PCA Series
Sensorless Brushless
DC Motor Controller
Installation Manual

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Phone (928) 348-9652 Fax (928) 348-9653

1.0 Introduction

Thank you for selecting a SunPumps SCS series solar pump system. The SCS series pump and PCA series pump controller are the key components to high quality solar powered pumping systems. Their stand-alone, pollution free and low noise operation makes them an ideal solution for remote homes, wildlife and stock watering problems without violating the environment.

SunPumps SCS series pumps are multi-stage centrifugal, brushless, sensorless three phase DC powered, submersibles constructed of high quality stainless steel. These pumps were designed specifically for water delivery in remote locations.

The PCA-series controllers are micro-processor-based, solid-state DC power converters designed as the interface between a solar module array and a brushless, sensorless three phase DC pump motor. The purpose of the controller is to maximize the total daily water output while providing protection for the pump as well as providing an interface with other related pumping system equipment.

Although these SCS series pump systems are easy to install, please read this manual to become familiar with the controller features, functions, connection points and various configurations. For future reference, keep this manual and other relevant product information in a safe place.

PRECAUTIONS

- **Safety First – Always understand what you are doing when working with any form of electricity. Guessing at something is not worth the potential of product damage and/or severe personal injury.**

- **Shut down all power when working on the system**.

- **Do not attempt to feed live wires into the PC-series controller or product damage and/or personal injury may result.**

- **Do not exceed the voltage and power rating of the controller**.

- **Do not splash water on the controller when the cover is open**.

- **Mount the controller in a shaded, well vented, *vertical* position**.

- **Installation of this system should be done by a licensed Solar Pump Contractor.**

2.0 Product Overview

SunPumps PCA series controllers were primarily designed for the 60V and 120V SCS-series, brushless, sensorless three phase DC submersible pump. When properly installed and configured, the unique features incorporated into this stand-alone system will automatically control and protect your pump system permitting many years of dependable, trouble free service. SunPumps has produced multiple versions of this controller. The differences between the versions are certain set points and electrical characteristics which are detailed in the table on the next page.

Table 1

Controller Model	Min Voltage[1]	Max Voltage	Min Power	Max Power	Low Water Cutoff Min	Low Water Cutoff Max	Nominal Voltage
PCA-60BLS-M2[2]	30 V	100 V	Set by LWC	840 W	50 W	300 W	60 V
PCA-120BLS-M2[2]	90 V	200 V	Set by LWC	1500 W	50 W	500 W	120 V

[1]Min Voltage is the minimum voltage which the unit must see in order to start the pump. If this voltage is not obtained, the unit will not attempt to start the pump. Voltages lower than this will not hurt the unit.
[2]Both controller models have the same operating features, functionality and setup. Voltage and power tolerances are the only differences of concern to the end user. This manual will only differentiate when necessary for clarity.

2.1 Controller Features

1. Current boosting for matching the load requirements of the pump.
2. Voltage regulation of the solar electric array at its maximum power point.
3. Over-current protection via integrated electronic circuit breaker.
4. Reverse polarity protection (10 amperes maximum) on the input terminals.
5. Voltage and current limiting to pump motor.
6. Transient protection and surge suppression.
7. Adjustable pump motor voltage control for precision output flow.
8. System ON/OFF switch.
9. LED indicators; 1. Power In, 2. Motor Run, 3. MPPT, 4. RS Stop, 5. Low Power, 6. Over-Current, 7. Fault Condition.
10. Weather resistant cast aluminum enclosure with hinged door.
11. Rising clamp screw terminal blocks – no fork terminals required.
12. Remote switch interface – float switch or remote shutdown –Normally Open or Normally Closed user selectable.
13. Sensor and sensor less "Low Water Cutoff" circuit
14. Low Power Shut Down circuit

2.2 Application

The only application the PCA series controllers are designed for is the interface between a solar module array or battery bank and a brushless, sensorless three phase DC motor as well as various peripheral pump system signal devices.

No other applications or DC power sources are recommended or warranted unless written approval is provided by the SunPumps factory.

3.0   Installation and Operation

The following sections are outlined in a step-by-step format to guide you through the installation of a PCA series controller. **Before installing any pump system, read all product manuals and review all system components to become familiar with the physical and electrical layout.** Check all equipment for any product damage. Refer to applicable figure(s) as a guide during the installation. Controller door must be closed during normal operation.

Warning

Reverse polarity on a panel system capable of producing over 10 amps will result in non-warranted product damage. Please check polarity before connecting power to the controller.

3.1   Location

As the majority of system installations vary greatly, only general comments can be made as to location. Prior to installing the system, it is suggested to make a system layout plan. During the system layout, take into consideration any potential shading of the solar electric modules, wire runs, wire size, conduit runs, trenching, controller accessibility, tank location, pump head etc.. Shading even a small portion of the array can reduce the output of the entire array and thus reduce or completely stop the output of the pump. There is no substitute for a good plan!

