



ENERGYFICIENT®

## Installation and User Manual Solo Lighting Control Series LCL-0.2 model

Manual V 5.3

Software V 2.07.02

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Patent Pending



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# 1 General Information

## 1.1 System Overview

The Solo family of products is designed to adapt to a variety of controlled environments. It is exceptionally well suited for all types of farm buildings including poultry houses, pig houses, dairy barns, and greenhouses.




We recommend that you read this manual thoroughly before connecting and commissioning this product. Installation and use of this unit which does not comply with the operating instructions described in this manual is hazardous to the health and safety of people, may result in damages to the building and will void the warranty.

## 1.2 Revisions

Version	Content/Changes	Date	Author/In charge
3.3	Corrections Software V1.14	2014-06-09	Josée Samson
4.0	Describe software V. 2.05.00	2017-06-05	Louissette Fournier
5.0	Describe software V. 2.06.03	2018-05-11	Louissette Fournier
5.1	Change I/P Voltage specs	2018-09-21	Louissette Fournier
5.2	Minor changes in Technical Specifications	2018-12-13	Louissette Fournier
5.3	Minor changes for software version 2.07.02	2019-06-19	Louissette Fournier

### 1.3 Symbols Used

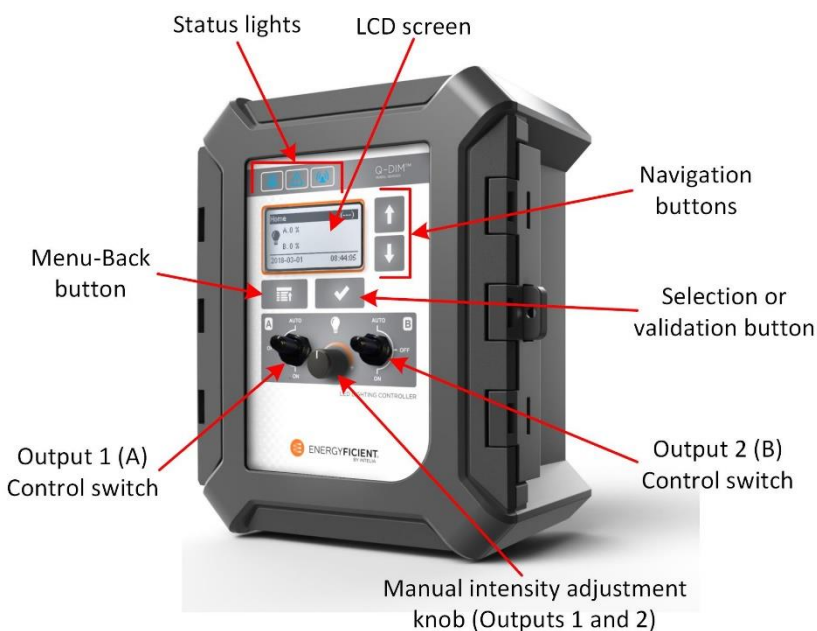
The following symbols will be used in this manual:

	Caution, risk of ELECTRIC SHOCK
	Caution, risk of DANGER
	Important NOTE

## 2 Usage & Features

The programmable lighting controller unit (LCL-0.2) is specifically developed to modulate the intensity of LED lighting products.

This controller is equipped with a graphical LCD display with white backlight and four navigation keys for programming lighting schedules. The controller provides two power outputs, configurable in automatic mode or in manual mode using dedicated bypass switches and an intensity knob.



LCL-0.2 is available in 3 options of operating voltage and frequencies:

- **LCL-0.2-120V-60Hz** (P/N 30-014-00188-L134)
- **LCL-0.2-240V-60Hz** (P/N 30-014-00180-L134)
- **LCL-0.2-240V-50Hz** (P/N 30-014-00180-L134-50)



Whatever option of operating voltage and frequency is chosen, it should match the lighting equipment specifications.

The main characteristics of the controller include:

- Two 1000W precise light dimming output
- Minimum inertia method used for smooth sudden transitions in light intensity
- Minimum and maximum intensities specified as a percentage of full lamp intensity
- Internal clock with battery backup to keep time in case of failure
- Electronic bypass switches for each output
- Protection against leaving bypass switches in the ON position
- Capability to adjust light intensity according to the voltage applied
- Up to 20 programmable periods based on the flock age with
  - Programmable sunrise and sunset lighting
  - Up to 12 light cycles per day
  - Up to 20 stimuli per day
- Two Analog 0-10V signal can be configured as outputs to drive remote controllers or as inputs to dim the light according to the signal level.
- Built-in USB port used for backup/restore configuration and firmware updates
- Can act as a Slave unit controlled by 0-10V input



## 3 Installation, Commissioning and Operation

### 3.1 Technical Support

The technical support related to the Solo models can be obtained from your distributor or directly from the manufacturer.

Website: [www.intelia.com](http://www.intelia.com)

Email: [support@intelia.com](mailto:support@intelia.com)

Phone: 1-866-666-6221

### 3.2 Safety

The technical staff performing an operation on a controller must have read and understood this manual and accept its content.

Before the commissioning of the controller, all the connections must be checked. All the electrical cables and connections must be inspected to detect any potential defect.

The controller must not be operated if one of its components (whatever it is) is defective.

The repair or replacement of a defective component can only be done by the technical staff trained for this purpose. The qualification of this technical staff must be previously confirmed and accepted by your distributor.

The manual switches on a Solo controller are not a safe way to disconnect the equipment from the electrical network.

It is important to provide a complete disconnection device between the equipment and the controller, or to turn off the power at the source before undertaking any work on the equipment and its electrical wiring.



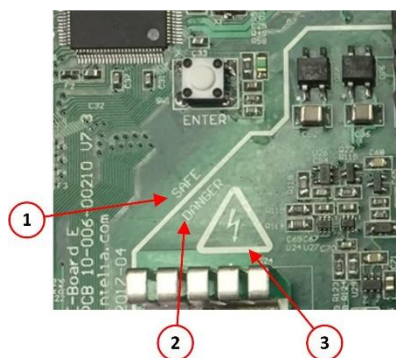
The non-compliance with these instructions can cause the complete or partial voiding of the warranty.



When accessing the unit's electronic board directly, there is a risk of ELECTRIC SHOCK if touching specific areas. To help the user know where these areas are located, a white line is printed right on the board to show the limits of the safe (1) and danger (2) areas. The danger area is also identified by a danger symbol (3) (refer to illustration below).

### LEGEND :

1. Safe area
2. Danger area
3. Danger of electrocution symbol



### **3.3 Installation and Positioning**

It is essential to respect the following installation instructions:

1. The controller is designed for a wall installation and it absolutely needs to be installed vertically.
2. Some heat may be generated by the device. It is therefore important to make sure that there is no obstacle that obstructs or disrupts the free flow of air 20 cm (8") above and 10 cm (4") below the controller.
3. It is important never to install the controller over a heat source such as a radiator or another controller equipped with a heat sink.
4. The controller must be installed in a location where it will not be exposed to noxious gases or excessive moisture. It shall in no case be sprayed directly.
5. The temperature of the location where the controller will be installed must always be between 0°C and 40°C (32°F and 104°F).
6. The relative humidity of the location where the controller is installed must always remain between 5% and 90%.
7. The low voltage cables (control signals, sensors and potentiometers) must be isolated from the high voltage cables.
8. It is absolutely mandatory to connect the ground wire at the location provided to this purpose. An improper grounding could lead to malfunction.
9. The wall where the controller is installed must be flat and able to withstand a temperature of 80°C (180°F). The controller must never be installed directly on a Styrofoam or urethane wall, or any other heat-sensitive material.
10. Install the controller in an accessible location at eye level for ease of installation, usage and maintenance.

### 3.4 Electrical Connection

#### 3.4.1 Electrical Wiring and Connections



TURN OFF POWER AT THE SOURCE BEFORE AND DURING THE CONNECTION TO AVOID ANY RISK OF ELECTROCUTION AND DETERIORATION OF THE CONTROLLER.

