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Fuel Maintenance System – Basic Controller Instruction & Operation Manual

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IOM – Instruction Manual.pdf
Basic Controller FMS Assembly

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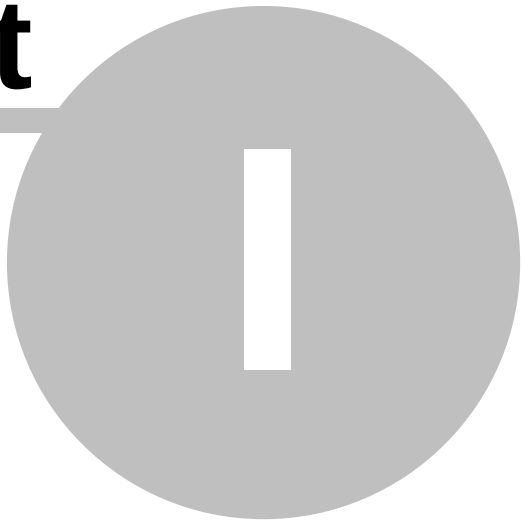

1 Introduction

1.1 Welcome

There are two types of safety instructions throughout this manual:

- A note will draw attention to a particular condition or fact, or give information on a subject
- Warnings caution about conditions which may result in serious injury or death and/or damage to the equipment. They also tell you how to avoid the danger. The warning symbols are used as follows:

Dangerous voltage warning warns of high voltage which can cause physical injury and/or damage to the equipment.

General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.

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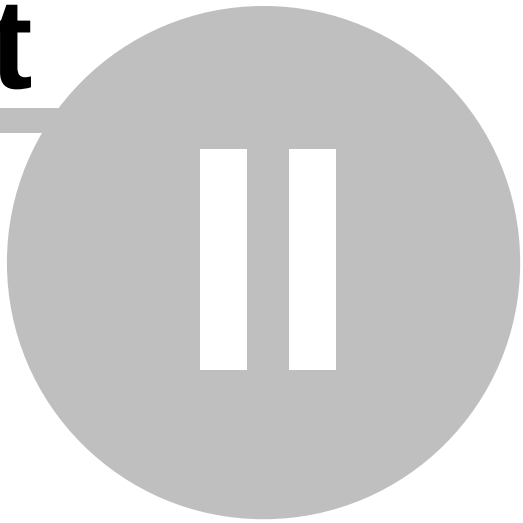
Part



2 General

2.1 Overview

How often you will need to run the ACS Fuel maintenance system for your storage tank will depend on the condition of the existing fuel in your storage tank and the frequency that new fuel is added to the tank. Normal operation with a 3 gpm system is 8 hrs per week on a 5000 gallon tank. We recommend filtering at least 25% of the tank volume per week.

Depending on the condition of the existing fuel in your storage tank, you may be changing the replaceable filter in the system more frequently than expected. This condition will clear up as the fuel is filtered and the load of initial contaminants is removed by the system.

In cases of severe fuel contamination, it is recommended that your stored fuel be polished prior to the initial use of the ACS system. Although the ACS system is primarily designed to keep clean fuel clean through regularly programmed use, it will clean up heavily contaminated fuel but will require greater than normal filter changes and maintenance attention for the period of time needed to remove the initial contamination.

The ACS Fuel Maintenance system uses a multi-stage filtering and water removal process. It has a 7 day programmable PLC/HMI with an EEPROM memory backup which operates from a 120 Volt AC power source. Pressure sensor switches, a vacuum sensor switch, leak detector and water sensors will automatically turn the system off, and turn on individual red indicator lights to note conditions which require maintenance or filter changes. There are two dry contacts included in the control logic for customer interface. One is to allow remote indication of a general alarm condition and the other to indicate when the pump is running.

Standard on the touchscreen control system and optional on the basic control system is MODBUS (RS-485) serial and Ethernet TCP/IP Communication. The following items are available for monitoring through the communication system:

Address	Description	Value	Type
40017	Remote Alarm Silence 33	Word	Read / Write
40021	Controller Input Status 33	Word	Read
40022	Controller Output Status 34	Word	Read
40023	Alarm Code 35 (see Alarm History 22 for code values)	Word	Read
40024	Pump Operation Status 35	Word	Read
40033	Controller Time Clock: Seconds / Week day	Byte / Byte	Read / Write
40034	Controller Time Clock: Hours / Minutes	Byte / Byte	Read / Write
40035	Controller Time Clock: Month / Day/month	Byte / Byte	Read / Write
40036	Controller Time Clock: Century / Year	Byte / Byte	Read / Write

2.2 Installation Notes

1. The ACS Fuel Maintenance system will operate on all fuel storage tanks. A qualified plumbing contractor and a qualified electrical contractor should complete all installations.
2. Regardless of the method of mounting, the unit should be bolted into place.
3. The installation site must have an electrical supply available, rated for 120VAC / 20A / 1-Phase minimum.
4. Pipe caps are installed on the supply and return lines for shipping purposes, and must be removed prior to installation.
5. A hole and conduit connector will need to be added in the filter cabinet for the electrical supply.
6. Ball valves must be installed at the Fuel Maintenance System Cabinet, in the fuel supply and tank return lines, to allow the cabinet to be isolated during servicing. Two 316 SS full ported ball valves are recommended.
7. The filter cabinet supply line should be installed at the sump end of the storage tank 1 inch from the bottom, and piped using 3/4 inch black pipe. A foot valve should be installed at the tank to keep the filter system pump primed.
8. A 3/4 inch black pipe fuel return line should be installed from the filter cabinet to return fuel to the opposite end of the fuel storage tank.
9. Caution should be taken not to exceed the 15 foot suction lift capacity of the filter circulation pump.
10. The system pump is not self priming, therefore a priming port is provided on the filter unit to allow priming the filters and circulation pump before start up. Close the tank return ball valve before priming. Open the tank return ball valve when priming is completed.
11. Do NOT run the pump longer than 2 minutes without fluid.
12. If filling the system filters and pump through the priming ports fails, fill the entire filter system and fuel supply line with fuel and re-start the system.

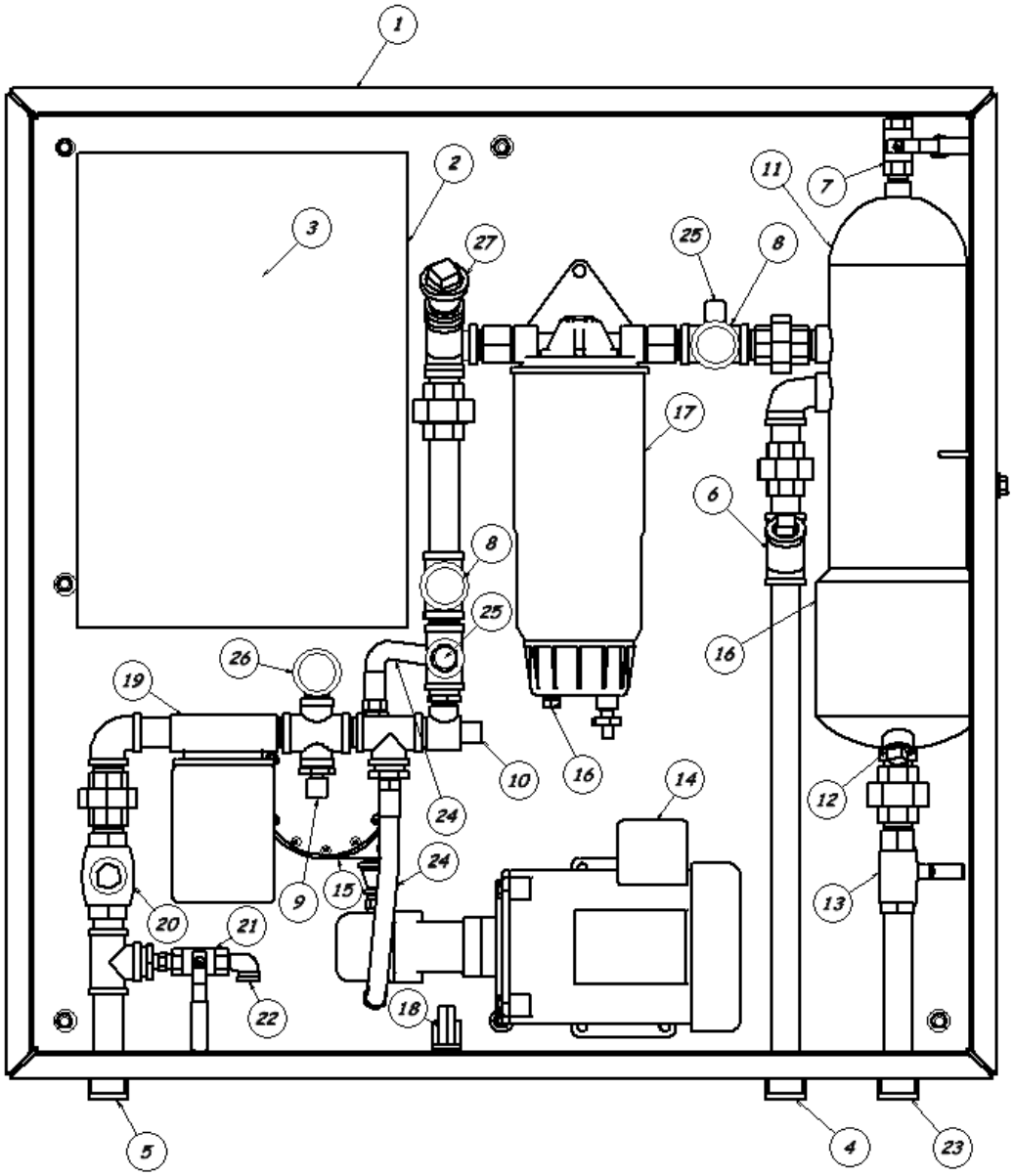
NOTE: For details on how to start the system, reference the System Operation 12 section located in this manual.

2.3 Start Up Procedure

1. Assure pump and filter system is primed with fuel. The system pump is not self priming. See installation note on priming the system.
2. Assure system supply and return valves are open.
3. Power up system and turn the Hand / Off / Auto switch to "Hand".
4. The pump will start and fuel should start circulating.
5. If there is no indication that fuel is circulating within 2 minutes, turn system selector switch to "Off" and re-prime the pump and filters. For long supply pipe runs, the supply piping may need to be filled with fuel as well.
6. Once the system is circulating fuel, check for leaks. Although, the system has been tested for leaks before shipping, the piping in the filter unit is rigidly connected and looseness in a connection could develop during shipping.
7. Tighten any loose connections.
8. After this initial start up, turn the Hand / Off / Auto switch to "Auto" to allow the unit to operate on its programmed time schedule.

