



VEGA

VLS-46 LED Sector Light Projector

Installation and Operation Manual



SINGLE PROJECTOR

THREE SECTOR LIGHT WITH BASEPLATE

Part Number, single projector: 146-000 Red, Green, White
(specify colour required). Please read this manual before operation
Ten Nautical Mile range marine LED Sector Light Projector (night at T=0.74)

CAUTION: The LED projector is a source of bright light, do not stare directly into the beam from close range. Observe all warnings and guidelines in this instruction manual.

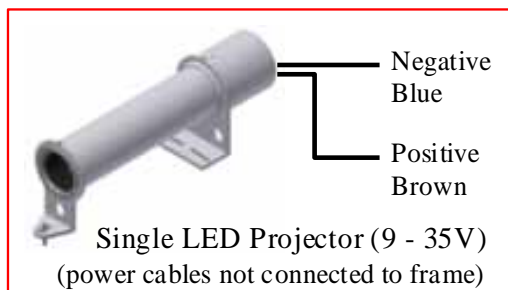


VLS-46 LED Sector Light Projectors are classified as Class 3R LED devices according to the standard IEC 60825-1:1993+A1:1997+A2:2001, with maximum optical output power 300mW

VEGA INDUSTRIES LIMITED
21 Heriot Drive, Porirua 6006, New Zealand
Tel: +64 4 237 4393; Fax: +64 4 237 4392
e-mail: tech@vega.co.nz; web site: <http://www.vega.co.nz>

**This manual describes the VLS-46 LED sector light projector.
Instructions are included for adjustment the projector.**

VLS-46 with flasher cable connections



External Power Source
from solar, wind or AC charge regulator

Positive
Negative

Common Negative
sync connection
at battery

External Battery



VLL-43 option for flasher and LDR (12Volt)

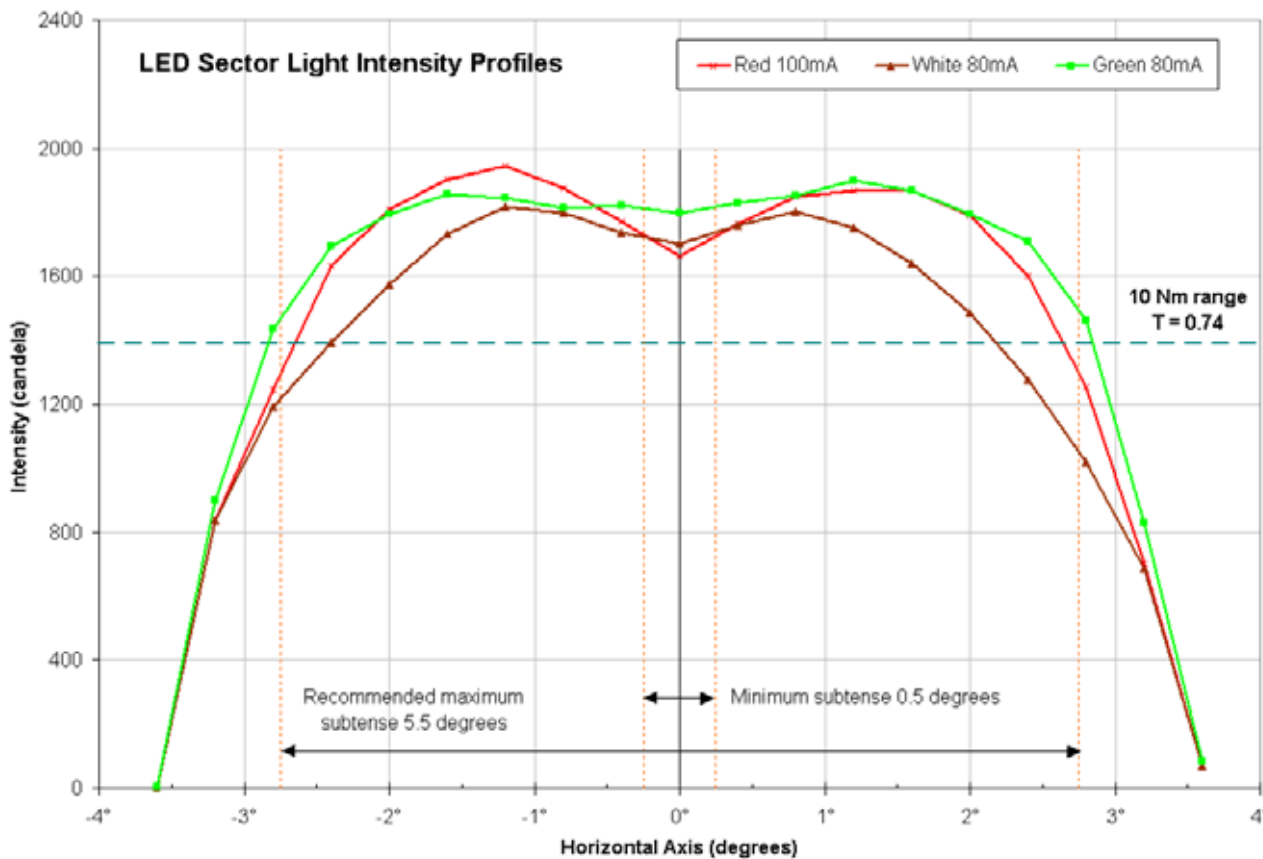
Negative Blue

Positive Brown

Sync Green/Yellow
(isolate if not used)

GPS Receiver 12V
option for synchronisation

Vega



Observe eye safety procedures when working with this equipment
LED Radiation – Do not stare into light beam at close range



Table of Contents

Quick Reference Information.....	4
Section 1: Overview and Special Features.....	5
Section 2: Fixing the Projector in Place	7
Section 3: Projector Operation	11
Section 4: Wiring Connections	12
Section 5: Power Calculations.....	13
Section 6: Daylight Switch, Flash Characters and Synchronisation.....	14
Section 7: Routine Maintenance.....	17
Section 8: Table of Stored Flash Characters VLF-43	18
Specifications Optional VLF-43 Flasher, LDR & 4-way junction box	23
Specifications VLS-46 Individual LED Sector Light Projector	24

Part Number: 146-000	VLS-46 , LED Sector Light projector.
	Specify colour required - Red Green White
Mounting Studs required	Size 1xM6 and 2xM5 bolts, nuts, lock nuts
	Individual projector mounting bolt separation 280 mm PCD
Base Plate options	Part number 146-083 for Support Plate-3 (3 projectors)
	Part number 146-082 for Support Plate-2 (2 projectors)

Product Warranty

Vega warrants that all products supplied are free from labour and material defects, and will repair or replace (at its option) the whole or any part of the products found to be faulty. This warranty is valid for 12 months from the date of dispatch. Vega is not to be liable for any charge beyond the point of delivery, including installation, alignment or testing. To claim under warranty the product must be returned to the manufacturer.

Specifications Subject to Change

Vega's LED Projectors will promptly incorporate suitable new high-performance LED's as they become available. This will lead to increased energy efficiency, improved output intensity and improved colours. Please check with Vega Industries Limited for the most recent information.

EMI EMC Performance

It is intended that the VLS-46 will comply with the following standards for EMI radiation, protection against static electricity discharge and surge protection typical of lightning sources:

EN 55015:	Radiated and Conducted Emissions
EN 61000 - 4 - 2:	1995 Electrostatic Discharge Immunity
EN 61000 - 4 - 5:	1995 Class 3 Surge Immunity

Quick Reference Information

Important notes

Before doing any work on the projector always observe the following:

- Always disconnect any solar panels before disconnecting the battery
- Always connect the battery before connecting any solar panels
- Never exceed 35.0V at positive battery terminal of a projector. A supply voltage greater than 35.0V will cause internal damage and void warranty
- If using the VLF-43 Flasher never exceed 18.0V at positive battery terminal. A voltage greater than 18.0V will cause internal damage and void warranty

Cable Connections (see diagram inside front cover)

Cable Colour		Function	CAUTION	CHECK POWER SUPPLY VOLTAGE
Red	Brown	Battery positive + ve	(9 to 35 V DC)	
Black	Blue	Battery negative - ve	(Do NOT connect to frame or earth)	

Eye Safety with high power LED light

Document	Description
IEC EN 60825-1	Safety of laser products – Part 1: Equipment classification, requirements and user's guide

This light has a fixed character.

Power on = light on.

Nominal operating voltage 12V DC

MAXIMUM OUTPUT OF LED RADIATION: 300 mW
EMITTED WAVELENGTHS 400 TO 700 nm
IEC 60825-1:1993+A1:1997+A2:2001

External Accessories

Part Number: 146-780 VLS-46 – Installation and Operation Manual

Options

Part Number: 143-250 Vega LDR Assembly, daylight switch rated to 3A, for mounting in an M20 cable gland.

Part Number: 143-500 Vega VLF-43 Flasher with daylight switch and 4-way junction box (1 per 4 projectors - only available for 12 volt operation).

Vega GPS Receiver 12V Synchronization of projector(s) via GPS satellites (1 per site) (part number depends on choice of options - only available for 12 volt operation).

AC power supply To operate this projector from an external source 110V or 240V AC use a power converter, with a well regulated 12V 200 mA output per projector.

Section 1: Overview and Special Features

1.1 Introduction

The Vega VLS-46 LED sector light projector is an energy-efficient marine projector, in the range of colours used for marine navigation aids. It uses a light-emitting diode (LED) as the light source.

The projector gives a narrow angle fixed single colour signal.

For all colours the projector vertical beam spread is:

$\pm 1.5^\circ$ at 100% intensity
$\pm 2.0^\circ$ at 80% intensity at edge of sector.

For all colours the horizontal beam spread is dependent on the setting of the aperture plates:

Minimum setting at 100% intensity	$\pm 0.25^\circ$
-----------------------------------	------------------

Maximum setting at 100% intensity	$\pm 2.5^\circ$
-----------------------------------	-----------------

Maximum setting at 80% intensity at edge of sector	$\pm 2.75^\circ$
--	------------------

Boundary resolution	3 minutes of arc
---------------------	------------------

To use this light as a marine aid to navigation an external daylight switch and flasher are required.

