

A complex, glowing cyan circuit board pattern on a black background, featuring various traces, pads, and vias.

HAVENTECHNIK

LUMENS

Technical Documentation

Copyright © 2018, Haventechnik

LUMENS

Contents

Configuration Management	3
LUMENS	4
Key Value Add Points	4
Technical Overview	5
Out of the box	5
Safety	6
System Operation	6
Control Panel	6
LED Banks	6
Solar Panel	7
Day night function	7
The Lumens Range	8
Lumens 1	8
LUMENS 2	9
Lumens User Instructions	9
Lumens Comparison	10
System Installation	11
Lumens 1	11
Lumens 2	11
Basic Peripherals Connection	12
What is needed	13
Basic Technical Specifications	13
Appendix	14
Re programming LUMENS	14

Configuration Management

Purpose of this document				
This document provides orientational information for clients when using and installing the Lumens.				
Special Instructions				
Document Information				
Document Name	Lumens Technical Manual			
Product / System	LUMENS			
Document Type	Technical Content			
Date	Saturday, July 28, 2018	Revision	1	
Prepared For	Clients	Author	M A Havenga	
SME	Michael A Havenga			
Distribution Format	PDF			
Security Classification	Public			
Distribution	Marketing Campaigns Website Down load			
Affected Manuals				
Queries	contactus@haventechnik.com			
Document Amendment Record				
Revision	Date	ECP NO	Amended By	Summary of Changes
1	7/28/2018	NA	Michael A Havenga	Original Document

LUMENS

LUMENS

Lumens is a series of 12 V LED Lighting controllers, which run on a battery and can be recharged via solar or any other alternative power source.



Although reference may be made to Lumens 1, this product was / is the BETA testing unit and it was made available to some clients for testing. There are not many differences between the two units.

Key Value Add Points

The following information will assist as a quick reference to what Lumens is and how best to conceptualize its value:

- **Lumens:** Means light, which is fitting as a name as the controller regulates the power to an LED light controlling how bright or dim it is
- **Lumens:** Is DC powered; it can therefore run off any DC power source; which is between 16V and 24 Volts



Lumens is not designed to run directly from AC or Mains power.

- **Lumens** is primarily designed to charge and run off a 12 V battery of either 4-amp hour or 7-amp hour rating



Lumens is not designed to run off any other type of battery other than a 12V battery. 12-volt batteries are normally automobile (car) batteries of the 12 V SLA types which are used as battery backups in alarm systems and UPS systems

- **Lumens** has two output channels. This allows for two led lights or two strips of LEDs to be powered by the same system
- **Lumens** has built in battery recharge circuitry, but does not need to be run off a battery and can be run directly from a DC power source



The time needed to recharge the battery depends on several factors. If there is trouble with the battery recharging, or the battery drains very quickly this may be due to an aged or degraded cell or over user during the charge cycle.

- **Lumens** has a day | night function. This means it switched the LEDs on when dark or when there is not enough sunlight and switched them off when there is enough sunlight



When it is overcast, raining or the sensor is obstructed, this can cause the LEDs to switch on

- **Lumens** does allow you to control how bright the LEDs are and when they switch on and off
- **Lumens** can be reprogrammed, and it does run using a tiny computer (PIC microcontroller)

LUMENS

Technical Overview

Lumens is technically referred to as an embedded application as it runs an 8 BIT pic microcontroller. It is the combination of analog and digital electronic technology that gives Lumens the ability to offer a bundle of useful features and be reprogrammable and reconfigurable.

The Lumens core is a [PIC16F1847*](#), which runs software controlling the device's response to its outside world. The unit does not run an RTOS or operating system but runs what is referred to as firmware. Reprogramming the device is an advanced function and is beyond the scope of this manual.

*Although the PIC16F1847 may be used, alternative devices may be introduced for various reasons, however system functionality will not change or be altered unless stated.



