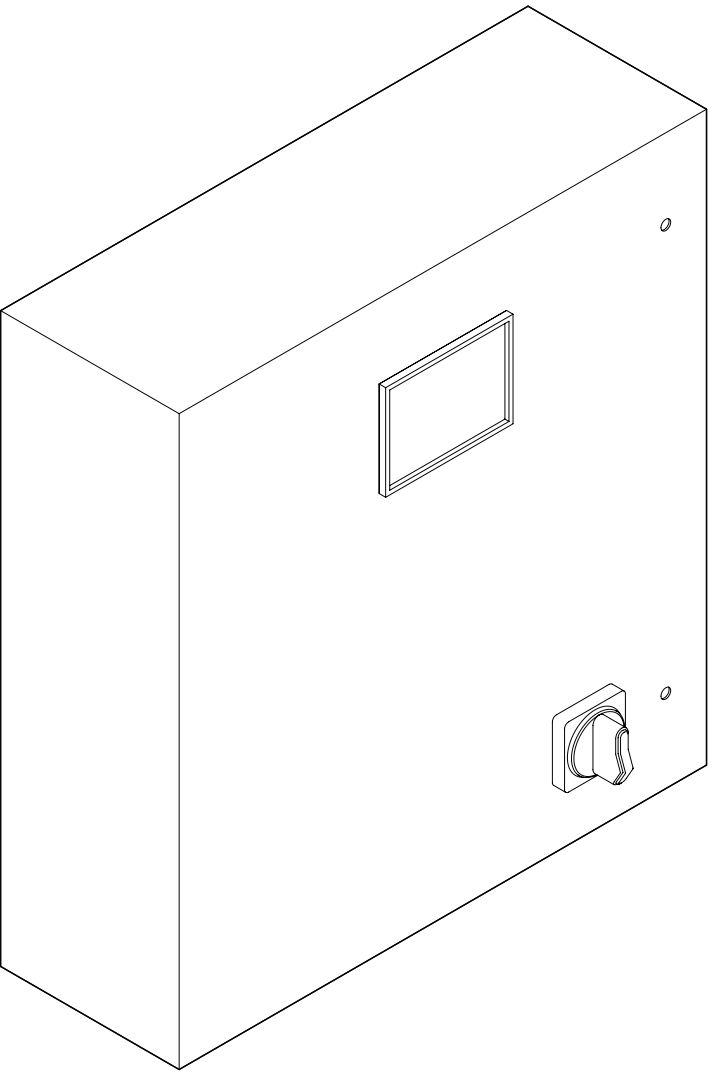
ARMSTRONG



IPS controller 4000

Integrated pumping system for variable secondary application

Installation and operating instructions

File No: 90.974
Date: JANUARY 31, 2019
Supersedes: NEW
Date: NEW

CONTENTS

Armstrong integrated pumping system controllers, IPS controllers 4000, are completely factory-assembled, tested, and shipped to the job site as integral units ready to receive incoming power supply. These instructions describe the procedures to be followed during installation, commissioning and operation to ensure optimum performance and reliability. When contacting the factory for assistance, please provide the unit Serial Number and other pertinent data, such as IPS model no.

1.0 IPS CONTROLLERS 4000

1.1 INSTALLATION INSTRUCTIONS

Incoming supply - stand-alone IPS controllers (no rack): The incoming power supply should be brought in through the bottom of the panel adjacent to the main terminals. Note that this is the only electrical connection required at the panel. The power supply voltage is 100-240VAC / 50-60 Hz as standard. Please refer to drawings the wiring diagram supplied with the unit for instructions to connect to IPS controller.

Incoming supply - IPS system on racks: The incoming power supply to the IPS controller is achieved through a transformer in the main enclosure of the whole IPS system rack. No power connection is required.

NOTE:

All electrical wiring should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

1.2 ENVIRONMENTAL LIMITS

Operation temperature range: 0°C to 50°C (32°F to 122°F) (must not be exposed to direct sunlight)

Operation humidity range: (10% - 85%) non-condensing

Ambient air temperature for storage: -20°C to 70°C (-4°F to 158°F)

1.3 FIELD DEVICES INSTALLATION INSTRUCTIONS

Before attempting to start configuring the IPS controller using the display, make sure all the field installed devices such as DP sensors, temperature sensors, DP switches are properly installed and wired to the IPS controller as per wiring diagrams provided.

NOTE: Please fill in the IPS commissioning check sheet (below) which will help you through the set-up procedure of the IPS controller

1.4 BUILDING AUTOMATION SYSTEM (BAS) CONNECTION

When the IPS controller is provided with a serial port to communicate serially to the BAS, the possible communication protocols are Modbus or BACnet. Refer to wiring diagrams supplied with the unit for wiring instructions. IPS controller can also communicate to the BAS by hard wired option. Please refer to the IPS controller generic terminal block for the different parameters and data points communicated to the BAS. For more information please contact your local Armstrong representative or Armstrong factory service department.

2.0 IPS COMMISSIONING CHECK SHEET

(Used for inputting data in the IPS controller)

NOTE: The following data should be documented prior to setting up your new IPS controller. By collecting this information and documenting it, you will not only be prepared for the setup process, but you will also have a printed record of the data that was selected. If you have chosen to have an Armstrong certified controls service technician enter the data onto the IPS controller, they will require that the contractor(s) sign off that the mechanical connections and electrical connections are completed prior to visiting the site to commission the controller.

PROJECT NAME: _____

BUILDING ADDRESS: _____

CONTRACTOR NAME: _____

IPS CONTROLLER SERIAL NUMBER: _____

DATE OF INSTALLATION/COMMISSIONING: _____

IPS MODEL NUMBER (E.G. IPS 4001W CONTROLLER): _____

ARMSTRONG SERVICE REPRESENTATIVE (IF APPLICABLE): _____

SYSTEM CONFIGURATION

Number of pumps: _____

Is there a standby pump: _____

Pump make, model, and size pump(s) legend: _____

System design point flow (with units): _____

System design point head (with units): _____

Pump selection point flow: _____

Pump selection point head: _____

Differential pressure switch (flow switch): ☐ Yes ☐ No

Desired default speed (factory preset at 95%): _____

Minimum drive speed (factory preset at 30%): _____

Number of controller zones (process variables): _____

* If not known use pump selection point flow and head

MOTOR DATA

Horsepower: _____

Speed: _____

Voltage: _____

FLA rating: _____

Service factor: _____

FL efficiency: _____

FL slip: _____

Power factor: _____

Temperature class: _____

CONTROLLING DATA

PROCESS VARIABLES/CONTROLLING ZONES

Zone number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Zone legend																
DP sensor range																
Zone set-point																

Rate of speed change/ramp time (0 - full speed): _____

Minimum speed (factory set 30%): _____

Maximum speed (factory set 100%): _____

Temperature sensor type, range: _____

High temperature high alarm set-point: _____

Hours of operation before switching lead pump: _____

_____ _____

Date Signature

3.0 IPS 4000 FUNCTION DISPLAYS

The IPS 4001W/4002W/4003W/4004W controllers displays are divided in two set of displays: Operation and Setup. The Operation displays are used by the operators to monitor and control the IPS. The Setup screens are used to set, view, save, and restore the system specific settings (i.e. number of pumps, sensor range, etc.).

