



Solar Panel Cleaning System

Installation Manual



Please read the entire manual before commencing installation

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Table of Contents

Before Starting	3
Setting the GP component box	3
Installing the brackets and Nozzles	4
Installing the water tubing and zone valves	5
Installing the zone valve wiring.	6
Wiring Sequence Chart for six station controller	6
Green Power system illustrations.	7 & 8
Connecting the water input	9
Programming the controller	9
How wash and rinse cycles are created.	11
Programming example	11
Finishing the installation.	13
Inspecting the system	13
Adding soap to the system, optional	13
Adjusting the metering valve	14
Recharge the solar system.	15
Replacing the water filter	14
Replacing the soap concentrate	14
Technical support.	15
Warranty	15

Before Starting

GREEN POWER RECOMMENDS THAT THE GREEN POWER AUTOMATIC SOLAR PANEL CLEANING SYSTEM SHOULD BE INSTALLED BY LICENSED SOLAR INTEGRATORS ONLY. IMPROPER MOVING AND RECONNECTION OF SOLAR POWER SYSTEMS MAY CAUSE DAMAGE TO THE SYSTEM.

Caution: Before installing the GP system check with your local building department to determine if there are any additional requirements.

- Check the gallons per minute (GPM) of the water source you will be connecting to with the GP system. The GPM at the level it enters the box, needs to be minimum of 4 GPM to function correctly. Additional GPM flow rates maybe required with installations that are higher than 16 feet above where the water source enters the GP component box. Water pressure should not be less than 55 PSI or exceed 95 PSI.
- Prior to attempting to install the system, ensure that there is a standard AC power GFFI outlet where you intend to install the Green Power (GP) component box.
- Ensure that you have a sufficient amount of poly tubing and 24 V zone wire to reach the furthest zone valve.
- Calculating the number of nozzles per zone. For calculation purposes, where the nozzles will not be higher than 16 feet above the GP component box, figure one GPM per nozzle (each nozzle sprays two panels). This will tell you how many nozzles can be placed on any one zone valve to ensure proper water supply to each nozzle. It is best to not try to overload any one zone, as the reduced water supply will result in the nozzles not performing as designed.

Where there are an odd number of panels in a zone, add one more nozzle to that zone.

- Calculating the size of the controller required. The size of the controller required depends on the number of zone valves required for your installation.

Note: When ordering a controller, be sure to allow one terminal station (#6) in the controller be left for the soap demand pump.

- We recommend that you draw a sketch of your installation array and map out the zones and the path that you intend to run the tubing and zone valves. This will ensure that you have the correct length of wire, tubing, nozzles etc..
- The top row of panels in any rack will be zone 1.
- The supply line can enter the array from any direction.

Setting the GP Component Box

Considerations:

- Install the component box close to existing outdoor AC power source (which has a GFCI)
- Site it close to existing water source, such as a hose bib on a residence. Make sure to look at all possible potential positions to ensure selecting the site with the best GPM's and the best P.S.I.

- To minimize the amount of piping required, site the GP box as close to the solar panels as possible.
- Determine whether the location will be near a bedroom or another room where pump noise may be an issue.
- Green Power does NOT recommend putting the component box inside any structure.
- The dimensions of your solar panel, as larger panels or unusual array configurations may require more nozzles to ensure coverage.

Inspect the GP component box

- Open the shipping box and remove the GP component box.
- Inspect the GP box and all parts and match them with the material packing list.
- Ensure that you have the correct controller for the amount of zones your installation will require.
- The controller is pre-wired and already attached to the component box.
- Zone valve wire is pre-wired into the controller allowing for the maximum number of zones available to the controller. **Remember that station terminal No. 6 is dedicated to the soap demand pump.**

Note: Your GP component box has been pre-tested at the manufacturing facility

System Installation

- Place the GP component box at the location you have selected. The location should be level. It is preferable to set the box on concrete, blocks, bricks, tiles or any weatherproof material. The soap reservoir is at the back side of the GP component box. (If near a wall, the soap reservoir would be next to the wall.)
- Use the attached template in the controller box to locate the screw positions necessary to attach the controller to the wall, post or pedestal. Hang the controller on the mounting screw and secure the controller in place. It is recommended that the controller be mounted at eye level.

