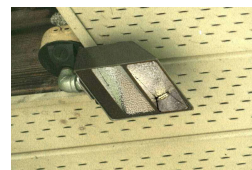# CSbG-EcoLight - Deluxe

Thank you for purchasing the CSbG-*EcoLight-D.* Its design grew out of the need for lighting with low ecological impact: no glare or light trespass with low-power use - and especially, light that will help preserve your health and night vision.
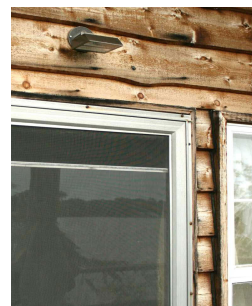
It uses 110-220 or 277 vac – typical of available voltage levels (Line to Neutral fusing), with voltage surge suppression. At full power, it uses about 7-watts and less than 1/2W with daytime standby yet emits almost 500 lumens. And, its adjustability and versatility allows a wide range of applications for subsequent re-purposing.
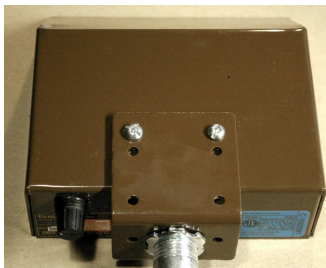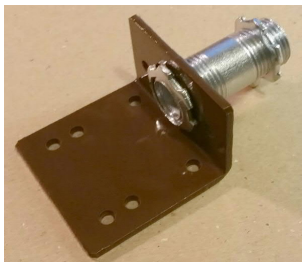
## MOUNTING (Default mounting bracket)

The *EcoLight* has a versatile mounting bracket so you can mount it in several ways. Orient the *EcoLight* to suit your needs. The area of coverage will increase with higher mounting heights, but the ground illumination will decrease. We ask that you do not shine any of the light off your property.

This bracket is attached to the *EcoLight* with two 3/8" #10-32 screws and star washers. The supplied washers are required under the screw heads to ensure the fixture is safely grounded.

The threaded pipe (standard 1/2" x 14 NPS, supplied) connects with most outdoor light fixture mounting plates (not supplied). It can be secured with the clamp nuts (3 are supplied).

INSTALLATION

There are no user serviceable parts inside the *EcoLight*, so don't pry it open. It may damage the internal components.

To connect the *EcoLight*, the supply power must be turned off. The *EcoLight* has three power wires.

**Black = +ve or "*Live*"**
**White = -ve or "*Neutral*"**
**Green = Ground**

Run the *EcoLight* wires through the threaded pipe. In the electrical junction box, connect the black and white wires to the same coloured supply wires using approved electrical connectors. The green wire is connected to the metal of the utility box.

Level the *EcoLight* and tighten the clamp nuts. Turn the supply power back on.

## WHAT TO EXPECT

The *EcoLight-D* is like a young child – it has to learn! We can't just talk to it, so it must learn on its own – from experience. As with all young children we must be patient. But it will learn quickly. The longer the power is turned on, the more it will learn.

However, if you would like the *EcoLight-D* to remain an infant, you may turn it on and off with your light switch. To help protect the environment, it will still dim down to your minimum set brightness, after a few hours of use. If you forget to turn it off, it will automatically turn off at dawn.

If it has dimmed and you want it bright again, just turn the power off-then-on within 1-sec. It will brighten to your maximum setting for about 10-min. Then it will dim to your minimum setting when you are done. If you want it to remain on at the bright setting - increase your dim limit.

### First Power-on (daytime or night installation)
After installing the *EcoLight-D*, the light will turn on for about 10 minutes so you may verify the power is connected. It then turns off until sunset. If the power is first connected at night, then it behaves like "First Night".

### First Night
The *EcoLight-D* gradually turns on over about 1 minute near sunset when the ground dims below the preset threshold level (see "t*nnn*" in the Table on page 4). It will brighten to the "b*nnn*" value (see the Table). On this first night, the light slowly dims after 4-hours to the dim level ( "d*nnn*" in the Table). It slowly turns off at sunrise.

