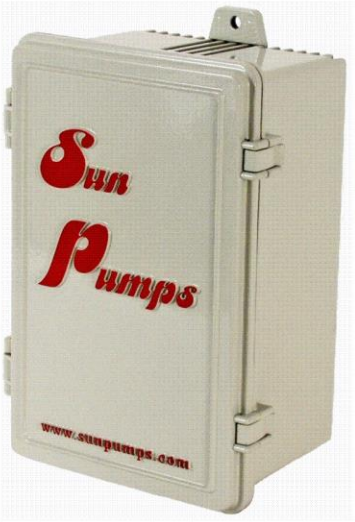
OPERATION AND INSTALLATION MANUAL

PCC Series
Brush Type
DC Motor Controller



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Made in America

SunPumps® Inc.

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1.0 Introduction

Thank you for selecting a SunPumps PCC-BT series solar pump system. The PCC-BT series pump controller is a key component to high quality solar 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.

The PCC-BT series controllers are microprocessor based solid state DC power converters designed as the interface between a solar module array and a brush type 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 and accessories.

Although these PCC-BT 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-BT 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-BT series controllers were designed for brush type 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 longer dependable, trouble free service. The controller is designed for an open circuit voltage up to 300 volts DC with a recommended nominal voltage from 30 to no greater than 220 volts DC. The nominal voltage of the system should be sized according to the desired pump voltage and power. The controller has various settings for the maximum current and will be discussed later in this manual.

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. (Maximum Power Point Tracking or MPPT)
3. Current regulation at 5, 7.5, 10, or 14 amps. (Configurable via dip switches)
4. Settable output voltage regulation 195 to 0 volts (Factory default is set to 195 volts).
5. Adjustable output motor voltage control for precision output flow and motor protection.
6. Reverse polarity protection (20 amperes maximum) on the input terminals.
7. Transient protection and surge suppression (additional lightning arrestor is also recommended).
8. Digital display indicating status including power, voltage, current and more.
9. System ON/OFF switch.
10. LED indicators; 1. Power In, 2. Motor Run, 3. MPPT, 4. RS Stop, 5. Low Power, 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. Two remote switch interfaces – float switch or remote shutdown –Normally Open or Normally Closed, user selectable logic.
14. Zero, three, seven and ten minute turn on delay for Remote Switch 1.
15. Low Power Shut Down circuit

2.2 Application

The only application the PCC-BT series controllers are designed for is the interface between a solar module array and a compatible brush type DC motor. Check with SunPumps, Inc. for motor compatibility.

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-BT series controller. The procedure for installing the SCB, SCP or pump jack is not in the scope of this manual. Any licensed pump contractor will be familiar with the proper installation procedures. 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 panel system capable of producing over 20 amps will result in non-warrantied product damage. Please check polarity before connecting power to the controller.

This controller is for brush type DC motors only. Do NOT use this controller for other types of motors. Compatible motors must be used. Proper voltage and current rating of the motor is essential. Be certain to set the current and voltage of the controller to protect your motor. Proper sizing of the solar panel array will maximize the efficiency and production of the system.

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 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 PCC–BT series controller can either be mounted indoors or outdoors. Locate all system equipment as close as possible to each other. For top of pole mount racks, the controller is usually mounted on the north side (shaded side) of the mounting pole. 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 pump installation. 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 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 wire splice be made correctly. This splice must be watertight if it is to be submerged. Improper sealing of the splice will cause poor pump performance and may cause damage to the system. Wire splicing must be done in accordance to local, state and national electrical codes. A submersible 3 wire splice kit is recommended for watertight connections.

3. Never install the controller in direct sunlight. Direct sunlight on the controller may cause over-heating of or damage to 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.** A convenient place to mount the controller is on the north side (shaded side) of the solar module array.

