

TASKLED

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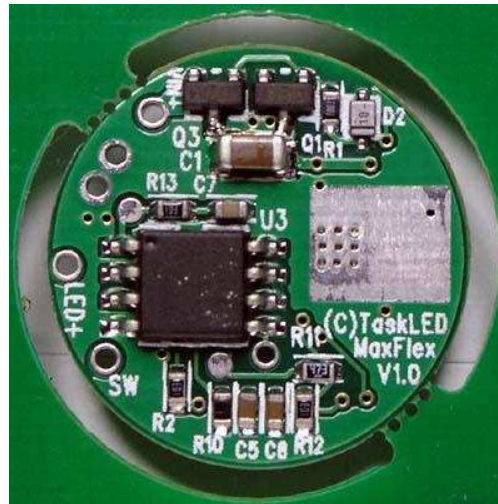
MaxFlex: *** Coming SOON -> BEGINNING OF OCT *******

- Microcontroller based Constant current boost regulator.
- User configuration options stored in non-volatile EEPROM.
- Ships configured for 350mA current limit.
- User reconfigurable current limit: 350/500/700/1000/1200 or 1400mA at any time.
- Two UI's that the user can switch between: Flashlight specific (UIP, 5 brightness levels) or Fixed lighting specific (UIF, 8 brightness levels). Refer to MaxFlex technical section for downloadable PDF manuals.
- Non-volatile storage of brightness level.
- Draws < 50uA when in 'sleep mode' (25uA typical).
- User selectable voltage trip point to warn of low input voltage, useful to protect rechargeable batteries from overdischarge (Refer technical section).
- >85% efficiency.
- Can drive up to 24V of series connected Luxeons
- Operates from 2.5V to 20V (input voltage).
- Open circuit protected (boosts to 24V maximum).
- Board is circular (0.80" diameter)

1 of 2

10/6/2006 2:05 PM

MaxFlex

<http://www.taskled.com/maxflex.html>

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2 of 2

10/6/2006 2:05 PM

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[Technical](#)
[Installation](#)
[History](#)
[Order Products](#)
[Contacts](#)
[home](#) > [technical \(maxFlex\)](#)

******* AVAILABLE NOW *******

MaxFlex ships with UIP (flashlight optimized firmware):

- MaxFlex_UIP (optimized for flashlight version of the firmware) - manual is here:
 - [MaxFlex_ui.pdf](#) (V1.10 of the manual).

Top view of MaxFlex. The exposed rectangular tinned area just above the (C) TaskLED is a direct thermal interface to the bottom of the switcher IC (on the other side of the PCB). If the power dissipation of the MaxFlex board exceeds about 1W it is recommended to affix a heatsink of copper tab to a heatsink to the exposed area.

The VIN+ hole (top left corner) is the input power to MaxFlex.

The two holes below VIN+ (anticlockwise) are both ground pads (input ground and LED- output). MaxFlex has LED- common to battery ground input.

The LED+ hole connects to the LED positive pin and is the 'output' of MaxFlex.

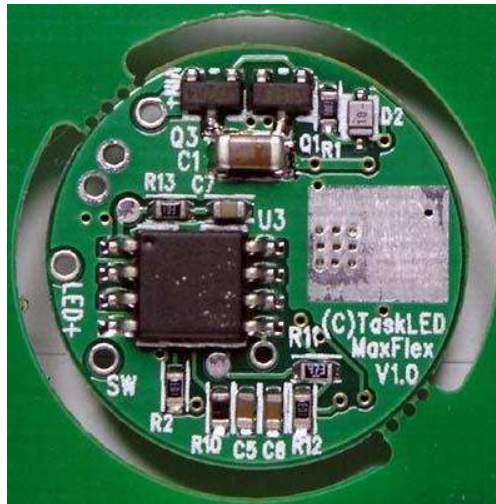
The SW hole below LED+ (anticlockwise) is one side of an external momentary action switch. The other side of the switch must be wired to Ground.

