LED Zone Controller 0-10V Installation Guide

Antenna (insulated end)

LRN button

DIM button

0.83" (21mm)

2.24"(57mm)

1.65" (42mm)

Wires: Gray, Red, Violet

Threaded connector and lock nut

1.20" (30.5mm)

Package Contents

- LED Zone Controller

Tools Required

- Screwdriver
- Wire nuts

Product Description

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

LEDD is directly supplied from the auxiliary 12V supply output of a connected LED driver. Its 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 link LEDD to a central controller or via a gateway to building automation systems like BACnet.

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	11.0 V – 13.2 V DC
Supply Current (typ)	16 mA @12VDC supply (no sourcing) 38 mA @12VDC supply (10V/20mA sourcing)
Power Consumption	< 200 mW @ 12 V DC (excluding 0-10V sourcing power) < 460 mW @ 12 V DC (at maximum 0-10V sourcing power)
0-10V output	Tolerances +3%/-4% (1-10V range) Current sourcing / sinking 20 mA* * For high sinking current and dim value settings below 1V, the output voltage may exceed the selected output value and reach 1V max.
Inputs/Outputs	Flying-lead style wires: - 2 power input wires - 2 output wires for 0-10V control
Local User Interface	2 Buttons, 1 LED for device configuration & manual control
RF Standard	EnOcean 902 MHz (LEDRU)
Transmission Range	80 ft. (25 m)
EnOcean Equipment Profile	D2-40-00 with RECOM Compatible with Navigan™
Interoperable Products / EEPs (EnOcean Equipment Profiles)	Rocker Pad Switch (F6-02-02) Occupancy Sensor (A5-07-01) Occupancy Sensor (A5-07-02) Occupancy Sensor (A5-07-03) Light Level Sensor (A5-06-02) Light Level Sensor (A6-06-03) Central Controller (A5-38-08) Demand Response (A5-37-01)
Dimensions	2.24″ H x 1.65″ W x 1.2″ D (57mm x 42mm x 30mm)
Weight	2.5oz. (70g)
Mounting	- Connect to electrical boxes and fixtures using threaded nipple - Install inside standard electrical box
Environment	- Indoor use only - 32° to 140° F (0° to 60° C) - 20% to 95% relative humidity (non-condensing)
Agency Compliance	FCC, IC UL 2043 plenum rated

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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.

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.
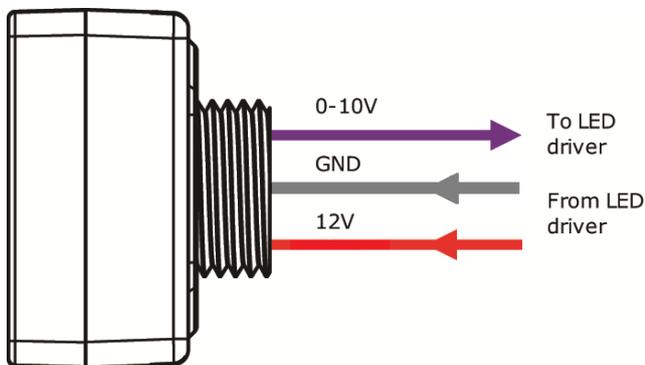
3. Connect the wires to the LED driver according to the wiring diagram shown above. Position the module so that the setup interface and antenna face forward (out).

   TIP: If the RF reception is poor, elongate the antenna as shown in figure A.

4. Restore power to the circuit.

5. Use the setup interface to link devices and configure settings (refer to the "Linking" & "Configuration" sections).

   WARNING: Move the module away from any power line before using the local setup interface.