OPERATION DISPLAYS:

- Welcome screen
- Main menu
- System overview
- Pump overview
- Sensorless overview
- Pump control
- Zone overview
- Temp overview
- Alarm overview
- PLC diagnostics
- Languages

SETUP DISPLAYS:

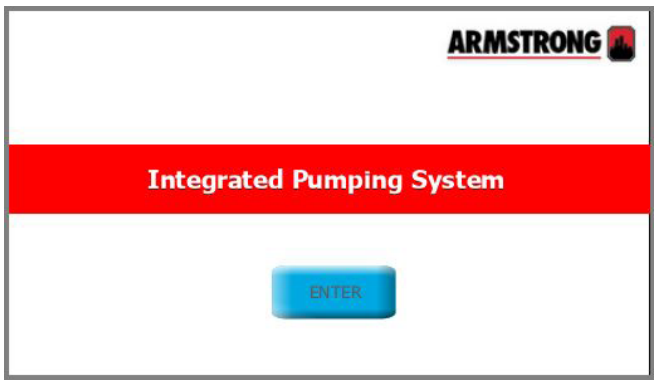
The setup displays are divided in three levels with each level having the same number of displays with different level of access. Level 0 setup displays are for viewing only and no adjustments can be made. Level 1 setup displays can be used for modifying the system setup (except pump PID & BAS parameters) and restoring the system factory defaults. Level 2 setup displays can be used for modifying the system setup, and saving and restoring the system factory defaults. To access level 1 and 2 an operator need to enter the proper password (please contact Armstrong factory service department).

The list of setup/default displays for every level is as follow:

- System setup
- Pump setup
- Sensorless setup
- Zone setup
- Zone 1 to 16 setup
- Speed setup
- BEP setup
- PID setup
- VFD readout setup
- System valve setup
- Temp control setup
- BAS setup
- Clock setup
- Login

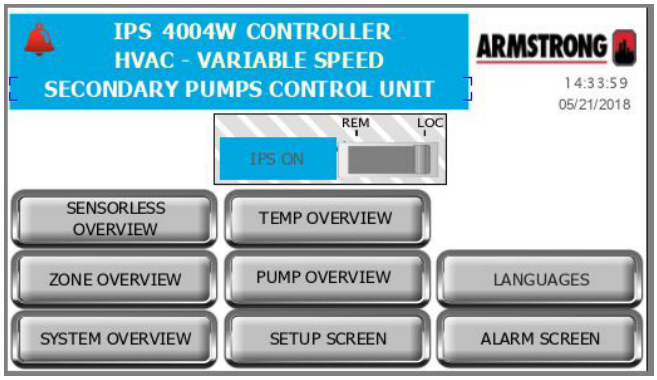
4.0 OPERATION DISPLAYS

4.1.0 WELCOME SCREEN



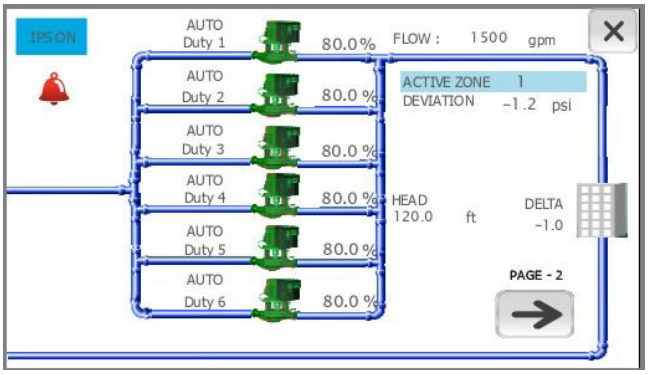
Description	
This is the Welcome Screen, appear when the unit is powered up.	
Buttons	
ENTER	Navigates to the Main Menu.

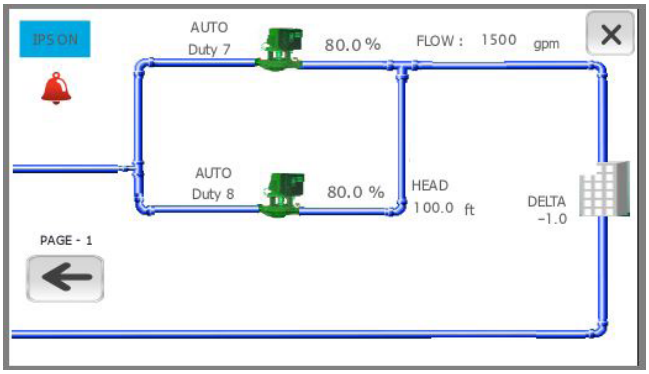
4.1.1 MAIN MENU



Description	
This screen indicates status of the system's most important variables, and navigates to all system screens.	
Data	
IPS status	Indicates if the IPS is on or off
Alarm	If there is an alarm in the system, a red bell appears at the top left corner
Buttons	
REM – LOC	Slider button that allows switching the IPS mode between remote and Local. Local will turn on the IPS immediately. Remote causes the IPS to follow the BAS signal (hard wired or serial communication) to turn on or off.
SENSORLESS OVERVIEW	Navigates to the Sensorless Overview screen. Only available if control type on Pump Setup screen is Sensorless or Hybrid.
TEMP OVERVIEW	Navigates to the Temp Overview screen. Only available if temp control on Temp Control Setup screen is enabled. This feature is not available on IPS 4001W.
ZONE OVERVIEW	Navigates to the Zone Overview screen. Only available if control type on Pump Setup screen is Sensor or Hybrid.
PUMP OVERVIEW	Navigates to the Pump Overview screen.
LANGUAGES	Navigates to the Languages screen.
SYSTEM OVERVIEW	Navigates to the System Overview screen.
SETUP SCREEN	Navigates to the Setup Menu level zero screen.
ALARM SCREEN	Shows the Alarm Screen. If there is an active alarm, this button turns red.
Clock	Navigates to the Clock Setup screen. Level 2 password required.

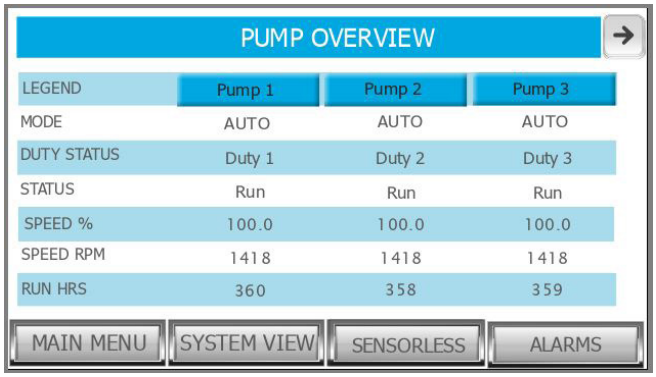
4.1.2 SYSTEM OVERVIEW





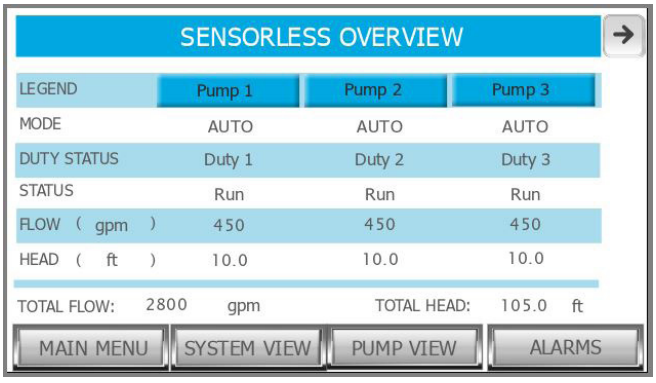
Description	
Shows a detailed view of the system. The screen adapts to the configuration of the system by showing the number of pumps, system flow, zone PVs or head and flow. If more than 6 pumps, use the grey arrow at the bottom right corner to scroll. Press the x button on the top right corner to go back to the previous screen.	
Data	
Pump 1 to 8 status	The pump icons show the pump status: grey – stopped green – running red – alarm
Pump 1 to 8 mode	Shows each pump mode: Hand, Off or Auto.
Pump 1 to 8 duty	Shows each pump duty: Duty1, Duty2, Duty3, Duty4, Duty5, Duty6, Duty7, Duty8, or stand-by.
Pump 1 to 8 speed	Shows each pump speed in percentage.
ACTIVE ZONE	Indicates which zone is assigned as Active. Only visible if control type on Pump Setup screen is Sensor or Hybrid.
DEVIATION	Indicates the active zone deviation. Only visible if control type on Pump Setup screen is Sensor or Hybrid.
SETPOINT	Indicates the active zone setpoint in the chosen unit. Only visible if control type on Pump Setup screen is Sensor or Hybrid, or if system valves control is enabled.
MAX OPEN VLV	Indicates the opening of the driving system valve. Only visible if control type on Pump Setup screen is Sensor or Hybrid, or if system valves control is enabled.
FLOW	Indicates both sensor and sensorless flow values in the system based on the selection.
HEAD	Indicates the total head in the system. Only visible if control type on Pump Setup screen is Sensorless or Hybrid.
DELTA	Indicates how far from the control curve the pump(s) are operating. The IPS regulates the pump speed to achieve an error of zero.
IPS STATUS	Indicates whether the IPS is on or off.
Alarm	A red bell indicates an alarm in the system.
Buttons	
Pump 1 to 8 icon	Touching a pump icon brings up the corresponding Pump Control screen.
Alarm Bell	Touching the alarm bell navigates to the Alarm Screen.