Note: See the controller guide for mounting instructions.

Caution: Do not plug the controller into the AC power source until the system installation is completely finished.

Installing the nozzle brackets and nozzles

- Prior to beginning, make a plan of where you want the nozzles to be located. Once nozzle covers two panels. Odd number of rows will have an extra nozzle. Avoid placing the odd nozzle on the outside of an end panel where it will create unnecessary overspray off the panels.
- The bottom row of the panel array does not need to be moved. Carefully loosen each successive row above move about eight inches up to allow a walkway between the rows, IF, needed to gain access to the top of the row you wish to install nozzles. Small installations or ground mounts may not require any movement of panels.
- Attach one of the custom nozzles to the Green Power solar panel mounting bracket. **IMPORTANT: MAKE SURE THAT THE NOZZLE IS AIMED FORWARD AND THE NOZZLE CUT IS PARALLEL TO THE TOP EDGE OF THE BRACKET.** This avoids having to crawl back out later on the panels to adjust the aim of the water spray.

CAUTION**Failure to follow the directions below may cause the adhesive on the bracket to fail!!!!!!**

- Ensure that the panel frame where you want to mount the bracket is wiped clean of any dust
- Scuff the panel frame where you intend to mount the bracket with a scotch brite type of pad
- Clean the scuffed area with denatured or isopropyl alcohol, wiping clean
- **DO NOT TOUCH THE AREA AFTER CLEANING**
- Place the nozzle into the bracket, aiming the opening forward
- Remove the plastic strips, cautioning to **NOT** touch the adhesive surface with your fingers or anything and place the bracket on the solar panel frame
- Press and hold the bracket into place for 15 seconds
- Do not pull or push on the bracket. 70% of its strength is immediate. It takes 72 hours for the adhesive to fully cure. Minimize any movement of the bracket during this curing time.

Installing the water tubing and zone valves

- Your system will supply the amount of flex poly tubing required (based on your order specifications when the order was placed). The tubing from the outlet port of the component box is a 5/8 inch supply line that runs to each zone valve. The tubing from the zone valve to each nozzle is 1/2 inch.
- Connect one end of the poly tubing to the fitting on the right side of the Green Power component box. **CAUTION: HAND TIGHTEN ONLY. DO NOT USE A WRENCH.**
- **To properly install the tubing into the fitting, tighten the fitting until you feel resistance. Then back off one full turn and install the tubing, ensuring to push it all the way into the fitting (about 1”). If you loosen the fitting too much, the “O” ring will drop down and pinch the tubing which will result in a leak.**
- **Then hand tighten the fitting.**
- Run the pipe to the panel array. Mount a zone valve to the panel rack assembly using a zone valve mounting bracket and a self-tapping screw. **IMPORTANT:** Make sure that you check the flow direction of the zone valve by looking at the arrow on the top of the valve.
- **Important:** Ensure that all tubing is securely attached in the fitting by shoving it in as far as it will go into the fitting. **CAUTION: HAND TIGHTEN ONLY. DO NOT USE A WRENCH.**
- Attach tubing and continue up to the next row. Again, cut the tubing and install another zone valve.
- Continue to the next successive rows, repeating until the top row is reached.

(See Figure Number 2)

- From the outlet port of the zone valve, attach a piece of ½ inch flex poly pipe and go to the first nozzle position. Attach a reducer tee fitting. From the top of the fitting (3/8 port) and connect to the 3/8 shaft of the custom Heliotex nozzle.
- Fully seat the nozzle into the fitting and push the fitting up until it touches the solar panel frame. This will ensure that all of the nozzles are at the same height.
- Allow one to two inches slack in the tubing. Do not cut the distance exact. This will avoid any pulling on the tee reducer fittings and the nozzle brackets.
- For the last end of row nozzle, attach a ½ inch to 3/8 inch reducer elbow fitting and connect it to the last nozzle.
- Then reset the solar panels in the row. Important: Make sure to secure all fasteners correctly and to reconnect the ground cable. Move up to the next row and repeat until the top row is completed.

Installing the zone valve wiring

- Your controller is pre-wired with the amount of 24 V D.C. wire specified in your order. In the event that one of the wires comes loose, see the wiring diagram on Page six to ensure that you reconnect the wire to the correct station terminal.

