



VLB-44XU USCAG Ultra High Intensity

Product Manual

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1. Introduction to the VLB-44X Marine LED Beacon

1.1. Overview

The VLB-44X LED beacon is an energy-efficient marine beacon that is available in a wide range of configurations. The number of tiers can range from 1 to 6 (excluding 5 tiers), with each tier having a vertical divergence of 2.5, 5 or 10 degrees. The USCG Ultra High Intensity version is based upon a six-tier 2.5-degree lantern.

Four LED colours available are red, green, white and yellow. The peak light intensity and power requirement is different for each colour and this needs to be taken into account when calculating for the power requirements for a particular beacon.

The beacons are designed to operate using a 12 VDC power supply and have a maximum voltage capability of 18 VDC. Reverse polarity protection is provided. The beacon is supplied with a 2m length of neoprene 3-core cable for the power and hard wire synchronizing connections. The size of wire is 2.5mm² up to 2-tiers and 6 mm² for more than two tiers.

The VLB-44X has been designed with many features to allow the user to set up the required operation for a specific site. These features are programmable using the Vega infra-red programmer. This programmer is provided with the beacon and is also available separately. The beacon will be delivered with factory default settings. Details on how to reprogram the VLB-44X are provided in the Vega IR Programmer instruction manual.

While the VLB-44X beacon is capable of various ranges and can handle a multitude of flash characters, the power requirement must be able to be supported by the power supply connected to the beacon, especially where it is solar / battery powered. Increasing the range or the duty cycle of the beacon will require a larger solar panel and battery capacity. Information is provided in this manual on how to calculate the beacon power consumption. Sabik Marine or the local Sabik Marine Distributor can assist with the calculation if required.

The VLB-44X beacons are fitted with hard wire synchronization, which can be used to synchronize the flash character with other Vega beacons that are within wiring distance. GPS synchronization can be provided to allow synchronization with more remote beacons by fitting the optional VSU-29 GPS Synch Unit.

When using the optional VSU-29 GPS unit, ensure the power requirements of this device is included in any overall power calculation for the beacon.

To begin using the VLB-44X beacon the power will need to be connected, and the unit programmed for the flash character, effective intensity, and any other features required.

The VLB-44X beacon has a 10-year design life.

1.2. The initial power-up

Upon first powering-up the beacon will start in night mode. If the beacon is in the default sync-master mode then it will be operating with the programmed flash character.

- After power-up the beacon will begin to monitor for the low battery threshold (factory setting 11 Volts). If the input voltage is below the threshold then the beacon will be turned off. The beacon will not return to normal operation again until the battery charges to above the high voltage reset voltage (factory setting 13.0 volts) and daylight is detected.
- After about 20 seconds the beacon will begin to monitor the ambient light level. If day is detected and the beacon is set for night-only operation then the beacon will be turned off.

Note: If the beacon does not flash when power is connected.

- The power connection might be reversed. Check that the power connection is correct. The beacon is protected from damage for reverse-polarity connection.
- The beacon might be set to sync-slave mode. Either provide an external hard-wire sync source or program the beacon to sync-master mode to enable it to operate.

1.3. Infra-red programming

The infrared receiver for programming the beacon is located on the base of the beacon. For best results when programming direct the IR remote at this part of the beacon. Refer to the separate instruction manual for operating the Vega IR Programmer.

1.4. Automatic Schmidt Clausen/Modified Allard Correction

The VLB-44X beacon is programmed for the required effective intensity. This is the intensity needed to see a light that is continuously “on” at a certain distance. For example, 77 Candela is required to see a fixed on light at 5NM at a transmissivity of 0.74T. When a light is flashed the intensity must be increased to maintain the visibility of the light at the required distance. The VLB-44X automatically maintains the effective range of the light by increasing the intensity to compensate for shorter flash periods. This is done according to the Schmidt Clausen multiplier.

1.5. VLB-44X Intensity Performance

The effective candela settings and the maximum candela capability for the different versions of the VLB-44XU are provided in Appendix B.

A beacon cannot output an intensity above its maximum peak candela capability. When programming a flash character the user should check that the peak candela needed for the required effective candela is below the maximum peak intensity of the beacon. If higher peak intensity is required than what the VLB-44X can produce then the beacon will not have the required range. Should this be the case the choice to achieve the desired range would be to:

- Increase the flash “on” period (select a different flash character) or
- Use a VLB-44X beacon with additional tiers.

1.6. Beacon On Override

The VLB-44X may be forced on by activating the On/Off input. This input is not capable of turning the beacon off. For example, if the beacon were configured in night only mode, setting the on/off input high during the day would cause the beacon to come on for as long as that input is held high. If the on/off input is low or open circuit (i.e. inactive) then the beacon will operate normally, sensing day/night and switching automatically in the normal way.

- On/Off input - if this input is high ($\geq 7V$) the beacon will turn on; if this input is open-circuit or low ($< 6V$) then the beacon operates automatically according to its settings, sync input and day/night detection.
- Flash/Fixed & Day/Night inputs are inert.

2. Getting Started

From knowing the flash character, colour, and range required (effective candela)

- i. Determine the number of tiers required and the power requirement (Appendix D)
- ii. Connect power to the VLB-44X and any I/O signals that are required.
- iii. Program the beacon for the required flash character, effective candela, and other features (Section 3 and Appendices A & B.)
- iv. Install the VLB-44X beacon (Section 4 and 5)
- v. Set synchronization options (Section 6)
- vi. Check that the beacon is working (Section 7)
- vii. Routine maintenance and inspection (Section 7)

The valid combinations of operation, feature and value are listed in Appendix A.
 The valid beacon intensity settings can be found in Appendix B for the relevant beacon model.

Please take the time to familiarise yourself with the tables in Appendices A & B before continuing.

3.1.3. Visual feedback

The VLB-44X will provide visual feedback of the programming instructions it receives from the TVIR programmer. It is important to understand the feedback that is provided to ensure that the beacon will be programmed correctly.

Programmer Keys	Beacon 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 When programming code recognised	1 flash for each key pressed The 3 or 4 digit value code is repeated using a series of flashes of 0.1sec on and 0.1 sec off with a gap of 0.5 sec between each number of the code. A zero is represented by a 2 second on flash.
When programming code is not recognised	Proper termination of custom character programming: the feedback code will be 000 3 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 beacon will give two quick flashes followed by a short pause followed by another two quick flashes. After this it will resume normal operation. The beacon will flash its character for 16 seconds while it checks the day/night settings. If it is day time and the beacon is set to operate at night only the beacon will turn off.

3.1.4. Troubleshooting TVIR Programming

If you find that the beacon will not enter the programming mode it will be caused by one of 4 reasons (ensure first that the Remote02 TVIR programmer is pointed directly at the light sensor window on the base of the VLB-44X):

- If there is no response to the Remote02 then the battery in the IR Programmer could be missing, or the plastic battery insulator might not have been removed, or the battery might have a low voltage.
- If there is no response to the Remote02 and the beacon is not operating then there might be no 12VDC supply connected to the beacon.
- If there is no response to the Remote02 then the beacon might have been set to storage mode, in which case it will initially be very slow to respond to the Remote02 request to enter programming mode.
- If the beacon responds and enters programming mode but rejects (triple-flash) any programming operations then the beacon needs a security PIN to allow programming.

3.1.5. Remote02 TVIR Programming Tutorial

If you have not used the Vega TVIR Programmer before, we suggest that you spend some time learning how the beacon will respond to the various programming actions. Make sure that the beacon is connected to a 12VDC supply and experiment with the following.

3.1.5.1 Enter and Exit Program mode

1. Enter program mode

Press the red standby button for 5 seconds

The beacon will give 4 quick flashes to indicate it has entered programming mode

2. Exit program mode

Leave the programmer idle for 10 seconds

The beacon will give two quick flashes followed by a short pause followed by another two quick flashes.

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

3.1.5.2 Program a Flash Character with a flash character of Q 1s 0.4. (0.4 "on" 0.6 "off")

To program this Flash Character find the three digit code from Appendix ?, "Flash character table with program codes". (Flash Q 1s 0.4 = code 602). Determine the programming syntax from Appendix A for the setting:

Operation	= Programming	= 1
Feature	= Flash Character	= 0
Value	= Code	= 602

The programming sequence to enter this flash character is 1-0-602

(The '-' character in the above sequence is inserted only to provide clarity for the reader and has no meaning in the programming input sequence.)

0. Enter programming mode

Press the red standby button for 5 seconds

The beacon will give 4 quick flashes to indicate it has entered programming mode

2. Enter the programming sequence for the flash character (10602)

The beacon will flash once each time a key on the programmer is operated.

When the sequence is completed and accepted the beacon will repeat the value 602 in a series of flashes. Six quick flashes followed by a 0.5sec gap followed by a 2 second flash (for a zero) followed by a 0.5 second gap followed by two quick flashes

1. Exit programming mode

Leave the programmer idle for 10 seconds

The beacon will give two quick flashes followed by a short pause followed by another two quick flashes.

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

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

Determine the programming Syntax from Appendix A for the setting:

Operation	= Programming	= 1
Feature	= Operation Mode	= 5
Value	= Code	= 002

Note: The programming sequence to enter this Operation Mode is 1-5-002.