1 of 4

10/6/2006 2:06 PM

MaxFlex Driver Technical Information

http://www.taskled.com/techmaxflex.html

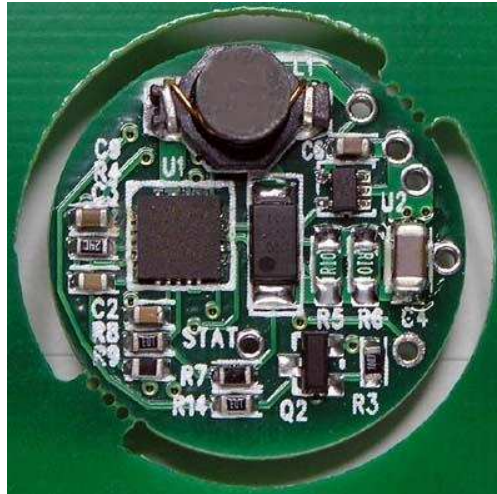


Bottom view of MaxFlex.

Note the pin labeled STAT in the bottom/center of the board. Refer to the operating manual above for how STAT can be used to drive a Red or Amber LED to warn of low voltage.

2 of 4

10/6/2006 2:06 PM



Note, MaxFlex is a Boost regulator (step up), so input voltage must be less than the output voltage to ensure MaxFlex remains in regulation. If the input voltage exceeds the output voltage (at the dialed in drive current), MaxFlex will no longer regulate and the input voltage will go through the series inductor and schottky diode directly to the load. This will cause the output current to a LED to rise rapidly since LEDs have a very steep Current vs Voltage curve (Vf).

Examples on how to calculate battery/LED combinations:

Step 1: Determine output power

$$\text{Power_output} = \text{Number_of_LEDS} * \text{Vf} * \text{Output_current}$$

Step 2: Determine input power

3 of 4

10/6/2006 2:06 PM

$$\text{Power_input} = \text{Power_output}/\text{efficiency}$$

For calculation purposes we can assume efficiency will be 85%

Step 3: Determine input current

$$\text{Input_current} = \text{Power_input} / \text{Battery_voltage}$$

Do this calculation for the lowest Battery_voltage you plan to run

Now, Input_current should be around 2.6A or less for optimal performance of MaxFlex. When running at high input power it is recommended to solder a tab to the pad on the back of the MaxFlex board (the pad is at ground potential) and to bolt it to a heatsink or the body of the flashlight.

Potting Warning:

Areas of the circuitry on MaxFlex utilize high impedance paths and if potting (not required) is to be utilized, the user must ensure that the compound is non-conductive and non-capacitive otherwise correct operation may be compromised.

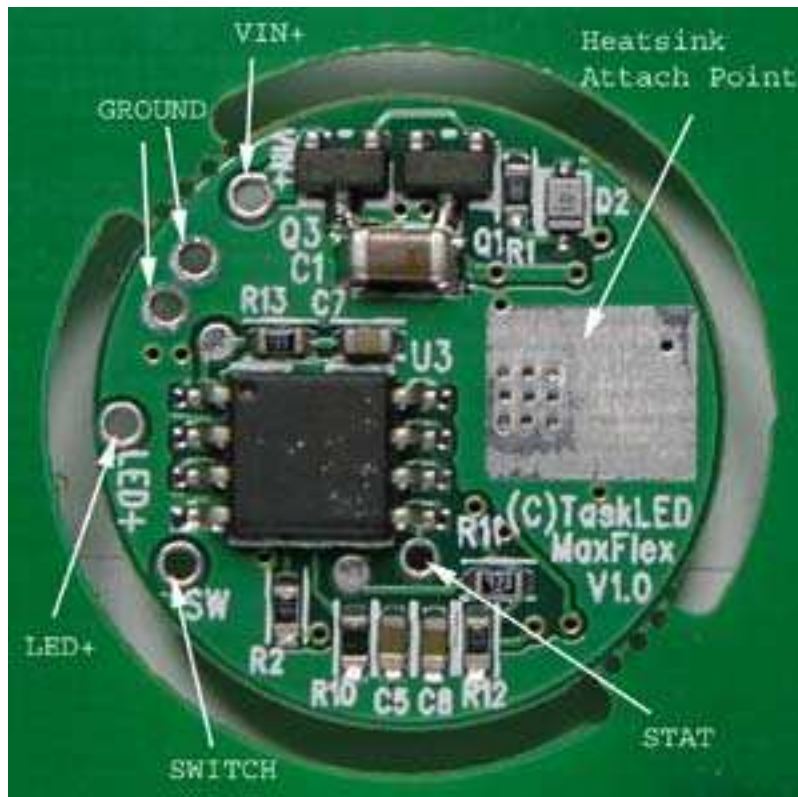
Operating Manual for MaxFlex UI (V1.11)