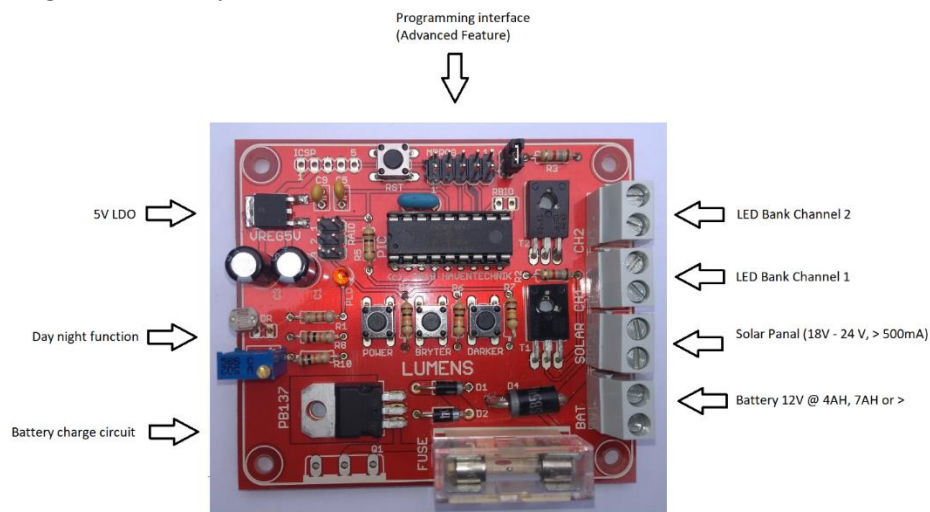
The PICs installed on the units contain proprietary software which is copyright ©, Haventechnik. This code will not under any circumstances be provided to a client in a compiled or digital form for alteration or amendment for reprogramming more devices.

IMPORTANT: *When the Lumens is reprogrammed, the warranty is automatically void and no return of the Lumens can or will be processed. This is because once the device is reprogrammed, it is no longer being used in the way designed or tested and therefore HavenTechnik cannot be held liable for damage or loss incurred.*

Out of the box

Lumens is a compact and practical product with several useful features that facilitate solar powered, LED driven lighting. Feature summary:

- Microcontroller powered design, with LDO managed power consumption
- Dual Channel PWM from 0 to 100% duty cycle
 - Dual Channel: as seen in the image below right, two LED lights or two banks of LEDs can be controlled simultaneously
- Battery Recharge capability
- Day | Night Function
- Reprogrammable (Advance feature)
- Mounting holes for easy installation



LUMENS

Safety

Fuse Protection

The system is protected by a fuse and this prevents over-loading. The fuse can be replaced and is housed in a clear protective case.

Shock Protection



The Lumens may be a low powered device; however, all necessary safety precautions must be observed to ensure safe operation. Any form of short circuiting because of negligence or faulty installation may have severe repercussions of the health and wellbeing of the user.

System Operation

The system is designed with a power up, power on approach. This means that no configuration is required of the system and it will function as described in the manual. Any changes to the software installed will alter the basic operation of the system rendering the manual no longer valid.

Control Panel

There are four push buttons mounted on the PCB, and every button except the reset button can be repurposed. The reset button performs a system reset, and therefore cannot be changed. The remaining three buttons are configured in software and therefore their role can be changed. Note that the default operation is described in the description below.



Reprogramming the function of the buttons is an advanced feature and is beyond the scope of this document.

	Button	Description
	Reset	Resets Lumens if it becomes non-responsive
	Power	Power switch; switches the device off or after initial power up. If power is removed the status of the device will return to a default on when powered up.
	Bryter	Increases the brightness of the LED lighting*
	Darker	Decreases the brightness of the LED lighting*

*The description and function of the button described above is the default operation

LED Banks

The LUMENS have 2, 12 V LED drive channels. TWO led banks can be connected. Polarity of the connection must be observed.

LUMENS

Solar Panel

Solar Panel physical size is not relevant provided the panel can deliver sufficient power to recharge the battery. The recommended panel output is described below in the specifications table.

	Panel	Specifications
	VDC minimum	> 16 Vdc
	VDC maximum	< 30 Vdc
	Idc	> 500 mA* (1.5 Amps Maximum)

*The battery will draw as much current as required to charge. If the



Since there are many solar panels types and brands available, it is not possible to recommend a specific brand or model for purchase. Please consult your local stockiest of solar panels to determine the best available match to the recommended specifications.

Day night function

The Day | Night function used by Lumens is configured by adjusting the sensitivity of the potentiometer. The best time to do this would be at dusk, when the sun is setting. Once this has been configured, the LED channels will illuminate at the same light intensity regardless of the season. This configuration would only need to be performed once.