<p>1. Enter programming mode</p> <p>Press the red standby button for 5 seconds</p>	<p>The beacon will give 4 quick flashes to indicate it has entered programming mode</p>
<p>2. Enter the programming sequence for the Operation Mode (15002)</p>	<p>The beacon will flash once each time a key on the programmer is operated.</p> <p>When the sequence is completed the value will be rejected and an error indicated by 3 quick flashes.</p> <p>The beacon will then return to programming mode and is ready for a new instruction.</p>
<p>3. Exit programming mode</p> <p>Leave the programmer idle for 10 seconds</p>	<p>The beacon will give two quick flashes followed by a short pause followed by another two quick flashes.</p> <p>After this it will resume normal operation. The beacon will flash its character for 16 seconds while it checks the day/night settings. If it is day time and the beacon is set to operate at night only the beacon will turn off.</p>

3.1.5.4 Read System Information

To read the current level of the battery or 12VDC supply, determine the Syntax from Appendix A:

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

The programming sequence to get the information is 3-1

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

3.1.5.5 Programming or Reading Multiple Settings

Each feature can be programmed one at a time as done in the examples above, however it can be extremely time consuming to enter multiple settings in this manner. Alternatively, and more conveniently, various settings can be programmed sequentially in the same programming session. Once the beacon has accepted a program sequence and has flashed back the value code, the next program sequence can be entered. If you delay more than 10 seconds after the confirmation flashes before entering the next program sequence the beacon will exit the program mode. One way to hold the beacon in programming mode is to press the Standby (red) button on the Remote02 periodically.

3.2. Programming Features

3.2.1. Flash character

(Factory set default 1-0-100 <ISO 2s (1.0s on 1.0s off)>)

Vega beacons are pre-programmed with 246 standard characters represented by a 3 digit code XYY. The first digit of the code represents a flash type such as 1YY for isophase characters. If a customer uses a set of flash characters which are not included in the standard set these can be included if advised at time of ordering the beacons. These would then be available for programming under type 9YY (Special characters).

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

3.2.2. Custom Flash Character

Vega beacons allow the user to create one custom character. When programmed the flash character code for the custom character is 999. To program the non-standard character the details of the on and off periods of the flash character have to be entered into the beacon.

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

Operation	= Custom Character	= 2
Value	= The custom codes for the character	

These custom codes are entered in a series of 3 digit values representing an on period or off period. Each 3 digit value is a multiple of 0.05 seconds. The three digit code for a 1 second on or off period would be 020 (20 multiplied by 0.05 seconds is 1 second). Each code must comprise exactly three digits so leading zeroes must be included.

The following restrictions apply:

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

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

- The ADD code to get on or off periods greater than 12.75 seconds = 001
- The termination code to let the beacon know that the programming sequence is finished = 000

For assistance Appendix G provides a work sheet, and an example, for programming a Custom Character. It is best to prepare the character code sequence and write it down ready for programming. If an error occurs when entering a custom character the beacon will flash the error code of 3 quick flashes. If there is an error detected then the custom character programming must be restarted from the beginning (it can be restarted within the same programming session).

Please note: Programming a custom character creates a flash character with code 999. To get the beacon to use the custom character the value of 999 must be entered as the flash character for the beacon: 1-0-999.

3.2.3. Day / Night control

(Factory set default 1-4-005 <night only, 75Lux sunset, 175Lux sunrise>)

The user has the ability to program when the beacon will recognize sunset and sunrise from a choice of nine available settings. The daylight sensor is located on the base of the beacon. The beacon can be set for night-only operation or for both day and night (24 hour) operation. The default setting when the beacon is shipped from the factory is to operate at night only.

To program the selected lux setting:

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

How the beacon operates is controlled by the first digit of the Day/Night Control value.

- 0YY enables night-only operation
- 1YY enables day and night operation

When the beacon changes from day to night operation is determined by the last two digits of the Day/Night Control Value. The lux level of each of the 9 settings is detailed in Appendix A. The default setting is YY=05 which is the IALA suggested setting. The accuracy of the light sensor is $\pm 10\%$.

The Day/Night transition can be synchronised between multiple beacons when the sync wires of the beacons are connected. This synchronization scheme overcomes the difference in the accuracy of the light sensor in each beacon or their slightly different location. The synchronization works as follows for beacons that are sync masters:

- The first beacon to see night sets all beacons to night mode.
- The last beacon to see day sets all beacons to day mode.

If the beacons are set to night-only mode then day mode is equivalent to off. If the beacons are set to day/night mode then day mode is equivalent to on at the day intensity. Night mode is always equivalent to on at the night intensity.

If some beacons are set to sync slave mode then these beacons do not participate in the collective day/night detection. Sync slaves only obey the external sync signal. For example, if a sync slave is set to night only then it will only illuminate when it receives a night sync signal. The absence of a night sync signal means that the sync-slaved beacon will turn off after a user-preset number of flash periods. A sync-slave beacon that is set to day/night mode will switch between day and night only according to the sync information that it receives via its hard-wire sync connection.

3.2.4. Effective intensity

(Factory default is *Maximum* for both day and night, 1-1-999999, 1-1-999999)

The VLB-44X is able to have a different intensity setting for each of day and night operation. If the beacon has been programmed for night operation only the beacon will be off during the day, irrespective of the day intensity setting. All intensity settings are available (in 1 cd steps) between the minimum and maximum intensity settings shown in the relevant performance table in Appendix B.

It should be noted that it is the effective intensity of the beacon that is programmed. The peak intensity is controlled automatically according to the flash character (Schmidt-Clausen correction) in order to maintain the effective intensity for a flashing beacon.

Six digits are required to set the intensity, including leading zeroes. This is because the VLB-44X has an extremely wide intensity range across all models. The six-digit code will often be displayed with a middle space – this is for clarity only and has no meaning during the programming procedure.

Some intensity VALUES that will have special effect

- 000 001 Will set the minimum legal intensity value (this value is never 1 cd).
- 999 999 Will set the maximum programmable intensity.

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

The flash compensation value is used by the VLB-44X both during day and night operation. The blue models' flash compensation value is always 0.2, regardless of the user's setting.

3.2.5. Beacon synchronization

(Factory settings:
1-3-999 <sync disable>;)

Hard wire synchronization is standard for the VLB-44X beacon.

Programming options allow the beacon to be set as a sync-master or as a sync-slave. The start of the flash character can be delayed from 0.1 to 9.9 seconds.

Further, detailed information on how the synchronization operates are detailed in Sections 3.2.3 and 6.

Some VALUES for the Synchronisation command (1-3-) that will have special effect:

- 999 Disable synchronization – the hardware sync will be inoperative for both send and receive. The beacon must be in sync-master mode when this feature is enabled, otherwise it will never turn on.

Operation = Program (or read) = 1 (or 9)
 Feature = Synchronisation = 3
 Value = XYZ

The first digit of the Value determines if the beacon is a master or slave unit. Master is the usual setting and is essential for a beacon that is not connected to any source of sync. If a GPS source is used, such as a VSU-29 then the beacon must also be set as a sync master since the GPS source cannot make day/night decisions and the beacon must be enabled to do so.

- 000 Master
- 1YY Slave

The second two digits of the value YY allows for the start of the flash character to be delayed from 0.1 seconds to 9.9 seconds in 0.1 second increments. For example, YY=25 would provide a delay of 2.5 seconds. This feature allows behaviours such as a string of beacons to create a runway flash sequence, or to allow two beacons to generate alternating flashes.

3.2.6. Operation mode

(Factory setting 1-5-001 <normal operation>)

The VLB-44X beacon can be set to one of three operating modes.

- “Storage Mode” (009), this forces the beacon into a very low power drain state and will remain out of operation until the beacon has been reprogrammed for normal operation.
- “Normal Operation Mode” (001). The beacon has to be programmed to this mode to recover from the storage mode. This mode puts the beacon into automatic operation according to its programmed settings and the ambient light level.

An example of setting or reading the operation mode of a beacon:

Operation = Program (or read) = 1 (or 9)
 Feature = Operation Mode = 5
 Value = 001 is normal operation mode

3.2.7. Battery Thresholds

(Factory default low threshold default 1-8-110 <11.0 Volts>;

Factory default high threshold default 1-9-128<12.8 Volts>)

The VLB-44X beacon monitors the power supply for low voltage and will switch off when the programmed low threshold is reached. This feature can be disabled if not required by setting value 000. Normal operation will resume once a daylight transition is detected and the voltage reading exceeds the high threshold setting. When normal operation is restored after a low voltage condition, the beacon switches on for ten seconds before making a determination of day or night.

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

The value range for the Low Threshold is 000 to 119 (i.e. 00.0 to 11.9V). 999 disables the Low voltage check. The value range for the High Threshold is 121 to 998 (12.1V to 99.8V). 999 sets the default setting of 12.8V.

Note: Take care in setting the high threshold to ensure that the charge voltage of an ageing battery will reach this threshold during charging. If the threshold set too high, the beacon might not resume operation after a low voltage threshold shutdown.

Note: The high voltage threshold shutdown can be manually bypassed by either disconnecting and reconnecting the battery or by putting the beacon into programming mode while the battery voltage is greater than the low voltage threshold value.

3.2.8. System Checks

Vega LED beacons contain details of their manufacture including calibration/characterisation details, firmware version, and LED type used. This information is useful should there either be a problem with the beacon or where it is necessary to locate the correct manual for the product.

