

Package Contents

- LED Relay Zone Controller

Tools Required

- Screwdriver
- Wire nuts

Product Description

The LED relay zone controller uses wireless technology to communicate with other self-powered EnOcean based products and provides an amazingly simple solution for dimming control of LED lighting.

The compact size enables flexible installation inside of or next to electrical boxes and fixtures so it can be easily wired out of sight using standard wiring practices.

Simply link the module to an EnOcean-based motion sensor, light level sensor or rocker switch and experience levels of efficiency and convenience that can only be achieved through wireless controls.

It is also possible to connect a 12V DC powered, wired occupancy sensor.

Product Features Include:

- Enables wireless dimming of a single fixture or a zone of multiple daisy chained LED fixtures (e.g. 20 each 30W or 10 each 60W).
- Supports California Title 24 daylight harvesting scenarios, occupancy control and manual dimming with input from self-powered wireless switches and sensors. Implements load shedding initiated by separate Demand Response controllers
- Installs inside or mounts to electrical box using threaded connector
- Supports wireless remote commissioning to link devices and set parameters

Specifications (typ. values)

Power Supply	120V - 277V VAC, 60 Hz
Maximum Load	General Purpose: 16A @ 120/277VAC Resistive: 16A @ 120/277VAC Tungsten: 960W @ 120VAC Ballast / LED Driver: 600W @ 120VAC
0-10V output	Tolerances +3%/-4% (1-10V range) Current sinking 35mA*, sourcing 20mA
Power Consumption	1W full load 0.35W quiescent
Surge Protection	3kV line to line, exceeding IEC61000-4-5 installation class 4
Inputs/Outputs	Flying-lead style wires: <ul style="list-style-type: none"> ■ 2 power input wires ■ 1 switched output wire ■ 0-10V control output ■ 12V DC external occupancy sensor Interface (25mA load max) only for LEDRU-W-AU
Local User Interface	2 Buttons, 1 bi color LED for device configuration & manual control
RF Standard	EnOcean 902 MHz (LEDRU)
Transmission Range	100 ft. (30 m)
Status reporting EEP (Outbound EnOcean Equipment Profile)	D2-40-00 (default) A5-11-01 (alternate) A5-38-08 (Master / Gateway)
RECOM	V1.1 - Compatible with Navigan™
Interoperable Products / EEPs (Inbound EnOcean Equipment Profiles)	Rocker Pad Switch (F6-02-02) Occupancy Sensor (A5-07-01, A5-07-02, A5-07-03) Light Level Sensor (A5-06-02, A6-06-03) Central Controller (A5-38-08) Demand Response (A5-37-01)
Dimensions	2.78" H x 1.65" W x 1.1" D (73mm x 42mm x 28mm)
Weight	3.2oz. (90g)
Mounting	<ul style="list-style-type: none"> ■ Connect to electrical boxes and fixtures using threaded nipple ■ Install inside standard electrical box
Environment	<ul style="list-style-type: none"> ■ Indoor use only ■ 32° to 140° F (0° to 60° C) ■ 20% to 85% relative humidity (non-condensing)
Agency Compliance	UL244A, UL 1472, CSA/CAN C22.2 No. 184.1, FCC, IC UL2043 Plenum Rated

* For high sinking current and dim value settings below 1V, the output voltage may exceed the selected output value and reach 1V max.


1. Planning

Take a moment to plan for the module's successful operation and optimal communication with other system components.

- Always use a qualified installer
- Install in an appropriate location
- Take care not to damage the radio antenna, the orange wire that runs in a groove on the outside of the module that runs in a groove on the outside of the module
- Consider the construction materials in the space and obstacles that may interfere with RF signals

2. Installing

Read and understand instructions completely before starting.

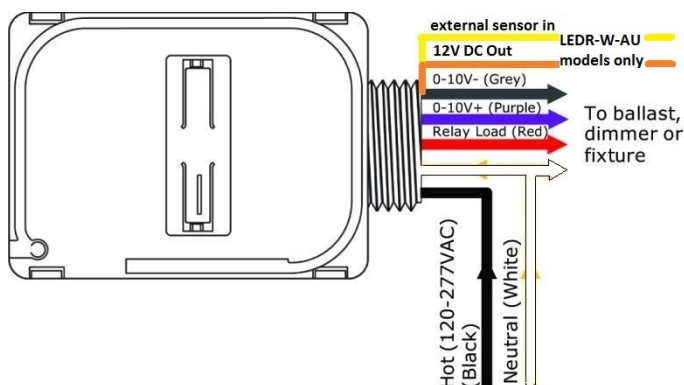
	<p>ELECTRICAL SHOCK HAZARD</p> <p>High Voltage. This device must be installed by a qualified installer or electrician. Follow all applicable electrical codes for installation.</p>
--	--

1. Turn off power at the circuit breaker or fuse and test that power is off before wiring the device.

NOTE: Use a non-metal electrical enclosure for best wireless communication performance.