The controller installation must comply with the wiring diagrams provided. These will give all the necessary information for an electrician to carry out all the wiring operations. In addition to all the electrical standards in effect, the following conditions must be respected:

1. All the perforations for the passage of the electrical cables must be made from underneath the unit. The non-compliance with this instruction can cause the complete or partial voiding of the warranty.
2. All the perforations made to route the electrical cables must be sealed with putty to prevent damage caused by moisture condensation inside the controller.
3. The wires must be identified at both ends with appropriately sized wire markers so they do not slip and come off.
4. The signal and communication cables must not run along an AC power cable for more than 60 cm (2 feet) to avoid electrical background noise affecting the signal.
5. The probe and communication cable must be of minimum size #22AWG in shielded, twisted and insulated copper with a PVC sheath.
6. A grounding conductor of stranded copper #12AWG must be provided and installed at the required location.

#### 3.4.2 Wiring Diagram

For input/output connection details, please refer to the wiring diagrams shown in Appendix C.

### 3.5 Starting the System

Starting the system will differ depending on the **Power Expansion** mode used in the *Advanced Parameters* menu (see section 6.2).

#### 3.5.1 When Using Power Expansion Master Mode

For system configuration in Master mode perform the following steps:

System Setup	
1	Configure the Control Mode and Preload adjustment. See <i>Configuration &gt; Advanced Parameters</i> in section 6.2.
2	Enable outputs and calibrate lighting intensity according to the applied voltage. See <i>Configuration &gt; Outputs</i> menu section 6.1.
3	Set the date and time of the system to allow a consistent functioning of the lighting periods and consistent history backups. Then set your display preferences. See <i>Configuration &gt; Local Settings</i> menu – section 6.3.
Daily Operation Setup	
4	Configure lighting curves to determine the lighting periods throughout the production cycle. See <i>Operating Parameters</i> menu (section 5)
Activate and Start	
5	Make sure to switch all outputs from MANUAL to AUTOMATIC mode See <i>Output Control</i> menu (section 5.4)
6	Finally, apply the lighting curve by setting the controller to Production Mode See <i>Production</i> menu (section 5.3)

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### 3.5.2 When Using Power Expansion Slave Mode

When used as a slave, the light intensity is set by the 0-10V input coming from a remote system. In **Slave** mode, there is no way to define a light program.

For system configuration in **Slave** mode perform the following steps:

System Setup	
1	Configure the Control Mode and Preload adjustment. See <i>Configuration &gt; Advanced Parameters</i> in section 6.2.
2	While still in <b>Master</b> mode, enable outputs and calibrate lighting intensity according to the applied voltage. See <i>Configuration &gt; Outputs</i> menu section 6.1.
3	Select the <b>Slave</b> mode in <i>Configuration &gt; Advanced Parameters</i> menu (see section 6.2)

### 3.6 Battery Replacement

An error message is displayed whenever the battery level is too low. Please proceed to its immediate replacement to avoid time and configuration loss in case of power failure.



Keep power ON during the following procedure to avoid irreversible configuration loss



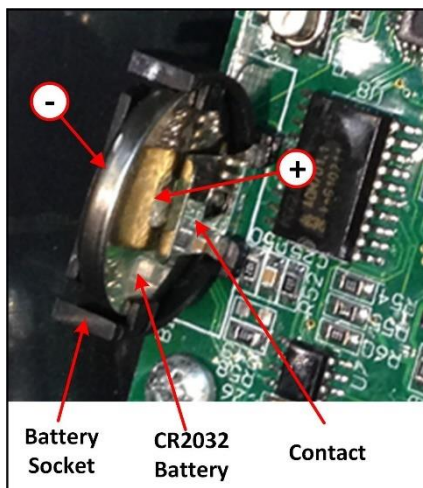
Be careful not to touch circuit components other than the battery to avoid risks of electrocution. Refer to section 3.2 for more detailed information. When in doubt ask help from a specialized technician.

Follow these steps to replace the battery:

1. Open the case
2. Locate the position of the battery (on the top left corner of the main board).

Take note of the polarity of the battery so the new one can be installed in the same position.

3. Pull up on the battery to remove it.
4. Place a new CR2032 lithium battery by sliding it between the socket and the contact making sure it is inserted in the same position as the one just removed.



5. Close the case.










## 4 User Interface

### 4.1 Control and Display for Model LCL-0.2

#### Status Lights

	<p><b>Communication</b></p> <p>This status light flashes on and off whenever data flows on the communication bus.</p>
	<p><b>Warning</b></p> <ul style="list-style-type: none"><li>– <b>Flashing:</b> when the Manual control, Simulation or Calibration option is activated.</li><li>– <b>Fixed:</b> when the control detects a preventive maintenance needs to be done, such as: change the battery, sensor fault ...</li></ul>
	<p><b>Alarm</b></p> <ul style="list-style-type: none"><li>– <b>Flashing:</b> at least one alarm is not acknowledged</li><li>– <b>Fixed:</b> all active alarms are acknowledged</li><li>– <b>Off:</b> no alarm is active.</li></ul>

#### Manual Control

 <p>Control Switch</p>	<p>Manual control switches offer three possible positions:</p> <p><b>AUTO:</b> The output is automatically controlled according to the current defined parameters.</p> <p><b>OFF:</b> The output is manually disabled.</p> <p><b>ON:</b> The output intensity is set by the Adjustment Knob.</p>
 <p>Manual Intensity</p>	<p>Adjustment Knob: This button allows adjusting light intensity when one or more control switches are set into the ON position.</p> <p><i>Note: The manual intensity adjustment knob adjusts both lighting outputs simultaneously if both are set on manual mode (Control Switches in the ON position).</i></p>

## Navigation Keys

Navigation through the system's different menus and modification of parameters configurations are performed using the following four buttons:



Menu-Back

To return to previous menu or cancel the current modification.



Up

To increment a value or scroll up through a selection list.



OK





Selection and validation of changes made








Down

To decrement a value or scroll down through a selection list.

## Navigate through menus and available options

1. From the home page, press  to access the main menu.
2. Use  and  to select the desired sub-menu and press  to access available options

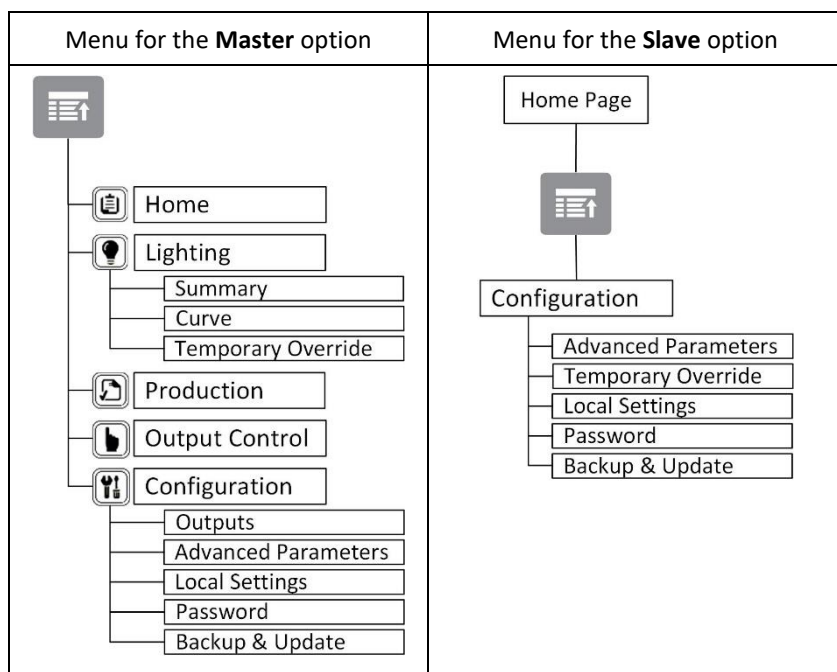
## Modify a parameter

1. Activate Edit mode of a selected parameter by pressing .
2. Modify the value using  and .
3. Press  to confirm the change or  to cancel.

### 4.2 Controller Menu and Options

Navigation through menus and sub-menus depends on which options are activated in the configuration menu. Thus, if one or more of the parameters presented below is not displayed on your unit, it is because they are not used by the functions that you chose to activate.