The Vega VLF-43 Beacon Flasher can be used for this purpose if the operating voltage is 12V.

1.2 Factory Sealed for Life

This projector is sealed by means of O rings and should not be opened in the field. The pressure equalisation membrane (breathing vent) forms part of the seal and must not be damaged in any way. It is not necessary to open the projector in the field unless the aperture plates require adjustment for horizontal sector angle. The LED is designed to last the full life of the projector (up to 10 years depending on flash character), and no provision is made for replacement.

1.3 External Features

The smooth exterior aluminium body stays clean longer and does not accumulate grime and salt spray with occasional washing by rainfall.

1.4 Temperature Profiles

Each colour LED has a different temperature profile. The current is adjusted automatically with temperature to maintain a constant light output. For some colours it is not possible to maintain a constant intensity output across the full ambient temperature range because of the nature of the LED substrate. This is particularly noticeable with yellow, and to a lesser extent with red projectors.

1.5 Projector Operation

The LED will illuminate as soon as power is applied, and extinguish as soon as power is removed.

The output intensity is pre-set to order at time of manufacture and cannot be adjusted by the user.

The horizontal sector angle (position of aperture plates) can be pre-set to order at time of manufacture. If adjustment of the sector angle is required, see section 2.7.

1.6 Power Calculation

The VLS-46 LED Sector Light projector consumes 1.4 Watt power at 12V for a 10 NM range with a fixed character. Refer to section 6 for operation with a flash character.

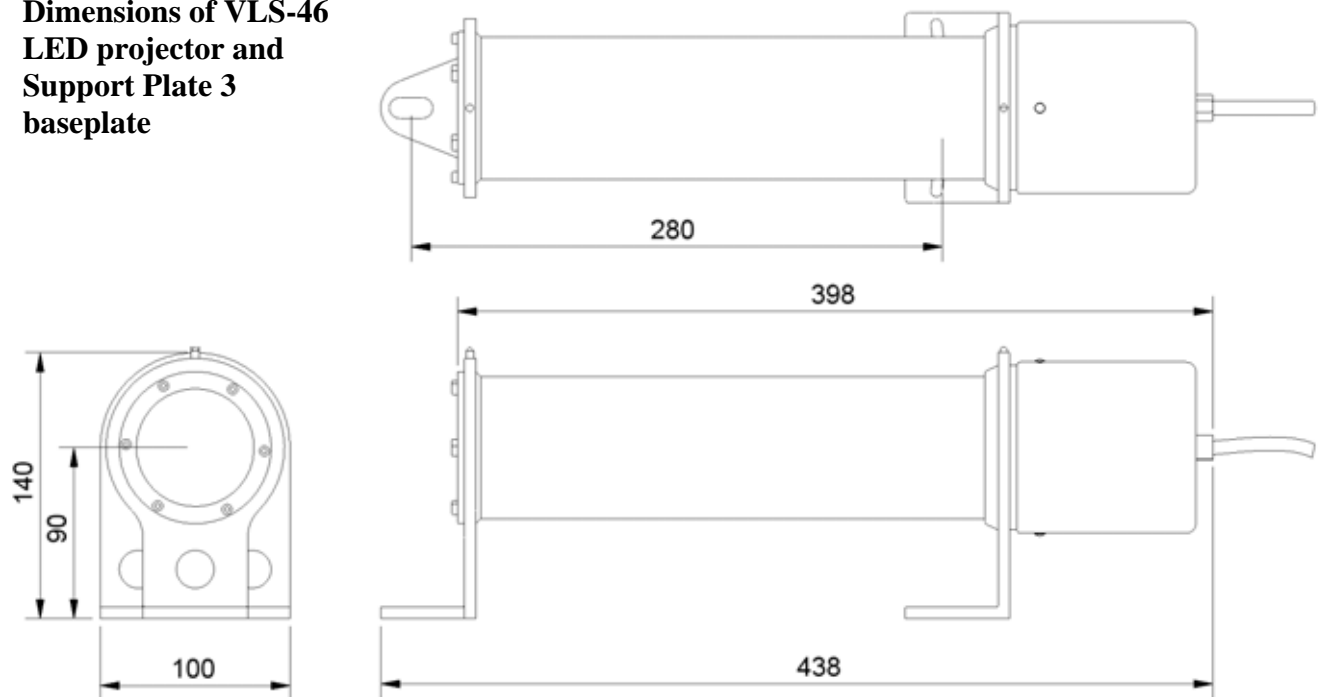
1.7 Night Range for Transmissivity Factor $T=0.74$

The range that the light will be visible can be factory set at time of order for a night range of between 6 NM to 10 NM at $T=0.74$. With a maximum intensity output of 2000 candela, the day range is limited to 0.6 Nautical miles.

1.8 Vega optional equipment (VLF-43 Flasher and GPS Receiver 12V)

A complete precision entrance light can be assembled by using three VLS-46 LED projectors mounted on a base plate. For an installation that requires a flash character and day/night switch (by means of a light dependent resistor LDR) the VLF-43 Flasher can be added. If synchronisation of multiple entrance lights is required one Vega GPS Receiver can be added per site.

Dimensions of VLS-46
LED projector and
Support Plate 3
baseplate



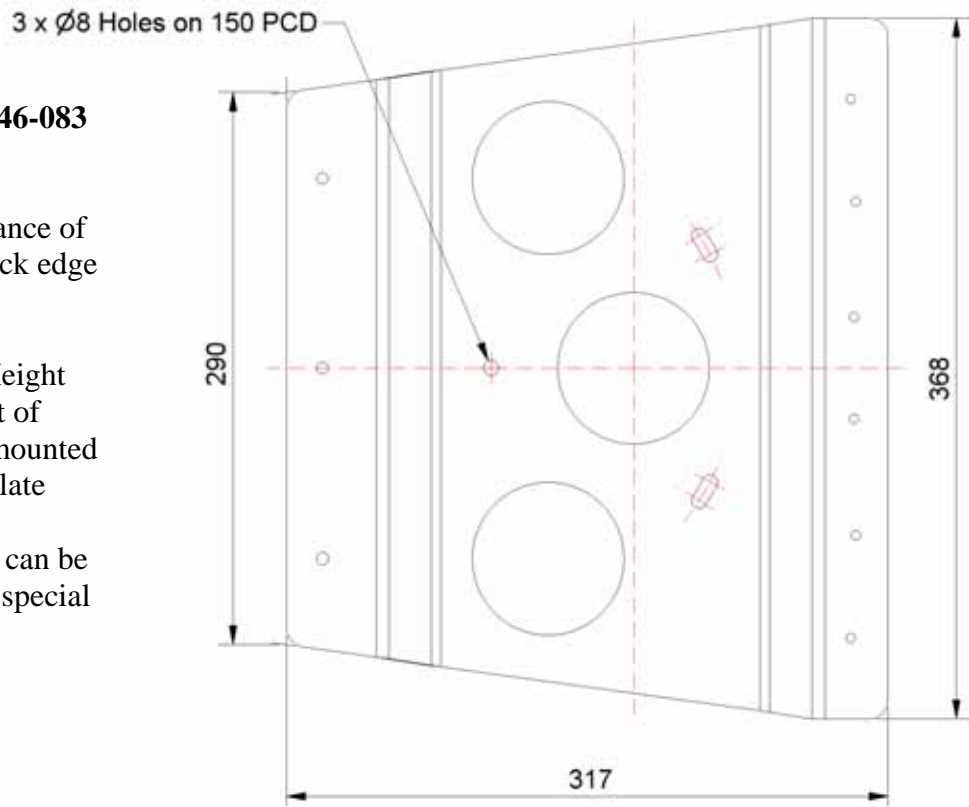
Front view	Plan view and Side view
Height 140 mm	Projector Length 398 mm
Focal Height 90 mm	Overall length including front foot 438 mm
Base width 100 mm	Mounting bolt separation 280 mm PCD
Cable gland at centre of rear cover, allow space at rear of projector for power cable bend radius (50 mm).	Three mounting holes (slotted), one ahead of front objective lens, inside diameter 6mm, and two on rear support foot under projector barrel, inside diameter 5mm.

Part number: 146-083
Support Plate 3

Allow rear clearance of 118 mm from back edge of support plate.

Add 20 mm to Height and Focal Height of projector when mounted on this support plate

Other baseplates can be manufactured to special order.



Section 2: Fixing the Projector in Place

There are no user serviceable parts in the projector.

Open the rear cover of the projector only to adjust the position of the aperture plates if the sector angle was not factory set at time of order. This is described in section 2.7.

2.1 Mounting Structure

The tower can be located anywhere on the extended centreline of the desired track. Moving the tower back from the point of closest approach can help to reduce the undesired effect of the beam becoming narrower and more intense for the pilot. Other considerations are ease of access for maintenance, security against unauthorised access, availability of existing structure, and level of background lighting in the viewing direction (consider day and night separately).

2.2 Height of Tower

The best elevation is at the height of the bridge of the largest vessel. This enables the beam to be set to horizontal. Check that there is adequate vertical divergence for the Sector Light to be visible in all required positions. It is acceptable to incline or decline the barrel up or down a degree or so. The barrel is exactly parallel to the centreline of the beam.

2.3 Outside in all Weathers

The platform needs to be stable enough to support the LED Light in all wind and weather conditions. It must not deflect significantly under wind loads, otherwise the intense but narrow beam will not always be visible to mariners. The light is designed to operate outside in all climates so no additional housing or protection is necessary. If installed inside a lighthouse or other building avoid having the beam pass through a glass window, as this will reduce the intensity of the beam and could reduce the boundary sharpness. In preference have the barrel protrude to the outside and seal with a flexible membrane around the barrel.

2.4 Provision for Servicing Access

For low towers where security is an issue, the light can be installed and maintained by cherry picker. If a standing platform is to be provided the LED projector should be mounted as though on a small table above the floor. The safety railing would be the safe working height and the light beam would pass over or under the railing. Generous space for the maintenance technician must be allowed for removal of the rear cover for aperture plate individual alignment if required.

