

IPS controller 4000

Integrated pumping
system for variable
primary application

Installation and operating instructions

File No: 90.973
Date: JANUARY 31, 2019
Supersedes: NEW
Date: NEW

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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 100-240 VAC / 50-60 Hz as standard. Please refer to the wiring diagram supplied with the unit for instructions on connecting power to the IPS controller.

Incoming supply - IPS system on rack: 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

Prior to using the display to configure the IPS controller, make sure all the field installed devices such as DP sensors, flow sensors, temperature sensors 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 through a hard wired option. Please refer to the IPS controller generic terminal block diagram 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): _____

MOTOR DATA

Horsepower: _____

Speed: _____

Voltage: _____

FLA rating: _____

Service factor: _____

FL efficiency: _____

FL slip: _____

Power factor: _____

Temperature class: _____

* If not known use pump selection point flow and head

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 4501W/4502W/4503W/4504W 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, chillers/boilers, sensor range, etc.).

OPERATION DISPLAYS:

- Welcome screen
- Main menu
- System overview
- Pump overview
- Sensorless overview
- Pump control
- Zone overview
- Bypass valve 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
- Flow setup
- Chiller/boiler 1 to 8 setup
- Bypass valve setup
- System valve setup
- Temp control setup
- BAS setup
- Clock setup
- Login

4.0 OPERATION DISPLAYS

4.1.0 WELCOME SCREEN



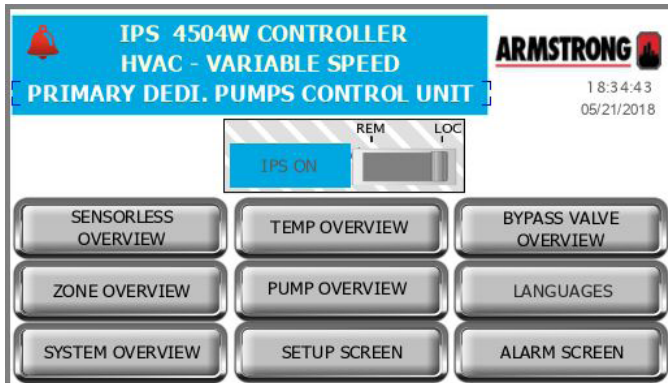
Description

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.

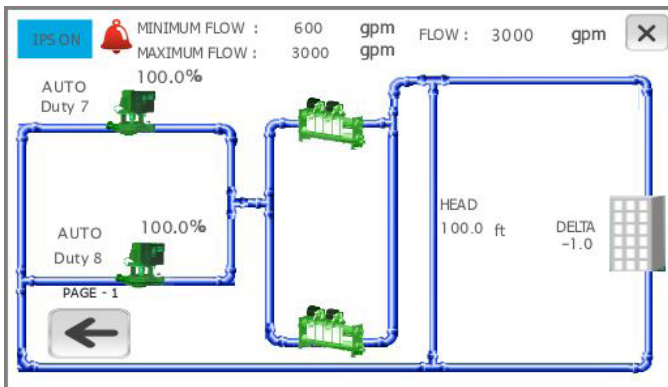
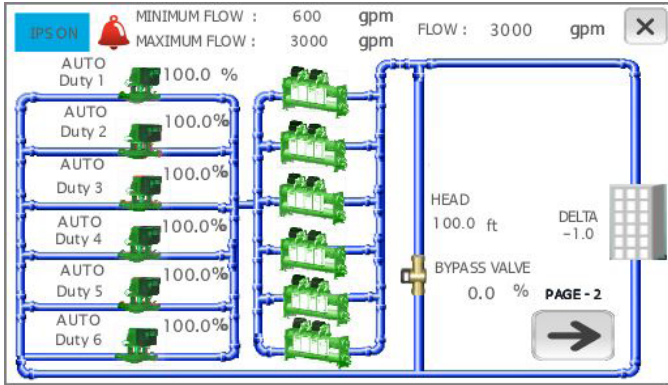
Data

| | |
|------------|---|
| 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 4501W. |
| BYPASS VALVE OVERVIEW | Navigates to the Bypass Valve Overview screen. |
| 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 (dedicated or headered) by showing the number of pumps, chillers/boilers, system flow, bypass valve, zone PVs or head and flow. If more than 6 pumps or chillers/boilers, 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.