2.4 Part Identification

2.4.1 Cabinet Assembly



2.4.2 Parts List

PARTS LIST	
ITEM	DESCRIPTION
1	BOX - 36" X 36" X 12"
2	FUEL MAINTENANCE CONTROLLER - (U.L. 508A)
3	6" TOUCH SCREEN PLC-HMI (Optional)
4	FUEL IN - 3/4" FNPT
5	FUEL OUT - 3/4" FNPT
6	"Y" STRAINER
7	PURGE VENT BALL VALVE
8	VACUUM GAUGE
9	PRESSURE SWITCH
10	PRESSURE RELIEF VALVE
11	WATER & PARTICULATE SEPARATOR, COALESCING
12	HEATER PORT - (HEATER NOT INCLUDED)
13	WATER FILTER DRAIN BALL VALVE
14	1/3 H.P. MOTOR W/ 3.0 G.P.M. PUMP
15	MAGNETIC FUEL CONDITIONER
16	WATER SENSOR
17	SECONDARY WATER REMOVAL SEPARATOR
18	FUEL LEAK SENSOR
19	2 MICRON FINAL PARTICULATE FILTER
20	VERTICAL CHECK VALVE
21	FUEL TEST SAMPLE BALL VALVE
22	FUEL TEST SAMPLE DISCHARGE
23	WATER FILTER DRAIN - 1/2" FNPT
24	FLEX HOSE
25	VACUUM SWITCH
26	PRESSURE GAUGE
27	1" FNPT PUMP PRIMING PORT

2.5 System Operation

The Fuel Maintenance System is equipped with three modes of operation. Each mode is dependent upon the position of the HAND / OFF / AUTO switch provided on the control panel. This switch may be referred to as the HOA switch in other sections of this manual. Detailed information pertaining to each mode can be found under HAND 12 and AUTO 12 modes.

2.5.1 Hand Mode

The "HAND" mode of operation allows the operator to directly control when the pump is turned on and off, by toggling the switch between the "HAND" and "OFF" positions.

Position	Pump Status
OFF	De-energized (off)
HAND	Energized (on)

2.5.2 Auto Mode

The "AUTO" mode of operation allows the operator to control the Fuel Maintenance System based on a configurable time / date schedule. To operate the system automatically, turn the switch to the AUTO position.

Position	Pump Status
OFF	De-energized (off)
AUTO	Time / Date Schedule

The internal time clock function will control the pump operation based on the schedule in the controller, along with monitoring the system safeties and generator status.

WARNING! Caution should be applied when operating the Fuel Maintenance System in the automatic mode. Safety sensors have been installed to minimize the risk of damage to equipment. Routine maintenance and observation is required to keep your system in proper operating condition.

2.5.3 Acknowledging Events

If an alarm condition is active or the generator is running, the controller will disable the pump operation until the condition has returned to a safe mode. Red indicator lights are included on the front of the control panel for visual indication of each alarm condition. A detailed alarm / event condition is displayed on the controller screen to help diagnose each event. For additional information pertaining to alarm status 19 and available screens 17 reference the corresponding sections of this manual.

2.5.3.1 Power On Pilot Light

The white, power on, pilot light is included to provide visual indication power is available to the controller.

NOTE: It is possible to have power to the controller and the system not operate. If this is experienced, verify the controller program is running by visually looking on the controller I/O Status 24 screen to confirm the controller is displaying RUN, not STOP.

2.5.3.2 Pump Running Pilot Light

The green, pump running, pilot light is included to provide visual indication the controller output is enabled and the pump should be running.

NOTE: It is possible the green light can be ON but the pump not be running. Internal thermal safeties, in the motor housing, my have tripped causing the motor to stop running. If the motor housing is physically hot, place the switch in the OFF position and allow the motor to cool before attempting to re-start.

2.5.3.3 High Vacuum Pilot Light

The red, high vacuum in separator, pilot light is included to provide visual indication one or both separator filters are clogged. For more detail on cleaning the filter reference the section for cleaning the Separator 14 or Y Strainer 14.

2.5.3.4 High Pressure Pilot Light

The red, high pressure filter alarm, pilot light is included to provide visual indication a filters is clogged. For more detail on changing the spin on final filter reference the section for changing spin on filter. 15

2.5.3.5 High Water Pilot Light

The red, high water in separator, pilot light is included to provide visual indication one or both separator filters are full. For more detail on draining the filter reference the section for draining the water separator 14.

2.5.3.6 Leak Detected Pilot Light

The red, leak detected in basin, pilot light is included to provide visual indication liquid has collected in the containment area of the Fuel System cabinet. This liquid may be fuel, water or a combination of both. This material may be hazardous to the environment and should be disposed of according to your environmental regulatory procedures.

DANGER! Extreme caution should be applied when liquids can come into contact with electrical equipment. Death or injury may result if proper safety procedures are not followed when working in this type of environment.

If you are not comfortable with working in this environment, do not attempt to resolve this condition. Instead contact certified personnel for assistance.

Steps for draining the filter cabinet:

- Place the HOA switch in the OFF position.

- Disable all electrical power supplied to the Fuel Maintenance System before attempting to drain or remove any accumulated liquids in the base of the cabinet.
- Drain the liquid from the bottom of the filter cabinet.
- Re-apply the electrical supply power to the filter cabinet
- Place the HOA switch in the HAND position to check for leaks inside the filter cabinet.
- If a leak is found, close the supply and return ball valves to isolate the maintenance system cabinet from the supply tank.
- Repair the leak and remove any additional fuel from the bottom of the cabinet.
- Place the HOA switch in the desired position to return the system to normal operation.

2.6 Filter Maintenance

2.6.1 Cleaning The "Y" Strainer

To clean the "Y" strainer, turn the HOA switch to Off, to disable the motor/pump. Close the supply and return ball valves to isolate the filter cabinet from the fuel supply tank. On the "Y" strainer, remove the cover on the 'Y' branch of the strainer and remove the internal screen. Clean the screen and replace it in the strainer housing. Open the supply and tank return valves and turn the HOA switch to Hand or Auto position and check for leaks.

2.6.2 Cleaning The Coale Separator

To clean the separator, turn the HOA switch to Off, to disable the motor/pump. Close the supply and return ball valves to isolate the filter cabinet from the fuel supply tank. Place a collection container under the drain valve outlet on the separator . Open the drain valve on the bottom of the separator and the purge valve on the top. Blow a jet of compressed air into the purge valve to clear the separator. Close the purge and drain valves on the separator. Open the supply and tank return valves and turn the HOA switch to Hand or Auto position and check for leaks.

2.6.3 Draining Water Separator

To remove water from either the Coale or Racor water separators, turn HOA switch to OFF, then open the drain valve on the bottom of the separator unit and the vent valve on the top of the unit. Allow accumulated water to drain into a collection container. Close the drain valve when fuel appears in the liquid being drained, and the vent valve when finished draining.

2.6.4 Changing Racor Water Separator

<u>To replace the Filter in the Racor water separator with the clear bowl:</u>

1. Turn the HOA Switch to "Off"
2. Disconnect the high water probe.
3. Open vent plug on mounting head with straight slot screwdriver
4. Remove the old filter:
    - Close the supply and return ball valves at the ACS Fuel Maintenance unit
    - Open the drain valve on the bottom of the sight bowl on the separator filter and drain the fuel
    - Turn the bowl and filter (together) counter clockwise and remove them from the mounting head
5. Install the new filter:
    - Remove the sight bowl from the old filter by turning the bowl counter clockwise
    - Clean the sight bowl and water sensor probe
    - Install a new gasket onto the sight bowl after lubricating it with clean fuel,
    - Turn the sight bowl clockwise on the new filter and hand tighten .
    - Fill new filter with fuel

- Lubricate the rubber seal on top of the new filter with clean fuel and turn the filter clockwise on the mounting threads until it makes contact with the filter housing. Then finish tighten by turning ½ to ¾ of a turn more. **DO NOT OVER TIGHTEN.**
- Reinstall vent plug on filter mounting head with straight slot screwdriver.
- Open the fuel supply and return ball valves
- Start the system and check for leaks

6. Reconnect high water probe and turn the HOA switch to Auto or Hand to check for leaks .

2.6.5 Changing The Spin On Filter

To remove the spin on filter, turn the HOA switch to OFF and close the fuel supply and return ball valves to isolate the filter. Turn the body of the filter counter clockwise and remove the filter. Install a new spin on filter and turn it clockwise until hand tight. Open the Fuel Maintenance unit fuel supply and return ball valves. Turn the HOA switch to HAND (on) or AUTO and check for leaks.

2.7 Replacement Filter List

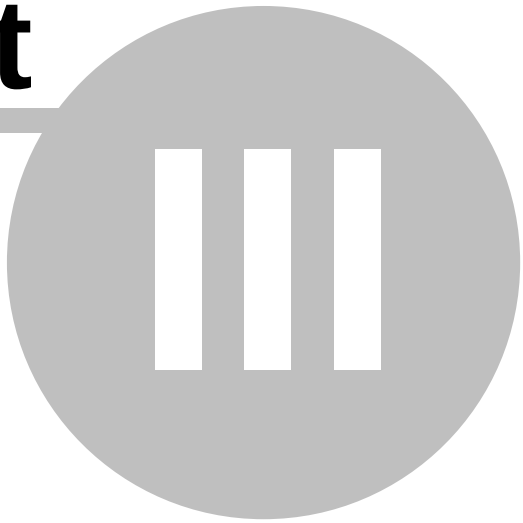
2.7.1 Separator Filter List

Filter No.	Description
S36S	2 Micron
S36T	10 Micron
S36P	30 Micron

2.7.2 Spin-on Filter List

Filter No.	Description
70806	2 Micron
70026	10 Micron
70059	10 Micron Hydrosorb

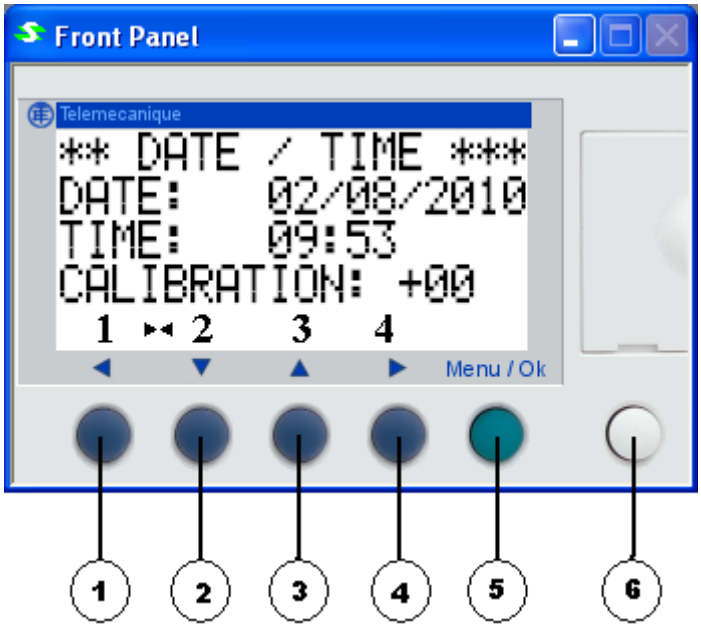
Part



3 Display Screens

3.1 Button Definition

The controller is provided with multiple buttons on the face. The buttons are configured for different functions based on which screen is active. The buttons might be referenced by their arrow direction or the button number throughout this manual.