5. The controller should be grounded to the pump motor housing, the frame of the solar modules and to an 8-foot ground rod. The cemented support structure pole will not provide an adequate ground. Do not ground the positive or negative electrical wires. Always use a DC surge/lightning arrestor on the panel side of the controller. (Midnight Solar MN-SPD surge arrestor is recommended)

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

3.3 Wiring

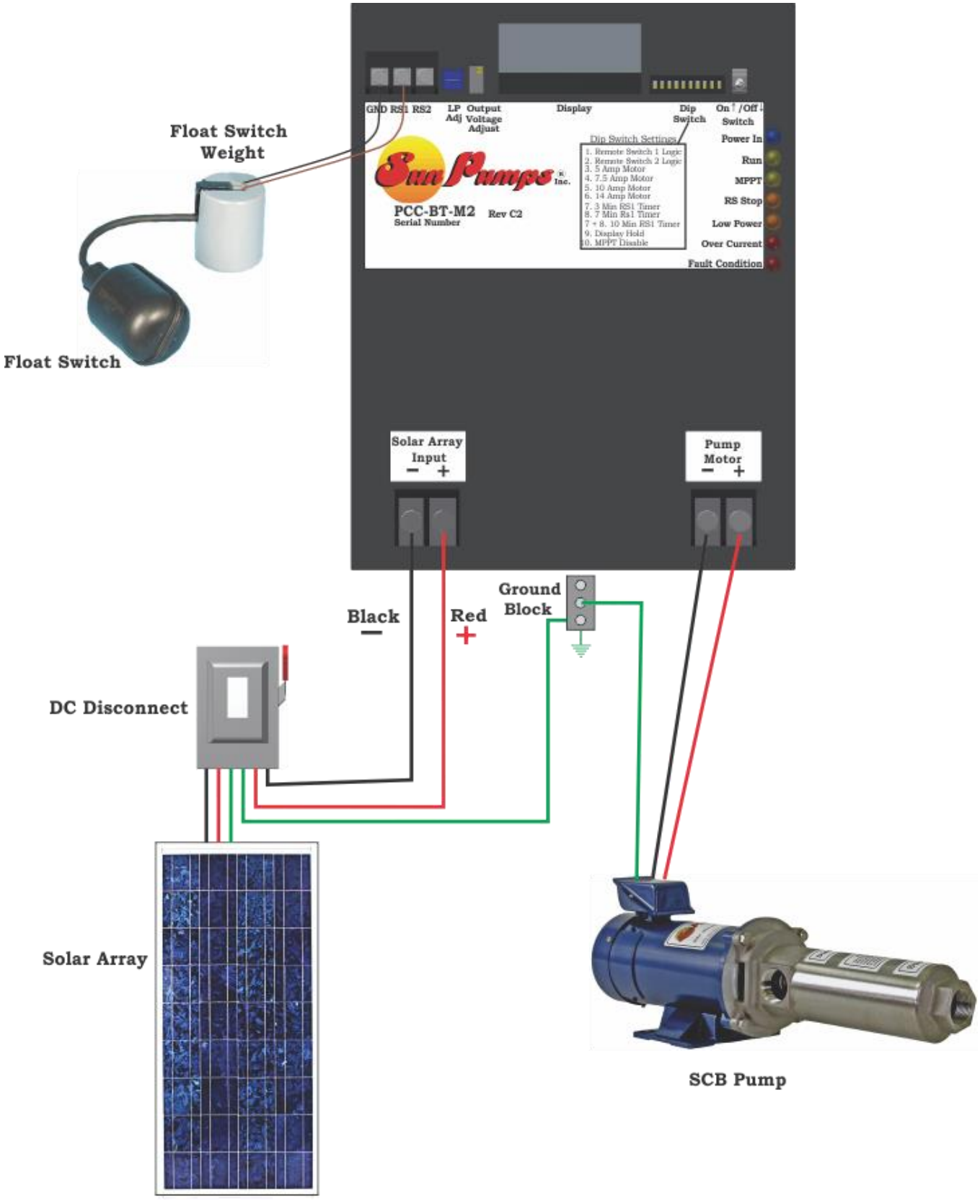
Prior to connecting any wires to the controller, be sure you have a system wiring diagram to use as a reference (see figure 1). Guessing at polarity and connection points is not worth the risk of potential product damage and/or personal injury.