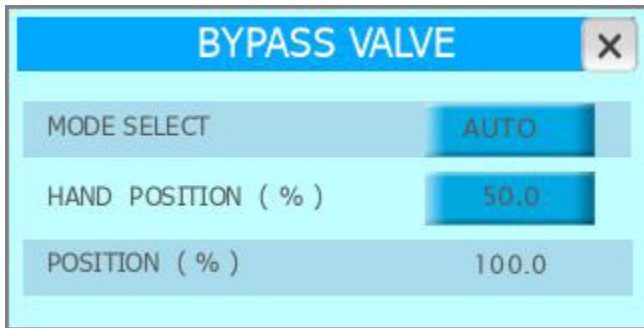
Data

| | |
|-------------------------------------|---|
| 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. |
| Chiller/boiler 1 to 8 status | The icons show the device status: grey - stopped; green - running |
| 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. |
| BYPASS VALVE | Indicates valve position in percentage (100% means fully open). |
| 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. |
| MINIMUM FLOW | Indicates the rated minimum chiller/boiler flow. Updates dynamically based on number of chillers/boilers enabled. |
| MAXIMUM FLOW | Indicates the rated maximum chiller/boiler flow. Updates dynamically based on number of chillers/boilers enabled. |

4.1.3 CHILLER/BOILER FACEPLATE



4.1.4 BYPASS VALVE FACEPLATE



Buttons

| | |
|----------------------------|--|
| Pump 1 to 8 icon | Touching a pump icon brings up the corresponding Pump Control screen. |
| Chiller/Boiler 1 to 8 icon | Touching a chiller/boiler icon brings up the corresponding Chiller/Boiler Faceplate. |
| Bypass Valve Icon | Touching the bypass valve icon brings up the Bypass Valve Faceplate. |
| Alarm Bell | Touching the alarm bell navigates to the Alarm Screen. |

Description

This faceplate is a quick access screen for viewing the rated minimum and maximum flow of each chiller/boiler from System Overview screen. Press the x on the top right corner to return to the previous screen.

Description

This faceplate is a quick access screen for viewing and modifying the bypass valve from System Overview screen. Press the x on the top right corner to return to the previous screen.

Data

| | |
|--------------|---|
| POSITION (%) | Indicates valve position in percentage (100% means fully open). |
|--------------|---|

Buttons

| | |
|-------------------|--|
| MODE SELECT | Allows user to select the operation mode manual or auto. |
| HAND POSITION (%) | If manual mode is selected, the user can enter the desired valve position. |

4.1.5 PUMP OVERVIEW

| PUMP OVERVIEW | | | |
|---------------|--------|--------|--------|
| LEGEND | Pump 1 | Pump 2 | Pump 3 |
| MODE | AUTO | AUTO | AUTO |
| DUTY STATUS | Duty 1 | Duty 2 | Duty 3 |
| STATUS | Run | Run | Run |
| SPEED % | 100.0 | 100.0 | 100.0 |
| SPEED RPM | 1418 | 1418 | 1418 |
| RUN HRS | 360 | 358 | 359 |

MAIN MENU SYSTEM VIEW SENSORLESS ALARMS

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. |

4.1.6 SENSORLESS OVERVIEW

| SENSORLESS OVERVIEW | | | |
|---|--------|----------------------|--------|
| LEGEND | Pump 1 | Pump 2 | Pump 3 |
| MODE | AUTO | AUTO | AUTO |
| DUTY STATUS | Duty 1 | Duty 2 | Duty 3 |
| STATUS | Run | Run | Run |
| FLOW (gpm) | 450 | 450 | 450 |
| HEAD (ft) | 10.0 | 10.0 | 10.0 |
| TOTAL FLOW: 2800 gpm | | TOTAL HEAD: 105.0 ft | |
| <div style="display: flex; justify-content: space-around;"> MAIN MENU SYSTEM VIEW PUMP VIEW ALARMS </div> | | | |

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.

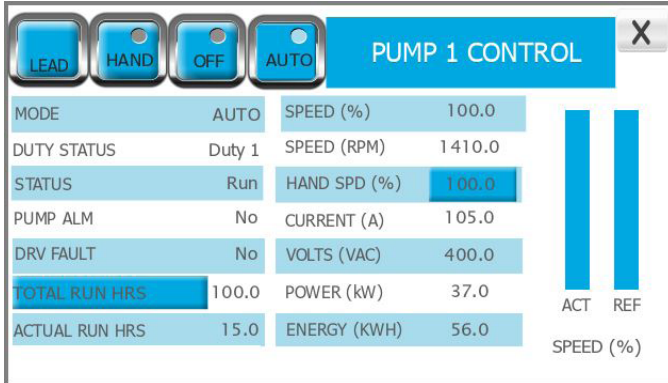
Data

| | |
|--------------------------------|--|
| 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. |

4.1.7 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 kW. |
| 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. |

4.1.8 ZONE OVERVIEW

| ZONE OVERVIEW | | | |
|-----------------------|----------|--------|--------|
| LEGEND | ZONE 1 | ZONE 2 | ZONE 3 |
| ACTUAL (psi) | 38.0 | 37.5 | 34.0 |
| SET POINT (psi) | 36.0 | 36.0 | 36.0 |
| DEVIATION (psi) | 2.0 | 1.5 | -2.0 |
| STATUS | ENABLE | ENABLE | ENABLE |
| ACTIVE ZONE | 3 | | |
| ACTIVE ZONE DEVIATION | -2.0 psi | | |

