The logo for PUMP Vision, consisting of the word 'PUMP' in white capital letters inside a blue circle, followed by the word 'Vision' in white capital letters inside another blue circle. The two circles are connected at their bottom edges.

# PUMP Vision TS1040

## Lift Station Level Controller



## Installation and Operation Manual

# PUMP Vision TS1040

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# PUMP Vision TS1040

## Features

The PUMP Vision TS1040 Level Controller is a microprocessor based level controller designed with an easy to use color touch screen type operator interface.

The PUMP Vision TS1040 level controller can be configured to operate in simplex, duplex, triplex and quadruplex mode as standard. It can be set to control the pumps in constant speed mode, as well as variable speed mode when variable frequency drives (VFDs) are used.

A trending screen is provided to allow the operator to track recent changes in the sump level. In VFD mode a graph of the VFD speed is also shown. Data logging is provided to keep a record of fault conditions.

### Overview of Standard Features

The PUMP Vision TS provides the following functions in a level control application:

- Constant speed mode
- Variable speed mode
  - Proportion
  - PID Mode
- Setpoint control of an analog input with these set points:
  - Stop lead pump
  - Start lead pump
  - Stop lag pump (for each lag pump independently)
  - Start lag pump (for each lag pump independently)
  - High level alarm
  - Low level alarm
- Display of liquid level in 1/10 ft resolution
- Display of pump call status
- Display of pump status for each pump
  - Off, Running, Called, Failed, Out-of-service
  - “Soft” H-O-A - used for remotely controlling the pump
  - Elapsed run time
  - Number of starts counter
  - In VFD mode:
    - VFD command speed
    - VFD output frequency
    - Output watts
    - Manual speed control
- Alternation mode selector
  - Automatic — alternates with each pumping cycle
  - Time clock — alternates daily
  - Manual — any pump can be set as the lead pump

# PUMP Vision TS1040

## Features

- Automatic transfer to standby pump on pump failure
- Automatic purge control (for trapped air and bubbler type level sensing systems)
- Start delay timers to prevent simultaneous starting of pumps after power failure
- Modbus communications port (serial or Ethernet) for connection of SCADA, dialers and other remote monitoring devices
- Number of pumps—up to four
- Trending—graphical display of sump or tank level as well as VFD speed when used. Saves up to five years data at 1 second interval.
- Pump start time/date, stop time/date and run duration data log. Every pump run and alarm event for up to 10 years.
- Pump up or pump down capability
- Automatic test mode
- Easy to use setup wizard
- User definable fault handling of the following inputs
  - High level—transducer
  - High level—redundant float
  - Low level—transducer
  - Low level—redundant float
  - Power failure
  - Seal failure
  - High temperature
  - Pump failure
  - VFD fault
  - Transducer failure
- Fault logging with date and time stamp of last 1000 alarm conditions
  - Date
  - Time
  - Duration
  - User acknowledgement
- Ability to accept any analog signal
  - 4-20 ma
  - 0-10 volts
  - Others
- Ability to scale to any signal
  - PSI
  - Inches of water
  - Others
- Offset entry
- Modbus connection to MotorSaver 777 electronic overload relay
  - Voltage, current, phase failure and ground fault display
  - Shuts down pump and logs alarms

# PUMP Vision TS1040

## Features

### Access Security

There are three levels of access to the menus, designed to allow any user access to the normal operation modes and qualified personnel to have access to the setpoints. The final level of access is reserved for the higher level setup of the system.

- No password protection
  - Level display, Pump Control, Alternation, Time, Trending, Alarms
- 1st level password protection
  - All set points—Stop, start, alarms, timers, alarm handling and purge cycle
- 2nd level password protection
  - System setup—number of pumps, VFD or constant speed, PID, transducer, ETM reset, start counter reset, network configuration, email configuration

### Optional features

The PUMP Vision can be ordered with an Ethernet communication port. With a wide variety of methods, this port can be connected to a LAN or WLAN. With such a connection, the following integral features can be accessed:

- Email alarm notification—up to four recipients
- Text message alarm notification—up to four recipients
- Web Server
  - Operate the pumps
  - Change set points
  - Monitor level
  - Monitor alarm conditions
- DDE Server
  - Operate the pumps
  - Change set points
  - Monitor level
  - Monitor alarm conditions
- Remote Access Program
  - Provides a virtual PUMP Vision on a PC—completely control the TS1040
  - Access to the data log
- SD Card Manager
  - Remotely download the data in the SD data memory to view trend chart
  - Remotely download the event log to read pump run and alarm data

# PUMP Vision TS1040

The PUMP Vision is housed in a rugged 272 x 227.5 (10.7" x 8.95") case that is door mounted with NEMA 4X or IP65 protection. All wiring is terminated at pull out terminals, making it simple to replace the unit should the need arise.

The backlit 800 x 600 pixel TFT, LCD display is graphical and can display any font type, bitmap images, and animated graphics. The five key membrane type keypad can be programmed to provide complex functions with the press of a single button or with multiple button combinations.



## Communication

Two RS232C or RS485 (user configurable) ports and an Ethernet port are provided and each can be used to program the unit, or connect to other controllers in a network. These ports can each be set to communicate with the Modbus protocol and the PUMP Vision can be set to operate as a Modbus master or slave. It can even be programmed to be a Modbus master on one port and a slave on the other. In this way, it can operate as a gateway between other devices on a Modbus network.

## Remote Access

One of the remote control options available for the PUMP Vision is our Remote Access software. Once connected to the PUMP Vision, either directly through the COM port, or through a remote connection method such as dial-up modem (land-line or GSM cellular), Internet, or radio, a user can open the Remote Access software program that provides a "virtual" PUMP Vision on the screen of the PC. This software can be downloaded from our Website



Operation of the system is identical to being there. The user simply uses the mouse to press the "buttons" of the on-screen version of the PUMP Vision. All of PUMP Vision information and setpoint screens can be accessed. The pumps can be started and stopped. Alarm messages can be read, setpoints can be changed, data and trends can be viewed.

# PUMP Vision TS1040

## DataXport

DataXport is a powerful software package that can either automatically, on a scheduled time, or manually extract data from the PUMP Vision's data logging memory and insert it into an Excel spreadsheet. Once connected to the PUMP Vision, either directly through the COM port, or through a remote connection method, such as dial-up modem (land-line or GSM cellular), Internet, or radio, the user can receive the data directly into their spreadsheet.

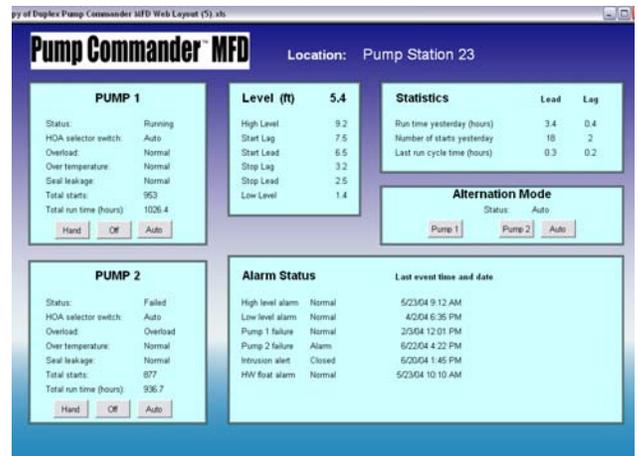
Important data, such as liquid levels, pump run times, and alarm conditions, all with date and time stamps, can be stored and analyzed.



## Excel DDE

Our Excel DDE server application is another method of obtaining data from the PUMP Vision. With this application, the user can connect to the PUMP Vision by one of the previously described methods, and operate the PUMP Vision with either our own Excel based "dashboard", or one that they create with their own design.

The example shown here, which is available from California Motor Controls, has "HAND-OFF-AUTO" buttons to remotely start and stop the pumps, status display of the pumps, alarms and alternation, setpoint access for the user to change the setpoints, and date and time stamps of the last alarms



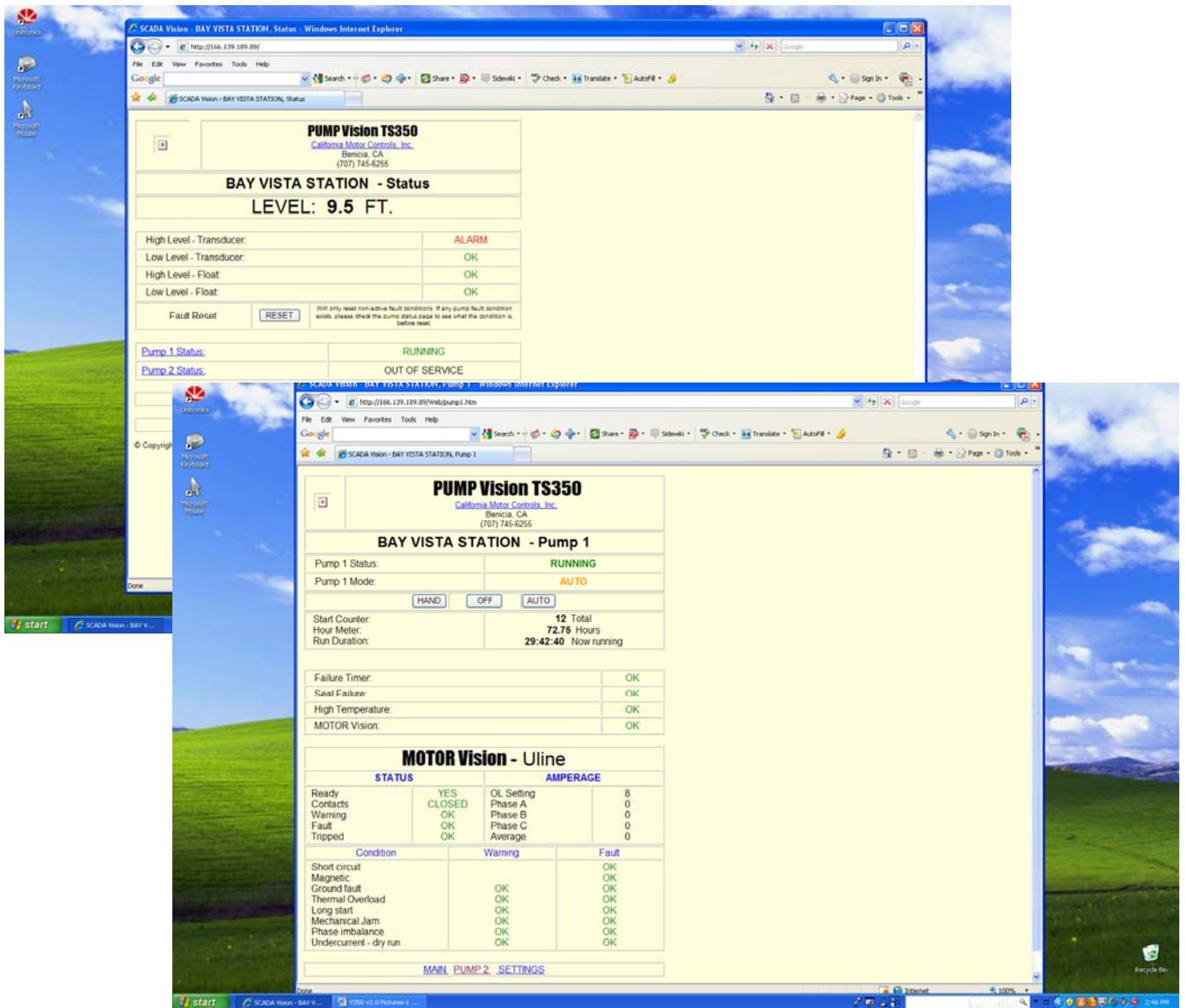
The DDE application program and data file that we provide makes it simple to setup a custom spreadsheet. Multiple lift stations can be setup with a separate station on each sheet of a multiple sheet file.

# PUMP Vision TS1040

## Web Server

The PUMP Vision has a built in Web Server. When connected to the Internet through the Ethernet port option, the system can be monitored and operated using an Internet browser from any remote location. Simply open your browser to the IP address of the PUMP Vision and the web pages will appear.

Pump operating status can be viewed, the pump HAND-OFF-AUTO mode can be changed, and start and stop set points can be changed.



### SAFETY CONSIDERATIONS



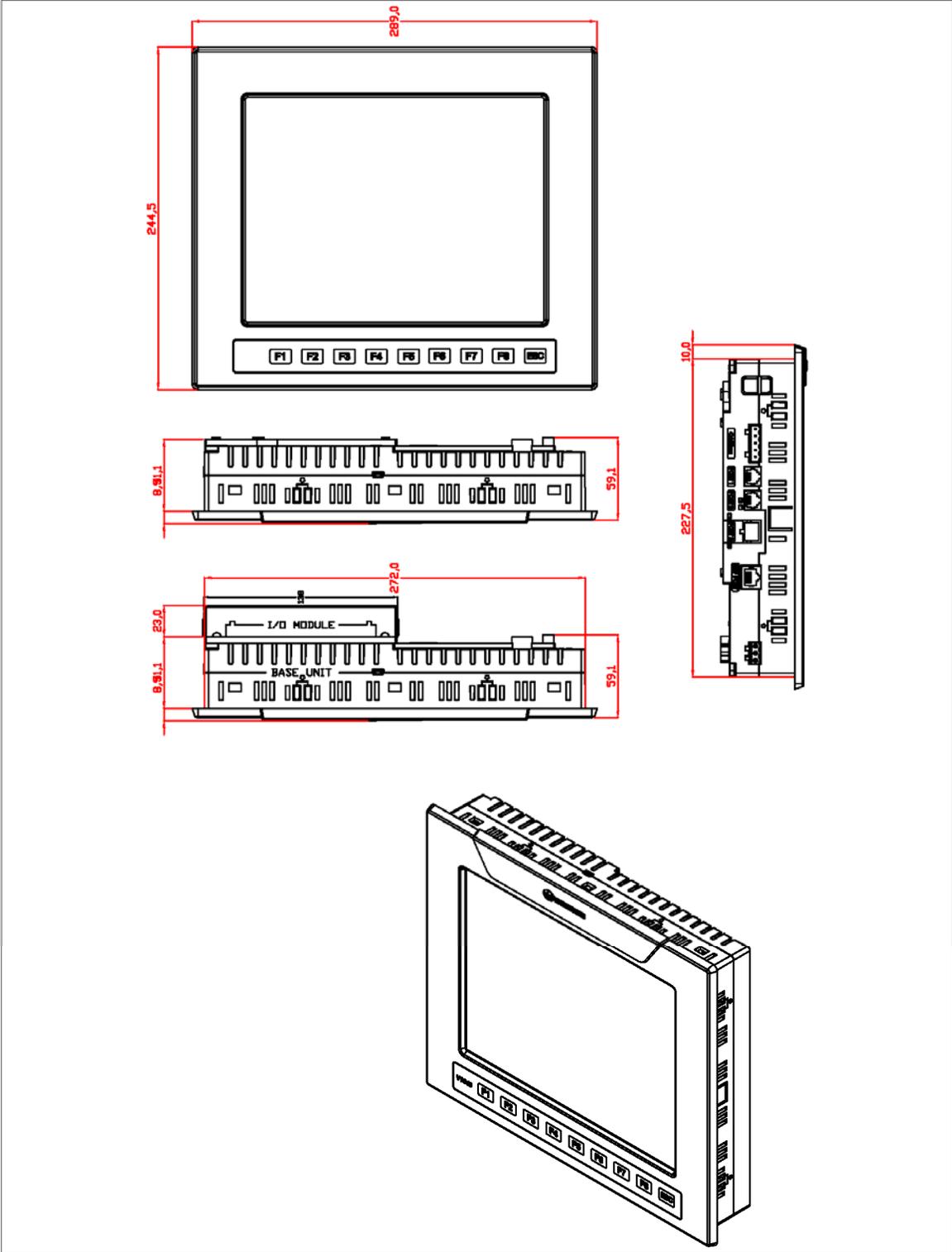
- Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage. Always exercise proper caution when working with electrical equipment.
- Do not attempt to use the controller with voltage exceeding permissible levels. Permissible voltage levels are listed in the technical specifications provided in this manual.
- Install an external circuit breaker or fuse and take all appropriate safety measures against short-circuiting in external wiring.
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.
- Do not place in water or let water leak onto the controller.
- Do not allow debris to fall inside the unit during installation.
- Double-check all the wiring before turning on the power supply.
- Ascertain that terminal blocks are properly secured in place.
- Do not touch live wires.
- Stay as far as possible from high-voltage cables and power equipment.
- Leave a minimum of 10mm space for ventilation between the top and bottom edges of the controller and the enclosure walls.
- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.



- Standard safety considerations require that metal cabinet panels be grounded to avoid electrocution.
- Do not connect either the Neutral or Line signal of the 120VAC circuit to the device's 0V terminal.
- In the event of voltage fluctuations, or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.
- The wiring of this device is specifically designed to be safe and easy. A technician or engineer trained in the local and National Electric Code should perform all tasks associated with the electrical wiring of the device.

# PUMP Vision TS1040

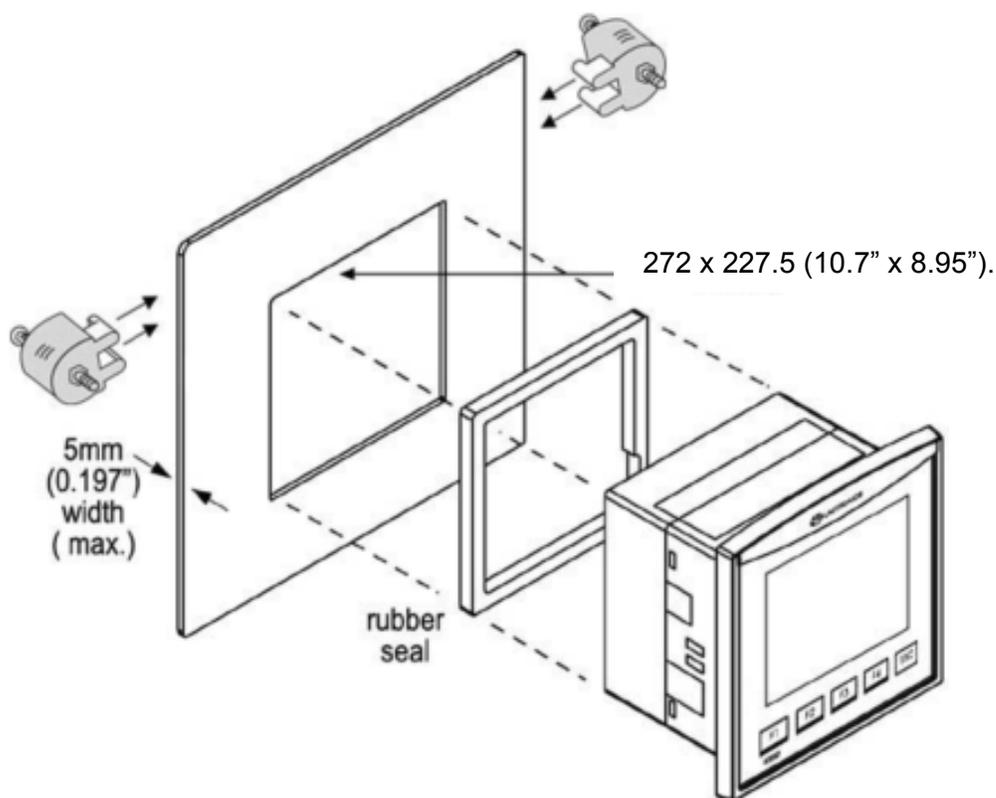
## DIMENSIONS



## PANEL MOUNTING

Before you begin, note that the panel itself cannot be more than 0.197" thick.

1. Make a panel cut-out that measures 272 x 227.5 (10.7" x 8.95").
2. Check the seal that is placed over the back of the unit. The seal must fit snugly against the back rim of the operating panel.
3. Slide the controller into the cut-out.
4. Push the four black plastic mounting brackets into their slots on the sides of the controller as shown in Figure 2.
5. Tighten the bracket screws against the panel as shown Figure 3.



Example drawing

## WIRING

### Wiring Considerations



- A technician or engineer trained in the local and National Electric Code should perform all tasks associated with the electrical wiring of the controller.

- Input or output cables should not be run through the same multicore cable or share the same wire.

- Do not lay input or output cables near high voltage power cables.

- Allow for voltage drop and noise interference with input and output lines used over an extended distance. Use wire that is properly sized for the current load.



- Double-check all the wiring before turning on the power supply.

- Unused I/O terminals should not be connected. Ignoring this directive may damage the controller.

### On-board I/O

I/O connection points are provided by external connectors at the top and bottom of the controller. The connectors plug in, enabling quick and easy removal. They provide screw-type connection points for the power source, inputs and outputs. The connection points are clearly labeled on the controller itself.

The top generally provides connections for the power supply, analog inputs and digital inputs. The bottom connector provides terminals for the relay outputs.

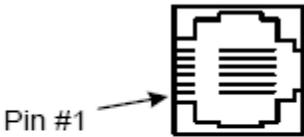
### Connections to the Controller

1. Strip the wire to a length of 0.250-0.300 inches.
2. Unscrew the terminal to its widest position before inserting a wire.
3. Insert the wire completely into the terminal to ensure a proper connection.
4. Tighten enough to keep the wire from pulling free.
5. Use 14 gauge to 26 gauge wire.
6. Do not exceed 1 inch pounds of torque.
7. We recommend crimp connectors (ferrules) in the wire ends.

