ST Engineering LCUN35G Light Control Unit User Manual

Contents

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Street Lighting Control

- Street lighting is one of the most essential services provided by municipalities and the lighting's electricity bill is one of their major expenses. The Telematics Wireless' T-Light™ networks enable municipalities and utilities to control and manage street light operations with operational efficiency and cost-effectiveness.
- T-Light Galaxy Network – a wide area network utilizing a single Base Station that covers an area of up to 20 km radius and monitoring directly thousands of luminaries.
- The Galaxy network comprises of three major elements:
- LCU – Light Control Unit / Node, installed on top or inside the luminaire (external "NEMA" or internal configuration), enabling the transmission of information, and the reception of control commands for the luminaire's LED fixtures. Includes built-in energy metering and possesses auto-commissioning functionality.
- DCU – Data Communication Unit / Base station – The information from and to the LCU is routed via the DCU and via the Internet, using GPRS/3G or Ethernet connections directly to the BackOffice application.
- CMS – Control and Management System- is a web-enabled BackOffice application, accessible at any location in the world simply by using a standard browser, such as Internet Explorer or Google Chrome. CMS usually

contains a database of static and dynamic LCU information: ambient light values, lighting and dimming schedules, power usage, status, etc.

Figure 1 – System Topology

LCU NEMA model LCUN35G

The LCU NEMA is installed on top of a luminaire cover into a standard NEMA receptacle

Standard Features

- Light sensor – Operates as a photocell with the integrated microcontroller and is used as a backup light control in the event of microcontroller failure.
- Energy meter – Continuous measurement collection and aggregation with 1% accuracy.
- Integrated RF antenna.
- Over the air firmware updates.
- Each unit is configurable as a repeater, resulting in one additional ‘hop’ from the DCU.
- Real Time Clock
- Network data is protected by AES 128 encryption.
- Relay Control for LED driver/ballast power.
- Uses licensed frequency.
- Built in GPS receiver for auto-commissioning
- “Auto Detection and Verification” Software

“Auto Detection and Verification” Software
The LCU NEMA includes the Telematics “Auto Detection and Verification” software that automatically detects and stores the ballast type (1-10V or DALI) in the LCU. The ballast type is then retrieved during the commissioning process, thereby eliminating the need to enter it manually into the CMS (auto detection process also occur each time the power turns on from off state)
Note: By default, the “Auto Detection and Verification” procedure works during the day and the night. To configure the procedure to work only during daylight hours, contact Telematics support.

Options for Commissioning
Commissioning is the last step in the installation process whereby each LCU is identified in the CMS. In order for the CMS to communicate with individual LCUs or groups of LCUs, the CMS must receive the GPS coordinates for each installed LCU. Installer activity during installation is partially dependent on whether the LCU NEMA is equipped with one of the commissioning-related components.

GPS
If the LCU NEMA contains a GPS component, the coordinates are obtained without installer involvement.

No Commissioning Components
The installer uses a customer-supplied GPS device to obtain the coordinates. The installer then manually records the LCU's serial number, pole number if any, and coordinates in a comma-separated value (CSV) file.

Safety Instructions

- Only qualified personnel should perform the installation.
- Follow all local electrical codes during installation.
- Although it is not necessary to disconnect power to the pole during installation, one should always be aware of possible exposure to electrical elements.
- When working from heights, it is important to follow standard safety precautions to avoid any danger of potential injury.
- Use appropriate work tools.

Mandatory Customer-Supplied Equipment
System integrity for the LCU NEMA is ensured with the mandatory installation of customer-supplied voltage and current surge protection equipment.

Mandatory Voltage Surge Protection
Warning: To prevent damage due to power network voltage surges, it is mandatory that you also provide and install a surge protection device to protect the LCU and the luminaire driver.

Mandatory Current Surge Protection
Warning: To prevent damage due to power network current surges, it is mandatory that you also provide and install a 10 amp slow-blow fuse or a circuit breaker to protect the LCU and the luminaire driver.

