State of the Art
Outdoor Lighting Controls

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Benefits of Lighting Controls

- Benefits
  - Energy maintenance savings, works for HPS
  - Extend life & reduce light pollution
- Dimming
  - AASHTO
- Constant Light Output
- Programmable Drivers
- Curfews
- Field Adjustable Drive Current
- Real-time Asset Management
Programmable Drivers

Field Adjustable Drive Current

Field Adjustable Wattage Selector
Optional Field Adjustable Wattage Selector (FAWS) switch can be operated even while wearing Lineman’s gloves, providing tactile, audible and visual switch position markers.
Real-time Asset Management

- **Wireless RF Mesh Network**
  - Communicates from node to node
  - Line of sight
  - Node installs in photocell socket
  - Energized 24/7

- **Powerline Mesh Network**
  - Communicates over existing branch conductors
  - Can communicate around corners (downtown)
  - Controller installs in pole base
  - Energized 24/7, can be deenergized during daytime hours

- **Communication Methods to Server**
  - Ethernet
  - Cellular
  - Signal System Interconnect
  - SCADA
ROAM Wireless RF System

**Nodes**
- Operate with any outdoor LED, HID or other fixture
- Can be spaced up to 1,000 feet apart

**Gateway**
- Receives data from and transmits commands to nodes
- Communicates with up to 2,000 devices

**Server**
- Pre-configured with ROAMview software
- Collects and stores lighting system performance data

**Portal**
- Displays operating conditions, performance data and energy use
- Accessible from a web browser
- Allows user to establish ON/OFF/TRIM/DIM schedules
ROAM Wireless RF System

- ROAM Portal
- Internet
- PDA used for Node Activation
- Encryption: RSA 1024 bit and 3DES
  Port: 20000 for node data and commands
  Note: Also attempts to connect to a time server resolved from pool.ntp.org
- Node
- Mesh Network
  Encryption: AES 128 bit Encryption
  Freq: 2.4GHz
  Protocol: 802.15.4
- Cellular Network
- Gateway
- Customer's Servers
- ActiveSync over port 22031
ROAM RF Components

The Node

• Receives Commands to Control the Fixture from the Gateway
• Monitors Voltage and Current and Sends Data to the Gateway
• One Node Required Per Fixture
• 1000’ Clear Line of Sight
• Multi-volt (120 – 277V)
  • Requires a NEMA Twist-Lock Receptacle
• Decorative Utility (120 – 277V)
  • Proprietary Design for Use With LP Utility Series Decorative Post Top Fixtures
ROAM RF Components

**The Gateway (120 – 277V)**

- Receives Commands From the Network Operation Center (NOC) and Forwards to the Nodes
- Receives Fixture Data and Forwards to the NOC
- Can Communicate Using Cellular or Ethernet Connection
- One Gateway Can Manage Up to 2,000 Devices

**The Dimming Control Module – DCM (120 – 277V)**

- For Dimming Drivers/Ballasts (LED, Electronic HID)
  - Embedded in the Fixture, Wirelessly Receives Dimming Commands From the Node and Adjusts the 0 to 10V Signal to the Driver/Ballast
- For Electromagnetic HID
  - Embedded in the Fixture, Wirelessly Receives Dimming Commands From the Node and switches between the terminals of a Dual Capacitor
- Accepts Occupancy and Temperature Sensor Input
- Fixture Price Adder added by the manufacturer
Powerline Mesh System

Central Management Software in City Operations Center / Cloud

Segment Controller in Neighborhood

Community of Open Standard Devices
- Lights
- Motion Sensors
- Lux sensors
- Pollution Sensors

PL Meshed Segment

PL Lighting Controller on each luminaire

Networked Sensors
Powerline - RF Hybrid

Central Management Software in City Operations Center / Cloud

Segment Controller in Neighborhood

PL Meshed Segment
- PL Lighting Controller on each luminaire
- Networked Sensors

RF Meshed Segment
- RF Lighting Controller on each luminaire
- Networked Sensors

Community of Open Standard Devices
- Lights
- Motion Sensors
- Lux sensors
- Pollution Sensors
Powerline Components

Street Light Controller

- Input Voltage Range: 100 VAC to 305 VAC (2-wire + Earth)
- Input Frequency: 47 to 63 Hz
- Power Line communication frequency
  Dual frequency 115kbps and 132kbps
- Two ways communications on LONWORKS PL channel based on ISO 14908.3 standard
- Meter capability with 2% accuracy
- Dimming capability using PWM or 0-10V*
  - Requires dimmable ballast or driver
- Filtered auxiliary power output for lighting
- Current: Max 5 Amp
- Internal 12A relay for On/Off control
- Greater than 48 dB attenuation for lighting noise sources (built-in filter)
- IP 66 rating
Powerline Components

*Street Light Bridge – RF Powerline Coupler*

- Combines multiple power line segments into one segment
  - Minimizes segment controllers
  - Maximizes ROI
- Increases communication reliability
  - For longer distances - uses power line communications
  - For shorter hops - uses 2.4 GHz frequency band
- Fast, simple, zero complexity installation
  - No external tools required to visualize the functioning of PL and RF connections
- Maximizes installation flexibility
  - For better & line-of-site RF communications: RF/PL bridge can be installed at any location of a given segment
Powerline Components

**RF Street Light Controller**

- Input Voltage Range: 100 VAC to 305 VAC (2-wire + Earth)
- Input Frequency: 47 to 63 Hz
- Meter capability with 2% accuracy
- Integrated Photocell
- Maximum 1000 watts
- Internal relay for On/Off control
- IP 65 rating
- Dimming capability using DALI or 0-10V
  - Requires dimmable ballast or driver

- Compatible with “New” ANSI C136.41 Photocell Receptacle
Powerline Components

Integrated Autonomous Segment Controller

Powerline communication with Light Controllers using ISO14908 protocol
Embedded astronomical clock for SUNRISE/SUNSET signals
Numerous calendars and schedulers
Real-time synchronized clock
Datalog up to 3 months
TCP/IP : HTTP, XML, FTP, TELNET
Alarm and Notification Manager
Customized programmable modules
User-friendly configuration Software allowing simple, rapid and lean installation process

Dynamic and Automatic Repeating
To enable any Light Controller to communicate with Segment Controller without any configuration nor engineering

Digital Inputs & Outputs
Control Mains Relay
Detect cabinet failures

External MODBUS Devices
Additional I/O modules
Voltage Variators and Regulators
Energy Meters
Performance Analysis and History
Energy & Lifetime Analysis
Follow-me Lighting for LED street lights
- Motion sensor detects cars on less travelled roadways and communicates directly to instantly turn on multiple lights

Parking Lot LED lights
- Motion sensors detect the presence of cars and pedestrians at multiple entrances to a parking lot and immediately turns lights on
Wireless RF and Powerline Features

- Secure Web-based access for monitoring and control
- 24 hour duty cycle
- Daily operational dashboard
- Dynamic or static asset mapping
- Historical performance and reporting
- Light grouping and scheduling for on-off and dimming
- Work order management
Thank you.

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