PUMP STATION DIRECTOR™

OPERATIONAL SCREEN GUIDE

PRELIMINARY DRAFT FOR SCREEN REVIEW ONLY
(All screens are not included)

Including complete step by step instructions for
operating all of the PSD™ screens

EG
Controls
JACKSONVILLE, FLORIDA

PUMP STATION DIRECTOR™ OPERATIONAL SCREEN GUIDE

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INTRODUCTION

The Pump Station Director (PSD) ™ is a system interface controller composed of 32 soft touch information and control screens.

The screens graphically and digitally display all of the operating information for a pump station. The PSD™ includes specific control and pumping status screens, system hydraulic and electrical overview screens, energy consumption screens with daily, weekly, monthly and annual reports and a complete system set-up menu that allows the operator with a valid password code to make operational program changes to the PLC by simply answering questions or entering numeric values.

The actual screens contain instructions and "walk the user through the system".   This guide will help explain the application and functionality of each screen and is a ready reference tool for specific questions that may develop as you use the screens.

Note: The screens depicted in this Manual reflect the full system including Energy Information. Please be aware that each system is customized for a particular application and the screens may be dependent upon the componentry of your system. If your system does not include the Energy Information package, for example, the screens may look different.

Main Screen

Station OutFlow NN.NN

NN - NN.N MGD

Cost Per Million NNN.NN

0 - NNN Dollars

Pump Speed NNN.N

0-100 %

Wet Well Level
Bargraph 0-100% ACTUAL
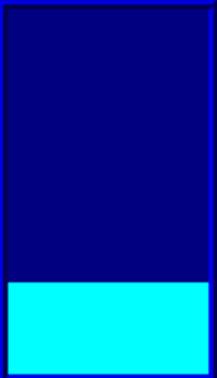
FOFO Alternation

EG Controls
Pump Station Director

9/25/2006 11:21:17 AM

THE PLC IS IN CONTROL

NN.NN

Actual Feet

▼ ▲
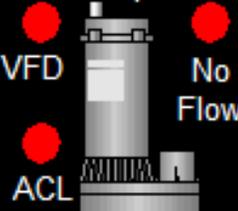
Lag2 Call

Lag1 Call

Lead Call

LEVEL SIMULATION
AUTO CANCEL

NNN

SECONDS

Cancel

Main
Menu

Alarms

Level
Setpoints

Pump 1

VFD   No
            Flow

ACL

Lead

Auto

Pump 2

VFD   No
            Flow

ACL

Lag 1

Auto

Pump 3
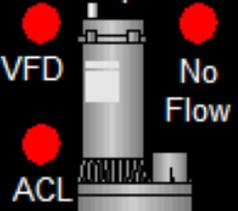
VFD   No
            Flow

ACL

Lag 2

Auto

Alternate Pumps
Now

MAIN SCREEN

The Main Screen gives you an overview of your pump station conditions by displaying and updating the following information:

Station Outflow (in MGD)	Displayed with a digital readout and a bargraph near the top of the screen
Cost per Million Gallons (in dollars)	Displayed with a digital readout and a bargraph near the top of the screen
Pump Speed (in %) indicated	Displayed with a digital readout and a bargraph near the top of the screen
Wet Well Level(in feet)	Displayed with a digital readout and a bargraph at the left of the screen
Lead, Lag and Lag 2 Start/Stop Setpoints	Displayed by vertical bargraphs to the right of the level bargraph
Lead, Lag 1 and Lag 2 Calls	Displayed by icons below the setpoint bargraphs

Complete information on each pump is displayed by the pump icon(s) and text adjacent to each pump:

Pump Alternation alignment (Lead, Lag 1 or Lag 2)	Indicated by text below the pump icon.
HAND/OFF/AUTO switch position	Indicated by text below the alignment text.
Pump Color	RED for STOPPED and GREEN for RUNNING

Pump Status is displayed by two icons located to the left of each Pump icon: VFD and ACL
The VFD Light will be GREEN when the VFD is running and RED when it is not. If a VFD alarm or fault condition exists, the VFD Icon will flash YELLOW.
The ACL Light will be GREEN when running ACL (Bypass) Mode and RED when it is not. If a ACL alarm or fault condition exists, the ACL icon will flash YELLOW.

The message box in the center of the screen is used for station identification and any messages pertaining to system operation.

Testing the System:
You can create rising and falling levels of your wet well to test your system. Touch and hold the UP arrow key for rising level or the DOWN arrow key for falling level. Both arrows are located at the bottom left corner of the screen. Be aware that once no pressure is placed on the arrow keys to make any level changes for a period of 120 seconds, the Automatic cancel feature will return the system to full automatic mode. This protects the system from being inadvertently left in the Simulate mode. If desired, you can also touch the CANCEL button to stop the Level Simulation test immediately.

The real (actual) wet well level is shown by the bargraph. The digital readout at the bottom of the bargraph will indicate simulated level during the simulation and actual level during normal operation. Being able to see both levels enables to you to maintain control over the actual levels while testing your system at the same time. You should never accidentally run the wet well dry while testing.

When Alternation is enabled, the "Alternate Pumps Now" button (at the lower right of the screen) can be pressed to alternate the pumps at any time.