1 Description

The heart of the MaxFlex board is a Microcontroller (uC) that contains the firmware to implement the following features:

- High efficiency Boost mode (step up) switching regulator (maximum drive current set in firmware).
- Single switch to select from various brightness levels, turn the unit on/off and to select the operating mode.
- Non-volatile (EEPROM) storage of operating mode, last selected brightness level and maximum drive level (350mA, 500mA, 700mA, 1000mA, 1200mA or 1400mA).

1.1 Wiring the MaxFlex



The picture shows the connections to the MaxFlex. The user needs to provide DC power to the MaxFlex (e.g. battery, DC wallwart etc).

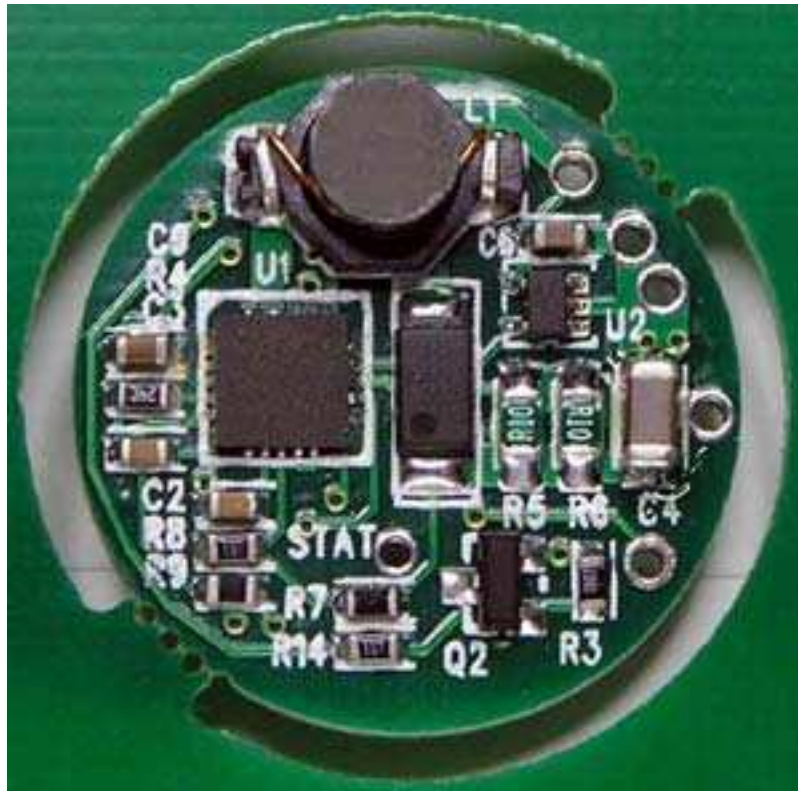
The MaxFlex does not have a switch soldered on the board; a switch must be connected via leads soldered to the holes SW and GND. The switch needs to be of a momentary action push to close type, i.e. normally open contacts.

