

IPS controller 4000

Integrated pumping
system for variable
secondary application

Installation and operating instructions

File No: 90.95
Date: OCTOBER 31, 2017
Supersedes: 90.95
Date: JULY 25, 2014

—

—

—

—

CONTENTS

1.0	IPS controllers 4000	4
1.1	Installation instructions	4
1.2	Field devices installation instructions	4
1.3	Building automation system (BAS) connection	4
2.0	IPS commissioning check sheet	5
3.0	IPS 4000 function displays	6
4.0	Operation displays	7
5.0	Setup displays	17

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 115VAC/1/60 or 230VAC/1/50 as standard. Please refer to drawings the wiring diagram supplied with the unit for instructions to connect to IPS controller terminal block.

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 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, flow 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

1.3 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, LonWorks 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 4001 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: _____
 Pump end of curve flow rating: _____
 Pump end of curve pressure rating: _____
 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
Zone legend											
DP sensor range											
Zone set-point											

Rate of speed change/ramp time (0 - full speed): 20 sec _____
 Minimum speed (factory set 30%): _____
 Maximum speed (factory set 100%): _____
 Flow sensor range: _____
 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 4001 / 4002 / 4003 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:

- Main menu
- System overview
- Zone overview
- Pump overview
- Sensorless overview
- Pump control
- Temp control overview
- Auto bypass reset
- Login
- Alarm overview
- Diagnostics
- Languages

SETUP DISPLAYS:

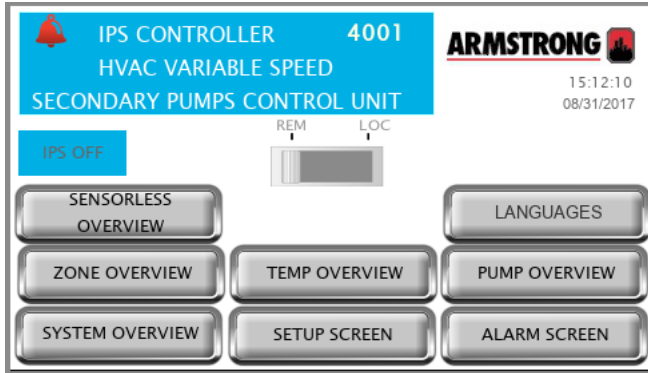
The setup displays are divided in three levels with each level having the same number of displays with different level of access. Level 0 setup displays are for viewing only and no adjustments can be made. Level 1 setup displays can be used for changing the system setup and restoring the system factory defaults. Level 2 setup displays can be used for changing 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
- Zone setup
- Zone 1 to 12 setup
- Sensorless setup
- Pump setup
- Speed setup
- Staging setup
- PID setup
- BAS setup
- Clock setup
- Temperature control setup
- System valves setup
- VFD readout setup

4.0 OPERATION DISPLAYS

4.1.0 MAIN MENU



Description

This is the screen the operator will see when powering up the unit. Offers status of system's most important variables and navigation to all system screens

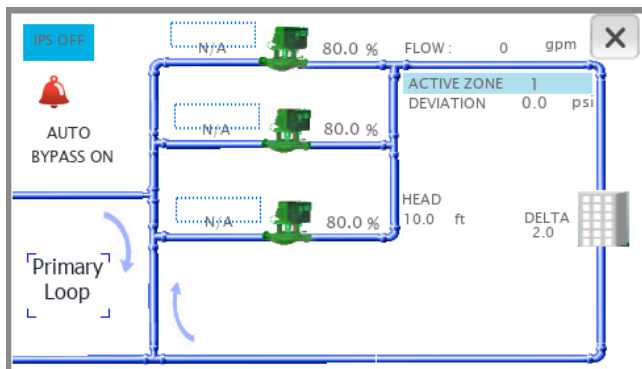
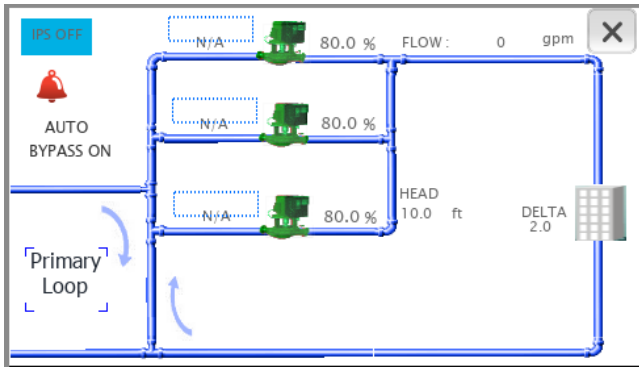
Data

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 changing the IPS mode to Remote or Local. Local will turn on the IPS immediately. Remote causes the IPS to follow the BAS signal (hardwired or serial communication) to turn on or off
ZONE OVERVIEW	Changes the screen to zone overview. Not available if the VFD type is IVS sensorless
SENSORLESS OVERVIEW	Changes the current screen to sensorless overview. Not available if the VFD type is FC102
SYSTEM OVERVIEW	Changes the current screen to system overview
TEMP OVERVIEW	Changes the current screen to temp overview. Only available if the temperature control is enabled
SETUP SCREEN	Navigates to the setup menu level 0 screen
PUMP OVERVIEW	Navigates to the pump overview screen
ALARM SCREEN	Shows the alarm screen. If there is an active alarm, this button turns red

4.1.1 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, the zone PVs or head and flow. Press the x on the top right corner to go back to the previous screen