Technical Data

Electrical Characteristics

Feature	Specification
Dimming – Ballast/Driver Communication Protocols	DALI, Analog 0-10V
Operating Input Voltage	120-277V AC @50-60Hz
Load Current – Optional 7-pin	10A
self-consumption	<1W
Internal Surge Protection	350J (10kA)
Operating Temperature	-40° F to 161.6° F (-40° C to +72° C)
MTBF	>1M hours
Isolation	2.5kVac/5mA/1Sec

RF Radio Characteristics

Parameter	Value	Unit
Operating Frequency:	450-470, License band	MHz
Network Topology	Star	
Modulation	4GFSK	
Maximum Transmitter output power	+28	dBm
Bandwidth	6.25	KHz
Data Rate	4.8kbps	
Receiver sensitivity, typical	-115dBm@4.8kbps	dBm
Antenna Type	built in Antenna	

Dimensions

Model	**Measurements**
External – NEMA	3.488 in D x 3.858 in H (88.6 mm D x 98 mm H)
Weight	238 g

Figure 2 - LCU NEMA Enclosure

Electrical wiring

NEMA receptacle Wiring

Following is a wiring diagram for a NEMA receptacle with dimming pads for use with the LCU NEMA:

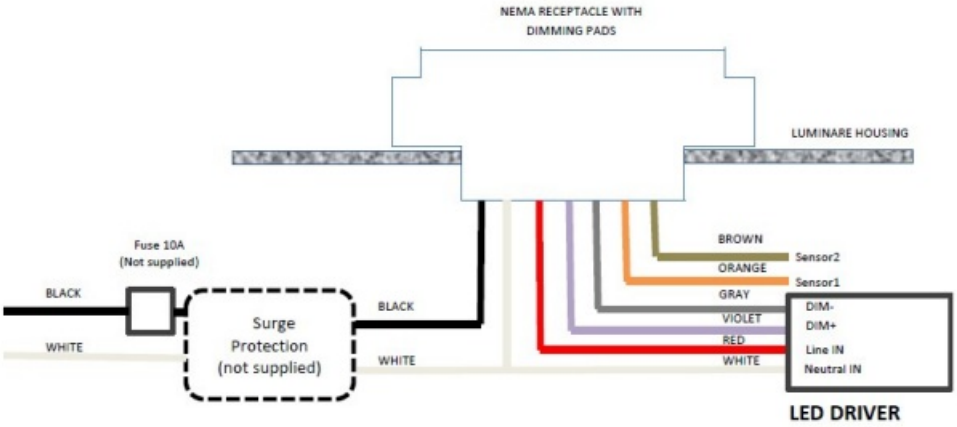

Figure 3 - NEMA Receptacle Wiring Diagram for use with LCU NEMA

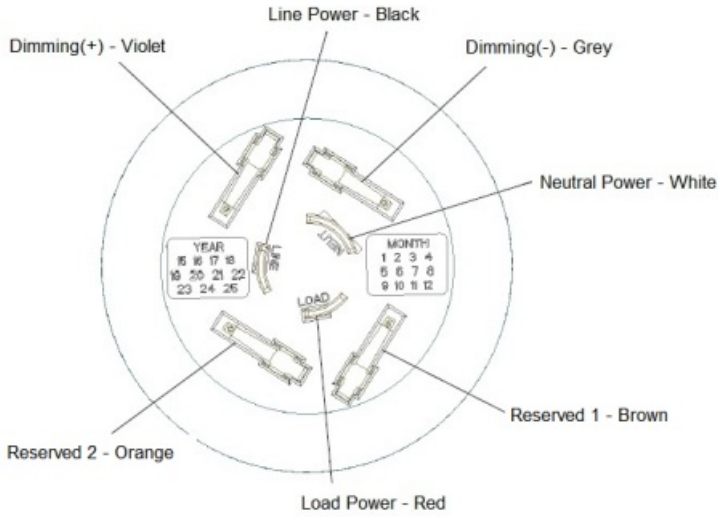

Figure 4 - LCU NEMA 7-Pin Contact Interface

LCU NEMA Contact Details

#	Wire Color	Name	Purpose
1	Black	Li	AC Line In
2	White	N	AC Neutral
3	Red	Lo	AC Line Out: Load
4	Violet	Dim+	DALI(+) or 1-10V(+) or PWM(+)
5	Gray	Dim-	Common GND: DALI(-) or 1-10V(-)
6	Brown	Reserved 1	Dry Contact Input or serial communication
7	Orange	Reserved 2	Output Open Drain or serial communication