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.

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. Install a disconnect switch between the solar modules and the controller.

Figure 1 **Controller Wiring Diagram**



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

2. Verify that only one current set dip switch is on and that it is the proper current setting for your pump system.

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

4. Connect solar module 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. Negative to the "-" terminal and positive to the "+" terminal. Verify this connection is made on the "Pump Motor" terminals of the controller and not the "Solar Array" terminals.

7. NOTE: The power should be connected to a disconnect and it should be in the OFF position before connecting power to the controller. Verify that the disconnect switch is in the off position. Connect the DC source supply negative (-), the black conductor, to one of the controller terminals labeled "-" on the "Solar Array Input".

8. Connect the DC source supply positive (+), the red conductor, to one of the controller terminals labeled "+" on the "Solar Array Input".

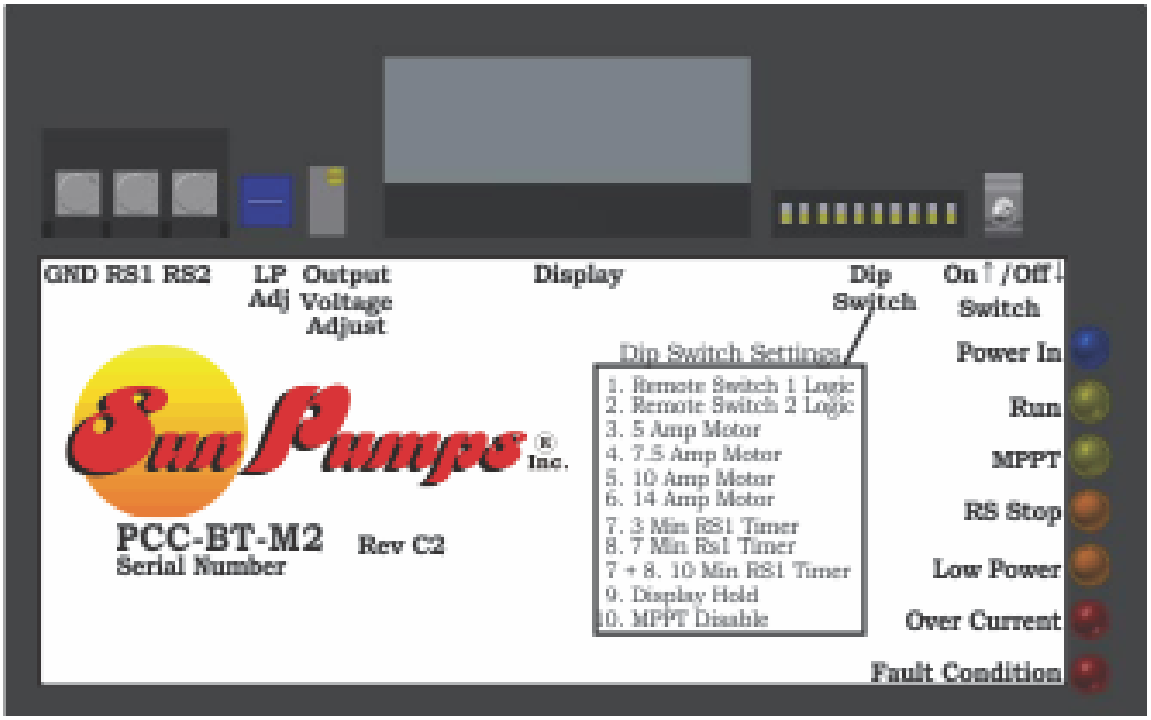
9. Refer to the next section for "Remote Switch 1" and "Remote Switch 2" connections as well as "Adjustment Procedures" for configuration.

10. 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 array open circuit voltage (Voc) on the array side of the disconnect switch and the module polarity. Record the Voc for future reference. You may do this on the Before Calling Sun Pumps Worksheet near the end of this manual. Open circuit voltage should not be higher than 300 volts for the PCC-BT series controllers. The general recommendation for the solar array is sized for a **nominal voltage no less than the desired motor voltage and no greater than 40 volts above the motor rated voltage**. Contact SunPumps if you would like a recommendation for your specific installation.

