Document revision history

Revision	Date	Description of Change	Software version	Serial number
1.0.0	Dec 2014	Initial Release	2.0.5	225-0110+
1.0.1	Feb 2015	Added mention of turntable packing, warning section, extra detail for input voltage limit.	2.0.7	225-0130+
1.1.0	Jul 2015	Added 3 and 4 tier installation instruction	2.1.1	225-0150+
1.2.0	Dec 2016	Added Warm White LED. Software Updated.	2.1.2	225-0190+
1.3.0	Feb 2016	Added: • RPM customer-setting which calculates beacon effective intensity. • Remote control main/standby/standalone customer-setting.	2.1.6	225-0200+
1.3.1	July 2016	Included performance tables (Appendix B) for standard colours.	2.1.6+	225-0200+
1.3.2	July 2016	Update Product Warranty	2.1.6	225-0200+
1.3.3	August 2016	Corrected typo in 1-5 command of programming table	2.1.6	225-0200+
1.3.4	February 2017	Added monitoring and on-demand control information.	2.2.3+	225-0450+
1.3.5	March 2017	Corrected plot units.	2.2.3+	225-0450+
2.0	March 2018	Version 2 product	2.2.8+	225-0580+

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(1-tier)

(4-tier)

VRB-25-LED

ROTATING MARINE BEACON

Installation and Operation Manual

Version: 2.0

Date: January 20th, 2021

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WARNINGS

PLEASE READ THIS MANUAL BEFORE POWERING UP THE BEACON.

THIS BEACON IS CAPABLE OF PRODUCING VERY HIGH INTENSITY LIGHT - DO NOT LOOK DIRECTLY INTO THE BEAM.

Standard Models	White, Red, Green, Warm White; 6 or 8 Panels; 1 to 4 Tiers
Rotating Speed	1.00 RPM to 15.90 RPM
Intensity, Divergence, Current at 20C, 12 or 24V	Refer to Appendix B
Product Version	2
The manual applies from software version:	2.2.8+
Manual version:	225-900 V2.0
Status:	Released

WARNING

- The beacon's turntable may be shipped with transit screws and packing spacers that prevent rotation – these must be removed before power is applied
- DO NOT discard the transit screws and the packing spacers as they must be refitted if the beacon needs to be moved in future.
- This beacon is capable of producing very high intensity light – DO NOT look directly into the beam.
- The beacon should be kept vertical up all the time. Tilting the beacon may cause the internal bearing to be damaged.
- DO NOT lift the beacon by the glazing cover and the top. The beacon can only be lifted from the bottom of the base.
- DO NOT connect supply voltages exceeding 18.0V peak (whether continuous or AC ripple).
- Other than removal of the transparent cover, unapproved access, maintenance or modification could result in voiding of the warranty. Consult Vega before undertaking any such operations on the beacon.

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Disclaimer: Every possible effort has been made to ensure the validity of this document. It represents the current view (as of the publishing date) on the functions and properties of the products mentioned in the document. SABIK OY is not responsible for possible typing errors. The pictures and drawings are for descriptive use only.

The document may be updated or changed without notice.

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1. Introduction

1.1. Overview

Each VRB-25 LED beacon is supplied for a particular application, therefore the colour, flash character, range, number of lenses and physical configuration of the beacon may differ between individual units.

The number of lenses required for any application is determined from the effective intensity requirement, the colour and flash character, and the rotation rate.

The VRB-25 LED beacon operates from a nominal 12VDC supply. The peak and average currents as well as the off currents of the beacons are detailed in Appendix B of this manual.

Because the VRB-25 LED beacon is delivered to meet a specification, there should be no need to alter the program settings. However, the beacon's software now supports user adjustment of RPM (to calculate the correct effective intensity and monitor the turntable) and remote control options (for Main/Standby/Standalone configurations). Installation should normally only involve mounting, alignment and the supply of power. If required, the intensity or rotation speed can be adjusted according to the instructions detailed in Section 4.0.

The VRB-25 LED beacon has the following capability:

Nominal range is dependent on the colour, intensity and rotation speed.

Effective intensity is programmed with the standard Vega TVIR programmer Remote-02. The effective intensity information provided in Appendix B of this manual is calculated for the specified rotation speed. If the rotation speed is changed then the effective intensity table and the beacon's programmed effective intensity are no longer applicable.

1.2. Construction

The metal components of the VRB-25 LED beacon are made from machined marine grade aluminium and stainless steel. All aluminium components are anodised and external surfaces are painted. The LED lenses are made from machined cast acrylic. Heat is dissipated through the heat sink that the LEDs are mounted on.

The turntable drive uses an electronically-commutated direct-drive motor which is managed by the CALC-20B motor controller that provides speed control to within ±2% over the full range of speeds with feedback from an optical speed encoder.

The VRB-25 LED beacon is sealed against dust and moisture to the level of IP-65 and if the light is to be used outside it will be fitted with bird spikes. The lenses are fully sealed. A breather vent is fitted on the underside of the beacon.

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2. Installation

2.1. Mounting

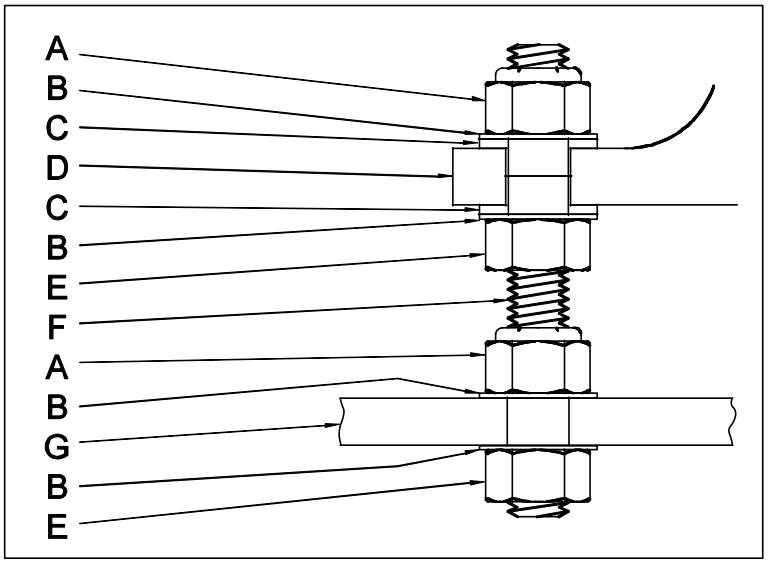
The mounting surface must be perfectly horizontal, and robust enough to support the weight of the beacon (see Appendix E for dimensions and weights).

Three 13 mm mounting holes must be drilled equally spaced on a 200mm circle.

Place the beacon on the mounting surface, ensuring that there is easy access to both the Access Hatch and Terminal Plate.

A mounting hardware kit, comprising three lengths of stainless steel threaded rod, six hex nuts, six Nylok nuts and 12 flat washers, is provided with each Beacon.

Black Acetyl bushes have been supplied to insulate the bolts from the base. To prevent corrosion between the base and the mounting bolts due to dissimilar metals being in contact these bushes must be installed underneath the beacon base and over the bolts where they pass through the holes in the beacon base. The beacon is shipped with these bushes in place.



A	Stainless Steel Nylok Nuts
B	Stainless Steel Flat Washer
C	Acetyl Insulating Bush
D	Beacon Base Plate
E	Stainless Steel Plain Nuts
F	Threaded Stainless Steel Rod
G	Mounting Plate

Figure 1: Installation of Mounting Hardware

Fit the threaded rods through the mounting holes and secure them firmly to the base plate with a washer and Nylok nut on the top and a washer and plain hex nut on the bottom.

Screw a plain hex nut on each threaded rod to 10 mm of the Nylok nuts securing the rod to the base plate. This is the “levelling nut”. Fit a flat washer over each rod.

Place the beacon with the acetyl bushes in place over the three threaded rods. Place a flat washer over each rod and secure with a plain hex nut. Figure 3 illustrates the assembly of the mounting hardware.

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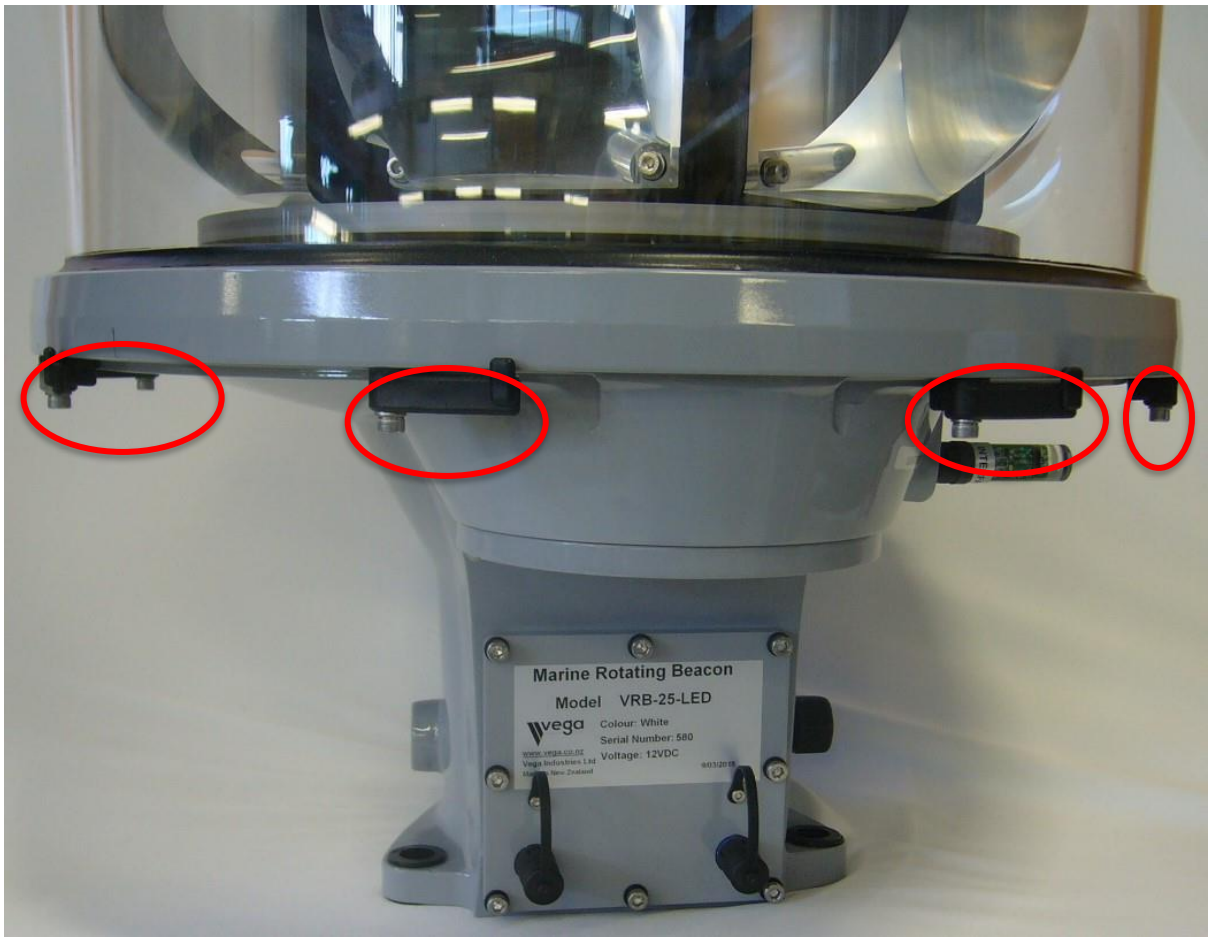
2.2. Beacon Unpacking and Setup (For 1 and 2 tiers only)

The one-tier and two-tier beacons are shipped completely assembled, in one crate.

Before being powered-up the beacon must have three packing spacers removed from the turntable, as shown below.

Required tools: 5mm Hex/Allen key for M6x20 cap screw.

Step 1. Remove the glazing cover. The glazing cover is secured to the base with eight thumb latch locking clamps (shown circled in red below). Release the eight thumb latches by rotating each approximately 180°.



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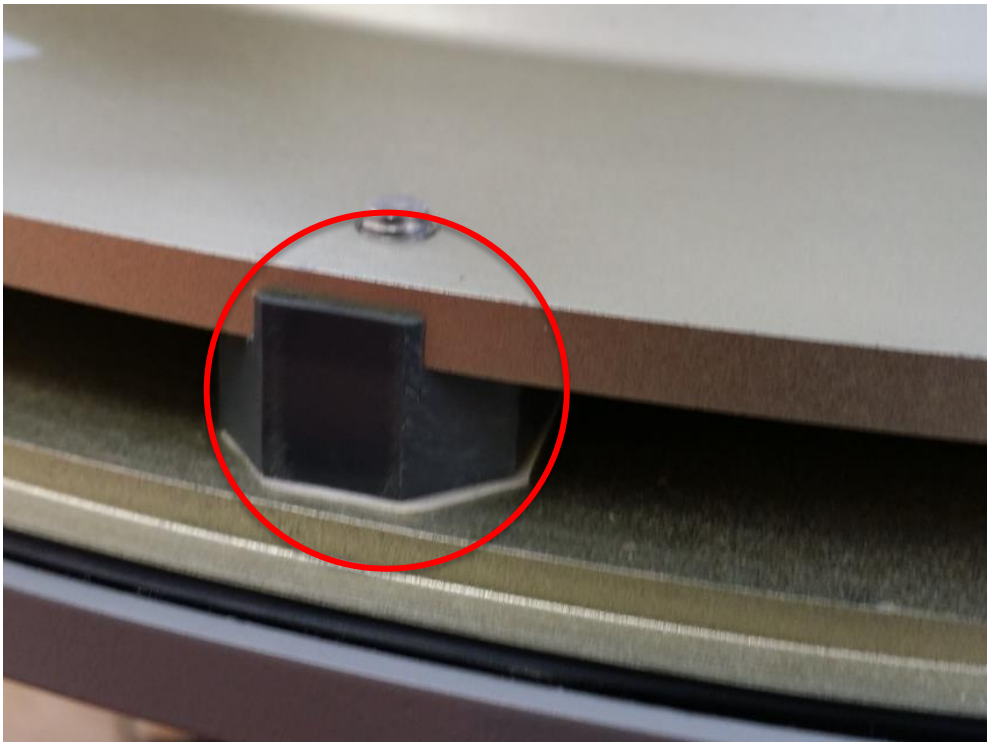
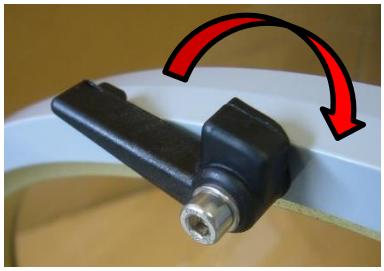
Step 2. Remove the three packing spacers (shown in red below) using the 5mm hex/Allen key.



Step 3. Restore the glazing cover by lowering it down vertically. Take care not to tilt the glazing excessively or the inside of the glazing cover and the optics could be marked or scratched.

Secure the eight thumb-latch locking clamps by hand.



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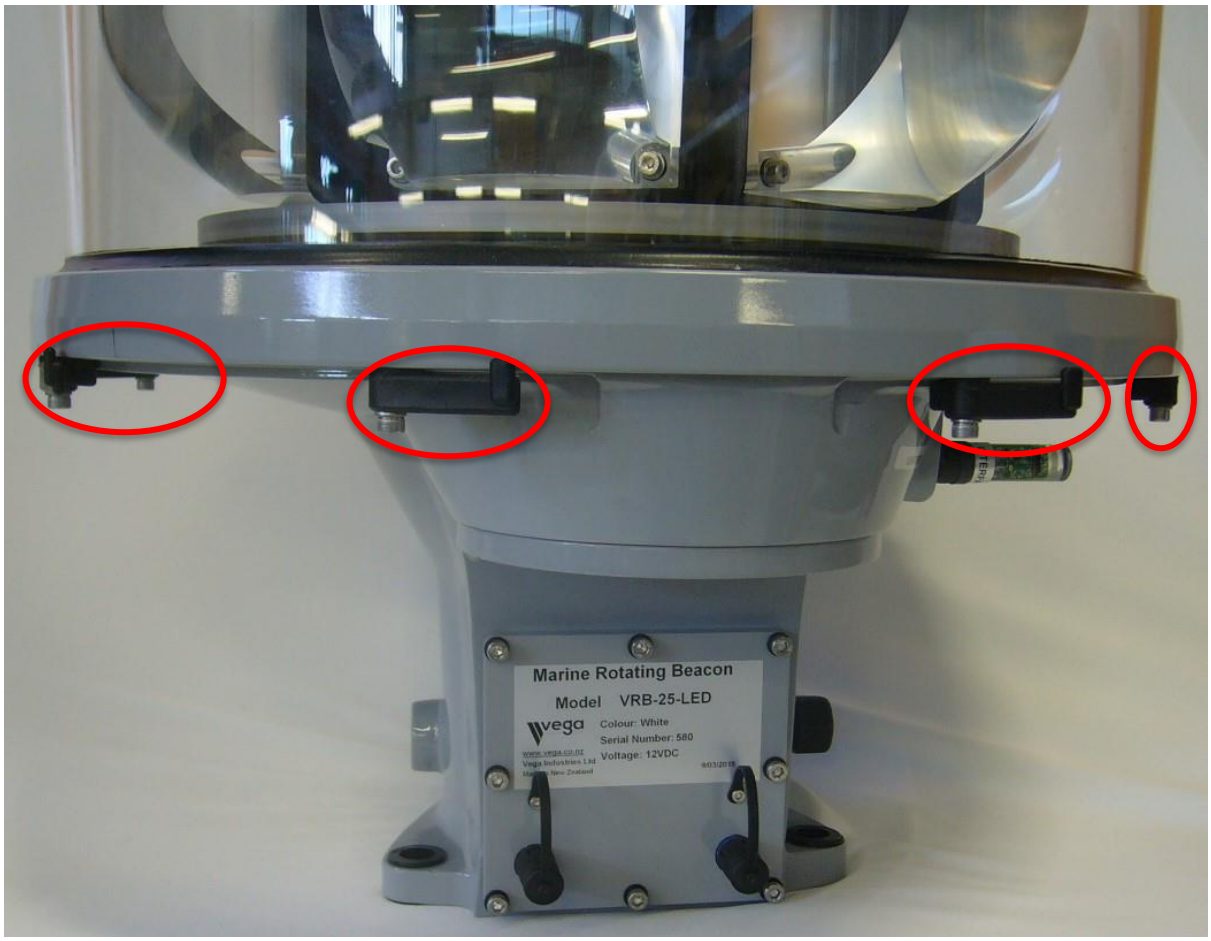
2.3. Optic Assembly Installation (For 3 and 4 tiers only)

Three-tier and four-tier beacons are shipped with the beacon base and cover in one crate and the optic assembly in a second crate. To complete the beacon, the optic assembly must be mounted onto the beacon's turntable.

The Optic Assembly Installation procedure requires a minimum of two technicians to complete. Depending on the model, the optic assembly can weigh up to 40kg (88lb) and proper health and safety precautions should be followed when lifting this weight.

Required tools: 5mm Hex/Allen key with over 150mm arm length for M8x20 CSK head socket screws.

Step 1. Remove the glazing cover. The glazing cover is secured to the base with eight thumb-latch locking clamps (shown circled in red below). Release the eight thumb-latches by rotating each approximately 180°.



