VLB-92 OMNI MEGA
LED MARINE BEACON

Installation and Operation Manual

Models	VLB-92-W16 1T, 2T (available in 12 or 24V), 3T (24V only).
Product Versions	2.00 (W16)
Day and night off current	Day 50mA, Night 50mA @ 24V, Day 100mA, Night 100mA @ 12V
Software version:	034
Manual version:	1.19
Status:	Released

WARNING

THIS OMNI MEGA BEACON IS CAPABLE OF PRODUCING VERY HIGH INTENSITY LIGHT OF OVER 200,000 CANDELAS. THE BEACON'S VERTICAL DIVERGENCE IS ±0.8 DEGREES. IT IS RECOMMENDED THAT OPERATORS DO NOT LOOK DIRECTLY INTO THE BEAM.

This LED PRODUCT has been tested to IEC60825-1 and found to be exempt from classification.
THIS OMNI MEGA BEACON MAY BECOME HOT TO THE TOUCH.

Manual revision history

Manual Version	Released	Description of Change	Software version	VLB-92 Serial number
1.0.0	March 2011	• First issue	012	92-00000010
1.0.1	June 2011	• Second issue	016	92-00000020
1.0.2	March 2012	• Introduced new base-adaptor that supports both 200PCD mount and stack mount; software version update; beacon's operating power limit increased.	018	92-00000030
1.0.5	April 2013	• Software fixes	023	92-00000130-
1.0.6	September 2013	• Synced beacon behaviour improved at day/night transition.	024	92-00000070 upgrade 92-00000160-
1.0.7	October 2013	• Updated beacon App. H dimension drawing; • Added specs to App. J for beacons with 25C and 40C max temperature; • Updated App. B description of safe, and specification, operating powers.	024	92-00000190-
1.0.8	July 2014	• Software update with various bug-fixes.	025	92-00000290+
1.0.9M	August 2014	• Manual generalised for 1T, 2T & 3T • Safe operating power limit increased	025	92-00000300+
1.0.9X	September 2014	• 1.6D and 12V/24V versions supported.	028	92-00000310+
1.1.0	October 2014	• Merged 1.6D, 3.0D, 12V & 24V White	028	92-00000310+
1.11	October 2014	• Added custom flash character	028	92-00000350+
1.12	February 2015	• Additional custom characters	028	92-00000380+
1.13	June 2015	• Correction to the monitoring data units	028	92-00000380+
1.14	Feb 2016	• Additional special flash characters • Minor correction to Schmidt-Clausen compensation • Normalised monitoring protocol tags for better interfacing to Mini Vegaweb • Increased max. operating voltage spec to 36.0V for 24V version.	029	92-00000490+
1.15	Feb 2016	• Fixed rounding error that forbade operation at full thermal power.	030	92-00000500+
1.16	July 2016	• Update Product Warranty Statement	030	92-00000500+
1.17	July 2017	• Beacon controller hardware upgraded. • Upgraded serial monitoring output to Vegaweb-compatible smart beacon format.	031	92-00001000+
1.18	Nov 2017	• Added EU DoC.	031	92-00001000+
1.19	Dec 2018	• Manufacturer contact information changed	034	92-00001100+

VLB-92 LED Versions by colour, release date and serial number

WHITE LED		
LED Version	**Release Date**	**VLB-92 Serial Number**
465	September 2014	92-00000310

VEGA INDUSTRIES LIMITED

QF-34 V1.0

Declaration of Conformity (DoC)
for Products under EMC Directive 2014/30/EU

Manufacturer	Vega Industries Limited
Postal Address	PO Box 50443, Porirua 5240, New Zealand.
Physical Address	21 Heriot Drive, Porirua 5022, New Zealand.
Authorized Representative within the EU	**Hydrosphere UK Ltd** **Head Office & Registered Office** The Old Grain Store, West End Farm, Upper Froyle, Hampshire, GU34 4JR, UK Tel: 01420 520374
Object of the declaration (means of type, batch, serial number or other info.)	**VLB-92**

This declaration of conformity is issued under the sole responsibility of the manufacturer.

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation.

The product of the declaration described above is in conformity with the requirements of the following specifications:

Documents-No.:	Title	Edition/Date of Issue
EN 55015	**Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment**	**2006 + Amd 1: 2007 + Amd 2: 2009**

Additional Information:

The product is also compliant with IEC 61547 Ed 2.0 2009 + IS1:2013.

Signed for and on behalf of:

Porirua, New Zealand 23 / 11 / 17	John Brook, Product Design Manager	
(Place & Date of issue of the DoC)	(Name & title of responsible person)	(Signature of responsible person)

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Product Warranty

Sabik Oy 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. Sabik Oy is not 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.

Legal Notice

Table of Contents

1.0 INTRODUCTION TO THE VLB-92 OMNI MEGA LED MARINE BEACON

WARNING

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1.1 Overview

Each VLB-92 Omni Mega is supplied for a particular application depending on the colour, flash character and range required. As such the number of lenses required will vary even though the range may be the same for different applications. The details of the application for this Omni Mega Beacon are provided on the cover of this manual.

The number of lenses required for any application is determined from the peak intensity of the flash character and the thermal constraints of the LED's in the Omni Mega design. Longer on period within a flash character and lower duty cycle will minimise the number of lenses required and consequently the cost of the Omni Mega Beacon.

The VLB-92 Omni Mega is available in two supply voltage options for operation from nominal 12VDC or 24VDC supplies. The peak and average night currents as well as the day and night off currents of the beacon are detailed in Appendix B of this manual.

As the VLB-92 Omni Mega is delivered against the application specification there should be no need to alter the program settings. Installation should only involve the assembly/mounting and the supply of power. If an external light sensor is required this will need to be connected to the beacon.

If required the intensity can be adjusted according to the capabilities and settings detailed in Appendix B.

The Omni Mega requires a high level of current in order to meet the range specification of the application. Care should be taken to size the electrical cabling so that the voltage supplied to the beacon is within specification. With any cable size calculation remember to account for the total length of the electrical circuit. Where possible, keep the length of DC cabling within a few metres. To minimise cable inductance the supply cables should be straight and strapped together.

1.2 Performance at a Glance

This Omni Mega has been supplied to meet the requirements on the sales order.

As a product the Omni Mega has the following specification:

- Nominal Night range of 17 to 23.5Nm for the 1.6 degree version, at an atmospheric transmission of 0.74T (10Nm visibility) depending on the colour, flash character and the number of lenses used.
- Automatic Schmidt Clausen intensity correction for flash characters
- Vertical Divergence is better than 1.6 degrees, as appropriate, at 50 percent of the peak intensity.
- Hard-wire synchronising (negative transition)
- RS232 (or RS485) and IRDA data ports
- Hard wire control and monitoring connections including inputs for operation override, and outputs for alarm, beacon healthy, and LEDs on

- Programmed with Vega TVIR programmer and Vega Prog-03 IRDA computer program kit.
- The Omni Mega has a 15-year design life

1.3. Construction

The metal components of the VLB-92 Omni Mega are made from cast or machined marine grade aluminium. All aluminium components are anodised and the cast components are painted in a marine grade undercoat and two-part gloss final coat. The LED lenses are made from machined cast acrylic. Cooling of the LED's is achieved using multiple heat pipes in the central core to transfer the heat to the heat sink mounted on top of the beacon.

The VLB-92 Omni Mega is sealed against dust and moisture to the level of IP-67. There should be no need for the beacon to be opened during its design life. The Omni Mega is fully sealed. There is no breather vent.

1.4 Other Options

The VLB-92 Omni Mega operation can be enhanced using the following Vega products

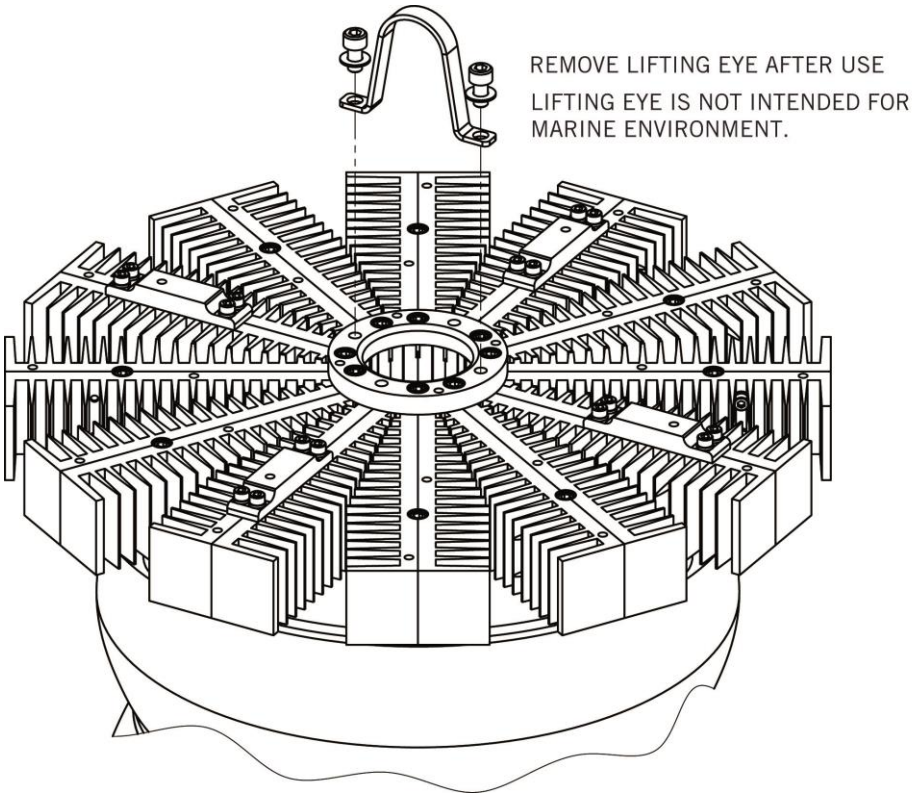
- GPS synchronisation using the Vega VSU-29 GPS synchronisation unit
- Monitoring using the Mini VegaWeb Internet based monitoring system (requires VLB-92 firmware version 029 or later. New firmware can be loaded into a beacon in the field – contact Vega for details.).

2.0 MECHANICAL ASSEMBLY AND INSTALLATION

2.1 Assembly

For Omni Mega bigger than a three-lens unit the separate parts will need to be assembled by bolting parts together and connecting the cables. The Omni Mega is shipped in this format to spread the shipping weight across a number of items and to allow the light to be more easily transported to where it will be used.

The separate parts should be bolted together as shown in Appendix F.



2.2 Lifting Eye

VLB-92 Omni Mega will be delivered with a lifting eye that can be attached to each section of the light to allow easy handling. It should be used with the components of the Omni Mega as delivered from Vega. Do not use the lighting eye on anything more than a single unit assembly. The lifting eye is not designed to lift an assembled Omni Mega over the size of single unit. The intention is to lift the component parts to the assembly location. Ensure the lifting eye is removed after the Omni Mega is installed to ensure the sealing integrity of the beacon.

2.3 Bird Spikes

The VLB-92 Omni Mega is supplied with 28 stainless steel bird spikes to be screwed into the top of the beacon.

2.4. Mounting Omni Mega

The mounting base of the Omni Mega contains 14mm holes for three or four bolt mounting on a 200mm diameter circle. The mounting holes contain corrosion isolation inserts to prevent corrosion occurring between the base and the mounting bolts. Do not over tighten the mounting bolts as the corrosion isolators will compress and this will cause metal-to-metal contact between the base and the bolt.

As the focal plane for the beacon is parallel to the base, the mounting surface needs to be level to ensure the Omni Mega has a horizontal beam. This can be checked by placing a builder's level on the mounting surface then moving the level 90 degrees at a time checking the surface is level in at least two directions. If the mounting surface is not level take appropriate measures to ensure it is before permanently fixing the Sector Light in place.

2.5 The Mounting Structure

Any sway of the mounting structure needs to be constrained to a level where the Omni Mega can be visible to the intended user.

For the 1.6 degree Omni Mega beacon: The vertical divergence of the beacon is 1.6 degrees. At ± 0.8° the intensity is at 50%, and at ± 1.6°the intensity is approximately 10% of the peak intensity.

3.0. ELECTRICAL CONNECTION

3.1 Power Connection

The VLB-92 Omni Mega is available in 12VDC and 24VDC models. The correct model must be requested at the time of ordering. A beacon cannot be converted from one voltage type to another. The beacon must never be connected to any voltage over 36.0VDC. The Omni Mega will shut down to protect its electronics if the input voltage is outside the rated voltage range listed in Appendix J.

The 1.5m power cable supplied with the Omni Mega has either a 6mm^2 or 10mm^{2}copper conductor. This size cable is adequate where the distance to the supply is 5m or less. Where the distance is greater than 5m the cable should be sized to allow no more than a 5% voltage reduction when carrying the peak beacon current over the entire length of the electrical circuit. Connections to the Beacon are as shown below.

Power Cables	Function
Red	Vin +
Black	GND

3.2 Other Connections to the Omni Mega

All other connections to the Omi Mega beacon are through a single multi pin connector fitted to the base of the beacon. A plug and 1.5m of connection cable is supplied with the beacon. The connection diagrams of the connector and cable are shown in Appendix E. The electrical specification is provided in the specifications section of this manual.

3.2.1 Hardwire Synchronization

The Vega hardwire sync operates as a positive to negative transition. The start of the flash character can be delayed between 0 and 9.9 seconds should it be desirable to have a different start time to other beacons connected to the synchronising wire.

Where GPS synchronisation is required the Vega VSU-29 GPS sync unit can be connected to the synchronising wire of the Omni Mega. Alternatively a GPS sync pulse can be generated from a VegaWeb monitoring unit when it is fitted with a GPS unit.

Other beacon manufacturers may not use a negative transition signal and will not be able to synchronise with Vega Beacons. If there is a requirement to synchronise with beacons with a positive transition signal it may be possible to use the signal inverter module (Vega 167-295). The Omni Mega will only operate in Slave Sync mode when connected to the signal inverter module.

Vega 12V products that generate or receive hard-wired sync, such as the VSU-29 and the VLB-44, etc, can be safely connected to the sync wire on the Omni Mega.

3.2.2 Omni Mega Monitor.

The Omni Mega monitor outputs consists of a normally-open (NO) and normally-closed (NC) contact that are used to provide an indication when the Omni Mega is able to operate or not able to operate. This alarm monitors the current and the supply voltage as well as internal functioning of the beacon. These contacts are electrically isolated from the power supply and the rest of the beacon circuitry.

The two output signals, Beacon FAIL and Beacon OK, are always in opposite states from each other. A relay contact is provided for each signal and they share a common contact.

The Beacon FAIL relay contact is closed to the common when the Omni Mega is in any of the following states:

- For a few seconds at first power-up.
- No voltage or low voltage is present.
- No LED current or low current is detected when the Omni Mega LED’s should be on.
- Alarm is being tested using Operation mode 1-5-007 (Clause 5.5.6).

To use the Beacon FAIL and/or Beacon OK signals, first connect the common signal to a supply rail, e.g. battery negative. A voltage from 0 to 30VDC can be applied to these contacts. The maximum current the outputs can handle is 2A and an open circuit maximum voltage of 30VDC. For additional details refer to the specification section.

3.2.3 Omni Mega “Beacon ON” Output

The Omni Mega ”Beacon On” output is a solid-state relay and will operate when the beacon is awake and the LEDs are on. Please note that the relay will not follow the flash character. It will be

on when flash characters are being generated. A normally open relay contact pair is provided and is isolated from all other circuitry in the beacon.

The Beacon On relay contacts will be closed when:

- The flash character is being generated according to the programmed settings of the Omni Mega and no fault is detected.
- When the Omni Mega is forced on by the “Beacon On” input.

The Beacon On relay contacts will be open when:

- The Omni Mega flashes its LEDs during, or on leaving, programming mode.
- Any alarm detection state that turns off the LEDs and activates the Beacon FAIL output.
- The beacon is in an off state due to either day detection, if in night mode only, or is forced off by the “Beacon Off” input.

A voltage from 0 to 30VDC can be applied to the “Beacon On” output. The maximum current the monitor output can handle is 125mA DC. For additional details refer to the specification section.

3.2.4 Omni Mega Force inputs: Beacon On and Beacon Off

The Omni Mega Force inputs for “ON” and “OFF” will force the beacon into the selected state regardless of the programmed operation and day/night detection status. When “Forced ON”, the Omni Mega will flash the programmed flash character and night intensity.

If both force inputs are operated at the same time the inputs will be ignored and the Omni Mega will operate according to its programmed parameters.

A voltage from 0 to 30VDC can be applied to the Beacon ON and beacon OFF inputs. An input voltage of 6V or more will activate an input. An open-circuit input will be inactive. For additional details refer to the specification section.

