



INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



This manual shall always be kept close to the unit's location of operation or directly on the controller.



These operating instructions contain fundamental information and precautionary notes. Please read the manual thoroughly prior to installation of the unit, electrical connection, and commissioning. It is imperative to comply with all other operating instructions referring to components of individual units.

NOTE: The information contained in this manual is intended to assist operating personnel by providing information on the characteristics of the purchased equipment.

It does not relieve the user of responsibility to adhere to local codes and ordinances and the use of accepted practices in the installation, operation, and maintenance of this equipment.



A. SCREEN NAVIGATION.

The following figures explain the screens and help with screen navigation.

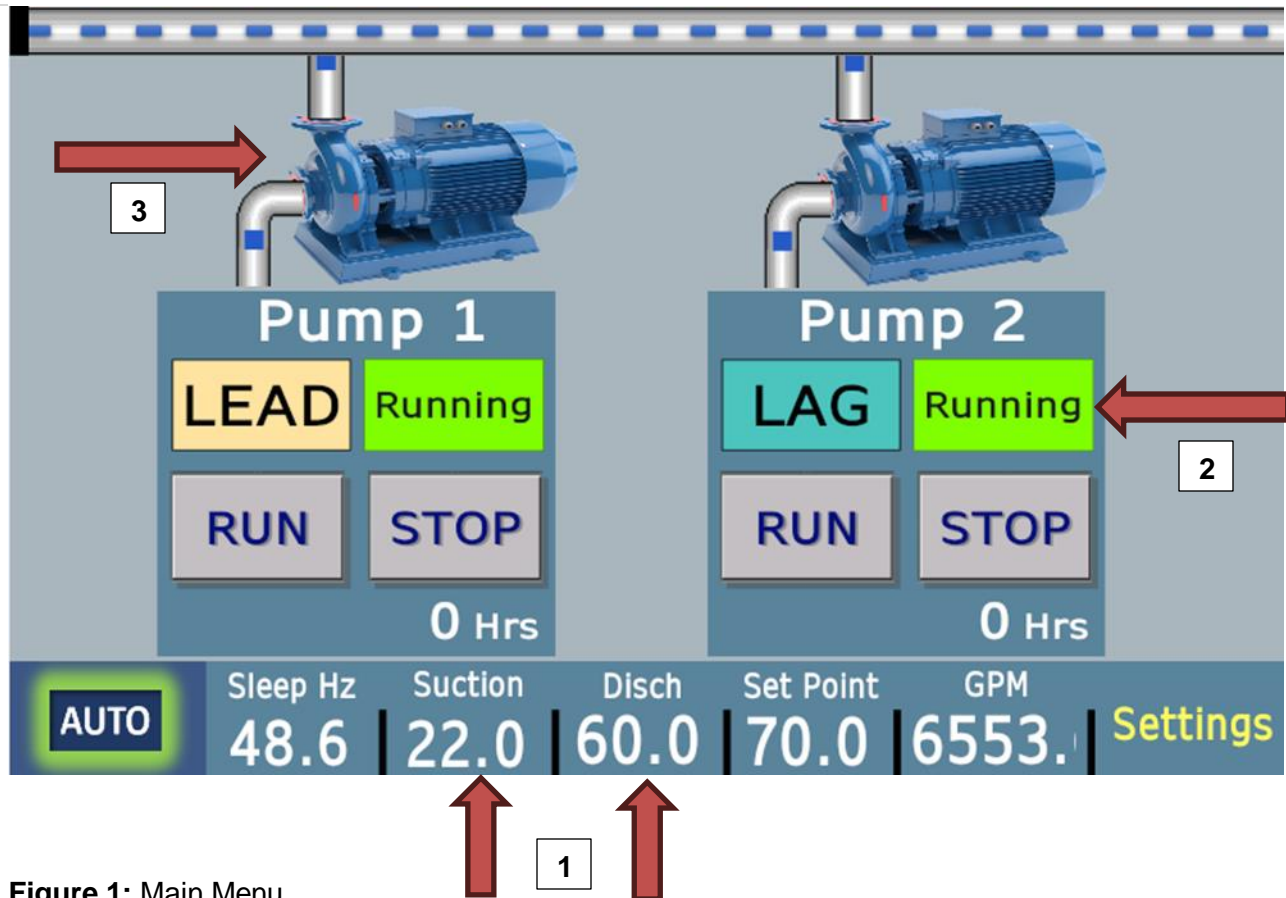


Figure 1: Main Menu

1. Pressure Displays

- Displays current suction and discharge pressure, in psi.

2. Pump Status Indicator Lamps

- Indicator lamp(s) that display the current status of each pump.