To perform a system check:

Operation	= Read Only	= 3
Feature		= X

Use the System Check options to access:

- Software version (0);
- Battery voltage (1);
- Beacon internal temperature (2);
- Serial number (4);

4. Installing the VLB-44X Beacon

4.1. The Mounting Structure

Any movement of the mounting structure will affect how the intended user will see the beacon. The amount of sway that can occur needs to be limited to ensure that the beacon will remain visible. This includes the sway on a fixed structure and the degree of roll on a buoy. The vertical divergence of the beacon is the point where the intensity is at 50% of the peak intensity. For example, the VLB-44X-10D has 50% of the peak intensity 5° above and below the focal plane of the beacon. At twice the vertical divergence ($\pm 10^\circ$) the intensity will be approximately 10% of the peak intensity. Narrowing the vertical divergence of the beacon increases the intensity of the light produced and increases the range for a fixed power consumption.

- The VLB-44X-2.5D ($\pm 1.25^\circ$) has been designed for rigid, fixed structures
- The VLB-44X-5D ($\pm 2.5^\circ$) has been designed primarily for use on fixed structures and can also be used on a stable floating buoy where the vertical divergence limits are acceptable for the expected heeling angles.
- The VLB-44X-10D ($\pm 5^\circ$) has been designed primarily for use on a floating buoy.

4.2. Mounting

The VLB-44X beacon should be carefully levelled to ensure that the focal plane of the beacon is horizontal. The focal plane of the beacon is parallel with the base. This levelling can be done by placing a builder's level across the mounting surface of the structure, then moving the level 90 degrees to check the surface is level in at least two directions. If the mounting surface is not level take appropriate measures to ensure it is level before permanently fixing the beacon.

An alternative option is to use a levelling mechanism, such as adjustable rods to level the base of the beacon.

When the beacon is mounted on a floating structure (buoy), the beacon should be level when the buoy is floating freely in calm air and water.

4.2.1. Base Mounting

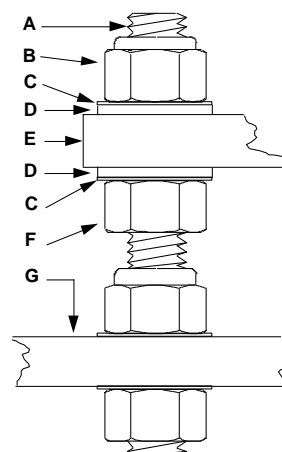
The VLB-44X supports both 3- and 4-hole base mounting.

The holes on the base are $\varnothing 14\text{mm}$ in diameter and located on a 200mm PCD. The beacon can be secured using M12 (or 1/2" UNC) 316-grade stainless steel bolts or threaded rod.

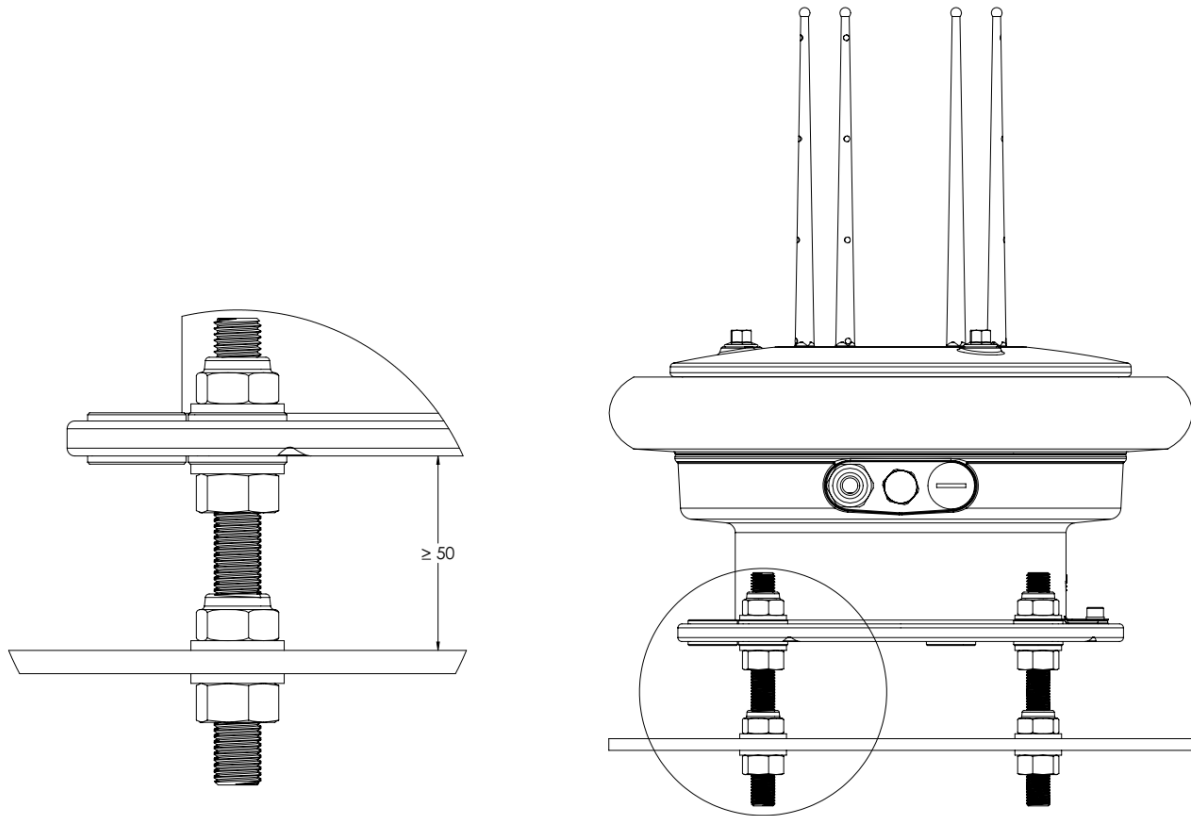
Plastic isolation bushes have been fitted in the mounting holes to prevent bi-metallic corrosion occurring. Please ensure that these bushes remain in place and that the mounting bolts are **not over-tightened** as this may cause the base to make contact with the mounting surface and defeat the purpose for having the bushes fitted.

The beacon can be levelled using adjustable rods. Fit the mounting rods firmly in place on the mounting surface; place one nut and washer on each stud. Slip the beacon (with corrosion isolation bushes in place) over the studs, and adjust the nuts by hand until the beacon is level. Then add the top washers and locking nuts and tighten.

A	M12 Stainless Steel Stud
B	Locking Nut
C	Stainless Flat Washer (2)
D	Plastic Bush (2)
E	Beacon Base
F	Plain Nut
G	Mounting Base plate



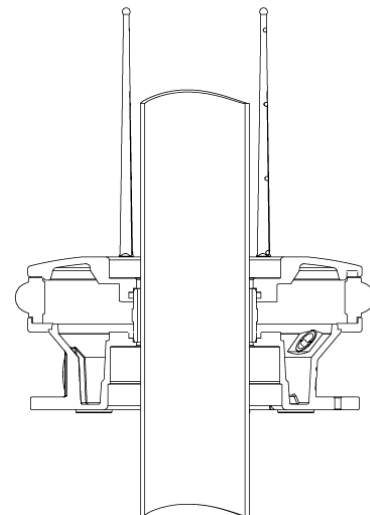
NOTE! When operation with high power settings, RMS power consumption above 50W, the lantern must be installed with a minimum of 50mm clearance.



4.2.2. Central Pole Mounting

The Ø88mm hole through the centre of the VLB-44X beacon provides an alternative mounting option.

A	Secure Head Fastener
B	Top view of fastener
C	Aluminium tube
D	Base Mounting Plate with Taper-Lock collar.



4.3. Bird Spikes

The beacon is supplied with four plastic bird spikes. To install the bird spikes simply screw them by hand into the threaded holes in the beacons lid.

4.4. Mounting the VSU-29 Pulse Sync unit

The internal diameter of the centre hole allows for the fitting of the VSU-29 GPS Sync Unit and mounting ring.

Alternatively, the VSU-29 can be separately mounted.

Refer to the VSU-29 GPS Sync Unit manual for mounting instructions

5. Power Supply & I/O Connections

5.1. Power Supply Requirements

Supply voltage is nominally 12 VDC, with an operating range of 9.0 – 18.0 VDC. Normal operating voltage should not exceed 18.0V. Reverse polarity and internal transient voltage protection are provided.

A low and high voltage threshold is programmable and the beacon will switch off if the low threshold is reached. This feature is provided to prevent the total discharge of a battery if it is being used as the power source. The default low voltage threshold is 11 Volts. Refer to section 3.4 for details.

Where possible do not earth any of the supply wiring such as the battery negative. This precaution may avoid setting up additional electrical current paths that could cause metallic corrosion.

5.2. Power Supply Connection

Wire	Voltage	Polarity
1 B+	+12 Volts	Battery positive
2 B-	0 Volts	Battery negative
3 S	Sync	If required



The VLB-44X is supplied with a 2 metre length of PUR 3-core 2.5mm² cable already sealed into the cable gland. If there is a need to shorten the power cable, ensure that the cable is resealed using heat shrink and marine sealant at the cut to prevent any moisture being able to enter the beacon.

6. Synchronization with Other Beacons

6.1. Hard-wire synchronization option

The VLB-44X beacon comes with a sync wire to allow synchronizing with other beacons that are within a reasonable wiring distance.