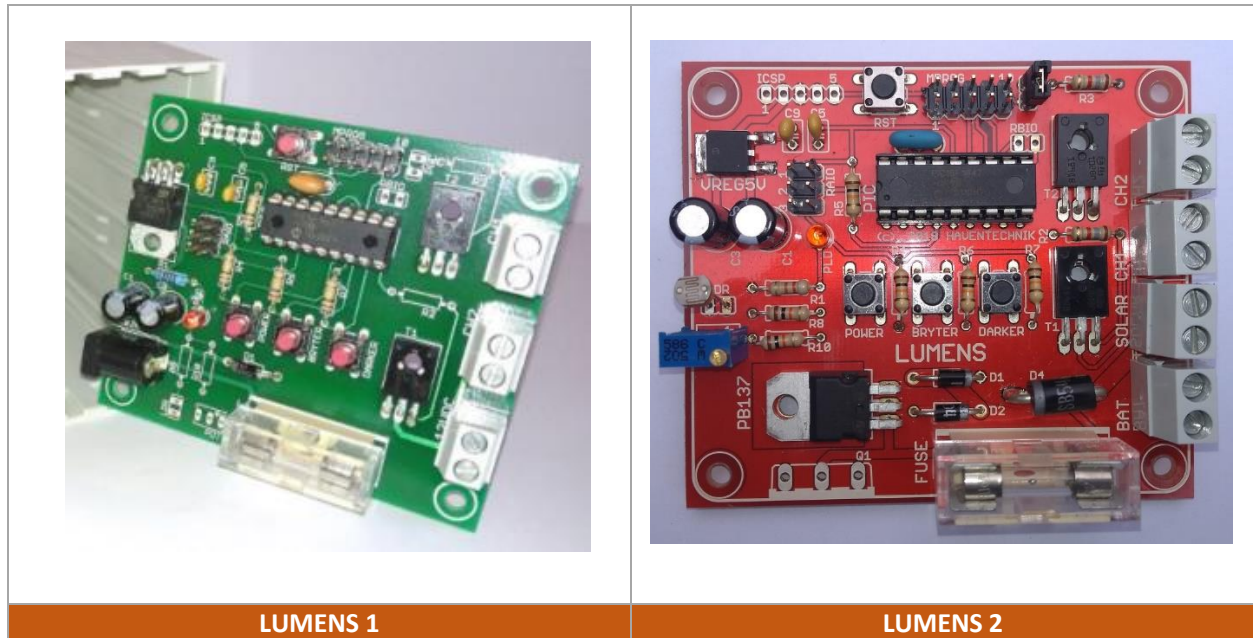
The Lumens Day | Night sensitivity has been preconfigured, so there is no need to adjust the potentiometer unless the ambient light prevents the light sensor from switching and performing its function.

LUMENS

The Lumens Range

The expanding range of PCBs is comprised of the following iterations:

1. LUMENS 1
2. LUMENS 2



Lumens 1

The LUMENS 1 is an LED control only PCB, with the following features

1. Dual Channel Pulse Width modulation driven LED drive
2. Physical Buttons Configurable in software
 - a. Lighting ON / OF
 - b. Light Brighter
 - c. Light Dimmer
3. Day night function
 - a. The Day / Night function is set manually, external to code
 - b. The configuration of the day to night switch over is performed by adjusting a potentiometer for customizable use

LUMENS

LUMENS 2

LUMENS 2 is the same physical size as LUMENS 1 and is therefore a swap out replacement for LUMENS 1. LUMENS 2 includes battery charging capability in the form of the PB137, a specialized charging regulator. The battery charge / operational characteristics are supplemented by a high current pass transistor. This ensures that the charge voltage stays consistent, preventing the PB137 from going into thermal shutdown when under heavy load.

The LUMENS 2 is an LED controller with battery re-charge function, with the following features

1. Dual Channel Pulse Width modulation driven LED drive
2. Physical Buttons Configurable in software
 - a. Lighting ON / OF
 - b. Light Brighter
 - c. Light Dimmer
3. Day night function
 - a. The Day / Night function is set manually, external to code

The configuration of the day to night switch over is performed by adjusting a potentiometer for customizable use.

