ROAM System Specification Guideline
Division 16520

PART 1. GENERAL

1.1   INTRODUCTION

    A.   The intent of this specification is to provide requirements for the ROAM system as a whole.

1.2   DESCRIPTION OF WORK

    A.   Provide system information for photocontrols for outdoor lighting and the components necessary for communication and user control.

    B.   Requirements are indicated elsewhere in these specifications.

1.3   QUALITY ASSURANCE

    A.   Individual components of the system shall undergo quality control and testing as appropriate

1.4   CODES AND STANDARDS

    A.   ANSI C136.10

    B.   ANSI C136.24

1.5   SUBMITTALS

Prior to fabrication manufacture shall submit the following materials for approval for each individual component:

    A.   Manufacturer's published catalog data sheets for the ROAM System.

    B.   Shop Drawings - Submit detailed drawings and documentation of the ROAM System. As a minimum, the shop drawings shall include the following:

        1.   Wiring diagrams as appropriate for the various components of the ROAM System.

        2.   Full catalog sheets

PART 2. PRODUCTS

2.1   SYSTEM DESCRIPTION

    A.   The ROAM Network shall consist of a series of ROAM photocontrols communicating with each other and ROAM Gateway controls which in turn communicate with a single Network Operations Center (NOC). The System shall also include a database of control operational data and a web interface designed to both display operational data and interface with individual units in a network of controls.

2.2 RATINGS

    A.   Ratings shall be listed for each control individually in its specification.

2.3 HARDWARE

    A.   The ROAM network shall consist of a series of ROAM photocontrols communicating with each other, ROAM dimming control modules interfacing with fixtures and dimming drivers, and ROAM Gateway controls which in turn communicate with a single Network Operations Center (NOC)

    B.   ROAM shall support three types of photocontrols designed for different fixtures

        1.   Standard 120-277 Volt photocontrols

        2.   480 Volt photocontrols

3.   Photocontrols that interface with decorative post top fixtures

C.   Standard 120-277 Volt photocontrols shall include the following features:
1.   Collects data from streetlight, then sends data wirelessly to Gateway
2.   Wireless enabled communication
- a.)   2.4 GHz - 802.15.4 compatible
- b.)   FCC Part 15 approved
- c.)   1000 foot clear line of sight
3.   Photocontrol
- a.)   70 to 1000 watts; 320J MOV - 6500 amp surge protection
- b.)   Complies with ANSI C136.10-2006
- c.)   Voltage 100-305 VAC
- d.)   Average power consumption of 1.6 watts
- e.)   Maximum power consumption of 2.2 watts
- f.)   -40 to +85°C; up to 90°C interface per ANSI; base rated at 120°C
- g.)   ANSI standard 2.5 to 5 second turn off/on delay
- h.)   Base rated at 120°C; Acrylic window, brass legs, neoprene gasket, polypropylene cover; Filtered silicon light sensor
- i.)   Wirelessly interfaces with the DCM
4.   Control
- a.)   Remote on/off control
- b.)   Grouped scheduling (energy savings)

D.   480 Volt photocontrols shall include the following features:
1.   Collects data from streetlight, then sends data wirelessly to Gateway
2.   Wireless enabled communication
- a.)   2.4 GHz - 802.15.4 compatible
- b.)   FCC Part 15 approved
- c.)   1000 foot clear line of sight
3.   Photocontrol
- a.)   70 to 1000 watts; 320J MOV - 9500 amp surge protection
- b.)   Complies with ANSI C136.10-2006
- c.)   Voltage 408-528 VAC
- d.)   Average power consumption of 4.0 watts
- e.)   Maximum power consumption of 5.4 watts
- f.)   -40 to +85°C; up to 90°C interface per ANSI; base rated at 120°C
- g.)   ANSI standard 2.5 to 5 second turn off/on delay
- h.)   Base rated at 120°C; Acrylic window, brass legs, neoprene gasket, polypropylene cover; Filtered silicon light sensor
- i.)   Optical indicator to alert line crew of malfunction
- j.)   Larger than a standard PC
- k.)   Wirelessly interfaces with the DCM
4.   Control
- a.)   Remote on/off control
- b.)   Grouped scheduling (energy savings)

