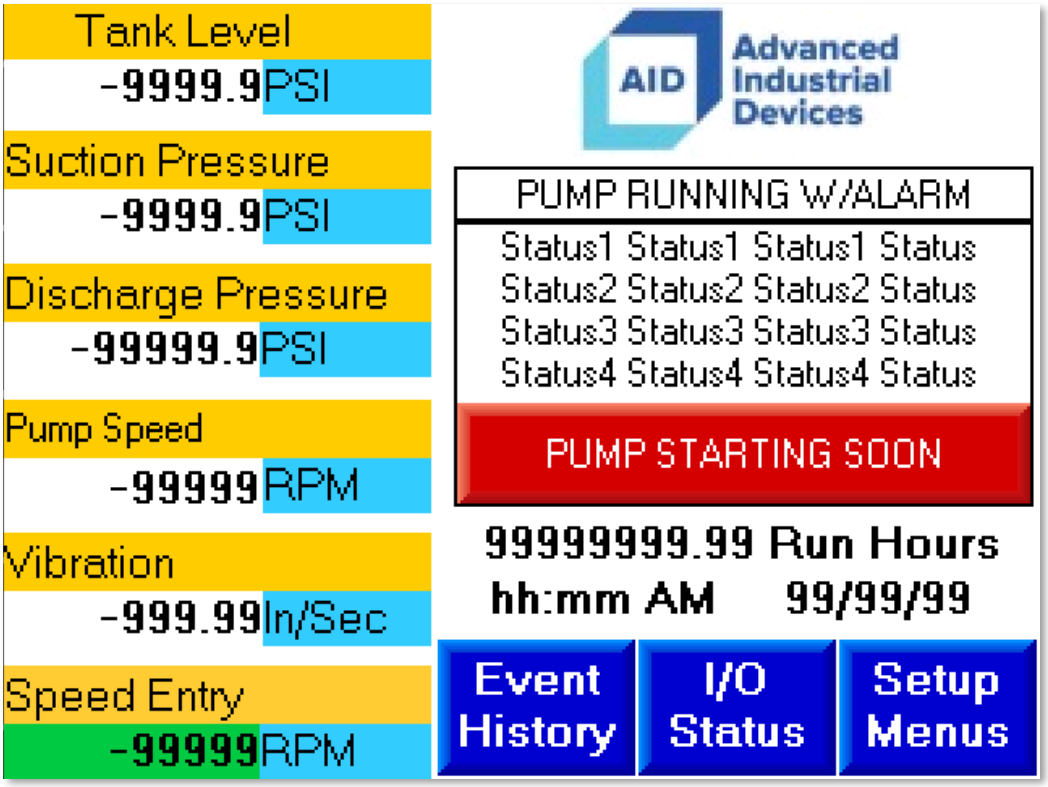
OptiPump

Mobile Duty



Technical Manual

AID Advanced Industrial Devices

V2.99 STANDARD

What is the OptiPumpMD?

The OptiPumpMD is designed to handle the automation needs of many generic pumping applications, including sewage lift systems, municipal water supply systems, dewatering systems, Disposal and Injection Pump systems, Jet Pump systems, and Pipeline Pump stations. This controller will automate your main pump, charge/booster pump, cooling fan, and a variety of other devices. It complements Advanced Industrial Device's versatile PumpMaster Variable Frequency Drive (VFD) package and provides many application specific features such as:

- **Throttle Valve Control for Centrifugal Pumps**
- **Booster Pump Control**
- **Thrust Chamber Oil Cooler/Pump Control**
- **Tank Level Control**
- **Pressure Control**
- **13 User-Defined Digital Inputs**
- **5 User-Defined Analog Inputs (Standard)**
- **250 Fault History**
- **Remote Programming for PumpMaster VFDs**
- **Works with all brands of VFDs and Soft Starts**
- **ModbusRTU and ModbusTCP SCADA Support**

The OptiPumpMD also provides an easy to use graphical interface for configuring the VFD and eliminates the need to memorize cryptic parameter names and associated values. We are confident that this drive package and controller will simplify the automation experience and reduce the total cost of ownership.

Table of Contents

Specifications

Voltage Rating	24VDC
Temperature Rating	13° - 122° F
Safety Rating	Class 1, Division 2 UL Listed
Interface	Resistive Color Touch Screen
Analog Outputs	Pump Speed (0-10v & 4-20mA) Throttle Valve Position (0-10v & 4-20mA)
Analog Inputs (Standard)	(4) 4-20mA (User definable)
	(1) 0-10v (User definable)
Digital Inputs	17
Digital Device Control	Main Pump, Charge Pump, Oil Pump, Thrust Chamber Oil Cooler
Analog Device Control	Main Pump Speed, Discharge Throttle Valve
Data Storage Media	SD Card (up to 32GB) (Secure Digital)
Data Storage File Support	Data logging—CSV Parameter Backup Firmware Update
SCADA Interface	RS-485 / ModbusRTU
	Ethernet / ModbusTCP (optional)
Power Protection Circuit	Upgrade available to mitigate issues caused by phase loss and brown-out conditions.
Enclosure NEMA Type	Nema 3r
Enclosure Color	White Standard (Other custom colors available)

Hardware Installation

Device Connection:

If the unit was built with camlock Connectors, simply connect your incoming power and motor leads according to the labeling provided.

Power connections are made inside the side box on the right hand side of the unit. This keeps you incoming power separated from the main enclosure when the breaker is in the "off" position.

Connect your incoming power to the bottom side of the breaker.

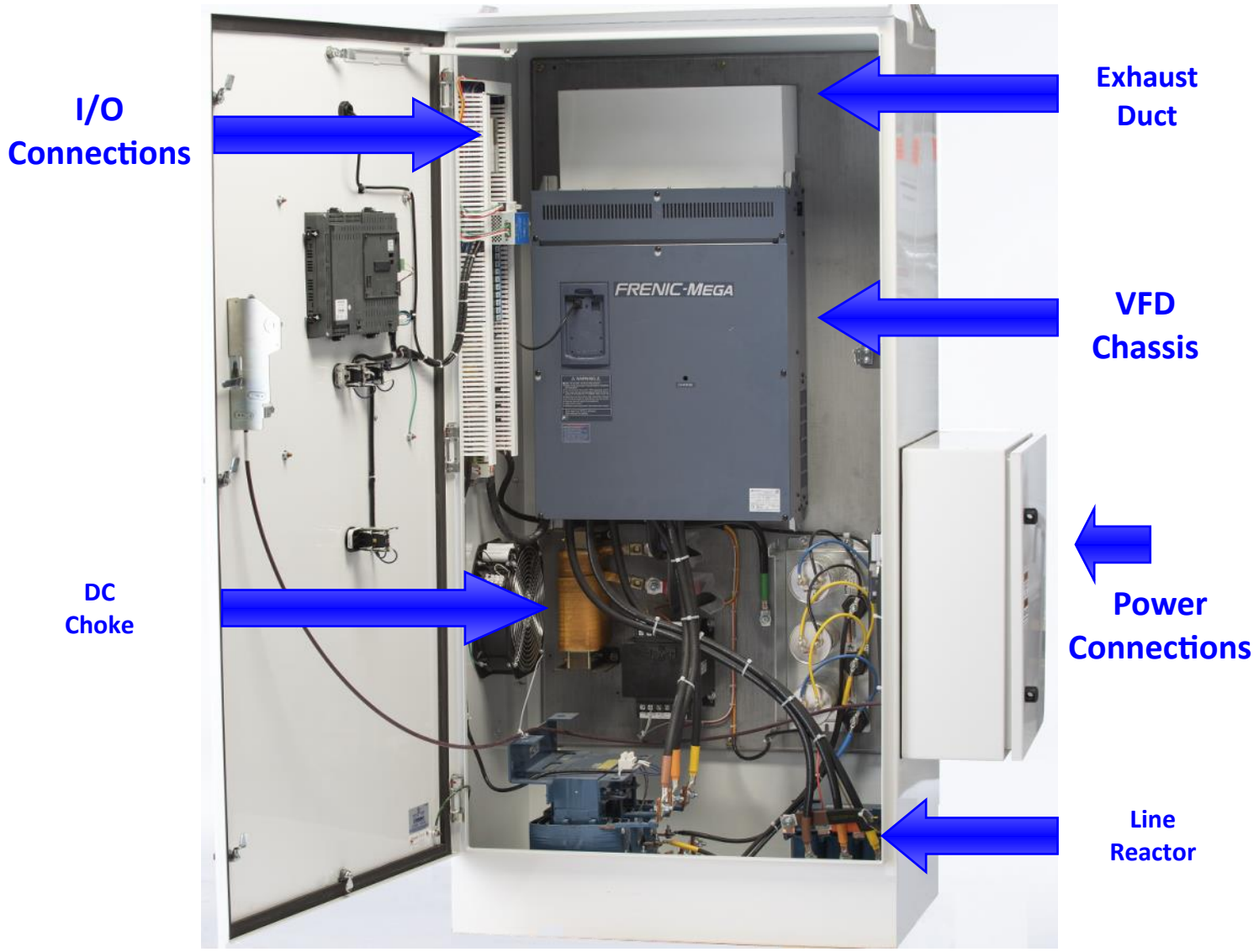
Connect your motor leads to the power distribution block.