The PC-series controller can either be mounted indoors or outdoors. Locate all system equipment as close as possible to each other. Generally the controller is mounted on the north side of a pole which has solar electric modules mounted on top of it. The controller must be mounted in a vertical position for proper cooling and to keep the electronics dry. The pole should be located close to the well (bore hole). This general physical layout is conducive to clean installation aesthetically and electrically.
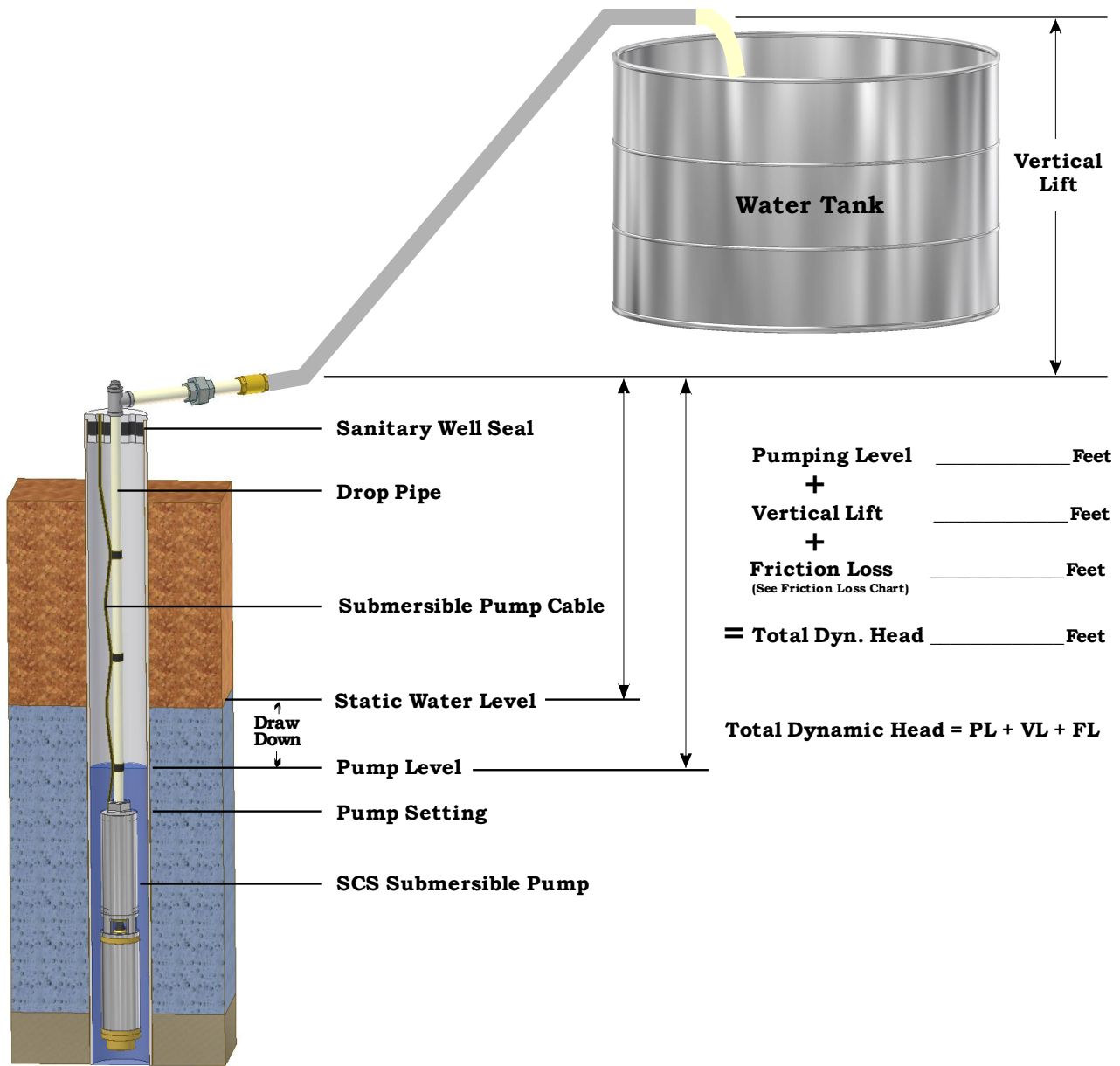
3.2 <u>System Design Basics</u> **(Read carefully before installation)**

1. For optimum pump performance make sure that the wire is sized properly for the length of run between the pump and the solar modules. Wire sized too small will cause a decreased output from the pump. Keep the distance from the solar modules to the pump as short as possible. Refer to a DC wire loss chart for proper sizing. It is recommended to keep the voltage drop under 3%.

2. Due to the aggressive action of DC power, it is essential that any under-water splice be made correctly. This splice must be watertight. Improper sealing of the splice will cause poor pump performance and may cause damage to the system. A SunPumps splice kit S-703 is recommended for this watertight connection.

3. Never install a pump in a well that has had an oil-lubricated line shaft turbine in it without cleaning it first. Any drip oil remaining in the water may damage the pump shaft bearing sleeves.

4. Never install the controller in direct sunlight. Direct sunlight on the controller may cause over-heating of the controller.

5. Never lay the controller on the ground or mount the controller in a horizontal position. The controller should be mounted in a vertical position only. A convenient place to mount the controller is on the north side (shaded side) of the solar module array.

6. The controller should be grounded to the pump motor housing, the frame of the solar modules and to an 8-foot ground rod. If the well casing is steel it may be used as the ground rod. Drill and tap a hole in the casing or weld a bolt to the casing for the ground lug. Use only a copper lug to attach the ground wire. The cemented support structure pole will not provide an adequate ground. Do not ground the positive or negative electrical wires.

7. Do not ground the positive or negative electrical wires.

3.3 <u>Well Measurements</u>

Before installing the pump measure the depth of the well (bore hole) and static water level. The static water level is the distance from the top of the well casing to the water level in the well (bore hole). This information is necessary in determining the pump setting (See Figure 1).

Figure 1   Solar Pump System Terms & Head Calculations

Water Tank

Vertical Lift

- Sanitary Well Seal
- Drop Pipe
- Submersible Pump Cable
- Static Water Level
- Draw Down
- Pump Level
- Pump Setting
- SCS Submersible Pump

Pumping Level	_____ Feet
+	
Vertical Lift	_____ Feet
+	
Friction Loss	_____ Feet
(See Friction Loss Chart)	
= Total Dyn. Head	_____ Feet

Total Dynamic Head = PL + VL + FL

Determining Total Dynamic Head

Pumping Level
Pumping level is the vertical distance in feet from the discharge pipe at the well head to the water level in the well while pumping at the specified flow rate.

