A Joint Standard of AASHTO, ITE, and NEMA

NTCIP 1213 version v02

National Transportation Communications for ITS Protocol

Object Definitions for Electrical and Lighting Management Systems (ELMS)

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NTCIP 1213 v02 was prepared by the NTCIP ELMS Working Group under the auspices of the NTCIP Joint Committee. It is one of many NTCIP documents developed under a cooperative agreement among the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), and the Transportation Management Systems and Associated Control Devices Section of the National Electrical Manufacturers Association (NEMA). The NTCIP development effort is guided by the NTCIP Joint Committee, which consists of six representatives from each of the above organizations.

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- Washington Department of Transportation

FOREWORD

NTCIP 1213 v02 defines the generic reference model and conformance requirements for traffic management centers (TMCs) that wish to provide interfaces to external centers. NTCIP 1213 v02 defines requirements that are applicable to all NTCIP TMCs, and contains optional and conditional sections that are applicable to specific environments for which they are intended.

NTCIP 1213 v02 defines the Electrical and Lighting Management System (ELMS) data element objects that are supported by the NTCIP. An ELMS is defined as any system capable of monitoring, controlling, and communicating certain electrical and lighting system parameters using NTCIP.

The effort to develop an NTCIP ELMS standard began with the International Technology Exchange Program's European Road Lighting Technologies scan tour in April of 2001 (Report FHWA-PL-01-034 dated September 2001). This technology and implementation plan was further developed by the AASHTO Task Force for Highway Lighting and is being implemented as the Master Lighting Plan in the AASHTO publication entitled *Roadway Lighting Design Guide*. The Task Force's original desire was to define the features, functionality, and point of interoperability for ELMS equipment.

NTCIP 1213 v02 defines data elements in ASN.1 using the SNMP Object Type Macro for field devices that monitor and control electrical and lighting systems.

NTCIP 1213 v02 is an NTCIP Device Data Dictionary Standard. Device Data Dictionaries Standards define management information in terms of objects (data elements, data frames, and messages) for use within NTCIP systems.

The following keywords apply to NTCIP 1213 v02: AASHTO, ITE, NEMA, NTCIP, ELMS, data logger, electrical service, branch circuit, luminaire, data elements.

For more information about NTCIP standards, visit the NTCIP Web site at www.ntcip.org.

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All User Comments will be referred to the committee responsible for developing and/or maintaining this standards publication. The committee chairperson, or their designee, may contact the submitter for clarification of the User Comment. When the committee chairperson or designee reports the committee’s consensus opinion related to the User Comment, that opinion will be forwarded to the submitter. The committee chairperson may report that action on the User Comment may be deferred to a future committee meeting and/or a future revision of the standards publication. Previous User Comments and their disposition may be available for reference and information at www.ntcip.org.

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Approvals

NTCIP 1213 v02 was separately balloted and approved by AASHTO, ITE, and NEMA after recommendation by the Joint Committee on the NTCIP. Each organization has approved NTCIP 1213 v02 as the following standard type, as of the date:

AASHTO—Standard Specification; July 2008
ITE—Software Standard; March 2008
NEMA—Standard; June 2007

History

In 1992, the NEMA 3-TS Transportation Management Systems and Associated Control Devices Section began development of the NTCIP. The Transportation Section's purpose was in response to user needs to include standardized systems communication in the NEMA TS 2 standard, *Traffic Controller Assemblies*. Under the guidance of the Federal Highway Administration's NTCIP Steering Group, the NEMA effort was expanded to include the development of communications standards for all transportation field devices that could be used in an Intelligent Transportation Systems (ITS) network.

In September 1996, an agreement was executed among AASHTO, ITE, and NEMA to jointly develop, approve, and maintain the NTCIP standards. In 2002, the Joint Committee on the NTCIP accepted the invitation from Karl Burkett (Texas DOT) to transfer the initial work of an ad-hoc committee of the Illuminating Engineering Society of North America (IESNA), and formed the NTCIP ELMS Working Group to further develop the control objects based on NTCIP. The NTCIP ELMS Working Group's first meeting was in April 2003.

NTCIP 1213 v02 development started in 2002 under funding provided by the FHWA.

NTCIP 1213 v01.03. February 2004—Accepted as a User Comment Draft by the Joint Committee on the NTCIP. March 2004—NTCIP Standards Bulletin B0090 distributed for user comment.

NTCIP 1213 v02. The ELMS WG incremented the major version number to indicate the substantial reorganization of content. Version v01 never advanced beyond the User Comment Draft stage.

NTCIP 1213 v02.19. December 2005—Accepted v02.19b as a Recommended Standard by the Joint Committee on the NTCIP. December 2006—NTCIP Standards Bulletin B0111 referred v02.19d for balloting. Approved by AASHTO in July 2008, approved by ITE in March 2008, and approved by NEMA in June 2007.

NTCIP 1213 v02.20. June 2010—Began editing publication. July 2010—discussed proposals for alternative MIB object definitions (astronomical clock); November 2010—incorporated compilable alternative MIB object definitions and polled the NTCIP ELMS Working Group for approval.