3. Device Configuration

The LED controller can be configured in two ways:

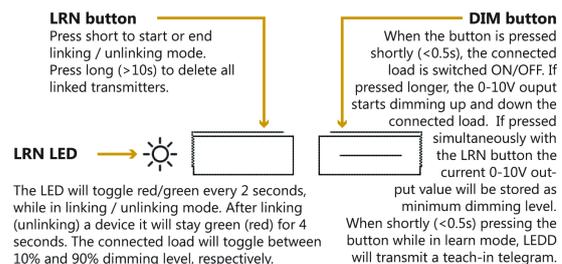- By user input to the local setup interface
  This approach is used for basic setup tasks

- 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).

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.

LRN button
Press short to start or end linking / unlinking mode. Press long (>10s) to delete all linked transmitters.

LRN LED
The LED will toggle red/green every 2 seconds, while in linking / unlinking mode. After linking (unlinking) a device it will stay green (red) for 4 seconds. The connected load will toggle between 10% and 90% dimming level, respectively.

DIM button
When the button is pressed shortly (<0.5s), the connected load is switched ON/OFF. If pressed longer, the 0-10V ouput starts dimming up and down the connected load. If pressed simultaneously with the LRN button the current 0-10V output value will be stored as minimum dimming level. When shortly (<0.5s) pressing the button while in learn mode, LEDD will transmit a teach-in telegram.

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.

Parameters that are configurable using the Navigan Wireless Commissioner NWC 300U are marked in *italic* throughout this document.

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 can work together with two types of devices:

n Transmitters (switches and sensors) can provide input data to the LED controller

n Transceivers (gateways or controllers) can exchange data and commands with the LED controller

To link LED controller with a transmitter or transceiver, LED controller must be powered, within wireless range of the device it is to be linked to, and set to linking mode to accept links.

Once these conditions are met, the link device is triggered to send a special link message. LED Controller receives this link message and stores the link parameters permanently so that the two devices can interact to provide a variety of intelligent control options.

Linking to transmitters (sensors or switches)

Transmitters are typically energy-harvesting devices that send RF messages to communicate a condition, level, or state.

The following wireless transmitter types can be linked to the LED controller:

n Switches

n Occupancy Sensor

n Light Level Sensor

Transmitters can only be linked to transceivers (such as LED controller), not to other transmitters (such as switches).

Transmitter link / unlink procedure

1. Shortly press the LRN button to enter linking / unlinking mode. The LRN LED starts toggling red / green indicating that linking / unlinking mode is active. In addition, the connected load will toggle between 0% and 100%. Once activated, this mode stays temporary active to provide time to link / unlink multiple devices. The mode will stop after 30 seconds if no LRN telegram is received.

2. For the transmitter to be linked, do one of the following according to the type of device:

   A. Sensor: click the designated link button.

   B. 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.

3. If the device has been linked successfully, the LRN LED will display solid green for 4 seconds. The LED controller is now ready to accept new links.

   NOTE: After a device is linked, additional learn telegrams received in operating mode (not in linking / unlinking mode) from that device will cause the connected load to toggle three times between 0% and 100%, if the *EnableLinkChecker* parameter is set to *ON*. This allows quickly checking the connection between this device and the LED Controller.

4. For a linked transmitter to be unlinked, please use the same action as described in point 2 above.

5. If the device has been unlinked successfully then the LRN LED will display solid red for 4 seconds and the load will be switched to a dimming level of 10% for 4 seconds.

6. To exit linking / unlinking mode and return to normal operation, wait 30s without sending new LRN telegrams, or shortly press the LRN button again.

Clear all linked transmitters

In order to clear all linked devices and reset the LED controller to factory settings, please press and hold the LRN button for 10 seconds. After that the LRN LED will display solid red for 10 seconds.

Linking to Transceivers (gateways or controllers)

The LED controller is a transceiver.

Transceivers are controlling devices that send as well as receive RF messages. They typically contain control logic and might actuate appropriate outputs (switching a light ON or OFF for example).
LED controller can be linked to other transceivers if desired. The following other transceiver types are supported:

n Demand Response Controller

n Central Controller

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Transceiver link / unlink procedure

1. Set the other device into linking mode, then shortly press the LRN button. The LRN LED starts toggling indicating that linking / unlinking mode is active. The connected load will toggle between 10% and 90%.

