SOLARSYSTEM 550 AND CONTROLLER USERS GUIDE

Congratulations for purchasing the California LightWorks SolarSystem 550 (SS 550) and Controller. The SolarSystem 550 is the most efficient, productive and technologically advanced LED grow light available.

The SS 550 replaces a 600w HID fixture while using only 400watts at full power. Three SS 550's will replace 2 x 1000watt HID fixtures using only 1200 watts. It can be operated manually or programmed for digital on/off, dimming, and independent spectrum control using the Controller.

Please DO NOT operate the unit without reading ALL the Information contained in this **SolarSystem 550 Users Guide** and the enclosed **SolarSystem 550 Product Manual** carefully**.**

The touch screen of the SolarSystem controller is made of a thin glass sheet, and it is very fragile - a small crack or break will make the entire touch screen unusable. Don't drop or roughly handle the controller. When pressing on the touchscreen, you should be able to use the tip of their fingers. If you find the buttons to be too small for your fingers, you can use a rounded stylus which will certainly work. DO NOT press HARD on the screen. It WILL crack and this is NOT COVERED by our Warranty.

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1.0 Specifications & Performance

	SolarSystem 550
Input Voltage	120-240VAC
Max Current	3.3A @ 120V
Operating Frequency	50Hz - 60Hz
Power Consumption	400Watts
Total PPF Output* (uMoles/s)	642
Efficiency* (uMoles/s/W)	1.60
Weight	13 lbs
Dimensions	18" x 8.5" x 4"
Operating Temperature	0°F to 130°F (-18°C to 45°C)
Warranty	5 years
Power Factor	> 0.95

*Efficiency at full power

2.0 Installing the SS 550

2.1 What comes in the box?

When you open the box you will find: 1-SS 550 fixture, 1 - 6’ Phone (data)cable, 1 6’ Power cable, 2 steel hangers, and documentation.

The Controller Box contains: 1 – SolarSystem Controller, 1 controller holder, 1 - 14’ phone (data) Cable, 1 - AC Adapter, and Documentation.

2.2 Mode Switch – Operating with No Controller

On one end of the SSS550 you will see the Operating Mode switch at the bottom of the heat-sink with a label marked “Always ON and CONT.”

In “Always On” mode, (the switch slid to the Left) the SS550 will operate at Full power (all channels at 99%) and will not respond to commands from the SS550 Controller.

In “Controller” mode, (the switch slid to the Right) the SS550 will respond to all commands received from the SS550 Controller and will remember the last command received when power is removed. When power is reapplied*, the unit will restart in whatever state it was in prior to the power being removed.*

The SS550 unit will not remember any commands issued to it if the power to the unit is off.

NOTE: The SS550 system ships with the Operating Mode switch in the “Always On” position.

2.3 Hanging the SS 550

The 2 metal hangers provide a stable 2-point connection to the light that can be suspended using chain hangers, cables, carabineers etc., (suspension systems not provided) from a ceiling or structure capable of handling at least 26 lbs. of weight per light. You can also purchase ratchet hooks sold separately from California LightWorks to suspend your luminaries (CLW part # **CHNK**)

When attaching the steel hangers into the holes in the End caps, please insure the hangers are inserted all the way through the holes before releasing.

A single point connection can be made to either of the two holes on each side to suspend the light at an angle to control light wash when necessary.

Do not operate the luminaries close to flammable materials. The fixture can get hot to the touch without damage so please exercise caution when handling the system, during or shortly after operation.

NOTE: AT LEAST 4" of clearance (air space) above the unit and 6" from the heat-sinks on each end must be maintained at all times to insure proper airflow and cooling.

2.4 Environmental Conditions - Operating Requirements

The temperature of the fixture is the most important parameter for lifetime and reliability. A normal operating environment temperature should be maintained below 104 deg. Fahrenheit (40 deg. Celsius). Exceeding this maximum environmental temperature will stress the electronic components, which can lead to shorter life expectancy and decreased reliability, for short durations, no harm should be expected.

The SolarSystem 550 has a built-in internal over-temperature protection sensor. Should the heat sink temperature exceed 149 deg Fahrenheit (65 de Celsius) the system will shut down until the system cools down, after which it will restart.

For more information, please consult the SolarSystem 550 Product Manual

2.5 Mounting Heights, Spacing and Lighting Distribution

NOTE: *Minimum Distance from canopy* – A minimum distance of 16" should be maintained *from the highest point in the canopy* at all times to insure proper blending of light and to prevent any light stress.