4.1.3 PUMP OVERVIEW



Description	
This screen allows monitoring pump information. If there are more than 3 pumps, scroll using the arrow on the top corner.	
Data	
Pump 1 to 8 MODE	Shows each pump mode: Hand, Off or Auto.
Pump 1 to 8 DUTY STATUS	Shows each pump duty: Duty1, Duty2, Duty3, Duty4, Duty5, Duty6, Duty7, Duty8, or stand-by.
Pump 1 to 8 STATUS	Shows if each pump is running or stopped.
Pump 1 to 8 SPEED %	Indicates the speed of each pump in percentage.
Pump 1 to 8 SPEED RPM	Indicates the speed of each pump in RPM.
Pump 1 to 8 RUN HRS	Indicates the total run time of each pump in hours.
Buttons	
Pump 1 to 8	Touching a pump button brings up the corresponding Pump Control screen. If the corresponding pump is in alarm, this button changes to red color.
MAIN MENU	Returns to Main Menu.
SYSTEM VIEW	Changes the current screen to System Overview.
SENSORLESS	Changes the current screen to Sensorless Overview. Only available if control type on Pump Setup screen is Sensorless or Hybrid.
ZONE VIEW	Changes the current screen to Zone Overview. Only available if control type on Pump Setup screen is Sensor.
ALARMS	Navigates to the Alarm Screen. If there is an active alarm, this button turns red.
Scroll arrows	If there are more than 3 pumps in the system, scroll using the grey arrow on the top corner.

4.1.4 SENSORLESS OVERVIEW

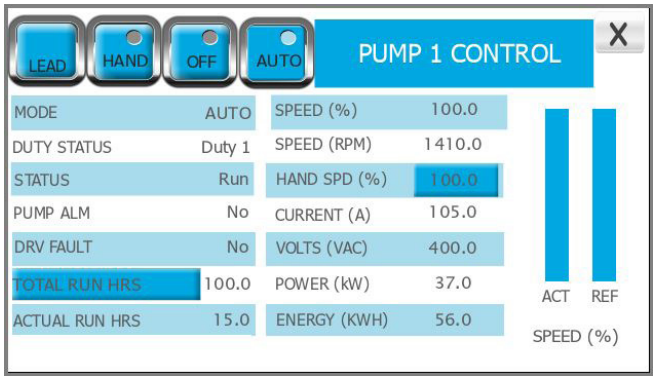


Description
This screen is only available if control type on Pump Setup screen is Sensorless or Hybrid, it complements the Pump Overview screen. If there are more than 3 pumps, scroll using the arrow on the top corner.

Data	
Pump 1 to 8 MODE	Shows each pump mode: Hand, Off or Auto.
Pump 1 to 8 DUTY STATUS	Shows each pump duty: Duty1, Duty2, Duty3, Duty4, Duty5, Duty6, Duty7, Duty8, or stand-by.
Pump 1 to 8 STATUS	Shows if each pump is running or stopped.
Pump 1 to 8 FLOW	Indicates the current flow of each pump in the selected unit.
Pump 1 to 8 HEAD	Indicates the current head of each pump in the selected unit.
TOTAL FLOW	Indicates the system flow in the selected unit.
TOTAL HEAD	Indicates the system head in the selected unit.

Buttons	
Pump 1 to 8	Touching a pump button brings up the corresponding Pump Control screen. If the corresponding pump is in alarm, this button changes to red color.
MAIN MENU	Returns to Main Menu.
SYSTEM VIEW	Changes the current screen to System Overview.
PUMP VIEW	Changes the current screen to Pump Overview.
ALARMS	Navigates to the Alarm Screen. If there is an active alarm, this button turns red.
Scroll arrows	If there are more than 3 pumps in the system, scroll using the grey arrow on the top corner.

4.1.5 PUMP 1 TO 8 CONTROL

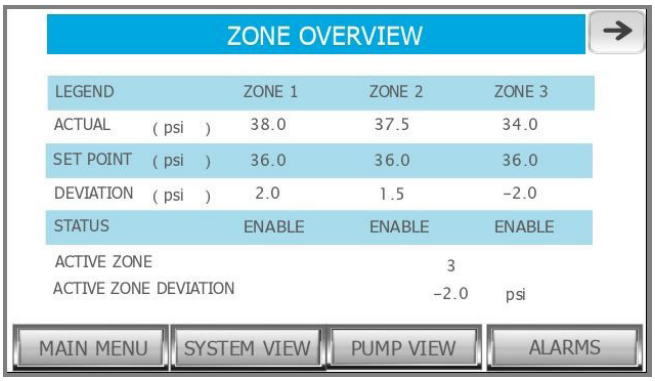


Description
This screen allows control of each pump and shows more detailed information. Press the x on the top right corner to return to the previous screen.

Data	
MODE	Shows pump mode: Hand, Off or Auto.
DUTY STATUS	Shows pump duty: Duty1, Duty2, Duty3, Duty4, Duty5, Duty6, Duty7, Duty8, or stand-by.
STATUS	Shows if pump is running or stopped.
PUMP ALM	Indicates if there is a pump alarm.
DRV FAULT	Indicates if the VFD is reporting a fault.
ACTUAL RUN HRS	Indicates the pump run time in hours when the pump is running. Reset to 0 when the pump stops.
LEAD SWITCHING	Indicates the remaining time to switch the Duty1 (Lead) pump.
SPEED (%)	Shows pump speed in percentage.
SPEED (RPM)	Shows pump speed in RPM.
CURRENT (A)	Shows the VFD current.
VOLTS (VAC)	Shows the VFD AC voltage.
POWER (kW)	Shows the VFD power in kWs.
ENERGY (kWh)	Shows the VFD energy consumption in kWh.
SPEED BARS	Show the pump speed reference and actual speed in a graphical manner.
Alarm	If there is a pump alarm, a red bell appears at the top right corner.

Buttons	
LEAD	Assigns the pump as Duty1 or Lead.
HAND	Changes the pump mode to Hand. If the IPS is on, the pump will start immediately and run at the hand speed (see below).
OFF	Changes the pump mode to Off. The pump will stop immediately and it will be excluded from the duty rotation.
AUTO	Changes the pump mode to Auto. The pump will be assigned a duty status and it will run according to the IPS control algorithm.
TOTAL RUN HRS	Opens a password protected window to confirm resetting the pump total run time in hours as indicated. Please contact your local Armstrong representative for more information.
HAND SPD (%)	If the pump is placed in Hand, it will run at the Hand Speed entered.

4.1.6 ZONE OVERVIEW

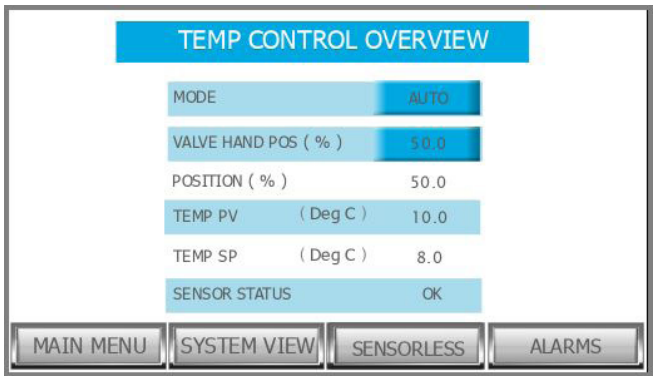


Description
Shows an overview of the system zones. If there are more than 3 zones, scroll using the arrow on the top corner. This screen is only available if control type on Pump Setup screen is Sensor or Hybrid.

