

DPC 2-1

Installation and Operating Instructions

DPC 2-1 For Single Phase Pumps up to 15A



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SAFETY

Following are the safety instructions which must be followed by the service partners or user while installing & operating the product. If ignored, physical injury or even death may happen. Read the safety instructions before handling the system.



WARNING

If these safety instructions are not observed, it may result in malfunction or damage to the equipment.

- All electrical connections must be carried out by skilled and qualified personnel.
- Never connect AC power to output L1 & N1 / L2 & N2 terminals.
- Ensure the motor, controller and power specifications are matching.



CAUTION

If these safety instructions are not observed, it may result in personal injury.

- Before carrying out any installation or maintenance operation, the controller must be disconnected from the power supply.
- Don't open the cover while the pump is running.
- Don't put wire, metal bar filament etc. into the controller.

NOTE (Notes or attention to ensure safe operation)

Important

- The manufacturer is not liable for malfunctioning if the product is not correctly installed, damaged, modified and/or put to run beyond the working range as given in this manual.
- The manufacturer reserves the right to make any modifications to this product from time to time.

INTRODUCTION

Thank you for choosing a DPC Series Digital Pump Controller.

The Digital Pump Controller model is easy to use, programmable controller and protection device for direct start with single phase two pumps with output power from 0.37kW - 1.5 kW (1.5 - 15A) each.

The controller has many operation modes for adapting different pumping applications. Important features that distinguish the DPC Series Digital Pump Controllers from other controllers are the push button calibration for overload and the ability of dry run protection without float switches. It shows pump parameter, status and faults, etc.

APPLICATIONS:

The controller is useful in all cases where there is a need to control and protect two pump installations and managing the automatic operation by a variety of switching methods.

Typical applications:

- Water supply
- Irrigation
- Sewage
- Booster sets
- Rainwater reuse
- Stormwater

FEATURES:

- Built-in function switch for:
 - Drainage by liquid level control through float switches
 - Boosting water supply by pressure control through pressure switch and tank
 - Transfer of water by liquid level control through float
- switches Dry run protection without float switches
- Auto/ manual switch with screen lock in AUTO mode
- Dynamic LCD displaying for pump running status
- Protect the pump against many faults
- Push button calibration
- Pump accumulative run
- time Last five fault records
- RS485 communication Modbus
- Starts and stops the pump in accordance with liquid levels or pressure settings
- Pump shaft anti rust feature

PARAMETERS AND SPECIFICATIONS:

Following chart shows the main technical parameters & specifications:

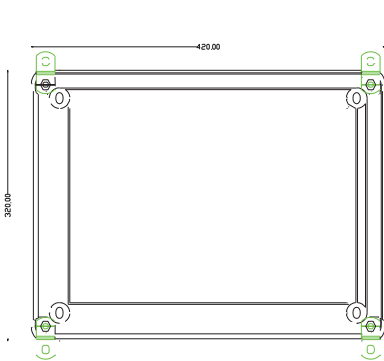
Main Technical Characteristics	
Control characteristic	Double liquid level control
	Pressure control
Working modes	Manual / auto
Drainage application	By using float switch
Pressure Boosting application	By using pressure switch
Water Transfer application	By using float switch
Main Technical Data	
Rated output power (amperes)	1.5 to 15A for each pump
Rated input voltage	AC 220V / 50 Hz / Single Phase
Trip response time of overload	5 sec - 5 min
Trip response time short circuit	Less than 0.1 sec
Trip response time of under/over voltage	Less than 5 sec
Trip response time of dry run	6 sec (or this can be set manually)
Recovery time of overload	30 min (or this can be set manually)
Recovery time of under/over voltage	5 min
Recovery time of dry run	30 min (or this can be set manually)
Trip voltage of over voltage	115 % of rated input voltage
Trip voltage of under voltage	80 % of rated input voltage
PROTECTIONS COVERED	Dry run (without float/ probe)
	Overload (auto-calibrated or can be set)
	Transient surge
	Under voltage
	Over voltage
	Pump stalled
	Short circuit
Pump shaft anti rust protection	
Other Technical Data	
Permissible ambient temperature	-5 to +50 deg C
Degree of protection	IP 55
Installation position	Vertical
Unit dimensions (L X W X H)	320 x 420 x 138 mm
Physical interface	RS485 bus interface: Asynchronous
Baud rate	1200, 2400, 4800, 9600 bps (default)
Protocol type	MODBUS protocol (RTU)

INSTALLATION

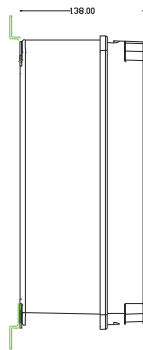
Please read this manual carefully before starting installation and operation. Any damage to the equipment caused due to failure to comply with the descriptions in this manual in installation or operation will be beyond the scope of the company's quality guarantee.