3.2.5 Data Port

The RS232 (or RS485) data port is continuously operational. Beacon commands that correspond to those offered via the TVIR Remote will be accepted on the Data port’s serial input at any time. Additionally, the beacon will output any error status on the Data port’s serial output.

The Data port can be enabled to send monitoring data either on-demand or continuously. The command input function will continue to be available when monitoring is enabled.

Details of the data port protocol and the beacon parameters available via this protocol are contained in Appendix G.

4.0 INITIAL POWER UP

4.1 Initial Power up and Alignment

The beacon works as a single light irrespective of the number of units used in the assembly.

The beacon is shipped with factory settings that meet the customer's requirements of range, flash character, etc. The beacon can be returned to these factory default settings at any time by sending the Reset Factory Default 8-1-000 command.

The programming features of the Omni Mega will be covered later in the manual.

At power-on when the supply voltage is first connected, the Omni Mega will remain inactive for up to 30 seconds and the Beacon FAIL output will be asserted during this time. Subsequently, the beacon will start in night mode with the beacon flashing with the programmed flash character and the Beacon FAIL signal will be de-asserted.

- After a further 10 seconds the beacon will begin to monitor the ambient light level. If day is detected, and the beacon is programmed in night-only mode, the LED's will be turned off.
- After 14 seconds the beacon will begin to monitor the voltage for the low threshold (factory setting of 20.0 Volts for the 24V version or 10.0V for the 12V version). If the threshold is reached the Omni Mega will be turned off. The beacon will not return to normal operation again until the supply voltage rises to above the high threshold (25.6 volts for the 20V version or 12.8 volts for the 12V version). Recycling the power to the Omni Mega will reset the low voltage cut out operation.

Note: If the supply terminals (+ / -) are connected in reverse the Omni Mega will not power up. No damage will be caused by reverse connecting the beacon.

5.0 PROGRAMMING

5.1 Programming Methods

There are two recommended methods of programming the Omni Mega:

- Using the Vega remote TVIR Programmer (Remote-02);
- Using a Computer with the VLB-92 IRDA Programming Kit (Prog-03).

Advanced users may also program the Omni Mega via the Data port serial input.

The Beacon will be shipped with a default setting for programming with the Remote TVIR Programmer. The IRDA data port will need to be enabled to allow computer IRDA programming.

5.1.1 Using the Vega Remote TVIR Programmer

The location of the TVIR sensor in the Omni Mega is shown in the diagram below. For best results the TVIR programmer should be used at this point on the Omni Mega.

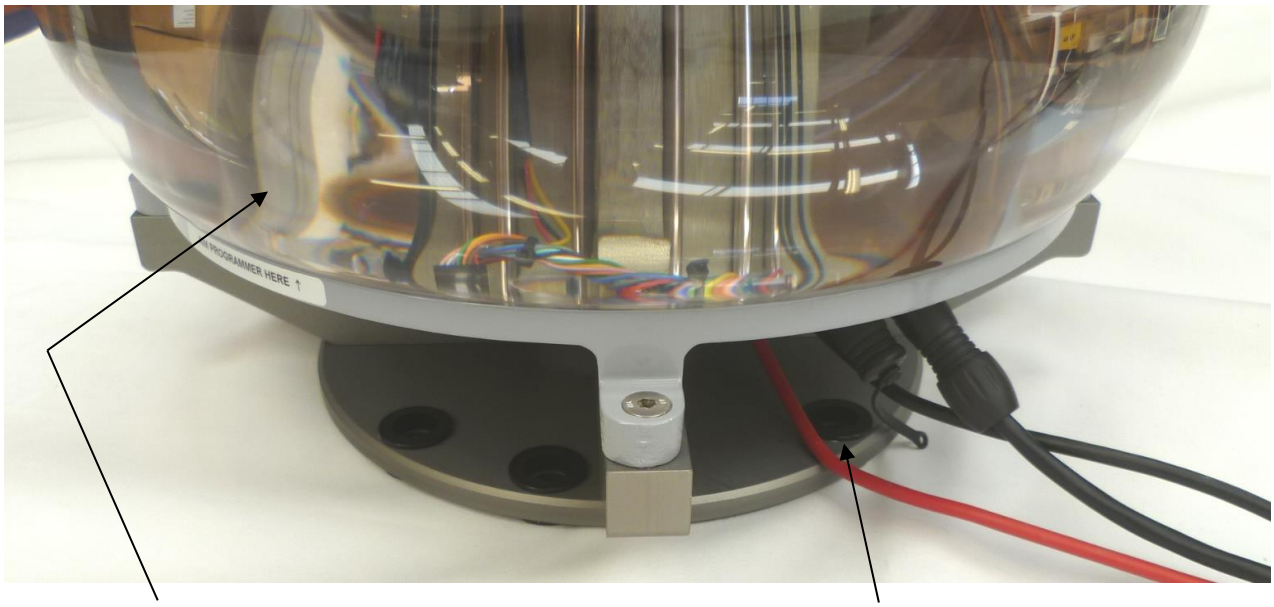
IMPORTANT

Before attempting to use the Programmer for the first time, please pull the plastic insulating strip out of the battery holder – you do not need to remove the battery holder to do this.

The programmer will not work if the plastic strip is left in place.

Red standby key, used to enter programming mode.

Numeric keypad, used to configure the programmable features of the light.



During programming the Omni Mega will provide visual feedback by flashing as the keys are operated on the TVIR programmer. On completion of a program option the beacon will provide visual feedback by repeating the code of the programmed function by a series of flashes.

Because of the high intensity of the Omni Mega and the corresponding risk to the eyes of the programmer a green LED is used to provide the visual feedback as programming is carried out. This is the default feedback option for TVIR programming and the main LEDs of the Omni Mega will be turned off when the beacon is in programming mode. The green LED is located at the same point as the TVIR sensor. If the green LED cannot be seen because of high daylight intensity there is an option to use the main LEDs in the Omni Mega to provide the programming feedback. When used during programming the intensity of the beacon LED's will be 4% of the maximum possible intensity.

5.1.2 Using a Computer

Computer programming can be carried out using the RS232 (or RS485) or the IRDA data port. The RS232 port is always switched on in the Omni Mega. Two-way IRDA communication to the Beacon can be provided via a USB to infrared adapter plugged into the computer. The IRDA must be turned on using the TVIR programmer to become active.

With computer programming all options for the Omni Mega will be displayed on the screen. Computer programming is more straightforward than using the Remote TVIR programmer as all features can be set at once and can be verified by up-loading the settings from the beacon. Copies of the program settings can be saved or recalled from memory.

For Computer programming please refer to the PROG-03 Instruction Manual.

The programming described in the rest of this manual relates to the infrared TVIR programmer only.

5.2 Default Settings

The Omni Mega is delivered from the factory with default settings including the range and flash character required for the application. These settings are detailed in Appendix A. If there is a need to return the light to the default settings use the Reset Factory Default option (8-1-000).

5.3 Programming Syntax

All programming of uses the syntax of: OPERATION_FEATURE_VALUE

There are six OPERATION functions:

Programming	Operation 1
Creating a Custom Character	Operation 2
System Information	Operation 3
Optional PIN code	Operation 7
Other settings	Operation 8
Read settings	Operation 9

FEATURE items represent the features of the light such as flash character and intensity.

VALUES are the actual settings or value of the various features.

Appendix A of this manual provides a Table for the programming features of the Omni Mega. Please take the time to become familiar with the table before continuing.

5.4 Visual Feedback when Using the TVIR Programmer

The Omni Mega will provide visual feedback of the programming instructions it receives from the TVIR programmer. It is important to understand the feedback that is provided to ensure the light will be programmed correctly.

Note:
The default operation of the Omni Mega is for the visual feedback to be provided from a green or blue LED in the bottom lens of the beacon. If the green or blue LED is not bright enough to see the visual feedback the main LEDs can be used for providing the visual feedback. See Section 5.5.11. When the main LEDs are used to provide the visual feedback their intensity is reduced to 4% of the maximum intensity of the Omni Mega.

Programmer Keys	Light response
Enter Programming Mode By pressing red standby key for 5 seconds	4 quick flashes (0.1sec on 0.1sec off).
Numeric key when programming	1 flash for each key pressed
When programming code recognised	The 3 or 4 digit value code is repeated using a series of flashes of 0.1sec on and 0.1sec off with a gap of 0.5sec between each number of the code. A zero is represented by a 2 second on flash. Proper termination of custom character programming: the feedback code will be 000
When programming code **is not** recognised	3 quick flashes (0.1sec on 0.1sec off) The light will remain in programming mode waiting for a new programming instruction.

Exiting Programming mode **No programming activity for 10 Seconds**	The light will give two quick flashes followed by a short pause followed by another two quick flashes. After this it will resume normal operation. The light will flash its character for 16 seconds while it checks the day/night settings. If it is daytime and the light is set to operate at night only the light will turn off.

5.4.1 The Omni Mega Will Not Enter Programming Mode

If you find the beacon will not enter the programming mode it will be caused by one of 2 reasons:

- The battery in the TVIR Programmer is missing, or the plastic battery insulator has not been removed, or the battery has low voltage.
- There is no power supply connected to the light or it is out of the specified voltage range.

If the beacon enters programming mode but rejects all commands then it requires a security PIN to be entered by the operator to allow programming. Refer clause 5.5.10.

5.4.2 Becoming Familiar with the Syntax and Flash Feedback

If you have not used the Vega TVIR Programmer before, spend some time learning how the light will respond to the various programming actions. Make sure the Omni Mega is connected to an appropriate power supply voltage with sufficient current capacity and experiment with the following.

Enter and Exit Program mode

1. Enter program mode Press the red standby button for 5 seconds	The light will give 4 quick flashes to indicate it has entered programming mode
2. Exit program mode Leave the programmer idle for 10 seconds	The light will give two quick flashes followed by a short pause followed by another two quick flashes. After this it will resume normal operation. The light will flash its character for 16 seconds while it checks the day/night settings. If it is daytime and the light is set to operate at night only the light will turn off.

Program a Flash Character with a flash character of Fl 10sec(1sec “on” 9sec “off”)
To program this Flash Character find the three-digit code from Appendix K, “Flash character table with program codes”. (Flash 10sec = code 350). Determine the programming Syntax from Appendix A for the setting:

Operation	=Programming	=1
Feature	=Flash Character	=0
Value	=Code	=350

The programming sequence to enter this flash character is 10350

0. Enter programming mode Press the red standby button for 5 seconds	The light will give 4 quick flashes to indicate it has entered programming mode
2. Enter the programming sequence for the flash character (10350)	The light will flash once each time a key on the programmer is operated. When the sequence is completed and accepted the light will repeat the value 350 in a series of flashes. Three quick flashes followed by a 0.5sec gap followed by five quick flashes followed by a 0.5 second gap followed by a 2 second flash (for a zero)
1. Exit programming mode Leave the programmer idle for 10 seconds	The light will give two quick flashes followed by a short pause followed by another two quick flashes.

	After this it will resume normal operation. The light will flash its character for 16 seconds while it checks the day/night settings. If it is daytime and the light is set to operate at night only the light will turn off.

Create a programming error by attempting to enter an invalid Operation Mode code 003

Determine the programming Syntax from Appendix A for the setting:

Operation	=Programming	=1
Feature	=Operation Mode	=5
Value	=Code	=003

The programming sequence to enter this Operation Mode is 15003

1. Enter programming mode Press the red standby button for 5 seconds	The light will give 4 quick flashes to indicate it has entered programming mode
2. Enter the programming sequence for the Operation Mode (15003)	The light will flash once each time a key on the programmer is operated. When the sequence is completed the value will be rejected and an error indicated by 3 quick flashes. The beacon will then return to programming mode and is ready for a new instruction.
3. Exit programming mode Leave the programmer idle for 10 seconds	The light will give two quick flashes followed by a short pause followed by another two quick flashes. After this it will resume normal operation. The light will flash its character for 16 seconds while it checks the day/night settings. If it is daytime and the light is set to operate at night only the light will turn off.

Read System Information

To read the voltage level of the battery or supply, determine the Syntax from Appendix A:

Operation	=System Checks	=3
Feature	=Battery Voltage	=1

The programming sequence to get the information is 31

1. Enter programming mode Press the red standby button for 5 seconds	The light will give 4 quick flashes to indicate it has entered programming mode
2. Enter the programming sequence for the information (31)	The light will flash once each time a key on the programmer is operated. When the sequence is completed and accepted the light will provide the voltage level in a series of flashes (e.g. 23.2VDC). Two quick flash followed by a 0.5sec gap followed by 3 quick flashes followed by a 0.5 second gap followed by two quick flashes.
3. Exit programming mode Leave the programmer idle for 10 seconds	The light will give two quick flashes followed by a short pause followed by another two quick flashes. After this it will resume normal operation. The light will flash its character for 16 to 20 seconds while it checks the day/night settings. If it is daytime and the light is set to operate at night only the light will turn off.

5.4.3 Deciding what Settings are Required

Appendix D contains tables for noting the program settings of the Omni Mega.

As the Omni Mega is delivered from the factory with default settings, it is only necessary to program the settings that need to be changed. The “Read Settings” feature can be used to note the values already programmed.

Once the required settings are known use the second table in Appendix D to note the correct syntax and programming code from programming tables in Appendix A.

5.4.3.1 Programming or Reading Multiple Settings

Each feature can be programmed one at a time as done in the examples given, by entering and exiting the program mode each time a feature is programmed. However this can be extremely time-consuming to enter multiple settings as it is necessary to wait for the Omni Mega to flash its response and return to normal operation before entering the programming mode again.

To avoid this difficulty the various settings can be programmed sequentially. Once the Omni Mega has accepted a program sequence and has flashed back the value code, the next program sequence can be entered. If there is a delay of more than 10 seconds after the confirmation flashes before entering the next program sequence the Omni Mega will exit the program mode.

The use of the table in Appendix D will allow all the programming sequences to be pre-determined and allow for a quick entry of the program settings without the need to exit the programming mode.

5.5.0 Programming Features

(Refer to Appendix A for the full list).

5.5.1 Flash Character

Vega lights are pre-programmed with 246 standard characters represented by a 3-digit code XYY. The first digit of the code represents a flash type such as 1YY for Isophase characters. If flash characters are required that are not included in the standard set these can be included if advised at time of order. These would then be available for programming under Custom character type 9YY.

Operation	=Program (or read)	=1 (or 9)
Feature	=Flash character	=0
Value	=Select from Appendix D	=XYY

5.5.2 Custom Flash Character.

When programmed the flash character code for the custom character is 999.

To program the custom character the details of the on and off periods of the flash character has to be recorded.

The programming a custom character has its own syntax and this needs to be followed correctly to be able to program the character successfully.

Operation	=Custom Character	=2
Value	=Code for the character	

The code is entered in a series of 3 digit values representing an on period or off period. Each 3-digit value is a multiple of 0.05 seconds. The 3-digit code for a 1 second on or off period would be 020 (20 multiplied by 0.05 seconds is 1 second).

The following restrictions apply:

- The minimum period that can be programmed is 0.1 second or the code of 002.
- The maximum period that can be programmed is 12.75 seconds or the code of 255. For longer periods than 12.75 seconds an ADD code can be entered

There are two special codes used as part of the custom character programming

- The ADD code to get on or off periods greater than 12.75 seconds = 001
- The termination code when the programming of the custom character is finished = 000

Appendix C provides a work sheet, and an example, for programming a Custom Character

If an error occurs when entering a custom character the Omni Mega will flash the error code of 3 quick flashes.

Programming a custom character creates a flash character with code 999. To get the Omni Mega to use the custom character the value of 999 must be entered as the flash character.

5.5.3 Day/Night Use of the Light

The Omni Mega is capable of operation at night only or both day and night. The default setting when the beacon is shipped is to operate at night only.

How the Omni Mega transitions from day to night mode and vice versa is determined by the programmed day and night Lux levels. There are 9 different day/night transition light levels allowing for a shorter or longer night.

Operation	=Program (or read)	= 1 (or 9)
Feature	=Day/Night Control	= 4
Value	=Select from Appendix A	=XYY

The first digit of the Day/Night Control value programs Day or Day/Night operation.

- 0YY allows night time operation only
- 1YY allows day and night operation

The YY digits of the Day/Night Control Value determine when the Day/Night transition occurs. The Lux levels of the 9 settings are detailed in Appendix A. The accuracy of the light sensor is ±10%.

5.5.4 Intensity Settings

A different effective intensity setting can be programmed for both day and night operation. By having different intensity settings the Omni Mega can be operated at a higher intensity during the day than at night. The programmable effective intensity settings are provided in Appendix B.

The effective intensity is programmed into the Omni Mega. The peak intensity is controlled automatically according to the flash character to maintain the required effective intensity. This is done by increasing the intensity by the Schmidt Clausen multiplier for LED lights:
(Flash period in seconds+0.2)/Flash period in seconds

Operation	=Program (or read)	=1 (or 9)
Feature	=Intensity	=1 for night intensity, 2 for day intensity
Value	=Select from Appendix B	=XXXX

5.5.5 Synchronising Options

The synchronisation options available are as follows:

Product	Hard wired	GPS
VLB-92 Omni Mega	Yes	External GPS using Vega VSU-29

For Vega LED products the sync pulse has a positive to negative transition.