Main Menu Screen

Pump 1 Status	Set-Up Menu
Pump 2 Status	Energy Information
Pump 3 Status	Power Information
Level System Setpoints (Graph)	Level System Operational Setpoints
Previous Screen	Main Screen	Alarm Log
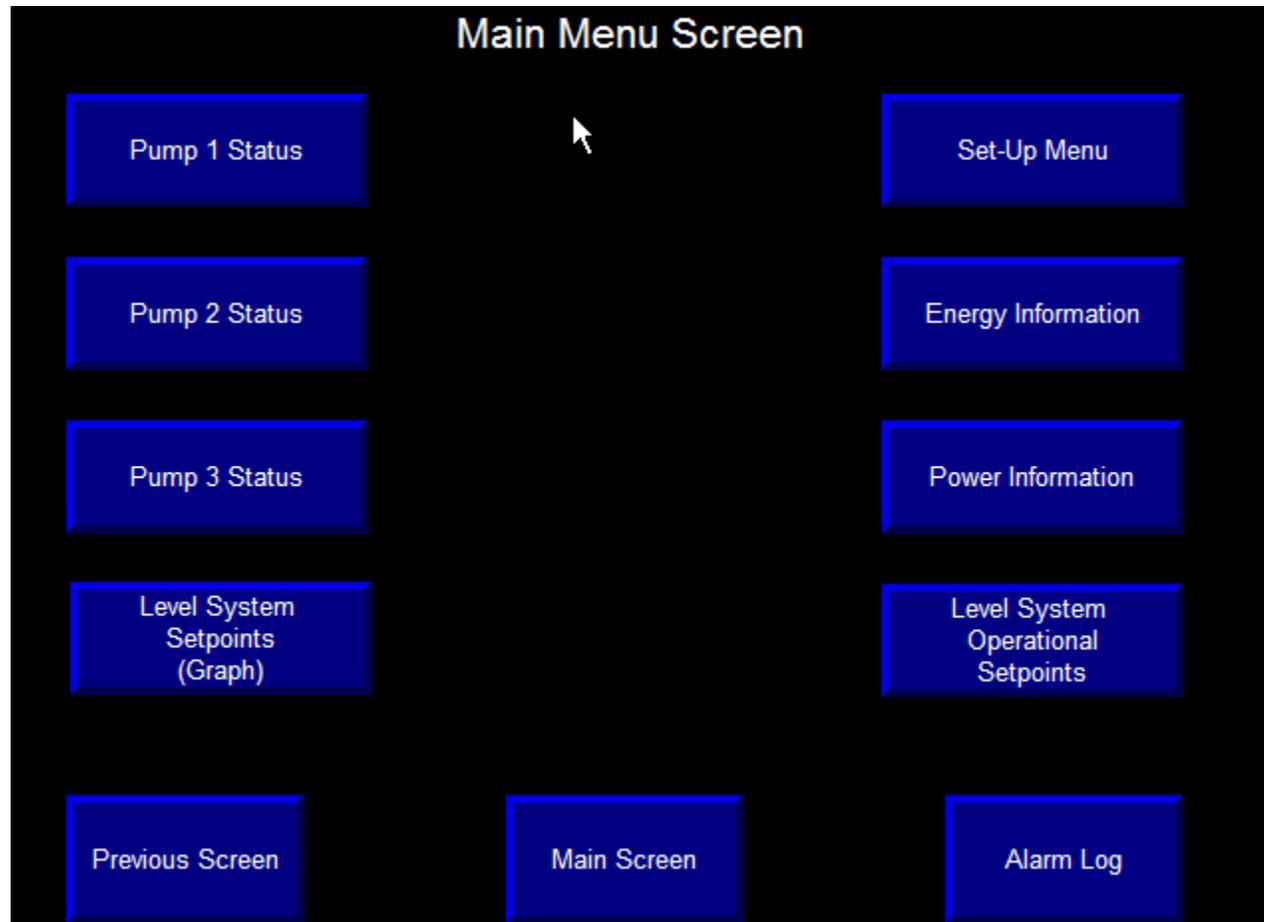
MAIN MENU SCREEN

The MAIN MENU screen is your road map to various status screens throughout your system. Touch the appropriate button to take you to any of the different Pump Station Director™ screens. All of the screens offer some interactivity but the setpoint screens are designed for entry of setpoint data and should be used primarily for making any changes to your system.

Pump 1 Status

Electric HP = NNNNN / KW = NNNNN

0 to NNNNN HP / 0 To NNNNN KW

Pump Speed = NNN.N %

0-100%

Total Flow = NNNNN GPM / NNN.N MGD

0 To NNNNN GPM / NNN.N MGD

Discharge Pressure NNN.N

0 To NNNNN PSI

Drive Status
- VFD Called
- ACL Called
- VFD Run
- ACL Run
- Stopped
- Disabled

Runtime Hrs= NNNNN.NN

Starts = NNNNNNNN

Drive Alarms

VFD FAULT
OVERLOAD
OVERTEMP
PHASE ALARM
VFD START FAILURE
ACL START FAILURE
VFD AMPS LOW
ACL AMPS HIGH

Fail to Start

Reset

Panel Selectors
- Hand
- Off
- Auto

Alternation Position

Lead

Drive Selection
- VFD
- ACL

Previous Screen	Main Screen	Setup Menu	Alarm Log	Level Setpoints	Main Menu	Pump 2

PUMP STATUS SCREEN

The Pump Status Screen is an informational screen that gives you the complete operational status for each individual pump in your system. Up to four separate pump screens are available with your Pump Station Director™. Each Pump Status Screen uses horizontal bargraphs and digital readouts to display and update the following:

1) Electrical HP Consumption in HP and kW
2) Station Outflow by pump in Gallons per Minute (GPM)
3) Station Outflow by pump in Millions of Gallons per Day (MGD)
4) Pump Speed in Percentage (%) and RPM
5) Discharge/Leader Pressure (in PSI)
6) Pump Runtime Hours
7) Pump Starts per Hour

Each individual Pump Status Screen also displays current pump operational conditions, such as:

1) Pump Called For VFD or Bypass
2) Pump Running in VFD or Bypass
3) Pump Stopped or Disabled
4) Panel Selector Position (Hand/Off/Auto)
5) Pump Alternation Position (Lead, Lag 1, etc.)
6) Operator Drive Selection (VFD or Bypass)