TOOLS USED IN CONTROLLER INSTALLATION:

Controller installation and wire installation will need the following tools, you also can choose the right tools according to your own experience.



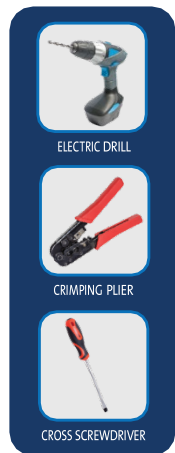
Back view



Side view



wall
Mounting
clamp

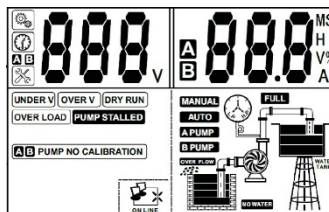


CONTROLLER COMPONENTS:

LCD SCREEN

Voltage Displaying Area

Fault Displaying Area



Ampere Displaying Area

Pump Running Status Displaying Area

MEANING OF THE ICONS SHOWN ON THE LCD:



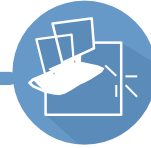
The parameter configuration icon, when this icon appears, controller is in manual parameter adjustment mode.

Time displaying icon, when this icon appears, it mean controller is displaying some parameter of time, eg: pump dry run trip time(units: seconds).



Pump fault icon, when this icon appears, it means controller is displaying some fault condition.

Network connection error icon, when this icon appears, it means there is no network connection or network connection error between pump controller and computer/SCADA/BMS.



Network normal connection icon, when this icon appears, it means the network connection between pump controller and computer/SCADA/BMS.

Voltage

V

M

Minute

Second 


 Hour


Ampere 

 Percent

Pump running 

 Pump stopped

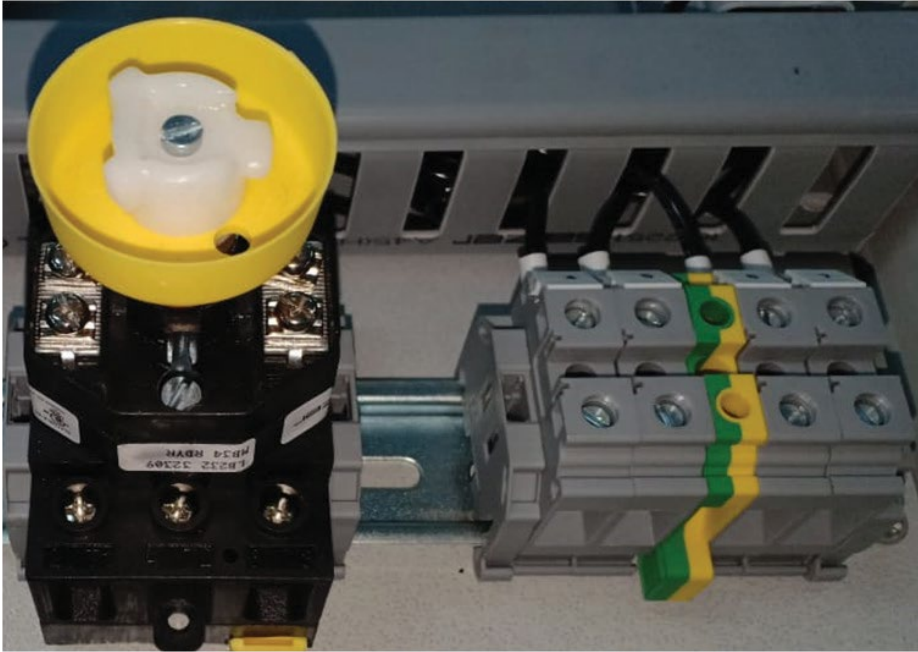
Low pressure or lack of pressure in the pipeline or pressure tank. 

 High pressure or full of pressure in the pipeline or pressure tank.

Pump A 

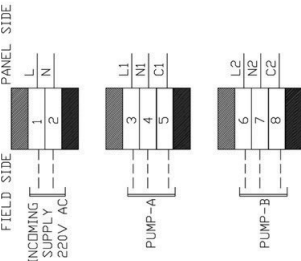
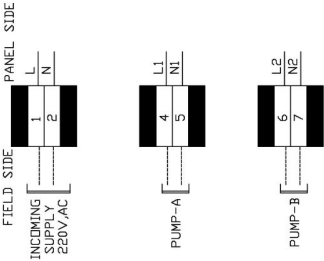
 Pump B

POWER TERMINAL CONNECTIONS:

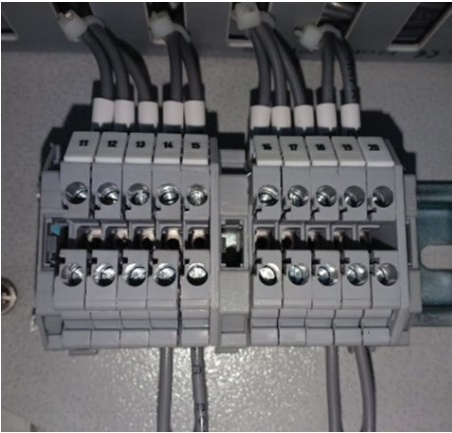


Single Phase (without running capacitor)

Single Phase (with running capacitor)



CONTROL PCB TERMINAL CONNECTIONS:

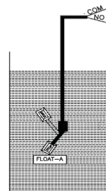
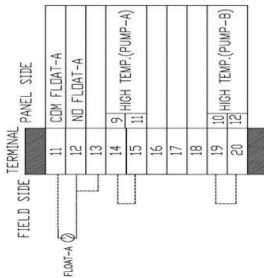


The control terminal connection varies based on the app

INSTALLATION - DRAINAGE:

TERMINALS

Using one float switch



NOTE : NO CONTACT IN FLOAT DOWN POSITION

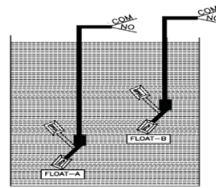
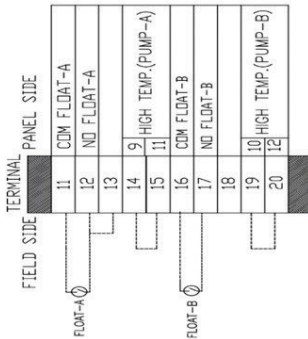
Start condition:

If the liquid level in the pit/tank rises, ie. Float A is in up position. Panel will start pump A. Panel will alternate between pump A and pump B after previous cycle is completed. LCD screen will display RUN whichever pump in running.

Stop condition:

If the liquid level in the pit/tank falls, ie. Float A is in down position. Panel will stop whichever pump is running. This means that there is not enough water to pump. LCD screen will display No water.

Using two float switches



NOTE : NO CONTACT IN
FLOAT DOWN POSITION

Start condition:

If the liquid level in the pit/tank rises, ie. Float A is in up position. Panel will start pump A. Panel will alternate between pump A and pump B after previous cycle is completed. LCD screen will display RUN whichever pump in running.

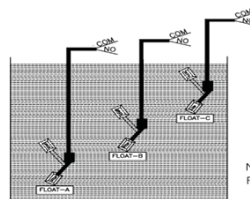
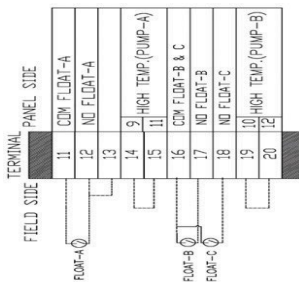
If the liquid level in the pit/tank rises even further after first pump is running ie. Float Switch A and Float switch B are in up position. As soon as Float switch B reaches up position, panel will start whichever pump is in standby. E.g., If pump A was running and liquid level rose even further and Float B comes in up position, pump B will also start operating in parallel to pump A.

Stop condition:

If the liquid level in the pit/tank falls, i.e.. Float A is in down position. Panel will stop whichever pump is running. This means that there is not enough water to pump. LCD screen will display No water.

If both pumps, we're running, then both pumps will stop simultaneously when float switch A is in down position. LCD screen will display No water.

Using three float switches



NOTE : NO CONTACT IN
FLOAT DOWN POSITION

Start condition:

If the liquid level in the pit/tank rises, ie. Float A is in up position. Panel will start pump A. Panel will alternate between pump A and pump B after previous cycle is completed. LCD screen will display RUN whichever pump is running.

If the liquid level in the pit/tank rises even further after first pump is running ie. Float Switch A and Float switch B are in up position. As soon as Float switch B reaches up position, panel will start whichever pump is in standby. Eg. If pump A was running and liquid level rose even further and Float B comes in up position, pump B will also start operating in parallel to pump A.

Alarm condition:

If the liquid level in the pit/tank rises even further after both pumps are running and Float switch C is in up position. In this situation in addition to both pumps running, an overflow alarm will generate an audio-visual sound with fault indication on LCD screen showing Overflow. This fault will reset itself only when liquid level in pit/tank falls below Float C, and Float C is in down position.

Stop condition:

If the liquid level in the pit/tank falls, ie. Float A is in down position. Panel will stop whichever pump is running. This means that there is not enough water to pump. LCD screen will display No water.

If both pumps, we're running, then both pumps will stop simultaneously when float switch A is in down position. LCD screen will display No water.

DANGER Electric shock risk.



Before carrying out any installation or maintenance operation, the controller should be disconnected from the power supply and the person should wait at least 2 minutes before opening the controller.



Never connect AC power to output L1&N1 / L2&N2 terminals.