Lumens User Instructions

Power Up

1. Power up the device by connecting either of the following
 - a. The Battery
 - b. The solar panel
 - c. Bothe the Battery or the Solar Panel
2. Cover the lens of the LDR and the LEDs will illuminate



When powered up for the first time, the Lumens will illuminate at 30%

-
3. Adjust the brightness by pressing either Bryter | Darker buttons
 4. Press the Power button to switch the LEDS ON | OFF



The Lumens will remember | store the last illumination setting.

LUMENS

Lumens Comparison

Below the table identifies differences between the two products.

	Lumens 1*	Lumens 2
Dual Channel Outputs	Y	Y
Customizable Software	Y	Y
Software Configurable Buttons	Y	Y
Day Night Function	Y	Y
Advanced Functionality		
Battery Charge Capability	NO	Y
High Current Pass Capability	NO	Y
*Lumens 1 is available on request or as stock remains available.		

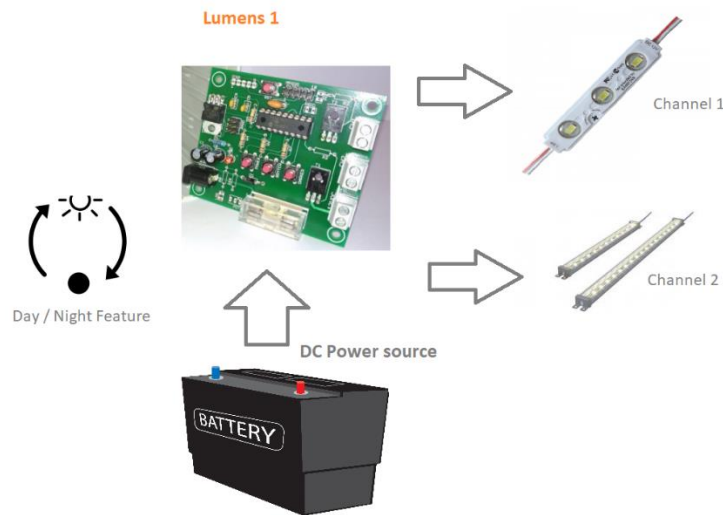
LUMENS

System Installation

Shown below are the installation configurations for Lumens 1 and Lumens 2.

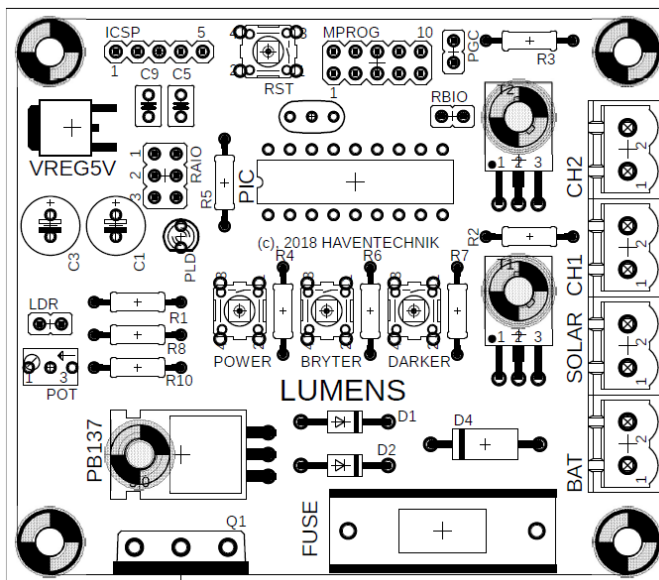
Lumens 1

Lumens 1 is fundamentally an LED lighting controller, with day night functionality.



Lumens 2

Shown below is the line art for the Lumens 2. Please note the orientation of the +ve / -ve connections to ensure that the board is connected correctly



