SL-155 Series
SL-155-2.5D Model
Marine Lanterns

INSTALLATION & SERVICE MANUAL

V2.8

Version No.	Description	Date	Approved
1.0	Manual Launch	June 2014	Y. Chambers
1.1	Manual Update	August 2014	Y. Chambers
1.2	Spec Update	March 2015	J. Dore
2.0	Separate Manual. Power consumption & Power supply design considerations added.	June 2015	Y. Chambers
2.1	Intensity update	July 2015	D. Tomaszewicz
2.2	Operational Mode IR Command	July 2015	Y. Chambers
2.3	Intensity update	July 2015	Y. Chambers
2.4	PC Configuration Tool Update	September 2015	D. Tomaszewicz
2.5	The maximum luminous intensity values update	September 2018	M.Nicholson
2.6	Day/Night mode	April 2019	M.Nicholson
2.7	Earthing advice	April 2020	M.Nicholson
2.8	Lantern Configuration Tool	May 2020	M.Nicholson

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Introduction

Congratulations! By choosing to purchase a Sealite lantern you have become the owner of one of the most advanced LED marine lanterns in the world.

Sealite Pty Ltd has been manufacturing lanterns for over 25 years, and particular care has been taken to ensure your lantern gives years of service.

As a commitment to producing the highest quality products for our customers, Sealite has been independently certified as complying with the requirements of ISO9001:2015 quality management system. Sealite lanterns comply with requirements of the US Coast Guard in 33 CFR part 66 for Private Aids To Navigation.

By taking a few moments to browse through this booklet, you will become familiar with the versatility of your lantern, and be able to maximise its operating function.

Operating Principle

A microprocessor drives an array of ultra bright LED's through a DC/DC converter, which enables the LED's to operate within the manufacturer's specifications.

On darkness, the microprocessor will initiate a program check and after approximately 1 minute begin flashing to the set Flash Character.

The flasher unit has a low current requirement to optimise its use with external battery power supply systems.

Technology

Sealite is the world's fastest growing manufacturer of marine aids to navigation. We employ leading mechanical, optical, hardware & software engineers to create innovative products to service the needs of our customers worldwide, and offer the widest range of solar-powered LED lanterns in the marketplace.

Electronics
Sealite employs leading in-house electronic engineers in the design and development of software and related circuitry. All individual electronic components are sourced directly by Sealite procurement staff ensuring that only the highest quality components are used in our products.

LED Technology
All marine lanterns use the latest advancements in LED (Light Emitting Diode) technology as a light source. The major advantage of LED's over traditional light sources is well established in that they typically have an operational life in excess of 100,000 hours, resulting in substantial savings to maintenance and servicing costs.

Precision Construction
Commitment to investing in the design and construction of injection-moulded parts including optic lenses, light bases and a range of other components ensures that all Sealite products are of a consistent & superior quality.

Optical Performance
Sealite manufactures a range of marine LED lenses moulded from multi-cavity dies. The company has superior in-house lens manufacturing capabilities to support outstanding optical performance.

Award-winning, Patented Technology
Several United States and Australian patent registrations are held on Sealite's range of innovative designs, with other regional patents pending in Canada, United Kingdom and Europe.

SL-155 Series
6–13NM Marine Lantern
SL-155-2.5D Model

The SL-155-2.5D, 6-13NM lantern is the most advanced LED marine lantern on the market. Utilising the latest software and micro circuitry developments, the lantern boasts a huge number of features including flash-memory and the most efficient power conversion available.

This maintenance-free model is available in 2.5 degree vertical distribution.

The SL-155 Complete Lantern Assembly provides a complete solution for visual navigation requirements and is available with remote monitoring and control capabilities allowing the performance of the units to be monitored from remote sites. System status includes battery condition, flash characters, operational configuration, and lantern/buoy position.

Integrated bird deterrent

LED Optic

UV-stabilised acrylic lens

7-stage powder coated aluminium base

200mm bolt pattern for ease of installation

231

151

104

$\varnothing$ 230

30°

PCD 200

16 X 15 Slots
6 Places
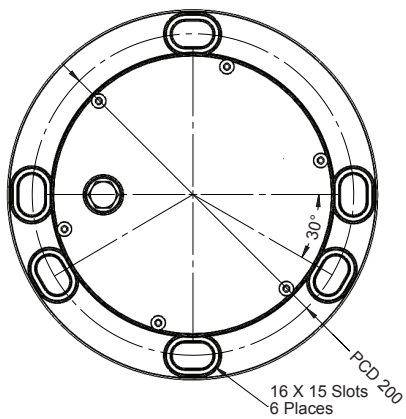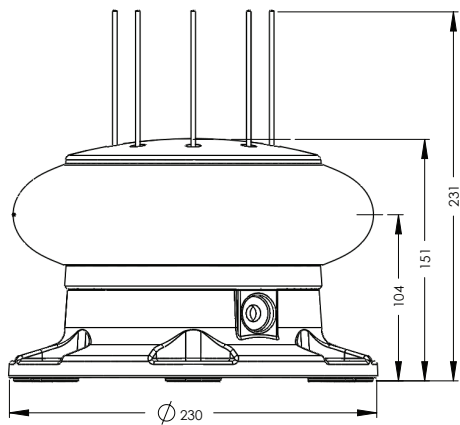
SPECIFICATIONS·*	2.5° Model
	SL-155-2.5D
Light Characteristics	
Light Source	High efficiency LEDs
Available Colours	Red, Green, White, Yellow
Maximum Luminous Intensity (cd)†	2.5 degree model: Red - 6,357 Green - 6,052 White - 10,505 Yellow - 5,414
Visible Range (NM)	AT @ 0.74: 6–13 AT @ 0.85: 7.8–19.2
Horizontal Output (degrees)	0° - 360°
Vertical Divergence (degrees)	2.5°
Available Flash Characteristics	Up to 310 including 256 IALA recommended, & 1 custom
Intensity Adjustments	User adjustable
LED Life Expectancy (hours)	>100,000
Electrical Characteristics	
Average Power (W)	Variable up to 22
Circuit Protection	Polarity protected
Nominal Voltage (VDC)	12–24
Temperature Range	-40 to 80°C
Physical Characteristics	
Body Material	Marine grade two-part epoxy coating
Lens Material	UV-stabilised acrylic
Lens Diameter (mm/inches)	224 / 8¾
Lens Design	Multiple LED optic
Mounting	3 & 4 hole 200mm bolt pattern
Height (mm/inches)	231 / 9⅛
Width (mm/inches)	230 / 9
Mass (kg/lbs)	5.5 / 12¼
Product Life Expectancy	Up to 12 years
Environmental Standards	
Shock	MIL-STD-202G Test Condition H, Method 213B 30G vertical and 35G horizontal shock
Vibration	MIL-STD-202G, Test Condition B, Method 204D 5G in all axes
Immersion	MIL-STD-202G, Method 104A
Ice Loading	Rated to withstand 22kg/m²
Humidity	0 – 100%, condensing
Waterproof	IP68
Certifications	
CE & Electrical	FCC Part 15 Rules & ICES-003. EN61000-6-1: 2007 (IEC61000-6-1:2005) Part 6-1 Immunity. EN61000-6-3: 2007 (IEC61000-6-3: 2006) Electromagnetic compatibility (EMC) - Part 6-3 Emission. IEC61000-4-2: 2008 Ed 2 Part 4-2 Electrostatic discharge immunity test Level 4. IEC61000-4-3: 2010 Ed 3.2 Part 4-3. Radiated, radio-frequency, electromagnetic field immunity. IEC61000-4-6: 2008 Ed3. , Electromagnetic compatibility (EMC) - Part 4-6 Immunity.
IALA	Signal colours compliant to IALA E-200-1
Quality Assurance	ISO9001:2015
Intellectual Property	
Trademarks	SEALITE® is a registered trademark of Sealite Pty Ltd
Warranty *	3 years
Options Available	· GPS Synchronisation · AIS Type 1 or Type 3 · GSM Monitoring & Control System · RS232/422/485 Port · General purpose inputs (2) & outputs (2) · Variety of solar/battery configurations · Serial programming cable · Hard-wire Synchronisation

CE

Product Components

The following components come standard with each lantern:-

- SL-155 lantern
- IR Programmer
- Programming Cable
- Installation & service manual

These components are securely packaged within foam in a carton, and shipped to you.

PLEASE NOTE: The programming cable provided is suitable for use with PC's. If you require connection to your notebook/laptop, a Serial Port to USB cable may need to be purchased.

Please check that ALL of these components are included with your order, and contact your Sealite representative as soon as possible if anything is missing.

Programming the Lantern

PC Configuration Tool

The SL-155 Series are extremely intelligent lanterns with a number of features which can be programmed directly via a user-friendly computer program. The program can be downloaded from the Sealite website by visiting the following link:

www.sealite.com/lantern-configuration-tool/

To initiate the settings of your lantern, please read the following instructions:

1. **Download the Programming Software from the Sealite Website**

   Visit the Lantern Configuration Tool page on the Sealite website:

   www.sealite.com/lantern-configuration-tool/

   Click the download link and the programming software will download as a zip file "LanternConfig2.52.zip". Extract all the files to a preferred location on the hard drive of your computer.

   Running the Programming Software from your computer
   • Navigate to the folder where you have saved the "LanternConfig2.52" file. Double-click the file called "LanternConfig.exe".
   • A new window will appear displaying the PC Configuration Tool.
   Continue to step 2 to connect your SL-155 lantern to the Lantern Configuration Tool Software.