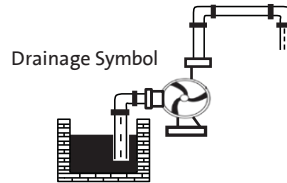
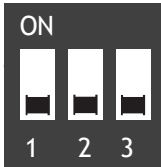
Ensure the motor, controller and power specifications match.



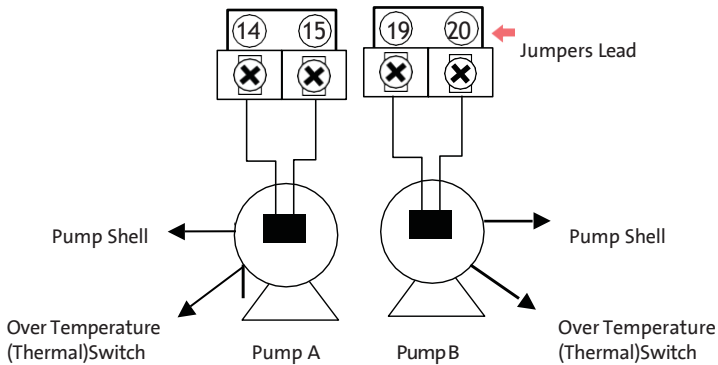
The electrical and hydraulic connections must be carried out by competent, skilled, qualified personnel.

DIP SWITCH SETTINGS

Users can set the function switch to suit different applications. Before setting the function switch, the unit should be disconnected from the power supply. After completing the settings of dip switches, power may be applied to the unit. The symbol corresponding to the application will be displayed on the LCD Screen.

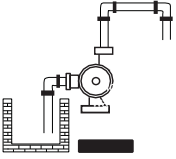
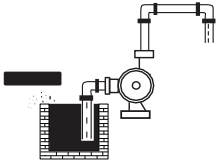


Pump connection for over temperature protection (where supplied with pump)



NOTE: To enable the pump's over temperature protection connect the pump's thermistor leads to terminals 14 and 15, 19 and 20 and remove the jumper.
If the pump is without thermistor switch, please use jumper to connect terminals 14 and 15, 19 and 20.

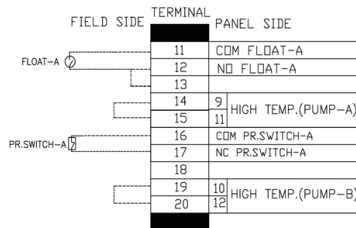
Meanings of the messages & graphic shown on the LCD screen

Messages & Graphics	
	Lack of water in sump
	Overflow in sump

INSTALLATION - BOOSTING:

TERMINALS

Using 1 Float Switch and 1 Pressure Switch



Start condition:

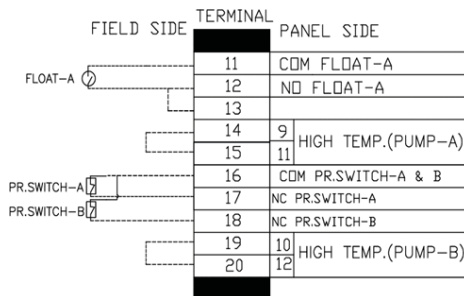
If the water level in source tank is high and the float switch A in the source tank is in up position and the Pressure in the line is below the cut-in pressure setting on the pressure switch A the pump starts. Panel will alternate between pump A and pump B, when previous demand cycle is completed, and pump(s) have stopped. LCD screen displays RUN indicating pump is running.

Stop condition:

If the water level in the source tank is low and Float switch A in the source tank is in down position, the pump stops. LCD screen displays NO WATER, that means there is no water in the source tank and can lead to a dry run situation.

If the Pressure in the line is equal to or above the cut-out pressure setting on the pressure switch A installed, the pump stops. LCD screen displays FULL, that means there is no demand of water.

Using 1 Float Switch and 2 Pressure Switch



Start condition:

If the water level in source tank is high and the float switch A in the source tank is in up position and the Pressure in the line is below the cut-in pressure setting on the pressure switch A the pump starts. Panel will alternate between pump A and pump B, when previous demand cycle is completed, and pump(s) have stopped. LCD screen displays RUN indicating pump is running.

If the pressure in the line is below cut-in pressure setting of pressure switch B, then panel will start the standby pump to run in addition to operating pump. Both pumps will run simultaneously in parallel operation.

Note: Cut in pressure of Pressure switch B < Cut in pressure of Pressure switch A





Stop condition:

If the water level in the source tank is low and Float switch A in the source tank is in down position, the pump(s) stops. LCD screen displays NO WATER, that means there is no water in the source tank and can lead to a dry run situation.

If the Pressure in the line is equal to or above the cut-out pressure setting on the pressure switch A installed, the pump(s) stops. LCD screen displays FULL, that means there is no demand of water.

