	Exit to the Main operating screen.	

Pump Screen

This screen is used to enter the pump information. Press any on the data fields to enter the information. When finished entering the pump information press save to update the information. Pressing Cancel will discard any changes. The pump screen, and a detailed explanation for the pump settings are shown in table 4.2.
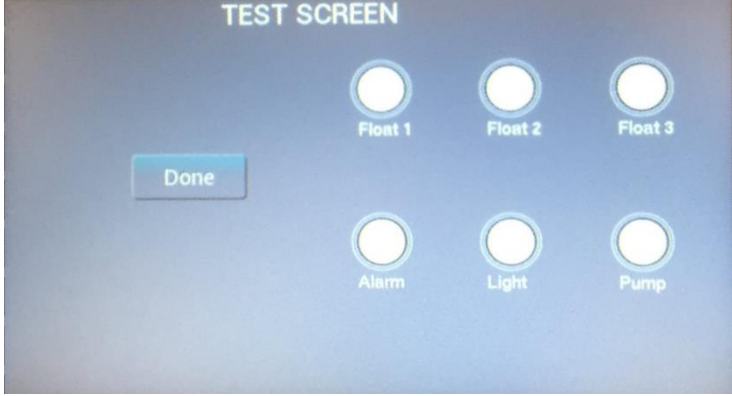
Low voltage alarm	Any voltage below this level will be regarded as an error	
High voltage alarm	Any voltage above this level will be regarded as an error	
Low current alarm	Any current below this level while the pump is operating will be regarded as an error.	**Pump Setup** LOW VOLTAGE ALARM [0] LOW CURRENT ALARM [0] HIGH VOLTAGE ALARM [0] HIGH CURRENT ALARM [0] MAX RUN [ ] Get Specs Cancel
High current alarm	Any current above this level while the pump is operating will be regarded as an error	
Max run	This is the maximum time the pump should run to empty the tank.	

Test Screen

This screen is used to test the system hardware during setup or maintenance. The float indicators show the status of the three level sensors. The pump, light and alarm indicators may be pressed to test those functions. Pressing the run button on the module will test the pump but will not update the status indicator on the main display. Table 4.3 shows the test screen with a detailed explanation of each icon use.
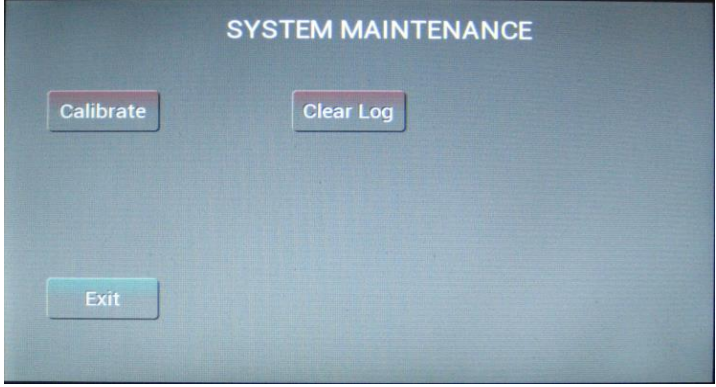
Float 1	Used to test the first level sensor	
Float 2	Used to test the second level sensor	
Float 3	Used to test the third level sensor	
Alarm	Used to test the failure alarm	
Light	Used to test the failure alarm light	
Pump	Used to test the pump operation	

Maintenance Screen

The maintenance screen is used to perform system maintenance. Calibrate is used when the touch screen needs adjustment. Clear log will clear the message log on the system. This is used to remove clutter on the main screen and will not change the log on the server. The maintenance screen is shown in table 4.4.
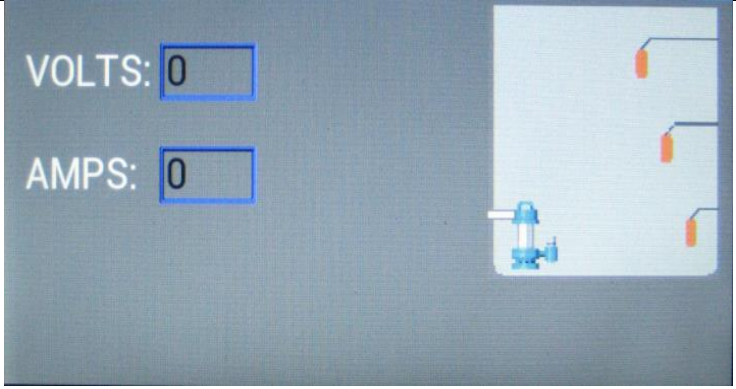
TABLE 4.4: SYSTEM MAINTENANCE SCREEN