Pump Status Alarms

Each Pump Status Screen also displays pump specific diagnostic alarm conditions. Your individual system will display only those alarms designed for your system. Please be aware that every potential alarm condition requires a sensory input to display that condition.
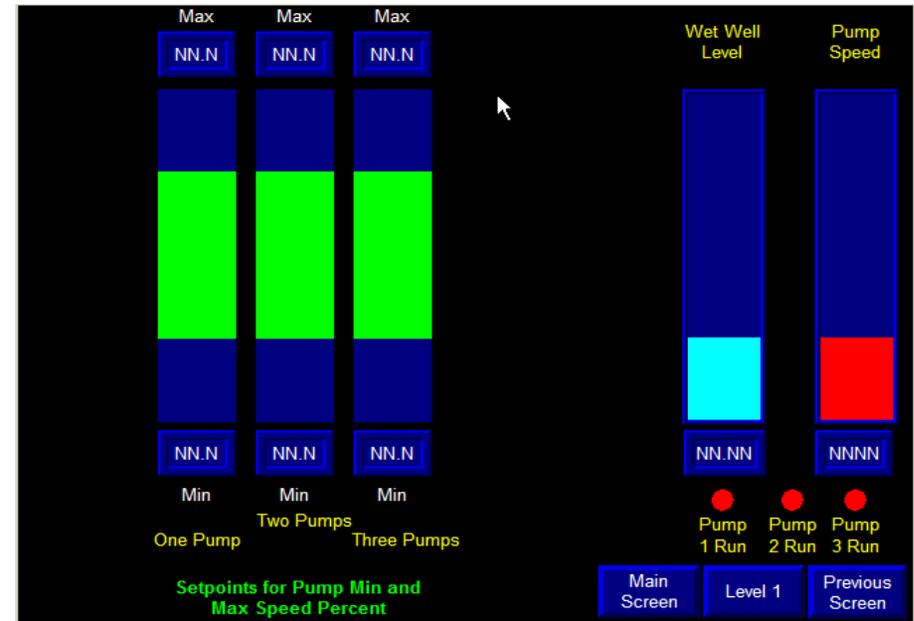
Screen 1 of 2   Screen 2 of 2

LEVEL SETPOINT GRAPH SCREENS

This screen is designed for creating setpoints for pump operations. To change the Lead Pump Start Setpoint, touch the number at the top of the vertical bargraph. A data entry pop-up appears and you can enter your new setpoint. The top of the green vertical bar will move to the correct position. Enter the stop setpoint in the same manner at the bottom of the vertical bargraph. The bottom of the green vertical bar will move to the correct position. Continue to enter data for the remaining setpoints in the same way.

Use Screen 1 to establish or change the following setpoints: Lead, Lag 1 and Lag 2 Pump Start and Stop Levels, One Pump, Two Pump, Three Pump Level Setpoints for Pump Minimum and Maximum Speeds.

Use Screen 2 to establish or change the following setpoints: One pump, Two Pump and Three Pump Minimum and Maximum Percents.
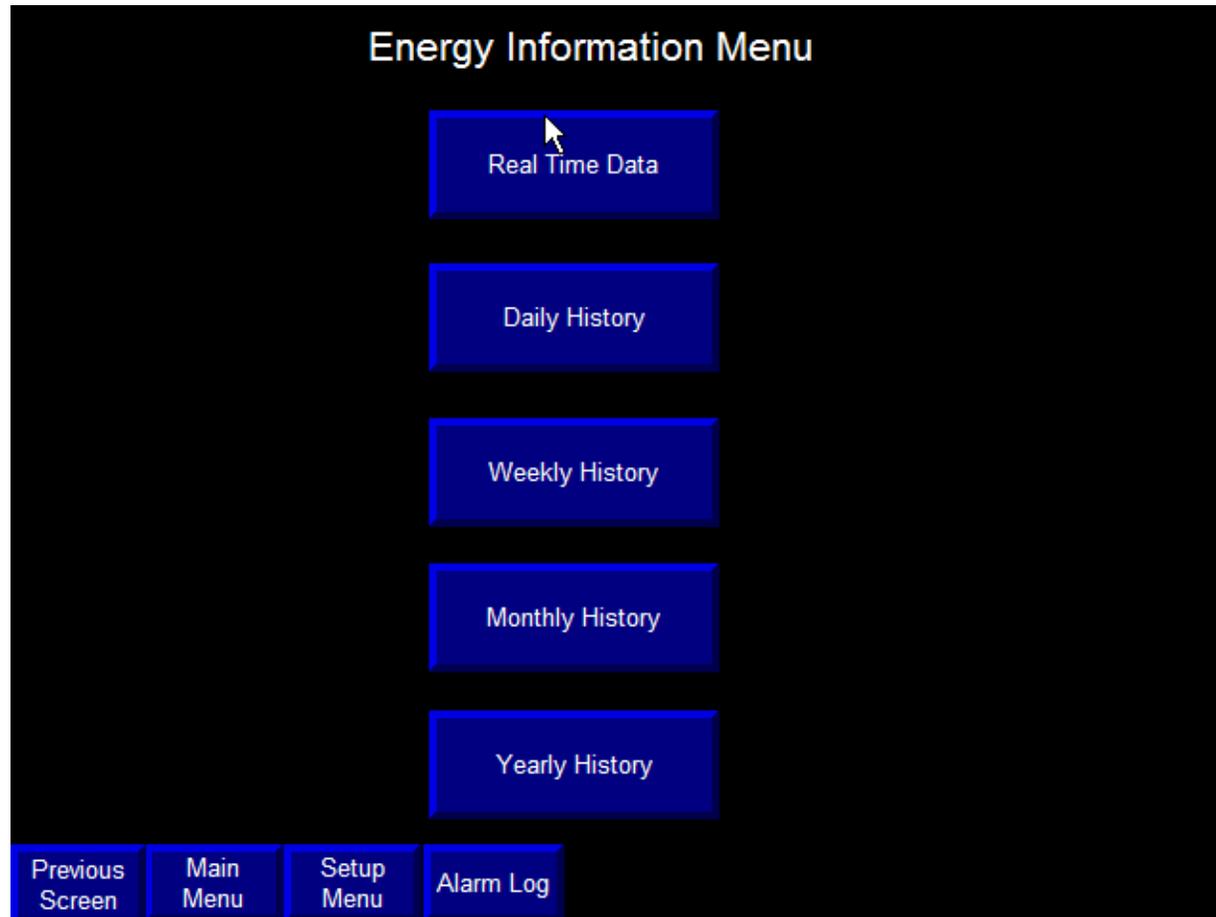
ENERGY INFORMATION MENU SCREEN

The Energy Information System of the Pump Station Director™ has been designed to give you a complete picture of the energy consumption patterns of your system. You can do this by viewing the immediate conditions or by looking at the history on a daily, weekly, monthly and yearly basis.