Incoming and Output power connections are labeled in accordance with UL 508a and marked with the Input Voltage level the panel was designed for. *If these markings are inconsistent with power on your location, please call our technical support line.*

Additional analog and digital devices may be connected to the terminal blocks on the left side of the enclosure. Five digital inputs and three analog inputs are available for customer devices. Additional details are provided in the "Startup" chapter of this manual.

- **When installing analog devices and transducers**, use good quality shielded cable and terminate the drain (shielding) to a ground on the VFD side of the connection. Float the shielded cables drain/shield on the remote end of the cable. VFDs, especially in applications with long motor leads, are inherently noisy devices and can cause unreliable readings from 0-10v and 4-20mA devices wired with non-shielded cables. Using shielded cable on the initial installation can save time troubleshooting a noisy device later.

Inside the OptiPump Panel:



Key components of an OptiPump VFD Panel.

- **When testing motors connected to a VFD, always use a megaohm meter.** Checking resistance to ground with a regular volt-ohm meter will only detect a direct short. Surface motors should always be "megged" at the 1000V setting (for 480V motors). Downhole motors at 2500V or 5000V depending on cable length. Autotransformers, cabling, and electrical filters can also be sources of shorts that will require "megging" to detect.

- **Make sure the VFD/panel is properly grounded.** UL recommends a resistance to ground of no more than 25Ω, though in most soil types a resistance to ground under 5Ω should be easily obtainable. (Sandy soil types will be an exception to this. A ballasting material is highly recommended.) A high resistance to ground, or a non-typical grounding method that causes a ground-loop can create communications problems. An improper ground may also reduce the sensitivity of the lightening/surge suppressor and expose the equipment to high voltage. Modern surge protection devices are reliant on a good ground reference to function correctly. A ground-resistance meter is a valuable tool that can ensure these devices are properly installed protected.

Programming Guide

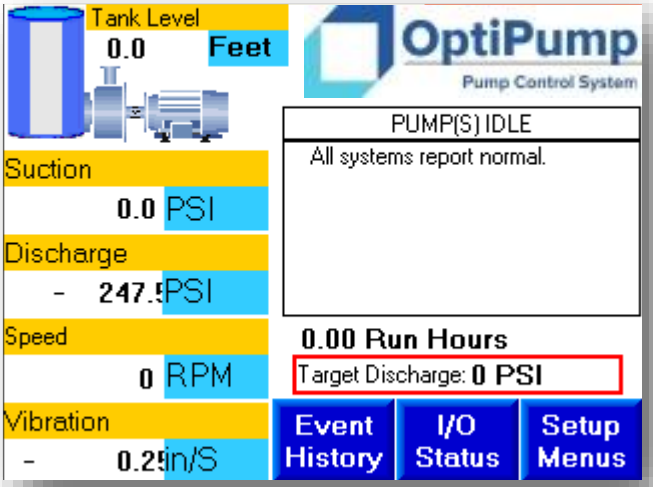
Main Screen:

The **OptiPumpMD** has two selectable main screens:

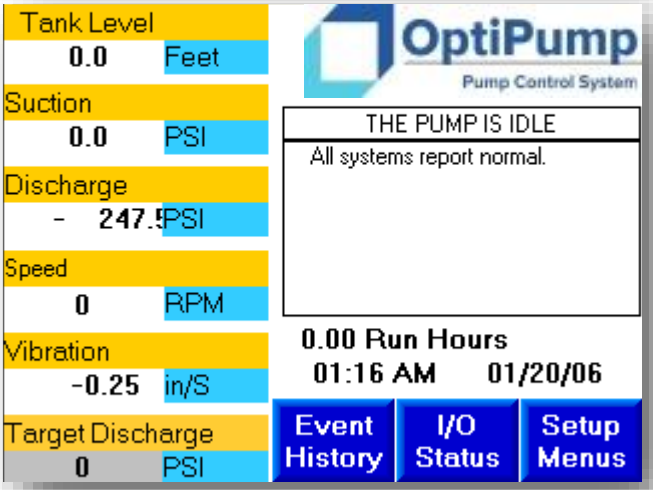
Tank Level—Shows a tank level graphic, useful for pumping applications that drain or fill a tank.

Numeric—Shows all numerical values. Great for any application, the bottom monitor can show your Target Discharge Pressure for centrifugal pumping applications or function as a direct entry box for Pump Speed for specialty applications like Jet Pumps.

Each of these main screens annunciate system status, you may select which one you prefer based off the application you are configuring the OptiPumpMD to control.



Tank Level Main Screen



Numeric Main Screen

The buttons on the bottom right of the screen function the same regardless of which theme is selected:

Event History / Log— Shows detailed information logged during alarm and fault events.

I/O Status—Shows current status of inputs and outputs. Shows details for I/O beyond the first five inputs if additional expansion modules are used.

Setup—Access to configure the **OptiPumpMD**

Logging into Setup:

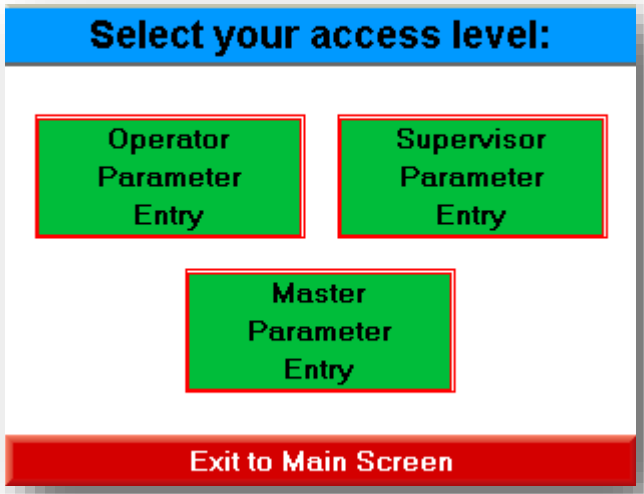
The **OptiPumpMD** has three levels of access:

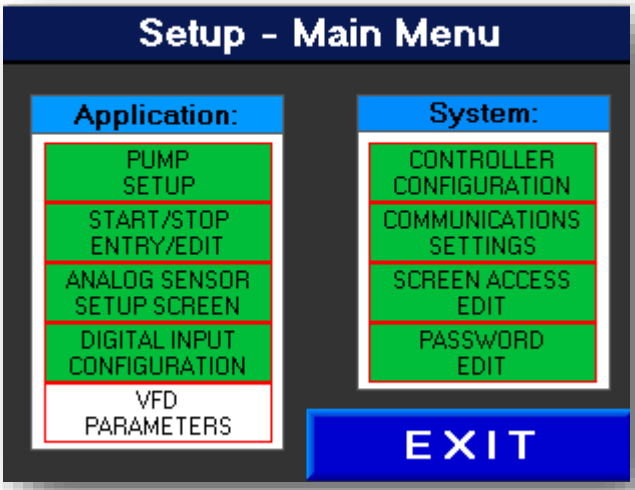
Master—This user can access everything.

Supervisor—This user can access just the parameters that Master allows it to.

User—This user can also access only the parameters that Master allows it to.

For now, log in as **Master**. The default password is "**0**".





Setup Menu:

The setup menu is divided into two groups:

Applications—These parameters control how you pumps and peripheral equipment operate.

System—These Parameters control how the **OptiPumpMD** controller looks and behaves.

Application Parameters:

Pump Setup— Parameters related to Pump Speed, Throttle Valve Control, Pump Curve, and Charge Pump & Oil Pump delay timers.

Start/Stop Entry Edit—Configures how to control Pump Start and Stop.

Analog Sensor Setup Screen— Parameters to setup and scale analog inputs and control alarm levels and actions.

Digital Input Configuration—Parameters to configure devices connected to the digital inputs.

Pump Setup:

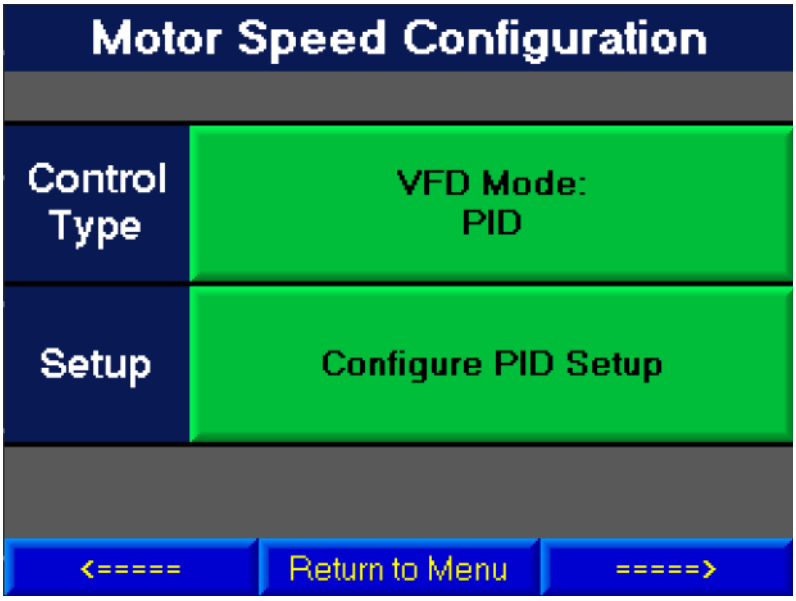
These parameters configure how the system controls pump speed, throttle valve, and timers related to peripheral

Motor Speed Control:

This page configures Pump Speed. Select the Control Type preferred for your application, then select the "Setup" button below to configure parameters for that Mode.