LCU NEMA Pinout

		LED Driver		
Model	**Pin 1-2** **Black-White**	**Pins 3-2** **Red-White**	**Pins 5-4** **Gray-Violet**	**Pins 6-7** **Brown-Orange**
NEMA 7-pin	Main AC Line IN Mai n AC Neutral IN	AC for lamp Line O UT Neutral IN	Dimming – 1-10V An alog, DALI, PWM,	Digital input – Dry c ontact, output open drain, Serial communication

Standards Compliance

Region	Category	Standard
All	Quality Management Systems	ISO 9001:2008
	IP Rating	IP 66 per IEC 60529-1
Europe	Safety	IEC 61347-2-11 (IEC 61347-1)
	EMC	ETSI EN 301-489-1 ETSI EN 301-489-3
	Radio	ETSI EN 300-113
United States Canada	Safety	UL 773 CSA C22.2#205:2012
	EMC/Radio	47CFR FCC Part 90 47CFR FCC Part 15B RSS-119 ICES-003

Regulation Information

FCC and Industry Canada Class B Digital Device Notice
The digital circuit of this device has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAN ICES-3 (B)/NMB-3(B)
This Class B digital apparatus complies with Canadian ICES-003.

Industry Canada interference Notice
This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

FCC interference Notice
This device complies with part 90 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

FCC and Industry Canada Radiation Hazard Warning
WARNING! To comply with FCC and IC RF exposure compliance requirements, the device should be located at a distance of at least 20 cm from all persons during normal operation. The antennas used for this product must not be co-located or operated in conjunction with any other antenna or transmitter.
WARNING! Changes or modifications to this equipment not expressly approved by the party responsible for compliance (ST Engineering Telematics Wireless Ltd.) could void the user's authority to operate the equipment.

Installation Overview

Important Note: Read the entire Installation Guide before beginning the installation process. It is assumed that the customer has installed the following:

- NEMA ANSI C136.10-2010 and C136.41-2013 compliant receptacle in the luminaire cover.
- Required customer-supplied voltage and current surge protection.

Preparing for installation is different depending on which, if any, GPS coordinate obtaining components are in the LCU NEMA. See the Pre-Installation topic in each of the following chapters
Note: The only acceptable format for importing GPS coordinates into the CMS is decimal degrees. See Appendix A. – About GPS Coordinate Formats.

The installation process consists of different steps depending on the following:

- Telematics GPS component
- Type of network
- LCU information preloaded into the "Equipment Inventory"
- No GPS component and no preloading

In order to verify the installation by observing the “Auto Detection and Verification” ON/OFF light sequence:

- If the “Auto Detection and Verification” procedure was configured to work only during daylight hours, schedule the installation accordingly.
- Prepare an easy to use list of the expected ON/OFF light sequence, including dimming if configured.

Installation with the GPS Component

1. Install the LCU NEMA. See 9. Installing the LCU NEMA.
2. Observe the ON/OFF light sequence that verifies the LCU installation. See 9.1 Observing the “Auto Detection and Verification” Procedure.
3. After all NEMAs are installed, alert the CMS Administrator to start commissioning.

Installation without the GPS components

CSV file
During the installation, the installer needs to obtain and record the following required commissioning information in a CSV file:

- Unit ID/serial number of the installed LCU NEMA
- Pole number (if any)
- GPS coordinates obtained using a handheld GPS device. See 8.2.2. Options for Obtaining GPS Coordinates.