<u>Energy Information Menu Screen</u>

This screen lists all five screens (Real Time, Daily, Weekly, Monthly and Yearly) and serves as a vehicle for moving through the system.

Real Time Data Flow Energy Information

Cost Per Million Gallons = 67.0
0 to $250 CPMG

Wire To Water Efficiency = 22.0
0 to 100% Efficiency

Electric HP = 115.3 / KW = 86.0
0 to 100%

Wet Well Level = 35.0
0 to 39.0 Feet

Previous Screen | Main Screen | Setup Menu | Alarm Log

Hydraulic HP = 5.7
0 to 580.3 HP

OutFlow = 150.0 GPM / 5.0 MGD
0 to 10000 GPM / 10000 MGD

Pressure = 150.2 Feet / 65.0 Psi.
0 to 100.0 Feet Of Head

Pump Speed = 35.0 / 1785 RPM
0 to 100% / 1725 RPM

REAL TIME DATA ENERGY INFORMATION SCREEN

This screen consists of 8 horizontal bargraphs that graphically and digitally update and display the following information:

1)Cost per Million Gallons (CPMG)
2)Wire to Water Efficiency (in %)
3)Electric Horsepower/kW Consumed (in HP and kW)

4) Wet Well Level (in Feet)
5) Hydraulic Horsepower (in HP)
6) Station or Pump Outflow (in GPM and MGD)

7) Discharge Pressure (in Feet and PSI)
8) Pump Speed (in % and RPM)

Daily Flow Energy History

Period	Million Gallons Pumped	Energy Cost Daily	Total Pump Run Time	Average Cost Per Million Gallons	Daily X 365 = Yearly Cost
Today To Now	0	2	0	611	563
Sunday	0	0	0	0	0
Monday	0	0	12	52	54
Tuesday	7	175	0	25	63794
Wednesday	7	178	41	26	64872
Thursday	4	145	45	38	52795
Friday	2	82	41	39	29749
Saturday	0	0	19	0	0
Total	20	579			
Average	3	83			

Day Ends 12:00 Midnight

"Today To Now" Data Not Included In "Average" Or "Total".

Previous Screen	Main Screen	Setup Menu	Alarm Log		Now	Weekly	Monthly	Yearly

DAILY FLOW ENERGY HISTORY SCREEN

This screen plays a large role in your ability to identify pump degradation and the resulting cost of degradation, as well as other equipment problems early on. This screen also provides data on any cost savings after equipment repairs have been made. The screen consists of 6 vertical columns of information that cover the following:

PERIOD	MILLION GALLONS PUMPED	ENERGY COST DAILY	AVERAGE COST PER MILLION GALLONS	YEARLY COST
The specific time period being measured	The total number of gallons pumped during the specified time period	The total energy cost for the total pump run time over the specified time period	The cost derived by dividing the cost by the total pump run hours for the specified time period	The daily energy cost multiplied by 365 days per year to provide an annual cost

Weekly totals for Flow and Energy Costs are totaled and displayed at the bottom of each column.

Important: In order to fully analyze this data, it is important to be aware of the two information statements in the lower right corner of this screen:
1. DAY ENDS AT 12:00 MIDNIGHT
This statement defines one day as a twenty-four period from midnight on one day until midnight on the next day. Any information gathered after midnight will be used for the next day's calculations.
2. TODAY TO NOW DATE NOT INCLUDED IN AVERAGE OR TOTAL
This statement tells you that the first item of data (TODAY TO NOW) is not included in any of the calculations for the Total Flow, Energy Costs or Average Cost per Million Gallons™. This number changes constantly and is displayed for information only.

Similar screens depicted on the next page show totals for Weekly, Monthly and Annual Costs. Interactive buttons that can be used to move within the Energy Information System are located in the lower right hand corner. From the Daily Screen, your choices are:

Touch NOW to go directly to the REAL TIME DATA Real Time Energy Information
Touch WEEKLY to go directly to the Weekly History Screen
Touch MONTHLY to go directly to the Monthly History Screen
Touch YEARLY to go directly to the Yearly History Screen

WEEKLY, MONTHLY AND ANNUAL ENERGY INFORMATION SCREENS

Weekly Flow Energy History

Period	Million Gallons Pumped	Energy Cost Weekly	Total Pump Run Time	Average Cost Per Million Gallons	Weekly X 52 = Yearly Cost
This Week To Now	20	582	146	29	30255
Week 1	7	108	62	15	5629
Week 2	4	0	0	0	0
Week 3	0	0	0	0	0
Week 4	0	0	0	0	0
Week 5	0	0	0	0	0
Week 6	0	0	0	0	0
Week 7	0	0	0	0	0
Week 8	0	0	0	0	0
Week 9	0	0	0	0	0

Week Ends Saturday 12:00 Midnight

Week 1 = Last Week

| Previous Screen | Main Screen | Setup Menu | Alarm Log | | Now | Weekly | Monthly | Yearly |

Monthly Flow Energy History

Period	Million Gallons Pumped	Energy Cost Monthly	Total Pump Run Time	Average Cost Per Million Gallons	Monthly X 12 = Yearly Cost
Month To Now	0	2	0	374	2
January	2	69	42	35	833
February	0	0	0	0	0
March	0	0	0	0	0
April	0	0	0	0	0
May	21	0	157	29	7381
June	0	0	0	0	0
July	0	0	0	0	0
August	4	2	9	1	27
September	0	0	0	0	0
October	0	0	0	0	0
November	0	0	0	0	0
December	0	9	0	0	112
Total	27				

| Previous Screen | Main Screen | Setup Menu | Alarm Log | | Now | Weekly | Monthly | Yearly |