2.5 Mounting the VLS-46

Stainless steel machine screws or studs of 6mm diameter for the front foot and 5 mm diameter for the rear foot should be used to mount the projector. The pitch circle diameter between front and rear slotted holes is 280 mm. The projector base should be fitted with insulating bushes to isolate the aluminium projector base from mounting fixtures and fasteners. This prevents corrosion between dissimilar metals as occurs particularly in saltwater environments. If the mounting surface is a conducting material then use a layer of insulating material between the mounting surface and the projector base to prevent electrolytic corrosion.

2.6 Levelling and alignment

The projector must always be level in roll and pitch axes. Use a builders spirit level to check the mounting surface before attaching the projector. It may be desirable at high elevation sites to tilt the beam downwards a fraction of a degree. External shims may be inserted under the rear mounting foot for this purpose. Adjust the angle of elevation of the beam so that the vertical centre is at the average height of a ship's bridge at the maximum range at which the light is used. Align the sector pattern in azimuth using an observer located on the boundary between two adjacent sectors. Sector positions should be checked by survey, and the location of the sector boundaries should be verified from the waterway before commissioning.

2.7 Single Projector Aperture plates adjustment

Turn off the power before performing this procedure.

2.7.1 Removal of rear cover

- Push the rear cover towards the front of the projector and then rotate counter-clockwise 10° when viewed from back of projector.
- Gently pull the rear cover backwards away from the rear mounting foot.
- When free from the O-ring, move cover horizontally until clear of the printed circuit board.
- The power cable remains attached to the rear of the printed circuit board.
- Lay the cover down behind the projector body



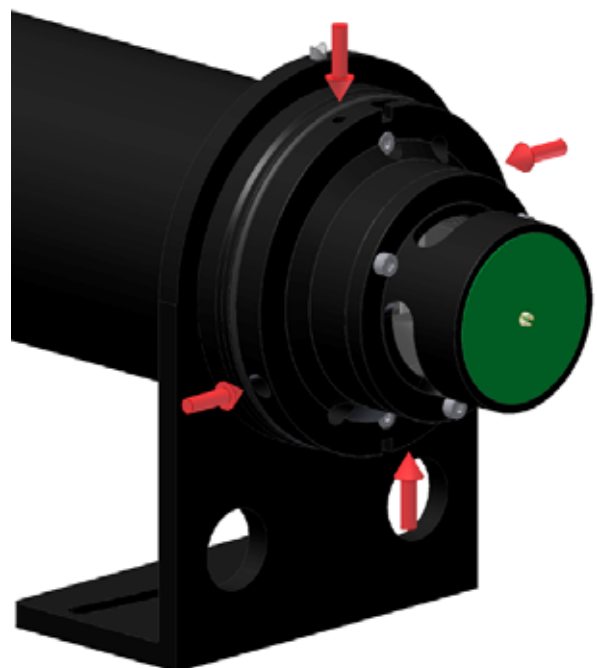
SINGLE PROJECTOR REAR COVER VIEW WITHOUT CABLE

2.7.2 Location of locking and adjustment screws

The four cylindrical arrows on this picture show the location of the locking grub screws (vertical arrows) and aperture plate adjustment screws (horizontal arrows).

The aperture plates are adjusted individually, they are not linked together. These plates can only be moved horizontally. Vertical divergence is fixed.

Power cable and rear cover not shown.



REAR OF PROJECTOR WITH COVER REMOVED

2.7.3 Adjustment of aperture plate

- Position of the hex keys shown is for adjustment of the right hand side aperture plate when viewed from front of the projector. Anti-clockwise rotation moves the aperture plate outwards.
- The vertical locking grub screw hex key size is 1.5 mm. Release both lock screws before attempting aperture plate adjustments.
- The horizontal aperture plate adjustment screw hex key size is 2.5 mm. One complete turn inserts or retracts the aperture plate about 0.09°
- If the aperture plate is closed (inserted) until it reaches a mechanical stop it is set at 0.25° from the beam centre line. Do not force the plate further, the threads may be damaged.
- Horizontal beam sector angle is minimum at 0.5° if both aperture plates are fully inserted.
- Set the required half sector angle for the right hand side aperture plate, then repeat this setting for the left hand side aperture plate.
- Set both locking grub screws when adjustments are complete.



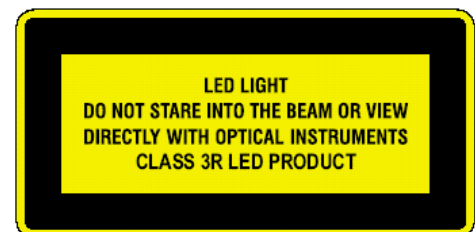
FRONT VIEW FOR APERTURE PLATE ADJUSTMENT

2.7.4 Attachment of rear cover

- Make sure the inside of the projector is clean and dry
- Lubricate the O-ring if required
- Be careful not to pinch the power cable or damage the sealing O-ring when replacing the cover
- Reverse the procedure described for removal of the rear cover in section 2.7.1.

2.7.5 Check required sector angle

Mount the projector on site, apply power and when *viewing from long range*, check the sector angle size and position.



2.8 Twin projector boundary adjustment

The required sector angle for each projector should be adjusted individually as per section 2.7. if not pre-set at the factory at time of manufacture.

The light beam from each projector will cross over in the horizontal plane before reaching the target distance (the control point) in the marked channel.

The outer horizontal edge of each projector beam (not the body of the projector) should be almost parallel when the two projectors are setup on the baseplate.

This setup has to be confirmed when **viewing from long range**, so that there is a clear transition from one colour sector to the other, without loss of light.

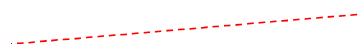


Green

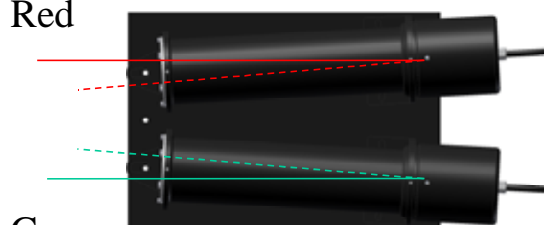


Red

Minimum sector overlap
at control point distance



Red



Green

DISTANCE FROM PROJECTOR TO CONTROL POINT CAN BE UP TO 10 NAUTICAL MILES.

2.9 Triple projector boundary adjustment

The required sector angle for each projector should be adjusted individually as per section 2.7. if not pre-set at the factory at time of manufacture.

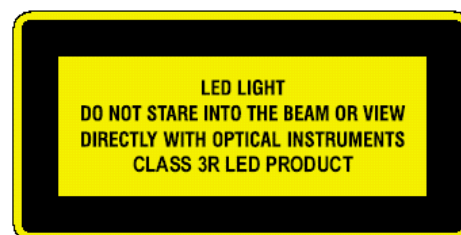
The light beam from each of the outer projectors will cross over the beam of the centre projector in the horizontal plane before reaching the target distance (the control point) in the marked channel.

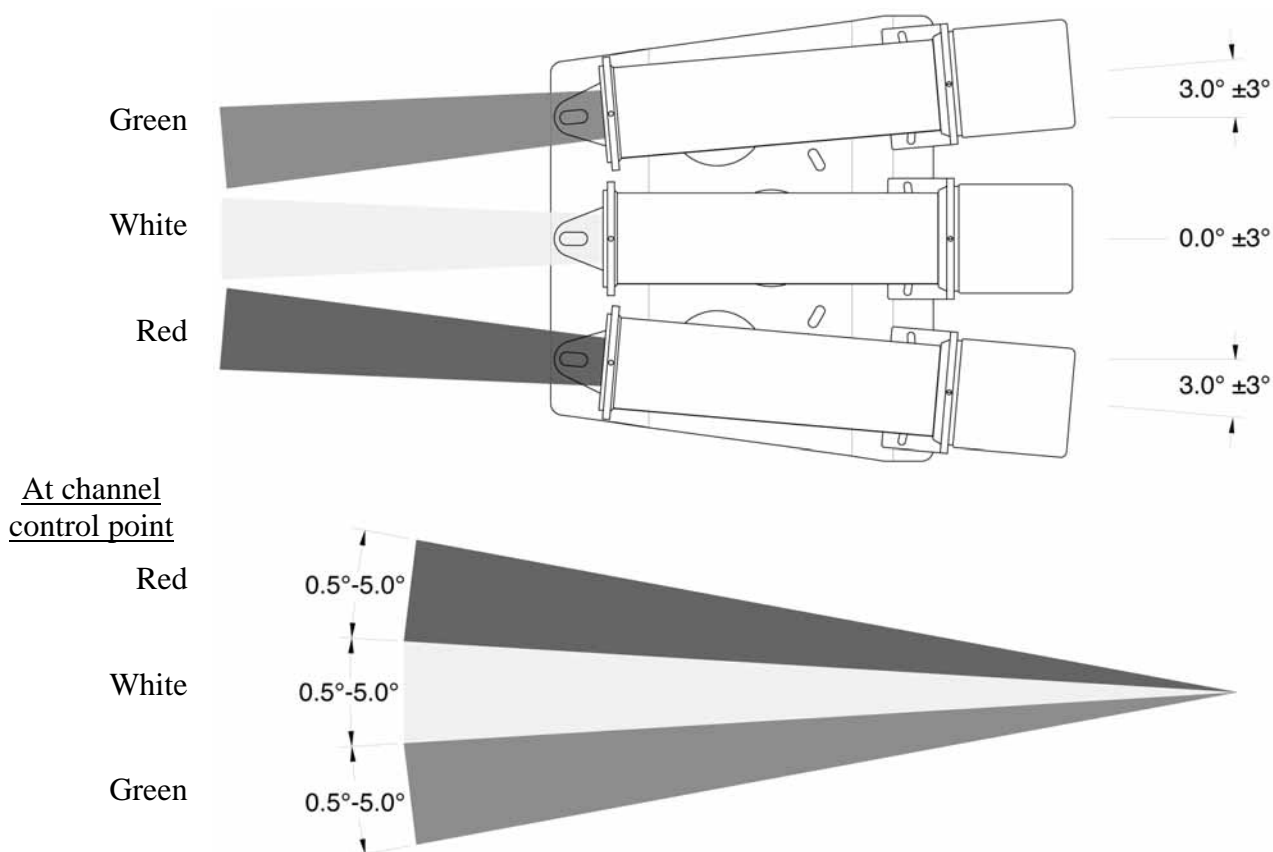
The position of the centre projector and baseplate should be adjusted on site for correct placement of this colour sector at the control point in the marked channel.