## COMMUNICATION PORTS

The PUMP Vision has two serial ports. Both can be set for RS232 or RS485 independently.

Table 1: RS232: Pinout

Diagram	Pin Number	RS232: Function
	1	DTR signal
	2	0V reference
	3	TxD signal
	4	RxD signal
	5	0V reference
	6	DSR signal

The PUMP Vision is connected directly to the PC with a standard RJ11 type cable which should not be longer than 10' when using RS232. An RJ11 to 9 pin D connector is used to connect to the PC.

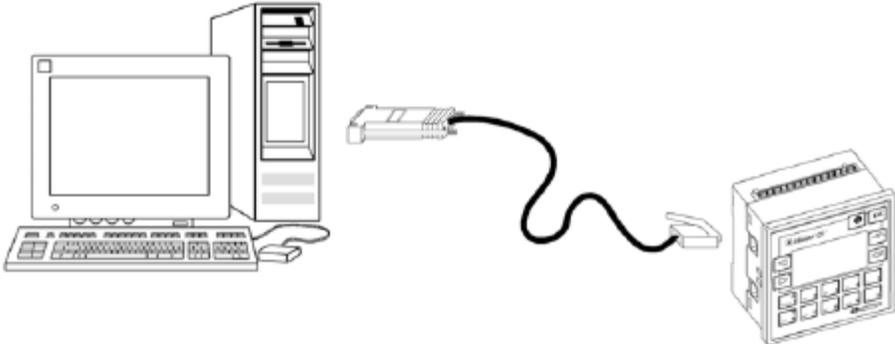
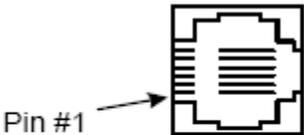


Figure 10. Connecting the PC to the Controller

## RS485

Use RS485 to create multi-drop network containing up to 32 stations, or for Modbus communications.

Table 2: RS485: Pinout

Diagram	Pin Number	Function
	1	A signal (+)
	2	(RS232 signal)
	3	(RS232 signal)
	4	(RS232 signal)
	5	(RS232 signal)
	6	B signal (-)

Note that when a port is set to RS485, both RS232 and RS485 can be used simultaneously if flow control signals DTR and DSR are not used.



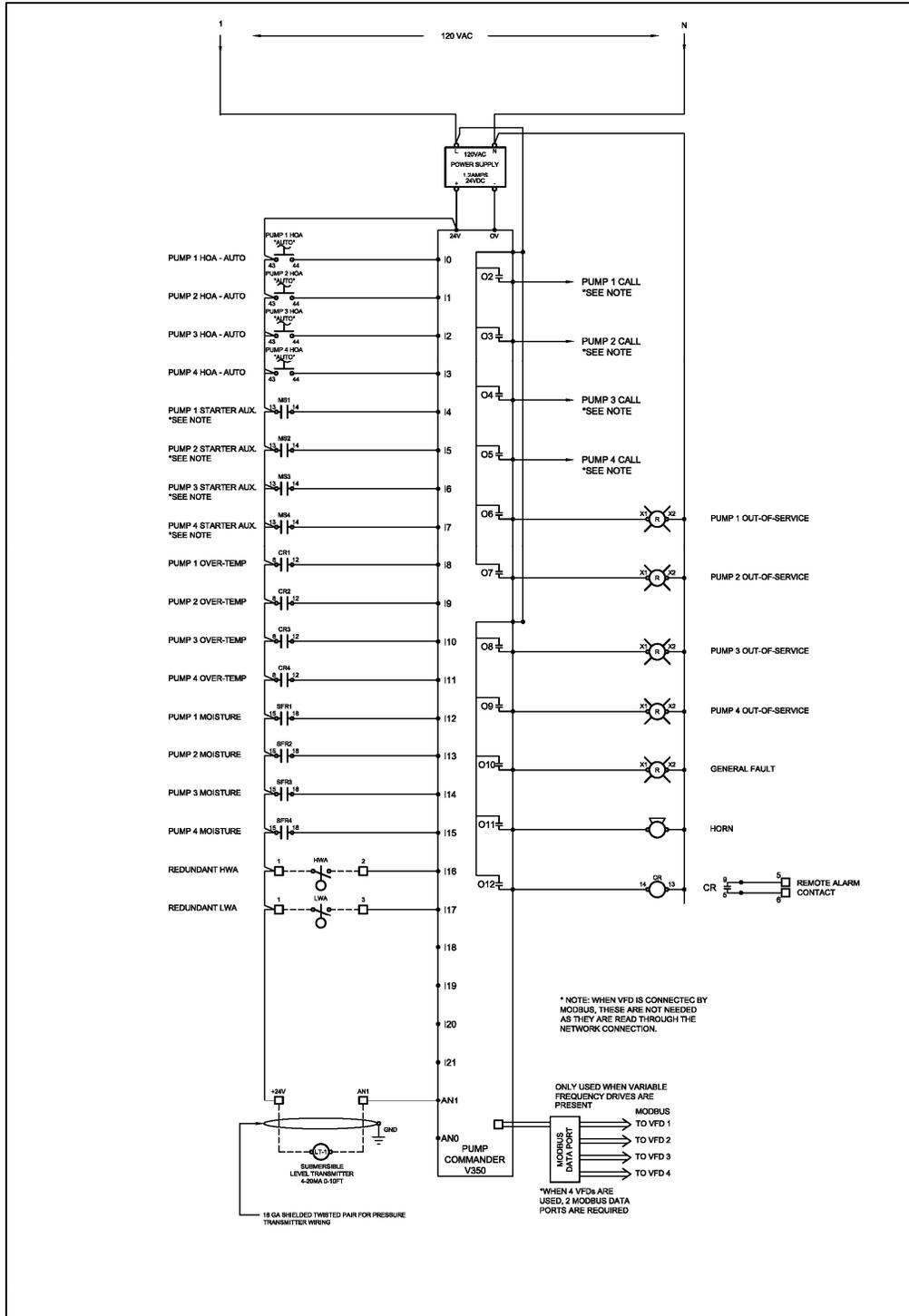
- Note that the ports are not isolated. If the controller is used with a non-isolated external device, avoid potential voltage that exceeds  $\pm 10V$ .
- To avoid damaging the system, all non-isolated device ports should relate to the same ground signal.
- Use shielded, twisted pair cable.



- Minimize the drop length leading from each device to the bus.
- Ideally, the main cable should be run in and out of the network device.
- Do not cross positive (A) and negative (B) signals. Positive terminals must be

# PUMP Vision TS1040

## Typical Wiring Diagram for Constant Speed or VFD Mode



<p>California Motor Controls 3070 Bay Vista, Suite C Benicia, CA 94510 (707) 746-6255 www.cmcontrols.com</p>	CUSTOMER and PROJECT NAME PUMP VISION TS1040 TYPICAL WIRING		REV.	DESCRIPTION:	DATE:	BY:	DRAWN BY: TD	APPROVED BY: TED
	CUSTOMER PO:	FILE:					DATE: 10/28/13	SCALE: NONE
							DRAWING NO.:	SHEET:
								1 of 1

# PUMP Vision TS1040

Safety

## IO LIST

Connect input and output devices as needed.

### Inputs

I0	Pump 1 HOA - AUTO
I1	Pump 2 HOA - AUTO
I2	Pump 3 HOA - AUTO
I3	Pump 4 HOA - AUTO
I4	Pump 1 starter auxiliary contact
I5	Pump 2 starter auxiliary contact
I6	Pump 3 starter auxiliary contact
I7	Pump 4 starter auxiliary contact
I8	Pump 1 high motor temperature
I9	Pump 2 high motor temperature
I10	Pump 3 high motor temperature
I11	Pump 4 high motor temperature
I12	Pump 1 seal failure
I13	Pump 2 seal failure
I14	Pump 3 seal failure
I15	Pump 4 seal failure
I16	High level alarm - redundant float switch
I17	Low level alarm - redundant float switch
AN0	0-10V transducer input
AN1	4-20ma transducer input

### Outputs

O2	Pump 1 run
O3	Pump 2 run
O4	Pump 3 run
O5	Pump 4 run
O6	Pump 1 Out-of-Service indicator
O7	Pump 2 Out-of-Service indicator
O8	Pump 3 Out-of-Service indicator
O9	Pump 4 Out-of-Service indicator
O10	Alarm light
O11	Alarm horn
O12	Alarm contact
O13	Purge Solenoid

### **Constant Speed Operation**

It is recommended that the control system include an H-O-A selector switch. Inputs are provided and programmed into the PUMP Vision for a contact of the AUTO position of the selector switch. When the H-O-A is placed into the HAND position, the PUMP Vision will be bypassed and the pump should run.

If the contact to the HOA-Auto input of the PUMP Vision is not closed, the PUMP Vision sets the status of that pump to Out-Of-Service. When the H-O-A is placed into the AUTO position, the pump is available to run as instructed by the PUMP Vision.

### **A. Constant Speed Manual Operation**

Touching the HAND, OFF or AUTO buttons on the Pump Status page will select the mode of operation.

Touching the HAND button will start the pump in manual mode.

This “soft” H-O-A is provided in the PUMP Vision to enable remote operation of the pumps, either through the Remote Access system, DDE program, through the Web Server system, or by other SCADA systems.

### **A1. Constant Speed Automatic Operation**

The pumps are available for automatic run when the AUTO selector switch input is enabled and the “soft” H-O-A is in the AUTO mode.

The analog level signal is converted to tenths of feet and that value is compared to the start and stop set points that are entered into the system by the user.

On rising level, when the level is equal to or greater than the lead pump start set point, the lead pump will start. If the level continues to rise beyond the start lag pump set point, the lag pump will start. If there are more than two pumps, rising level will start the additional pumps in sequence.

On falling level, the pumps will sequence off as the level drops below the respective stop set points.

The start and stop sequence is reverse when the controller is configured for pump up (fill).

## **B. Variable Frequency Drive Manual Operation**

When the hard wired H-O-A is place into the HAND position, the PUMP Vision will be by-passed and the pump will run at a user preset speed. The preset speed is entered on the Pump Status screen and saved into the VFD. The VFD is not dependant upon the PUMP Vision in any way for manual operation.

When the hard wired H-O-A is place into the AUTO position, the mode of operation is selected by touching the HAND, OFF or AUTO buttons on the Pump Status screen.

When the “soft” HOA is set to HAND, the pump will run and the VFD speed can be increased or decreased using the INC or DEC buttons on the Pump Control screen.

This “soft” H-O-A is provided in the PUMP Vision to enable remote operation of the pumps, either through the Remote Access system, DDE program, through the Web Server system, or by other SCADA systems.

## **Variable Frequency Drive Automatic Operation—PID Mode**

The pumps are available for automatic run when the AUTO selector switch input is enabled and the “soft” H-O-A is in the AUTO mode.

The analog level signal is converted to tenths of feet and that value is compared to the start and stop set points that are entered into the system by the user.

On rising level, when the level is equal to or greater than the lead pump start set point, the lead pump will start and will maintain the level at the “Target” set point

On falling level, the pumps will sequence off as the level drops below the respective stop set points.

The start and stop sequence is reverse when the controller is configured for pump up (fill).

## **Variable Frequency Drive Speed Control—PID Mode**

Once started, the lead pump VFD will immediately ramp up to the minimum run set point at the rate programmed into the VFD acceleration function. The speed of the drive will be modulated automatically by the PLC to maintain the target level set point.

When the drive reaches minimum speed, the sample cycle timer begins timing. When the sample cycle timer elapses, a change will be made to the VFD speed proportional to the system level deviation from the target level set point.

The speed can increase up to the maximum speed set point and decrease to the minimum speed set point. The speed changes occur at the interval set in the sample timer.

The proportion of the change can be adjusted in the PID setup screen and is entered as a ratio of ft.:% Speed. If a 1.0:1 ratio is set, the VFD speed will change 1% for each 0.1 feet of deviation.

The amount of change is limited by the trim set point. This function is useful in controlling a “runaway” speed condition. A typical setting for the trim may be 6.0% which would allow the VFD speed to change by that amount with each sample timer cycle.

# PUMP Vision TS1040

Sequence of Operation  
Variable Speed  
PID Mode

## **Variable Frequency Drive Lag Pump Start—PID Mode**

When the speed of the VFD(s) running meets or exceeds the lag pump start set point, the lag pump start delay timer begins timing.

When the timer elapses, the lag pump will start and ramp up to match the speed of the lead pump at the rate programmed into the VFD acceleration function.

While running, the lead pump and lag pump will modulate at the same speed.

In triplex or quadraplex systems, each lag pump starts in the same manner.

## **Variable Frequency Drive Lag Pump Stop—PID Mode**

When the speed of the VFD(s) running is at or below the lag pump stop set point, the last lag pump that started will stop.

In triplex or quadraplex systems, each lag pump stops in the same manner, with a 60 second delay between stops.

# PUMP Vision TS1040

## Sequence of Operation Variable Speed Proportion Mode

### **Variable Frequency Drive Automatic Operation—Proportion Mode**

The pumps are available for automatic run when the AUTO selector switch input is enabled and the “soft” H-O-A is in the AUTO mode.

The analog level signal is converted to tenths of feet and that value is compared to the start and stop set points that are entered into the system by the user.

On rising level, when the level is equal to, or greater than start set point, the lead pump will start. If the level continues to rise beyond the start lag pump set point, the lag pump will start. If there are more than two pumps, rising level will start the additional pumps in sequence.

On falling level, the pumps will sequence off as the level drops below the respective stop set points.

The start and stop sequence is reverse when the controller is configured for pump up mode.

### **VFD Speed Control—Proportion Mode**

In the proportion only mode, the pump speed is proportional to where the water level is within the VFD speed range band.

The VFD speed range band is the range between VFD minimum speed and maximum speed. For example, you may set the VFD minimum speed at 50% because the pump curve shows that below 50% speed there is no output from the pump. If the maximum speed is set at 100% then the VFD speed range is 50%.

The VFD speed range is spanned where the minimum speed is at the Lead Pump Stop setpoint and the maximum speed is at the last Lag Pump Start setpoint.

In a duplex system for example, if the Lead Pump Stop setpoint is a 5.0 ft. and the Lag Pump Start setpoint is 10.0 feet, then when the level is at 10.0 ft. the pumps will run at 100% speed and at 5.0 ft. they will run at 50% speed. If the Lead Pump Start setpoint is at 8.0 ft., the lead pump will start at 80% speed and as the level drops toward the stop setpoint, the pump speed will slow proportionally.

When the lag pump is called to run, both pumps will be running at 100% speed and will reduce speed at the same rate as the water level drops.

# PUMP Vision TS1040

## Sequence of Operation

### **Alternation of the Pumps (Constant and Variable Speed)**

The pump alternation mode is set by the user. Automatic, time clock and manual modes are available.

- Automatic mode—the pumps will alternate after each pumping cycle.
- Time clock—the pumps will alternate daily at the time set by the user.
- Manual—the pumps will not alternate. The lead pump is selected by the user

# PUMP Vision TS1040

## Sequence of Operation

### Alarm Conditions

All alarm conditions will operate according to the way they are setup in the Setup Wizard. Each alarm can optionally be setup to:

- Be enabled or disabled
- Stop the pumps
- Require manual reset
- Sound the horn
- Light the alarm light
- Flash the alarm light
- Close the alarm contact
- Send an email
- User adjustable time delay

All enable alarm conditions will be logged into the alarm data logger.

All enable alarm conditions will be managed by the fault handler.

For all alarm conditions, touching the screen of the PUMP Vision will silence the horn output.

Inputs are provided for the following alarm conditions:

- High level—transducer
- Low level—transducer
- High level—redundant float
- Low level—redundant float
- High motor temperature for each pump
- Seal failure for each pump
- Pump failure for each pump
- Power failure

In VFD mode the VFD Fault conditions are monitored through Modbus and annunciated on the controller.

### Pump Failure

This condition is determined by the motor starter failing to close an input to the controller within a preset time period. If a pump fails to start, the pumping duty is automatically transfer to the next available pump in sequence.

The pump can be taken “Out-of-service” and this failure alarm is prevented, by putting either the “soft” H-O-A, or the panel H-O-A into the OFF position. This allows maintenance of the pump without generating an alarm condition. As with a pump failure condition, the pumping duty is automatically transferred to the remaining pump(s).

# PUMP Vision TS1040

## Sequence of Operation

### Test Mode

The PUMP Vision has a test mode which simulates the rise and fall of the level and enables the complete testing of the system without filling and re-filling the tank. Once activated, the level is simulated within controller, starting at 0.0 ft and rising to the top of the level scale at the rate of 1.0 ft in 5 seconds. As it rises, pump run outputs and alarm outputs will activate at the programmed set points. When the level reaches the top of the range, it will automatically reverse and fall back down to 0.0 ft. The outputs will drop out at their programmed set points.

While the test mode function will automatically rise and fall through the full level range, the direction of the simulation can be manually reversed by touching the up or down buttons.

The user can touch the STOP button key to leave the test mode at any time and the system will return to the normal run mode. The system will automatically exit the test mode after five minutes. This feature insures that the user will not inadvertently leave the system in test mode.

### Automatic Purge Control

An output is provided on the PUMP Vision to control a purge compressor and solenoid valve. This function is necessary for reactive air and bubbler type level sensing systems.

The frequency of purge cycle, and the duration of the purge is defined by user set points in the Purge setup page of the PUMP Vision.

When the purge cycle runs, the PUMP Vision will “freeze” the level signal from the level transducer for two seconds before the purge starts until 15 seconds after the compressor stops. This prevents the higher pressure condition that the purge process creates from interfering with the pumps starting and stopping, or causing a false high level alarm.

### Manual Purge

The system can be manually purged by pressing the MAN key while in the purge setup page of the PUMP Vision. The purge duration will be the same as with the automatic purge mode.

# PUMP Vision TS1040

## Sequence of Operation

### Transducer Scaling

The PUMP Vision is designed to allow nearly any type of level sensing device to be connected, including voltage or current types with any range.

To scale the range of the PUMP Vision to match the transducer, go to the Advance Setup Wizard. The scale is entered with four parameters.

First, the transducer type is entered. Either 0-10V or 4-20ma. Note that the transducer must be physically wired to the appropriate input. See the wiring diagram.

Next, the range of the measurement is entered (example: 0—15 PSI, or 0-120 ft. water).

Then the type of unit is entered as either PSI or Inches of Water.

Finally, an offset can be programmed. The offset adds a value to the level display. This is useful when the transducer or bubbler tube is positioned off of the tank floor, preventing the buildup of debris from interfering with the measurement. The resulting display will be an actual liquid depth.

### Fault Data Logging

Fault conditions are logged into memory with a date and time stamp. When a fault condition occurs, the fault status indicator will light on the main screen. Touching the fault status indicator will take the user to the fault handler when details about the alarm condition can be viewed and managed.

The ALARM button in the main menu will take the user to the fault data logger where the last three fault conditions are displayed with the date and time of occurrence. The screen can be scrolled down through the past 1000 fault conditions.

When the screen is exited and then re-entered, the log automatically returns to showing the latest three fault conditions.

### Trending

The on screen trending graph plots the sump or tank level with a reading saved every second. It saves history for the past 1.5 hours. The graph can be scrolled by the user to view the history. The optional micro SD card records the trend data in a file that is automatically created once a month. A maximum of 64 months is retained on the SD card.

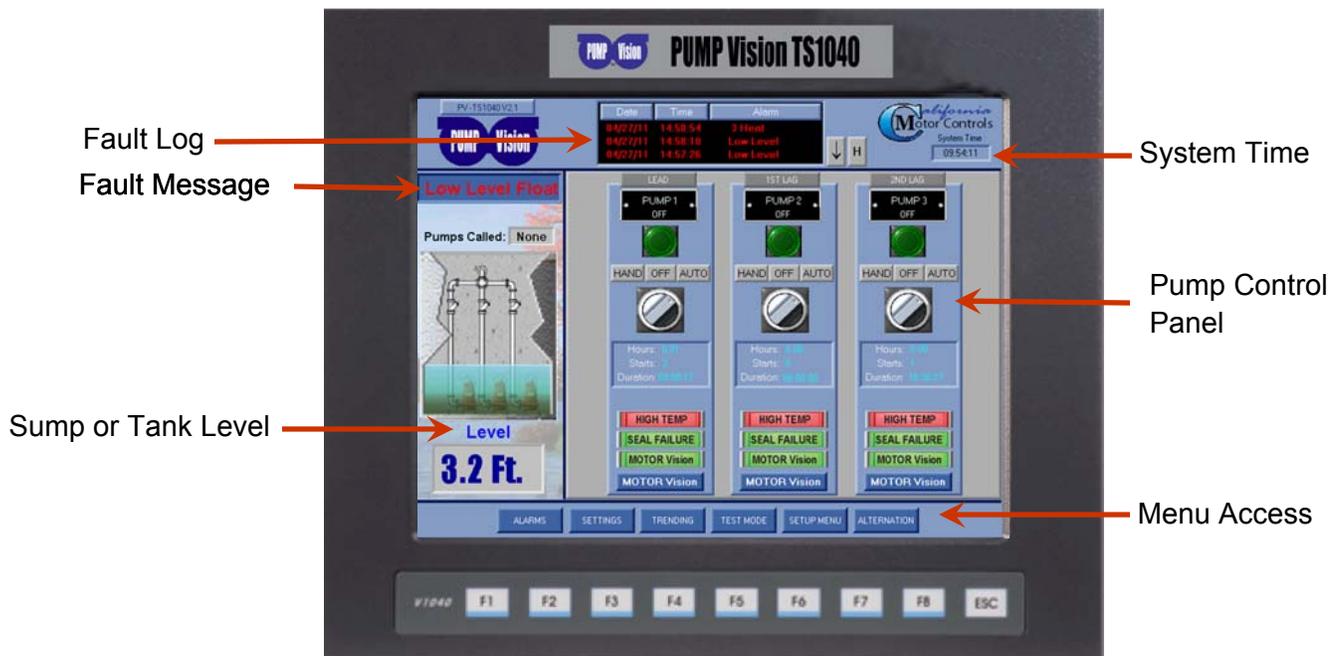
# PUMP Vision TS1040

Navigation

## MAIN DISPLAY SCREEN

### NAVIGATING CONTROLLER

The PUMP Vision TS1040 is an easy to use touch screen controller with a menu driven display. Each display includes intuitive buttons to navigate through the controller.