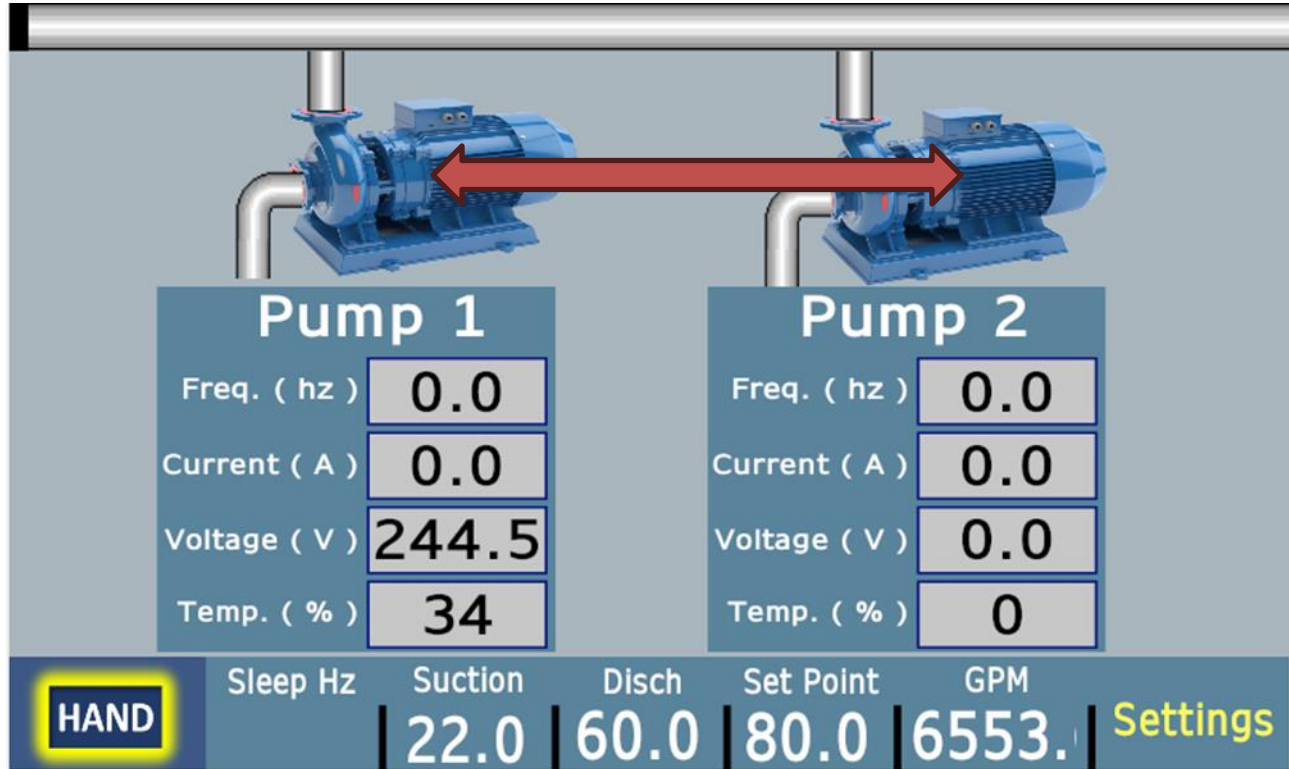
3. Pump Menu

- Button to access the Pump Menu. Touch Pump Icon and Data will appear. See Image below:



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4. Selecting Pump Data

- a. To Select the Pump Data Screen, touch the image of the pump and the data screen for each pump will appear. Touch the pump image again to return to the pump status screen.



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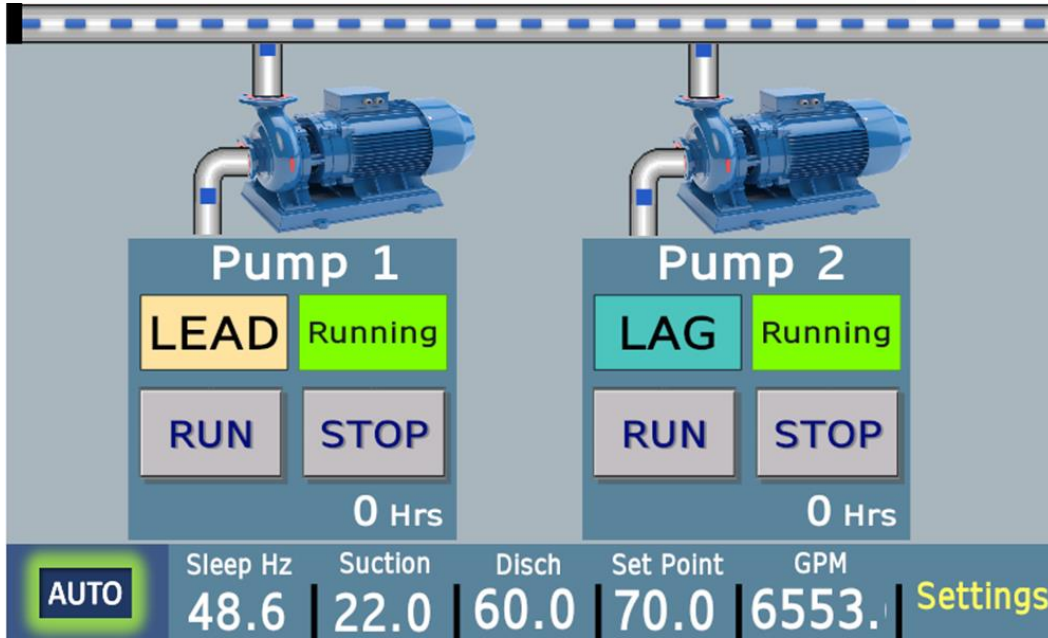


Figure 1: Main Menu

5

7

5. PSI Setpoint

- Displays current user defined setpoint pressure, in psi. Touching here will allow you to adjust the setpoint.

6. Parameter Backup

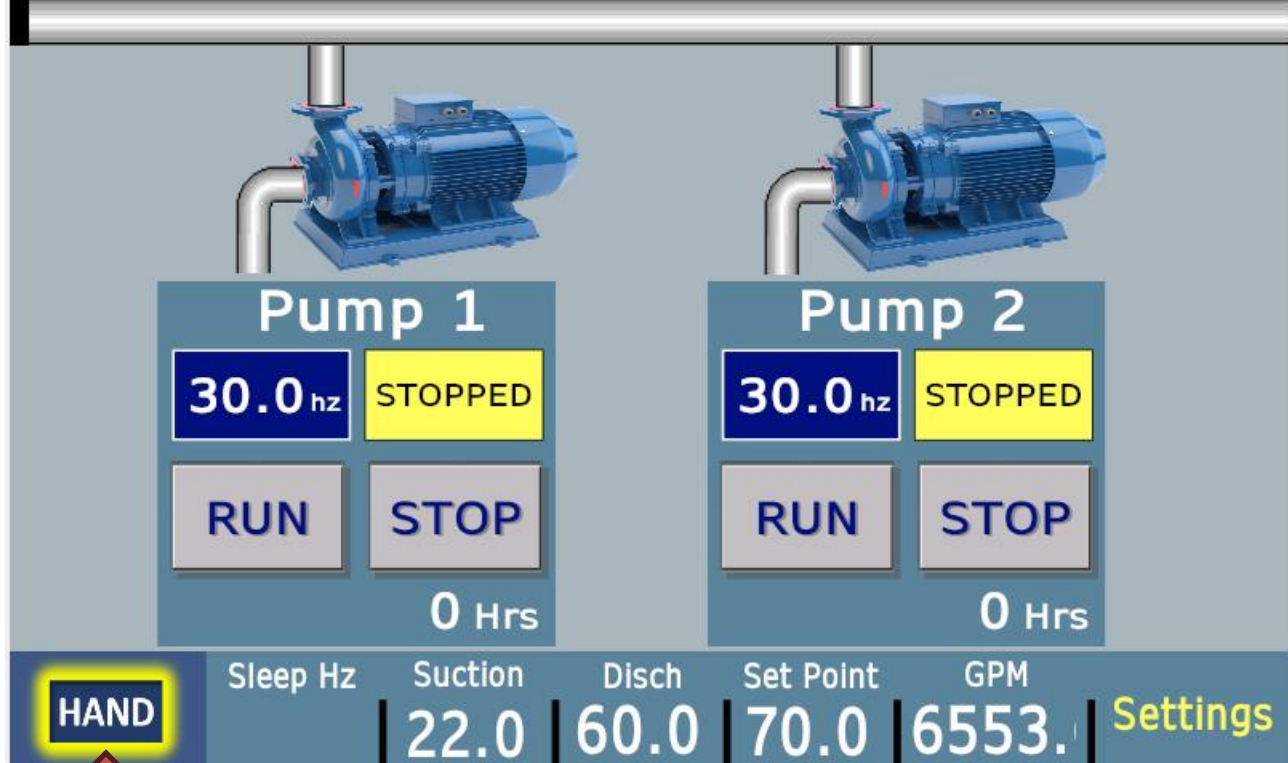
- Any changes to the settings will be automatically stored.