Data

Pump 1 to 6 status	The pump icon shows the pump status: grey - stopped green - running red - alarm
Pump 1 to 6 mode	Shows each pump mode: Hand, Off or Auto
Pump 1 to 6 duty	Shows each pump duty: Duty1, Duty2, Duty3, Duty4, Duty5, Duty6 or Stand-by
Pump 1 to 6 speed	Shows each pump speed in percentage
ACTIVE ZONE	Indicates which zone is assigned as active. Not visible if the vFD type is IVS sensorless
ERROR	Indicates the active zone error. Not visible if the vFD type is IVS sensorless
AUTO BYPASS	Indicates the pump auto bypass condition (set at 4.1.7)
MAX OPEN VLV	Indicates the opening of the driving system valve. Not visible if the vFD type is IVS sensorless and the system valves control is not enabled
FLOW	Indicates the total flow in the system. Only visible if the vFD type is IVS sensorless
HEAD	Indicates the total head in the system. Only visible if the vFD type is IVS sensorless
ERROR (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 6 icon	Touching a pump icon brings up the corresponding pump control screen
ALARM BELL	Alarm Bell is provided with navigation to the Alarm Page. User can go to the Alarm Page by clicking on Alarm bell present on the HMI screen

4.1.2 ZONE OVERVIEW

ZONE OVERVIEW			
LEGEND	ZONE 1	ZONE 2	ZONE 3
ACTUAL (psi)	12.0	13.0	9.0
SET POINT (psi)	10.0	10.0	10.0
DEVIATION (psi)	2.0	3.0	-1.0
STATUS	ENABLE	ENABLE	ENABLE
ACTIVE ZONE		3	
ACTIVE ZONE DEVIATION		-1.0	psi

Description

Shows an overview of the system zones. If there are more than 3 zones, use the grey arrows to scroll. This screen is not available if the VFD type is IVS sensorless

Data

ACTUAL	Indicates the present value of the zone sensor in the selected units
SET POINT	Indicates the set point of the zone in the selected units
ERROR	Indicates the zone error in the selected units
STATUS	Indicates whether the zone is enabled or disabled
ACTIVE ZONE	Indicates which zone is assigned as active.
ACTIVE ZONE ERROR	Indicates the active zone error.

Buttons

MAIN MENU	Navigates to the main menu
SYSTEM VIEW	Changes the current screen to system overview
PUMP VIEW	Changes the current screen to pump overview
ALARMS	Shows the alarm screen. If there is an active alarm, this button turns red

4.1.3 PUMP OVERVIEW

LEGEND	Pump 1	Pump 2	Pump 3
MODE			
DUTY STATUS	N/A	N/A	N/A
STATUS	Stop	Stop	Stop
SPEED %	0.0	0.0	0.0
SPEED RPM	0	0	0
RUN HRS	0 000	0 000	0 000

Description

Allows monitoring pump information. If there are more than 3 pumps, scroll using the arrows on the top corners.

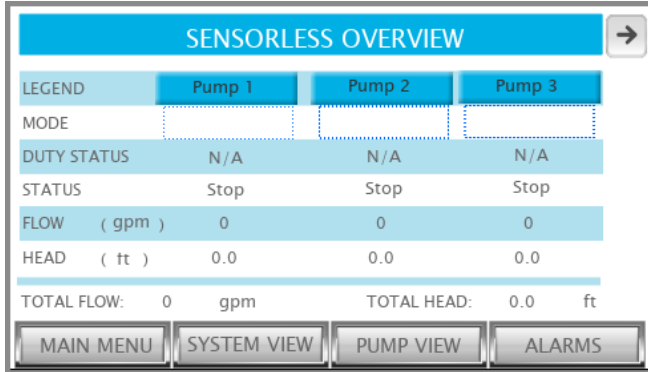
Data

Pump 1 to 6 mode	Shows each pump mode: Hand, Off or Auto
Pump 1 to 6 status 1	Shows each pump duty: Duty1, Duty2, Duty3, Duty4, Duty5, Duty6 or Stand-by
Pump 1 to 6 status 2	Shows if the pump is running or stopped
Pump 1 to 6 speed%	Shows each pump speed in percentage
Pump 1 to 6 speed RPM	Shows each pump speed in RPM
Run HRS	Shows the total pump run time in hours
AUTO BYPASS ON	If the pumps are in auto bypass, the AUTO BYPASS ON label appears on the top left corner. Touching this label brings up the auto bypass reset screen

Buttons

Pump 1 to 6	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	Navigates to the main menu
SYSTEM VIEW	Changes the current screen to system overview
SENSORLESS VIEW	Changes the current screen to sensorless overview. Only available if the vfd type is ivs sensorless
ZONE OVERVIEW	Navigates to the zone overview screen. Not available if the vfd type is ivs sensorless
ALARMS	Shows 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, use the grey arrow buttons to scroll

4.1.4 SENSORLESS OVERVIEW



Description

This screen is only available when the vfd type is ivs sensorless, it complements the pump overview screen. If there are more than 3 pumps, scroll using the arrows on the top corners

