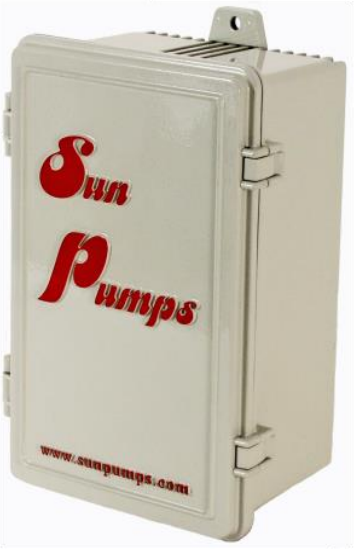
OPERATION AND INSTALLATION MANUAL

PCC Series
Sensorless Brushless
DC Motor Controller



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1.0 Introduction

Thank you for selecting a SunPumps battery powered pump system. Sun Pumps battery pumps and PCC series Sensorless Brushless DC - pump controller are the key components to high quality battery powered pumping systems. Their stand-alone, pollution free and low noise operation makes them an ideal solution for remote homes, irrigation projects, and wildlife and stock watering without violating the environment.

SunPumps pumps are multi-stage centrifugal or piston, three phase brushless sensorless DC powered, pumps constructed of high quality parts. These pumps were designed specifically for water delivery in remote locations.

The PCC-BLS series controllers are microprocessor based solid state DC power converters designed as the interface between a battery bank and a three phase brushless sensorless DC pump motor. The purpose of the controller is to operate the high efficiency, high reliability DC motor and maximize the total daily water output while providing protection for the pump as well as providing an interface with other related pumping system equipment. **Three phase brushless DC motors cannot be run from a battery bank without a controller.**

Although these PCC series pump controllers 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 may cause 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 PCC-series controller. Product damage and/or personal injury may result.**
- **Do not exceed the voltage 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 Pump Contractor.**

2.0 Product Overview

The SunPumps PCC-BLS-M2 series controllers were designed specifically for SunPumps Sensorless Brushless DC motors. 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. Currently SunPumps has only produced one version of this controller. The default set points and electrical characteristics are detailed in the table below.

Table 1

Controller Model	Min Start Voltage[1]	Max Input Voltage	Low Battery Voltage[2]	Max Power	Nominal Voltage	Dead Battery Shut Down[3]
PCC-48BLS-M2	49 V	64 V	47 V	2500 W	48 V	44V

[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 but may harm batteries. This voltage can be adjusted. See Input Voltage Threshold Adjustments.

[2]Low Battery Voltage is the voltage threshold which will cause the controller to turn the pump off after 45 seconds. This voltage can be adjusted. See Input Voltage Threshold Adjustments.

[3]Dead Battery Shutdown is similar to note 2 but will shut down the pump immediately. This voltage can be adjusted. See Input Voltage Threshold Adjustments.

2.1 Controller Features

1. Current boosting for matching the load requirements of the pump.
2. Adjustable voltage regulation of the battery bank.
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 output motor power control for precision output flow.
8. Digital display indicating status, power, voltage, current and more.
9. System ON/OFF switch.
10. LED indicators; 1. Power In, 2. Motor Run, 3. Battery Ready 4. RS Stop, 5. Low Battery, 6. Over-Current, 7. Fault Condition.
11. Weather resistant powder coated, die cast aluminum enclosure with a hinged door.
12. Rising clamp screw terminal blocks – no fork terminals required.
13. Pre-adjusted pump configuration and power source selection.
14. Remote switch interface – float switch or remote shutdown –Normally Open or Normally Closed, user selectable.
15. Sensor and sensor less "Low Water Cutoff" circuit
16. Low Power Shut Down circuit

2.2 Application

The only application the PCC-48BLS-M2 controllers are designed for is the interface between a battery bank and a SunPumps three phase Brushless Sensorless DC motor.

No other applications or DC power sources are recommended or warrantied 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 and configuration of a PCC series controller. The installation and operation should be in accordance with local regulations, accepted codes of good practice and common sense.