Wiring Sequence Chart for Six Station Controller

Station number 6 (The soap demand pump) The red wire from relay station #3 to Station # 6 on the controller.

Note: While the wire can run from any station number to any zone valve and still function, the system will not run in the correct sequence when washing and rinsing. Therefore keep track of which wire is connected to which zone at the controller and ensure that you connect it to the proper zone valve at the array.

- From the controller, run the wire next to the tubing up to the bottom row of the solar panels, to the lowest zone valve. Note: check with your local building department to determine if conduit is required. If not, then we recommend that you use mounting brackets to affix the tubing and the wire to the wall if there is an uphill installation. Use flexible zip ties to attach the wire to the pipe. For ground arrays, again check with your local building department to determine if you can run the water line and the 24 V D.C. line in the same trench. When surfacing above ground, use conduit or zip tie the lines to a rack assembly and/or mounting posts.
- Peel open the wire insulation and attach the correctly colored wire (eg. Zone 1 wire to station No. 1 in the controller) to one terminal and the green common wire to the other terminal of the zone valve.
- Ensure that the incoming green wire, the outgoing green wire and the green wire to the common terminal of the zone valve are spliced together. The color of wire selected for each incoming terminal of a zone valve need not be continued on. It can be ended at the incoming terminal of its appropriate zone valve.
- Ensure that a waterproof seal it put over any splices.
- In order to utilize gravity, try to make zone one the highest row of panels in any array and then continue down.

Caution: When installing the GP system on an existing solar array, first disconnect all power to the array.

- Solar panels will be removed row by row in order to gain access to the tops of the panels. The wire and pipe can be threaded up from the bottom as described for new installations above.
- The Bottom row is not moved. Start with the second row up in order to gain access to the top of the bottom row panels.
- Carefully loosen the mounting brackets for the panels in the row you are working. Slide the panel up and out of the way, taking care not to damage the wiring connections of the panel. It is recommended that a tarp or cover of some kind, such as a moving blanket be utilized to avoid damaging the panel above.
- Slide the zone valve wiring and the flex poly tubing up from the bottom as described above.
- Follow the steps noted above to install the bracket, rigid connector piece, nozzle body and nozzle to each panel.
- When complete, remember to attach tubing under the next uphill row as well as continue the zone valve wire run up to the top of the next row.
- When complete, reattach the solar panels in that row and move uphill to the next row.