2. Shortly press the DIM button. This will cause the LED Controller to transmit a teach-in message identifying the status message EEP used by it.

3. Shortly press the LRN button again 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:

1. Press and hold the DIM button.
   The load will start dimming up and down.

2. Release the button when the desired minimum output voltage (dimming value) is reached.

3. Shortly press DIM and LRN button simultaneously to store this value.

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 controller	During a demand response event output will be reduced to the value specified in the command. After the demand response timeout the system will switch back to the previous state.	Yes

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.

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 "0" 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" / "0" 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

If at least one sensor detects motion, light is switched ON - Auto ON function. Light level is set to *OccAutoOnLevel* (default 100%) if no light level sensor is linked.

Otherwise light level is set according to the natural light level reported by the light level sensor as described below.

If none of the linked occupancy sensors reports motion for a period defined by *OccAutoOffTimer* (default 15min) then light is set to *OccAutoOffLevel* (default 0%) - Auto OFF function.

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.

If no presence has been reported by any of the linked occupancy sensors and no switch input has been received during a period defined by *OccAutoOffTimer* (default 15min), then light will be set to *OccAutoOffLevel* (default 0%).

Light will be automatically turned back ON at the last state 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* = TRUE) 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.

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 light level has been adjusted by the user (by single or double click on the "I" button or by brightening / dimming via "I" / "O" button), then the selected light level will be maintained for a period defined by *LIsAdjustmentDelay* (default 15 minutes).

After that, LEDR output is adjusted according to the light level reported by the light level sensor.

In five point dimming mode, users can modify the dimming curve if *LIsEnableCurveAdjustment* = ON.

This is achieved using a fast triple click (<0.7s) on the "I" button. Doing so will replace the supporting point matching most closely the current reported illumination level with the current illumination level and the current 0-10V output level.

The connected light will blink (0% / 100%) three times to acknowledge successful adjustment. Doing that at different daylight levels allows defining the whole curve.

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* (output will be set to *MaxVoltageLevel* for reported values below this level) and *PhotoOffThres* (output will be set to *MinVoltageLevel* for reported values above this level).

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 (EEP D2-40-00) after 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.

Central controller

LEDR can also be connected to a central controller (EEP A5-38-08). It supports the dimming command 0x02 of this EEP.

7. Troubleshooting

Problem	Solution Checklist
The device does not power up	• Check the wiring for errors • Check the circuit breaker • Use a voltage meter to confirm power
Cannot link other devices	• Check if linking mode can be accessed • 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 devices has not been exceeded - 20 switches - 10 occupancy sensors - 1 light level sensor - 1 central controller - 1 demand response controller
The device does not respond to wireless messages or selected settings	• Check for environment or range issues • Verify the device is linked • Check if appropriate devices are linked according to good system planning • Extend the antenna to amplify the range: remove it from the groove in the module, and straighten it.

Contains: 902 MHz: FCC: SZV-STM300U
IC: 5713A-STM300U

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)
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
OccAutoOffTimer	Time after which lights will be switched to OccAutoOffLevel in case of no motion	15 min 0=disabled
OccAutoOffLevel	Dimming value to which lights will be dimmed after an occupancy sensor Auto OFF timer event	0%
VacancyGrace-Timer	If occupancy is detected within the VacancyGraceTimer period after an occupancy Auto OFF event, lights are turned back ON	45 s

Parameter	Description	Default / Notes
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%
RAMP12, 23, 34, 45	Ramp speeds between light levels 1 and 2, 2 and 3, 3 and 4 , 4 and 5	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
LlsEnable-CurveAdjustment	Enables or disables user adjustment of the 5 point dimming curve using triple click on the "I" button	ON (enabled)

Generic Sensor Parameters (Occupancy and Light Level)

Parameter	Description	Default / Notes
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
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)