Yearly Flow Energy History

Period	Million Gallons Pumped	Average Cost Per Million Gallons	Total Pump Run Time	Energy Cost Yearly
Year To Now	21	29	157	618
Year 10	0	0	0	0
Year 9	0	53	0	0
Year 8	0	0	0	0
Year 7	2	35	42	69
Year 6	4	1	7	2
Year 5	0	0	0	0
Year 4	0	0	0	0
Year 3	0	0	0	0
Year 2	0	0	0	0
Year 1	0	0	0	0

| Previous Screen | Main Screen | Setup Menu | Alarm Log | | Now | Weekly | Monthly | Yearly |
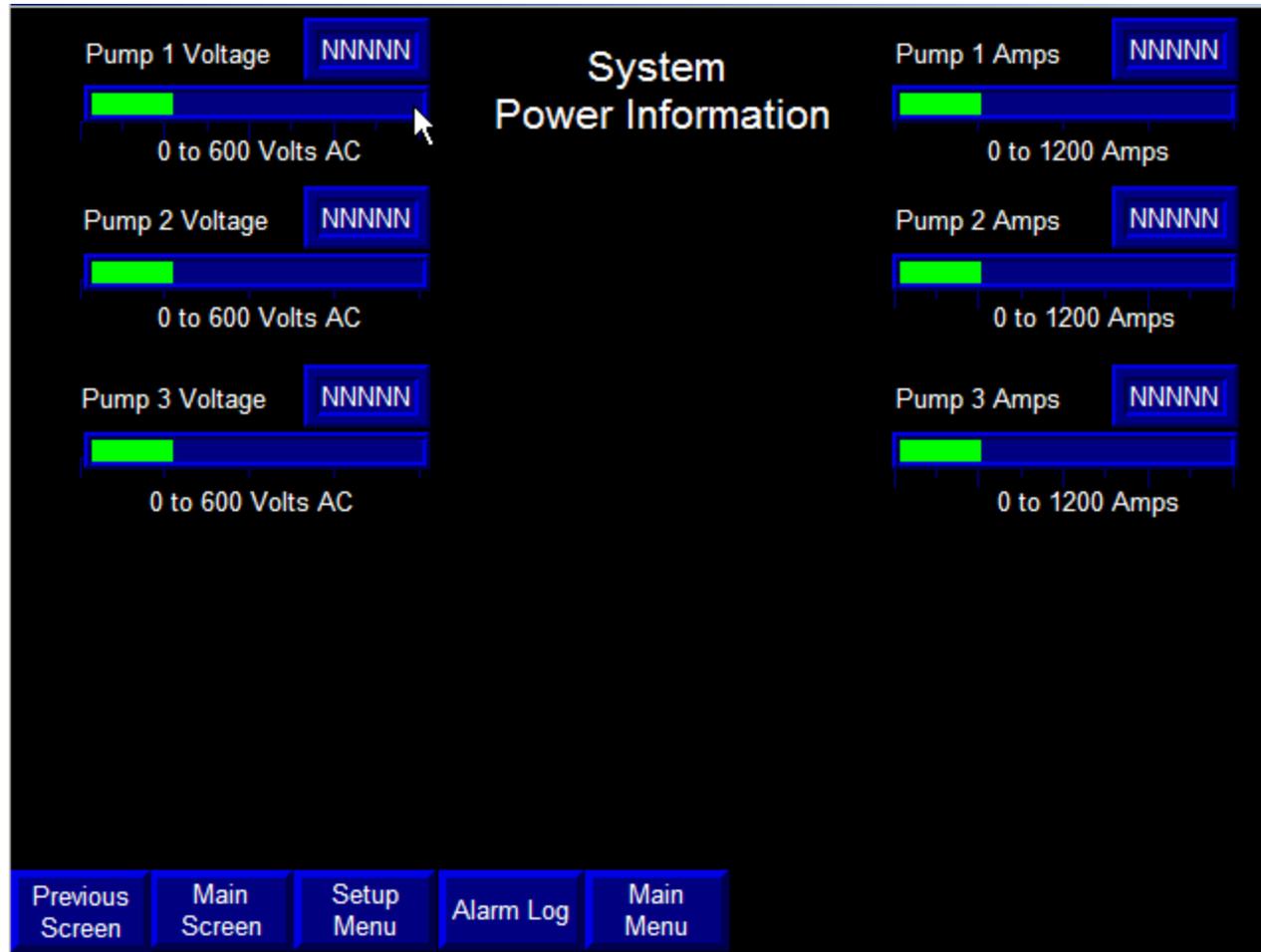
SYSTEM POWER INFORMATION SCREEN

The System Power Information Screen displays: voltage for each pump and amperage for each pump.

Set-Up Menu

Engineering Screens	Alarm Set Points
Pump Alternation	Pump Set-Up
Log In	Time Set-up Screen