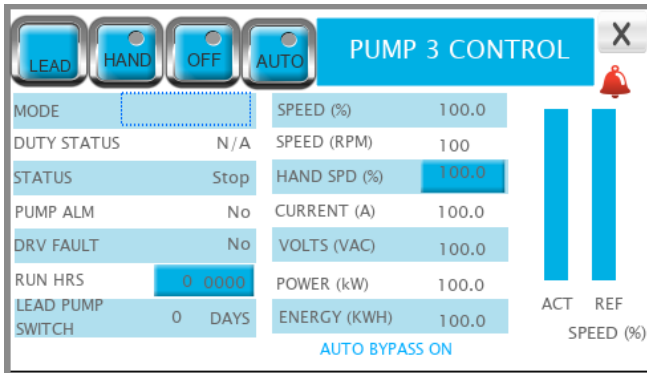
Data

Pump 1 to 6 mode	Shows each pump mode: Hand, Off or Auto
Pump 1 to 6 status 1	Shows each pump duty: Duty1, Duty2, Duty3, Duty4, Duty5, Duty6 or Stand-by
Pump 1 to 6 status 2	Shows if the pump is running or stopped
FLOW	Indicates the current flow of that pump in the selected units
HEAD	Indicates the current head of that pump in the selected units
TOTAL FLOW	Indicates the system flow in the selected units
TOTAL HEAD	Indicates the system head in the selected units

Buttons

Pump 1 to 6	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	Navigates to the main menu
SYSTEM VIEW	Changes the current screen to system overview
PUMP VIEW	Changes the current screen to pump overview
ALARMS	Shows 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, use the grey arrow buttons to scroll

4.1.5 PUMP 1 TO 6 CONTROL



Description

This screen allows control of each pump and shows more detailed information. Press the x on the top left corner to go back to the previous screen

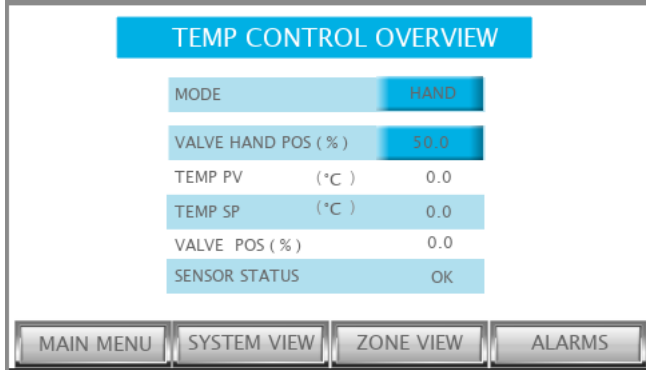
Data

MODE	Shows pump mode: Hand, Off or Auto
STATUS 1	Shows pump duty: Duty1, Duty2, Duty3, Duty4, Duty5, Duty6 or Stand-by
STATUS 2	Shows if the pump is running or stopped
PUMP ALM	Indicates if there is a pump alarm
DRV FAULT	Indicates if the VFD is reporting a fault
RUN HRS	Indicates the pump total run time in hours. Touching the RUN HRS label resets the total run hours
LEAD PUMP SWITCH	Indicates the remaining time in days or hours 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)	Show the VFD energy consumption in kWh for the above indicated run hours
SPEED BARS	Show the pump speed reference and actual speed in a graphical manner
AUTO BYPASS ON	If the pump is in auto bypass, the AUTO BYPASS ON label appears on the bottom of the screen. Touching this label brings up the auto bypass reset screen
Alarm	If there is a pump alarm, a red bell appears at the top right corner

Buttons

LEAD	Assigns the pump as Duty 1 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
HAND SPEED	If the pump is placed in Hand, it will run at the hand speed entered

4.1.6 TEMP CONTROL OVERVIEW



Description

This screen allows monitoring and control of the temperature control feature

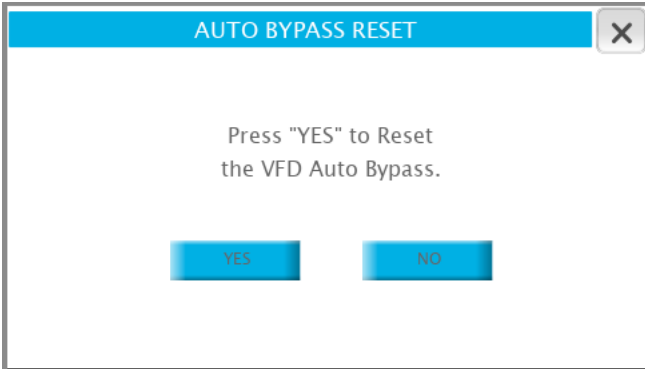
Data

MODE	Indicates the valve mode: HAND or AUTO
VALVE HAND POS (%)	Indicates the valve hand position in percentage
TEMP PV	Indicates the temperature sensor present value in the selected units
TEMP SP	Indicates the temperature set point in the selected units
VALVE POS (%)	Indicates the current position of the valve in percentage
SENSOR STAT	Indicates the status of the temperature sensor: OK or ALARM

Buttons

MODE	Allows changing the valve mode between HAND and AUTO
VALVE HAND POS (%)	Opens a keypad to enter the desired valve position
MAIN MENU	Navigates to the main menu
SYSTEM VIEW	Changes the current screen to system overview
ZONE VIEW	Changes the current screen to zone overview
ALARMS	Shows the alarm screen. if there is an active alarm, this button turns red