**Sump or Tank Level** - Displays the level of the sump or tank, both graphically and digitally in tenths of a foot.

**System Time** - The system time is used to provide a data and time stamp to the fault logger and also to set the time of day that the system alternates if time clock alternation mode is selected.

**Menu Access** - Touch these buttons to navigate to the other screens.

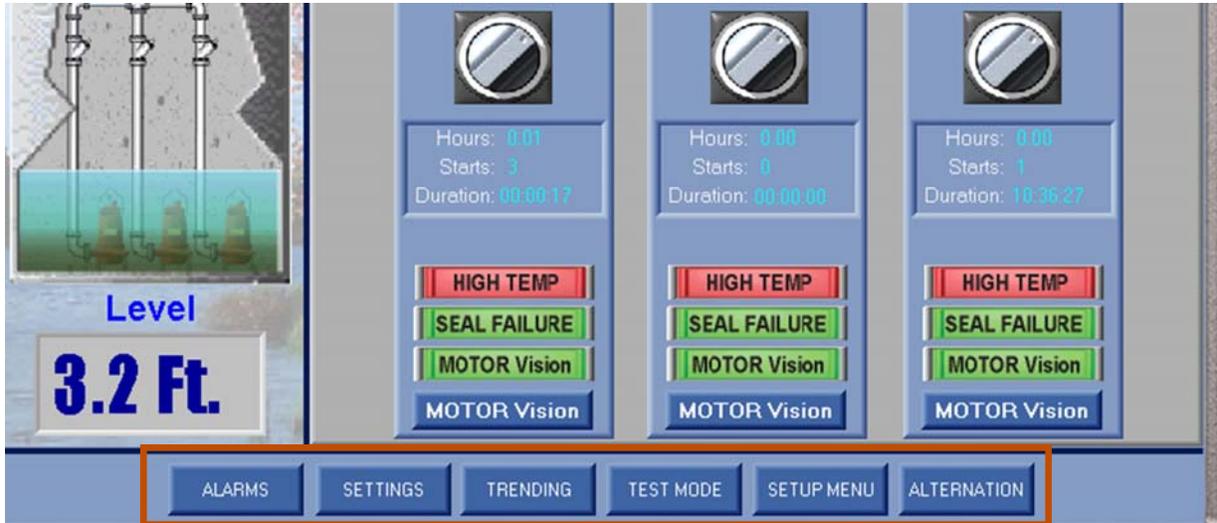
**Alarm Silence** - If an alarm horn is connected to the controller, touch the screen anywhere to silence the horn.

**Fault Log** - Displays an abbreviated fault log. Scroll the log with the down arrow and return to Home (most recent fault) with the H button

**Fault Message** - Displays active alarm conditions. Touch this text to scroll through all active fault conditions.

# PUMP Vision TS1040

## MENU BAR



The menu buttons are at the bottom of all screens. Touch the buttons to access other functions.

**Alternation** - Touch to go to alternation status and setup screen

**Trending** - Touch to go to trending screen

**Alarms** - Touch to go to fault logger screen

**Settings** - Touch to go to setting information screen

**Setup Menu** - Touch to go to start the system setup menu

**Test Mode** - Touch to go to automatic test mode screen

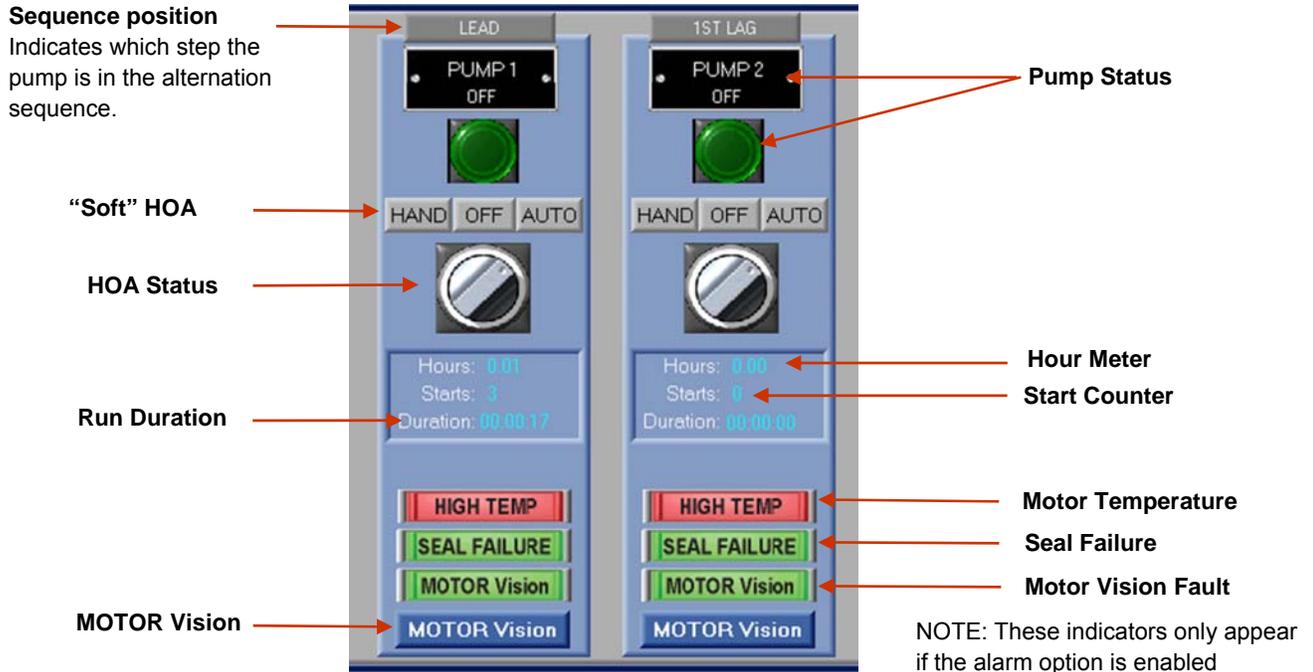
**\*Purge** - Touch to go to purge timer setup screen. \*Only available if purge function is enabled in the setup wizard.

**Back** - Touch to go back to the main screen. Pressing the ESC will return to the main screen from any location.

# PUMP Vision TS1040

## PUMP CONTROL PANEL (Constant Speed)

A separate Control Panel is provided for each pump.



**Pump Status** - Indicates pump RUNNING, STOPPED, FAILED, OUT OF SERVICE, CALLED

The PUMP Vision has an input for an auxiliary contact of the motor starter to wired to. It monitors the status of that input to determine if the pump is running or stopped. When the PUMP Vision output energizes the motor starter, the status is CALLED. When the input goes high, the status is RUNNING. If the input does not go high, the status is FAILED. The status is OUT OF SERVICE if the input from the hardware HOA is not high.

**HOA Status** - Indicates status of the “soft” HOA

**“Soft HOA”** - Touch these buttons to put the PUMP Vision into HAND, OFF, or AUTO

The “soft” HOA is in the PUMP Vision to allow remote control of the pumps when the controller is wired through a network or wireless connection.

**Hour Meter** - Displays the total run time of the pump. The display is in hundredths of an hour and will display over 40 million hours. This can be reset in the advanced setup wizard.

**Start Counter** - Displays the total number of pump starts. This counter can count to over 32,000 starts. This can be reset in the advanced setup wizard.

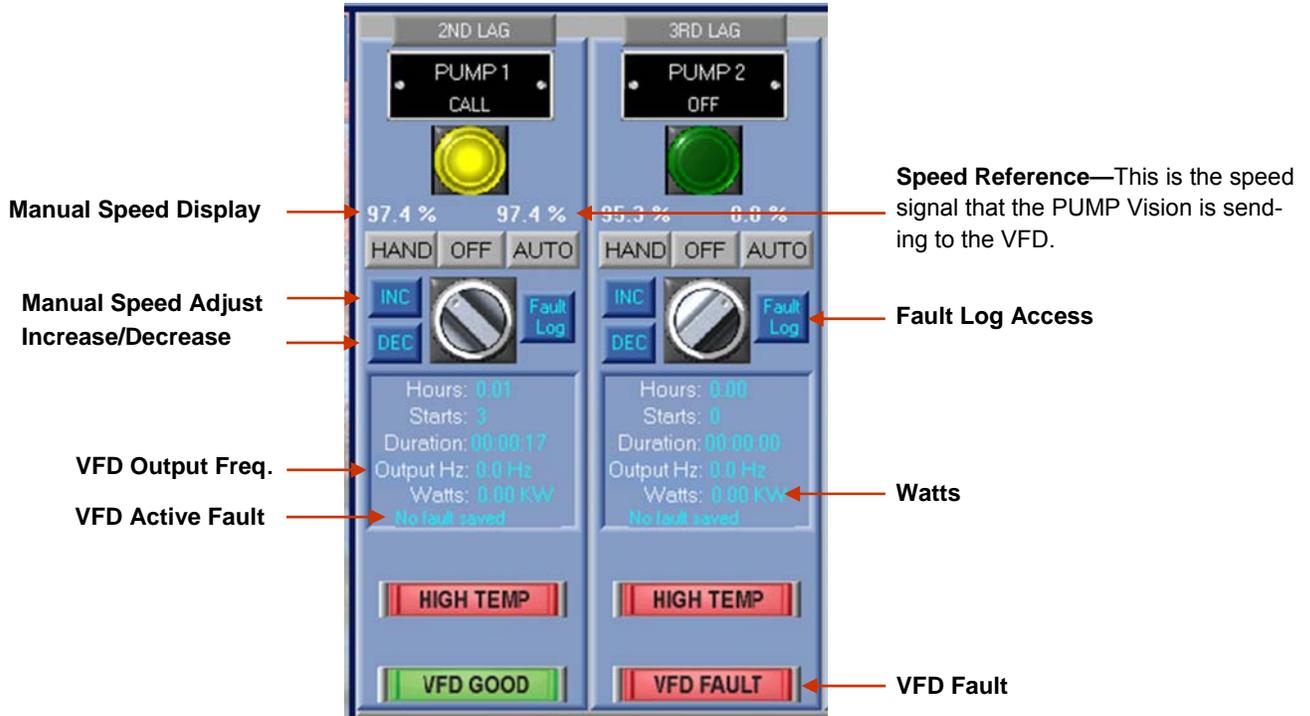
**MOTOR Vision** - This button only appears if Motor Vision is installed and enabled.

**Run Duration**—Displays the length of time that the pump has been running during the current run cycle, or the length of time that the pump ran during the last run cycle. This value is also stored to a data log on the SD card.

# PUMP Vision TS1040

## PUMP CONTROL SCREEN (VFD Mode)

The VFD version of the Pump Control Panel is similar to the constant speed version, and has additional controls and monitoring of the VFD.



**Manual Speed** - Adjusts the VFD speed manually by touching the INC or DEC buttons. The speed can also be manually adjusted by touching the manual speed display and then entering the desired set point on the keypad screen.

**VFD Output Frequency** - Displays the current VFD output frequency in hertz (0-60).

The following features are available only when using Square D Altivar 21 VFDs.

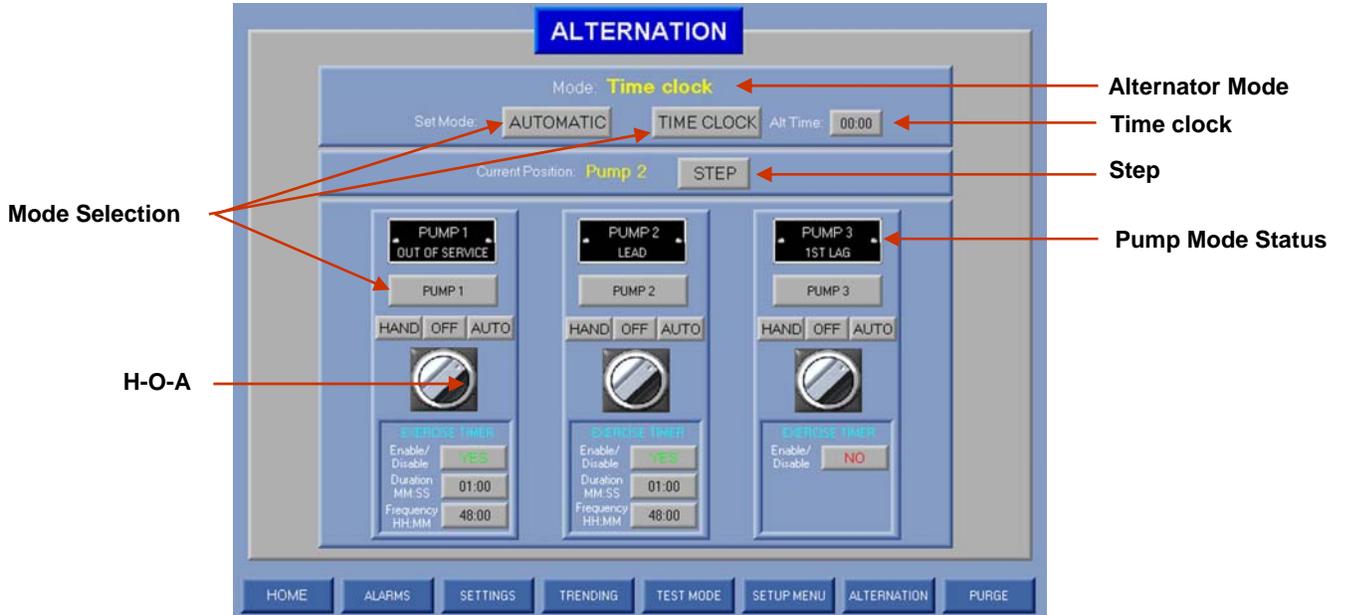
**Fault Log** - Touch to display the current VFD fault as well as a history of 250 previous faults.

**Watts** - Displays the watts for each pump.

**VFD Active Fault** - Displays the active fault if any is present.

# PUMP Vision TS1040

## ALTERNATION SCREEN



**Note:** This screen does not appear when the controller is set for simplex operation. The screen shown is for triplex. Duplex and Quadraplex are configured for their respective number of pumps.

**Alternator Mode-** Shows the current alternation sequence mode.

**Mode Selection** - Touch these buttons to select the alternation mode.

Automatic – alternation after each pump cycle

Time clock – alternation once a day at the time set in Alt time.

Pump 1 – Pump 1 is always the lead pump

Pump 2 – Pump 2 is always the lead pump

Pump 3 – Pump 3 is always the lead pump (when controller is set for triplex or quad)

Pump 4 – Pump 4 is always the lead pump (when controller is set for quadraplex)

**Step** - The lead pump can be manually stepped to the next pump in sequence by touching the step button. Note that this can be done while the pumps are running and will occur instantly.

**Time Clock** - Indicates the time of day that the system will alternate when in time clock alternation mode. Touch this button to change the alternation time.

**Pump Mode Status** - Shows the current sequence position of each pump. If the pump is out-of-service, the sequence is shifted *behind* the failed pump. Example above; if the alternator position is Pump 2 and Pump 3 is Out-Of-Service, Pump 1 will be the 1st Lag pump.

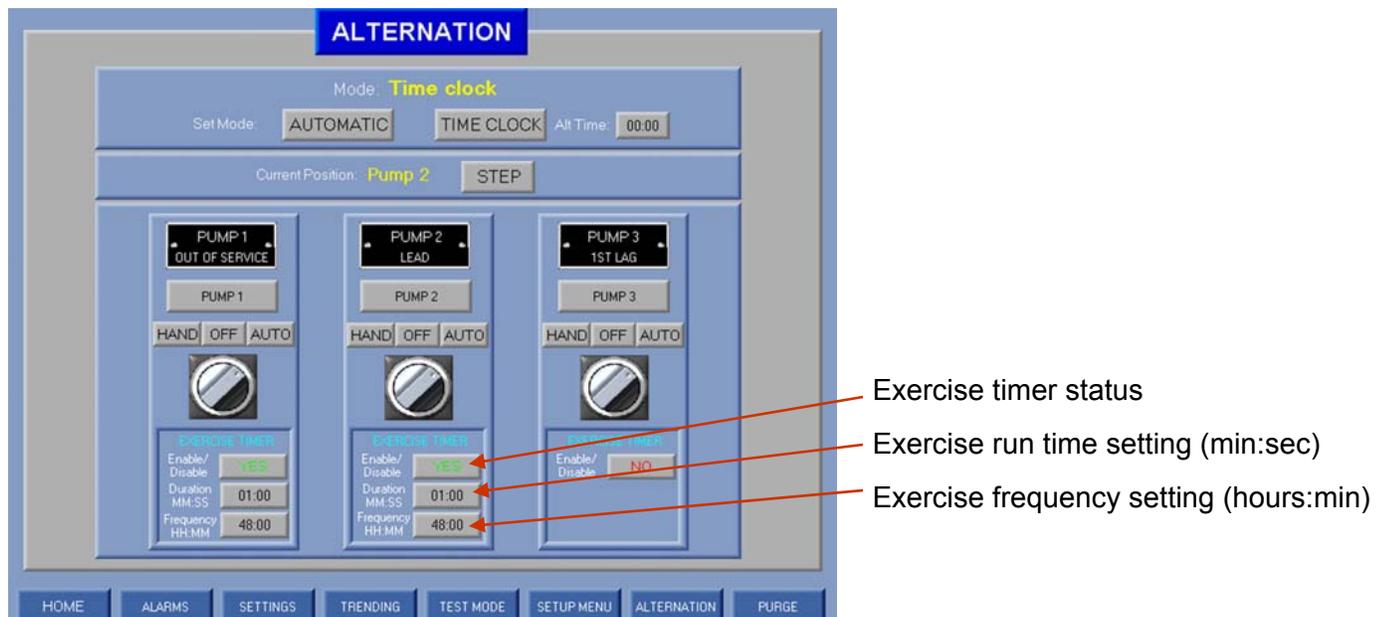
# PUMP Vision TS1040

## EXERCISE TIMERS

The Exercise Timer function allows the user to set up each pump individually with an exercise schedule. The user can enter settings for:

- Pump exercise frequency
- Pump exercise run time
- Pump exercise timer status

The individual pump exercise settings are displayed on the Alternator screen as shown below.

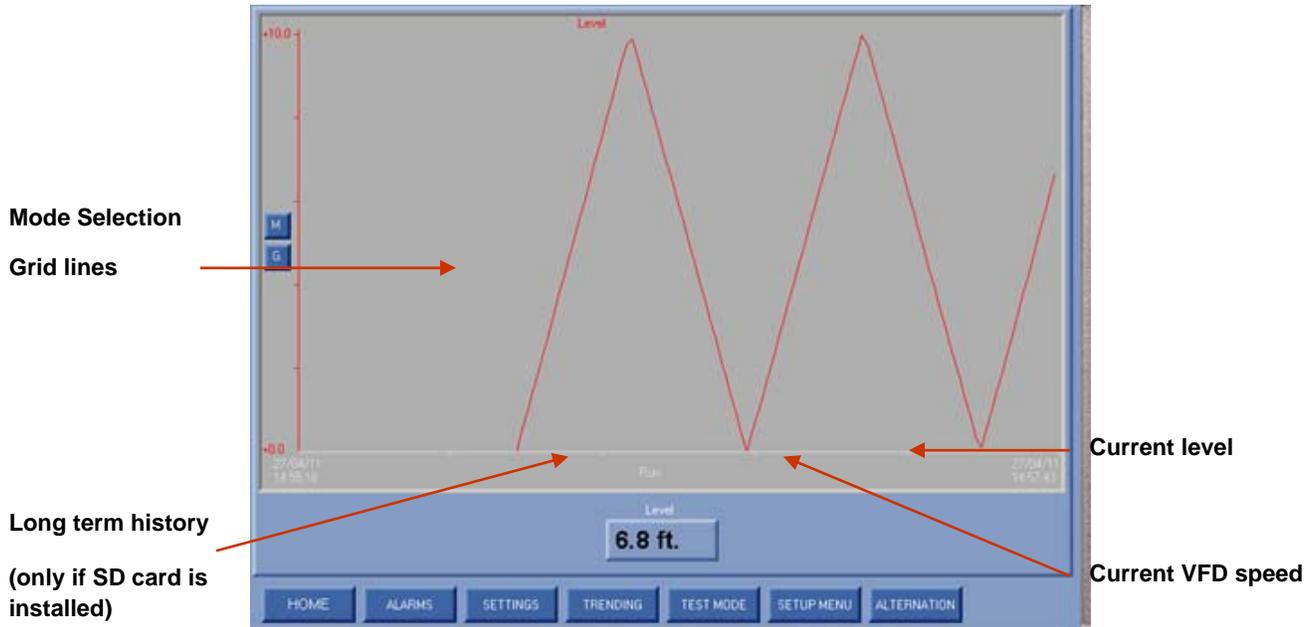


When the controller is set to the Constant Speed mode, the pumps will run at full speed when being exercised.