Item	Description
1	Left arrow or Button 1
2	Down arrow or Button 2
3	Up arrow or Button 3
4	Right arrow or Button 4
5	Menu / OK
6	*Unused*

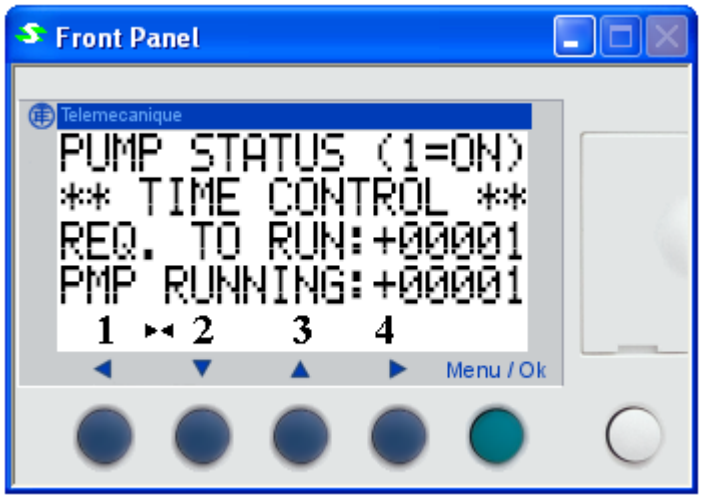
3.2 Screen Navigation

To navigate from one screen to the next press button 4. A total of 10 different screens are provided for monitoring or operating the controller. The following screens are available to the operator in the listed order. After the last screen has been displayed the program will loop back to the first screen.

Screen Number	Screen Name
1	Pump Status 18
2	Vacuum Alarm Status 19
3	High Water Alarm Status 19
4	High Pressure Alarm Status 20
5	Misc. Alarm Status (Sump / Leak) 20
6	Misc. Alarm Status (Level / Gen.) 21
7	Alarm History 22
8	Current Date / Time 23
9	Lamp Test 24
10	Input / Output Status 24

3.3 Pump Status

The pump status screen allows the operator to view the request to run and running status of the pump. A value of "+00001" defines the pump as requested or running and a value of "+00000" defines the off state. Each controller is provided with a relay/contactor for the pump. The pump is controlled, in automatic, by the internal time clock operations defined by the operator. The "Req. To Run" value is defined by the controller output to the relay/contactor. The "PMP Running" value is defined by the contactor feedback input confirming the relay/contactor has engaged.



NOTE: If the REQ. TO RUN is ON and the PMP RUNNING is OFF check the breaker protecting the motor, or verify the motor is not physically hot. If the motor housing is hot the thermal safeties in the motor may have tripped and will require time to cool before automatically resetting.

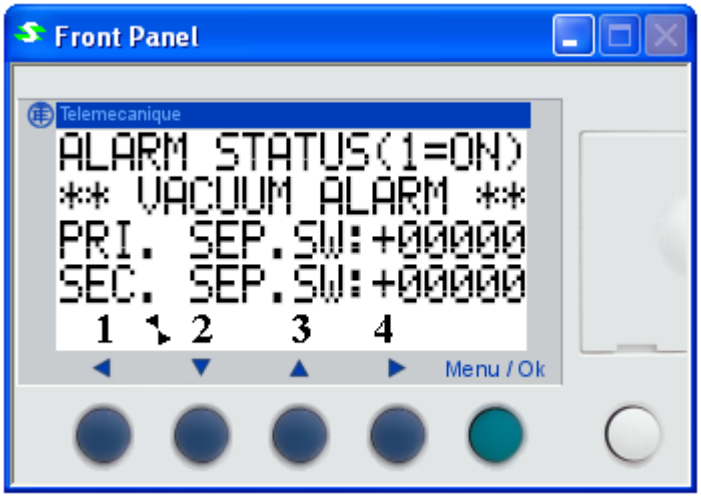
3.4 Alarm Status

The fuel polishing basic controller provides five different screens for displaying the alarm status. Each screen defines the alarm type and associated filter. Each alarm must be cleared before pump operation can continue.

3.4.1 Vacuum Alarm

Two separator filters may be provided. Each filter is equipped with a vacuum switch to detect if the filter is clogged. Each switch will create an alarm condition that will disable the pump operation.

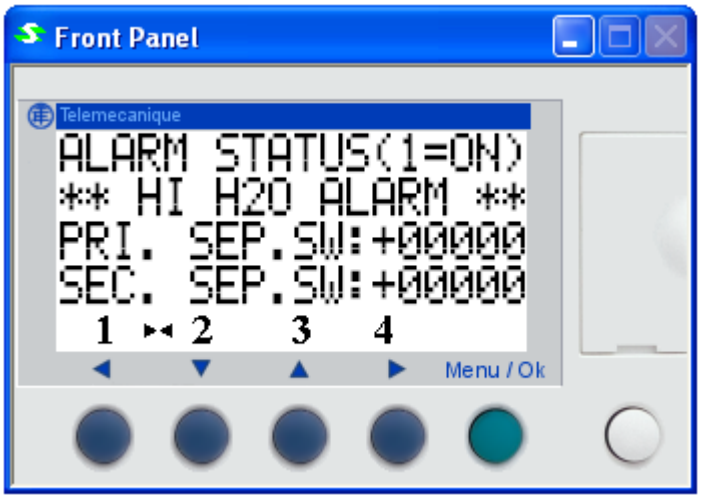
Alarm Description	Sensor Type	Wired to Controller Input
PRI. SEP. SW	Vacuum Switch	I7
SEC. SEP. SW	Vacuum Switch	IC



3.4.2 High Water Alarm

Two separator filters may be provided. Each filter is equipped with a water sensor to detect the amount of water in the filter water container. The PRIMARY SEPARATOR WATER SENSOR is located at the base of the primary separator and the SECONDARY SEPARATOR WATER SENSOR would be located at the base of the secondary separator. Each sensor will create an alarm condition that will disable the pump operation.

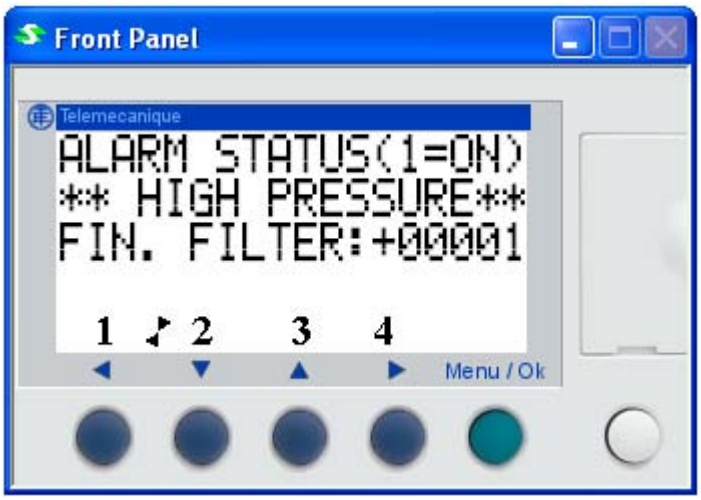
Alarm Description	Sensor Type	Wired to Controller Input
PRI. SEP. SW	Water Sensor	I6
SEC. SEP. SW	Water Sensor	IB



3.4.3 High Pressure Alarm (Optional)

If so equipped, a pressure switch may be provided to detect if a spin-on filter is clogged. A final spin-on filter would be located after the pump. The switch will create an alarm condition that will disable the pump operation.

Alarm Description	Sensor Type	Wired to Controller Input
FIN. FILTER	Pressure Switch	I8

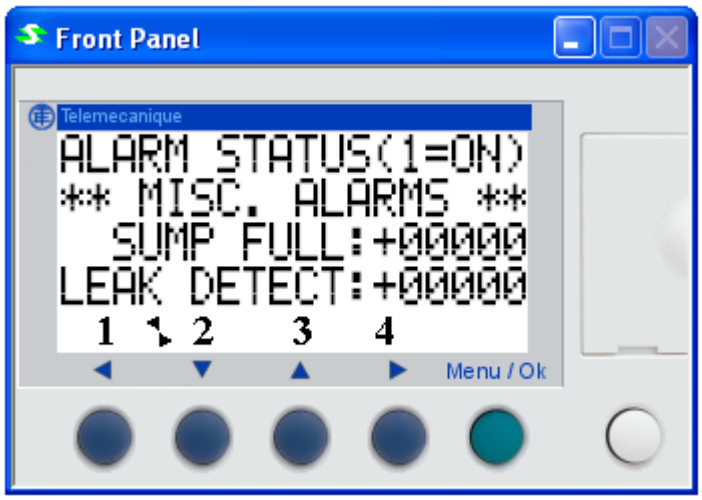


3.4.4 Misc. Alarm (Sump / Leak)

An optional water container may be provided to drain the water separator filters any time a high water alarm is detected. The water alarm will energize a solenoid to drain the filter into the container. Once the container is full the SUMP FULL alarm will become active, requiring an operator to dispose of the contents of the container.

A liquid level sensor is provided in the base of the main enclosure to monitor for leaks in the filters or plumbing. If a leak is detected an alarm will generated and the filter pump will be disabled.

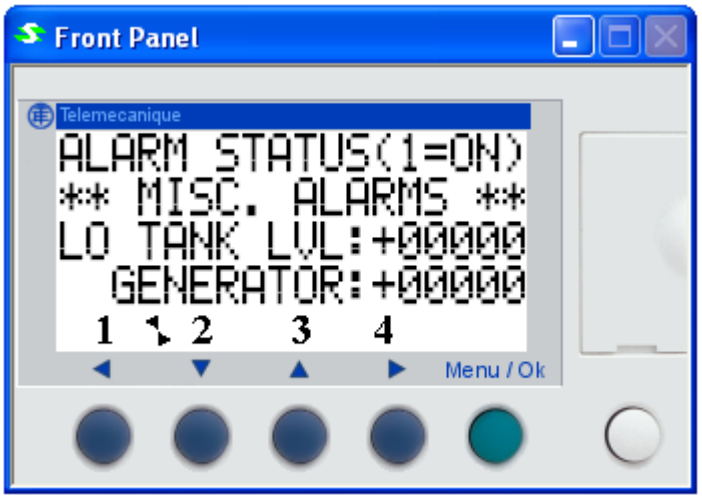
Alarm Description	Sensor Type	Wired to Controller Input
SUMP FULL	Water Sensor	IE
LEAK DETECT	Liquid Level Sensor	I9



3.4.5 Misc. Alarm (Tank Level / Gen.)

The low tank level alarm is responsible for monitoring the supply tank level. If the level in the supply tank drops to an undesired level an alarm will be generated. The generator running input will NOT create an alarm condition that requires the operator to acknowledge. This input is used to keep the filter pump disabled any time the generator is running.