2. Identify the wiring connection at the installation site to coordinate with the following wiring diagram.

NOTE: For display purposes, white wire is shown as yellow.



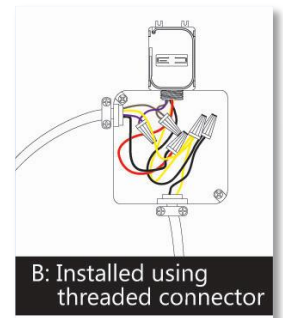
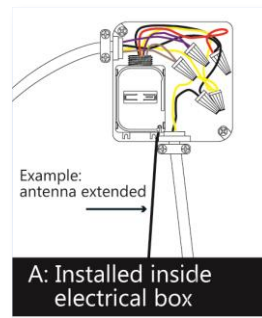
3. Determine which of the two installation methods is most appropriate:

- A. Installed inside the electrical box.


NOTE: For best performance, remove the antenna from its slot and elongate it outside and away from the box.

- B. Installed using the threaded connector:

- i. Insert the threaded connector through a 1/2" diameter knockout.
- ii. Thread the 5 module wires inside the electrical box and through the lock nut.



4. Connect the wires using wire nuts and cap any bare wires.
NOTE: After the module is linked and configured, you can secure it in the installed location, see step 8.
5. Fold the wires neatly and either place the module in the box or secure the threaded connector with the lock nut.
6. Position the module so that the setup interface and antenna face forward (out).
TIP: If the RF reception is poor, elongate the antenna as shown in figure A.
7. LEDRU-W-AU models only: If connecting an external Occupancy sensor, use the orange 12V DC out wire to supply the sensor, connect Sensor Ground to the Grey wire and connect the Yellow external sensor in wire to the Occupancy sensor output. The sensor output must be able to connect the yellow wire to 12V in case of occupancy, otherwise to disconnect.
8. Restore power to the circuit.
9. Use the setup interface to link devices and configure settings (refer to the "Linking" & "Configuration" sections).

	<p>Shorting the Relay Load (RED) or shorting the 0-10V output wires (Grey/Purple) will cause permanent damage to the LED controller. The 0-10V control lines must be connected to matching control interfaces</p>
---	---

	<p>only or capped.</p> <p>DO NOT WIRE HOT!!</p>
--	--

3. Device Configuration

The LED controller can be configured in two ways:

- By user input to the local setup interface
This approach is used for basic setup tasks
- Remotely using the remote commissioning interface
This approach is used for advanced configuration tasks

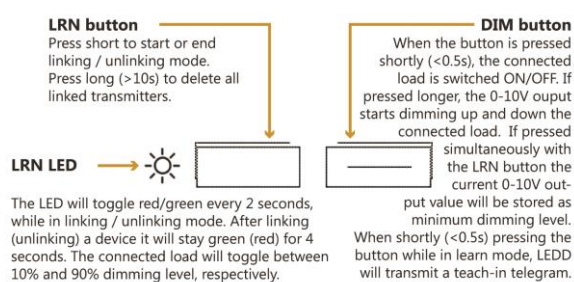
Local User Interface

The local setup interface consists of two buttons - LRN and DIM - and a 2-color LED (green, red).

During normal operation, the LED blinks shortly once per second according to the output relay state (red = OFF, green = ON).

The two buttons can be used to link and unlink transmitters, to dim up and down manually and to set the minimum dimming value.

To use the local setup interface, hold the module so both thumbs can click the buttons without obscuring the LED.



Remote Commissioning Interface

The LED controller provides a wireless remote commissioning interface for all commissioning tasks. This interface allows configuring all device parameters wirelessly using a laptop computer equipped with **Navigan™ Wireless Commissioner** (NWC 300U), consisting of a USB stick and software.