When the controller is set to the VFD mode, the pumps will run at the pre-set manual speed on the Pump Control screen when being exercised.

# PUMP Vision TS1040

## TRENDING SCREEN



The trending graph plots the following data with a reading saved every second. It saves history for the past 1.5 hours.

RED curve = Sump or tank level

YELLOW curve = Number of pumps running and the duration

GREEN curve = VFD Speed (in VFD enabled systems)

**Mode Selection** - Touch this button to toggle between Run and History mode.

Run – the graph shows current time for the past minute (approximately).

History – the graph can be scrolled using the forward and backward buttons.

**Grid Lines** - Grid lines can be added to the graph.

**History** - When a Micro SD card is installed, this button is available and when touched, the trend history will be displayed for the month that is selected in the SD card Trend Setup screen. Up to 64 months of data can be archived.

**Active Range** - Touching the graph will toggle the display to bring either the Level or the VFD curve data forward and change the range scale on the left side of the display to that of the active curve data.

# PUMP Vision TS1040

## TREND LOGGING—SD CARD

The PUMP Vision has a slot for an optional 8GB Micro SD card. This card is specially formatted for the PUMP Vision and is ordered from California Motor Controls.

This card can store 64 months of trend data due to a limit on the number of files.

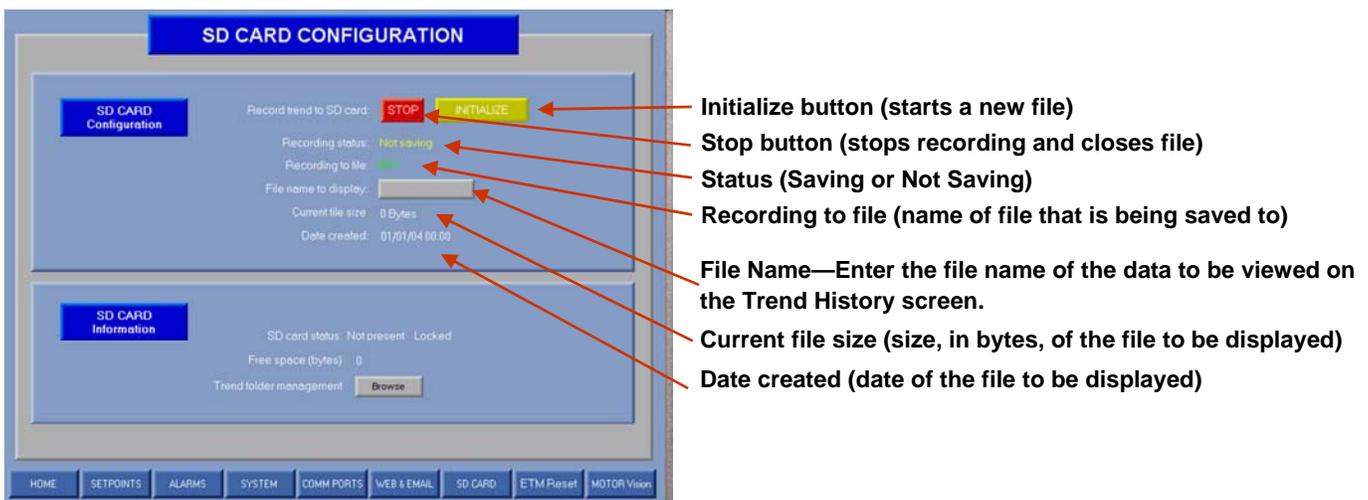
To enable the SD card feature:

- Insert the SD card into the slot (located) on the upper left side of the controller when viewing the controller from the back).
- Access the SD Card Trend Setup screen through MENU>TRENDING>HISTORY>SD SETUP
- Touch the yellow “Initialize” button to open a file. The PUMP Vision will automatically start a file with the name format MMY (month and year). This file will be written to until the end of the current month, at which time the PUMP Vision will automatically start a new file.

The data can be viewed at a any time by touching the File Name button and entering the desired file name, then going to the Trend History screen and scrolling through the data.

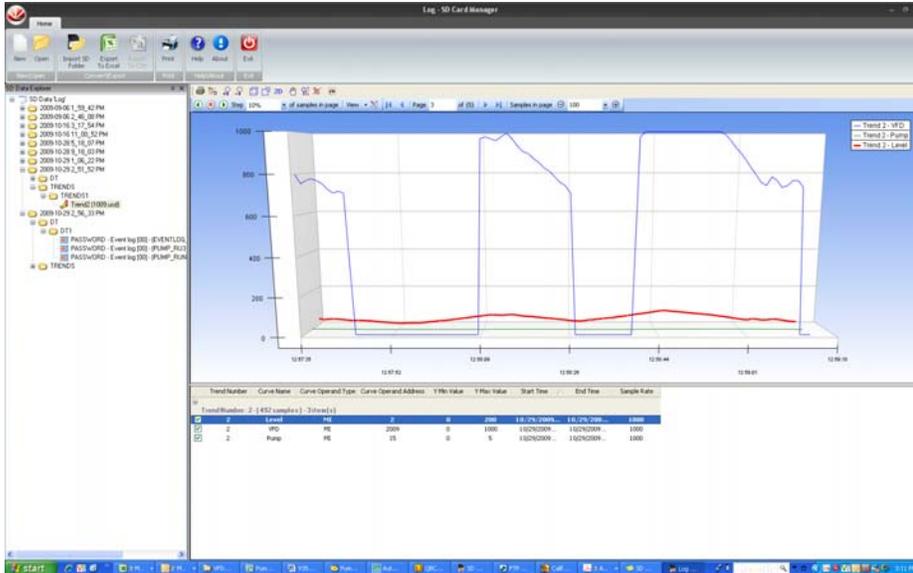
It is also possible to retrieve the data and store it to a PC, either by connecting to the PUMP Vision through a serial or Ethernet connection, or by removing the SD card from the PUMP Vision and inserting it into an SD card slot on the personal computer.

Once the data is on the PC, it can be viewed with software available form California Motor Controls.



# PUMP Vision TS1040

## TREND LOGGING—SD CARD

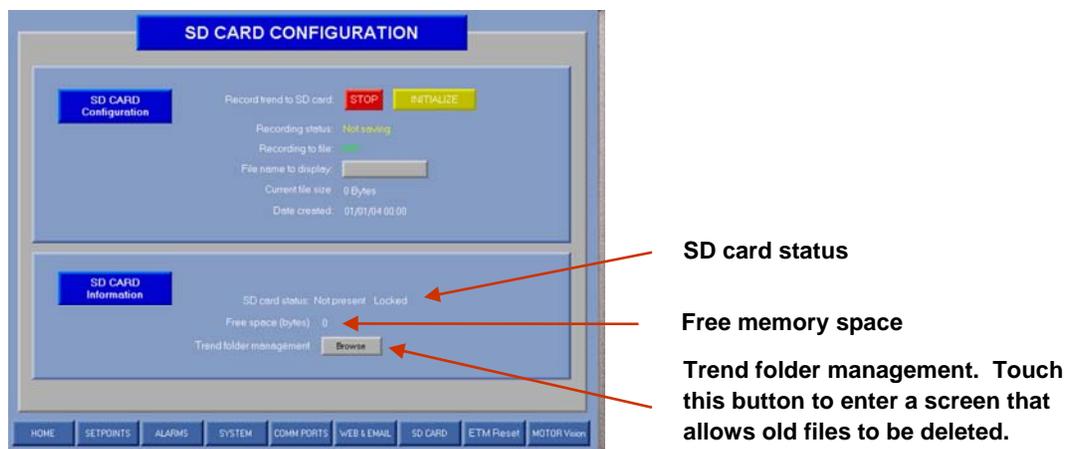


The Windows based SD Card Manager software allows the user to easily select which month's file to view on a PC.

Special order versions are available with custom configured trend graphs for other data inputs such as flow, pump run times and other requirements.

## SD CARD INFORMATION

SD Card status and file information is available on the SD CARD CONFIGURATION screen.



# PUMP Vision TS1040

## EVENT LOG—SD CARD

When an SD card option is installed into the PUMP Vision, all major events are logged into a file. This event log can store over 10 years of event activity, based on a frequency of one event per minute.

Events logged:

Pump run—Date, start time, stop time and run duration

Alarms—all enabled alarm conditions with date and time of alarm.

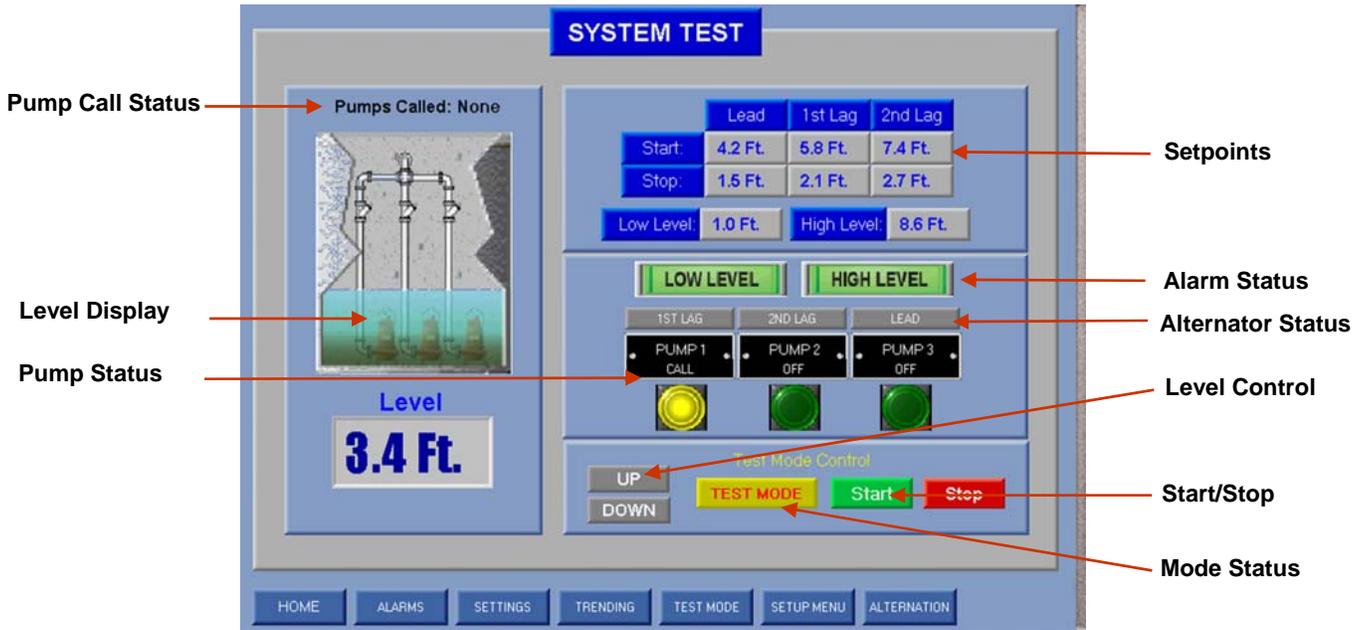
Row #	Event Name (String,12)	Date (String,8)	Start Time (String,5)	Stop Time (String,5)	
0	High Level	10/29/09	13:17		
1	Pump 2 Run	10/29/09	13:17	13:18	00:00:37
2	High Level	10/29/09	13:18		
3	Pump 2 Heat	10/29/09	13:18		
4	Pump 2 Run	10/29/09	13:18	13:18	00:00:16
5	Pump 1 Seal	10/29/09	13:18		
6	High Level	10/29/09	13:19		
7	Pump 1 Run	10/29/09	13:18	13:19	00:01:04
8	Low Float	10/29/09	13:19		
9	Pump 2 Run	10/29/09	13:19	13:20	00:00:13
10	High Level	10/29/09	13:20		
11	Pump 2 Run	10/29/09	13:20	13:20	00:00:30
12	Pump 2 Run	10/29/09	13:20	13:21	00:00:19
13	Pump 1 Heat	10/29/09	13:21		
14	Low Float	10/29/09	13:21		
15	Pump 1 Run	10/29/09	14:51	14:51	00:00:00
16	Pump 3 Run	10/29/09	14:51	14:51	00:00:00
17	Pump 2 Run	10/29/09	14:51	14:51	00:00:01
18	Pump 1 Run	10/29/09	14:51	14:51	00:00:01

The SD Card Manager software also allows the user to easily access the PUMP Vision Event Log, either through the Ethernet or serial connection while the card is still in the PUMP Vision, or by inserting the card directly into the PC card reader slot.

Once downloaded from the card, the file can be viewed directly with the SD Card Manager software, or exported to an Excel file, or to a .csv format file.

# PUMP Vision TS1040

## TEST MODE SCREEN



The automatic test screen provides a way for the operator to check out the control functions of the complete pump system. The test mode will automatically raise and lower the sump or tank level reading and the controller will activate all outputs and alarms just as if the level readings were from the transducer.

Once the Start button is touched, the controller will go into the test mode until the stop button is pressed. The controller will also automatically go back to the normal mode after five minutes. This feature prevents the operator from accidentally leaving the system in test mode.

**Mode Status** - Indicates if the controller is in normal or test mode.

**Start/Stop** - Touch these buttons to start and stop the test mode.

**Level Display** - Shows the level digitally and graphically.

**Level Control** - When the test mode is started, the controller starts at 0.0 level, then automatically increases the level until the top of range is reached, then reverses and drops the level back to 0.0. This cycle continues until returned to normal mode. The operator can touch these buttons to control the direction of level change.

**Pump Call Status** - Indicates how many pumps are being called to run.

**Alarm Status** - Indicates normal or alarm condition. If there is an alarm condition, this button can be touched to go to the alarm handler.

**Setpoints** - These are the current setpoints settings.

**Alternator Status** - Indicates the alternation sequence.

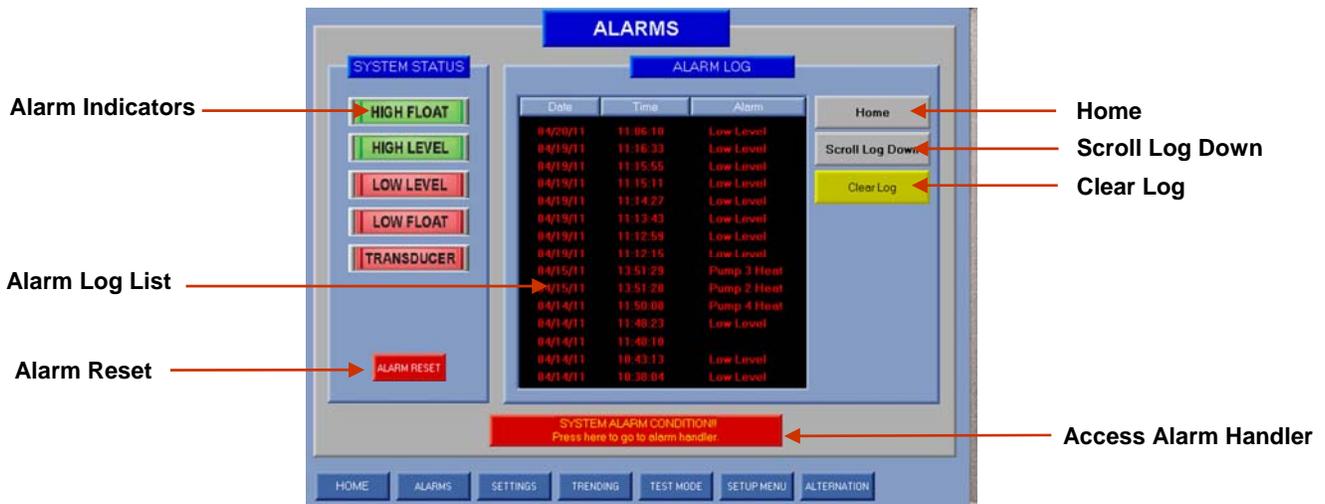
**Pump Status** - Indicates when the pump is running, failed, and out-of-service

# PUMP Vision TS1040

## ALARM LOG

The alarm log page displays the alarm log, has alarm fault indicators for the most common alarms, and has the alarm reset button.

The alarm log screen displays the alarm conditions with date and time of occurrence. This log saves the past 1,000 alarm conditions.



**Alarm Indicators** - Indicate status of important alarm conditions

**Alarm Log** - Displays fifteen alarms at a time. Each time the page is accessed, the most current alarm condition will be at the top of the list.

**Alarm Reset** - Touch this button to reset any alarm condition that has been configured to require a manual reset.

**Home** - Touch this button to return to the top of the list.

**Scroll Down** - Touch this button to page down through the list.

**Clear Log** - Touch this button to clear all fault log history. The required password to clear the log is 1234.

**Alarm Handler Access** - Touch this to go to the Alarm Handler. Note that this option is only available when the button is red, indicating an unacknowledged alarm condition.

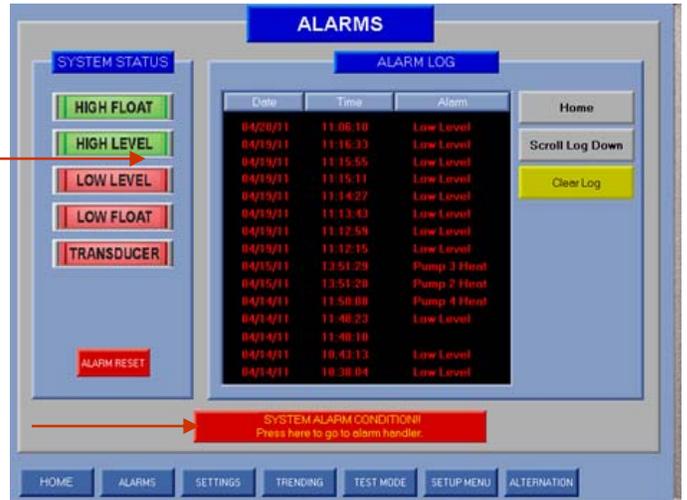
# PUMP Vision TS1040

## ALARM MESSAGE HANDLER

In the event of an alarm condition, two indications will appear on the main screen.

A text message will be displayed at the top of the screen, indicating the nature of the alarm condition. If multiple conditions exist, touching the text will scroll through all active events. No message is displayed when there is no active alarm.

At the bottom of the screen, a bold red message indicates that there is an alarm condition. Touching the message bar provides access to the alarm handler.

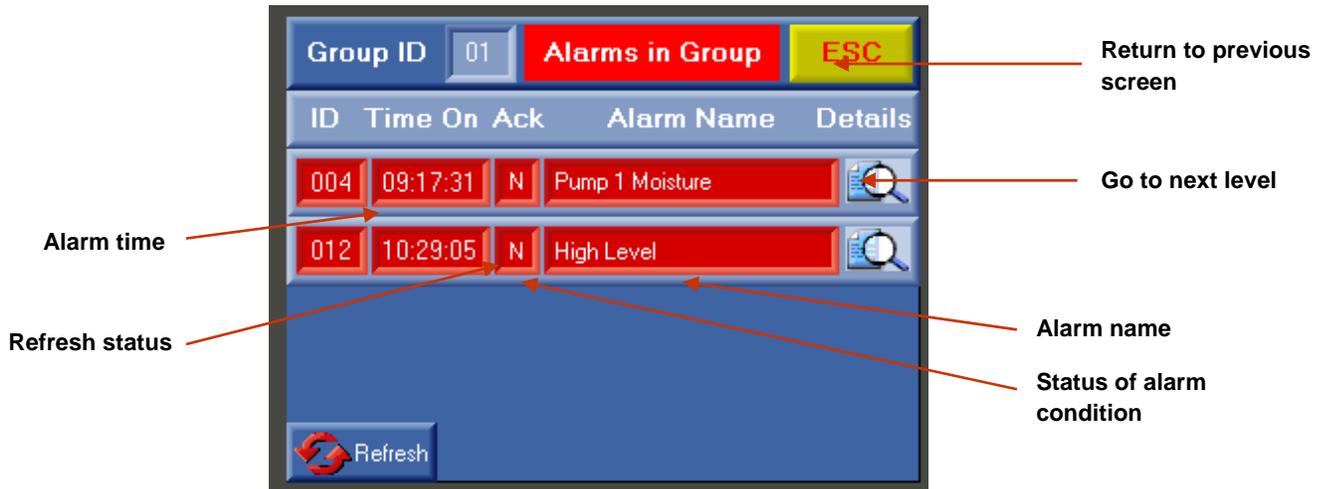


The alarm handler is a series of screens that provides access to active and non-acknowledge alarm conditions. The handler displays information about each alarm condition. This is the first screen that appears when entering the alarm handler and the user must touch the “magnifying glass” button to go to the alarm display page.



# PUMP Vision TS1040

## ALARM HANDLER SCREEN 2



The second level of the alarm handler is list of all alarm conditions that are either still active, or are inactive but have not been acknowledged by the operator. Once an alarm is no longer active and it has been acknowledged, it is removed from the list.