Fixed Area Lighting

In applications where a fixed area is to be lit, i.e. Flood trays etc. and light must be kept from spilling into isles, the unit should be suspended at a height that will create a light footprint of the smallest dimension to be lit.

For example, in a row of 4'x8' flood trays, the smallest dimension is 4' so you would mount the fixtures at a height that will produce a footprint of 4' x4'. This is typically a height of 24"-30" above the ***average top height*** of the canopy, and should be spaced such that the lighting provides the desired amount of power density per square foot.

For Flowering Plants - each **3 – SS 550s at full power** (all channels at 99%) **will light a 4' x 8' area** or roughly 32 sq ft of canopy in flower, or **~10 sq ft. per SS 550 unit.**

So in the case of a row of 4'x8' trays, the lights would be mounted at 24-30" above the canopy, and at spacing's of 2' on center, or 3 per 4'x8' tray, for Flowering. *Power density requirements for other stages of growth besides Flower can vary from grower to grower, and is dependent on many factors, and spectrum mixes.*

Diffused Lighting Applications

For applications where plants are arranged in larger areas with taller plants so only small percentages of the light are lost to isles, and with highly reflective walls (>90%) on all sides, a *Diffused Lighting Design* can be employed to dramatically reduce shadowing and light level stratification at varying heights in the canopy.

Diffusion, or designing the lighting such that each plant sees multiple light sources from different directions will provide more even PAR readings at all locations and canopy heights in the room, with only small losses for light wasted on isles and wall bounces.

A common situation would be a 20'x20' room (and larger) full of 3-4' or taller plants in 5 to 10gallon Ebb and Flow or Deep Water Culture Buckets, evenly spaced in the room with just enough space between plants for workers to squeeze through. Again, ALL walls MUST be highly reflective.

In such a scenario, the lights can be mounted higher than in the previous Fixed Area approach. Generally, for a Diffused Lighting application the light would be raised such that light footprint is 4 times as large as the area a single light would illuminate. So in the case of the SS 550, the light can individually handle ~10sq ft of canopy or an area slightly over 3'x3'. So to use this approach you would now mount the light at a height that provides a foot print of 40 sq ft or slightly more than 6' x 6'.

This allows each fixture to not only light the 3'x3' area directly below it, but overlap to the center of the pattern of each light that surrounds it. In this way the lights all average out to a much more consistent light level at all locations and heights in the canopy.

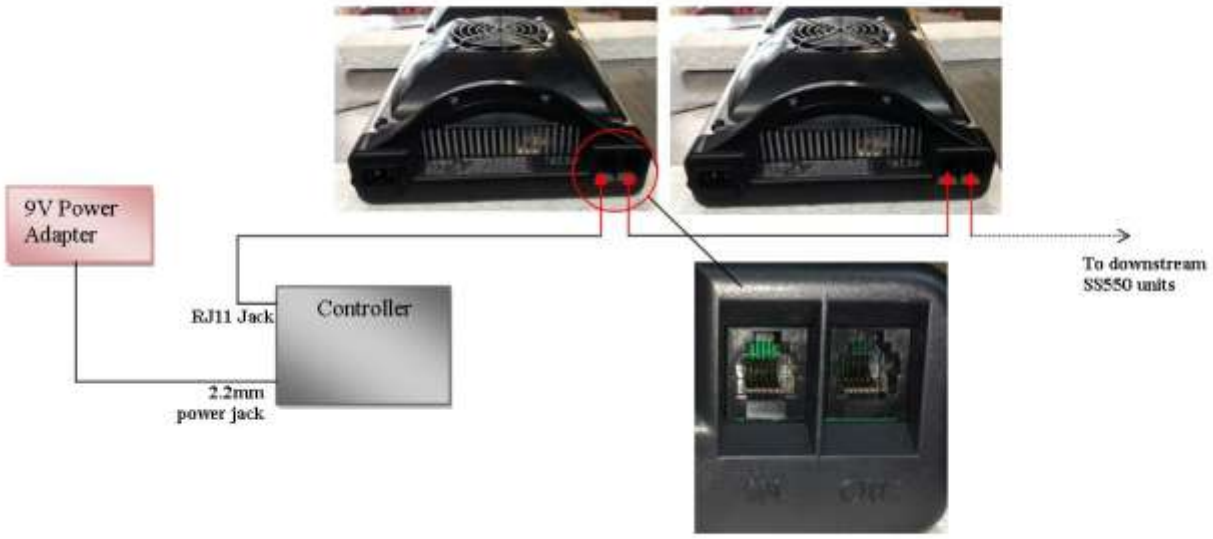
Please contact a lighting specialist or a California LightWorks applications specialist for support when using this approach.