4.1.7 AUTO BYPASS RESET



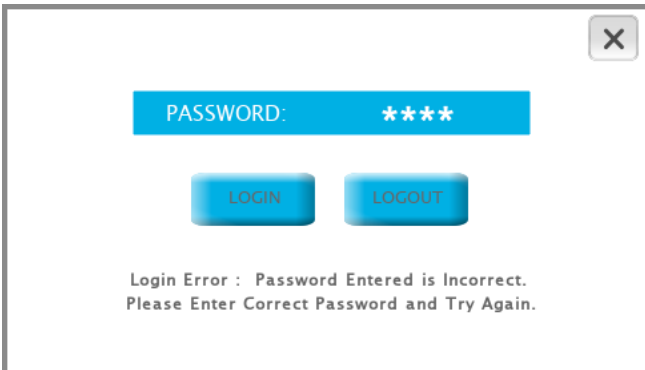
Description

This screen allows the operator to reset the pump auto bypass condition. Press the x on the top right corner to go back to the previous screen

Buttons

YES	Resets the auto bypass. If the conditions that caused the auto bypass don't exist anymore, the pumps will resume normal operation
NO	Closes the auto bypass reset screen and returns to the previous screen

4.1.8 LOGIN SCREEN



Description

This screen allows the operator to login to the desired level by providing the appropriate password

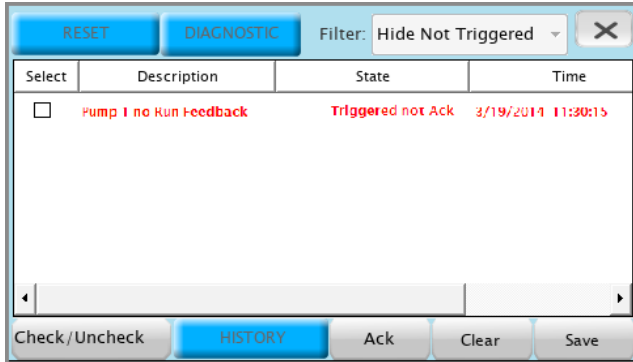
Data

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 the main menu

4.1.9 ALARM SCREENS



Description

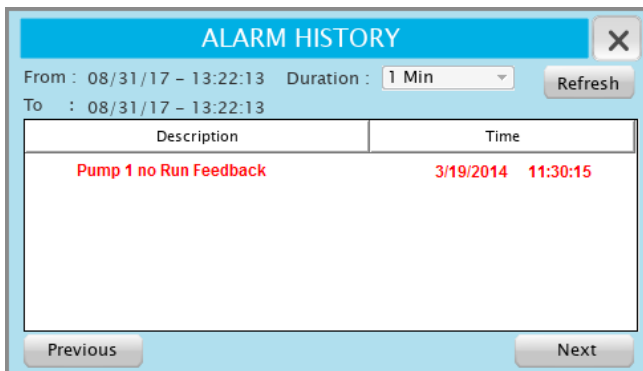
This screen shows the current alarms in the system. Press the x on the top right corner to go back to the previous screen

Data

Select	Select the alarm in order to be acknowledged and reset
Description	Shows the description of the alarm. The possible alarms are shown below in section 1.2.1.
State	Provides information about two alarm conditions: <ol style="list-style-type: none"> 1 Triggered or Not Triggered (triggered means that the condition that generates the alarm is still present, the alarm can be acknowledged but not reset). 2 Acknowledged or Not Acknowledged

Buttons

RESET (upper case)	Resets the alarms. In order to clear from the list see Reset button below.
DIAGNOSTIC	Brings up the PLC diagnostics screen
HISTORY	Brings up the alarm history screen
Check/Uncheck	Selects/unselect the alarms. Only selected alarms can be acknowledged and cleared from the list
FILTER	Not used
ACK	Acknowledges the selected alarms
Reset	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 go back to the previous screen

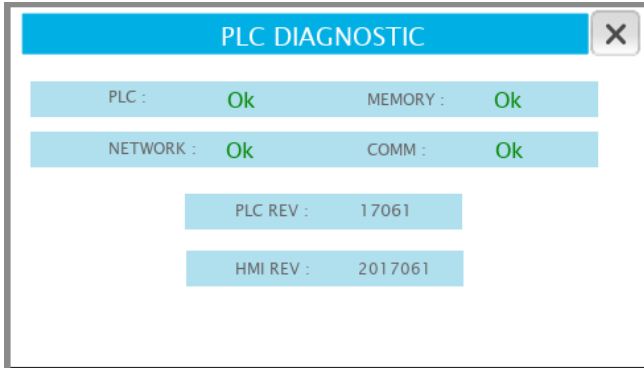
Data

Description	Shows the description of the alarm. The possible alarms are shown below in section 1.2.1.
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
Backward	Shows alarm history from the previous period selected in the duration dropdown menu
Forward	Shows alarm history from the next period selected in the duration dropdown menu

4.1.10 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 go back to the previous screen

Data

PLC	Indicates if the PLC is working properly
NETWORK	Indicates if the PLC network is working properly
MEMORY	Indicates if the PLC memory is working properly
COMM	Indicates if the serial communication port of the PLC is working properly
PLC REV	Indicates the software revision installed on the PLC
HMI REV	Indicates the software revision installed on the HMI