Control Type / VFD Mode:

- **PID—**Uses setpoint and adjusts speed to maintain an analog input level.
- **Fixed Speed Setpoints–** User sets a high and low speed, pump runs the high speed when above the setpoint and the low speed below it.
- **Fixed Speed Screen Entry**—User sets speed from main screen. Useful for Jet Pump and other specialty applications. **Also used if speed will be controlled by a remote SCADA device.**
- **Signal Following—** User sets high and low setpoints, speed will linearly scale between these setpoints.

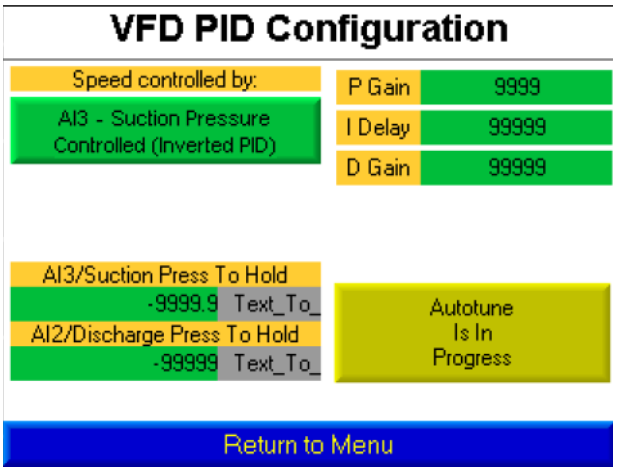


Pump Setup—Motor Speed Configuration

PID Mode:

Speed Controlled By: Selects which Analog Input is used for the process value.

Autotune PID: When PID Autotune is activated, the controller will allow the unit to go above and below the setpoint a few times and measure the reaction of the process value in relation to motor speed. The OptiPumpMD will then fill in P, I, D, and sample time values based off the reaction it sees.



Pump Setup—PID Configuration

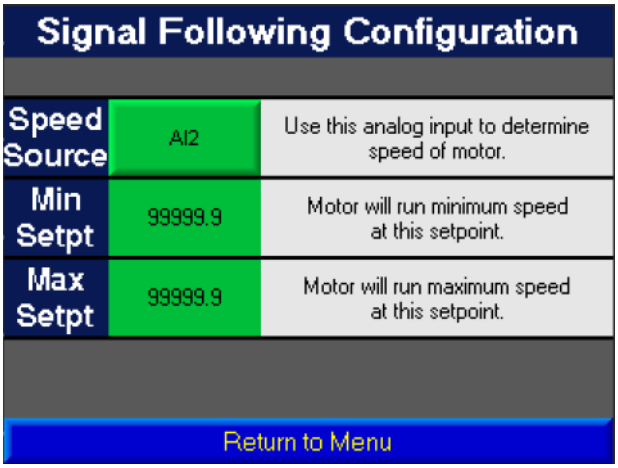
Signal Following Mode:

Speed Source: Selects which Analog Input will be used for speed reference.

Min Setpoint: Pump runs at minimum speed at or below this setpoint.

Max Setpoint: Pump runs at maximum speed at or above this setpoint.

The speed will adjust linearly between the two setpoints.



Pump Setup—Signal Following Configuration

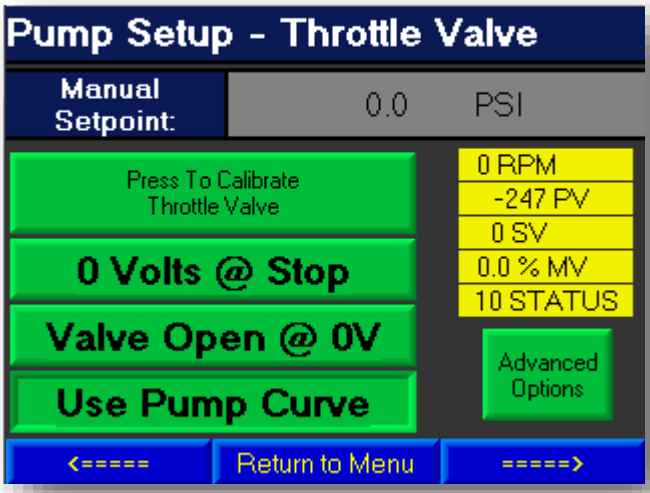
Throttle Valve:

Manual Setpoint: The throttle valve will hold this pressure if Pump Curve is not active.

0 Volts @ Stop / 10V @ Stop: Selects whether the throttle valve is given a low or high signal while the pump is stopped.

Valve Open @ 0V / Valve Open @ 10V: Select whether a low or high signal results in an Open condition of the throttle valve.

Use Pump Curve / Manual Setpoint: Selects if the pump curve or the manual setpoint is active. If Pump Curve is active, the next screen must have pressure values defined.



Pump Setup—Throttle Valve

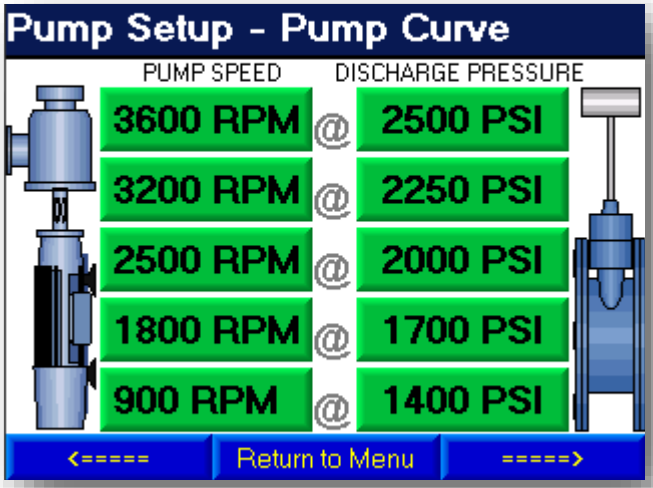
Monitor Values:

This page shows real time values in the yellow box. These can be useful for initial configuration and troubleshooting of your system.

- **RPM:** The main pump's motor speed.
- **PV**: Process Value, the current Discharge Pressure.
- **SV:** Set Value, the Target Discharge Pressure the valve is trying to hold.
- **MV:** The signal being sent to the throttle valve. 0% is 0V or 4mA, 100% is 10V or 20mA.

Pump Curve:

This page configures the curve of a centrifugal pump, so that the OptiPumpMD can change the target discharge pressure based off the Pump's RPM.

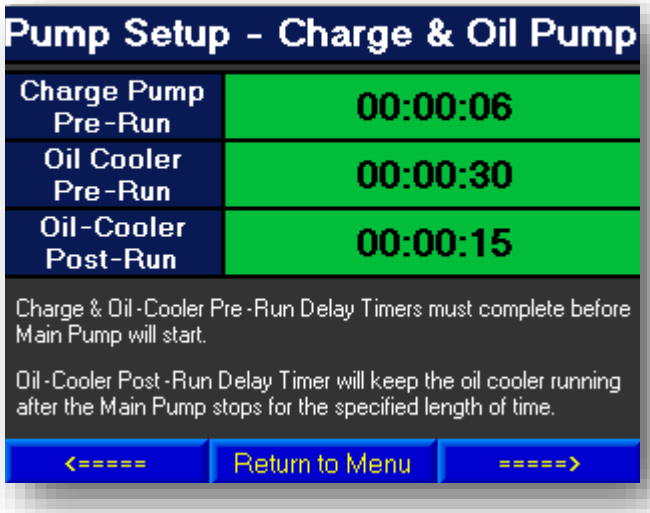


Each line of the chart has a speed and a discharge pressure.

At that speed, the controller will use the throttle valve to hold that discharge pressure if the discharge pressure is lower than that value. If the discharge pressure is already higher than that value obviously the throttle valve isn't going to be able to help your situation any. We would suggest a bypass valve, or perhaps a consultation with a wizard.

If the Pump is above the highest speed shown on the first line, the throttle valve will target that pressure. If the pump speed is below the lowest speed shown on the bottom line, the throttle valve will target that pressure. If the pump speed is between two speeds the controller will scale a target pressure between the two values you entered.