Green Power System Illustration

Standard Installation with even number of panels

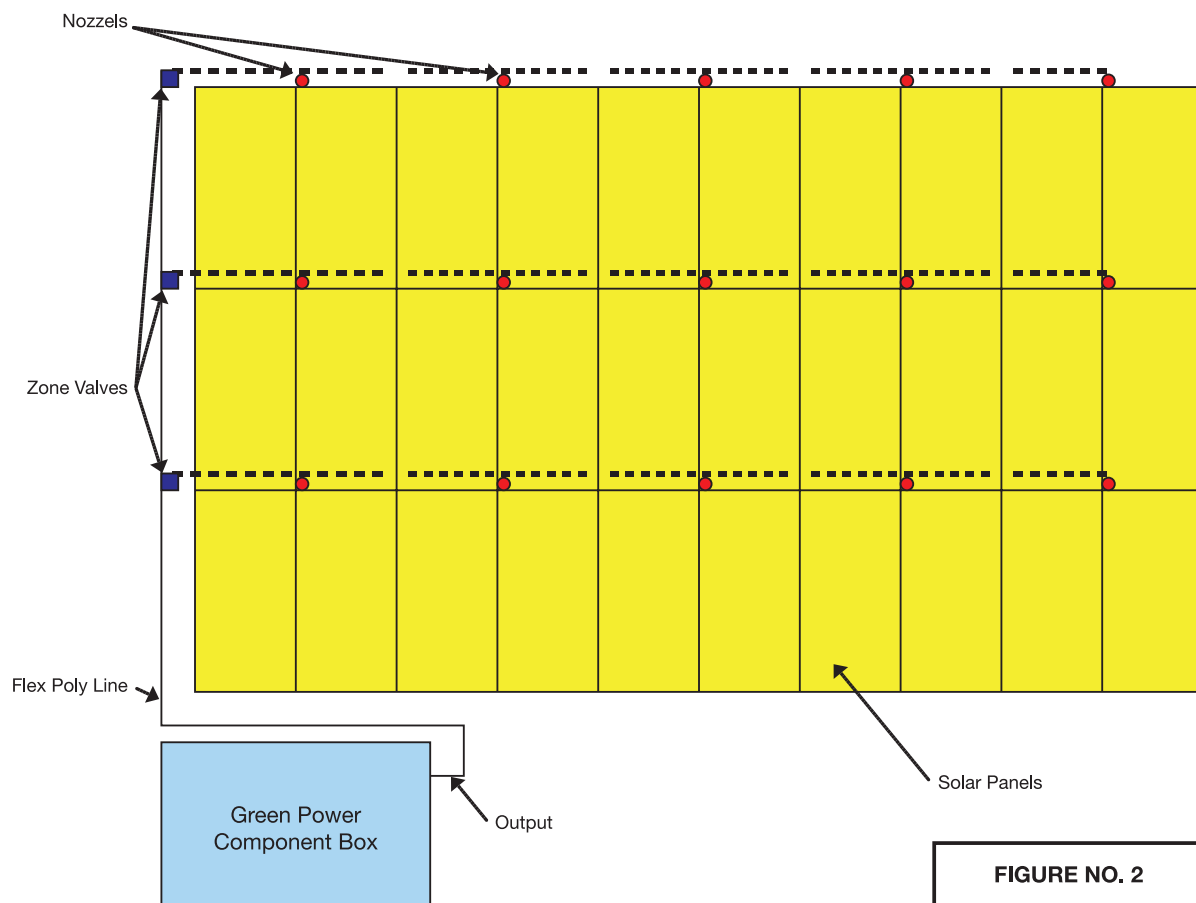
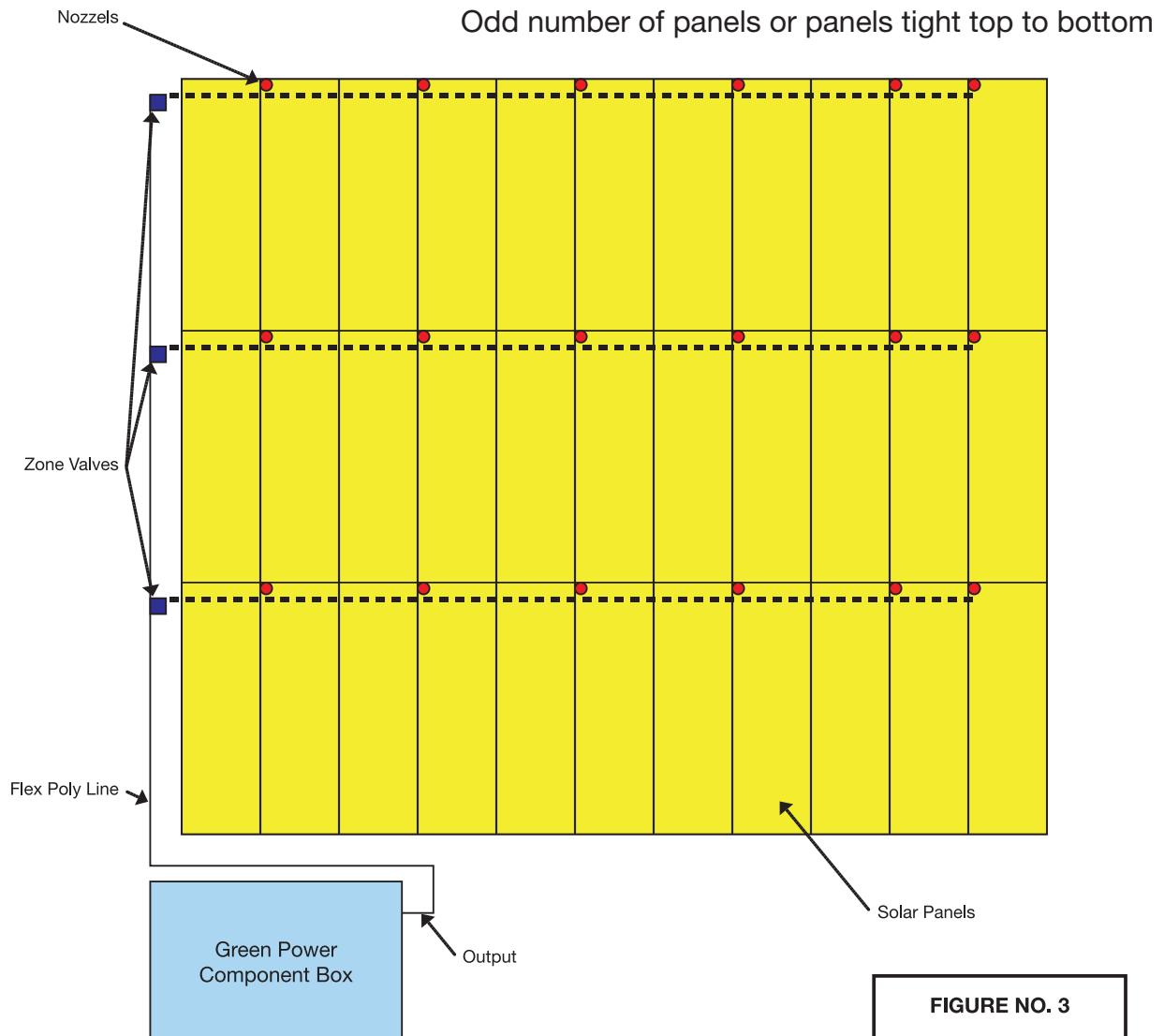