4.2.1 ALARMS

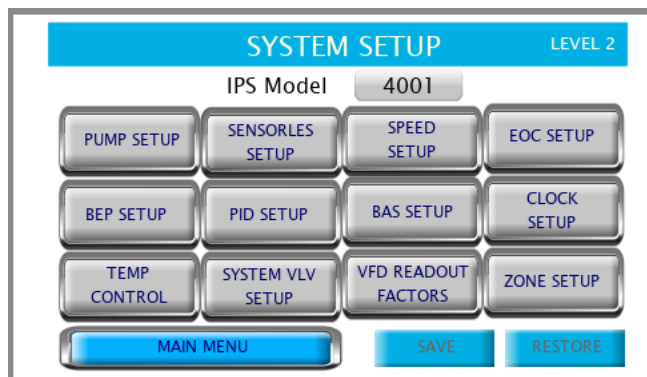
Alarm	Description	Possible causes
Pump n alarm	Indicates that pump n is in alarm	Any pump alarm will trigger this alarm
Pump n run feedback alarm	Indicates that the PLC didn't detect the pump run feedback after commanding the pump to start	<ul style="list-style-type: none"> vfd not configured for serial communication Loose or broken wire from vfd Incorrect vfd type selected on ips Impeller is stuck
Pump n no flow alarm	Indicates that the PLC didn't detect flow (DP switch not closed) after commanding the pump to start	<ul style="list-style-type: none"> DP switch not correctly adjusted Loose or broken wire Damaged PLC digital input Impeller is stuck
Pump n drive fault alarm	Indicates that the pump vfd is reporting a fault	vfd over current or other problem. Check vfd local display
Dp transmitter fail alarm	Indicates that the DP 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
Flow transmitter fail alarm	Indicates that the 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 that the zone 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
All zones transmitter alarm	Indicates that all zones transmitters are out of range	All zone sensors are in alarm
Pump n flow deviation alarm	Indicates that the sensorless flow of the pump is 20% off the average of the running pumps	<ul style="list-style-type: none"> There is a problem with the sensorless mapping of the vfd Air in the system A manual valve is obstructing flow

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 Restore previously saved default values (factory defaults); except pump PID and BAS parameters
Level 2	<ul style="list-style-type: none"> Modify all parameters Save changes Restore previously saved default values (factory defaults)

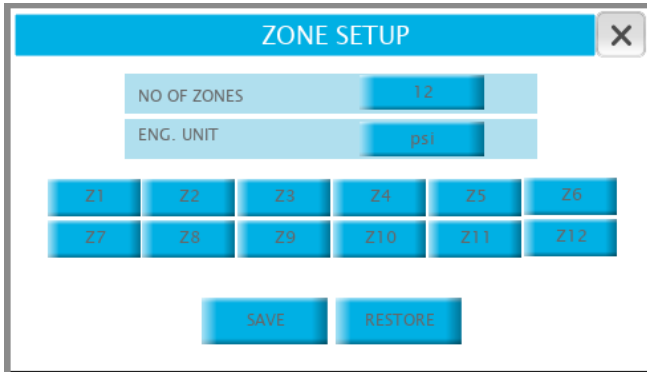
5.1.0 LEVEL 2 SETUP MENU



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.

Description	
This screen allows navigation to each of the setup screens.	
Button	
PUMP SETUP	Navigates to the pump setup screen
ZONE SETUP	Navigates to the zone setup screen. Available if the vfd type on pump setup screen is IVS sensorless and if hybrid mode is selected.
SENSORLESS SETUP	Navigates to the sensorless setup screen. Available if the vfd type on pump setup screen is IVS sensorless and if hybrid mode is selected.
SPEED SETUP	Navigates to the pump speed setup screen
EOC SETUP	Navigates to the End Of Curve (EOC) protection screen
BEP SETUP	Navigates to the duty speed staging setup screen
PID SETUP	Navigates to the PID setup screen
BAS SETUP	Navigates to the BAS setup screen
CLOCK SETUP	Navigates to the clock setup screen
TEMP CONTROL	Navigates to the temperature control setup screen
SYSTEM VLV SETUP	Navigates to the system valves setup screen
VFD READOUT FACTORS	Navigates to the vfd readout factors setup screen
MAIN MENU	Returns to the main menu. User must login again to return to the level 1 & level 2 setup menu
SAVE	Saves all the current setup parameters as default. Only available in level 2
RESTORE	Restores all the default parameters as default. Only available in level 1 & 2
IPS Model	Selects the IPS model: 4001, 4002 or 4003. Only available in level 1 & 2

5.1.1 ZONE SETUP



Parameter: NO OF ZONES

Range	Function
1-12	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: SAVE

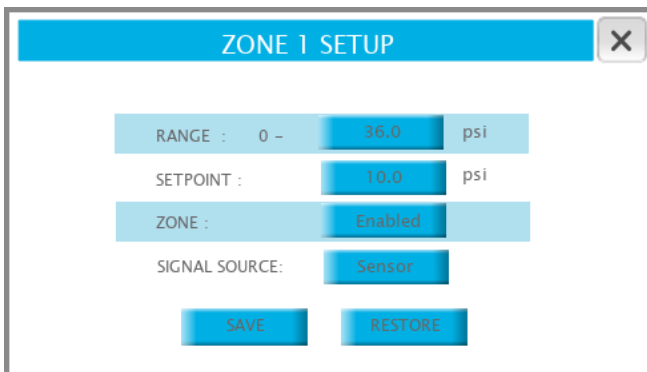
Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

There is one screen per zone

5.1.2 ZONE 1 TO 12 SETUP



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

Parameter: SET POINT

Range	Function
0.0-999.9 (PSI, FT, kPa, m, BAR, °F, °C)	Indicates the set point of the zone. The IPS uses this value to determine the pump speed