Charge & Oil Pump:

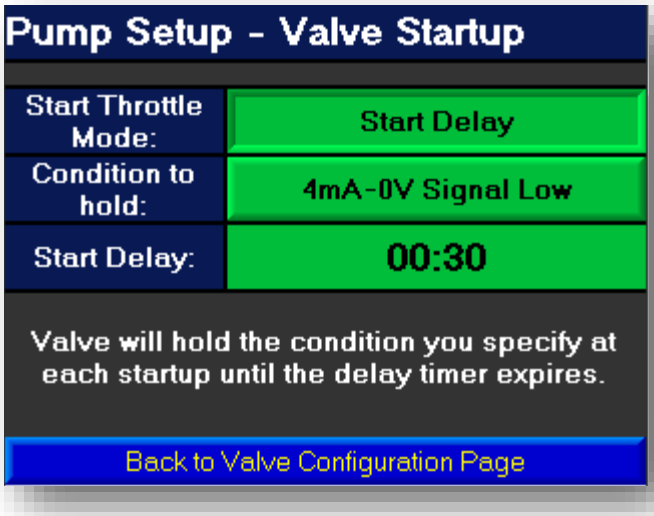


Charge Pump Pre-Run: The charge pump will run for this long before the main pump starts.

Oil Cooler Pre-Run: The oil cooler will run for this long before the main pump starts.

Oil Cooler Post-Run: The oil cooler will run for this long each time after the main pump stops.

Throttle Valve Advanced Parameters:



These parameters define the behavior of the throttle valve at startup.

Start Throttle Mode:

- **Normal**: Starts normally. *The other parameters on this page are disabled.*
- **Start Delay:** The Throttle valve will hold the condition you specify for the length of time you specify at each startup before beginning normal operation.

Condition to hold: Selects if a low or high signal is sent to the throttle valve when the system starts.

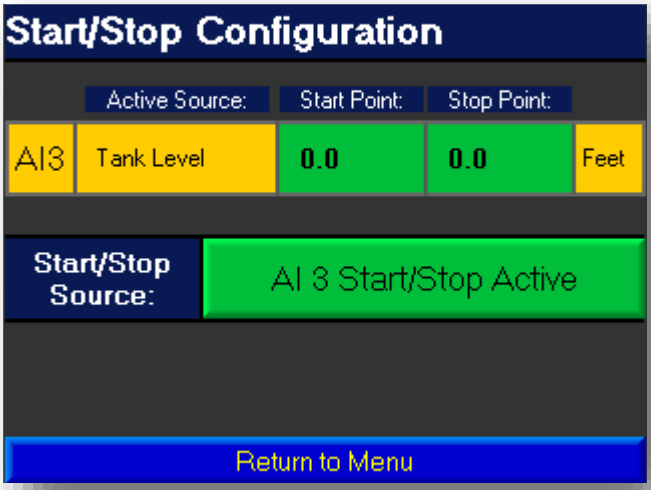
Start Delay: How long the system will hold the valve in this "start condition" at each startup.

Start/Stop Configuration:

These parameters configure how the system is started and stopped.

Start/Stop Source:

- **AI1 Start/Stop Active:** Unit uses the start and stop point set above to start and stop the unit based on the signal received on Analog Input 1.
- **AI2 Start/Stop Active:** Unit uses the start and stop point set above to start and stop the unit based on the signal received on Analog Input 2.
- **AI3 Start/Stop Active:** Unit uses the start and stop point set above to start and stop the unit based on the signal received on Analog Input 3.



Start/Stop Configuration

- **Momentary Start/Stop Switch:** Digital Inputs that have had their action defined as **Momentary Start and Stop** will be used to start and stop the unit. *Digital Inputs must also be configured for this to function.*
- **Maintained Run Switch:** A Digital Input that have had it's action defined as **Maintained Run Signal** will be used to start and stop the unit. *Digital Inputs must also be configured for this to function.*

Additional Parameters for Analog Input Start/Stop:

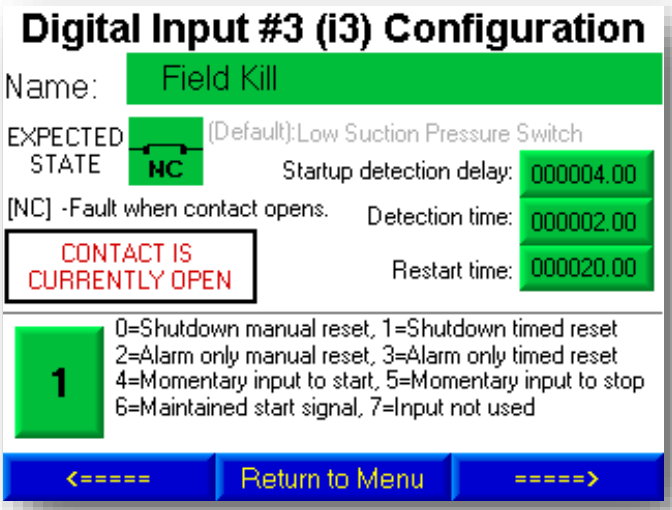
Start Point: The level at which to Start.

Stop Point: The level at which to Stop.

Digital Inputs:

Digital shutdowns must be dry (unpowered) contacts. No external voltage should be input to the digital shutdown terminals.

Digital shutdowns are terminated to the **DI00-DI17** terminals. The **0V** terminal (the negative side of your 24VDC power supply) is the common for all of these. OptiPumpMD units purchased in a panel will have these inputs pre-terminated to terminal blocks to make wiring simpler. Each of these inputs has independent configuration options:



Digital Input Configuration

Name: Each Digital Input may be assigned an alphanumeric name of up to 20 characters.

Expected State: Each Digital Input may be Normally Open (NO) or Normally Closed (NC). *(Please note that the box below this parameter shows the current state of the input to make configuration more convenient.)*

Startup Delay: The controller will ignore a fault condition on this input for the time specified at each startup. (*Useful for low discharge and low oil pressure shutdowns.)*

Detection Time: The Digital Input must remain in a tripped state for the time specified for a shutdown or alarm to occur.

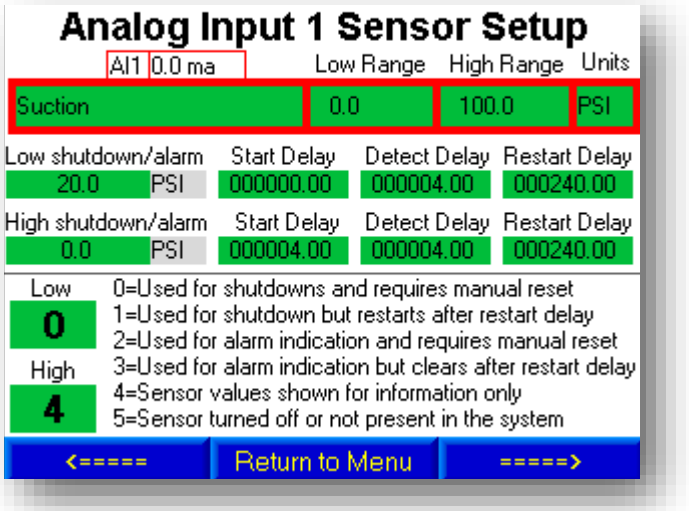
Restart Time: If automatic restarts for this input are enabled, this parameter specifies the delay before such a restart occurs.

Input Actions:

- **Shutdown, with manual reset:** Unit shuts down and will wait for an operator to reset it.
- **Shutdown, with timed reset:** Unit shuts down and restarts according to timer.
- **Alarm only with manual reset:** Unit keeps running, but displays alarm until it is reset.
- **Alarm only with timed reset:** Unit keeps running, but displays alarm until timer clears.
- **Momentary Input to Start**: A pulse from this input will start the unit, if **Momentary Start/Stop** is selected in Start/Stop Entry.
- **Momentary Input to Stop:** A pulse from this input will stop the unit, if **Momentary Start/Stop** is selected in Start/Stop Entry.
- **Maintained Start Signal**: The unit will run when this input is made, if **Maintained Start/Stop** is selected in Start/Stop Entry.
- **Input not used:** Connections to this terminal will be ignored.

Analog Inputs:

Analog input configuration includes all the same options available on the digital inputs, plus a few extra parameters. Use the arrow at the bottom of the display to scroll through the Analog Inputs.



Analog Input Configuration.

Low/High Range Scaling: The low and high range of the analog device. *(Eg: If you are using a 0-10 PSI pressure transducer, 0 would be the low range and 10 would be the high range.)*

Engineering Units: The engineering units used by your scaled range. *(Eg: PSI, FEET, GPM, BPD)*

Low/High Shutdown/Alarm Levels: The value at which low/high faults will occur with this analog input.

Actions: Low and High levels may be set to function as a shutdown, alarm, or as a monitor value only.

Shutdowns will shut the unit down. Available with manual restart or automatic restart with timed delay.