Each light can be set to be a sync master or sync slave. As a slave the Omni Mega will not generate sync pulses. As a master a sync pulse will occur at the start of the flash character. Where the lights connected are all masters the first light to send a sync pulse will control the other lights.

In slave mode the Omni Mega will operate on the basis of the sync pulses received and will stop operating after a programmed number of flash cycles after the sync pulse is lost.

Operation	=Program (or read)	=1 (or 9)
Feature	=Synchronisation	=3
Value		=XYY (999 disables synchronisation)

X determines if the light is a master or slave unit.

- 0YY Master
- 1YY Slave

YY allows for the start of the flash character to be delayed from 0.0 seconds to 9.9 seconds in 0.1second increments. For example YY=25 would provide a delay of 2.5 seconds.

When an external GPS sync unit is used, such as the Vega VSU-29, refer to the manual for this device.

5.5.5.1 Loss of Sync when in Slave Sync Mode

To program a slave Omni Mega to keep running for a number of flash cycles after the loss of the master sync pulse.

Operation	=Program (or read)	=1 (or 9)
Feature	=Flash count on Loss of Sync	=7
Value		=0YY where YY is the number of flashes (999 = never stops flashing)

5.5.6 Operation Mode

The Operation Mode provides control of how the Omni Mega will operate.

- Normal, Failsafe (001): Allows Normal Operation and beacon stops working if an error is detected.
- Normal, Best Effort (002): Allows normal Operation and beacon will operate with diminished performance if error detected.
- Beacon On Output Test (005): The Beacon On output will be asserted for 10 seconds.
- AIS Beacon On Output Test (006): The AIS Beacon On output will be asserted for 10 seconds.
- Beacon Fail Alarm Test (007): Beacon Fail will be asserted for 10 seconds and Beacon OK will be simultaneously de-asserted for 10 seconds.
- Test mode (008): Temporary 4 minute test mode.

To change the operating mode of the Omni Mega

Operation	=Program (or read)	=1 (or 9)
Feature	=Operation Mode	=5
Value		=YYY where 001 is Failsafe mode. (Refer to Appendix A for other codes)

5.5.7 Programming Mode

Programming Mode controls the operation of the IRDA port. The RS232 (or RS485) port is always on.

The IRDA or the RS232 port can be used for Computer programming or for the external monitoring of the Omni Mega.

To begin using a Computer for programming with the IRDA port it will need to be turned on using the TVIR remote programmer. Information on using the IRDA port to program the Omni Mega is provided in the Supplementary Programming manual (PROG-03). After completing programming with PROG-03 via the IRDA port, it is recommended that the IRDA port be turned off (this is the default state) before the Omni Mega is installed. This precaution will reduce the possibility of IR interference with the TVIR controller input.

Monitoring the Omni Mega using the IRDA or RS232 (or RS485) port can be continuous or on demand, when data is requested by an external device. Only one of the ports can be used for monitoring at any time. Details of the protocol to exchange data with the beacon is provided in Appendix G

Operation	=Program (or read)	=1 (or 9)
Feature	=Operation Mode	=6
Value		=000 has the IRDA port disabled. See Appendix A for other settings

5.5.8 Battery Thresholds

The Omni Mega has programmable battery threshold settings designed to protect a battery from damage by being over-discharged. If the low threshold is reached the beacon will turn off and assert Beacon FAIL and de-assert Beacon ON until the battery voltage is above the high voltage threshold. Where no batteries are used the low voltage threshold can be disabled, however operation will still cease if the battery voltage drops below 15 Volts for the 24V version or 9.8V for the 12V version for 5 cycles immediately after the light is switched on. This precaution is intended to protect the power supply input from over-current damage and to reduce the chance of malfunctioning of the light.

Operation	=Program (or read)	=1 (or 9)
Feature	=Operation Mode	=8 Low battery threshold (9 High battery threshold)
Value		=YYY in tenths of Volts

The value range for the Low Threshold is 000 to 240 for the 24V version and 000 to 120 for the 12V version (999 disables the Low voltage threshold). The default setting is 20.0VDC for the 24V version and 10.0VDC for the 12V version.

The value range for the High Threshold is 201 to 280 for the 24V version and 101 to 140 for the 12V version (999 sets the default setting of either 25.6VDC for the 24V version or 12.8VDC for the 12V version).

Take care in setting the high threshold to ensure the voltage of the battery will reach this voltage during charging. If the high threshold is set too high, the light may not resume operation after a low voltage threshold shutdown. Any of these events will also reset the low voltage lockout: disconnection and reconnection of the supply voltage (be sure to disconnect the supply for long enough to power down the microprocessor – watch the green heartbeat LED go out), or putting the light into TVIR programming mode, or if the light experiences a day-to-night transition.

5.5.9 System Information

The Omni Mega contains details of manufacture including calibration details, firmware version, and LED type used. This information is useful should there either be a problem with the Omni Mega or where it is necessary to locate the correct manual for the serial number of the beacon.

The supply voltage to the Omni Mega can also be read as a quick means of checking battery voltage.

Operation	=Read Only	=3
Feature	=Operation Mode	=1 for battery voltage, (see Appendix A for others)
Value		=Series of flashes providing the requested value.

All information is in numeric format and represented by a series of flashes 0.1 sec on, 0.1 sec off, separated by 0.5 sec gap between numbers. The Voltage level is provided in tenths of a volt.

5.5.10 Security PIN Number

The Omni Mega is shipped from the factory without any security protection. If there is concern about unauthorised programming it is possible to have a 3-digit PIN number for security access. Use of the PIN code is only necessary to change settings. It is possible to read settings without using the PIN code

<u>For setting a Security PIN</u>
Enter TVIR programming mode by operating the standby button for 5 seconds.

Operation	=7	=PIN
Feature	=1	=Set PIN

Value =XXX =PIN Code (Value 000 no PIN)
The Omni Mega will then flash back the three numbers in a series of flashes.

To change settings when a Security PIN is used.
Enter TVIR programming mode by operating the standby button for 5 seconds.
Operation =7 =PIN
Feature =7 =Check PIN
Value =XXX =PIN Code
The Omni Mega will flash back the number using a series of flashes. You can then continue onto programming your beacon.

Note: Where a PIN has been set, and a user attempts changing any settings, an error message will be generated and no changes will actually occur.
If you lose your PIN number, please contact Vega for further instruction.

5.5.11 Other Settings

The other settings options allows user to reset the Omni Mega to the default factory settings and to select which option of programming feedback is used on the beacon. The default setting for the programming feedback is to use the single green LED located in behind the lower lens. The alternate option is to use the Omni Mega main LED's. If the main beacon LED's are used to provide programming feedback the intensity used will be 4% of their peak capability.

For programming the "Other Settings"
Enter TVIR programming mode by operating the standby button for 5 seconds.
Operation =8 =OTHER SETTINGS
Feature =1 or 6 =1 is reset to factory default, 6 is the program indicator select
Value =XXX =not required for factory reset,
000 main LED's off, 001 main LED's on
The Omni Mega will then flash back the Value in a series of flashes.

6.0 ROUTINE MAINTENANCE

6.1 Maintenance Cleaning

Vega LED beacons require little to no maintenance.

The Omni Mega should be inspected and cleaned occasionally to ensure maximum intensity and that no foreign material has got trapped in the heat sink on top of each unit.

Use warm soapy water to wash the outside of the beacon and rinse off with clean water. Do not use any solvent-based cleaner.

6.2 Inspection Check

Periodically check that the beacon remains firmly secured and level, and that the mounting fasteners are still in good condition. Investigate any corrosion and take appropriate preventive action.

The Beacon can be tested by programming for the "test "mode or if daytime, covering the unit (or an external daylight sensor if fitted) briefly to simulate night-time operation. When the light is flashing check it is displaying the correct flash character.

Remember to remove the cover before leaving the site.

User Notes

APPENDIX A PROGRAMMING TABLE

Operation	Feature	Value
1 = Program Mode 9 = Read Settings	0 = Flash Character	000 – Fixed character 1YY – Iso phase (ISO) 2YY – Occulting (OC) 3YY – Flash (Fl) 4YY - Multiple Flash (Fl(x)) 5YY - Very Quick (VQ) 6YY - Quick (Q) 7YY – Long (LF) 8YY – Morse (MO) 9YY – Custom (CCG Codes)
	1 = Night Effective Intensity	Four Digit Value – Enter value as a number 0000 to 9999. 0000 Sets to minimum programmable intensity. 0001 Set to factory preset intensity. 9999 sets maximum allowed value. Automatic Schmidt Clausen correction
	2 = Day Effective Intensity	Four Digit Value – Enter value as a number 0000 to 9999. 0000 Sets to minimum programmable intensity. 0001 Set to factory preset intensity. 9999 sets maximum allowed value. Automatic Schmidt Clausen correction
	3 = Synchronisation	999 – Disable Synchronisation 998 – Beacon activated by holding sync low. Synchronization not possible since sync line used. 0YY Light in normal mode 1YY Light operates only when sync pulse present YY=sync delay seconds (0.0 to 9.9 seconds)
	4 = Day/Night Control	0YY Light operates night only 1YY Light operates day and night YY= Day/Night transition Lux Level Night Lux. Day Lux YY=01 40 100 shortest night YY=02 50 150 YY=03 75 100 CCG YY=04 75 150 YY=05 75 175 IALA suggested YY=06 100 175 YY=07 100 200 YY=08 150 250 YY=09 250 320 longest night USCG

Operation	Feature	Value
1 = Program Mode 9 = Read Settings	5 = Operation Mode	001 – Normal Operation, Failure Mode = Failsafe: Beacon stops operating when error detected. 002 – Normal Operation, Failure Mode = “Best Effort” operation: Continue to operate in possibly diminished capacity – may result in loss of some intensity from beacon.) 005 – Beacon On output test, asserts for 10 seconds. 006 – AIS Beacon On output test, asserts for 10 seconds. 007 – Alarm test, asserts Beacon Fail for 10 seconds. 008 – Test Mode for 4 minutes (beacon ignores day off status and operates continually). Temporary Mode (will reset to 001 or 002 after execution).
	6 = Programming Mode/IRDA/(RS232 always on) *Default 000*	000 – IRDA Disabled, No Monitoring (Default) 001 – IRDA Enabled, No Monitoring 002 – IRDA Monitoring Output, Free Running 003 – IRDA On-demand Monitoring Output 004 – RS232 Free-running Monitoring Output 005 – RS232 Monitoring on Demand Output 006 – RS232, Intermittent (6s) Monitoring in AIS format
	7 = Slave Mode Flash count on loss of sync *Default 001* *1 Character cycle*	0YY– Continue “Y” number of cycles (0-99) 999 – Disabled, never stop flashing
	8 = Set Low battery threshold *24V version:* *Default 200, 20.0VDC* *12V version:* *Default 100, 10.0VDC*	YYY – Battery low threshold. (24V version: 00.0 to 24.0, or 12V version: 00.0 to 12.0) 999 – Disabled, No battery low cut off
	9 = Set High battery threshold *24V version:* *Default 256, 25.6VDC* *12V version:* *Default 128, 12.8VDC*	YYY – Battery high threshold. (24V version: 20.1 to 28.0, or 12V version: 10.1 to 14.0) 999 – Default setting (25.6)

2 – Custom Character Setting	Custom flash character segments	Up to 9 On/Off pairs. Comma Separated, 50 millisecond units. Numbers 002 to 255 are permitted in the On/Off pairs. 001 is a special case indicating continuation (connect the two values on either side of 001) 002 to 255: 100 milliseconds to 12.75 seconds 001 - Extend an on or off period). 000 – End command Examples: a: 010 020 015 020 200 001 200 020 000 b: 006 012 006 012 000 c: 125 125 000 Illegal: a: 020 001 001 020 000 (repeated connecting character) b: 010 020 015 000 (no off period after 015) c: 020 010 020 010 (no terminating 000)

Operation	Feature	Value
3 – System Information	0 = Software version	Version Y.Y.Y (i.e. 0.2.8)
	1 – Battery voltage	YY.Y Volts (e.g. 21.7 volts or 10.8 volts) Last voltage prior to entering programming mode
	2 – Master Temp sensor reading	Temperature in degrees Kelvin (C+273).
	4 – Serial Number	Displays beacon serial number as a series of flashes
	5 – LED version number	Displays LED version number identifier

Operation	Feature	Value
7 - Pin	1-Set PIN *Default 000*	XXX (000 clears the PIN)
	7 – Enter PIN	XXX

Operation	Feature	Value
8 – Other Settings	1 – Reset Factory Default	000
	5 – Set RS232 Baud Rate	000 – Default (required for Vegaweb) – 115200 Baud 001 – 4800 002 – 9600 003 – 14400 004 – 19200 005 – 38400 (required for AIS) 006 – 57600 007 – 115200
	6 – Indicator Select *Default 000*	000 – Beacon main LEDs do not flash during programming 001 – Beacon main LEDs flash in response to programming

APPENDIX B INTENSITY SETTINGS AND CURRENTS

Last update: September 2014

1.6 Degree White Beacon, 1 Tier VLB-92-W16-1T (Max Ambient Operating Temperature 50C)					
Range (NM @ 0.74T)	**Range (NM @ 0.85T)**	**Effective Luminous Intensity (cd)**	**Prog Code**	**Current (A) @25C, 24V**	**Current (A) @25C, 12V**
				WHITE	**WHITE**
				465	**465**
19.14	30.0	80,000	**0800**	**16.7**	**41.5**
19.0	29.7	75,600	**0756**	**15.8**	**39.0**
18.5	28.8	61,600	**0616**	**12.9**	**31.0**
18.0	27.9	50,200	**0502**	**10.5**	**26.0**
17.5	27.1	40,800	**0408**	**8.5**	**22.0**
17.0	26.2	33,100	**0331**	**6.9**	**18.5**
16.5	25.2	26,900	**0269**	**5.6**	**15.0**
16.0	24.4	21,700	**0217**	**4.5**	**12.5**
15.5	23.5	19,500	**0195**	**4.1**	**11.5**
15.5	23.5	17,500	**0175**	**3.7**	**10.5**
15.0	22.7	14,100	**0141**	**3.0**	**8.7**
14.5	21.8	11,400	**0114**	**2.4**	**7.3**
14.0	21.0	9,100	**0091**	**1.9**	**6.1**
13.5	20.0	7,300	**0073**	**1.5**	**5.1**
13.0	19.3	5,800	**0058**	**1.2**	**4.2**
Max Candela (cd, -30C to +50C)				**80, 000**	**80,000**
Max Current (A @ 25C)				**16.7**	**41.5**
Night current (A)				**0.05**	**0.1**
Day off current (A)				**0.05**	**0.1**
Safe operating power limit (Ipsafe) for one stack at @50C max ambient: Product of peak intensity and duty cycle averaged over the flash character. E.g. Ieff * SC * duty <= Ipsafe The beacon will automatically reject any combination of flash character and intensity that exceeds this limit.				**80,000**	**80,000**

Last update: September 2014

1.6 Degree White Beacon, 2 Tiers VLB-92-W16-2T (Max Ambient Operating Temperature 50C)					
Range (NM @ 0.74T)	**Range (NM @ 0.85T)**	**Effective Luminous Intensity (cd)**	**Prog Code (kcd output intensity)**	**Current (A) @25C, 24V**	**Current (A) @25C, 12V**
				WHITE	**WHITE**
				465	**465**
20.87	33.0	160,000	1600	33.5	82.5
20.5	32.4	138,200	1382	29.0	70.5
20.0	31.5	113,200	1132	23.5	57.5
19.5	30.6	92,500	0925	19.5	48.5
19.14	30.0	80,000	**0800**	**16.7**	**43.0**
19.0	29.7	75,600	**0756**	**15.8**	**41.0**
18.5	28.7	61,600	**0616**	**12.9**	**34.5**
18.0	27.9	50,200	**0502**	**10.5**	**28.5**
17.5	27.0	40,800	**0408**	**8.5**	**23.5**
17.0	26.1	33,100	**0331**	**6.9**	**20.0**
16.5	25.2	26,900	**0269**	**5.6**	**16.5**
16.0	24.4	21,700	**0217**	**4.5**	**14.0**
15.5	23.5	17,500	**0175**	**4.1**	**12.0**
15.0	22.7	14,100	**0141**	**3.7**	**10.0**
14.5	21.8	11,400	**0114**	**3.0**	**8.3**
Max Candela (cd, -30C to +50C)				**160,000**	**160,000**
Max Current (A @ 25C)				**33.5**	**82.5**
Night current (A)				**0.05**	**0.1**
Day off current (A)				**0.05**	**0.1**
Safe operating power limit (Ipsafe) for one stack at @50C max ambient: Product of peak intensity and duty cycle averaged over the flash character. E.g. Ieff * SC * duty <= Ipsafe The beacon will automatically reject any combination of flash character and intensity that exceeds this limit.				**80,000**	**80,000**

Last update: August 2014

1.6 Degree White Beacon, 3 Tiers VLB-92-W16-3T (Max Ambient Operating Temperature 50C)				
Range (NM @ 0.74T)	**Range (NM @ 0.85T)**	**Effective Luminous Intensity (cd)**	**Prog Code (kcd output intensity)**	**Current (A) @25C, 24V**
				WHITE
				465
21.9	34.8	240,000	2400	50.2
21.5	34.1	205,500	2055	43.0
21.0	33.3	168,600	1686	35.2
20.5	32.4	138,200	1382	28.9
20.0	31.5	113,200	1132	23.7
19.5	30.6	92,500	0925	19.3
19.14	30.0	80,000	**0800**	**16.7**
19.0	29.6	75600	**0756**	**15.8**
18.5	28.7	61,600	**0616**	**12.9**
18.0	27.9	50,200	**0502**	**10.5**
17.5	27.0	40,800	**0408**	**8.5**
17.0	26.1	33,100	**0331**	**6.9**
16.5	25.2	26,900	**0269**	**5.6**
16.0	24.4	21,700	**0217**	**4.5**
Max Candela (cd, -30C to +50C)				**240,000**
Max Current (A @ 25C)				**50.2**
Night current (A)				**0.05**
Day off current (A)				**0.05**
Safe operating power limit (Ipsafe) for one stack at @50C max ambient: Product of peak intensity and duty cycle averaged over the flash character. E.g. Ieff * SC * duty <= Ipsafe The beacon will automatically reject any combination of flash character and intensity that exceeds this limit.				**80,000**

Notes:

- Currents are based on the specified 12V or 24V supply voltage.
- Currents are based on operation at an ambient temperature of 25ºC and are rounded to within +/-0.5A (peak currents) or +/-0.1A (mean currents) of the nominal value.
- Currents are temperature-dependent.
- The VLB-92 is rated to operate within specification over the ambient temperature range, -30ºC to +50ºC for 1.6 degree versions. The safe operating power limit and the specification operating power limit are provided in the intensity table in Appendix A. The beacon will reject user settings that exceed the safe operating limit. Regardless of any settings and actual ambient temperature the beacon will automatically limit its output if it detects an internal temperature that exceeds its designed safe limit.