Calibrate	Used to adjust the touch screen	
Clear Log	Used to clear the message log on the system	

This is the main operation screen of the system. When the fluid level reaches the second float the pump will turn on. The pump will run until the fluid level is below the first float. Should the fluid level reach the third flaot the alarm will sound and the light will turn on. Pressing the button on the bottom of the enclosue will silence the alarm.Should the operational voltage or current limits be exeded the unit will lock and display the lock icon.Table 4.5 shows the main pump screen.

TABLE 4.5: MAIN PUMP SCREEN

Volts	The Operational Voltage	
Amps	The Operational Amper	

5.0 Troubleshooting Guide

Table 5.1 shows the different fault cases, the problem in each case and the possible solutions. The fault massages mentioned in the table will appear as error notifications on the user's cellular device and on the panel screen. In the cases of the first four errors the pump will restart operation for three times, if the error has not disappeared the pump operation will be locked by the third time.

TABLE 5.1: TROUBLESHOOTING GUIDE.

Fault Massage	Problem	Possible solution
High Voltage	The running input voltage is higher than the permissible voltage.	Contact the power utility.
Low Voltage	The running input voltage is lower than the permissible voltage.	Contact the Power Utility.

High Current	The running pump current is higher than the permissible current	Check the pump
Low Current	The running pump current is lower than the permissible current	Check the pump
Pump locked	The Pump locked because one of the previously mentioned errors kept happening.	Try the previously mentioned possible solutions.
Max. Fluid Level	The water level reached the third sensor, which means that the pump isn't working for some reason.	Check the pump or the previously mentioned cases in case of having the pump locked too. To stop the alarm press on the push button on the bottom of the panel.

Appendix A

Modbus W-registers

Modbus Register	W-Register	module.h	IOM-44	IOM-66	IPM-3	CCM-2
0	40001					INTERFACE_OUTPUT_REGISTER
1	40002				IMP_3_CH1_VOLTAGE_REGISTER	INTERFACE_INPUT_REGISTER
2	40003				IMP_3_CH1_CURRENT_REGISTER	
3	40004		CTI_IOM_44_STATUS_REGISTER		IMP_3_CH1_POWER_REGISTER	INTERFACE_STATUS_REGISTER
4	40005		CTI_IOM_44_CMD_REGISTER		IMP_3_CH1_VA_REGISTER	INTERFACE_CMD_REGISTER
5	40006		CTI_IOM_44_LENGTH_REGISTER		IMP_3_CH1_PHASE_REGISTER	INTERFACE_LENGTH_REGISTER
6	40007		CTI_IOM_44_TRANSFER_REGISTER		IMP_3_CH1_FREQUENCY_REGISTER	INTERFACE_TRANSFER_REGISTER INTERFACE_RESPONSE_REGISTER
7	40008				IMP_3_CH1_WATT_HOURS_REGISTER	INTERFACE_TRANSFER_REGISTER
8	40009				IMP_3_CH2_VOLTAGE_REGISTER	—

9	40010				IMP_3_CH2_CURRENT_REGISTER	—
10	40011				IMP_3_CH2_POWER_REGISTER	—
11	40012				IMP_3_CH2_VA_REGISTER	—
12	40013				IMP_3_CH2_PHASE_REGISTER	—
13	40014				IMP_3_CH2_FREQUANCY_REGISTER	—
14	40015				IMP_3_CH2_WATT_HOURS_REGISTER	—
15	40016				IMP_3_TOTAL_WATT_HOURS	—
16	40017				IMP_3_TOTAL_VA_REGISTER	—
17	40018					—
18	40019					—
19	40020					—

20	40021				IMP_3_STATUS_REGISTER	—
21	40022				IMP_3_CMD_REGISTER	—
22	40023				IMP_3_CMD_ARG_REGISTER	—
23	40024				IMP_3_TRANSFER_REGISTER	—
24	40025				IMP_3_TRANSFER_REGISTER2	—
						INTERFACE_TRANSFER_REGISTER
100	40101	BAUD_RATE_ADDRESS	CTI_IOM_44_BAUD_RATE_ADDRESS		IMP_3_BAUD_RATE_ADDRESS	CTI_CCM_2_BAUD_RATE_ADDRESS
101	40102	WORD_LENGTH_ADDRESS	CTI_IOM_44_WORD_LENGTH_ADDRESS		IMP_3_WORD_LENGTH_ADDRESS	CTI_CCM_2_WORD_LENGTH_ADDRESS
102	40103	PARITY_ADDRESS	CTI_IOM_44_PARITY_ADDRESS		IMP_3_PARITY_ADDRESS	CTI_CCM_2_PARITY_ADDRESS