Alarm Description	Sensor Type	Wired to Controller Input
LO TANK LVL	Float Switch (NO)	IA
GENERATOR	Relay Contact (NO)	I5

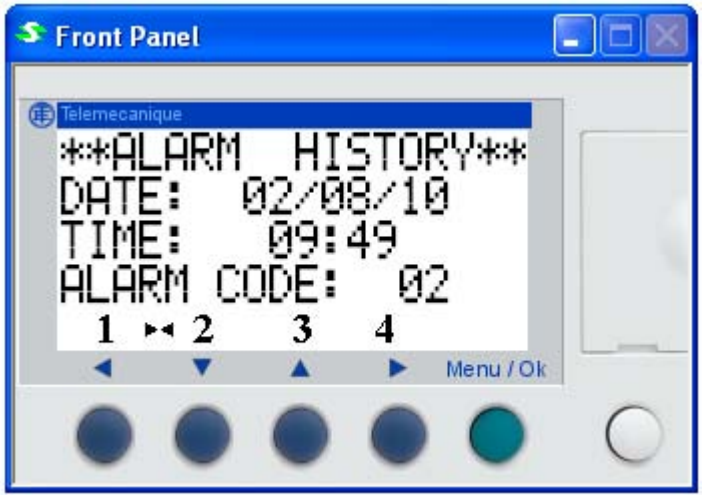


NOTE: This feature is OPTIONAL and not required for normal operation. The controller has been prewired to accept the use of each sensor as required by the end user. Sensors are not included with the standard fuel maintenance assembly.

3.5 Alarm History

The alarm history screen is provided as a troubleshooting tool to verify the last recorded alarm event. This alarm event is date and time (military time) stamped and includes the alarm code as a numerical value. The following table can be used to determine the event based on the code, along with the sensor that created the alarm event.

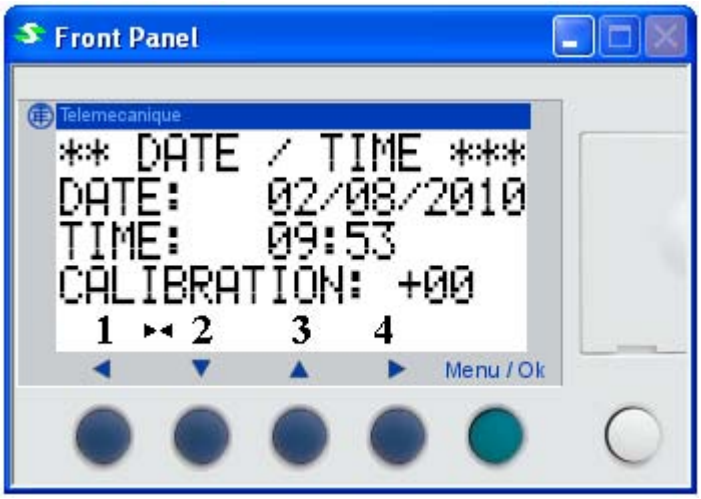
Code	Description	Sensing Device
0	No Active Alarms	N/A
1	Primary Separator H2O	Water Sensor On Pri. Sep.
2	Primary Separator Vacuum	Vacuum Switch On Pri. Sep.
4	Secondary Separator H2O	Water Sensor On Sec. Sep.
8	Secondary Separator Vacuum	Vacuum Switch On Sec. Sep.
16	Final Filter Over Pressure	Pressure Switch After Pump
32	Leak Detected In Basin	Level Sensor In Basin
64	Low Level In Supply Tank	Float Switch in Supply Tank
128	Water Collection Sump Full	Level Sensor In Sump



NOTE: If the recorded alarm code does not match one of the values defined in the table, a combination of active alarms were present at the time the event was recorded.

3.6 Date/Time

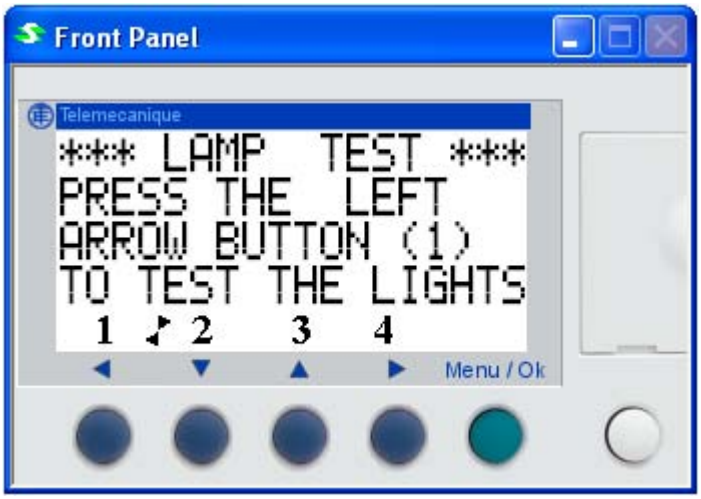
The date and time screen allows the operator to verify the internal clock and calendar values along with the calibration drift value. This is a read only screen and the date and time can not be modified from this screen.



NOTE: To modify the date or time you must enter the Menu screen. Please reference the Parameters: Main Menu section of this manual for details on how to modify the date and time.

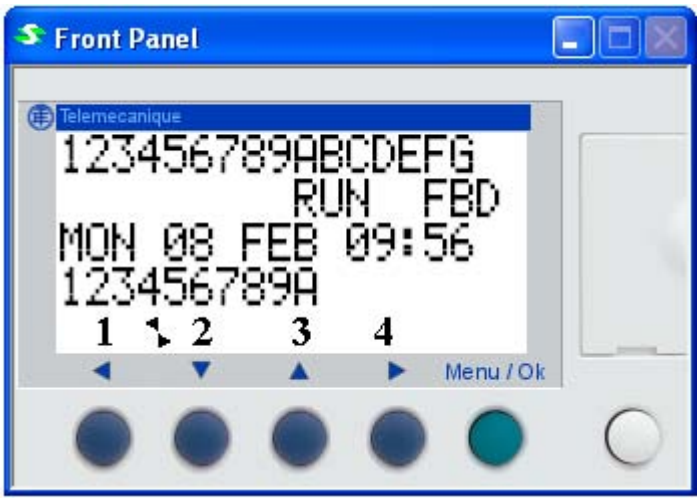
3.7 Lamp Test

The lamp test function allows the operator to press and hold button 1 (left pointing arrow) and energize all indicator lights until the button is depressed. The lamps do not include a replaceable bulb/LED. If a lamp is found to be non functional you must replace each lamp assembly directly.



3.8 I/O Status

The I/O status screen is provided as a troubleshooting tool for technicians. The top row (1 - G) defines the status of each input. If the number or letter is blocked out in black, it defines the input as being energized by a switch or sensor. The second row defines the program as running (RUN) or stopped (STOP). The third line shows the internal clock and calendar settings. The fourth row (1 - A) defines the status of each output. If the number or letter is blocked out in black, it defines the output as being energized by the software. The following table defines each input and output as their default values. If you have a custom day tank controller you must reference your electrical drawings for input and output definitions.



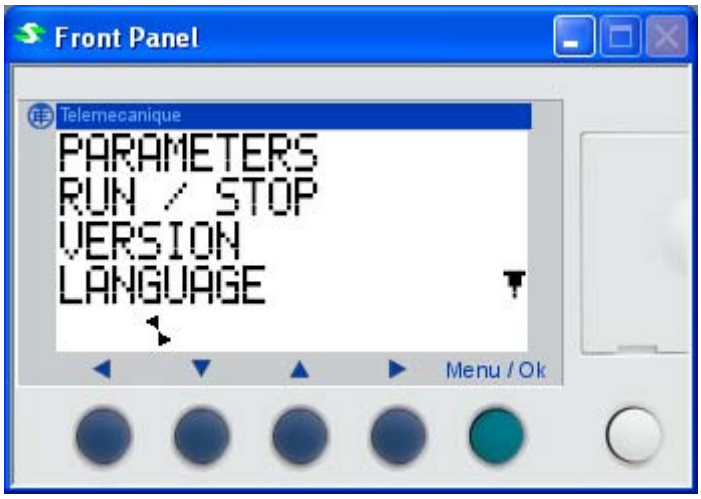
Input	Output	Description
I1		Emergency Stop Enabled (Okay to run = ON)
I2		Filter Pump Running Feedback
I3		Switch in Hand
I4		Switch in Auto
I5		Generator Running
I6		Primary Separator H2O Sensor
I7		Primary Separator Vacuum Switch
I8		Final Filter Pressure Switch
I9		Leak Detect Sensor
IA		Low Tank Level (Rise in float = ON)
IB		Secondary Separator H2O Sensor
IC		Secondary Separator Vacuum Switch
ID		*Unused*
IE		Water Sump Full Sensor
IF-IG		*Unused*
	Q1	Filter Pump Relay / Contactor
	Q2	General External Alarm Light
	Q3	External Audible Alarm Horn
	Q4	Light: H2O Collection Sump Full
	Q5	Light: Critical Low Fuel In Storage Tank
	Q6	Light: High Vacuum In Separator
	Q7	Light: High H2O In Separator
	Q8	Light: High Pressure In Filter
	Q9	Filter H2O Water Drain Solenoid
	QA	Light: Leak Detected In Basin

3.9 Modify Date / Time

3.9.1 Main Menu (Screen 1)

Upon pressing the MENU / OK button the operator will see the following options. It is recommended that operators do not modify any variables found under the Parameters, Run / Stop or Language options. The language options are based on the controller language and has no effect on the display screens themselves. To EXIT the menu screen press button 1 (left pointing arrow) once.