   IMPORTANT: The Sealite PC Configuration Tool is designed for Windows Platforms only.
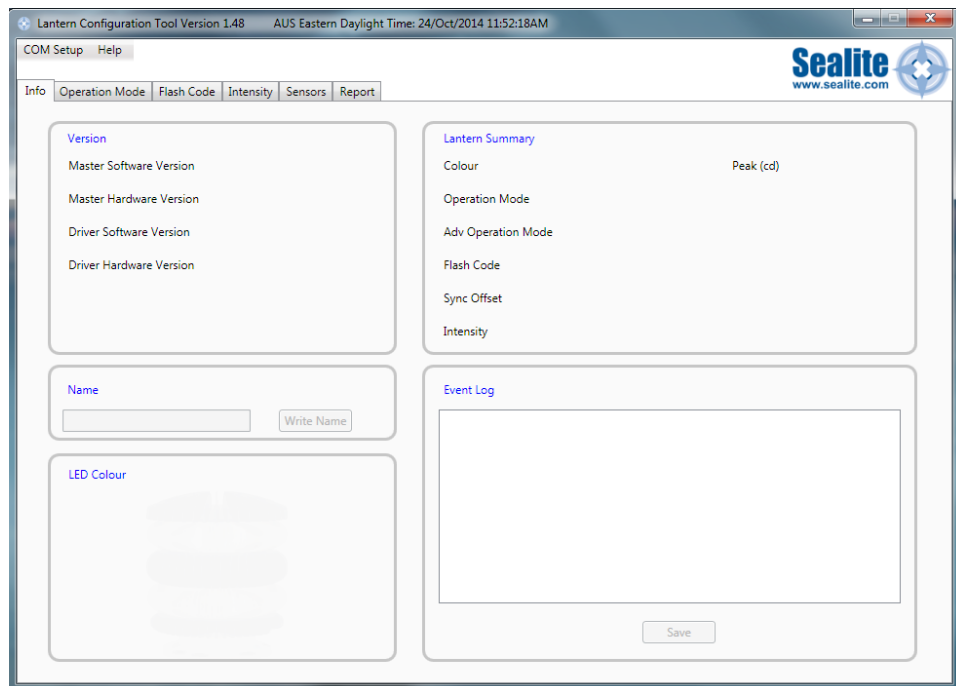
Image 1. Sealite PC Configuration Tool

2.   Connect the SL-155 Series Lantern to a Power Source & the Computer

Now that the programming software has been run, you will need to connect the lantern to your computer & power supply so that it can receive programming commands.

Once connection is made, the software automatically determines the colour and pre-programmed settings of the lantern.

Connecting the Lantern to a Power Source

Option 1: Battery

•   Connect the blue negative wire of the lantern to the battery negative terminal
•   Connect the brown positive wire of the lantern to the battery positive terminal

Option 2: 12V Power Supply

•   Connect the blue negative wire of the lantern to the power supply negative terminal
•   Connect the brown positive wire of the lantern to the power supply positive terminal

CAUTION: to avoid personal injury do not position the lantern at eye level.

Connecting the Lantern to the Computer

•   Plug the Bulgin connector end of the programming cable into the lantern PC Programming Port, and the serial port end of the cable into your computer serial/communication port (RS232-E)

PLEASE NOTE: The programming cable provided is suitable for use with desktop PC's. If you require connection to your notebook/laptop, a Serial Port to USB cable may need to be purchased.

3.   Establish the Programmer-to-Lantern Computer Connection (COM Port)

Now that the lantern is connected to the computer and the Sealite PC Configuration software has been run, the user must create the programmer-to-lantern connection.

The COM Port is the hardware port which the computer accesses when communicating with the lantern.

•   Click the "COM Setup" at the top left of the PC Configuration Tool to open the "Serial Port" dialogue box
•   In the "Serial Port" dialogue box select the appropriate COM Port from the drop down field for "Port Name"
•   Check the "Open Port" check box to open the port
•   Click the "OK" button to initiate the connection

The Sealite PC Configuration Tool will then attempt to connect/interrogate the lantern.
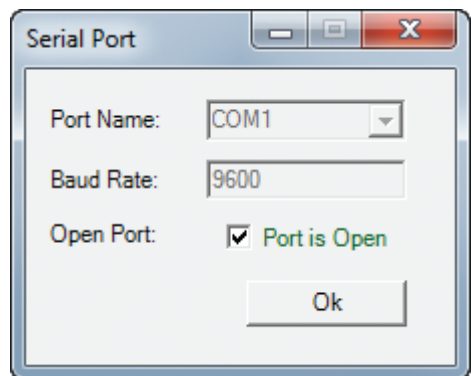
Image 2. Serial Port dialogue box

Correct Connection Established

If the connection is established data about the lantern configuration will appear on the "Info" tab under the headings "Version" & "Lantern Summary" (eg. Lantern Colour, Flash Code, Intensity etc).
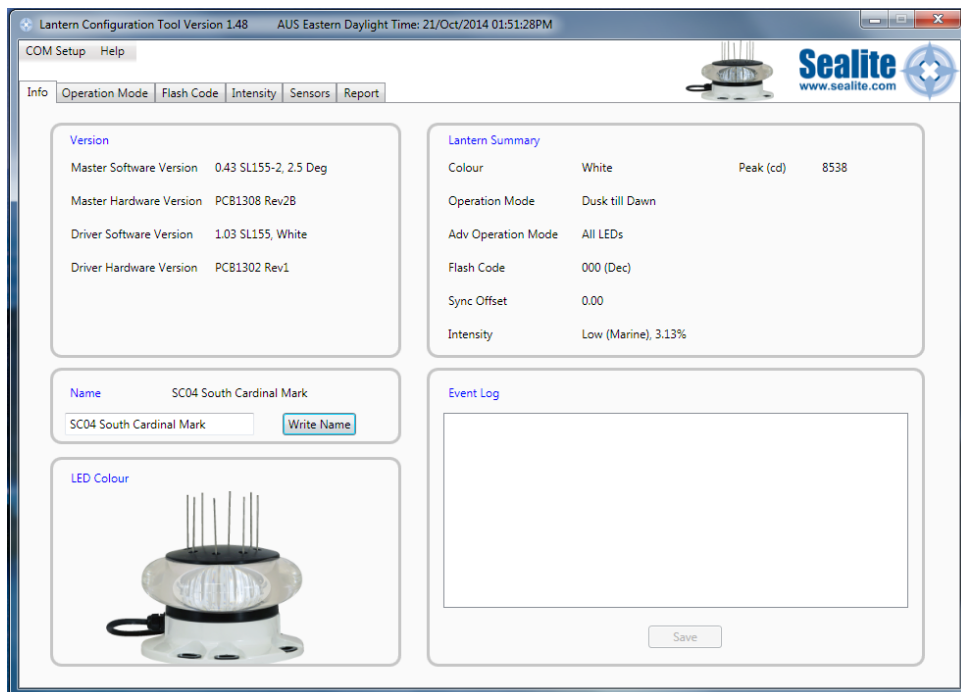
Image 3. Sealite Configuration Tool "Info" tab – showing COM Port connection established, Version & Lantern Summary information

Connection NOT Established

If the connection is not available, the Sealite PC Configuration Tool will not display any lantern specific information under the headings "Version" & "Lantern Summary". If this error occurs, please check the following:

- Reconnect the lantern to the computer
- Check that the lantern power supply has sufficient charge (eg. Battery is charged), and then reconnect it to the lantern
- Re-run the Sealite PC Configuration Tool and follow the information in step 3. The connection should now become established.

The Sealite lantern is now ready to be programmed to your specific requirements.

Info Tab
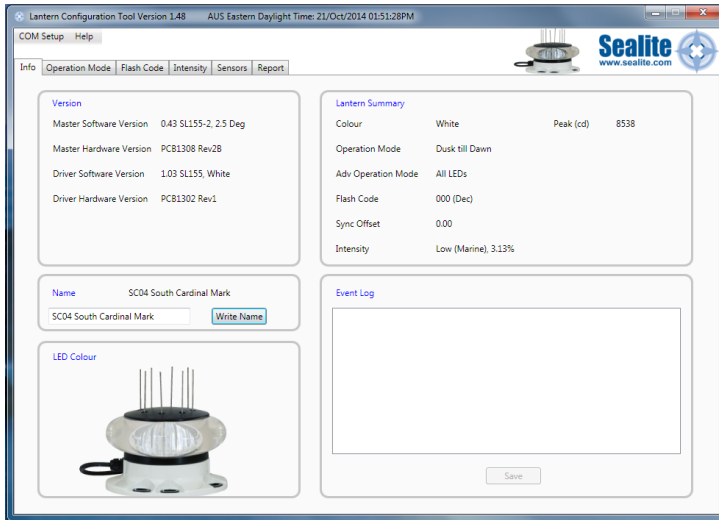
Provides a summary of the lantern configuration settings, hardware and software versions, and event log.

Version

Is an information panel that identifies the Lantern's internal electronic hardware and firmware versions.

Lantern Summary

Is an information panel that displays a summary of the key lantern settings: colour, operation mode, Peak Intensity setting, Advance Operational Mode, Flash Code, Flash Sync offset and Intensity setting. Refer to the Information, Operation Mode Flash Code, and Intensity Tabs for a description of these parameters.

Name

A user defined name, comprising alphanumeric characters (and -, $, #,@) can be typed into dialogue box and by pressing and stored within the lantern's non-volatile memory by pressing the 'Write Name' button.

LED Colour

A generic picture of the lantern model and colour that the software tool is communicating with is displayed in this panel.

Event Log

Displays the alarm events recorded by the lantern firmware. Possible alarms (flat battery, low battery, LED failure, high temperature). All alarm events are recorded irrespective of whether the lantern has been configured to respond to an alarm.
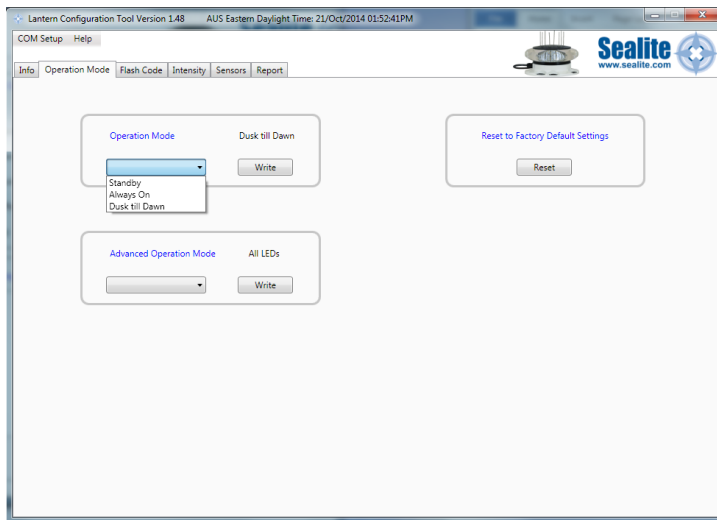
Defines the lanterns mode of operation of which there are four possibilities:

Operational Mode

Standby

The lantern is configured in a minimum current state in which the LEDs are always off and the internal GPS (if installed) is disabled.