Data	
ACTUAL	Indicates the present value of the zone sensor in the selected unit.
SET POINT	Indicates the setpoint of the zone in the selected unit.
DEVIATION	Indicates the zone deviation in the selected unit.
STATUS	Indicates whether the zone is enabled or disabled.
ACTIVE ZONE	Indicates which zone is assigned as active.
ACTIVE ZONE DEVIATION	Indicates the active zone deviation in the selected unit.

Buttons	
MAIN MENU	Returns to Main Menu.
SYSTEM VIEW	Changes the current screen to System Overview.
PUMP VIEW	Changes the current screen to Pump Overview.
ALARMS	Navigates to the Alarm Screen. If there is an active alarm, this button turns red.
Scroll arrows	If there are more than 3 pumps in the system, scroll using the grey arrow on the top corner.

4.1.7 TEMP CONTROL OVERVIEW

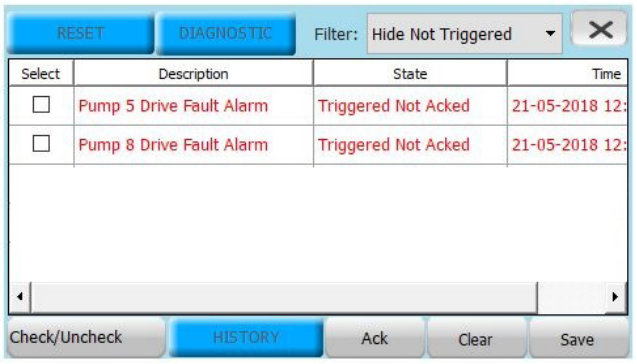


Description
This screen is only available if temp control on Temp Control Setup screen is enabled, it allows monitoring and controlling of the temperature control feature. This feature is not available on IPS 4001W.

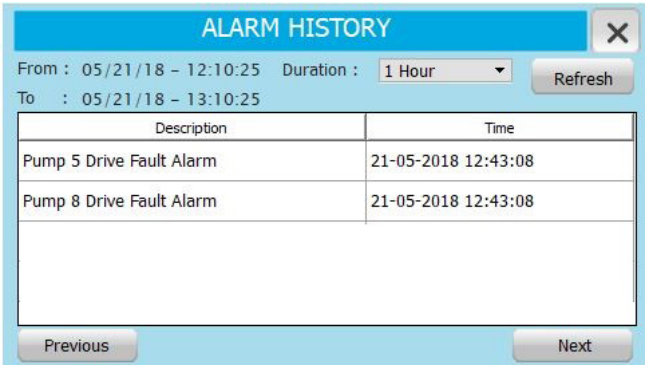
Data	
POSITION (%)	Indicates valve position in percentage (100% means fully open).
TEMP PV	Displays the temperature sensor present value in the selected unit.
TEMP SP	Displays the temperature sensor set point in the selected unit.
SENSOR STATUS	Indicates the status of the temperature sensor: OK or ALARM.

Buttons	
MODE	Allows user to select the valve mode HAND or AUTO.
VALVE HAND POS (%)	If HAND mode is selected, the user can enter the desired valve position.
MAIN MENU	Returns to Main Menu.
SYSTEM VIEW	Changes the current screen to System Overview.
SENSORLESS	Changes the current screen to Sensorless Overview. Only available if control type on Pump Setup screen is Sensorless or Hybrid.
ZONE VIEW	Changes the current screen to Zone Overview. Only available if control type on Pump Setup screen is Sensor.
ALARMS	Navigates to the Alarm Screen. If there is an active alarm, this button turns red.

4.1.8 ALARM SCREENS

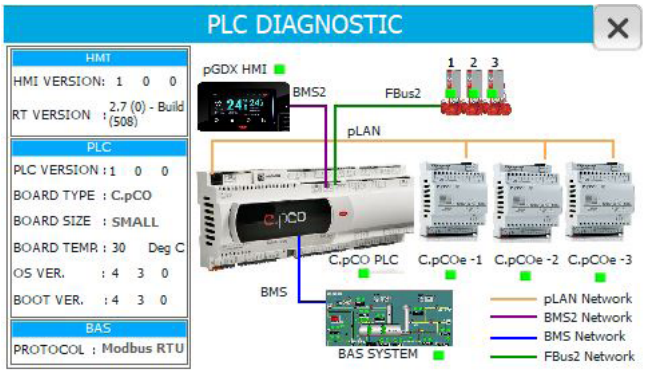


Description	
This screen shows the current alarms in the system. Press the x on the top right corner to return to the previous screen.	
Data	
Select	Select the alarm to be acknowledged and reset.
Description	Shows the description of the alarm. The possible alarms are shown in section 4.2.1.
State	Provides information about two alarm conditions: **1** Triggered or Not Triggered (Triggered means the condition that generates the alarm is still present, the alarm can be acknowledged but not reset) **2** Acknowledged or Not Acknowledged
Buttons	
RESET	Resets the alarms. To clear from the list, see Clear button below.
DIAGNOSTIC	Brings up the PLC Diagnostics screen.
HISTORY	Brings up the Alarm History screen.
Check/ Uncheck	Select/unselect the alarms. Only selected alarms can be acknowledged and cleared from the list.
Filter	Not used.
Ack	Acknowledges the selected alarms.
Clear	Clears the selected alarms that are not triggered.
Save	Not used.



Description	
This screen shows the alarms history. Press the x on the top right corner to return to the previous screen.	
Data	
Description	Shows the description of the alarm. The possible alarms are shown in section 4.2.1.
Time	Shows the time of occurrence of each alarm.
Buttons	
Refresh	Refreshes the alarm list.
Duration	Drop down menu that allows to filer the list of alarms based on time of occurrence.
Previous	Shows alarm history from the previous period selected in the duration dropdown menu.
Next	Shows alarm history from the next period selected in the duration dropdown menu.

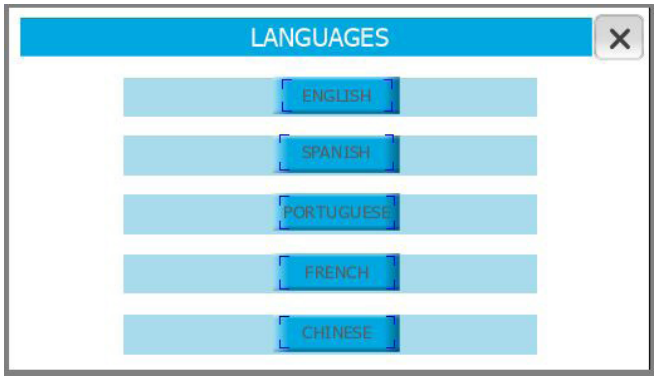
4.1.9 PLC DIAGNOSTIC



Description
This screen shows the current state of the PLC and the software revisions installed. Press the **x** on the top right corner to return to the previous screen.

Data	
HMI VERSION	Shows the graphics version downloaded in the HMI.
RT VERSION	Shows the real-time version of the HMI.
PLC VERSION	Shows the program version downloaded in the controller.
BOARD TYPE	Shows the type of board used in the system (C.pCO)
BOARD SIZE	Small or Medium
BOARD TEMP.	Shows the internal temperature of controller (°c)
OS VER.	Shows the version of the firmware
BOOT VER.	Shows the hardware version of the controller
PROTOCOL	Shows the selected communication protocol (BACnet or Modbus)

4.1.10 LANGUAGES



Description
This screen allows user to select the language displayed on all screens. Press the x on the top right corner to return to the previous screen.