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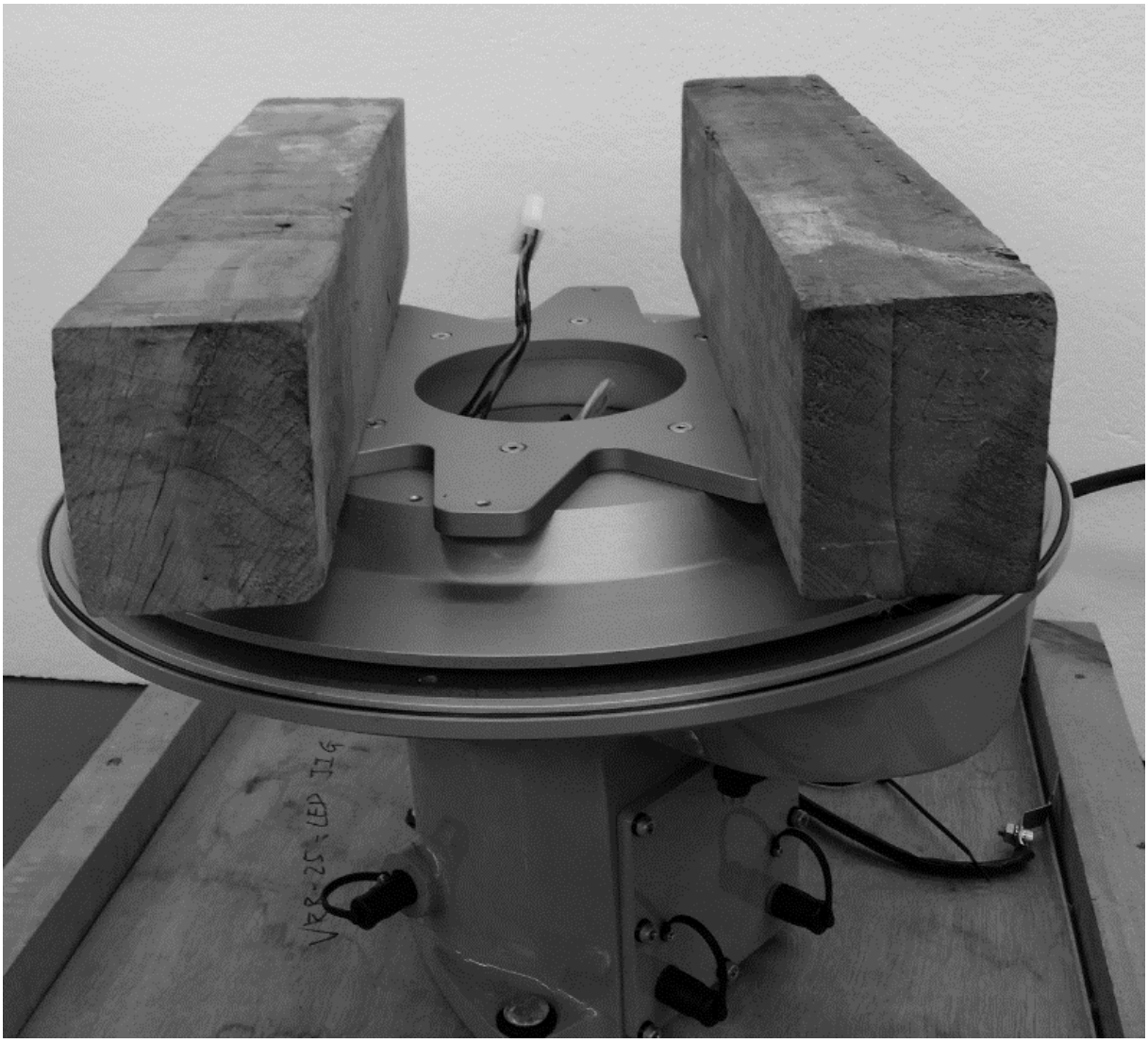
Step 2. Place 2 pieces of minimum 100mm height solid spacers on top of turntable as shown. The spacers will provide clearance for hand-wiring access.



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Step 3. Carefully place the optic assembly on top of the spacers as shown.

Only lift the optic assembly from the handles at the top.

Do not lift by the optics. Do not apply force to the optics.

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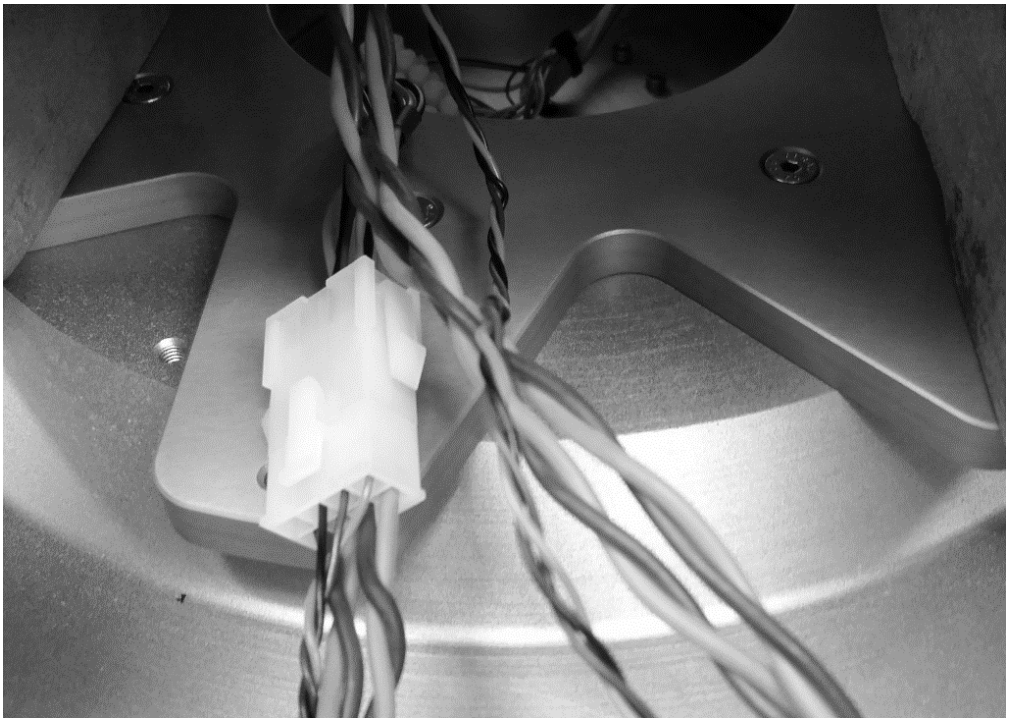
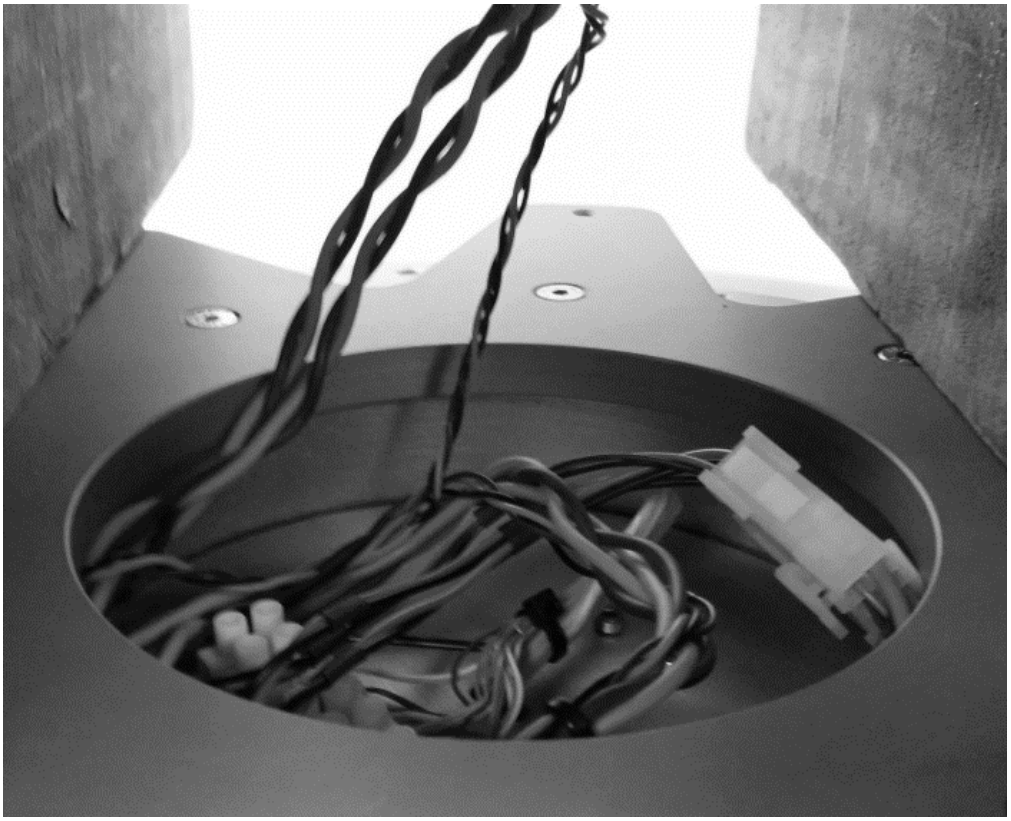
Step 4. Join the in-line connector from the optic assembly to the mating connector from the turntable.

Tidy up the wire looms into the pocket as shown.





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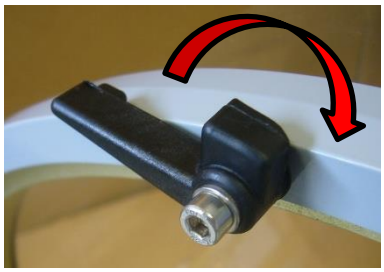
Step 5. Remove the spacers, lower down the optic assembly to the turntable. Make sure there are no wires jammed between the two plates.

Align the plates using the 6 x M8 screw-holes. There is no particular orientation required for the optic assembly. Fit and tighten the 6 x M8 countersunk screws with a 5mm hex/Allen key.

Step 6. Restore the glazing cover by lowering it down vertically. Take care not to tilt the glazing excessively or the inside of the glazing cover and the optics could be marked or scratched. Secure the eight thumb-latch locking clamps by hand.



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2.4. Levelling the Beacon

Levelling the Beacon is essential to ensure correct turntable operation and to ensure that the signal is visible throughout a 360° arc.

A levelling bubble is attached to the base of the rotating turntable. This bubble has been factory set for the turntable, and must not be disturbed.

Adjust the levelling nuts until the bubble stays within the centre mark throughout an entire rotation of the turntable. The turntable may be rotated by hand and should rotate freely while the beacon power is off. If not, check for foreign objects between the turntable and base.

After the beacon has been levelled, the upper Nylok nuts can be gently tightened down. Check for level after tightening all nuts.

2.5. Final Checks Before Leaving the Site

Check that the Beacon is securely mounted level and all nuts tightened correctly.

Check the levelling bubble through a complete rotation of the turntable.

The turntable should be rotating and the daylight control should be uncovered.

All glands and connections should be sealed. The Terminal Plate and Top cover should be installed and secure.

Check that the correct rotation speed (RPM) is set on the CALC-20B motor controller switches (refer to Section 4.1).

Check that the day/night sensor is fitted to the appropriate connector on the side of the base (refer to Section 3.1.5).

Check that the correct operating mode (Main/Standby/Standalone) is programmed into the beacon controller software with the TVIR Remote02 (refer to Section 3.1.2).

Check that the correct rotation speed (RPM) is programmed into the software with the TVIR Remote02 (refer to Section 4.2). Make sure that this step is performed after any change is made to the Main/Standby/Standalone operating mode.

Check that the correct night and day effective intensities are programmed into the beacon controller software with the TVIR Remote02 (refer to Section 4.2 & 4.10). Only perform this step after programming the RPM value into the beacon controller software.

Check that the low battery threshold (1-8-XXX) and high battery threshold (1-9-XXX) are set appropriately for the power supply voltage (refer to Section 4.15). Note that the Factory Default Reset command resets these thresholds.

Check that the beacon has the appropriate data cable connection (see Section 3) fitted.

The day/night operation of the beacon can be tested by gently covering the light sensor with a dark material such as a rag. If the beacon is in bright sunlight then it can take approximately two minutes to detect night once the sensor is covered.

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3. Connection and Setup

3.1. Power, Control and Alarm Connections

The VRB-25 LED beacon is designed to operate in both a standalone capacity or as a main or standby beacon within a system. The beacon can be easily configured and connected by the user for any of these applications.

Connection details are shown on the following pages.

3.1.1. Power Connection

The VRB-25 LED beacon is designed to operate from a nominal supply voltage of 12VDC. The beacon must not be connected to any voltage under 10.5V as it will shut down to protect its inputs from excessive current. The beacon must not be connected to any voltage, including peaks of over 18.0VDC or damage might result.

If the power supply is connected in reverse the beacon will not operate. However, this will not damage the beacon. The beacon is protected from reverse polarity connection.

Wire Colour	Function
Brown or Red	Vin +
Blue or Black	GND or 0V 0r Battery negative

3.1.2. Main & Standby Setup and Operation

All beacons are provided with the facilities to control or be controlled by another beacon. This control mechanism uses an alarm switch output from a Main beacon to connect to an On/Off input on a Standby beacon.

The beacon Alarm Outputs (Alarm 1 and Alarm 2) are connected to 0V when a beacon is not operating or if it has an alarm condition. For example, if the beacon's normal firmware is not operating then the Alarm outputs will be connected to 0V. Or, if the beacon senses a problem, such as a jammed turntable or faulty LEDs, or low operating voltage, then it will also connect the Alarm outputs to 0V.

When the beacon is operating normally, the Alarm outputs are open circuit (floating), like a switch that is off. The Standby beacon provides an internal pullup signal at its On/Off input so that it can detect when the Main beacon's Alarm output is connected to 0V.

The Alarm1 and Alarm2 outputs provided at each connector (Control Connection and Customer Alarm Connection, respectively) are electrically separate, but functionally identical.

Main Beacon Setup

A Main beacon should be set up to turn off if it detects a problem. If a problem occurs then the Main beacon's alarm output will enable a Standby beacon to begin operating.

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A beacon can be set into the Main mode by using a factory default reset command. This command modifies a group of beacon settings at once for the user's convenience. Then the beacon's RPM (rotations per minute) and intensity settings might need adjustment (because the factory default reset command resets the RPM and intensity settings to the 1 RPM defaults). Refer to Appendix A for more detailed information about how to program the beacon.

The following commands, in sequence, can be used to set up a Main beacon:

1. Aim the programmer in-line with the day/night sensor projecting from the side of the base.
2. Enter programming mode by pressing the red button until the green light on the sensor flashes back four quick flashes (the bottom tier(s) of the beacon will also flash).
3. Enter command 1-5-998 . This is the Main Beacon Factory Default Reset command.
4. Enter command 7-8-ABCD . This is the RPM command, where, for example, 1.50 RPM would be entered as 7-8-0150, 2.00 RPM would be entered as 7-8-0200, and 15.90 RPM would be entered as 7-8-1590. Ensure that the CALC-20B motor controller (see Section 4.1) is manually set to the same RPM value that is entered using this command. This command will also set night intensity to maximum and day intensity to zero.
5. Optionally enter a different day or night intensity using the 1-2-XXXX command for day, and 1-1-XXXX command for night.
6. Optionally adjust the low battery threshold (1-8-XXX) and high battery threshold (1-9-XXX) (refer to Section 4.15). Note that the Factory Default Reset commands reset these thresholds.

Note that when this setup is followed, the Main beacon will be set to turn off when it detects a fault. The Main beacon will also ignore its On/Off input.

Standby Beacon Setup

A Standby beacon should be set up to be enabled via its On/Off input if a Main beacon indicates an alarm. The Main beacon's Alarm output will connect to the Standby beacon's On/Off input using a cable provided by Vega.

A Standby beacon should attempt to continue operating (if possible) even if it detects a problem with its own operation. If a problem occurs the Standby beacon's Alarm outputs will become active.

A Standby beacon can be set up using a quick command that sets the beacon to the correct defaults. Then the beacon's RPM (rotations per minute) and intensity settings might need adjustment (because the quick command resets the RPM and intensity settings to the 1 RPM defaults). Refer to Appendix A for more detailed information about how to program the beacon.

The following commands, in sequence, can be used to set up a Standby beacon:

1. Aim the programmer in-line with the day/night sensor projecting from the side of the base.
2. Enter programming mode by pressing the red button until the green light on the sensor flashes back four quick flashes (the bottom tier(s) of the beacon will also flash).
3. Enter command 1-5-999 . This is the Standby Beacon Factory Default Reset command.

4. Enter command 7-8-ABCD . This is the RPM command, where, for example, 1.50 RPM would be entered as 7-8-0150, 2.00 RPM would be entered as 7-8-0200, and 15.90 RPM would be entered as 7-8-1590. Ensure that the CALC-20B motor controller (Section 4.1) is manually set to the same RPM value that is entered using this command. This command will also set night intensity to maximum and day intensity to zero.
5. Optionally enter a different day or night intensity using the 1-2-XXXX command for day, and 1-1-XXXX command for night.

Note that when this setup is followed, the Standby beacon will be set to turn on only when the Main beacon that it is connected to detects a fault condition and sets its alarm output to the active state (0V). The Standby beacon will not operate unless its On/Off input is connected to 0V (usually by the Main beacon's Alarm output). If the Standby beacon is to be used or tested on its own then it will either require the On/Off input to be grounded or the operation mode can be temporarily changed to enable the beacon (set 1-5-002 temporarily and then change it back to 1-5-004). The diagnostic cable will also operate as an enable plug.

Standalone Beacon Setup

A Standalone beacon operates on its own without any connection to another beacon. A Standalone beacon should be set up to stay operating (if possible) if it detects a problem.

A Standalone beacon can be set up using a quick command that sets the beacon to the correct defaults. Then the beacon's RPM (rotations per minute) and intensity settings might need adjustment (because the quick command resets the RPM and intensity settings to the 1 RPM defaults). Refer to Appendix A for more detailed information about how to program the beacon.

The following commands, in sequence, can be used to set up a Standalone beacon:

1. Aim the programmer in-line with the day/night sensor projecting from the side of the base.
2. Enter programming mode by pressing the red button until the green light on the sensor flashes back four quick flashes (the bottom tier(s) of the beacon will also flash).
3. Enter command 1-5-997 . This is the Standalone Beacon Factory Default Reset command.
4. Enter command 7-8-ABCD . This is the RPM command, where, for example, 1.50 RPM would be entered as 7-8-0150, 2.00 RPM would be entered as 7-8-0200, and 15.90 RPM would be entered as 7-8-1590. Ensure that the CALC-20B motor controller (see Section 4.1) is manually set to the same RPM value that is entered using this command. This command will also set night intensity to maximum and day intensity to zero.
5. Optionally enter a different day or night intensity using the 1-2-XXXX command for day, and 1-1-XXXX command for night.

Note that when this setup is followed, the Standalone beacon will be set to remain operating (if possible) when it detects a fault. The Standalone beacon will also ignore its On/Off input.

If a beacon indicates a fault almost immediately then check that the CALC-20B rotation speed settings match the programmed RPM settings, and correct one of them if necessary.

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3.1.3. Control Connection

The 12-pin control connection on the terminal plate can be used to control and diagnose beacon operation. The connection can also be used to upgrade firmware for the beacon. An RS232 diagnostic cable and a control cable is supplied with the beacon. If the beacon needs to be monitored or diagnosed, contact Vega for more information about the serial protocol available on the RS232 port.

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Control Cable Connection (12-way connector)			
PIN	Wire Colour	Function	Notes
	Pink	Beacon On Output	Connects to 0V when beacon is lit. Floats when beacon is off.
	White	Alarm1 Output	Connects to 0V when beacon detects a fault or is not powered. Floats when beacon is operating correctly.
	Red	On/Off Input	When connected to 0V, Standby beacons are enabled. When floating or connected to >6V, Standby beacons are disabled. Ignored by Main & Standalone beacons.
	Green	GPO (Do not use)	General purpose output. Do not connect.
	Yellow	RS232 – TX (Master driver)	Beacon RS232-level Transmit & Receive pair. Use this port pair for beacon control or monitoring and also for updating master controller firmware and diagnostics tests.
	Violet	RS232 – RX (Master driver)	
	Black	GND/0V	Signal ground (0V) connection for all signals on this connector.
	Cyan	GND/0V	
		n/c	
		n/c	
		n/c	
		n/c	

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3.1.4. Customer Alarm Connection

The 8-pin alarm connection can be used for customer monitoring of alarm status. An alarm adapter cable is only supplied upon request.

When the beacon is operational with no fault detected and power supply voltages are within the correct range then the Alarm2 output will be floating (not connected).

If a fault is detected or if the power is off then Alarm2 output will be connected to 0V (pin 7).

Customer Alarm Connection (8-way connector)			
8-Pin Connector PIN	4-pin Connector PIN	Function	Notes
	1	Do not use/Do not connect	
	3	Alarm2 Output	Connects to 0V when beacon detects a fault or is not powered. Floats when beacon is operating correctly.
		Not Connected	
		Not Connected	
		Not Connected	
		Not Connected	
	2	GND/0V	Signal ground (0V) connection for all signals on this connector.
		Not Connected	

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3.1.5. External TVIR and Day/Night Light Sensor Connection

The day/night light sensor also includes a TVIR receiver to receive commands from the TVIR Remote02. The day/night light sensor is shipped separately within the beacon crate, in a protective wrapping.

After installing the beacon, but before applying power, the day/night light sensor should be unwrapped and carefully connected to the beacon.

Locate the day/night sensor socket, which is high on the beacon's base, under the turntable, as shown. To connect the day/night light sensor to its socket on the beacon, first locate the key marks on both the sensor and its mating socket. Align the sensor key with the beacon socket key. Ensure that the sensor is aligned straight with the socket, and gently push the sensor into the socket, making sure to apply force only along the arrow shown in the diagram. The sensor or its mating socket on the beacon could be damaged if the keys are not aligned or if the sensor is at an angle when force is applied.