Always On

The daylight sensor is disabled and the lantern operates according to the set flash character and intensity levels.

Dusk till Dawn

The daylight sensor is monitored and the lantern will only operate at night time.

Adv Op Mode

This is an advanced user mode and typically only used if the lantern is to be used as a special navigational aid such as emergency wreck mark.

All

Default on setting. All LEDs are operated in unison and configured by the Operation Mode, Flash Code and Intensity Tabs.

Alternating

Adjacent LED, alternate their on/off state based upon the intensity and flash character settings. For example, ship wreck marks.

Note: This will be preset if you have ordered an emergency wreck mark.

Reset

By clicking Reset, the factory set default parameters are restored.

Flash Code

Marine Characteristic Selection

The flash character is defined by first selecting the Mariner code, then the Flash code name and finally timing.

Sealite Code Selection

This is an alternative method to define the lantern flash code by using the Sealite IR remote control numerical figure character. Refer to the IR remote control section for valid flash characters.

Sync Offset

This panel is used to set a fixed delay to the commencement of the flash character. The built-in GPS receiver and advanced software of the Sealite synchronised lanterns allow for the adoption of SeaFlare™ channel marking – a unique system that cascades the flash synchronisation of channel lanterns in a uni or bi-directional flash pattern. By default this figure is set to zero.

Manual Entry Custom Flash Character

In this panel one, custom flash characteristics can be defined with up to 10 individual on/off times.

Intensity
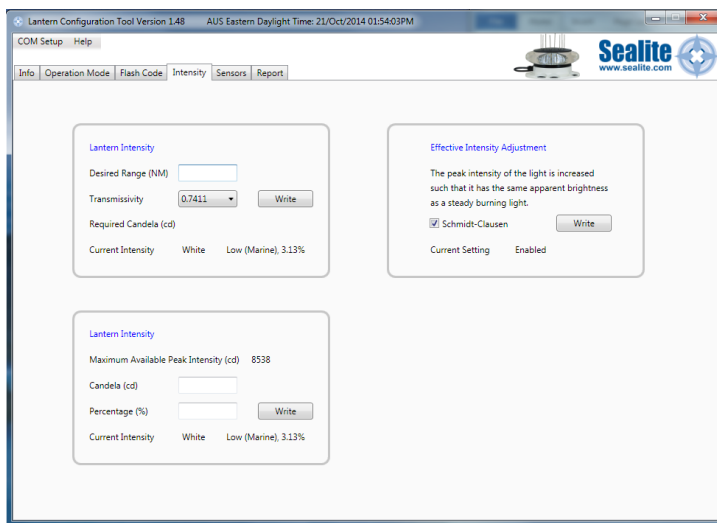
Lantern intensity

The lantern intensity level can be set by either by defining the operating range of the lantern (in nautical miles) or by entering a desired peak candela or a percentage of maximum peak intensity level.

If Schmidt Clausen is applied is selected, the lantern will automatically adjust the intensity level based up on the entered range and flash character setting. The intensity level is automatically each time a new range (NM) or flash character is written to the lantern.

If an intensity level is selected that is beyond the specification of the lantern, the entered figure will be displayed in red coloured text, and the lantern will be configured to its maximum.

Note: The lanterns has been designed with a dynamic intensity limit. This limit will come into effect if you select a flash characteristic with a heavy duty cycle (> 28.125%) and set a very high intensity.

Under these conditions the lantern will automatically reduce its intensity so that it is operating within the thermal design window. Thus giving you years of operation without any noticeable degrade in light output. This intensity limit will not be reached for the majority of applications.

The peak power limit for the SL-155-5D and SL-155-10D lanterns has been set to 28.125%. There are 69 flash codes in the base table of 256 that will have an intensity cap.

The peak power limit for the SL155-2 has been set to 34.375%. There are 51 flash codes in the base table of 256 that will have an intensity cap.

Sensors

Battery sensors

The SL-155 series of lantern continuously monitors its input voltage using three finable thresholds.

- For voltages greater than "OK" level, the lantern reports via IR Remote control requests or the GSM that the input voltage is satisfactory.
- For voltages below "low" the lantern can be configured to operate the internal alarm relay and /or reduce the intensity level by 25% as a measure to extend the operation of the lantern until it reaches the "Fail" voltage.
- At "Fail" the lantern shuts down entirely, and turns of the GPS and the mains LEDs. The lantern will only commence operation once the input voltage has exceeds the "OK" voltage level.

The three thresholds: Flat, Low and OK are user definable.

Temperature

The SL-155 utilises two temperature sensors. One on contact with the LED heat sink and second that monitors the internal temperature within the lantern.

Each sensor has two user configurable boundaries. At the "low" boundary temperature point, the lantern intensity is reduced by 25% to help reduce the heating of the housing. Reaching this point does not trigger the alarm reply. The second boundary is "high", where at which point, the lantern turns off and triggers the alarm relay.

LED Sensor

Built into the SL-155 lantern, is a closed loop monitoring system for each LED within the lantern. In the event of a single LED failure, the lantern can be configured to trigger the internal alarm relay which in turn can be connected externally to trigger other devices, such a redundant light source.

Light Sensor

The SL-155 lantern has its own internal light sensor and whose day/twilight/night thresholds are defined in LUX. These levels can be customised by entering in separate values as a measure of LUX.

If optioned, an external light sensor such as Light dependant resistor or photodiode can be electrically connected to the SL-155.

AIS Report
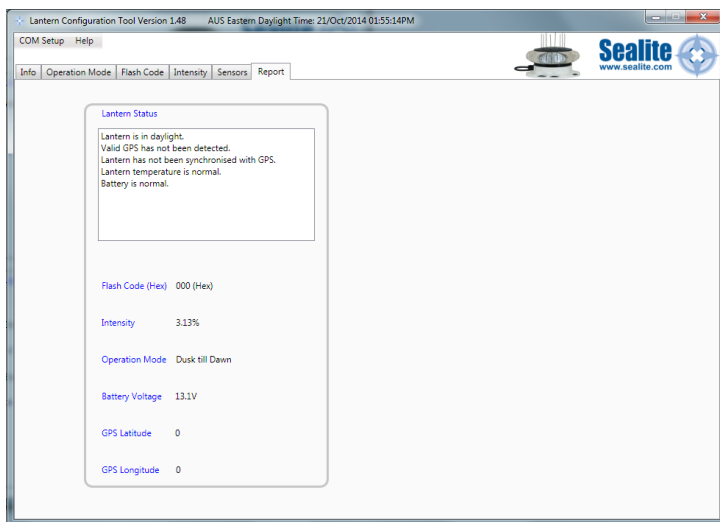
Lantern Status

This panel displays the Lantern's AIS message that is output via the serial communications port every 10 seconds. Typically this message is processed by an externally installed AIS module, however by itself is a quick summary of the lantern operating status. This detail is also displayed on the INFO tab.

IR Programmer

The IR programmer is used to communicate with Sealite lighting products that have an IR sensor fitted. The remote control is used for the following functions:

• Flash Code: read the current flash code, configure a new flash code.

• Lamp Intensity: read the current lamp intensity, configure a new intensity level.

• Ambient Light Thresholds: read the current light thresholds, configure new ambient light thresholds.

• Perform a battery health check.

On receiving a valid key signal from the IR Programmer, the light will flash once. The user should wait until the light responds to each keypress before pressing another key. If there is no response to the keypress after 3 seconds, it has not been detected by the light and the key can be pressed again.

If an invalid key is detected, the light will flash quickly 5 times. In this case, the command will have to be restarted.
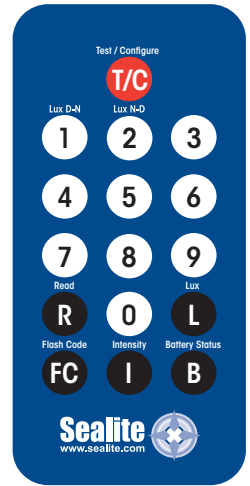
Sealite IR Programmer / Universal Remote Compatibility

If you lose your Sealite IR Programmer, the following Universal Remote Controller has been tested for compatibility: RCA Type RCR312WR programmed for Phillips TV Type Code 10054

Sealite Key	Universal Remote Key
T	Power
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
0	0
R	Channel+
L	Mute
FC	Volume+
I	Volume-
B	Channel-

Test Mode / Configure

T/C

Pressing the T/C button for up to 5 seconds places the light in Test Mode. The light will flash once in response to the T/C button being pressed and then turn off.

Normal Operation

The light will return to normal operation once it has not detected a valid key press for 30 seconds. The light will flash once to indicate it is returning to normal operation.

Read

Pressing the Read followed by one of the configuration keys shall cause the light to flash the configured value.

Example Key Sequences:

R **FC** **T/C** The light flashes the 'IR Remote' number belonging to the currently set Flash Code. Refer to the Flash Code tables to match the 'IR Remote' flash number to the Flash Code.

R **I** **T/C** The light flashes the current intensity setting: 1 flash for 25%, 2 for 50%, 3 for 75% and 4 for 100%.

R **B** **T/C** The light flashes the current battery status.

R **L** **T/C** The light flashes the sunset level in Lux, followed by a 2 second gap, followed by the sunrise level. Levels are in the range of 1 to 5.

Flash Code

FC

This key sets the flash code on the light.

Example Key sequence:

FC (1) (2) (3) **T/C**

This sets the flash code to value 123. The light responds by flashing the flash code value.

Flash Code Numbers

The lamp flashes numbers as follows: Hundreds, Tens, Ones. A value of 125 will be flashed as: 1 flash, followed by a delay, 2 flashes, followed by a delay, 5 flashes.

The flash for number 0 is one long flash.

For example if the current Flash Code is set to 51 via the AB Sealite Code, the lamp will flash number 081. For a flash code set to 01, the lamp will flash 001.

Intensity

I

This function sets the light intensity and is automatically calculated by user selecting the required operational range of the lantern.

I (X) **T/C**   writes the range in nautical miles (0–9) where x represents the range

I (X) (X) **T/C**   writes the range in nautical miles (0–32) where x represents the range

A range value from 6 to 13NM is valid however the maximum allowable range is dependent on the lantern's vertical divergence, LED colour and flash character.