MAIN MENU SYSTEM VIEW PUMP VIEW ALARMS

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. |

4.1.9 BYPASS VALVE OVERVIEW

| BYPASS VALVE OVERVIEW | |
|------------------------|------|
| MODE SELECT | AUTO |
| HAND POSITION (%) | 50.0 |
| POSITION (%) | 0.0 |
| ACTUAL FLOW PV (gpm) | 3000 |
| MINIMUM FLOW (gpm) | 600 |
| MAXIMUM FLOW (gpm) | 3000 |

MAIN MENU SYSTEM VIEW PUMP VIEW ALARMS

Description

This screen allows monitoring bypass valve information.

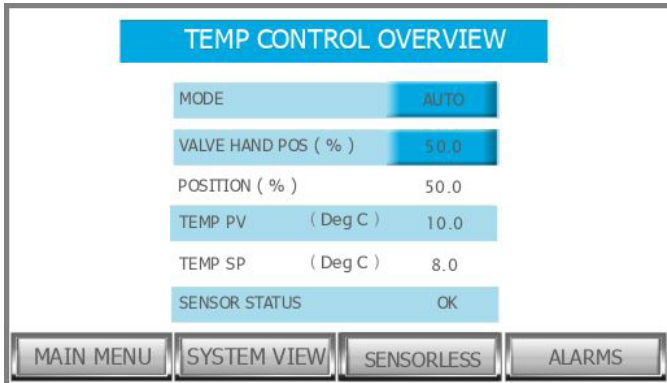
Data

| | |
|----------------|--|
| POSITION (%) | Indicates valve position in percentage (100% means fully open). |
| ACTUAL FLOW PV | Displays system flow in the selected unit. Obtained from flow meter or from sensorless readout depending on the selection. |
| MINIMUM FLOW | Indicates rated minimum chiller/boiler flow in the selected unit. Updates dynamically based on number of chillers/boilers enabled. |
| MAXIMUM FLOW | Indicates rated maximum chiller/boiler flow in the selected unit. Updates dynamically based on number of chillers/boilers enabled. |

Buttons

| | |
|---------------------|--|
| MODE SELECT | Allows user to select the operation mode MANUAL or AUTO. |
| HAND POSITION (%) | If MANUAL 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. |
| 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. |

4.1.10 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 4501W.

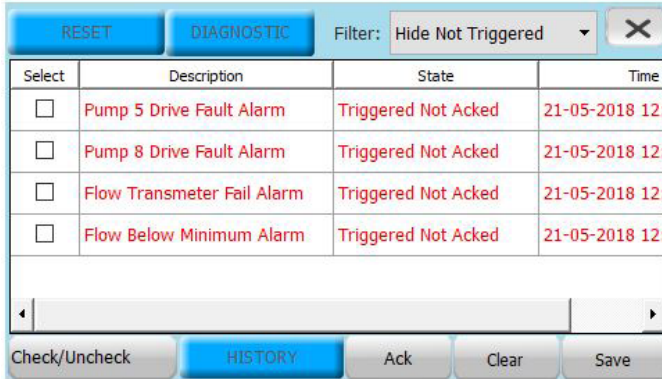
Data

| | |
|----------------------|---|
| 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. |

4.1.11 ALARM SCREENS



Description

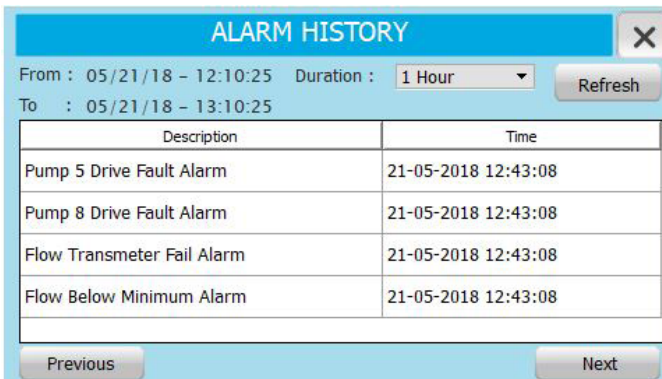
This screen shows the current alarms in the system. Press the x on the top right corner to return to the previous screen.

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: <ol style="list-style-type: none"> 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.