Configurable parameters are marked as *italic* throughout this document. A list of all configurable parameters is available on the EnOcean product web site.

4. Linking

Linking is the process by which different devices are configured to work with each other in a system. Sometimes this process is also called "Teach-in" or "Learn-in".

The LED controller links to different types of devices:

- Transmitters (switches and sensors) can provide input data to the LED controller
- Transceivers (Gateways or controllers) can exchange data and commands with the LED controller
- An LED controller is also capable of controlling other LED controllers in a Master / Slave scenario.

To establish links, the LED controller must be powered and within wireless range of the device it is to be linked with.

Inbound link / unlink procedure

Inbound links are connecting wireless switches, sensors or gateways to the LED controller. An established link will allow the external device to control output and dimming level. Refer to interoperable products EEP table (Page 1, under Specifications) for linkable devices.

To establish inbound links, the LEDR has to be set in Learn mode and the link candidate must send a learn message.

To set the LEDR into Learn mode, press the LRN button for 1 second. The LRN LED starts toggling red / green indicating that linking / unlinking mode is active. In parallel, the output will turn on and the connected loads will toggle between 10% and 90%.

Once activated, this mode stays temporary active to provide time to link / unlink multiple devices. The mode will stop itself after 30 seconds if no LRN telegram is received.

1. For the transmitter to be linked, do one of the following according to the type of device:
 - A. Rocker Pad: click the "I" button (top button marked on the switch plastic or "I" symbol on the back of the switch) 3 times quickly.
 - B. Sensor: click the designated link button.
 - C. Gateways: refer to specific Gateway user manual
2. If the device has been linked successfully, the LRN LED will display solid green for 4 seconds and the output will stay at 90% during this period. Afterwards, the Learn Mode continues and the LED controller is ready to accept more inbound links.

- For a linked transmitter to be unlinked, just send another link message using the same action as described in 1. If the device has been unlinked successfully, the LRN LED will display solid red and the load will be switched to a dimming level of 10% for 4 seconds.
- To exit linking / unlinking mode and return to normal operation, wait 30s without sending new link messages, or press the LRN button again for 1 second.

Inbound Link Checker

If a device is linked, learn telegrams received in operating mode (not in linking / unlinking mode) from that device will cause the connected load to toggle between 0% and 100%, if the *EnableLinkChecker* parameter is set to *ON*.

This allows quickly checking both logical and radio link between this device and the LED Controller.

Factory reset clears all linked transmitters

In order to clear all linked devices and reset the LED controller to factory settings, press and hold the LRN button for 10 seconds till the LRN LED will display solid red. Release the button. The LED will stay red for 10 seconds to indicate a successful factory reset.

Outbound Links / send outbound link message

The LED controller can report its own status and in addition is capable of instructing other LED controllers to match its own output. Changing parameter *Status Reporting EEP*, one EEP from Status Reporting EEP table (Page 1, under Specifications) may be chosen.

To link a LED controller outbound, it is possible to trigger the transmission of an outbound link message, also called Learn Telegram:

- Set the link-receiving device (e.g. Gateway, LED controller as slave) into linking mode, and then press the LRN button for 1 second. The LRN LED starts toggling indicating that linking / unlinking mode is active. The connected load will toggle between 10% and 90%.
- Shortly press the DIM button. This will cause the LED Controller to transmit a link message (teach-in message) identifying the status message EEP used by it.
- Press the LRN button again for 1 second or wait 30 seconds to return to normal operation.

Setting the minimum output voltage level

It is possible to configure the minimum output voltage (*MinVoltageLevel*) of the LED Controller via its button interface. This level is typically set to avoid flickering and will be the minimum level the load starts at when it is switched on. It will not be possible to dim the output below this value.

Use the following steps to configure this minimum dimming value:

- Press and hold the DIM button.
The load will start dimming up and down slowly and continuously, while the LRN LED will flash green twice a second (double blink speed).
- Release the button when the desired minimum output voltage (dimming value) is reached.
- Press both DIM and LRN button shortly and simultaneously to store this value. The LRN LED will flash red twice within one second to confirm storage.