Vertical Lift
Vertical lift is the vertical distance in feet from the discharge pipe at the well head to the discharge pipe at the top of the water tank.

Friction Loss
Friction loss is the resistance to flow through a pipeline measured in PSI drop and converted to head feet. The amount of loss depends on the diameter of the pipeline, the length of the pipeline, the flow rate, the number and type of fittings and the coefficient of friction of the pipeline material. Refer to friction loss tables for your specific application. (There is a Friction Loss Program on the SunPumps web site in the engineering section at www.sunpumps.com.)

3.4 Pump Installation

1. The well should be clean and disinfected before the pump is installed. You should always clean and develop a new well before installing the pump.

2. Write the pump, motor and controller model number and serial number in the space provided on the last page in this Instruction Manual. This information will be needed when filling out the Warranty Card. And will aide in any troubleshooting which may be necessary.

3. Inspect all components for shipping damage and insure that you have all the components that are required for a complete installation.

4. Select a well-ventilated, shaded location in which to <u>vertically</u> mount the control box. The shaded side of the solar panel rack mounting pole is usually a convenient place.

5. If using unthreaded discharge pipe install a stainless steel or brass adapter fitting into the pump discharge head. Consult your pump supplier for other available adapter materials. **Do not use galvanized connections on stainless steel or bronze discharge heads as galvanic corrosion will occur.** Connect the drop pipe, safety rope and sand shroud (if used) to the pump. Barbed type connectors should always be double clamped. For poly pipe, compression fittings are recommended.

6. Splice the drop cable to the motor lead using an underwater splice kit. (See wire splicing instructions provided with splice kit.) Match the drop cable wire colors to the pump motor leads. If the drop cable does not have the same color wires as the pump, be sure to record which colors go to the various colors of the motor lead and label them. The motor can run in reverse if not connected properly.

7. You can now lower the pump into the well. Set the pump at least 10' off the bottom (see 3.2 System Design Basics #4). **Never rest the pump on the bottom of the well. Never lower the pump by the submersible pump cable.**

8. Tie the drop pipe, drop cable and safety rope together every ten feet with 2" 10 mil pvc pipe wrap tape. Make sure that the tape does not loosen as it will block the pump suction if it falls down the well. The use of the safety rope is at the discretion of the installer.

9. Slide the well seal over the discharge end of the pipe, connect the discharge fitting, pull the drop wire through the well seal and connect the safety rope, if used, to the eye-bolt on the inside of the well seal.

10. Finish lowering the pump and pipe assembly into the well (bore hole) positioning the well seal over the top of the casing. Connect the discharge pipe to the fitting on top of the well seal and run the pump wires to the controller.

3.5   <u>Wiring</u>

Prior to connecting any wires to the controller be sure you have a system wiring diagram to use as a reference. Generic system wiring diagrams are included in this manual for your convenience. **(See Figures 2 and 3)** Guessing at polarity and connection points is not worth the risk of potential product damage and/or personal injury.
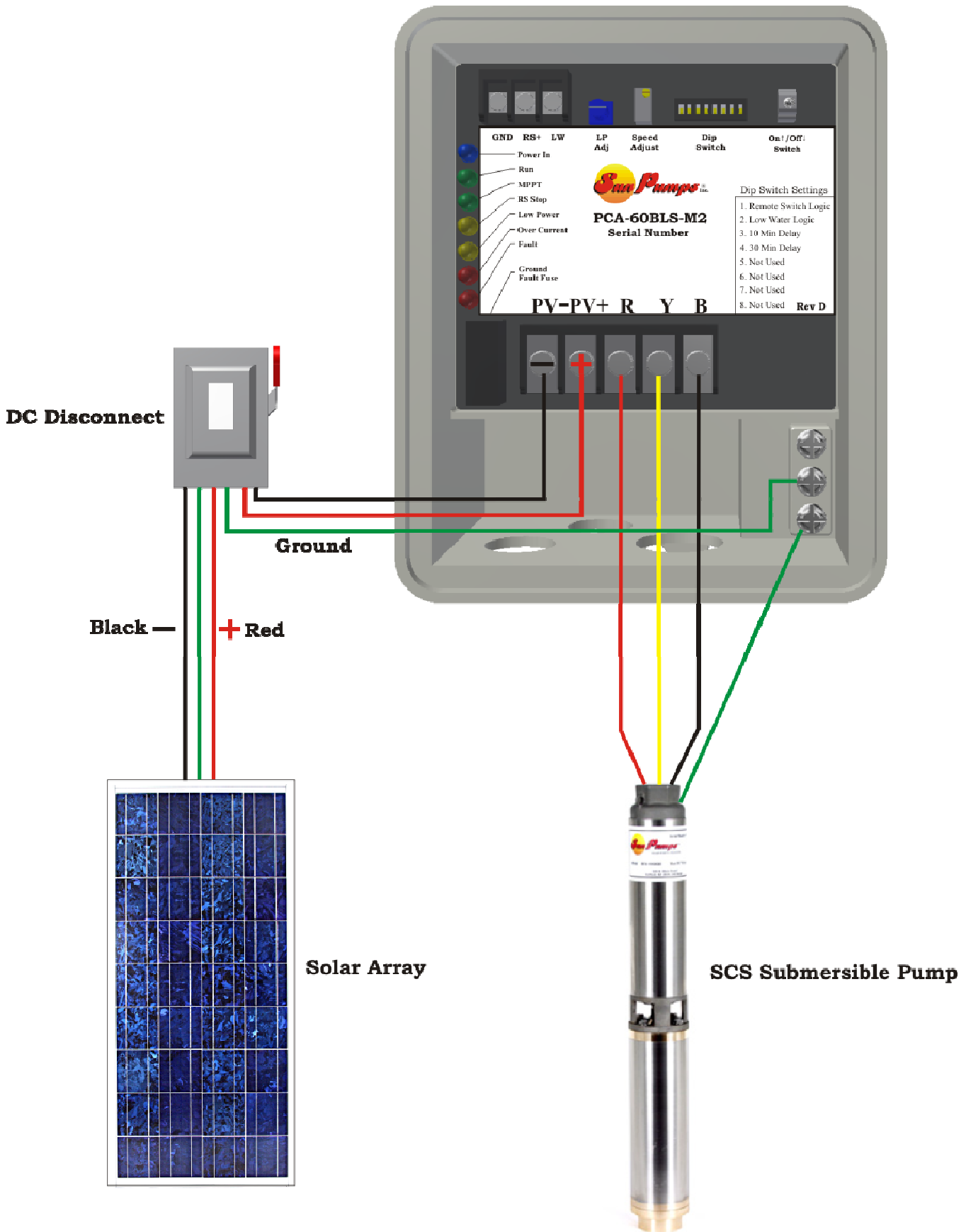
Ensure the wire sizes are of adequate diameter (gauge) to minimize voltage drop. Please refer to a DC voltage loss table or call your SunPumps dealer for assistance.