2.6 Connecting the SS 550 Communication Network

The SS 550 system uses a simple and robust, hard-wired proprietary serial communications protocol distributed to a ZONE of lights (i.e. all the lights that are to be operated identically by one controller) through standard RJ11 cables (RJ11 Phone Cable 6P4C Straight for Data).

The communications cords are connected as follows. The SS 550 Controller is mounted in a convenient location and powered. One RJ11 cord is ran from the RJ11 jack of the SS550 Controller to the INPUT RJ11 jack of the first SS 550 in the chain. Then a second RJ11 cord is connected from the OUTPUT

RJ11 jack of that SS550 to the INPUT jack of the next SS 550, and so on for the entire chain (ie. control zone). The OUTPUT jack of the last SS 550 unit in the chain is left unconnected.



NOTE: If any SS 550 unit in the chain loses power, the communications will not be interrupted to downstream units. This is a unique feature of the SS 550 systems.

However, if any RJ11 cord is unplugged in the chain, all communications will be lost to all units downstream from that point.

If the SS 550 Controller loses power, ALL communications will stop until power is reapplied to the SS 550 Controller, and all connected SS 550 units will continue to operate in the mode of the last command they received until new commands are issued by the controller when power is restored.

The Controller is the brain of the system, so it is recommended that you power the controller form the same general power circuit that is used for all SS 550 lights.

2.7 Electrical Considerations & Operation

NOTE: Please read the enclosed **SolarSystem 550 Product Manual** before first applying power to the SolarSystem 550.

Each cord from a SS 550 should be plugged into an appropriate 120vac or 240vac receptacle. Extension cords are NOT RECOMMENDED for use with the SS 550.

NOTE: Most local electrical codes recommend that no Electrical circuit be loaded to a current level more that 75% of the rated capacity. For a 20 amp 120vac circuit that would be 15 amps. The SS 550 consumes 3.3 amps at 120vac. Consult your local electrical codes or a qualified electrician for proper circuit loading.

The SS 550 can be used with a new or pre-existing properly sized 2-pole Lighting Contactor, Light Controller or Timer. To do so the SS 550 can be either operated in “Always On” Mode, (units operate just like an HID system) or if used in “Controller” mode, the SS 550 Controller can be used to change the spectrum or dim the SS 550’s while the Contactor and external clock handle the Master on/off function.

3.0 Using the SolarSystem Controller

3.1 Key Functions – Overview

ADJUSTABLE SPECTRUM CONTROL

The SS 550 has 3 separate channels of spectrum control, RED, BLUE, and WHITE.

1) The RED channel controls all the Red AND Far Red LEDs.

2) The BLUE channel controls ALL the Blue and Deep Blue LEDs.

3) The WHITE channel controls all the White LEDs and just a small amount of Red LED's to correct the Color temperature of the cool white LEDs to a 3000K for more accurate plant inspection.

The spectrum can be programmed manually for a single setting or automatically for changing light spectrums to match natural sunlight transitions during the day.

AUTOMATIC 24 HOUR PROGRAMING

The controller provides up to 20 program steps for different spectrum mix and timing throughout a 24-hour period. Various spectrum mixes can be created and programs will run automatically over a 24-hour period or even over days/weeks/months. Battery back-up saves the program if power is lost.

AUTOMATIC DAY/WEEK/MONTH CALENDAR PROGRAMS

The SS 550 controller can also automatically run programs over days, weeks and an entire season. Up to 10 x 24 hour programs can be created and then change over the seasons such as Spring, Early Summer, Late Summer and Fall lighting or veg, pre-flower, flower and final finishing strategies. Natural transitions offer less plant stress and better yields.

BUILT-IN DIGITAL TIMER

Controls the On and Off times *digitally* without a Lighting Contactor, Light Controller or external Time Clock

SUNRISE/SUNSET TRANSITIONS

Digital On/Off with *Morning Fade-up* and Evening *Fade-down* with adjustable Fade duration can be adjusted to match the sun and reduce plants stress.

VIEW MODE

A single button switches to a natural white view mode for working in the garden or inspecting plants.