Using the selected operational range and current flash character, the lantern uses the Schmidt-Clausen Method, as described in IALA E200-4 to determine the peak intensity.

If the flash character is changed, the peak intensity is automatically adjusted.

Battery Status

B

This function reads the battery status. The response from the light is High Voltage: 4 flashes, Good Voltage: 3 flashes, Low Voltage 2 flashes, Cutoff Voltage or below: 1 flash.

Example Key sequence:

R **B** **T/C**

Lux

L

This key sets the ambient light threshold levels.

The format is

L **X** **T/C**

Where 'x' is the desired setting from the table below.

There are 5 programmable lux levels which are set together for the sunset and sunrise transitions.

Level	Sunset (Dusk)	Sunrise (Dawn)
1	64	100
2*	**100**	**150**
3	150	240
4	240	370
5	370	600
* Default / Factory Preset		

Example key sequence:

L **1** **T/C**

Assume the current Lux settings are at the factory preset values of 2.

This sets the ambient light level to be lower than the default 100 lux. The light will turn on when its surroundings are darker.

The light responds by acknowledgement with a long flash.

Error / Acknowledge Indication

If the key sequence is invalid, or an out of bounds value is attempted to be set, the light flashes 5 times for 1 second. (The command then needs to be sent from the start.)

Example key sequence: (Set the intensity level to 5 – undefined.)

I **5** **T/C**

The light flashes 5 times for 1 second.

When a key sequence has been entered successfully the light will respond acknowledgement with a long 1 second flash.

Configuration Settings

The intensity and flash codes can be changed using the IR Remote Control. The lamp intensity and flash code settings are set to the last detected change, carried out with the IR Remote Control.

Example #1: If the intensity is set at 100% with the intensity switches, and is then set to 50% using the IR Remote Control, the intensity setting will change to 50%. If the intensity is then set to 75% using the switches, the new intensity value will be 75%.

In order to change intensity settings using the IR Remoter Control, the lamp must be powered.

The lamp can detect a change in switch settings if they are changed while the light is powered down.

Example #2: The flash code is set according to the Sealite Code settings: A=5, B = 1. The operator changes the flash code to 65 (A=4, B=1) using the IR Remote Control. The new flash code is now configured to A=4, B=1. The lamp is powered down and the operator changes the flash code Sealite Code to A=3, B=1 and powers on the light. The new flash code is now A=3, B=1. If the flash code is read from the light using the IR Remote Control, the lamp will flash 49 which is the corresponding number for Sealite Code A=3, B=1.

Use the IR Remote Control to read the current lamp intensity setting and flash code.

Operational Mode (Advanced users)

The lantern has three modes of operation: *Always on, Standby Mode and Dusk-to-Dawn* mode. These modes can be selected either via the IR remote control or via the GSM module (if fitted).

In Always On mode, the daylight sensor is disabled and the lantern will remain ON.

In Standby mode, the lantern is turned off and the daylight sensor is disabled. This mode does not affect the operation of the GSM module.

In Dusk-to-Dawn, the daylight sensor is enabled.

B **I** (1) **T/C**   Always on mode

B **I** (2) **T/C**   Standby mode

B **I** (3) **T/C**   Dusk-to-Dawn mode

SL-155 Series Lantern Power Consumption

Power Basics

(a) Power is a measure of the rate in which electrical energy is transferred within an electrical circuit and is measured in Watts (W). For DC (Direct Current) electrical circuits it is expressed as:

Power (Watts) = Voltage (Volts, V) x Current (Amps, A)
                where volts & current are instantaneous values.

(b) Peak Power is the maximum power rating of a Lantern. In an instant of time, this is the maximum power the lantern will consume. It is determined when all a lantern's features are on and the LEDs intensity is at 100%.

(c) Average Power is a measure of Power over a period of time. In raw terms, it expressed as

Average Power (Watts) = Peak power (Watts) x MULTIPLIER (%),

where the

MULTIPLIER (%) = Flash Character duty cycle (%) x Intensity level (%)

(d) The SL-155 and SL-300 lanterns intensity setting are available in 32 steps from 0% to 100% with a step size of 3.125% (or 1/32%)

Earthing

A Protected Earth Point ⏚ has been provided on the base of the lantern, this provides the lantern with a low impedance path for any static or discharge faults that may occur. Electrically it is connected to both the Lanterns body (chassis) and the Negative Power Supply line (-Vbatt).

Pay particular attention to eliminate any ground loops that may form between the Lantern Body, the Lantern Power supply lines and the lantern's Mounting platform.

⚠️	ATTENTION
	Electrically, the Protect Earth Point is connected directly to the negative supply line (-VBATT). **Pay particular attention to eliminate all electrical ground loops between the Protected Earth Point , the negative power supply line (-VBATT) and power supply.**

Sealite recommends that installers perform a holistic review of the installation's grounding paths, the lantern and its power supply paths with the purpose of dissipating electrostatic charge build up and eliminating grounding loops. If this is not done there can be a serious safety risk to personnel and equipment.

Thermal Management

The lanterns incorporate a dynamic intensity module as part of the thermal management system that ensures it operates within the thermal design window. In practice the thermal management system limits the lanterns average power consumption by automatically adjusting the intensity to prevent overheating.

The Thermal Management system does so by multiplying the flash character duty cycle with the lantern intensity and compares this figure to the Thermal Limit. If the figure (called the "multiplier") is greater than the Thermal Limit the intensity is then adjusted to ensure the Thermal Limit is not exceeded.

This Thermal Limit will come into effect if you select a flash characteristic with a heavy duty cycle and set a very high intensity. Under these conditions the lantern will automatically reduce its intensity so that it is operating within the thermal design window. Note, this intensity limit will not be reached for the vast majority of applications.

The Thermal Limit for the SL-155-2.5D Series lanterns has been set to 34.375%.

The relationship between the Thermal Limit, Intensity and Flash Duty Cycle is illustrated in the following graph:
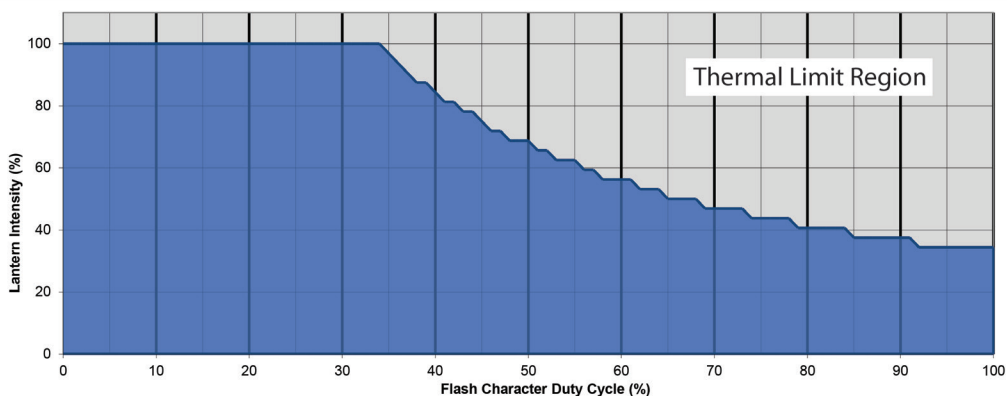
Lantern data

The following tables detail the electrical power consumption of the SL-155-2.5D lanterns:

SL-155-2.5D

	Red	Green	White	Yellow
Peak power (W)	48.4	64.2	60.4	60.7
Max power thermal limit %	34.375%	34.375%	34.375%	34.375%
Max average power at thermal limit (W)	16.6	22.1	20.7	20.9
Peak intensity (cd)	6,357	6,052	10,505	5,414
Voltage range (VDC)	12 to 24	12 to 24	12 to 24	12 to 24

Electrical Consumption of Control and Flasher Electronics

	SL-155 Series at 12V		
Parameter	(mA)	(W)	Description
Iq, Quiescent current	4.8	0.06	Consumption during the day and night time
Ie, Eclipse Current	16.7	0.20	Consumption between flashes
Igps (average)	2	0.01	Consumption over the entire day
Irelay	20	0.24	Consumption when energised

Thermal limit operation

Automatically the lantern calculates the MULTIPLIER and compares it to the maximum power Thermal limit. If the calculated value exceeds maximum power thermal limit, then the intensity is reduced to the highest intensity step to ensure that it is not exceeded.

Case 1:

SL-155-2.5D-W, White, 13NM, Flash Character Fl(3+1) 18s
[1.5s on,1.5s off,1.5s on,1.5s off,1.5s on,4.5s off,1.5s on,4.5s off] 33.3%

1. Calculate the Flash Character Duty cycle (%)

    = (1.5+1.5+1.5+1.5)/(1.5+1.5+1.5+1.5+1.5+4.5+1.5+4.5)*100 = 33.3%

2. With a range of 13NM, use IALA E-200-2 and determine the Effective Intensity (cd)

    = 5,447cd

3. Using the Method of Modified Allard, determine the Peak Intensity (cd)

    = 6,173cd

4. Calculate the desired Intensity step setting (0 to 32=100%) based upon the SL-155-2.5D Maximum Peak Intensity (cd)

    = 6,173(cd) / 7,900(cd) * 32(steps) = 25 (rounded up)

5. Calculate the MULTIPLIER (%)

    = 33.3% * (25/32*100%) = 26.02%

6. Compare this to the Max Power Thermal Limit for a SL-155-2.5D-W which equals 34.4%

    The MULTIPLIER < 34.4% and is below the Max Power Thermal Limit.

7. With an Intensity Step of 25, recalculate the range.

    Peak Intensity   = (25/32) * 3,078cd

    = 6,172cd

8. Using the Modified Allard method in reverse, the new Effective Intensity is

    = 5,446cd

9. Using IALA E-200-4, the range is confirmed as 13NM. (PASS)

Case 2:

SL-155-2.5D-W, White, 10NM, Flash Character = Occ(3) 16s [2s on, 2s off,2s on,2s off,6s on,2s off]

1. Calculate the Flash Character Duty cycle (%)

    = (2+2+6)/(2+2+2+2+6+2)*100 = 62.5%

2. With a range of 13NM, use IALA E-200-2 and determine the Effective Intensity (cd)

    = 5,447cd

3. Using the Method of Modified Allard, determine the Peak Intensity (cd)

    = 5,991cd

4. Calculate the desired Intensity step setting (0 to 32=100%) based upon the SL-155-2.5D Maximum Peak Intensity (cd)

    = 5,991(cd) / 7,900 (cd) * 32(steps) = 25 (rounded up)

5. Calculate the MULTIPLIER (%)

    = 62.5% * (25/32*100%) = 48.83%

6. Compare this to the Max Power Thermal Limit for a SL-155-2.5D

    = 34.4%

    The MULTIPLIER > 34.4% and exceeds the Thermal Limit.

