

# LORENTZ

Available From:

**Solar Power & Pump Co.**  
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## PS150 Centric

**INSTRUCTIONS FOR  
INSTALLATION  
OPERATION  
SERVICE**

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## Symbols



**WARNING**

disregard might lead to injury or damage the installation



**CAUTION**

recommended to avoid disfunction or premature ageing of the pump etc.

# 1 INTRODUCTION

**Thank you for purchasing a LORENTZ PUMP.** We set a new standard for quality and economy in solar pumping. It incorporates the best solar pump technologies that were very expensive until its introduction in 2002.

**PS150 is a highly efficient pump system** which provides city water pressure, anywhere. It is economical for (drip-) irrigation, livestock, dugout floating pump, water transfer to remote places and many other applications. It is a submersible pump.

The pump end of PS150 is a **positive displacement type pump or a centrifugal** one.

The PS150 **brushless DC motors** are specially made for this system. The motor is using very advanced raw earth magnet technology, hand made wiring for highest copper density and does not need wearing brushes. This results in an exceptional high efficiency with low temperature dissipation.

PS150 can either be used in a **battery system** with voltages of 12, 24V or alternatively it can be operated as a **solar direct system** using the same Controller PS150.

The solar battery is charged up during daylight hours using the integrated charger of the PS150 controller. The charger works effectively during reduced sunlight conditions when direct pump operation is not possible.

The energy stored in the battery is available to operate the pump at any time, day or night and during periods of bad weather.

Extended bad weather periods with water demands of up to 10m<sup>3</sup> per day will be reliably bridged due to the high system efficiency even with low capacity batteries.

The pump is **manufactured from non-corrosive material** (stainless steel).



**Before you begin** Check the model numbers of all the components of your system, and verify that they are the items that you ordered. Also check against the *PUMP* specifications and performance charts (end of this manual) to be sure the system is appropriate for your application. If you think you may have the wrong pump for your application, call your supplier immediately.

If you think you may have the wrong pump for your application, call your supplier immediately.

**Please fill in the SYSTEM REPORT.** This will be essential information if any problems occur.

## 2 WARNINGS

*PS150 pumps are different from other pumps.*

**It is a submersible pump.**

Before beginning installation procedures, these installation and operating instructions should be studied carefully.

**The installation and operation should also be in accordance with local regulations and accepted codes of good practice.**

This INSTRUCTION MANUAL contains maintenance information, and is the property of the pump owner

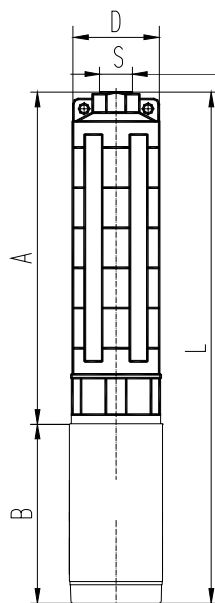
Please give this manual to the pump owner or maintenance personnel when you are finished!



**Failure to follow these instructions will void the warranty.**

## 3 DIMENSIONS

Pump Unit ( Pu) ( motor + pump end)	Dimensions					Shipping Dimensions			
	L	A	B	D	S	packaging	shipping volume	net weight	gross weight
	[mm]	[mm]	[mm]	[mm]		[mm]	[m <sup>3</sup> ]	[kg]	[kg]
C-SJ5-8	593	408	185	100	G 1 1/2"	650X160X150	0,016	12	12,5
Controller Type									
PS150-C						320X240X160	0,0123	1,2	1,8



## 4 SYSTEM REPORT FORM

Before you start, indicate your systems datas.