| Previous Screen | Main Menu | Setup Menu | Alarm Log |
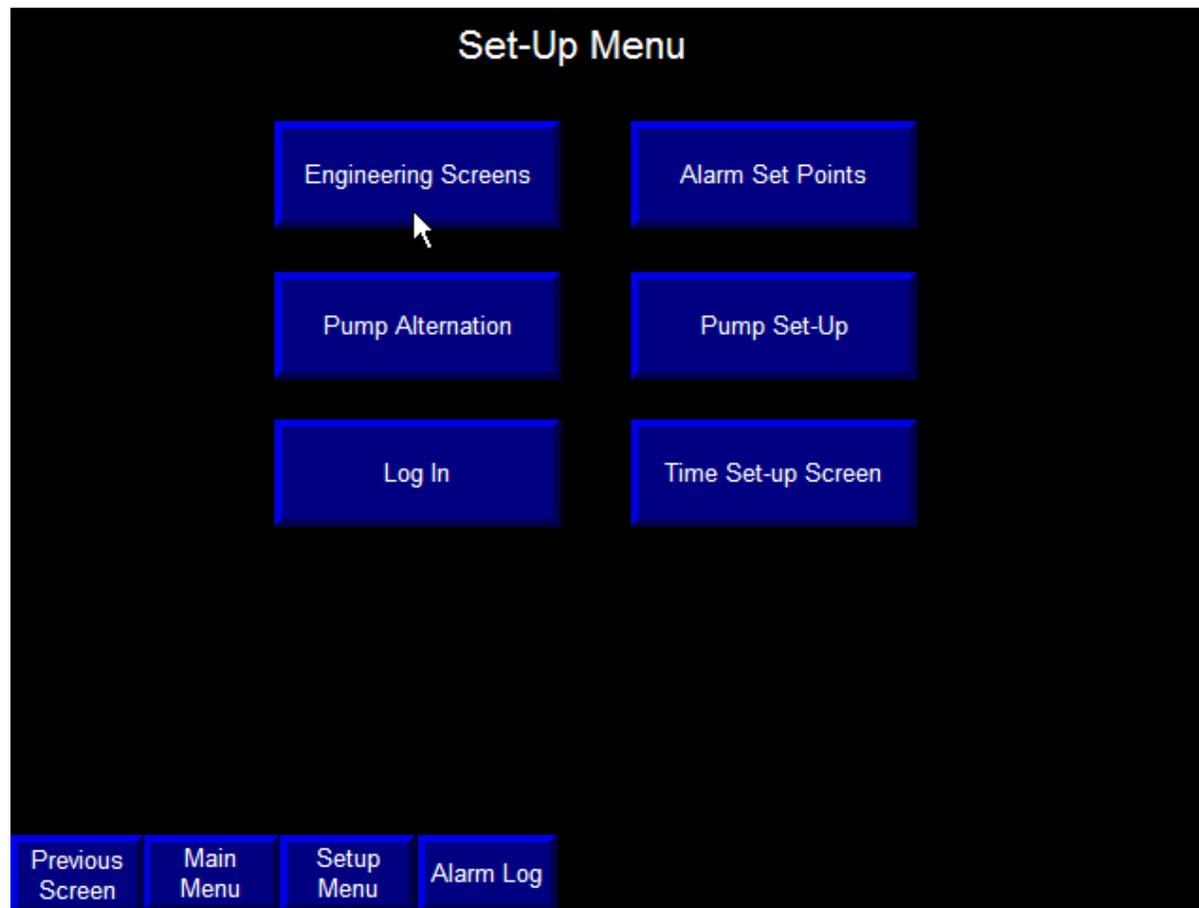
SET UP MENU SCREEN

The Set-up Menu Screen is your roadmap to the brain or Programmable Logic Controller (PLC) controlling the full operation of the system. You must have a password to access this screen. Once you have access to this screen, you will be able to gain access to all the individual set-up screens where changes can be made to the configuration of the pumps, the calibration of certain bargraphs and the control functionality throughout the system. The Set-up Menu lists the following individual set-up screens that can be reached from this menu.

PUMP ALTERNATION SET UP SCREEN

The Pump Alternation Set-up Screen is used to create the operational alternation scheme best suited to your operation.

Alternation [Yes or No]: Touching the pushbutton will toggle between Yes and No. Yes indicates alternation is requested and No indicates manual lineup is selected.

Type of Automatic Alternation [LOFO or FOFO]: Touching the pushbutton will toggle between the LOFO (Last On First Off) or FOFO (First On First Off). If manual lineup was selected, enter the lineup order for your pumps to operate (123, 231. 312). Press the "Enter" button after you have entered your line up numbers. If Automatic Alternation was selected, choose when you want alternation to occur. The choices are at Lead Pump stopped, at two different times of the day, every chosen quantity of hours or when Lead Pump stops, or every quantity of hours.
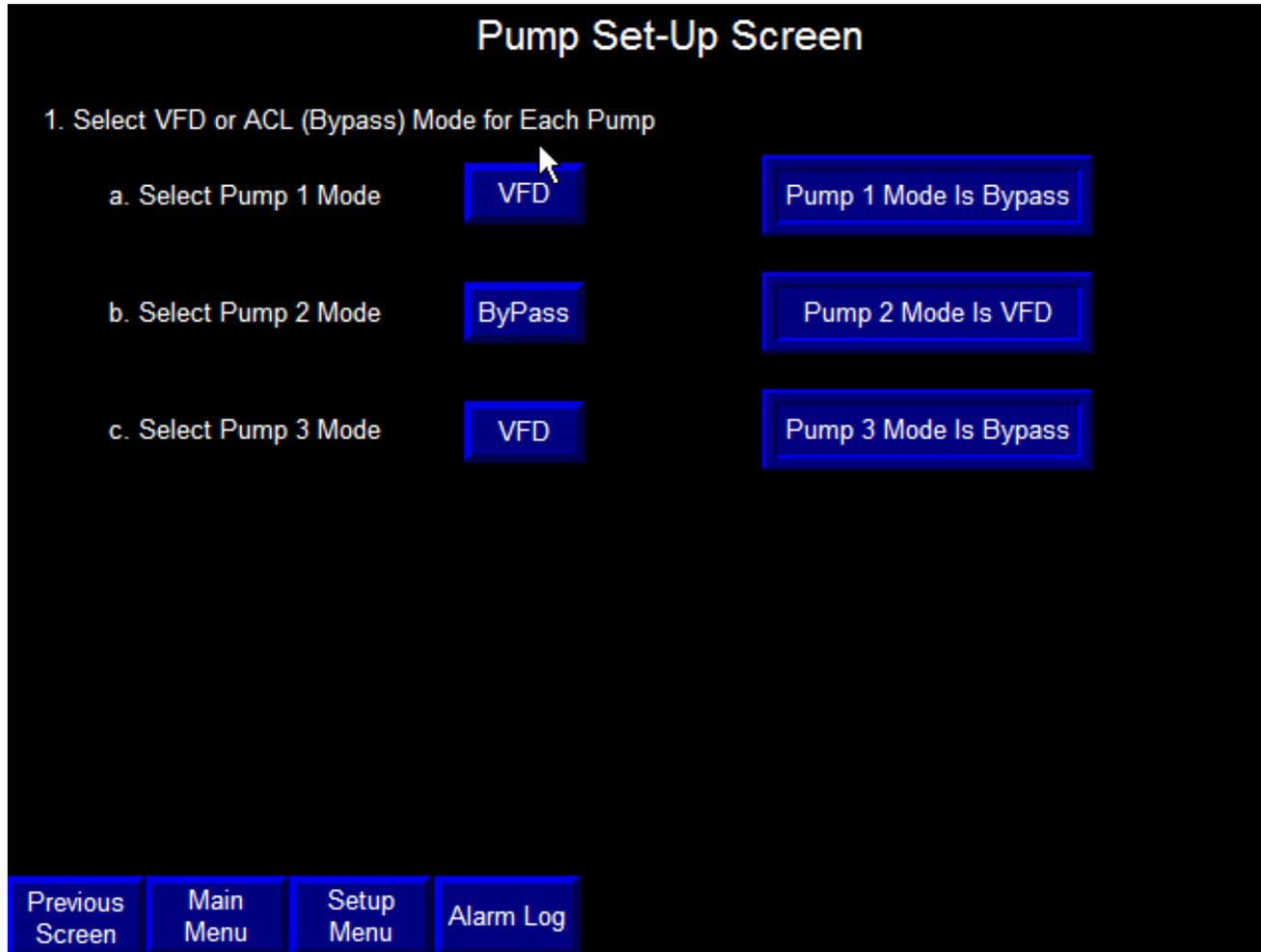
PUMP SET UP SCREEN