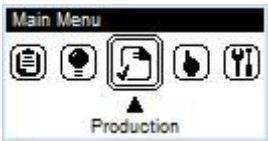
The menus available are also dependent on the mode option chosen for the **Power Expansion Mode** in the *Advanced Parameters* menu.





# 5      Operating Parameters

This section describes each menu available when using the Master mode of the Power expansion parameter.

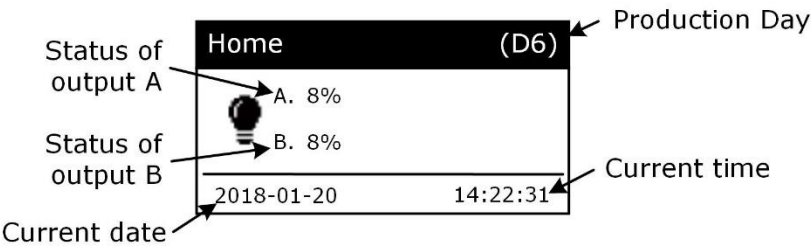


Press the **Menu-Back** key to access the main menu:

## 5.1      Home



The Home menu is the default display of the controller and it provides a quick snapshot of controller information. It is always possible to access Home pages by pressing the **Menu-Back** key as many times as necessary to display the home page. The home page is displayed as follows:



If the system is in Manual Control or in temporary manual override mode, the home page alternates with one of the two following warning pages:

Home (D6)	
Manual Control	
2018-01-20	14:22:31

Home (D6)	
Temporary Override	
Time Left : 20:10	
2018-01-20	14:22:31

## 5.2 Lighting



The lighting submenus are used to view the lighting status, configure the lighting program according to the age of the animals and configure the temporary lighting override.

Select the lighting menu and press the **OK** key. The submenus appear.

The light controller can manage each output independently or share a single schedule (curve) over the production.

To manage both outputs on separate curves, the option **Independent** must be selected for the **Curve** parameter in *Advanced Parameters* (see section 6.2). According to this option, the lighting menu will then display as shown to the right.

Select the submenu and press the **OK** key to view it.

### Lighting

- ▶ Summary
- Curve
- Temporary override

Shared Curve

### Lighting

- ▶ Summary
- Curve A
- Curve B
- Temporary override

Independent Curve

### 5.2.1 Lighting Summary

The Lighting Summary page displays the general lighting status as shown below:

#### Summary

Setpoint (prod.) 10%

#	Status	Actual
A	Dim.	27%
B	Auto	10%

Display for shared curves

#### Summary

Setpoint (prod.)

#	Status	Actual	Setpoint
A	Dim.	27%	50%
B	Auto	10%	10%

Display for independent curves

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- Current lighting setpoint and its nature:

The setpoint defines the light intensity targeted in percent. The source of its definition depends on the operating mode.

- **Non-Production:** the setpoint comes from the Production page (see Production for details – section 5.3.1.2).
- **Production:** the setpoint comes from the Lighting - Curves page (see Curve for details – section 5.2.2).
- **Manual:** the setpoint comes from the Lighting - Temporary Override page (see Temporary Override for details – section 5.2.3) or the Output Control page (see Output Control for details – section 5.4).

- Current status and intensity of the lighting outputs:

The status defines which source currently sets the intensity of the output. These sources are:

- **AUTO:** the lighting output takes the setpoint defined above.
- **Manual:** the lighting output is under manual control (see Output Control for details – section 5.4).
- **Dimmer:** the lighting output takes the setpoint of its external dimmer currently set to manual (0 to 100%). Set the dimmer to **AUTO** so that the lighting output takes the setpoint of the solo system.

**Switch:** The output is set on manual operating mode. The intensity is set by the Manual Intensity Adjustment Knob.

### 5.2.2 Curve

The Curve page allows the definition of the light schedule and its transitions according to the age of the animals.

All lighting outputs operate along a curve constituted of up to 20 lighting periods. Each period may include up to 12 cycles and 20 stimuli per 24 hours.

The page to the right presents a lighting curve summary.

- To edit or view details, select a period and press the **OK** key.
- To create a new period, select "---" then press the **OK** key.

Curve		
Period	Daylight	Duration
0-4	95>>60%	14 : 00
5-20	60%	12 : 40
21-50	60>>45%	10 : 50
---		

### 5.2.2.1 Editing a Period

Up to 12 lighting cycles and 20 stimuli per day can be defined for each period. Each lighting cycle is performed as shown in Figure 1. Transitions at the beginning and end of the cycle simulate the natural sunrise and sunset to reduce animal stress. Growth and weight gain are enhanced by the introduction of momentary light stimuli during a light cycle. The intensity of the stimuli is variable.

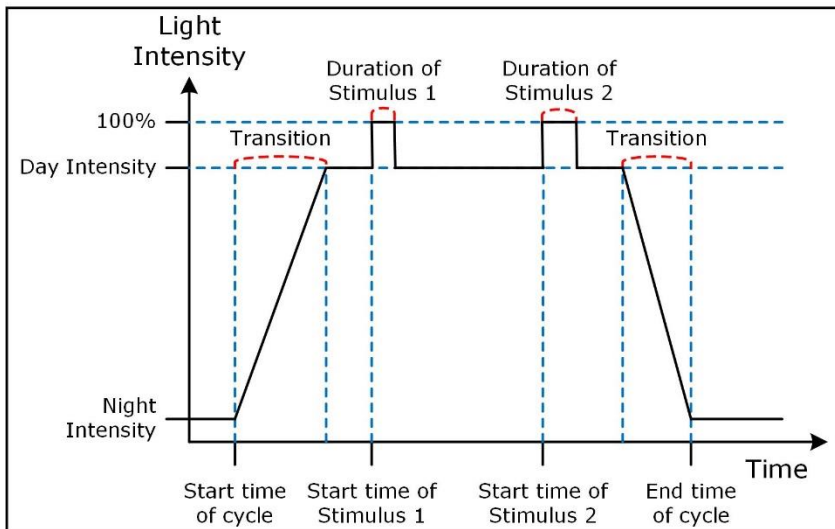


FIGURE 1 LIGHTING CYCLE - VARIATION OF INTENSITY VERSUS TIME



5.2.2.2 Period Settings

Each period includes the same parameters that define the daily light schedule according to the animals’ age.

These parameters are explained in detail thereafter:

**Day Start:** (0 to 500)

Determines the start day for the period. All parameters for this period will be applied until the production day reaches the start day of another period. If the period is the last defined, the parameters will be repeated indefinitely until the production day is reset by the user.

**Day Intensity:** (0 to 100%)

The day intensity is the light intensity when the lights are turned on. This intensity can be constant every day or slowly transiting to the value of the day intensity defined in the next period.

- **Constant Daylight Mode:** lighting intensity within the lighting cycles once the transition is complete.
- **Gradual Daylight Mode:** lighting intensity used to calculate the current daylight intensity value. Daylight intensity is applicable within the lighting cycles once the transition is complete.

*In all cases, the last period settings will be used for the subsequent days.*

**Night Intensity:** (0 to 100%)

Lighting intensity outside of lighting cycles.

**Daylight Mode:**

- **Constant:** The Daylight intensity remains steady over the period.
- **Gradual:** The Daylight intensity is automatically adjusted during the period. A linear regression is applied as shown in Figure 2.