    As such, go back to Step 5 and reduce the Intensity Step from 15 until the MULTIPLIER is less than Max Power Thermal Limit.

7. In this example, an Intensity Step of 17, results in a MULTIPLIER of

    = 62.5% * (17/32*100%) = 33.20%

    Which is less than the Max Power Thermal Limit of 34.4%

8. With this reduced intensity step, recalculate the reduced range.

    Peak Intensity = (17/32) * 7,900cd = 53.125% * 7,900cd

    = 4,197cd

9. Using the Modified Allard method in reverse, the new Effective Intensity is

    = 3,815cd

10. Using IALA E-200-4, the new range is reduced to 12.1NM. (0.9NM less than desired range of 13MN)

Power Supply
Design Considerations

Long range lanterns are designed to operate over a wide operational voltage range and thus the average power consumption will vary accordingly.   The lanterns incorporate a dynamic intensity limit as part of the thermal management system that ensures operates within the thermal design window. In practice the thermal management cap limits a lanterns average power to a practical thermal limit of the lantern in order to prevent overheating.

Power Supply Design Considerations

As discussed in IALA Guide 1067-2, there are vast array of power sources that can be utilised for power lanterns. However the vast majority of customer power supplies comprise of either Photovoltaic Power or AC Utility and as such this bulletin will focus on these types and how they apply to Sealite SL-155 and SL-300 long range lanterns.

Contact Sealite for advice when designing your power supply.

(1) PV Power Systems

These systems generally comprise of a 1 or more PV panels, a solar regulator and storage battery.

Batteries such as marine grade SLAs are very tolerant of fast switch high peak currents as they electrically behave like a large smoothing capacitors. As detailed in IALA 1067 Solar sizing depends on a number of factors. For Sealite lanterns, pay particular attention to average power consumption and power cable sizing.

(2) Alternating Current (AC) Utility Power

In their simplest form, these systems comprise an AC/DC power supply convertor.   Unlike PV Power Systems, AC/DC Power Supplies are limited to their internal storage capacity and as such are not able to maintain voltage regulation to fast switch currents.

As such a lantern's peak current must be determined when selecting an AC/DC power supply.

For Sealite's long range lanterns, the peak current can be determined by using the following equation:

Peak current (A) = Peak Power (W))/(Supply Voltage (Vdc)

Using this method the peak currents for the SL-155 and SL-300 Long range lanterns are:

SL-155 (2.5/5/10) : Peak Current (A) = 64 / 12 = 5.3A

SL-300-1 : Peak Current (A) = 384 = 16A

SL-300-2 : Peak Current (A) = 768 = 32A

As an AC/DC power supply has minimal storage capacity the selected power supply must be capable of delivering a lantern's peak current for all conditions. This is regardless of the lanterns set Flash Duty Cycle or Intensity Settings. Other considerations such as de-rating the AC/DC power supply due to environment and usage.

Lantern Testing

Now that the SL-155 has been programmed to suit the project requirements, it's important that the lantern is tested prior to installation, including flash code and intensity settings.

To test the SL-155:

- Connect the SL-155 to a 12V power supply or battery.
- For lanterns programmed to "Dusk to Dawn" operation setting, cover lantern with a dark cloth or jacket in darkness for more than 1 minute. After this time the lantern will activate.
- Next, check that the lantern is flashing to the required flash code and intensity.
- If the settings are correct, disconnect from the 12V power supply or battery.
- If the settings are incorrect, following the Programming Instructions of this manual to re-configure lantern characteristics, and then re-test prior to installation.

IMPORTANT: when lantern is being programmed using the Sealite PC Configuration Tool software, it is recommended that the operation setting is set to "Always On" for ease of testing/viewing new settings. Once the programming is complete, remember to change the operation mode back to your specific installation requirement (Sealite recommend "Dusk to Dawn" mode).

Lantern Installation

The Sealite SL-155 may be installed with connection to mains power, or as a complete solar powered system (available from Sealite).

IMPORTANT: the SL-155 must be installed appropriately where the lantern is not blocked by buildings, trees or other shadows that may affect the visibility of the lantern or the ambient light.

Option 1: Installation of Lantern to Mains Power

To connect the SL-155 to a 12VDC power supply:

- Connect the blue negative wire of the lantern to the power supply negative terminal
- Connect the brown positive wire of the lantern to the power supply positive terminal

IMPORTANT: it is important that a 15 Amp AC-DC power supply is connected between the mains power and the lantern to maximise the life of your product. The AC-DC power supply should be no more that 20m from the lantern.

2.5 degree model

5 degree/10 degree model

Option 2: Installation of Lantern to Solar Powered System

Sealite has an optional complete solar powered system available to purchase with the standard SL-155 lantern. Detailed instructions for installation of the solar system are listed as follows.

1. Unpacking Instructions

Unpack all hardware and verify container contents in accordance with Figure 2. Please contact your Sealite representative if there is any hardware missing.

2. Initial Inspection

Inspect all hardware for damage. If there is any damage, please contact your Sealite representative.

3. Installation

Refer to Figure 1 "Panel & Cage Footprint" and Figure 2 "Installation of Solar Panel & Battery Box Cage" during installation of the panel and cage.

3.1 Installing the Post

A suitable mounting point for the Solar Panel and Battery Box Cage is to be provided by the client. It is usual to use a purpose installed post.

The following should be observed:-

- The post should be of a durable timber, or other durable material
- Recommended minimum post size is 150mm x 150mm, or larger if the battery box cage needs to be installed immediately beneath the solar panel
- The length of post required is the sum of exposed length (normally 1.25m) plus the required depth into the ground which is dependent on local soil conditions (recommended depth 850 minimum)
- The faces of the post must be aligned with the cardinal points of the compass. This will allow the Solar panel to be aligned with the equator and sun
- The post should not be more than 20m from the lantern, and should not be located so as to place the solar panel in shade for a significant time
- The solar panel is tempered glass, so the post should be located away from any objects which might fall on the installation
- The post and equipment footprint should be at least 300mm clear of any shading under all conditions
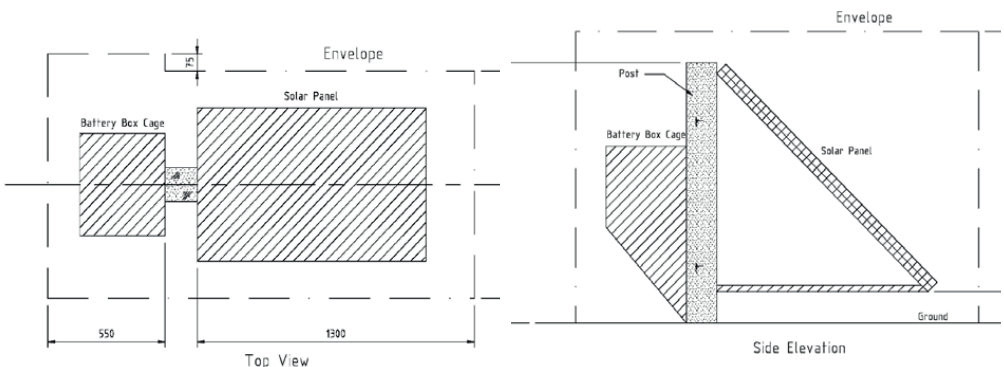
Ref No.	Description	No. Required
2.1	140W Solar Panel & Frame	1
2.2	Battery Box Cage	1
2.3	Post, 150x150 minimum	Client Supplied
2.4	Steel Support	1
2.5	Steel Brace	1
2.6	Screw, 12mm x 75	12
2.7	Washer, 12mm	12
2.8	Bolt, 10mm x 25	4
2.9	Washer, 10mm	4
2.10	Self Locking Nut, 10mm	4
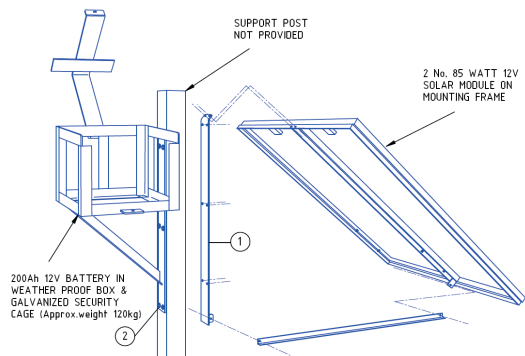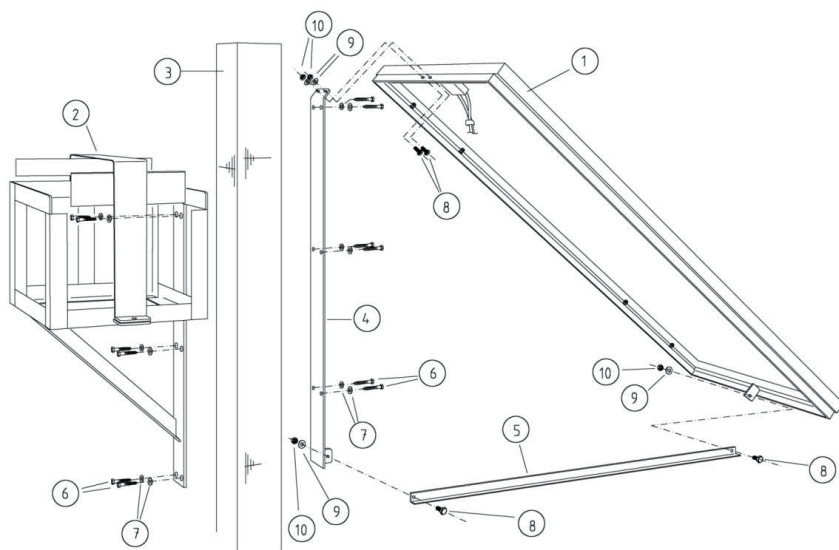
Alternative setup, using 2 x 85W panels.
Lantern duty cycle and intensity will determine the size and quantity of solar panels and batteries.