5. Operating modes

The LED Controller supports the following operation modes based on different types of connected devices:

Mode	Default Action	Title 24 Compliance
Switches only	Manual DIM or ON/OFF	No
Occupancy sensors only	Auto ON/ Auto OFF (default Auto OFF after 15 minutes)	No
Occupancy sensors and switches	Manual DIM or ON, Auto OFF Can be configured to Auto ON / Auto OFF via remote commissioning. (default Auto OFF after 15 minutes)	Yes
Light level sensor	Continuous dimming based on 5 supporting points or two level (ON / OFF) dimming	Yes
Additional central controller	Dimming via central controller overriding sensor and switch input	Yes
Additional demand response	During a demand response event output will be reduced to the value specified in the command. After the demand response	Yes

controller	timeout the system will switch back to the previous state.
------------	--

6. Functional behavior

0-10V Interface

The minimum output voltage is *MinVoltageLevel* (default 1.0V); the maximum output voltage is *MaxVoltageLevel* (default 10.0V).

Dimming below *MinVoltageLevel* or above *MaxVoltageLevel* is not possible.

Level and ramp percentage levels refer to the interval between *MinVoltageLevel* (1%) and *MaxVoltageLevel* (100%). An output level of 0% equals OFF state.

Switches only

Short click (<0.7s) on "I" button: Light comes ON and brightens to most recent dimming value stored before device was switched OFF or to the *FixedOutputLevel* value (default=75%) if *EnableFixedOn*=enabled (default=disabled). If a light level sensor is linked, then light will be set according to its input (see below). The minimum initial light level in this case is *MinVoltageLevel* (default 1.0V).

Double click (<0.7s) on "I" button: Light is switched ON at *MaxVoltageLevel* (default 10.0V).

Short click (<0.7s) or double click (<0.7s) on "O" button: The current light level is stored, light is dimmed down to *MinVoltageLevel* and then switched OFF.

Ramp up (*RockerSwitchOnSpeed*) and ramp down (*RockerSwitchOffSpeed*) speeds for rocker switch operation are configurable (default 20% per second).

Press and hold "I" / "O" button: Light is brightened / dimmed until button is released or *MinVoltageLevel* / *MaxVoltageLevel* is reached.

Ramp up (*RockerDimUpSpeed*) and ramp down (*RockerDimDownSpeed*) speeds for rocker dim operation are configurable (default 20% per second).

Rocker-based dimming can be disabled by setting *RockerDimEnable* = OFF. In this case light will be switched ON / OFF immediately upon pressing the "I" / "O" button.

Light can be switched OFF automatically in absence of a linked occupancy sensor if no user (switch) action occurs during a period defined by *RockerSwitchAutoOffTimer*.

This feature can be disabled by setting *RockerSwitchAutoOffTimer* = 0. This feature is automatically disabled if an occupancy sensor is present. In this case, automatic switch OFF of the light will be performed based on the input from the occupancy sensor as described below.

Occupancy Sensors only – Auto Off Timers

If at least one sensor detects motion, Light level is set to *Auto On Light Level* (default 100%). Default setting (*OccAutoOn* = disabled) is disregarded in this scenario.

If none of the linked occupancy sensors reports motion for a period defined by *Auto Off Time1* (default 10min) then light is set to *Auto Off Level 1* (default 50%) and timer 2 starts with *Auto Off Time 2* (default 5min). *Auto Off Level 1* is always relative to the current light level when timer 1 did elapse. For instance, if the Auto On Light Level had been changed to 80%, the resulting absolute light level for timer 2 is 40%, cutting the level in half (with *Auto Off Level 1* = 50% = default). If Timer 2 has elapsed, the light level will be switched to *Auto Off Level 2* (default 0%).

Any motion detected by any linked occupancy sensor will reset both timers and the light level back to timer 1 level.

Ramp up (*SensorRampUpSpeed*) speed for Auto ON and ramp down (*SensorRampDownSpeed*) speed for Auto OFF are configurable (default 20% per second).

Occupancy Sensors and Switches

Light can be switched ON / OFF manually, function as described above. Time-based automatic switch OFF (as defined by *RockerSwitchAutoOffTimer*) is always disabled if at least one occupancy sensor is linked.

While no presence is reported by any of the linked occupancy sensors and no switch input is received, both Auto Off Timers will act as described above. Any input will reset both Auto Off Timers.

Light will be automatically turned back ON to timer 1 value if occupancy is reported within the *VacancyGraceTimer* period (default 45s) after such Auto OFF event even if the Auto ON function is disabled.

The system can also be configured (*OccAutoOn* = Enabled) to automatically switch ON the light as described above.