System Voltage	<input type="text"/>	V
Date of Purchase	<input type="text"/>	
Purchased from	<input type="text"/>	
Quantity of Batteries	<input type="text"/>	
Battery Type	<input type="text"/>	
Quantity of Solar Modules (panels)	<input type="text"/>	
Solar Module Type	<input type="text"/>	
Pump Model	<input type="text"/>	
Pump Serial #	<input type="text"/>	
Controller Model	<input type="text"/>	
Controller Serial #	<input type="text"/>	

**Installer:** Record the following

Installation Date	<input type="text"/>	
Installed by	<input type="text"/>	
Cut-in Pressure	<input type="text"/>	bar / PSI
Cut-out Pressure	<input type="text"/>	bar / PSI
Additional Suction Lift	<input type="text"/>	m / ft
Total Pipe Length, Pressure Side	<input type="text"/>	m / ft
Total Pipe Length, Suction Side	<input type="text"/>	m / ft
Pipe		
Size	<input type="text"/>	
Type	<input type="text"/>	

## 5 INSTALLATION CONTROLLER PS150

### 5.1 General Information

- > Controlling and monitoring of the motor
- > Integrated MPP-tracking and LVD battery protection
- > LVD protection (low voltage disconnect) for 12 and 24V batteries
- > Hig Run battery function to avoid cycling of battery
- > Check and display the operating states
- > Two control inputs for float- or pressure switches, remote control, etc.
- > 92% max. efficiency (motor + controller)
- > Adjustable maximum RPM setting, refer to pump manual for details

### 5.2 Warnings to Installer

**Open circuit (no-load) voltage** above 50 V will destroy the controller. This may occur if the wrong PV modules (solar panels) are used, or if the solar array is incorrectly wired. Measure the array voltage before connecting to the controller. A "12 V" (nominal) array should produce an open circuit voltage around 22-25 V under any daylight conditions.

**Do not attempt** to use this controller for any motors other than *ECDRIVE*<sup>®</sup>.

To be installed, connected and serviced **by qualified personnel only**. Ensure all power sources are disconnected when making connections to this unit. Follow all appropriate electrical codes. There are no user serviceable parts inside the motor or the controller.

### 5.3 Mechanical Installation

**Location** Place the controller close to the solar array, not the pump. This will reduce the risk of lightning damage.

**Protection from heat** Electronic devices are most reliable when they are protected from heat. Mount the controller in the shade of the mid-day sun. An ideal location is directly under the solar array or in a nearby shaded location. An alternative is to fold a piece of sheet metal so that it mounts behind the controller and curves over it to provide shade. This provides protection in extremely hot climates.

### 5.2 Technical Data

Input voltage battery:	12 V - 24 V DC
PV max. open circuit:	50 V DC
Input current, max.	20 A
Battery low voltage disconnect:	11/22 V DC
Restart voltage:	13/26 V DC
<b>If in High Run mode:</b>	
Battery low voltage disconnect:	12,3/24,6 V DC
Restart voltage:	13,3/26,6 V DC
Output:	4-18V EC PWM 3-phase
Type of enclosure:	IP 54
Ambient temperature:	-20 °C to +50 °C
Weight:	1.5 kg
Dimensions:	260 x 175 x 100 mm

Install **proper grounding for safety and lightning protection**

**Do not touch the controller input or motor wires** together to test for a spark.

**TEST THE VOLTAGE** before connecting power to the controller. Voltage (open circuit) must not exceed 50 V. Some thin-film PV-modules may produce excessive voltage, especially when they are new. If the open circuit voltage exceeds 50 V, **DO NOT** connect power to the controller. Contact your supplier.

**Battery system** Place the controller near the batteries but safely isolated from the battery terminals and from corrosive gases. (Batteries must be in a cool location for best longevity and enclosed for cleanliness and safety.) Connect the battery (12 or 24 V) directly with the + and – Terminal of the controller. Do not use the load terminals of the charge controller as they may be not strong enough to allow the start current to flow. The PS150 controller has a low voltage function to protect the batteries from deep discharge. The charger (additional) is only needed for charging the batteries.

**Position** If it is outdoors, mount the controller in a vertical position to assure that rain will not enter the box.

## 5.4 Electrical Installation-Terminals

**Power IN** For PV-direct systems, a two-pole disconnect switch may be installed between the solar array and the controller. Switch it off to prevent shock and arc burn hazard during installation and maintenance, or if the system will be shut down for the season. For battery systems a 30 Amp slow blow fuse must be installed between the controller and the battery.