Using the tables:

1. The VLB-92 beacon is programmed for the effective intensity required. The programmed effective intensity is shown in the Effective Luminous Intensity column for the relevant Prog Code entered. For example a 16.2NM light at 0.74T has an effective candela of 23.6kCandela. Program code 0236.
2. Any effective intensity can be programmed between the minimum candela value shown in the table to the maximum candela value shown. For example, although it is not shown in the table, 10,000cd (approximately) can be programmed with Prog Code 0100.
3. For Fixed Character operation, any effective intensity up to and including the Specification Operating Power Limit (Ipspec) value shown in the table can be programmed and the beacon will perform to specification. Additionally, any effective intensity up to and including the Safe Operating Power Limit (Ipsafe) value shown in the table can be programmed and the beacon may operate but is not guaranteed to operate to specification. If the Ipspec value is not stated then the IPsafe value also defines beacon specification performance.
4. For effective intensities exceeding the Specification Operating Power Limit (Ipspec), where it differs from the Safe Operating Power Limit (Ipsafe), flash characters with reduced duty cycles can be programmed. The beacon will operate to specification if the product of peak intensity and duty cycle is less than or equal to the Ipspec value. For example, if the effective intensity is 23.6kcd, the flash character is 0.7s giving a Schmidt-Clausen of 1.2857 and the flash period is 10s, giving a duty cycle of 0.07 then the operating power limit is equal to Ip = 23600 * 1.2857 * 0.07 = 2123.97 . If this figure is less than or equal to Ipspec, then the beacon will operate to specification. If a complex flash character is used then the formula above needs to be summed across the SC and duty factors of each flash on portion of the character.
5. For effective intensities exceeding the Safe Operating Power Limit (Ipsafe), some flash characters with reduced duty cycles can be programmed. The beacon actively checks the user settings of flash character and effective intensity to limit the heat generated to protect the LEDs and circuitry. The beacon will accept any combination of flash character and effective intensity settings that falls within, or equal to its Safe Operating Power Limit shown in the table. If a user attempts to program a combination of flash character or effective intensity (in either order) that exceeds the Safe Operating Power Limit then the beacon will reject the command. To guarantee acceptance of a combination that the user believes is valid, set the intensity to the lowest setting, set the desired flash character and then set the effective intensity to the required setting. An example of a safe operating power limit check is as follows. If the effective intensity is 23.6kcd, the flash character is 0.7s giving a Schmidt-Clausen of 1.2857 and the flash period is 10s, giving a duty cycle of 0.07 then the operating power limit is equal to Ip = 23600 * 1.2857 * 0.07 = 2123.97 . If this figure is less than or equal to Ipsafe then the beacon settings will be accepted when entered by the user. If a complex flash character is used then the formula above needs to be summed across the SC and duty factors of each flash on portion of the character.

6. The VLB-92 beacon has automatic Schmidt Clausen correction to maintain the effective intensity for short flash periods. For example to achieve an effective candela of 23600 Candela (16.2NM) for a 0.7s flash period the peak intensity required is 30300 Candela (23600 Candela*(flash period+0.2)/flash period).
7. The beacon is unable to output more than the maximum candela shown in the table. The user should check that the beacon is able to reach the peak candela required after the Schmidt Clausen correction. In the example above the peak candela for the 0.7s flash is 30300 Candela and is less than the maximum of 30300. The beacon will therefore support the flash for the required range of 16.2NM.
8. The beacon will operate to specification over the specified operating ambient temperature range and if its settings are within both the indicated specification operating power limit (Ipspec) and safe operating power limit (Ipsafe). Outside of any of these conditions the beacon is not guaranteed to operate within specification and in some circumstances might activate protection functions and/or indicate abnormal conditions via the alarm-monitor output.
9. To determine the on current of a flash it is necessary to determine the peak candela required. Using the example of a 1s-second flash, and a peak candela of 60.24kCd, the currents for settings bordering this value can be obtained from reading across from the effective candela column, 25.5A for 61600 Candela, and 19A for 50200 Candela. The option is to use the higher of the two currents (25.5) or carry out a linear approximation between the two values, (~24.7A≈19A+(25.5A-19A)/(61600Cd-50200Cd) *(60240Cd-50200Cd).
10. The off current of the beacon between flashes and the base current when the beacon is not operating (switched off during daytime) are provided at the bottom of the table.

APPENDIX C WORKSHEET FOR A CUSTOM CHARACTER

Fill out the table below for the values required to program a custom character.
The steps to program a custom character is as follows
Example given for Fl (2) 38.5sec (1sec on 2sec off 16sec on 19.5sec off)

Step		Example	Required Character
Enter programming mode	The light will flash 4 times to indicate it is in programming mode	Press standby button for 5 seconds	Press standby button for 5 seconds
Enter Operation and Class syntax	Light will flash each time button is pressed	**2**	**2**
Enter ON time If greater than 12.75 seconds use ADD code 001	Value is multiple of 0.05 seconds max value 255	On time of 1sec **020**	
Enter OFF time If greater than 12.75 seconds use ADD code 001	Value is multiple of 0.05 seconds max value 255	Off time of 2 sec **040**	
Enter ON time. If greater than 12.75 seconds use ADD code 001		On time 16 seconds. Need to program 8 sec plus 8 sec using ADD **160 001 160**	
Enter OFF time. If greater than 12.75 seconds use ADD code 001		Off time 20 seconds Need to program 10 sec plus 10 sec using ADD **200 001 200**	
Enter ON time. If greater than 12.75 seconds use ADD code 001			
Enter OFF time. If greater than 12.75 seconds use ADD code 001			
FINISHED code	Light will flash 3 long flashes to indicate the instruction has been accepted	**000**	**000**

When the light exits the programming mode it will flash the character that is currently selected. To use the custom character, you must select character 999 (enter programming mode then press 1 0 999).

If an error is made when programming the custom character, the light will flash 3 times and exit the programming mode

APPENDIX D OMNI MEGA SETTINGS

Complete the table for the required settings. It is only necessary to program the specific settings where they are different to the settings already programmed.

The programming can be done sequentially without leaving the program mode. After the light has flashed back the setting enter the next setting within 10 seconds or the light will exit the programming mode.

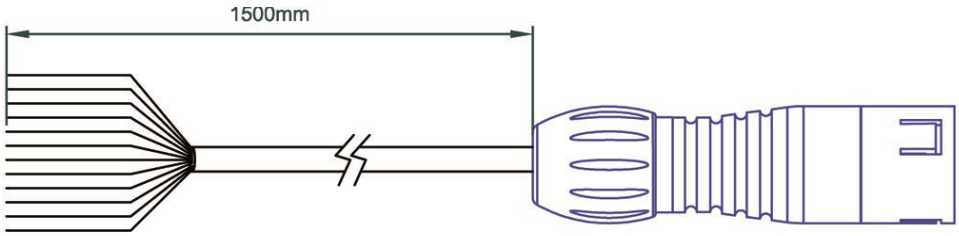
To read the settings already programmed

Setting	Key sequence	Value
Flash Character	**90**	
Night Effective Intensity	**91**	
Day Effective Intensity	**92**	
Synchronisation	**93**	
Day/Night Control	**94**	
Operation mode	**95**	
Programming mode	**96**	
Slave Mode Flash count on loss of sync	**97**	
Battery Low Threshold	**98**	
Battery High Threshold	**99**	

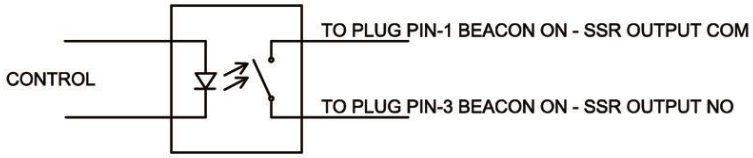
To enter new settings

Setting	Default		Settings required
Flash Character			**10**_____
Night Effective Intensity			**11**_____
Day Effective Intensity			**12**_____
Synchronisation	Master, no delay	1_3_000	**13**_____
Day/Night Control	Night, IALA setting	1_4_005	**14**_____
Operation mode	Normal, best effort	1_5_002	**15**_____
Programming mode	IRDA off	1_6_000	**16**_____
Slave Mode Flash count on loss of sync	1 Character cycle	1_7_001	**17**_____
Battery Low Threshold	20.0/10.0 Volts	1_8_200	**18**_____
Battery High Threshold	25.6/12.8 Volts	1_9_256	**19**_____
PIN	No PIN	7_1_000	**71**_____
Program Indicator	Main LEDs off	8_6_000	**86**_____

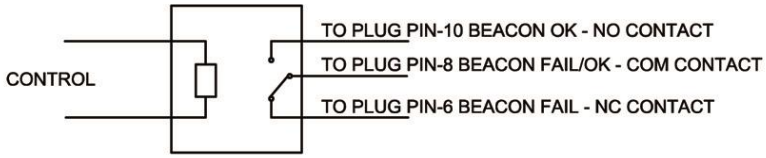
APPENDIX E ELECTRICAL CONNECTIONS

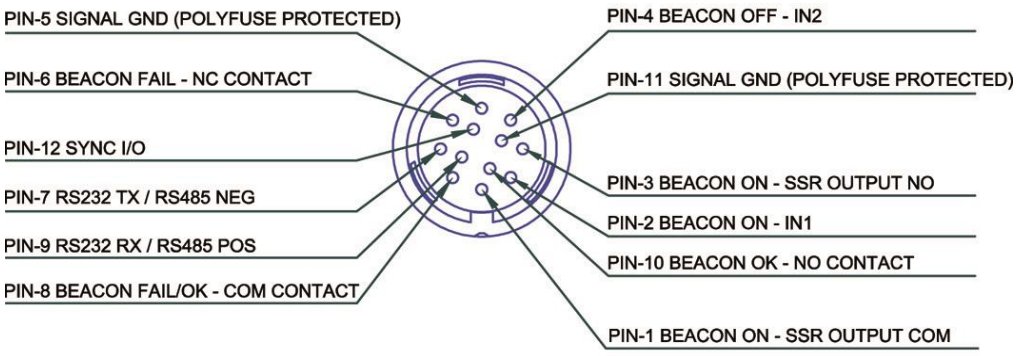


SSR OUTPUT DIAGRAM



RELAY(CONTACT) DIAGRAM





	PLUG PIN	WIRE COLOUR	FUNCTION
SSR OUTPUT	1	PINK	BEACON ON - SSR OUTPUT COM
	3	ORANGE	BEACON ON - SSR OUTPUT NO
RELAY (CONTACT)	6	WHITE	BEACON FAIL - NC CONTACT
	8	CYAN	BEACON FAIL/OK - COM CONTACT
	10	GREY	BEACON OK - NO CONTACT
INPUTS	2	BROWN	BEACON ON - IN1
	4	RED	BEACON OFF - IN2
RS232/RS485	7	YELLOW	RS232 TX / RS485 NEG
	9	PURPLE	RS232 RX / RS485 POS
	5	BLUE	SIGNAL GND (POLYFUSE PROTECTED)
SYNC	11	BLACK	SIGNAL GND (POLYFUSE PROTECTED)
	12	GREEN	SYNC I/O

APPENDIX F OMNI MEGA MULTI-UNIT ASSEMBLY USING ADAPTOR-BASE

Overview

This appendix describes how to mount and wire up two VLB-92 beacon stacks into a multi-stack arrangement.
These instructions refer specifically to models with pass-through cables. The pass-through cables are provided as a convenience to avoid a customer having to risk obscuring the light from a lower beacon when cabling to an upper beacon.
The cabling instructions refer to the pass-through cables that are fitted to the bottom stack in a multi-stack installation. The pass-through cables for the top stack, if present, should be capped off and can be ignored.

Accessories provided with VLB-92 beacon stacks intended for multi-stacking:

- M6x20 CSK Screw x 4
- M6 Cone Washer x 4

Required Tools:

- 4mm Allen Key

Assembly Instructions

Note:

- Remove any lifting eye from the lower stack before assembly. Make sure bird-spikes are not fitted to the lower stack.
- Ensure all unused cables have tightly-fitted caps.
- Refer to the following figure showing how to mount one stack upon another.

Assembly Step 1: Preparation

- Remove or cut all p-clips securing all of the carry through cables on the heatsink of the lower beacon. Be sure to put back the screws and the washers that had secured any p-clips.
- It is suggested that the cable-ties holding the pass-through cables in place at the outer edges of the lower stack's heatsink be left in place until after the top stack is mounted. This will provide some security in keeping the cables from being pinched between the stacks during the mounting operation.

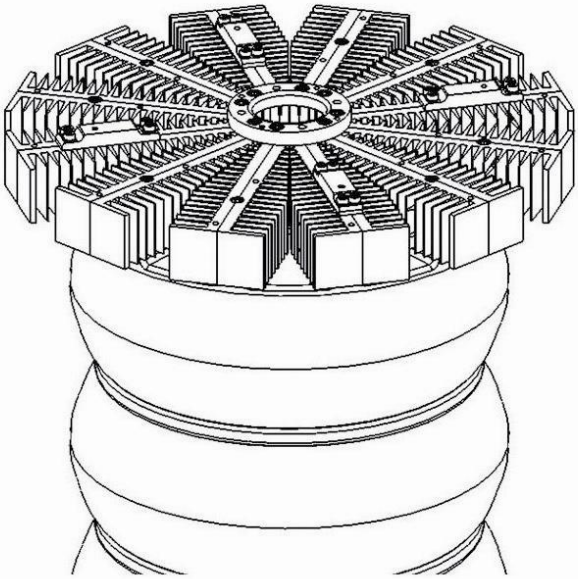
Assembly Step 2: Mount & Secure Top Stack

- Lift the top stack and position it over the bottom stack using the product label on each stack as a reference.
- Rotate the top stack by 15 degrees in either direction to align its base with the mounting points on the lower stack.
- Lower the top stack on to the spacers that form part of the lower stack's heatsink.
- Apply Loctite 243 or similar thread locking product to 4x M6x20 CSK screws, and install the screws with the cone washers to secure the top stack to the bottom stack.