Leave on the power after sunrise so the *EcoLight-D* can learn. Indeed you may leave the power on all the time and the *EcoLight-D* will be able to track the progression of the seasons and the changing length of night.

### Second Night Plus
The *EcoLight-D* will follow its low-impact schedule (see page 5). It turns on after sunset. At about 22:30 (21:30 when in Local Standard Time), it will automatically dim down to its dim setting. It will turn off at sunrise. You may set/reset your desired maximum and dimmed brightness levels at anytime.

If you would like the *EcoLight-D* to dim earlier or later, set an extend value ("E*nnn*" in the Table). Setting E-30 (negative30) will dim the *EcoLight-D* at 10 pm and E30 for 11 pm, and E90 for about midnight.

## PROGRAMMING the EcoLight-DELUXE

The *EcoLight-D* comes with a set of default operating parameters. However it can be wirelessly re-programmed to your needs. The communication range of the Bluetooth is about 20 meters (65 feet) - minimizing the threat from off-site hackers. It uses Bluetooth control freeware for Android and iOS Smart Phones such as from NORDIC. (The NORDIC example is used below.)

The free APP can be downloaded from the APP Store or Google Play (play.google.com/store/apps/details?id=com.nordicsemi.nrfUARTv2&hl=en) - [or search for NORDIC nRF UART APP].

Opening the NORDIC APP presents the first screen (Screen 1). Touch "CONNECT" to list all the Bluetooth devices in range (Screen 2). One of these will be your *EcoLight*. Touching "EcoLight" will bring up Screen 3.

Screen 6          Screen 7          Screen 3          Screen 4          Screen 5

At the bottom of Screen 3 is the line for writing your *EcoLight-D* Commands. Touching this space will bring up Screen 4 so you can type in your commands. Pressing "SEND" (Screen 5) will upload your commands to the *EcoLight*. The upload process will be displayed (Screen 6). Once the parameters are set, you will not need to change them unless you re-purpose the *EcoLight-D*. You can ask questions and upload other parameters that are in the table on the following page. Touching "Disconnect" closes the programming session. Then exit the APP.

Instructions for the use of the more general NORDIC ToolBox APP can be downloaded from our website:

www.csbg.ca/articles/PROGRAMMING_WITH_THE_MORE_GENERAL_NORDIC_TOOLBOX.pdf

You may ask the *EcoLight-D* about a particular setting. The formats of the commands are important, so the following table lists the commands with a description of what they do. (See page 6 for examples.)

Here are a few general notes:

- Commands are case-insensitive. It makes no difference if they are entered as lowercase, uppercase, or a mix.
- Only the minimal number of letters to uniquely identify a command need to be entered.  Usually, this will just be the first letter of the command.  There are a few cases where the first two letters will be needed. In the table, the minimum required letters are in bold.  Of course, there's nothing wrong with entering commands in full.  When there's more than one command that matches what's been entered, the *EcoLight-D* will respond with "ERROR: ambiguous command".
- Passwords ARE case-sensitive and must be entered exactly as specified.
- If a password is set, then it must be entered before any commands can be executed.  The *EcoLight-D* will respond with "Logged on" when the correct password has been entered.  When you're done, use the QUIT command to log off after setting password.