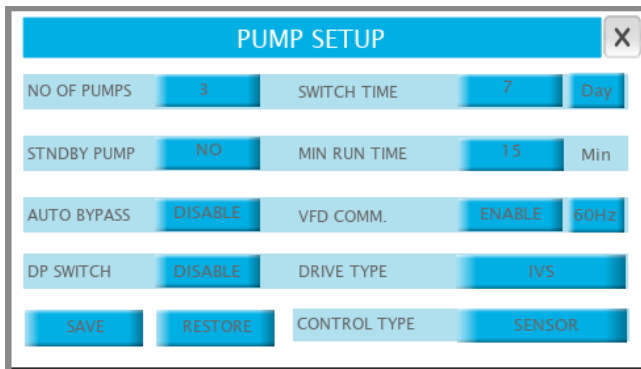
Parameter: ZONE

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	Reading directly from a sensor
BAS	Reading obtained from the BAS

5.1.3 PUMP SETUP



Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

Parameter: NO OF ZONES

Range	Function
1-6	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

Parameter: AUTO BYPASS

Options	Function
DISABLE	Auto bypass function is disabled
ENABLE	When a pump fails (due to no run feedback, vfd fault or communication), the IPS will determine if there is another pump available to replace the faulty pump. If there is no pump available, a digital output will mechanically bypass the vfd and energize the pump motor directly. All pumps running at that moment will be bypassed.

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

PUMP SETUP
✕

NO OF PUMPS	3	SWITCH TIME	7	Day
STNDBY PUMP	NO	MIN RUN TIME	15	Min
AUTO BYPASS	DISABLE	VFD COMM.	ENABLE	60Hz
DP SWITCH	DISABLE	DRIVE TYPE	IVS (SENSORLESS)	
SAVE RESTORE		CONTROL TYPE	HYBRID	

Parameter: MIN RUN TIME

Range	Function
1-999	Indicates what is the minimum time the lead (duty minutes) pump will run once it is started

Parameter: VFD COMM.

Options	Function
DISABLE	No serial communication to VFDs. The IPS will use hard wired 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 Yasgawa E7 drive
IVS (SENSORLESS)	Serial communication to Armstrong IVS drive configured for sensorless operation. By selecting this option the IPS4000 will operate in parallel sensorless mode.

***NOTE:** The IPS4000 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)

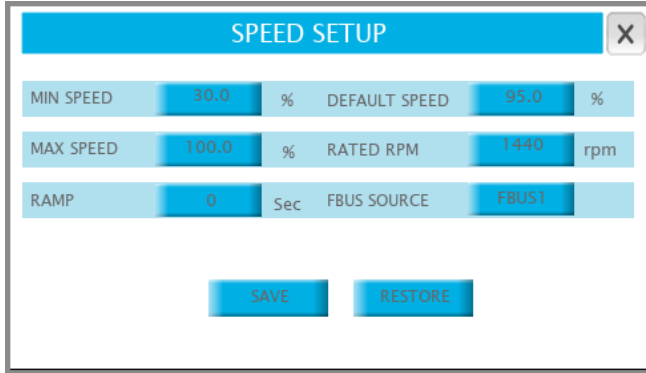
Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

5.1.4 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 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%

Parameter: FBUS SOURCE

Options:	Function:
FBUS1	This is the default. The PLC utilizes the field card in the FieldBus card slot to communicate with the VFDs
FBUS2	The PLC utilizes port J26 FBus2 to communicate with the VFDs. This option can be used if the field card is damaged (this option is not available for IPS4003)

Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

5.1.5 SENSORLESS SETUP

Parameter: PARAMETER SELECTION

Options	Function
AUTO SELECT	The below parameters will be filled automatically based on the selected pump model
MANUAL SELECT	The below parameters will need to be filled by the user

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

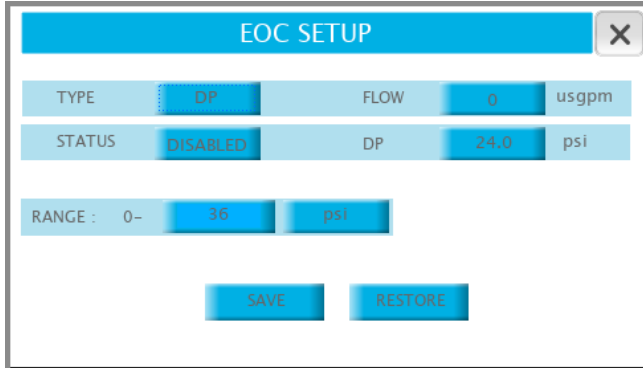
Parameter: FLOW DESIGN

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

5.1.6 EOC SETUP



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	
Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE	
Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

Parameter: TYPE	
Options	Function
DP	EOC (End of Curve) protection is achieved with a DP sensor only for sensor or hybrid control mode
FLOW	EOC protection is achieved with a flow sensor or with the sensorless flow if available

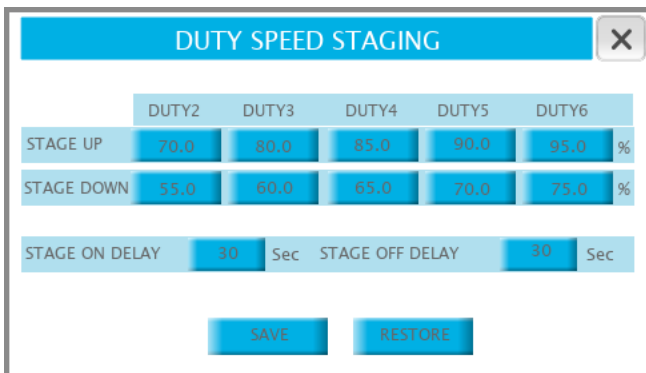
Parameter: STATUS	
Options	Function
DISABLED	EOC protection is disabled
ENABLED	EOC protection is enabled. If the DP or flow of one pump exceeds the EOC set point (see below), the next lag pump will be immediately staged on