103	40104	STOP_BIT_ADDRESS	CTI_IOM_44_STOP_BIT_ADDRESS		IMP_3_STOP_BIT_ADDRESS	CTI_CCM_2_STOP_BIT_ADDRESS
104	40105	SLAVE_ADDRESS	CTI_IOM_44_SLAVE_ADDRESS		IMP_3_SLAVE_ADDRESS	CTI_CCM_2_SLAVE_ADDRESS
108	40109	MODEL_CODE_ADDRESS	CTI_IOM_44_MODEL_CODE_ADDRESS		IMP_3_MODEL_CODE_ADDRESS	CTI_CCM_2_MODEL_CODE_ADDRESS
109	40110	HARDWARE_REV_ADDRESS	CTI_IOM_44_HARDWARE_REV_ADDRESS		IMP_3_HARDWARE_REV_ADDRESS	CTI_CCM_2_HARDWARE_REV_ADDRESS
110	40111	SOFTWARE_VER_ADDRESS	CTI_IOM_44_SOFTWARE_VER_ADDRESS		IMP_3_SOFTWARE_VER_ADDRESS	CTI_CCM_2_SOFTWARE_VER_ADDRESS
114	40115	W_REGISTER_COUNT_ADDRESS	CTI_IOM_44_W_REGISTER_COUNT_ADDRESS		IMP_3_W_REGISTER_CNT_ADDRESS	CTI_CCM_2_W_REGISTER_CNT_ADDRESS
115	40116	B_COIL_COUNT_ADDRESS	CTI_IOM_44_B_COIL_COUNT_ADDRESS		IMP_3_B_COIL_CNT_ADDRESS	CTI_CCM_2_B_COIL_CNT_ADDRESS
116	40117	SPECIAL_FUNCTION_ADDRESS	CTI_IOM_44_MODE_INPUT1_ADDRESS			
117	40118		CTI_IOM_44_MODE_INPUT2_ADDRESS			

118	40119		CTI_IOM_44_MODE_INPUT3_ADDRESS			
119	40120		CTI_IOM_44_MODE_INPUT4_ADDRESS			

EE Address	0	1	2	3	4	5
Keen Pump I/O	BAUD_OFFSET	BAUD_OFFSET	BAUD_OFFSET	BAUD_OFFSET	WORD_OFFSET	PARITY_OFFSET
IPM-3	BAUD_OFFSET	BAUD_OFFSET	BAUD_OFFSET	BAUD_OFFSET	WORD_OFFSET	PARITY_OFFSET
CCM-2	BAUD_OFFSET	BAUD_OFFSET	BAUD_OFFSET	BAUD_OFFSET	WORD_OFFSET	PARITY_OFFSET

6	STOP_OFF SET	STOP_OFF SET	STOP_OFF SET
7	SLAVE_ID _OFFSET	SLAVE_ID _OFFSET	SLAVE_ID _OFFSET
8			
9			
10	PUMP_LOW _VOLTAGE _OFFSET	CAL_V1_O FFSET	
11	PUMP_LOW _VOLTAGE _OFFSET	CAL_V1_O FFSET	
12	PUMP_HIG H_VOLTAG E_OFFSET	CAL_C1_O FFSET	
13	PUMP_HIG H_VOLTAG E_OFFSET	CAL_C1_O FFSET	
14	PUMP_LOW _CURRENT _OFFSET	CAL_V2_O FFSET	
15	PUMP_LOW _CURRENT _OFFSET	CAL_V2_O FFSET	
16	PUMP_HIG H_CURREN T_OFFSET	CAL_C2_O FFSET	

17	PUMP_HIGH_CURRENT_OFFSET	CAL_C2_OFFSET	
18	PUMP_MIN_RUN_OFF_SET		
19	PUMP_MIN_RUN_OFF_SET		
20	PUMP_MAX_RUN_OFF_SET		
21	PUMP_MAX_RUN_OFF_SET		