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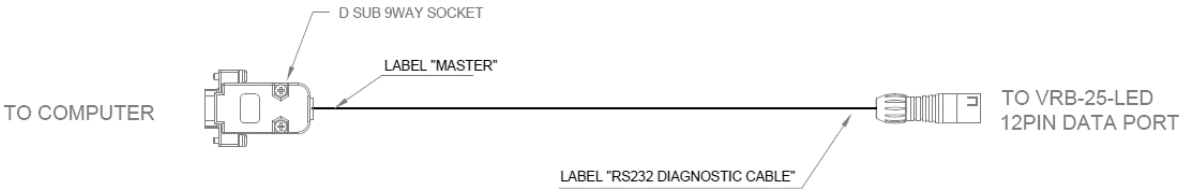
3.2. RS232 Diagnostic Cable

The cable can be used for:

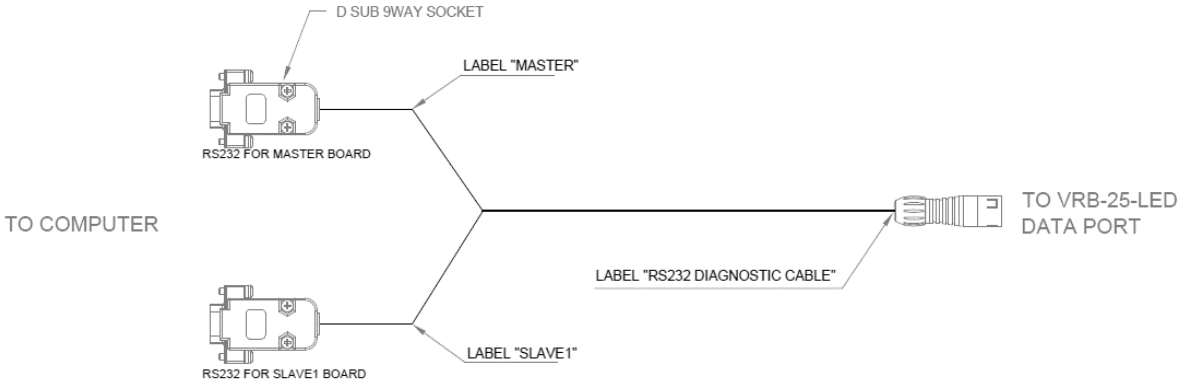
1. Diagnosing and monitoring the beacon
2. Upgrading controller software

Depending on the model of beacon, one of the following cables will be included.

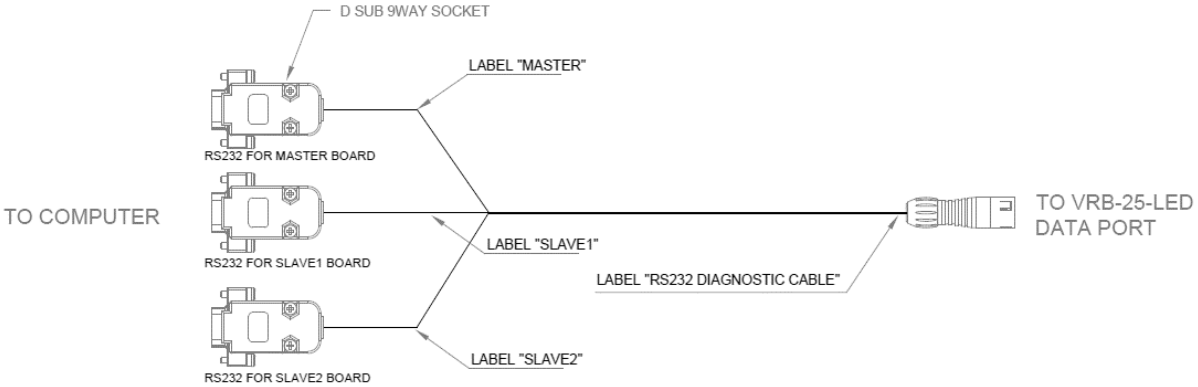
3.2.1. Part 225-511-1 (for 1 driver)



3.2.2. Part 225-511-2 (for 2 drivers)



3.2.3. Part 225-511-3 (for 3 drivers)



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4. Beacon Programming

The VRB-25 LED beacon is supplied pre-set to the rotation speed and intensity that was specified in the customer's order. It will not normally be necessary to change either of these.

However, should it be necessary to change these parameters, the instructions are supplied below.

The beacon includes two separate controllers:

- The CALC-20B motor controller operates the turntable. The CALC-20B can be programmed manually by setting Hex switches.
- The beacon controller operates the LEDs, monitors the overall operation (including the rotation rate) and interfaces to the user and external devices. The beacon controller can be programmed using the TVIR Remote02 or the serial interface.

The rotation speed and LED intensity are programmed as follows:

- The rotation speed of the turntable is manually set on hex switches on the internal CALC-20B motor controller.
- The rotation speed (RPM) value must also be programmed into the beacon controller using the TVIR Remote02 device. The programmed rotation speed is used to both check that the turntable is operating correctly (with +/-10% tolerance) and to calculate the correct effective intensity range of the beacon (which depends on rotation speed).
- Effective intensity is set by the Vega remote TVIR Programmer. The effective intensity information provided in Appendix B of this manual is calculated for the specified rotation speed. If the rotation speed is changed then the effective intensity table and the beacon's programmed effective intensity are no longer applicable. After changing the rotation speed, the beacon's new maximum effective intensity can be determined using the TVIR Remote02. See Section 4.2 for an explanation.

4.1. Setting the CALC-20B Motor Controller Rotation Speed

The speed of the turntable is user-selectable from 1.0 to 15.9 revolutions per minute. The turntable rotation speed is controlled by the CALC-20B motor controller.

The rotation speed also controls the maximum effective intensity of the beacon, as explained by the IALA E-200 Recommendation. The maximum effective intensity of the beacon can be calculated by a mathematical formula which approximates the human eye's perception of the beacon's light output, based on several design parameters including rotation speed. The faster the beacon rotates, the lower the maximum effective intensity specification for the beacon. The slower the beacon rotates, the higher the maximum effective intensity specification of the beacon. Section 4.2 describes in more detail about calculating and setting the beacon intensity.

Required tools:

- 5mm Hex/Allen key for removal and reinsertion of the cover plugs.

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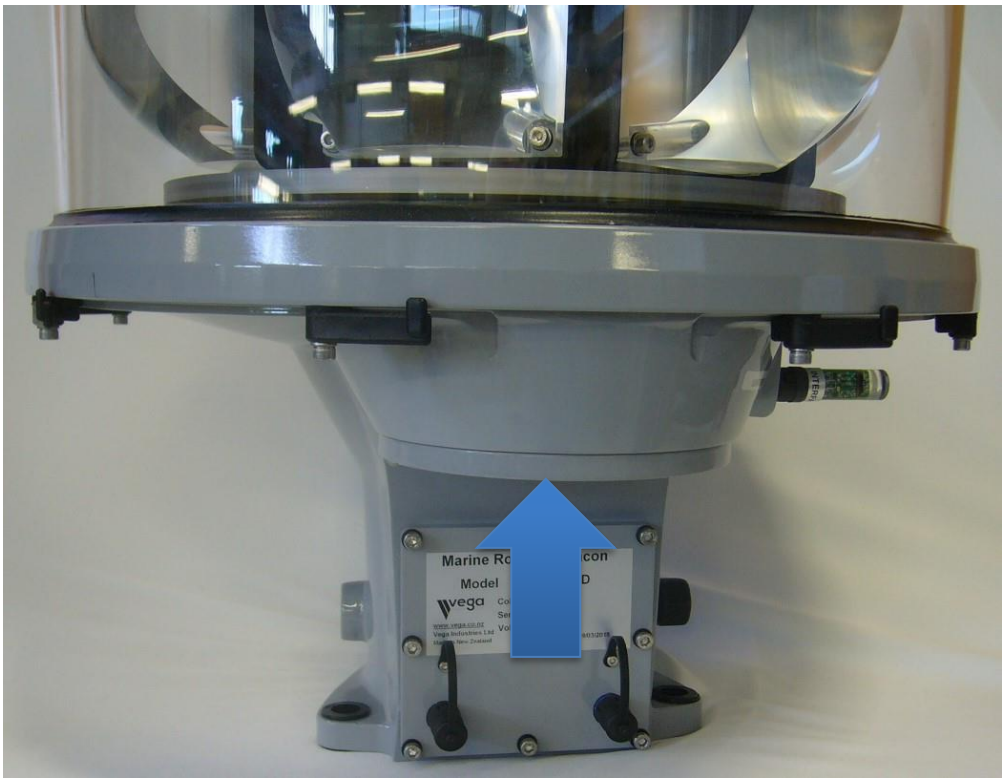
- 3mm or smaller flat-bladed screwdriver or Pozi 0 screwdriver for adjustment of the rotary switches.
- A small hand mirror and torch or smartphone with light and camera will improve visibility of the rotary switch settings.

Rotation speed selection on the CALC-20B is made by two rotary hex switches.

1. Disconnect power from the beacon.
2. The controller is located in its own housing attached to the beacon base. The two Calc-20B rotary switches can be accessed via removable plugs and do not require access to, or removal of, the Calc-20B itself.
3. The following image shows the general location of the removable cover plugs, positioned on the underside of the Calc-20B housing, as illustrated by the blue arrow. Using a 5mm hex/Allen key, remove both plugs to allow access to the rotary switches inside.

Important:

- It is recommended that the beacon not be tilted to gain better access to the rotary switches.
- It is strongly recommended that the beacon is never laid on its side for any reason.



4. The following image is viewed from the base looking upward at the cover plugs on the underside of the Calc-20B housing. The identity of each of the rotary switches under the cover plugs is indicated in the image (the upper edge of the image and SW1 will be nearest to the operator).

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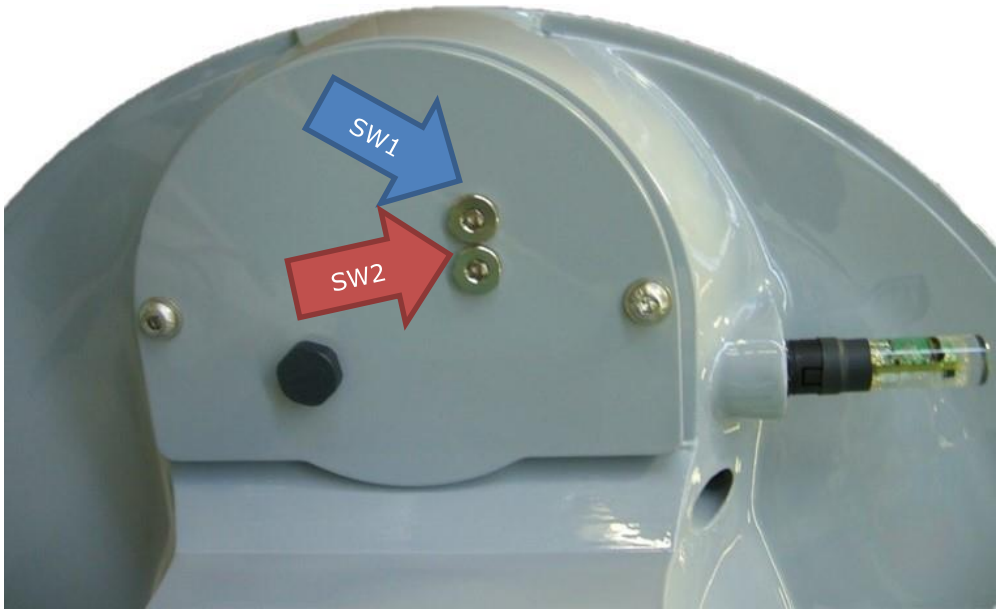
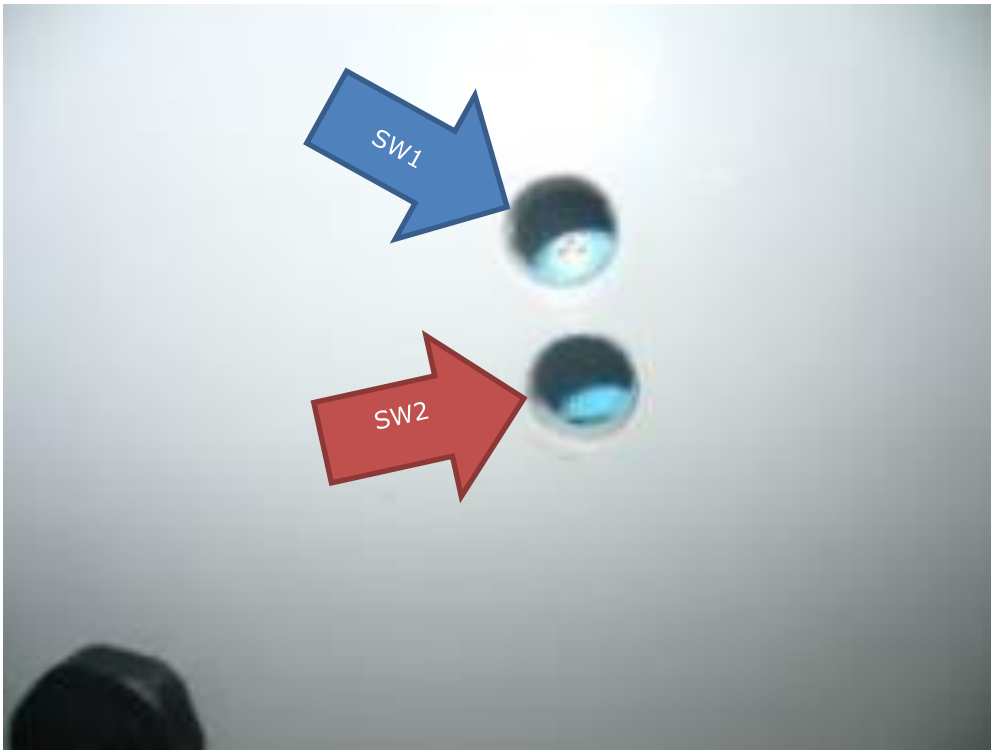


5. Carefully insert the screwdriver sequentially into each of the holes and adjust the rotary switches to the required settings, as per the following table. Be careful to locate the screwdriver into each rotary switch properly and apply limited force to avoid damage.



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6. Power can be applied to the beacon at this point and the rotation speed checked. It is recommended that the selected Calc-20B rotation speed be immediately programmed into the beacon controller on power-up using the 7-8-ABCD command as explained in the following section. If this is not done then during the rotation check the beacon will likely detect a rotation speed error and will shut down.
7. If the Calc-20B rotation setting needs further adjustment then it is recommended that the power be turned off again.
8. Once the adjustments are completed, the cover plugs should be re-inserted and gently tightened with the 5mm hex/Allen key.

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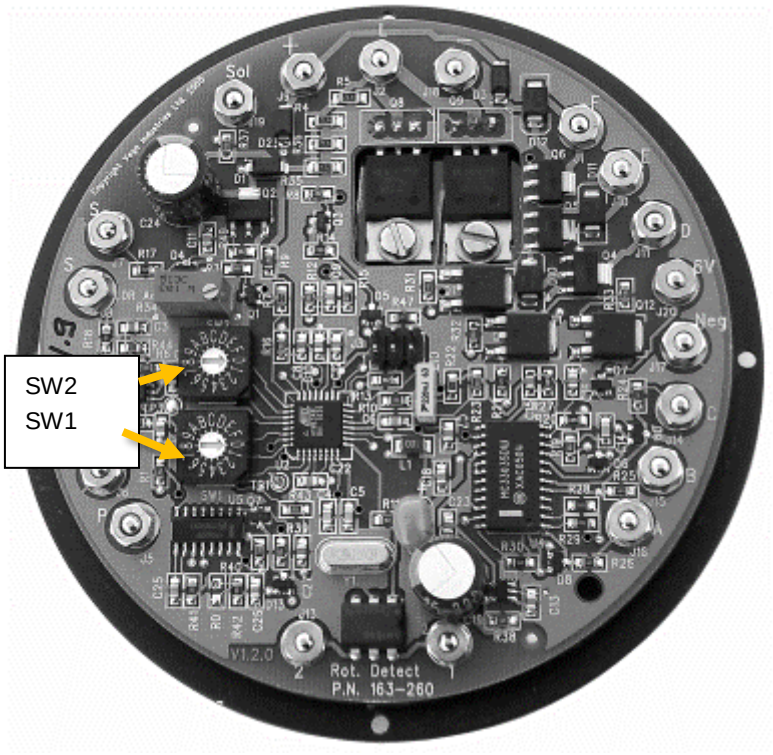
Figure 2: CALC-20B Rotation Rate Switches



Calc-20B Rotation Speeds (RPM)

Units		Fractions	
SW 2	RPM	SW 1	RPM
0	-----	0	0.0
1	1	1	0.10
2	2	2	0.16
3	3	3	0.20
4	4	4	0.25
5	5	5	0.30
6	6	6	0.33
7	7	7	0.40
8	8	8	0.50
9	9	9	0.60
A	10	A	0.66
B	11	B	0.70
C	12	C	0.75
D	13	D	0.80
E	14	E	0.83
F	15	F	0.90

For example:

For 10.5RPM use the following switch settings:

SW2=A, SW1=8

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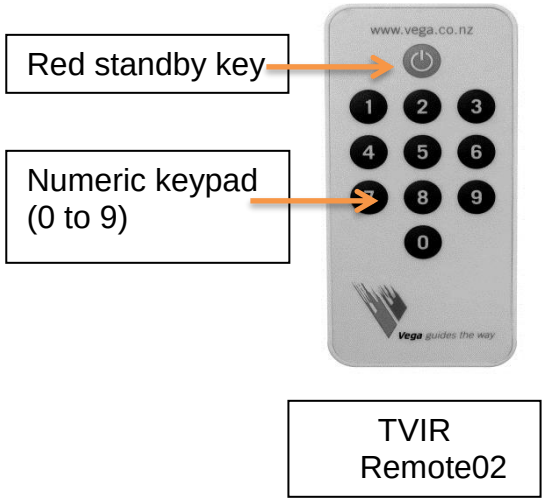
4.2. Programming the RPM and Intensity into the Beacon Controller Software

To program or read back settings the TVIR Remote02 programmer needs to be pointed at the infra-red sensor in the VRB-25 LED beacon day/night sensor.

During programming, the VRB-25 LED beacon will provide visual feedback by flashing the green LED

IMPORTANT
Before attempting to use the TVIR Remote02 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.



TVIR Remote02

in the sensor and also faintly flashing the main LEDs as each key is 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.

The beacon's maximum effective intensity depends on the programmed rotation speed (RPM). The beacon calculates the maximum effective intensity based on its design specification and the user's RPM setting. The beacon will not allow an effective intensity to be programmed that is above its calculated maximum value.

The beacon controller's RPM setting can be set with the 7-8-ABCD TVIR command and it can be read with the 7-9 TVIR command. The RPM value should always be reprogrammed after a factory default reset command (see Section 3.1.2) because the reset command sets the RPM value back to 1.00 RPM.

When programming the RPM value, the 'ABCD' characters in command 7-8-ABCD represent a four-digit RPM value. For example, 1.50 RPM would be entered as 7-8-0150, or 2.00 RPM would be entered as 7-8-0200, or 15.90 RPM would be entered as 7-8-1590. Ensure that the CALC-20B motor controller (see Section 4.1) is manually set to the same RPM value that is entered using this command.

For convenience, programming a new RPM value automatically sets the beacon to the maximum effective intensity for night operation and zero intensity for day operation. The night intensity value can be read back by using the night intensity read-back command (9-1), which will flash back a four-digit number, as explained in the following sections. This value represents the effective intensity in kCd (i.e.

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thousands of Candela). If the read-back command is used immediately after a new RPM value is programmed then the maximum effective intensity will be read back.

If the customer wishes to set a lower night effective intensity then the 1-1-XXXX command can be used to set any four-digit value that is between 0000 and the maximum effective intensity calculated from the RPM rate (inclusive). A zero value will turn the beacon off at night.

The day intensity can be programmed or read using commands 1-2-XXXX (programming) and 9-2 (reading).

4.3. Programming Syntax

Reading or writing parameters with the TVIR involves entering a sequence of numbers on the keypad. The programming syntax is: OPERATION FEATURE [VALUE]

Note: - the VALUE parameter is only required when writing data to the beacon.

There are four OPERATIONs:

Programming	Operation 1
System Information	Operation 3
Optional PIN code	Operation 7
Read settings	Operation 9

The FEATURE parameter represents the feature of the beacon to be read or written such as intensity.

The VALUE parameter is the new value to set the selected FEATURE to.

For example, the sequence 9 8 reads the low battery threshold (operation 9 = read setting, feature 8 = low battery threshold).

Appendix A of this manual provides a Table for the programming features of this VRB-25 LED beacon. Please take the time to become familiar with the table before continuing.

4.4. Visual Feedback when Using the TVIR Programmer

The beacon will provide visual feedback of the programming instructions it receives from the TVIR programmer. This feedback that is provided to confirm that TVIR commands have been received correctly and therefore ensures the beacon is programmed correctly.

The feedback is summarised below:

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

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When programming sequence recognised	The 3 or 4 digit value code is output 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.
When programming sequence is not recognised	quick flashes (0.1sec on 0.1sec off) The beacon 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 the beacon will resume normal operation.

4.5. If the VRB-25 LED beacon will not enter Programming Mode

If 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.

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.

4.6. Becoming Familiar with the Programming 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 VRB-25 LED beacon is connected to a 12VDC supply and experiment with the following.

4.6.1. 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

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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 the beacon will resume normal operation.