Buttons	
ENGLISH	Displays all screens in English.
SPANISH	Displays all screens in Spanish.
PORTUGUESE	Displays all screens in Portuguese.
FRENCH	Displays all screens in French.
CHINESE	Displays all screens in Chinese.

4.2.1 ALARMS

Alarm	Description	Possible causes
Emergency alarm	Indicates operator activated field emergency switch/button through hardwire or BAS.	• Field emergency • Critical conditions
Pump n alarm	Indicates pump n is in alarm.	Any pump alarm will trigger this alarm.
Pump n run feedback alarm	Indicates PLC didn't detect the pump run feedback from pump n after commanding it to start.	• VFD not configured for serial communication • Loose or broken wire from VFD • Incorrect VFD type selected on IPS • Impeller is stuck
Pump n no flow alarm	Indicates that the PLC didn't detect flow (DP switch not closed) after commanding the pump to start.	• DP switch not correctly adjusted • Loose or broken wire • Damaged PLC digital input • Impeller is stuck
Drive n communication alarm	Indicates VFD of pump n failed to communicate with PLC.	• VFD not configured properly • Communication card not installed properly • Incorrect or faulty wiring
Pump n drive fault alarm	Indicates VFD of pump n is reporting a fault.	VFD over current or other problem. Check VFD local display.
Zone n transmitter alarm	Indicates transmitter of zone n is out of range.	• Connection to transmitter is short or open circuited • Damaged PLC analog input • Loose or broken wire from transmitter • Damaged transmitter
All zones transmitter alarm	Indicates all zones transmitters are out of range.	All zone sensors are in alarm.
Temperature sensor fail alarm	Indicates temperature sensor for Temp Control Valve is out of range.	• Connection to sensor is short or open circuited • Damaged PLC analog input • Loose or broken wire from sensor • Damaged sensor

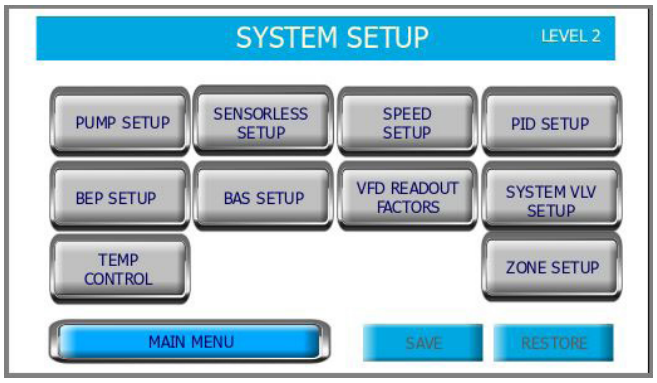
5.0 SETUP DISPLAYS

The setup displays allow viewing, modifying, saving and restoring system parameters. There are 3 levels of password protected access:

Level	Actions Allowed
Level 0	• View only
Level 1	• Modify all parameters, except pump PID and BAS parameters • Restore previously saved default values (factory defaults)
Level 2	• Modify all parameters • Save changes • Restore previously saved default values (factory defaults)

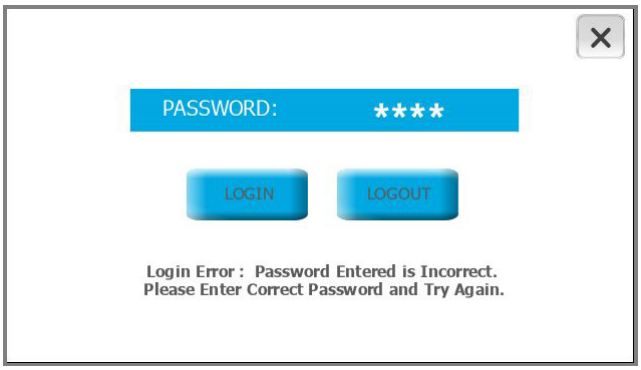
The following sections list and describe each setup screen. Only Level 2 screens are shown, however each level has the same screens with their respective level restrictions.

5.1.0 LEVEL 2 SETUP MENU



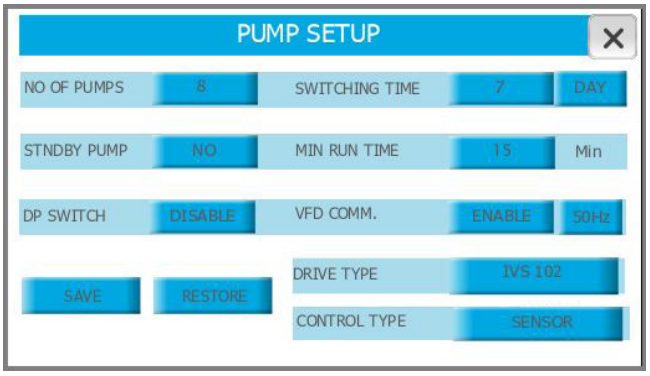
Description	
This screen allows navigation to each of the setup screens.	
Button	
LOGIN	Navigates to the Login screen.
PUMP SETUP	Navigates to the Pump Setup screen.
SENSORLESS SETUP	Navigates to the Sensorless Setup screen. Only available if control type on Pump Setup screen is Sensorless or Hybrid.
SPEED SETUP	Navigates to the Speed Setup screen.
PID SETUP	Navigates to the PID Setup screen.
BEP SETUP	Navigates to the Duty Speed Staging Setup screen.
BAS SETUP	Navigates to the BAS Setup screen.
VFD READOUT FACTORS	Navigates to the VFD Readout Factors Setup screen.
SYSTEM VLV SETUP	Navigates to the System Valve Setup screen. Only available if control type on Pump Setup screen is Sensor or Hybrid.
TEMP CONTROL	Navigates to the Temperature Control Setup screen. This feature is not available on IPS 4001W.
ZONE SETUP	Navigates to the Zone Setup screen. Only available if control type on Pump Setup screen is Sensor or Hybrid.
MAIN MENU	Returns to Main Menu. User must login again to access Level 1 & Level 2 setup menu.
SAVE	Saves all current setup parameters as default. Only available in Level 2.
RESTORE	Restores all parameters to default. Only available in Level 1 & 2.

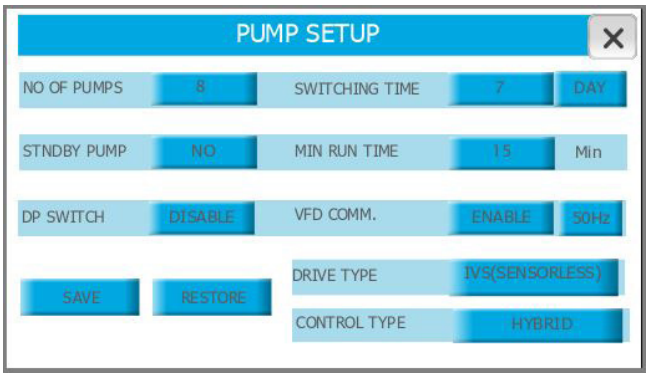
5.1.1 LOGIN SCREEN



Description	
This screen allows the operator to login to the desired level by providing the appropriate password.	
Data	
PASSWORD	Shows the encoded password. Touching it brings up a numeric keypad to enter the password.
Buttons	
LOGIN	If the password entered is valid, touching this button will change the screen to the Setup Menu of the corresponding level.
LOGOUT	Changes the screen back to Main Menu.