3.2 Operation Without a Controller – Mode Switch

The SS 550 can be used with a properly sized and grounded Lighting Contactor, Light Controller or External Timer. To do so the SS 550 can be either operated in "Always On" Mode, (units operate just like a HID system) or if used in "Controller" mode, the SS 550 Controller can be used to change the spectrum or dim the SS 550's while the Contactor and external clock handle the Master on/off function.

To run in "Always On" Mode, on one end of the SS S550 you will see the Operating Mode switch at the bottom of the heat-sink with a label marked "Always ON and CONT."

In “Always On” mode, (the switch slid to the left) the SS 550 will operate at full power (all channels at 99%) and will not respond to commands from the SS550 Controller.

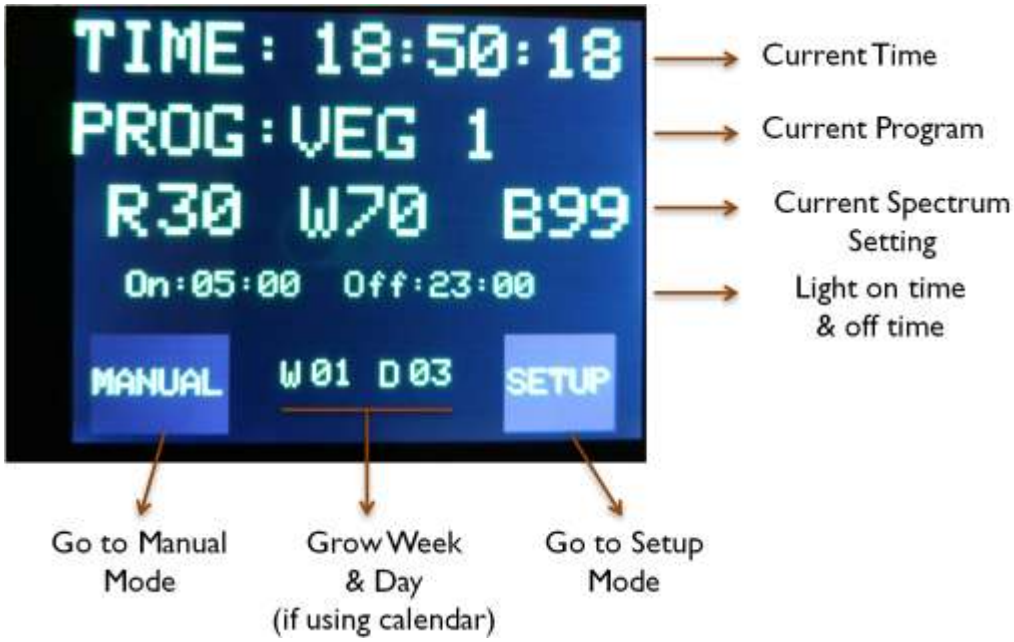
In “Controller” mode, (the switch slid to the Right) the SS 550 will respond to all commands received from the SS 550 Controller and will remember the last command received when power is removed. When power is reapplied*, the unit will restart in whatever state it was in prior to the power being removed.*

The SS 550 unit will not remember any commands issued to it if the power to the unit is off.

NOTE: The SS 550 system ships with the Operating Mode switch in the “Always On” position.

3.3 The SS 550 Controller Home Screen

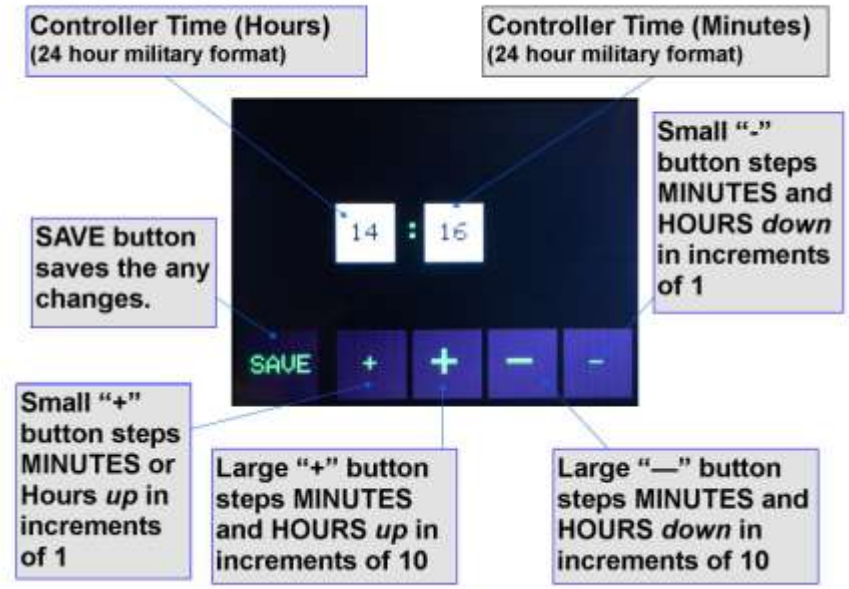
When you first power up the controller you will see the screen below. There are 4 lines of Red, White & Blue channel state and programming information, and then 2 control buttons at the bottom. The controller screen is touch sensitive but only the “MANUAL” and “SETUP” buttons are touch selectable in the Home screen.