**Alarm Name** - This shows what the alarm condition is.

**Status of Alarm** - This shows if the alarm has been acknowledged or not.

**Refresh Status** - Touch this to refresh the list.

**Alarm Time** - This shows what time the alarm condition occurred.

**“Magnifying Glass”** - Touch this to go to the next level screen. Each alarm condition has one of these buttons to give access to the level 3 screens and specific information on the alarm status and condition.

# PUMP Vision TS1040

## ALARM HANDLER SCREEN 3



The third level of the alarm handler is detailed information about the specific alarm condition.

**Alarm Name** - This shows what the alarm condition is.

**Status** - This shows if the alarm has been acknowledged or not.

**Count** - This shows how many times the alarm condition has occurred.

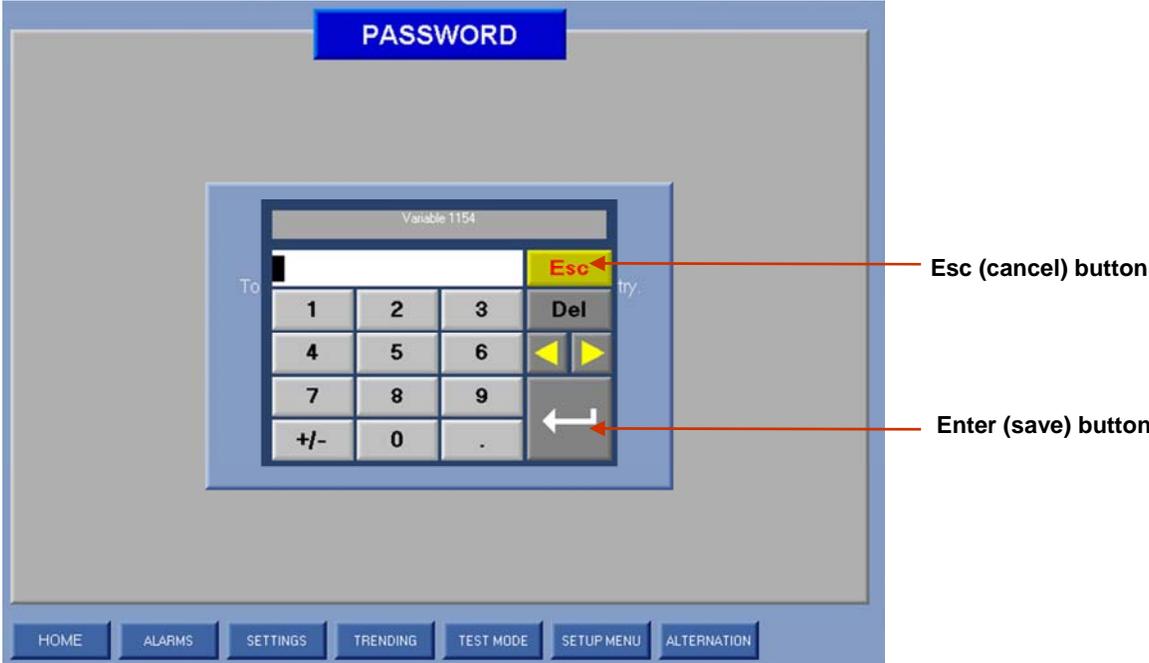
**Alarm Time and Date** - This shows what time the alarm condition occurred.

**Acknowledgement Control** - Touch the Ack button to acknowledge this alarm. Touch the << or >> buttons to scroll through the other unacknowledged alarms.

# PUMP Vision TS1040

## DATA ENTRY

The data entry keypad will pop up whenever any setpoint or data entry field is touched. The screen is intuitive. Touch the number buttons to enter a value, touch the ↵ button to save the value. Touch the Esc button to leave the data entry screen without changing the value.

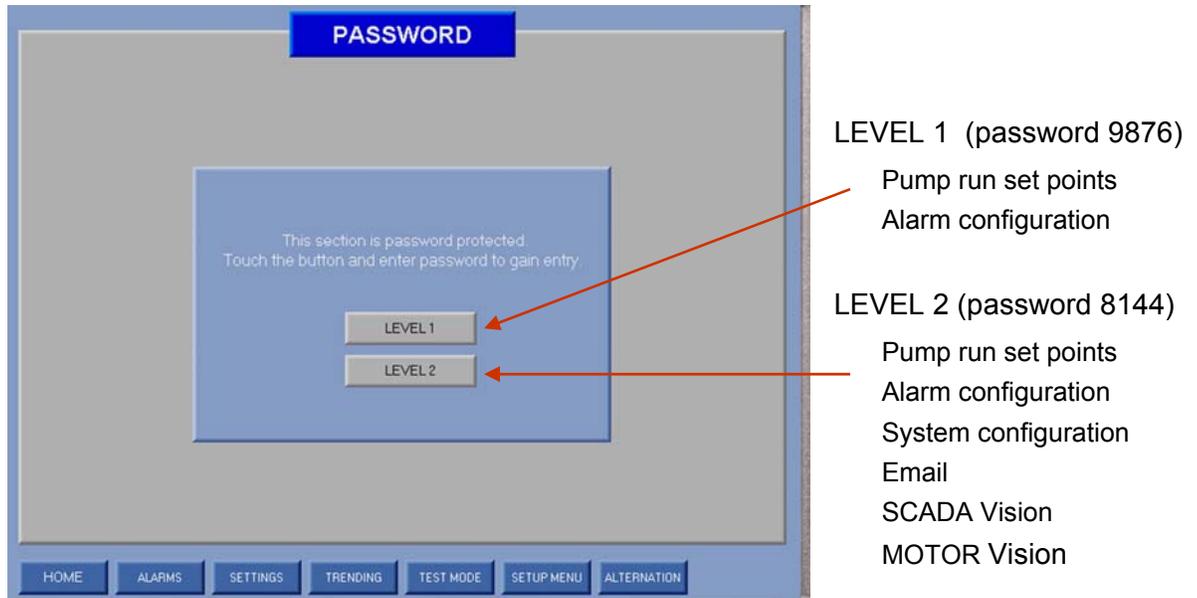


# PUMP Vision TS1040

## SETUP MENU

Accessing the Setup Menu requires that a password be entered. Touch the LEVEL 1 or the LEVEL 2 button and the keypad will appear. Enter the password to proceed.

Two levels of access are provided so that the higher level configuration functions can be protected from some users.



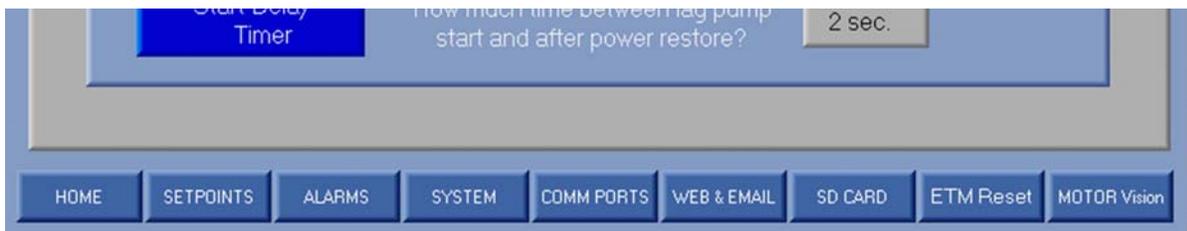
Once the password is entered, the Menu Bar changes to the Setup Menu Bar

### Level 1



These are the available setup options with the Level 1 password.

### Level 2

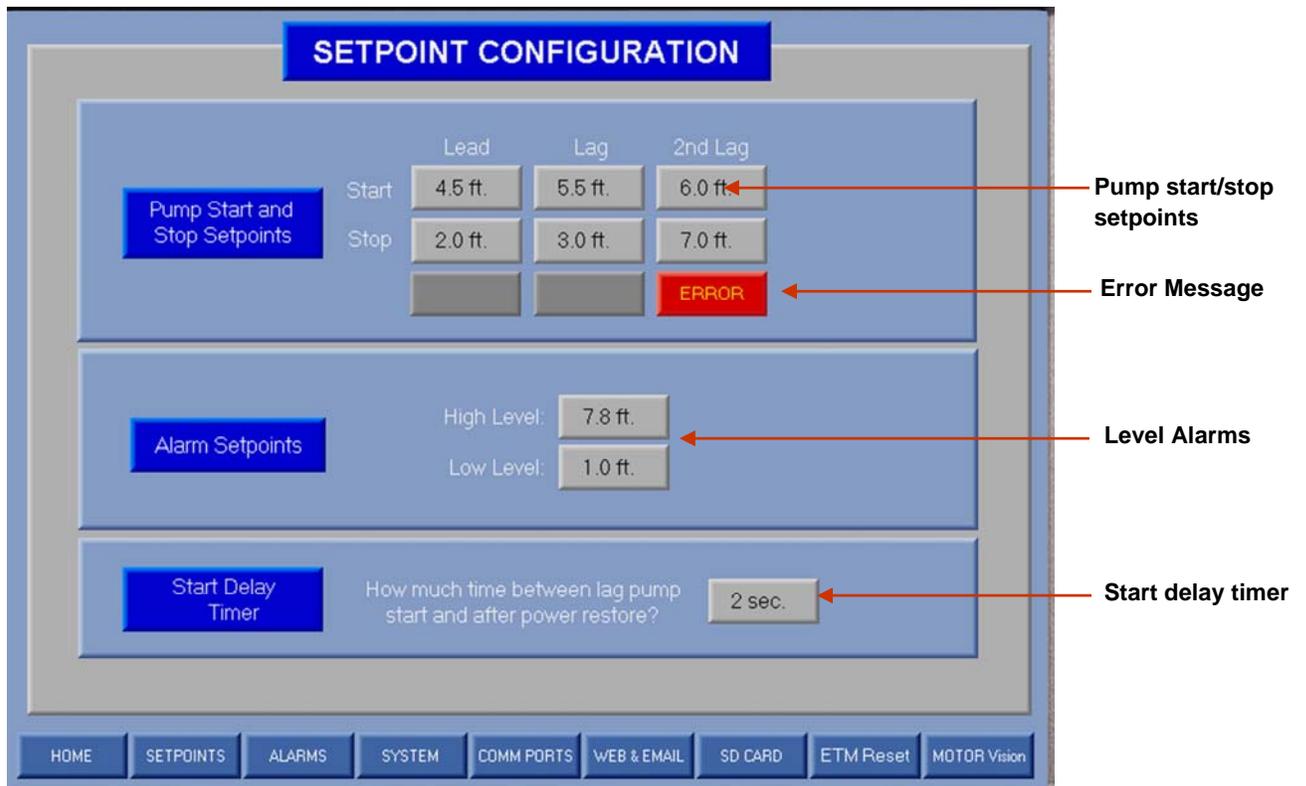


All setup options are available with the Level 2 password.

# PUMP Vision TS1040

## SETPOINT CONFIGURATION

### CONSTANT SPEED



The pump start and stop setpoints as well as high and low level alarms setpoints are easily entered in the Setpoint Configuration screen which is access by touching the SETPOINTS button. Additionally this is the screen that is displayed when the password is entered.

**Pump start and stop setpoints** - touch these to change the level at which the pumps will start and stop. Lag pump setpoints are shown as required by configuration—unnneeded entry fields are hidden. The allowable range of all level entries is 0.1 to top of the transducer range.

**Error Message** - The controller requires that there be a dead band (hysteresis) to prevent the pumps from cycle on and off too quickly. When the controller is set up to operate in the pump down mode, the stop level must be at least 0.1 ft. less than the start setpoint or the error message will display and that pump function will be locked out from operation. When the controller is set up to operate in the pump up mode, the stop level must be set at least 0.1 ft higher than the start setpoint.

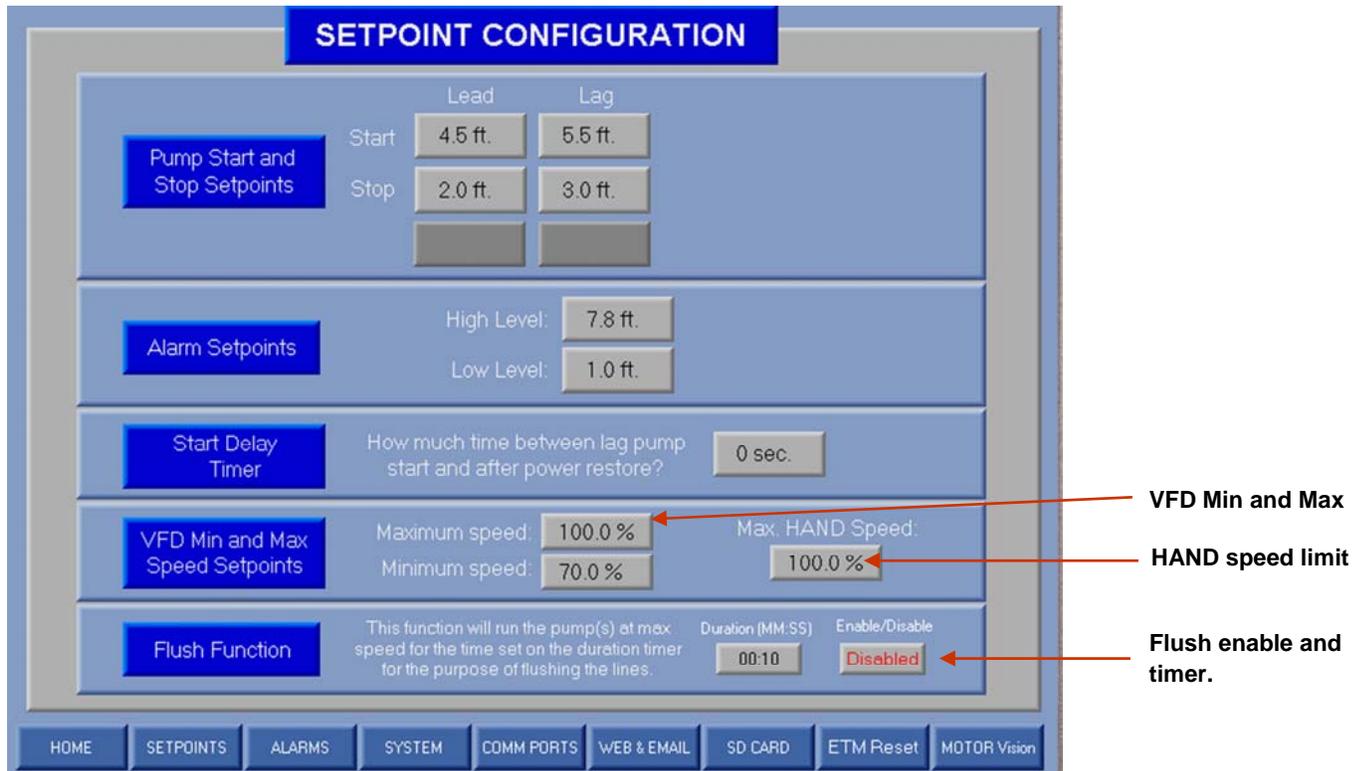
**Level Alarms** - touch these to change the level at which the high and low level alarms operate.

**Start Delay Timer**— Pump start is delayed to provide a “stagger start” of the pumps, reducing the amount of peak current consumption.

# PUMP Vision TS1040

## SETPOINT CONFIGURATION

### VFD PROPORTION MODE



When the controller is set up in the VFD Proportion Mode, the SETPOINT CONFIGURATION screen includes the same pump start and stop setpoints, alarm setpoints, and pump start delay timer as the Constant Speed Mode, and these additional functions:

**VFD Min and Max Speed setpoints** - touch these to change the speed range limits for the VFD. This setting is an important part of maximizing pumping and energy efficiency.

**HAND Speed Limit** - This setting limits the speed that a user can manually operate the VFD at without a password to change the limit. This is important in systems where too much pump speed can result in damage. This is also the speed at which the VFD will run when the hardwired H-O-A is switched to HAND.

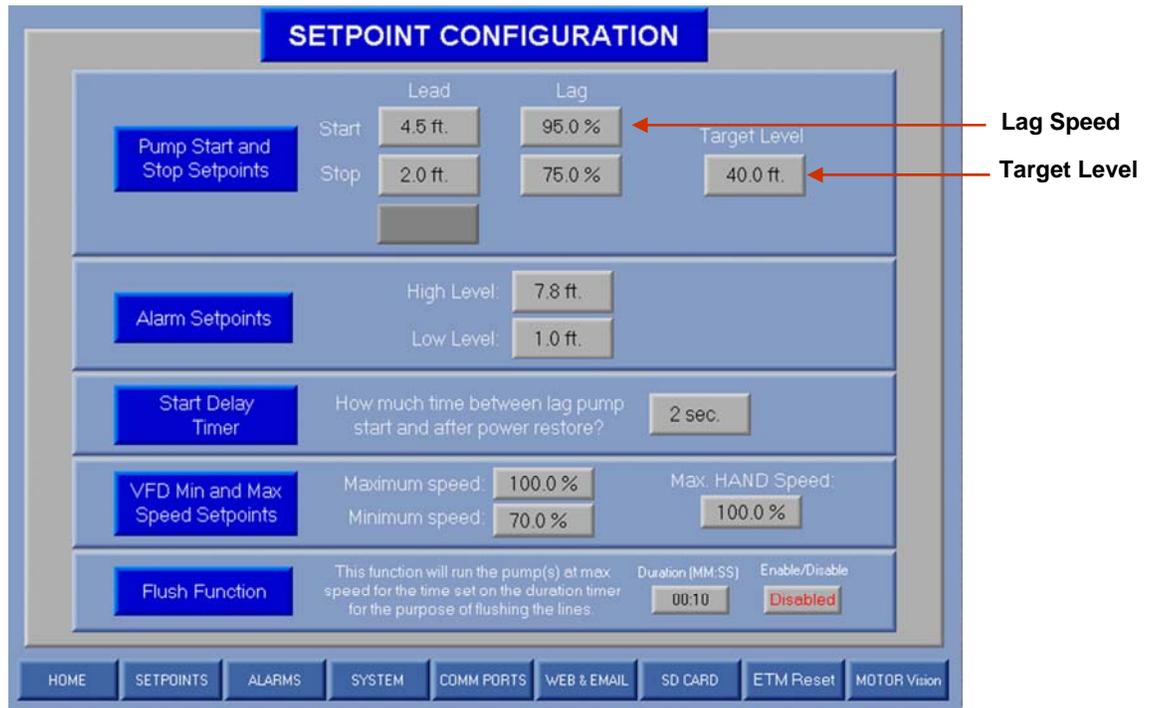
**Flush Function** - This function will flush the lines and is available in VFD modes and will enable the pumps to run at maximum speed for the time set on the duration timer to flush the lines.

When the pump stop command is triggered, the VFD will ramp its speed to the maximum speed setpoint and run for the period of time set on the duration timer. Once the duration timer elapses, the pump will shut down.

# PUMP Vision TS1040

## SETPOINT CONFIGURATION

### VFD PID MODE



When the controller is set up in the VFD PID Mode, the SETPOINT CONFIGURATION screen includes all the same functions as both the Constant Speed and VFD Proportional modes, which the two additional settings:

**Lag Speed** - touch these to change the speed that the lag pumps start and stop at. In the PID mode the lag pumps are sequence based on VFD speed.

**Target Level** - touch this to enter the level that the VFDs will be speed modulated to maintain.

See the sequence of operations section of this manual for additional information on the purpose of these functions.

# PUMP Vision TS1040

## SYSTEM CONFIGURATION

### FVNR or VFD, VFD Selection

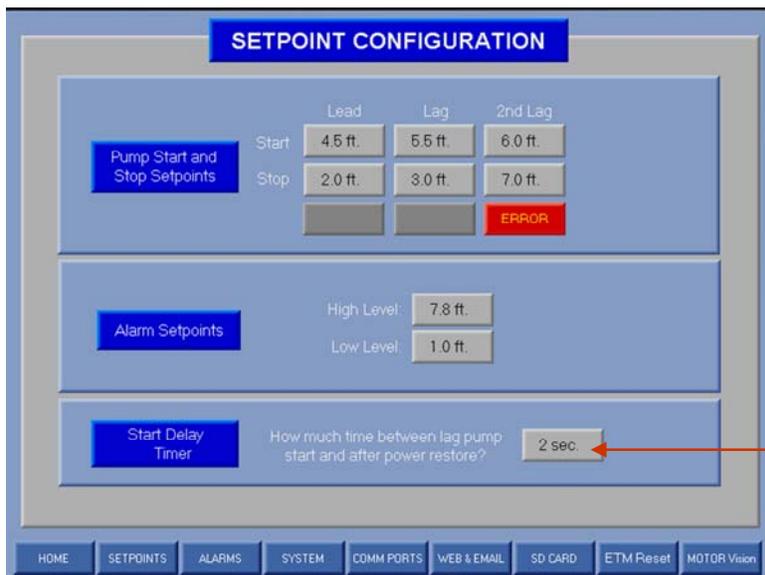
The pump start delay timer delays the start of the lag pump(s).

The primary purpose of the delay is to stagger the start of all pumps when power is restored after a power failure. This staggered start prevents power surge and voltage drop on the utility system and is especially important when the system is operating on an emergency power generator.

The lead pump start will be delayed until the controller is finished with its power on self-test, and then each subsequent pump is delayed by the amount of time set on the start delay timer.

When the PUMP Vision is set up for operating constant speed pumps, or when in the VFD—Proportional mode, the recommended delay time is 3 seconds.