This setup has to be confirmed when **viewing from long range**, so that the centre sector boundaries are at the required positions.

The position of each outer projector is then adjusted on site for correct placement of their colour sector in relation to the centre sector at the control point in the marked channel

This setup has to be confirmed when **viewing from long range**, so that there is a clear transition with minimum overlap from one colour sector to the other, without loss of light.





RANGE OF SECTOR ANGLE ADJUSTMENT – TRIPLE PROJECTOR ENTRANCE LIGHT

Section 3: Projector Operation

3.1 Basic Operation

The LED Sector Light is a light source which projects an enlarged rectangular aperture shape to a very considerable distance. The sector colours are created from an individual LED per projector. All sectors appear at uniform intensity. These signal colours are defined on marine charts, enabling navigators to identify the sector in which their vessel is placed. These fixed sectors are recognisable by colour alone (normally red, white and green), and by application of a flash character for the complete projection system for all colours.

In an optical projection system at least 0.5% of the light will be scattered by the last lens surface, and even more if the lens is not completely clean. In the case of a powerful sector light there can be enough stray light for an observer outside the beam to think he or she is inside the beam.

3.2 Temperature Compensation

The temperature is measured every four seconds. This measurement is used to adjust the LED current to compensate for variations in light output with temperature.

3.3 LED Operating Current and Colour

The LED current depends on the type and colour of LED being used, as well as temperature, range selected, and length of the flash character. Each circuit board is individually aligned at the factory for the LED colour installed with the board. LEDs and circuit boards should not be interchanged.

3.4 Day/Night Detection

An external switch is required if the projector is to be operated only at night. The optional Vega LDR Assembly for a load of up to 3 amps, or the VLF-43 Flasher with LDR switch can be

specified. The VLF-43 internal daylight switch can drive a load up to 3 amps at 12V. See section 6 for details of either device.

3.5 Sync Operation (cable connection)

The VLF-43 Flasher will accept a synchronization pulse but will not generate one. When a falling edge is seen on the sync wire with respect to common negative, the flash character is restarted. Sync pulses should be 10 mS and are de-bounced in software for 50ms. The pulse should be from an external voltage free normally open contact between sync and the negative connections.

Section 4: Wiring Connections

4.1 Power Supply Requirements

The input supply voltage range to the projector is between 9 to 35 VDC, for nominal operating voltages 12V or 24V DC battery bank with well regulated charging from AC mains or by solar or wind energy. The operating voltage should never exceed 35.0V as this will damage internal components and void the warranty. Reverse polarity and internal transient voltage protection is built in. Do not earth or ground any of the positive or negative battery connections. If a mains-based power supply is used, it is strongly recommended that the projector is connected to a battery, and the mains used to float charge the battery using a switched-mode regulator type charger.

Caution: *If the VLF-43 Flasher is used with this projector the input supply voltage must not exceed 18.0V as this will damage internal components and void the warranty.*

4.2 Identification and Termination of Wires to a Junction Box

Do not mount any junction box for the cable higher than the base of the projector.

The VLS-46 LED projector is supplied complete with a 1.5 metre length of double insulated 2 core 0.75 mm² cable already sealed into the cable gland. Take care not to loosen or disturb the gland and break the seal. If cutting the power cable shorter from that supplied, the end user must tin each cable core and reseal both external sheath and internal cores with heatshrink and marine sealant. Wiring identification is give on page 4 with a wiring diagram on page 2.. Keep cable lengths as short as possible to minimise voltage drop from the battery.

Multiple projectors can be operated with a flash character when connected via one or more VLF-43 Flasher with LDR and 4-way junction box.

Any set of projectors at a site that require synchronisation to other beacons can use the optional Vega GPS Receiver 12V. All equipment on site has to use a common battery negative as this is the return circuit for sync pulses.

4.3 Final Checks

Ensure all cables are securely attached, and will not rub against anything that might cause damage. No cable should obscure any projector. To turn the projector on in daytime with power connected, cover the external daylight switch. ***Only view this navigation light from long range, do not look directly into the projector at close range.***

Check that the LED lights, and check the flash character with a stopwatch if an external flasher is used. Remember to remove any daylight switch covers before leaving the site.



Section 5: Power Calculations

Note that these calculations assume the temperature is 25°C and the battery is supplying 12.0V. Energy use (Amp-hours) will increase if the temperature is higher or if the battery voltage is lower.

Table 1: Output Intensity and projector current for VLS-46 (at 25°C)

Use these projector operating current figures in this table to calculate individual daily energy use.

Quiescent current at night for VLL-43 Flasher is 7 milliamps and for day mode is 0.5 milliamps.

Operating Current Tolerance $\pm 10\%$	Horizontal Effective Intensity (candela)			
	166 minimum	500 minimum	1740 minimum	2250
RANGE	6 NM	8 NM	10 NM	
COLOUR	Projector Current (mA) Fixed Character at 12.0V DC			
Red	10	30	100	NA
Green	10	20	80	120
White	10	20	80	120

NA – Not available in Red.

5.1 Determine Daily Energy Use

Operating Hours at night	<input type="text"/>	A	Worked Example = 14 hours per night
Maximum Projector Intensity	<input type="text"/>	B	= 2,250 cd
LED colour	<input type="text"/>	C	= Green
Fixed character projector current (mA) from Table 1	<input type="text"/>	D	= 120 mA at 12.0V
Flash Character (Tables in Section 8)	<input type="text"/>	E	= Fixed
Duty cycle (from Flash Character Table)	<input type="text"/>	F	= 1.0
Night On Energy = (includes VLF-43) (7mA + (D * F)) * A	<input type="text"/>	G	= (7 + (120* 1.0)) * 14 = 1778 mAh
Night Off Energy = 7mA * (1-F) * A	<input type="text"/>	H	= 7 * 0.00 * 14 = 0 mAh
Day Off Energy = 0.5mA * (24 - A)	<input type="text"/>	J	= 0.5 * 10 = 5mAh
TOTAL (Milliamp-hrs/day) = G + H + J (for 12V supply)	<input type="text"/>	K	= 1778 + 0 + 5 = 1783 mAh /day

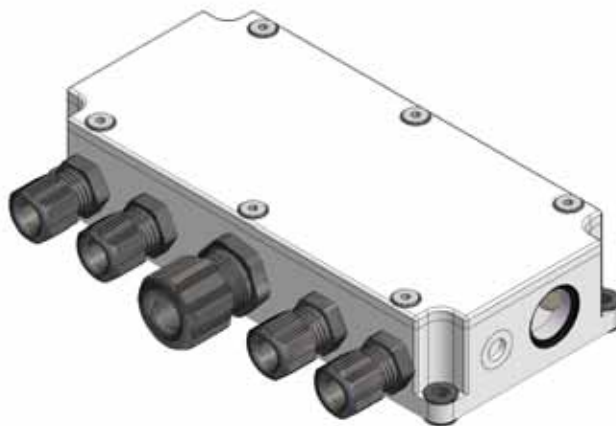
Section 6: Daylight Switch, Flash Characters and Synchronisation

6.1 Daylight Switch Only

The user can add an external daylight switch for night only operation of the projector if a fixed character is all that is required. The Vega LDR Assembly (light dependent resistor), part number 143-250 can be used for this purpose. It will fit into an M20 cable gland that can be mounted on the side of a junction box. This LDR Assembly is capable of switching a load of up to 3 amps at 12V. The ambient light level at which the light-sensing device is activated cannot be adjusted.

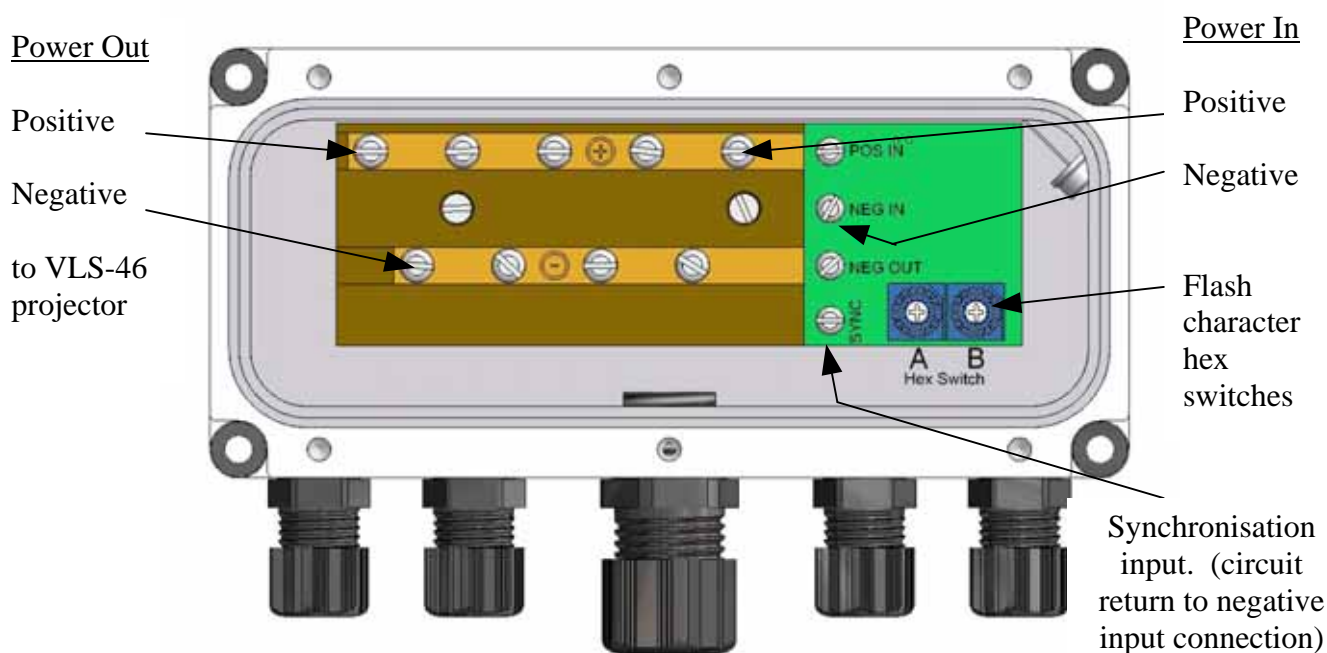
6.2 Daylight Switch and Flash Character

If a flash character is required, the Vega VLF-43 Flasher with LDR and 4-way Junction Box, part number 143-500 can be used. A wide range of flash characters are available, see table in Section 8. There is limited room in memory for extra characters.