Parameters

--Period--

Day Start	0
Day Intensity	95%
Night Intensity	10%
Daylight Mode	Gradual

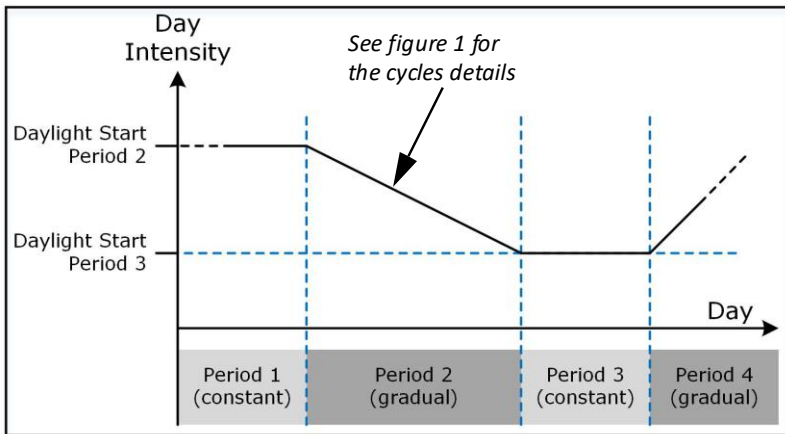


FIGURE 2 VARIATION OF DAYLIGHT INTENSITY OVER THE PERIODS

### 5.2.2.3 Daily Cycles Settings

The daily cycle allows turning the lights on and off several times per day according to the animals age, the type of production, the feed schedule, ...

**Transition On:** (0 to 100 min)

Parameters	
--Daily Cycles--	
Transition On	5 min
Transition Off	7 min
Cycles	Edit

This parameter simulates the gradual increase of light intensity during a sunrise. It corresponds to the time that will be used to increase the level of intensity from **Night Intensity** to **Day Intensity** before each cycle.

**Transition Off:** (0 to 100 min)

This parameter simulates the gradual decrease of light intensity during a sunset. It corresponds to the time that will be used to decrease the level of intensity from **Day Intensity** to **Night Intensity** at the end of each cycle.

**Cycles:**

The cycles define the time of the day when the light turn on and off. There are up to 12 cycles possible per period.

Select the option **Edit** to bring up the page to the right and determine the following parameters for each cycle.

**Enable:** Select this option to activate the cycle.

Cycles			
	Enable	Start	Stop
1	<input checked="" type="checkbox"/>	08:00	12:00
2	<input checked="" type="checkbox"/>	14:00	18:00
...		...	...
12	<input type="checkbox"/>	00:00	00:00

**Start:** Starting time for lighting cycle (00:00 to 23:59).

**Stop:** End time for lighting cycle (00:00 to 23:59).

**5.2.2.4 Daily Stimuli Settings**

The Daily Stimuli is entirely independent of the day intensity and the day cycles. That option allows to define a second intensity step in place at any moment of the day. It's especially useful to stimulate animals to eat or drink by increasing the light for a brief moment during a light cycle.

Parameters	
--Daily Stimuli--	
Intensity	100%
Transition On	1 min
Transition Off	1 min
Stimuli	<input type="button" value="Edit"/>

**Intensity:** (0 to 100%)

Lighting intensity of the Stimulus

**Transition On:** (0 to 100 min)

The time that will be used to increase the level of intensity from **Day Intensity** to stimulus **Intensity**.

**Transition Off:** (0 to 100 min)

The time that will be used to decrease the level of intensity from stimulus **Intensity** to **Day Intensity**.

**Stimuli:** Select the option *Stimuli - Edit* to bring up the Stimuli page shown to the right.

For each stimulus, set the following parameters:

**Enable:** Select this option to enable the stimulus.

**Start:** Starting time for stimulus (00:00 to 23:59). A stimulus will be performed only within a lighting cycle.

**Duration:** Duration of the light stimulus (from 00m00s to 23m59s).

Stimuli			
	Enable	Start	Duration
1	<input checked="" type="checkbox"/>	08:00	2m30s
2	<input checked="" type="checkbox"/>	14:00	2m00s
3	<input checked="" type="checkbox"/>	20:00	0m30s
...		...	...
19	<input type="checkbox"/>	00:00	0m00s
20	<input type="checkbox"/>	00:00	0m00s



Stimuli will not be activated if defined outside of a lighting cycle.  
Stimuli will not be visible if the current daylight intensity value is equal to the stimulus value.

### 5.2.3 Temporary Override

The Temporary Override page allows overriding the lighting intensity setpoint temporarily without changing the current lighting curve. This prevents accidentally leaving the lights on when maintenance is finished.

Temporary Override	
Actual Intensity	55 %
Temporary Override	<input type="checkbox"/>
Activation Duration	30 min
Manual Intensity	20 %

To temporarily override the current lighting setpoint, follow these steps:

1. Select the **Activation Duration** of the setpoint (1 to 120 min) and the desired **Manual Intensity** of lighting (0 to 100%).
2. Start the temporary override by checking the **Temporary Override** checkbox.

The temporary override setpoint will be applied during the activation duration; once this time has elapsed, the temporary lighting control is automatically disabled



### **TEMPORARY MANUAL OVERRIDE SHORTCUT:**

The temporary manual override mode can be enabled/disabled in any program mode by simultaneously pressing on the up and down arrows on the controller.



## 5.3 Production



The solo ensures the monitoring and management of production settings, as well as that of non-production times used for cleanup. This menu allows starting or stopping production as well as changing the production day.

### 5.3.1 Starting and Managing a Production

#### 5.3.1.1 In Production

To start production, follow these steps:

1. Enable the **In-Production** option; the Production page appears as shown to the right.
2. Update the Production day (between 0 and 500). The production day corresponds to the animals age. This day is used to determine which lighting periods is applicable (refer to *Lighting > Curve* for details – section 5.2.2).

Production	
In Production	<input checked="" type="checkbox"/>
Day	<input type="text" value="10"/>

#### 5.3.1.2 Non-Production

To operate in Non-Production mode, disable the **In-Production** option; the Production page appears as shown to the right:

Production	
In Production	<input type="checkbox"/>
Lighting	<input type="text" value="10 %"/>

Adjust the desired lighting intensity (0 to 100%) in the Non-Production mode. Lighting outputs will be automatically adjusted to this value.

## 5.4 Output Control



The menu *Output Control* allows the user to manually control all active outputs of the solo controller without using the bypass switches.

This option is especially useful to test the output or during building maintenance. Here is a description of each option:

Output Control		
#	Status	Value
A	Manual	50%
B	Manual	50%
All Automatic		

- **#:** Controller output identifier. Only the active outputs are listed.
- **Status:** Controller mode status
  - **Auto:** the output will be enabled or disabled according to the lighting curves.
  - **Manual:** output is manually enabled according to the manual value.
- **Value:** Current lighting intensity.
- To rapidly set all available outputs to automatic mode, select the **All Automatic** hot key located at the end of the page, and then press the **OK** key.
- To change the status of an output, select the desired output and press the **OK** key.
- One of the following pages will appear depending on the current mode selection for this output:

Control – Output A	Control – Output A	Control – Output A
Mode <input type="text" value="Auto"/>	Mode <input type="text" value="Manual"/> Value <input type="text" value="50%"/>	Mode <input type="text" value="OFF"/>

- Select the desired mode (**Auto** / **Manual** / **OFF**) and confirm by pressing the **OK** key.
- When the **Manual** mode is selected, a value should be selected for the lighting intensity. Confirm by pressing the **OK** key. The output is automatically adjusted to the value entered.

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- When the **OFF** mode is selected, the lighting intensity correspond to 0%.



If one or more outputs are not in AUTO control mode, the warning LED light flashes and a message appears on the Home page.



If the **All Automatic** hot key is selected, the *Temporary Manual Override* option is automatically disabled (see Temporary Override – section 5.2.3).

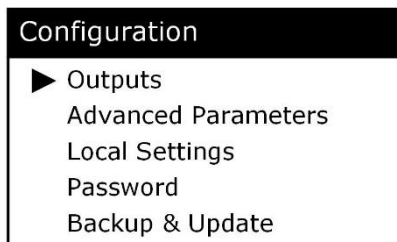




## 6 System Configuration



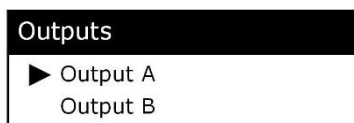
The *Configuration* Menu is used to setup the initial parameters during the installation. It allows you to configure the light curves according to the lamp model, the operation mode, the user preference, password, options to backup or restore settings and finally update the firmware.



From the *Configuration* menu, select the desired submenu and press the **OK** key.

### 6.1 Outputs

This menu allows activating and calibrating the solo lighting controller outputs.



Select the output you wish to setup and press the **OK** key.