NOTE: Displays only shows 2 digits for levels so 99 is actually 100% or full power, 1 is 10% or minimum power. 0 is off.

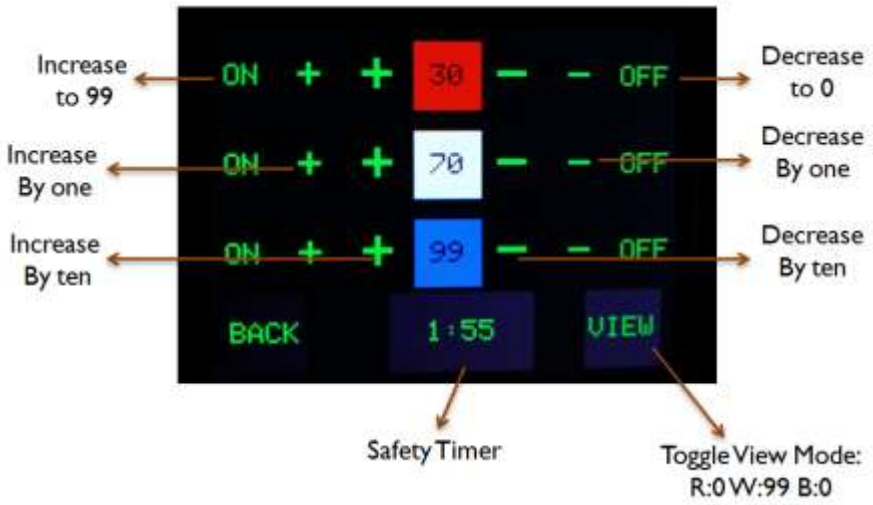
3.4 Setting the Clock

On the HOME page, touch the button marked “SETUP”Touch the “SET TIME” button in the SETUP menu page. Set the Controller clock as follows:



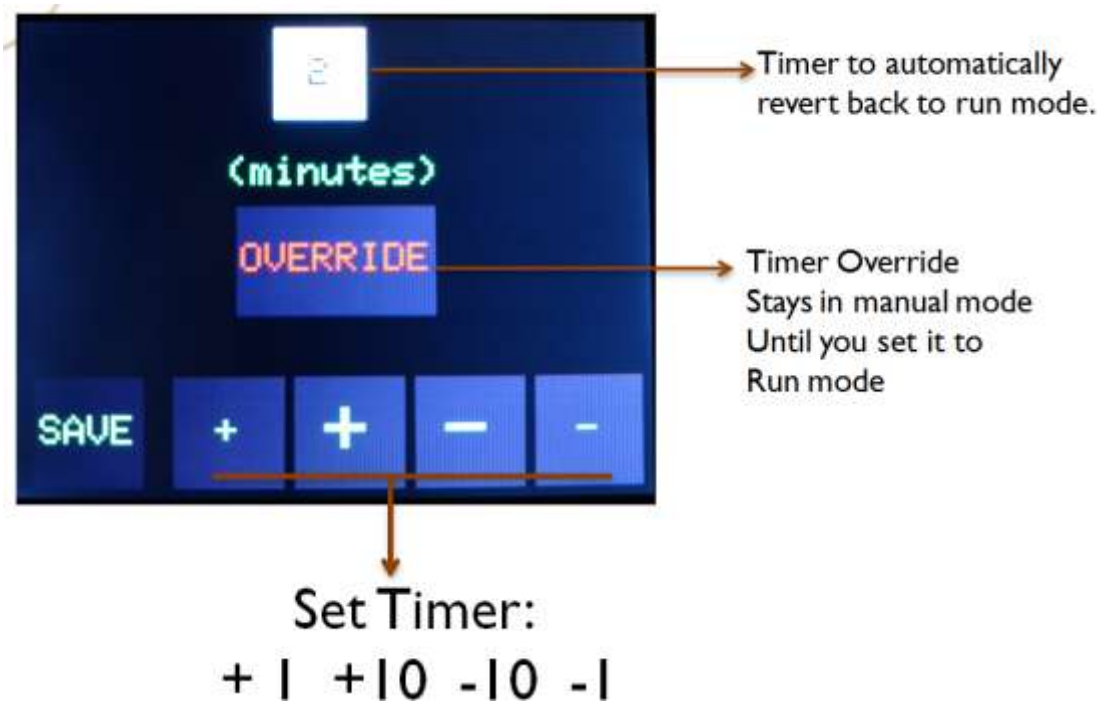
3.5 Manual Color Spectrum Selection and View Mode