Telematics provides a sample commissioning CSV file to customers for recording the required information.
Note: Before beginning the installation, it is important to decide which additional information the installer should obtain for the Post-Installation Commissioning, if any. For the additional equipment information, see Appendix B. Commissioning CSV File.

Options for Obtaining GPS Coordinates
The following options refer to customer-supplied equipment:

- **Smartphone with internal GPS receiver:**
  - Enable Location services.
  - Set Locating method at High accuracy or similar.
- **Smartphone with external GPS device:**
  - Disable Location services: Location services are turned off.
  - Install and pair external GPS device.
- **Handheld GPS device:**
  Follow manufacturer’s instructions for obtaining high accuracy coordinates.

Installation

1. Record the LCU NEMA unit ID /serial number and pole number, if any.
2. Standing as close as possible to the pole, obtain the GPS coordinates for the pole using one of the options described in 8.2.2. Options for Obtaining GPS Coordinates.
3. Record the coordinates for the LCU NEMA in a CSV file.

4. Install the LCU NEMA. See 9. Installing the LCU NEMA.
5. Observe the ON/OFF light sequence that verifies the LCU installation. See 9.1 Observing the “Auto Detection and Verification” Procedure.
6. After each LCU NEMA installation, the installer has the following options for providing the commissioning information to the CMS Administrator:
    - Sending the required information of each LCU NEMA as it is installed to the CMS Administrator, by calling or messaging.
    - Updating the CSV file with the LCU serial number and coordinate values obtained during the installation.

Installing the LCU NEMA

1. Align the LCU until the North Marking Arrow at the top cover will be in the same direction as the North Marking Arrow at the receptacle.
   Firmly insert the plug into the receptacle:

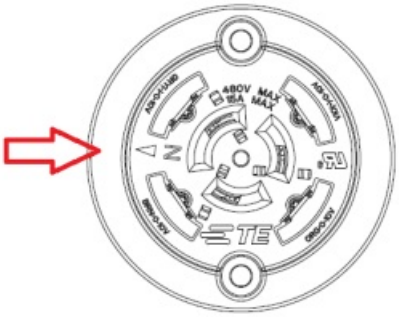

Figure 1 - Top view of the NEMA receptacle showing the North direction

   Warning: Inserting the LCU NEMA prongs into the wrong sockets in the receptacle can damage the LCU NEMA

2. Twist the LCU clockwise until the LCU stops moving and is securely locked.
3. If the electrical power is not ON, turn ON the power to the pole and be ready to verify that the installation is correct. See 9.1. Observing the “Auto Detection and Verification” Procedure.

Observing the “Auto Detection and Verification” Procedure

To perform the “Auto Detection and Verification” procedure:

1. If the luminaire is not already under power, power ON the main power line connected to the luminaire.
2. The luminaire will turn ON (light on) immediately upon installation of the LCU to the powered luminaire or immediately upon connection of the power line.After initially turning ON, the luminaire will run the “Auto Detection and Verification” procedure which identifies the lamp driver type and executes the following light ON/OFF sequence:
   In case of dimming method 0 – 10:
    - After approximately 18 seconds of being ON, the luminaire will dim to about 50%, if dimming is supported.
    - After approximately 9 seconds, the luminaire will change to 5% if dimming is supported.
    - After approximately 10 seconds, the luminaire will return to 100%.

- After approximately 8 seconds, the luminaire will turn OFF (light out).
- After approximately 12 seconds, the luminaire will return to whatever operational state the internal photocell or CMS schedule determines.

  In case of dimming method dali:

- After approximately 27 seconds of being ON, the luminaire will dim to about 50%, if dimming is supported.
- After approximately 4 seconds, the luminaire will change to 5% if dimming is supported.
- After approximately 10 seconds, the luminaire will return to 100%.
- After approximately 6 seconds, the luminaire will turn OFF (light out).
  After approximately 12 seconds, the luminaire will return to whatever operational state the internal photocell or CMS schedule determines.

3. If the luminaire does not complete the verification procedure, follow the basic troubleshooting steps in 9.2. Troubleshooting:
4. If the luminaire successfully finished the “Auto Detection and Verification” procedure, the LCU physical installation is complete.
   Note: Each time the main power to the pole is lost, the “Auto Detection and Verification” procedure is executed when power is restored.