This screen is used to establish VFD or ACL (Bypass) Mode for each pump. On the above screen, Pump 1 will operate in VFD mode, Pump 2 in Bypass and Pump 3 in VFD. This lineup would be used if you had a problem with Pump 2 VFD.

ALARM SETPOINTS SCREEN

This screen is used to create setpoints to trigger alarms in your pumping system. You can set both the level at which the alarm should go off and the level at which the system will be allowed to be reset. Select the desired setpoint level by touching the appropriate box and entering your new setpoint.

Lead Pump Setpoints-1 Pump		System Operational Setpoint Screen	Lag2 Pump Setpoints-3 Pumps	
Start Level	NNN.N		Start Level	NNN.N
Minimum Speed %	NNN.N	THE PLC IS IN CONTROL	Minimum Speed %	NNN.N
Reach Max. Speed At	NNN.N		Reach Max. Speed At	NNN.N
Maximum Speed %	NNN.N	Present WetWell Level	Maximum Speed %	NNN.N
Stop Level	NNN.N		Stop Level	NNN.N
Reach Min. Speed At	NNN.N	NNN.N	Reach Min. Speed At	NNN.N

Lag1 Pump Setpoints-2 Pumps		
Start Level	NNN.N	
Minimum Speed %	NNN.N	
Reach Max. Speed At	NNN.N	Present Pump speed
Maximum Speed %	NNN.N	
Stop Level	NNN.N	NNN.N
Reach Min. Speed At	NNN.N	

Previous Screen	Main Screen	Setup Menu	Alarm Log	Main Menu

SYSTEM OPERATIONAL SETPOINT SCREEN

This screen is for display only and will allow <u>no</u> changes. If operators are not allowed access to setup screens, this screen will give them all the information they may need without allowing changes.

Alarm History

Alarm time	Acknowledge time	Message
* 9/25/2006 11:00:37 AM	9/25/2006 11:00:37 AM	ABCDE FGHIJK LMNOPQ RSTUV WXYZ ABCDE*

	Ack Alarm	Silence Alarms	⊤	⬆	▲	Print History	Alarm Status	
Previous Screen	Ack All	Clear All	⊥	⬇	▼		Sort Alarms	Main Menu
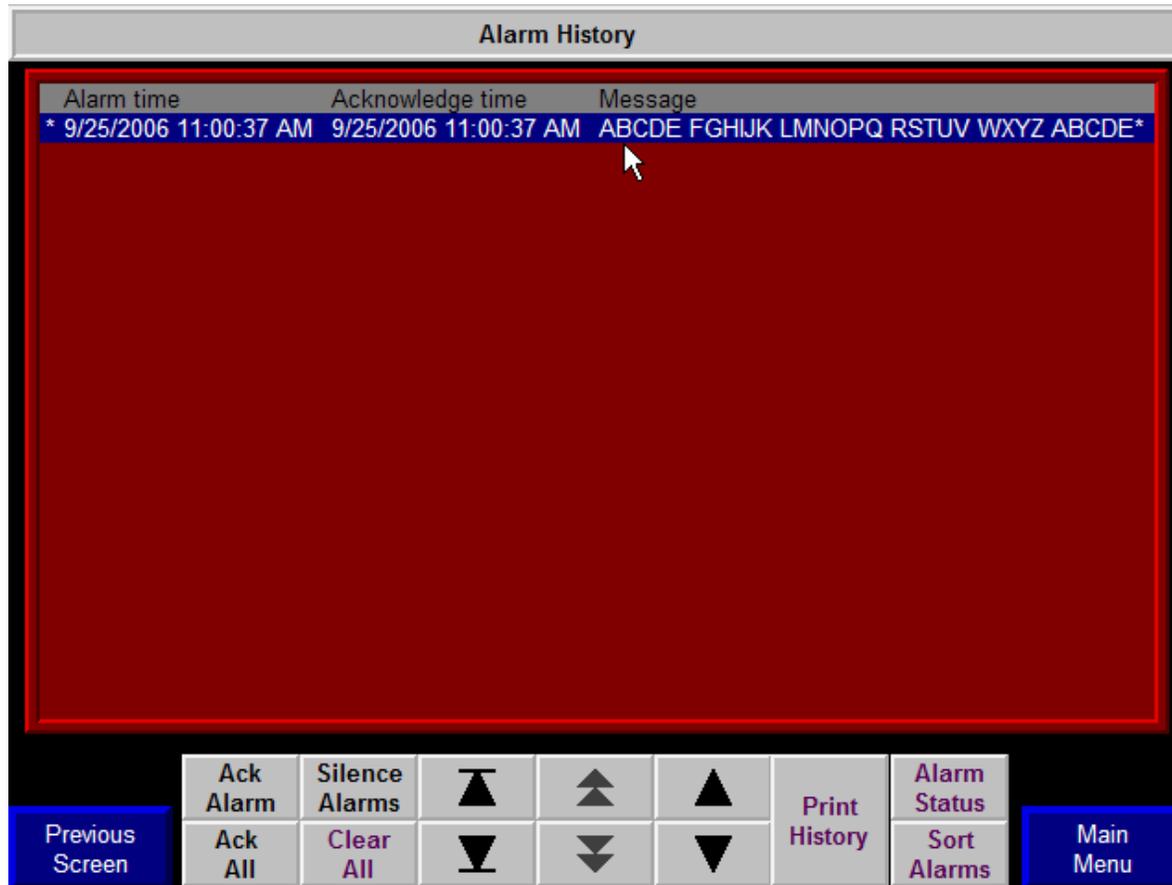
ALARM HISTORY SCREEN