VLF-43 Flasher with LDR and 4-way junction box

- The marine-grade aluminium enclosure is fully waterproof for outdoor use, has high strength and impact resistance, and includes a pressure equalisation membrane that allows air exchange but blocks moisture.
- This junction box complete with electronic flasher enables connection of up to four 12V DC lights on a single station with maximum load of 3 Amps. The flasher can be set to any of the stored flash characters by means of simple hex switch adjustment.
- The built in light dependent resistor daylight switch allows fully automatic switching of the connected lights, on at dusk and off at dawn for unattended operation. Optimal mounting of the VLF-43 Flasher should place the photocell window with an unobstructed view of the horizon away from the equator. Special units can be supplied with the LDR switching the lights on at dawn and off at dusk. The ambient light level for activation cannot be adjusted.
- Reverse Polarity Protection is built into the junction box. The flasher is designed to operate from a 12V DC battery with AC, solar or wind power charge controller. Maximum ratings are 10 – 18 V from a well regulated DC supply. Transient protection is built in. Power consumption of the flasher is 0.007 Amps at night (plus the load current of connected lights). The quiescent current is 0.0005 Amps during the day.
- A Synchronisation Pulse on the green/yellow sync wire in the battery cable resets the flash character of the connected lights from an external source (e.g. Vega VLB beacon or GPS Receiver). The required sync pulse is a >1 ms duration connection to negative battery.
- This flasher does not generate sync pulses, nor does it have a delay option on receipt of sync pulses.



CONNECTIONS TO VLF-43 FLASHER

6.3 Setting the Flash Character with the VLF-43

To access the hex switches for flash character setting, remove the 6 screws holding the lid of the junction box with a 2.5mm Allen key. A small screwdriver can be used to adjust the hex switches. This code can be changed dynamically with power connected.

On re-seating the lid for closure always check that the inside of the junction box is clean and dry, and the O-ring is correctly placed without distortion to maintain a waterproof seal.

6.4 Synchronisation

The sync wire is used for multiple VLF-43 units so that they flash in unison. The time between sync pulses from a voltage free normally open contact must be the same, or an exact multiple period of the flash character period of each VLF-43 Flasher.

If sync is required an external sync generator is necessary, as these VLF-43 Flashers cannot generate sync pulses, only accept them. Isolate the sync wire if not used.

6.4.1 Synchronising Several Projectors or Beacons on the Same Site

The “hard sync” wires of all the VLF-43 Flashers are connected together and then to a sync generator. The VLF-43 Flashers and sync generator must all have a common negative connection. If cable lengths are long use shielded cable and do not exceed 10 metres when this facility is used.

6.4.2 Synchronising VLF-43 Flashers on Separate Sites

VLF-43 Flashers further than 10 metres away from each other can be synchronised using separate sync generators which are themselves synchronised in some way e.g. by radio or time code from global positioning satellites.

6.4.3 Sync Generation

The sync generator should connect via a voltage free contact the synchronisation wire to the negative battery wire for a duration of 10 milliseconds. Maximum connection loop resistance is 400 ohms. An optomos is a suitable switching device, as it provides electrical isolation. One option for a sync generator is the Vega GPS Receiver 12V unit.

6.4.4 GPS Receiver Introduction

The Vega GPS Receiver, is only available for 12V operation. This receiver updates its internal clock from time information (coordinated universal time UTC) from GPS satellites. This internal clock generates sync pulses at intervals set by the user. The interval duration between sync pulses must be the same, or an exact multiple, of the programmed flash character period in the VLF-43 Flasher. The Flasher, or multiple Flashers linked at the same site, are synchronised to the GPS Receiver 12V internal clock.



6.4.5 Synchronisation Accuracy with GPS Receiver

Where two or more projectors or beacons on different sites are required to be in-sync using a GPS Receiver 12V on each site, the clock update interval for each GPS Receiver has to be as short as possible. The mariner may identify projectors as "out-of-sync" if the time difference for start of character is as short as 20 milli-seconds from different sites.

To maintain accurate multi-site synchronisation, the update period for the GPS Receiver 12V internal clock should not exceed 15 minutes, and if sufficient power capacity is available an update every 5 minutes is preferred.

6.5 Specifications, Optional Vega GPS Receiver 12V

Electronics

Active Mode Duration	Typical update time is <1 minute, first fix within 15 minutes (s/n G-0070 & above)
Update Interval	Satellite update programmable between 2 minutes to 12 hours (14 steps)
Synchronisation	Positive or negative polarity with 10 or 60 millisecond pulse duration (s/n G-0070 & above)
Sync Flash Period	Programmable between 1.0 to 30.0 seconds (23 steps)
Reverse Polarity	Diode protected against reverse polarity connection (April 2003 onwards)
Data Transfer	Proprietary RS485 to VegaTEL with 6 wire cable, sync pulse only with 3 wire cable

Power Requirements

Input Voltage	Nominal 12VDC battery with AC, solar or wind power charge controller
Maximum Ratings	10 - 24V from well regulated DC supply (April 2003, serial no: G-0052 onwards) 10 - 18V (pre April 2003, up to serial no: G-0051 unless modified)
Power	Active mode 35 mA (s/n G-0070 & above), 117.0 mA for earlier serial numbers
Quiescent Current	Sleep mode 4 mA (s/n G-0070 & above), 6.2 mA for earlier serial numbers

Enclosure

Material	DT 5008 Marine Grade Aluminium, anodised to 12μ
Top Cover	Epoxy GRP
Sealing	Sikaflex sealant on top cover, O-ring on plastic plug

Environmental

Acceleration	Rated to 40g in all directions
Temperature	-40°C to +60°C
Salt	Rated for continuous exposure to salt water and spray
Wind	Rated to withstand winds to 100+ knots
Cooling	Natural radiation only

Dimensions

Without connector	91.5 diameter x 114.2 high
Bare Weight	480 grams
Mounting	Female thread M25 x 1.5, cable through centre
Plug on Base	Amphenol C16 female connector, add 29 mm height
Pole Mount Adapter	Use 2 x 25 mm saddle or hose clip, add 110 mm height

Further details of the GPS Receiver 12V are available on request from Vega.

Section 7: Routine Maintenance

7.1 Projector Materials

The enclosure is anodised marine-grade aluminium suitable for a service life of more than 10 years.

7.2 Sealing

The VLS-46 LED sector light projector is sealed against the ingress of moisture, dust, insects and other environmental contaminants. The lens cover is sealed to the aluminium body with polyurethane sealant, and metal-to-metal joints are sealed with O-Rings. Because the projector does not need to be opened for relamping, these seals can remain undisturbed for the life of the projector. A small vent is incorporated in the rear cover of the projector to enable the internal pressure to equalise with the outside. A high-resistance semi-permeable membrane across the vent allows the passage of air but not moisture. The membrane is fragile so keep foreign objects away and don't let the projector sit in a pool of water. Do not let water accumulate in the battery box.

7.3 Cleaning

Use warm soapy water to wash the outside of the projector. Rinse off with clean water. Do not use any solvent-based cleaner. Clean the external surface of the objective lens at intervals (say 90 days). This period may need to be shortened if reduced definition of the sector boundaries or overall intensity reduction is reported.

7.4 Inspection

Check that the projector remains firmly secured and level, and that the plastic insulating bushes around the mounting fasteners are still intact. Investigate any corrosion and take appropriate preventive action. Check the LED is operational at each service visit.

7.5 Intensity Monitoring

The light output from the LED gradually reduces after some years of use; this is normal. The initial output of the projector at manufacture is stated in Table 1 and is 10% higher than the required intensity to meet the stated visibility range of 10 NM with transmissivity factor $T=0.74$.

7.6 Trouble shooting table

Apparent problem	Possible Cause Remedy
Loss of Intensity or Change in Intensity Profile	<ul style="list-style-type: none"> dirty optical surfaces, clean with warm soapy water, dry with tissue water between lenses dry with clean tissue paper, replace O-ring seal LED output degradation, plan for programmed replacement
Poor Sector Resolution	<ul style="list-style-type: none"> dirty optical surfaces clean with warm soapy water, dry with tissue cracked condenser lens, replace lens scratched or weathered objective lens, replace lens
LED Inoperative	<ul style="list-style-type: none"> Power supply failure, repair or replace Circuit board fault, repair or replace Flasher fault, repair or replace

Section 8: Table of Stored Flash Characters VLF-43

Flash characters are the same as stored in the Vega Remote Sensor Programmer RSP Flash Character Table dated 4 July 2002, Rev 2.0 (without custom flash characters). Correction for duty cycle, code A4 and A5 1st September 2004