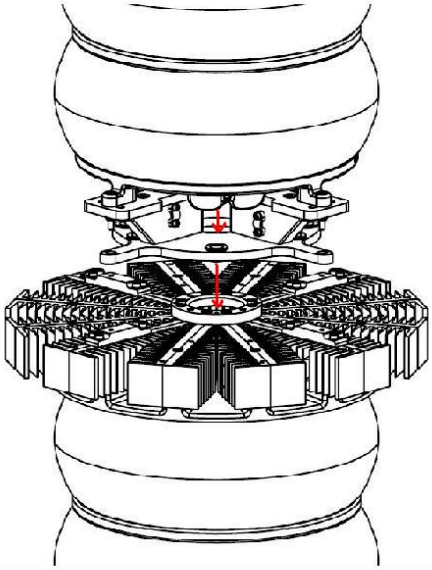
Assembly Step 3: Connect Carry-through Cables

- Connect the "Carry through Data" cable on bottom stack to the "Data" connector on top stack.
- Connect the "Carry through power 0V" cable on bottom stack to the "Power 0V" cable on top stack.
- Connect the "Carry through power 24V" cable on bottom stack to the "Power 24V" cable on top stack.

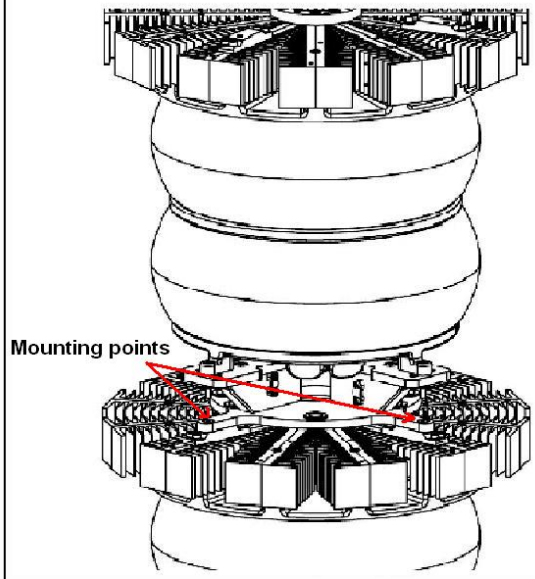
(1) Remove lifting eye from bottom stack



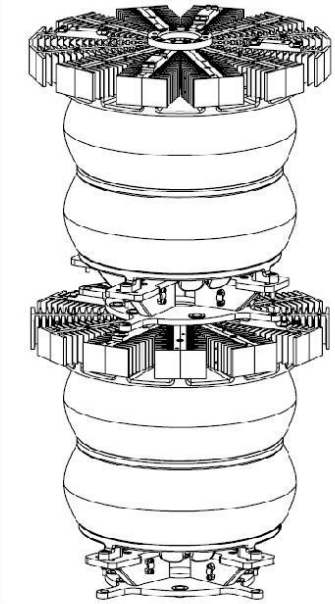
(2) Lift top stack & position over bottom stack
(3) Feed all top stack cables down centre core of bottom stack and pull through base of bottom stack.



(4) Lower top stack on to 4 mounting brackets on top of heat sink.
(5) Install 4 m6 csk screws to secure top stack.



(6) Remove lifting eye from top stack.



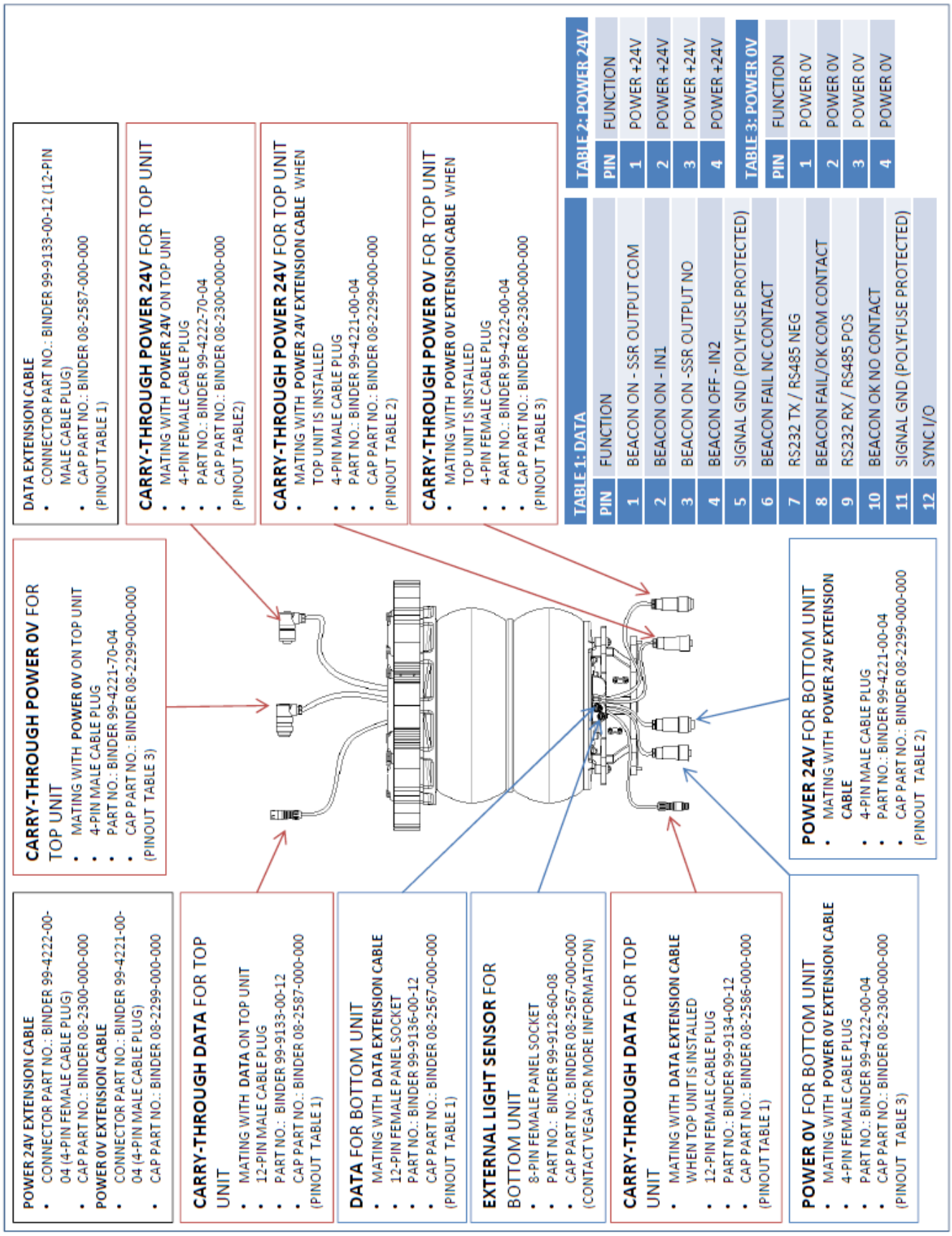
Cabling Instructions

The following figure provides detailed information about an individual beacon's pass-through cables and direct power and data connectors. The pass-through cables on a lower beacon are designed to mate directly with the power input and data input connectors of an upper beacon.

Extension power and data cables are provided for both beacons to connect to external power sources and other equipment. These extension cables connect to the lower beacon directly and to the upper beacon via the lower beacon's pass-through cables. The extension cables are left unterminated for customer use.

Making the Final Connections:
All cables feed out of the bottom beacon base assembly.

- Bottom Unit connections are labelled:
    1. "Power +24V/+12V"
    2. "Power 0V"
    3. Data Connector on the bottom plate boss
- Top Unit connections are labelled:
    1. "Carry Through Power +24V/+12V"
    2. "Carry Through Power 0V"
    3. "Carry Through Data"


DATA EXTENSION CABLE
• CONNECTOR PART NO.: BINDER 99-9133-00-12 (12-PIN MALE CABLE PLUG)
• CAP PART NO.: BINDER 08-2587-000-000
(PINOUT TABLE 1)
CARRY-THROUGH POWER 24V FOR TOP UNIT
• MATING WITH POWER 24V ON TOP UNIT
• 4-PIN FEMALE CABLE PLUG
• PART NO.: BINDER 99-4222-70-04
• CAP PART NO.: BINDER 08-2300-000-000
(PINOUT TABLE2)
CARRY-THROUGH POWER 24V FOR TOP UNIT
• MATING WITH POWER 24V EXTENSION CABLE WHEN TOP UNIT IS INSTALLED
• 4-PIN MALE CABLE PLUG
• PART NO.: BINDER 99-4221-00-04
• CAP PART NO.: BINDER 08-2299-000-000
(PINOUT TABLE 2)
CARRY-THROUGH POWER 0V FOR TOP UNIT
• MATING WITH POWER 0V EXTENSION CABLE WHEN TOP UNIT IS INSTALLED
• 4-PIN FEMALE CABLE PLUG
• PART NO.: BINDER 99-4222-00-04
• CAP PART NO.: BINDER 08-2300-000-000
(PINOUT TABLE 3)
TABLE 1: DATA
PIN FUNCTION
1 BEACON ON - SSR OUTPUT COM
2 BEACON ON - IN1
3 BEACON ON -SSR OUTPUT NO
4 BEACON OFF - IN2
5 SIGNAL GND (POLYFUSE PROTECTED)
6 BEACON FAIL NC CONTACT
7 RS232 TX / RS485 NEG
8 BEACON FAIL/OK COM CONTACT
9 RS232 RX / RS485 POS
10 BEACON OK NO CONTACT
11 SIGNAL GND (POLYFUSE PROTECTED)
12 SYNC I/O
TABLE 2: POWER 24V
PIN FUNCTION
1 POWER +24V
2 POWER +24V
3 POWER +24V
4 POWER +24V
TABLE 3: POWER 0V
PIN FUNCTION
1 POWER 0V
2 POWER 0V
3 POWER 0V
4 POWER 0V
CARRY-THROUGH POWER 0V FOR TOP UNIT
• MATING WITH POWER 0V ON TOP UNIT
• 4-PIN MALE CABLE PLUG
• PART NO.: BINDER 99-4221-70-04
• CAP PART NO.: BINDER 08-2299-000-000
(PINOUT TABLE 3)
POWER 24V EXTENSION CABLE
• CONNECTOR PART NO.: BINDER 99-4222-00-04 (4-PIN FEMALE CABLE PLUG)
• CAP PART NO.: BINDER 08-2300-000-000
POWER 0V EXTENSION CABLE
• CONNECTOR PART NO.: BINDER 99-4221-00-04 (4-PIN MALE CABLE PLUG)
• CAP PART NO.: BINDER 08-2299-000-000
CARRY-THROUGH DATA FOR TOP UNIT
• MATING WITH DATA ON TOP UNIT
• 12-PIN MALE CABLE PLUG
• PART NO.: BINDER 99-9133-00-12
• CAP PART NO.: BINDER 08-2587-000-000
(PINOUT TABLE 1)
DATA FOR BOTTOM UNIT
• MATING WITH DATA EXTENSION CABLE
• 12-PIN FEMALE PANEL SOCKET
• PART NO.: BINDER 99-9136-00-12
• CAP PART NO.: BINDER 08-2567-000-000
(PINOUT TABLE 1)
EXTERNAL LIGHT SENSOR FOR BOTTOM UNIT
• 8-PIN FEMALE PANEL SOCKET
• PART NO.: BINDER 99-9128-60-08
• CAP PART NO.: BINDER 08-2567-000-000
(CONTACT VEGA FOR MORE INFORMATION)
CARRY-THROUGH DATA FOR TOP UNIT
• MATING WITH DATA EXTENSION CABLE WHEN TOP UNIT IS INSTALLED
• 12-PIN FEMALE CABLE PLUG
• PART NO.: BINDER 99-9134-00-12
• CAP PART NO.: BINDER 08-2586-000-000
(PINOUT TABLE 1)
POWER 0V FOR BOTTOM UNIT
• MATING WITH POWER 0V EXTENSION CABLE
• 4-PIN FEMALE CABLE PLUG
• PART NO.: BINDER 99-4222-00-04
• CAP PART NO.: BINDER 08-2300-000-000
(PINOUT TABLE 3)
POWER 24V FOR BOTTOM UNIT
• MATING WITH POWER 24V EXTENSION CABLE
• 4-PIN MALE CABLE PLUG
• PART NO.: BINDER 99-4221-00-04
• CAP PART NO.: BINDER 08-2299-000-000
(PINOUT TABLE 2)

APPENDIX G DATA PORT PROTOCOL

PURPOSE

The VLB-92 communication protocol provides a human and machine-readable format for control, configuration and status information used in the VLB-92 beacon. The primary purpose is to provide inter-system communication and external configuration control. The data is also suitable for communicating beacon status.

DESCRIPTION

The VLB-92 Communication protocol transmits status data via the RS232 port. Each data package uses a pseudo XML format consisting of three letter tags surrounded by '<' and '>', a comma separated data field and a termination character, '/'.

Communication Port Settings

The VLB-92 Communication protocol transmits data via RS232 port using the following communication parameter settings:
Baud Rate: 115200
Parity: None
Data Bits: 8
Stop Bits: 1

DATA FORMAT

Command Data:

Each data package uses a pseudo XML format consisting of a tag followed by comma separated data then a terminator or subsequent tag.

Tags are always three characters surrounded by the '<' and '>' symbols.
This is a tag: <TAG>

Data is a comma separated list consisting of one or more long signed integers, signed integers, or floating point numbers (indicated by the presence of a decimal point).

The termination character is '/'.

An entire data packet might look like this: <NRG>1,120/

The data may or may not contain white space characters. These are to be ignored.

Optional Checksum
<TAG>data…/*C where C is the XOR of all characters from the first < to the / inclusive. The check sum is always the character after the *.
If the checksum not present (no *) it is ignored.

Query Requests:

A request for data consists of the three letter data code with a question mark in the desired space i.e.; <NRG>1,?/

TAG DEFINITIONS

Note, the address is compulsory in most commands. The beacon will usually accept a command without an address but the required value will not necessarily be stored. The address value used in a command should be 0 or 1 for correct operation.

Night Range
<NRG> Addr,Range/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Range is the desired range in candela

Day Range
<DRG> Addr, Range/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Range is the desired range in candela

Sync Delay
<SYD>Address,Delay/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Delay: is the sync delay in 50 millisecond units, range 0 to 9.95 seconds.

On Sync Only("slave mode")
<OSO> Address, Bool/
Beacon will only operate if a sync pulse is present.
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Bool : 0 for normal operation, Non-zero for slave sync operation.

Slave Sync Flash Count
<SSF> Address, SyncCount/
Beacon will only operate if a sync pulse is present.
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
SycnCount : 0-254 number of flashes to permit after loss of incoming sync pulses. 255 means never stop flashing.

On During Day
<ODD> Address, Bool/
Beacon will only operate during day light.
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Bool : 0 if inactive during daylight, Non-zero for operation during daylight.

Day Night Threshold index
<DNT> Address, DayNightArrayIndex/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
DayNightArrayIndex integer from 0-9 where 0 is the shortest night (most sensitive to light) and 9 is the longest night (least sensitive to light).

On Day/Night
<ODN> Address, Bool/
Beacon will parse this command value as a combination of ODD and DNT commands, as per the 1-4-XXX TVIR syntax. E.g: Values in the range 0-12 define night-only operation (ODD) and

specific day/night thresholds (DNT). Values in the range 100-112 define day and night operation (ODD) and specific day thresholds in the range 0-12 (DNT).
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Bool (100s) + DayNightArrayIndex+1 (units) : Refer to DNT for vaid Index values and ODD for the effect Boolean shifted to the 100s position.

Operation Mode
<OPM> Address, Mode/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Mode:

0	Normal Operation
5	Test Beacon On
6	Test AIS Beacon On
7	Test Alarm (Beacon Fail)
8	5 minute test mode

Battery Low Threshold
<BLW> Address, Voltage/
Parameters:
Address: Address of unit (0 – All units, 1 = Master Unit,2 = Slave 1 or 3 = Slave 2)
Voltage*10: Battery low voltage threshold (beacon ceases operation if incoming power voltage is below this number). Range 0 to 24.0volts (0 to 240) for the 24V version or 0 to 12.0 volts (0 to 120) for the 12V version (MAX_BATTERY_LOW).
Note: Even if the battery low threshold is set to 0, if the beacon sees a voltage drop below 15 volts for the 24V version or below 9.8 volts for the 12V version immediately after turn on for 5 cycles, the beacon will stop operating until reset (manually or through day/night transition) or battery high threshold is exceeded.

Battery High Threshold
<BHI> Address, Voltage/
Parameters:
Address: Address of unit (0 – All units, 1 = Master Unit,2 = Slave 1 or 3 = Slave 2)
Voltage*10: Power supply voltage level where beacon will resume operation after experiencing a battery low shutdown. Range 20.1 to 28.0 volts (201 to 280) for the 24V version or 10.1 to 14.0 volts (101 to 140) for the 12V version (MIN_BATTERY_RESTART to MAX_BATTERY_RESTART). Beacon will reset upon battery recovery.