The History Screen is designed to provide complete data on the last 100 alarms occurring in the control system. The Log displays the following information on each alarm: Time and Date triggered; Description, Time acknowledged and Time reset or cleared. To move through the Alarm Log: Use the arrow buttons in the lower menu in the center.
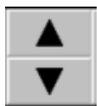
▲ ▼ moves one alarm at a time.   ⊤ ⊥ moves one page at a time   ⬆ ⬇ moves to the beginning or end of the list

You can also acknowledge one or all alarms, silence alarms, check alarm status or sort alarms using the buttons in the bottom of the screen.

Time Delay after Lead Start	NNNN	Seconds
Time Delay after Lag1 Start	NNNN	Seconds
Lead Pump Call Delay	NNNN	Seconds
Lag 1 Pump Call Delay	NNNN	Seconds
Lag 2 Pump Call Delay	NNNN	Seconds
Pressure Simulation Duration	NNNN	Seconds

Previous Screen | Setup Menu | Main Menu | Engineer Page 4 | Configure Display

TIMER SET UP SCREEN

This screen is designed to set time delays for any pumping or system operation. All time delays are in seconds. Touch the blue box that you would like to change and enter the desired value. Use the buttons on the bottom of the screen to navigate through your system. Engineer page 4 takes you to another timer setup screen. The Configure Display button is included in the Engineering screens to allow access to panel functionality. It is not for operations use.
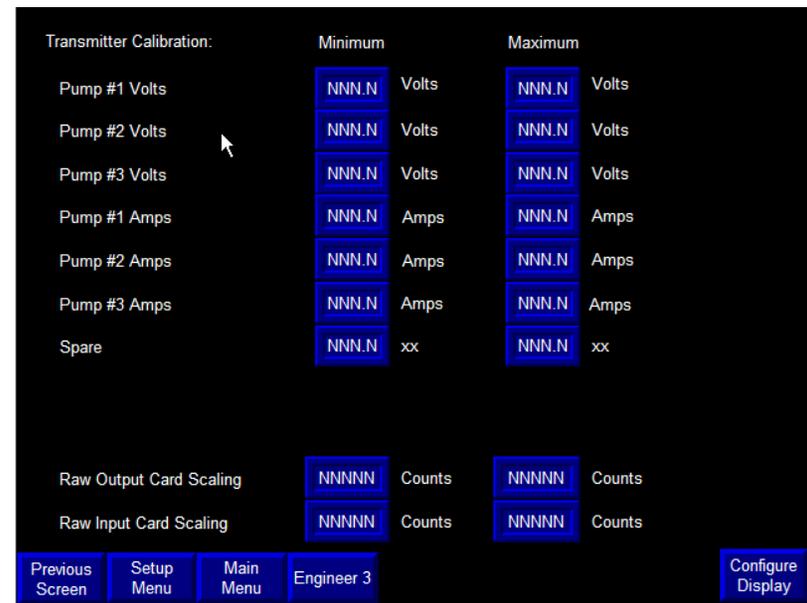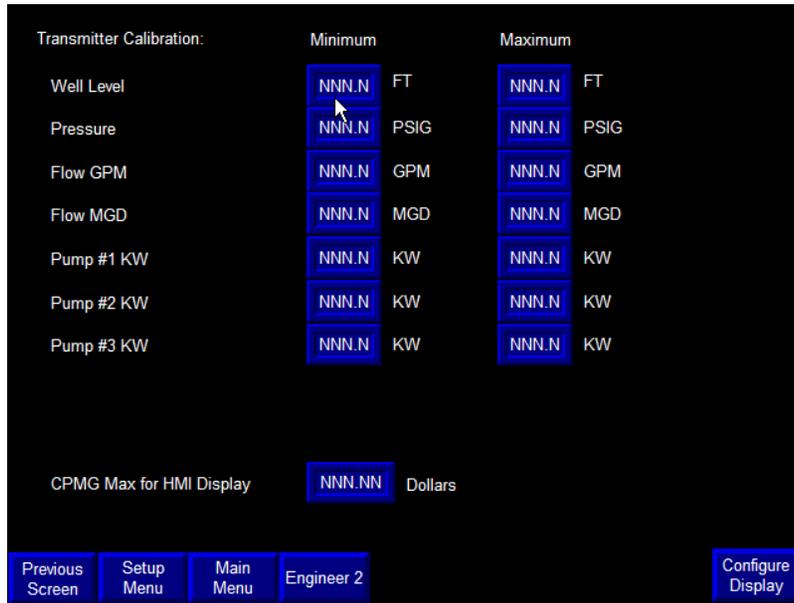
TRANSMITTER CALIBRATION (ENGINEER) SCREEN

This screen allows field transmitter calibration to be entered. These entries scale bargraphs, displays, etc within the system. This screen also allows for future transmitters that may be installed with different calibration.

SUMMARY

The Pump Station Director™ is the first controller designed to meet pump station operator needs. These unique screens not only provide important operating data but they also make it easy to make changes and customize your system. Trying different set-up parameters and reviewing the effect on system operating conditions is an excellent way to optimize your equipment --and save money on energy consumption.

You can also learn more about how your pump station really works. The PSD™ makes it easy to experiment and try different settings. The simulation capacity allows you to create conditions that you might otherwise never see. Consider the PSD™ your own personal training tool and improve both your system's performance and your professional skills.

Please consult the factory if you have additional questions not answered in this Guide. We are confident that you will see a significant improvement in how you operate your system after you have installed and used the Pump Station D
.irector(PSD)™ by EG Controls.