| Command Name | Description |
|---|---|
| **L**ATITUDE**?** <br> **L**ATITUDEnnn | Returns the currently set latitude, in degrees. <br><br> Sets the latitude to nnn, in degrees.  Must range between -90 and 90.  Default is 45. |
| **B**RIGHT**?** <br> **B**RIGHTnnn | Returns the currently set brightness of the bright phase. <br><br> Sets the brightness of the bright phase to nnn.  May not be less than the dim setting, and no greater than 255.  Default is 150. |
| **D**IM**?** <br> **D**IMnnn | Returns the currently set brightness of the dim phase. <br><br> Sets the brightness of the dim phase to nnn.  May not be less than 0, and no greater than the bright setting.  Default is 50.  A setting of 0 will cause the lights to be off during the dim phase. |
| **E**XTEND**?** <br><br> **E**XTENDnnn | Returns the currently-set "Dim-Time" shift, in minutes. Sets the shift in dimming time from the default dimming time (minutes). <br><br> In the late evening the EcoLight-D automatically dims from the bright setting to the dim setting. To shift this time to an earlier or later time, set "nnn" to the number of minutes earlier (-negative) or later (+positive). The range is -99 to +99 minutes.  Default is 0. |
| **T**HRESHOLD**?** <br> **T**HRESHOLDnnn | Returns the photosensor reading that will determine the transition between day and night. <br><br> Sets the EcoLight's day/night threshold to determine when it will turn on, and turn off at sunset and sunrise, respectively. "nnn" is from 1 to 65535. Too low a value may cause the EcoLight-D to never come on.  Too high a value will have the EcoLight-D turn on in daylight.  Default is 50. |
| **N**AME**?** <br> **N**AME abc | Returns the name the EcoLight's Bluetooth radio name. <br><br> Sets the EcoLight's Bluetooth radio name to 'abc'.  The name can be up to 18 characters.  Note there must be at least one space between the command and the name.  Any space or tab characters following the name will be ignored.  The default name is "Ecolightxxxxx", where xxxxx is the EcoLight's serial number. |
| **V**ERSION | Returns the firmware version. |

| Command Name | Description |
|---|---|
| **ST**ATE | Returns the operational state of the *EcoLight-D*. Response will be one of "BRIGHT", "ON", "DIM", "DAYLIGHT", or "OFF" |
| **SE**RIAL | Returns the serial number of the *EcoLight-D* unit. |
| **I**NTENSITY | Returns the current reading from the photo sensor in the same units as the THRESHOLD command. |
| **ON**<br>**OF**F | Turns the EcoLight-Don for an hour, at the Bright setting, if the *EcoLight-D* is not already on.<br><br>Turns the *EcoLight-D* off until the next sunset, if the *EcoLight-D* is not already off. |
| **H**ISTORY | Returns the length-of-day history. The first line is the 'light on time', the number of minutes the light has been or was at full brightness ("B"). The following lines are the number of minutes between sunrise and sunset on the preceding days (up to 20 days), most recent full-day first. The timing is based on the threshold brightness ("T") |
| **C**LEAR | Erases the length-of-day history, resetting the *EcoLight-D* to its 'out-of-the-box' memory. |
| **PA**SSWORD<br><br><br><br><br>**PA**SSWORD | Sets the password. Passwords can be between 1 and 8 characters long, and are case sensitive. Note there must be at least one space between the command and the password. Any space or tab characters following the password will be ignored. Once a password is set, use the QUIT command to block non-authorized Bluetooth access to your *EcoLight-D*.<br><br>Clears the password. Bluetooth access will now be open to anyone. |
| **Q**UIT | If a password is set, this terminates the session. The password must be entered to start a new programming session. |
| **PI**NG | Replies with the word "ping". Can be used to confirm the Bluetooth connection to the EcoLight. |

## HOW BRIGHT FOR HEIGHT?

| Mounting Height meters (feet) | Setting for Approx. Illumination ("*bnnn*" or "*dnnn*") | |
|---|---|---|
| | **1 Lux on Ground** | **3 Lux on Ground** |
| 1 (3.3) | 2 | 8 |
| 2 (6.6) | 10 | 30 |
| 3 (10) | 20 | 70 |
| 4 (13) | 40 | 120 |
| 5 (16) | 60 | 190 |
| 6 (20) | 80 | 255 |
| 8 (26) | 140 | - |