Define the lighting output settings as follows:



1. Check **Enable** to enable the output.
2. Calibrate the lighting output.

The light intensity is not the same for all lamp models. There are differences from one model to another. Rather than using sophisticated light sensor we provide the means to calibrate an intensity curve that is made from 5 calibration points plus the ignition point, providing a much better lighting every day. This adjustment procedure is normally required only once during the controller installation.

- a) Select **Calibration** > **Edit** and then press the **OK** key. The page to the right appears:

Calibration – Light (A)	
	Stop
ON Threshold	10
Intensity 1%	1
Intensity 25%	25
Intensity 50%	50
Intensity 75%	75
Intensity 100%	100
--Excluded Percentages--	
<input type="text"/>	---

- b) Adjust the Minimum Intensity (1%):

Since the main supply voltage may vary somewhat from one location to another, it is required to adjust the minimum lighting intensity. This feature is provided to avoid situations where the lights are either fully extinguished or flickering when operating at the 1% low intensity limit.

Adjust the Intensity 1% value to obtain the lowest lighting intensity possible without flickering. The output is automatically adjusted.

- c) Adjust the next point of the curve as follows:
- I. Select Intensity 25% and press the **OK** key to enter edit mode. The output delivers intensity proportional to the input value.
  - II. Enter a number from 0 to 100 (this is a percentage of the power delivered by the variable output) and measure the corresponding output with a voltmeter.
    - If this value is lower than desired for a 25% power, enter a larger value.
    - If this value is greater than that desired for a 25% power, enter a smaller value.

Repeat as needed until the desired value is achieved.

- d) Repeat step c for all remaining intensity levels (**Intensity 50%**, **Intensity 75%** and **Intensity 100%**). At any time, the output can be disabled by selecting **Stop**.
- e) Adjust the **ON Threshold** setpoint:

This is the minimum voltage that the lamp needs to turn on at the lowest intensity. So, when the system turns on the lamps, the ignition

voltage defined by the **ON Threshold** value is momentarily applied, then the intensity is adjusted to the current setpoint.

Set the **ON Threshold** value to adjust the minimum power that the controller must inject for light activation.

- A value too high will result in an intensity peak upon light activation.
  - A value too low will cause the lights to go out or turn ON in an unsynchronized manner.
3. If there are some percentage values where there is disparity between lamps, it is possible to exclude these values by entering these percentages in the **Excluded Percentages** section. Select one of the percentage entry points and edit it to the desired value. A maximum of 5 points can be entered. In normal operation, the controller will jump over these points.

## 6.2 Advanced Parameters

The Advanced Parameters menu allows the user to configure advanced settings for additional and advanced operating parameters.

As the controller starts, parameters are initialized to default values (shown below), thereby allowing the standard utilization of the solo system. The user can decide whether to customize these values to meet the specific needs of the production environment.

Advanced Parameters	
--Alarms--	
Hold Time	3m 00s
--Power Expansion--	
Mode	<div>Master</div>
--Lighting Control--	
Curve	Shared
Control Mode	Leading Edge
Preload	0 %

*Master Mode*


Advanced Parameters	
--Alarms--	
Hold Time	3m 00s
--Power Expansion--	
Mode	<div>Slave</div>
Control Mode	Leading Edge
Preload	0 %

*Slave Mode*

## Power Expansion

**Mode:** the LCL model can be configured as Master dimmer used to manage the light schedules for its own outputs and extra controller outputs through a 0-10V signal. When configured as a Slave, the controller simply dims the LED lamps according to the level of the 0-10V signal it receives.

- **Master:** the controller applies the lighting program (depending on the period and lighting cycle defined for the production day and system time). The master controller also applies a low intensity signal (between 0 and 10 volts) to the power expansion bus, which is proportional to the current intensity required by the lighting setpoint. This signal is interpreted by all slave controllers to modulate their outputs connected to an intensity requested by the master controller.
- **Slave:** the controller follows the low intensity signal provided by the Master controller. In this mode, only a modified configuration menu (refer to section 4.2) will be available and the *Home* page will be displayed as shown to the right.

Home	Slave
	A. 50% B. 50%



When in Slave mode, the configuration menu contains *Temporary Override*, which is the same as described in section 5.2.3.

## Lighting Control

### Curve:

- **Shared:** Both outputs follow the same lighting schedule.
- **Independent:** Each output follows its own lighting schedule.

### Control Mode:

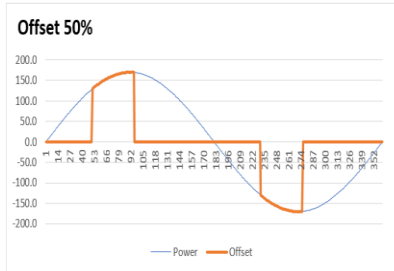
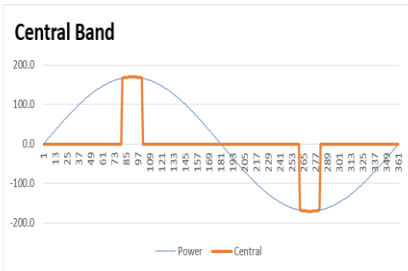
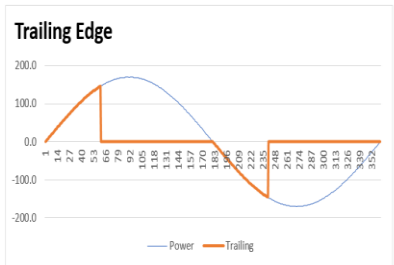
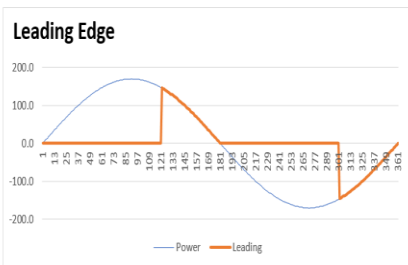
Its purpose is to provide different light control waveforms. According to the type of lamp, some modes offer best stability and linearity. The options available are:

# Solo Lighting Control – LCL-0.2 model

- **Leading Edge:**
- **Trailing Edge:**
- **Central Band:**
- **Offset:** Percentage of offset from 5% to 100% in increments of 5.



The default control mode is **Leading Edge**.



**Preload:** This parameter makes it possible to preload the lamp circuit at a determined voltage below its ignition point. This option is useful only for the Leading-edge, Offset and Central band control mode. It reduces current peaks that can cause activation of the controller's protection circuit or circuit breakers and eliminates much of the electrical noise generated on the network by the lamps.

To adjust the **Preload** parameter, follow this procedure:

1. Set the **Manual control switches** ON and set the light **adjustment knob** to its minimum value (1%).
2. In the *Advanced Parameters* menu, set the **Control Mode** to **Trailing edge**.
3. In the *Advanced Parameters* menu, select **Preload** and increase its percentage until the lamps turn on. Then progressively reduce the value 3% below the point where the lamps turn off. Press **OK** to confirm.
4. Return the **Manual control switches** to **AUTO**.
5. Select the desired **Control Mode**.

### 6.3 Local Settings

This menu allows the user to enter the following local settings:

#### Language:

Language used (**English / Français**) in the control interface.

#### Date / Time:

Current date and time.

#### Format-Date:

Date display format. Three date formats are available:

- **YYYY-MM-DD**,
- **DD-MM-YYYY**, or
- **MM-DD-YYYY**

#### Format- Time:

Time display format. Two time-formats are available:

- **24h** or
- **AM/PM**.

Local Settings	
Language	English
Date	2016-05-26
Time	15:40:46
Format-Date	YYYY-MM-DD
Format-Time	24h



Incorrect date and time settings may result in inconsistent history backups.

## 6.4 Password

This menu is used to limit controller access to authorized personnel only.




**Enable:** Check this option to limit the access to the solo controller by using a password. The user must confirm his password before having access:

When the password is activated:

- If no session is active, then only the Home menu is accessible.
- The user must log on to access the menus, parameters and system configuration.
- A return to the Home menu will automatically end the session.
- A session is automatically ended after a period of inactivity (refer to **Logout Delay** parameter for details).