7. Flowmeter display (If equipped)

- Optional – If flowmeter is equipped it will be displayed here.



Main Screen in HAND



8. Hand/OFF/Auto Selector switch.

- a. By Touching the Selector Switch a screen will appear to select the mode that is desired. Please note that whatever mode you select by touching Hand/Off/Auto, it will be set for both pumps and displayed. See image below:





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Off and Stopped

Pump 1
--- STOPPED
RUN STOP
0 Hrs

Pump 2
--- STOPPED
RUN STOP
0 Hrs

OFF | Sleep Hz | Suction | Disch | Set Point | GPM | **Settings**
| 22.0 | 60.0 | 70.0 | 6553. |

Ready in Auto

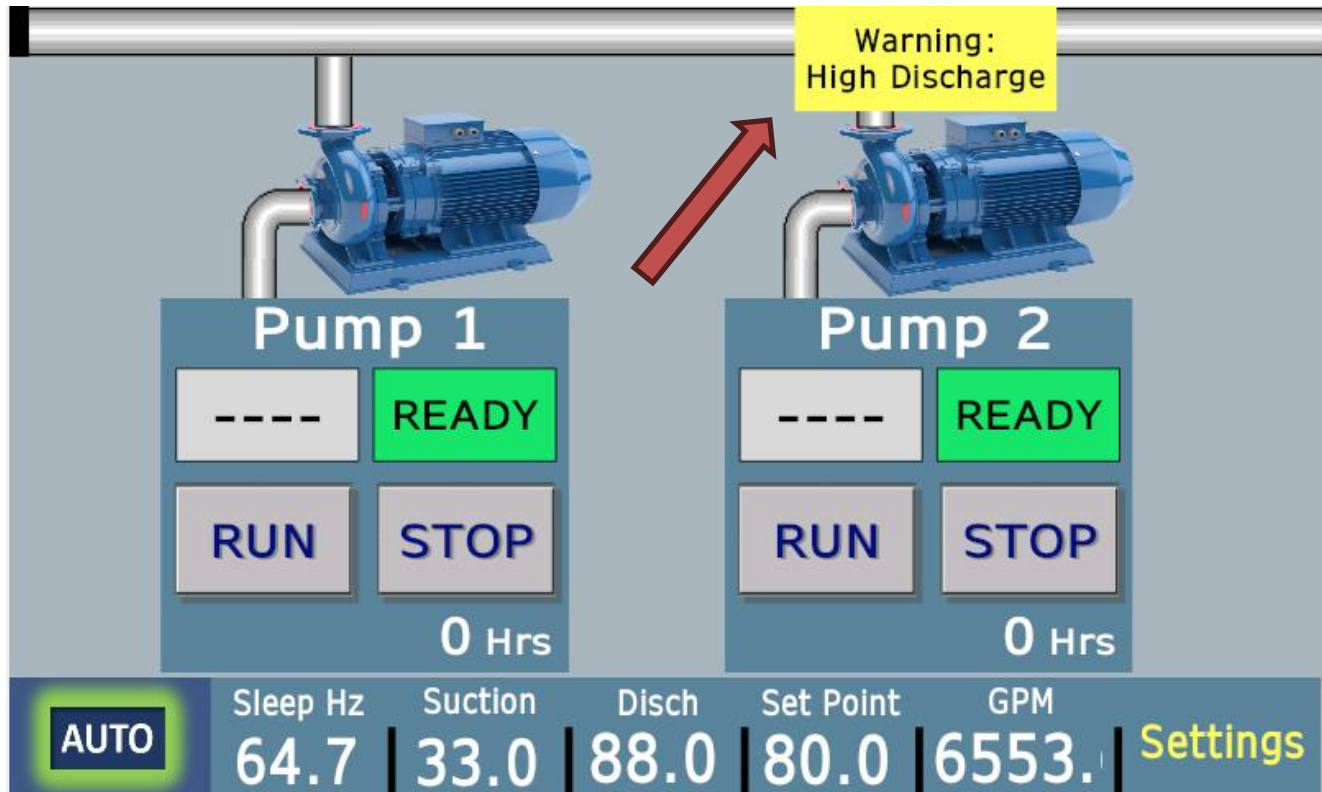
Pump 1
--- READY
RUN STOP
0 Hrs

Pump 2
--- READY
RUN STOP
0 Hrs

AUTO | Sleep Hz | Suction | Disch | Set Point | GPM | **Settings**
| 57.4 | 33.0 | 79.0 | 80.0 | 6553. |