All other system equipment should be installed before proceeding with wiring the controller.   Double check polarity and wire termination tightness before powering up the system.

CAUTION : Photovoltaic panels produce DC electricity when exposed to sunlight. Cover the panels with a blanket or with an opaque material before wiring. Install a disconnect switch between the solar modules and the controller.

Figure 2

Controller Wiring Diagram
(Power Connections)

DC Disconnect

Black — **+ Red**

Ground

Solar Array

SCS Submersible Pump

Controller labels

GND RS+ LW   LP Adj   Speed Adjust   Dip Switch   On! /Off! Switch!

Power In
Run
MPPT
RS Stop
Low Power
Over Current
Fault
Ground Fault Fuse

PCA-60BLS-M2
Serial Number

Dip Switch Settings
1. Remote Switch Logic
2. Low Water Logic
3. 10 Min Delay
4. 30 Min Delay
5. Not Used
6. Not Used
7. Not Used
8. Not Used   **Rev D**

PV– PV+ R   Y   B

1. Switch the controller to the OFF position.

2. Connect ground rod conductor to the controller chassis ground block (See Figure 2).

3. Connect solar module frame ground conductor and the pump ground conductor to controller chassis ground block (See Figure 2).

4. Connect pump motor leads to the lower terminal block. Red leg to "R", yellow leg to "Y" and black leg to "B" (See Figure 2).

5. Connect the DC source supply negative (-), black conductor to the controller terminal labeled "PV-". (NOTE: If a fused disconnect is used, the power should be connected to it first and then to the controller see Figure 2).

6. Connect the DC source supply positive (+), red conductor to the controller terminal labeled "PV+". (NOTE: If a fused disconnect is used, the power should be connected to it first and then to the controller see Figure 2).

7. Connect the remote switch and the low water cutoff sensor to the upper terminal block (See Figure 3). Refer to the next section for "Remote Switch" and "Sensor Low Water Cutoff" connections and configuration (if applicable) and then return to this point.

8. At this point, all system components are installed and wired, double check conductor polarities, wire termination tightness and controller configuration. If you have a volt meter check the open circuit voltage and the module polarity before connecting power to the controller.

9. Switch the disconnect on. If the polarity is correct the red light will be on.

10. Turn the "ON/OFF" switch to the ON position. The system should be operational. If the system is not working refer to the "Troubleshooting" section.