Password	
Enable	<input type="checkbox"/>
Lock Toggles	✓
Password	****
Logout Delay	5 min

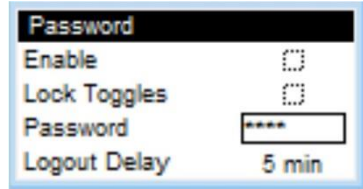
**Lock Toggles:** When this option is activated, the toggle switched on the front of the unit are locked in automatic mode regardless of the switch position.

**Password:** The password is the access code required to access the main menu from the home page. Initially the password is deactivated. To enter or modify a password, use the up  down  and OK  keys.

1. Enter the password following this sequence:

- a) Select **Password** using the **up** or **down** keys and press **OK**.

A black line appears in the field.



- b) Select a number with the **up** and **down** keys.

a)

If you want to enter another digit, press **OK** once. Another black line appears with an Asterix to its left.

b)  2  \*

If you do not want to enter more digits, press **OK** twice.

Repeat step b) as many times as you need to enter all digits. A maximum of four digits is allowed.

2. Activate the password protection by setting the **Enable** parameter to ON (checked)

Your control is now protected with the password you just entered.



It is important to take note of your password. If you forget it, you will have to contact technical support to have it reinitialized.

**Logout Delay:** Period (from 1 to 60 min) after which an idle controller will automatically return to the Home display. If a session is open, it will automatically logout after this time delay.

For calibration pages linked to outputs, a 5-minute logout delay is applied in all cases.



### 6.5 Backup and Update

This menu provides information about the current version of the solo controller and allows importing or exporting configurations, as well as updating the software as needed via the USB port located on the unit's main board.

**Current Version:** Current software version

**Model:** Solo Model.

**Serial Number:** Serial number of the solo controller.

#### Backup & Update

Current Version	2.07.02
Model	LCL-0.2
Serial Number	20300001
Configuration	<input type="button" value="Import"/>
Configuration	<input type="button" value="Export"/>
Firmware	<input type="button" value="Update"/>

#### Configuration Import Procedure

This option allows the user to import an existing configuration file (either from another Solo controller of the same model or a previous controller backup).

#### Prerequisites:

- A USB key containing one or more configuration files must be available.

This configuration file may be obtained from a previous Export procedure from the same Solo equipment or from another Solo.



To prevent any data loss, it is highly recommended to export the current configuration before importing a new one.

#### Procedure:

- With the **Up** and **Down** keys, select the **Configuration Import** function.
- Insert the USB key containing the configuration file into the USB port.
- Press the **OK** key to launch the import process.

**Result:** The Solo interface will display a list of all the configuration files located on the USB key.

#### Configuration - Import

LCL-0.2_01.cfg
LCL-0.2_02.cfg
LCL-0.2_03.cfg

4. With the **Up** and **Down** keys, select the desired configuration file.

- If you want to import the configuration, press the **OK** key.

*Result:* this launches the import sequence where the current configuration is deleted and replaced by the new one.

*Note:* Do not remove the USB key during the import process.

- If you want to cancel the import, press the **Menu-Back** key to return to the previous menu.

### Configuration Export Procedure

This option allows the user to export the current configuration of the Solo controller to a USB drive.

#### Prerequisites:

- A USB key with sufficient space for the configuration file must be available.

#### Procedure:

1. Select the **Configuration Export** function.
2. Insert the USB key into the USB port.
3. Press the **OK** key to launch the export process.

*Result:* The solo controller automatically creates a file on the USB key and displays the following menu.

*Note:* the name of the file created includes the Solo model from which it is exported with two more sequential digits to differentiate it from other files created previously.



4. Select either **Confirm** or **Cancel**.
  - If you select **Confirm** and press **OK**, the export sequence is launched. The current configuration will be saved on the USB key in the file named on the interface.

## Solo Lighting Control – LCL-0.2 model

*Note: Do not remove the USB key during the export process.*

- If you select **Cancel** and press **OK**, the export is aborted, and the display returns to the previous menu.

### Firmware Update Procedure

This option is used to update the Firmware (embedded software) using a USB key. It is possible to update all Solo controllers in a network from a master controller.

#### Prerequisites:

- A USB key with the appropriate update files must be available.



It is highly recommended to export the current configuration before updating the firmware.

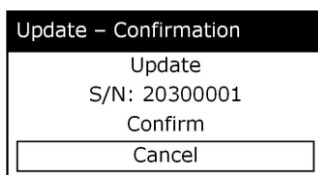


**Warning: risk of electrocution.** Caution while plugging the USB key in the main circuit. Refer to section 3.2 for more detailed information.

#### Procedure:

1. Select the **Firmware Update** function.
2. Insert the USB key into the USB port.
3. Press the **OK** key to launch the update function.

*Result:* The Solo controller displays the menu displayed to the right, where a request to confirm or cancel appears.



4. Select **Confirm** and launch the update or select **Cancel** to cancel.

*Note: Do not remove the USB key during the update process.*



## 7 Hardware Configuration

Several configurations may be done through the hardware located on the electronic board. This section describes each of them.

### 7.1 USB Interface

The system includes a USB interface which enables software updates and the calibration of lighting outputs. The USB interface is located close to the power circuits which deliver the power to the lamps. When using the USB key, it is imperative to avoid any contact with the power circuits to avoid severe and lethal injuries. The use of a USB key is reserved to qualified electricians or technicians.

#### 7.1.1 Firmware Update Using a USB Key

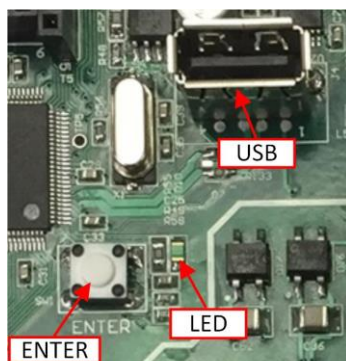


**Warning: risk of electrocution.** Refer to section 3.2 for more detailed information.

1. Copy the software update at the root folder of a formatted fat 32 USB key;
2. Insert the USB key into the USB interface;
3. Press and hold the **ENTER** key for 5 seconds;

*Note: The approximative time for the file transfer to be completed is about 10 to 30 seconds. During the file transfer, the green LED close to the USB connector will blink quickly. The transfer is completed when the green LED pauses for 2 seconds and then turns off permanently.*

4. Take out the USB key.



### 7.1.2 Import / Export the output calibration using a USB key

Using the USB key, the controller can import and export the control mode and the outputs calibration from a file. This option is useful when you want to reuse your favorite calibration for other controllers.

The following procedure import the configuration from the file **curves.ini** and create a copy of the current configuration in the file **curves.bak**.

The user can easily edit those files with any standard text editor like Notepad to change the configuration. The file **curves.bak** can also be renamed to **curves.ini** for importation in other controllers.



The first time this procedure is done, there is no **curves.ini** file available since it is generated by the controller. Therefore, an error message (LED flashing rapidly) is generated to indicate that it could not import the **curves.ini** file, but it will still create the **curves.bak** file from which the first **curves.ini** file can be produced.



**Warning: risk of electrocution.** Refer to section 3.2 for more detailed information.

*Note: Return the LCD screen to the home page or main menu before performing this procedure. Otherwise, the **ENTER** key will not work properly.*

1. Insert the USB key into the USB interface;
2. Press the **ENTER** button momentarily.

*Note: The approximative time for the file transfer to be completed is about 1 to 5 seconds. During the file transfer, the green LED close to the USB connector will blink quickly. The file transfer is completed when the green LED pauses for 2 seconds and then turns off permanently.*

3. Remove the USB key.

### 7.1.3 Removing a point of intensity from the lighting curve

This procedure allows the removal of a 1% intensity point on the lighting curve where lamps may be unstable or have different levels of intensity. When an intensity point is removed, the system creates an intensity jump avoiding the problem area. For instance, while executing this procedure, when the intensity is adjusted at 13%, the increasing intensity will jump from 12% to 14% and inversely from 14% to 12% when the intensity decreases.

It is possible to remove a maximum of 5 intensity point of 1%.