Input power is connect via VIN+ (positive input voltage) and GND (negative input voltage).

The LED load is connected to LED+ (positive LED) and GND (negative LED).

The STAT pin is driven high (can drive an optional 3mm or 5mm Red or Amber warning LED). The other positive side of LED would connect to STAT and the negative side to GND.

Below is the view of the other side of the MaxFlex board.



As shipped, the MaxFlex is configured for nominal 350mA drive. The user may reconfigure the MaxFlex drive level as described later in this document.

Please refer to the technical section of the TaskLED website for details on working out valid battery/LED configurations.

1.2 Turning the MaxFlex ON the first time

MaxFlex is open circuit protected, so can be safely powered up without a load connected. It will drive a maximum of 24V in this condition. Do not connect the LED load if MaxFlex is powered up as the 24V 'spike' from the output capacitor can damage the LED(s).

The MaxFlex is shipped with the lowest drive level (350mA) as the default and with auto-sleep mode turned off and Poweron mode turned on. When power is first applied, the MaxFlex will drive the Luxeon(s) at the nightlight level (~20mA).

2 Definitions

- Click – a short, less than 0.3 seconds press and release.
- Press – a longer, greater than 0.3 seconds press and hold.
- Force – an option to always have the light turn on at a specific user-selected level.
- UI – User Interface.
- EEPROM – non-volatile memory. Data stored here will remain even if the battery is disconnected.

3 Initial Power Application

As shipped, when power is first applied, the MaxFlex will not light the LED(s). If Poweron Mode is active (it ships by default with it disabled) MaxFlex will power up and light the LED at the lowest level. If the switch is pressed when the electrical circuit is first made, MaxFlex will light up in the same way as if the switch had been pressed from off.

4 Initial Shipped Configuration

MaxFlex is shipped preconfigured as follows:

- Autosleep OFF
 - Force OFF
 - Poweron Mode ON
 - Autolockout OFF
 - 350mA maximum drive
 - Voltage Warning (0V → OFF)
 - Voltage Warning Status (flash interval = 1 second)
 - UIP selected
-

5 UIP (Portable lighting optimized User Interface), 5 Discrete Levels

There are 6 operating modes for UIP. They are described below.

5.1 On/Off Mode

To turn on the light, click the switch. The light will turn on at the previous level or the Force level if Force is enabled.

To turn off the light, click the switch.

5.2 Adjustment Mode

To adjust the brightness of the light start with the light off, then press the switch. The light will always turn on at Level 1 (dimkest level) and in the brightening direction. Release the switch at the desired level, and that new level will be stored in the EEPROM. Pressing the switch again (within 1.5 seconds) will start the light adjustment in the opposite direction (the direction toggles each time).

When the light reaches the dimkest or brightest level it will stay there until the switch is released. Once the switch is released for longer than 1.5 seconds no more brightness adjustment is possible without turning off the light and starting the sequence again.

5.3 Latched Full Brightness Mode

With the light turned on, a press will latch to Level 5 (brightest). A second press will unlatch and return the light to the original brightness level.

To turn off the light, click the switch.

5.4 Lockout Mode

To prevent accidental turn on or unintended use the light can be electronically locked out. Lockout can be manually selected each time prior to turning off the light or a menu option (see Sec 7.4) can auto-lockout every time the light is turned off.

To manually enter lockout, begin with the light on and ensure light is on for at least 1 second. Then click the switch rapidly three times, no more than 0.3 seconds apart. The light will cycle off/on/off and then flash once and then go dim for 2.5 seconds then flash three times. The light is now in lockout mode and can only be turned on again by three clicks spaced no more than 0.3 seconds apart.

5.5 Autosleep Mode

If Autosleep is enabled (see Sec 7.0), the timer will reset and start counting whenever a switch click or press occurs. When the selected number of minutes goes by without a click or press, the Autosleep function will commence dimming the light. The brightness level will visibly drop after each subsequent minute until the lowest light level is reached. After a further 10 minutes elapses from the start of dimming the light will turn itself off.