**Ground** Connect the ground wire to the ground connection in the controller. Grounding helps to prevent shock hazard if there is a fault in the motor.

**L1 – L2 – L3** *ECDRIVE*<sup>®</sup> requires four-conductor (four-wire) cable between the controller and the motor. The three wires L1, L2 and L3 carry power. The fourth wire carries ground. To reverse direction of rotation reverse any two wires.

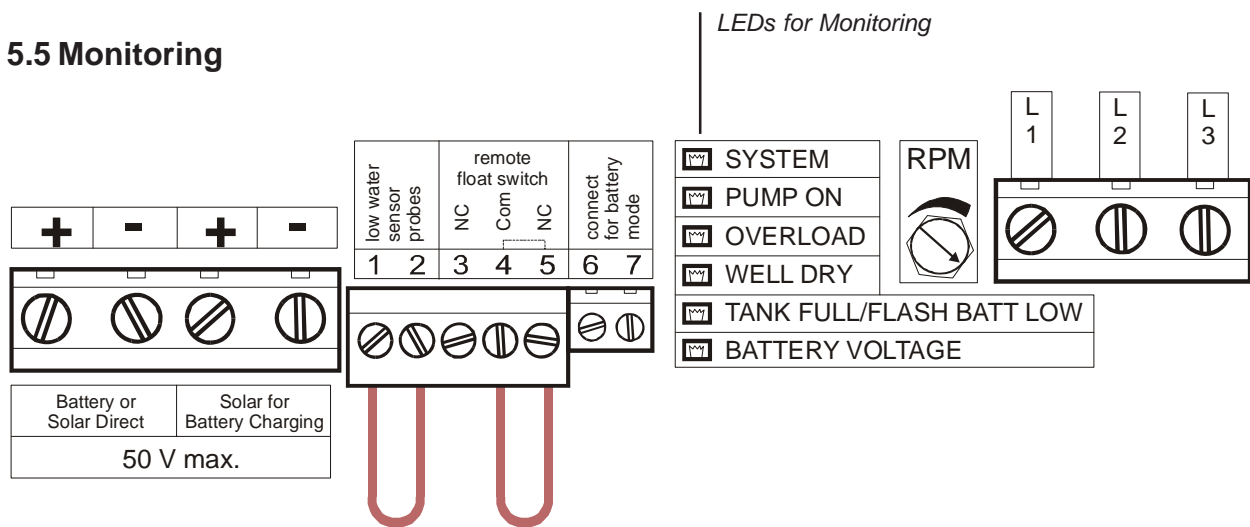
**No. 1 and 2** In order to protect a pump from being damaged by dry running connect one well probe cable

to each terminal. If dry run protection is not needed, short cut these two terminals.

**No. 3, 4 and 5** Connect any kind of external switch (NO or NC type) for remote control of the controller. In case no switch is used the terminals No. 4 and 5 have to be connected with a short cable (factory setting). In case a NO-switch is used (connected to the terminals No. 3 and 4) the short cable (connecting the terminals No. 4 and 5) must remain installed.

**No. 6 and 7** Connect these two terminals to switch the controller to battery mode. The motor will be switched OFF by the controller if the input voltage is below 11 V for a 12 V battery system and 22 V for a 24 V battery system in order to protect the battery. If the battery voltage increases to 13 or 26 V the motor will be switched ON automatically. ( High run function with 13,3 and 26,6V)

## 5.5 Monitoring



### SYSTEM

Green light indicates "SYSTEM ON"

### PUMP ON

Green: "MOTOR / PUMP ON"

Red: Motor OFF caused by overload protection

### PUMP SPEED

PUMP ON LED will flash in following sequence:

- > 700 RPM PUMP ON LED IS ON
- > 1200 RPM 1 Flash
- > 1600 RPM 2 Flash
- > 2000 RPM 3 Flash
- > 2400 RPM 4 Flash
- > 2800 RPM 5 Flash

### SOURCE LOW

Red light: Water level is low. After recovering the motor will start within 20 minutes.