When operating in the VFD-PID mode on 3 and 4 pump systems, it is important to increase the time to at least 20 seconds. The reason is that lag pumps are sequenced on when the pump or pumps that are running reach a determined speed (set as the lag pump start speed). In VFD systems with more than two pumps, if the time delay is too short, the lag pump that is called to start will not have enough time to ramp up to the current VFD speed command and have an impact on the PID function in time to prevent the next lag pump from starting. It may take some experimentation to determine the best delay time in these systems as there are several factors that come into play. It is recommended that the time be set to the minimum possible without causing all pumps to sequence on unnecessarily.



Enter the time delay between pump starts.

# PUMP Vision TS1040

## ALARM CONFIGURATION

### Alarm Setup Table

The Alarm Setup screen is table that allows for individual configuration of the following alarms:

- High level—transducer
- Low level—transducer
- High level—redundant float
- Low level—redundant float
- High motor temperature
- Seal failure
- Pump failure
- MOTOR Vision fault
- Transducer failure
- VFD fault
- Power failure (note: a UPS is needed to maintain power to the TS1040)

Alarms can be disabled, sound alarms, switch contacts, lights, e-mails, etc., simply touch the appropriate cell in the table for the feature to be changed.

ALARM SETUP											
Configure each alarm condition by choosing to enable it or not. Stop: If YES, the pump(s) are shutdown on the condition. Reset: Automatic or Manual. A Manual reset requires a button to be pressed. Horn, Light and Contact: If YES, the Horn, Light, and Contact outputs are triggered. Flash: If YES, the Light output will flash at 1Hz. Email: If YES, an email is sent out - only if email option is installed. Delay: Delays the alarm trigger. 0-99 seconds											
	High Level	Low Level	High Level Float	Low Level Float	Pump Fail	Seal Fail	High Temp	Transducer Fail	Power Fail	MOTOR Vision	VFD Fail
Enable	YES	YES	YES	YES	NO	YES	YES	YES	NO	YES	NO
Stop	NO	NO	NO	NO		NO	NO	NO	YES	NO	YES
Reset	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO
Horn	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	NO
Light	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO
Flash	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Contact	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO
Email	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Delay	8 Sec	0 Sec	2 Sec	0 Sec	0 Sec	0 Sec	0 Sec	0 Sec	0 Sec	0 Sec	0 Sec

- Alarm function enabled or disabled
- Will this alarm stop the pumps?
- Will this alarm be manual reset or auto?
- Will this alarm sound the horn?
- Will this alarm light the alarm light?
- If above is yes, will it flash the light?
- Will this alarm close the alarm contact?
- Will this alarm be transmitted to e-mail?
- Time delay before alarm is triggered.

If the alarm is not enabled, the input and condition will be ignored by the controller. No alarm handling or logging will occur.

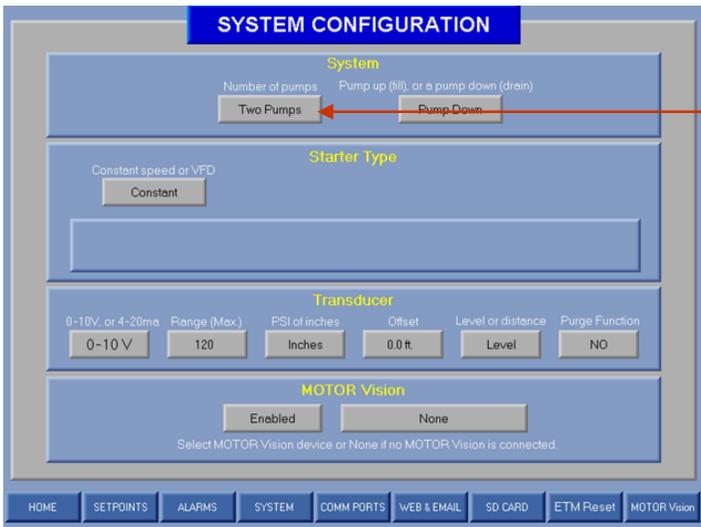
If the alarm is set for manual reset, the alarm must be reset by touching the ALARM RESET button on the main menu screen.

# PUMP Vision TS1040

## SYSTEM CONFIGURATION

### Number of Pumps, Fill or Drain

When first commissioning the PUMP Vision TS1040, the System Configuration screens must be configured. Once these parameters are set, it should not be necessary to go into the System Configuration Wizard again.

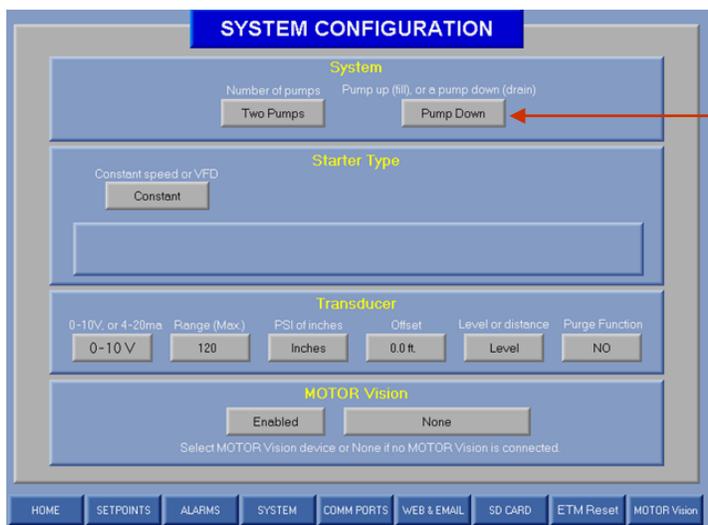


#### Number of Pumps

Touch this button to select the number of pumps to be controlled. All related features will automatically adjust based upon the number of pumps selected.

The button will display the mode that is selected:

- 1 Pump
- 2 Pump
- 3 Pump
- 4 Pump



#### Fill or Drain

Touch this button to toggle between the two types of operation, sump or tank fill and sump or tank drain.

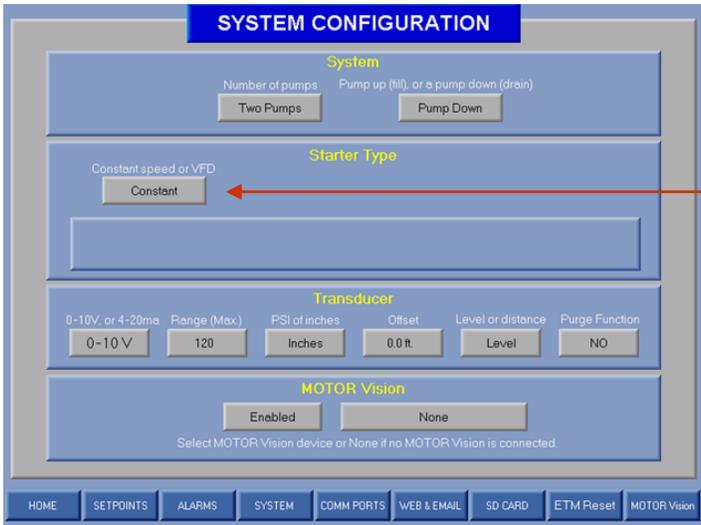
The button will display the mode that is selected:

- Pump Down
- Pump UP

# PUMP Vision TS1040

## SYSTEM CONFIGURATION

### FVNR or VFD, VFD Selection

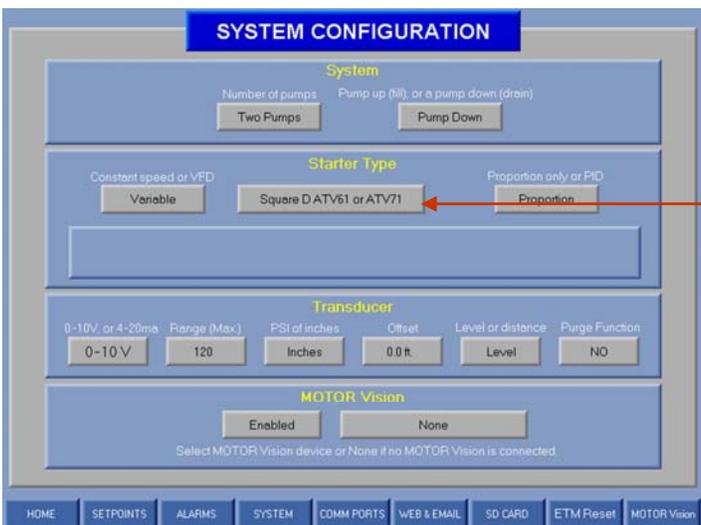


#### FVNR or VFD

Touch this button to select the type of system, constant or variable speed. Constant speed is used in systems with across-the-line motor starters and variable speed is used in systems with variable frequency drives.

The button will display the mode that is selected:

Constant  
Variable



#### VFD Selection

Touch this button to select the VFD model that is in the system. The VFDs listed below are the models that have been previously tested with the controller. Others that have Modbus network connection can be programmed and tested by CMC.

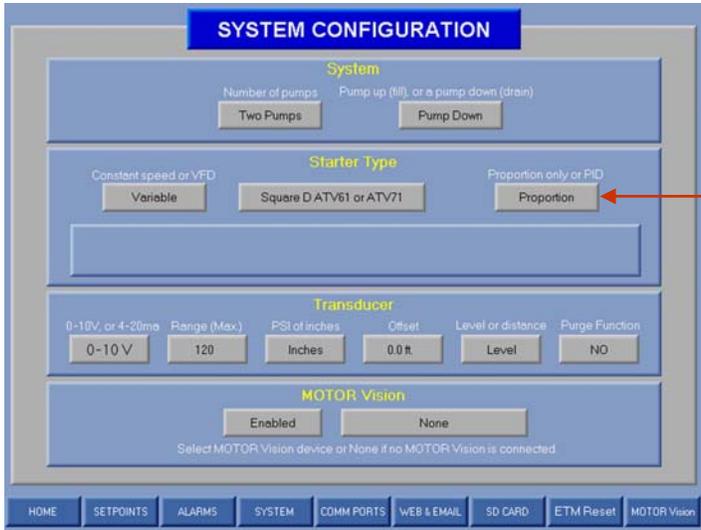
The button will display the VFD that is selected:

Square D Altivar 21  
Square D Altivar 61/71  
ABB ACS/ACH550

# PUMP Vision TS1040

## SYSTEM CONFIGURATION

### FVNR or VFD, VFD Selection



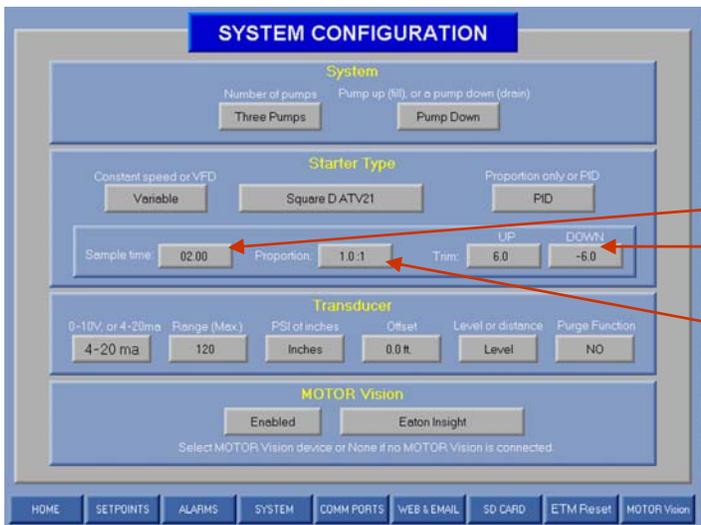
### Proportion or PID

This function is only available if Variable mode is selected

Touch this button to select whether this system is a proportion only or PID system.

The button will display the mode that is selected:

Proportion  
PID



### PID

These functions only available if Variable and PID modes are selected.

Touch these buttons to enter the PID parameters.

Sample (cycle) timer (sec:ms)

Trim, Up and Down

Proportion

Sample time—the frequency that the PID function will check for a deviation from setpoint.

Setting range is 10ms to 99.99 seconds

Proportion—the amount of VFD speed change relative to the deviation from setpoint. If 1.0:1 is selected, the VFD speed will change 0.1% for each 0.1ft of deviation each time the sample timer elapses.

Allowable setting range is 0.1:1 to 99.9:1

Trim—the maximum VFD speed change allowed with each adjustment (sample timer elapse). This prevents a large deviation from setpoint from allowing too large of a speed adjustment to the VFDs.

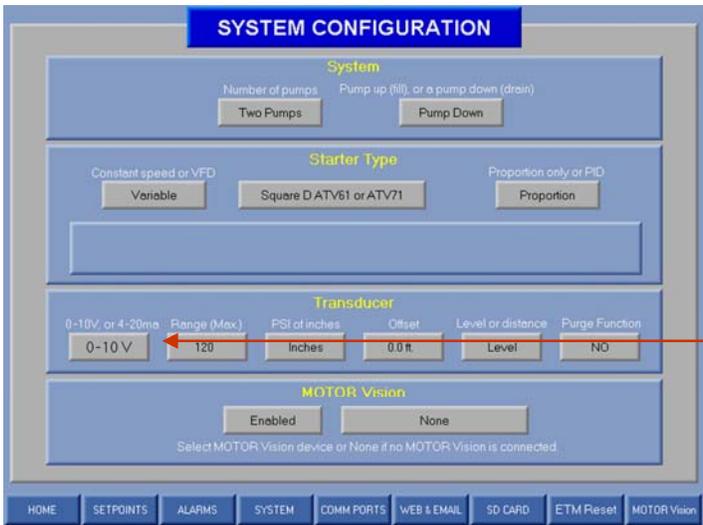
Setting range is 1.0 to 30.0%

Note: PID tuning is a bit of an art and settings are very dependant upon system conditions. The unit is shipped with factory settings that will get the system started and then tuning should be performed to prevent “hunting” by the VFD. Consult technical support for more information.

# PUMP Vision TS1040

## SYSTEM CONFIGURATION

### Transducer Type, Transducer Range

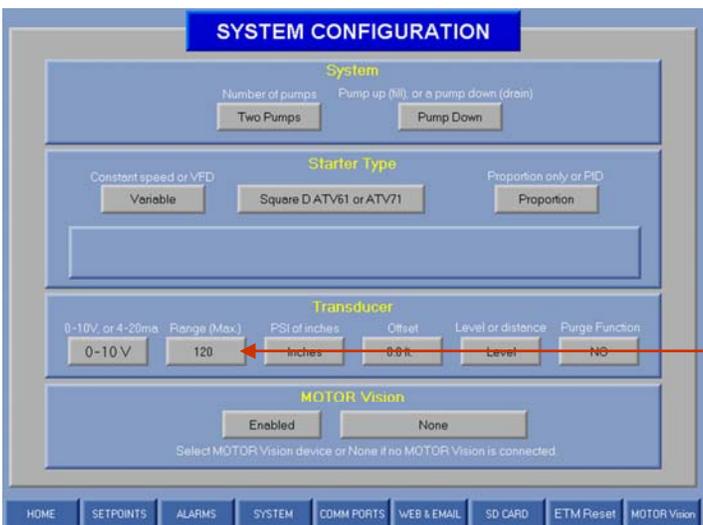


### Transducer Type

Touch this button to select the transducer input type. Refer to the wiring diagram and IO list for connection instructions

The button will display the mode that is selected:

0-10VDC  
4-20mA.



### Transducer Range

Touch this button to set the transducer range (maximum reading).

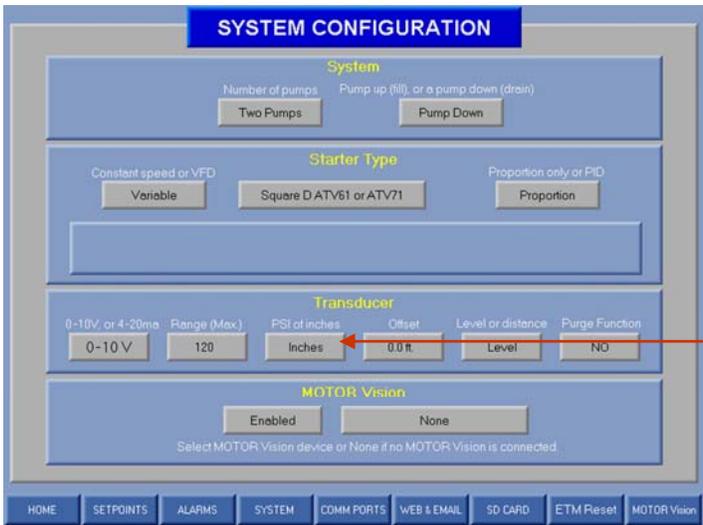
Transducers are typically manufactured with a fixed range, although they are also available with a programmable range. The value entered here must match the range or the transducer. If the system has a programmable transducer, set the range on it first and then set the range here.

Allowable range is 1—9999

# PUMP Vision TS1040

## SYSTEM CONFIGURATION

### Transducer Units, Level Offset



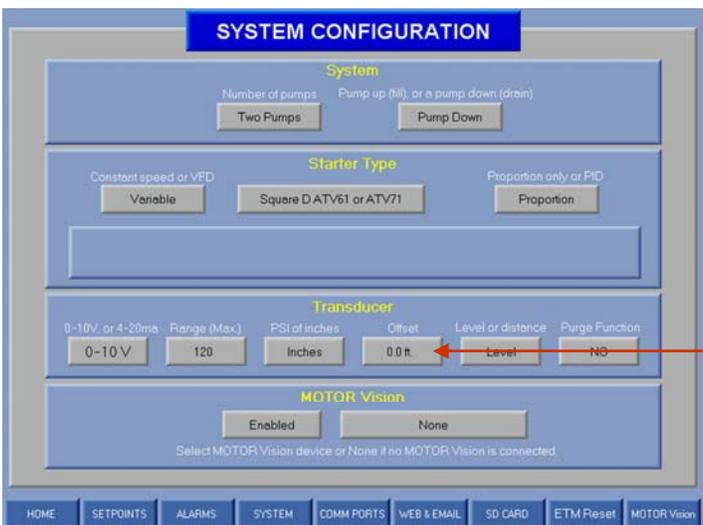
### Transducer Units

Touch this button to set the units of measurement used by the transducer, in PSI or inches of water.

If PSI is selected, the PUMP Vision will automatically convert the range to tenths of feet of water. For example, a range of 15 PSI will result in a maximum level display of 34.6 ft.

The button will display the mode that is selected:

- Inches
- PSI



### Level Offset

Touch this button to set how far the transducer (or bubbler tube) is from the bottom of the tank or sump.

This offset is added to the level reported by the transducer so that the displayed level is accurate.

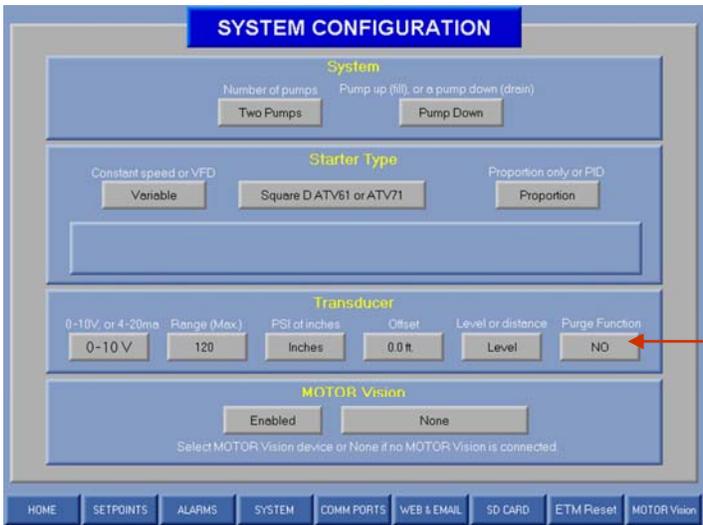
Allowable setting range is from 0.0 to 99.9 feet.

**Note: Do not enter any pump start/stop or alarm level setpoints for a value less than the offset value as the operating level cannot drop below the offset.**

# PUMP Vision TS1040

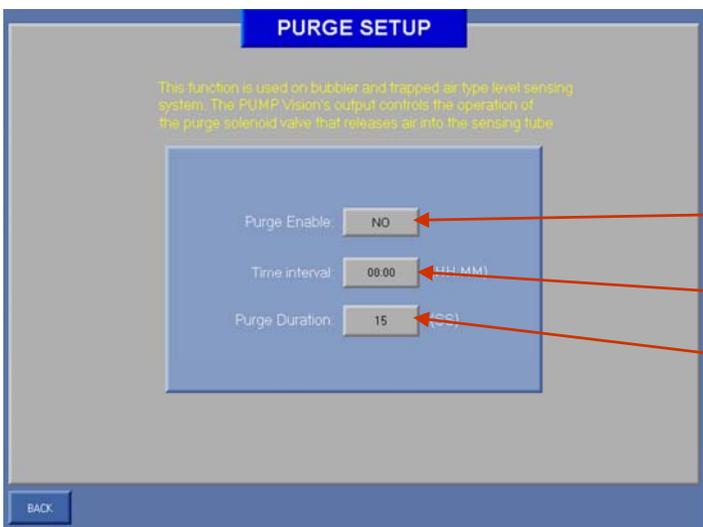
## SYSTEM CONFIGURATION

### Purge Function



### Purge Function

Touch this button to access the bubbler purge solenoid setup screen. The button also shows whether the purge function is enabled or not.