Warning: Flags



9. Warning Flags

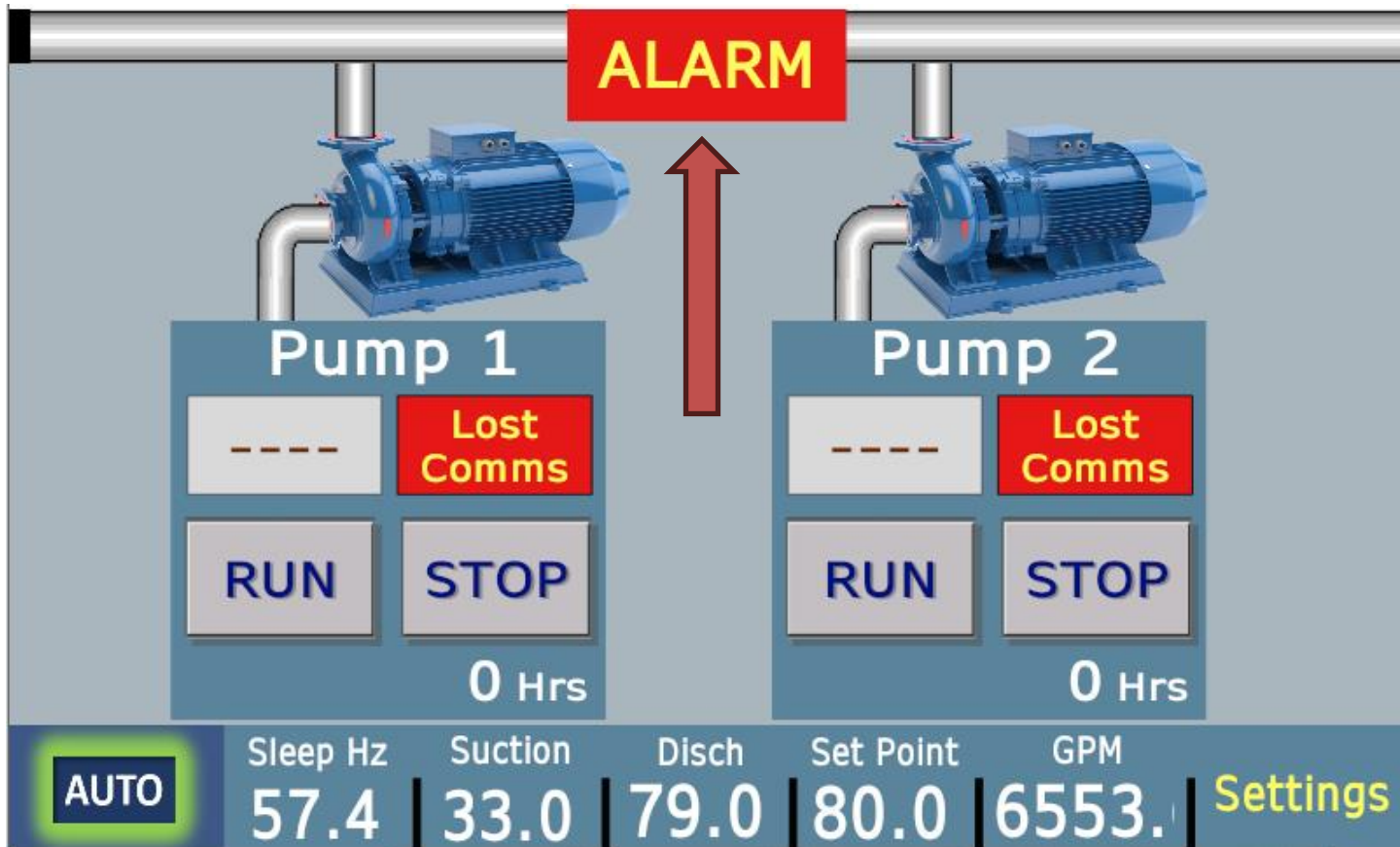
- a. **Warning Flags at the top of the screen that flash in YELLOW will not shut down the system. They are there to warn you of a condition that is outside of the normal operating range. There is no cause for alarm, but it should be monitored for conditions that changed outside the system.**

1. Warnings that will not shut the system down are:

- a. **High Suction Warning** – incoming water pressure from the city or source has increased which can cause the booster pump system to not perform as designed.
- b. **High Discharge Warning** – pressure after the booster pump system has increased and can cause the booster pump system to not perform as designed.
- c. **High Tank Level Warning** – water has exceeded the limit of the tank and could be losing water to the tank overflow. Pump will remain running, but the tank fill should be checked to prevent overfilling.



Alarm Flags:



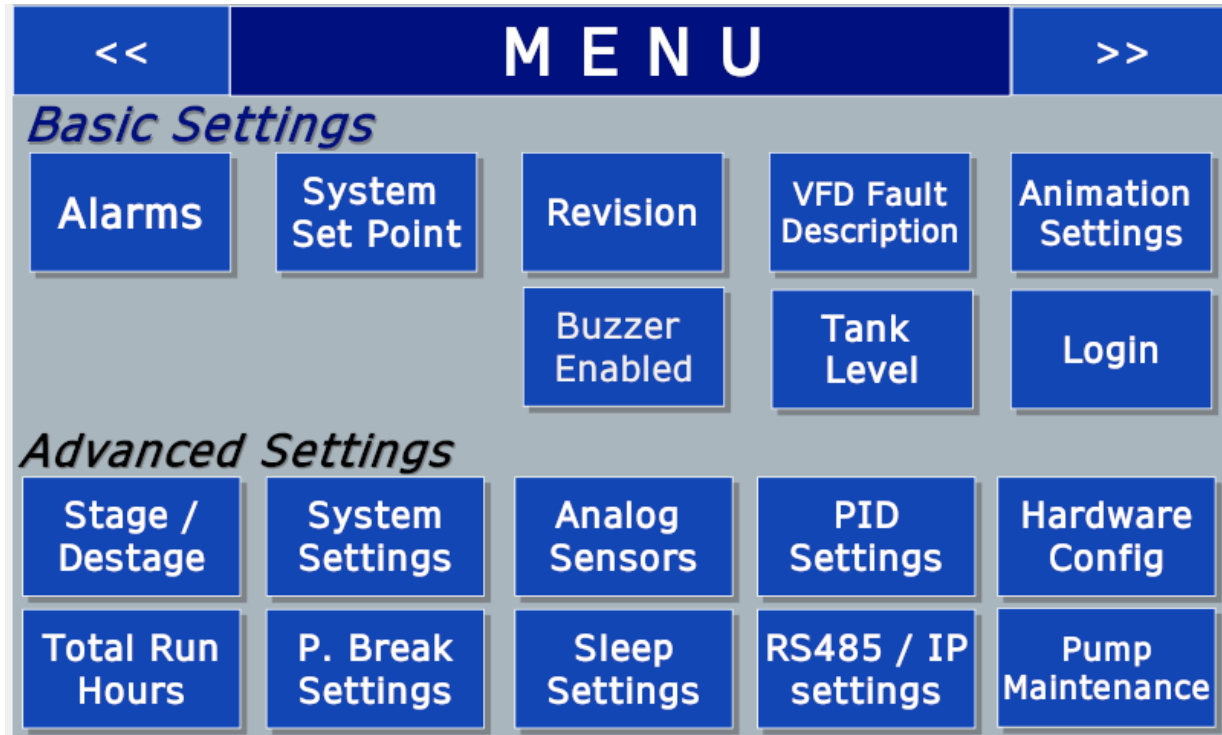
10. Alarm Flag

a. Flags that appear in RED will shut the system down and will require manual reset on the alarm screen to reset some of the conditions. These types of alarms are critical to the system protecting itself from severe damage. These alarms could include:

1. Lost Communication with Drive – Self resetting
2. Secondary High Discharge Pressure – Requires Manual Reset
3. Suction Pressure is too Low – Self resetting
4. Tank Level Low. – Self resetting



Menu:



11. Basic Settings

- a. Basic settings are settings that can be selected without a passcode. You are able to view and reset alarms, change the setpoint, check the program revision number, view VFD fault descriptions, view the tank level display, and adjust the animation settings

12. Advanced Settings

- a. Advanced settings require a passcode to adjust how the system runs. These adjustments should be made by a qualified professional. Please consult the authorized service contractor for additional support.



User Login Screen

<< LOGIN

Username : [redacted]

Password : [redacted]

Login Cancel

13. Login Screen

- a. The login screen will require a user name and passcode to unlock the advanced settings. Once logged in you will have 5 minutes to adjust any settings before the screen will lock and require another login attempt.



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<<

LOGIN

press this button
to Log in

<<



LOGIN

You're logged in

press this button
to Log Out



Active Warnings, Alarms, and History Screen

<<		Active Warnings / Alarms	Reset	History
Active Date	Active Time	AlarmMessage		
				

14. Alarm Warnings / Alarms

- Any message that appear on this screen will be shown in an active state and will be recorded in the history. Items on this screen will show what is currently in alarm status.
- There is a RESET button at the top of the screen for any alarms that require a manual reset.
- The alarm HISTORY button, will allow you to see the complete alarm log.



Stage / De-stage Settings

<< Stage / Destage Settings 1		Stage/Destage 2	
LEAD		LAG 1	
123	STAGE Call Value (psi) (Below Set Point Differential)	123.4	STAGE Hz
123.4	STAGE Delay (sec)	123.4	STAGE Delay (sec)
123	DESTAGE Call Value (psi) (Above Set Point Differential)	123.4	DESTAGE Hz
123.4	DESTAGE Delay (sec)	123.4	DESTAGE Delay (sec)
1234	Max Run Time As LEAD (min)		
LEAD alternation is Disabled			
123	:	123	Rem. Time to alternate LEAD (min : sec) NOTE: at least 1 pump must be available to alternate LEAD

15. Lead Settings

- a. Stage Call Value
 1. This value is a PSI value that is below the setpoint and tells the lead pump when to turn on. (Typically 5 PSI)
- b. Stage Delay
 1. This sets the amount of time you would like to delay the Stage Call Value before the condition would be met. (Typically 1 second)
- c. De-stage Call Value
 1. This value is a PSI value that tells the system when to turn off the lead pump. This value represents how many psi above the setpoint will trigger the condition to turn off the pump. Example: (0 = at setpoint.) or (2 = Setpoint + 2 psi.) (Typically 2)
- d. Max Run Time As LEAD
 1. Amount of time before the lead pump and lag pump switch positions (Typically 30). Please make sure the Lead Alternation button is enabled and the Next Pump to Start Rule on the System settings 2 Page is not switched on.



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16. Lag Settings

- a. Stage Hz
 1. The frequency at which you would like the lag pump to start running. (Check your test sheet for this value set by the factory)

- b. Stage Delay
 1. The amount of time in seconds that you would like to delay the lag pump from starting. (Typically 2)

- c. De-stage Hz
 1. The frequency at which you would like the lag pump to shut off. (Check your test sheet for this value set by the factory)

- d. De-stage Delay
 1. The amount of time in seconds that you would like to delay the condition once it is met. (Typically 10)



<<

System Settings 1

Sys Settings
2

<div style="border: 1px solid #003366; background-color: #003366; color: white; padding: 5px; display: inline-block; width: 60px; text-align: center; font-size: 24px; margin-bottom: 5px;">2.0</div> 2nd Discharge delay (s)	<div style="border: 1px solid #003366; background-color: #003366; color: white; padding: 5px; display: inline-block; width: 60px; text-align: center; font-size: 24px; margin-bottom: 5px;">30.0</div> High Suction Warning (psi)
<div style="border: 1px solid #003366; background-color: #003366; color: white; padding: 5px; display: inline-block; width: 60px; text-align: center; font-size: 24px; margin-bottom: 5px;">70.0</div> High Discharge Warning (psi)	<div style="border: 1px solid #003366; background-color: #003366; color: white; padding: 5px; display: inline-block; width: 60px; text-align: center; font-size: 24px; margin-bottom: 5px;">5.0</div> High Suction Warning delay (s)
<div style="border: 1px solid #003366; background-color: #003366; color: white; padding: 5px; display: inline-block; width: 60px; text-align: center; font-size: 24px; margin-bottom: 5px;">3.1</div> High Discharge Warning delay (s)	<div style="border: 1px solid #003366; background-color: #003366; color: white; padding: 5px; display: inline-block; width: 60px; text-align: center; font-size: 24px; margin-bottom: 5px;">10.0</div> Low Suction Alarm (psi)
	<div style="border: 1px solid #003366; background-color: #003366; color: white; padding: 5px; display: inline-block; width: 60px; text-align: center; font-size: 24px; margin-bottom: 5px;">5.0</div> Low Suction Alarm delay (s)

17. System Settings 1

- a. 2nd Discharge Delay (Seconds)
 1. Delay timer for the 2nd discharge alarm. (Typically 2)
- b. High Discharge Warning (PSI)
 1. This warning will occur when the pressure is at or above this value. (Typically set from the factory. Take your setpoint and add 15 PSI for this value.)
- c. High Discharge Warning Delay (Seconds)
 1. Delay Timer for the High Discharge Warning.(Typically 5)
- d. High Suction Warning (PSI) (Typically the Suction Pressure + 20 PSI will give you the value)
- e. High Suction Warning Delay (Seconds) (Typically 5)
- f. Low Suction Alarm (PSI) (Typically 10 PSI for city pressure)
- g. Low Suction Alarm Delay (Seconds) (Typically 5)