If both pumps, we're running then both pumps will stop simultaneously when cut-out pressure switch of Pressure switch A is achieved.

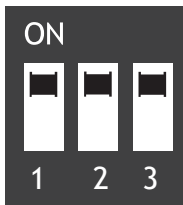
DANGER Electric shock risk.

-  Before carrying out any installation or maintenance operation, the controller should be disconnected from the power supply and the person should wait at least 2 minutes before opening the controller.
-  Never connect AC power to output L1 & N1 / L2 & N2 terminals.
-  Ensure the motor, controller and power specifications match.
-  The electrical and hydraulic connections must be carried out by competent, skilled, qualified personnel.

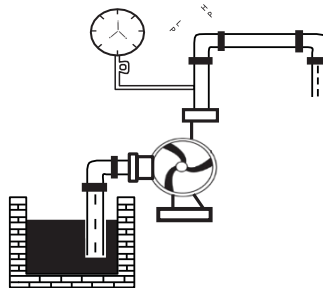
DIP SWITCH SETTINGS

Users can set the function switch to meet different applications. Before setting the function switch, the controller should be disconnected from the power supply.

After completing the setting, apply power to the controller and observe the application sign displayed on the LCD conforming to the BOOSTING symbol.

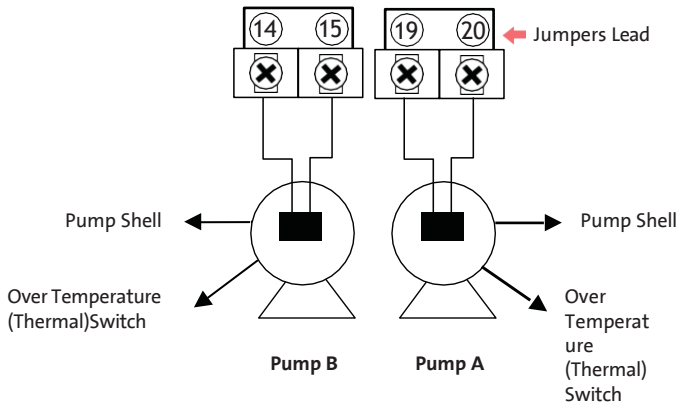


Boosting Setting
Switches UP



Boosting Symbol

Connections for pump over temperature protection (where supplied with pump)



NOTE: To enable the pump’s over temperature protection, connect the pump’s thermistor leads to terminals 14 and 15, 19 and 20 and remove the jumper. If the pump is without thermistor switch, please use jumper to connect terminals 14 and 15, 19 and 20.

Meanings of the messages & graphic shown on the LCD screen

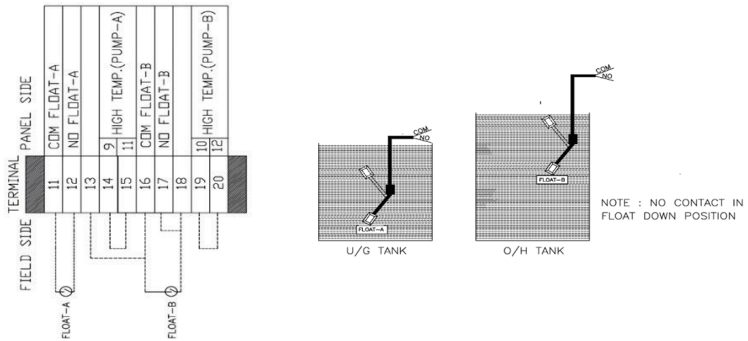
Messages & Graphics	Description
	Low water level in source tank
	Enough water in source tank
	High pressure in pipeline or pressure tank
	Low pressure in pipeline or pressure tank

NOTE: Pressure Switch A = Low Pressure Switch, Pressure Switch B = High Pressure Switch.

INSTALLATION - WATER TRANSFER:

TERMINALS

Using 2 Float switch (one float in UG tank, one float in OH tank)



Start condition:

If water level in UG tank is high ie. Float A is up and water level in OH tank is low ie. Float B is down, panel will start pump A. Panel will alternate between pump A and pump B, after previous cycle is completed. LCD screen will display pump A/B run on screen.

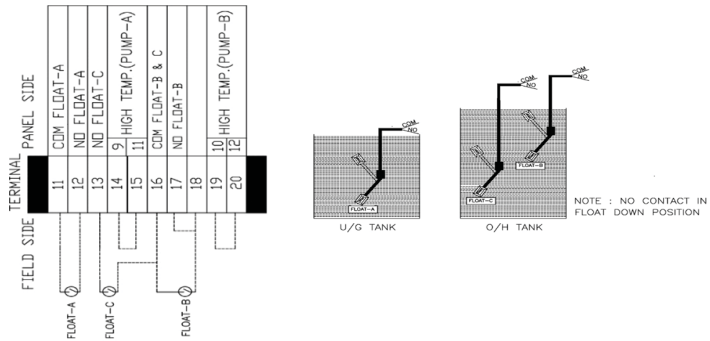
Stop condition:

If the water level in UG tank is low ie. Float A is down, if any of the pump(s) are running, panel will stop the pump(s) indicating that there is not enough water in UG tank. LCD screen will display No water.