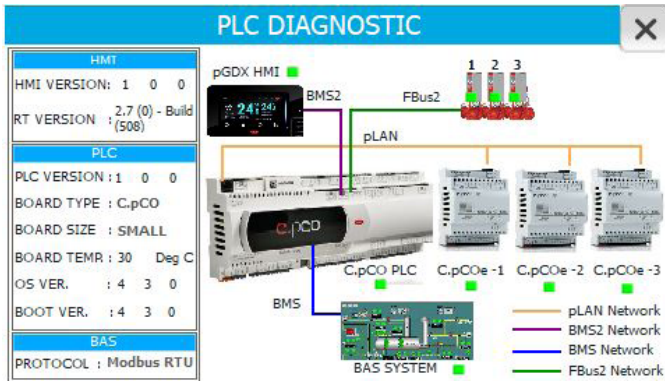
Data

| | |
|--------------------|---|
| 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 filter 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. |

4.1.12 PLC DIAGNOSTIC



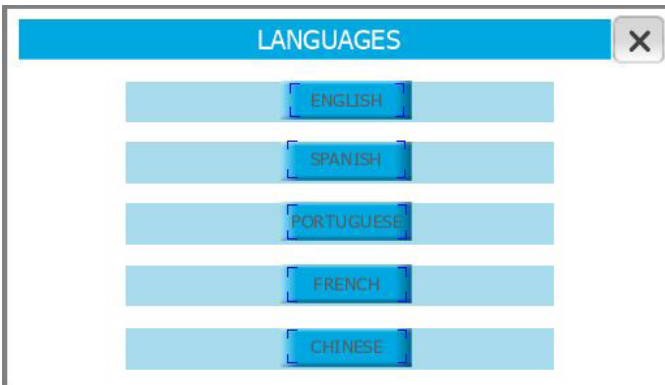
Description

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) |

4.1.13 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. | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> VFD not configured for serial communication Loose or broken wire from VFD Incorrect VFD type selected on IPS Impeller is stuck |
| Drive n communication alarm | Indicates VFD of pump n failed to communicate with PLC. | <ul style="list-style-type: none"> 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. |
| Flow transmitter fail alarm | Indicates flow transmitter is out of range. | <ul style="list-style-type: none"> Connection to transmitter is short or open circuited Damaged PLC analog input Loose or broken wire from transmitter Damaged transmitter |
| Zone n transmitter alarm | Indicates transmitter of zone n is out of range. | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> Connection to sensor is short or open circuited Damaged PLC analog input Loose or broken wire from sensor Damaged sensor |
| Chiller/boiler flow below minimum alarm | Indicates system flow is less than chiller/boiler total minimum set value. | <ul style="list-style-type: none"> Incorrect calibration of flow meter Bypass valve not open Flow obstruction in the pipe |
| Chiller/boiler flow above maximum alarm | Indicates system flow is greater than chiller/boiler total maximum set value. | <ul style="list-style-type: none"> Incorrect calibration of flow meter Bypass valve not close Incorrect design sensorless data |

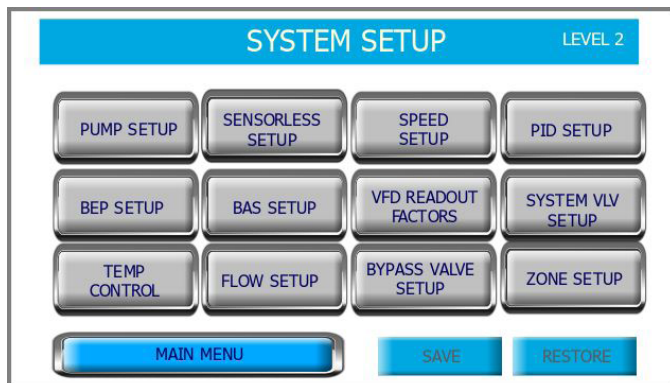
5.0 SETUP DISPLAYS

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

| Level | Actions allowed |
|---------|---|
| Level 0 | <ul style="list-style-type: none"> View only |
| Level 1 | <ul style="list-style-type: none"> Modify all parameters, except pump PID and BAS parameters Restore previously saved default values (factory defaults) |
| Level 2 | <ul style="list-style-type: none"> Modify all parameters Save changes Restore previously saved default values (factory defaults) |

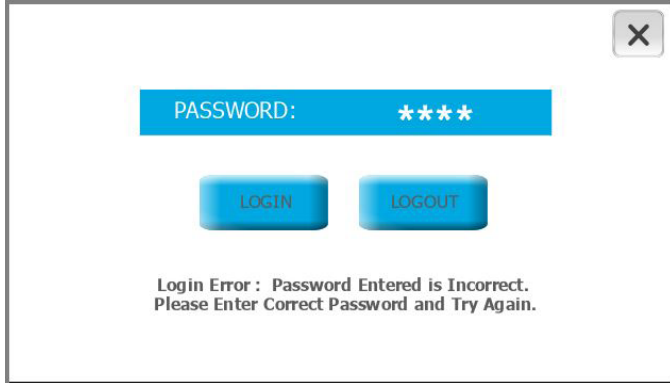
The following sections list and describe each setup screen. Only Level 2 screens are shown, however each level has the same screens with their respective level restrictions.