Figure 2. Installation of Solar Panel & Battery Box Cage

3.2 Installing the Solar Panel & Battery Box Cage

The battery box cage (Ref 2.2) and the steel support bracket (Ref 2.4) are attached to the post (Ref 2.3) using coach screws and washers (Ref 2.6, 2.7).

a. Drill the post for the steel support bracket (6 places) and install using supplied screws

IMPORTANT: the Solar Panel must face the equator. Locate the solar panel support bracket accordingly.

b. Drill the post for the battery box cage (6 places) on the opposite side to the solar panel and install using supplied screws

c. Install the solar panel and frame (Ref 2.1) and the brace (Ref 2.5) to the steel support bracket using bolts (Ref 2.8), washers (Ref 2.9) and nuts (Ref 2.10)

3.3 Installing the Battery Box

Refer to Figure 3 "Battery and Battery Box" during installation of the battery and battery box.

a. Open the battery box cage door and place the battery case (Ref 3.1) into the cage with the hinge of the case adjacent to the hinge of the cage

b. Open the battery case and lower the battery into the case ensuring the battery terminals are upright

c. Insert one bolt (Ref 3.3) with a washer (Ref 3.4) under the head through each of the battery terminals

d. Place the red eye connector over the tail of the bolt protruding through the red battery terminal

e. Fit a washer (Ref 3.4), spring washer (Ref 3.5) and nut (Ref 3.6) on the terminal bolt. Tighten

f. Place the blue eye connector over the tail of the bolt protruding through the black battery terminal. Fit a washer (Ref 3.4), spring washer (Ref 3.5) and nut (Ref 3.6) on the terminal bolt. Tighten

g. Insert the end of the cable from the solar panel through one of the cable glands in the back of the battery case. Join bullet connectors, red to red and blue to blue

•   Test the lantern. Cover the lantern completely to resemble night time. Allow 60 seconds for the lantern to activate

•   Uncover the lantern and it will turn off after 60 seconds

Ref No.	Description	No. Required
3.1	Battery Case, SPC353534	1
3.2	Battery, 12V 70AH or equivalent	1
3.3	Bolt, battery	2
3.4	Washer, battery	4
3.5	Spring Washer, battery	2
3.6	Nut, battery	2
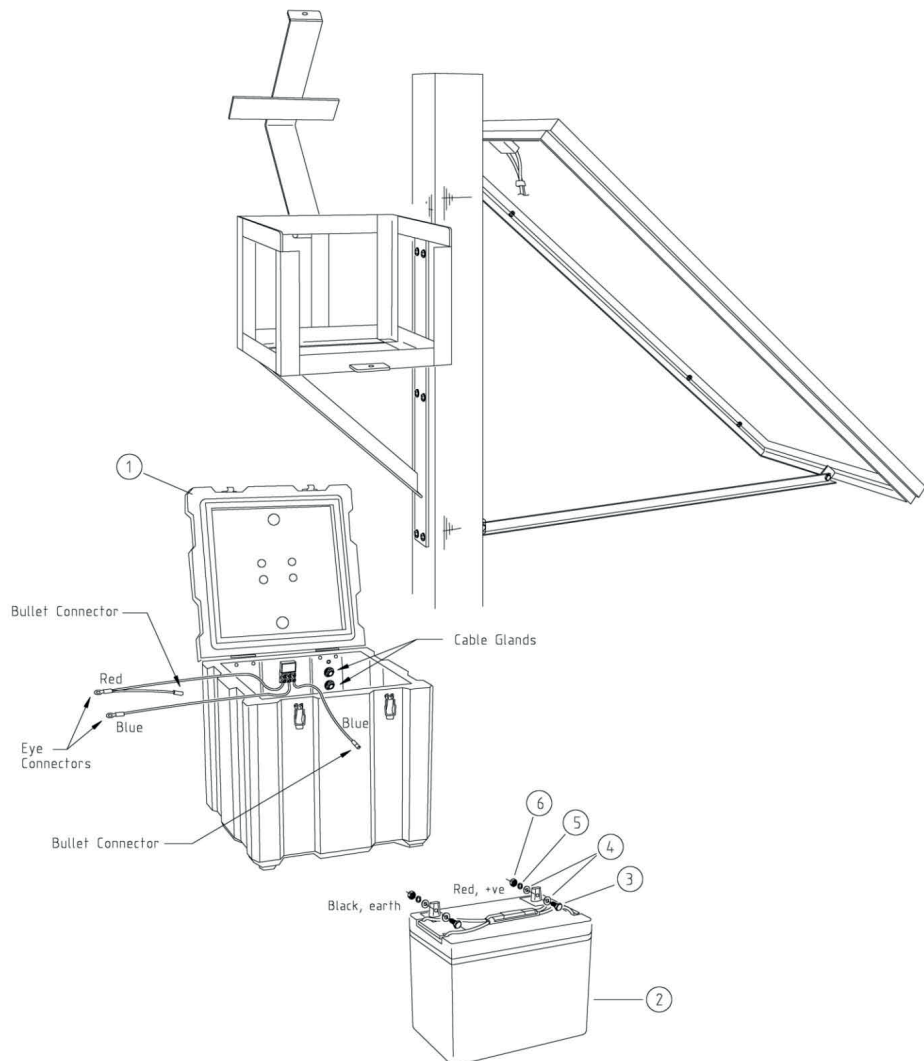
Figure 3. Battery and Battery Box

3.4 Connecting the Lantern

To connect the SL-155 to the solar powered system:

- Connect the blue negative wire of the lantern to the battery negative terminal
- Connect the brown positive wire of the lantern to the battery positive terminal

The lantern must to be connected to a 12VDC power supply.

Please ensure the solar panel array has been installed appropriately. To maximise solar collection, the solar panel array should be installed facing the equator and in a location that ensures it will not be shaded by buildings, trees or other structures. **Solar panels will significantly reduce in efficiency if a small shadow is positioned over the solar panel.**

IMPORTANT: it is important to work with the team at Sealite when determining the quantity and size of both batteries and solar panels for this lantern. Duty cycle, intensity and local solar conditions are important factors to take into consideration when building a solar powered battery supply.

Sealite solar marine lanterns will give years of trouble free service if installed correctly initially.

- Please ensure all connections are tight
- Please ensure that solar panels are always clean and free from bird droppings and shade and that the solar array it pointed toward the sun to maximise solar collection
- Please ensure that battery box covers are latched properly and that cages are secured appropriately, to prevent theft and vandalism

Please contact your Sealite representative if you have any questions regarding the installation and service of the lantern.

Optional GPS Synchronisation

The lanterns can be fitted with a GPS module, and provide the user with the ability to install independently operating lanterns that all flash in synchronisation.

No additional power supplies, aerials or control systems are required, and with its microprocessor-based system, the GPS option is specifically designed to provide maximum reliability and performance over a wide range of environmental conditions.

Operating Principle

Each light operates independently and requires no operator intervention. A minimum of 4 satellites need to be in view for the built-in GPS receiver to collect time data. At dusk, the light sensor will turn the light on. If time data is available the light will come on synchronised to every other light with the same selected flash code.

Synchronisation is achieved using an internal algorithm based on the highly accurate time base and time data received from the satellites. The satellite data is provided from a number of earth stations using atomic clocks as the time base. Continuous self-checking ensures that the light will continue to run in synchronisation.

Light Activation

At power-up the microprocessor checks that the internal GPS module is programmed correctly and is able to provide valid time base and time data.

Once outside with a clear view of the sky, valid data should become available within 20 minutes.

Daylight Operation

During daylight hours the microprocessor is in idle mode to reduce power consumption. Time data continues to be updated once per second. The microprocessor will automatically exit the idle mode as soon as dark conditions are detected.

Dark Operation

When dark conditions are detected the light:

- Checks for valid time data and is turned on after a delay based on the current time and the length of the selected flash code;
- If valid time data is not detected the light will turn on after approximately 10 seconds. This light will not be synchronised.
- If the light turns on unsynchronised it will continually check for valid time data. Once valid data is found the light will automatically synchronise.

Note: Lights will not synchronise if different flash codes are selected.

Optional GSM Monitoring & Control System

The lanterns may also be fitted with GSM Cell-Phone Monitoring and Control – enabling users to access real-time diagnostics data and change lantern settings via cell-phone. The system can also be configured to send out alarm SMS text messages to designated cellular telephone numbers. Users can also have alarms and reports sent to designated email addresses.

Please contact Sealite for further information and instructions.

Maintenance & Servicing

Designed to be virtually maintenance-free, the SL-155 Series will require minimal attention.

However, the following maintenance and servicing information is provided to help ensure the life of your Sealite product.

1. Cleaning Lens - occasional cleaning of the lantern lens may be required. Using a cloth and warm soapy water, wipe off any foreign matter before rinsing the lens with fresh water.
2. Ensure the external vent and programming port are free from foreign material.

Trouble Shooting

Problem	Remedy
Unable to communicate with lantern via the Lantern Configuration Tool.	1. Visit the Lantern Configuration Tool page on the Sealite website www.sealite.com/lantern-configuration-tool/ 2. Click the download link and the programming software will download as a zip file "LanternConfig2.52.zip". 3. Extract all the files to a preferred location on the hard drive of your computer. 4. Navigate to the folder where you have saved the "LanternConfig2.52" file. 5. Double-click the file called "LanternConfig.exe". 6. Connect the lantern to a power source 7. Connect the lantern to the PC 8. Click "COM Setup" 9. Select the appropriate COM Port from the drop down menu in the "Serial Port" dialogue box 10. Ensure the "Open Port" check box is selected and "Port is Open" is displayed 11. Click "OK" 12. Lantern should be connected and ready for programming
Lantern will not activate.	• Ensure lantern is in darkness • Wait at least 60 seconds for the program to initialise in darkness • Ensure battery terminals are properly connected • Ensure lantern is connected to a 12 volt power supply
Programming settings will not change	• Check programming cable is properly connected to both lantern and computer, and check that the lantern is connected correctly to a power source (and that the power source is charged eg. Battery)

Appendix

Flash Codes

Sealite marine lanterns may be set to any of 256 IALA recommended flash settings which are user-adjustable onsite without the need for external devices.