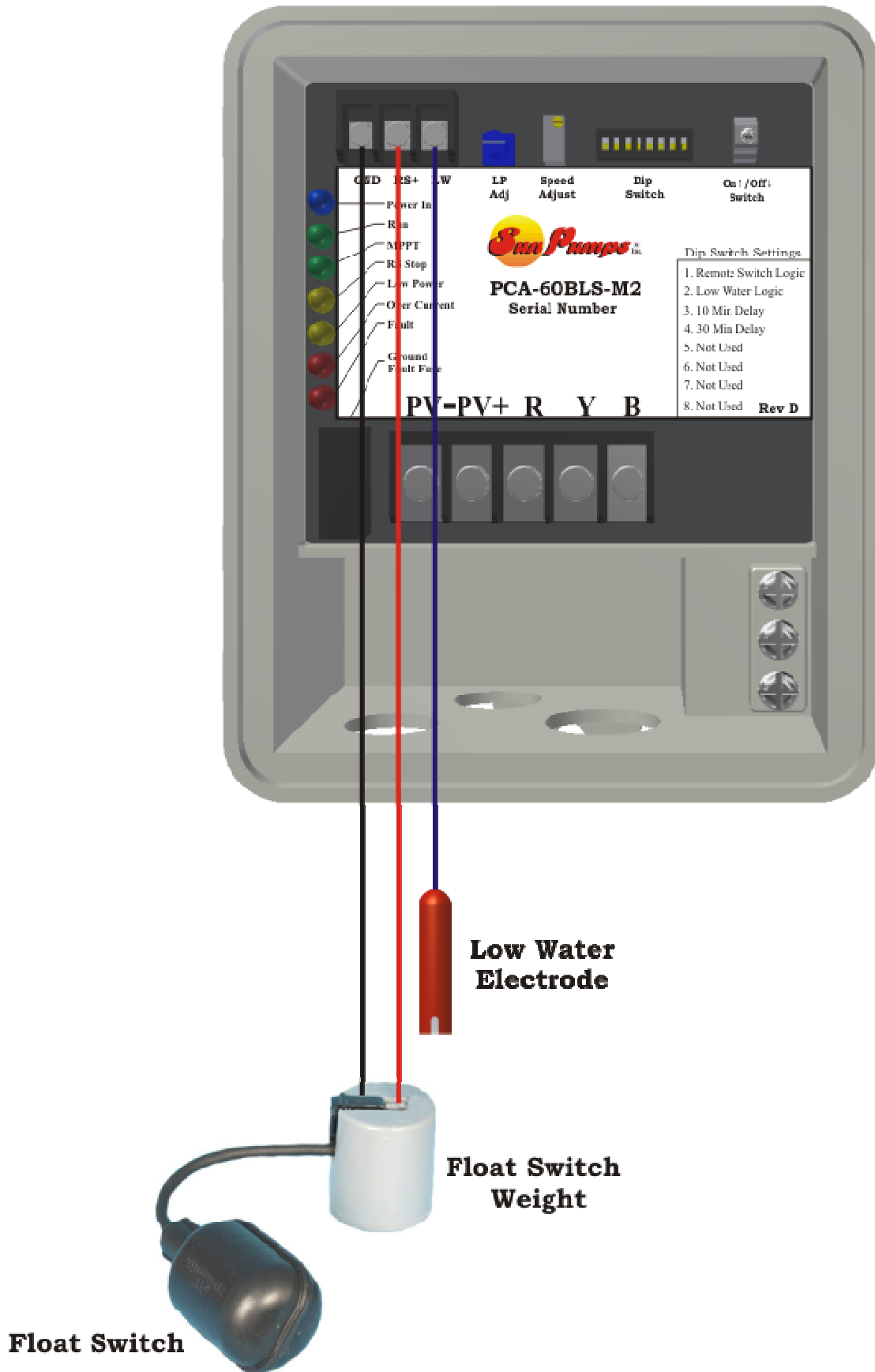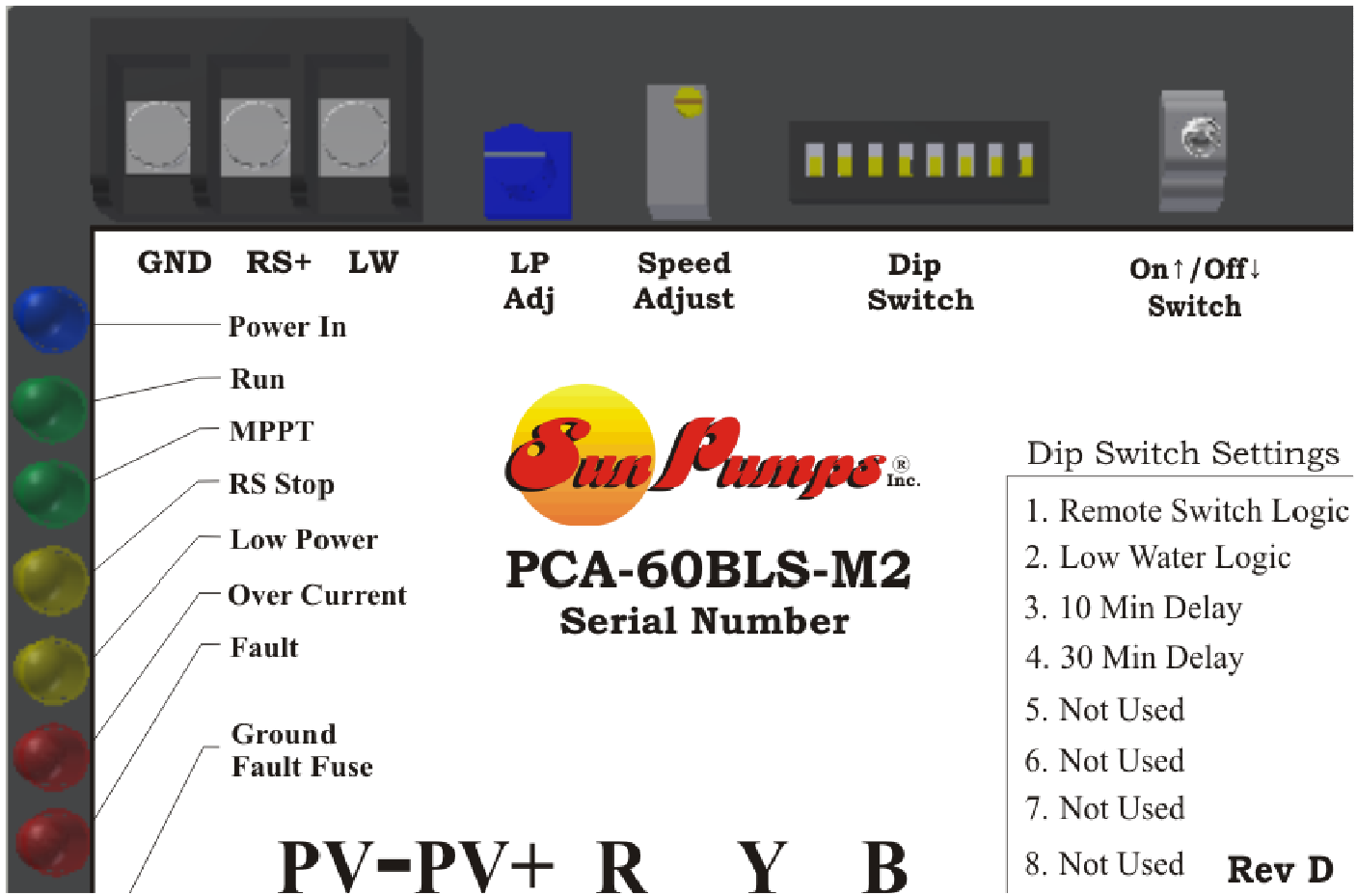# Figure 3   Controller Wiring Diagram
(Auxillary)