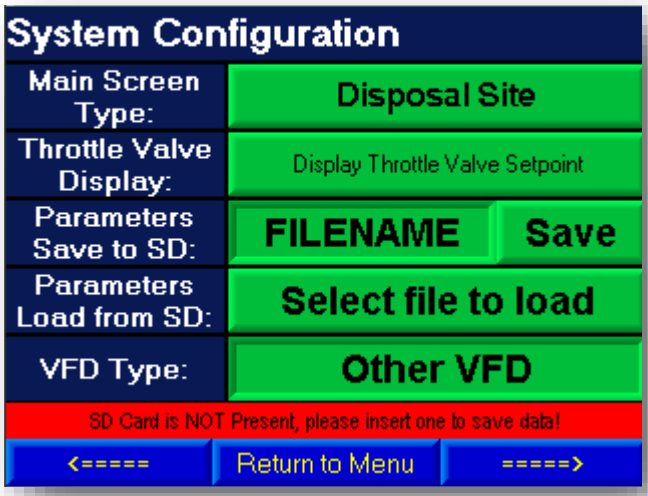
Alarm Only will save the event in the log but continue running.

Monitor Value Only will not display any messages but make the value available as an on-screen monitor.

Controller Configuration:

Main Screen Type: Selects which main screen is shown:

- **Tank Level**: Shows a tank level graphic, useful for pumping applications that drain or fill a tank.
- **Numeric:** Shows all numerical values. Great for any application, the bottom monitor can show your Target Discharge Pressure for centrifugal pumping applications or function as a direct entry box for Pump Speed for specialty applications like Jet Pumps.
- **Disposal Site:** Shows the common components of a horizontal pumping system being used for disposal. Graphics of charge pump and horizontal pump change color based off current condition and pressure values are shown at the physical point they exist in the system.



System Parameters

Each of these main screens annunciate system status, you may select which one you prefer based off the application you are configuring the OptiPumpMD to control. Actual operation of the controller remains consistant regardless of which Screen Type is selected.

Throttle Valve Display: Selects if the throttle valve setpoint is shown on the main screen.

Parameters Save to SD: Backup the parameter settings to a file on the microSD or SD card. Enter an alphanumeric filename eight characters long and press "**Save**" to save. This is useful to backup configuration of a unit to copy to other similar units or recovery from a future disaster event.

Backup filenames must be 8 characters long. If the "**Save"** button is grey and you cannot click it, your filename is not the correct length.

Parameters Load from SD: Select a previously saves parameter backup file and load it into the OptiPumpMD.

Screen Saver Delay Time: This is the amount of time after button/screen presses the controller will wait before turning off the backlight. *Default is 20 minutes.*

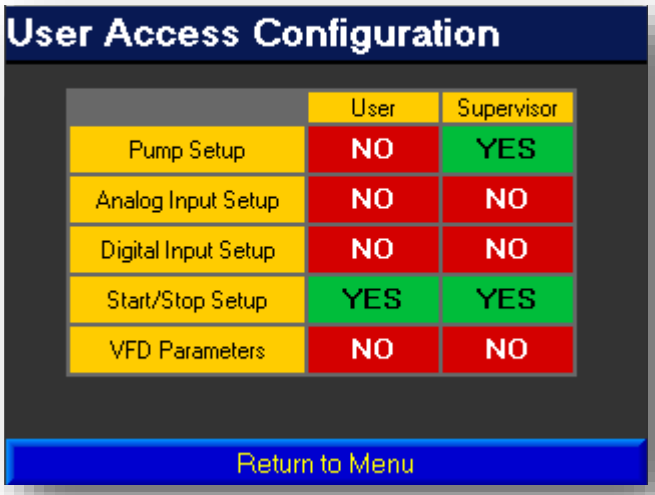
SD Card Log Rate: The parameter on this page specifies the sample rate for the log being written to the microSD or SD card if one has been inserted into the controller. After the time specified here, a new line will be written to the CSV file being saved. These files are easily read and trended in Excel, OpenOffice, Google Docs, or any other spreadsheet program. *Default setting is 1:00.00 (1 Minute).*

VFD Type: The OptiPumpMD will work with any brand of variable frequency drive. If a Fuji Mega VFD is being used, the OptiPumpMD can communicate with it over RS-485/ModbusRTU to provide additional information such as motor performance data and log it when events occur.

Screen Access Edit

The Master user can define which screens are accessible for other users. **This screen is only accessible by the Master user.**

Select YES or NO to determine if User and/or Supervisor users get access to each feature's configuration pages.

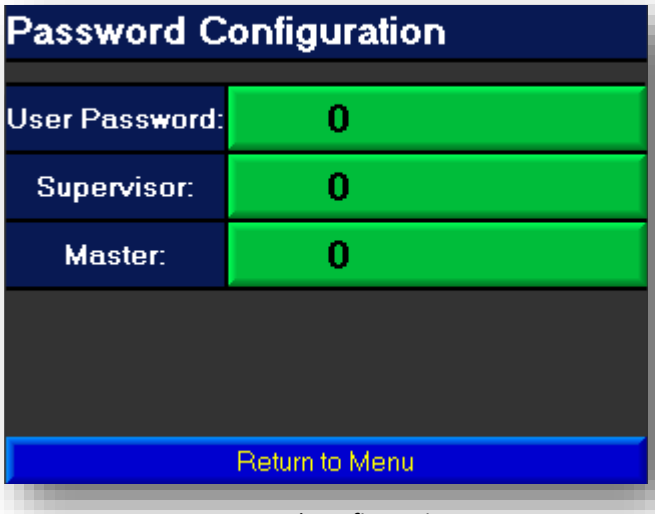


Screen Access Edit

Password Edit:

The Master user can define passwords for other users. **This screen is only accessible by the Master user.**

Enter the value for each password. The default is "0".



Password Configuration

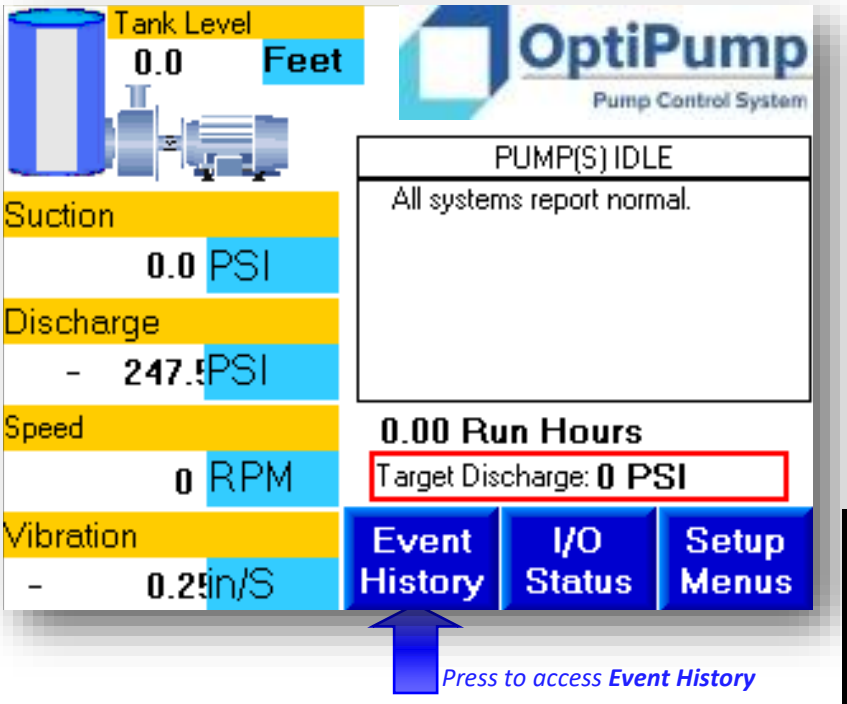
Troubleshooting

Event History:

The **OptiPumpMD** records all of the monitor values, plus if it is connected to a PumpMaster VFD package, a snapshot of detailed VFD data every time the unit faults (a shutdown or alarm condition occurs). These data snapshots are available for the last 250 faults.

Accessing the Fault History:

Press the "*Alarms*" button from the home screen to access the Fault History page.



*The default home screen of the **OptiPumpMD.***

Navigation:

The *Fault #* shown on the upper right-hand corner of the Fault History display is the current fault being displayed. 0 is the most recent fault, and 249 is the oldest fault recorded by the system.

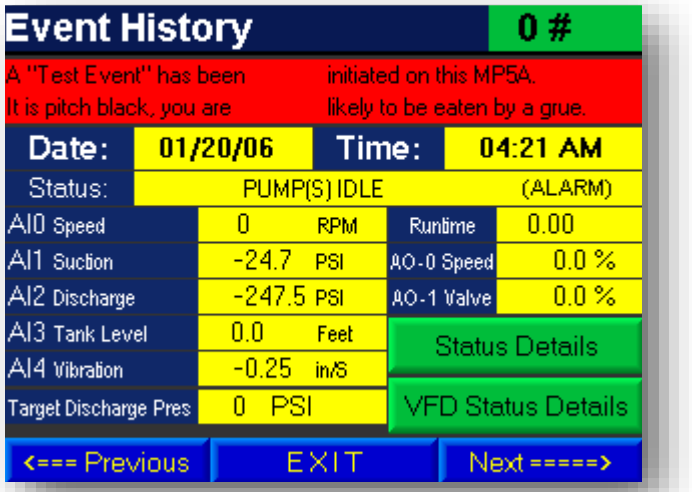
The right "Next" arrow will increment the fault number and travel backwards in time through the history of the units faults until is shows 249, the oldest fault.