11. After you have verified the voltage and polarity, turn the disconnect switch on - if the polarity is correct the first LED light will be on.

12. Turn the "On/Off "switch to the ON position. 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 **Dip Switch Settings**



Switch Number	Switch Position	Description	Function	Default Setting
1	OFF	Remote Switch Logic 1	Turns pump off when “RS1” and “GND” terminals connect.	OFF
1	ON	Remote Switch Logic 1	Turns Pump on when “RS1” and “GND” terminals connect.	OFF
2	OFF	Remote Switch Logic 2	Turns pump off when “RS2” and “GND” terminals connect.	OFF
2	ON	Remote Switch Logic 2	Turns pump on when “RS2” and “GND” terminals connect.	OFF
3	ON	5 Amp Setting	Sets current regulation to 5 amps.	OFF
4	ON	7.5 Amp Setting	Sets current regulation to 7.5 amps.	OFF
5	ON	10 Amp Setting	Sets current regulation to 10 amps.	OFF
6	ON	14 Amp Setting	Sets current regulation to 14 amps.	OFF
7 & 8	OFF	RS1 Switch Turn-On Timer	No Timer is Active	OFF
7 Only	ON	RS1 Switch Turn-On Timer	3 Minute Turn-On Timer	OFF
8 Only	ON	RS1 Switch Turn-On Timer	7 Minute Turn-On Timer	OFF
7 & 8	ON	RS1 Switch Turn-On Timer	10 Minute Turn-On Timer	OFF
9	ON	Display Freeze	Holds display on current screen	OFF
10	ON	MPPT Disable	Disables the MPPT function of the controller. For testing only.	OFF

3.4 Controller Settings

The PCC series controllers have several settings (see figure 2). 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 1. With this switch off (down), terminals "RS1" and "GND" must be connected to turn the controller off. With this switch on (up), terminals "RS1" and "GND" must be connected to turn the controller on. Never connect a float switch between "RS1" and "RS2" terminals.

Switch 2 is the Remote Switch Logic 2. With this switch off (down), terminals "RS2" and "GND" must be connected to turn the controller off. With this switch on (up), terminals "RS2" and "GND" must be connected to turn the controller on. Never connect a float switch between "RS1" and "RS2" terminals.

Switches 3, 4, 5 and 6 are current regulation settings. The controller will regulate current at 5, 7.5, 10 and 14 amps respectively depending on which one of the 4 dipswitches is on. One must be on for the controller to operate but only one should be on at a time. In the case of multiple switches the lower current setting will take precedence.

Switches 7 and 8 are used for a turn-on timer for remote switch 1. With both off, there will be no timer and the pump will turn on immediately. With only dip switch 7 on, the timer will be 3 minutes from the time the "RS1" and "GND" connect/disconnect until the pump turns on. With only dip switch 8 on, the timer will be 7 minutes from the time the "RS1" and "GND" connect/disconnect until the pump turns on. With dip switches 7 & 8 on, the timer will be 10 minutes from the time the "RS1" and "GND" connect/disconnect until the pump turns on.

Switch 9 is used to control the user interface. When switch 9 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 dip switch number 9 on, the display will stop cycling and the current screen will stay on the display.

Switch 10 is used to disable the Maximum Power Point Tracking feature for testing purposes. All other functionality of the controller remains unchanged including the current and voltage regulation which will continue to function normally. The low power setting will be ignored but minimum input voltage and current will still be functional.

3.5 Auxiliary Control

The auxiliary control circuits are configured and controlled with the "Dip Switches", "LP Adj.", "Output Voltage Adjust" and the "RS1", "RS2" and "GND" terminals. (See Figure 2)

These circuits offer expanded capability and are described here. The remote switch controls are for float switches (storage tank level), pressure switches or a remote system "ON/OFF" toggle switch.

The output voltage adjustment is for regulating the output voltage to the pump and is used to limit the maximum flow rate of the system.