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 4501W. |
| FLOW SETUP | Navigates to the Flow Setup screen. |
| BYPASS VALVE SETUP | Navigates to the Bypass Valve Setup screen. |
| 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.

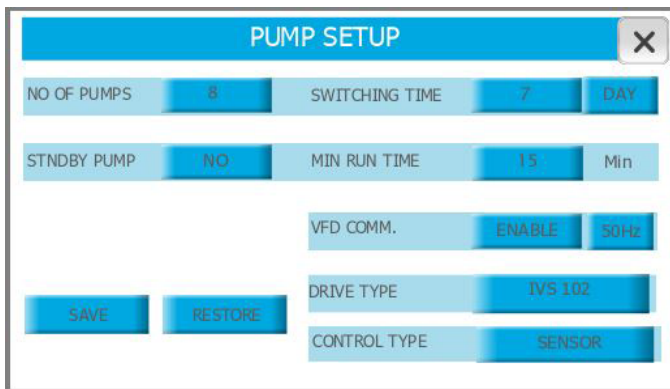
Data

| | |
|-----------------|---|
| 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 PUMPS

| 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 Duty1 pump also rotates the Standby Pump to achieve even hours of operation. |

Parameter: SWITCHING TIME

| Range | Function |
|---------------------|---|
| 1-999 (Days, Hours) | Indicates how often the lead (Duty1) pump will rotate among the duty pumps. |

Parameter: MIN RUN TIME

| Range | Function |
|---------------|---|
| 1-999 minutes | Indicates what is the minimum time the lead (Duty1) 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. |

5.1.3 SENSORLESS SETUP

The screenshot shows a 'SENSORLESS SETUP' window with the following parameters and values:

| Parameter | Value | Unit | Parameter | Value | Unit |
|-----------|-------|------|----------------|-------|------|
| FLOW BEP | 150 | gpm | FLOW DESIGN | 160 | gpm |
| HEAD BEP | 50.0 | ft | HEAD DESIGN | 80.0 | ft |
| DEAD BAND | 0.1 | | ZERO FLOW HEAD | 32.0 | ft |
| HEAD UNIT | ft | | FLOW UNIT | gpm | |
| SENS ADJ | 30 | % | | | |

Buttons: SAVE, RESTORE

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). |

Buttons

| | |
|---------|---|
| SAVE | Saves current parameters as default. Only available in Level 2. |
| RESTORE | Restores default parameters. Only available in Level 1 & 2. |

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 to 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 |
| Buttons | |
| 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. |

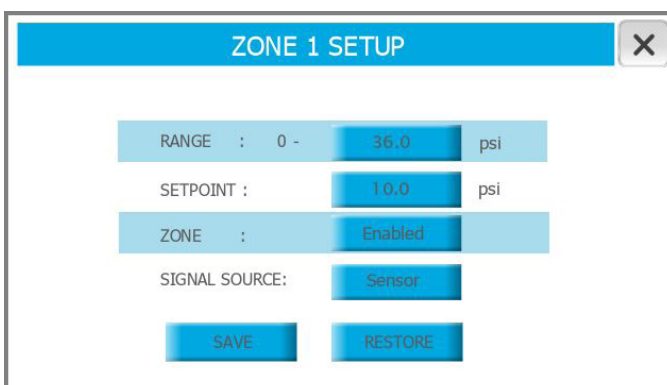
Parameter: ENG. UNIT

| 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. |

Buttons

| | |
|-----------|---|
| 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: SETPOINT

| 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

| Range | Function |
|--------|--|
| Sensor | The signal is obtained directly from a sensor. |
| BAS | The signal is obtained from the BAS. |

Buttons

| | |
|---------|---|
| 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 |

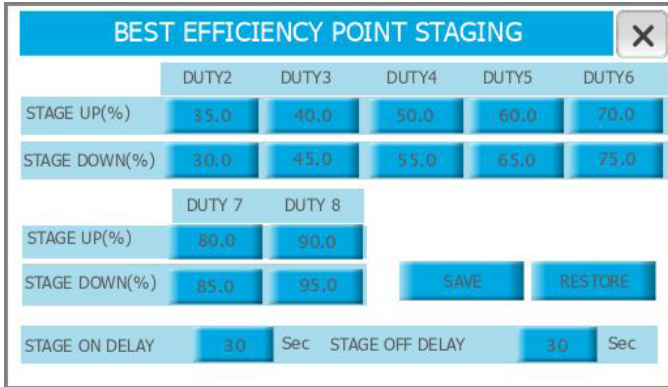
| Parameter: DEFAULT SPEED | |
|--------------------------|---|
| Range | Function |
| 0.0 – 100.0% | Indicates the speed the pumps will run at if all zone sensors fail. It does not apply in Sensorless or Hybrid mode. |

| 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% |

| Buttons | |
|---------|---|
| 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). |