When synchronizing, the start of the flash character can be delayed between 0 and 9.9 seconds after the sync pulse. Refer to Appendix A for further details. The day/night transition will be synchronized and occur within 20 seconds for all of the beacons that are connected together with the sync wire.

Using hard-wire synchronizing will not increase the power requirement of the beacon.

6.2. External GPS synchronization option

The VLB-44X beacon can operate with an external GPS sync pulse unit (VSU-29) and will allow the beacon to synchronize with other beacons being controlled by a GPS sync pulse. The negative sync signal from the VSU-29 should be connected to the sync wire of the beacon. Refer to the VSU-29 product manual for details of installation and connection.

On synchronization the start of the flash character can be delayed between 0 and 9.9 seconds from the time the sync signal from the VSU-29 is received. Refer Appendix A for further details.

The VSU-29 GPS sync unit has two mounting options. The unit can be mounted in the centre hole of the beacon or can be mounted separate from the beacon. The mounting arrangement must be defined when ordering the VSU-29 unit.

It is necessary to take into account the power consumption of the VSU-29 GPS Sync Pulse Unit in any power load calculations for the beacon installation. The GPS sync unit runs continuously whether or not the VLB-44X is operating. The VSU-29 updates its clock periodically as programmed by the user (factory setting is every 30 minutes). The update takes approximately 2 minutes. The highest power usage is when the VSU-29 is updating the clock. Increasing the period between updates will reduce the overall power requirements. Refer to the VSU-29 manual for details on how to calculate the power requirements.

7. Routine Maintenance

7.1. Maintenance cleaning

This LED beacon requires little to no maintenance other than the occasional cleaning with warm soapy water. Rinse off with clean water. Do not use any solvent-based cleaner.

If the beacon is solar powered, panels should be inspected and cleaned occasionally to ensure maximum solar energy capture. Battery capacity should also be monitored.

7.1.1. Inspection check

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

The beacon can be tested by programming the “test” mode or if daytime covering the daylight sensor briefly to simulate night time operation. When the beacon is flashing check it is displaying the correct flash character. Remember to remove any daylight sensor cover before leaving the site.

The beacon must be properly monitored and maintained to ensure its continuous functioning. A non-working AtoN may result in severe consequences up to loss of life at seas.

User Notes

Appendix A VLB-44X TVIR Programming Syntax Table

Operation	Feature	Value																																							
1 = Program Mode 9 = Read Settings	0 = Flash Character	000 – Fixed character 1YY – Iso phase (ISO) 2YY – Occulting (OC) 3YY – Flash (FI) 4YY - Multiple Flash (FI(x)) 5YY - Very Quick (VQ) 6YY - Quick (Q) 7YY – Long (LF) 8YY – Morse (MO) 9YY – Custom (CCG Codes)																																							
	1 = Night Effective Intensity	YYYYYY (Six-digit intensity value) Refer to Appendix B for the specific beacon. Includes automatic Schmidt Clausen correction																																							
	2 = Day Effective Intensity	YYYYYY (Six-digit intensity value) Refer to Appendix B for the specific beacon. Includes automatic Schmidt Clausen correction																																							
	3 = Synchronisation	999 – Disable Synchronisation Functions 000 Beacon in master mode 1YY Beacon in slave mode YY=sync delay seconds (0.1 to 9.9 seconds)																																							
	4 = Day/Night Control This function does not operate in Traffic Light mode.	0YY Beacon operates night only 1YY Beacon operates day and night YY= Day/Night transition Lux Level <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Night Lux.</th> <th>Day Lux</th> </tr> </thead> <tbody> <tr> <td>YY=10</td> <td>15</td> <td>40 shortest night</td> </tr> <tr> <td>YY=12</td> <td>15</td> <td>60</td> </tr> <tr> <td>YY=11</td> <td>30</td> <td>50</td> </tr> <tr> <td>YY=01</td> <td>40</td> <td>100</td> </tr> <tr> <td>YY=02</td> <td>50</td> <td>150</td> </tr> <tr> <td>YY=03</td> <td>75</td> <td>100 CCG</td> </tr> <tr> <td>YY=04</td> <td>75</td> <td>150</td> </tr> <tr> <td>YY=05</td> <td>75</td> <td>175 IALA suggested</td> </tr> <tr> <td>YY=06</td> <td>100</td> <td>175</td> </tr> <tr> <td>YY=07</td> <td>100</td> <td>200</td> </tr> <tr> <td>YY=08</td> <td>150</td> <td>250</td> </tr> <tr> <td>YY=09</td> <td>250</td> <td>320 longest night USCG</td> </tr> </tbody> </table>		Night Lux.	Day Lux	YY=10	15	40 shortest night	YY=12	15	60	YY=11	30	50	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
		Night Lux.	Day Lux																																						
	YY=10	15	40 shortest night																																						
	YY=12	15	60																																						
	YY=11	30	50																																						
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																																							
5 = Operation Mode	001 – Normal, also cancel Auto Storage/ Auto Leave Storage mode. 009 – Storage Mode																																								
8 = Low battery threshold	YYY – Battery low threshold. (00.0 to 11.9VDC) 999 – Disabled, No battery low cut off																																								
9 = High battery threshold	YYY – Battery high threshold. (12.0 to 18.0VDC) 999 – Default setting (12.8VDC)																																								

Operation	Feature	Value
2 – Custom Character Setting	Custom flash character segments	<p>Up to 9 On/Off pairs. Comma Separated, 50 millisecond units. Numbers 002 to 255 are permitted in the On/Off pairs. 001 is a special case indicating continuation (connect the two values on either side of 001) 002 to 255: 100 milliseconds to 12.75 seconds 001 - Extend an on or off period). 000 – End command</p> <p>Examples: a: 010 020 015 020 200 001 200 020 000 b: 006 012 006 012 000 c: 125 125 000</p> <p>Illegal: a: 020 001 001 020 000 (repeated connecting character) b: 010 020 015 000 (no off period after 015) c: 020 010 020 010 (no terminating 000)</p>
3 – System Checks (read only)	0 = Software version	Version Y.Y.Y (i.e. 1.9.2 or 1.7)
	1 – Supply voltage	YY.Y Volts (i.e. 11.7 volts) Last voltage prior to entering programming mode
	2 – Beacon Temperature	YYY in degrees Kelvin. Subtract 273 to obtain the temperature in °C. (e.g. 298°K is 25°C).
	3 – Reserved	Reserved for future use
	4 – Serial Number	Displays the beacon 8-digit serial number as a series of flashes

Appendix B VLB-44X Performance Tables

Using the Programming and current tables

Performance tables are provided for each vertical divergence of the VLB-44X beacon. Each table details the effective intensity settings that can be programmed and the current that the beacon will draw.

Currents in bold font indicate fixed character operation (100% duty) capability.

Currents in blue, italicised font indicate 30% duty capability. These intensities cannot be programmed directly but result from Schmidt-Clausen correction.

All currents should have a 10% margin added to them.

Appendix B.1 VLB-44XU-6T-2D5-H Ultra High Intensity

Range (NM @ 0.74T)	Range (NM @ 0.85T)	Effective Candela (cd)	Prog code	2.5 Degree Beacon Nominal Current (mA) @12V, 25C Ambient			
				White	Red	Green	Yellow
		48000	048 000	21,13			
17,5		40900	040 900	17,32			
17		33200	033 200	12,89			
	26	31800	031 800	12,33			
16,5		26900	026 900	10,63			
16		21700	021 700	8,53			
	24	19600	019 600	7,57			
15,5		17600	017 600	6,80			
15		14130	014 130	5,11			
	22,5	13450	013 450	5,04			
	22	11900	011 900	4,46			
14,5		11400	011 400	4,27			
	21,5	10400	010 400	3,81			
14	21	9180	009 180	3,27			
	20,5	8070	008 070	2,92			
13,5		7280	007 280	2,52			
	20	7080	007 080	2,45			
	19,5	6200	006 200	2,14			
13		5810	005 810	2,01			
	19	5430	005 430	1,88			
	18,5	4750	004 750	1,67			
12,5		4620	004 620	1,63			
	18	4140	004 140	1,46			
12	17,5	3660	003 660	1,29			
	17	3140	003 140	1,11			
11,5		2890	002 890	1,02			
	16,5	2720	002 720	0,96			
	16	2360	002 360	0,83			
11		2280	002 280	0,80			
	15,5	2040	002 040	0,72			
Measured / Estimated (mm/yy)				Oct-19			
Maximum Fixed Candela				48000			
Maximum Peak Candela (50% duty max)				<i>65000</i>			
Maximum Peak Current (A)				<i>34</i>			
Night off current (mA)				4			
Day current (mA)				1			

- Currents in **bold** font indicate fixed character operation (100% duty). Currents in *blue, italicised* font indicate 50% duty capability and cannot be programmed directly but result from effective intensity correction.
- All currents should have a 10% margin added to them and will increase with increasing ambient temperature.
- Any intensity value from the minimum shown in the table to the maximum fixed intensity for that number of tiers can be programmed (i.e. not limited to the examples in the table).