The simplest way to use the spectrum control features of the SS 550 is by using the “MANUAL” mode. Manual mode functions like 3 digital dimmers, RED, WHITE, and BLUE. To enter MANUAL mode from the HOME page touch the left “MANUAL” button.



The image above shows the controller screen in Manual mode. You’ll notice the three boxes in the middle of the screen representing the 3 channels you can control, RED, WHITE and BLUE.

First override the safety timer. You can do this by clicking on the countdown box in the lower middle part of your screen.



On this screen click the OVERRIDE button. This will put the manual mode safety timer in override mode basically keeping the controller in manual mode until you exit this mode.

After you press the OVERRIDE button, the screen will revert back to manual mode. Now you can change the power level of each channel. To change the intensity value for each channel you can use the ON, +, +, -, -, OFF buttons on either side of each color box:

- The ON button sets the channel to max, which is 99
- The small + sign increments the intensity by 1
- The large + sign increments the intensity by 10
- The large – sign decrements the intensity by 10
- The small – sign decrements the intensity by 10
- The OFF button sets the intensity to 0, which is off.

The VIEW button on the bottom right hand corner of the screen will instantly set the Red and Blue channels to 0 and the White channel to 100 for brief plant inspections. Touch it again to go back to the previous state.

It's possible to use your SolarSystem 550 unit(s) with a controller in manual mode and contactors boxes. The SolarSystem 550 is designed to always keep its current spectrum state when it's disconnected from power. So when the lights are powered down then powered back on, they're revert back to their last state.

NOTE: When the Controller is placed in MANUAL mode, all programmed events are suspended until the Controller is taken out of MANUAL mode. Also, if you change the setting in manual mode then go back to Run mode, the light setting will remain until the next programmed event.

3.6 Basic Spectrum Control for Flowering Plants

What follows are some basic Spectrum mixes for various growth stages for flowering plants. These Spectrum mixes have been determined from 8 years' experience with our professional grower network, and are supported by various university studies on varying spectrums effect on Plant Morphology.

In general, blue is essential in vegetative growth and produces lush growth and bushy plants. Red tends to make plants stretch in Vegetative growth but is key high yields in fruit or flowering plants. The SS 550 allows you to dial in exactly the spectrum mix needed for any phase of growth.

Growth Stage	Week No.	RED	WHITE	BLUE
Vegetative	Varies	49	99	99
Pre-Flower	1 to 2*	74	99	99
Flower	3 to 6*	99	99	99
Ripen (finish)	7 to 8*	80	90	99

(* Weeks are based on an 8-week Flower cycle. *Visit the CLW website for more advanced information on using Spectrum control to optimize your results**)***

3.7 Spectrum Control and Timer for 24 Hour Program Cycles

One powerful feature of the SolarSystem controller is that it allows you to operate your SS 550 lights digitally without a separate Lighting Contactor. The SS 550's are simply plugged into appropriate AC outlets and the 550 Controller will control the on/off times DIGITALLY for all lights as well controlling more sophisticated dimming and spectrum variations.

The simplest way to do this feature is to use a single program that repeats every 24 hours.

From the home screen touch SETUP, on the next screen touch EDIT PROGRAMS, then on the next screen touch EDIT STEPS.

The top three boxes allow you to change the spectrum. Click on each box that you would like to change and you'll notice the numbers in the box turn blue. Now you can use the buttons at the bottom of the screen to change them similar to manual mode. Click anywhere outside the boxes once you're done.