If the water level in OH tank is high ie. Float A is up. Panel will stop the pump(s) that are running indicating that the OH tank is full. LCD screen will display Full.

On any of the situation stated above occur, pump(s) will stop running.

Using 3 Float switch (one float in UG tank, two floats in OH tank)



Start condition:

If water level in UG tank is high ie. Float A is up and water level in OH tank is low ie. Float B is down, panel will start pump A. Panel will alternate between pump A and pump B, after previous cycle is completed. LCD screen will display pump A/B run on screen.

If the water level in the OH tank goes down even further below, and Float C is down panel will start the standby pump along with the duty pump which is running. ie. If pump A was running earlier when float B was down, and water level in OH tank has gone even more down due to rising demand and Float C is also now in down position, panel will start pump B also.

Stop condition:





If the water level in UG tank is low ie. Float A is down, if any of the pump(s) are running, panel will stop the pump(s) indicating that there is not enough water in UG tank. LCD screen will display No water.

If the water level in OH tank is high ie. Float A is up. Panel will stop the pump(s) that are running indicating that the OH tank is full. LCD screen will display Full.

If both pumps, ie. Pump A and Pump B are running and water level in OH tank is high which means Float B and Float C are up. Both pumps will stop simultaneously only when the higher float ie. Float B is in up position.

On any of the situation stated above occur, pump(s) will stop running.

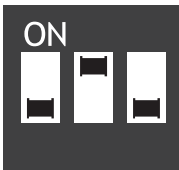
DANGER Electric shock risk.

-  Before carrying out any installation or maintenance operation, the controller should be disconnected from the power supply and one should wait at least 2 minutes before opening the controller.
-  Never connect AC power to output L1&N1 / L2&N2 terminals.
-  Ensure the motor, controller and power specifications.
-  The electrical and hydraulic connections must be carried out by competent, skilled, qualified personnel.

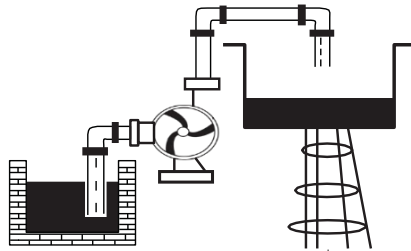
DIP SWITCH SETTINGS

Users can set the function switch to meet different applications. Before setting the function switch, the controller should be disconnected from the power supply.

After completing the setting, apply power to the controller and observe the application sign displayed on the LCD conforming to the TRANSFER symbol.

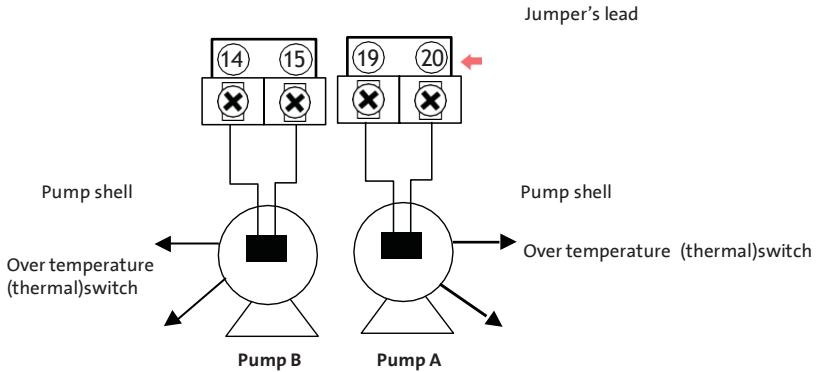


Transfer Setting



Transfer Symbol

Connections for pump over temperature protection (where supplied with pump)



NOTE: To enable the pump's over temperature protection connect the pump's thermistor leads to terminals 14 and 15, 19 and 20 and remove the jumper.
 If the pump is without thermistor switch, please use jumper to connect terminals 14 and 15, 19 and 20.

Messages & Graphics	Description
	Low water level in underground tank
	Enough water in underground tank
	Low level in overhead tank
	Overhead tank full

OPERATION

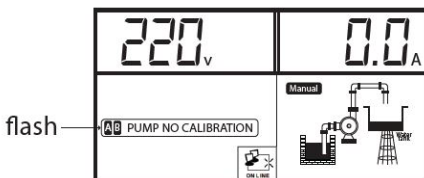
BEFORE YOU START - Parameter calibration and erasing

To achieve best level of protection of the pump, it is essential that parameter calibration be done immediately after successful pump installation or pump maintenance.