FIGURE NO. 2



For an odd number of panels add one additional nozzle to each zone. (Note that the nozzles are lowered here but can be mounted as normal on the top if space allows.)

When the panels are butted together tightly from top to bottom, there is space to the sides of the panels. Place the brackets and nozzles as note in the upper left hand corner of the panel. This positioning places the bracket high enough to ensure total coverage of the top of the panel with the spray. If you place it on the other side, it lowers the nozzle about one inch and can create a dirty spot at the top of the panel.

Caution: Make sure that all solar panel connections, including the ground wires are properly connected before moving to the next row.

Caution: Use caution when reattaching panels to ensure that no wires are crimped (which may cause the solar system to short out) and that all wires, including the ground wire, are returned to their original mounting position.

Connecting the Water Input

- Once the system is installed on the panels, connect the incoming water line from the source to the ¾" FIP Union and the inlet port with tubing or pipe of your choice (which is not included).
- Once the water connections are installed, SLOWLY, turn on the water to the system.

PROGRAMMING THE CONTROLLER

- A Controller Manual from the manufacturer of the controller is included with your system. This manual will give you basic information about how to use the controller.
- Ignore irrigation sections that do not apply.
- Additional information is required to establish the necessary wash and rinse cycles of the Green Power system. The information follows below.

Program Selector Switch (1)

Program A. Program A is used to determine the amount of time each zone of panels will be washed during the soap cycle.

Program B. Program B is used to activate the soap injector pump.

Program C. Program C is used to activate the rinse cycle(s).

Important: In order for the washing cycle to function correctly, the **days of operation AND the start and finish times** of Program A and Program B **must be the same.** For example, if you are operating a total of five zones and each zone runs for two minutes and you start zone one at 5:00 A.M.; since each zone would run two minutes, you would complete the entire sequence in ten minutes. Therefore Program A would run zone one from 5:00 A.M. until 5:02 A.M. Zone two would then operate from 5:02 A.M. until 5:04 A.M. The final zone, in this example zone five, would

complete at 5:10 A.M. Since the total operating time of Program A (the aggregate of all zones running during program A) is ten minutes, Program B must be programmed to operate from 5:00 A.M. to 5:10 A.M. Failure to match these times will keep the soap from being injected into the system for the wash cycle.

While there are three possible start and stop times for Programs A and B, we would anticipate only washing the panels once every one to two weeks unless adverse weather conditions dirty the panels sooner.