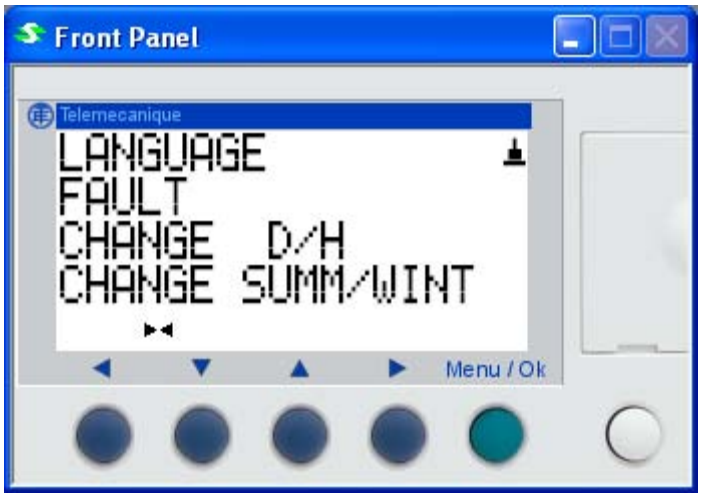
To change the date and time you must press button 2 (down pointing arrow) to access additional items.



⚠	**<u>WARNING!</u> CAUTION SHOULD BE APPLIED WHEN NAVIGATING THROUGH THE MENU SCREENS. THE PROGRAM EXECUTION CAN BE STOPPED AND THE CONTROLLER WILL NO LONGER OPERATE AS SPECIFIED.** **IT IS RECOMMENDED THAT FACTORY TRAINED TECHNICIANS ONLY, ACCESS THESE SCREENS.**

3.9.2 Main Menu (Screen 2)

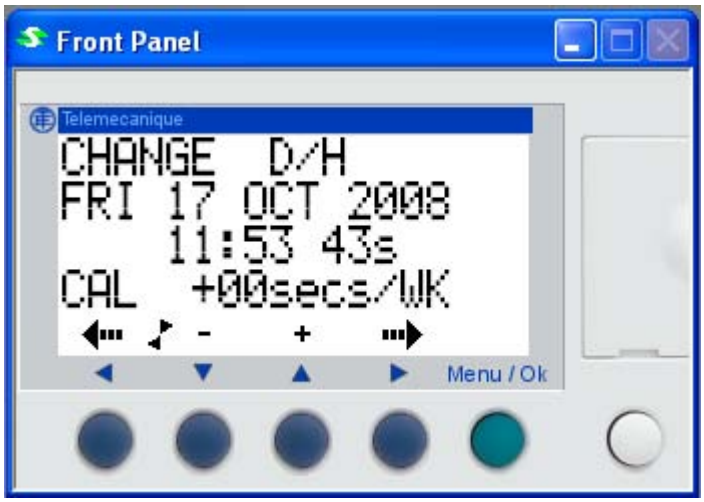
To access the date and time variables you must press the down arrow button to select the "CHANGE D/H" option. Once this option is blinking press the MENU / OK button once.



3.9.2.1 Change D/H

To change a date or time value, the desired variable must be blinking. If you want to change a value you must use the left or right arrow buttons to navigate to the desired variable. Once that variable is blinking, press the up or down arrow buttons to make the desired change. Once the items have been modified, press the MENU / OK button to exit back to the Main Menu screen. To EXIT the main menu

screen, press the left arrow button.



Part

4 Time Clock Operation

To add or modify a time clock event you must navigate to the PARAMETER section of the MENU. This is accomplished by pressing the "MENU/OK" button on the face of the controller and selecting the PARAMETER option, and pressing the "MENU/OK" button to accept. By using the UP or DOWN arrow keys, navigate to parameter R00B000. By using the LEFT and RIGHT arrow keys you can navigate to each variable and modify the desired value. The following variables can be modified on the screen to create a time entry.

Variable	Value
T:	Event number
W:	Enable weeks of the month
D:	Enable days of the week
XX:XX	Event Time
ON / OFF	Time clock output status

To create a single pump on and pump off cycle you must create two time entries. The first entry will be used to turn the pump on and the second entry will be used to turn the pump off.

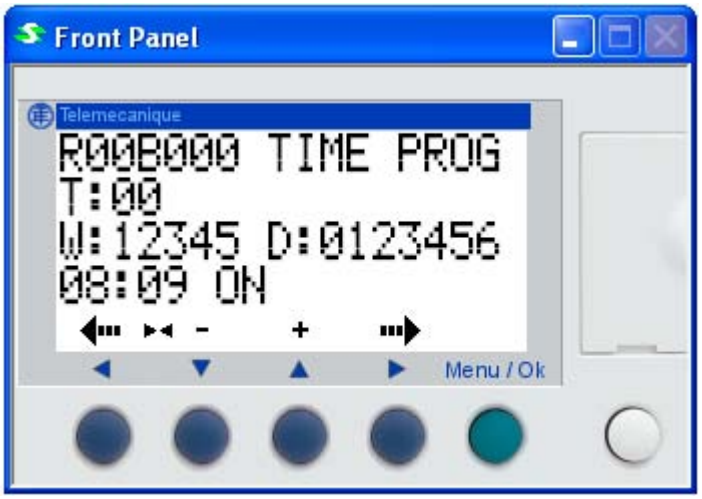
The following table is provided as an example of how you might set up the filter pump to run on Monday, Wednesday and Friday of each week from 9:00 AM until 5:00 PM.

Event No.	Weeks of the month	Days of the week	Event Time	Output Status
T:00	12345	-1-3-5-	09:00	ON
T:01	12345	-1-3-5-	17:00	OFF

4.1 Time On Event

As displayed on this screen sample the time clock output will turn ON at 08:09 (08:09 AM), each day of the week and each week of the month.

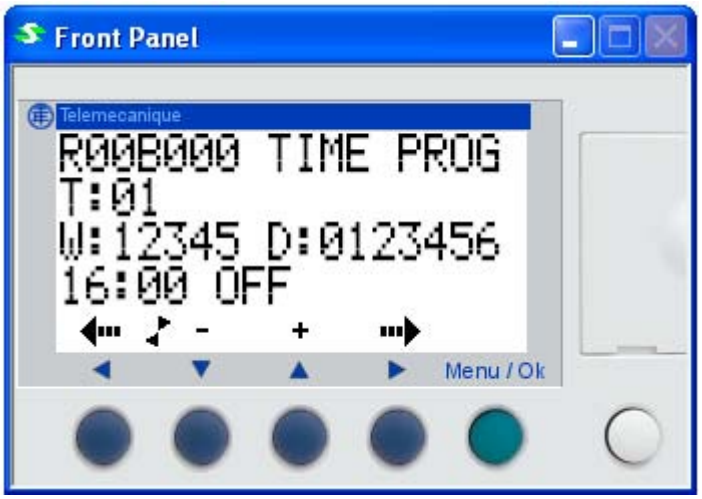
Event No.	Weeks of the month	Days of the week	Event Time	Output Status
T:00	12345	0123456	08:09	ON



4.2 Time Off Event

As displayed on this screen sample the time clock output will turn OFF at 16:00 (04:00 PM), each day of the week and each week of the month.

Event No.	Weeks of the month	Days of the week	Event Time	Output Status
T:01	12345	0123456	16:00	OFF



4.3 Time Clock Functions

4.3.1 Events

The " T " variable can be 00 through 13 for a total of 14 different events or 7 different on/off cycles. This would allow the user to configure a schedule to cycle the pump on and off each day of the week, each week of the month.

Variable	Value
T:XX	Event number

4.3.2 Weeks

The " W " variable can be 12345 representing each possible week of each month. This would allow the user to configure a schedule to cycle the pump on and off each week of the month.

Variable	Value
W:	Enable weeks of the month

4.3.3 Days

The " D " variable can be 0123456 representing each possible day of each week. This would allow the user to configure a schedule to cycle the pump on and off each day of the week.

Variable	Value
D:	Enable days of the week

4.3.4 Event Times

The " XX:XX " variable can be any military time from 00:00 (12:00 AM) to 23:59 (11:59 PM), representing each possible hour and minute of each day.

Variable	Value
XX:XX	Event Time

4.3.5 Output Status

The " Output State " variable can be either ON or OFF.

Variable	Value
ON / OFF	Time clock output status

Part V

5 MODBUS COM Module (Optional)

5.1 Register Addressing

Address	Description	Value	Type
40017	Remote Alarm Silence 33	Word	Read / Write
40021	Controller Input Status 33	Word	Read
40022	Controller Output Status 34	Word	Read
40023	Alarm Code 35 (see Alarm History 22 for code values)	Word	Read
40024	Pump Operation Status 35	Word	Read
40033	Controller Time Clock: Seconds / Week day	Byte / Byte	Read / Write
40034	Controller Time Clock: Hours / Minutes	Byte / Byte	Read / Write
40035	Controller Time Clock: Month / Day/month	Byte / Byte	Read / Write
40036	Controller Time Clock: Century / Year	Byte / Byte	Read / Write

5.1.1 Remote Alarm Silence

The remote alarm silence register is a standard MODBUS holding register with an address of 40017. By writing a value of 1 to this register and then clearing the value back to 0 this will emulate the operator pressing button 3 or 4 on the controller face to silence an active alarm. This operation will not clear an alarm. A technician will be required to address the actual problem and acknowledge the alarm locally by pressing buttons 1 and 2, at the same time, on the face of the controller.

Numeric Value	Function
0	N/A
1	Silence Alarm

5.1.2 Controller Input Status

The controller input status register is a standard MODBUS holding register with an address of 40021. This value can be read to identify the status of each physical input. For a description of each input reference the I/O Status 24 section of this manual.

Numeric Value	Input
0	No Inputs Active
1	I1
2	I2
4	I3
8	I4
16	I5
32	I6
64	I7
128	I8
256	I9
512	IA
1024	IB
2048	IC
4096	ID
8192	IE

5.1.3 Controller Output Status

The controller output status register is a standard MODBUS holding register with an address of 40022. This value can be read to identify the status of each physical output. For a description of each output reference the I/O Status 24 section of this manual.

Numeric Value	Output
0	No Outputs Active
1	Q1
2	Q2
4	Q3
8	Q4
16	Q5
32	Q6
64	Q7
128	Q8
256	Q9
512	QA

5.1.4 Active Alarm Status

The alarm code status register is a standard MODBUS holding register with an address of 40023. This value can be read to identify the status of each active alarm. For a description of each alarm code reference the Alarm History 22 section of this manual.

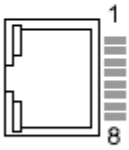
5.1.5 Pump Operation Status

The pump operation status register is a standard MODBUS holding register with an address of 40024. This value can be read to identify the status of the following internal functions of the controller.

Numeric Value	Function
0	N/A
1	Time Clock Output Enabled
2	Pump Request To Run Enabled
3	Both prior conditions active. The pump is running in automatic based on the time clock operation.