Red light will remain ON to indicate low water level has occurred. For "Reset" press the ON/OFF switch.

### TANK FULL

Red light: The motor has been switched OFF by remote switch.

### BATTERY LOW

Red light flashing: "LOW VOLTAGE DISCONNECT" when battery is empty (in battery mode only)

## 5.6 Wiring Order for Correct Rotation

The power wires on the pump are black with white lettering to indicate L1, L2 and L3. WRITE DOWN the colors that you splice to L1/ L2 / L3 so you can match them with the L1/ L2 / L3 terminals in the pump controller.

**If your pump cable has the standard RED, BLACK and YELLOW colors, use this sequence:**

RED	BLACK	YELLOW	GREEN
L1	L2	L3	Ground

**The power wires on the pump may also be brown-black-grey for Motors delivered Q2 2005. Then use brown as L1, black as L2 and grey as L3**

**Testing the pump for direction** Helical rotor pumps will produce water flow only if they are rotating in the right direction. If you place it in a water tank or a bucket, you will observe flow if the rotation is correct. (Submerge at least 75% to observe full flow).

**Alternative, dry test** If you don't have a water vessel to test the pump in, you can test it dry by watching the pump shaft and running it for only a few seconds. The metal label on the pump has an arrow to indicate the proper direction of rotation. If the pump is new from the factory, it is lubricated so it can run dry for about 90 seconds without risk. If the pump is not new, it can be run dry safely for about 15 seconds. Either way, this is more than enough time to observe the direction of the shaft.

If you did not write down the color match (or the wind blew your note away) connect the three power wires to the controller in ANY random order. Apply power. Observe the pump shaft rotation, then turn the power off. If

the direction is wrong, exchange ANY TWO of the power wires at the controller. In any case, when you are finished connecting the pump to the controller, test it to assure the proper direction.

**Did you install the pump in the well without checking the wiring order or the direction?**

**OR – Is it running but not pumping?**

**HELICAL ROTOR pump (model number does NOT contain “C”)** Turn the pump on. Observe if air is rising from the pipe. If it isn't, reverse any two motor wires and observe again. If you cannot observe air rise, chose whichever direction is quieter (less vibration). There is risk of dry-run damage if it runs too long in reverse. If the pump is new from the factory, it is lubricated so it can run dry for about 90 seconds without risk. If the pump has been used, it must not be run for more than about 15 seconds. In many cases, a pump that is reversed will turn off due to overload.

**CENTRIFUGAL pump (model with C in the name)** in reverse will produce no flow (or very little). This will NOT damage the pump. If the flow is not normal, reverse any two motor wires.

**Question** *The motor shaft is hard to turn by hand, and moves in a bumpy manner. Is this normal?*

**Answer** YES. This is caused by permanent magnets in the motor. It is especially hard to turn when it is connected to the controller, or if the pump wires are connected together.



**WARNING** *If the pump wires are in the wrong order, the motor will run in reverse and the pump will not function. Damage may result. Check the direction BEFORE installing the pump. The proper direction is COUNTER-CLOCKWISE when viewed from above.*