Before installing any pump system read all product manuals then 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 system capable of producing over 50 amps can result in non-warrantied product damage. Please check polarity before connecting power to the controller. All 48 volt systems should have a fuse/breaker rating of no more than 50 amps.

This controller is for SunPumps three phase Sensorless Brushless DC Motors only. DO NOT use this controller on Brush-Type motors, Sensor Type Brushless DC motors or on any AC motor. Damage to the controller will result.

3.1 Location

As the majority of system installations vary greatly, only general comments can be made about the installation location. Prior to installing the system, it is suggested to make a system layout plan. During the system layout, take into consideration physical battery bank size, wire runs, wire size, conduit runs, trenching, controller accessibility, tank location, pump head etc. There is no substitute for a good plan!

The PCC-series controller can either be mounted indoors or outdoors. Locate all system equipment as close as possible to each other. The controller is not designed for use in direct sunlight and should be mounted in a shaded location. The controller must be mounted in a vertical position for proper cooling and to keep the electronics dry. This general physical layout is conducive to clean installation both aesthetically and electrically.

3.2 Installation Basics (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 battery bank. Wire sized too small will cause a decreased output from the pump. Keep the distance from the batteries 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 submersible 4 wire splice kit is recommended for this watertight connection.

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

4. 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.**

5. The controller should be grounded to the pump motor housing, the frame of any conductive battery box and to an 8-foot ground rod. Use only a copper lug to attach the ground wire. The Ant thing which is cemented in the ground will not provide an adequate ground. SunPumps recommends that you always use a DC surge/lightning arrestor on the battery side of the controller. (Midnight Solar MN-SPD surge arrestor is recommended)

6. Do not ground the battery positive or negative electrical wires.

3.3 Wiring

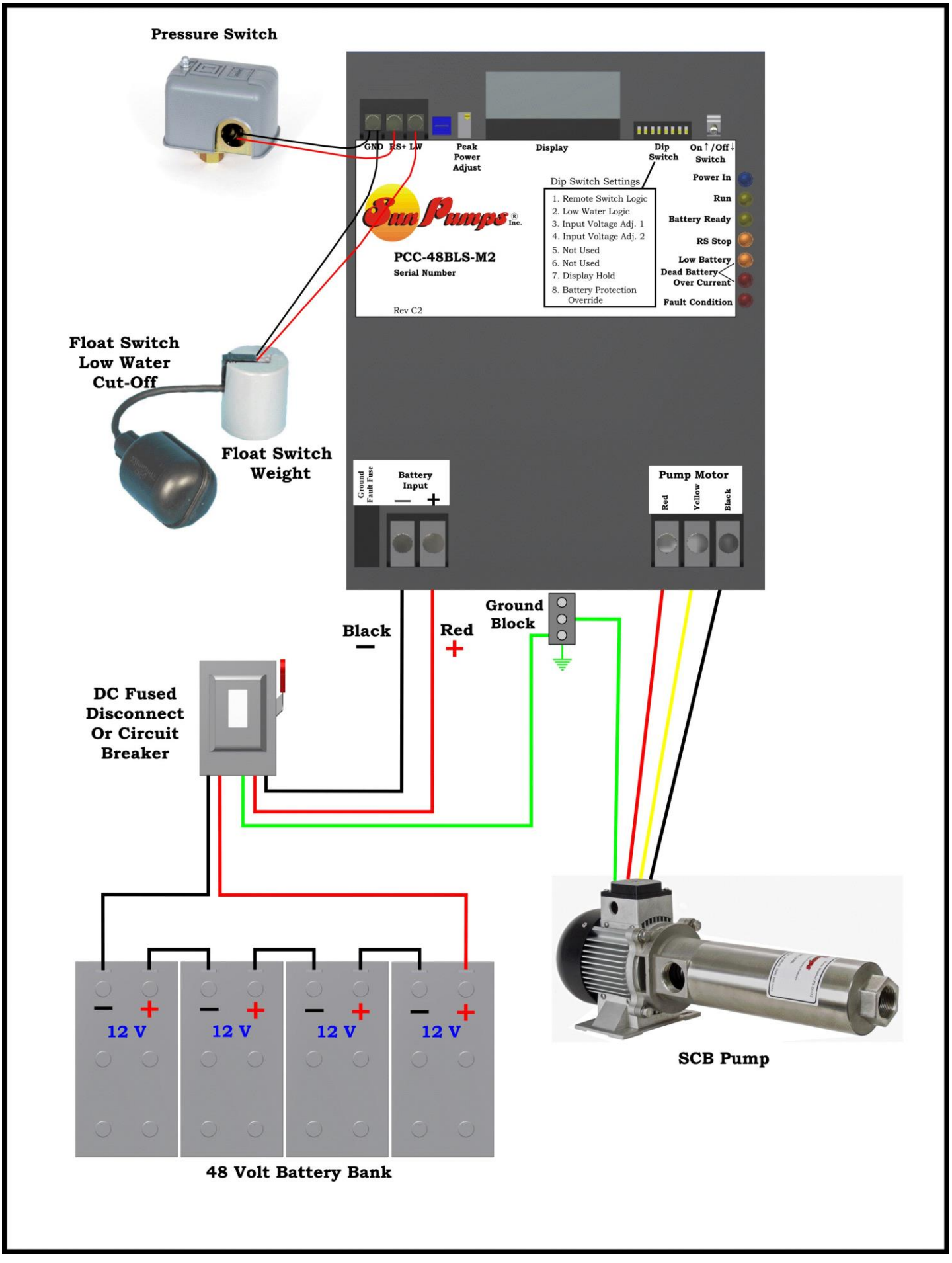
Prior to connecting any wires to the controller, be sure you have a system wiring diagram to use as a reference (see figure 2). Guessing at polarity and connection points is not worth the risk of potential product damage and/or personal injury.