5.2 Wiring Connection

Slave Modbus Zelio 2 RJ45



	2 fils/2-wire/2 hilos	4 fils/4-wire/2 hilos
1	N.C.	RXD0
2	N.C.	RXD1
3	N.C.	N.C.
4	D1	TXD1
5	D0	TXD0
6	N.C.	N.C.
7	N.C.	N.C.
8	COMMON	COMMON

RJ45 (Pins)	2 wire RS485 Network
4	B(+)
5	A(-)
8	Common

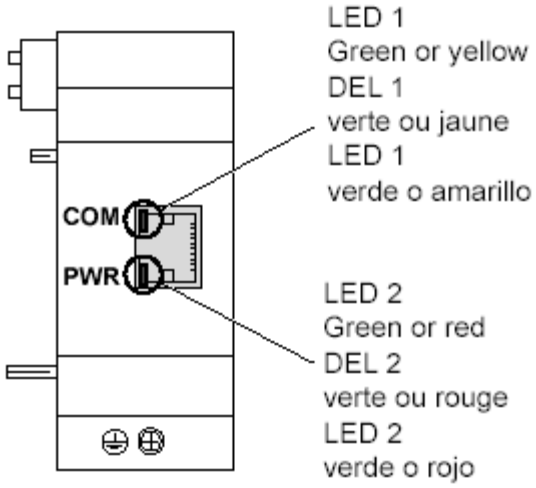
<u>WARNING!</u> MAKE SURE POWER IS OFF IN THE CONTROL PANEL BEFORE MAKING CHANGES TO THE WIRING. THERE MAY BE MULTIPLE SOURCES OF VOLTAGE IN THE PANEL. ALWAYS USE A VOLT METER TO VERIFY EVERYTHING IS TURNED OFF BEFORE WORKING IN THE PANEL.

5.3 COM Settings

Settings	Value	Default	View / Modify
Number of wires	2 or 4	2	View Only
Frame format	RTU or ASCII	RTU	Modify
Network address	1...247	11	Modify
Transmission rate in baud	1200, 2400, 4800, 9600, 19200, 28800, 38400, 57600	19200	View Only
Parity	None, Even, Odd	None	Modify

NOTE: To modify any of the default communication settings you must contact ACS Manufacturing for assistance. The frame format, network address and parity are the only values that can be modified without providing a custom EEPROM (memory module) with the specified values defined, from the table listed above.

5.4 COM Module LEDs



COM (LED 1)	
OFF	No network communication
Flashing yellow	Reception in progress (communication on the bus)
Flashing green	Transmission in progress
PWR (LED 2)	
OFF	Product not powered
Green	Product powered and programmed
Flashing red	Product powered and not programmed
Red	Internal fault
Transmission display has priority over reception LED flashing period: 200 ms "ON" and 1000 ms "OFF" (single flash)	

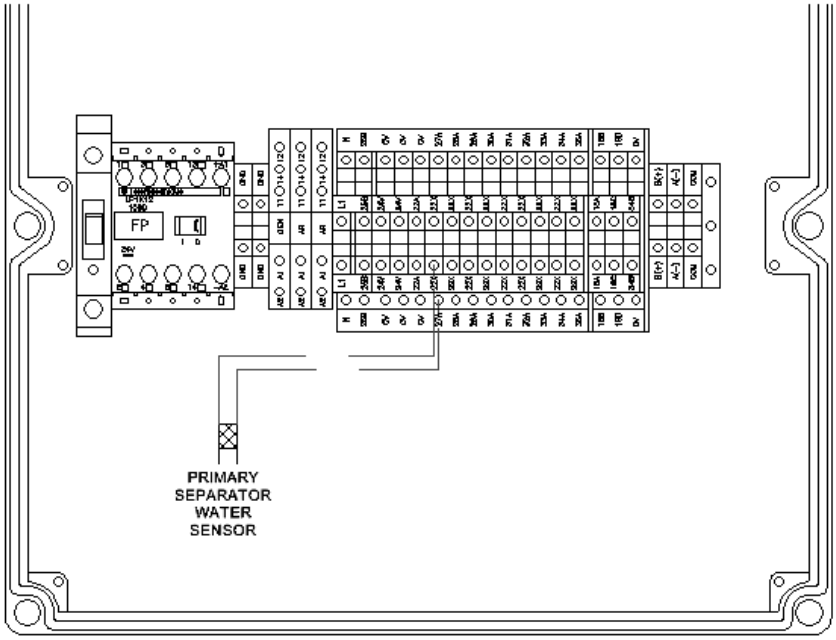
Part VI

6 Sensor Wiring

6.1 Primary Separator Water Sensor

The secondary separator water sensor is provided as a normally open switch, that will close upon a rise in water in the filter container. This switch is provided with two wires.

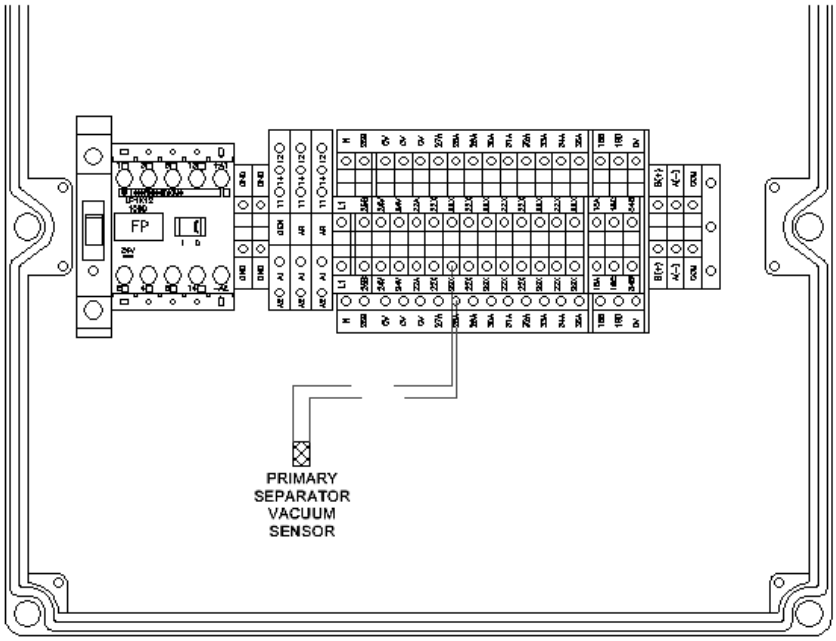
CONNECTION POINT	DESCRIPTION
22X	24VDC sensor supply (+) voltage
27A	24VDC return signal from sensor



6.2 Primary Separator Vacuum Sensor

The secondary separator vacuum sensor is provided as a normally open switch, that will close upon a rise in vacuum. This switch is provided with two wires.

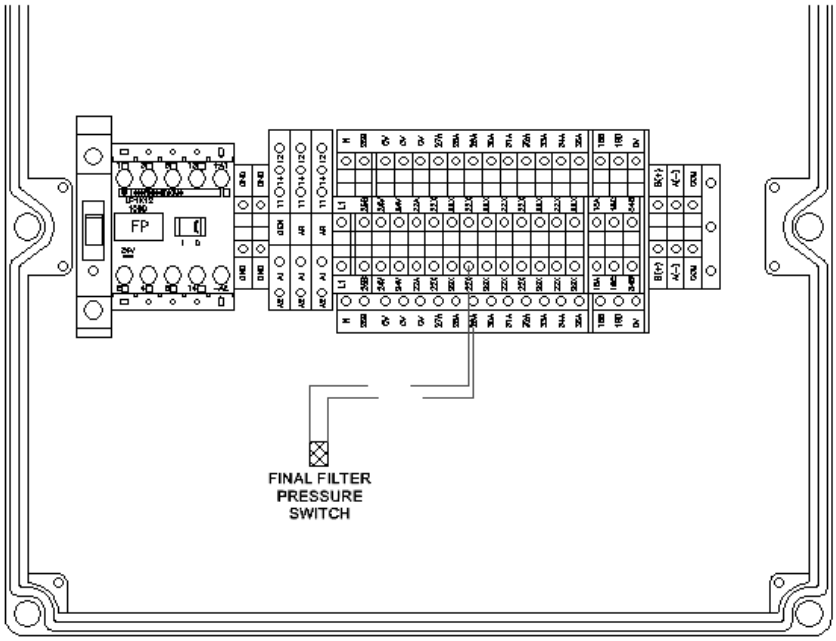
CONNECTION POINT	DESCRIPTION
22X	24VDC sensor supply (+) voltage
28A	24VDC return signal from sensor



6.3 Final Filter Pressure Switch

The final filter pressure switch is provided as a normally open switch, that will close upon a rise in pressure above 30 PSI. This switch is provided with two wires.

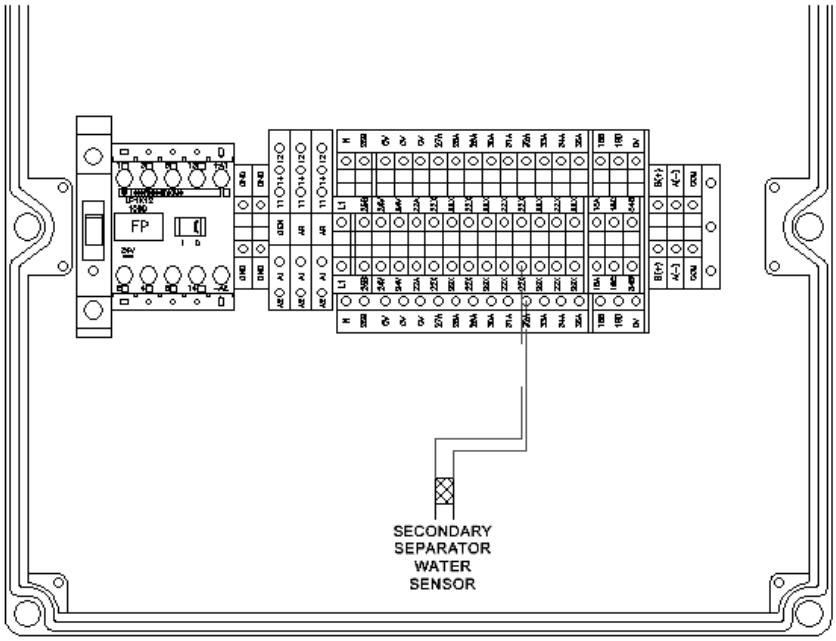
CONNECTION POINT	DESCRIPTION
22X	24VDC sensor supply (+) voltage
29A	24VDC return signal from switch



6.4 Secondary Separator Water Sensor

The secondary separator water sensor is provided as a normally open switch, that will close upon a rise in water in the filter container. This switch is provided with two wires.