Software Version
<VER> Address, VersionNumber/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
VersionNumber: Software Version Number

Configuration Serial Number
<CSN> Address, SerialNumber/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
SerialNumber: Serial Number for the factory loaded configuration parameter table. Distinct from the Beacon Serial Number. Range 0 to 65534

Security PIN Number
<PIN> Address, PinNumber/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)

PinNumber: Three digit pin number to protect settings from TVIR changes. Range 001-999. 000 Means no pin protection.

Flash ID
<FID> Address, FlashID/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
FlashID: The flash character for the beacon. Range 000 to 999, not all values are valid. See Vega Flash table.

Special Character String
<SPC> Address, NNN, FFF{,[NNN],[FFF]…},0/

Example:
<SPC>2,10,20,30,5,5,5,100,255,1,20,0/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
NNN: An on segment in 50 millisecond units. Range 2 to 255
FFF: An off segment in 50 millisecond units. Range 2 to 255
0: Zero, the terminating character.
Note: 1 has a special meaning, it is the linking symbol used to extend an on or off period. Any NNN above can be replaced with NNN, 1, NNN. Similarly any FFF can be replaced with FFF, 1, FFF. These represent segments that are the sum of the two fields. Number of segments is limited to 18.

Serial Number
<SER> SerialNumber/
Parameters:
SerialNumber: Serial for the Beacon. Serial Number. Range 00000000 to 99999999
Stored internally as two variables – ee_serial_number and ee_config_serial_number where ee_config_serial_number is ee_serial_number – 10*(int)(ee_serial_number/10).

Beacon Type
<TYP> VLB92/
Parameters:
VLB92: String that says VLB92.

Sync Disable
<SDA> Address, Bool/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Bool: 1 if sync disable, 0 if normal operation.

IRDA Enable
<RDA> Address, Bool/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Bool: 1 if IRDA operation enabled, 0 if disabled.

Reboot
<REB> Address, XXX/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
XXX: Anything to reboot.

Restart
<RST> Address, XXX/
Parameters:

Address: Address of unit (0 – All units,1 = Master Unit)
XXX: Anything to restart, forcing loading of new parameters from EEprom.

IRDA Report Select
<SEL> N/
Parameters:
N: N equals 1 for status information, 2 for power information 3 for both.

Enable Monitoring
<MON> Bool/
Parameters:
Bool: 1 if Monitoring is enabled, 0 if disabled.

Monitoring Free Run
<MFR> Bool/
Parameters:
Bool: 1 if Monitoring free run is enabled (unsolicited reporting), 0 if disabled.

On Demand Sync
<ODS> Address, Bool/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Bool: 1 If beacon on state is controlled by pulling the sync line low, 0 if disabled.

Failure Mode
<FMD> Address, Bool/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
Bool: 1 If beacon continues to attempt illumination on failure, 0 if beacon remains off on failure.

Set to Factory Defaults
<FDF> Address, XXX/
Parameters:
Address: Address of unit (0 – All units,1 = Master Unit)
XXX: Anything (0). Sets the beacon to the hardcoded factory defaults.

Error Report
<ERR>Address,VVV/
Error report – report the error value for a given tier. May be unsolicited.
Address: Address of unit (0 – All units,1 = Master Unit)
Parameters:
VVV: A logical sum of the following values:

Led channel 1 Vout too low	1
Led channel 1 on voltage too low or too high	2
Led channel 2 Vout too low	4
Led channel 2 on voltage too low or too high	8
Led channel 3 Vout too low	16
Led channel 3 on voltage too low or too high	32
Battery Voltage too low during turn on	64
Top Tier Error	128
Middle Tier Error (not used in the VLB92)	256
Stack communication Error	512
Low Battery Voltage Error	1024
High Battery Voltage Error	2048

The most likely actual conditions that will cause the above errors are as follows:

Error Number	Likely Cause
1,4,16	The fuse to the drive circuit is opened or the drive has been shorted.
2,8,32	An LED has failed open circuit (more likely) or short circuit (less likely); the driver is not connected to the LED chain.
64	The battery or power supply is failing or the connection to the power source has become too resistive or the power cables being used are too small in diameter for the length required.
128,512	The other tier is not connected or is not powered or has one of the above errors.
1024	The power supply voltage is less than the threshold that has been set, or error 64 has occurred more than 5 times.
2048	The voltage being supplied is too high, possibly a battery has disconnected from a solar panel charge system if one is present.

MONITORING DATA PACKET TAG DEFINITIONS

The following data tags have been defined:

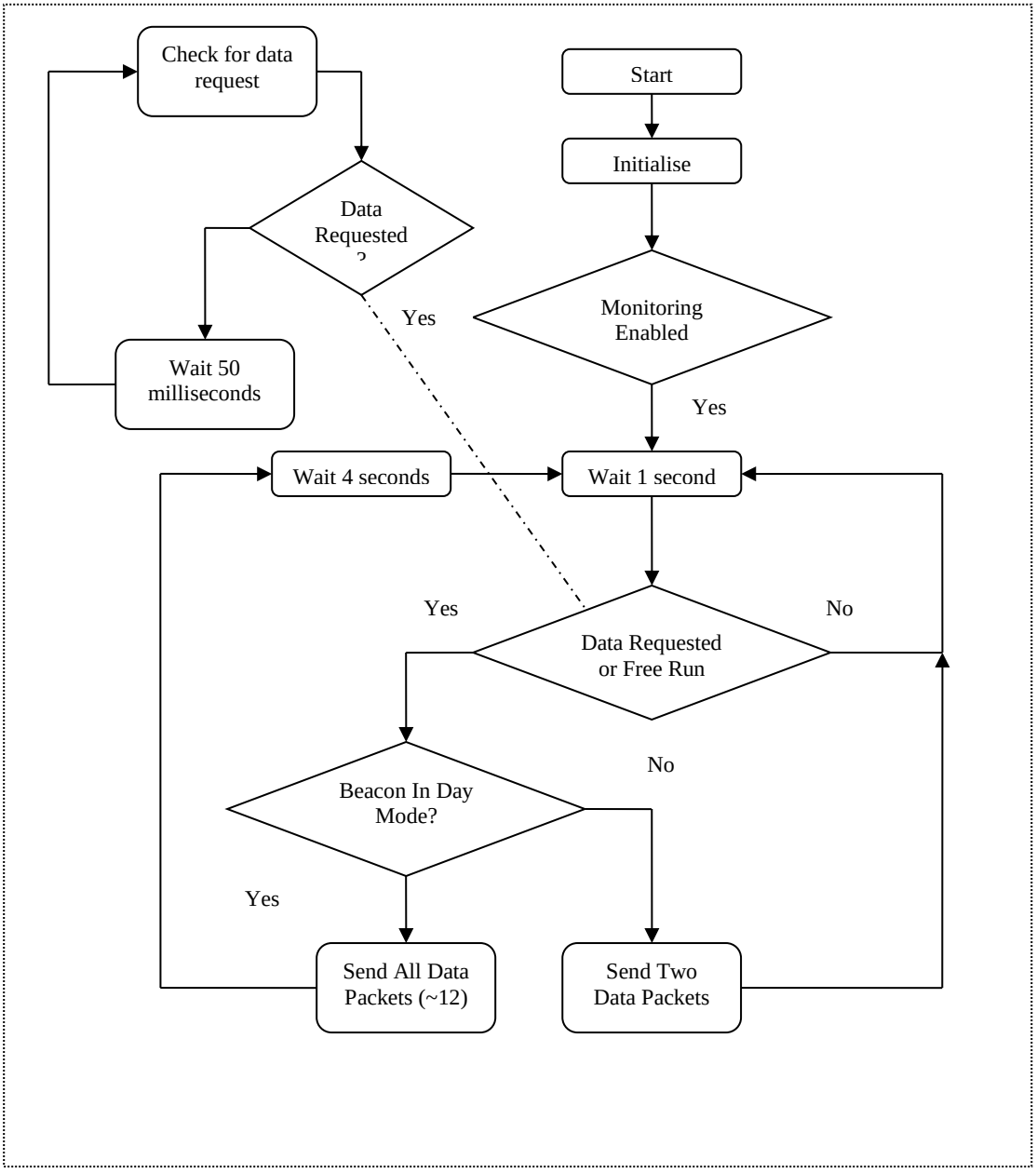
Tag	Description	Units & Scale
BAT	Beacon battery voltage * 10 (e.g. 230 means 23.0V)	Tenths of a volt, i.e. Volts * 10 (e.g. 230 means 23.0V)
LIT	Beacon photo sensor reading	Lux level, 0 = fully dark
BCI	Beacon instantaneous current	milliAmps
LOI	LED on current	Averaged peak LED on current in milliAmps
LDI	Beacon (Load) on current	Average LED current over entire flash character in milliAmps
TMP	Beacon core temperature sensor reading	Degrees Kelvin * 10 (e.g. 3030 means 303.0 Kelvin which is 30 Celsius)
GUD	Beacon alarm status	(1 = No Alarm, 0 = Alarm)
DAY	Beacon day/night status	(1 = Day detected, 0 = Night detected)
TYP	Beacon type identification	“VLB92V2”
END	End of Data Packets	

In free-run monitoring mode data is transmitted every second while the beacon is operating, and a slower rate or not at all while the beacon is hibernating. Data transmission will continue as long as ‘/’ characters continue to be received if the MFR tag is set to 0, otherwise will continue if MFR is set to 1 and the beacon is active (flashing). If multiple ‘/’ are received they will be queued up until the receive buffer is filled. To guarantee monitoring data transmissions while the beacon is hibernating, set MFR to 0 and send ‘/’ characters.

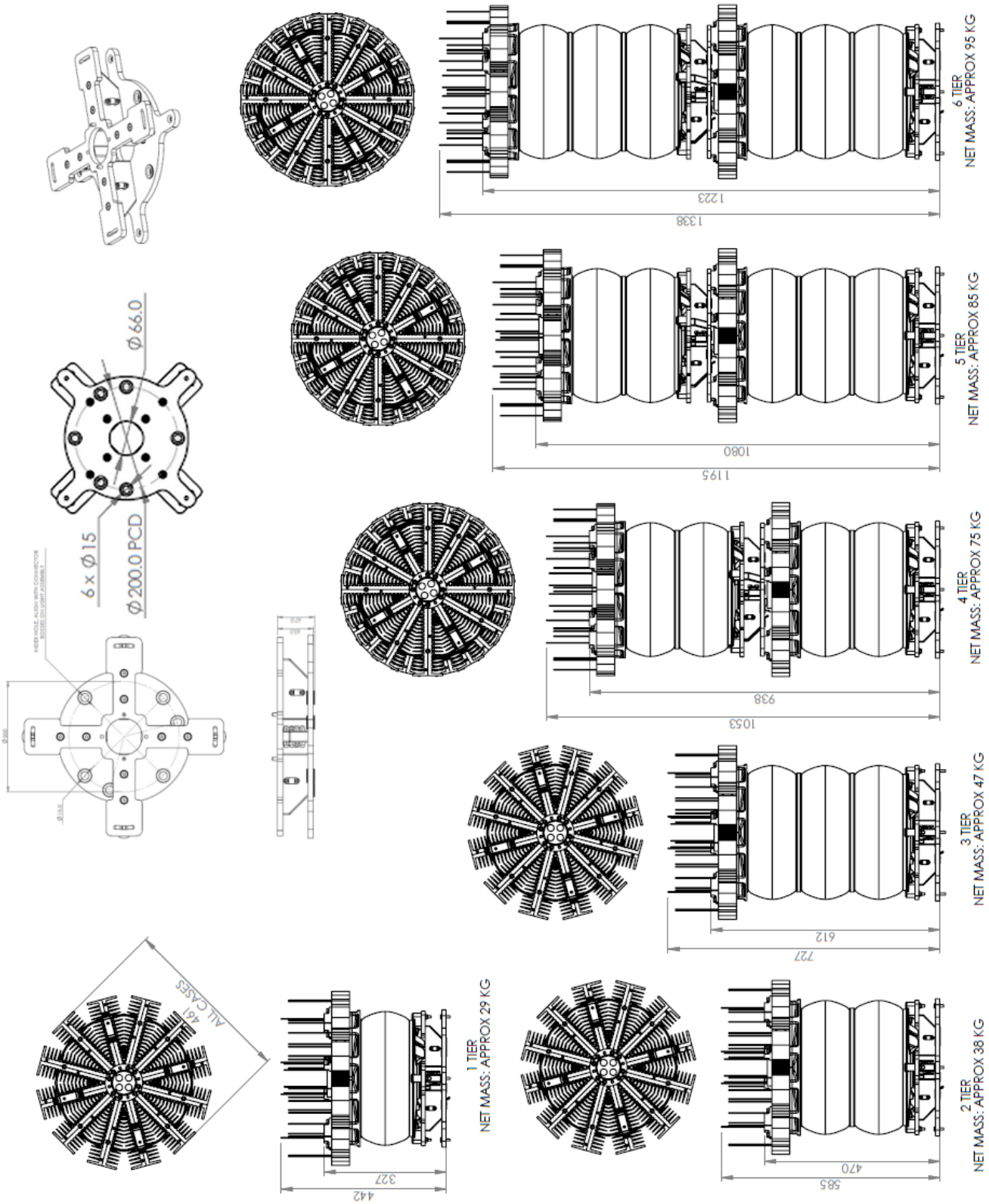
Free Run Mode:
If the beacon is in free run mode data is automatically transmitted every second while the beacon is operating, and every four seconds while the beacon is hibernating (in day mode).

Data Request Mode:
If the beacon is not in free run mode, data transmission will start following the reception of the ‘/’ character.