Appendix C Day and Night Intensity and Range Tables

Day Range Table

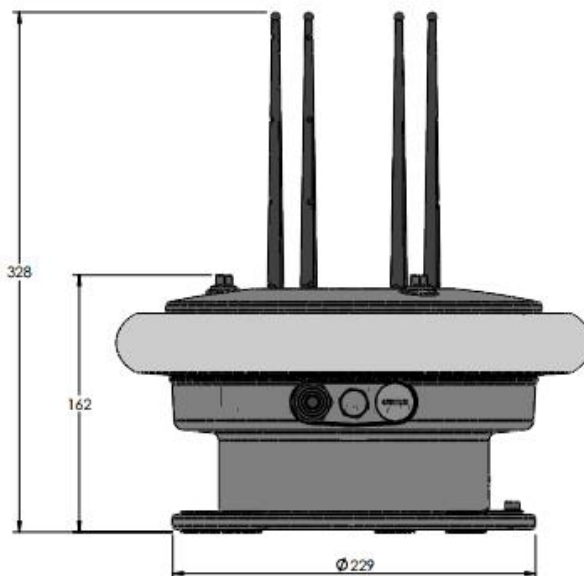
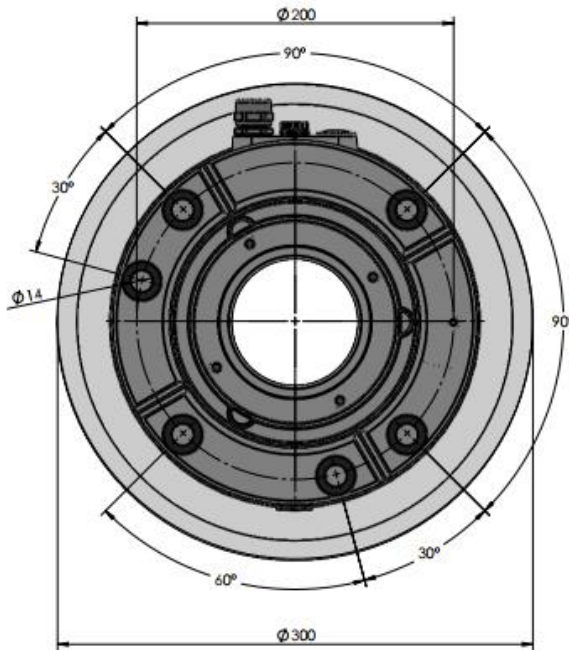
Night Range Table

Day-Time Range in Nautical Miles for 0.74T assuming background light intensity of 10,000cd/M ³		Night-Time Range in Nautical Miles assuming no background light at 0.74T and 0.85T											
NM	cd	0.74			0.85			0.74			0.85		
		NM	cd	cd	NM	cd	cd	NM	cd	cd	NM	cd	cd
0.1	35	0.5	0.2	0.2	4.0	37	21	9.0	836	240			
0.2	146	0.6	0.3	0.3	4.1	40	22	9.2	928	259			
0.3	338	0.7	0.4	0.4	4.2	43	24	9.4	1,030	280			
0.4	620	0.8	0.6	0.5	4.3	46	26	9.6	1,140	301			
0.5	998	0.9	0.7	0.6	4.4	50	27	9.8	1,260	324			
0.6	1,480	1.0	0.9	0.8	4.5	54	29	10.0	1,390	349			
0.7	2,080	1.1	1.2	1.0	4.6	58	31	10.2	1,540	375			
0.8	2,800	1.2	1.4	1.2	4.7	62	33	10.4	1,700	403			
0.9	3,650	1.3	1.7	1.4	4.8	67	35	10.6	1,880	432			
1.0	4,640	1.4	2.1	1.7	4.9	72	37	10.8	2,070	463			
1.1	5,790	1.5	2.4	2.0	5.0	77	39	11.0	2,280	497			
1.2	7,100	1.6	2.8	2.3	5.1	83	41	11.2	2,510	532			
1.3	8,580	1.7	3.3	2.6	5.2	89	43	11.4	2,760	569			
1.4	10,300	1.8	3.8	3.0	5.3	95	46	11.6	3,040	609			
1.5	12,100	1.9	4.4	3.4	5.4	102	48	11.8	3,340	651			
1.6	14,200	2.0	5.0	3.8	5.5	109	51	12.0	3,670	695			
1.7	16,600	2.1	5.7	4.3	5.6	116	54	12.5	4,630	818			
1.8	19,100	2.2	6.4	4.8	5.7	124	56	13.0	5,820	960			
1.9	22,000	2.3	7.3	5.3	5.8	132	59	13.5	7,290	1,120			
2.0	25,100	2.4	8.1	5.8	5.9	141	62	14.0	9,120	1,310			
		2.5	9.1	6.4	6.0	151	66	14.5	11,400	1,520			
		2.6	10.2	7.1	6.2	171	72	15.0	14,100	1,770			
		2.7	11.3	7.8	6.4	193	80	15.5	17,600	2,050			
		2.8	12.5	8.5	6.6	218	87	16.0	21,700	2,370			
		2.9	13.8	9.3	6.8	246	96	16.5	26,900	2,730			
		3.0	15.3	10.1	7.0	277	105	17.0	33,200	3,150			
		3.1	16.8	10.9	7.2	311	115	17.5	40,900	3,620			
		3.2	18.4	11.8	7.4	349	125	18.0	50,300	4,150			
		3.3	20.2	12.8	7.6	391	136	19.0	75,700	5,440			
		3.4	22.1	13.8	7.8	438	148	20.0	113,000	7,090			
		3.5	24.1	14.9	8.0	489	161	22.0	250,000	11,900			
		3.6	26.3	16.0	8.2	545	175	24.0	544,000	19,600			
		3.7	28.6	17.2	8.4	608	190	26.0	1,170,000	31,800			
		3.8	31.1	18.4	8.6	677	206	28.0	2,470,000	51,000			
		3.9	33.8	19.7	8.8	753	222	30.0	5,180,000	81,000			

Appendix D Beacon Dimensions

NUMBER OF TIERS	BEACON HEIGHT [A] (mm)*	FOCAL HEIGHT (mm)*	BEACON WEIGHT (Kg)
1	162	120	4.2
N	$162 + ((N-1) \times 40)$	$120 + ((N-1) \times 20)$	$4.2 + ((N-1) \times 2.7)$

* Includes mounting bush



Appendix E Product Codes

Marine LED beacon with IR programmer

VLB44XU-1T-cddd-L

c = Beacon colours, RED, WHT, GRN, YEL.
ddd = Vertical divergence 2D5, 05D and 10D degrees
L = Low Intensity version

Mounting studs required:

3 or 4 M12 Bolts, nuts, washers, lock nuts (or 1/2")
3 or 4 M12 Threaded rod, nuts, washers, locking nuts (1/2")
Mounting bolt separation 200mm PCD

Appendix F Specifications of VLB-44XU Beacon

Optical

Light Source	High-Intensity Light-Emitting Diodes Output temperature controlled to protect LEDs
Colours Available	Red, White, Green and Yellow
Intensity	See Appendix B
Effective intensity settings	Up to 15 levels for both day and night operation
Peak Intensity	Automatic effective intensity correction up to beacon max intensity
Flash Characters	246 standard characters plus one custom character 20 factory set custom characters if required
Vertical Divergence	VLB44XU-2.5 ±1.25° at 50% centre-peak VLB44XU-5 ±2.5° at 50% centre-peak VLB44XU-10 ±5° at 50% centre-peak
Synchronization	Wired sync standard, delay up to 9.9 seconds in 0.1 second steps. Optional external VSU-29 GPS sync pulse unit (beacon top-mount available)

Electrical

Voltage	Nominal 12.0VDC (9VDC to 18VDC) Programmable low voltage cut off threshold
Beacon on current	See Appendix B
Current between flashes	See Appendix B
Current by day	See Appendix B
Day/Night transition.	Photo-sensor located in base. Nine program settings for the day/night transition. Accuracy of sensor ±20 lux
Reverse Polarity	Internally protected against reverse polarity connection

Material for Beacon

Lens	Optical grade acrylic
Body	Marine grade aluminum (AlSi12), anodized to 25 microns, powder coated
Additional Bird Spikes	4 bird spikes, PC-ABS blend.
Sealing	O-rings

Environment

Temperature	-30°C to +50°C
Design Wind speed	Rated to withstand winds to 100+ knots
Immersion	MIL-STD-202G Method 104A, Cond A IP68, 1.5m for 60 minutes
Ultra-Violet Radiation	All external materials are UV resistant
Vibration	MIL-STD-202G Method 204D, Cond B 1G (5Hz to 40.8Hz, xyz axis, 1 octave/min) 5G (40.85Hz to 2000Hz, xyz axis, 1 octave/min)
Shock	MIL-STD-202G Method 213B, Cond H 75G, xyz axis
Electrical	47 CFR FCC Part 15 Subpart B: 2009 EN 55015:2006+A2:2009 (Disturbance voltages) EN 61547:1995+A1:2000 (Radiated disturbance 30MHz to 300MHz) IEC 61000-4-2: 2008, Level 3 (Electrostatic discharge immunity) IEC 61000-4-3: 2006+A1:2007, 3V/m (Radiated, radio frequency, electric field immunity) IEC 61000-4-5: 2005 (Surge immunity)

Programming

Vega Infra Red programmer

Design Life

>10 years depending on flash character and duty cycle

Weights and Dimensions

Mounting holes	Three corrosion-insulated holes, Ø14 mm, on 200 (7-7/8") PCD
Overall Height	See Appendix D
Focal plane	See Appendix D
Beacon diameter	See Appendix D

Centre Hole	Ø88mm
Power Connection	2m length of neoprene 3-core 2.5mm ² cable
Weight	See Appendix D

Appendix G Worksheet for a Custom Character

Fill out the table below for the values required to program a custom character.