4.6.2. Reading System Information

Referring to Appendix A it can be seen that the power supply voltage can be read from the System Checks (feature 3), feature 1. The value that is returned is the power supply voltage * 10 (three digits):

Operation	= System Checks	= 3
Feature	= Power Supply Voltage	= 1
The sequence to read the power supply voltage is therefore		3-1

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 (12.3VDC). One quick flash followed by a 0.5sec gap followed by 2 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 the beacon will resume normal operation.

4.7. Deciding which Settings are required

As the VRB-25 LED beacon is delivered from the factory with default settings as requested by the customer, 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. Refer to section 3.1.2 about programming the operation mode of the beacon (Main, Standby or Standalone), section 4.1 about programming the rotation speed (RPM) and section 4.2 about programing the intensity. Other programmable features are available and these are described in Appendix A.

4.8. Programming or Reading Multiple Settings

In the examples above the VRB-25 LED beacon was allowed to time out of programming mode after

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reading or writing each parameter. This is not absolutely necessary – multiple parameters can be read and written in one programming sequence. As soon as the beacon has finished flashing back a code from a command or read request the next command or read request can be entered.

4.9. Programming Features

Refer to Appendix A for the full list of programming features.

4.10. Intensity Settings

A different effective intensity setting can be programmed for both day and night operation. By having different intensity settings, the VRB-25 LED beacon can be operated at a higher intensity during the day than at night. However, the typical use of the beacon is to operate at night only and by default the beacon will be shipped from the factor with a zero day intensity unless otherwise requested.

The programmable effective intensity settings are provided in Appendix B. The effective intensity information provided in Appendix B of this manual is calculated for the specified rotation speed. If the rotation speed is changed then the effective intensity table and the beacon's programmed effective intensity are no longer applicable. Refer to section 4.2 for further explanation of the dependency of effective intensity on rotation speed (RPM).

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

4.11. Day/Night Use of the Beacon

The VRB-25 LED beacon can be configured to operate at night-only or day-only or both at day and night. The beacon will automatically transition from day to night mode and vice versa based on pre-programmed day and night Lux levels.

The beacon can be programmed for remote control of its day/night function. When remote control of day and night is enabled, the light sensor data is no longer used to control the beacon's operation. (However, please leave the day/night sensor plugged into the beacon as it has other functions as well).

4.11.1. Automatic Day/Night Operation

There are 12 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	=0YY

The first digit (0) of the Day/Night Control value should be zero.

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The YY digits of the Day/Night Control Value determine when the Day/Night transition occurs. The Lux levels of the 12 settings are detailed in Appendix A. The accuracy of the light sensor is ±10%.

To program night-only operation, set the required night intensity using the 1-1-XXXX command and set the day intensity to zero using the 1-2-0000 command.

To program day-only operation, set the required day intensity using the 1-2-XXXX command and set the night intensity to zero using the 1-1-0000 command.

To program day and night operation, set the required night intensity using the 1-1-XXXX command and set the required day intensity using the 1-2-YYYY command.

4.11.2. Remote Control of Day/Night Operation

Remote control day/night operation is possible, when enabled, by changing the voltage at the Day/Night digital input. When this input is allowed to float (open-circuit) or is held at >6V then night intensity is selected. When this input is connected to 0V then day intensity is selected.

The Day/Night remote control input can be enabled as explained in sections 4.12 and 4.13.

When Day/Night remote is enabled, the programmed day/night automatic thresholds (i.e. 1-4-XXX command) are ignored.

4.12. Operation Modes

The operation mode setting on this VRB-25 LED beacon controls the operating mode of the beacon (normal or test modes).

Operation =Program (or read) = 1 (or 9)

Feature =Operation Mode = 5

Value =XXX

The values that can be programmed are as follows:

Mode	Description	Comment
001	Normal Mode-Failsafe Beacon operates automatically (remote control inputs are ignored). Beacon turns off if it detects a fault.	Recommended for Main beacons in a Main/Standby pair operating automatically.
002	Normal Mode-Best Effort Beacon operates automatically (remote control inputs are ignored). Beacon attempts to continue operating if it detects a fault.	Recommended for Standalone beacons operating automatically.
003	Remote Control Mode- Failsafe	Suitable for Main

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	Beacon operates under partial or full remote control. Beacon turns off if it detects a fault.	beacons that are remotely controlled by the customer.
004	Remote Control Mode-Best Effort Beacon operates under partial or full remote control. Beacon attempts to continue operating if it detects a fault.	Recommended for Standby beacons operating in a Main/Standby pair.

The operation modes supporting remote control operation of a beacon allow the On/Off and Day/Night inputs to be used to control a beacon. Which of these inputs is actually enabled is set with a separate command, the remote control command, which is described in section 4.13.

The recommended settings for the operation mode are included in the factory default reset commands that are explained in section 3.1.2 and listed in Appendix A. The factory default reset commands are provided as a shortcut method of configuring a beacon for Main, Standby or Standalone operation.

4.13. Remote Control Modes

The remote control options for the beacon allow an external control system to control a beacon's behaviour using one or both of two inputs: the On/Off input and Day/Night input.

The On/Off input is enabled and used for Standby beacons to allow a Main beacon to control the Standby beacon. The Main beacon would normally hold the Standby beacon off unless the Main beacon detects a fault and enables its Alarm output.

The recommended settings for the remote control mode are included in the factory default reset commands that are explained in section 3.1.2 and listed in Appendix A. The factory default reset commands are provided as a shortcut method of configuring a beacon for Main, Standby or Standalone operation.

If the customer wishes to use the remote control modes for purposes in addition to the Main/Standby operation or for different purposes then the control options are listed in the appropriate table in Appendix A. The summary of the available control option combinations is as follows:

- Full automatic operation: 7-4-010
  All inputs are disabled and operation is fully automatic.
  The same operation can be obtained by setting the operation mode to normal (either 1-5-001 or 1-5-002).

- On/Off input only enabled: 7-4-014
  Only the On/Off input is enabled. When this input is pulled to 0V the beacon is enabled and obeys the information from its light level sensor. (i.e. the beacon cannot be forced on by this input since the day/night light level controls the beacon's operation. This input is useful for forcing the beacon into the off state.)

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- Day/Night input only enabled: 7-4-012
  Only the Day/Night input is enabled. The light sensor no longer controls the day/night operation of the beacon. This input can be used to force the beacon to operate at one of two pre-programmed intensity levels according to the state of this remote control input. If the day intensity is set to zero and the night intensity is set to maximum then the beacon could be forced on (at maximum intensity) or off by this input.

- On/Off and Day/Night inputs enabled: 7-4-016
  The operation of both inputs is combined. If the On/Off input is holding the beacon Off then the Day/Night input is ignored. If the On/Off input is holding the beacon On then the output intensity will depend on the pre-programmed day and night intensities and the state of the Day/Night input. For example, using this combination of inputs, a beacon could be remotely controlled to display three intensities such as maximum (On and Night active), Medium (On and Day active) and Off (On inactive).

The beacon includes further remote control functionality that supports remote control by serial command. This functionality works identically to the description above, but using serial commands instead of switched inputs. The advantage of having dual command options is that the beacon can be remotely controlled by serial command and locally controlled by switched inputs. This approach allows manual override or manual control if serial communications fails at any time. This functionality is already included in the shipped software. Contact Vega for a more detailed explanation of how to use this advanced remote control functionality.

4.14. Factory Default Resets

The factory default reset commands are provided to create convenience in the reprogramming of a beacon. For example, if a beacon needs to be changed from a Standby to a Main role due to a failure or maintenance requirements then this functional change can be performed very quickly with the appropriate factory default reset command and with very few other commands. Typically, a factory default reset command should be followed by an RPM (rotation speed) command.

The list of factory default reset commands is provided in a table in Appendix A. That table describes all of the user settings that are affected by operation of the command.

Refer to section 3.1.2 for details of the procedure for changing a beacon from one mode to another using a factory default reset command followed by an RPM command.

4.15. Battery Thresholds

The VRB-25 LED beacon has programmable battery threshold settings designed to protect a battery from damage by being over-discharged.

The beacon protects the battery from low voltage damage and will switch off when the programmed low threshold is reached. This feature can be disabled. If the beacon detects multiple, consecutive voltage readings that are lower than the programmed low voltage threshold the beacon will turn off.

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Normal operation is resumed once the voltage exceeds the battery high threshold value. When normal operation is restored after a low voltage condition, the beacon switches on for approximately one to two minutes in night mode before making a determination of day or night.

The 12V factory-set thresholds are:

- Low voltage threshold (beacon stops operating): 11.0V
- High voltage threshold (beacon starts operating): 12.8V

If the customer wishes to adjust these thresholds, it is important that the correct values are set for the nominal operating voltage that is powering the beacon. If incorrect settings are used then either the beacon might not operate as desired, or it might be possible to damage the battery by over-discharging it, or both circumstances might occur.

Setting the low voltage threshold value to 999 will disable this function. This means that the beacon will only turn off when the voltage becomes low enough for it to stop operating properly (typically below 10.5V). For example, if a power supply without battery is connected to the beacon then the low voltage threshold can be optionally disabled using this feature.

4.16. System Information

The VRB-25 LED beacon controller software can be asked to display specifications and manufacturing details. With the System Checks TVIR commands, calibration details, firmware version, and LED type used can be displayed to the user. Battery voltage, beacon temperature, and serial number can also be displayed to the user.

Refer to Appendix A for the full list of parameters available and the System Check commands required to display them.

For example the VRB-25 LED beacon provides a reading of the supply voltage as a quick means of checking battery voltage.

Enter programming mode with the TVIR Remote02 and then enter the following command:

Operation =Read Only =3

Feature =Input Voltage =1 (see Appendix A for others)

Value =Series of flashes providing the requested value.

The battery voltage value is displayed in tenths of a volt.

4.17. Security PIN Number

The VRB-25 LED beacon is shipped from the factory without any security protection. If there is concern about unauthorised programming, a 3-digit PIN number can be set. When a pin number is set then that PIN number will need to be entered before programming any parameters. Entering the PIN code is only necessary to change settings; it is possible to read settings without using the PIN code

For setting a Security PIN:

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 VRB-25 LED beacon will then flash back the PIN code 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 VRB-25 LED beacon will flash back the PIN code using a series of flashes. You can then continue onto programming the beacon settings.

Note: Where a PIN has been set, and a user attempts changing any settings without previously entering the PIN code, an error message will be generated and no changes will actually occur.

The PIN can be changed using the same method. Enter the old pin using command 7-7-XXX, then immediately enter a new pin using command 7-1-XXX.

If you lose your PIN number, please contact Vega for further instructions.

4.18. Monitoring

The VRB-25 LED beacon is a Vega Smart Beacon and is capable of being monitored by a VegaAIS or VegaWeb device through the control port serial interface connection.

To support monitoring, the VRB-25 must have its serial monitoring output stream enabled in free-run mode. The required TVIR command for setting this mode is 1-6-005 and is described in Appendix A.

The wiring of a VRB-25 LED beacon to a mini Vegaweb for serial monitoring is shown in Appendix H. The mini Vegaweb must have software version 034 or later installed.

4.19. On-Demand Control

The VRB-25 LED beacon is capable of being controlled by a Vegaweb device. On-demand control is available with or without monitoring. The VRB-25 must have its on/off remote control input enabled. Refer to the instructions in Appendix A.

The wiring of a VRB-25 LED beacon to a mini Vegaweb for on-demand control is shown in Appendix H.

4.20. Main/Standby Control

Appendix H shows how to interconnect a main and standby pair of VRB-25-LED beacons. Alternative

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beacons can be used in place of the main or standby beacon, if desired, as long as an appropriate input or output control is provided with the matching electrical specifications and function.

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5. Routine Maintenance

5.1. Cleaning

Clean the external surface of the VRB-25 LED beacon at intervals of about 90 days. The optimal interval between cleaning will be determined after experience, as the degree of salt encrustation on the glazing is dependent on the weather, wind direction, and rainfall.

The glazing should be cleaned with fresh water and a little household detergent (washing up liquid) added to dissolve the salt and dirt. A soft sponge or cleaning cloth may be used. Avoid using cleansers which could scratch the acrylic, as this could reduce the effective intensity of the Beacon. Under no circumstances should solvent-based cleaners be used.

5.2. Internal Inspection

After washing (and drying) is completed, remove the top inspection hatch. Visually inspect the inside surfaces of the lenses and the base of the carousel. If there is evidence of water ingress, dirt or corrosion then the enclosure is leaking and this must be rectified. Enclosure leaks may require removal of the Beacon to a suitable workshop for dismantling.

5.3. Focus and Level Check

Observe the levelling bubble as the carousel rotates. The bubble should remain entirely within the marked circle during rotation. If it deviates significantly adjust the level according to the instructions in Section 2.3 (Levelling the Beacon).

5.4. Rotation Check

Observe and listen to the carousel for smooth, even and quiet rotation.

Refer to the specified rotational speed required for the site. Time the beacon using a watch for a convenient time or number of rotations (eg 10 rotations), and calculate the RPM to confirm it has been set correctly. The monitoring function of the beacon controller can also be used to perform this check. Access to the master serial interface will be required and knowledge of the command and monitoring protocol will be needed. Contact Vega for further information.

Coat the sealing O-Ring under the top access hatch with O-ring grease and refit. Rotate the latches to clamp the hatch in place. If security latches are fitted use the correct tool to close the latches. Check that the photo-sensor is uncovered before leaving.

5.5. Bi-Annual Maintenance

It is recommended to replace the O-rings on the Access Hatch Cover and the Lower Glazing Ring at two or three year intervals, depending on condition. The O-rings should be lubricated with Molykote valve and O-ring lubricant.

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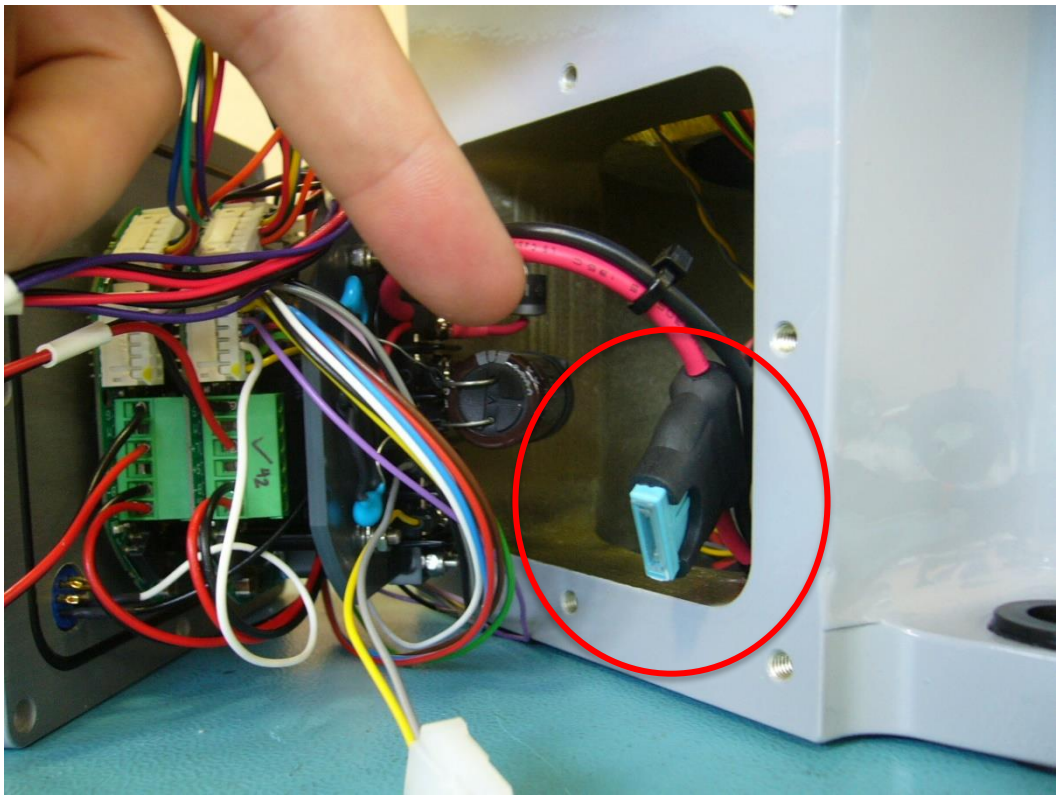
5.6. Surge Protection and Fuse Check

The VRB-25-LED V2.0 includes an internal surge protection device (an 18VWM 5KP18CA TVS Diode) and an in-line TAC ATO 15A Blade fuse. In the event of a surge the TVS protection device might be damaged since it operates in a sacrificial manner to protect the VRB-25-LED. In such an event the fuse might have blown, which would cause the VRB-25-LED to fail to operate.

The protection device and in-line fuse are located behind the terminal plate in the base of the VRB-25-LED. The fuse (light-blue) is shown in the following photograph. A spare fuse is provided with each product. To replace the fuse, use a small pair of pliers or similar tool to grip the light-blue fuse tab and pull it out from the black socket. Insert the replacement fuse firmly by hand.



Any VRB-25-LED suffering a suspected surge event, and especially if the fuse has blown, should be internally inspected by a qualified technician for electronic and fire damage prior to the re-application of power. The internal surge protection device, an 18VWM 5KP18CA TVS Diode should be replaced even if it appears undamaged. This device, as shown below, is mounted on the power connection panel on the top of the board stack-up behind the terminal plate.

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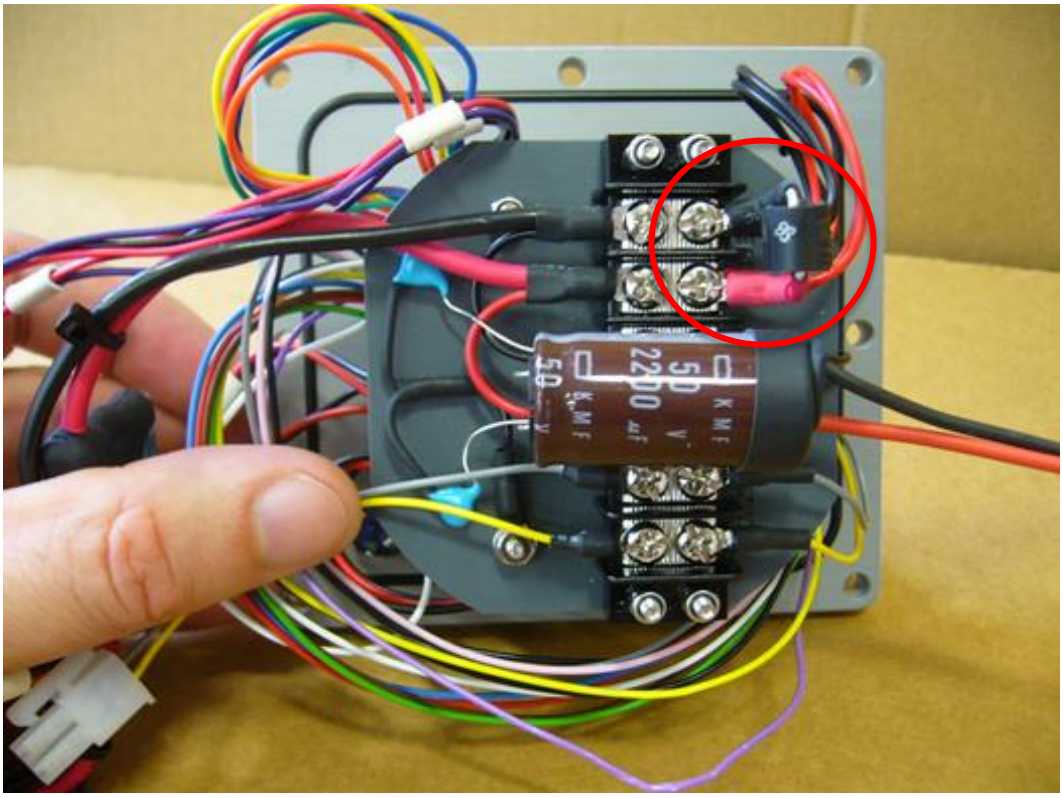

6. Appendix A Programming Table

Beacons are shipped in Standalone Mode (i.e. Normal, Best Effort Mode) unless specifically requested otherwise. Mode, and other settings will be indicated on the associated Test Sheet.

The customer has full control of the beacon's operational mode and all settings can be altered as described in the following tables.

For most TVIR commands in the following table, the corresponding serial interface command or related serial commands are shown in Courier New font. All serial interface commands can accept a question mark, '?' as a parameter and will return the current settings after the receipt of the trailing forward slash '/'. (Parameter 'b' in various commands represents a binary value, '0' or '1' and parameter 'x' represents a decimal digit or numeral.) Most commands require a beacon restart ('<RST>1/') before they will affect beacon operation. The serial interface commands are explained in more detail in Appendix H.

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Generic TVIR Programming Commands		
Operation	Feature	Value
1 = Program Mode 9 = Read Settings	0 = Flash Character *Factory setting: 000*	000 – Fixed character
	1 = Night Effective Intensity <NRG>XXXX/	4-digit value Refer to Appendix B for a table of available settings. This night intensity value must be set after the RPM value is set (command 7-8-XXXX). The RPM value determines the valid maximum night intensity.
	2 = Day Effective Intensity <DRG>XXXX/	4-digit value Refer to Appendix B for a table of available settings. This day intensity value must be set after the RPM value is set (command 7-8-XXXX). The RPM value determines the valid maximum day intensity.
1 = Program Mode 9 = Read Settings	3 = Synchronisation *Factory setting: 000* <OSO>B/ <SYD>YY/ <SDA>B/ <GPE>B/ <HSD>B/	000 Light in master mode 999 – Disable Sync. 998 – On When Sync is Low. (Send 000 setting to cancel 998 through 999 modes).