If the user has switched the light OFF (by a linked switch) then it can be turned ON again by occupancy sensor input only after *OccAutoOnDelay* (default 15 minutes).

Light Level Sensor

One light level sensor can be linked to enable open-loop dimming for daylight harvesting. The system then adjusts the output light level according to incoming natural light.

The light level sensor should therefore be placed at a position facing the window or skylight where it is not or only minimally influenced by light from the fixtures.

If a light level sensor is linked, the LED controller will by default activate daylight harvesting with continuous open loop dimming according to a user-defined dimming curve based on 5 configurable supporting points and *RampSpeed*.

Each of these 5 supporting points defines the output light level (*OUT1* ... *OUT5*) to be set by the LED controller for a given reported natural light level (*LEV1* ... *LEV5*).

For natural light levels below *LEV1*, output light level *OUT1* is set. Likewise, for natural light levels above *LEV5*, output light level *OUT5* is set. Linear interpolation is used between the defined points (e.g. between *LEV1/OUT1* and *LEV2/OUT2*).

Setting the output light level to 0 will cause the output of LEDR to go to OFF state.

If the output has been switched on by an occupancy Auto on event, the *Auto On Light Level* value will be replaced by the dimming curve output value.

If the dimming curve defined light level has been adjusted by user rocker interaction, the selected light level will be temporary maintained for a period defined by *LlsAdjustmentDelay* (default 15 minutes).

The light level sensor can alternatively be used to activate an automatic switching mode between 0% (OFF) and 100% (*MaxVoltageLevel*) based on light intensity (twilight switch). This can be achieved by configuring *DaylightingMode* to 2-level mode via remote commissioning.

The thresholds for switching between the two levels are defined by *PhotoOnThres* and *PhotoOffThres*.

Repeater function

The LED controller provides the option to activate one-level (repeat only original telegrams) or two-level (repeat original telegrams or telegrams that were repeated once) repeater mode for EnOcean radio telegrams.

By default (*RepeatLinkedDevicesOnly*=ON) only messages from linked devices are repeated. Setting this parameter to 0 will cause all messages to be repeated.

Note: 2-level repeating function and repeating of all messages (*RepeatLinkedDevicesOnly*=OFF) should only be used if really needed! Otherwise the system function can be compromised by collisions of telegrams.

Status messages

The LED controller will transmit a status message defined by the selected outbound EEP for every change of its output state or after *StatusMessageTimer* has elapsed.

By setting *StatusMessageTimer* to 0 status messages can be switched off completely. By setting it to 0xFFFF only event based messages will be sent.

7. Troubleshooting

Problem	Solution Checklist
The device does not power up	<ul style="list-style-type: none"> • Check the wiring for errors • Check the circuit breaker • Use a voltage meter to confirm power
The device does not control linked load	<ul style="list-style-type: none"> • Click the DIM button to open/close the relay manually • Turn off the power and then restore it
Cannot link a device	<ul style="list-style-type: none"> • Move closer to the device; it may be out of range • Try linking a different device • Check for environmental conditions that interfere with RF signals • Verify the maximum number of 32 inbound devices has not been exceeded and not more than 1 Light Level sensor has been linked
The device does not respond to wireless messages or selected settings	<ul style="list-style-type: none"> • Check for environment or range issues • Verify the device is linked • Extend the antenna to amplify the range: remove it from the groove in the module, and straighten it.



Contains: FCC: SZV-TCM515U
IC: 5713A-TCM515U

This device complies with part 15 of the FCC rules and Industry Canada ICES-003. Operation is subject to the following two conditions: (1) This device may not cause

harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT! Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

8. Remote Commissioning Parameters

Parameter	Description	Default / Notes
Rocker Switch Parameters		
RockerSwitch-OnSpeed	Ramp-up speed when rocker input request light switch ON	20%/s 0= No ramp (immediate)
RockerSwitch-OffSpeed	Ramp-down speed when rocker input request light switch OFF	20%/s 0= No ramp (immediate)
RockerDim-UpSpeed	Ramp-up speed when rocker input request light dim UP	20%/s 0= No ramp (immediate)
RockerDim-DownSpeed	Ramp-down speed when rocker input request light dim DOWN	20%/s 0= No ramp (immediate)
RockerSwitch-AutoOffTimer	Delay after last switch action before light is switched OFF automatically	0 (disabled)
RockerDimEnable	Enables or disables dimming via rocker switch	ON (enabled)
Scene Pair 1,2 Button 1,2	Defines light levels for scene buttons	1,25,50,75
Occupancy Sensor Parameters		
OccAutoOn	Defines if a signal from an occupancy sensor automatically switches on lights (True/False)	FALSE if at least one switch is linked, otherwise TRUE
OccAutoOnLevel	Dimming value at which light is switched on in case of Auto ON event from occupancy sensor	100%
OccAutoOnDelay	Time before the occupancy sensor can switch the light back ON in Auto ON Mode after the user switched it OFF	15 min
OccAutoOffTime1	Time after which current light level will be relatively changed by AutoOffLevel1	10 min
OccAutoOffTime2	Time after which lights will be switched to AutoOffLevel2	5 min
OccAutoOffLevel1	Factor applied to current light	50%