The left "Previous" arrow will decrement the fault number and travel forwards in time until it reaches 0, the most recent fault.

Monitor Values:

Date and Time are displayed at the top of the screen, followed by a detailed description of the fault encountered in the second red area.

The Numerical data that occupies the lower side of the display is a collection of analog inputs, outputs, and process variables.



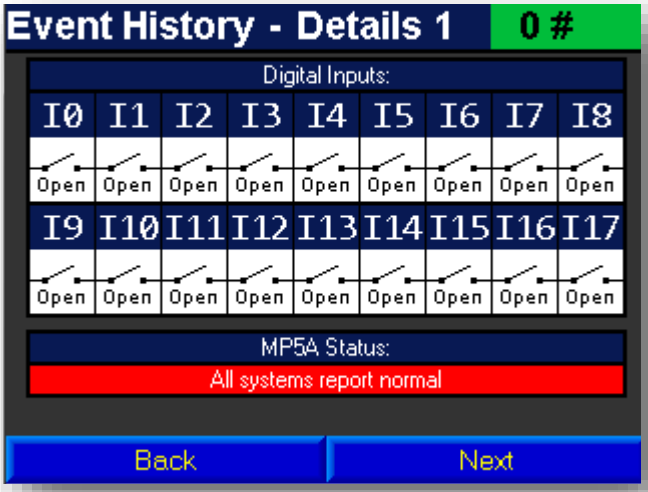
Fault History

Monitor	Description	Unit
Status	System Status when event was recorded	
AI0	Value from analog input 0 *Default Pump RPM*	RPM
AI1	Value from analog input 1 *Default Suction Pressure*	PSI
AI2	Value from analog input 2 *Default Discharge Pressure*	PSI
AI3	Value from analog input 3 *Default Tank Level*	Feet
AI4	Value from analog input 4 *Default Vibration*	In/S
Target Discharge Pressure	The discharge pressure the throttle valve is trying to maintain.	PSI
Runtime	How long the pump has ran	Hours
AO-0 Output	Pump Speed	%
AO-1 Output	Throttle Valve Position	%

Status Details

The **Status Details** button will allow you to see the condition of the controller's digital inputs and outputs when the event was logged.

This data can be useful for determining the exact condition of your system when troubleshooting a fault event.



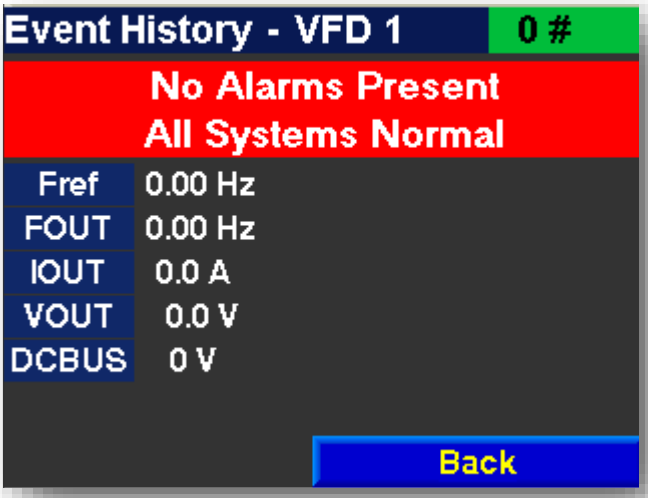
Event Status Details—Page 1 (Digital Inputs)

Event Status Details—Page 2 (Digital Outputs)

VFD Status Details

If your OptiPumpMD is connected to a PumpMaster VFD, the **VFD Status Details** button will allow you to see the monitor values of the VFD when the event was logged.

This data can be useful for determining the exact condition of your system when troubleshooting a fault event.



VFD Status Details

Monitor	Description	Unit
FREF Frequency Reference	The speed that has been requested for the pump to run.	Hz
FOUT Frequency Out	The speed that the pump is currently running at.	Hz
IOUT Current Out	The amperage being output by the VFD.	Amps
VOUT Voltage Out	The voltage output by the VFD.	VAC
DC BUS Voltage	The voltage of the VFD's DC BUS.	VDC

Digital Inputs:

DI2—DI15 are available for general purpose digital inputs, primarily used for shutdowns. (The 0V terminal is the common for all of the inputs. This is the negative side of the 24V power supply used to supply power to the controller. Use dry contacts only, do not power these inputs.)

DI16 is the dedicated "hand" run input. When this input is closed the unit runs, bypassing any automatic start/stop that has been configured.

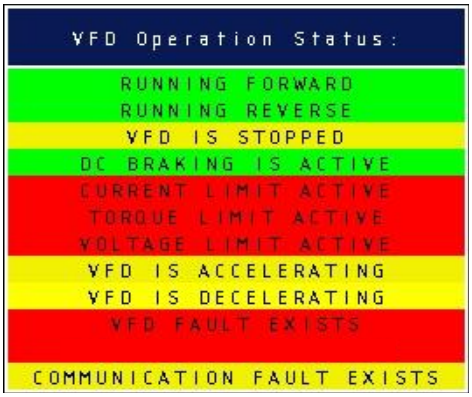
DI17 is the dedicated "automatic" run input. Every **OptiPumpMD** package has a off/on switch terminated to this input. When this input is closed the unit provides "normal" operation and starts/stops according to the options that have been configured in *Start/Stop Entry Edit.*

For safety purposes, either DI17 or DI16 must be in a closed state for the unit to operate.

OptiPump VFD Operation Status:

The VFD has a number of operating conditions that are recorded when faulting. This data can help you determine exactly what was happening when the fault occurred.

The **RUNNING FORWARD**, **RUNNING REVERSE**, and **VFD IS STOPPED** statuses will never show active at the same time during practical operation. The VFD will either be stopped, or running when it faults; and that condition will be easily determined using these first three statuses.



VFD Operation Status

DC BRAKING IS ACTIVE indicates that the VFD is using DC to try to stop the motor electrically. This option is not used with traditional inductive submersible motors (and doesn't react well with AC step-up transformers) and there is no way to enable it with the **OptiPumpMD** controller. If you happen to notice DC Braking is active, verify that VFD parameter F22 is set at 0, or do an H03 Reset on the inverter and cycle power to let the **OptiPumpMD** reinitialize the VFD.

CURRENT LIMIT ACTIVE indicates that the VFD is reducing the output speed in an attempt to lower the output current below the setpoint of the current limit.

TORQUE LIMIT ACTIVE indicates that the VFD is reducing speed to keep the output torque below the setpoint of the torque limit. This setting is not typically used with ESP applications.

VOLTAGE LIMIT ACTIVE indicates that the VFD is experiencing high DC Bus voltage.

VFD IS ACCELERATING indicates that the VFD is increasing the output speed.

VFD IS DECELERATING indicates that the VFD is decreasing the output speed.

VFD FAULT EXISTS indicates that the VFD is in a faulted state. (An internal VFD fault occurred)

COMMUNICATION FAULT EXISTS indicates that the VFD is experiencing issues with the communications. Some suggestions related to this topic exists in the next section, *Troubleshooting COM Faults*.

Troubleshooting COM Faults:

COM Lost: This indicates a communications failure between the controller and the VFD.

- **Make sure the baud rate is set correctly on the VFD.** Perform a "H03" reset by setting VFD parameter "H03" to a value of "1" and then cycle power to the controller. If the controller does not establish communication and reprogram the VFD, then there is a problem with the communications cable or hardware and you should contact our technical support department.

- **Make sure shielding on communications cable between VFD and controller is grounded to the VFD.**

- **Make sure the VFD/panel is properly grounded.** UL recommends a resistance to ground of no more than 25Ω, though in most soil types you should easily be able to have a resistance to ground under 5Ω. (Sandy soil types will be an exception to this. A ballasting material is highly recommended.) A high resistance to ground, or a non-typical grounding method that causes a ground-loop can create communications problems. An improper ground may also reduce the sensitivity of the lightening/surge suppressor and expose the equipment to high voltage.

- **Make sure the motor leads and any output filter and/or transformer is connected correctly.** Route the power and motor leads far away from the communications cables. Listen for any audible hums from inductors used in input and output electrical filters, this could indicate a potential issue.