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Generic TVIR Programming Commands		
Operation	Feature	Value
	4 = Day/Night Control *Factory setting: 005* <DNT>0YY/	0YY Entry Format YY= Day/Night transition Lux Level Night Lux. Day Lux YY=01 40 100 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 YY=10 15 40 shortest night YY=11 30 50 YY=12 15 60
	5 = Operation Mode <OPM>XXX/ <TST>B/	Normal, Automatic Operation Modes 001 – Normal Failsafe (Recommended) 002 – Normal Best Effort Remote Control/Traffic Light Modes 003 – Remote Control Failsafe Mode 004 – Remote Control Best Effort Mode Transient Test Modes 007 – Alarm Test – Sets alarm until TVIR programming mode exit. Other Operations 99X – Factory Default Reset (see corresponding table)

1 = Program Mode	6 = Interface Mode & PBA Bus Address *Factory setting: 006* <MON>b/ <MFR>b/ b = 0 or 1 <R2B>x/ x = baud rate <TYR>b/ b=10, 20, 21, etc.	Interface Mode: 00X, where X is: 0 – Disable IRDA and RS232, No Monitoring 1 – Enable IRDA, No Monitoring 2 – Enable IRDA, Monitoring on Demand 3 – Enable IRDA, Monitoring Free Running 4 – Enable RS232, Monitoring on Demand 5 – Enable RS232, Monitoring Free Running (suitable for Vegaweb monitoring) 6 – Enable RS232, No Monitoring (default setting) 7 –Enable RS232, Monitoring, 60s Free Running 8 – Enable RS232, Monitoring, 60s Free running (suitable for AIS monitoring), 38400 baud (i.e. includes command 8-7-005) PBA (Driver) Bus Addressing: Warning: ADJUSTING THIS SETTING COULD DISABLE THE BEACON. This information is provided for service purposes. 9TA – Set PBA address to A within a set of T PBAs. Where T = 1 to 3; A = 0 (master address) to 2 (1-2 are slave addresses); T>A . Valid examples: Single projector system: 910 – Single PBA system (Total = 1, PBA is master = address 0). Two-PBA system: 920 – PBA is master;

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Generic TVIR Programming Commands		
Operation	Feature	Value
		921 – PBA is first slave; Three-PBA system: 930 – PBA is master; 931 – PBA is first slave; 932 – PBA is second slave.
9 = Read Settings	6 = Interface Mode & PBA Bus Address	TA0X where TA holds the Bus Addressing code and X is the Interface Mode code (see definitions above).

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Generic TVIR Programming Commands		
Operation	Feature	Value
1 = Program Mode 9 = Read Settings	7 = Additional Sync Options *Factory setting: 002* <SSF>YY/ <ODS>B/	0YY– Continue “Y” number of cycles (002-099) after loss of sync. 999 – Disable sync low off mode 998 – Beacon deactivated by holding sync low
	8 = Low battery threshold *12V Factory setting: 110* <BLW>YYY/	YYY –Battery low threshold (00.0 to 12.0VDC) 999 – Disabled, No battery low cut off.
	9 = High battery threshold *12V Factory setting: 128* <BHI>YYY/	YYY –Battery high threshold (08.0 to 13.8VDC) 999 - reset to default setting (12.8V)
3 – System Checks	0 = Software version <VER>?/	Version Y.Y.Y (i.e. 2.2.8)
	1 – Battery voltage <BAT>?/	YY.Y Volts (i.e. 11.7 volts) Last voltage prior to entering programming mode
	2 – Temperature Reading	Temperature of the electronics in degrees Kelvin (C+273)
	3 – Current adjustment	Percentage output adjust (100% only)
	4 – Serial Number <SER>?/	Displays beacon serial number as a series of flashes (8 digits)
	5 – LED version number <LED>?/	Displays LED version number identifier (4 digits)
	6 – Characterisation number <CAR>?/	Displays LED characterisation identifier (4 digits)

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	9 – Testing & Error Logging <ERR>Error, Qty, Before, Between, After, Restart count, Flag/ Flag: 0 for decimal, not monitored; 1 for hex, not monitored; 10 for decimal, monitored; 11 for hex, monitored; <CLE>/	000 – 001 – 002 – Display Battery Voltage in volts x 10 003 – Display Solar Voltage in volts x 10 004 – Temperature in Kelvin from default sensor 005 – Display raw light level reading in ADC counts 006 – 0 100 – Display master error code (0 = Good) 101 – Display logged error code (0 = none) 102 – Display logged error count 103 – Reset logged error code & error count, night counts & restart count 104 – Display night count before error 105 – Display night count between first & last errors 106 – Display night count after last error 107 – Display restart count

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Generic TVIR Programming Commands		
Operation	Feature	Value
7 – Special	1 - Set PIN *Factory setting 000 (No PIN)* <PIN>XXX/	XXX (000 clears the PIN) If the new PIN code is non-zero then it must be entered using the 7-7-XXX command before any settings can be programmed. Commands for reading settings can be entered without previously entering the PIN.
	4 – Set Remote Controls <RCM>XYZ/ <OPM>3/ or <OPM>4/ <RON>B/ <RDN>B/ <RFF>B/ <TLS>…/	Sets remote control mode function of the Control Connection port I/O lines. Defines beacon functionality only when Remote Control mode is enabled (1-5-003 or 1-5-004). Refer to the following Remote Control table for a detailed description. The default setting is 010.
	5 – Read Remote Controls <RCM>?/ <RON>?/ <RDN>?/ <RFF>?/ <TLS>…/	Reads back the remote control mode function of the Control Connection port I/O lines. Describes beacon functionality only when Remote Control mode is enabled (1-5-003 or 1-5-004). Refer to the following Remote Control table for a detailed description.
	7 – Enter PIN *Factory Setting: No PIN*	XXX – If the PIN is correct then this function allows access to change settings.
	8 – Set RPM <RPM>XXXX/	ABCD – Revolutions Per Minute * 100 (Interpret as: AB.CD RPM, e.g. 0100 means 01.00 RPM. Must be set to same RPM as programmed into CALC-20B in VRB-25-LED). This RPM value must be set correctly prior to setting the night or day intensity.
	9 – Read RPM <RPM>?/	ABCD – Revolutions Per Minute * 100

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VRB-25-LED Remote Control I/O Settings					
Programming Code / Serial Command	Input's Active Level (X)	Internal Pull-up or Pull-down (Y)	Enabled Inputs (Z)		Type of Inputs and Operational State (Active states are On & Day)
			On/ Off (val 4)	Day/ Night (val 2)	
7-4-010 <RCM>010/	Low Active (Open circuit is inactive)	Pull-up	Auto	Auto	Normal Automatic (Best Effort) operation. All inputs inactive. All serial control commands inactive.
7-4-012 <RCM>012/			Auto	☑	Beacon automatically On. Day/Night input is operational. <RDN> serial command is operational.
7-4-014 <RCM>014/			☑	Auto	On/Off input is operational. <RON> serial command is operational. Day/Night and Flash/Fixed operations are automatic.
7-4-016 <RCM>016/			☑	☑	On/Off and Day/Night inputs operational. <RON> and <RDN> serial commands are operational. Flash/Fixed operation is automatic.

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VRB-25-LED Factory Default Resets (Always follow a factory reset with a Set RPM command 7-8-XXXX if RPM is not 1.00 and then reprogram the intensity settings, 1-1-XXXX & 1-2-XXXX)		
Programming Code / Serial Command	Reset Variant	Reset Effects
1-5-999 <FDF>999/	Standby Beacon of a main/standby pair	The beacon is programmed with these settings: Night & Day Characters set to Fixed(1-0-000) Night intensity is set to max intensity Day intensity is set to zero intensity IALA day/night thresholds (1-4-005) Remote Control Best Effort Mode (1-5-004) On/Off input is enabled & must be low to activate beacon. Controller RPM set to 1.00 RPM (this does not adjust the CALC-20B motor setting.) Low and high battery thresholds reset. These should be adjusted by the user to be suitable for the supply voltage.
1-5-998 <FDF>998/	Main Beacon of a main/standby pair	The beacon is programmed with these settings: Night & Day Characters set to Fixed(1-0-000) Night intensity is set to max intensity Day intensity is set to zero intensity IALA day/night thresholds (1-4-005) Normal Failsafe Mode (1-5-001) Remote control inputs are ignored. Controller RPM set to 1.00 RPM (this does not adjust the CALC-20B motor setting.) Low and high battery thresholds reset. These should be adjusted by the user to be suitable for the supply voltage.
1-5-997 <FDF>997/	Standalone Beacon (not part of a pair)	The beacon is programmed with these settings: Night & Day Characters set to Fixed(1-0-000) Night intensity is set to max intensity Day intensity is set to zero intensity IALA day/night thresholds (1-4-005)

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		Normal Best Effort Mode (1-5-002) Remote control inputs are ignored. Controller RPM set to 1.00 RPM (this does not adjust the CALC-20B motor setting). Low and high battery thresholds reset. These should be adjusted by the user to be suitable for the supply voltage.

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7. Appendix B Intensity Settings and Currents

The following table specifies the beacon's effective intensities and currents at 12VDC, 20°C, for particular rotation speeds (RPM) and flash rates for 1 tier beacon of each colour. The current and intensity for 2, 3 and 4 tier beacons can be calculated from the current and intensity figures for a single tier in the following tables, multiplied by the desired number of tiers.

To obtain a particular flash rate, the correct rotation speed must be first manually set on Hex switches in the CALC-20B motor controller (Refer to Section 4.1) and also programmed into the RPM setting of the beacon controller software (Refer to Section 4.2).

Other flash rates that are not shown in the following table can also be programmed into the beacon.

Notes:

- Currents are based on 12VDC supply voltage.
- Currents are based on operation at an ambient temperature of 20ºC and may be rounded to the nearest 0.1A value.
- A +10% tolerance should be added to the currents shown.
- Currents are temperature-dependent.
- The VRB-25 LED beacon is rated to operate to specification over the ambient temperature range, -30ºC to +50ºC.

Cool White: VRB-25-LED-6P-1T

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Intensity (kcd)	Program Code	Current (A) @ 20°C			12VDC
				Fl 10s	Fl 7s	Fl 6s	Fl 5s
				1.00RPM	1.40RPM	1.66RPM	2.00RPM
21.5	34.1	205	0205	1.77			
21.0	33.3	169	0169	1.48	1.80		
20.5	32.4	138	0138	1.23	1.49	1.67	
20.0	31.5	113	0113	1.02	1.24	1.39	1.57
19.5	30.6	93	0093	0.86	1.04	1.16	1.31
19.0	29.7	76	0076	0.72	0.87	0.97	1.09
18.5	28.9	62	0062	0.61	0.73	0.81	0.91
18.0	27.9	50	0050	0.51	0.61	0.67	0.75
17.5	27.1	41	0041	0.44	0.52	0.57	0.64
9.4	13.1	1	0001	0.11	0.12	0.12	0.12
OFF	OFF	0	0000	0.10	0.10	0.10	0.10
Max Effective Intensity (kcd)				209	169	150	131
Max Current (A)				1.8	1.8	1.8	1.8
Motor Current (A)				0.08			
LED Off Current with Motor Running (A)				0.1			

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Cool White: VRB-25-LED-8P-1T

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Intensity (kcd)	Program Code	Current (A) @ 20°C			12VDC
				Fl 10s	Fl 7s	Fl 6s	Fl 5s
				1.00RPM	1.40RPM	1.66RPM	2.00RPM
21.0	33.3	169					
20.5	32.4	138	0138	1.51			
20.0	31.5	113	0113	1.26	1.53	1.71	
19.5	30.6	93	0093	1.05	1.28	1.42	1.63
19.0	29.7	76	0076	0.88	1.06	1.18	1.35
18.5	28.9	62	0062	0.74	0.89	0.98	1.12
18.0	27.9	50	0050	0.61	0.73	0.81	0.92
17.5	27.1	41	0041	0.52	0.62	0.69	0.78
17.0	26.2	33	0033	0.44	0.52	0.57	0.64
9.4	13.1	1	0001	0.12	0.12	0.12	0.12
OFF	OFF	0	0000	0.10	0.10	0.10	0.10
Max Effective Intensity (kcd)				167	135	120	104
Max Current (A)				1.8	1.8	1.8	1.8
Motor Current (A)				0.08			
LED Off Current with Motor Running (A)				0.1			

Red: VRB-25-LED-6P-1T

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Intensity (kcd)	Program Code	Current (A) @ 20°C			12VDC
				Fl 10s	Fl 7s	Fl 6s	Fl 5s
				1.00RPM	1.40RPM	1.66RPM	2.00RPM
19.0	29.7	76	0076	1.47			
18.5	28.9	62	0062	1.22	1.50		
18.0	27.9	50	0050	1.00	1.23	1.40	
17.5	27.1	41	0041	0.84	1.03	1.17	1.33
17.0	26.2	33	0033	0.70	0.85	0.96	1.09
16.5	25.3	27	0027	0.59	0.71	0.80	0.91
16.0	24.5	22	0022	0.50	0.60	0.68	0.76
15.5	23.7	18	0018	0.43	0.51	0.57	0.64
15.0	22.7	14	0014	0.36	0.42	0.47	0.52
9.4	13.1	1	0001	0.12	0.13	0.13	0.13
OFF	OFF	0	0000	0.10	0.10	0.10	0.10
Max Effective Intensity (kcd)				78	62	54	47
Max Current (A)				1.5	1.5	1.5	1.5
Motor Current (A)				0.08			
LED Off Current with Motor Running (A)				0.1			

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Red: VRB-25-LED-8P-1T

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Intensity (kcd)	Program Code	Current (A) @ 20°C			12VDC
				Fl 10s	Fl 7s	Fl 6s	Fl 5s
				1.00RPM	1.40RPM	1.66RPM	2.00RPM
18.5	28.9	62					
18.0	27.9	50	0050	1.35			
17.5	27.1	41	0041	1.13	1.38		
17.0	26.2	33	0033	0.93	1.13	1.29	1.46
16.5	25.3	27	0027	0.78	0.94	1.07	1.22
16.0	24.5	22	0022	0.65	0.79	0.89	1.01
15.5	23.7	18	0018	0.55	0.66	0.75	0.85
15.0	22.7	14	0014	0.45	0.54	0.61	0.68
14.5	21.7	11	0011	0.38	0.45	0.50	0.56
9.4	13.1	1	0001	0.13	0.14	0.14	0.15
OFF	OFF	0	0000	0.10	0.10	0.10	0.10
Max Effective Intensity (kcd)				56	45	39	34
Max Current (A)				1.5	1.5	1.5	1.5
Motor Current (A)				0.08			
LED Off Current with Motor Running (A)				0.1			

Green: VRB-25-LED-6P-1T

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Intensity (kcd)	Program Code	Current (A) @ 20°C			12VDC
				Fl 10s	Fl 7s	Fl 6s	Fl 5s
				1.00RPM	1.40RPM	1.66RPM	2.00RPM
20.5	32.4	138	0138	2.00			
20.0	31.5	113	0113	1.65	2.02		
19.5	30.6	93	0093	1.38	1.68	1.88	
19.0	29.7	76	0076	1.15	1.39	1.55	1.76
18.5	28.9	62	0062	0.95	1.16	1.29	1.45
18.0	27.9	50	0050	0.79	0.95	1.06	1.19
17.5	27.1	41	0041	0.67	0.80	0.89	1.00
17.0	26.2	33	0033	0.56	0.66	0.73	0.82
16.5	25.3	27	0027	0.47	0.56	0.62	0.69
9.4	13.1	1	0001	0.12	0.12	0.12	0.13
OFF	OFF	0	0000	0.10	0.10	0.10	0.10
Max Effective Intensity (kcd)				146	118	105	92
Max Current (A)				2.1	2.1	2.1	2.1
Motor Current (A)				0.08			
LED Off Current with Motor Running (A)				0.1			

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Green: VRB-25-LED-8P-1T

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Intensity (kcd)	Program Code	Current (A) @ 20°C			12VDC
				Fl 10s	Fl 7s	Fl 6s	Fl 5s
				1.00RPM	1.40RPM	1.66RPM	2.00RPM
20.0	31.5	113					
19.5	30.6	93	0093	1.80			
19.0	29.7	76	0076	1.49	1.83	2.03	
18.5	28.9	62	0062	1.23	1.51	1.67	1.90
18.0	27.9	50	0050	1.01	1.24	1.37	1.55
17.5	27.1	41	0041	0.85	1.04	1.14	1.29
17.0	26.2	33	0033	0.70	0.85	0.94	1.06
16.5	25.3	27	0027	0.60	0.72	0.79	0.89
16.0	24.5	22	0022	0.50	0.60	0.66	0.74
9.4	13.1	1	0001	0.12	0.13	0.13	0.13
OFF	OFF	0	0000	0.10	0.10	0.10	0.10
Max Effective Intensity (kcd)				110	88	79	69
Max Current (A)				2.1	2.1	2.1	2.1
Motor Current (A)				0.08			
LED Off Current with Motor Running (A)				0.1			

Warm White: VRB-25-LED-6P-1T

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Intensity (kcd)	Program Code	Current (A) @ 20°C			12VDC
				Fl 10s	Fl 7s	Fl 6s	Fl 5s
				1.00RPM	1.40RPM	1.66RPM	2.00RPM
19.5	30.6	93	0093	1.61			
19.0	29.7	76	0076	1.34	1.64		
18.5	28.9	62	0062	1.11	1.36	1.51	1.73
18.0	27.9	50	0050	0.91	1.12	1.24	1.41
17.5	27.1	41	0041	0.77	0.93	1.03	1.18
17.0	26.2	33	0033	0.64	0.77	0.85	0.97
16.5	25.3	27	0027	0.54	0.65	0.72	0.81
16.0	24.5	22	0022	0.46	0.55	0.60	0.68
15.5	23.7	18	0018	0.40	0.47	0.51	0.58
9.4	13.1	1	0001	0.12	0.13	0.13	0.13
OFF	OFF	0	0000	0.10	0.10	0.10	0.10
Max Effective Intensity (kcd)				105	84	75	65
Max Current (A)				1.8	1.8	1.8	1.8
Motor Current (A)				0.08			
LED Off Current with Motor Running (A)				0.1			

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Using the tables:

Warm White: VRB-25-LED-8P-1T

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Intensity (kcd)	Program Code	Current (A) @ 20°C			12VDC
				Fl 10s	Fl 7s	Fl 6s	Fl 5s
				1.00RPM	1.40RPM	1.66RPM	2.00RPM
19.0	29.7	76	0076	1.66			
18.5	28.9	62	0062	1.37	1.68		
18.0	27.9	50	0050	1.13	1.37	1.55	1.74
17.5	27.1	41	0041	0.94	1.15	1.29	1.45
17.0	26.2	33	0033	0.78	0.94	1.06	1.18
16.5	25.3	27	0027	0.66	0.79	0.88	0.99
16.0	24.5	22	0022	0.56	0.66	0.74	0.82
15.5	23.7	18	0018	0.47	0.56	0.62	0.69
15.0	22.7	14	0014	0.39	0.46	0.51	0.56
9.4	13.1	1	0001	0.13	0.13	0.13	0.14
OFF	OFF	0	0000	0.10	0.10	0.10	0.10
Max Effective Intensity (kcd)				83	67	59	52
Max Current (A)				1.8	1.8	1.8	1.8
Motor Current (A)				0.08			
LED Off Current with Motor Running (A)				0.1			

1. The externally-controlled VRB-25 LED beacon should be programmed for the RPM and effective intensity required (in that order). The programmed effective intensity is shown in the Effective Intensity column for the relevant Prog Code entered. For example, Prog code 0500 will set an intensity of 500kCd if this is within the capability of the beacon.
2. Any effective intensity can be programmed between the minimum candela value shown in the table to the maximum candela value shown for a particular rotation speed (RPM). For example, 0050 (50kCd), 0051 (51kCD), 0052 (52kCD), etc, are all legal programming values even if they are not shown in the table.
3. The beacon is unable to output more than the maximum candela shown in the table for a particular rotation speed (RPM).