The steps to program a custom character are as follows

Example given for FI (2) 38.5sec (0.5sec on 2sec off 16sec on 20sec off)

Step	Example	Required Character
Enter programming mode	The beacon will flash 4 times to indicate it is in programming mode	Press standby button for 5 seconds
Enter Operation, Colour/Units, Feature and Feature syntax	Beacon will flash each time button is pressed	Press standby button for 5 seconds
Enter ON time If greater than 12.75 seconds use ADD code 001	Value is multiple of 0.05 seconds max value 255	20
Enter OFF time If greater than 12.75 seconds use ADD code 001	Value is multiple of 0.05 seconds max value 255	On time of 0.5 sec 010
Enter ON time If greater than 12.75 seconds use ADD code 001	Value is multiple of 0.05 seconds max value 255	Off time of 2 sec 040
Enter OFF time If greater than 12.75 seconds use ADD code 001		On time 16 seconds. Need to program 8 sec plus 8 sec using ADD 160 001 160
Enter ON time If greater than 12.75 seconds use ADD code 001		Off time 20 seconds Need to program 10 sec plus 10 sec using ADD 200 001 200
Enter OFF time If greater than 12.75 seconds use ADD code 001		
FINISHED code	Beacon will flash 3 long flashes to indicate the instruction has been accepted	000

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

If an error is made when programming the custom character, the beacon will flash 3 times.

Appendix H Flash Character Table with Programming Codes

<u>Code</u>	<u>Description</u>	<u>Duty Cycle</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>
FIXED CHARACTER CODE										
000	Fixed	1.00								
00Y	Fixed – 0.Y sec SC Correction		<i>FOR LAB TESTING ONLY – DO NOT USE IN THE FIELD</i>							
ISOPHASE CODES										
100	ISO 2s	0.50	1.00	1.00						
101	ISO 3s	0.50	1.50	1.50						
102	ISO 4s	0.50	2.00	2.00						
103	ISO 5s	0.50	2.50	2.50						
104	ISO 6s	0.50	3.00	3.00						
105	ISO 8s	0.50	4.00	4.00						
106	ISO 10s	0.50	5.00	5.00						
OCCULTING CODES										
200	OC 1.25s 0.75	0.60	0.75	0.50						
201	OC 3s 2.0	0.67	2.00	1.00						
202	OC 3s 2.5	0.83	2.50	0.50						
203	OC 3.5s 2.5	0.71	2.50	1.00						
204	OC 4s 2.5	0.63	2.50	1.50						
205	OC 4s 3.0	0.75	3.00	1.00						
206	OC 5s 3.0	0.60	3.00	2.00						
207	OC 5s 4.0	0.80	4.00	1.00						
208	OC 5s 4.5	0.90	4.50	0.50						
209	OC 6s 4.0	0.67	4.00	2.00						
210	OC 6s 4.5	0.75	4.50	1.50						
211	OC 6s 5.0	0.83	5.00	1.00						
212	OC 7s 4.5	0.64	4.50	2.50						
213	OC 8s 5.0	0.63	5.00	3.00						
214	OC 8s 6.0	0.75	6.00	2.00						
215	OC 9s 6.0	0.67	6.00	3.00						
216	OC 10s 6.0	0.60	6.00	4.00						
217	OC 10s 7.0	0.70	7.00	3.00						
218	OC 10s 7.5	0.75	7.50	2.50						
219	OC 12s 8.0	0.67	8.00	4.00						
220	OC 15s 10.0	0.67	10.00	5.00						
221	OC(2) 8s 3.0 2.0	0.50	3.00	2.00	1.00	2.00				
222	OC(2) 8s 5.0 1.0	0.75	5.00	1.00	1.00	1.00				
FLASH CODES										
300	FI 1.5s 0.2	0.13	0.20	1.30						
301	FI 1.5s 0.3	0.20	0.30	1.20						
302	FI 1.5s 0.4	0.27	0.40	1.10						
303	FI 1.5s 0.5	0.33	0.50	1.00						
304	FI 2s 0.2	0.10	0.20	1.80						
305	FI 2s 0.3	0.15	0.30	1.70						
306	FI 2s 0.4	0.20	0.40	1.60						
307	FI 2s 0.5	0.25	0.50	1.50						
308	FI 2s 0.7	0.35	0.70	1.30						
309	FI 2s 0.8	0.40	0.80	1.20						
310	FI 2.5s 0.3	0.12	0.30	2.20						
311	FI 2.5s 0.5	0.20	0.50	2.00						
312	FI 2.5s 1.0	0.40	1.00	1.50						
313	FI 3s 0.2	0.07	0.20	2.80						
314	FI 3s 0.3	0.10	0.30	2.70						
315	FI 3s 0.4	0.13	0.40	2.60						

<u>Code</u>	<u>Description</u>	<u>Duty Cycle</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>
316	FI 3s 0.5	0.17	0.50	2.50						
317	FI 3s 0.6	0.20	0.60	2.40						
318	FI 3s 1.0	0.33	1.00	2.00						
319	FI 4s 0.2	0.05	0.20	3.80						
320	FI 4s 0.3	0.08	0.30	3.70						
321	FI 4s 0.4	0.10	0.40	3.60						
322	FI 4s 0.5	0.13	0.50	3.50						
323	FI 4s 0.6	0.15	0.60	3.40						
324	FI 4s 0.8	0.20	0.80	3.20						
325	FI 4s 1.0	0.25	1.00	3.00						
326	FI 4s 1.5	0.38	1.50	2.50						
327	FI 5s 0.2	0.04	0.20	4.80						
328	FI 5s 0.3	0.06	0.30	4.70						
329	FI 5s 0.5	0.10	0.50	4.50						
330	FI 5s 0.9	0.18	0.90	4.10						
331	FI 5s 1.0	0.20	1.00	4.00						
332	FI 5s 1.5	0.30	1.50	3.50						
333	FI 6s 0.2	0.03	0.20	5.80						
334	FI 6s 0.3	0.05	0.30	5.70						
335	FI 6s 0.4	0.07	0.40	5.60						
336	FI 6s 0.5	0.08	0.50	5.50						
337	FI 6s 0.6	0.10	0.60	5.40						
338	FI 6s 1.0	0.17	1.00	5.00						
339	FI 6s 1.5	0.25	1.50	4.50						
340	FI 7s 1.0	0.14	1.00	6.00						
341	FI 7s 2.0	0.29	2.00	5.00						
342	FI 7.5s 0.5	0.07	0.50	7.00						
343	FI 7.5s 0.8	0.11	0.80	6.70						
344	FI 8s 0.5	0.06	0.50	7.50						
345	FI 9s 0.9	0.10	0.90	8.10						
346	FI 10s 0.2	0.02	0.20	9.80						
347	FI 10s 0.3	0.03	0.30	9.70						
348	FI 10s 0.5	0.05	0.50	9.50						
349	FI 10s 0.8	0.08	0.80	9.20						
350	FI 10s 1.0	0.10	1.00	9.00						
351	FI 10s 1.5	0.15	1.50	8.50						
352	FI 12s 1.2	0.10	1.20	10.80						
353	FI 12s 2.5	0.21	2.50	9.50						
354	FI 15s 1.0	0.07	1.00	14.00						
MULTIPLE FLASH CODES										
400	FI(2) 4s 0.5	0.25	0.50	1.00	0.50	2.00				
401	FI(2) 4.5s 0.3	0.13	0.30	1.00	0.30	2.90				
402	FI(2) 4.5s 0.4	0.18	0.40	1.00	0.40	2.70				
403	FI(2) 4.5s 0.5	0.22	0.50	1.00	0.50	2.50				
404	FI(2) 5s 0.2 0.8	0.08	0.20	0.80	0.20	3.80				
405	FI(2) 5s 0.2 1.2	0.08	0.20	1.20	0.20	3.40				
406	FI(2) 5s 0.4	0.16	0.40	0.60	0.40	3.60				
407	FI(2) 5s 0.5	0.20	0.50	1.00	0.50	3.00				
408	FI(2) 5s 1.0	0.40	1.00	1.00	1.00	2.00				
409	FI(2) 5.5s 0.4	0.15	0.40	1.40	0.40	3.30				
410	FI(2) 6s 0.2 1.4	0.07	0.20	1.40	0.20	4.20				
411	FI(2) 6s 0.3	0.10	0.30	1.00	0.30	4.40				
412	FI(2) 6s 0.4	0.13	0.40	1.00	0.40	4.20				
413	FI(2) 6s 0.5	0.17	0.50	1.00	0.50	4.00				