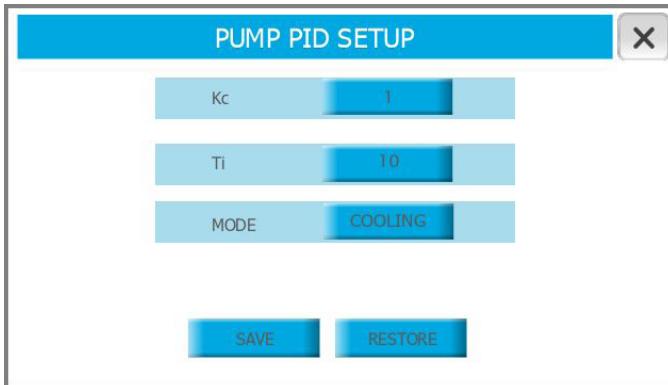
| Parameter: STAGE DOWN DUTY2 | |
|-----------------------------|--|
| Range | Function |
| 0.0 – 100.0% | Determines the Duty1 pump speed at which the Duty2 pump will be staged off. (Not available for IVS sensorless drives). |

| 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. |
| Buttons | |
| 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. |

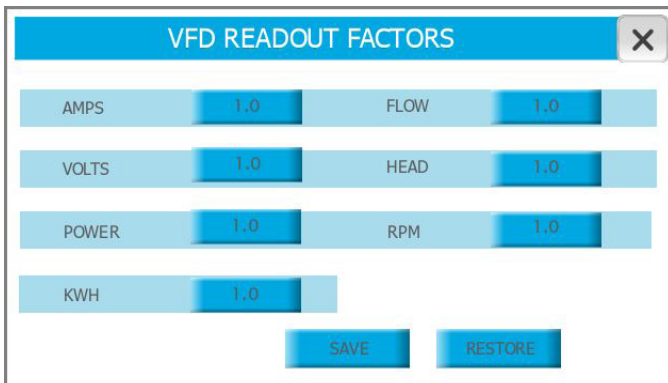
Parameter: MODE

| 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. |

Buttons

| | |
|---------|---|
| 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. |

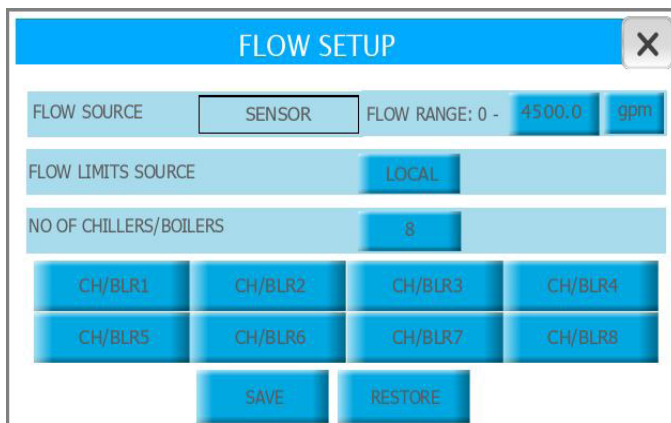
Parameter: FLOW

| 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. |

5.1.10 FLOW SETUP



| Parameter: RPM | |
|----------------|---|
| Range | Function |
| 0.01 – 100 | The RPM value read from the VFD is scaled by this factor. |

| Buttons | |
|---------|---|
| SAVE | Saves current parameters as default. Only available in Level 2. |
| RESTORE | Restores default parameters. Only available in Level 1 & 2. |

| Parameter: FLOW SOURCE (read only) | |
|------------------------------------|--|
| Options | Function |
| SENSOR | Indicates that the flow is obtained from a sensor. This parameter is automatically set based on the VFD type selected on the Pump Setup screen. |
| SENSOR-LESS | Indicates that the flow is obtained from Sensorless VFDs. This parameter is automatically set based on the VFD type selected on the Pump Setup screen. |

| Parameter: FLOW RANGE | |
|-----------------------|--|
| Options | Function |
| 0 – 32767 | Indicates the range of the flow sensor in engineering units. This value corresponds to the sensor's 20mA output. Note: this parameter only appears when FLOW SOURCE is SENSOR. |

| Parameter: FLOW ENG. UNIT | |
|---------------------------|---|
| Options | Function |
| gpm | Flow sensor in gpm is used. |
| L/s | Flow sensor in L/s is used. |
| m ³ /h | Flow sensor in m ³ /h is used. |

| Parameter: FLOW LIMITS SOURCE | |
|-------------------------------|---|
| Options | Function |
| LOCAL | Select LOCAL to manually setup the number of available chillers or boilers and enter flow limits of each unit on the corresponding Chiller/Boiler Setup screen. IPS 4000 uses digital inputs to determine which chillers/boilers are enabled. |
| BAS | Select BAS for automatic selection of chiller/boiler minimum and maximum flow obtained from BAS. |

| Parameter: NO OF CHILLERS/BOILERS | |
|-----------------------------------|---|
| Range | Function |
| 1 – 8 | Indicates number of chillers/boilers installed in the system. |

| Buttons | |
|--------------------|---|
| CH/BLR1 to CH/BLR8 | Touching a Chiller/Boiler button brings up the corresponding Chiller/Boiler Setup screen. |
| SAVE | Saves current parameters as default. Only available in Level 2. |
| RESTORE | Restores default parameters. Only available in Level 1 & 2. |