**Warning: risk of electrocution.** Refer to section 3.2 for more detailed information.

*Note: Return the LCD screen to the home page or main menu before performing this procedure. Otherwise, the **ENTER** key will not work properly.*

1. Press quickly and consecutively on the **ENTER** button twice to enter the withdrawal point mode. The system will confirm the activation of this mode by continuously flashing the status LED as follows: 2 fast pulses followed by a pause.
2. Set both bypass switches to **MAN** and adjust the intensity of the lighting to the value you wish to remove.
3. Press the **ENTER** button for 1 second.  
*Note: If one of the outputs is in **AUTO** or **OFF** mode, this will not affect it.*
4. Repeat for all the points to be removed from the curve (a maximum of 5 points per curve)

To remove all exclusion points, set both bypass switches from **manual** to **automatic** and back to **manual**. Then hold the **ENTER** button for 5 seconds.

*Note: When activating a programming mode, the unit will exit this mode automatically if no change is done within 60 seconds. To exit a mode, press **ENTER** momentarily.*

### 7.1.4 Light Curve Adjustment

Light intensity differs from one lamp model to another. Thus, a light calibration must be performed for the lowest acceptable brightness desired.



**Warning: risk of electrocution.** Refer to section 3.2 for more detailed information.

*Note: Return the LCD screen to the home page or main menu before performing this procedure. Otherwise, the **ENTER** key will not work properly.*

1. Press quickly and consecutively the **ENTER** key 3 times to enter the 1% adjustment mode. The system confirms the activation of this mode by continuously flashing the status LED as follows: 3 fast pulses followed by a pause.
2. Set the bypass switches on the front of the unit to **MAN** and adjust the intensity of the lighting to the 1% setpoint.
3. Press the **ENTER** button for 1 second.

To reset the ON threshold setpoint as well as all other calibration points to the default factory configuration, press the **ENTER** button for 5 seconds. Default factory configuration is:

ON Threshold = 8%	1% = 1%	25% = 25%
50% = 50%	75% = 75%	100% = 100%

*Note: When programming these setup modes, it will automatically exit the mode if no changes are made in a 60-seconds time laps. To exit a mode, press **ENTER** momentarily.*



The hardware selection of a **Control Mode** and **Preload** adjustment have been disabled on the LCL model. These can only be performed with the LCD screen.



## 7.2 Adjusting Timespan in Manual Mode

The system incorporates a timer which forces the lighting control to go back into automatic mode following a prolonged use of the controller in manual mode. The allowed manual mode delay begins when the lighting output switch is changed from the automatic position to the manual position.

### 7.2.1 Adjusting Timespan



**Warning: risk of electrocution.**

Refer to section 3.2 for more detailed information.

Use a small screwdriver to adjust the timespan (1 to 120 minutes) by turning the potentiometer to the desired time delay.

It is important that no contact is made with any surrounding parts, which could lead to severe injuries or permanent damages to the system.



To disable the timer, align the potentiometer arrow with the infinite symbol  $\infty$ .

To revert to the manual mode after the timer expiration, change the controller switches position to automatic and then back to manual. This will start a new timer cycle.



## Appendix A. Technical Specifications

Operating Voltage and Frequency	
P/N 30-014-00188-L134	100-120VAC,60Hz (LCL-0.2-120V),
P/N 30-014-00180-L134	220-240VAC,60Hz (LCL-0.2-240V-60Hz)
P/N 30-014-00180-L134-50	220-240VAC,50Hz (LCL-0.2-240V-50Hz)

Inputs	
Analog input (AI1 & AI2) in Slave Mode	0 - 10 VDC, input resistance: 22k $\Omega$

Outputs	
Variable Output	Per A or B output: 4.16A, 1000VA @ 240VAC 8.33A, 1000VA @ 120VAC
Analog outputs (in power expansion master mode)	0-10VDC, source, maximum load: 10mA

The maximum load capacity must be respected. Please refer to the nameplate on the controller.

Mechanical	
Dimensions	8.7" X 10.6" X 5.5"
Operating temperature	32° to 104°F (0° to 40° C)
Storage temperature	5° à 122°F (-15° to 50° C)
Relative humidity	5 to 90% without condensation



## Appendix B. Troubleshooting

### 1 - The control outputs don't seem to respect the instructions given

1. Make sure that the control switches of the relevant outputs (located on the front panel of the solo controller) are in the AUTO position.
2. Ensure that the relevant outputs are configured in AUTO control mode (see section 5.4 Output control).
3. If a dimmer is associated to the output, ensure that this dimmer is fully turned to the left (AUTO position).

### 2 - An error message appears during an import

1. Check that the USB key is properly inserted and that a configuration file compatible with your solo control (same model) is present.

### 3 - An error message appears during an export

1. Check that the USB key is properly inserted and that your USB drive has sufficient memory space.

### 4 - A "Low Battery" message appears on the home page.

1. Change the battery immediately to avoid data loss in case of power failure (see section 3.6 Battery Replacement for details).

**5 - LED lights flicker, flash, pop or behave erratically.**

1. Try another *Control Mode* in *Configuration > Advanced Parameters* - section 6.2
2. Investigate mains power for noise, voltage spikes, or distortion caused by neighboring equipment or dirty power.
3. Consider installing a power conditioner/filter.


**6 – Lamp turns off after several minutes**

1. Validate Timespan adjustment while using manual mode (see section 7.2)

### Appendix C. Connection Diagrams

This appendix contains all the connection diagrams needed. A list is provided below giving a brief description and a figure reference for each diagram.

Models	Description	Figure
Solo LCL-0.2	Main board - Page 1 of 5	Figure 3
	System Connections - Page 2 of 5	Figure 4
	Electrical panel details for model 120V - Page 3 of 5	Figure 5
	Electrical panel details for model 240V- Page 4 of 5	Figure 6
	Power Bus connections - Page 5 of 5	Figure 7
Solo LEL-0.2	Regarding connections, the LEL model is similar to the LCL except for a few less connectors. For more information on this model consult its user manual.	



The electrical load distribution must be determined by a qualified electrician and installed as prescribed by the applicable regulations of the electrical code.

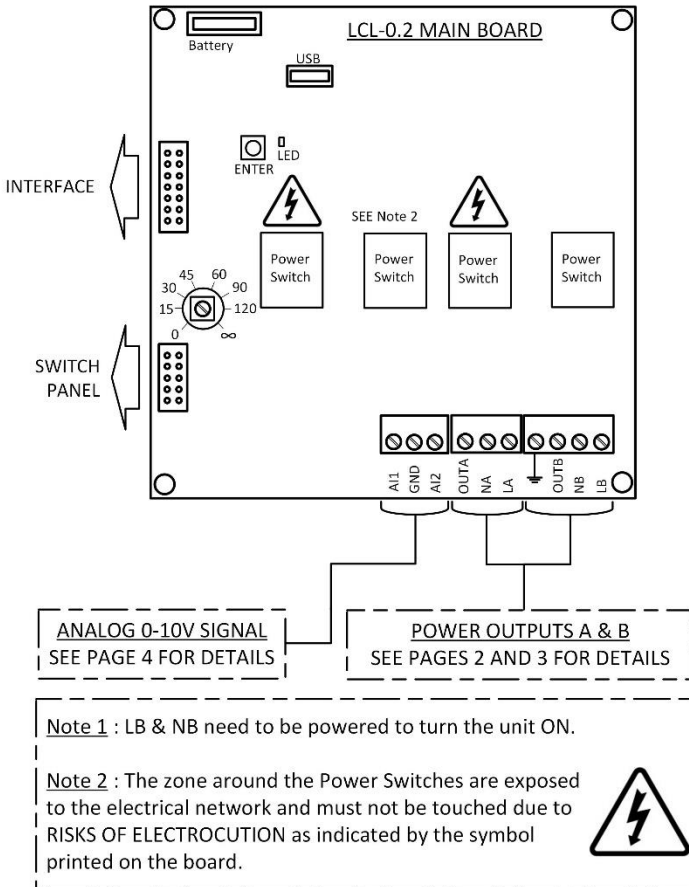
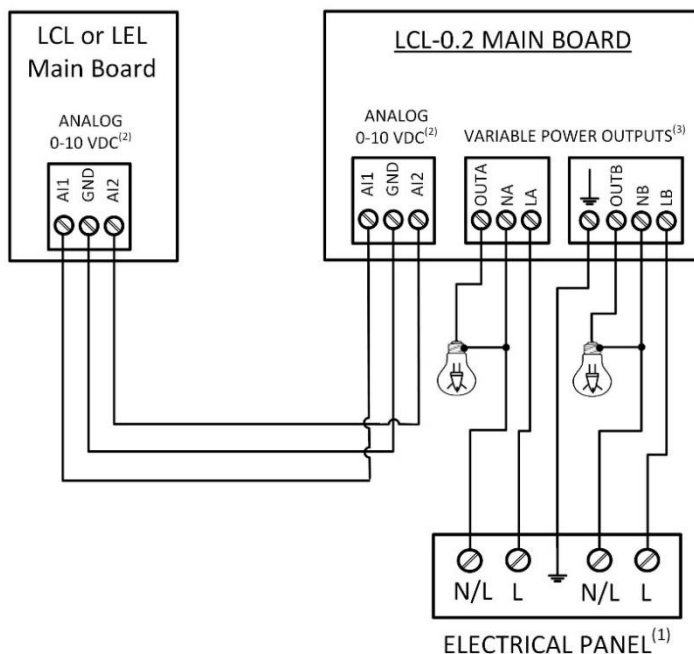