E.   Decorative Utility Photocontrol shall include the following features:
1.   Collects data from streetlight, then sends data wirelessly to Gateway
2.   Wireless enabled communication
- a.)   2.4 GHz - 802.15.4 compatible
- b.)   FCC Part 15 approved
- c.)   1000 foot clear line of sight
3.   Photocontrol
- a.)   40 to 400 watts; 320J MOV - 9500 amp surge protection
- b.)   Complies with ANSI C136.10-2006
- c.)   Voltage 72-305 VAC
- d.)   Average power consumption of 1.94 watts
- e.)   -40 to +85°C; up to 90°C interface per ANSI; base rated at 120°C
- f.)   ANSI standard 2.5 to 5 second turn off/on delay
- g.)   Base rated at 120°C; brass legs, neoprene gasket, polypropylene cover; Filtered silicon light sensor

    h.) Optical indicator to alert line crew of malfunction
    i.) Wirelessly interfaces with the DCM
   4. Control
    a.) Remote on/off control
    b.) Grouped scheduling (energy savings)
   5. Mounting
    a.) Accommodates Utility Style Decorative Fixtures
  F. Dimming control modules shall include the following features:
   1. Dimming module provides wireless dimming control for any fixture with 0 to 10V dimming ballast/driver.
   2. Remote sensor inputs
   3. Wireless enabled communication
    a.) 2.4 GHz - 802.15.4 compatible
    b.) FCC Part 15 approved
    c.) 1000 foot clear line of sight
   4. General
    a.) Compatible with 0-10V dimming ballasts
    b.) Voltage 72-305 VAC;320J MOV – 9500 amp surge protection
    c.) Average power consumption of 1.6 watts
    d.) Maximum power consumption of 2.2 watts
    e.) Dimming control module shall operate in -40 to +85°C ambient temperatures
   5. Control
    a.) Remote continuous dimming control
  G. Gateways shall be preconfigured to connect to the NOC and require no explicit configuration
  H. Gateways shall include the following features:
   1. Transmits node data back to NOC
   2. Synchronizes network via NTP.
   3. Wireless enabled communication
    a.) 2.4 GHz (new) – 802.15.4 compatible
    b.) Cellular network uplink – GSM, GPRS, CDMA, modem; Ethernet link for optional WAN connection via the internet
    c.) FCC Part 15 approved
    d.) 1000 foot clear line of sight
    e.) Supports up to 2000 nodes
   4. General
    a.) 320J MOV - 6,500 amp surge protection
    b.) Voltage 100-265 VAC
    c.) Gateway shall operate in -40 to +85°C ambient temperatures
    d.) Mast arm mounting (1-3 inch) or wall mounting
    e.) Powered through standard locking type receptacle on fixture
    f.) 3 foot cable and locking type plug included
    g.) Average power consumption: 5.5 watts
    h.) Maximum power consumption: 12 watts
    i.) EPA: 1.62
    j.) Weight: 10 pounds
  I. The system shall be scalable and support networks of varying size
  J. All controls, dimming control modules, and gateways shall be designed to work for a minimum of eight years
  K. The Network Operations Center shall consist of multiple servers used to collect, store and display the data to the user
   1. A secondary NOC shall exist at a Disaster Recovery site
   2. Both NOCs shall have secondary power backups in the form of batteries and diesel generators
   3. All servers in the NOC shall use the NTP protocol to ensure that their clocks are in sync.