Parameter: RANGE	
Range	Function
0 – 32767	Indicates the range of the sensor (DP or flow) in engineering units. This value corresponds to the sensor's 20mA output. (Not available for IVS sensorless drives)

Parameter: FLOW	
Range	Function
0 – 32767	Indicates the pump's flow EOC set point. If the reading from the sensor exceeds this value, the next lag pump is staged on

Parameter: DP	
Range	Function
0–32767	Indicates the pump's DP EOC set point. If the reading from the sensor exceeds this value, the next lag pump is staged on

5.1.7 STAGING SETUP



Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

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 DOWN DUTY2

Range	Function
0.0 – 100.0 %	Determines the Duty1 pump speed under 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 under 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 under 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 under 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 under which the Duty6 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

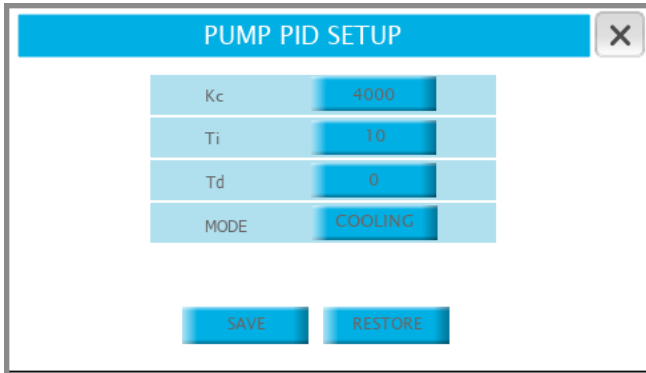
Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 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: Td

Range	Function
0-999	Not used

Parameter: TYPE

Options	Function
Cooling	The speed of the pumps will increase when the Active Zone present value is below the set point
Heating	The speed of the pumps will decrease when the Active Zone present value is below the set point

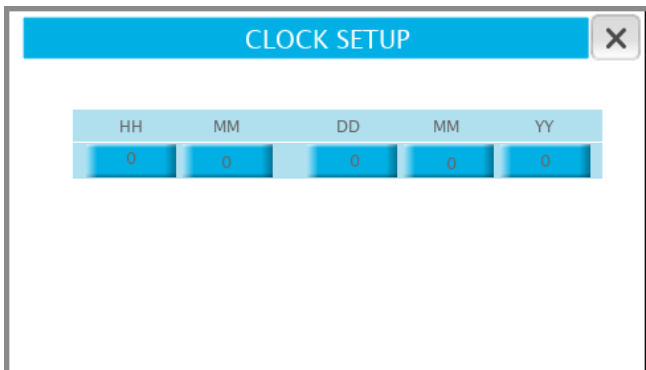
Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

5.1.9 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

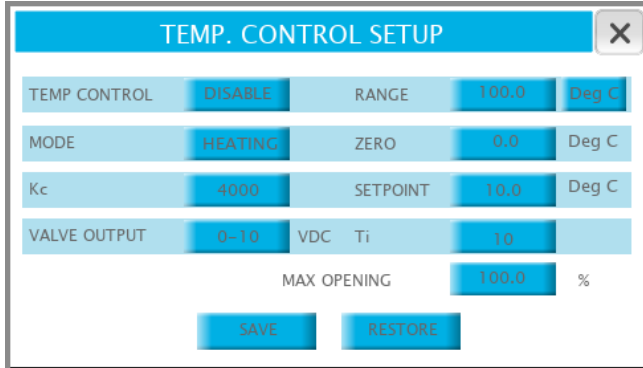
Parameter: MM

Range	Function
1 - 12	System clock month

Parameter: YY

Range	Function
00 - 99	System clock year

5.1.10 TEMPERATURE 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 set point. The temperature control button on the main menu is displayed

Parameter: MODE

Options	Function
HEATING	The valve opens if the temperature is under the set point
COOLING	The valve closes if the temperature is under the set point

Parameter: Kc

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

Parameter: VALVE OUTPUT

Options	Function
0 - 10 VDC	Selects 0 VDC as valve fully closed command
2 - 10 VDC	Selects 2 VDC as valve fully closed command

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: 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

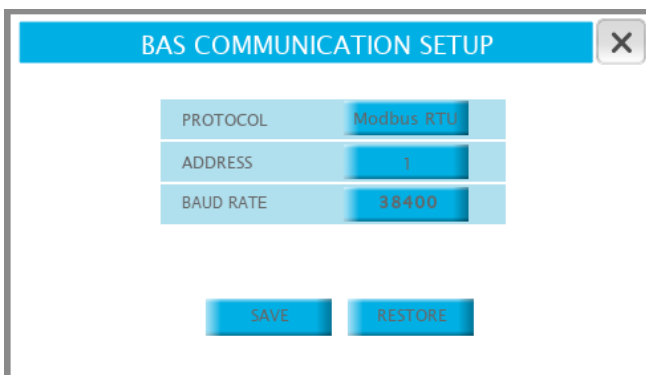
Parameter: UNITS

Option:	Function
°F	Temperature sensors in °F are used
°C	Temperature sensors in °C are used

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

5.1.11 BAS COMMUNICATION SETUP



Parameter: MAX OPENING

Range	Function
0.0 - 100.0 %	Determines the maximum allowable opening (in %) of the valve.

Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

Parameter: PROTOCOL

Options	Function
N/A	No BAS protocol is selected
Modbus RTU	Selects Modbus RTU
Lonworks	Selects Lonworks
BACnet	Selects BACnet

Parameter: ADDRESS

Range	Function
0-127	Selects the IPS BAS address. Only applies to Modbus RTU protocols

Parameter: BAUD RATE

Options	Function
1200	Selects 1200 as baud rate. Only applies to Modbus RTU protocol
2400	Selects 2400 as baud rate. Only applies to Modbus RTU protocol
4800	Selects 4800 as baud rate. Only applies to Modbus RTU protocol
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

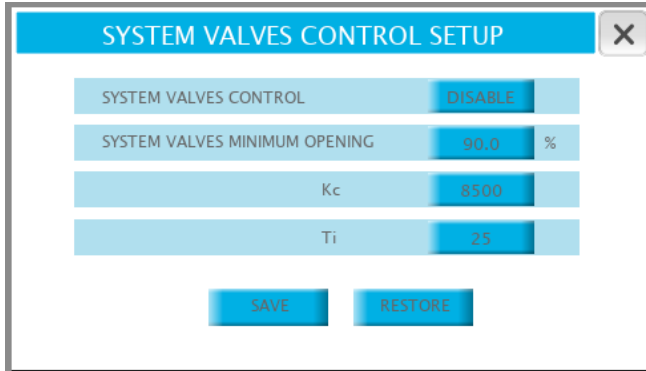
Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

5.1.12 SYSTEM VALVES CONTROL SETUP



Parameter: SYSTEM VALVES CONTROL

Options	Function
DISABLE	System valves control is disabled
ENABLE	System valves control is enabled. The PLC will modify the active zone set point in order to maintain the system valve with the maximum opening at set point

Parameter: SYSTEM VALVES MINIMUM OPENING

Range	Function
0.0 – 100.0%	Indicates the set point for the minimum opening of the system valves

Parameter: Kc

Range	Function
0–9999	Determines the system valves control PID loop gain. Smaller values correspond to a more responsive controller

Parameter: Ti

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

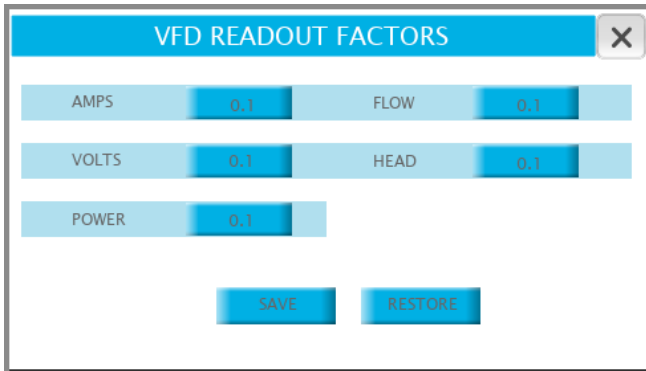
Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

5.1.13 VFD READOUT SETUP



Parameter: AMPS

Options	Function
0.1	The current value read from the vFD is divided by 10
1	The current value read from the vFD is not scaled
10	The current value read from the vFD is multiplied by 10

Parameter: VOLTS

Options	Function
0.1	The voltage value read from the vFD is divided by 10
1	The voltage value read from the vFD is not scaled
10	The voltage value read from the vFD is multiplied by 10

Parameter: POWER

Options	Function
0.1	The kW value read from the vFD is divided by 10
1	The kW value read from the vFD is not scaled
10	The kW value read from the vFD is multiplied by 10

Parameter: FLOW

Options	Function
0.1	The flow value read from the vFD is divided by 10
1	The flow value read from the vFD is not scaled
10	The flow value read from the vFD is multiplied by 10

Parameter: HEAD

Options	Function
0.1	The head value read from the vFD is divided by 10
1	The head value read from the vFD is not scaled
10	The head value read from the vFD is multiplied by 10

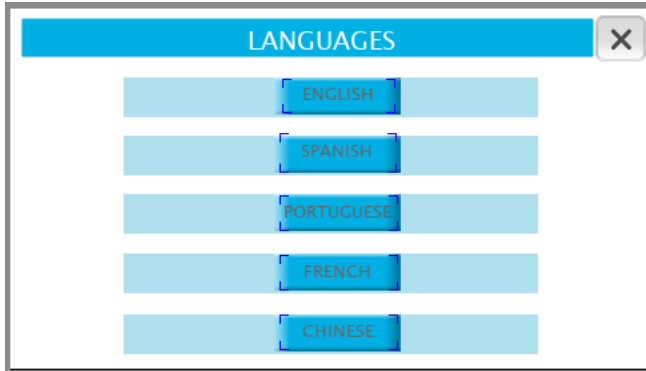
Button: SAVE

Range	Function
N/A	Saves current parameters as default. Only available in level 2

Button: RESTORE

Range	Function
N/A	Restores default parameters. Only available in levels 1 & 2

5.1.14 LANGUAGES



Description

This screen allows the selection of the language on the different screens

Button

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

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 4781 5500

ARMSTRONG FLUID TECHNOLOGY
ESTABLISHED 1934

ARMSTRONGFLUIDTECHNOLOGY.COM

**MAKING
ENERGY
MAKE
SENSE™**