There are also the low power shut down and current regulation circuits. See each corresponding detailed description below.

NOTE: **Use only "Shielded Wire" to run from the remote switch to the controller. The shielding must be grounded to the controller side only. This can be done on the terminal labeled "GND" or on the ground lug at the bottom of the controller.** If shielded wire is not used, induced voltages from lightning storms or two-way radio transmissions could damage the controller.

Current Regulation

The PCC-BT series controller is designed to run at the maximum power possible for the system. This may be the maximum power point of the solar panels, the maximum current of the pump motor or it may be at the maximum output voltage of the controller. When enough power is available to run the pump at the maximum current, the current regulation will limit the pump to maximum current set by the dip switches. During this regulation the "Over Current" LED on the controller will flash. This is normal operation.

If the controller is not able to build an output voltage when the current is maximized, the controller will turn off in over current or a fault condition. This implies the motor is not spinning and should be checked.

Remote Switch

The Remote Switch 1 and Remote Switch 2 interface can serve as automatic switches when used with a water storage tank mounted float switch, a pressure switch or may also serve as a manual system switch with a remote system ON/OFF toggle switch. The remote switch logic feature (dip switches 1 and 2) allow the use of standard "Pump-Up or Pump Down" float switches. Please refer to the following operation scenarios for configuration options.

Remote Switch 1: 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 use 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

Remote Switch 2: Operation is the same as Remote Switch 1except instead of using the "RS1" terminal and Dip Switch 1, use the "RS2" terminal and Dip Switch 2.

Low-Power Shut-Down Circuit (LP)

The Low-Power Shut-Down Circuit (LP) turns the pump off any time the controller output power drops below a functional level. This is usually caused by lack of power from the solar panels but may be cause by a change in the pump. 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. When using positive displacement pumps, setting this feature is essential for proper system operation.

This feature is always monitoring the output of the controller to the motor. If you are not interested in using this feature turn the "LP Adj" trim pot fully counter-clockwise (recommended for circulator pumps with low total dynamic head). This will give the pump the minimum low power set point possible.

LP Adjustment

The Low Power Shut-Down circuit is adjusted using the same trim pot labeled "LP Adj." on the controller. The default is the arrow pointing straight up. This adjustment will maximize the life and output of your system. On a sunny day with plenty of power available, follow the steps below to adjust this feature.

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

2. Turn the "Output Voltage Adjust" trim pot counter clockwise until the pump is pumping the desired minimum flow. This may be down to 0 gal/min for centrifugal pumps but is not recommended. Call SunPumps if you need a recommendation for positive displacement systems.

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

4. For verification go to the power display and compare the POWER reading to the LP (low power) reading. They should be very close. Usually the LP setting should be slightly lower than the POWER reading at this minimum flow.

5. Reset the "Output Voltage Adjust" trim pot back to the desired position.

Output Voltage Adjustment (Motor Speed Control)

The Output Voltage Adjustment is used to help protect your motor from accidentally receiving too much voltage or to control the speed of the pump motor and thus the flow rate of the pump. It is highly recommended that you set this value to the voltage rating of your pump. However, it can also be used any time specific flow rates are required. The maximum output voltage (MV) is displayed on the LCD with POWER and LP. Maximum setting is 195 volts.

Output Voltage Adjustment

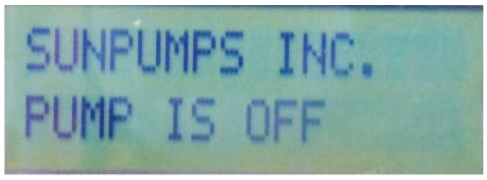
The purpose of this procedure is to adjust the maximum output voltage of the controller and better protect the motor or to reduce the flow of the pump. If tests have shown the pump will out produce the maximum flow desired, then the controller "Output Voltage Adjust" feature can be used to match the flow rate of the pump to the desired flow rate. If you do not desire to limit the flow of the water, it is still recommended that you set this value to the nominal voltage of your motor for proper protection.