3.2. SOFTWARE
  A. The ROAM Network shall interface with a web portal capable of displaying data collected over the network
  B. The ROAM Network shall interface with a web portal providing remote user control over elements

within the network
- C. The web portal shall include the following views:
  1. Dashboard
  2. Maps
  3. Reporting
  4. History
  5. Grouping
  6. Scheduling
  7. Work Order Management
- D. The Dashboard view shall summarize the status of all photocontrols, gateways, and dimming control modules within the network
  1. Users shall be able to quickly determine the operational status of all fixtures within the system
  2. Users shall be able to export status data
  3. Users shall be able to print status data in a format conducive to presentation
  4. Users shall be able to request additional information about abnormal operations within the system
     - a.) Users shall be able to see basic information about malfunctions
     - b.) Users shall be able to see the location of each malfunctioning device
     - c.) Users shall be able to see a seven day history of each device
  5. Users with appropriate permissions shall be able to create work orders
- E. The Map view shall provide a geographical representation of system assets
  1. Users shall be able to navigate around the map using standard navigational constructs
     - a.) The Map view shall support panning
     - b.) The Map view shall support zooming
     - c.) The Map view shall support bookmarks
  2. Users shall be able to determine which assets are operating normally and which ones are malfunctioning in some way based on the icons used to represent each fixture
  3. Users shall be able to view information about each asset including any additional information about operational status by mousing over the relevant asset icon on the map
  4. Users with appropriate permissions shall be able to relocate a fixture from within the Map view
  5. Users with appropriate permissions shall be able to add or view notes about a fixture from within the Map view
  6. Users with appropriate permissions shall be able to view or edit the attributes collected about each fixture during node activation from within the Map view
  7. Users with appropriate permissions shall be able to issue the following commands to fixtures from within the Map view
     - a.) Turn on for x time, x not to exceed one day
     - b.) Turn off for x time, x not to exceed one day
     - c.) Return to normal operation
     - d.) Dim to x level for y time, x ranging from 0-100 and y not to exceed one day
  8. Users with appropriate permissions shall be able to issue commands to groups as well as individual units within the system
  9. Users with appropriate permissions shall be able to create work orders from within the Map view
  10. All users shall have read only access to the information on the Map view regardless of permissions
- F. The History view shall provide historical data for all fixtures
  1. The history shall be available for either seven days or thirty days
  2. The history view shall include filters that focus attention on specific assets or operational conditions
     - a.) Users shall be able to filter by group
  3. The history view shall include daily and hourly data for each fixture in the system
     - a.) Data shall be available in both report and graphical formats
  4. Users with appropriate permissions shall be able to create work orders from within the History view
- G. The Reporting view shall include reports and graphs used to monitor the system and its components
  1. All reports shall use a common interface
  2. All reports shall be exportable in the following formats:

a.) Microsoft Excel

                a.)   Microsoft Excel
                b.)   PDF
                c.)   XML

3. Users shall be able to view additional data about any unit listed on any of the reports from the Reporting view

4. Users shall be able to pinpoint any unit listed on any of the reports on a map from the Reporting view

5. Users with appropriate permissions shall be able to create work orders from within the Reporting view

H. The Grouping view shall enable users to interact with units within the network as a single group

  1. Users shall be able to define a subset of units on the network as a group from within the Grouping view

  2. Users shall be able to name each group from within the Grouping view

  3. Users shall be able to add additional nodes to a group from within the Grouping view

  4. Users shall be able to remove devices from a group from within the Grouping view

  5. Users shall be able to view information about the status of all devices within a group from the Grouping view

    a.) Status information displayed in the Grouping view shall use the same format as the same information within the Dashboard view

I. The Scheduling view shall enable users to schedule commands

  1. Users shall be able to define schedules from within the Scheduling view

  2. Users shall be able to issue schedules from within the Scheduling view

  3. Users shall be able to define events from within the Scheduling view

  4. Users shall be able to issue events from within the Scheduling view

  5. The Scheduling view shall recognize and use groups defined within the Grouping view

  6. The schedule interface shall split each day into four time intervals

    a.) Users shall be able to choose time intervals based on sunrise and sunset if desired

  7. The event interface shall split each day into eight time intervals

  8. Events shall take priority over schedules if both are in place for the same units at the same time

J. The Work Order Management view enables creation of work orders

  1. Users shall be able to assign work directly to crews or to crew coordinators

  2. Users shall be able to define repair procedures

  3. Users shall be able to record and track parts and material for billing

  4. Users shall be able to track repair time

  5. Users shall be able to print repair orders

    a.) Repair orders shall provide operating details to assist field performers in troubleshooting