Hex Sw	Description	Junction Box Flasher 143-500						V 1.03		le / lo Ratio	Duty Cycle
		On	Off	On	Off	On	Off	On	Off		
00	Fixed	continuous								1.0000	1.00
01	ISO 2s	1.00	1.00							0.8333	0.50
02	ISO 3s	1.50	1.50							0.8804	0.50
03	ISO 4s	2.00	2.00							0.9091	0.50
04	ISO 5s	2.50	2.50							0.9294	0.50
05	ISO 6s	3.00	3.00							0.9432	0.50
06	ISO 8s	4.00	4.00							0.9546	0.50
07	ISO 10s	5.00	5.00							0.9615	0.50
08	OC 1.25s 0.75	0.75	0.50							0.7933	0.60
09	OC 3s 2.0	2.00	1.00							0.9091	0.67
0A	OC 3s 2.5	2.50	0.50							0.9294	0.83
0B	OC 3.5s 2.5	2.50	1.00							0.9294	0.71
0C	OC 4s 2.5	2.50	1.50							0.9294	0.63
0D	OC 4s 3.0	3.00	1.00							0.9432	0.75
0E	OC 5s 3.0	3.00	2.00							0.9432	0.60
0F	OC 5s 4.0	4.00	1.00							0.9546	0.80
10	OC 5s 4.5	4.50	0.50							0.9583	0.90
11	OC 6s 4.0	4.00	2.00							0.9546	0.67
12	OC 6s 4.5	4.50	1.50							0.9583	0.75
13	OC 6s 5.0	5.00	1.00							0.9615	0.83
14	OC 7s 4.5	4.50	2.50							0.9583	0.64
15	OC 8s 5.0	5.00	3.00							0.9615	0.63
16	OC 8s 6.0	6.00	2.00							0.9667	0.75
17	OC 9s 6.0	6.00	3.00							0.9667	0.67
18	OC 10s 6.0	6.00	4.00							0.9667	0.60
19	OC 10s 7.0	7.00	3.00							0.9709	0.70
1A	OC 10s 7.5	7.50	2.50							0.9728	0.75
1B	OC 12s 8.0	8.00	4.00							0.9756	0.67
1C	OC 15s 10.0	10.00	5.00							0.9804	0.67
1D	OC(2)8s 3.0 2.0	3.00	2.00	1.00	2.00					0.8333	0.50
1E	OC(2)8s 5.0 1.0	5.00	1.00	1.00	1.00					0.8333	0.75
1F	LFL 5s 2.0	2.00	3.00							0.9091	0.40
20	LFL 6s 2.0	2.00	4.00							0.9091	0.33
21	LFL 8s 2.0	2.00	6.00							0.9091	0.25
22	LFL 8s 3.0	3.00	5.00							0.9432	0.38
23	LFL 10s 2.0	2.00	8.00							0.9091	0.20
24	LFL 10s 3.0	3.00	7.00							0.9432	0.30
25	LFL 10s 4.0	4.00	6.00							0.9546	0.40
26	LFL 12s 2.0	2.00	10.00							0.9091	0.17
27	LFL 15s 4.0	4.00	11.00							0.9546	0.27
28	FL 1.5s 0.2	0.20	1.30							0.5000	0.13
29	FL 1.5s 0.3	0.30	1.20							0.5900	0.20
2A	FL 1.5s 0.4	0.40	1.10							0.6615	0.27
2B	FL 1.5s 0.5	0.50	1.00							0.7143	0.33
2C	FL 2s 0.2	0.20	1.80							0.5000	0.10
2D	FL 2s 0.3	0.30	1.70							0.5900	0.15
2E	FL 2s 0.4	0.40	1.60							0.6615	0.20
2F	FL 2s 0.5	0.50	1.50							0.7143	0.25
30	FL 2s 0.7	0.70	1.30							0.7821	0.35

Hex Sw	Description	Junction Box Flasher 143-500						V 1.03		I _e / I _o Ratio	Duty Cycle
		On	Off	On	Off	On	Off	On	Off		
AB	Flash Character										
31	FL 2s 0.8	0.80	1.20							0.8030	0.40
32	FL 2.5s 0.3	0.30	2.20							0.5900	0.12
33	FL 2.5s 0.5	0.50	2.00							0.7143	0.20
34	FL 2.5s 1.0	1.00	1.50							0.8333	0.40
35	FL 3s 0.2	0.20	2.80							0.5000	0.07
36	FL 3s 0.3	0.30	2.70							0.5900	0.10
37	FL 3s 0.4	0.40	2.60							0.6615	0.13
38	FL 3s 0.5	0.50	2.50							0.7143	0.17
39	FL 3s 0.6	0.60	2.40							0.7535	0.20
3A	FL 3s 1.0	1.00	2.00							0.8333	0.33
3B	FL 4s 0.2	0.20	3.80							0.5000	0.05
3C	FL 4s 0.3	0.30	3.70							0.5900	0.08
3D	FL 4s 0.4	0.40	3.60							0.6615	0.10
3E	FL 4s 0.5	0.50	3.50							0.7143	0.13
3F	FL 4s 0.6	0.60	3.40							0.7535	0.15
40	FL 4s 0.8	0.80	3.20							0.8030	0.20
41	FL 4s 1.0	1.00	3.00							0.8333	0.25
42	FL 4s 1.5	1.50	2.50							0.8804	0.38
43	FL 5s 0.2	0.20	4.80							0.5000	0.04
44	FL 5s 0.3	0.30	4.70							0.5900	0.06
45	FL 5s 0.5	0.50	4.50							0.7143	0.10
46	FL 5s 0.9	0.90	4.10							0.8195	0.18
47	FL 5s 1.0	1.00	4.00							0.8333	0.20
48	FL 5s 1.5	1.50	3.50							0.8804	0.30
49	FL 6s 0.2	0.20	5.80							0.5000	0.03
4A	FL 6s 0.3	0.30	5.70							0.5900	0.05
4B	FL 6s 0.4	0.40	5.60							0.6615	0.07
4C	FL 6s 0.5	0.50	5.50							0.7143	0.08
4D	FL 6s 0.6	0.60	5.40							0.7535	0.10
4E	FL 6s 1.0	1.00	5.00							0.8333	0.17
4F	FL 6s 1.5	1.50	4.50							0.8804	0.25
50	FL 7s 1.0	1.00	6.00							0.8333	0.17
51	FL 7s 2.0	2.00	5.00							0.9091	0.29
52	FL 7.5s 0.5	0.50	7.00							0.7143	0.07
53	FL 7.5s 0.8	0.80	6.70							0.8030	0.11
54	FL 8s 0.5	0.50	7.50							0.7143	0.06
55	FL 9s 0.9	0.90	8.10							0.8195	0.10
56	FL 10s 0.2	0.20	9.80							0.5000	0.02
57	FL 10s 0.3	0.30	9.70							0.5900	0.03
58	FL 10s 0.5	0.50	9.50							0.7143	0.05
59	FL 10s 0.8	0.80	9.20							0.8030	0.08
5A	FL 10s 1.0	1.00	9.00							0.8333	0.10
5B	FL 10s 1.5	1.50	8.50							0.8804	0.15
5C	FL 12s 1.2	1.20	10.80							0.8555	0.10
5D	FL 12s 2.5	2.50	9.50							0.9294	0.21
5E	FL 15s 1.0	1.00	14.00							0.8333	0.07
5F	FL(2) 4s 0.5	0.50	1.00	0.50	2.00					0.7143	0.25
60	FL(2) 4.5s 0.3	0.30	1.00	0.30	2.90					0.5900	0.13
61	FL(2) 4.5s 0.4	0.40	1.00	0.40	2.70					0.6615	0.18
62	FL(2) 4.5s 0.5	0.50	1.00	0.50	2.50					0.7143	0.22
63	FL(2) 5s 0.2 0.8	0.20	0.80	0.20	3.80					0.5000	0.08
64	FL(2) 5s 0.2 1.2	0.20	1.20	0.20	3.40					0.5000	0.08
65	FL(2) 5s 0.4	0.40	0.60	0.40	3.60					0.6615	0.16