Figure 4 <u>Dip Switch Settings</u>

Switch Number	Switch Position	Description	Function	Default Setting
1	OFF	Remote Switch Logic	Turns pump off when terminals connect.	OFF
1	ON	Remote Switch Logic	Turns Pump on when terminals connect.	OFF
2	OFF	Low Water Cutoff Logic	Turns pump off when terminals connect.	OFF
2	ON	Low Water Cutoff Logic	Turns pump on when terminals connect.	OFF
3	ON	10 Minute Delay	Increases turn on delay to 10 minutes	OFF
4	ON	30 Minute Delay	Increases turn on delay to 30 minutes	OFF
5,6,7,8	OFF	Not used at this time	Must be in the off position for proper operation	OFF

3.6   Controller Settings

The PCA series controllers have several settings (see figure 3). Most features include system configuration adjustments, some of which are user selectable by an eight position DIP-switch located on the face of the controller.

Switch 1 is the Remote Switch Logic. With this switch off (down), terminals "RS+" and "GND" must be connected to turn the controller off. With this switch on (up), terminals "RS+" and "GND" must be connected to turn the controller on.

Switch 2 is the Low Water Cutoff Logic. With this switch off (down), terminals "LW" and "GND" must be connected to turn the controller off. With this switch on (up), terminals "LW" and "GND" must be connected to turn the controller on.

Switches 3 and 4 are delay timer adjustments. The delay timer is used for the remote switch and the low water cutoff. This timer by default is set for one minute. Switch 3 will increase the timer to 10 minutes; Switch 4 will increase it to 30 minutes. See Remote Switch and Low Water Cutoff for more information.

Switches 5, 6, 7 and 8 are not used at this time and should remain down.

3.7 Auxiliary Control Circuits

The auxiliary control circuits are configured and controlled with the "Dip Switches", "LP Adj.", "Speed Control" and the "RS", "LW" and "GND" terminals. (See Figure 3)

These circuits offer expanded capability and are described here. The remote switch control is for float switches (storage tank level), pressure switches or a remote system "ON/OFF" toggle switch. The motor speed control is for adjusting the flow rate of the pump. There is also the low water cutoff, low power shut down and over current protection circuits. See each corresponding detailed description below.

NOTE: **Use only "Shielded Wire" to run from the remote switch to the controller and the ground wire must be grounded to the controller side only.** Induced voltages from lightning storms or two-way radio transmissions could damage the controller.

Over-Current Shut Down Circuit

The over-current shut down circuit will turn the controller off any time the current exceeds the current limit of the controller. When it turns the controller off it will remain off for 3 minutes and then turn on again. When it turns off an error light will light and the display will say Over-Current. When it turns on again, if it is still pulling excessive current it will continue to shut down for 3 minutes and try to restart.

Sensor Low Water Cutoff Circuit

The sensor type low water cutoff circuit is designed as a safety feature to protect your pump from running dry or your tank from over flowing. The "LW" terminal of the controller should be attached to a low water sensor electrode which is mounted in your tank or well. The system can be used to detect low water or to detect high water depending on the position of switch 2 on the dip switch. When dip switch 2 is in the off position, the low water cutoff circuit expects not to touch water. If water comes into contact with it, and completes the circuit to ground, the pump will shut off until the water is removed and the delay timer times out. A three minute timeout is default for this feature but is modifiable by switches 3 and 4 to 10 or 30 minutes respectively. This timeout applies to remote switch and low water cutoff.

Remote Switch

The Remote Switch interface can serve as an automatic system shutdown when used with a water storage tank mounted float switch, a pressure switch or it can also serve as a manual system shutdown with a remote system ON/OFF toggle switch. The remote logic circuit allows the use of standard "Pump-Up or Pump Down" float switches. Please refer to the following operation scenarios for configuration options.

With switch number 1 in the *OFF* position, the controller is configured to accommodate a Normally Open (N.O.) float switch or remote toggle switch. In this configuration the controller will operate as follows:

PUMP ON
float switch open = water tank low = pump ON

PUMP OFF
float switch closed = water tank high = pump OFF

With switch number 1 in the *ON* position, the controller is configured to accommodate a Normally Closed (N.C.) float switch, pressure switch or remote toggle switch. In this configuration the controller will operate as follows:

PUMP ON
switch closed = water tank low = pump ON

PUMP OFF
switch open = water tank high = pump OFF

A one minute minimum timeout is default for this feature but is modifiable by switches 3 and 4 to 10 or 30 minutes respectively. At certain times the controller may be off for up to 14 minutes depending on various factors in the controller program. This timeout applies to remote switch and low water cutoff.

Low-Power Shut-Down/Sensorless Low Water Cut-Off Circuit (LPLW)

The Low-Power Shut-Down/ Low Water Cut-Off Circuit (LPLW) turns the pump off any time the controller output power drops below a functional level. This may be caused by lack of power from the solar panels or from running out of water. This protects the pump in stall conditions and saves wear on the system when no or very little water is being pumped. This feature must be adjusted for your specific application.

This feature is always monitoring the output of the motor. If you are not interested in using this feature turn the "LP Adj" trim pot fully counter-clockwise. This will give the pump the minimum low power set point possible.

LPLW Adjustment
The Low Water Cut-Off Circuit and the Low Power Shut-Down circuit are adjusted using the same trim pot labeled "LP Adj." on the controller. The default is the arrow pointing straight up. This is sufficient for most systems but adjustment will maximize the life and output of your system. Follow the steps below to adjust this feature.

1. Turn the "LP Adj." trim pot fully counter clockwise.

2. Turn the "Speed Control" trim pot counter clockwise until the pump is pumping the desired minimum flow. This may be down to 0 gal/min but is not recommended for proper pump cooling.