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. Wire gauge being too small will cause excessive voltage losses to the motor and will reduce the flow rate of the pump. Also be certain that you have the right type of wire for your usage. Any wires which will be in water must be rated for such an application. SunPumps recommends using stranded wire for all DC applications.

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

CAUTION: Batteries are capable of large amounts of current. Install a fused disconnect or circuit breaker between the batteries and the controller of the pump. Maximum fuse/breaker rating is 50 amps. If using photovoltaic panels to charge the batteries, remember that they produce DC electricity when exposed to sunlight. Install a disconnect switch between the solar modules and the charge controller.

Figure 1 **Controller Wiring Diagram**



1. After mounting the controller, switch the controller to the OFF position.

2. Verify all dip switches are off at this time.

3. Connect ground rod conductor to the controller chassis ground block.

4. Connect battery box frame ground conductor to controller chassis ground block.

5. Connect the green pump ground conductor to controller chassis ground block.

6. Connect pump motor leads to the corresponding "Pump Motor" terminals on the controller. Red to "Red", yellow to "Yellow" and black to "Black".

7. Verify that the disconnect switch is in the off position. Connect the DC source supply negative (-), the black conductor, to the controller terminal labeled "-" on the "Battery Input". (NOTE: The power should be connected to the controller through a fused disconnect or appropriately sized breaker and it should be in the OFF position before connecting power to the controller).

8. Connect the DC source supply positive (+), the red conductor, to on the controller terminal labeled "+" on the "Battery Input". (NOTE: The power should be connected to the controller through a fused disconnect or appropriately sized breaker and it should be in the OFF position before connecting power to the controller).

9. Refer to the next section for "Remote Switch" and "Low Water Cutoff" connections as well as "Adjustment Procedures" for configuration, if applicable.