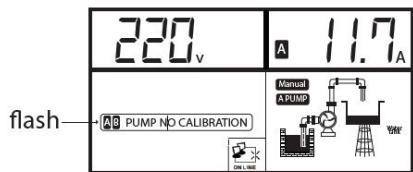
PARAMETER CALIBRATION:

Pump/s must be able to pump water to enable correct calibration. If pumps are calibrated without water, overload and pump stalled errors may occur

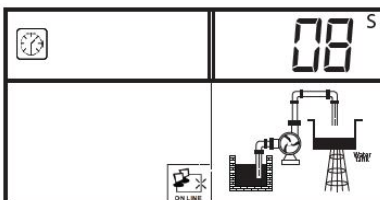
1. Press the **MODE** key to switch to manual mode. If the controller is locked press MODE and STORE keys together and hold until the countdown timer stops and mode switched from Auto to Manual. Make sure that the pump is not running and LCD screen is displaying:



Press the **A START** key to run pump A, confirm the pump and all pipe network is in normal working state (including voltage, amps etc.) with LCD screen displaying:

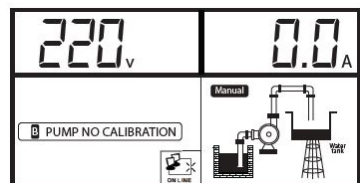


3. Press and hold the **START** key and release when the countdown starts. The controller makes a “beep” and a countdown starts with the LCD displaying: Controller now counts down from 8 seconds:



5. Pump A is ready for running.

4. The pump stops running and parameter calibration is completed with LCD displaying:



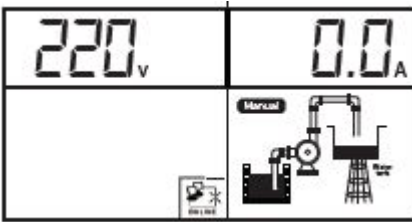
6. Press the **B START** key to repeat calibration for pump B. And follows the same procedure.

ERASING FORMER PARAMETERS:

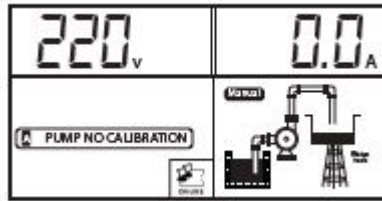
When pump is reinstalled after maintenance or a new pump is installed, user must erase the former calibration and a new calibration must be done.

ERASING THE PARAMETER CALIBRATION:

1. Press the **MODE** key to switch to manual mode. If the controller is locked press MODE and STORE keys at the same time to unlock and go into manual mode. Make sure that the pump is not running and LCD screen is displaying:



2. Press the **A STOP** key for 3 seconds; the controller makes a “beep” sound, and the controller recovers the default factory setting and **A PUMP** no calibration flashing will appear in the LCD displays:



Repeat for pump B by using the **B STOP** key for 3 seconds.

SWITCHING TO AUTO MODE:

To switch between MANUAL and AUTO mode press **MODE** key. AUTO mode automatically locks controller. Under AUTO mode the controller will run or stop the pump according to the signal from the float switch.

NOTE:

- Under AUTO mode, if the pump is running and user wants to stop the pump, press the MODE key to switch to MANUAL mode and the pump stops.
- Under AUTO mode, if the input power is cut off and resumed, the controller will come in to operating state after a 10 seconds countdown.
- No matter if the controller is AUTO or MANUAL state, if the input power is cut off and resumed again, the control panel will resume its operation in the same state as before the power being cut off.

SWITCH TO MANUAL MODE:

To switch from Auto mode to manual mode, and if the controller is under Auto screen lock, then press MODE and STORE button simultaneously until the countdown timer stops and mode switches back to manual. Press the START key to start the pump and the STOP key to stop the pump.

PUMP PROTECTION:

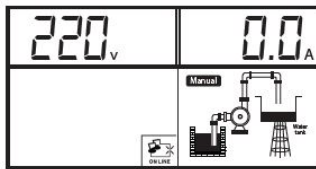
During pump running, if dry run, overload, over voltage, etc. failures occur, the controller will immediately shut down the running pump and automatically execute a check for restarting conditions after a built-in time delay has elapsed. The controller will not recover automatically until all the abnormal situations have been cleared. If pump stalled, open phase or other serious failure has occurred, pump user must immediately check pump and motor.

LAST FIVE FAILURE RECORD:

The control panel can memorize the last five failures of pump, so it is very convenient for the users to analyze the pump running conditions.

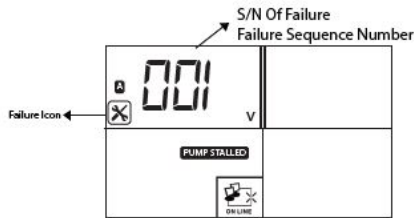
DISPLAYING THE LAST FIVE:

1. Press the **MODE** key to switch to MANUAL mode, make sure the pump is not running and the LCD screen is displaying:



2. Press and hold **A STOP** key and **MODE** key, the controller makes a “beep” sound and displays pump A failure record.