3. Turn the "LP Adj." trim pot clockwise until the pump shuts off.

4. Reset the "Speed Control" trim pot back to the desired position.

Motor Speed Control

The Output Power Limit Control circuit is used to control the speed of the pump motor and thus the flow rate of the pump. It is primarily used for low producing wells where the pump output is matched to the production rate of the well. However it can also be used any time specific flow rates are required.

Motor Speed Control Adjustment

The purpose of this procedure is to adjust the output power of the controller and thus reduce the water flow of the pump. If tests have shown the pump will out produce the well capacity, then the controller "Speed Control" feature can be used to match the flow rate of the pump to the production of the well.

1. With the system installed and controller properly configured, allow the pump to run at full power at mid-day until the pump starts surging.

2. Slowly turn the "Speed Control" trim pot located on the face of the controller counter clockwise until the pump stops surging. This is the point where the pump flow rate equals the well production. This process will probably take a few attempts to "balance" the system for optimum water production. If maximum water is not a critical issue you may want to reduce the pumps flow rate an additional 5% to 10% to insure the pump will not run dry.

   (NOTE: The trim pot has a10- turn range. It usually takes many complete turns in a counter-clockwise direction before you will notice any change in water output or motor speed).

4.0   Troubleshooting

Sun Pumps, Inc. is dedicated to its customers and will gladly help you trouble shoot any problems with your system. However, especially during the busy summer pumping season, we may not be able to help you right away. Using this trouble shooting guide as your first resource when your system is not working properly can save you valuable time in getting your system fully functional. If at any time however, you are not comfortable performing any of these tasks, or do not fully understand the system, it is better to call than to guess. **Before calling please go through the section below labeled "Before Calling Sun Pumps" and complete the steps there.**

 CONTROLLER DOES NOT TURN ON

1. Check the LED's on the face of the controller. The top LED, labeled "Power In", should be on. This indicates power is connected to the controller and the polarity is correct. If it is not on, verify that the controller is properly wired, including polarity, and that the input terminals have at least 30 volts. Less than 30 volts at the input terminals and the unit may show no signs of operation. If you do have at least 30 volts in the right polarity, contact Sun Pumps for further assistance.

2. If the expected voltage is not present, disconnect the panels from the controller using the disconnect, and check any fuses and breakers in the system. Replace blown fuses and reset tripped breakers.

3. If there are no blown fuses and no tripped breakers, check the open circuit voltage of your array. If the open circuit voltage is not correct trouble shoot the array to find the problem. If the open circuit voltage is correct, call Sun Pumps for further assistance.

CONTROLLER TURNS ON BUT PUMP DOES NOT RUN

1. Make sure the On/Off switch is in the up position (On). The second LED is labeled "Run". This indicates the pump is running. If it is on, go to the bore hole and listen for the sound of the motor. Check for breaks in the pipe. If you cannot find a problem call Sun Pumps for further assistance.

2. Check the fourth LED, labeled "RS Stop"; this is the remote switch shutdown indicator. If it is on, the remote circuit or low water cutoff circuit is preventing the controller from running the pump. Set the #1 and #2 dip switches to off and disconnect the remote switch and low water cutoff. Turn the switch off then back on. If the light goes out and the pump starts, troubleshoot the remote switch and low water cutoff individually. If the pump does not start and the LED is still lit, call Sun Pumps for further assistance.

3. Check the fifth LED, labeled "Low Power"; this is the low power shutdown indicator. If it is on, the controller detected a low power or low water condition. The low power shut down is a common occurrence on days which have clouds which block the sun momentarily. First check the input voltage to the controller. Verify that this exceeds the minimum voltage in Table 1. If it does not meet or exceed the minimum voltage, you do not have enough power to start your pump. **Note**: To accurately trouble shoot this feature there should be absolutely no clouds blocking the sun at any time during the following tests. If you have enough input voltage, turn the controller off then on again to reset this fault. If the low power or low water condition still exists then the controller will start but shut down again. Turn the blue pot labeled "LP Adj" all the way counter-clockwise. Cycle the pump off then on. If the pump does not shut down, the low water cutoff was causing the error. If you want to use this feature, readjust the low water cutoff as seen earlier in this manual. If the does not run properly, skip to step 7. Check to verify the pump is not running out of water. If your pump is not running out of water, call Sun Pumps for further assistance.

4. If the sixth LED, labeled "Over Current" is on, the controller has exceeded its current limit and shut down. Turning the controller off then on again will reset this fault. If the controller continues to need high current, it will turn itself off again. Verify the nominal voltage of your array. If the calculated Vmp for your array is higher than 200 V, the controller may go into over current. Remove one series panel from each string and try again. Check the pump for a short to ground using an ohm meter and call Sun Pumps for further assistance.

5. If the seventh LED, labeled "Fault Condition", is on, this indicates a motor or ground fault fuse error.. Check motor wiring and connections. Also check the ground fault fuse, it may have been blown. Check your system for ground loops and replace the fuse with a 500 VDC 1A rated fuse. If this does not solve the issue, contact Sun Pumps for further assistance.

6. Check for proper dip switch settings on your controller. Switches 5, 6, 7, and 8 must be in the off position for proper operation.

7. Check for proper controller input voltage. If the pump is not running, the input voltage should be the array open circuit voltage, (Voc). Verify that this voltage is below the maximum input voltage allowed for your controller (model dependent see Table 1). Check the Voc on the label on the back of the solar modules and multiply this figure times the number of modules that are connected in series. This number should be + - 10% of the measured reading. If it is not then confirm all electrical terminations are tight and secure. Use a DC volt meter to check each solar module for proper open circuit voltage (Voc). A single bad module can drop the voltage and current of an entire string of panels.