SCADA

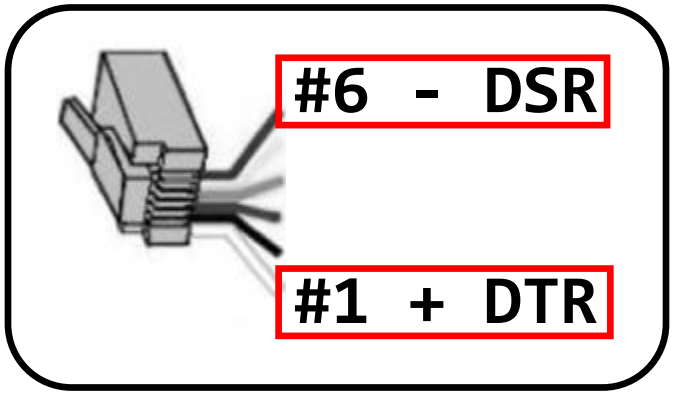
Device Hardware Connection:

If used, the SCADA device's RS-485 or RS-232 must connect to the **OptiPumpMD's COM Port 1**. Only Pin 1 and Pin 6 are used for RS-485. Pin 1 is the Positive (DTR), Pin 6 is the Negative (DSR). Pins 2-5 remain unused. For RS-232, Pin 2 is Ground, Pin 3 is Transmit (TXD), Pin 4 is Receive (RXD).

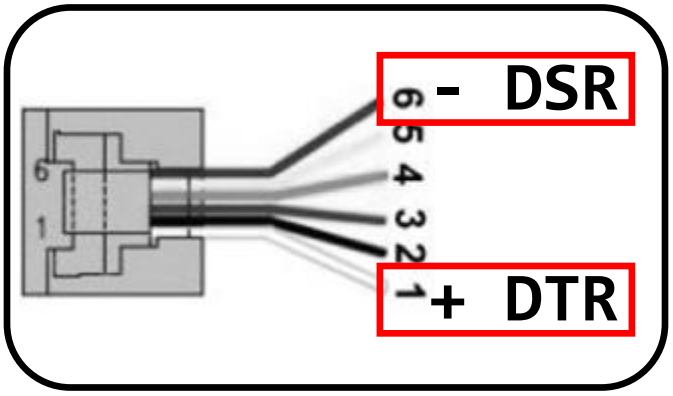
If used, the **PumpMaster VFD**'s RS-485 must connect to the **OptiPumpMD's COM Port 2**. Only Pin 1 and Pin 6 are used for RS-485. Pin 1 is the Positive (DTR), Pin 6 is the Negative (DSR). Pins 2-5 remain unused.

If installed, ethernet may be connected to the **OptiPumpMD's 's COM Port 3**.

Shielded cable is recommended for optimum performance and reliability. Please terminate the drain wire (the shielding) of the communications cable on the SCADA modem side.



Male (connector side) Termination Pinout.



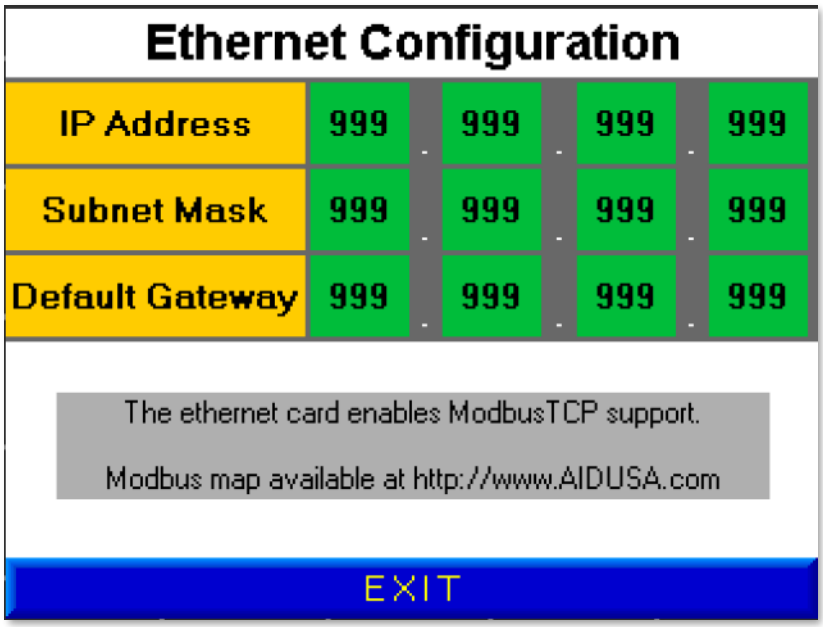
Female (controller side) Termination Pinout.

SCADA

ModbusTCP Configuration:

IP Address, Subnet Mask, and Default Gateway must be configured to use ModbusTCP.

An ethernet card must be installed in COM3 to utilize ethernet. The system must be power cycled after changes are made to these parameters.



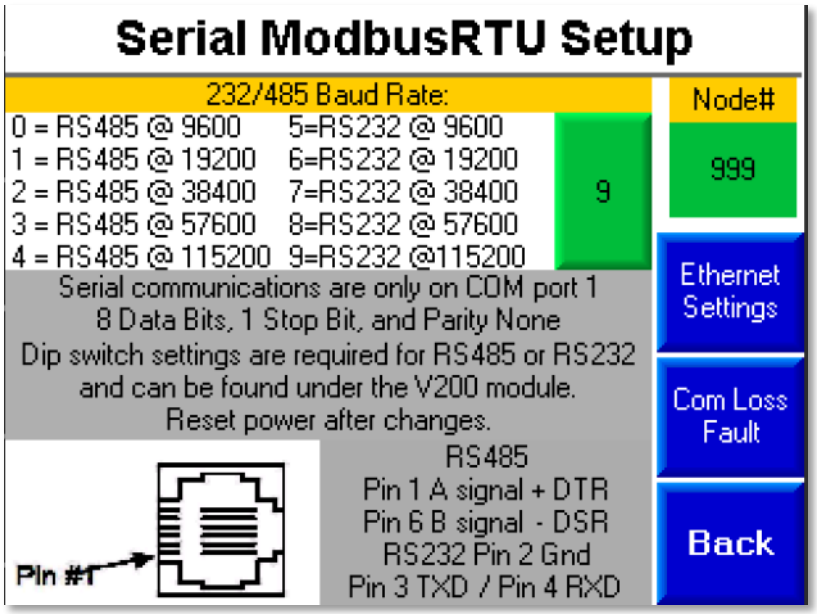
ModbusRTU Configuration:

The **OptiPumpMD** supports node numbers 0-255

Baud rates from 9600-115.2kBPS are supported

RS-232 and RS-485 are both supported, but the dip switches under the V200-18-E6B module on the back of the controllers must be configured to match your selection on this page.

The system must be power cycled after changes are made to these parameters.



Modbus Compatibility:

The **OptiPumpMD** will respond to single or multiple read holding register commands. It supports retrieval of up to 256Bytes (128 Registers) worth of data with each read command. Most of the data in the SCADA Register Map is stored in Signed 16BIT integer format.

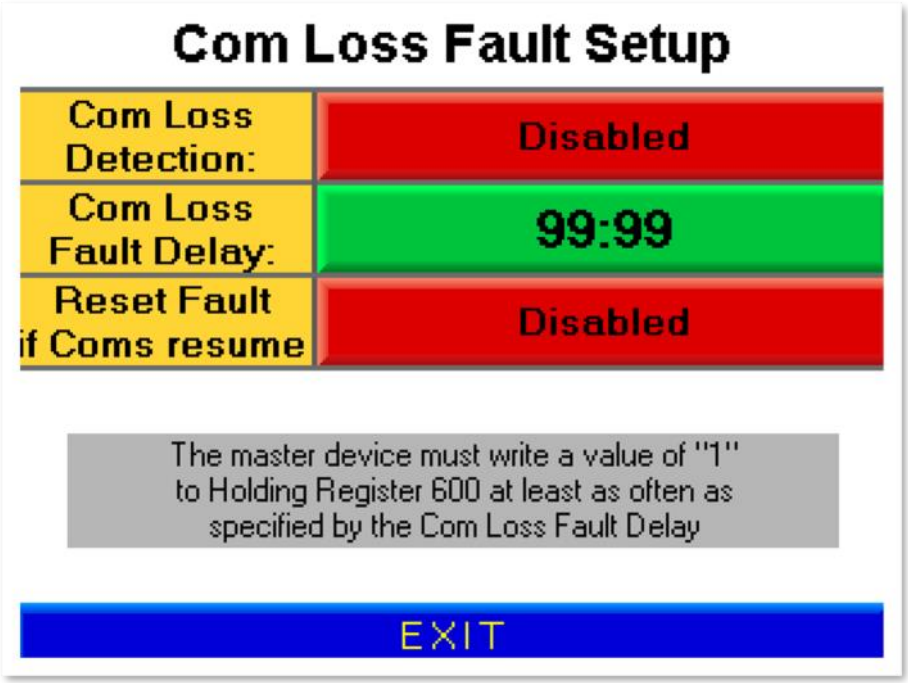
Baud Rate	RS-485 9600 BPS
Parity	None
Data Bits	8
Stop Bits	1

SCADA

Com Loss Fault Detection (Remote Control Watchdog)

If **Com Loss Detection** is enabled, a value of “1” must be continually written to **Holding Register 600** at least as often as the time interval configured in **Com Loss Fault Delay.**

The system will remain faulted until reset, unless **Reset Fault if Coms resume** is enabled. If enabled, the system will resume normal operation as soon as a value of “1” is once again written to **Holding Register 600** .