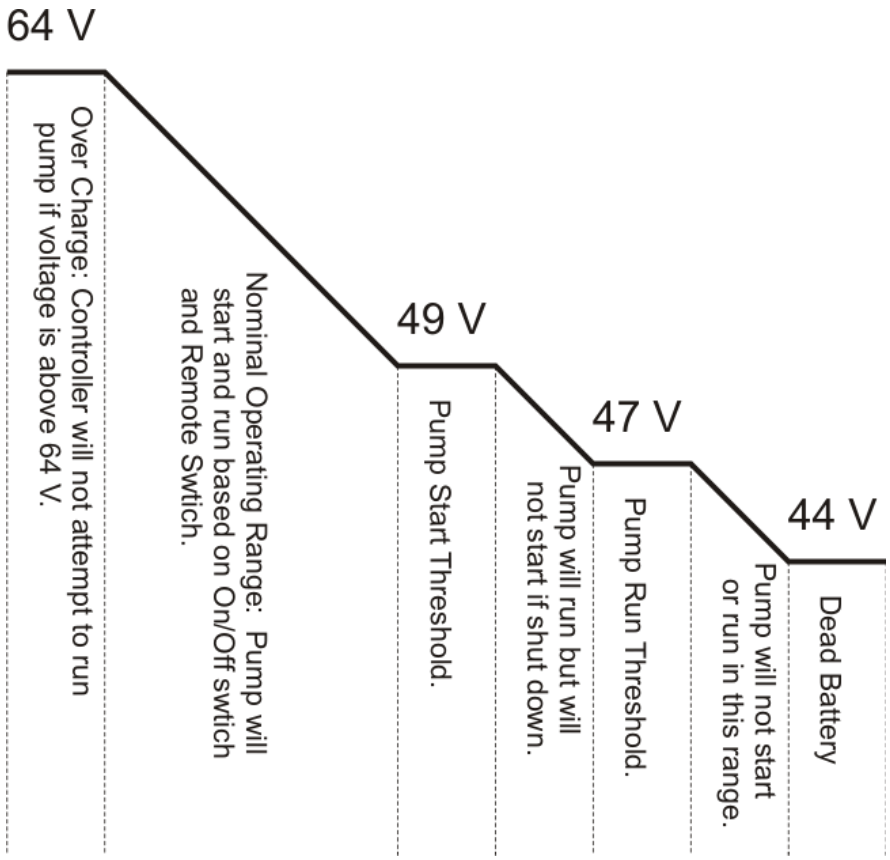
10. For new installations, be certain to allow the batteries to fully charge before powering the controller.

11. At this point, all system components are installed and wired, double check conductor polarities, wire termination tightness and controller configuration. With a DC volt meter check the battery bank voltage at the input of the disconnect switch. Pay particular attention to the polarity of the voltage. Verify it is correct. Most battery systems will cause non warrantied damage to the controller if connected in reverse polarity. Record the actual and theoretical voltages for future reference. You may do this on the Before Calling Sun Pumps Worksheet near the end of this manual. Check the voltages for proper range for your specific system.

12. After you have verified the voltage and polarity, switch the disconnect switch on. If the polarity is correct the controller will go through its normal boot up cycle. When it is finished, the first LED light will be on.

13. Turn the "On/Off "switch to the ON position. It may take up to 15 seconds for the pump to show signs of running. However, the "Run" light on the controller will light immediately if the motor is preparing to run. The system should be operational. If the system does not start and turns on any error lights or gives you an error message, proceed to the troubleshooting guide.