**WARNING** *When testing for direction, do not run the pump dry for more than 15 seconds.*



## 7.1 System Wiring for 12 V Battery Installation

**12 V system:** Voltage from panels will read 22-25 V when disconnected (open circuit).

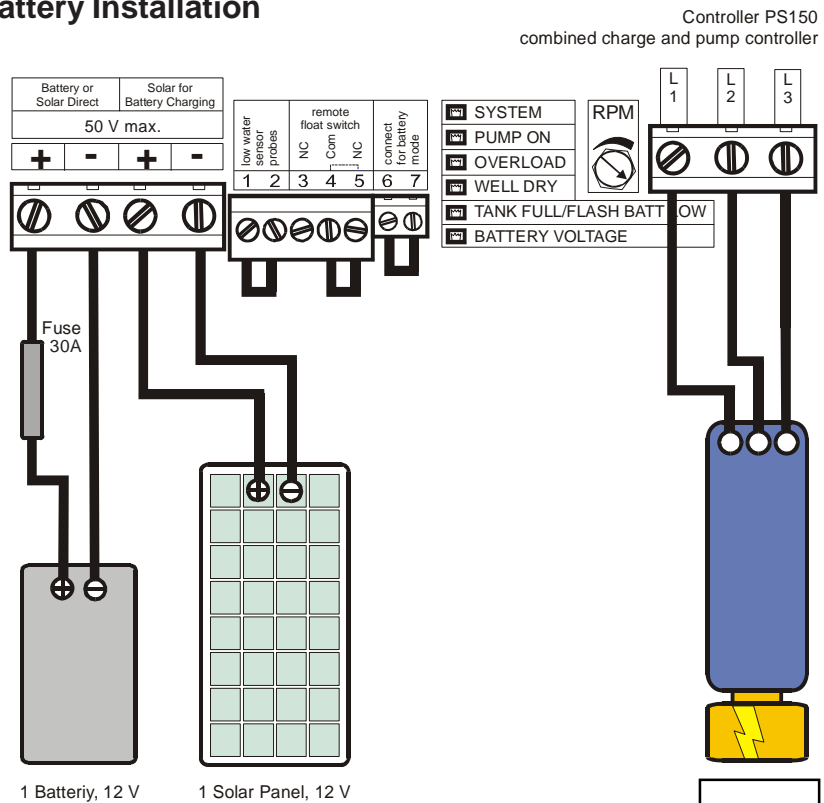
Connect the pump controller directly to battery bank.

**Remote Tank Float Switch:** Connect float switch to terminals 4-5 of the pump controller when it breaks contact on rise, to turn the pump OFF.

Otherwise use terminals 3-4 for opposite function.



**Grounding:** Connect either battery minus or solar minus to ground, never connect both to ground!



## 7.2 System Wiring for 24 V Battery Installation

**“Series” Wiring** is shown, for *nominal* 24 V system: Voltage from panels will read 45 V when disconnected (open circuit).

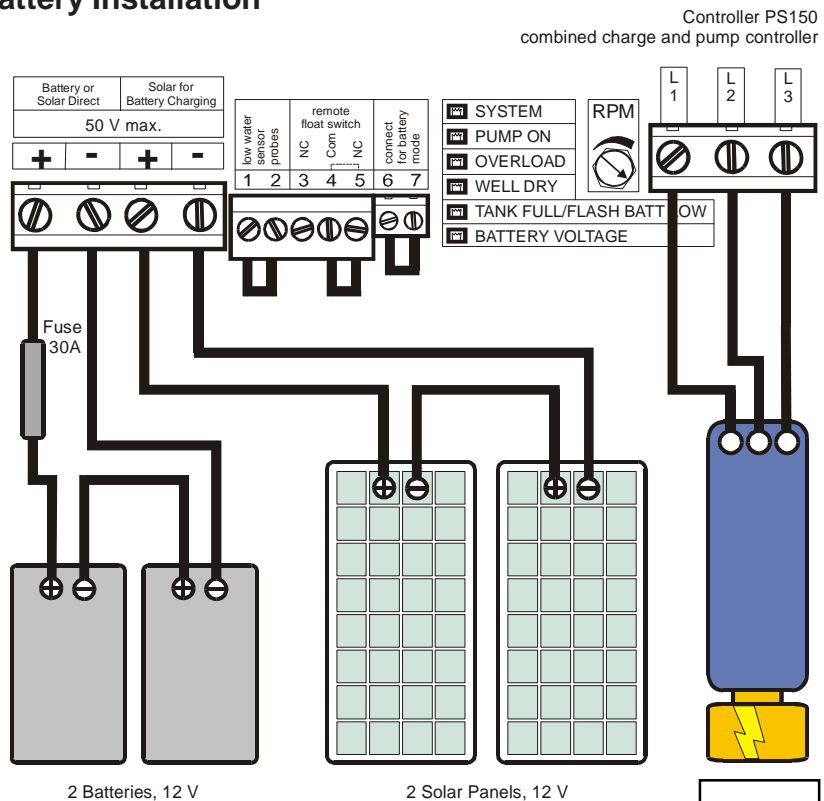
**Installing a Solar Tracker?** Use stranded wire for flexibility. Secure the wires to tracker with plenty of tape. Leave a good slack loop to allow free motion of tracker.