A press during any time after the dimming has commenced will return the light to its starting brightness level prior to dimming having started.

To turn off the light, click the switch.

5.6 Force Mode

This mode is selected from the power-on menu (see Sec 7). Force mode overrides the initial turn on brightness level that was set via the Adjustment Mode on the previous turn off. The user can always set a new temporary light level by using the Adjustment mode during turn on, but it will be overridden the next time the light is turned off and back on.

6 UIF (Fixed lighting optimized User Interface), 8 Discrete Levels

There are 6 operating modes for UIF. They are described below.

6.1 On/Off Mode

To turn on the light, click the switch. The light will turn on at the previous level or the Force level if Force is enabled.

To turn off the light, click the switch.

6.2 Turning the MaxFlex ON to an alternate brightness level

Pressing the button for longer than $\frac{1}{2}$ a second but less than $1\frac{1}{2}$ seconds will select the nightlight illumination level. To aid the user in knowing this level is being selected, the Luxeon will illuminate at the nightlight level after $\frac{1}{2}$ a second. This level is stored in the EEPROM as the current illumination level.

Pressing the button for longer than $1\frac{1}{2}$ seconds will select the full brightness illumination level. To aid the user in knowing this level is being selected, the Luxeon will switch to full brightness level after $1\frac{1}{2}$ seconds. This level is stored in the EEPROM as the current illumination level.

6.3 Adjustment Mode

There are 7 equally spaced brightness levels (human eye model) in addition to the nightlight level. With the MaxFlex already switched on, the user can scroll through the brightness levels by pressing the button for longer than $\frac{1}{2}$ a second. The brightness will either increase or decrease one level every $\frac{1}{3}$ of a second. MaxFlex will toggle from the bright or dim direction each time the button is released.

If the unit is turned on and the unit starts in nightlight mode, then the direction is initially set to increasing. If the unit is turned on and the unit starts in full bright mode, then the direction is initially set to decreasing. If the unit is turned on at any in between level then the direction is initially set to decreasing.

Each time the brightness level is changed the new level is stored in EEPROM ready to be retrieved next time the unit is turned back on.

6.4 Lockout Mode

To prevent accidental turn on or unintended use the light can be electronically locked out. Lockout can be manually selected each time prior to turning off the light or a menu option (see Sec 7.4) can auto-lockout every time the light is turned off.

To manually enter lockout, begin with the light on and ensure light is on for at least 1 second. Then click the switch rapidly three times, no more than 0.3 seconds apart. The light will cycle off/on/off and then flash once and then go dim for 2.5 seconds then flash three times. The light is now in lockout mode and can only be turned on again by three clicks spaced no more than 0.3 seconds apart.

6.5 Autosleep Mode

If Autosleep is enabled (see Sec 7.0), the timer will reset and start counting whenever a switch click or press occurs. When the selected number of minutes goes by without a click or press, the Autosleep function will commence dimming the light. The brightness level will visibly drop after each subsequent minute until the lowest light level is reached. After a further 10 minutes elapses from the start of dimming the light will turn itself off.

A press during any time after the dimming has commenced will return the light to its starting brightness level prior to dimming having started.

To turn off the light, click the switch.

6.6 Force Mode

This mode is selected from the power-on menu (see Sec 7). Force mode overrides the initial turn on brightness level that was set via the Adjustment Mode on the previous turn off. The user can always set a new temporary light level by using the Adjustment mode during turn on, but it will be overridden the next time the light is turned off and back on.

7 Menu Selection (Configuring MaxFlex)

This section describes how to enter the Menu system and how to change operating options. The changes will be stored in the EEPROM.

To access the Menu, begin with the light on and ensure light is on for at least 1 second. Then click the switch rapidly three times, no more than 0.3 seconds apart. The light will cycle off/on/off and then flash once and then light up dim. The Menu Mode is now active and you can select the Menu you wish to access.