Program C is utilized for the rinsing cycle. As each program is independent, Program C maybe activated to run more frequently (for example daily). While it can be programmed to operate up to three times per day, it is normally not necessary to rinse the panels more than once a day. **IMPORTANT:** One of the start times for Program C must begin at

the conclusion of the wash cycle. In the example above, the rinse cycle would commence at 5:10 A.M. when the total wash cycle had completed. While it is anticipated that Program C will be activated more often (for example daily versus washing weekly) **one activation time must be at the conclusion of the Program A&B wash cycle.**

LCD Display (2)

High-contrast LCD panel displays all controller programming and operating information.

Plus and Minus Buttons (3)

Push button used to increase and decrease display values during controller setup, programming and manual operations. Adjust values incrementally (press and release) or by rapid scrolling (press and hold).

Dial (4)

A 25-position rotary switch used to select stations, start times, watering days and special functions for setup, programming and manual operations

Manual Button (5)

Push button used to start and control manual operations by station. Also serves as an advance button for setup, programming and manual operations.

Function Switch (6)

A three-position slide switch used to select one of three controller function modes:

Off or Stop – Stops all current washing or rinsing operations, prevents all automatic and manual operations and used in setting Rain Delay feature

Set Programs – Enables program setup values to be selected and changed.

Run or Manual – Normal switch position for all automatic and manual watering operations.

Semi-Auto Start Button (7)

Push button used to manually start P program A, B, or C cycles (as selected) or the Station Test Run feature.



FIGURE NO. 4

How Wash and Rinse Cycles are Created

- **The Basic Wash Cycle:** Once Program A and Program B are given a start time, it causes all zone valves assigned to that program to operate in sequence beginning with the lowest numbered valve. Zone or valve 1 should always be assigned to the uppermost row of panels. This allows for runoff downhill.

Note: Recall that Program B must operate only zone valve number six and start at the same time as the start time of Program A and end at the combined number of minutes for all zones in Program A (refer to valve run times section).

- **The Basic Rinse Cycle:** Program C operates the rinse cycle. Program C start time should begin at the conclusion of Programs A and B end times. Set each zone valve to run the amount of minutes necessary for rinse.
- **Frequent Rinsing:** Green Power recommends that the panels be rinsed at least every three days. When setting the rinse cycle program (C), two additional start times are available if wanted.
- **Minimum rinsing time:** It is recommended that the rinse time should always be a minimum of one minute in order to ensure that all remaining soap in the line is purged. Shorter or longer times maybe used depending on your local area and conditions. Factory setting is two minutes.
- **Run Time increments:** Different fractions of minutes maybe accomplished if desired by utilizing the “%” (Water Budget) feature. For example, if a desired wash and rinse time of 1-½ minutes is desired, each zone valve run time should be set for three minutes. Then set the Water Budget setting to 50%. The valves will then run for 1-½ minutes (or 50% of the 3 minute run times). See Water Budget Section for instructions.

Programming example

As an example, the following is the factory programming for a five zone array with a six station controller. The factory assumes that you want to wash the panels every two weeks starting today (Tuesday). That the wash cycle will run for two minutes on each zone and the rinse cycle for two minutes three times a week (NOTE: one of the days must match the wash day); also that you will rinse on Tuesday, Friday and Sunday. The start time is set for 7:00 AM.

1. Power the controller with the 9V. battery or plug in the AC plug
2. Move the Function Switch (6) to the middle Set Programs position.
3. Turn the Dial (4) to the Current Time. Enter the current time.
4. Turn the dial to “Today.” Set the current day (eg. Tuesday) using the plus or minus buttons.
5. Set the Program Switch (1) to Program A. As we are going to set the wash to every two weeks, twist the dial to the left and ensure that each of the days indicate “OFF.” Continue on down to the Skip Days Special Function Position and press the negative button (3). It should register 31. Continue pressing until the number 14 appears. You have now told Program A to run every 14 days.