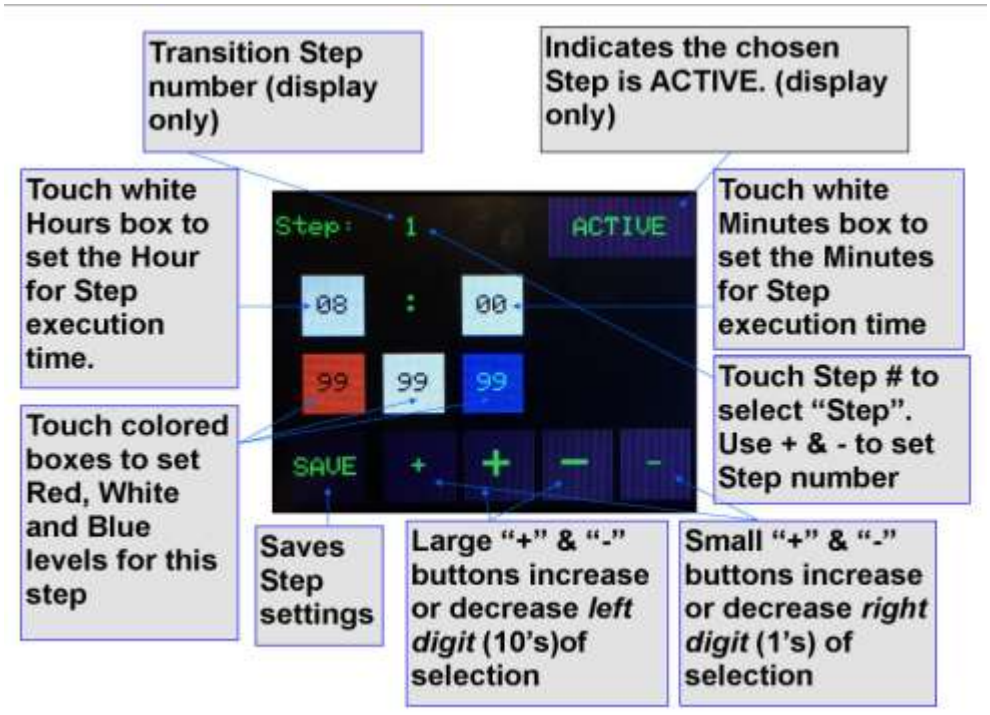
Next you can set the On Time which is the time you want the lights to turn on, then the off time. First click on the HRs (first box) then MINs (second box.) Finally, you can set the Sunrise/Sunset time again by clicking on the box to the right lower corner (showing 30 on the screen shot above.) This is the time in minutes that it will take the lights to gently ramp up and slowly turn off. Once you're done click SAVE. Make sure the program that you just edited shows ACTIVE on the top right corner. Click the BACK button twice and you're done! If you simply want this program to repeat every 24 hours, indefinitely then make sure **that no calendar routine is set to ACTIVE under the calendar function.** If you have a routine setup and ACTIVE, then it will take precedence over a program that is enabled in this menu. See the next section: Multi-day/week spectrum programming

The Controller can be programmed for more advanced transitions such as making the Red or Blue Spectrum go up or down through the course of a day to simulate the changes in Spectrum that plants see from the Sun from early bluish morning light to late afternoon deep red.

The programming is the same as used in the digital On/Off scheduling except you can add additional Steps that make the transition changes.

Or you can set the spectrum at start time at 08:00 in our earlier example with the Red at 70% (Extra Blue) instead of 100%, make the second step at 10:00 the Red back up to 99, then the 3rd Step at 17:00 with the Blue dropping to 80% and at the Off time all channels to 0. And you can set the fade to 59 to give you nice gradual changes.

And you can do up to 20 total transitions (Steps) for a nice even gradation across the entire day. Watch the California LightWorks website for additional programming strategies.



3.8 Multi-Day/Week/Season Schedules

Once you have set up 24 hour programs as explained in section 3.7 you can program these to run on consecutive days or weeks throughout the entire growth cycle. It is possible to schedule up to 10 different programs over the grow cycle up to 24 weeks. A simple calendar program might be to run a veg cycle which is rich in blue with less red and is set for 18 hours for 6 weeks and then automatically transition to bloom with high intensity red set at 12 hours for 8 weeks. This can all be set up automatically – both for the spectrum settings and length of day in each phase.