**Remote Tank Float Switch:** Connect float switch to terminals 4-5 of the pump controller when it breaks contact on rise, to turn the pump OFF.

Otherwise use terminals 3-4 for opposite function.



**Grounding:** Connect either battery minus or solar minus to ground, never connect both to ground!



### 7.3 System Wiring for 12-24 V Solar Direct Operation

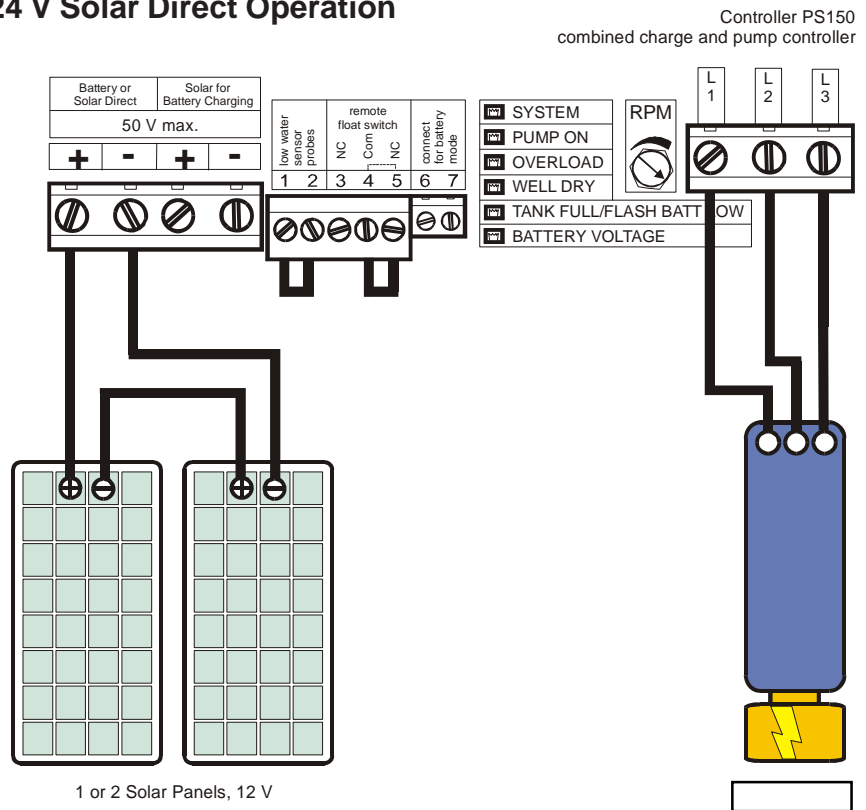
**12-24 V Solar direct system:**  
Voltage from panels will read 22-44 V when disconnected (open circuit).

Use the **left** power terminals to connect the solar array with the controller

Note: The jumper wire on terminal 6 and 7 must be taken out for solar direct mode.

**Remote Tank Float Switch:**  
Connect float switch to terminals 4-5 of the pump controller when it breaks contact on rise, to turn the pump OFF.

Otherwise use terminals 3-4 for opposite function.



**Wire sizing Table Controller to Pump Motor**

Feet max. length	Meters	Pump Watts - wire size mm <sup>2</sup> / AWG		
		70W / 12V	150W / 17V	300W / 24V -30V
17	5	2,5 / #14	2,5 / #14	2,5 / #14
33	10	2,5 / #10	4 / #10	4 / #10
50	15	4 / #10	4 / #10	4 / #10
65	20	4 / #10	6 / #10	6 / #10
80	25	6 / #10	6 / #10	6 / #8

wire sizing layout for max. 6% cable loss

### 7.4 Battery High Run Jumper



In order to set the Battery High Run function set the jumper as shown in above picture. This will increase the Low Voltage Disconnect settings to 12,3 / 24,6V and the re-start voltages to 13,3 / 24,6V to allow pumping only when the batteries receives charging current from the solar array. The lifetime of the battery will be increased considerably as cycling is avoided.