6. Turn the dial to the Valve Run Times (4). At position 1 (zone 1) press the plus or minus buttons until you see the number two for two minutes. Continue entering two minutes for valves one through five. **IMPORTANT! Make sure that zone number six is OFF.** If you have a larger controller that has more unused stations make sure that any unused zone valve times are in the OFF position.
7. Turn the Dial (4) to the Start Times. Using the plus or minus button, set the start time for 7:00 AM. Caution: It is easy to mistake the AM and PM indicators so make sure that you are at 7 AM and not 7 PM. Keep the start times 2 and 3 OFF.
8. Set the Program Switch (1) to Program B. As we are going to set the wash to every two weeks, twist the dial to the left and ensure that each of the days indicate "OFF." Continue on down to the Skip Days Special Function Position and press the negative button (3). It should register 31. Continue pressing until the number 14 appears. You have now told Program B (the soap valve) to run every 14 days.
9. Turn the dial to the Valve Run Times (4). Make sure that valves one through five are OFF. **IMPORTANT! Make sure that zone number six is set for ten minutes.** Zone valve number six is set for ten minutes as this is the total time of zones one through five in Program A. If you have a larger controller that has more unused stations make sure that any unused zone valve times are in the OFF position.
10. Turn the Dial (4) to the Start Times. Using the plus or minus button, set the start time for 7:00 AM. We have now matched the start time for Programs A & B and created our wash cycle. Keep the start times 2 and 3 OFF.
11. Set the Program Switch (1) to Program C. Program C is our rinse cycle. Turn the dial (4) to Sunday and push either the plus or minus button (3) until "ON" appears. Continue through the days of the week, keeping Tuesday, Friday and Sunday in the ON position and Monday, Wednesday, Thursday and Saturday in the OFF position (for our example). **NOTE: MAKE SURE THAT ONE OF THE RINSE DAYS IS THE SAME AS THE WASH CYCLE DAY. WE RECOMMEND SETTING WASH CYCLES IN 7 DAY INCREMENTS, EG. EVERY 7, 14, 21 OR 28 DAYS.** If an odd number of days were set, such as every five days, it would not match up with the days of the week scheduling of the rinse cycle. Rinse cycles are conducted more frequently than wash cycles.
12. Turn the dial to the Valve Run Times (4). At position 1 (zone 1) press the plus or minus buttons until you see the number two for two minutes. Continue entering two minutes for valves one through five. **IMPORTANT! Make sure that zone number six (the soap pump) is OFF.** If you have a larger controller that has more unused stations make sure that any unused zone valve times are in the OFF position.
13. Turn the Dial (4) to the Start Times. Using the plus or minus button, set the start time for **7:10 AM.** We have set this time to 7:10 AM as that is the time the last of the five zones will finish when there is a wash cycle. Keep the start times 2 and 3 OFF unless there is some reason why you would want additional rinses in the same operational days.
14. The programming is now complete. Push the Set Programs switch (6) to the right to the Run Programs position.

Finishing the Installation

- Once the water source is full open, plug in the 110 V AC plug into the GFCI outlet.
- Program the controller. Follow the instructions for programming in the User's Guide.
- Once the controller is programmed, push the program selector to Program C, push the selector switch to the Run position. Then push the semi-auto/manual button. This should start the system on a rinse cycle only and will allow water to go to each zone valve sequentially.

Inspecting the System

- Visually inspect the system for leaks.
- Check the nozzles to see that they are properly aligned on each panel as the controller shifts from zone to zone.
- Repair any loose connections or leaks. Correct any misalignment of nozzles.
- Ensure that the zone valve selector switches are in the "OFF" position. (If left on, they will run any time water is introduced and all zones will try to run at one time.)

Adding Soap to the System

- For the washing cycle, add the Green Power Solar Panel Cleaning concentrate to the reservoir in the back of the HT system component box. The reservoir holds five gallons of concentrate.
- Push the selector switch to the Run position and push the program selector to Program A. Then push the semi-auto/manual button. Then quickly push the program selector to Program B. Then push the semi-auto/manual button once again. This should start the system on a wash cycle.
- When the soap demand pump is activated, it makes a pulsing sound as soap is injected into the water line. If the soap is not being injected, there may be a vapor lock due to the head pressure on the water line.
- In order to alleviate this condition, turn the water to the system off.
- Remove the connection from the outlet side of the demand pump. Turn the water source on briefly to ensure that liquid is flowing through the pump.
- Reconnect the water line.
- Turn the system back on.
- Upon completion of the wash cycle, push the program selector to Program C; push the selector switch to the Run position. Then push the semi-auto/manual button. This will again start the system on a rinse cycle and will rinse the soap from the wash cycle off the panels.