5.1.2 PUMP SETUP





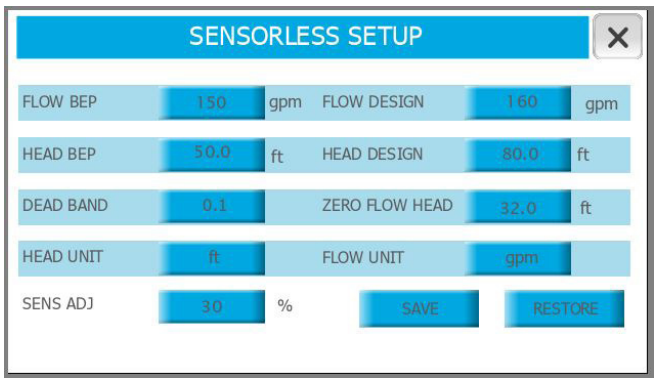
Parameter: NO OF ZONES	
Range	Function
1 – 8	Indicates how many pumps are installed in the system.
Parameter: STNDBY PUMP	
Options	Function
NO	All pumps in the system are duty.
YES	One of the pumps in the system will be assigned as standby, it will only operate if a duty pump fails and there is no other duty pump to replace it. Rotation of Duty 1 pump also rotates the Standby Pump to achieve even hours of operation.
Parameter: DP SWITCH	
Options	Function
DISABLE	Pump DP switches are not installed. The IPS will use the drives' run feedback as confirmation that the pumps are operating.
ENABLE	Pump DP switches are installed. The IPS will use them as confirmation that the pumps are operating.
Parameter: SWITCH TIME	
Range	Function
1-999 (Days, Hours)	Indicates how often the lead (Duty 1) pump will rotate among the duty pumps.
Parameter: MIN RUN TIME	
Range	Function
1-999 minutes	Indicates what is the minimum time the lead (Duty 1) pump will run once it is started.
Parameter: VFD COMM.	
Options	Function
DISABLE	No serial communication to VFDs. The IPS will use hardwired connections.
ENABLE	The IPS uses serial communication to the VFDs. Select if the VFD power is 50 or 60 Hz. The available VFDs are listed below.

Parameter: DRIVE TYPE	
Options	Function
IVS	Serial communication to Armstrong IVS drive.
ACH 550	Serial communication to ABB ACH 550 drive.
FC 102	Serial communication to DANFOSS FC102 drive.
E7	Serial communication to Yaskawa E7 drive.
IVS (SENSORLESS)	Serial communication to Armstrong IVS drive configured for sensorless operation. By selecting this option, the IPS 4000 will operate in Parallel Sensorless™ mode.

*NOTE: The IPS 4000 is configured to communicate to the drives with the following parameters: Modbus RTU, 19200 baud, no parity, 8 bits 1 stop bit.

Parameter: CONTROL TYPE	
Options	Function
SENSOR	If Sensor is selected, the drive type is defaulted to FC102.
SENSORLESS	If sensorless is selected, the drive type is defaulted to IVS(SENSORLESS).
HYBRID	If hybrid is selected, the drive type is defaulted to IVS(SENSORLESS).
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

5.1.3 SENSORLESS SETUP



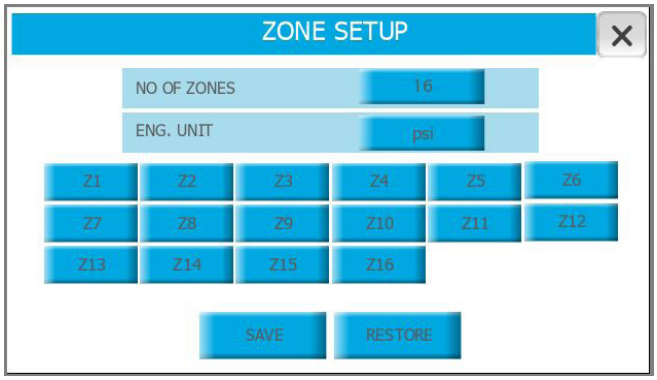
Parameter: FLOW BEP	
Range	Function
0–32767	Flow at BEP (Best Efficiency Point) for one pump. It is used in conjunction with HEAD BEP to stage pumps on and off in order to maintain the system operating efficiently. For more information please contact your local Armstrong representative.

Parameter: HEAD BEP	
Range	Function
0.0–9999.9	Head at BEP (Best Efficiency Point) for one pump. It is used in conjunction with FLOW BEP to stage pumps on and off in order to maintain the system operating efficiently. For more information please contact your local Armstrong representative.

Parameter: DEAD BAND	
Range	Function
0.0–1.0	It is used to prevent constant staging of pumps. For more information please contact your local Armstrong representative.

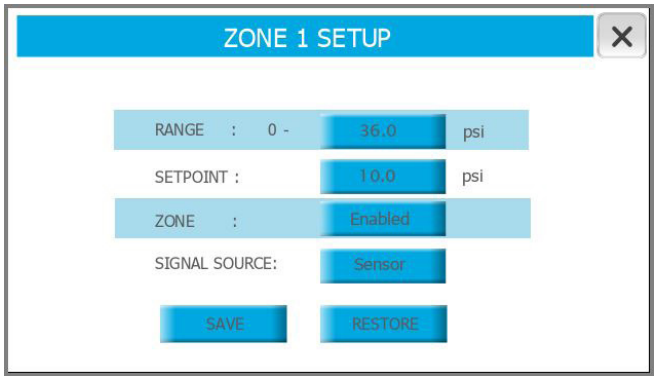
Parameter: HEAD UNIT	
Options	Function
FT	The drive sensorless head is programmed in ft.
PSI	The drive sensorless head is programmed in psi.
kPa	The drive sensorless head is programmed in kPa.
m	The drive sensorless head is programmed in m.
BAR	The drive sensorless head is programmed in bar.
Parameter: SENS ADJ	
Range	Function
0–5%	It is used to adjust the sensorless mapping of the VFD. For more information please contact your local Armstrong representative.
Parameter: FLOW DESIGN	
Range	Function
0–32767	Pump Design Flow. It is used to determine the system control curve.
Parameter: HEAD DESIGN	
Range	Function
0.0–9999.9	Pump Design Head. It is used to determine the system control curve.
Parameter: ZERO FLOW HEAD	
Range	Function
0.0–9999.9	Pump Head at zero flow. It is used to determine the system control curve.
Parameter: FLOW UNIT	
Options	Function
gpm	The drive sensorless flow is programmed in gpm.
L/s	The drive sensorless flow is programmed in L/s.
m^3/h	The drive sensorless flow is programmed in m^3/h.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

5.1.4 ZONE SETUP



Parameter: NO OF ZONES	
Range	Function
1 – 16	Indicates how many zones will be used to control the system, typically one zone per area of the building.
Parameter: ENG. UNIT	
Options	Function
PSI	DP sensors in PSI are used.
FT	DP sensors in FT are used.
kPa	DP sensors in kPa are used.
m	DP sensors in m are used.
BAR	DP sensors in BAR are used.
°F	Temperature sensors in °F are used.
°C	Temperature sensors in °C are used.
Button	
Z1 to Z16	Touching a zone button brings up the corresponding Zone Setup screen.
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