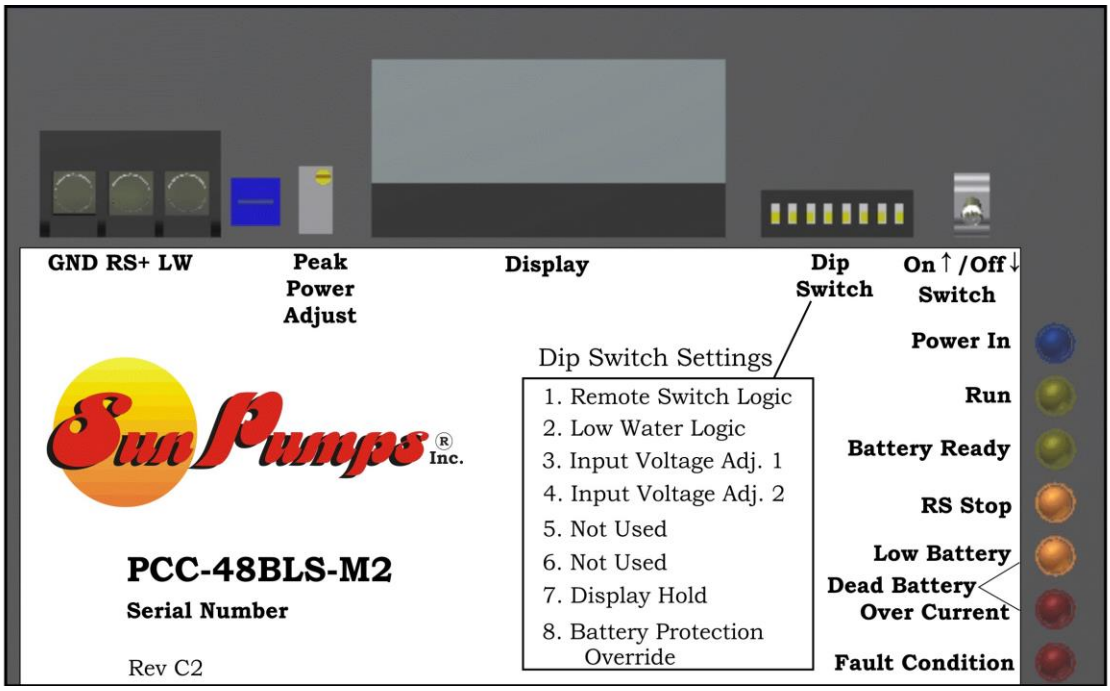
Figure 2 **Battery Voltage Regulation**



State	Voltage	Behavior
Over Charge	> 64 V	Controller will not attempt to start pump when more than 64 volts is seen on the input terminals. Less than 64 V on the input will reset this fault. If the pump is running when the input goes to 64 V, the pump will immediately be shut down.
Nominal Operating Range	49 V – 64 V	Controller will start and run the pump according to the position of the on/off switch, remote switch, and low water cutoff inputs. It takes 30 seconds in this range or cycling the on/off switch while the input is in this range to allow the controller to attempt to start the pump.
Pump Start Threshold	49 V	Minimum voltage for the controller to start the pump. Input voltages less than this for 45 seconds or more will cause the controller to protect the batteries from excessive discharging.
Pump Run Hysteresis	47 V – 49 V	If the pump is running and the voltage drops into this range, the pump will continue to run. If the controller shuts down the pump for any reason, the voltage will have to attain 49 V for 30 seconds to start the pump again.
Pump Run Threshold	47 V	Minimum voltage for the pump to run. Voltages lower than this for 45 seconds will turn the pump off. Pump will not start until 30 seconds of input voltage above 49 V has been achieved or the on/off switch is cycled while the voltage is above the Pump Start Threshold.
Dead Battery	44 V	Pump will immediately shut down and will stay off until 30 seconds of 49 V or more is attained on the input to the controller or the on/off switch is cycled while 49 V – 64 V is applied to the input terminals.

*Note: At any time cycling the on/off switch will reset all faults, timers and status and bypassing the timer, establish the current state immediately.

Figure 3 **Dip Switch Settings**



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	Input Voltage Thresholds Adjust 1	Reduces the input voltage requirements See Table 2	OFF
4	ON	Input Voltage Thresholds Adjust 2	Reduces the input voltage requirements See Table 2	OFF
5,6		Not used at this time	Should be in the off position for proper operation	OFF
7	ON	Display Freeze	Holds display on current screen	OFF
8	ON	Battery Protection Override	Disables the battery bank protection.	OFF

3.4 Controller Settings

The PCC series controllers have several settings (see figure 4). 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 disconnected to turn the pump on. With this switch on (up), terminals "RS+" and "GND" must be connected to turn the pump on.

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

Switches 3 and 4 are Input Voltage Threshold Adjustments. See Table 2 in Input Voltage Threshold Adjustment for more information.

Switch 7 is used to control the user interface. When switch 7 is down, the LCD will display various screens conveying pump and controller operating parameters. The display will cycle through each screen at a predetermined rate. For troubleshooting and some setup features certain screens are desired. By turning the switch number 7 on, the display will stop cycling and the current screen will stay on the display.