3. Press the **A STOP** key to quit the failure record display:



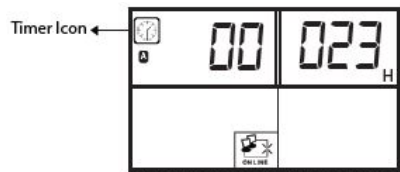
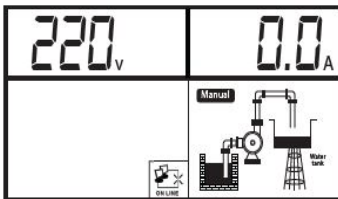
NOTE: The failure displayed above is PUMP STALLED. Repeat for pump B by using B STOP key.

PUMP ACCUMLATIVE RUNNING TIME:

The controller can memorize how many hours that pump has run, so it is very convenient for the pump user to analyze the pump running conditions and do maintenance.

DISPLAYING THE PUMP ACCUMLATIVE RUNNING TIME:

1. Press the **MODE** key to switch to manual mode, make sure that the pump is not running and the LCD screen is displaying:
2. Press and hold the **STORE** key and **A STOP** key. The controller makes a “beep” sound and displays the accumulative run time. The pump has run for 23 hours.



THE PUMP HAS A RUN FOR 23 HOUR

3. Press the **A STOP** key to quit the accumulative running time display.
4. Repeat for pump B by using B STOP key.

COMMUNICATION LINK

The controller has communication interface, between the pump controller and computer/SCADA/BMS, users can realize a long-distance monitoring function. This function applies to where the controller is installed in the basement or pumping room, but users require to monitor and control the pump on the ground or in a control room.

BASIC FUNCTION:

Computer/SCADA/BMS (Optional) with communication interface can realize long distance monitoring. In the control room, users can realize all the functions of the master controller through the slave controller, except parameter calibration and adjusting.

SPECIAL APPLICATION:


As adopting communication interface, the communication distance through wire is less than 1200 meters. whereas for a longer communication distance like mine, water tower, across railway road and bridge etc., users can adopt RS485 extender.

TECHNICAL PARAMETER:

The following chart shows main technical parameters of communication between the pump controller and Computer/SCADA/BMS.

Main Technical Data	
Physical interface	RS485 Bus Interface: asynchronous semi duplex
Data format	1 start bit, 8 data bit, 1 stop bit, no verify
	1 start bit, 8 data bit, 2 stop bit, no verify
	Default: 1 start bit, 8 data bit, 1 stop bit, no verify
Baud rate	1200,2400,4800,9600 bps (default 9600bps)
	Setting range of controller address: 1-126
	127: broadcast address, host computer broadcasting, slave machine response forbidden
Protocol type	MODBUS protocol (RTU)
Rated input voltage for SC	AC 240V/50Hz, single phase
Main Installation Data	
Wire communication distance	1200 meters max by shield twisted pair cable (STP) for RS485 & CAN
	5000 meters max by shield twisted pair cable (STP) and RS485 extender
STP	STP-120U one pair 20AWG for RS485 & CAN
RS485 extender	5000 meters (9600bps)

TROUBLE SHOOTING GUIDE

Fault message	Possible cause	Solutions
Flashing of UNDER V	The real running voltage is lower than the set voltage, pump is in under voltage protection state.	Report low line voltage to the power supply company.
		Control will attempt to restart the pump every 5 min until line voltage is restored to normal.
Flashing of OVER V	The real running voltage is higher than the set voltage, pump is in over voltage protection state.	Report high line voltage to the power supply company.
		Controller will attempt to restart the pump every 5 min until line voltage is restored to normal.
Flashing of OVERLOAD	The real running ampere is higher than the calibrated / set running ampere, pump is in over load protection	Controller will attempt to restart the pump every 30 min until running ampere is restored to normal.
		Inspect pump and motor winding.
Flashing of PUMP NO CALIBRATION	Parameter calibration not completed.	Refer to parameter calibration setting.
Flashing of DRY RUN	Liquid level in the well/ sump is below the pump intake, pump stops running.	Controller will attempt to restart the pump every 30 min until liquid level is above the pump.
Flashing of PUMP STALLED	Pump running amps exceeded normal run amps by more than 200%.	Cut off power supply and repair or replace pump.
Flashing of REPEATED START	Pump starts more than 5 times per minute.	<ul style="list-style-type: none"> Check pressure tank precharge Check pressure tank bladder Check pressure switch settings Check pressure switch for defects.
 ON LINE	No communication link between SC / computer and control.	Connect the control to SC / computer to realize long distance monitoring.



NOTE: Float/pressure switch should be ordered separately.

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