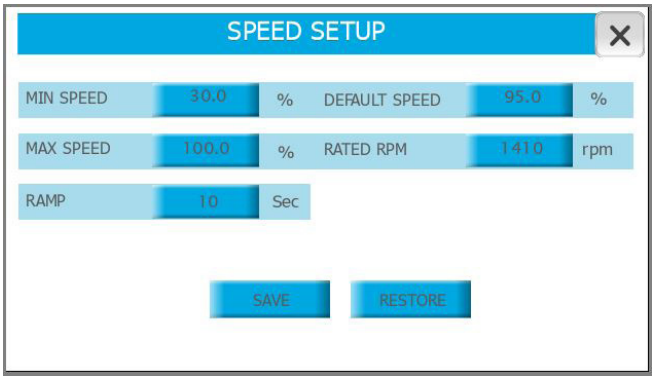
5.1.5 ZONE 1 TO 16 SETUP



There is one screen per zone

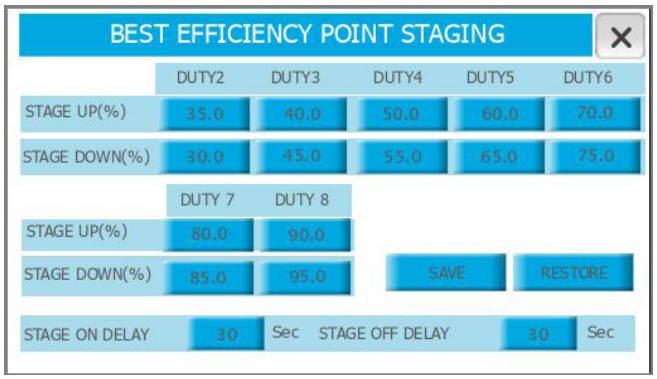
Parameter: RANGE	
Range	Function
0.0-999.9 (PSI, FT, kPa, m, BAR, °F, °C)	Indicates the range of the DP or Temperature sensor of the zone in the selected unit.
Parameter: SET POINT	
Range	Function
0.0-999.9 (PSI, FT, kPa, m, BAR, °F, °C)	Indicates the setpoint of the zone in the selected unit. The IPS uses this value to determine the pump speed.
Parameter: ZONE	
Option:	Function
Disable	The zone is disabled, it won't be used to determine the active zone and pump speed.
Enable	The zone is enabled, it will be used to determine the active zone and pump speed.
Parameter: SIGNAL SOURCE	
Option:	Function
Sensor	The signal is obtained directly from a sensor.
BAS	The signal is obtained from the BAS.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

5.1.6 SPEED SETUP



Parameter: MIN SPEED	
Range	Function
0.0–100.0%	The minimum speed the pumps will be allowed to run in Auto or Hand mode.
Parameter: MAX SPEED	
Range	Function
0.0–100.0%	The maximum speed the pumps will be allowed to run in Auto or Hand mode.
Parameter: DEFAULT SPEED	
Range	Function
0.0–100.0%	Indicates the speed the pumps will run at if all zone sensors fail. It does not apply in Sensorless or Hybrid mode.
Parameter: RATED RPM	
Range	Function
0-9999 RPM	The pump rated RPM as indicated on the motor nameplate.
Parameter: RAMP	
Range	Function
1-999 SEC	Indicates the amount of time it will take the pumps to increase their speed from 0% to 100% or to decrease their speed from 100% to 0%.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

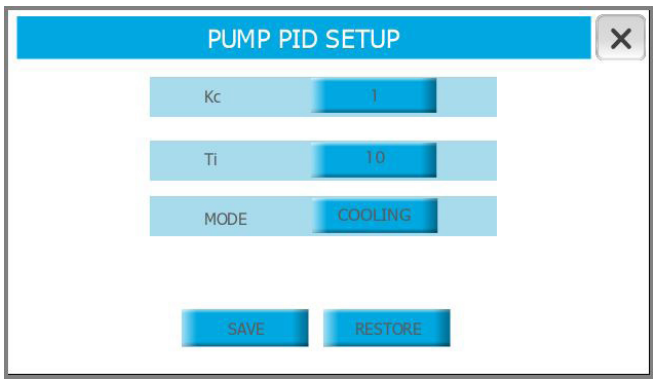
5.1.7 STAGING SETUP



Parameter: STAGE UP DUTY2	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty2 pump will be staged on. (Not available for IVS sensorless drives).
Parameter: STAGE UP DUTY3	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty3 pump will be staged on. (Not available for IVS sensorless drives).
Parameter: STAGE UP DUTY4	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty4 pump will be staged on. (Not available for IVS sensorless drives).
Parameter: STAGE UP DUTY5	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty5 pump will be staged on. (Not available for IVS sensorless drives).
Parameter: STAGE UP DUTY6	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty6 pump will be staged on. (Not available for IVS sensorless drives).
Parameter: STAGE UP DUTY7	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty7 pump will be staged on. (Not available for IVS sensorless drives).
Parameter: STAGE UP DUTY8	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty8 pump will be staged on. (Not available for IVS sensorless drives).
Parameter: STAGE DOWN DUTY2	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty2 pump will be staged off. (Not available for IVS sensorless drives).
Parameter: STAGE DOWN DUTY3	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty3 pump will be staged off. (Not available for IVS sensorless drives).
Parameter: STAGE DOWN DUTY4	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty4 pump will be staged off. (Not available for IVS sensorless drives).

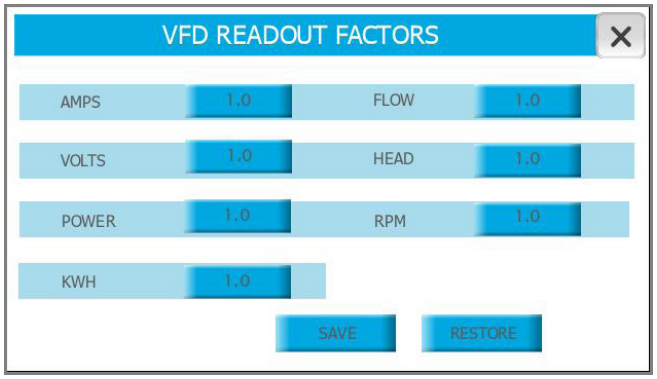
Parameter: STAGE DOWN DUTY5	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty5 pump will be staged off. (Not available for IVS sensorless drives).
Parameter: STAGE DOWN DUTY6	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty6 pump will be staged off. (Not available for IVS sensorless drives).
Parameter: STAGE DOWN DUTY7	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty7 pump will be staged off. (Not available for IVS sensorless drives).
Parameter: STAGE DOWN DUTY8	
Range	Function
0.0–100.0%	Determines the Duty1 pump speed at which the Duty8 pump will be staged off. (Not available for IVS sensorless drives).
Parameter: STAGE ON DELAY	
Range	Function
0.0-999 SEC	Determines the time delay before staging on the next lag pump once the conditions are met. It applies to all drives, including IVS sensorless.
Parameter: STAGE OFF DELAY	
Range	Function
0.0 - 999 SEC	Determines the time delay before staging off the last lag pump once the conditions are met. It applies to all drives, including IVS sensorless.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

5.1.8 PID SETUP



Parameter: Kc	
Range	Function
0–9999	Determines the pump speed control PID loop gain. Smaller values correspond to a more responsive controller.
Parameter: Ti	
Range	Function
0–999	Determines the pump speed control PID loop integral time. Larger values correspond to more iterations and reduction of steady state error.
Parameter: MODE	
Options	Function
COOLING	The speed of pumps will increase when the Active Zone present value is below the set point.
HEATING	The speed of pumps will decrease when the Active Zone present value is below the set point.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

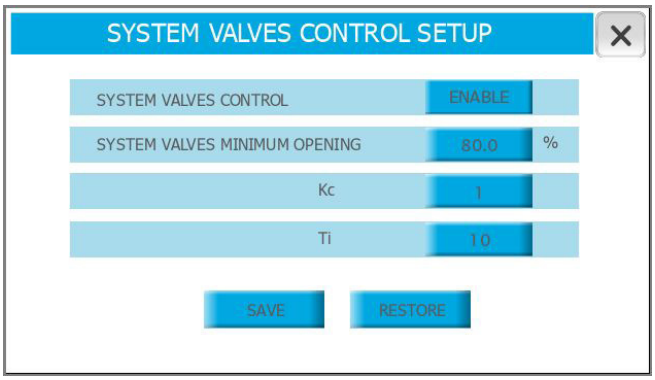
5.1.9 VFD READOUT SETUP



Parameter: AMPS	
Range	Function
0.01–100	The current value read from the VFD is scaled by this factor.
Parameter: VOLTS	
Range	Function
0.01–100	The voltage value read from the VFD is scaled by this factor.
Parameter: POWER	
Range	Function
0.01–100	The kW value read from the VFD is scaled by this factor.
Parameter: KWH	
Range	Function
0.01–100	The kWh value read from the VFD is scaled by this factor.
Parameter: FLOW	
Range	Function
0.01–100	The flow value read from the VFD is scaled by this factor.
Parameter: HEAD	
Range	Function
0.01–100	The head value read from the VFD is scaled by this factor.