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

Switch 8 is used as a battery protection DISABLE. It is used to bypass the battery protection features shown in Figure 3 in cases when water must be pumped. Over voltage protection by the controller still functions. In other words if the input voltage is greater than 64 V, the controller will still not attempt to run the pump. **Do not operate your pump with switch 8 in the on position for extended periods of time. Only use it when it is absolutely necessary as it can cause the controller to ruin batteries which are connected to it by discharging them too far. Sun Pumps, Inc. warranty does not cover damages to batteries.**

3.5 Auxiliary Control Circuits

The auxiliary control circuits are configured and controlled with the "Dip Switches", "Speed Control" and the "RS", "LW" and "GND" terminals. (See Figure 4)

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 are also the low water cutoff 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 under the Sun Pumps Inc. on the first screen. After the 3 minutes, 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. This feature is designed for use in the submersible SCS systems with the ground wire installed. For use with the SCB or SCP systems contact SunPumps for assistance. 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 one minute timeout is included in this feature.

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
float switch closed = water tank low = pump ON

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

The remote switch feature does not have a time out since many of these units are used for pressure systems. The pump should immediately begin running when the remote switch is turned to "On".

Input Voltage Threshold Adjustments

The Input Voltage Threshold Adjustment is available to help accommodate for differences in battery banks, systems with other power draws (such as inverters or other pumps), or systems which are not able to be located near the battery bank. The Input Voltage Threshold Adjustment will modify the Minimum Start Voltage, the Minimum Run Voltage and the Dead Battery Shutdown Voltage. See Table 2 below.

Table 2

	Minimum Start Voltage	Low Battery Voltage	Dead Battery Shutdown
Both Dip Switches OFF	49 Volts	47 Volts	44 Volts
Dip Switch 3 ON	48 Volts	46 Volts	43 Volts
Dip Switch 4 ON	48 Volts	45 Volts	42 Volts

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.

Output Power Limit Circuit (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.

Output Power Limit 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.

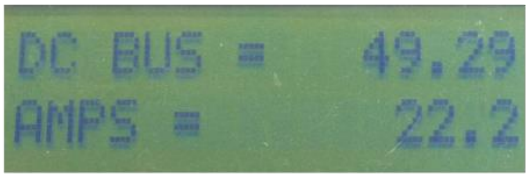
1. With the system installed and controller properly configured, allow the pump to run at full power at mid-day until the pump starts surging.

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 a 15- turn range. It may take multiple complete turns in a counter-clockwise direction before you will notice any change in water output or output power on the display).

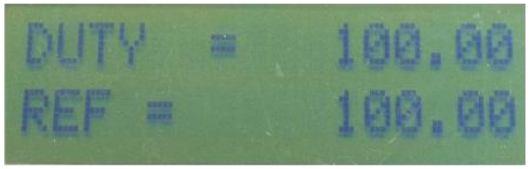
Figure 4 **Display Screens**

Status Screen may show additional information regarding system status, especially errors.



Input Screen shows the voltage of the DC input and the current consumed by the pump.

RPM Screen shows OP which is an internal parameter which may be needed during trouble shooting and also shows the RPM of the motor.



Duty Cycle Screen shows the current duty cycle of the motor output and the maximum duty cycle allowed by the peak power adjustment pot.

Power Screen shows the power consumed by the motor and the peak power allowed.

The display cycles through various screens showing information about the status of your system. To freeze the display turn dip switch 7 on.

NOTE: If the system is powered up with switch 7 on, the display will only show the SUNPUMPS INC. screen. Turn off switch 7 to unfreeze the display.

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 35 volts. Less than 35 volts at the input terminals and the unit may show no signs of operation. If you do have at least 35 volts in the right polarity, contact Sun Pumps for further assistance.