	level if AutoOffTimer1 elapses	Range: 0-200%
OccAutoOffLevel2	Output value to which lights will be dimmed if AutoOffTimer2 elapsed	
VacancyGrace-Timer	If occupancy is detected within the VacancyGraceTimer period after an occupancy Auto OFF event, lights are turned back ON	45 s
Field device	Enables and defines the wired external occupancy sensor input	disabled

Light Level Sensor Parameters

DaylightingMode	2-level or 5 point continuous daylight dimming	5 point
PhotoOnThres	In case of 2-level mode, light is switched to MaxVoltageLevel if light level is below PhotoOnThres	<200lux
PhotoOffThres	In case of 2-level mode, light is switched to MinVoltageLevel if light level is above PhotoOffThres	>400lux
LEV1...5	Defines 5 input light levels for open loop dimming curve (LEV1<LEV2<...<LEV5)	100, 200, 400, 600, 800 lux
OUT1...5	Defines the LED controller output values for the corresponding input light levels	100, 100%, 60%, 20%, 0%
RAMP	Ramp speeds between light levels	1%/s
LlsAdjustment-Delay	Time before the light level sensor can adjust the output light level after it was set by the user	15 min

Generic Sensor Parameters (Occupancy and Light Level)

SensorRamp-UpSpeed	Ramp-up speed when change is triggered by an occupancy or light level sensor (2 point mode)	20%/s 0= No ramp (immediate)
SensorRamp-DownSpeed	Ramp-down speed when change is triggered by an occupancy or light level sensor (2 point mode)	20%/s 0= No ramp (immediate)

Parameter	Description	Default / Notes
System Parameters		
MinVoltageLevel	Minimum 0-10V output voltage level when light is switched ON	1.0V
MaxVoltageLevel	Maximum 0-10V output voltage level when light is switched ON	10.0V
0-10VRelayDelay	Delay between switching the relay on and starting to ramp up the 0-10V output	50ms
ModeAfter-PowerLoss	ModeAfterPowerLoss (ON/OFF/LAST STATE)	LAST STATE
StatusMessage-Timer	Defines, how often status messages are transmitted (seconds, 0=off, 0xFFFF=only event based)	0xFFFF
RepeaterFunction	Defines the repeater level of the device (OFF/1-Level/2-Level)	OFF (disabled)
RepeatLinked-DevicesOnly	Configures the repeater to only repeat telegrams from devices linked to it	ON (enabled)
Enable-DebugMessages	Enable or disable debug messages	OFF (disabled)
EnableLink-Checker	Enable or disable link checker (if a learn telegram from a linked device is received while in operating mode, the 0-10V output will toggle once between 10% and 90%)	ON (enabled)
Switch diming curve	Defines four different diming curved	Linear curve
Enable relay on permanently	Relay out line voltage will not be cut off if enabled	Disabled
Accumulated uptime value	Accumulated time for output = On	n/a
Average output value	Average output dim level over entire usage while output is on	n/a
Fixed output level	Light level used for On after power loss (if on is selected, see Mode AfterPowerLoss) of for a short rocker click "I"	75%
Fixed output on	Short rocker click "I" sets output value to FixedOutput Level if enabled, otherwise to last state before turned off.	disabled
Status reporting EEP	Defines outbound EEP	D2_40_00
Link Health Mode	Can be used to check RSSI levels of inbound links, LED controller will send a special message for every link based event or the entire network	disabled
Secure telegram type	Sets encryption to standard or advanced	Standard
Device identification 1-6	Can be used to store a string of Characters in the LED EEPROM for the purpose of naming the device or the location	n/a