Hex Sw	Description	Junction Box Flasher 143-500						V 1.03		Ie / Io Ratio	Duty Cycle
		On	Off	On	Off	On	Off	On	Off		
66	FL(2) 5s 0.5	0.50	1.00	0.50	3.00					0.7143	0.20
67	FL(2) 5s 1.0	1.00	1.00	1.00	2.00					0.8333	0.40
68	FL(2) 5.5s 0.4	0.40	1.40	0.40	3.30					0.6615	0.15
69	FL(2) 6s 0.2 1.4	0.20	1.40	0.20	4.20					0.5000	0.07
6A	FL(2) 6s 0.3	0.30	1.00	0.30	4.40					0.5900	0.10
6B	FL(2) 6s 0.4	0.40	1.00	0.40	4.20					0.6615	0.13
6C	FL(2) 6s 0.5	0.50	1.00	0.50	4.00					0.7143	0.17
6D	FL(2) 6s 0.5 1.5	0.50	1.50	0.50	3.50					0.7143	0.17
6E	FL(2) 6s 0.8	0.80	1.20	0.80	3.20					0.8030	0.27
6F	FL(2) 6s 1.0	1.00	1.00	1.00	3.00					0.8333	0.33
70	FL(2) 6s 3.0	3.00	1.00	1.00	1.00					0.8333	0.67
71	FL(2) 7s 1.0	1.00	1.00	1.00	4.00					0.8333	0.29
72	FL(2) 8s 0.4	0.40	1.00	0.40	6.20					0.6615	0.10
73	FL(2) 8s 0.5	0.50	1.00	0.50	6.00					0.7143	0.13
74	FL(2) 8s 1.0	1.00	1.00	1.00	5.00					0.8333	0.25
75	FL(2) 10s 0.4	0.40	1.60	0.40	7.60					0.6615	0.08
76	FL(2)10s 0.5 1.0	0.50	1.00	0.50	8.00					0.7143	0.10
77	FL(2)10s 0.5 1.5	0.50	1.50	0.50	7.50					0.7143	0.10
78	FL(2)10s 0.5 2.0	0.50	2.00	0.50	7.00					0.7143	0.10
79	FL(2)10s 0.6 2.4	0.60	2.40	0.60	6.40					0.7535	0.12
7A	FL(2)10s 0.8 1.2	0.80	1.20	0.80	7.20					0.8030	0.16
7B	FL(2)10s 1.0 1.0	1.00	1.00	1.00	7.00					0.8333	0.20
7C	FL(2)10s 1.0 1.5	1.00	1.50	1.00	6.50					0.8333	0.20
7D	FL(2)10s 3.0 1.0	3.00	1.00	5.00	1.00					0.9432	0.80
7E	FL(2)12s 0.4 1.0	0.40	1.00	0.40	10.20					0.6615	0.07
7F	FL(2)12s 0.5 1.0	0.50	1.00	0.50	10.00					0.7143	0.08
80	FL(2)12s 1.0 2.0	1.00	2.00	1.00	8.00					0.8333	0.17
81	FL(2)12s 1.5 2.0	1.50	2.00	1.50	7.00					0.8804	0.25
82	FL(2)15s 1.0 2.0	1.00	2.00	1.00	11.00					0.8333	0.13
83	FL(2)20s 1.0 3.0	1.00	3.00	1.00	15.00					0.8333	0.10
84	FL(2)25s 1.0 1.0	1.00	1.00	1.00	22.00					0.8333	0.08
85	FL(3) 6s 0.5	0.50	1.00	0.50	1.00	0.50	2.50			0.7143	0.25
86	FL(3) 6.1s 0.5	0.40	1.00	0.40	1.00	0.40	2.90			0.6615	0.20
87	FL(3) 8s 0.5	0.50	1.00	0.50	1.00	0.50	4.50			0.7143	0.19
88	FL(3) 9s 0.3	0.30	1.00	0.30	1.00	0.30	6.10			0.5900	0.10
89	FL(3) 9s 0.8	0.80	1.20	0.80	1.20	0.80	4.20			0.8030	0.27
8A	FL(3) 10s 0.5	0.50	1.50	0.50	1.50	0.50	5.50			0.7143	0.15
8B	FL(3) 10s 1.0	1.00	1.00	1.00	1.00	1.00	5.00			0.8333	0.30
8C	FL(3)12s 0.5 1.5	0.50	1.50	0.50	1.50	0.50	7.50			0.7143	0.13
8D	FL(3)12s 0.5 2.0	0.50	2.00	0.50	2.00	0.50	6.50			0.7143	0.13
8E	FL(3)12s 0.8 1.2	0.80	1.20	0.80	1.20	0.80	7.20			0.8030	0.20
8F	FL(3)12s 1.0 2.0	1.00	2.00	1.00	2.00	1.00	5.00			0.8333	0.25
90	FL(3) 15s 0.3	0.30	1.70	0.30	1.70	0.30	10.70			0.5900	0.06
91	FL(3) 15s 0.4	0.40	1.00	0.40	1.00	0.40	11.80			0.6615	0.08
92	FL(3) 15s 0.5	0.50	1.50	0.50	1.50	0.50	10.50			0.7143	0.10
93	FL(3)20s 0.5 1.5	0.50	1.50	0.50	1.50	0.50	15.50			0.7143	0.08
94	FL(3)20s 0.5 3.0	0.50	3.00	0.50	3.00	0.50	12.50			0.7143	0.08
95	FL(3)20s 0.8 1.2	0.80	1.20	0.80	1.20	0.80	15.20			0.8030	0.12
96	FL(3)20s 1.0 1.0	1.00	1.00	1.00	1.00	1.00	15.00			0.8333	0.15
97	FL(3)30s 1.0 4.0	1.00	4.00	1.00	4.00	1.00	19.00			0.8333	0.10
98	FL(4) 10s 0.5	0.50	1.00	0.50	1.00	0.50	1.00	0.50	5.00	0.7143	0.20
99	FL(4) 10s 0.8	0.80	1.20	0.80	1.20	0.80	1.20	0.80	3.20	0.8030	0.32
9A	FL(4) 12s 0.3	0.30	1.70	0.30	1.70	0.30	1.70	0.30	5.70	0.5900	0.10

Hex Sw	Description	Junction Box Flasher 143-500								V 1.03	le / lo	Duty
AB	Flash Character	On	Off	On	Off	On	Off	On	Off		Ratio	Cycle
9B	FL(4) 12s 0.5	0.50	1.50	0.50	1.50	0.50	1.50	0.50	5.50		0.7143	0.17
9C	FL(4) 12s 0.8	0.80	1.20	0.80	1.20	0.80	1.20	0.80	5.20		0.8030	0.27
9D	FL(4) 15s 0.5	0.50	1.50	0.50	1.50	0.50	1.50	0.50	8.50		0.7143	0.13
9E	FL(4) 15s 1.0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	8.00		0.8333	0.27
9F	FL(4) 16s 0.5	0.50	1.50	0.50	1.50	0.50	1.50	0.50	9.50		0.7143	0.13
A0	FL(4) 20s 0.3	0.30	3.00	0.30	3.00	0.30	3.00	0.30	9.80		0.5900	0.06
A1	FL(4) 20s 0.5	0.50	1.50	0.50	1.50	0.50	1.50	0.50	13.50		0.7143	0.10
A2	FL(4) 20s 1.5	1.50	1.50	1.50	1.50	1.50	1.50	1.50	9.50		0.8804	0.30
A3	FL(4) 30s 0.5	0.50	0.50	0.50	0.50	0.50	0.50	0.50	26.50		0.7143	0.07
A4	FI(5)20s 0.5 1.5	0.50	1.50	[x 4]					0.50	11.50	0.7143	0.13
A5	FI(5) 20s 0.80	0.80	1.20	[x 4]					0.80	11.20	0.8030	0.20
A6	FL(2+1) 6s 0.3	0.30	0.40	0.30	1.20	0.30	3.50				0.5900	0.15
A7	FL(2+1) 10s 0.5	0.50	0.70	0.50	2.10	0.50	5.70				0.7143	0.15
A8	FL(2+1) 12s 0.8	0.80	1.20	0.80	2.40	0.80	6.00				0.8030	0.20
A9	FL(2+1) 12s 1.0	1.00	1.00	1.00	4.00	1.00	4.00				0.8333	0.25
AA	FL(2+1) 15s 1.0	1.00	2.00	1.00	5.00	1.00	5.00				0.8333	0.20
AB	MO(A) 6s 0.3	0.30	0.60	1.00	4.10						0.5900	0.22
AC	MO(A) 8s 0.4	0.40	0.60	2.00	5.00						0.6615	0.30
AD	MO(A) 8s 0.8	0.80	1.20	2.40	3.60						0.8030	0.40
AE	MO(A) 10s 0.5	0.50	0.50	1.50	7.50						0.7143	0.20
AF	MO(A) 12s 1.0	1.00	1.00	3.00	7.00						0.8333	0.33
B0	MO(A) 15s 0.5	0.50	1.50	2.00	11.00						0.7143	0.17
B1	MO(B) 15s 1.5	1.50	0.50	0.50	0.50	0.50	0.50	0.50	10.50		0.7143	0.20
B2	MO(D) 10s 5.0	5.00	1.00	1.00	1.00	1.00	1.00				0.8333	0.70
B3	MO(N) 8s 5.0	5.00	1.00	1.00	1.00						0.8333	0.75
B4	MO(U) 10s 0.2	0.20	0.80	0.20	0.80	0.60	7.40				0.5000	0.10
B5	MO(U) 10s 0.3	0.30	0.70	0.30	0.70	0.90	7.10				0.5900	0.15
B6	MO(U) 10s 0.4	0.40	0.60	0.40	0.60	1.20	6.80				0.6615	0.20
B7	MO(U) 10s 0.5	0.50	0.50	0.50	0.50	1.50	6.50				0.7143	0.25
B8	MO(U) 15s 0.4	0.40	0.50	0.40	0.50	1.20	12.00				0.6615	0.13
B9	MO(U) 15s 0.45	0.45	0.45	0.45	0.45	1.35	11.85				0.6899	0.15
BA	MO(U) 15s 0.50	0.50	0.50	0.50	0.50	1.50	11.50				0.7143	0.17
BB	MO(U) 15s 0.55	0.55	0.35	0.55	0.35	1.45	11.75				0.7354	0.17
BC	MO(U) 15s 0.60	0.60	0.30	0.60	0.30	1.40	11.80				0.7535	0.17
BD	MO(U)15s 0.7 0.5	0.70	0.50	0.70	0.50	1.90	10.70				0.7821	0.22
BE	MO(U)15s 0.7 0.7	0.70	0.70	0.70	0.70	2.10	10.10				0.7821	0.23
BF	MO(U)15s .75 .15	0.75	0.15	0.75	0.15	1.65	11.55				0.7933	0.21
C0	MO(U)15s .75 .45	0.75	0.45	0.75	0.45	2.00	10.60				0.7933	0.23
C1	MO(U) 15s 1.15	1.15	0.75	1.15	0.75	3.00	8.20				0.8504	0.35
C2	MO(U) 15s 1.30	1.30	0.70	1.30	0.70	3.30	7.70				0.8647	0.39
C3	Q 1s 0.2	0.20	0.80								0.5000	0.20
C4	Q 1s 0.3	0.30	0.70								0.5900	0.30
C5	Q 1s 0.4	0.40	0.60								0.6615	0.40
C6	Q 1s 0.5	0.50	0.50								0.7143	0.50
C7	Q 1s 0.8	0.80	0.20								0.8030	0.80
C8	Q 1.2s 0.3	0.30	0.90								0.5900	0.25
C9	Q 1.2s 0.5	0.50	0.70								0.7143	0.42
CA	Q 1.2s 0.6	0.60	0.60								0.7535	0.50
CB	Q(2) 5s 0.3	0.30	0.70	0.30	3.70						0.5900	0.12
CC	Q(2) 5s 0.5	0.50	0.50	0.50	3.50						0.7143	0.20
CD	Q(2) 6s 0.30	0.30	0.70	0.30	4.70						0.5900	0.10
CE	Q(2) 6s 0.35	0.35	0.70	0.35	4.60						0.6284	0.12
CF	Q(2) 10s 0.6	0.60	0.40	0.60	8.40						0.7535	0.12