PUMP IS RUNNING BUT THE OUTPUT IS LOW

1. Make sure you have full sun light at midday, that there are no clouds and no shadows on any part of the array. Then verify power going into the controller by measuring the voltage and current. Check this against the pump chart for your specific application.

2. If the power is correct for your pump model and array size then make sure the pump wires are connected to the proper terminals. If two wires are reversed the motor will be running in reverse. It may still pump but not at the full rated output.

3. If the wires are correct verify that your system does not have any leaks where water can be lost. If you cannot determine the problem, contact Sun Pumps for further assistance.

PUMP DRAWS EXCESSIVE CURRENT (More than the rating of the pump, but less than the rating of the controller)

1. Check wiring diagram for proper connection.

2. Check for skinned wires or faulty underwater splice.

3. Check for locked motor armature. With the pump out of the well, remove the pump end from the motor (if this is not feasible skip this step and contact Sun Pumps). Allow the controller to attempt to start the motor. If the motor still does not run, contact Sun Pumps for further assistance.

4.1 *BEFORE CALLING SUNPUMPS*

If at all possible when calling Sun Pumps for technical support there are a few things which will help to speed up the process and help us determine the cause of and solution to the system failure. The best way to get help is to call while you are physically at the location of your pump, have good sunlight, and have a multimeter and a screwdriver with you.

Furthermore, please fill out the form below before calling. This information will provide us with most of the preliminary information we need to help you. If you cannot physically be at the site, filling out the worksheet is a must.

Pump Model Number: _____
Pump Serial Number: _____
Motor Serial Number: _____

Controller Model Number: _____
     Software Version _____

Date Purchased: _____

Solar Module Specifications:
    Model Number _____
    Rated Watts _____
    Voc _____
    Vmp _____
    Isc _____
    Imp _____

Solar Modules Connected in Series _____ X Voc _____ = _____ Array Voc

Solar Modules Connected in Series _____ X Vmp _____ = _____ Array Vmp

Series Strings Connected in Parallel_____ X Isc _____ = _____ Array Isc

Series Strings Connected in Parallel_____ X Imp _____= _____ Array Imp

Well Specifications:
    Well Depth _____
    Well Diameter _____
    Static Water Level _____
    Pumping Level _____
    Pump Setting _____

5.0   Technical Specifications

Model	Max Input Voltage	Max Power
PCA-60BLS-M2	100	840
PCA-120BLS-M2	200	1500

Maximum ambient temperature is 120 F.

Controller Dimensions and Weight

Model	Width Inches	cm	Height Inches	cm	Length Inches	cm	Weight Pounds	kg
PCA-60BLS-M2	6.3	16.1	4.2	10.7	7.7	19.5	4.2	1.9
PCA-120BLS-M2	6.3	16.1	4.2	10.7	7.7	19.5	4.2	1.9

For future reference, please list your system data before installing the pump.

Installation Date_____ Static Water Level_____

Pump Model_____ Pumping Level_____

Pump Serial No._____ Additional Vertical Lift_____

Controller Model_____ Pump Depth_____

Controller Serial No._____ Total Dynamic Head_____

Warranty Card No._____ Well Depth_____

Warranty Statement

SCS Series Pump Systems
Limited Warranty – Twenty-Four Months

SunPumps warrants to the original consumer that its products shall be free from defects in material and workmanship under normal applications and service conditions for a period of twelve (24) months after the original date of purchase, but not to exceed eighteen (30) months from the date of manufacture.

At its option, SunPumps will repair or replace any SunPumps product, which has failed due to a defect in material or workmanship during this warranty period. A PCA series controller must be installed in conjunction with an SCS pump to validate the warranty. This limited warranty shall not apply if the SunPumps product has been damaged by unreasonable use, accident, negligence, mishandling, misapplication, alteration, modification, abrasion (sand damage to pump), shipping, service or modification by anyone (other than by SunPumps), or failure which are caused by products not manufactured by SunPumps, or should the products serial number be altered, or by damage that is attributable to an act of God, or by any other causes unrelated to defective materials or workmanship. Any disassembly whatsoever of the product voids all warranty.

The original purchaser MUST complete and send in the warranty registration card, with the pump serial number and the controller serial number for warranty validation. ***No warranty performance will be rendered without a valid warranty card on file at the SunPumps factory.***

There are no express warranties except as listed above. SunPumps shall have no responsibility for damage to property, persons, animals, or other loss or injury resulting from the use of a SunPumps product. The purchaser's exclusive remedy shall be only as stated herein. This warranty is in lieu of all other warranties expressed or implied.

Except for the warranty that the products are made in accordance with the specifications therefore supplied or agreed to by customer, SunPumps makes no warranty expressed or implied, and any implied warranty of merchantability or fitness for a particular purpose which exceeds the forging warranty is hereby disclaimed by SunPumps and excluded from any agreement made by acceptance of any order pursuant to this quotation.

UNDER NO CIRCUMSTANCES WILL SUNPUMPS BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES, LOSS OR EXPENSE ARISING IN CONNECTION WITH THE USE OF OR THE INABILITY TO USE ITS GOODS FOR ANY PURPOSE WHATSOEVER. ALL PRODUCTS ARE SOLD AS IS WITH ALL FAULTS. SUNPUMPS MAXIMUM LIABILITY SHALL NOT IN ANY CASE EXCEED THE PURCHASE PRICE FOR THE GOODS CLAIMED TO BE DEFECTIVE OR UNSUITABLE.

SunPumps is not responsible for labor, transportation, and related costs incurred by the customer to make allegedly defective equipment available to the factory for inspection re-installation, lost profits or costs caused by interruption of service. SunPumps is not responsible for loss or damage to products, owned by customer and located on SunPumps premises, caused by fire or other casualties beyond SunPumps control.

This equipment is not to be used for anything other than the purpose stated in this manual.