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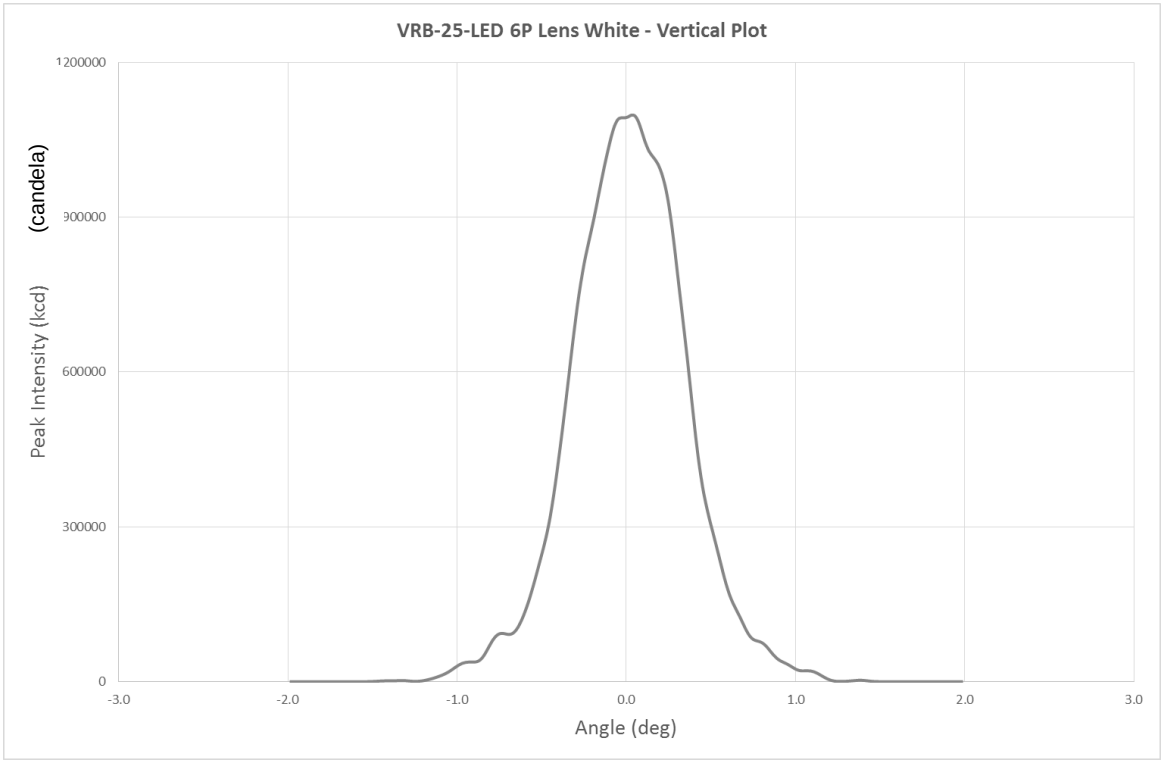
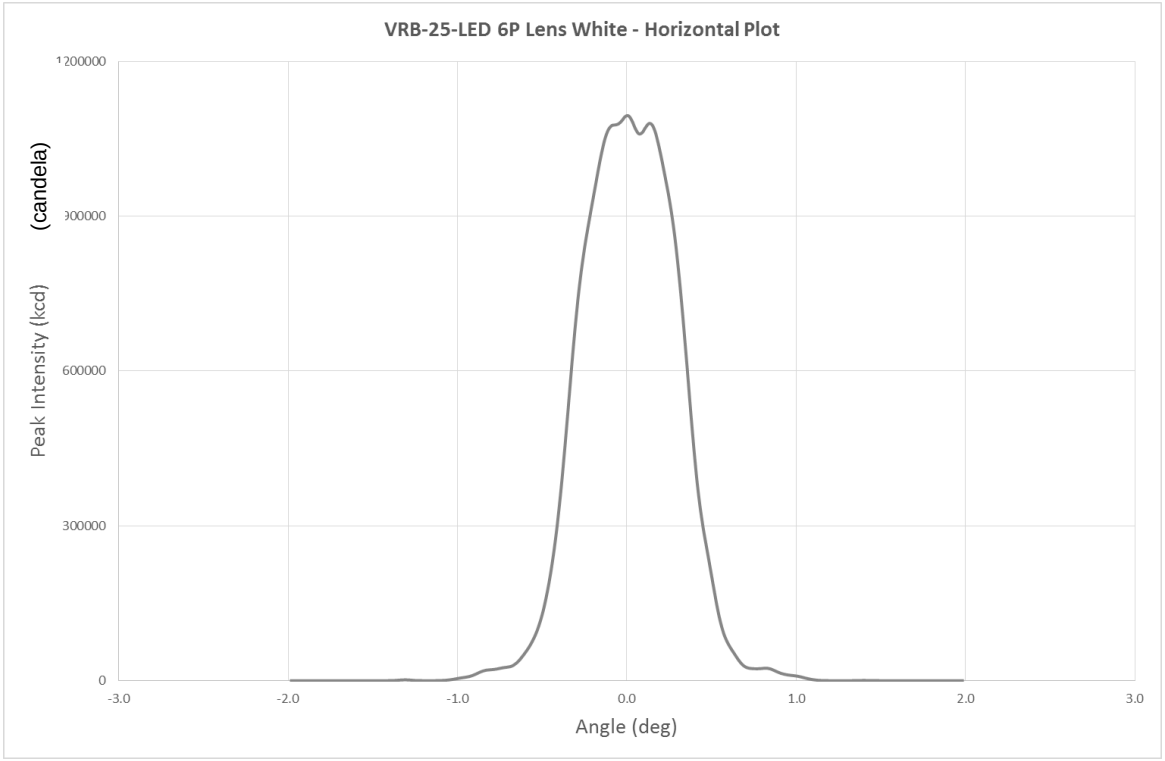
8. Appendix C Sample Optic Divergence Profiles

8.1. 6-Panel Divergence Profiles





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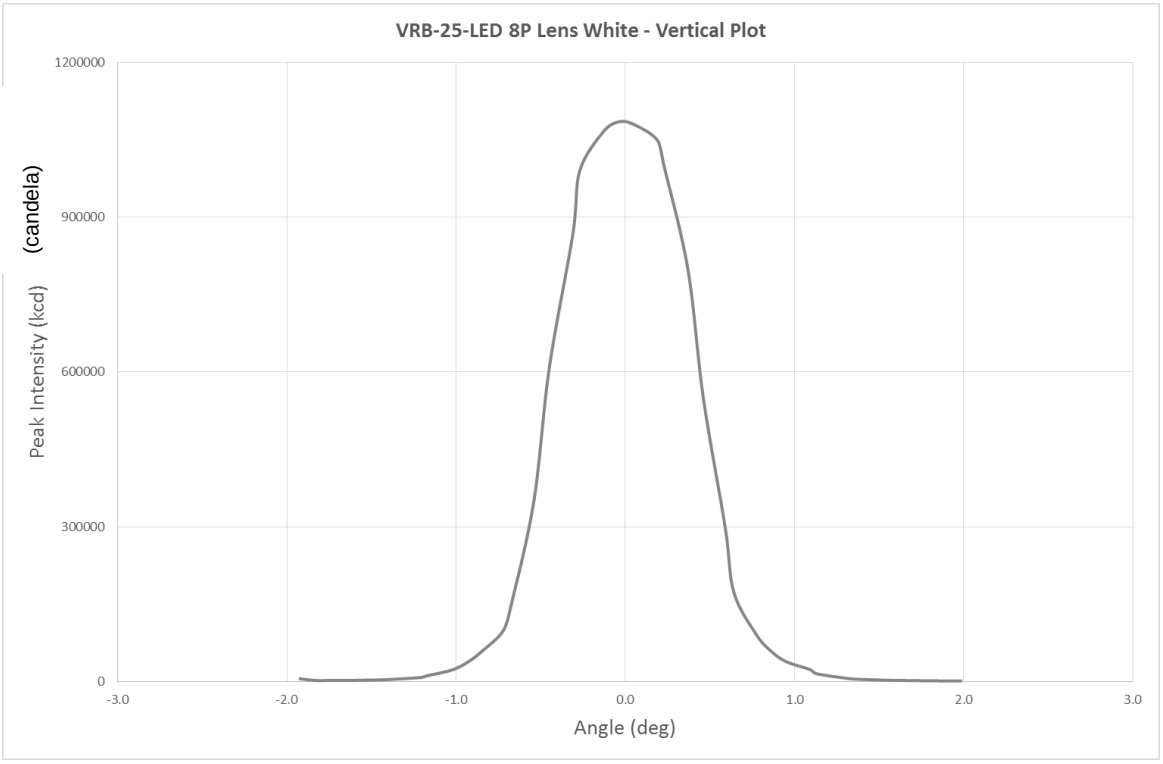
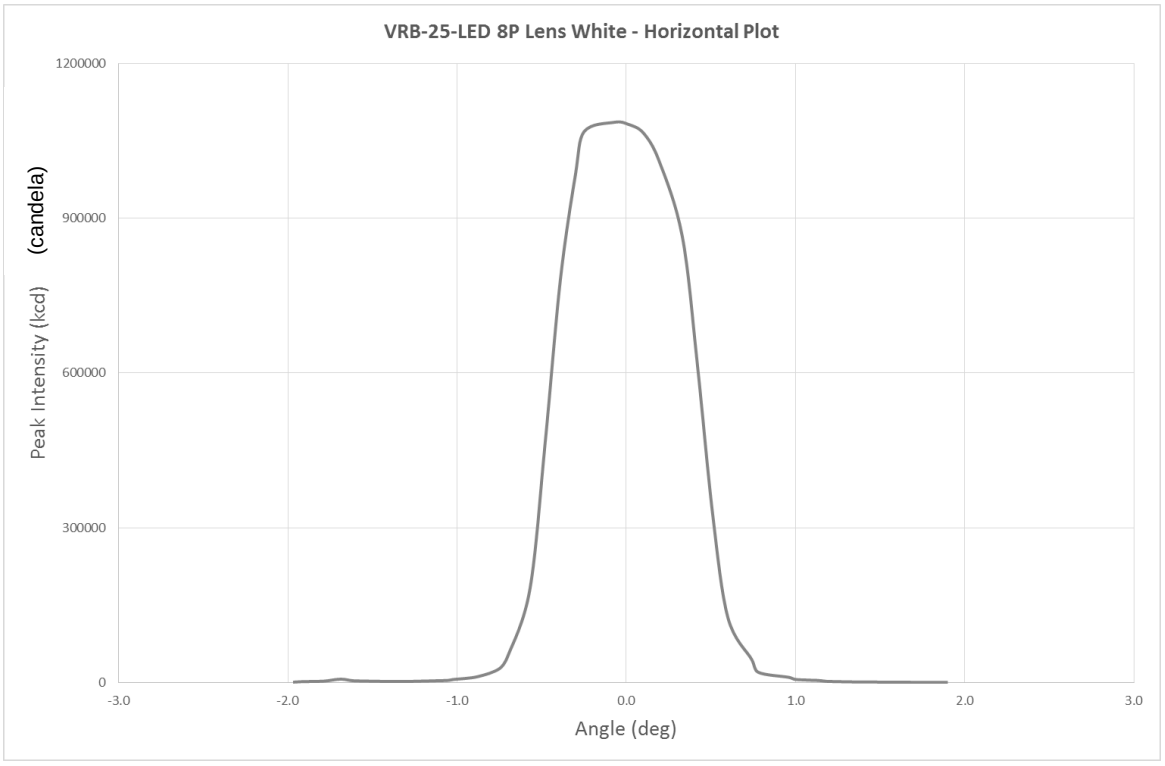
8.2. 8-Panel Divergence Profiles





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9. Appendix D Specifications

9.1. Optical

Light Source	High-Intensity Light-Emitting Diodes. Operating temperature controlled to protect LEDs.	
Coning	1º coning is available as a custom option.	
Colours Available	Red, Green, White IALA Recommendation E-200-1 part1	
Intensity	Appendix F IALA Recommandation E-200-3 Part 3 (2008)	
Flash Patterns	All unique symmetric patterns are available as standard. If an asymmetric pattern is required, please contact Vega.	
Effective Intensity Settings	Multiple levels up to Maximum set via TVIR programming	
Maximum Effective Intensity	Maximum value depends on RPM and numbers of panels and tiers. Refer to Appendix F	
Vertical Divergence	Nominal 1.5° vertical, 1.5° horizontal, measured at 5% of specified intensity	
Chromaticity Co-ordinates	Red	0.68<x<0.71, 0.29<y<0.32
	Cool White	0.28<x<0.37, 0.28<y<0.39
	Green	0.015<x<0.26, 0.72<y<0.80
	Warm White	0.415<x<0.455, 0.381<y<0.426

9.2. Electrical

Voltage	Nominal: 12 VDC. Absolute Maximum: 18.0V peak. Minimum 10.5 VDC. Important Note: At supply voltages above 18.0V the internal surge protection will begin to conduct and the internal fuse could be blown to assist in protecting the beacon. This protection is present independently of the LPD option. Refer to the maintenance section for more information.

Low Voltage Cut Out	Programmable low voltage cut off threshold
Day / Night Transition	Photo sensor located on side of the beacon. Twelve program settings for day/night transition. Accuracy of sensor +/- 10 lux.
Lens Carousel Motor Drive	Three-phase, electronically-commutated, thirty-pole, direct-drive motor. Turntable rotation is clockwise when viewed from above. Auto power reset if turntable stationary for one minute.

9.3. Materials

Glazing	5 mm Acrylic with UV stabilisation on outside, 7 years design life
Lens	Machined Cast acrylic
Frame	Anodised marine grade aluminium
Bird Spikes	316 Stainless steel.
Sealing	O rings
Paint	2-pot polyurethane paint on external surfaces

9.4. Environment

Safe Temperature Range	-35°C to +60°C
Intrusion Protection	IP65
Design Icing Load	20 kg/square metre on external surface
Design Wind Speed	90 knots (167kph)
Ultra-Violet Radiation	All external materials are UV resistant

9.5. Dimensions

Height including bird spikes	Appendix E
Height excluding bird spikes	Appendix E
Diameter	Appendix E
Mass	87kg
Base	3x M12 clearance holes on 200mm PCD

9.6. Programming Interface

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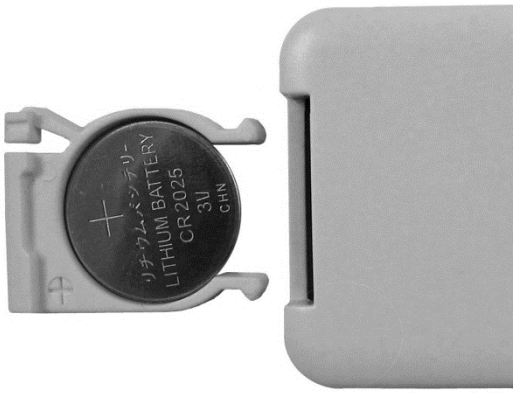
Dimensions	87mm x 41mm x 6.5mm
Weight	18g
Power Supply	1 x 3V lithium coin cell battery, CR2025 type

9.7. TVIR Programmer Battery Replacement

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.

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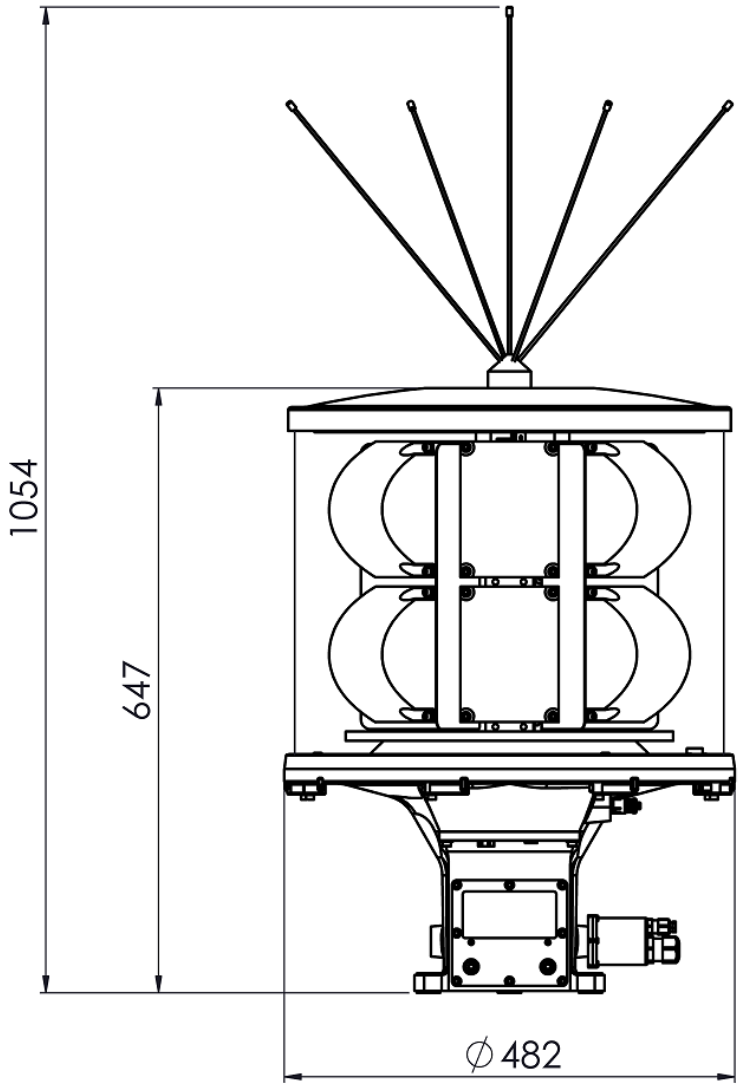
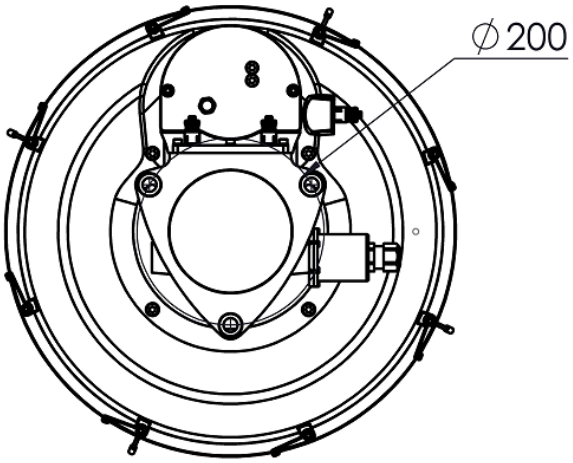
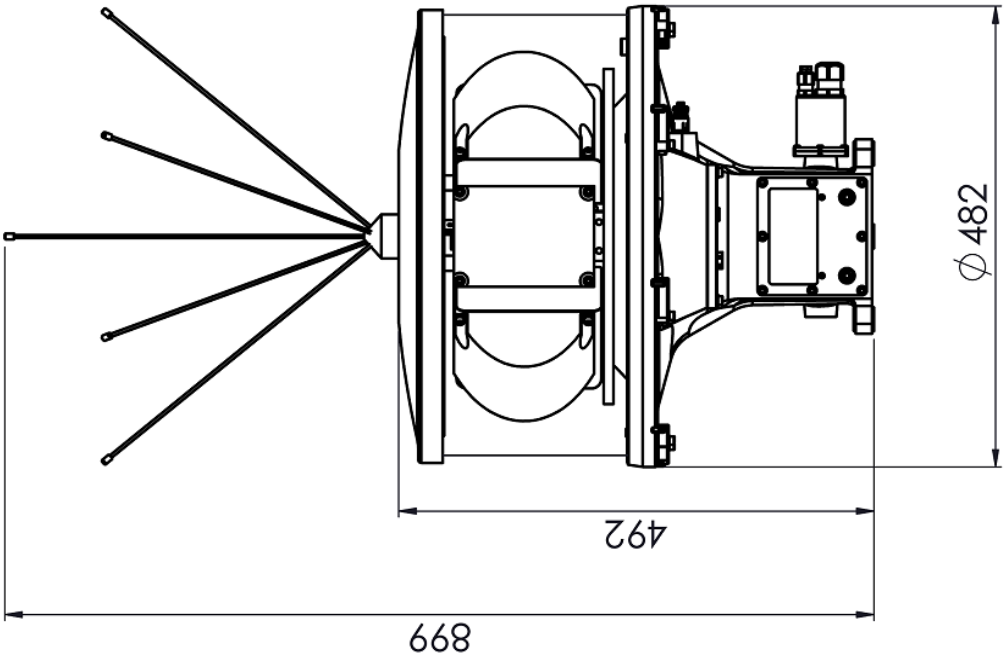
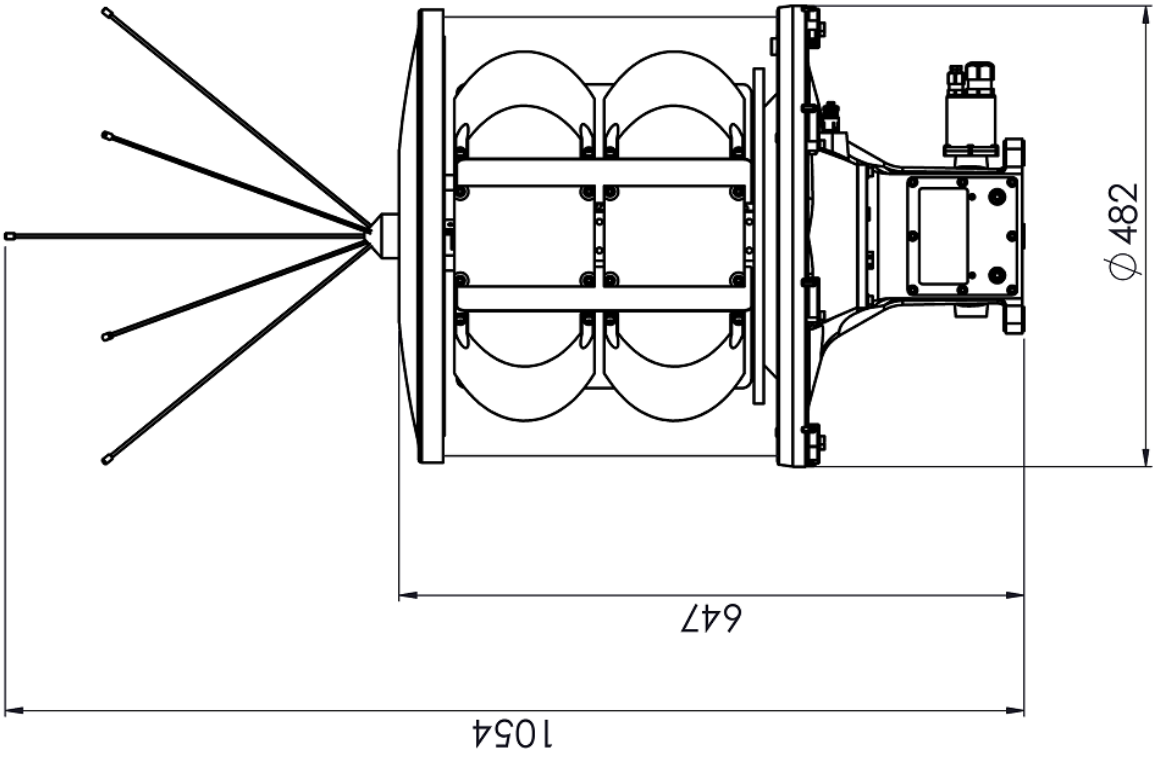
10. Appendix E Dimensions