SEALITE® code reference is listed by number of flashes

For the latest version of this document visit www.sealite.com or email info@sealite.com

Symbols

FL	Flash followed by number Eg. FL 1 S, one flash every second
F	Fixed
Q	Quick flash
VQ	Very quick flash
OC	Occulting; greater period on than off
ISO	Isophase; equal period on and off
LFL	Long flash long
MO	Morse code ( ) contains letter

For example, VQ (6) + LFL 10 S means 6 very quick flashes followed by a long flash, during a 10-second interval.

The amount of power your lantern draws through the night depends on the duty cycle, i.e. The amount of time on as a proportion to the timing cycle. For example, 0.5 seconds on and 4.5 seconds off equals a 10% duty cycle.

It is best to operate at the lowest duty cycle appropriate to the actual needs of the application.

Recommended Rhythm for Flashing Light - IALA Regions A and B

MARK DESCRIPTION	RHYTHM
Port Hand & Starboard Marks:	Any, other than Composite Group Flashing (2+1)
Preferred Channel Starboard:	Composite Group Flashing (2+1)
Preferred Channel Port:	Composite Group Flashing (2+1)
North Cardinal Mark:	Very quick or quick
East Cardinal Mark:	Very quick (3) every 5 seconds or quick (3) every 10 seconds
South Cardinal Mark:	Very quick (6) + long flash every 10 seconds or quick (6) + long flash every 15 seconds
West Cardinal Mark:	Very quick (9) every 10 seconds or quick (9) every 15 seconds
Isolated Danger Mark:	Group flashing (2)
Safe Water Mark:	Isophase, occulting, one long flash every 10 seconds or Morse Code "A"
Special Marks:	Any, other than those described for Cardinal, Isolated Danger or Safe Water Marks

Sealite Code A	B	IR Controller	Flash Code	ON	OFF	Sealite Code A	B	IR Controller	Flash Code	ON	OFF
0	0	000	F (Steady light)			7	1	113	FL 5 S	1.5	3.5
D	3	211	VQ 0.5 S	0.2	0.3	4	2	66	ISO 5 S	2.5	2.5
E	3	227	VQ 0.6 S	0.2	0.4	8	2	130	LFL 5 S	2.0	3.0
F	3	243	VQ 0.6 S	0.3	0.3	0	3	3	OC 5 S	3.0	2.0
7	3	115	Q 1 S	0.2	0.8	1	3	19	OC 5 S	4.0	1.0
8	3	131	Q 1 S	0.3	0.7	2	3	35	OC 5 S	4.5	0.5
9	3	147	Q 1 S	0.4	0.6	C	6	198	FL 6 S	0.2	5.8
A	3	163	Q 1 S	0.5	0.5	B	5	181	FL 6 S	0.3	5.7
8	4	132	Q 1 S	0.8	0.2	C	5	197	FL 6 S	0.4	5.6
B	3	179	Q 1.2 S	0.3	0.9	8	1	129	FL 6 S	0.5	5.5
9	4	148	Q 1.2 S	0.5	0.7	9	1	145	FL 6 S	0.6	5.4
C	3	195	Q 1.2 S	0.6	0.6	A	1	161	FL 6 S	1.0	5.0
F	4	244	FL 1.5 S	0.2	1.3	7	5	117	FL 6 S	1.2	4.8
1	0	16	FL 1.5 S	0.3	1.2	B	1	177	FL 6 S	1.5	4.5
0	5	5	FL 1.5 S	0.4	1.1	5	2	82	ISO 6 S	3.0	3.0
0	4	4	FL 1.5 S	0.5	1.0	9	2	146	LFL 6 S	2.0	4.0
2	0	32	FL 2 S	0.2	1.8	6	4	100	OC 6 S	4.0	2.0
3	0	48	FL 2 S	0.3	1.7	3	3	51	OC 6 S	4.5	1.5
4	0	64	FL 2 S	0.4	1.6	4	3	67	OC 6 S	5.0	1.0
5	0	80	FL 2 S	0.5	1.5	A	4	164	FL 7 S	1.0	6.0
6	0	96	FL 2 S	0.7	1.3	9	6	150	FL 7 S	2.0	5.0
7	0	112	FL 2 S	0.8	1.2	5	6	86	OC 7 S	4.5	2.5
1	2	18	ISO 2 S	1.0	1.0	D	5	213	FL 7.5 S	0.5	7.0
8	0	128	FL 2.5 S	0.3	2.2	C	1	193	FL 7.5 S	0.8	6.7
9	0	144	FL 2.5 S	0.5	2.0	E	5	229	FL 8 S	0.5	7.5
D	6	214	FL 2.5 S	1.0	1.5	B	4	180	FL 8 S	1.0	7.0
1	5	21	FL 3 S	0.2	2.8	6	2	98	ISO 8 S	4.0	4.0
A	0	160	FL 3 S	0.3	2.7	A	2	162	LFL 8 S	2.0	6.0
2	5	37	FL 3 S	0.4	2.6	6	6	102	OC 8 S	5.0	3.0
B	0	176	FL 3 S	0.5	2.5	B	2	178	LFL 8 S	3.0	5.0
3	5	53	FL 3 S	0.6	2.4	F	5	245	FL 9 S	0.9	8.1
C	0	192	FL 3 S	0.7	2.3	C	4	196	FL 9 S	1.0	8.0
D	0	208	FL 3 S	1.0	2.0	7	6	118	OC 9 S	6.0	3.0
2	2	34	ISO 3 S	1.5	1.5	0	6	6	FL 10 S	0.2	9.8
5	4	84	OC 3 S	2.0	1.0	1	6	22	FL 10 S	0.3	9.7
E	2	226	OC 3 S	2.5	0.5	D	1	209	FL 10 S	0.5	9.5
4	6	70	OC 3.5 S	2.5	1.0	2	6	38	FL 10 S	0.8	9.2
4	5	69	FL 4 S	0.2	3.8	E	1	225	FL 10 S	1.0	9.0
5	5	85	FL 4 S	0.3	3.7	1	4	20	FL 10 S	1.5	8.5
E	0	224	FL 4 S	0.4	3.6	C	2	194	LFL 10 S	2.0	8.0
F	0	240	FL 4 S	0.5	3.5	D	2	210	LFL 10 S	3.0	7.0
6	5	101	FL 4 S	0.6	3.4	7	2	114	ISO 10 S	5.0	5.0
0	1	1	FL 4 S	0.8	3.2	2	4	36	LFL 10 S	4.0	6.0
1	1	17	FL 4 S	1.0	3.0	8	6	134	OC 10 S	6.0	4.0
2	1	33	FL 4 S	1.5	2.5	5	3	83	OC 10 S	7.0	3.0
3	2	50	ISO 4 S	2.0	2.0	6	3	99	OC 10 S	7.5	2.5
3	6	54	OC 4 S	2.5	1.5	F	1	241	FL 12 S	1.2	10.8
F	2	242	OC 4 S	3.0	1.0	D	4	212	FL 12 S	2.5	9.5
3	1	49	FL 4.3 S	1.3	3.0	3	4	52	LFL 12 S	2.0	10.0
8	5	133	FL 5 S	0.2	4.8	0	2	2	FL 15 S	1.0	14.0
4	1	65	FL 5 S	0.3	4.7	4	4	68	LFL 15 S	4.0	11.0
5	1	81	FL 5 S	0.5	4.5	7	4	116	OC 15 S	10	5.0
9	5	149	FL 5 S	0.9	4.1	A	6	166	LFL 20 S	2.0	18.0
6	1	97	FL 5 S	1.0	4.0	E	4	228	FL 26 S	1.0	25.0

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF
A	B						
0	A	10	FL (2) 4 S	0.5	1.0	0.5	2.0
E	B	235	VQ (2) 4 S	0.2	1.0	0.2	2.6
1	A	26	FL (2) 4.5 S	0.3	1.0	0.3	2.9
2	A	42	FL (2) 4.5 S	0.4	1.0	0.4	2.7
3	A	58	FL (2) 4.5 S	0.5	1.0	0.5	2.5
F	9	249	FL (2) 5 S	0.2	0.8	0.2	3.8
2	C	44	FL (2) 5 S	0.2	1.2	0.2	3.4
4	A	74	FL (2) 5 S	0.4	0.6	0.4	3.6
0	7	7	FL (2) 5 S	0.5	1.0	0.5	3.0
1	7	23	FL (2) 5 S	1.0	1.0	1.0	2.0
9	B	155	Q (2) 5 S	0.3	0.7	0.3	3.7
2	9	41	Q (2) 5 S	0.5	0.5	0.5	3.5
5	A	90	FL (2) 5.5 S	0.4	1.4	0.4	3.3
7	8	120	FL (2) 6 S	0.3	0.6	1.0	4.1
A	A	170	FL (2) 6 S	0.3	0.9	0.3	4.5
6	A	106	FL (2) 6 S	0.3	1.0	0.3	4.4
7	A	122	FL (2) 6 S	0.4	1.0	0.4	4.2
9	9	153	FL (2) 6 S	0.5	1.0	0.5	4.0
2	8	40	FL (2) 6 S	0.8	1.2	0.8	3.2
3	7	55	FL (2) 6 S	1.0	1.0	1.0	3.0
3	9	57	Q (2) 6 S	0.3	0.7	0.3	4.7
A	9	169	FL (2) 7 S	1.0	1.0	1.0	4.0
7	B	123	FL (2) 8 S	0.4	0.6	2.0	5.0
8	A	138	FL (2) 8 S	0.4	1.0	0.4	6.2
4	7	71	FL (2) 8 S	0.5	1.0	0.5	6.0
8	8	136	FL (2) 8 S	0.8	1.2	2.4	3.6
5	7	87	FL (2) 8 S	1.0	1.0	1.0	5.0
4	C	76	OC (2) 8 S	3.0	2.0	1.0	2.0
5	C	92	OC (2) 8 S	5.0	1.0	1.0	1.0
F	B	251	VQ (2) 8 S	0.2	1.0	0.2	6.6
9	A	154	FL (2) 10 S	0.4	1.6	0.4	7.6
6	7	103	FL (2) 10 S	0.5	1.0	0.5	8.0
7	7	119	FL (2) 10 S	0.5	1.5	0.5	7.5
6	9	105	FL (2) 10 S	0.5	2.0	0.5	7.0
8	7	135	FL (2) 10 S	0.8	1.2	0.8	7.2
B	9	185	FL (2) 10 S	1.0	1.0	1.0	7.0
9	7	151	FL (2) 10 S	1.0	1.5	1.0	6.5
4	9	73	Q (2) 10 S	0.6	0.4	0.6	8.4
B	A	186	FL (2) 12 S	0.4	1.0	0.4	10.2
C	9	201	FL (2) 12 S	0.5	1.0	0.5	10.0
D	9	217	FL (2) 12 S	1.5	2.0	1.5	7.0
A	8	168	FL (2) 15 S	0.5	1.5	2.0	11.0
A	7	167	FL (2) 15 S	1.0	2.0	1.0	11.0
8	B	139	Q (2) 15 S	0.2	0.8	0.2	13.8
C	A	202	FL (2) 20 S	1.0	3.0	1.0	15.0
D	A	218	FL (2) 25 S	1.0	1.0	1.0	22.0