### Purge Setup

Touch this button to enable the bubbler purge solenoid output. The button will display the mode that is selected:

Enable

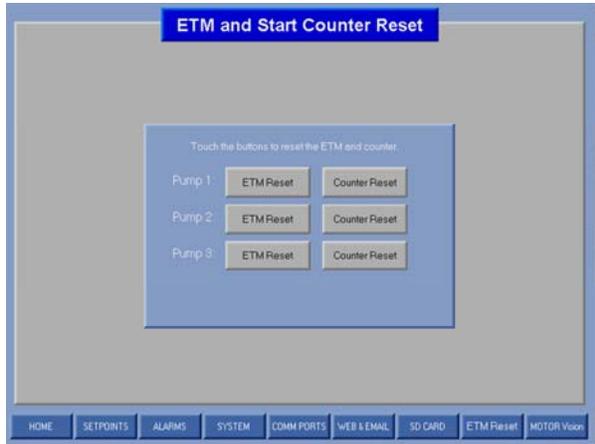
Time Interval— this is the length of time between each purge cycle.

Duration of purge—this is the length of time that the purge solenoid will be energized.

# PUMP Vision TS1040

## SYSTEM CONFIGURATION

### MOTOR Vision, Reset ETMs

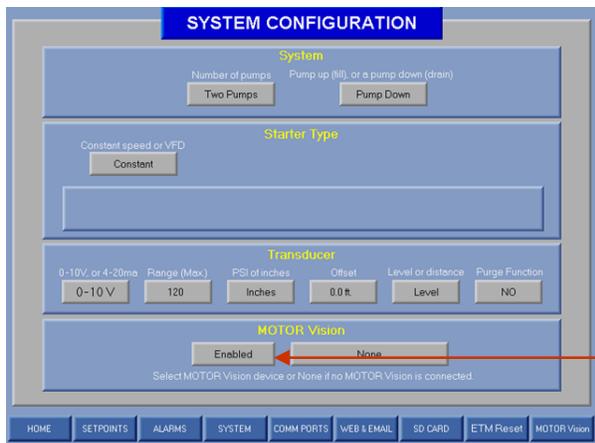


### Reset ETMs

Touch these buttons to reset the pump hour meters and start counters

A reset button is provided for each pump's hour meter and start counter to allow independent reset operation.

This screen is in the Level 2 password area to prevent unauthorized reset of the registers.



### MOTOR Vision Enable

Touch this button to enable the MOTOR Vision pump monitoring feature.

When enabled, a Monitor button appears on the Pump Control screens that provides access to the monitoring, fault status and setup screens of the MOTOR Vision device.

The button will display the mode that is selected:

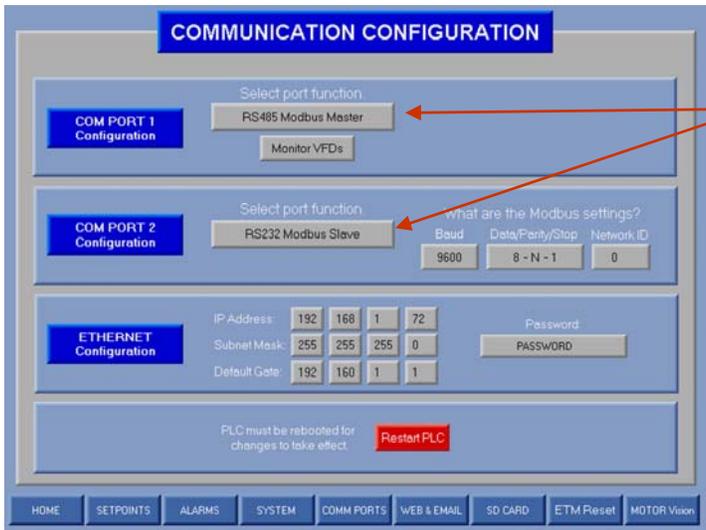
Yes  
No

For more information, see the Options section of the manual.

# PUMP Vision TS1040

## COMMUNICATION CONFIGURATION

Com 1, Com 2



### Configuration (typ. of COM 1 and COM 2)

Touch this button to select the desired configuration for the com port.

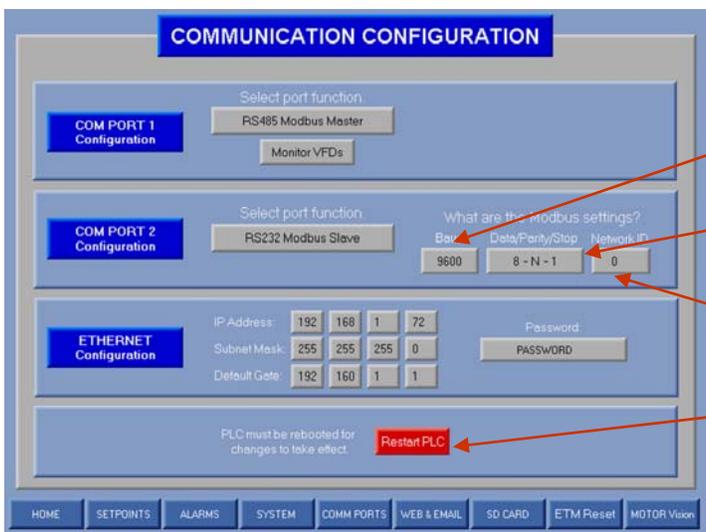
The button will display the mode that is selected.

For COM 1 the possible configurations are:

- None (default—RS232 with PLC protocol)
- RS232 Modbus slave
- RS485 Modbus slave
- RS485 Modbus master (for VFD control)

For COM 2 the possible configurations are:

- None (default—RS232 with PLC protocol)
- RS232 Modbus slave
- RS485 Modbus slave



Baud Rate: Touch this button to set the port baud rate.  
Choices are 9600 or 19200

Data bits / Parity / Stop Bits  
Choices are 8-N-1 or 8-E-1

Network ID: This button sets the Modbus network ID.  
Setting range is 1—255

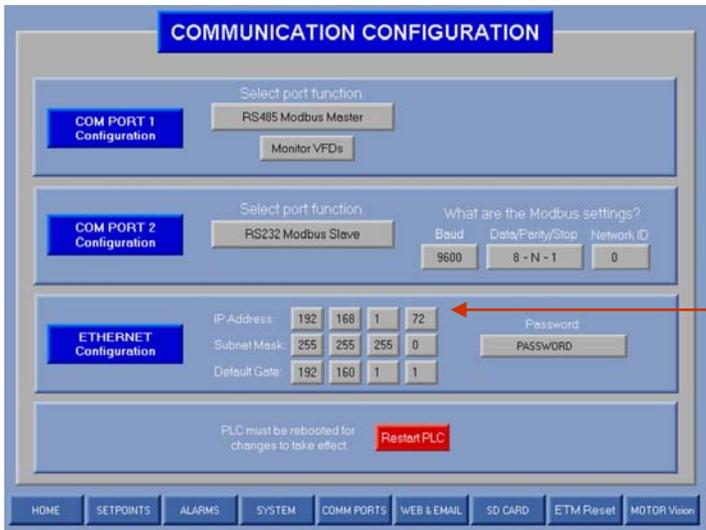
Power cycle the PLC after the selections have been made.

# PUMP Vision TS1040

## COMMUNICATION CONFIGURATION

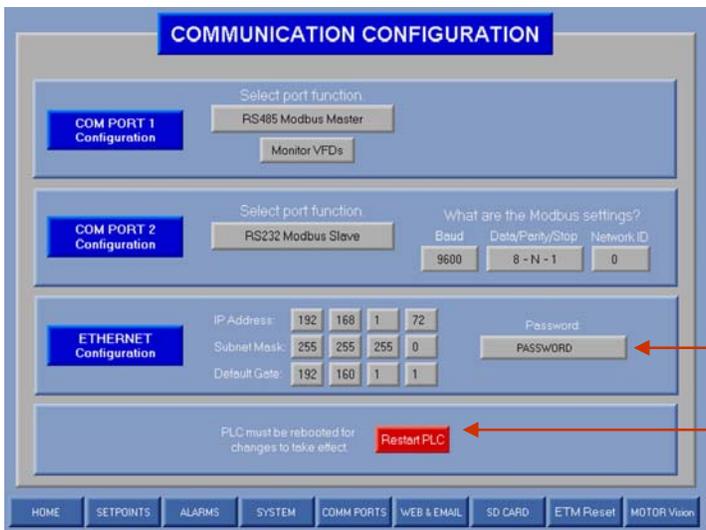
### Ethernet

An Ethernet port is an optional board that can be factory installed into the controller. When the option is installed, email, web server, remote access and monitoring are all available.



### Ethernet IP

Enter the device IP address, subnet mask and gateway IP addresses.



### Password

Enter PLC password here. This password will be needed to access the PLC from an Ethernet connection.

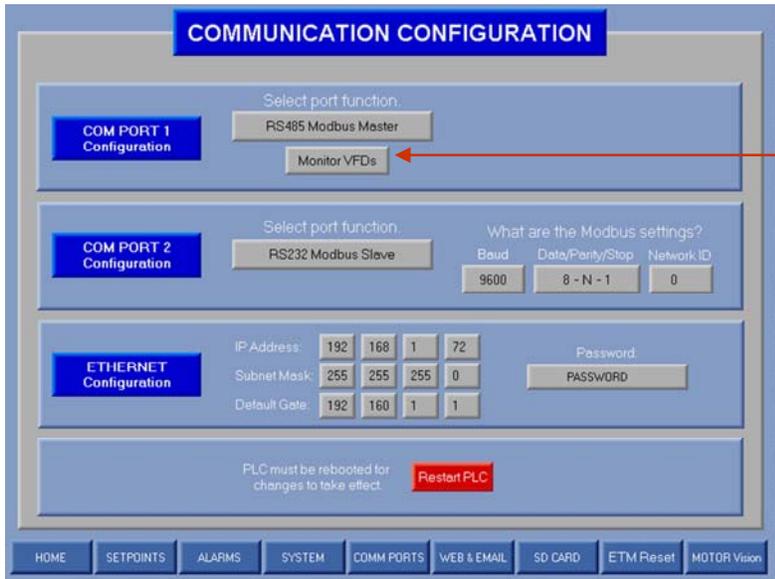
Touch this button to restart the PLC after entering new Ethernet IP data for the changes to be active.

# PUMP Vision TS1040

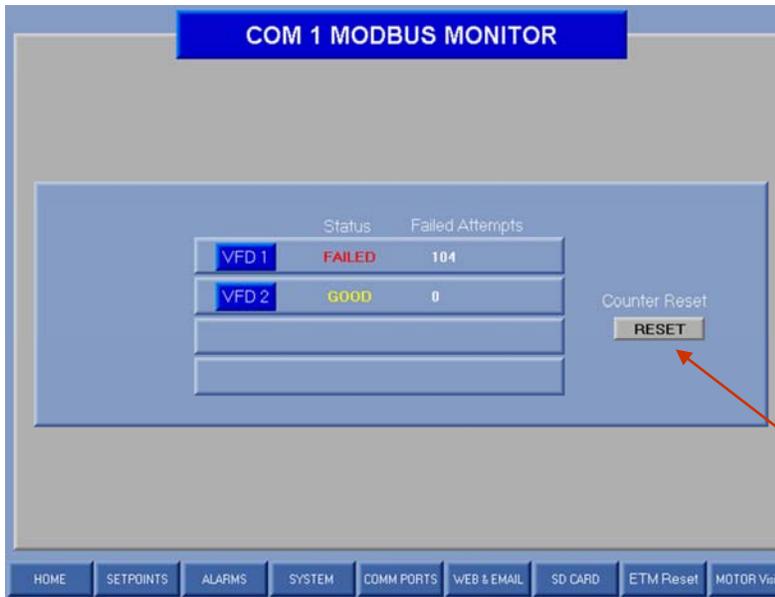
## COMMUNICATION CONFIGURATION

### Modbus to VFD Communication

The controller operates the VFDs through a Modbus connection to COM 1. This communication can be monitored for diagnostic purposes.



Touch here for access to the controller-to-VFD Modbus monitor screen.



This screen is only available when Com port 1 is configured for RS485 Modbus Master. To access this screen, touch the Monitor VFD button on the COM PORT 1 configuration.

For each VFD the status of the Modbus connection is reported and the total number of failed packets are counted.

The failed attempt counters can be reset by touching this button.

# PUMP Vision TS1040

## WEB & EMAIL SETUP

Options

### Email Service Provider

The PUMP Vision can send out alarm e-mail and text messages if configured with the option Ethernet board and if connected to the Internet. An SMTP server with a static IP address is also required.

First, an e-mail account must be established login user name and password.

Next, the IP address of the SMTP server must be determined. To find out what the IP address is for your server:

- From your Windows Start button click RUN
- When the RUN box opens, enter CMD into the command line and click OK.
- At the DOS prompt that appears, type "ping mail.server.com" (substitute the name of your SMTP server for the mail.server.com) and press enter.
- The IP address of your server will be displayed in brackets.
- Use this address to enter your IP address into the controller.

### Configuration (Outgoing Server)

Enter the SMTP server IP address and port number (most use port 25, but this can be confirmed by your provider).

Enter the user login name here.

Enter the user login password here.

### Sending a text message

An SMS text message can be sent to a cell phone on an alarm condition. The message will typically be received within five seconds of being sent by the controller.

To send a TM, simply send an e-mail to the cell phone using the format of 5555551212@provider.com where the phone number of the cell phone and the cell phone service provider are entered in the email recipient address.

Contact your service provider or check their website for their email address format.

### Some common service providers

- AT&T** – cellnumber@txt.att.net
- Verizon** – cellnumber@vtext.com
- T-Mobile** – cellnumber@tmomail.net
- Sprint PCS** - cellnumber@messaging.sprintpcs.com
- Virgin Mobile** – cellnumber@vmobl.com
- US Cellular** – cellnumber@email.uscc.net
- Nextel** - cellnumber@messaging.nextel.com
- Boost** - cellnumber@myboostmobile.com
- Alltel** – cellnumber@message.alltel.com

# PUMP Vision TS1040

## WEB & EMAIL SETUP

### Email Service Provider

The screenshot shows the 'WEB & EMAIL SETUP' interface. The 'Email Service Provider' section includes fields for SMTP IP (0 0 0 0), Remote port (0), Name, and Password. The 'Email Addresses' section has a 'Station ID' field containing 'STATION12' and a 'Send to: (e-mail addresses)' field containing 'tduling@cmcontrols.com'. The 'Test Email Function' section has a 'Send E-mails' button. The 'WEB Server Setup' section has 'Enable web server' and 'Password required' both set to 'Disabled', and 'User name' and 'Password' fields. A 'Restart PLC' button is visible at the bottom right. A navigation bar at the bottom includes HOME, SETPOINTS, ALARMS, SYSTEM, COMM PORTS, WEB & EMAIL, SD CARD, ETM Reset, and MOTOR Vision.

### Configuration (Station ID)

Station Name—this is the identification that will appear on the email and text message header .

Enter the email address of the PUMP Vision here. Without an email address, the SMTP server will reject the send request.

The screenshot shows the 'WEB & EMAIL SETUP' interface. The 'Email Service Provider' section includes fields for SMTP IP (23 12 125 14), Remote port (25), Name (USER NAME), and Password (PASSWORD). The 'Email Addresses' section has a 'Station ID' field containing 'STATIONX', a 'Send to: (e-mail addresses)' field containing 'name@domain.com', and a 'From (e-mail address)' field containing 'name@domain.com'. The 'Test Email Function' section has a 'Send E-mails' button. The 'WEB Server Setup' section has 'Enable web server' set to 'Enabled' and 'Password required' set to 'Disabled', and 'User name' (ASRYH) and 'Password' (eRT\*\*) fields. A 'Restart PLC' button is visible at the bottom right. A navigation bar at the bottom includes HOME, SETPOINTS, ALARMS, SYSTEM, COMM PORTS, WEB & EMAIL, SD CARD, ETM Reset, and MOTOR Vision.

### Configuration (Recipients)

Enter the email addresses of the recipients. Up to four can be entered and all will be contacted on an email enabled alarm condition.

The example in the screen is showing a text message to a Verizon customer in the first line and a standard email example in the second line.

# PUMP Vision TS1040

## WEB & EMAIL SETUP

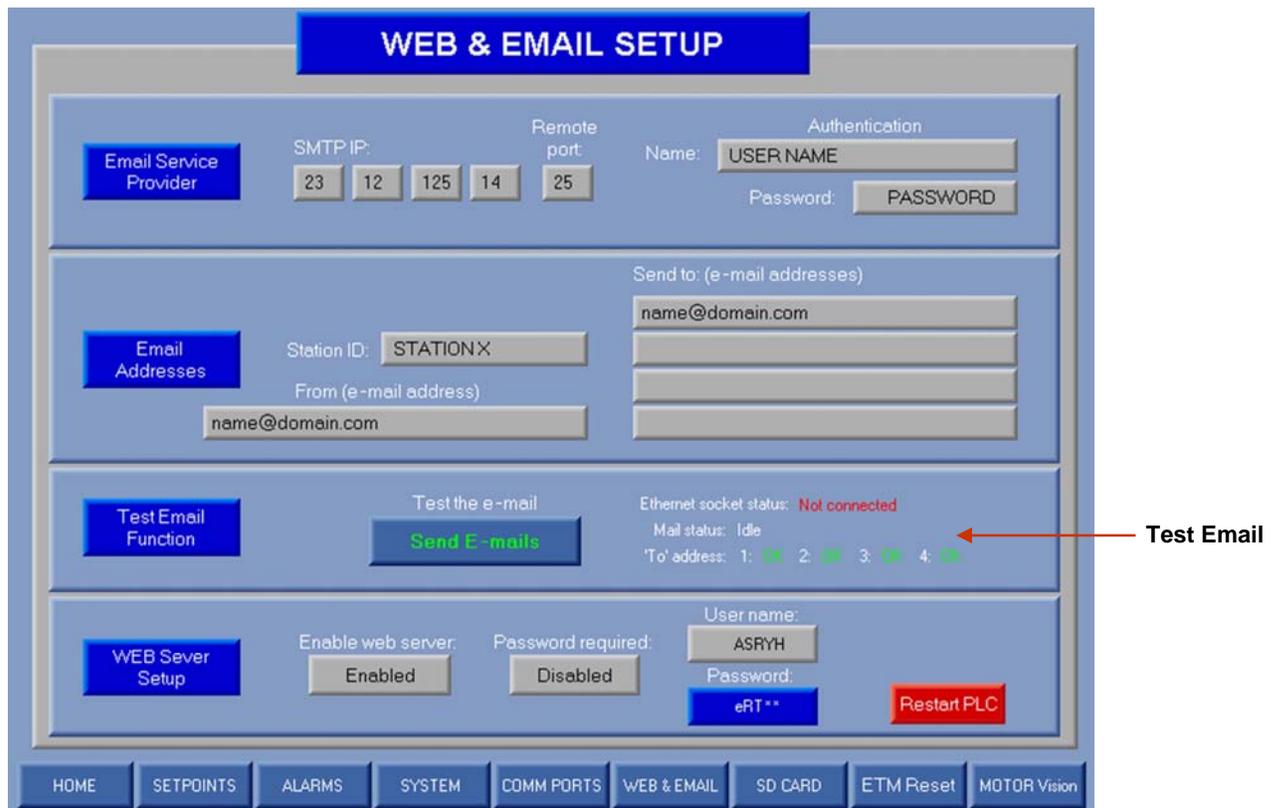
### Test Email

The email configuration and connection can be tested by touching the Send Emails button. The test function will send a message marked Test to each recipient in the "Send emails to:" list.

First the Ethernet socket status should show "Connected". If it does connect, there is a problem with the Ethernet configuration and Internet connection.

Once connected, the Mail status should indicate "In progress" and then "Success". If these messages don't appear, there is a problem with the SMTP server setup or the email addresses.

The "To Address" indicates if the recipient email addresses are a correct format. The controller will not report an invalid email address however.



# PUMP Vision TS1040

## SETPOINT ENTRY

### Alpha-numeric

When a data entry field is touched that requires an ASCII text entry, such as a email address, user login name, password, etc., the ASCII text entry screen will appear. By default the screen with all upper case letters is displayed, but two there are also screens for lower case and for special characters.

#### Upper Case Screen

Screen scroll buttons. Touch these to change to the lower case and special character screens.



ESC—leave the text entry screen without making a change.

#### Lower Case Screen

Del & BS— Delete a character and back-space a character.



Left & Right Arrows—move the cursor within the text entry field.

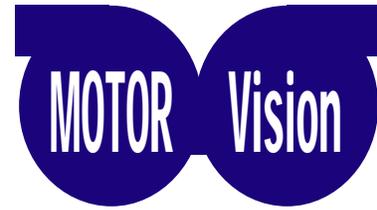
#### Symbols Screen

CLR— clear the text entry field completely when first entering the screen.

Enter—Save changes and leave the text entry screen.



# PUMP Vision TS1040



## The MOTOR Vision System

The PUMP Vision can communicate with smart motor starter via a Modbus connection that enables the PUMP Vision to display a variety of important pump and motor information.