System Settings 2

<< System Settings 2		System Settings 3 >>	
123.4	Discharge Sensor Failure delay (s)	123.4	VFD min Freq (Hz)
123.4	Suction Sensor Failure delay (s)	123.4	VFD max Freq (Hz)
123.4	Level Sensor Failure delay (s)	Cycle power if modified	
Flow meter is NOT present		Number OF pumps	
Ignore Calculated Sleep Freq		12	
Next Pump to start Rule: (must be in Manual or OFF to change Rule)		VFDs used in System:	
Pump Number		ATV 3xx	
?		Cycle power if modified	

18. System Settings 2

a. Discharge Sensor Failure Delay

1. Delay timer (in seconds) if the sensor shows 0 PSI the timer will start. The value entered will delay the condition before the alarm is presented. (Typically 5)

b. Suction Sensor Failure Delay

1. Delay timer (in seconds) if the sensor shows 0 PSI the timer will start. The value entered will delay the condition before the alarm is presented. (Typically 5)

c. Level Sensor Failure Delay

1. Delay timer (In Seconds) once sensor condition is met the timer will start. The value entered will delay the condition before the alarm is presented. (Typically 5)

d. VFD Min Freq

1. Variable Frequency Drive Minimum Frequency. The minimum speed in Hertz that you would like the drive to start at. (Typically 25)

e. VFD Max Freq

1. Variable Frequency Drive Maximum Frequency. The maximum speed in Hertz that you would like the drive to operate at. **(Please reference motor data plate.)**



<<

Analog Signal Calibration 1

>>

Discharge AI 1
(0 - 10 V)

Min Raw	Max Raw
0	1000
Min Eng	Max Eng
0	300
Raw	Scalled
0	60.0

Suction AI 2
(0 - 10 V)

Min Raw	Max Raw
0	1000
Min Eng	Max Eng
-14	150
Raw	Scalled
0	22.0

Flow AI 3
(4-20 mA)

Min Raw	Max Raw
0	1000
Min Eng	Max Eng
0	200
Raw	Scalled
-32768	-6553.6

19. Analog Signal Calibration 1

a. Discharge AI1

1. Discharge Transducer Input is located on AI1 on the PLC. The signal wire is a 0-10V signal. The blue boxes are values you can adjust to calibrate the digital display against the mechanical gauges. The gray boxes are for raw data that the PLC references.

b. Suction AI2

1. Suction Transducer Input is located on AI2 on the PLC. The signal wire is a 0-10V signal. The blue boxes are values you can adjust to calibrate the digital display against the mechanical gauges. The gray boxes are for raw data that the PLC references.

c. Flowmeter AI3

1. Flowmeter Transducer Input is located on AI3 on the PLC. The signal wire is a 4-20mA signal. The blue boxes are values you can adjust to calibrate the digital display against the mechanical gauges. The gray boxes are for raw data that the PLC references.



Tank Level

Tank Level (AI 5) (0- 10 V)	
Min Raw	Max Raw
0	1000
Min Eng	Max Eng
0	55
Raw	Scaled
0	0.0

20. Tank Level Calibration:

- The values in blue are to adjust for the tank height. Change Max Eng for the height of the tank.
- Tank Level Transducer – Signal wire is on Input AI-5 and is looking at a 0-10 Volt range.
- Other values are raw data values
- Tank Level Display will display the actual value in feet.



P I D settings

0.180 P gain

5 I gain

PID output (read only)

55.0 Hz

21. PID Settings

a. P gain

1. P gain will adjust the ratio of change in the output to the change of the input.

a. Small changes in this value are recommend. (Check your test Sheet for the factory set value)

b. I gain

1. I gain will adjust the speed of the signal sent out to the controller output. (Check your test Sheet for the factory set value)



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Running Hours

Pump 1

0

Pump 2

0

22. Running Hours

- a. Running Hours displays the total number of hours each drive has been running. It is not able to be reset for any reason, including installation of new pumps.



Pipe Break Settings

6.0

Motor FLA

10.0

Pressure Loss (psi)

10.0

Duration (sec)

Note: alarm will not be triggered if System in HAND mode

23. Pipe Break Settings

- a. This is a setting that uses the motor full load amps based on the motor data plate.

If the motors are running at full load amps and the pressure drops to 10 psi below the setpoint, the timer (Duration) will begin counting down. Once it times out and the condition is triggered, there will be an alarm for a pipe break and the system will shut down. This is a hard stop on all pumps and will need to be reset from the alarm screen.



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<<		Sleep Settings				Aux Buttons	
58.0	Differential (psi)	67.1	Calculated Sleep Freq (Hz)		30.0	PID output (Hz)	GPM
Set Point Reduction is DISABLED by user				15.0	Sleep ON Delay (sec)	57.0	LEAD Pump Max Sleep Freq (Hz)
30.0	Freq (Hz)	45.0	Freq (Hz)	60.0	Freq (Hz)		
17.3	DIFF (psi)	30.7	DIFF (psi)	49.2	DIFF (psi)	Pump 1	Pump 2
						STOPPED	STOPPED
Conditions to go to SLEEP (read only)							System SLEEP state
in Auto, No SysAlarms, Awake	only LEAD in Run	Speed Source is PID	Speed(Hz) <= User Sleep (Hz)	Sleep DIFF is not in use	Speed(Hz) <= Calculated Sleep (Hz)	Sleep Delay Timer	System is AWAKE
						0.0	
				0.180	P	Disch	Set Point
				5	I	80.0	80.0
							Suction
							22.0

24. Sleep Settings

a. Differential (PSI)

1. A measurement in difference between the discharge pressure and the incoming suction pressure.

b. Sleep Freq (Hz)

1. The speed at which the pump will enter a sleep state. This occurs when the condition is at or below the sleep frequency.

c. VFD Speed (Hz)

1. Actual VFD Speed Hertz

d. PID Output (Hz)