Troubleshooting

If the “Auto Detection and Verification” procedure is not successful, troubleshoot as follows:
To troubleshoot a LCU NEMA installation:

1. Remove the LCU plug by twisting the plug counterclockwise.
2. Wait 15 seconds.
3. Reseat the LCU in the receptacle securely.
   As soon as the LCU is reseated, the “Auto Detection and Verification” procedure will start.
4. Observe the ON/OFF sequence.
5. If the “Auto Detection and Verification” procedure fails again, select and install a different LCU.
6. If the verification procedure fails with a different LCU, verify the following:
   - The lamp driver and luminaire are working correctly.
   - The receptacle is installed correctly.
     For additional troubleshooting steps, contact Telematics support. See 11. Contact Details.

Post-Installation Commissioning

Commissioning is activated by the CMS Administrator after the LCUs and their respective DCUs are installed. Instructions for the CMS Administrator are available in the LCU Commissioning Guide.

Contact Details

Contact your local Telematics technical support representative, or contact us at: ST Engineering Telematics Wireless, Ltd.
26 Hamelacha St., POB 1911
Holon 5811801

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- **Sales:** **sales@tlmw.com**
- Support: **support@tlmw.com**
- **www.telematics-wireless.com**

Appendix – About GPS Coordinate Formats

Note: There are several different formats in which GPS coordinates are delivered. The only format acceptable for import into CMS is 'decimal degrees'. You can find conversion programs on the Web to transform unacceptable formats into decimal degrees.

GPS Format Name and Format	Latitude Example	Acceptable for Input to CMS
DD Decimal degrees DDD.DDDDD°	33.47988	Yes
DDM Degrees and decimal minutes DDD° MM.MMM'	32° 18.385' N	No
DMS Degrees, minutes and seconds DDD° MM' SS.S"	40° 42' 46.021" N	No

Appendix – Commissioning CVS File

Following is the full layout for the comma-separated value (CSV) file for import to CMS.
The file consists of at least two lines. The first line contains the following Keywords, each separated by a comma. The second through 'n' lines contain the data corresponding to the keywords.

Line 1 = Keywords **Line 2 to n = Data**	**Description**	**Example**
controller.host	Address.	10.20.0.29:8080
model	Model.	Xmllightpoint.v1:dimmer0
ballast.type	Ballast type: 1-10V or DALI	1-10V
dimmingGroupName	Name of group for dimming.	mazda_gr
macAddress *	ID or serial number from the LCU label.	6879
powerCorrection	Power correction.	20
install.date	Date of installation.	6/3/2016
power	Power that is consumed by device.	70
idnOnController	Unique identifier of the device on the DCU or gat eway	Light47
controllerStrId	Identifier of the DCU or gateway to which this de vice is connected.	204
name *	Name of device as displayed to user. ID of pole o r other identification used for marking	Pole 21 (5858)

Line 1 = Keywords **Line 2 to n = Data**	**Description**	**Example**
	LCU on map. Pole ID is preferred as it is most helpful for repair crew in locating L CU.	
lampType	Type of lamp.	1-10V maz
geoZone	Name of geographical zone.	Mazda
lat *	Latitude in decimal degrees format.	33.51072396
lng *	Longitude in decimal degrees format.	-117.1520082

*= data required
For each data field that you do not enter a value, type a comma. For example, an import file with only the serial number, name and coordinates will appear as follows:

- **[Line1]:**

  Controller.host,model,ballast.type,dimmingGroup,macAddress,powerCorrection,install.date,….
- **[Line2]:**

  ,,,,2139-09622-00,,,,,,name1,,,33.51072,-117.1520

Documents / Resources

	**ST Engineering LCUN35G Light Control Unit** [pdf] User Manual N35G, NTAN35G, LCUN35G Light Control Unit, Light Control Unit, Control Unit

References

- **ST Engineering Telematics Wireless – Smart City Solutions**