<u>Code</u>	<u>Description</u>	<u>Duty Cycle</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>
414	FI(2) 6s 0.5 1.5	0.17	0.50	1.50	0.50	3.50				
415	FI(2) 6s 0.8	0.27	0.80	1.20	0.80	3.20				
416	FI(2) 6s 1.0	0.33	1.00	1.00	1.00	3.00				
417	FI(2) 6s 3.0	0.67	3.00	1.00	1.00	1.00				
418	FI(2) 7s 1.0	0.29	1.00	1.00	1.00	4.00				
419	FI(2) 8s 0.4	0.10	0.40	1.00	0.40	6.20				
420	FI(2) 8s 0.5	0.13	0.50	1.00	0.50	6.00				
421	FI(2) 8s 1.0	0.25	1.00	1.00	1.00	5.00				
422	FI(2) 10s 0.4	0.08	0.40	1.60	0.40	7.60				
423	FI(2) 10s 0.5 1.0	0.10	0.50	1.00	0.50	8.00				
424	FI(2) 10s 0.5 1.5	0.10	0.50	1.50	0.50	7.50				
425	FI(2) 10s 0.5 2.0	0.10	0.50	2.00	0.50	7.00				
426	FI(2) 10s 0.6 2.4	0.12	0.60	2.40	0.60	6.40				
427	FI(2) 10s 0.8 1.2	0.16	0.80	1.20	0.80	7.20				
428	FI(2) 10s 1.0 1.0	0.20	1.00	1.00	1.00	7.00				
429	FI(2) 10s 1.0 1.5	0.20	1.00	1.50	1.00	6.50				
430	FI(2) 10s 3.0 1.0	0.80	3.00	1.00	5.00	1.00				
431	FI(2) 12s 0.4 1.0	0.07	0.40	1.00	0.40	10.20				
432	FI(2) 12s 0.5 1.0	0.08	0.50	1.00	0.50	10.00				
433	FI(2) 12s 1.0 2.0	0.17	1.00	2.00	1.00	8.00				
434	FI(2) 12s 1.5 2.0	0.25	1.50	2.00	1.50	7.00				
435	FI(2) 15s 1.0 2.0	0.13	1.00	2.00	1.00	11.00				
436	FI(2) 20s 1.0 3.0	0.10	1.00	3.00	1.00	15.00				
437	FI(2) 25s 1.0 1.0	0.08	1.00	1.00	1.00	22.00				
438	FI(3) 6s 0.5	0.25	0.50	1.00	0.50	1.00	0.50	2.50		
439	FI(3) 6.1s 0.4	0.20	0.40	1.00	0.40	1.00	0.40	2.90		
440	FI(3) 8s 0.5	0.19	0.50	1.00	0.50	1.00	0.50	4.50		
441	FI(3) 9s 0.3	0.10	0.30	1.00	0.30	1.00	0.30	6.10		
442	FI(3) 9s 0.8	0.27	0.80	1.20	0.80	1.20	0.80	4.20		
443	FI(3) 10s 0.5	0.15	0.50	1.50	0.50	1.50	0.50	5.50		
444	FI(3) 10s 1.0	0.30	1.00	1.00	1.00	1.00	1.00	5.00		
445	FI(3) 12s 0.5 1.5	0.13	0.50	1.50	0.50	1.50	0.50	7.50		
446	FI(3) 12s 0.5 2.0	0.13	0.50	2.00	0.50	2.00	0.50	6.50		
447	FI(3) 12s 0.8 1.2	0.20	0.80	1.20	0.80	1.20	0.80	7.20		
448	FI(3) 12s 1.0 2.0	0.25	1.00	2.00	1.00	2.00	1.00	5.00		
449	FI(3) 15s 0.3	0.06	0.30	1.70	0.30	1.70	0.30	10.70		
450	FI(3) 15s 0.4	0.08	0.40	1.00	0.40	1.00	0.40	11.80		
451	FI(3) 15s 0.5	0.10	0.50	1.50	0.50	1.50	0.50	10.50		
452	FI(3) 20s 0.5 1.5	0.08	0.50	1.50	0.50	1.50	0.50	15.50		
453	FI(3) 20s 0.5 3.0	0.08	0.50	3.00	0.50	3.00	0.50	12.50		
454	FI(3) 20s 0.8 1.2	0.12	0.80	1.20	0.80	1.20	0.80	15.20		
455	FI(3) 20s 1.0 1.0	0.15	1.00	1.00	1.00	1.00	1.00	15.00		
456	FI(3) 30s 1.0 4.0	0.10	1.00	4.00	1.00	4.00	1.00	19.00		
457	FI(4) 10s 0.5 1.0	0.20	0.50	1.00	0.50	1.00	0.50	1.00	0.50	5.00
458	FI(4) 10s 0.5 0.5	0.20	0.50	0.50	0.50	0.50	0.50	0.50	0.50	6.50
459	FI(4) 10s 0.8	0.32	0.80	1.20	0.80	1.20	0.80	1.20	0.80	3.20
460	FI(4) 12s 0.3	0.10	0.30	1.70	0.30	1.70	0.30	1.70	0.30	5.70
461	FI(4) 12s 0.5	0.17	0.50	1.50	0.50	1.50	0.50	1.50	0.50	5.50
462	FI(4) 12s 0.8	0.27	0.80	1.20	0.80	1.20	0.80	1.20	0.80	5.20
463	FI(4) 15s 0.5	0.13	0.50	1.50	0.50	1.50	0.50	1.50	0.50	8.50
464	FI(4) 15s 1.0	0.27	1.00	1.00	1.00	1.00	1.00	1.00	1.00	8.00
465	FI(4) 16s 0.5	0.13	0.50	1.50	0.50	1.50	0.50	1.50	0.50	9.50
466	FI(4) 20s 0.3	0.06	0.30	3.00	0.30	3.00	0.30	3.00	0.30	9.80
467	FI(4) 20s 0.5	0.10	0.50	1.50	0.50	1.50	0.50	1.50	0.50	13.5

<u>Code</u>	<u>Description</u>	<u>Duty Cycle</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>
468	FI(4) 20s 1.5	0.30	1.50	1.50	1.50	1.50	1.50	1.50	1.50	9.50
469	FI(4) 30s 0.5	0.07	0.50	0.50	0.50	0.50	0.50	0.50	0.50	26.5
470	FI(5) 20s 0.5 1.5	0.13	0.50	1.50	[x 4]				0.50	11.5
471	FI(5) 20s 0.80	0.20	0.80	1.20	[x 4]				0.80	11.2
472	FI(2+1) 6s 0.3	0.15	0.30	0.40	0.30	1.20	0.30	3.50		
473	FI(2+1) 10s 0.5	0.15	0.50	0.70	0.50	2.10	0.50	5.70		
474	FI(2+1) 12s 0.8	0.20	0.80	1.20	0.80	2.40	0.80	6.00		
475	FI(2+1) 12s 1.0	0.25	1.00	1.00	1.00	4.00	1.00	4.00		
476	FI(2+1) 15s 1.0	0.20	1.00	2.00	1.00	5.00	1.00	5.00		
VERY QUICK CODES										
500	VQ 0.5s 0.15	0.30	0.15	0.35						
501	VQ 0.5s 0.20	0.40	0.20	0.30						
502	VQ 0.6s 0.20	0.33	0.20	0.40						
503	VQ 0.6s 0.30	0.50	0.30	0.30						
504	VQ(2) 4s 0.20	0.10	0.20	1.00	0.20	2.60				
505	VQ(2) 8s 0.20	0.05	0.20	1.00	0.20	6.60				
506	VQ(3) 5s 0.15	0.09	0.15	0.35	0.15	0.35	0.15	3.85		
507	VQ(3) 5s 0.20	0.12	0.20	0.30	0.20	0.30	0.20	3.80		
508	VQ(3) 5s 0.3 0.2	0.18	0.30	0.20	0.30	0.20	0.30	3.70		
509	VQ(3) 5s 0.3 0.3	0.18	0.30	0.30	0.30	0.30	0.30	3.50		
510	VQ(3) 15s 0.10	0.02	0.10	0.50	0.10	0.50	0.10	13.70		
511	VQ(9) 10s 0.15	0.14	0.15	0.35	[x 8]				0.15	5.85
512	VQ(9) 10s 0.20	0.18	0.20	0.30	[x 8]				0.20	5.80
513	VQ(9) 10s 0.30	0.27	0.30	0.30	[x 8]				0.30	4.90
514	VQ(6)+LFI 10s 0.15	0.29	0.15	0.35	[x 6]				2.00	5.00
515	VQ(6)+LFI 10s 0.2	0.32	0.20	0.30	[x 6]				2.00	5.00
516	VQ(6)+LFI 10s 0.3	0.38	0.30	0.30	[x 6]				2.00	4.40
QUICK CODES										
600	Q 1s 0.2	0.20	0.20	0.80						
601	Q 1s 0.3	0.30	0.30	0.70						
602	Q 1s 0.4	0.40	0.40	0.60						
603	Q 1s 0.5	0.50	0.50	0.50						
604	Q 1s 0.8	0.80	0.80	0.20						
605	Q 1.2s 0.3	0.25	0.30	0.90						
606	Q 1.2s 0.5	0.42	0.50	0.70						
607	Q 1.2s 0.6	0.50	0.60	0.60						
608	Q(2) 5s 0.3	0.12	0.30	0.70	0.30	3.70				
609	Q(2) 5s 0.5	0.20	0.50	0.50	0.50	3.50				
610	Q(2) 6s 0.30	0.10	0.30	0.70	0.30	4.70				
611	Q(2) 6s 0.35	0.12	0.35	0.70	0.35	4.60				
612	Q(2) 10s 0.6	0.12	0.60	0.40	0.60	8.40				
613	Q(2) 15s 0.2	0.03	0.20	0.80	0.20	13.80				
614	Q(3) 5s 0.5	0.30	0.50	0.50	0.50	0.50	0.50	2.50		
615	Q(3) 6s 0.3	0.15	0.30	0.70	0.30	0.70	0.30	3.70		
616	Q(3) 10s 0.30	0.09	0.30	0.70	0.30	0.70	0.30	7.70		
617	Q(3) 10s 0.35	0.11	0.35	0.65	0.35	0.65	0.35	7.65		
618	Q(3) 10s 0.50	0.15	0.50	0.50	0.50	0.50	0.50	7.50		
619	Q(3) 10s 0.60	0.18	0.60	0.60	0.60	0.60	0.60	7.00		
620	Q(3) 30s 0.4	0.04	0.40	4.60	0.40	4.60	0.40	19.6		
621	Q(4) 6s 0.3	0.20	0.30	0.70	0.30	0.70	0.30	0.70	0.30	2.70
622	Q(4) 6s 0.4	0.27	0.40	0.60	0.40	0.60	0.40	0.60	0.40	2.60
623	Q(4) 10s 0.3	0.12	0.30	0.70	0.30	0.70	0.30	0.70	0.30	6.70
624	Q(4) 12s 0.3	0.10	0.30	0.70	0.30	0.70	0.30	0.70	0.30	8.70
625	Q(4) 15s 0.35	0.09	0.35	0.70	0.35	0.70	0.35	0.70	0.35	11.5