10.1. Dimensions for 1-tier & 2-tier models

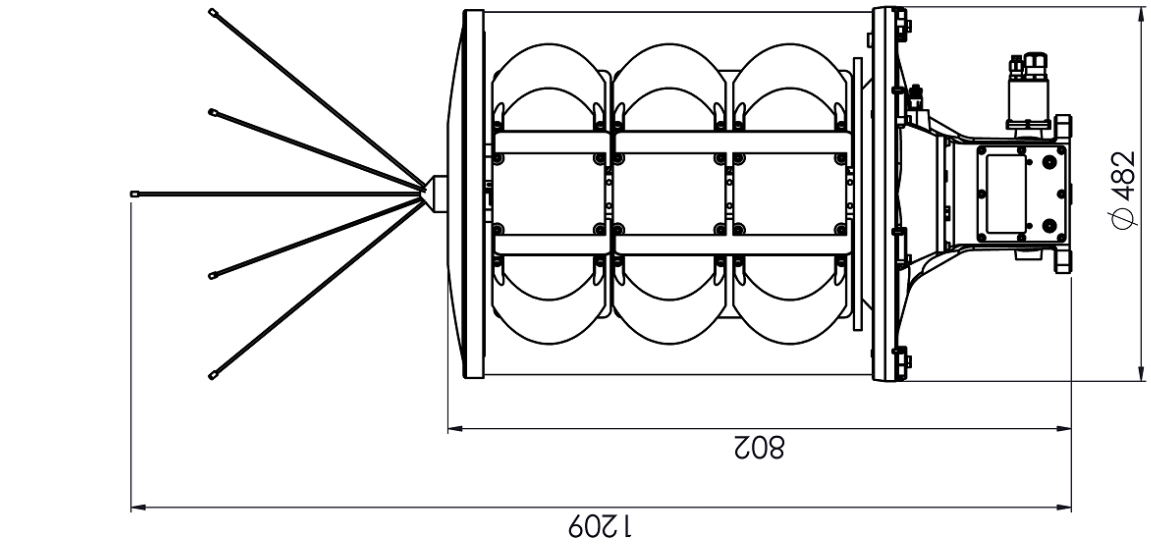


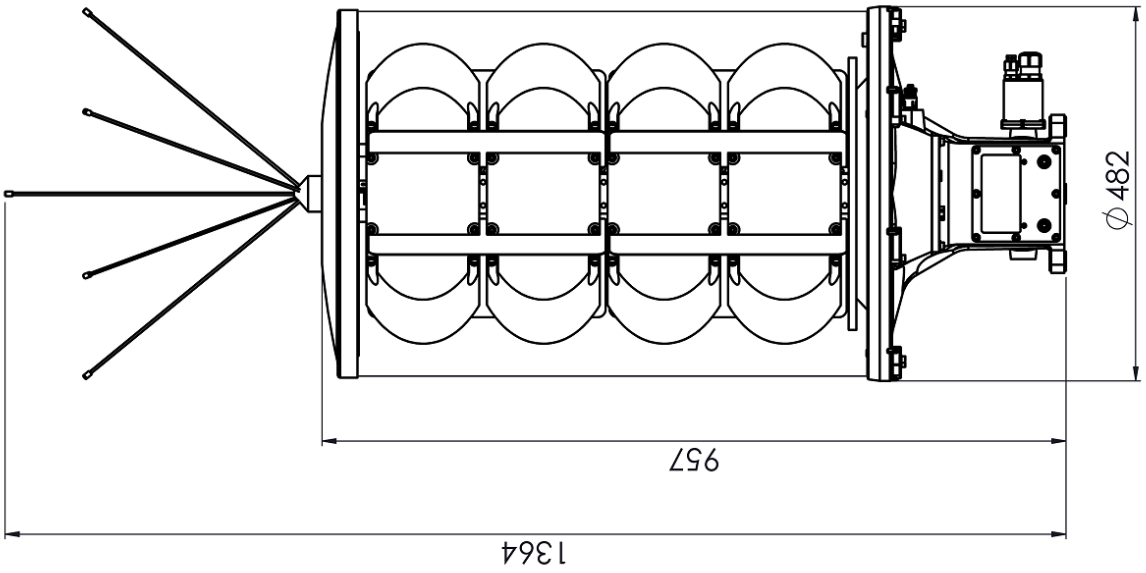



Ø482
492
899


Ø482
647
1054

10.2. Dimensions for 3-tier & 4-tier model





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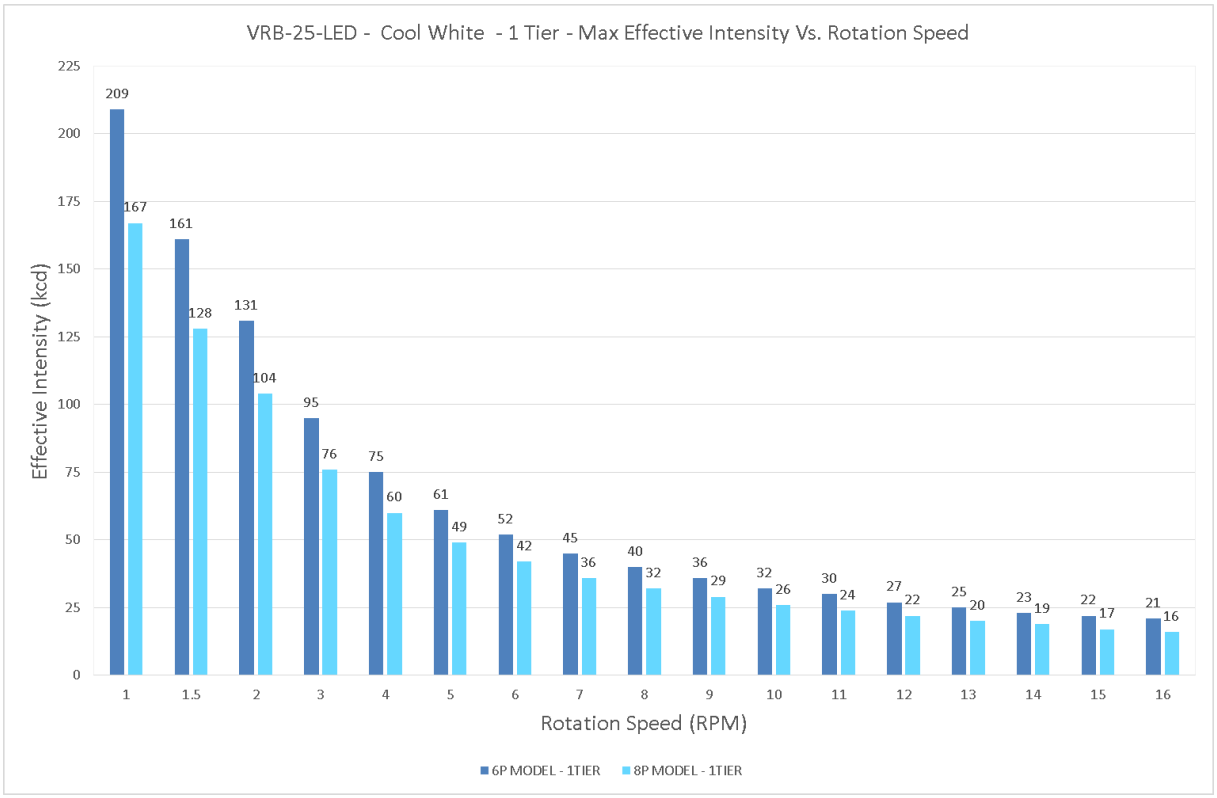
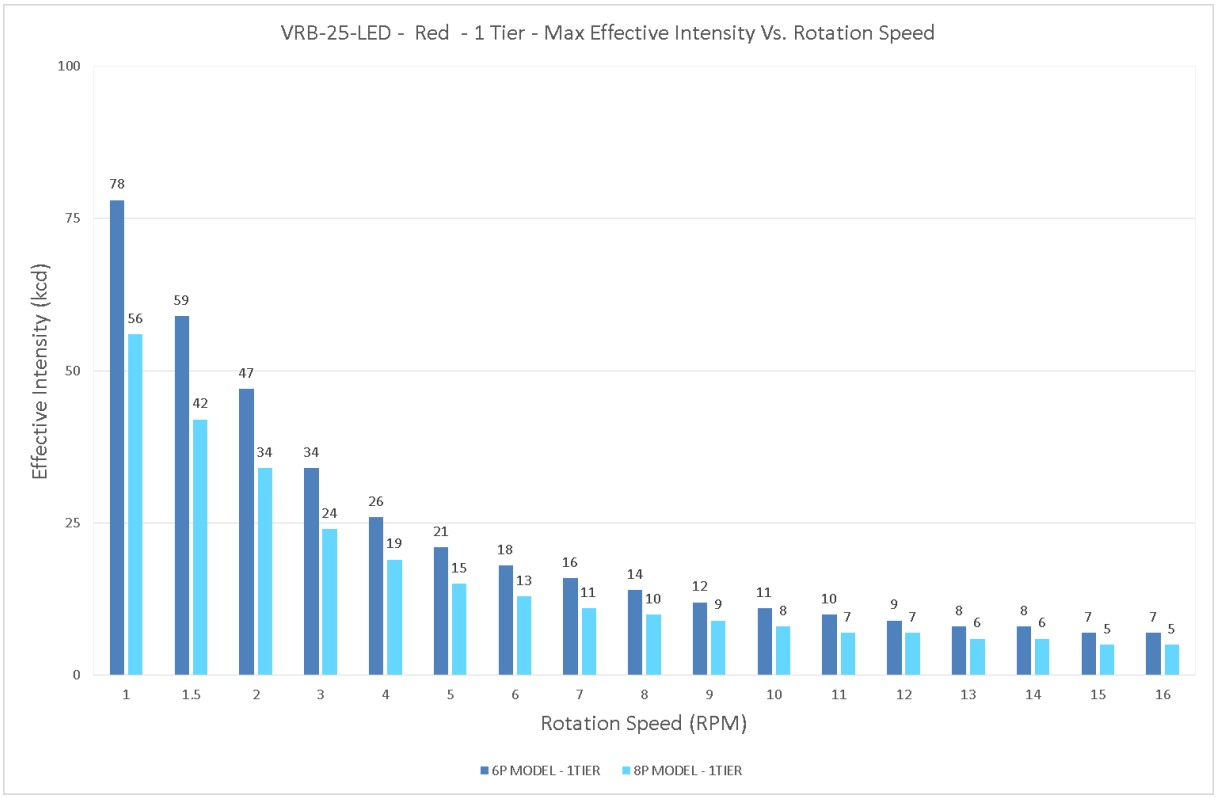
11. Appendix F Maximum Effective Intensity vs. Rotation Speed

The graph shows the maximum effective intensity for 1-Tier 6P (left data) and 8P (right data) VRB-25-LED beacons. Read off the maximum intensity vs RPM (rotation speed) for one tier and multiply by up to 4 tiers to get the final value of maximum effective intensity.





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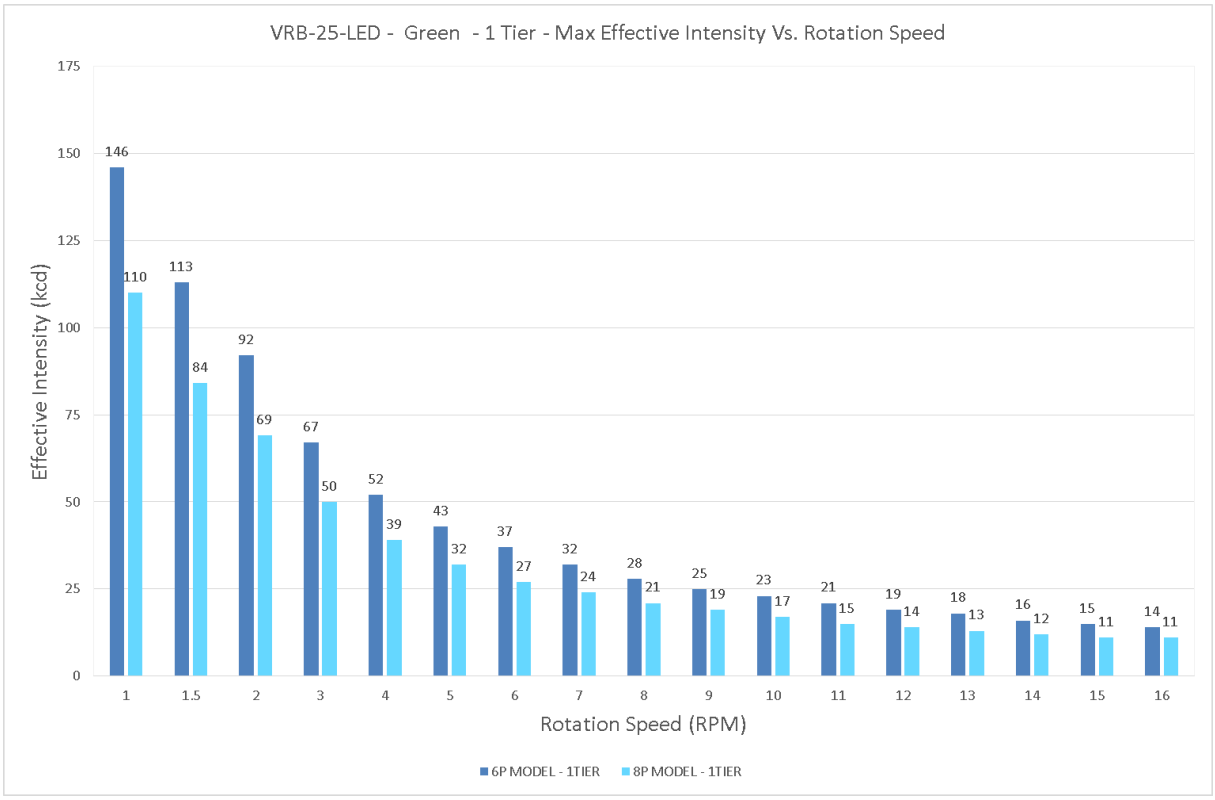

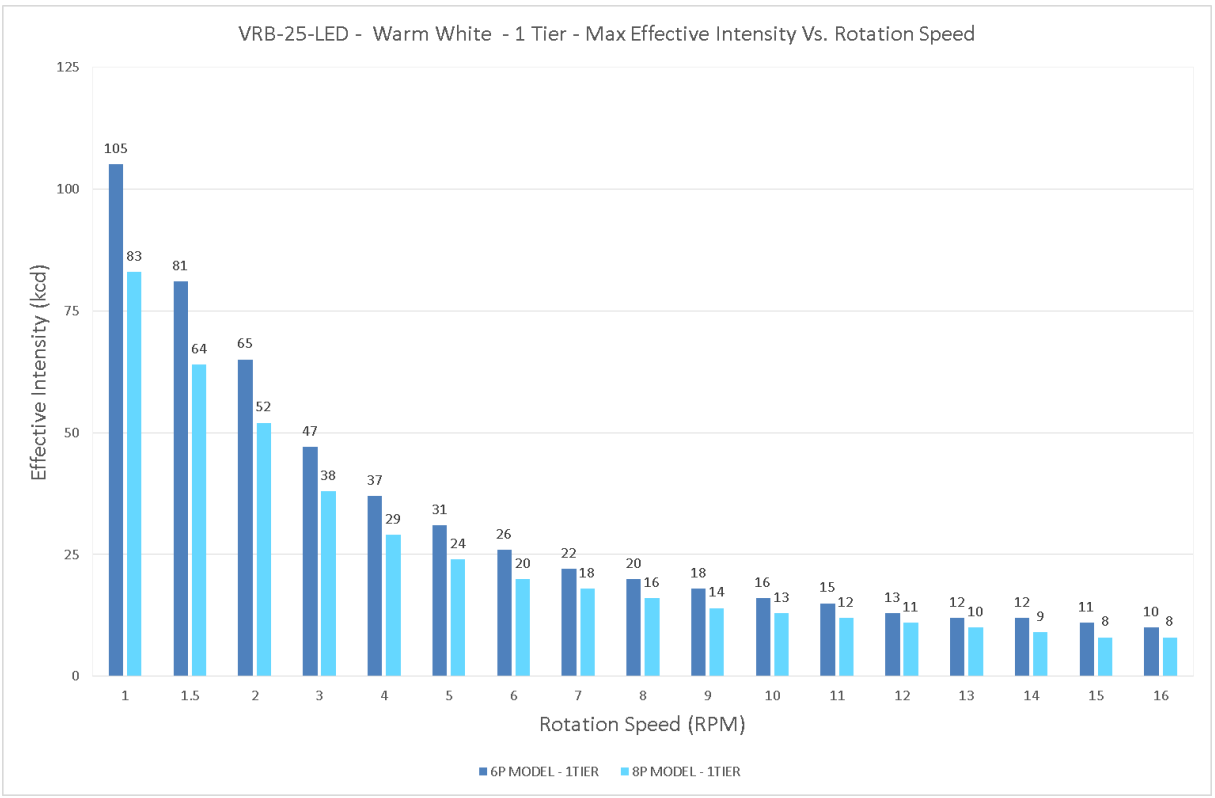

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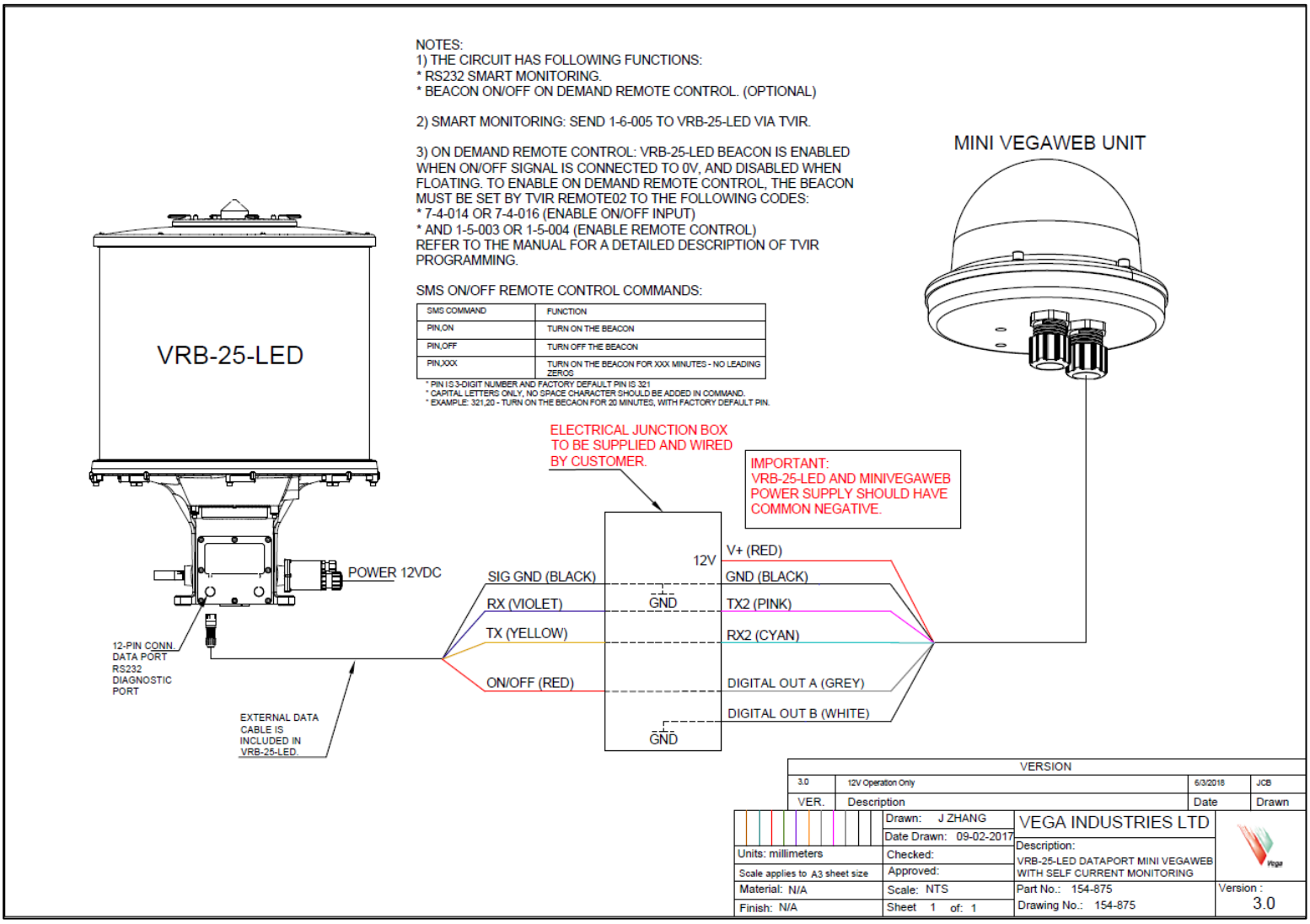
12. Appendix GExternal Connection