5.1.11 CHILLER/BOILER 1 TO 8 SETUP



There is one popup screen per chiller/boiler. Only accessible when FLOW LIMITS SOURCE is set to LOCAL.

Parameter: MINIMUM FLOW

| Range | Function |
|-----------|--|
| 0 - 32767 | Rated minimum flow across the chiller or boiler. |

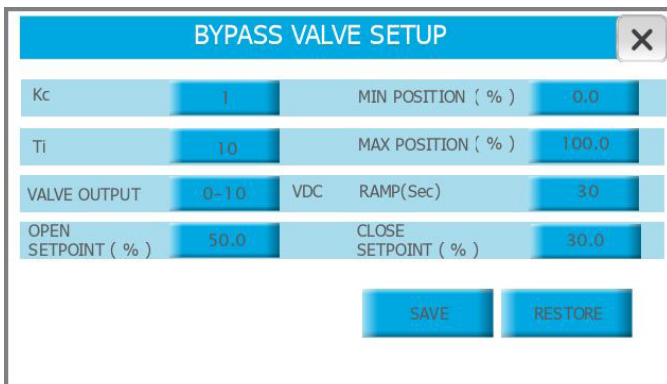
Parameter: MAXIMUM FLOW

| Range | Function |
|-----------|--|
| 0 - 32767 | Rated maximum flow across the chiller or boiler. |

Buttons

| | |
|---------|---|
| SAVE | Saves current parameters as default. Only available in Level 2. |
| RESTORE | Restores default parameters. Only available in Level 1 & 2. |

5.1.12 BYPASS VALVE SETUP



Parameter: Kc

| Range | Function |
|----------|---|
| 0 - 9999 | Determines the bypass valve control PID loop gain. Smaller values correspond to a more responsive controller. |

Parameter: Ti

| Range | Function |
|---------|--|
| 0 - 999 | Determines the bypass 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: MINIMUM POSITION

| Range | Function |
|--------------|--|
| 0.0 - 100.0% | Minimum position the valve is allowed to open. |

Parameter: MAXIMUM POSITION

| Range | Function |
|--------------|--|
| 0.0 - 100.0% | Maximum position the valve is allowed to open. |

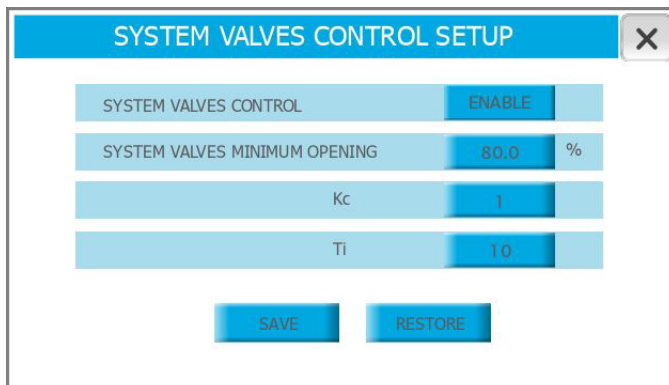
Parameter: RAMP

| Range | Function |
|-------------|--|
| 1 - 999 Sec | Indicates the amount of time it will take the valve to open from 0% to 100% or to close from 100% to 0%. |

Parameter: OPEN SETPOINT

| Range | Function |
|--------------|---|
| 0.0 - 100.0% | When system flow is under the chiller/boiler minimum and the bypass valve is open at this percentage (or above), the pumps will ramp up to maximum speed. |

5.1.13 SYSTEM VALVE CONTROL SETUP



Parameter: CLOSE SETPOINT

| Range | Function |
|--------------|---|
| 0.0 – 100.0% | When system flow is above the chiller/boiler minimum and the bypass valve is closing and reaches this percentage (or below), the pumps will return to their normal speed. |

Buttons

| | |
|---------|---|
| SAVE | Saves current parameters as default. Only available in Level 2. |
| RESTORE | Restores default parameters. Only available in Level 1 & 2. |