From the home screen touch SETUP. On the next screen touch SET CALENDAR. The WEEK and DAY are displayed. For a new program you would start with Week 1, Day 1 and start building you schedule. Next, touch
SET ROUTINE. This will allow you to schedule Phase 1 – the first routine in your grow cycle. Next select the program you want from the 24-hour program you have already set up. Touch the Program listed and it will give you the list of all current programs that have been set up. Select the program that you would like to run for the first phase of you grow cycle. Enter the number of weeks and days you would like this phase to run. Click on ACTIVE to save and start the program. To set the next phase touch the small plus sign. This will advance to Phase 2. Once again touch Program to select the program you want to run for Phase 2. Touch ACTIVE to save the phase and make it active and ready to run. Continue this process until you have scheduled all the desired Phases in the schedule. Touch BACK to return to the SET ROUTINE screen. Touch SAVE and then BACK to return to the HOME screen. You schedule will now be displayed on the HOME screen. It will tell you the name of the current program running, the spectrum settings, the time ON and time OFF. It will also tell you the current WEEK and DAY in the grow cycle.

3.9 Using Programs with External Contactor and Time Clock

When the SS550 system is used with lighting Contactor controlled by an External Clock, the SS550 can still provide all its features except for ON/Off scheduling with just a few minor programming changes:

All programmed dimming or spectrum transitions that change throughout a scheduled lighting period, must be programmed with a “Buffer Period”, such that any programmed Transitions should start *at least 2 minutes or more* after the Contactors scheduled ON time. No clock is perfectly accurate, so the buffer period is to allow for any inconstancies between the external time-clock settings of the Contactor and the SS550 Controller clock. Care must be taken to ensure that the two clocks (contactor clock and SolarSystem Controller clock) are always in synch. Periodic adjustments may be necessary.

So, to set a “Buffer Period” if for example, the Contactor is set for on time of 08:00 and off at 20:00, the CLW 550 Controller would have all programming steps start after 08:02 (or later) and end before 19:58 (or earlier) to insure power is always applied to the 550’s when ALL control commands are to be received from the 550 Controller. See the “Programming the SS550” section for more details on programming Transitions

4.0 Warranty and Service

California LightWorks (CLW) warrants its products are free from defects in material and workmanship. Subject to the conditions and limitations set forth below, CLW will, at its option, either repair, replace or give a refund for any product that prove defective by reason of improper workmanship or materials. Repaired or replacement products will be provided by CLW on an exchange basis, and will be either new or refurbished to be functionally equivalent to new. Any refunds given will be at the current value of the product at the time the warranty claim is made. This limited warranty does not cover any damage to this product that results from improper installation, accident, abuse, misuse, natural disaster, insufficient or excessive electrical supply, abnormal mechanical or environmental conditions, or any unauthorized disassembly, repair, or modification. This limited warranty also does not apply to any product on which the original identification information has been altered, obliterated or removed, has not been handled or packaged correctly or has been sold as second-hand. This limited warranty covers only repair, replacement or refund for defective CLW products, as provided above. CLW is not liable for, and does not cover under warranty, any loss of data or any costs associated with determining the source of system problems or removing, servicing or installing CLW products. This warranty excludes 3rd party software, connected equipment or stored data. In the event of a claim, CLW's sole obligation shall be replacement of the hardware.

Terms

The following CLW products are covered by this warranty for a period of five years from the date of purchase: SS 550. All other products including the SS 550 Controller are covered by this warranty for a period of one year from the date of purchase.

Disclaimers

The foregoing is the complete warranty for CLW products and supersedes all other warranties and representations, whether oral or written. Except as expressly set forth above, no other warranties are made with respect to CLW products and CLW expressly disclaims all warranties not stated herein, including, to the extent permitted by applicable law, any warranty that may exist under national, state, provincial or local law including but not limited to any implied warranty of non-infringement, merchantability or fitness for a particular purpose. All warranties, whether express or implied, are limited to the periods of time set forth above.

CLW's total liability under this or any other warranty, express or implied, is limited to repair, replacement or refund. Repair, replacement or refund are the sole and exclusive remedies for breach of warranty or any other legal theory. To the fullest extent permitted by applicable law, CLW shall not be liable to the purchaser or end user customer of a CLW product for any damages, expenses, lost data, lost revenues, lost savings, lost profits, or any other incidental or consequential damages arising from the purchase, use or inability to use the CLW product, even if CLW has been advised of the possibility of such damages.

Service Procedure

CLW is the only authorized provider of warranty service. Any attempt to service these products by customers will void the warranty. For Service please contact:

Email: support@californialightworks.com
Phone: 800-575-3475 x 300
Address:

California LightWorks
Attn: Warranty Repairs
7945 Deering Ave
Canoga Park, CA 91304