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF	ON	OFF
A	B								
7	9	121	Q (3) 5 S	0.5	0.5	0.5	0.5	0.5	2.5
5	9	89	VQ (3) 5 S	0.2	0.3	0.2	0.3	0.2	3.8
0	C	12	VQ (3) 5 S	0.3	0.2	0.3	0.2	0.3	3.7
E	9	233	VQ (3) 5 S	0.3	0.3	0.3	0.3	0.3	3.5
3	C	60	FL (3) 6 S	0.5	1.0	0.5	1.0	0.5	2.5
2	B	43	FL (2+1) 6 S	0.3	0.4	0.3	1.2	0.3	3.5

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF	ON	OFF
A	**B**								
A	B	171	Q (3) 6 S	0.3	0.7	0.3	0.7	0.3	3.7
F	A	250	FL (3) 8 S	0.5	1.0	0.5	1.0	0.5	4.5
0	B	11	FL (3) 9 S	0.3	1.0	0.3	1.0	0.3	6.1
B	7	183	FL (3) 9 S	0.8	1.2	0.8	1.2	0.8	4.2
B	8	184	FL (3) 10 S	0.3	0.7	0.3	0.7	0.9	7.1
C	8	200	FL (3) 10 S	0.4	0.6	0.4	0.6	1.2	6.8
C	B	203	FL (3) 10 S	0.5	0.5	0.5	0.5	0.5	7.5
C	7	199	FL (3) 10 S	0.5	1.5	0.5	1.5	0.5	5.5
D	B	219	FL (3) 10 S	0.6	0.6	0.6	0.6	0.6	7.0
D	7	215	FL (3) 10 S	1.0	1.0	1.0	1.0	1.0	5.0
3	8	56	FL (2+1) 10 S	0.5	0.7	0.5	2.1	0.5	5.7
8	9	137	OC (3) 10 S	5.0	1.0	1.0	1.0	1.0	1.0
B	B	187	Q (3) 10 S	0.3	0.7	0.3	0.7	0.3	7.7
D	8	216	FL (2 + 1) 10 S	0.5	0.5	0.5	0.5	1.5	6.5
1	B	27	FL (3) 12 S	0.5	1.5	0.5	1.5	0.5	7.5
E	A	234	FL (3) 12 S	0.5	2.0	0.5	2.0	0.5	6.5
E	7	231	FL (3) 12 S	0.8	1.2	0.8	1.2	0.8	7.2
B	6	182	FL (3) 12 S	1.0	1.0	1.0	3.0	1.0	5.0
4	8	72	FL (2+1) 12 S	0.8	1.2	0.8	2.4	0.8	6.0
5	8	88	FL (2+1) 12 S	1.0	1.0	1.0	4.0	1.0	4.0
1	8	24	FL (2+1) 13.5 S	1.0	1.0	1.0	4.0	1.0	5.5
F	7	247	FL (3) 15 S	0.3	1.7	0.3	1.7	0.3	10.7
9	D	157	FL (3) 15 S	0.4	1.0	0.4	1.0	0.4	11.8
0	8	8	FL (3) 15 S	0.5	1.5	0.5	1.5	0.5	10.5
F	8	248	FL (2+1) 15 S	0.6	0.3	0.6	0.3	1.4	11.8
0	9	9	FL (2+1) 15 S	0.7	0.5	0.7	0.5	1.9	10.7
1	9	25	FL (2+1) 15 S	0.7	0.7	0.7	0.7	2.1	10.1
6	8	104	FL (2+1) 15 S	1.0	2.0	1.0	5.0	1.0	5.0
1	C	28	VQ (3) 15 S	0.1	0.5	0.1	0.5	0.1	13.7
4	B	75	FL (3) 20 S	0.5	3.0	0.5	3.0	0.5	12.5
3	B	59	FL (3) 20 S	0.5	1.5	0.5	1.5	0.5	15.5
5	B	91	FL (3) 20 S	0.8	1.2	0.8	1.2	0.8	15.2
6	B	107	FL (3) 20 S	1.0	1.0	1.0	1.0	1.0	15.0

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF	ON	OFF	ON	OFF
A	**B**										
B	F	191	VQ (4) 4 S	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.3
B	D	189	Q (4) 6 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	2.7
8	D	141	Q (4) 6 S	0.4	0.6	0.4	0.6	0.4	0.6	0.4	2.6
1	D	29	FL (4) 10 S	0.5	1.0	0.5	1.0	0.5	1.0	0.5	5.0
2	D	45	FL (4) 10 S	0.8	1.2	0.8	1.2	0.8	1.2	0.8	3.2
F	E	254	Q (4) 10 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	6.7
B	E	190	FL (4) 12 S	0.3	1.7	0.3	1.7	0.3	1.7	0.3	5.7
4	F	79	FL (4) 12 S	0.5	0.5	0.5	0.5	0.5	0.5	0.5	8.5
C	E	206	FL (4) 12 S	0.5	1.5	0.5	1.5	0.5	1.5	0.5	5.5
3	D	61	FL (4) 12 S	0.8	1.2	0.8	1.2	0.8	1.2	0.8	5.2
A	D	173	Q (4) 12 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	8.7
4	D	77	FL (4) 15 S	0.5	1.5	0.5	1.5	0.5	1.5	0.5	8.5
8	E	142	FL (4) 15 S	1.0	1.0	1.0	1.0	1.0	1.0	1.0	8.0
7	D	125	FL (4) 15 S	1.5	0.5	0.5	0.5	0.5	0.5	0.5	10.5
D	E	222	FL (4) 16 S	0.5	1.5	0.5	1.5	0.5	1.5	0.5	9.5
C	D	205	FL (4) 20 S	0.3	3.0	0.3	3.0	0.3	3.0	0.3	9.8
5	D	93	FL (4) 20 S	0.5	1.5	0.5	1.5	0.5	1.5	0.5	13.5
0	D	13	FL (4) 20 S	0.5	1.5	0.5	1.5	0.5	4.5	0.5	10.5
3	F	63	FL (4) 20 S	1.5	1.5	1.5	1.5	1.5	1.5	1.5	9.5
0	F	15	Q (4) 20 S	0.5	0.5	0.5	0.5	0.5	0.5	0.5	16.5
E	E	238	Q (4) 28 S	0.5	0.5	0.5	0.5	0.5	0.5	0.5	24.5
6	F	111	FL (4) 30 S	0.5	0.5	0.5	0.5	0.5	0.5	0.5	26.5

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
A	B												
D	D	221	Q (5) 7 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	2.7
E	D	237	Q (5) 10 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	5.7
E	8	232	FL (5) 12 S	0.5	1.5	0.5	1.5	0.5	1.5	0.5	1.5	0.5	3.5
5	F	95	FL (5) 20 S	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	15.5
9	F	159	FL (5) 20 S	0.8	1.2	0.8	1.2	0.8	1.2	0.8	1.2	0.8	11.2
9	E	158	FL (5) 20 S	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	11.0

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
A	B														
F	D	253	Q (6) 10 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	4.7
A	F	175	FL (6) 15 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	9.7
7	F	127	FL (6) 15 S	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5	7.0

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
A	B																
6	E	110	VQ (6) + LFL 10 S	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	2.0	5.0
7	E	126	VQ (6) + LFL 10 S	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.0	4.4
2	F	47	Q (6) + LFL 15 S	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8	2.0	7.0
2	E	46	Q (6) + LFL 15 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	2.0	7.0
3	E	62	Q (6) + LFL 15 S	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	2.0	5.8
8	F	143	VQ (6) + LFL 15 S	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.0	9.4

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
A	B																				
4	E	78	VQ (9) 10 S	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	5.8
5	E	94	VQ (9) 10 S	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	4.9
1	F	31	Q (9) 15 S	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8	0.2	0.8	0.2	6.8
0	E	14	Q (9) 15 S	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3	6.7
1	E	30	Q (9) 15 S	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	4.8

Sealite Code		IR Controller	Flash Code	ON	OFF	ON	OFF	ON	OFF	ON	OFF
A	B										
MORSE CODE ( ) INDICATES LETTER											
7	8	120	MO (A) 6 S	0.3	0.6	1.0	4.1				
7	B	123	MO (A) 8 S	0.4	0.6	2.0	5.0				
8	8	136	MO (A) 8 S	0.8	1.2	2.4	3.6				
B	8	184	MO (U) 10 S	0.3	0.7	0.3	0.7	0.9	7.1		
C	8	200	MO (U) 10 S	0.4	0.6	0.4	0.6	1.2	6.8		
D	8	216	MO (U) 10 S	0.5	0.5	0.5	0.5	1.5	6.5		
9	8	152	MO (A) 10 S	0.5	0.5	1.5	7.5				
8	9	137	MO (D) 10 S	5.0	1.0	1.0	1.0	1.0	1.0		
A	8	168	MO (A) 15 S	0.5	1.5	2.0	11.0				
F	8	248	MO (U) 15 S	0.6	0.3	0.6	0.3	1.4	11.8		
0	9	9	MO (U) 15 S	0.7	0.5	0.7	0.5	1.9	10.7		
1	9	25	MO (U) 15 S	0.7	0.7	0.7	0.7	2.1	10.1		
7	D	125	MO (B) 15 S	1.5	0.5	0.5	0.5	0.5	0.5	0.5	10.5

Notes

Sealite LED Light Warranty

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