1. Actual PID Speed Hertz

e. Conditions To Go To Sleep

1. If all the buttons are green in this window, the sleep timer will begin a count down. Once the timer is complete the system will remain in this sleep state until the discharge pressure drops to 5 PSI below the setpoint, at which time the system will resume operation.

f. Sleep On Delay (sec)

1. Delay timer (in seconds) that allow the conditions to stabilize before going to a sleep state. (Typically set at 30)



g. Lead Pump Max Sleep Freq (Hz)

1. **(Note: Never set to 30Hz or the system will shut itself down and never turn back on.)** This is the Maximum frequency that the system will be looking for in order to go to sleep. It works in conjunction with the Minimum Sleep Frequency as a window setting. This is designed this way so that if the system were at full flow and the system is at 60 hertz, it will not shut down due to the Calculated Sleep Frequency would be at the value of 60 hertz which would cause the system to shut down. The pump would run at 60 Hertz and then shut off, then turn back on again and keep repeating until a valve after the booster pump and the pressure stabilizes. We typically disregard the calculated sleep frequency and use the Maximum sleep frequency and Minimum sleep frequency window type settings.

<< PLC ports settings

BACnet is Disabled

PLC IP address

192 168 1 75

PLC Subnet Mask

255 255 255 0

Apply

IMPORTANT: After making any changes:
1. press Apply button.
2. cycle power the PLC

25. PLC BACnet TCP/IP

- a. To enable BACnet, press the (BACnet is Disabled) button until it turns yellow. See image below. The Modbus address and BACnet ID will appear. Press the apply button and cycle the power to save the settings.



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<< **PLC ports settings**

BACnet is Enabled

BACnet / IP

Modbus Address

1

BACnet ID

1

PLC IP address

192 168 1 75

PLC Subnet Mask

255 255 255 0

Apply

IMPORTANT: After making any changes:
1. press Apply button.
2. cycle power the PLC

<< **PLC ports settings**

BACnet is Enabled

BACnet / MSTP

Modbus Address

1

Baud Rate

76800

BACnet ID

1

PLC IP address

192 168 1 75

PLC Subnet Mask

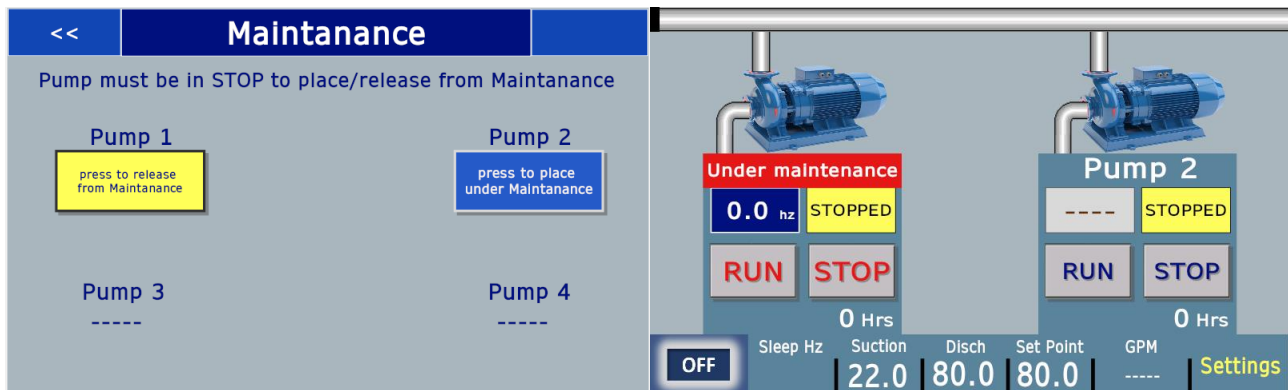
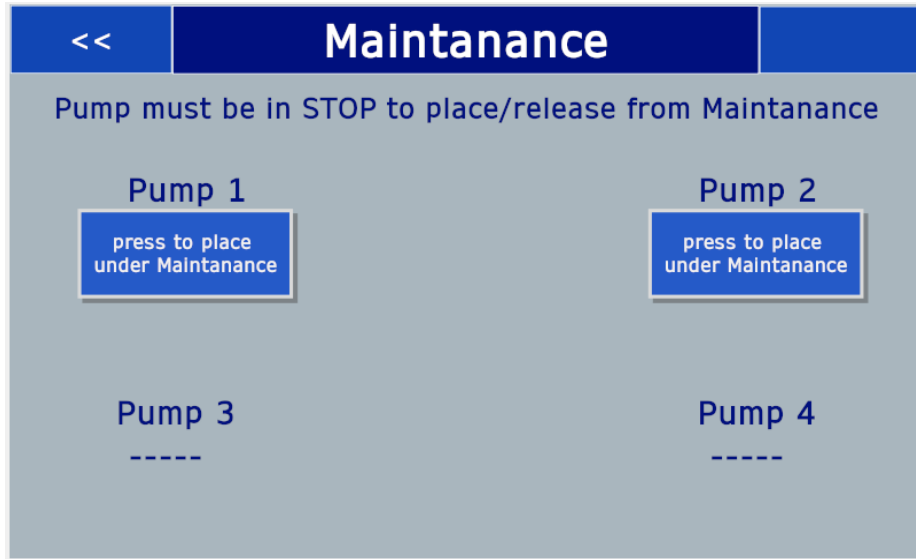
255 255 255 0

Apply

IMPORTANT: After making any changes:
1. press Apply button.
2. cycle power the PLC

26. PLC BacNet MS/TP

- a. To enable BACnet, press the (BACnet is Disabled) button until it turns yellow. Select the BACnet MSTP Option. It will turn green. The Modbus Address, Baud Rate, and BACnet ID will appear. Please press the apply button and cycle the power to save the settings.



27. Pump Maintenance

- a. Allows the user to have one pump in auto mode and control the 2nd pump in a manual mode set by the desired hertz. This can be achieved by stopping the pump you want to work on, by going to the maintenance screen. Press the pump number you want to service. The button will change to yellow in color. Once you go back to the main screen, there will be a “Under Maintenance” flag appear in RED on the pump you selected. The user is now able to control the pump by entering the hertz one would like the speed to operate. Press run to start the pump and press stop to shut off the pump.