12.1. Monitoring & On-Demand Control Wiring



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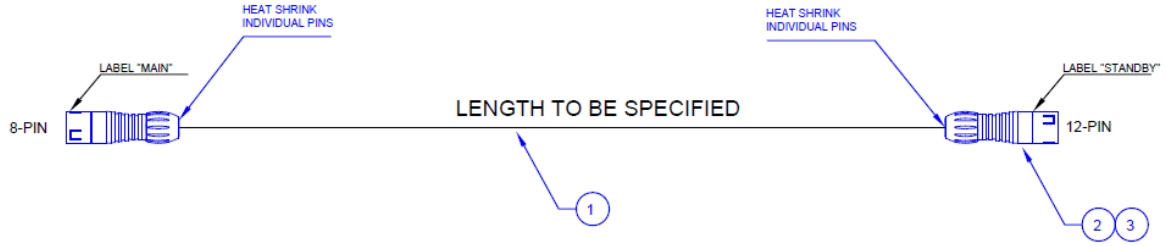
12.2. Main/Standby Wiring



TO MAIN BEACON 8 PIN CONNECTOR	WIRE COLOUR	TO STANDBY BEACON 12 PIN CONNECTOR
PIN 1	N/C	PIN 1
PIN 2 ALARM2 OUTPUT	BLUE	PIN 3 ON/OFF INPUT
PIN 3	N/C	PIN 2 ALARM1 OUTPUT
PIN 4	N/C	PIN 4
PIN 5	N/C	PIN 5
PIN 6	N/C	PIN 6
PIN 7 GND	GREEN	PIN 7 GND
PIN 8	N/C	PIN 8
	N/C	PIN 9
	N/C	PIN 10
	N/C	PIN 11
	N/C	PIN 12

*N/C: DO NOT CONNECT THESE PINS.

* STANDBY BEACON ON/OFF INPUT CONNECTS TO MAIN BEACON ALARM OUTPUT. WHEN AN ALARM IS PRESENT THIS OUTPUT IS GROUNDED, ENABLING THE STANDY BEACON.

* THE TWO BEACONS ARE IDENTICAL WITH THE FOLLOWING DIFFERENCES IN USER PROGRAMMING:
**MAIN BEACON SETTING: Factory reset 1-5-998 (followed by customer settings) or 1-5-001;
**STANDBY BEACON SETTING: Factory reset 1-5-999 (followed by customer settings) or 1-5-004 & 7-4-014.

VERSION			
4.0	CORRECTED MAIN BEACON UNUSED PINS. ADDED MAIN/STANDBY USER PROG SETTINGS	7/03/18	JCB
3.0	RELEASED TO MANUFACTURE	29-02-16	JZ
VER.	Description	Date	Drawn

ITEM	PART NO.	DESCRIPTION	QTY.
5	LABEL-BLANK05	LABEL 65mm X 8mm	2
4	ECON-BI-99-9133-00-08	BINDER 720 MALE CABLE PLUG, 8WAY	1
3	ECON-BI-99-9133-00-12	BINDER 720 MALE CABLE PLUG, 12WAY, BLACK	1
2	EHET-2.4MM-BLACK	HEAT SHRINK TUBING 2.4MM BLACK	14x 10mm
1	WIRE103	MULTICORE CABLE 3-CORE CABLE 0.75mm	CUSTOM

Units: millimeters	Drawn: JZHANG	VEGA INDUSTRIES LTD
Scale applies to A3 sheet size	Date Drawn: 18-02-16	Description: VRB-25-LED MAIN/STANDBY CONTROL CABLE
Material: N/A	Checked:	Part No.: 225-514
Finish: N/A	Approved:	Drawing No.: 225-514
	Scale: NTS	Version : 4.0
	Sheet 1 of: 1	

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13. Appendix H Serial Interface Commands & Status

The VRB-25-LED beacon offers a serial interface control and monitoring capability.

13.1. Serial Interface Commands

Many of the following serial commands can also be found in Appendix A as annotations to their related TVIR commands.

Any serial command can be turned into a query by inserting a question-mark character, '?' instead of the standard parameter. The consequent read-back format is the same as the command format, including the pseudo-XML tag.

The serial interface defaults to 115.2kbaud, 8 bits, no parity, 1 stop bit (8N1).

Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<NRG>X/	Night Range	X = 0 to 9999 Candela	Restart required	Sets night intensity in Candela. Zero turns the beacon off at night. 9999 or any value greater than or equal to the maximum intensity specification for the beacon sets the maximum intensity value (See Appendix B). This night intensity value must be set after the RPM value is set. The RPM value determines the valid maximum night intensity.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<DRG>X/	Day Range	X = 0 to 9999 Candela	Restart required	Sets day intensity in Candela. Zero turns the beacon off during the day. 9999 or any value greater than or equal to the maximum intensity specification for the beacon sets the maximum intensity value (See Appendix B). This day intensity value must be set after the RPM value is set. The RPM value determines the valid maximum day intensity.
<SYD>YY/	Sync Delay	YY = 0 to 99 tenths of a second	Restart required	Sets flash sync delay.
<OSO>B/	On Sync Only	B = 0 for sync-master or B = 1 for sync-slave	Restart required	Sets sync master/slave mode.
<DNT>0YY/	Day/Night Threshold	YY = 01 through 12 thresholds	Restart required	Sets day/night thresholds.
<DFI>B/	Display Indicator Off	B = 0: Display indicator is on B = 1: Display indicator is off	Restart required	Turns off the red LED mimic of the flash character that is mounted on the driver circuit board. The mimic LED always operates during TVIR programming.
<OPM>X/	Operation Mode	X = 1 to 4 (A subset of values shown in Appendix A for Operation Mode command)	Restart required	Sets beacon main operation mode. Used for enabling/disabling remote control & traffic light modes; setting fail-safe vs best-effort operation.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<BLW>YYY/	Low battery threshold	YYY: Threshold in tenths of a volt or disable code 999.	Restart required	Refer to Appendix A..
<BHI>YYY/	High battery threshold	YYY: Threshold in tenths of a volt or reset code 999.	Restart required	Refer to Appendix A..
<VER>?/	Software version query	Only '?' allowed	Immediate	Queries software version as per system command section of Appendix A.
<LED>?/	LED version query	Only '?' allowed	Immediate	Queries LED version as per system command section of Appendix A.
<CAR>?/	Characterisation version query	Only '?' allowed	Immediate	Queries optic characterisation version as per system command section of Appendix A.
<FID>XYY/	Flash Character Index	XYY = 0 through 999 as per valid characters. '999' represents the Custom character that is manually entered.	Restart required	Defines the default flash character that is used in single character mode. In dual character mode this is the night character. In emergency mode this is the normal character.
<AID>XYY/	Auxiliary Flash Character Index	XYY = 0 through 999 as per valid characters. '999' represents the Custom character that is manually entered.	Restart required	Defines the auxiliary flash character. In dual character mode this is the day character. In emergency mode this is the emergency character.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<SPC>…/	Special (Custom) Character	A sequence of comma-separated on/off pairs terminated with a '0' as last parameter, as per the definition in Appendix A.	Restart required	Defines the manually-entered custom character. This custom character can be selected by <FID> and/or <AID> by using index parameter 999.
<SER>?/	Serial number query	Only '?' allowed	Immediate	Queries beacon serial number as per system command section of Appendix A.
<SDA>B/	Sync disabled	B = 0: Sync pulse generation enabled B = 1: Sync pulse generation disabled.	Restart required	Enables or disables sync pulse generation.
<HSD>B/	Disable Hardwire Sync	B = 0: Disable HW Sync B = 1: Enable HW Sync (default)	Restart required	Disables hard-wired sync but leaves GPS Sync operating if fitted.
<REB>1/	Reboot command	Value doesn't matter	Immediate	Causes a reboot from the bootloader, which has a startup delay before the beacon application is entered. Intended to allow updating of beacon application software through the bootloader.
<MON>B/	Monitoring function	B = 0: disable monitoring B = 1: enable monitoring	Immediate	Enables monitoring the output stream over the serial interface. The stream can be set to free-running or on demand with the <MFR> command.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<MFR>B/	Monitoring free-run	B = 0: On-demand monitoring enabled B = 1: Free-running monitoring	Immediate	Enables free-running monitoring in which a semi-continuous stream of data is output. On-demand monitoring sends one or more data packets on receipt of a '/' character.
<RCM>XYZ/	Remote Control Mode	Refer to Appendix A	Immediate	Enables remote control or traffic light modes and sets the hardwire input levels.
<FDF>YYY/	Factory Default Reset	YYY = 999, 998 or 997 as defined in Appendix A.2	Restart required	Selects a factory default reset to occur on a restart. If beacon settings are modified after sending the <FDF> command and before a <RST> is performed then they could be lost and replaced with the defaults.
<ODS>B/	On-demand sync	B = 0: Disables On-demand sync behaviour (default, normal operation) B = 1: Enables on-demand sync behaviour	Restart required	When set the beacon turns off when sync is low and operates normally when sync is open-circuit or high.
<SSF>YY/	Slave sync flash count	YY = 002 to 099	Restart required	Sets the number of cycles that a beacon will continue to flash after loss of sync.
<TST>/	Test alarm	(No parameter required)	Immediate	Deactivates the Beacon OK output; activates the alarm output; waits ten seconds with beacon functionality stopped; after timeout clears alarm, sets OK and resumes beacon operation.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<RST>1/	Restart the beacon	Any value	This is the restart command	This command must be sent after any command or sequence of commands that are listed as requiring a restart. It causes the beacon application software to restart without waiting in the bootloader. A restart causes the non-volatile settings information to be copied into volatile, operational memory in the beacon.
<GPS>?/	GPS detected query	'?' only	Immediate	Identifies whether both a GPS daughterboard option is present (value=1 when detected, =0 when not) in the beacon and a GPS satellite lock has been obtained (value = 2).
<GPE>B/	GPS enabled	B = 0: Disable GPS B = 1: Enable GPS (default)	Restart required	When set to 1, GPS auto-detection is enabled. When cleared to 0, GPS detection will not occur and a GPS lock will never be established. Useful when deprecating a GPS unit so that it can be day/night synchronised in a hardwire sync connection to an enabled GPS unit.
<FCM>Z/	Flash compensation mode	Z = 0: Effective intensity mode enabled Z = 1: Peak intensity during the flash mode enabled	Immediate	Sets the flash compensation mode. 'Z' is the same parameter as appears in TVIR command 7-2-XYZ and also in <FCM>XYZ

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<RON>B/	Remote On/Off State	B = 0: Turn off beacon B = 1: Turn on beacon	Immediate	Turns the beacon on or off if the On/Off input is enabled with the <RCM> command and if <OPM> is set to enable remote control. Interacts with the hardwire On/Off input. Refer to Appendix A.
<RFF>B/	Remote Flash/Fixed State	B = 0: Fixed character B = 1: Flash character	Immediate	Selects the programmed <FID> or <AID> flash character as defined by other settings and states or forces the beacon into fixed character if the Flash/Fixed input is enabled with the <RCM> command and if <OPM> is set to enable remote control. Interacts with the hardwire Flash/Fixed input. Refer to Appendix A.
<RDN>B/	Remote Day/Night State	B = 0: Night state B = 1: Day state	Immediate	Selects the night or day state within the beacon if the Day/Night input is enabled with the <RCM> command and if <OPM> is set to enable remote control. Interacts with the hardwire Day/Night input. Refer to Appendix A.
<FOM>XYZ/	Flash operation mode	XYZ: Refer to Appendix A, command 7-2-XYZ	Restart required	Sets the flash operation mode.

Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<R2B>X/	Set baud rate	X: Standard baud rates: 4800, 9600, 14400, 19200, 38400 (AIS), 57600, 115200 (default & Vegaweb).	Restart required	Sets the command & monitoring serial interface to the required baud rate.
<TYR>XY/	PBA Driver Bus Addressing	X = total PBAs; Y = this PBA's address (0 for master, 1 to (X-1) for slaves.) Address must be unique.	Restart required	Sets the master-slave PBA bus address range and value for an individual projector. Critical to beacon operation.
<RPM>XXXX	PBA Driver RPM setting.	X = 0 to 9999 (RPM * 100, e.g. setting 0100 means 01.00 RPM).	Restart required	Used to calculate legal intensity programming range and as a timing reference to measure the turntable rotation for alarm detection. This setting value must always identically match the setting entered into the moto Calc DIP switches.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<ERR>B/	Error logging readout	B: defines decimal or hexadecimal error code readout and whether logged error value is included in monitoring output. 0: decimal, not monitored (default) 1: hex, not monitored. 10: decimal, monitored. 11: hex, monitored.	Immediate	Reads back the error log values, with the error code in decimal or hex format and other values in decimal format. Sets whether the error log is included in the monitoring stream (default is not and not recommended for Vegaweb or AIS monitoring). Output Parameters: Error code (log of first master error condition); Quantity of errors of any kind; Quantity of nights before first error; Quantity of nights between first and last error; Quantity of nights after last error; Quantity of Restarts; Control flag value (i.e. 'B' input parameter setting). This output format is maintained for both casual enquiry using the <ERR> command and when the <ERR> tag is included in the monitoring stream. Error logging commences 30 seconds after startup.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<CLE>/	Clears logging values	None or any parameter	Immediate	Clears all logged parameters apart from the control flag as used in the <ERR> command. Reads out the new (zeroed) logging data in the <ERR> format.
<BAT>?/	Battery voltage	'?' only	Immediate	Outputs battery voltage in mV identically to monitoring stream tag <BAT>.
<LIT>?/	Light level	'?' only	Immediate	Outputs detected daylight level in normalized units 0-1000 identically to the monitoring stream tag.
<TMP>B/	Temperature	B: Null, '?' or 0 sends data from the active sensor; 1 sends data from the on-board sensor; 2 sends data from the off-board sensor.	Immediate	Outputs the measured temperature in degrees Celsius (signed) from the selected sensor. Use parameter value 0 to get the same data as the monitoring stream tag.
<LOI>?/	LED On Current	'?' only	Immediate	Outputs the average LED on current (during flash-on) in milliamps.
<LDI>?/	Load Current	'?' only	Immediate	Outputs the average load current (i.e. averaged over flash-on and flash-off) in milliamps.
<SLI>?/	Solar Current	'?' only	Immediate	Outputs the average solar current in milliamps.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<MER>B/	Master Error Code	B: '?' or 0: Decimal readout of master error code; 1: hex readout.	Immediate	Outputs the current master error code (0 if none).
<ROT>?/	Rotation data	'?' only	Immediate	Outputs the half-rotation period in 50ms counts. E.g. a 1RPM rotation rate will output a nominal value approximating 600 = (60s/2 * 20). This data format is identical to that of the monitoring tag.
<GUD>?/	Good status	'?' only	Immediate	A '1' value indicates that the beacon is in a good (non-error, non-alarm) state. A '0' indicates an error and alarm state. This data format is identical to that of the monitoring tag.
<AON>?/	Beacon On	'?' only	Immediate	A '1' value indicates that the beacon is on, i.e. creating a flash or fixed character of non-zero intensity. A '0' that the beacon is dark. This data format is identical to that of the monitoring tag. This tag was previously named <BON>.
<DAY>?/	Day State	'?' only	Immediate	A '1' value indicates that the beacon is in day mode. A '0' that the beacon is in night mode. This data format is identical to that of the monitoring tag.
<TYP>?/	Beacon Type (numeral)	'?' only	Immediate	A numeral indicating the beacon product type.

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Command (Pseudo-XML Tag)	Command or Query Name	Legal Parameter Range & Unit	Acts Immediately or Requires Restart	Description
<TLS>?/	Traffic Light State	'?' only	Immediate	A numeral indicating the traffic light state of a beacon operating in traffic light mode. This identical tag is present in the monitoring stream if traffic light mode is enabled.
<TYP>?/	Beacon Type (string)	'?' only	Immediate	A string naming the beacon product type.

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13.2. Serial Interface Error Codes

The following error codes are available using the 3-9-10X commands and through the <MER> and <ERR> RS232 serial commands.

The error codes are a combined set of information.

If no error is present then a single, zero digit will be returned. If an error is present or has been logged then five digits of error code will be returned by the TVIR 3-9-100 (display master error code) and 3-9-101 (display logged error code) commands, respectively.

Decimal Error Code	Explanation	Suggested Action
0	No error present or no error logged.	None required
33344 to 33375	Slave communications error	Technician required: Check PBA master-slave bus address settings, and master or slave PBA functionality, and cycle power.
33408 to 33414	Slave operation error (address of the slave with an error is the returned value minus 33408)	Technician required: Check PBA master-slave bus address settings, and master or slave PBA functionality, and cycle power.
33472 to 33503	Slave operation and communications error	Technician required: Check PBA master-slave bus address settings, and master or slave PBA functionality, and cycle power.
33536	Low battery error	Check power supply wiring and voltage to the beacon. Check low battery threshold setting.
35328	Open LED error	Check for an inoperative optic or optics and report information to Vega.
37376	Rotation speed error	This status indicates a speed outside of a ±10% tolerance. Check for turntable malfunction, jamming, wear or incorrect tacho sensor positioning.
49664	High temperature error	This is a temporary state when a beacon detects over-heating due to either or both internal and external conditions. The LED(s) will be protected automatically unless another internal fault is present. If the cause is due to external temperature rise then once the temperature has returned to the specified operating

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		range the beacon will resume normal operation and will cancel the error. The recommended action is to gain an understanding of whether external temperature and/or solar loading could be the cause and if so, reduce the risk of such events. Externally-caused errors will result in a reduction in intensity from the beacon but it should never turn off. If no external cause can be attributed to the error then please provide a report to Vega.

These same error code will be returned (by default in decimal-format) if error information is requested by RS232 serial commands such as <MER> or <ERR>. It is possible to request hexadecimal-format error codes via the RS232 serial command interface. Refer to Appendix H for instructions on how to do this. The advantage of reading the error codes in Hexadecimal format is that multiple statii can be more easily separated.

RS232 Serial Hexadecimal Error Codes	Explanation
0	No error or no logged error
0x0040 to 0x005F	Slave communications error (last 5 bits contain comms status information if a slave operation error is not also present.) Not relevant to this product or indicates that the bus address has been incorrectly modified.
0x0080 to 0x0087	Slave operation error (last 3 bits contain address of failed slave). If present with a slave comms error then the last 3 bits contain the slave address. Not relevant to this product or indicates that the bus address has been incorrectly modified.
0x0100	Low battery error
0x0200	Alarm flag (always present with an alarm)
0x0400	Not used
0x0800	Open LED error
0x1000	Rotation error
0x2000	Not used
0x4000	High temperature error
0x8000	Error present or logged (always present with an error)

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User Notes:

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WARNING

- The beacon's turntable is shipped with transit screws and packing spacers that prevent rotation – these must be removed before power is applied
- DO NOT discard the transit screws and the packing spacers as they must be refitted if the beacon needs to be moved in future.
- This beacon is capable of producing very high intensity light – DO NOT look directly into the beam.
- The beacon should be kept vertical up all the time. Tilting the beacon may cause the internal bearing to be damaged.
- DO NOT lift the beacon by the glazing cover and the top. The beacon can only be lifted from the bottom of the base.
- DO NOT connect supply voltages exceeding 18.0V peak (whether continuous or AC ripple).
- Other than removal of the transparent cover, unapproved access, maintenance or modification could result in voiding of the warranty. Consult Vega before undertaking any such operations on the beacon.

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