Hex Sw	Description	Junction Box Flasher 143-500						V 1.03		Ie / Io Ratio	Duty Cycle
		On	Off	On	Off	On	Off	On	Off		
D0	Q(2) 15s 0.2	0.20	0.80	0.20	13.80					0.5000	0.03
D1	Q(3) 5s 0.5	0.50	0.50	0.50	0.50	0.50	2.50			0.7143	0.30
D2	Q(3) 6s 0.3	0.30	0.70	0.30	0.70	0.30	3.70			0.5900	0.15
D3	Q(3) 10s 0.30	0.30	0.70	0.30	0.70	0.30	7.70			0.5900	0.09
D4	Q(3) 10s 0.35	0.35	0.65	0.35	0.65	0.35	7.65			0.6284	0.11
D5	Q(3) 10s 0.50	0.50	0.50	0.50	0.50	0.50	7.50			0.7143	0.15
D6	Q(3) 10s 0.60	0.60	0.60	0.60	0.60	0.60	7.00			0.7535	0.18
D7	Q(3) 30s 0.4	0.40	4.60	0.40	4.60	0.40	19.60			0.6615	0.04
D8	Q(4) 6s 0.3	0.30	0.70	0.30	0.70	0.30	0.70	0.30	2.70	0.5900	0.20
D9	Q(4) 6s 0.4	0.40	0.60	0.40	0.60	0.40	0.60	0.40	2.60	0.6615	0.27
DA	Q(4) 10s 0.3	0.30	0.70	0.30	0.70	0.30	0.70	0.30	6.70	0.5900	0.12
DB	Q(4) 12s 0.3	0.30	0.70	0.30	0.70	0.30	0.70	0.30	8.70	0.5900	0.10
DC	Q(4) 15s 0.35	0.35	0.70	0.35	0.70	0.35	0.70	0.35	11.50	0.6284	0.09
DD	Q(4) 20s 0.5	0.50	0.50	0.50	0.50	0.50	0.50	0.50	16.50	0.7143	0.10
DE	Q(9) 15s 0.3	0.30	0.70	[x 8]				0.30	6.70	0.5900	0.18
DF	Q(9) 15s 0.35	0.35	0.65	[x 8]				0.35	6.65	0.6284	0.21
E0	Q(9) 15s 0.6	0.60	0.60	[x 8]				0.60	4.80	0.7535	0.36
E1	Q(6)+LFI15s 0.2	0.20	0.80	[x 6]				2.00	7.00	0.5000	0.21
E2	Q(6)+LFI15s 0.3	0.30	0.70	[x 6]				2.00	7.00	0.5900	0.25
E3	Q(6)+LFI15s0.35	0.35	0.65	[x 6]				1.05	7.95	0.6284	0.21
E4	Q(6)+LFI15s 0.6	0.60	0.60	[x 6]				2.00	5.80	0.7535	0.37
E5	VQ 0.5s 0.15	0.15	0.35							0.4383	0.30
E6	VQ 0.5s 0.20	0.20	0.30							0.5000	0.40
E7	VQ 0.6s 0.20	0.20	0.40							0.5000	0.33
E8	VQ 0.6s 0.30	0.30	0.30							0.5900	0.50
E9	VQ(2) 4s 0.20	0.20	1.00	0.20	2.60					0.5000	0.10
EA	VQ(2) 8s 0.20	0.20	1.00	0.20	6.60					0.5000	0.05
EB	VQ(3) 5s 0.15	0.15	0.35	0.15	0.35	0.15	3.85			0.4383	0.09
EC	VQ(3) 5s 0.20	0.20	0.30	0.20	0.30	0.20	3.80			0.5000	0.12
ED	VQ(3)5s 0.3 0.2	0.30	0.20	0.30	0.20	0.30	3.70			0.5900	0.18
EE	VQ(3)5s 0.3 0.3	0.30	0.30	0.30	0.30	0.30	3.50			0.5900	0.18
EF	VQ(3) 15s 0.10	0.10	0.50	0.10	0.50	0.10	13.70			0.3333	0.02
F0	VQ(9) 10s 0.15	0.15	0.35	[x 8]				0.15	5.85	0.4383	0.14
F1	VQ(9) 10s 0.20	0.20	0.30	[x 8]				0.20	5.80	0.5000	0.18
F2	VQ(9) 10s 0.30	0.30	0.30	[x 8]				0.30	4.90	0.5900	0.27
F3	VQ(6)+LFI10s0.15	0.15	0.35	[x 6]				2.00	5.00	0.4383	0.29
F4	VQ(6)+LFI10s 0.2	0.20	0.30	[x 6]				2.00	5.00	0.5000	0.32
F5	VQ(6)+LFI10s 0.3	0.30	0.30	[x 6]				2.00	4.40	0.5900	0.38
F6	spare										
F7	spare										
F8	spare										
F9	spare										
FA	spare										
FB	spare										
FC	spare										
FD	spare										
FE	spare										
FF	spare										
	END OF TABLE										

Rev A. Preliminary Rev B. Original issue Rev C. Intensity profile and minor text updates

Format A4 cm T 2.0 B 2.0 L 2.0 R 2.0 G 0.0 H 1.5 F 1.5

Legal Notice: - Information in this document is subject to change without notice. Vega Industries Ltd. makes no warranty of any kind with regards to this material, including but not limited to, the implied warranties of merchantability and fitness for purpose. Vega Industries Ltd. shall not be liable for errors contained herein or for incidental or consequential damages in connection with the use of this material. No part of this document may be photocopied, reproduced, or translated to another language without prior written consent of Vega Industries Ltd. The Vega logo is a registered trademark of Vega Industries Ltd. All other trademarks belong to their respective proprietors.

USERS Notes:

Specifications Optional VLF-43 Flasher, LDR & 4-way junction box

Electronics

Flasher Load	Maximum 3 Amps to drive connected lights
Photocell	Light dependant resistor (LDR) built into junction box Standard unit switches connected lights on at dusk and off at dawn, optional special unit can switch lights on at dawn and off at dusk for daytime operation
Reverse Polarity	Internally protected against reverse polarity connection

Synchronisation

Pulse Input	Triggered by negative edge of sync pulse, duration greater than 1 ms
From GPS Receiver or VLB beacon	Connect sync from GPS or VLB to sync wire in junction box battery cable (set GPS pulse duration to 10 ms negative with correct flash period)

Power Requirements

Input Voltage	Nominal 12VDC battery with AC, solar or wind power charge controller
Maximum Ratings	10 -18 V from well regulated DC supply. Maximum without damage 20 Volts
Power Drain	7 mA for flasher when operating plus connected load current
Quiescent Current	0.5 mA during the day with output to load turned off

Enclosure

Material	DT 5008 Marine Grade Aluminium, anodised to 12μ
Paint Finish	Epoxy Primer, 2-pot polyurethane gloss on exterior
Sealing	Sikaflex sealant around photocell window, O-rings on metal parts
Pressure Equalisation	Membrane port allows air exchange, blocks moisture

Environmental

Temperature	Tested -30°C to +60°C
Salt	Rated for continuous exposure to salt water and spray

Dimensions

Junction Box	160mm L x 75mm W x 33mm H. Add 31mm W for cable glands
Bare Weight	0.7 kg without cables, 0.9 kg with 1.5m battery cable
Mounting	Four only Ø5 mm Holes on 65 x 150 rectangle

Specifications VLS-46 Individual LED Sector Light Projector

Single Projector Part number: 146-000 (specify colour required)

Baseplate for 3 projectors Part Number: 146-083, Baseplate for 2 projectors Part Number: 146-082

VLF-43 Flasher with daylight switch and 4-way junction box Part Number: 143-500

Vega LDR Assembly (daylight switch fits in M20 cable gland) Part Number: 143-250

Optics

Light Source	High-Intensity Light-Emitting Diode			
Lens	Acrylic, UV-protected, Beam 360° horizontal spread			
	Vertical	±1.5° spread at 100% and ±2.0° spread at 80% intensity		
Colours Available	Red, Green, White, (All meet IALA recommendations for signal colours)			
Chromaticity	Red	0.68<x<0.71, 0.29<y<0.31	White	x=0.31, y=0.32
Co-ordinates	Blue green	0.09<x<0.13, 0.53<y<0.65		
Service Life	10 years			

Electronics

Power Control	Continuous, based on set intensity and temperature
Light Output	Independent of temperature and battery voltage but subject to LED current limit LED illuminates when power is applied and extinguishes as soon as power is removed.
Reverse Polarity	Internally protected against reverse polarity connection

Power Requirements

Input Voltage	Nominal 12V or 24V DC battery with AC, solar or wind power charge controller.
Maximum Ratings	Minimum 9.0V, maximum 35.0V from well regulated DC supply at battery terminals. Transient protection built in. Overvoltage will damage projector and void warranty.
Maximum Power	1.4W input power
Intensity Output	Set at time of order for range between 6 NM and 10 NM to a maximum of 2000 candela. Minimum ratings 6 NM 166 Candela, 8NM 500 Candela, 10 NM 1740 Candela
Active Current	120 mA at 12 VDC when set for 10 NM.

External Inputs

Flash Character	Light is a fixed character with power applied, use external flasher for other characters.
Day/ Night Switching	Use external daylight switch.

Enclosure

Material	Marine Grade Aluminium, anodised to 12 μ .
Sealing	Polyurethane sealant and O-rings for metal parts
Pressure Equalisation	Membrane port allows air exchange, blocks moisture

Environmental

Acceleration	Rated to 40g in all directions
Temperature	Tested -40°C to +60°C. Intensity output reduces at high temperature to protect LED
Salt	Rated for continuous exposure to salt water and spray
Wind	Rated to withstand winds to 100+ knots
Cooling	Natural radiation only
Intrusion Protection	IP 67 rating, 30 minutes immersion at 1 metre head of water

Dimensions

Focal Height	90 mm above baseplate
Projector	438 mm x 100 mm x 140 mm. Allow additional 50 mm cable bend radius at rear
Bare Weight	6 kg with 1.5 metre cable (3 projectors, 1 VLL-43, 1 GPS receiver and base plate)
Mounting	Three mounting holes (slotted), one ahead of front objective lens, inside diameter 6mm. and two on rear support foot under projector barrel, inside diameter 5mm. Mounting bolt separation, front to rear 280 mm PCD
Shipping Dimensions	480 x 430 x 350 mm, weight 14 kg

Mounting Bolts

Front foot, one M6x30, rear foot, two M5x30 per projector