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Delta P Carver Booster Pump Keypad Parameters

Simple Start
CONF

FULL

```

SIM-  [SIMPLY START]
      bFr  [Standard mot. freq]
      60  [60Hz NEMA]
      nCr  [Rated mot. current]
      11.6
      nSP  [Rated motor speed]
      3450
      ltH  [Mot. therm. current]
      13 A
      ACC  [Acceleration]
      7.5 s
      dEC  [Deceleration]
      2 s
      LSP  [Low speed]
      30Hz
      CLI  [Current Limitation]
      14 A
      CL2  [I Limit. 2 value]
      13.5 A
      tLS  [Low speed time out]
      15 s
      PAH  [Max fbk alarm]
      300
      rP2  [Preset ref. PID 2]
      70

      rP3  [Preset ref. PID 3]
      70
      rP4  [Preset ref. PID 4]
      70
      Ctd  [Current threshold]
      12.5 A
drC-  [MOTOR CONTROL]
      bFr  [Standard mot. freq]
      60 Hz
      CLI  [Current Limitation]
      14 A
I_O-  [INPUTS / OUTPUTS CFG]
      tCt  [2 wire type]
           LEL  trn PFO [Level]
      rrS  [Reverse assign.]
           nO   [No]
AI1-  [AI1 CONFIGURATION]
      AI1A [AI1 assignment]
           nO   [No]

```



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AI2- [AI2 CONFIGURATION]
AI2A [AI2 assignment]
Fr1 [Ref.1 channel]
AI2t [AI2 Type]
10U [Voltage]

CtL- [COMMAND]
Fr1 [Ref.1 channel]
A12 [AI2]
CHCF [Profile]
IO [I/O profile]
CCS [Cmd switching]
LI2 [LI2]
rFC [Ref. 2 switching]
LI2 [LI2]
Fr2 [Ref.2 channel]
Mdb [Modbus]

FbM- [FUNCTION BLOCKS]
Fbl- [FB IDENTIFICATION]
bnU [Prg. format version]
1
CtU [Catalog version]
1

FUn- [APPLICATION FUNCT.]
rPt- [RAMP]
ACC [Acceleration]
7.5 s
dEC [Deceleration]
2 s

PId- [PID REGULATOR]
PIF [PID feedback ass.]
A12 AI2]
PIF1 [Min PID feedback]
0

PIF2 [Max PID feedback]
300
PIP1 [Min PID reference]
10
PIP2 [Max PID reference]
200
PII [Act. internal PID ref.]
Yes
rPI [Internal PID ref.]
70
PAH [Max fbk alarm]
300
tLS [Low speed time out]
15 s



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rSL [PID wake up thresh.]
5
rP2 [Preset ref. PID 2]
70
rP3 [Preset ref. PID 3]
70
rP4 [Preset ref. PID 4]
70
CLI- [2nd CURRENT LIMIT.]
CL2 [I Limit. 2 value]
13.5 A
CLI [Current limitation]
14 A
MLP- [PARAM. SET SWITCHING]

CHA1 [2 parameter sets]
LI2 [LI2]
SPS [PARAMETER SELECTION]
LSP
PS1- [SET 1]
LSP 35 Hz
PS2- [SET 2]
LSP 30 Hz
FLt- [FAULT MANAGEMENT]
rSt- [FAULT RESET]
rSF [Fault reset]
Bit 7 digital control word
ALS- [ALARM SETTING]
Ctd [Current threshold]
12.5 A
COM- [COMMUNICATION]
Md1- [MODBUS NETWORK]
Add [Modbus Address]
1-4
Tbr [Modbus baud rate]
38 4

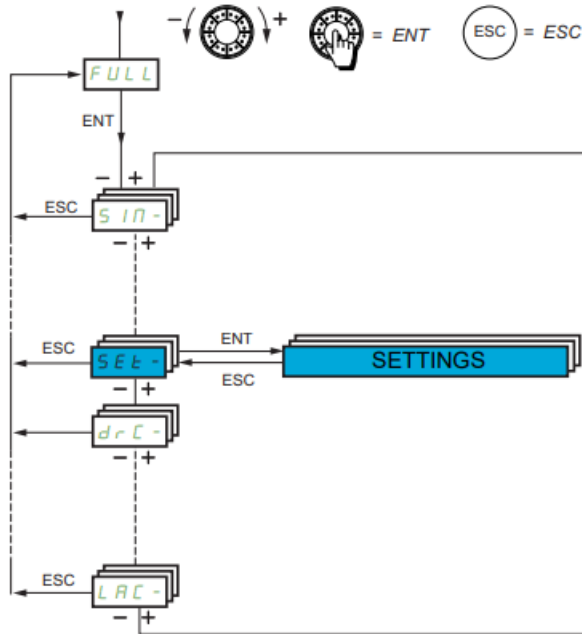


Settings

With integrated display terminal

It is recommend to stop the motor before modifying any of the settings.

From **C o n F** menu



The adjustment parameters can be modified with the drive running or stopped.

SEt- [SETTINGS]
ACC [Acceleration]
7.5 s
dEC [Deceleration]
2s
LSP [Low speed]
30Hz
ItH [Mot. therm. current]
13 A



DPC Motor Lubrication Chart

NOTE: Refer to motor nameplate for recommended lubricant. If none is shown, please use the table below.

Conditions:	Recommended Lubricant:
Standard	Shell Dolium R or Chevron SRI
Anti-Friction Bearings (-15°F to 120°F)	POLYREX EM
Min Start Temp (-100°F)	AEROSHELL #7
Extreme Conditions (>50°C or Class H Insulation)	Dow Corning DC44
Roller Bearings	ExxonMobil SHC-220

Relubrication Interval

Table is for Ball Bearing Motors ONLY. For Vertically Mounted Motors or Roller Bearings, divide the relubrication interval by 2. Submersible motors do not require relubrication (water lubricated).

NEMA (IEC) Frame Size:	Rated Speed (RPM)			
	3600	1800	1200	900
Up to 210 incl. (132)	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)	3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)	2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (400)	2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.



Amount of Grease to Add

Frame Size NEMA (IEC)	Bearing Description			
	Bearing	Weight of Grease to Add * oz (Grams)	Volume of Grease to be Added	
			<i>in</i> ³	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100-112)	6206	0.19 (5.0)	0.3	1
210 (132)	6307	0.30 (8.4)	0.6	2
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2	6.6
440(280)	6318	1.52 (40)	2.5	8.2
440 (280)	6319	2.12 (60)	4.1	13.4



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