FIGURE 3 SOLO LCL-0.2 - MAIN BOARD - PAGE 1 OF 5





The electrical load distribution must be determined by a qualified electrician and installed as prescribed by the applicable regulations of the electrical code.



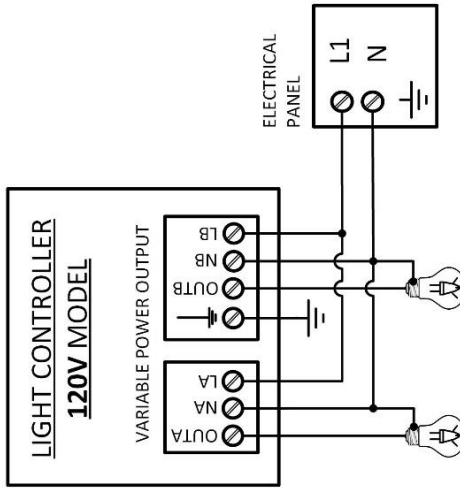
### NOTES

- (1) Refer to pages 3 and 4 for electrical panel details for the 120V or 240V models.
- (2) Refer to page 5 for power extension connection details.
- (3) LB and NB must always be powered to allow the unit to operate.

**FIGURE 4** SOLO LCL-0.2 - SYSTEM CONNECTIONS - PAGE 2 OF 5

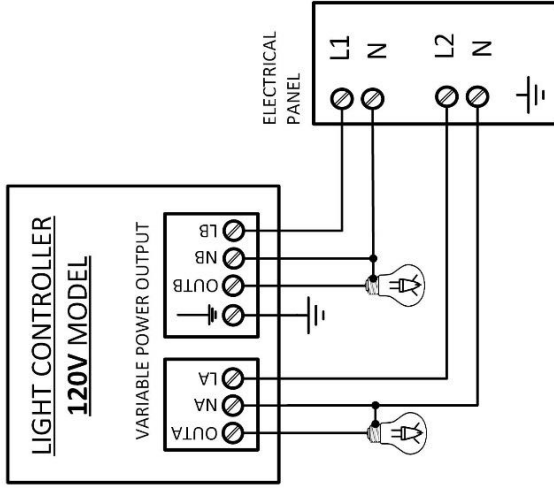
## 120 V MODEL

BOTH CIRCUIT ON A SINGLE BREAKER



## 120 V MODEL

EACH CIRCUIT ON A SINGLE BREAKER



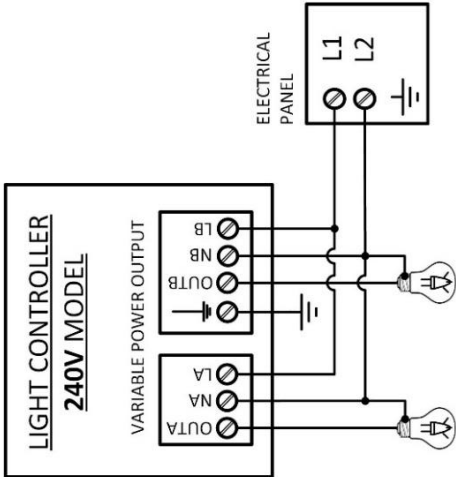
## NOTES

- LB and NB must always be powered to allow the unit to operate.

FIGURE 5 ELECTRICAL PANEL DETAILS FOR MODEL 120V - PAGE 3 OF 5

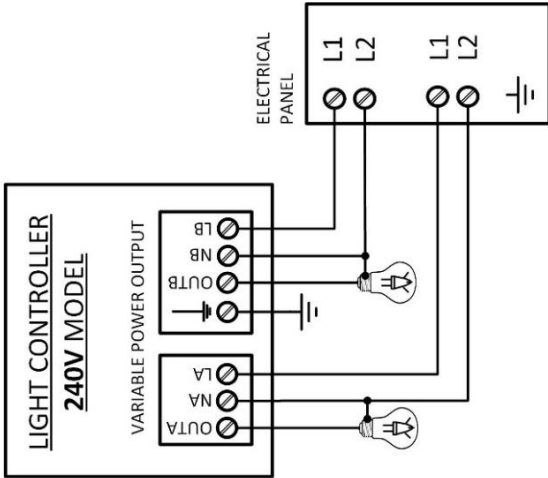
**240 V MODEL**

BOTH CIRCUIT ON A SINGLE BREAKER



**240 V MODEL**

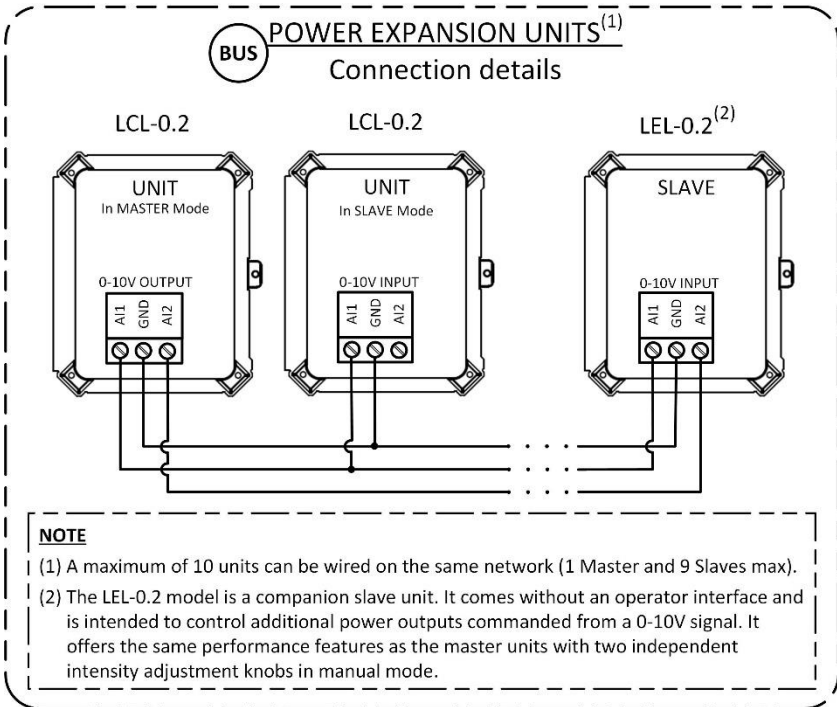
EACH CIRCUIT ON A SINGLE BREAKER



**NOTES**

- LB and NB must always be powered to allow the unit to operate.

FIGURE 6 ELECTRICAL PANEL DETAILS FOR MODEL 240V - PAGE 4 OF 5



**FIGURE 7 SOLO LCL-0.2 - POWER BUS CONNECTIONS - PAGE 5 OF 5**

**NOTES**

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**NOTES**

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