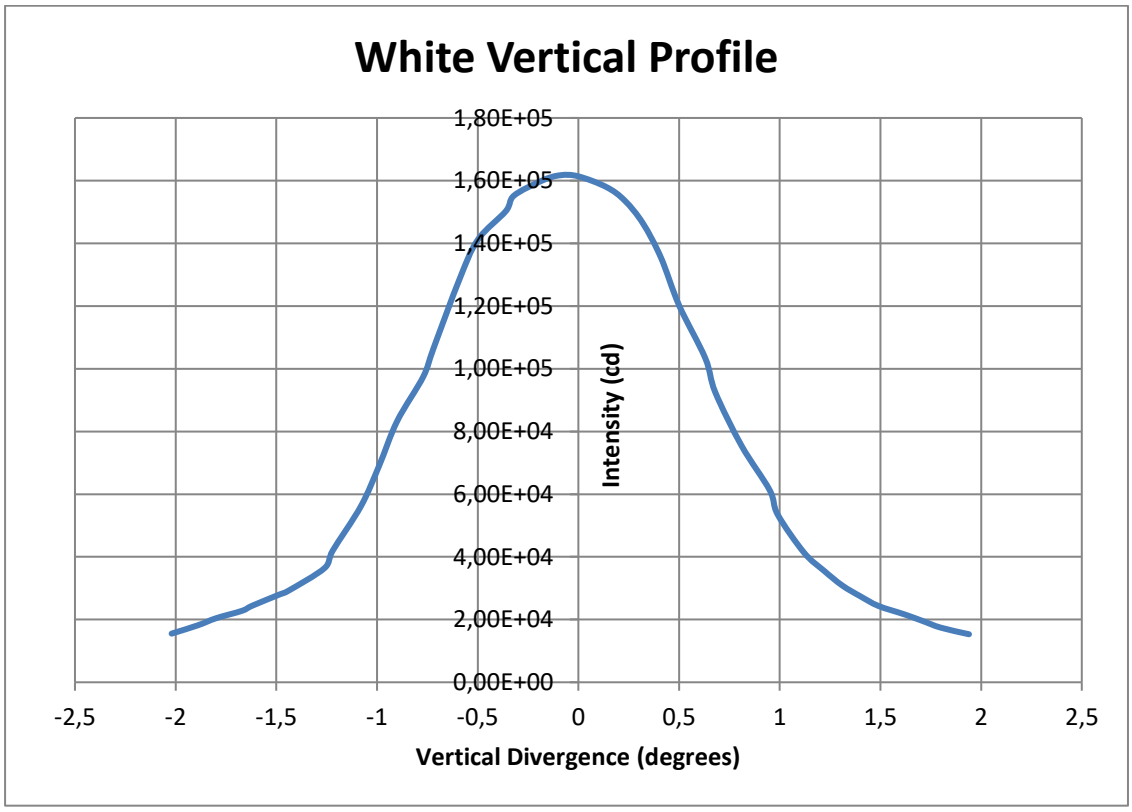
MONITORING COMMUNICATION DATA FLOW

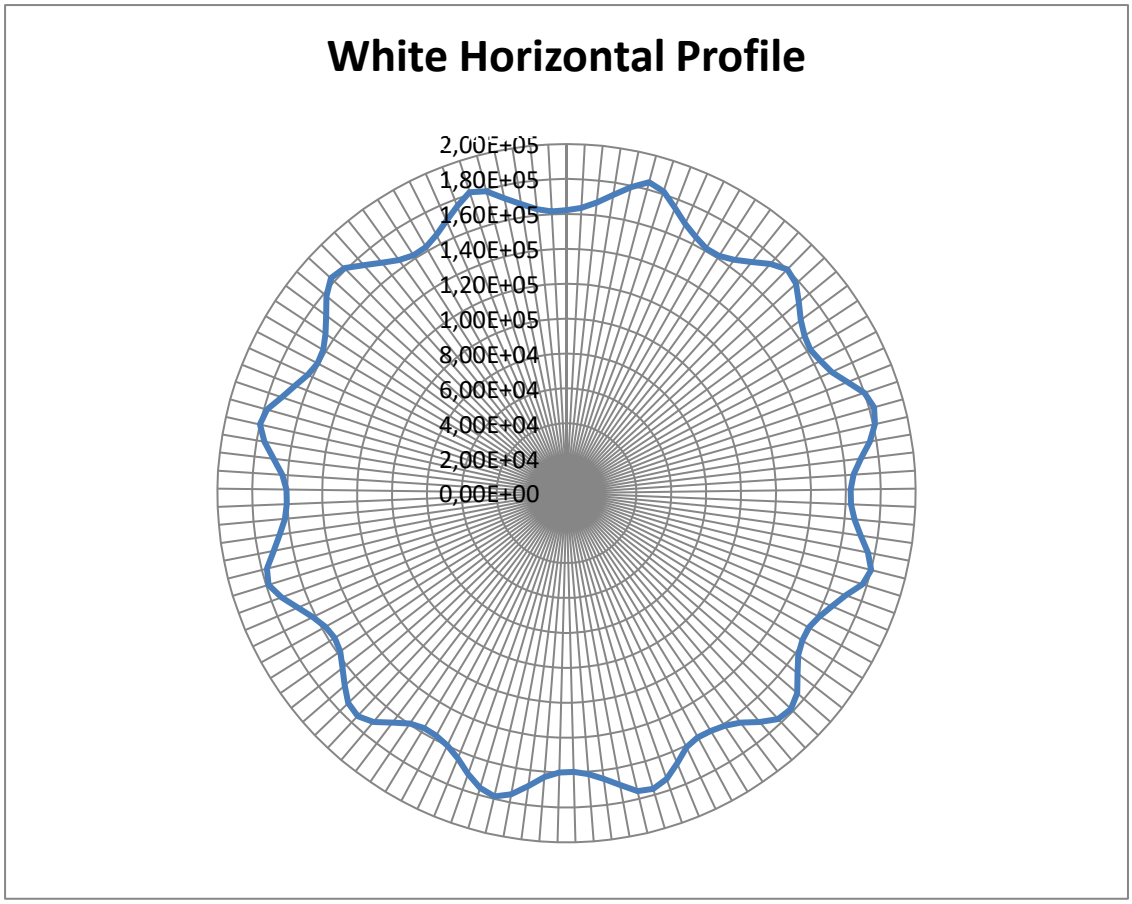


APPENDIX H VLB-92 LED BEACON DIMENSIONS AND WEIGHTS



APPENDIX I SAMPLE OPTIC DIVERGENCE PROFILES





APPENDIX J SPECIFICATIONS OF THE OMNI MEGA BEACON

Optical

Light Source	High-Intensity Light-Emitting Diodes Operating temperature controlled to protect LEDs
Colours Available	Red, Green, White, Yellow IALA Recommendation E-200-1 part1
Intensity	See Appendix B IALA Recommandation E-122(2001) & E-200-3 Part 3 (2008)
Effective Intensity Settings	Multiple levels for both day and night operation
Peak Intensity	Automatic Schmidt Clausen correction up to beacon max intensity
Flash Characters	246 standard characters plus one custom character 20 factory set custom characters if required
Vertical Divergence	1.6 degree version: ± 0.8°, measured at 50%, ± 1.6°, measured at approximately 10% of peak intensity.
Chromaticity Co-ordinates	Red 0.68<x<0.71, 0.29<y<0.32 White 0.28<x<0.37, 0.28<y<0.39 Green 0.015<x<0.26, 0.72<y<0.75 Yellow 0.525<x<0.605, 0.39<y<0.465

Synchronisation

Wire Synchronisation	Negative transition signal at start of flash character 12 or 24VDC operation Max sink-current 1.6mA @24V positive supply
GPS Synchronisation	With Vega VSU-29 GPS sync unit
Synchronising delay	Synch pulse delay settable from 0 to 9.9 seconds

Electrical

Voltage	Nominal 24VDC or 12VDC, absolute max input voltage 36.0VDC. 24V version: 20.0V to 36.0V operating range, 15V minimum transient voltage. 12V version: 10.0V to 18.0V operating range, 9.8V minimum transient voltage.
Low Voltage Cut Out	Programmable low voltage cut off threshold
Current between Flashes	50 mA per unit for 24V version, 100mA per unit for 12V version
Current by Day	50 mA per unit for 24V version, 100mA per unit for 12V version
Day / Night Transition	3 Photo sensors equally spaced inside lens. Nine program settings for the day/night transition Accuracy of sensor ±20 lux
Inputs	Beacon (Override) “On”/ Beacon (Override) “Off” Operates on >=6VDC input Max sink-current 1.6mA @24V positive supply Max input voltage 36.0V peak.
Outputs	<u>ON/AIS ON outputs</u> AC/DC Solid state relay contact pair. Voltage 0 to 36 VDC, either polarity. Current 125mA max. Leakage current 1 micro Amp. Typical Voltage drop across closed contacts: 1.3VDC@50mA. <u>Fail/OK/AIS Fail/OK outputs</u> AC/DC relay contact SPDT contacts with common. Voltage 0 to 36 VDC, either polarity. Current 2A max. Leakage current 1 micro Amp. Typical Voltage drop across closed contacts: <2mV@2A.
Optional Data Port	RS232, 2-wire, half-duplex serial interface, HW handshaking and SW flow control not supported.

	RS485 2-wire, differential, bidirectional half-duplex serial interface, custom protocol.
Materials for Beacon	
Lens	Machined Cast acrylic
Body and Heatsink	Anodised marine grade aluminium
Base	2 part painted cast marine grade aluminium
Additional Bird Spikes	28 spikes, 316 Stainless steel.
Sealing	O rings
Environment	
Temperature	1.6 degree: -30°C to +50°C;
Intrusion Protection	IP67
Design Icing Load	20 kg/square metre on external surface
Design Wind Speed	90 knots (170kph)
Ultra-Violet Radiation	All external materials are UV resistant
Shock	MIL-STD-202G, Method 213B, Cond H. 10g shock vertical and 35g horizontal
Vibration	MIL-STD-202G, Method 204D Cond B, peak value of 2g in all directions
Electromagnetic Interference	EN55015:2006; 2007:Amd1; 2009:Amd2 radiated emissions EN61000-4-2:2001 Electrostatic Discharge Immunity, Level 4 EN61000-4-3: 2002 Radiated Immunity, Class 1 EN6100-4.5:1995 Class 3 Surge Immunity, 0.5kV lead-to-lead
Eye Safety	This LED product is exempt from IEC60825-1 classification
Programming	Vega Remote02 Infra-red programmer By Computer using Prog-03 kit
Design Life	15 years

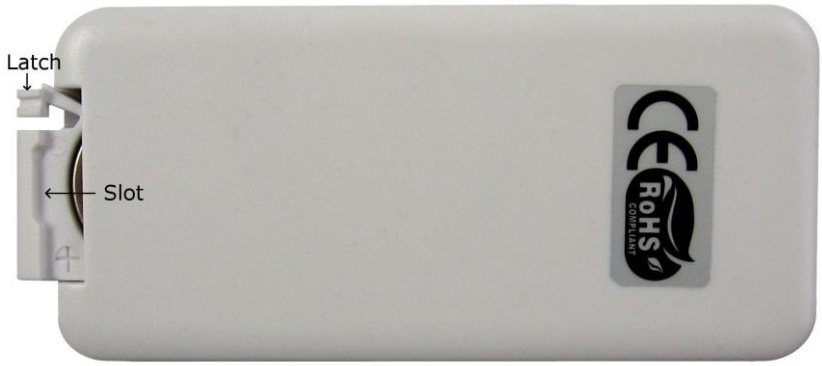
TVIR Programmer

Coding Scheme:	RC5 code with centre frequency 36.7 kHz
Dimensions:	87mm x 41mm x 6.5mm
Weight:	18gms
Power Supply:	1 x 3V lithium coin cell battery, CR2025 type

Battery Replacement on TVIR Programmer

Place the remote face down, and push the latch on the battery holder towards the centre of the programmer case, while at the same time levering the slot on the battery holder outward as shown in the illustration below.

(1) Pull the battery holder out of the case.



(2) Remove the old battery and insert a new one, ensuring that the + side of the battery is facing upwards as shown.

(3) Insert the battery holder into the programmer case, and press it until the latch clicks into place.

APPENDIX K FLASH CHARACTER TABLE WITH PROGRAMMING CODES

FIXED	DETAIL
000 Fixed	On
ISO	**DETAIL**
100 ISO 2s	1.0s, 1.0s
101 ISO 3s	1.5s, 1.5s
102 ISO 4s	2.0s, 2.0s
103 ISO 5s	2.5s, 2.5s
104 ISO 6s	3.0s, 3.0s
105 ISO 8s	4.0s, 4.0s
106 ISO 10s	5.0s, 5.0s
OCCULT	**DETAIL**
200 OC 1.25s 0.75	0.75s, 0.5s
201 OC 3s 2.0	2s, 1s
202 OC 3s 2.5	2.5s, 0.5s
203 OC 3.5s 2.5	2.5s, 1s
204 OC 4s 2.5	2.5s, 1.5s
205 OC 4s 3.0	3s, 1s
206 OC 5s 3.0	3s, 2s
207 OC 5s 4.0	4s, 1s
208 OC 5s 4.5	4.5s, 0.5s
209 OC 6s 4.0	4.0s, 2s
210 OC 6s 4.5	4.5s, 1.5s
211 OC 6s 5.0	5s,1s
212 OC 7s 4.5	4.5s, 2.5s
213 OC 8s 5.0	5s, 3s
214 OC 8s 6.0	6s, 2s
215 OC 9s 6.0	6s, 3s
216 OC 10s 6.0	6s, 4s
217 OC 10s 7.0	7s, 3s
218 OC 10s 7.5	7.5s, 2.5s
219 OC 12s 8.0	8.0s, 4s
220 OC 15s 10.0	10s, 5s
221 OC(2) 8s 3.0 2.0	3.0s, 2.0s, 1.0s, 2.0s
222 OC(2) 8s 5.0 1.0	5s, 1s, 1s, 1s
FLASH	**DETAIL**
300 FL 1.5s 0.2	0.2s, 1.3s
301 FL 1.5s 0.3	0.3s, 1.2s
302 FL 1.5s 0.4	0.4s, 1.1s
303 FL 1.5s 0.5	0.5s, 1s
304 FL 2s 0.2	0.2s, 1.8s

FLASH	DETAIL
305 FL 2s 0.3	0.3s, 1.7s
306 FL 2s 0.4	0.4s, 1.6s
307 FL 2s 0.5	0.5s, 1.5s
308 FL 2s 0.7	0.7s, 1.3s
309 FL 2s 0.8	0.8s, 1.2s
310 FL 2.5s 0.3	0.3s, 2.2s
311 FL 2.5s 0.5	0.5s, 2s
312 FL 2.5s 1.0	1s, 1.5s
313 FL 3s 0.2	0.2s, 2.8s
314 FL 3s 0.3	0.3s, 2.7s
315 FL 3s 0.4	0.4s, 2.6s
316 FL 3s 0.5	0.5s, 2.5s
317 FL 3s 0.6	0.6s, 2.4s
318 FL 3s 1.0	1s, 2s
319 FL 4s 0.2	0.2s, 3.8s
320 FL 4s 0.3	0.3s, 3.7s
321 FL 4s 0.4	0.4s, 3.6s
322 FL 4s 0.5	0.5s, 3.5s
323 FL 4s 0.6	0.6s, 3.4s
324 FL 4s 0.8	0.8s, 3.2s
325 FL 4s 1.0	1s, 3s
326 FL 4s 1.5	1.5s, 2.5s
327 FL 5s 0.2	0.2s, 4.8s
328 FL 5s 0.3	0.3s. 4.7s
329 FL 5s 0.5	0.5s, 4,5s
330 FL 5s 0.9	0.9s, 4.1s
331 FL 5s 1.0	1s, 4s
332 FL 5s 1.5	1.5s, 3.5s
333 FL 6s 0.2	0.2s, 5.8s
334 FL 6s 0.3	0.3s, 5.7s
335 FL 6s 0.4	0.4s, 5.6s
336 FL 6s 0.5	0.5s, 5.5s
337 FL 6s 0.6	0.6s, 5.4s
338 FL 6s 1.0	1s, 5s
339 FL 6s 1.5	1.5s, 4.5s
340 FL 7s 1.0	1s, 6s
341 FL 7s 2.0	2s, 5s
342 FL 7.5s 0.5	0.5s, 7s
343 FL 7.5s 0.8	0.8s, 6.7s
344 FL 8s 0.5	0.5s, 7.5s
345 FL 9s 0.9	0.9s, 8.1s
346 FL 10s 0.2	0.2s, 9.8s
347 FL 10s 0.3	0.3s, 9.7s
348 FL 10s 0.5	0.5s, 9.5s
349 FL 10s 0.8	0.8s, 9.2s

FLASH	DETAIL
350 FL 10s 1.0	1s, 9s
351 FL 10s 1.5	1.5s, 8.5s
352 FL 12s 1.2	1.2s, 10.8s
353 FL 12s 2.5	2.5s, 9.5s
354 FL 15s1.0	1s, 14s

MULTI FLASH	DETAIL
400 Fl(2) 4s 0.5	0.5s, 1s, 0.5s, 2s
401 Fl(2) 4.5s 0.3	0.3s, 1s, 0.3s, 2.9s
402 Fl(2) 4.5s 0.4	0.4s, 1s, 0.4s, 2.7s
403 Fl(2) 4.5s 0.5	0.5s, 1s, 0.5s, 2.5s
404 Fl(2) 5s 0.2 0.8	0.2s, 0.8s, 0.2s, 3.8s
405 Fl(2) 5s 0.2 1.2	0.2s, 1.2s, 0.2s, 3.4s
406 Fl(2) 5s 0.4	0.4s, 0.6s, 0.4s, 3.6s
407 Fl(2) 5s 0.5	0.5s, 1s, 0.5s, 3s
408 Fl(2) 5s 1.0	1s, 1s, 1s, 2s
409 Fl(2) 5.5s 0.4	0.4s, 1.4s, 0.4s, 3.3s
410 Fl(2) 6s 0.2 1.4	0.2s, 1.4s, 0.2s, 4.2s
411 Fl(2) 6s 0.3	0.3s, 1s, 0.3s, 4.4s
412 Fl(2) 6s 0.4	0.4s, 1s, 0.4s, 4.2s
413 Fl(2) 6s 0.5	0.5s, 1s, 0.5s, 4s
414 Fl(2) 6s 0.5 1.5	0.5s, 1.5s, 0.5s, 3.5s
415 Fl(2) 6s 0.8	0.8s, 1.2s, 0.8s, 3.2s
416 Fl(2) 6s 1.0	1s, 1s, 1s, 3s
417 Fl(2) 6s 3.0	3s, 1s, 1s, 1s
418 Fl(2) 7s 1.0	1s, 1s, 1s, 4s
419 Fl(2) 8s 0.4	0.4s, 1s, 0.4s, 6.2s
420 Fl(2) 8s 0.5	0.5s, 1s, 0.5s, 6s
421 Fl(2) 8s 1.0	1s, 1s, 1s, 5s
422 Fl(2) 10s 0.4	0.4s, 1.6s, 0.4s, 7.6s
423 Fl(2) 10s 0.5 1.0	0.5s, 1s, 0.5s, 8s
424 Fl(2) 10s 0.5 1.5	0.5s, 1.5s, 0.5s, 7.5s
425 Fl(2) 10s 0.5 2.0	0.5s, 2s, 0.5s, 7s
426 Fl(2) 10s 0.6 2.4	0.6s, 2.4s, 0.6s, 6.4s
427 Fl(2) 10s 0.8 1.2	0.8s, 1.2s, 0.8s, 7.2s
428 Fl(2) 10s 1.0 1.0	1s, 1s, 1s, 7s
429 Fl(2) 10s 1.0 1.5	1 s, 1.5s, 1s, 6.5s
430 Fl(2) 10s 3.0 1.0	3s, 1s, 5s, 1s
431 Fl(2) 12s 0.4 1.0	0.4s, 1s, 0.4s, 10.2s
432 Fl(2) 12s 0.5 1.0	0.5s, 1s, 0.5s, 10s
433 Fl(2) 12s 1.0 2.0	1s, 2s, 1s, 8s
434 Fl(2) 12s 1.5 2.0	1.5s, 2s, 1.5s, 7s
435 Fl(2) 15s 1.0 2.0	1s, 2s, 1s, 11s
436 Fl(2) 20s 1.0 3.0	1s, 3s, 1s, 15s
437 Fl(2) 25s 1.0 1.0	1s, 1s, 1s, 22s