Click the switch from 1 to 8 times (the LED will flash for each click) to select one of the five menu options to change as listed below. If no click occurs within 2.5 seconds lockout is set. If more than 7 clicks (10 clicks performs a configuration reset, refer Sec 7.8) are entered, the menu mode is exited, the LED flashes quickly 5 times to indicate a selection error and the light turns off.

After clicking from 1 to 7 times wait for the LED to light up dim (unless your choice is zero clicks). Then continue as below.

7.0 Zero clicks – Times Out to Lockout

If no menu is selected (zero clicks), after 2.5 seconds the LED flashes quickly 3 times to indicate Lockout has been set. The LED then turns off and the unit is locked out. To turn it back on requires following the lockout release sequence of three quick clicks as outlined in Sec 5.4 and Sec 6.4.

7.1 One click - Autosleep Enable/Disable

Initially the LED will be dim to indicate Autosleep will be active with 15 minutes. Each click will cycle through the next time value. The sequence is:

- 15 minutes, initial value (LED dim)
- 30 minutes (LED brighter)
- 1 hour (LED brighter)
- 2 hour (LED brighter)
- 4 hour (LED brighter)
- 8 hour (LED brighter)
- Autosleep disabled (LED off)

When you are happy with the choice, wait 2.5 seconds and the LED will flash once to indicate the selection has been made and MaxFlex will then turn off.
has been made and the light will then turn off.

7.2 Two clicks - Force Mode Enable/Adjust/Disable

Initially the LED will dim to indicate Force Level 1 (dimkest) will be active (i.e. if you don't click, Force will become active and set to Level 1). Each click will cycle to the next Force setting. The sequence is:

- Force Level 1 (LED dim)
- Force Level 2 (LED med/low)
- Force Level 3 (LED medium)
- Force Level 4 (LED med/high)
- Force Level 5 (LED brighter)
- Force Level 6 (LED brighter – ONLY AVAILABLE IN UIF)
- Force Level 7 (LED brighter – ONLY AVAILABLE IN UIF)
- Force Level 8 (LED brighter – ONLY AVAILABLE IN UIF)
- Force Disabled (LED is off)

The sequence will cycle through all 6 choices for UIP and all 8 choices for UIF. The LED brightness matches the 5 (or 8) operating levels of the UI. When you are happy with the choice, wait 2.5 seconds. The LED will flash once to indicate the selection has been made and the light will then turn off.

7.3 Three clicks – Poweron Mode Enable/Disable

MaxFlex can be configured to either power-up with the LED lit or unlit when power is first applied. E.g. In a light that has a power switch in series with MaxFlex and the battery the user may want MaxFlex to light up the LED as soon as the power switch is turned on. In this case the user would Enable Poweron Mode.

Initially the LED will be dim to indicate Poweron Mode will be enabled (i.e. if you don't click, Poweron Mode will be enabled). A click will brighten the LED to indicate Poweron Mode will be disabled. Each click will cycle from enabled to disabled. When you are happy with the choice, wait 2.5 seconds and the LED will flash once to indicate the selection has been made and the light will then turn off.

7.4 Four clicks – Auto-lockout Enable/Disable

To prevent accidental turn on or unintended use, the light can be electronically locked out. Auto-lockout can be enabled so that each time the light is turned off it enters Lockout and requires 3 quick clicks or 2 quick clicks and a press to turn the light back on.

Initially the LED will be dim to indicate Auto-lockout will be active (i.e. if you don't click, Auto-lockout will become active). A click will brighten the LED to indicate Auto-lockout will be inactive. Each click will cycle from active to inactive. When you are happy with the choice, wait 2.5 seconds and the LED will flash once to indicate the selection has been made and the light will then turn off.