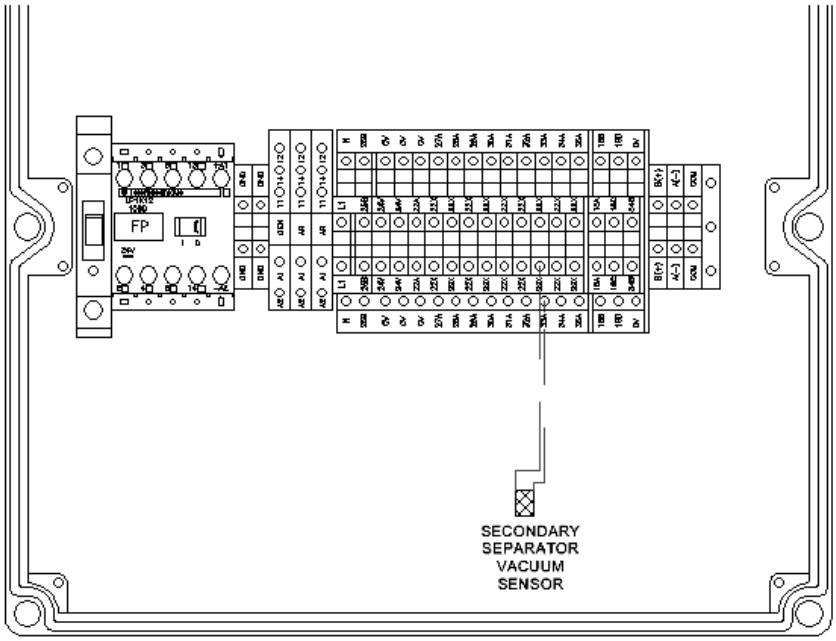
CONNECTION POINT	DESCRIPTION
22X	24VDC sensor supply (+) voltage
32A	24VDC return signal from sensor



6.5 Secondary Separator Vacuum Sensor

The secondary separator vacuum sensor is provided as a normally open switch, that will close upon a rise in vacuum. This switch is provided with two wires.

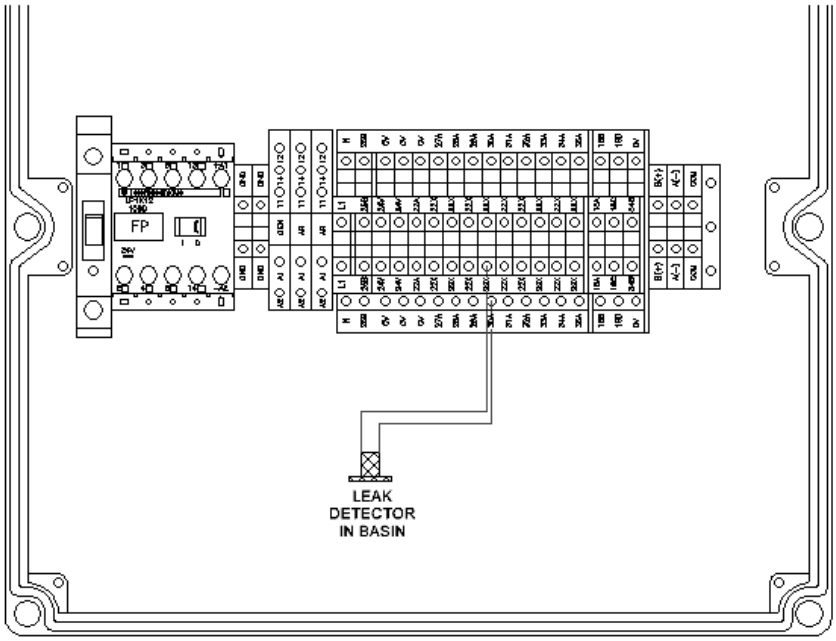
CONNECTION POINT	DESCRIPTION
22X	24VDC sensor supply (+) voltage
33A	24VDC return signal from sensor



6.6 Leak Detection In Basin

The basin leak detector float switch is provided as a normally open switch, that will close upon fluid rising in the bottom containment area of the cabinet. This switch is provided with two wires.

CONNECTION POINT	DESCRIPTION
22X	24VDC sensor supply (+) voltage
30A	24VDC return signal from float