Com Loss Fault Setup

VFD Parameters

If the OptiPumpMD is installed with a PumpMaster Fuji Mega VFD package, many VFD parameters may be configured with the controller.

Page 1

- **Maximum Speed:** The maximum operating speed, in Hertz. *Default is 60 Hz.*
- **Minimum Speed:** The minimum operating speed, in Hertz. *Default is 30 Hz.*
- **Overload:** Motor Overload Setpoint, in Amps.
- **Stop Mode:** Select whether VFD decelerates to a stop, or coasts to a stop.

Page 2

- **Torque Boost:** Torque boost increases torque by adding a constant voltage to the V/f pattern of the VFD. 0-2.0% is usually sufficient for most ESP applications. Use caution, while the range extends all the way to 20%, setting this value too high when torque is not needed can cause over-excitation, high current, and overheating. *Default is 0%, uses VFD Parameter F09.*
- **Carrier Frequency:** PWM Switching speed of VFD. 1-10kHz
- **Current Limit**: Limits VFD's output speed when above specified current level. *Default = 0, disabled.*
- **Phase Detection**: Allows the VFD to ignore input phase loss when single phase power is connected.

Page 3

- **Maximum Volts:** The voltage output when the VFD reaches maximum speed.
- **Base Frequency:** The frequency at which the VFD outputs full voltage.
- **Acceleration Time:** How long the VFD takes to reach full speed.
- **Deceleration Time:** How long the VFD takes to decelerate.

Page 4

- **VFD Mode:** Centrifugal (Volt/Hz Mode) or Positive Displacement (Torque Vector)
- **Regen:** How the VFD reacts to motor overspeed (regeneration)
- **Regen Hz**: How much overspeed is allowed before the VFD will attempt deceleration.
- **Torque Vector:** Enters Torque Vector Configuration Page.

Positive Displacement/Torque Vector Parameters

- **Motor Poles:** Number of electrical poles in motor.
- **Motor HP:** Rated Nameplate Horse Power of motor.
- **Motor Amps:** Rated Nameplate Current of motor.
- **Autotune:** Starts Autotune of motor. (Only needed if using Positive Displacement/Torque Vector mode)

SCADA Registers

HEX	DEC	Description	Read/Write	Unit
9	9	**AI1 Low Alarm Setpoint**	**R/W**	.x
A	10	**AI1 High Alarm Setpoint**	**R/W**	.x
D	13	**VFD Speed Reference (4-20 Output)**	Read	12bit (0-4095)
F	15	**Scada Run Command** (Only Active if Start/Stop Source set to SCADA)	**R/W**	0=Off, 1=On
10	16	**Status:** 0=IDLE, 1=PRECHARGE PUMP STARTED, 2=MAIN PUMP RUNNING, 3=PUMP SYSTEM FAULTED, 4= PUMP RUNNING WITH ALARM	Read	
11	17	**Start/Stop Source**	**R/W**	0=AI3, 1=AI2, 2=AI1, 3=Momentary DI, 4= Maintained DI, 5=SCADA
14	20	**AI3 Scaling Low Range**	**R/W**	.x
15	21	**AI3 Scaling High Range**	**R/W**	.x
1A	26	**AI0 Scaling Low Range**	**R/W**	
1B	27	**AI0 Scaling High Range**	**R/W**	
4A	74	**Tank Level (AI3)**	Read	xxx.x
4E	78	**RPM (AI0)**	Read	xxxx
50	80	**Suction Pressure (AI1)**	Read	xxx.x
64	100	**AI3 Low Alarm Setpoint**	**R/W**	.x
65	101	**AI3 High Alarm Setpoint**	**R/W**	.x
66	102	**AI2 Low Alarm Setpoint**	**R/W**	.x
69	105	**AI0 Low Alarm Setpoint**	**R/W**	
6A	106	**AI0 High Alarm Setpoint**	**R/W**	
79	121	**Suction Pressure PID Setpoint**	**R/W**	.x
7A	122	**Discharge Pressure PID Setpoint**	**R/W**	.x
E8	232	**Speed Control Mode**	**R/W**	0=PID, 1=Fixed Speed Setpoint, 2=SCADA/HMI Entry, 3=Signal Following
E9	233	**SCADA/HMI Speed Setpoint**	**R/W**	xxxx RPM
208	520	**AI3 Low Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
209	521	**AI3 High Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
20A	522	**AI2 Low Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
20B	523	**AI2 High Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	

SCADA Registers

20C	**524**	**AI0 Low Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
20D	**525**	**AI0 High Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
20E	**526**	**AI4 High Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
20F	**527**	**AI1 Low Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
210	**528**	**AI1 High Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
211	**529**	**AI4 Low Action** (0=Shutdown; 1=Shutdown w/ restart; 2-5=No Shutdown	**R/W**	
258	**600**	**Com Loss Watchdog**	R/W	Write "1"
708	**1800**	AI0 Name (20 Char)	Read	ASCII TEXT
717	**1815**	AI1 Name (20 Char)	Read	ASCII TEXT
726	**1830**	AI2 Name (20 Char)	Read	ASCII TEXT
735	**1845**	AI3 Name (20 Char)	Read	ASCII TEXT
744	**1860**	AI4 Name (20 Char)	Read	ASCII TEXT
76C	**1900**	**Status Display - Line 1 (30 Char)**	Read	ASCII TEXT
780	**1920**	**Status Display - Line 2 (30 Char)**	Read	ASCII TEXT
794	**1940**	**Status Display - Line 3 (30 Char)**	Read	ASCII TEXT
7A8	**1960**	**Status Display - Line 4 (30 Char)**	Read	ASCII TEXT
7E4	**2020**	AI3 Engineering Unit (5 Char)	Read	ASCII TEXT
7E7	**2023**	AI2 Engineering Unit (5 Char)	Read	ASCII TEXT
7EA	**2026**	AI0 Engineering Unit (5 Char)	Read	ASCII TEXT
7ED	**2029**	AI4 Engineering Unit (5 Char)	Read	ASCII TEXT
7F0	**2032**	AI1 Engineering Unit (5 Char)	Read	ASCII TEXT
3002	**12290**	**SD Card Status (0=Not Inserted, 1=Writing, 2=Present&idle, 4=WriteProtected**	Read	
7012	**28690**	**Total Run Hours**	Read	32bit .xx Hours
7014	**28692**	**AI2 Scaling Low Range**	**R/W**	32bit .x
7015	**28693**	**AI2 Scaling High Range**	**R/W**	32bit .x
7018	**28696**	**Discharge Pressure (AI2)**	Read	32bit .x
701F	**28703**	**AI2 High Setpoint**	**R/W**	32bit .x
7038	**28728**	**AI4 Scaling Low Range**	**R/W**	32bit .xx
7039	**28729**	**AI4 Scaling High Range**	**R/W**	32bit .xx
7042	**28738**	**AI4 Low Alarm Setpoint**	**R/W**	32bit .xx
7043	**28739**	**AI4 High Alarm Setpoint**	**R/W**	32bit .xx
7045	**28741**	**Vibration (AI4)**	Read	32bit .xx
7062	**28770**	**Signal Following Minimum Speed Setpoint**	**R/W**	32bit .x
7063	**28771**	**Signal Following Maximum Speed Setpoint**	**R/W**	32bit .x

SCADA Registers

Coil (hex)	DEC	Description		
	144	Speed Control Process Source: 0=AI2, 1=AI3	R/W	COIL
4002	16386	DO2 (Main Pump Run)	Read	COIL
4003	16387	DO3 (Charge Pump Run)	Read	COIL
4004	16388	DO4 (FREF Shift for Hand Input)	Read	COIL
4005	16389	DO5 (Oil Cooler Run)	Read	COIL
4007	16391	DO7 (Alarm Exists)	Read	COIL
6000	24576	DI0 (Main Pump Run Confirmation)	Read	COIL
6001	24577	DI1 (Charge Pump Run Confirmation)	Read	COIL
6002	24578	DI2 (Typically VFD Fault Input)	Read	COIL
6003	24579	DI3	Read	COIL
6004	24580	DI4	Read	COIL
6005	24581	DI5	Read	COIL
6006	24582	DI6	Read	COIL
6007	24583	DI7	Read	COIL
6008	24584	DI8	Read	COIL
6009	24585	DI9	Read	COIL
600A	24586	DI10	Read	COIL
600B	24587	DI11	Read	COIL
600C	24588	DI12	Read	COIL
600D	24589	DI13	Read	COIL
600E	24590	DI14	Read	COIL
600F	24591	DI15	Read	COIL
6010	24592	DI16 (HAND INPUT)	Read	COIL
6011	24593	DI17 (AUTO INPUT)	Read	COIL

Read/Write (Holding Register)
Read Only (Holding Register)
Coil Data (Binary)

This SCADA template is for the standard OptiPumpMD. OEM Versions may have additional or different registers available.