Caution: Do NOT use any soap or cleaning product other than Green Power Solar Panel cleaning concentrate. Use of any other product may damage the solar panel or the frame of the solar panel. The Green Power Solar Panel Cleaning concentrate is specifically designed to clean your panels without harming them or leave any film residue which will reduce the effectiveness of the panels. USE OF ANY PRODUCT OTHER THAN GREEN POWER SOLAR PANEL CLEANING CONCENTRATE will VOID the warranty on the system.

Adjusting the Metering Valve

- The metering valve is set at the manufacturer at the center position. It maybe increased or reduced to add or reduce the amount of soap concentrate being injected into your system. The higher the setting the more soap that is injected into the system. The pump should make a pulsing sound approximately every one to two seconds at the factory setting.
- Depending on the amount of dirt and debris in your area, the frequency of washings, amount of panels in your array etc., you may wish to adjust the factory setting.

Recharge the Solar System

- Once you have finished the installation and set the controller, remember to turn the solar power system back on if it has been disconnected. For the instructions of your solar integrator to return the system to the on position.

Replacing the Water Filter

- The Green Power component box contains a sediment filter which contains “Siliphos.” This is a scale and corrosion inhibitor. Normal replacement would be approximately every six months. Depending on the number of panels in your system, usage and the condition of the water in your area your filter may need to be replaced more frequently. Sediment as low as 5 microns are filtered out.
- To replace the filter, turn off the water to the system. Slowly turn the blue filter casing counterclockwise loosening and removing it. Discard the old filter in the proper waste receptacle and carefully place the new filter in the lid assembly. Place the housing carefully over the new filter and thread it back on slowly, making sure not to strip the threads on the lid.
- Ensure that the housing is tight and then turn the water back on to the system.
- Check for leaks. Repeat process and correct if necessary.

Replacing the Soap Concentrate

- The reservoir in the GP component box holds five gallons of soap concentrate.
- **Use only GP solar panel cleaning concentrate.**
- Running the soap demand pump in the wash cycle without soap in the reservoir will cause it to make excessive noise and may damage the demand pump. Make sure to keep the soap level above the inlet port on the bottom of the reservoir tank.
- The amount of soap consumption will vary with the number of panels in your system, the amount of time you program the controller to run and the frequency of wash cycles.
- Using any other soap product voids the warranty on the system and may cause damage to your Green Power system and/or your solar panels or solar panel frames.

If you have any problems, please contact Green Power at (877) 244-6473 for Technical support

Warranty

Limited Ten-Year Warranty

Green Power warrants, to the owner, each new system piece against defects in material and workmanship for a period of ten years from date of installation, provided that all system components are used only for solar panel cleaning under the manufacturers recommended specifications. Product failures due to acts of God (ie. lightning, flooding, etc.) are not covered by this warranty.

Green Power is not liable for failure of products not manufactured by them even though such products may be sold or used in conjunction with Green Power products.

During the warranty period, we will repair or replace, at our option, any part found to be defective. Your remedy is limited solely to the replacement or repair of defective parts.

Contact the dealer or return the defective part to the solar dealer who installed the system or call Green Power at (877) 244-6473.

This warranty does not apply where equipment is used, or installation is performed, in any manner contrary to Green Power's or the solar installation dealer's specifications and instructions, nor where equipment is altered or modified.

Green Power is not liable for indirect, incidental or consequential damages in connection with the use of equipment, including but not limited to: solar panel or mirror damage, damage to any solar wiring or connections, the cost of substitute equipment or services required during periods of malfunction or resulting non-use, property damage or personal injury resulting from installer's actions, where negligent or otherwise.

Use of any components or accessories not manufactured or supplied by Green Power, such as but not limited to, soap or soap concentrate, filters, nozzles, fittings, piping, controllers, wiring or valves, shall void the warranty and may cause damage to your solar panel system.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

All implied warranties, including those of merchantability and fitness for use, are limited to the duration of this express warranty.

Some states do not allow limitations of how long an implied warranty lasts, so the above limitation may not apply to you.

This warranty gives you specific legal rights and you may have other rights, which vary from state to state.

Green Power controllers are covered by this warranty for a period of ten years from date of installation.