NOTE:
b=255 is ~7 W, b=10 is <1 w,
3-Lx = Read map / instructions
1-Lx = Sense of place, navigation
$\frac{1}{10}$-Lx = Full Moon

| Canadian DSP Requirements | Amber Light |
|---|---|
| Pathways | 1-3 lux (~1 meter) |
| Buildings, Patios | 1-3 lux (~3 meters) |
| Parking Lots and Roads | 3-5 lux (~ 6 meters) |

## DOES THIS SOUND COMPLICATED?

If you don't wish to use the controller, and want to switch it on only when you need it – go ahead. If you forget to turn it off, it will automatically dim after a few hours to save both energy, and the night environment. If you forget to switch it off, it will automatically turn off at dawn.
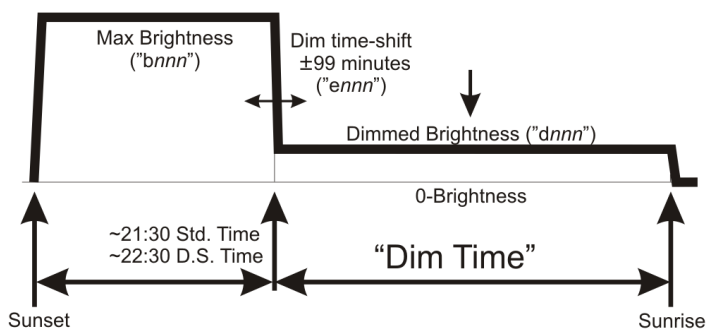
We think the *EcoLight-D* will adapt to the way you want to use it. If it is connected to a separate dust-to-dawn (D2D) sensor, it will still dim late in the evening, but the dim-time shift (*ennn*) is not enabled. If the *EcoLight-D* Threshold (*tnnn*) turns it on too soon for your D2D sensor, set "*t0*". If you find the neighbouring lights are turning the *EcoLight-D* off, then increase this threshold by about 10 units.

If you take a holiday, keep the power on, and the *EcoLight-D* will behave as if you were home.

The *EcoLight-D* can be mounted as high as perhaps 8-meters. (See the two tables in the Section "HOW BRIGHT FOR HEIGHT".) However we ask that you do not shine any of the light off your property. The area of coverage will increase with mounting height, but ground illumination will be dimmer.
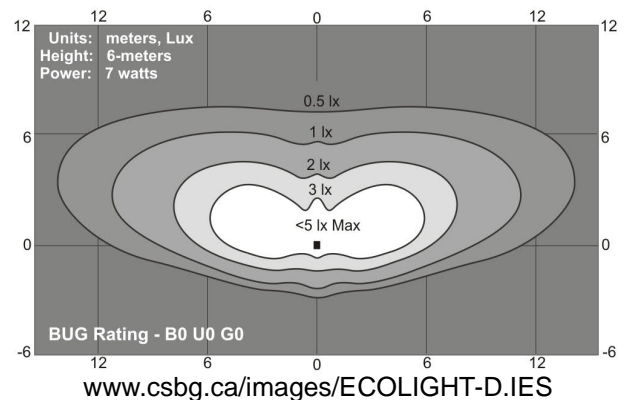
## LOW — IMPACT SCHEDULE

This is the schedule that your *EcoLight-D* will follow once it has been powered-on for a few days. (It needs this time to "learn" how to tell time!) The precise timing will vary depending on the exposure to the sky (foliage above your *EcoLight-D*) and the reflectivity of your ground cover (asphalt, grass or sand).



**LIGHTING SCHEDULE**

**LIGHT**



www.csbg.ca/images/ECOLIGHT-D.IES

**LIGHT DISTRIBUTION PATTERN
(B=255 [Maximum Brightness])**

## DISTRIBUTION PATTERN

The light distribution is typical of Type III coupled with a "forward throw" that minimizes the light loss behind the luminaire. The gradual fall-off in the light to the side enables wide pole-spacing and greater uniformity and fewer light fixtures. However, glare beyond the target area is prevented by the optics.