<u>Code</u>	<u>Description</u>	<u>Duty Cycle</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>
626	Q(4) 20s 0.5	0.10	0.50	0.50	0.50	0.50	0.50	0.50	0.50	16.5
627	Q(9) 15s 0.3	0.18	0.30	0.70	[x 8]				0.30	6.70
628	Q(9) 15s 0.35	0.21	0.35	0.65	[x 8]				0.35	6.65
629	Q(9) 15s 0.6	0.36	0.60	0.60	[x 8]				0.60	4.80
630	Q(6)+LFI 15s 0.2	0.21	0.20	0.80	[x 6]				2.00	7.00
631	Q(6)+LFI 15s 0.3	0.25	0.30	0.70	[x 6]				2.00	7.00
632	Q(6)+LFI 15s 0.35	0.21	0.35	0.65	[x 6]				1.05	7.95
633	Q(6)+LFI 15s 0.6	0.37	0.60	0.60	[x 6]				2.00	5.80
LONG FLASH CODES										
700	LFI 5s 2.0	0.40	2.00	3.00						
701	LFI 6s 2.0	0.33	2.00	4.00						
702	LFI 8s 2.0	0.25	2.00	6.00						
703	LFI 8s 3.0	0.38	3.00	5.00						
704	LFI 10s 2.0	0.20	2.00	8.00						
705	LFI 10s 3.0	0.30	3.00	7.00						
706	LFI 10s 4.0	0.40	4.00	6.00						
707	LFI 12s 2.0	0.17	2.00	10.00						
708	LFI 15s 4.0	0.27	4.00	11.00						
MORSE CODES										
800	MO(A) 6s 0.3	0.22	0.30	0.60	1.00	4.10				
801	MO(A) 8s 0.4	0.30	0.40	0.60	2.00	5.00				
802	MO(A) 8s 0.8	0.40	0.80	1.20	2.40	3.60				
803	MO(A) 10s 0.5	0.20	0.50	0.50	1.50	7.50				
804	MO(A) 12s	0.33	1.00	1.00	3.00	7.00				
805	MO(A) 15s 0.5	0.17	0.50	1.50	2.00	11.00				
806	MO(B) 15s 1.5	0.20	1.50	0.50	0.50	0.50	0.50	0.50	0.50	10.5
807	MO(D) 10s 5.0	0.70	5.00	1.00	1.00	1.00	1.00	1.00	1.00	
808	MO(N) 8s 5.0	0.75	5.00	1.00	1.00	1.00				
809	MO(U) 10s 0.2	0.10	0.20	0.80	0.20	0.80	0.60	7.40		
810	MO(U) 10s 0.3	0.15	0.30	0.70	0.30	0.70	0.90	7.10		
811	MO(U) 10s 0.4	0.20	0.40	0.60	0.40	0.60	1.20	6.80		
812	MO(U) 10s 0.5	0.25	0.50	0.50	0.50	0.50	1.50	6.50		
813	MO(U) 15s	0.13	0.40	0.50	0.40	0.50	1.20	12.00		
814	MO(U) 15s 0.45	0.15	0.45	0.45	0.45	0.45	1.35	11.85		
815	MO(U) 15s 0.50	0.17	0.50	0.50	0.50	0.50	1.50	11.50		
816	MO(U) 15s 0.55	0.17	0.55	0.35	0.55	0.35	1.45	11.75		
817	MO(U) 15s 0.60	0.17	0.60	0.30	0.60	0.30	1.40	11.80		
818	MO(U) 15s 0.7 0.5	0.22	0.70	0.50	0.70	0.50	1.90	10.70		
819	MO(U) 15s 0.7 0.7	0.23	0.70	0.70	0.70	0.70	2.10	10.10		
820	MO(U) 15s 0.75 0.15	0.21	0.75	0.15	0.75	0.15	1.65	11.55		
821	MO(U) 15s 0.75 0.45	0.23	0.75	0.45	0.75	0.45	2.00	10.60		
822	MO(U) 15s 1.15	0.35	1.15	0.75	1.15	0.75	3.00	8.20		
823	MO(U) 15s 1.30	0.39	1.30	0.70	1.30	0.70	3.30	7.70		

CUSTOM & SPECIAL CODES

900... Can be inserted at factory at time of order (up to 50, memory-limited)
See next page if special characters have been added.

999	Custom flash character programmed by user
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<u>Code</u>	<u>Custom Character Description</u>	<u>Duty Cycle</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>	<u>On</u>	<u>Off</u>
SPECIAL CHARACTER CODE										
900	FI 3s, 0.45	0.15	0.45	2.55						
901	FI 4s, 0.55	0.138	0.55	3.45						
902	FI 5s, 0.55	0.11	0.55	4.45						
903	FI 6s, 0.65	0.108	0.65	5.35						
904	FI 9s, 0.65	0.072	0.65	8.35						
905	FI 10s, 0.65	0.065	0.65	9.35						
906	FI 15s, 0.6	0.04	0.6	14.4						
907	FI (2) 8s, 0.55	0.138	0.55	1.45	0.55	5.45				
908	FI (2) 10s, 0.65	0.13	0.65	1.35	0.65	7.35				
909	FI (2) 12s, 0.65	0.108	0.65	1.35	0.65	9.35				
910	FI (2) 15s, 0.65	0.087	0.65	1.35	0.65	12.35				
911	FI (3) 10s, 0.65	0.195	0.65	1.35	0.65	1.35	0.65	5.35		
912	FI (3) 15s, 0.65	0.13	0.65	1.35	0.65	1.35	0.65	10.35		
913	FI (3) 18s, 0.65	0.108	0.65	1.85	0.65	1.85	0.65	12.35		
914	FI (4) 10s, 0.4	0.16	0.4	1.2	0.4	1.2	0.4	1.2	0.4	4.8
915	LFI 10s, 2.15	0.215	2.15	7.85						
916	MO (A) 5s, 0.45	0.38	0.45	0.25	1.45	2.85				
917	Q 15s, 1	0.067	1	14						
918	FI (5) 30s, 1	0.167	1	1	[x4]				1	21
919	FI (5) 30s, 1	0.167	1	1.5	[x4]				1	19
920	OC 3.5s, 3.2	0.914	3.2	0.3						
921	OC 4s, 2.4	0.6	2.4	1.6						
922	OC 4s, 3.5	0.875	3.5	0.5						
923	MO (F) 4.2s, 0.3	0.33	0.3	0.3	0.3	0.3	0.5	0.3	0.3	1.9
924	MO (U) 20s, 0.5	0.3	0.5	3	0.5	3	5	8		
925	Q 15s, 0.5	0.033	0.5	14.5						
926	OC 15s, 9	0.6	9	6						
927	LF1 (2) 12s, 2	0.33	2	2	2	6				
928	FI (4) 10s, 1.5	0.4	1	1.5	1	1.5	1	1.5	1	1.5
929	FI (4) 20s, 1.5	0.2	1	1.5	1	1.5	1	1.5	1	11.5
930	FI(2+1) 9s	0.167	0.5	0.5	0.5	1	0.5	6		
931	Q(6)+LFI 15s, 0.5s	0.333	0.5	0.5	[x6]	2	7			
932	Q(9) 15s, 0.5s	0.3	0.5	0.5	[x8]	0.5	6.5			

Appendix ITVIR Remote02 Specifications & Battery Replacement

Coding Scheme: RC5 code with centre frequency 36.7 kHz

Programming options:

- Flash Character
- Individual day / night Intensity
- Synchronisation
- Day / Night sensitivity control
- Operation mode
- Battery low threshold
- Slave sync flash cycle disable count
- Custom flash character

Dimensions: 87mm x 41mm x 6.5mm

Weight: 18g

Power Supply: 1 x 3V lithium coin cell battery, CR2025 type

Part Number: Remote 02

Battery Replacement:

- The programmer requires one 3V lithium battery type CR2025.
- 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.
- Pull the battery holder out of the case.



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



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