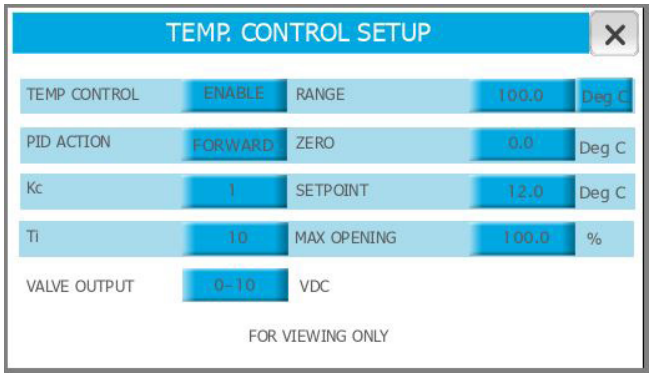
Parameter: RPM	
Range	Function
0.01–100	The RPM value read from the VFD is scaled by this factor.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

5.1.10 SYSTEM VALVES CONTROL SETUP



Parameter: SYSTEM VALVES CONTROL	
Options	Function
DISABLED	System valves control is disabled.
ENABLED	System valves control is enabled. The IPS will receive the position of the most open system valve from the BMS. The Active Zone Setpoint will then be adjusted based on a PID loop in order to maintain the position of this most open system valve at the **System Valves Minimum Opening** setpoint.
Parameter: SYSTEM VALVES MINIMUM OPENING	
Range	Function
0.0–100.0%	Indicates the setpoint for the optimum opening of the system valves. Setpoint should be at 95.0% in order to comply with ASHRAE 90.1 requirement.
Parameter: Kc	
Range	Function
0–9999	Determines the system valve control PID loop gain. Smaller values correspond to a more responsive controller.
Parameter: Ti	
Range	Function
0–999	Determines the system valve control PID loop integral time. Larger values correspond to more iterations and reduction of steady state error.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

5.1.11 TEMPERATURE CONTROL SETUP



This feature is not available on IPS 4001W.

Parameter: TEMP CONTROL	
Options	Function
DISABLE	The temperature control setup is disabled. The temperature control button on the main menu is not displayed.
ENABLE	The temperature control setup is enabled. The PLC will control a modulating valve to maintain the temperature at setpoint. The temperature control button on the main menu is displayed.

Parameter: PID ACTION	
Options	Function
FORWARD	The valve closes if the temperature is under the setpoint.
REVERSE	The valve opens if the temperature is under the setpoint.

Parameter: Kc	
Range	Function
0–9999	Determines the valve control PID loop gain. Smaller values correspond to a more responsive controller.

Parameter: Ti	
Range	Function
0–999	Determines the valve control PID loop integral time. Larger values correspond to more iterations and reduction of steady state error.

Parameter: VALVE OUTPUT	
Options	Function
0-10 VDC	0 VDC commands the valve as fully closed, 10 VDC as fully open.
2-10 VDC	2 VDC commands the valve as fully closed, 10 VDC as fully open.

Parameter: RANGE	
Range	Function
0.0–999.9	Indicates the range of the temperature sensor in engineering units. This value corresponds to the sensor's 20mA output.

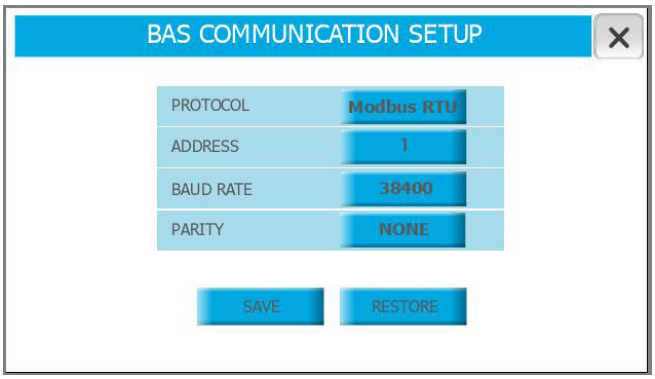
Parameter: UNITS	
Option:	Function
°C	Temperature sensors in °C are used.
°F	Temperature sensors in °F are used.

Parameter: ZERO	
Range	Function
0.0–999.9	Indicates the zero of the temperature sensor in engineering units. This value corresponds to the sensor's 4mA output.

Parameter: SETPOINT	
Range	Function
0.0–999.9	Indicates the setpoint of the temperature sensor in engineering units.

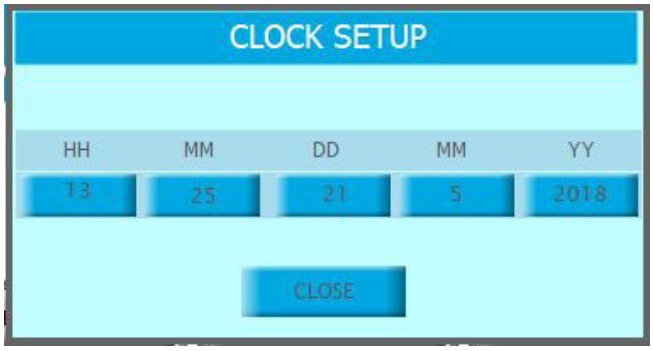
Parameter: MAX OPENING	
Range	Function
0.0–100.0%	Determines the maximum allowable opening (in %) of the valve.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

5.1.12 BAS COMMUNICATION SETUP



Parameter: PROTOCOL	
Options	Function
N/A	No BAS protocol is selected.
Modbus	Selects Modbus RTU.
BACnet	Selects BACnet.
Parameter: ADDRESS	
Range	Function
0–127	Selects the IPS BAS address. Only applies to Modbus RTU protocol.
Parameter: BAUD RATE	
Options	Function
9600	Selects 9600 as baud rate. Only applies to Modbus RTU protocol.
19200	Selects 19200 as baud rate. Only applies to Modbus RTU protocol.
38400	Selects 38400 as baud rate. Only applies to Modbus RTU protocol.
Parameter: PARITY	
Options	Function
NONE	No parity is used.
ODD	Odd parity is used.
EVEN	Even parity is used.
Button	
SAVE	Saves current parameters as default. Only available in Level 2.
RESTORE	Restores default parameters. Only available in Level 1 & 2.

5.1.13 CLOCK SETUP



Level 2 password is required to access this screen.

Parameter: HH	
Range	Function
0 – 24	System clock hour
Parameter: MM	
Range	Function
0 – 60	System clock minute
Parameter: DD	
Range	Function
1 – 31	System clock day
Parameter: MM	
Range	Function
1 – 12	System clock month
Parameter: YY	
Range	Function
00 - 99	System clock year
Button	
CLOSE	Saves current parameters as default

6.0 IPS 4000 CONTROL SYSTEM SERVICE LIFECYCLE

MANUFACTURER'S SUGGESTED MAINTENANCE SCHEDULE AND COMPONENT LIFE		YEAR AFTER INSTALLATION									
		1	2	3	4	5	6	7	8	9	10
SOFTWARE AND SETTINGS	**MAINTENANCE**										
All firmware	As required by manufacturer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Optimization logic & control programming	As service packs as released by Armstrong	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PANELS & PC/TOUCHSCREEN											
Integrated PC & touchscreen	Replace PC & touchscreen					✓					
PLCS	Check and confirm voltage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PLCS and associated components	Replace										✓
Power supply	Check and confirm voltage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Power supply	Replace on failure										
Panel integrity (gasket, terminals, glands...)	Inspect and repair as needed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Panel filter (when included)	Inspect and clean as needed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SENSORS											
Water temperature sensor(s)	Confirm accuracy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water flow sensor	Confirm accuracy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pressure differential sensor(s)	Confirm accuracy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

NOTES

- As with any system the component life expectancy varies according to usage and operating conditions.
- Components operating inside of a clean and weather controlled environment will typically last longer than components exposed to the elements or otherwise operating in dirty environments.
- Component life expectancy also varies according to the power quality (absence of harmonic distortion) and consistency of voltage supplied to the device.

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