2. If the expected voltage is not present, disconnect the battery bank 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 voltage of your battery bank. If the battery bank voltage is not correct troubleshoot it to find the problem. Double check all of the terminal connections for integrity. If the battery bank 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)

2. The third LED is labeled "Battery Ready". This light must be on for the controller to start the pump. If this light is off, it is generally caused by insufficient input voltage or if the sufficient voltage timer has not recorded enough time at the sufficient voltage to run. If the Low Voltage LED is lit, the 30 seconds of sufficient voltage, 49 V, has not been achieved. If both the Low Voltage and Over Current LED are lit it indicates a Dead Battery Condition. Then a 30 second timer of sufficient voltage, 49 V, must timeout as well. Cycle the on/off switch. This will bypass the timers and reset the dead battery condition. If 49 volts or more are present, the Battery Ready light should light and the pump will start. If the Battery Ready light does not turn on, check the input power. This may be done on the display screen, input voltage is labeled "DC BUS". If it is below 49 volts you must charge your batteries or use the Input Voltage Threshold Adjustment procedure under Controller Settings in this manual. If the voltage is above 49 V and the "Battery Ready" light does not turn on or the pump does not run, check the other lights for errors. If the voltage is higher than 64 V, your batteries are over charged and the controller will not attempt to start the pump. Discharge your batteries until the bank reads less than 64 V. If you cannot find any problems contact Sun Pumps for further assistance.

3. The second LED is labeled "Run". This indicates the pump is running. If it is on, check the power reading on the LCD screen of the controller. If it is greater than 50 watts, go to the pump and check for the sound of the motor. Check for breaks in the pipe. If you cannot find a problem call Sun Pumps for further assistance.

4. 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. Check the display to see if the controller has shut down for a Remote Switch error or Low Water error. Set the #1 and #2 dip switches to off and disconnect the remote switch and low water cutoff depending on the error displayed on the screen. Cycle the on/off switch. If the pump starts, troubleshoot the remote switch or low water cutoff accordingly. If the pump does not start and the LED is still lit, call Sun Pumps for further assistance.

5. 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. Check the pump for a short to ground using an ohm meter and call Sun Pumps for further assistance.

6. If the seventh LED, labeled “Fault Condition”, is on, this indicates a motor or ground fault fuse error. Check the controller display for the type of fault. Check motor wiring and connections. If the screen displays “GF FUSE OPEN” the ground fault fuse has 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.

7. Check for proper dip switch settings on your controller. Switches 5 and 6 must be in the off position for proper operation. Also dip switch 8 should be in the off position except when water is absolutely necessary. Damage to batteries may result in use of switch 8. Damage to battery systems is not covered under the pump or controller warranty.

PUMP IS RUNNING BUT THE OUTPUT IS LOW

1. Make sure you have a full battery bank and that you have sufficient voltage. Then verify power coming out of the controller. Look at the LCD screen and read the voltage, current and power. Check this against the pump chart for your specific application.

2. If the power is correct for your pump model and battery bank 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, check a DC voltage loss chart for the current shown on the LCD screen of the controller. Improperly sized wire can reduce the performance of the pump.

4. If the wires are correctly sized, 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 connections. Check all connections for tightness.

3. Check for locked motor armature. Watch the motor shaft or fan blade on the motor as the controller attempts to start the pump. You should see a couple of “twitches” as the controller prepares to run the pump. If the motor still does not run. Contact the Sun Pumps for further assistance.

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

Batteries Connected in Series _____ X _____ V = _____ V
Series Batteries Connected in Parallel_____ X _____ I = _____ I

Battery Specifications:
- Model Number _____
- Rated Amp-Hours _____
- V _____
- I _____

Charge Controller Model:
- Rated Amps _____
- Rated Voltage _____

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

Please record the following before calling:
- Battery Bank Voltage:
- Charge controller input voltage:
- Charge controller output voltage:
- Highest power consumed:
- Error messages:
- Illuminated LEDs:
- Dip switches setting

Warranty Statement

PCC Series Pump Controllers
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 twenty-four (24) months after the original date of purchase, but not to exceed thirty (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 PCC series controller must be installed in conjunction with the 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 being 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 its intended purpose as stated in this manual.

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_____