  6. The Work Order Management view shall provide system verification of completion of work orders

3.3.   NETWORKING

A. Photocontrols within the network shall be capable of remote turn off and turn on

B. Photocontrols within the network shall be capable of assignment to groups which can be controlled over the network as a single unit

C. Photocontrols within the network shall communicate with neighbor controls and gateway devices via 2.4 Gigahertz radio signals within a mesh network

D. Photocontrols within the network shall have a communications range of 1000 feet

E. Communications between controls shall require a direct line of sight view

F. Data for each control within an installation shall have a one hour collection interval resolution.

G. Data sent from individual controls via radio signals shall be encrypted

H. Data sent from the Gateway control to the NOC shall be encrypted

I. Photocontrols within the network shall provide troubleshooting information over the network in the form of alarms

  1. All troubleshooting reports shall include the MAC number of the associated photocontrol

  2. Fixture malfunctions shall be reported

  3. Cycling fixtures shall be reported

  4. Day burning fixtures shall be reported

  5. Uncommunicative photocontrols shall be reported

  6. Power details for fixtures shall be reported

J. Photocontrol within the network shall operate as a standard standalone photocontrol if networking fails
    1. Performance of scheduled operations shall continue while in standalone mode
K. No node within an installation shall be a communications bottleneck. If any control within an installation is unavailable for communication for any reason, the signal shall be sent via different path.
L. Daily data collation shall run from midnight to midnight each night

3.4. MONITORING
    A. The system shall monitor the following:
        1. Remote Monitoring and Diagnostics
            a.) Fixture Malfunction
            b.) Cycling
            c.) Day-burner
            d.) Unspecified Malfunction
                • No Communication
                • No Power
            e.) Low System Voltage
            f.) High System Voltage
            g.) High V Delta
            h.) Low Wattage
            i.) Excessive Power Use
            j.) Fixture on a Group Control
            k.) 120V PC on a 240V fixture
        2. Reports
            a.) Fixture status
            b.) Average, Max and Min Power for each reporting interval (typically 1 hour)
            c.) Power measurement accuracy - 0.5% at 400 watts.
            d.) Energy tracking (KWH reports)
            e.) Burn Hour report
            f.) Average Line Voltage
            g.) Minimum Line Voltage
            h.) Maximum Line Voltage
            i.) Light sensor reading
        3. Events/Alerts
            a.) On/Off transition alerts
            b.) Low voltage alert
            c.) High voltage alert
            d.) Excessive current alert (>14A)
            e.) Miswired fixture

3.5. INSTALLATION AND ACTIVATION
    A. The system installation process shall rely on barcodes to capture data
        1. The following information shall be encapsulated into a barcode associated with each fixture each unit
            a.) fixture type
            b.) lamp type
            c.) wattage
            d.) fixture manufacturer
            e.) pole type
            f.) pole material
            g.) system voltage
        2. Fixture barcodes shall be incorporated into a custom installation booklet for use during installation
        3. Installers shall be equipped with a handheld PDA capable of reading barcodes
        4. Installers shall scan the barcode of each fixture at the time of installation and store the related data on the PDA

5. GPS data shall be collected and stored on the PDA for each installed unit at the time of installation
6. Installers shall scan the barcode attached to each installed photocontrol, dimming control module, or gateway at the time of installation
7. The fixture barcode information, the installed ROAM unit barcode, and the GPS location shall be grouped together on the PDA for each installed unit
8. The grouped data shall be uploaded to the NOC for incorporation into the system database

3.6.   PRODUCT SUPPORT AND SERVICE

Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

3.7.   WARRANTY

Manufacturer shall provide a three year (3) limited warranty on the units within a ROAM installation consisting of a one for one control replacement. The official warranty policy is the following:

ROAM undertakes that this product shall operate within its original operating specifications and shall be free of electrical or mechanical defects. ROAM's liability hereunder shall be limited to providing a replacement unit and shall not cover the costs of removal or installation of the unit nor any consequential damages.

This express warranty is in lieu of and excludes all other warranties, guaranties or representations, expressed or implied, including, but not limited to, warranties of merchantability or fitness for a specific purpose, by operation of law or otherwise.

END