7.5 Five clicks – Current Drive Selection

Initially the LED will light up dim to indicate the 350mA current drive will be active. Each click will cycle to the next current drive level. The sequence is:

- 350ma (LED dim)
- 500mA (LED brighter)
- 700mA (LED brighter)
- 1000mA (LED brighter)
- 1200mA (LED brighter)
- 1400mA (LED brightest)

The sequence will cycle through all 6 choices. The LED brightness increases at each click. When you are happy with the choice, wait 2.5 seconds. The LED will flash once to indicate the selection

7.6 Six Clicks – Voltage Warning Setting

MaxFlex can be configured to warn the user when low input voltage occurs. The user can set the voltage warning to any value between 0V – 20V.

Entering the voltage is performed by setting a number in the format: xy.z (e.g. 06.8V).

Once 6 clicks are entered, the LED will dim and wait for entry of the 'x' (tens). Click 0 to 2 times. Wait and after 2.5 seconds the LED will flash once to signify that 'x' has been accepted.

The LED will dim again and wait for entry of the 'y' (units). Click 0 to 9 times. Wait and after 2.5 seconds the LED will flash once to signify that 'y' has been accepted.

The LED will dim again and wait for entry of the 'z' (tenths). Click 0 to 9 times. Wait and after 2.5 seconds the LED will flash once to signify that 'z' has been accepted and then MaxFlex turns off.

The xy.z value is stored in the EEPROM and can be changed by following the above procedure as often as necessary.

7.7 Seven Clicks – Voltage Warning Status

How MaxFlex reports the low voltage condition is configured using this menu option.

MaxFlex reports the low voltage condition via the STAT pin on the PCB. STAT will drive high (~2.5V) when the low voltage condition is detected. It will drive back to 0V when the low voltage condition is no longer detected. The STAT pin can drive a single 3mm or 5mm (at approximately 20mA). If this feature is used, wire the 3mm or 5mm LED between STAT and GND.

If the user does not want to wire a status LED to the STAT pin but still wants an indication of low voltage occurring, then the main LED(s) can be set to flash at a specific interval to give a visual warning. The main LED(s) will flash off for 0.1seconds, long enough to warn the user,

but short enough that the user can ignore the warning (in an emergency) and continue to use the light.

- 0 click (dim) → Main LED(s) flash once per 1 sec (undervoltage) - default
- 1 click (brighter) → Main LED(s) flash once per 5 sec (undervoltage)
- 2 click (brighter) → Main LED(s) flash once per 10 sec (undervoltage)
- 3 click (brighter) → Main LED(s) flash once per 30 sec (undervoltage)
- 4 click (brighter) → Main LED(s) flash once per 60 sec (undervoltage)
- 5 click (goes off) → No Main LED(s) flash for undervoltage

7.8 Eight clicks – User Interface Selection

Initially the LED will light up dim to indicate UIF will be active (i.e. if you don't click, UIF will become active). A click will light the LED up bright to indicate UIP will be active. Each click will cycle between UIF and UIP. When you are happy with the choice wait and after 2.5 seconds the LED will flash once to indicate the selection has been made and the light will then turn off.

7.9 Nine Clicks – Illegal entry

The LED flashes quickly 5 times to indicate a selection error and the light will then turn off.

7.10 Ten Clicks – Configuration Reset (to Initial shipping defaults)

If the user wants to reset MaxFlex menu options to their initial shipping defaults, this menu option will perform that function. All configuration options will return to their defaults, refer to Sec 4.

Initially the LED will be dim to indicate a Configuration Reset will not occur (i.e. if you don't click to toggle this option). A click will brighten the LED to indicate a Configuration Reset will occur. Each click will toggle from active to inactive. When you are happy with the choice, wait 2.5 seconds and the LED will flash once to indicate the selection has been made and MaxFlex will then turn off.

7.11 Menu Selection Complete

Once the above menu procedure is complete and the light turns off the new menu selection is immediately active. MaxFlex is ready to be used.

Only one menu item can be changed per Menu Selection sequence, i.e. MaxFlex turns off after one sequence.