## HOW TO REVISE THE BRIGHTNESS PARAMETERS

Communication with the EcoLight is through a Bluetooth connection, such as provided by the NORDIC APP referred to on page 3.

### 1) Change the maximum brightness setting ("b")

To find out the maximum brightness setting, write the command - "*b?*" using the NORDIC APP.

The result of your query will be displayed on a screen similar to Screen 6 above. The maximum is b=255 and the minimum is b=1. (The factory default is 150.)

Using table on page 4 as a guide, write other queries and commands for your revised brightness (perhaps revise the maximum brightness ... *b125*). The lowest brightness for "*b*" cannot be less than the dimmed brightness "*d*". The change will occur immediately.

The new brightness level will be displayed on the screen.

### 2) Change the minimum (dimmed) brightness setting ("d").

To find out the dimmed brightness setting, write the command - "*d?*" using the NORDIC APP.

The result of your query will be displayed on a screen similar to Screen 6 above. The maximum is *d255* (if b=255) and the minimum is d=0. (The factory default is *d50*.) Note again that the dimmed brightness (*d*) must be less than the maximum brightness (*b*).

The highest dimmed brightness cannot be more than the maximum brightness (*b?*). The change will occur immediately.

To verify the new bright level, write the command "*d?*".

### 3)  Change the On and Off Threshold ("t")

The *EcoLight-D* bases its turn-on and -off illumination by the reflected light from the ground. Therefore, the ground cover and tree canopy will significantly affect the turn on time. (Note that after sunset, the ground illumination is halved about every 5 minutes.)

When would you like your *EcoLight-D* to turn on? At the time in the evening when you would like it to turn on, write the command "*i?*" using the NORDIC APP. It may say that i= 30. Change the threshold by re-entering the number as "*t30*".

Note, the *EcoLight-D* responds to the threshold only after 5 minutes with the ambient illumination less than the threshold  (sunset) or greater (sunrise). So, be patient.

## MANUAL OVERRIDES

You can temporarily change the programmed automatic operations.

1) If the *EcoLight-D* dims and you want to brighten it again for a few minutes, "flick" the power switch OFF-ON (within a second). The *EcoLight-D* will brighten to your maximum brightness for another 5-minutes.

2) What if you would like to increase the brightness of the *EcoLight-*D to your maximum brightness for an hour? Open the NORDIC APP, connect to the *EcoLight-D* and input the **ON** command. If you turn the *EcoLight-D* on during the day, it will remain on for 5-minutes.

3) You can turn off the *EcoLight-D* for the night. Open the NORDIC APP, connect to the *EcoLight-D* and input the **OFF** command. The change will occur immediately. The *EcoLight-D* will remain off for the rest of the night, but will turn on again after the next sunset.

4) You change the maximum brightness and dim levels at any time. Open the NORDIC APP, connect to the *EcoLight-D* and input the ***bnnn, dnnn*** commands. Similarly, you can change any of the other settings.

## INTERESTING LINKS

Facts about outdoor lighting

       www.csbg.ca/BLOG.HTM

Canadian Guidelines for Outdoor Lighting

       rasc.ca/sites/default/files/RASC-CGOL_2020.PDF

IES Photometric Files for EcoLight-D

       www.csbg.ca/images/ECOLIGHT-D.IES
       www.csbg.ca/images/IESNA_FILE_SET.PDF

## END-OF-LIFE DISPOSAL - Component materials

| Mass (gms) | Parts | Materials |
|---|---|---|
| 260 | Enclosure, Bracket and screws+nuts | aluminium, steel and brass |
| 23 | Mirrors | aluminium |
| 1.2 | Silicone Adhesive / Sealant | Siloxanes and Silicones, Di-me, Hydroxy-Terminated (~80%) |
| 88 | Printed Circuits + Boards | FR4, RoHS compliant components and solder |
| 68 | Window | polycarbonate or acrylic (polymethyl methacrylate) |
| 440 grams | Total | |