Depending on the type of MOTOR Vision starter that is connected, the PUMP Vision can display:

- Current per phase, average and imbalance
- Voltage per phase, average and imbalance
- Ground fault, power factor and frequency
- Trip and fault information



Various motor controllers are able to connect to the PUMP Vision as MOTOR Vision devices, including:

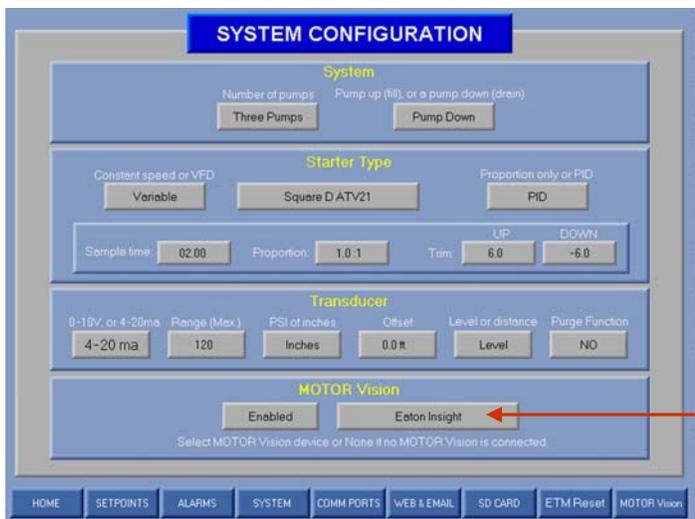
- Variable frequency drives
- RVSS starters
- Insight overload and power monitor
- U-Line integrated motor starter

## MOTOR Vision

### Enable, Type Selection

When first commissioning the PUMP Vision TS1040 that has MOTOR Vision connected, MOTOR Vision must be configured. Once these parameters are set, it should not be necessary to go into the MOTOR Vision Configuration again

- The PUMP Vision must be configured to communicate with the MOTOR Vision products. First, the COM 1 port must be configured as an RS485 Modbus master (see System Configuration - Communication).
- Then the MOTOR Vision starter must be connected with a Modbus network to the PUMP Vision com port. For connection instructions, refer to RS485 wiring instructions.
- The Modbus address must be properly configured on the MOTOR Vision starter.
  - Pump 1 motor controller must be set to Modbus address 11
  - Pump 2 motor controller must be set to Modbus address 12
  - Pump 3 motor controller must be set to Modbus address 13
  - Pump 4 motor controller must be set to Modbus address 14
- Finally, the MOTOR Vision parameters must be configured.



U-Line



Insight



Touch this button to scroll through the MOTOR Vision starter choices

- None - no MOTOR Vision connected
- TeSys U-Line - Schneider U-Line integrated starter
- Eaton Insight - Cutler-Hammer overload/power monitor

## MOTOR Vision—Uline

### Monitoring

The PUMP Vision is programmed to communicate with the Schneider (Square D) U-Line products via a Modbus connection that enables the PUMP Vision to display current, ground fault, and a variety of trip information.

Two monitoring screens are provided for each pump in the system that provide access to:

- Current information
- Trip and fault information



### Monitoring

**PUMP 1 MOTOR Vision**

The screen displays the following information:

- Current:** 12.8, 19.2, 25.6 (top values); 6.4, 0.0, 32.0 (bottom values); 0.0 AMPS.
- Thermal Status:** 40, 60, 80 (top values); 20, 0, 100 (bottom values); Thermal: 0%; OL setting: 18.5 A.
- Starter Status:** Ready: OK, Contacts: OK, Fault: OK, Warning: WARN, Tripped: OK.
- Ground Fault:** 40, 60, 80 (top values); 20, 0, 100 (bottom values); Ground: 0%.
- Warning:** Trip Reason (Short-circuit, Magnetic, Ground, Thermal) and Warnings (Ground, Thermal, Long start, Mech. Jam, Rev. phase, Underload).

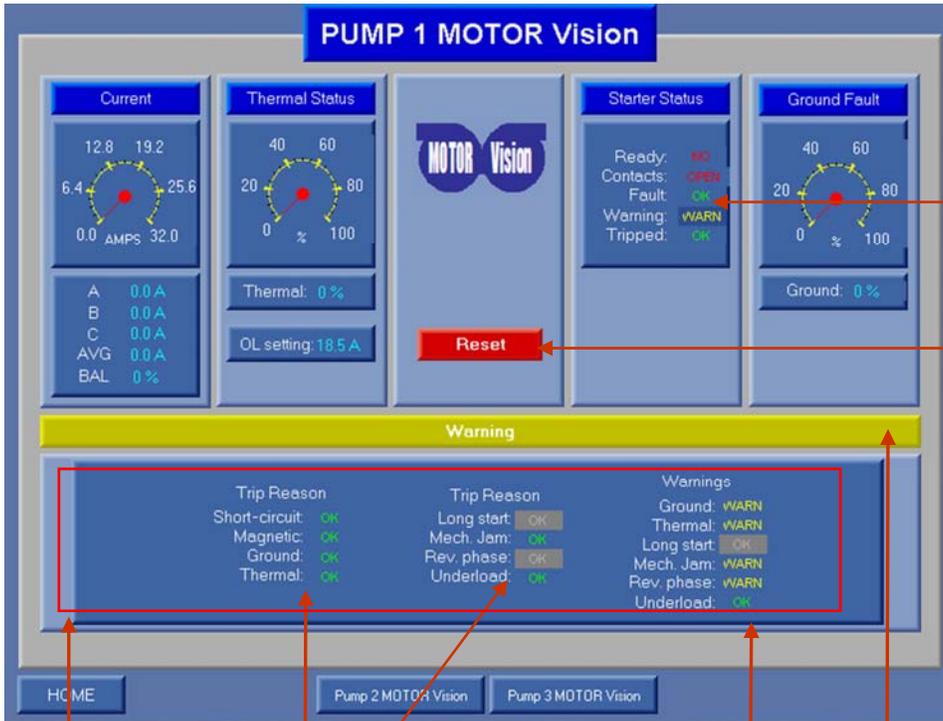
Annotations:

- Thermal (overload) percent of trip
- Ground fault percent of total current
- OL set point
- MOTOR Vision Modbus communication failure indicator
- Access MOTOR Vision on other pumps

#### Current display

- Current for each phase.
- Average current across all phases.
- Imbalance between phases.

## MOTOR Vision—Uline Monitoring



**MOTOR Vision Starter Status**  
 Ready—Starter on and connected  
 Contacts— Closed when running  
 Fault— Starter fault, see below  
 Warning— Impending trip  
 Tripped— Starter tripped, see below

MOTOR Vision Reset  
 Sends reset command to starter

**Reasons for trip**

- Short-circuit
- Magnetic
- Ground fault
- Thermal overload
- Start time too long
- Mechanical jam
- Phase reversal
- Underload

**Reasons for warning**

- Ground fault
- Thermal overload
- Start time too long
- Mechanical jam
- Phase reversal
- Underload

Motor Status—the status indicator gives the status of the U-line motor starter at a glance.

- Green—Normal, output relay on, pump can run
- Yellow—Warning, trip may be imminent.
- Red—Tripped, pump is shutdown, fault must be cleared.

**Fault Monitoring**

- Green OK
- Red Tripped
- Yellow Warning
- Gray is disabled

NOTE: For complete information about the proper configuration and use of the Schneider U-Line motor starter multifunction trip module type LUCM, please refer to **Schneider publication TeSys® U LUCM and LUCMT Multifunction Control Unit User Guide 1743237 03/2009**

## MOTOR Vision—Uline

### Setup

The MOTOR Vision SETUP page provides simple access to the programming of the U-Line motor starter. The PUMP Vision controller is constantly reading the data from the U-Line starters. When this setup page is displayed, the reading stops and the user can change values as needed.

The first time the system is configured, all data will be the Schneider factory default settings for the LUCM multifunction trip module installed.

Upon exiting this screen, all data will be written to the U-Line starter and saved. Since this screen sets up the trip characteristics of all connected U-Line starters at one time, it is critical that all of the system's starters are connected and communicating while changing this data.

**MOTOR Vision SETUP**

	Full Load Amps:	Trip Class: (5,10,15,20,25,30)	Short Circuit: (% of FLA trip point)
Pump 1 Overload	18.5 A (0.0 to 32.0 A)	10	1400 %
Pump 2 Overload	0.0 A (0.0 to 0.0 A)	0	0 %
Pump 3 Overload	0.0 A (0.0 to 0.0 A)	0	0 %
Pump 4 Overload	0.0 A (0.0 to 0.0 A)	0	0 %

	Warning	Enable/Disable	Trip	Enable/Disable	Reset Delay
Thermal	85 %	YES (10-100% FLA)	80 %	YES (35-95% FLA)	20 (0-1000 Sec.)
Under Current	50 %	YES (30-100% FLA)	50 %	YES	20 (1-200 Sec.)
Ground Fault	2.4 A	YES (1.6 - 40.0 A)	2.4 A	YES	1.0 (0.1-1.2 Sec.)
Current Imbalance	10 %	YES (10-30% FLA)	0 %	NO	3.0 (0.2-20.0 Sec.)
Mechanical Jam	200 %	YES (100-800% FLA)	200 %	YES	5 (1-30 Sec.)
Long Start	0 %	NO (100-800% FLA)	0 %	NO	10 (1-200 Sec.)

**WARNING!** At least one of the MOTOR Vision controllers is not communicating with the PUMP Vision controller. Please check connections. If you proceed, data will not be written to controllers that are not connected.

Annotations:

- Overload setting (FLA)
- OL range (read from U-Line starter)
- Overload setting Trip Class, 5 to 30
- Magnetic Trip, 300-1700% in 20% increments.
- Thermal overload—percentage of FLA
- Undercurrent—percentage of FLA
- Ground fault—amperes
- Current Imbalance—percentage of FLA
- Mechanical Jam—percentage of FLA
- Long start—percentage of FLA
- Warning setpoint
- Warning function enable
- Trip setpoint
- Trip function enable
- Time delay before warning or trip occurs. Value is entered in seconds, range is shown in yellow.

MOTOR Vision communication fault message. If this appears, at least one of the U-Line starters is not communicating by Modbus to the PUMP Vision controller and will not receive setting updates.

**IMPORTANT NOTE: IT IS UP TO THE INSTALLER TO ENSURE THAT ALL SETTINGS ARE CORRECT FOR THE APPLICATION.**

For complete information about the proper configuration and use of the Schneider U-Line motor starter multifunction trip module type LUCM, please refer to **Schneider publication TeSys® U LUCM and LUCMT Multifunction Control Unit User Guide 1743237 03/2009**

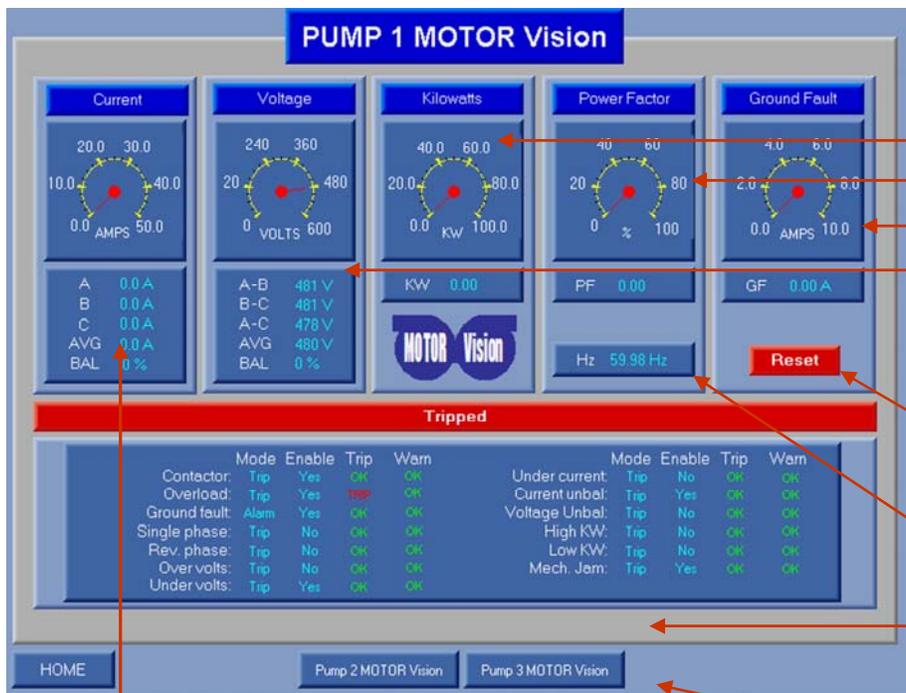
# PUMP Vision TS1040



## MOTOR Vision—Insight Monitoring

The PUMP Vision is programmed to communicate with the Eaton Insight power monitor/overload relay via a Modbus connection that enables the PUMP Vision to display volts, current, ground fault, power factor and a variety of trip information.

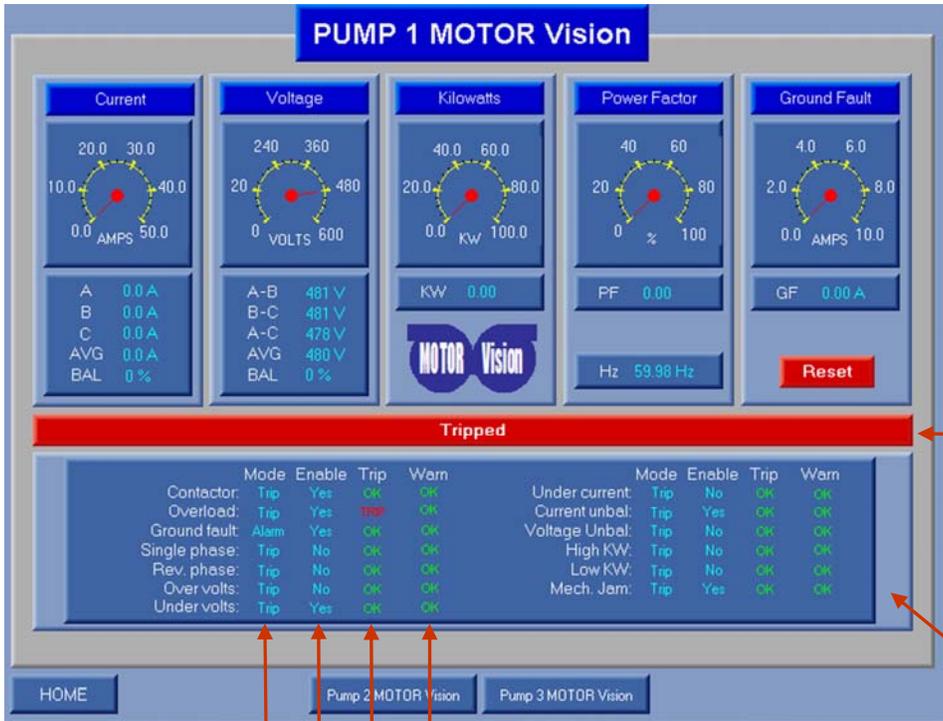
All of this information is available on one easy to read screen.



- ← Kilowatts
- ← Power factor
- ← Kilowatts
- ← Voltage display  
Voltage for each phase.  
Average voltage across all phases.  
Imbalance between phases.
- ← MOTOR Vision Reset  
Sends reset command to starter
- ← Frequency
- ← MOTOR Vision Modbus communication failure indicator
- ← Access MOTOR Vision on other pumps

- ← Current display  
Current for each phase.  
Average current across all phases.  
Imbalance between phases.

## MOTOR Vision—Insight Monitoring



Motor Status—the status indicator gives the status of the Insight power monitor at a glance.

- Green—Normal, output relay on, pump can run
- Yellow—Warning, trip may be imminent.
- Red—Tripped, pump is shut down, fault must be cleared.

### Fault Monitoring

- Green OK
- Red Tripped
- Yellow Warning
- Gray is disabled

- Warning status, OK or Warn
- Trip status, OK or Trip
- Enabled, yes or no
- Mode, Trip or alarm only

Alarms and trips are provided for:

- Contactors failure—loss of output phase
- Overload-pump jammed, motor failure, pump failure
- Ground fault—lead to cable or motor
- Loss of phase—possible power supply problem, bad wiring connection,
- Phase reversal—possible power supply problem
- Over and under voltage-possible power supply problem
- Under current)- possible jam, mechanical wear
- Mechanical jam-possible rags, debris
- Over power (KW)- possible jam, mechanical wear
- Under power (KW)-possible broken coupling, pump running dry
- Current imbalance— possible power supply problem, possible motor problem
- voltage imbalance-possible power supply problem

Trip Reason—When the Insight detects any of these faults, the output of the Insight will trip. If that contact is wired into the contactor circuit, the pump will be shut down. The PUMP Vision output to the starter will also be turned off if selected to do so in the MOTOR Vision Insight alarm setup screen

Warnings—The alarms in this category are imminent failures. They do not cause immediate trips, but will cause a trip indirectly by affecting a related condition trip.

The pump will not start if any of the trip or warning conditions exist prior to starting.

## MOTOR Vision—Insight

### Setup

The MOTOR Vision SETUP page provides simple access to the programming of the Eaton Insight Overload and Monitoring Relay. The PUMP Vision controller is constantly reading the data from the Insight overloads. When this setup page is displayed, the reading stops and the user can change values as needed.

The first time the system is configured, all data will be the Eaton factory default settings for the Eaton Insight Overload and Monitoring Relay installed.

Upon exiting this screen, all data will be written to the Insight overloads and saved. Since this screen sets up the trip characteristics of all connected Insight overloads at one time, it is critical that all of the system's starters are connected and communicating while changing this data.

**MOTOR Vision SETUP**

**Insight Range and Overload Configuration**

Supply Voltage	Select the best range for the application	Set motor FLA	Trip Class
PUMP 1 480V	6.67-30 amps <small>This setting requires three passes through the CT. The Insight connected has a 20-90A base range.</small>	10.00 A	10
PUMP 2 240V	2-9 amps <small>This setting requires one pass through the CT. The Insight connected has a 2-9A base range.</small>	6.00 A	10
PUMP 3 240V	120-270 amps <small>This setting requires 300.5 external CT. The Insight connected has a 2-9A base range.</small>	6.00 A	10

**Insight Restart Configuration**

Line Fault	Load Fault	Motor Fault
Delay: 0 sec. Attempts: 0	7 min. None	2 min. None

**WARNING!** At least one of the MOTOR Vision controllers is not communicating with the PUMP Vision controller. Please check connections. If you proceed, data will not be written to controllers that are not connected.

**BACK** **Insight Fault Configuration**

Annotations:

- The PUMP Vision reads this voltage from the Insight overload's part number which is available in three voltage models.
- Overload setting (FLA)
- Overload setting Trip Class, 5 to 30
- The Insight is available in two current ranges. The PUMP Vision determines which model is connected and display the current ranges of that model to select from. The PUMP Vision will indicate the correct number of C.T. windings to achieve proper calibration of the Insight overload.
- Time delay before motor fault reset attempt occurs.
- Number of reset attempts before lockout. 0-5, Auto
- Time delay before load related fault reset attempt occurs.
- Time delay before power related fault reset attempt occurs.

MOTOR Vision communication fault message. If this appears, at least one of the Insight overloads is not communicating by Modbus to the PUMP Vision controller and will not receive setting updates.

**IMPORTANT NOTE: IT IS UP TO THE INSTALLER TO ENSURE THAT ALL SETTINGS ARE CORRECT FOR THE APPLICATION.**

NOTE: For complete information about the proper configuration and use of the Eaton Corporation Insight Overload and Monitoring Relay, please refer to **Eaton Publication No. MN04209001E / Z7883**

## MOTOR Vision—Insight

### Setup

The first time the system is configured, all data will be the Eaton factory default settings for the Eaton Insight Overload and Monitoring Relay installed.

Upon exiting this screen, all data will be written to the Insight overloads and saved. Since this screen sets up the trip characteristics of all connected Insight overloads at one time, it is critical that all of the system's starters are connected and communicating while changing this data.

MOTOR Vision SETUP					
Insight Fault Configuration					
	Enabled	Threshold	Trip delay		
Mechanical Jam	YES	170 % (150-400% FLA)	1 sec.	(1-20 sec)	
Current Imbalance	YES	1 % (1-30% FLA)	10 sec.	(1-20 sec)	
Under Current	NO	10 % (10-90% FLA)	5 sec.	(1-60 sec)	
Low Power	NO	3.30 KW (10-90% FLA)	1 sec.	(1-60 sec)	
High Power	NO	8.30 KW (max. of KW range)	1 sec.	(1-60 sec)	
Ground Fault	YES	3.00 A (approx 3-22% of trip range)	10 sec.	Alarm	
Phase Rotation	NO	ABC		Trip	
Voltage Imbalance	NO	20 % (1-20%)	10 sec.	Trip	
Under Voltage	YES	478 V (323-528V)			
Over Voltage	NO	323 V (323-528V)			

Annotations:

- Mechanical Jam—percentage of FLA
- Current Imbalance—percentage of FLA
- Undercurrent—percentage of FLA
- Low power—Kilowatts
- High power—Kilowatts
- Ground fault—amperes
- Phase rotation—ABC, ACB set to needs
- Voltage imbalance—percentage of supply
- Undervoltage—volts
- Overvoltage—volts

Set these for alarm only or trip.

Enabled Yes or NO

Setpoint— must be entered within the limits shown in the yellow text next to the setpoint.

Time delay the fault

MOTOR Vision communication fault message. If this appears, at least one of the Insight overloads is not communicating by Modbus to the PUMP Vision controller and will not receive setting updates.

**IMPORTANT NOTE: IT IS UP TO THE INSTALLER TO ENSURE THAT ALL SETTINGS ARE CORRECT FOR THE APPLICATION.**

NOTE: For complete information about the proper configuration and use of the Eaton Corporation Insight Overload and Monitoring Relay, please refer to **Eaton Publication No. MN04209001E / Z7883**