MULTI FLASH	DETAIL
438 Fl(3) 6s 0.5	0.5s, 1s, 0.5s, 1s, 0.5s, 2.5s
439 Fl(3) 6.1s 0.4	0.4s, 1s, 0.4s, 1s, 0.4s, 2.9s
440 Fl(3) 8s 0.5	0.5s, 1s, 0.5s, 1s, 0.5s, 4.5s
441 Fl(3) 9s 0.3	0.3s, 1s, 0.3s, 1s, 0.3s, 6.1s
442 Fl(3) 9s 0.8	0.8s, 1.2s, 0.8s, 1.2s, 0.8s, 4.2s
443 Fl(3) 10s 0.5	0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 5.5s
444 Fl(3) 10s 1.0	1s, 1s, 1s, 1s, 1s, 5s
445 Fl(3) 12s 0.5 1.5	0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 7.5s
446 Fl(3) 12s 0.5 2.0	0.5s, 2s, 0.5s, 2s, 0.5s, 6.5s
447 Fl(3) 12s 0.8 1.2	0.8s, 1.2s, 0.8s, 1.2s, 0.8s, 7.2s
448 Fl(3) 12s 1.0 2.0	1s, 2s, 1s, 2s, 1s, 5s
449 Fl(3) 15s 0.3	0.3s, 1.7s, 0.3s, 1.7s, 0.3s, 10.7s
450 Fl(3) 15s 0.4	0.4s, 1s, 0.4s, 1s, 0.4s, 11.8s
451 Fl(3) 15s 0.5	0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 10.5s
452 Fl(3) 20s 0.5 1.5	0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 15.5s
453 Fl(3) 20s 0.5 3.0	0.5s, 3s, 0.5s, 3s, 0.5s, 12.5s
454 Fl(3) 20s 0.8 1.2	0.8s, 1.2s, 0.8s, 1.2s, 0.8s, 15.2s
455 Fl(3) 20s 1.0 1.0	1s, 1s, 1s, 1s, 1s, 15s
456 Fl(3) 30s 1.0 4.0	1s, 4s, 1s, 4s, 1s, 19s
457 Fl(4) 10s 0.5 1.0	0.5s, 1s, 0.5s, 1s, 0.5s, 1s, 0.5s, 5s
458 Fl(4) 10s 0.5 0.5	0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 6.5s
459 Fl(4) 10s 0.8	0.8s, 1.2s, 0.8s, 1.2s, 0.8s, 1.2s, 0.8s, 3.2s
460 Fl(4) 12s 0.3	0.3s, 1.7s, 0.3s, 1.7s, 0.3s, 1.7s, 0.3s, 5.7s
461 Fl(4) 12s 0.5	0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 5.5s
462 Fl(4) 12s 0.8	0.8s, 1.2s, 0.8s, 1.2s, 0.8s, 1.2s, 0.8s, 5.2s
463 Fl(4) 15s 0.5	0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 8.5s
464 Fl(4) 15s 1.0	1s, 1s, 1s, 1s, 1s, 1s, 1s, 8s
465 Fl(4) 16s 0.5	0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 9.5s
466 Fl(4) 20s 0.3	0.3s, 3s, 0.3s, 3s, 0.3s, 3s, 0.3s, 9.8s
467 Fl(4) 20s 0.5	0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 1.5s, 0.5s, 13.5s
468 Fl(4) 20s 1.5	1.5s, 1.5s, 1.5s, 1.5s, 1.5s, 1.5s, 1.5s, 9.5s
469 Fl(4) 30s 0.5	0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 26.5s
470 Fl(5) 20s 0.5 1.5	0.5s, 1.5s, [x 4], 0.5s, 11.5s
471 Fl(5) 20s 0.80	0.8s, 1.2s, [x 4], 0.8s, 11.2s
472 Fl(2+1) 6s 0.3	0.3s, 0.4s, 0.3s, 1.2s, 0.3s, 3.5s
473 Fl(2+1) 10s 0.5	0.5s, 0.7s, 0.5s, 2.1s, 0.5s, 5.7s
474 Fl(2+1) 12s 0.8	0.8s, 1.2s, 0.8s, 2.4s, 0.8s, 6s
475 Fl(2+1) 12s 1.0	1s, 1s, 1s, 4s, 1s, 4s
476 Fl(2+1) 15s 1.0	1s, 2s, 1s, 5s, 1s, 5s

VERY QUICK	DETAIL
500 VQ 0.5s 0.15	0.15s, 0.35s
501 VQ 0.5s 0.20	0.2s, 0.3s
502 VQ 0.6s 0.20	0.2s, 0.4s
503 VQ 0.6s 0.30	0.3s, 0.3s

VERY QUICK	DETAIL
504 VQ(2) 4s 0.20	0.2s, 1s, 0.2s, 2.6s
505 VQ(2) 8s 0.20	0.2s, 1s, 0.2s, 6.6s
506 VQ(3) 5s 0.15	0.15s, 0.35s, 0.15s, 0.35s, 0.15s, 3.85s
507 VQ(3) 5s 0.20	0.2s, 0.3s, 0.2s, 0.3s, 0.2s, 3.8s
508 VQ(3) 5s 0.3 0.2	0.3s, 0.2s, 0.3s, 0.2s, 0.3s, 3.7s
509 VQ(3) 5s 0.3 0.3	0.3s, 0.3s, 0.3s, 0.3s, 0.3s, 3.5s
510 VQ(3) 15s 0.10	0.1s, 0.5s, 0.1s, 0.5s, 0.1s, 13.7s
511 VQ(9) 10s 0.15	0.15s, 0.35s, [x 8], 0.15s, 5.85s
512 VQ(9) 10s 0.20	0.2s, 0.3s, [x 8], 0.2s, 5.8s
513 VQ(9) 10s 0.30	0.3s, 0.3s, [x 8], 0.3s, 4.9s
514 VQ(6)+LFl 10s 0.15	0.15s, 0.35s, [x 6], 2s, 5s
515 VQ(6)+LFl 10s 0.2	0.2s, 0.3s, [x 6]s, 2s, 5s
516 VQ(6)+LFl 10s 0.3	0.3s, 0.3s, [x 6], 2s, 4.4s

QUICK	DETAIL
600 Q 1s 0.2	0.2s, 0.8s
601 Q 1s 0.3	0.3s, 0.7s
602 Q 1s 0.4	0.4s, 0.6s
603 Q 1s 0.5	0.5s, 0.5s
604 Q 1s 0.8	0.8s, 0.2s
605 Q 1.2s 0.3	0.3s, 0.9s
606 Q 1.2s 0.5	0.5s, 0.7s
607 Q 1.2s 0.6	0.6s, 0.6s
608 Q(2) 5s 0.3	0.3s, 0.7s, 0.3s, 3.7s
609 Q(2) 5s 0.5	0.5s, 0.5s, 0.5s, 3.5s
610 Q(2) 6s 0.30	0.3s, 0.7s, 0.3s, 4.7s
611 Q(2) 6s 0.35	0.35s, 0.7s, 0.35s, 4.6s
612 Q(2) 10s 0.6	0.6s, 0.4s, 0.6s, 8.4s
613 Q(2) 15s 0.2	0.2s, 0.8s, 0.2s, 13.8s
614 Q(3) 5s 0.5	0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 2.5s
615 Q(3) 6s 0.3	0.3s, 0.7s, 0.3s, 0.7s, 0.3s, 3.7s
616 Q(3) 10s 0.30	0.3s, 0.7s, 0.3s, 0.7s, 0.3s, 7.7s
617 Q(3) 10s 0.35	0.35s, 0.65s, 0.35s, 0.65s, 0.35s, 7.65s
618 Q(3) 10s 0.50	0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 7.5s
619 Q(3) 10s 0.60	0.6s, 0.6s, 0.6s, 0.6s, 0.6s, 7s
620 Q(3) 30s 0.4	0.4s, 4.6s, 0.4s, 4.6s, 0.4s, 19.6s
621 Q(4) 6s 0.3	0.3s, 0.7s, 0.3s, 0.7s, 0.3s, 0.7s, 0.3s, 2.7s
622 Q(4) 6s 0.4	0.4s, 0.6s, 0.4s, 0.6s, 0.4s, 0.6s, 0.4s, 2.6s
623 Q(4) 10s 0.3	0.3s, 0.7s, 0.3s, 0.7s, 0.3s, 0.7s, 0.3s, 6.7s
624 Q(4) 12s 0.3	0.3s, 0.7s, 0.3s, 0.7s, 0.3s, 0.7s, 0.3s, 8.7s
625 Q(4) 15s 0.35	0.35s, 0.7s, 0.35s, 0.7s, 0.35s, 0.7s, 0.35s, 11.5s
626 Q(4) 20s 0.5	0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 16.5s
627 Q(9) 15s 0.3	0.3s, 0.7s, [x 8], 0.3s, 6.7s
628 Q(9) 15s 0.35	0.35s, 0.65s, [x 8], 0.35s, 6.65s
629 Q(9) 15s 0.6	0.6s, 0.6s, [x 8], 0.6s, 4.8s

QUICK	DETAIL
630 Q(6)+LFl 15s 0.2	0.2s, 0.8s, [x 6], 2s, 7s
631 Q(6)+LFl 15s 0.3	0.3s, 0.7s, [x 6], 2s, 7s
632 Q(6)+LFl 15s 0.35	0.35s, 0.65s, [x 6], 1.05s, 7.95s
633 Q(6)+LFl 15s 0.6	0.6s, 0.6s, [x 6], 2s, 5.8s

LONG FLASH	DETAIL
700 LFl 5s 2.0	2s, 3s
701 LFl 6s 2.0	2s, 4s
702 LFl 8s 2.0	2s, 6s
703 LFl 8s 3.0	3s, 5s
704 LFl 10s 2.0	2s, 8s
705 LFl 10s 3.0	3s, 7s
706 LFl 10s 4.0	4s, 6s
707 LFl 12s 2.0	2s, 10s
708 LFl 15s 4.0	4s, 11s

MORSE	DETAIL
800 MO(A) 6s 0.3	0.3s, 0.6s, 1s, 4.1s
801 MO(A) 8s 0.4	0.4s, 0.6s, 2s, 5s
802 MO(A) 8s 0.8	0.8s, 1.2s, 2.4s, 3.6s
803 MO(A) 10s 0.5	0.5s, 0.5s, 1.5s, 7.5s
804 MO(A) 12s	1s, 1s, 3s, 7s
805 MO(A) 15s 0.5	0.5s, 1.5s, 2s, 11s
806 MO(B) 15s 1.5	1.5s, 0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 0.5s, 10.5s
807 MO(D) 10s 5.0	5s, 1s, 1s, 1s, 1s, 1s
808 MO(N) 8s 5.0	5s, 1s, 1s, 1s
809 MO(U) 10s 0.2	0.2s, 0.8s, 0.2s, 0.8s, 0.6s, 7.4s
810 MO(U) 10s 0.3	0.3s, 0.7s, 0.3s, 0.7s, 0.9s, 7.1s
811 MO(U) 10s 0.4	0.4s, 0.6s, 0.4s, 0.6s, 1.2s, 6.8s
812 MO(U) 10s 0.5	0.5s, 0.5s, 0.5s, 0.5s, 1.5s, 6.5s
813 MO(U) 15s	0.4s, 0.5s, 0.4s, 0.5s, 1.2s, 12s
814 MO(U) 15s 0.45	0.45s, 0.45s, 0.45s, 0.45s, 1.35s, 11.85s
815 MO(U) 15s 0.50	0.5s, 0.5s, 0.5s, 0.5s, 1.5s, 11.5s
816 MO(U) 15s 0.55	0.55s, 0.35s, 0.55s, 0.35s, 1.45s, 11.75s
817 MO(U) 15s 0.60	0.6s, 0.3s, 0.6s, 0.3s, 1.4s, 11.8s
818 MO(U) 15s 0.7 0.5	0.7s, 0.5s, 0.7s, 0.5s, 1.9s, 10.7s
819 MO(U) 15s 0.7 0.7	0.7s, 0.7s, 0.7s, 0.7s, 2.1s, 10.1s
820 MO(U) 15s 0.75 0.15	0.75s, 0.15s, 0.75s, 0.15s, 1.65s, 11.55s
821 MO(U) 15s 0.75 0.45	0.75s, 0.45s, 0.75s, 0.45s, 2s, 10.6s
822 MO(U) 15s 1.15	1.15s, 0.75s, 1.15s, 0.75s, 3s, 8.2s
823 MO(U) 15s 1.30	1.3s, 0.7s, 1.3s, 0.7s, 3.3s, 7.7s

SPECIAL	DETAIL
900 Fl 3s	0.45s, 2.55s
901 Fl 4s	0.55s, 3.45s

SPECIAL	DETAIL
902 Fl 5s	0.55s, 4.45s
903 Fl 6s	0.65s, 5.35s
904 Fl 9s	0.65s, 8.35s
905 Fl 10s	0.65s, 9.35s
906 Fl 15s	0.6s, 14.4s
907 Fl (2) 8s	0.55s, 1.45s, 0.55s, 5.45s
908 Fl (2) 10s	0.65s, 1.35s, 0.65s, 7.35s
909 Fl (2) 12s	0.65s, 1.35s, 0.65s, 9.35s
910 Fl (2) 15s	0.65s, 1.35s, 0.65s, 12.35s
911 Fl (3) 10s	2 x (0.65s, 1.35s), 0.65s, 5.35s
912 Fl (3) 15s	2 x (0.65s, 1.35s), 0.65s, 10.35s
913 Fl (3) 18s	2 x (0.65s, 1.85s), 0.65s, 12.35s
914 Fl (4) 10s	3 x (0.4s, 1.2s), 0.4s, 4.8s
915 LFl 10s	2.15s, 7.85s
916 Morse A	0.45s, 0.25s, 1.45s, 2.85s
917 Q 15s	1.0s, 14s
918 Fl (5) 30s	4 x (1s, 1s), 1s, 21s
919 Fl (5) 30s	4 x (1s, 1.5s), 1s, 19s
920 OC 3.5s	3.2s, 0.3s
921 OC 4s	2.4s, 1.6s
922 OC 4s	3.5s, 0.5s
923 MO (F) 4.2s	2 x (0.3s, 0.3s), 0.5s, 0.3s, 0.3s, 1.9s
924 MO (U) 20s	2 x (0.5s, 3s), 5s, 8s
925 Q 15s	0.5s, 14.5s
926 OC 15s	9s, 6s
927 LF1 (2) 12s	2s, 2s, 2s, 6s
928 Fl (04) 10s	4 x (1s, 1.5s)
929 Fl (04) 20s	3 x (1s, 1.5s), 1s, 11.5s
930 Fl 15s 0.8s	0.8s, 14.2s
931 Fl (4) 30s	3 x (0.8s, 4.2s), 0.8s, 14.2s
932 Q60	0.3s, 0.7s
933 Q92	0.3s, 0.35s
934 Q44	0.3s, 1.05s
935 Fl 30s 5s	5s, 25s
936 Fl 20s 0.5s	0.5s, 19.5s
937 Fl 8s 1.5s	1.5s, 6.5s
938 Fl 20s 1s	1s, 19s
939 Fl (2+1) 9s	0.5s, 0.5s, 0.5s, 1s, 0.5s, 6.0s
940 Fl(3) 20s (0.8s on)	0.8s, 0.8s, 0.8s, 0.8s, 0.8s, 16s
941 Fl 10s 0.7s	0.7s, 9.3s
942 Fl (3) 8s 1s	1s, 1s, 1s, 1s, 1s, 3s
943 ISO 1.5s	0.75s, 0.75s
944 Q(6)+LFl 15s 0.5s	6 x (0.5s 0.5s) 2s 7s
945 Q(9) 15s 0.5s	8 x (0.5s 0.5s) 0.5s 6.5s
946 Oc (2) 12s	6s, 1s, 4s, 1s
947 Fl (2) 4s	1s 0.5s 1s 1.5s
948 Fl 4s, 0.7	0.7s, 3.3s

APPENDIX L VLB-92 OMNI MEGA BEACON PRODUCT CODES

VLB-92 Omni Mega Beacon VLB-92-cdd-yT

Where c is colour (W, R, G, Y) and dd is the divergence of 1.6D.

Where y is the number of lenses

Other information required:

- Range
- Flash Character
- Nominal operating voltage (12V or 24V)

Sync signal inverter module	167-295
Vega Remote TVIR Programmer	Remote-02
Computer programming kit	Prog-03