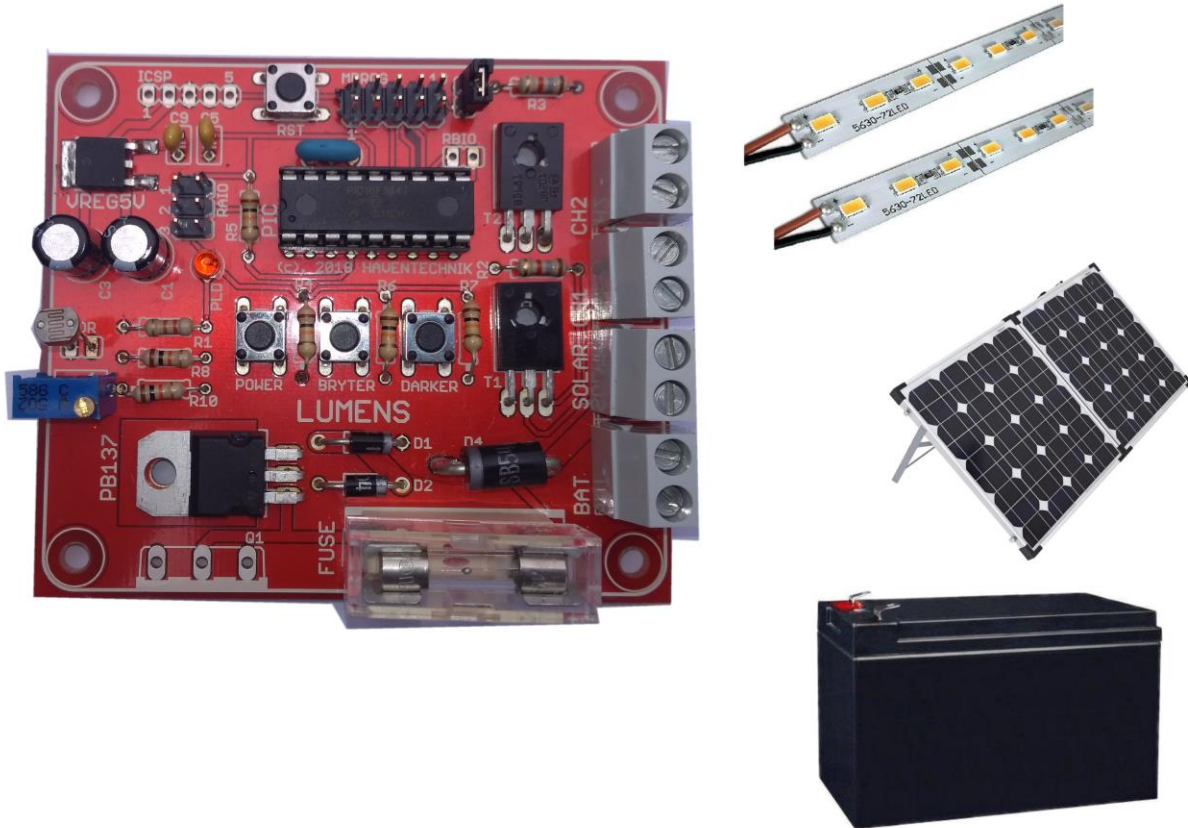
	+ve	-ve
BAT	1	2
SOLAR	1	2
CH1	2	1
CH2	2	1

NOTE: The orientation of the +ve and -ve connections changes between the channels and the power and solar connections.

LUMENS

Basic Connection

Shown below is a image representing the Lumens with the LED banks, Solar panel and battery for connection purposes.

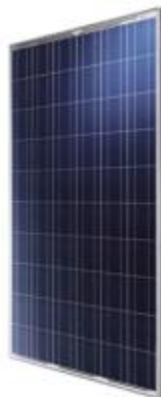


LUMENS

What is needed

NOTE: Since there is a vast array of LED lighting, solar panels and battery brands available examples of what is needed is shown.

- 12 v LED Lighting
- Solar Panel
- 12 Battery



Example Panel



Example Battery

Basic Technical Specifications

Item	Description
Battery*	12 V – 7 AH Sealed lead acid
Solar Panel*	Current > 500 mA Voltage > 16 Vdc and <35 Vdc

*All information listed are guidelines and should be confirmed or verified before implementation.

LUMENS

Appendix

Re programming LUMENS

The series of LUMENS products can be reprogrammed using one of the following products. The information below is not complete and a full discussion of this feature is beyond the scope of this document.

LUMENS contains a PIC microcontroller which allows the system to be reprogrammed with custom code. Once the device is reprogrammed however, all liability rests with the owner of the product at the time and all warranties expressed or implied are void.

The system has two programming interfaces using either the ICSP or MicroProg programming system. To leverage this feature, you will need a PICKIT 3 or a MikroProg programmer. To write the code, a PIC compiler will be required.