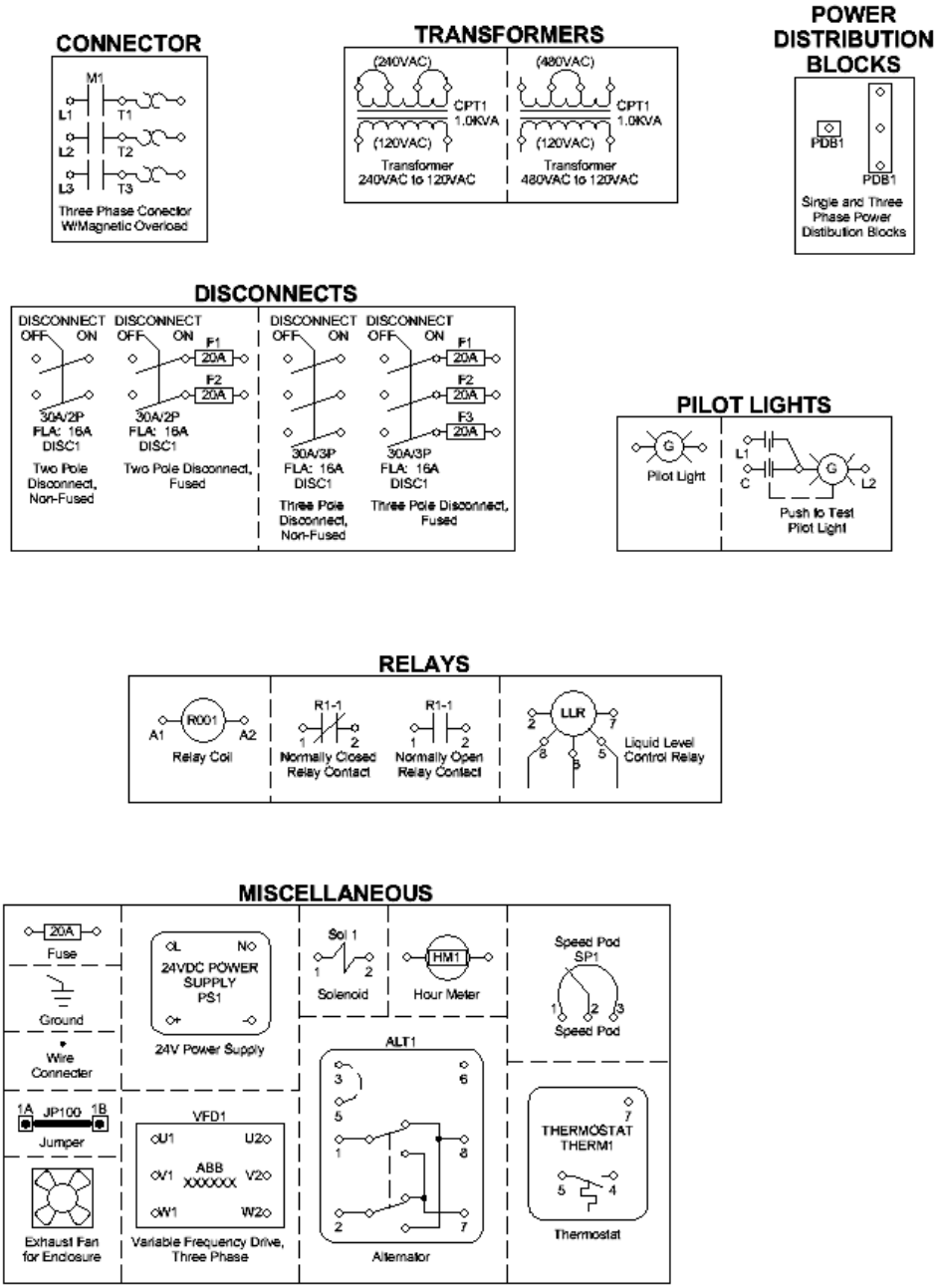


Part

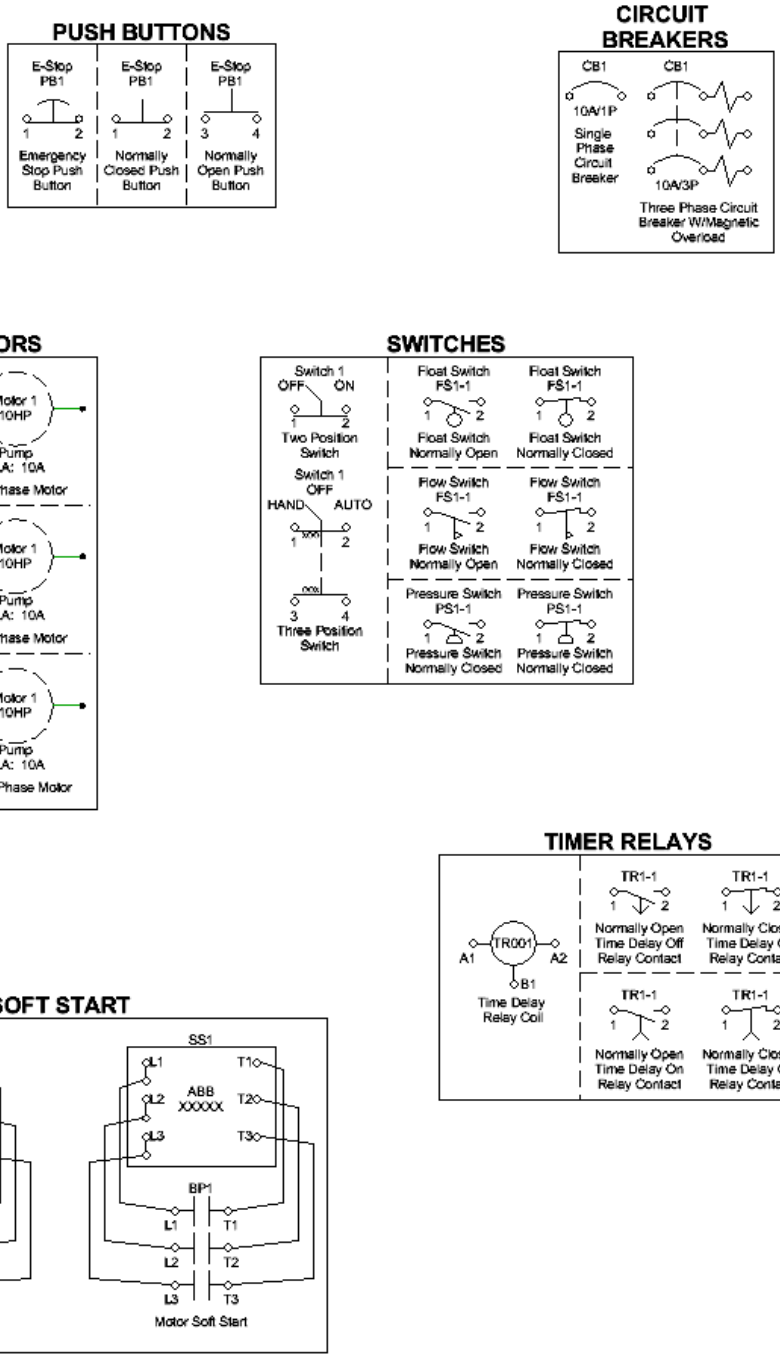
7 Electrical Drawings

7.1 Legend

7.1.1 Legend: Sheet 1

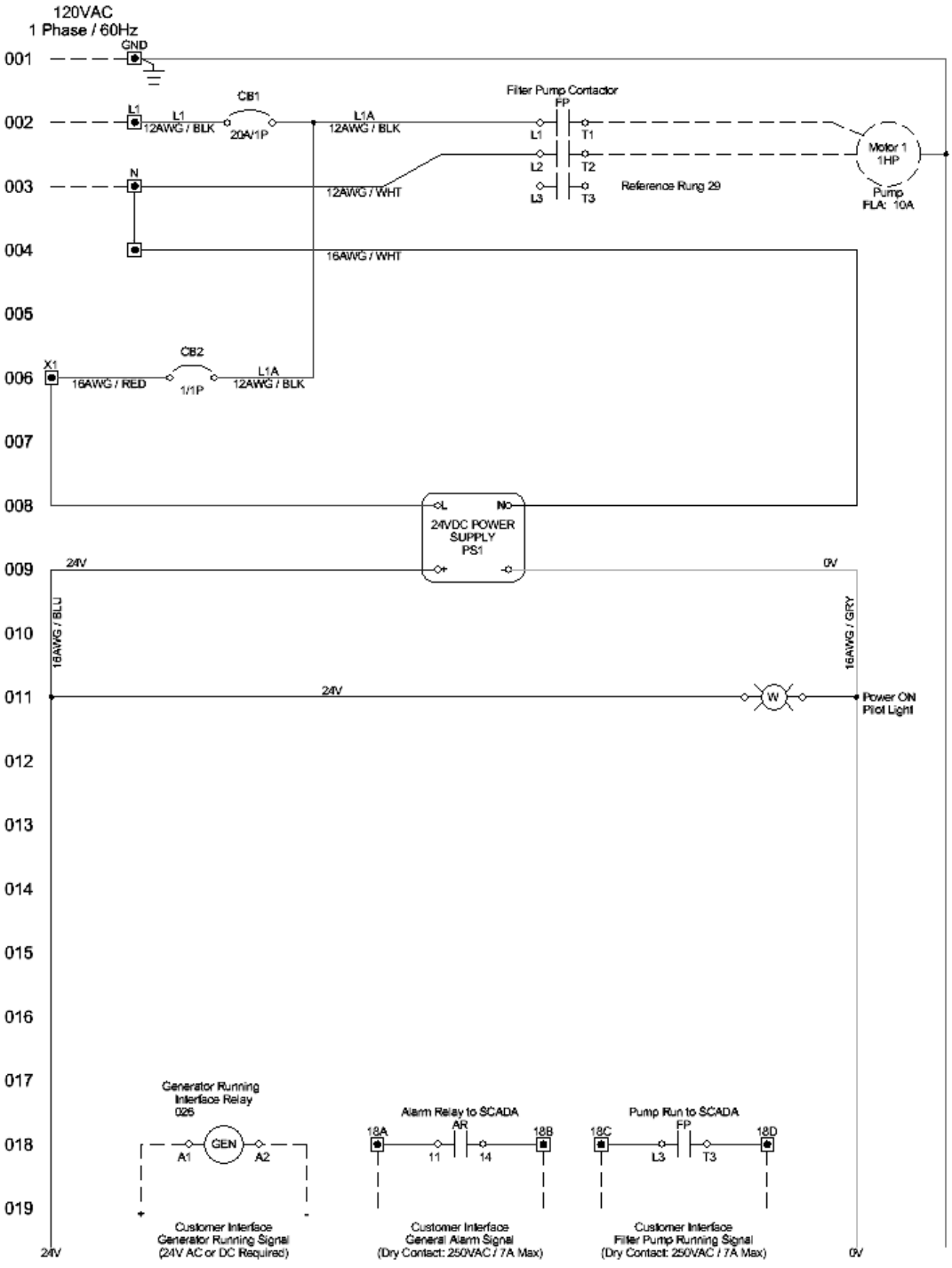


7.1.2 Legend: Sheet 2

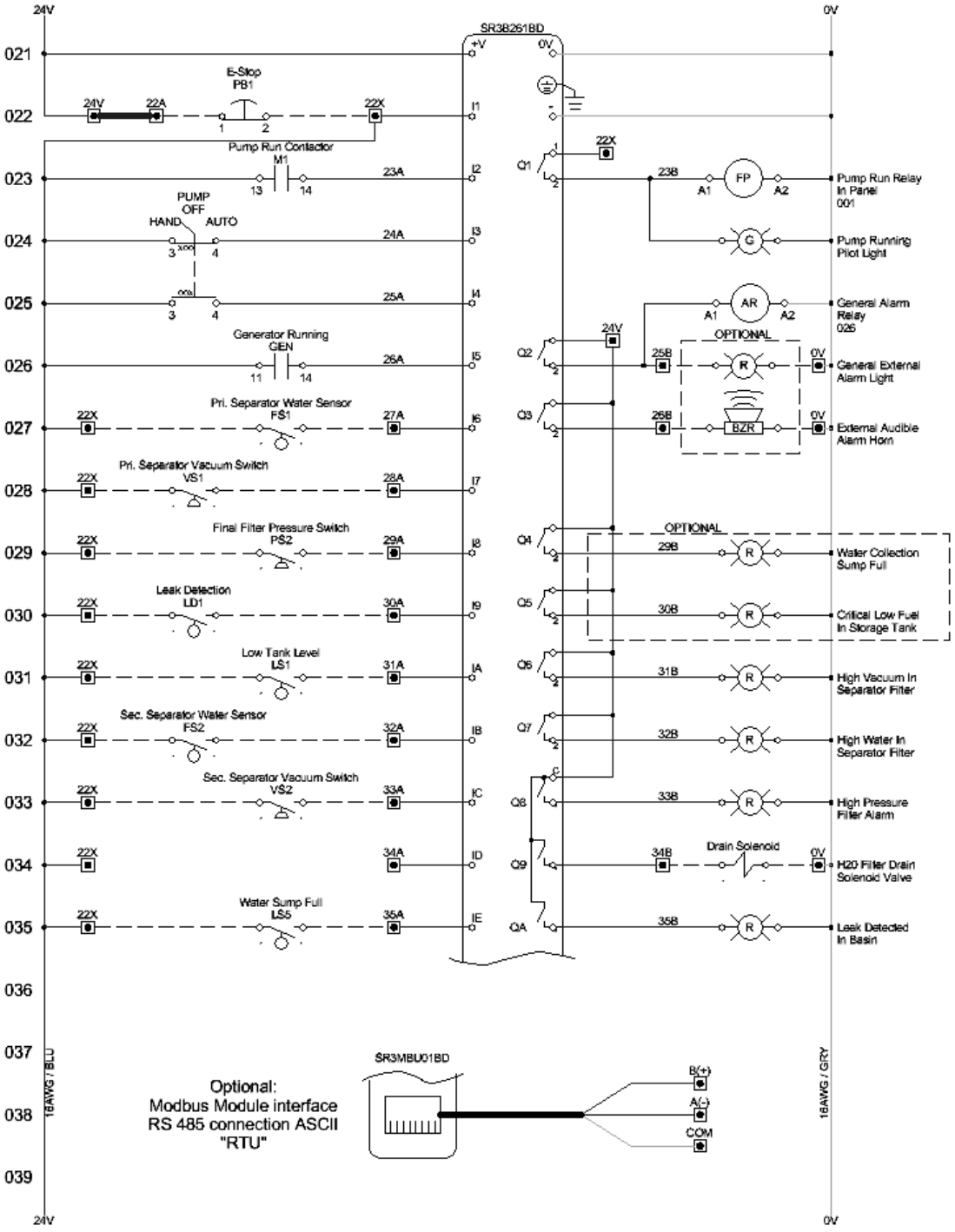


7.2 Schematics

7.2.1 Drawing 1 of 2



7.2.2 Drawing 2 of 2



Part

8 How To...

8.1 Silence Alarm

To silence the buzzer during an alarm / fault event you must press button 3 or 4 on the display. By silencing the alarm you do not acknowledge or clear an alarm / fault event. To acknowledge an alarm reference, How To...Acknowledge an Alarm 51.

8.2 Acknowledge Alarm

To acknowledge or clear an alarm the alarm condition must no longer be active. By pressing buttons 1 and 2, at the same time, the alarm will be acknowledged and the operator will be able to navigate to other screens. To silence an alarm reference, How To..Silence an Alarm 51.

8.3 Modify MODBUS COM settings

To verify the default MODBUS communication settings, reference section MODBUS COM MODULE 36 in this manual. To change any of the settings you must contact ACS Manufacturing for assistance or by upgrading the program application with the values specified by your control network administrator.

8.4 Restore Program

To restore a back up copy of the default factory settings and configuration, you must contact ACS Manufacturing for assistance. An ACS Manufacturing representative may be required to perform this task as the memory module and configuration menus are passcode protected. It is up to ACS Manufacturing to determine if a representative be on site to perform this function.

The passcode is not intended for public distribution and ACS Manufacturing reserves the right to maintain the privacy of this information.

Part

9 Limited Warranty

ACS MANUFACTURING, INC (ACS) makes every effort to assure that its products meet high quality and durability standards. We expressly warrant the original purchaser of our products that each product is free from defects in materials and workmanship. Our expressed warrantee is subject to the following terms and conditions:

1. The term of our warranty is one year from the date of purchase. A warranty claim received by us after one year from the date of purchase will not be honored even if it is claimed that the defect occurred prior to one year from date of purchase.
2. Our warranty does not cover defects due, directly or indirectly, to misuse, abuse, negligence of others, repairs or alterations done outside our facilities, or lack of maintenance.
3. Our liability for breach of our express warranty is limited to the repair or replacement of the product, at our cost.
4. We are not liable for general, special, consequential, incidental or contingent damages resulting, directly or indirectly, from the purchase or use of our products.

WE DISCLAIM ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR ANY PURPOSE OF OUR PRODUCTS.

To make a claim under this warranty, We ask you to notify us in writing with Date of purchase, Model number, Job number and a detailed explanation of the problem you are experiencing. Please send or FAX this written information to the attention of Warranty Dept/ QA at:

ACS Manufacturing, Inc

1601 Commerce Blvd.

Denison, Texas 75020

FAX (903) 462-2001 * Ph (903) 462-2001

E-Mail info@acsmanufacturing.com

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