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. |

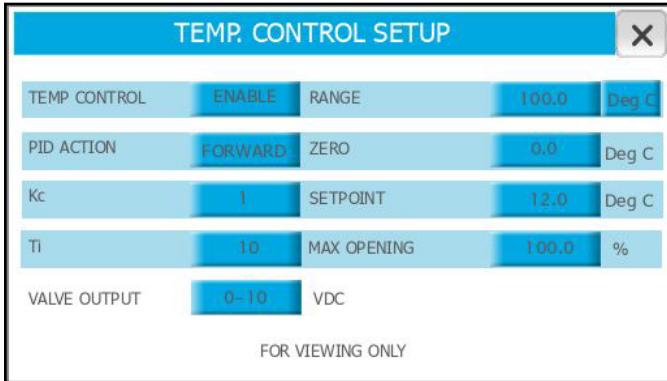
Parameter: Ti

| 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. |

Buttons

| | |
|---------|---|
| SAVE | Saves current parameters as default. Only available in Level 2. |
| RESTORE | Restores default parameters. Only available in Level 1 & 2. |

5.1.14 TEMP CONTROL SETUP



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. |

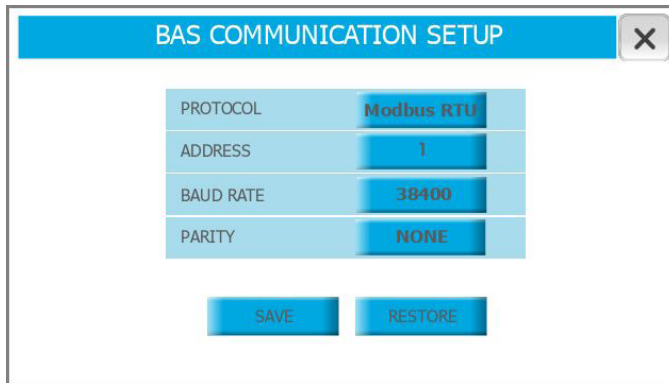
Parameter: UNITS

| Options | Function |
|---------|-------------------------------------|
| Deg C | Temperature sensors in °C are used. |
| Deg 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. |

5.1.15 BAS COMMUNICATION SETUP



| 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. |

| Buttons | |
|---------|---|
| SAVE | Saves current parameters as default. Only available in Level 2. |
| RESTORE | Restores default parameters. Only available in Level 1 & 2. |

| Parameter: PROTOCOL | |
|---------------------|-----------------------------|
| Options | Function |
| N/A | No BAS protocol is selected |
| Modbus | Selects Modbus RTU |
| BACnet | Selects BACnet |

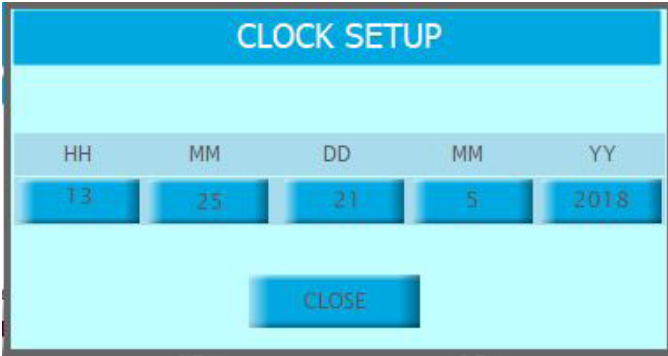
| Parameter: ADDRESS | |
|--------------------|---|
| Range | Function |
| 0 – 127 | Selects the IPS BAS address. Only applies to Modbus RTU protocol. |

| 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. |

| Buttons | |
|---------|---|
| SAVE | Saves current parameters as default. Only available in Level 2. |
| RESTORE | Restores default parameters. Only available in Level 1 & 2. |

5.1.16 CLOCK SETUP



| 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.

TORONTO

23 BERTRAND AVENUE
TORONTO, ONTARIO
CANADA
M1L 2P3
+1 416 755 2291

BUFFALO

93 EAST AVENUE
NORTH TONAWANDA, NEW YORK
U.S.A.
14120-6594
+1 716 693 8813

BIRMINGHAM

HEYWOOD WHARF, MUCKLOW HILL
HALESOWEN, WEST MIDLANDS
UNITED KINGDOM
B62 8DJ
+44 (0) 8444 145 145

MANCHESTER

WOLVERTON STREET
MANCHESTER
UNITED KINGDOM
M11 2ET
+44 (0) 8444 145 145

BANGALORE

#59, FIRST FLOOR, 3RD MAIN
MARGOSA ROAD, MALLESWARAM
BANGALORE, INDIA
560 003
+91 (0) 80 4906 3555

SHANGHAI

UNIT 903, 888 NORTH SICHUAN RD.
HONGKOU DISTRICT, SHANGHAI
CHINA
200085
+86 (0) 21 5237 0909

SÃO PAULO

RUA JOSÉ SEMIÃO RODRIGUES AGOSTINHO,
1370 GALPÃO 6
EMBU DAS ARTES
SAO PAULO, BRAZIL
+55 11 4785 1330

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ESTABLISHED 1934

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