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

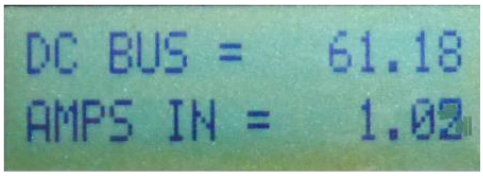
2. Slowly turn the "Speed Control" trim pot located on the face of the controller counter clockwise until the flow rate is at the desired maximum.

   (NOTE: The trim pot has a15- turn range and the maximum voltage is set at 195 volts. It may take many complete turns in a counter-clockwise direction before you will notice any change in water output or output power on the display, however the motor voltage setting, labeled "MV", should start to change after one or two turns).

Figure 3 **Display Screens**

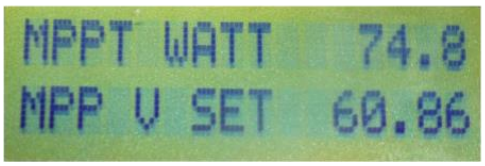


Status Screen may show additional information regarding system status, especially errors.



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

Output Screen shows the voltage on and current through the Pump Motor terminals.



Maximum Power Point Screen displays the controller setting for the MPP of the solar array.

Duty Cycle Screen shows internal values for the duty cycle and motor voltage set point. This is mostly used for troubleshooting.

Power Screen shows the power consumed by the motor, the low power set point and the maximum motor voltage allowed.

The display cycles through various screens showing information about the status of your system. To freeze the display turn dip switch 9 on.

NOTE: Because dip switch 9 will freeze the display on the current screen, if the system is powered up with switch 9 on, the display will only show the SUNPUMPS, INC screen. Turn off switch 9 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 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 not 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)

2. The second LED is labeled "Run". This indicates the pump is running. If it is on, 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.

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

4. Check the fifth LED, labeled "Low Power"; this is the low power shutdown indicator. If it is on, the controller detected a low power condition. The low power shut down is a common occurrence on days when clouds which block the sun are momentarily present. First check the input voltage to the controller. This will be shown on the LCD screen and is labeled DCBUS. Verify that this exceeds 30 volts. 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 condition still exists then the controller will start but shut down again. Verify power using the LCD screen. Wait for the screen to cycle to the power reading and turn on dip switch # 9. Note the number underneath the "LP" on the display. Cycle the pump off then on and watch the power reading. If the power reading goes higher than the LP set point, the controller is shutting down due to low output current or voltage condition. If the number is not higher than the set point, skip to step 5. 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.

5. Verify the current setting of dip switches 3, 4, 5 and 6 are correct. Only one should be on for normal operation and should coincide with the current rating on your motor. You should reduce the LP Adj trim pot to the minimum by turning it counter clockwise until it stops. Restart the controller by cycling the On/Off switch. If the controller again shuts down in low power, call Sun Pumps for further assistance.

6. 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. This light may flash in normal operation if the controller output is equal to the current setpoint. If both the sixth and seventh LED are lit, the controller has detected a motor fault too many times in the day and has shut down for the day. Cycle the on/off switch and verify the LP is properly adjusted.

7. If only the seventh LED, labeled "Fault Condition", is on, this indicates a motor or controller fault. Check the controller display for the type of fault. Check motor wiring and connections. If you cannot solve the issue, contact Sun Pumps for further assistance.

8. Check for proper dip switch settings on your controller. Only one current setting should be on for normal operation.

9. Check for proper controller input voltage. A quick look at the controller display will verify the array voltage. If the pump is not running the display should be reading the array open circuit voltage, (Voc). Verify that this voltage is below 300 volts. 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 display 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). One bad module will drop the voltage on the complete series string. If you cannot setermine the failure, call SunPumps for further assistance.

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 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 array size then make sure the pump wires are connected to the proper terminals. If the two wires are reversed the motor will be running in reverse. This will affect some types of pumps and 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, bad connections or faulty splices.

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 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

Other Specifications:
- Type of pump _____
- Total Dynamic Head _____
- Suction lift _____

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 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 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_____