### 7.5 Power Control for Solar Direct Operation

PS150 pumps require different current depending on speed and lift. When low light conditions are present, the PV array cannot supply the required current.

If you don't use a controller the voltage will drop to nearly zero, and the pump will "stall" (like a truck trying to start in 4th gear).

The PUMP CONTROLLER, also called LINEAR CURRENT BOOSTER (LCB) including Maximum Power Point Tracking (MPPT) acts like a "gear box" in your car. This device will match the power source to the load by transforming the voltage down while increasing the current delivered to the motor (like an automatic transmission).

## 8 TROUBLESHOOTING

**Please read this section before calling for help.**

If you call for help, please refer to the model and serial numbers.

### If The Pump Doesn't Run

Most problems are caused by wrong connections (in a new installation) or failed connections, especially where a wire is not secure and falls out of a terminal. The *System ON* light will indicate that system is switched on

and connected to the controller. It indicates that *VOLTAGE* is present but (in a solar-direct system) there may not be sufficient power to start the pump. It should attempt to start at intervals of 120 seconds.

#### **Pump attempts to start every 120 seconds but doesn't run**

The controller makes a slight noise as it tries to start the pump. The pump will start to turn or just vibrate a little.

1. There may be insufficient power reaching the controller. A solar-direct (non-battery) system should start if there is enough sun to cast a slight shadow. A battery system should start if the supply voltage is greater than 12V (12V system) or 24V (24V system).
2. If the pump was recently connected (or reconnected) to the controller, it may be running in reverse direction due to wiring error. See Section 5.6.
3. If the motor shaft only vibrates and will not turn, it may be getting power on only two of the three motor wires. This will happen if there is a broken connection or if you accidentally exchanged one of the power wires with the ground wire.
4. The pump or pipe may be packed with mud, clay, sand or debris.
5. Helical rotor models: The pump may have run dry. Remove the pump stator (outer body) from the motor, to reveal the rotor. If there is some rubber stuck to the rotor, the pump end must be replaced.
6. Helical rotor models: The check valve on the pump may be faulty or stuck, allowing downward leakage when the pump is off. This can prevent the pump from starting.

**PUMP OVERLOAD (PUMP ON light shows red instead of green)** The system has shut off due to an overload. This can happen if the motor or pump is blocked or very difficult to turn and is drawing excessive current (hard to turn). Overload detection requires at least 250 Watt output of the solar array. This can be caused by a high concentration of solids in the pump, high water temperature, excessive pressure due to high lift or a restriction in the pipe, or a combination of these factors. The controller will make 3 start attempts before shutting down the system. The System ON LED will be OFF and the red OVERLOAD LED ON. The system will not reset until the ON / OFF switch is turned OFF and ON again.

## 9 WARRANTY

Your pump is warranted to be free from defects in material and workmanship for two (2) YEARS from date of purchase.

Failure to provide correct installation, operation, or care for the product, in accordance with instructions, will void the warranty.

Product liability, except where mandated by law, is limited to repair or replacement, at the manufacturer's discretion. No specific claim of merchantability shall be assumed or implied beyond what is printed on the manufacturer's printed literature. No liability shall exist from circumstances arising from the inability to use the product, or its inappropriateness for any specific purpose. It is the user's responsibility to determine the suitability of the product for any particular use.

Pump Rotor / Stator / Impeller of PS150 Motor / Pump are considered to be normally wearing parts, and are not covered under warranty. Warranty does not cover damage due to sand or abrasive silt in the water, mishandling or other abusive conditions, lightning or other acts of nature.

Warranty of pump controllers does not cover damage due to: mishandling or abuse; failure to protect from weather exposure; failure to protect from overheating due to sun exposure; failure to seal out insects, spiders or rodents; lightning, flood or other acts of nature.

In all cases, it shall be the responsibility of the customer to insure a safe installation in compliance with local, state and national electrical codes.