December 2010—removed direct references to NTCIP 1103 v02 for trap support; addressed astronomical clock feature in supplied MIB modifications in Annex B. February 2011—completed editing and publication.

Compatibility of Versions

To distinguish NTCIP 1213 v02 (as published) from previous drafts, NTCIP 1213 v02 also includes NTCIP 1213 v02.20 on each page header. All NTCIP Standards Publications have a major and minor version number for configuration management. The version number syntax is 'v00.00a,' with the major version number before the period, and the minor version number and edition letter (if any) after the period.

NTCIP 1213 v02 is designated, and should be cited as, NTCIP 1213 v02. Anyone using NTCIP 1213 v02 should seek information about the version number that is of interest to them in any given circumstance. The MIB, the PRL, and the PICS should all reference the version number of the standards publication that was the source of the excerpted material.

Compliant systems based on later, or higher, version numbers MAY NOT be compatible with compliant systems based on earlier, or lower, version numbers. Anyone using NTCIP 1213 v02 should also consult NTCIP 8004 v02 for specific guidelines on compatibility.

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FIGURES

TABLES

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Section 1
GENERAL
[INFORMATIVE]

1.1 SCOPE

Communication between an ITS Management Center or portable computer and an Electrical and Lighting Management System (ELMS) is accomplished by using the NTCIP Application Layer services to convey requests to access or modify values of ELMS data elements resident in the device via an NTCIP network. An NTCIP message consists of a specific Application Layer service and a set of data elements. An NTCIP message may be conveyed using any NTCIP defined class of service that has been specified to be compatible with the Simple Transportation Management Framework (STMF).

The scope of NTCIP 1213 v02 is limited to the functionality related to ELMS within a transportation environment.

The remainder of NTCIP 1213 v02 includes the following sections, and each section builds on the previous section(s):

a) Concept of Operations (Section 2)—providing a description of user needs (needs for features and needs related to the operational environment) applicable to ELMS devices
b) Requirements (Section 3)—defining the functional requirements that address the user needs identified in the Concept of Operations, and including a Protocol Requirements List (PRL) that defines conformance requirements, thereby allowing users to select the desired options for a particular project
c) Dialog Specifications (Section 4)—describing how each functional requirement is fulfilled (the dialogs define the standardized procedure for a Traffic Management Center to exchange data with an ELMS device)
d) ELMS Object Definitions (Section 5)—defining the data exchanged during communications; some of the definitions are included via reference to another standard.
e) Requirements Traceability Matrix (Annex A)—providing a table that associates each requirement to a dialog, and its associated list of data
f) Object Tree (Annex B)-- provides a graphical representation of the branch and tree tructure for objects and the organization of the data defined in NTCIP 1213 v02
g) Astronomical Clock Support (Annex C)—including object definition modifications needed to support Astronomical Clock

NOTE—Test procedures needed for each functional requirement are not included in NTCIP 1213 v02, although they may be added in a future version.

Section 2 and Section 3 are presented at a high level and are of interest to most readers; Section 4 and Section 5 address more detailed design issues that are of interest to implementers, integrators, and testers.

1.2 REFERENCES

Normative references contain provisions that, through reference in this text, constitute provisions of NTCIP 1213 v02. Other references in NTCIP 1213 v02 might provide a complete understanding of the entire protocol and the relations between all parts of the protocol. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard listed.

1.2.1 Normative References

AASHTO / ITE / NEMA NTCIP 1103 v02	*Transportation Management Protocols* published July 2010
AASHTO / ITE / NEMA NTCIP 1201 v03	*Global Object (GO) Definitions* published March 2011
AASHTO / ITE / NEMA NTCIP 2301 v02	*Simple Transportation Management Framework (STMF) Application Profile (AP (AP-STMF)* published July 2010
AASHTO / ITE / NEMA NTCIP 8004 v02	*Structure and Identification of Management Information (SMI)* published June 2010
ISO/IEC 8824-1 ed4.0 (2008-12)	*Information technology—Abstract Syntax Notation One (ASN.1): Specification of basic notation*
IAB STD 16	(RFC 1155) *Structure and Identification of Management Information for TCP/IP-based Internets,* M. Rose; K. McCloghrie; May 1990, (RFC 1212) *Concise MIB Definitions*, M. Rose; K. McCloghrie; March 1991
SAE J2374	*Location Referencing Message Specification*

1.2.2 Other References

IAB STD 15	(RFC 1157) *A Simple Network Management Protocol (SNMP),* May 1990
IAB STD 17	(RFC 1213) *Management Information Base for Network Management of TCP/IP-based Internets: MIB-II*, March 1991

1.2.3 Texts

Perkins, David, and McGinnis, Evan, *Understanding SNMP MIBs*, New Jersey, Prentice Hall PTR, 1997, ISBN 0-13-437708-7

Booch, Grady, Rumbaugh, James, and Jacobson, Ivar, *The Unified Modeling Language User Guide, 2nd Edition*, Addison-Wesley Professional, May 29, 2005, ISBN 0-201-57168-4

1.2.4 Contact Information

1.2.4.1 NTCIP Standards

Copies of NTCIP standards may be obtained from:

NTCIP Coordinator
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Draft amendments, which are under discussion by the relevant NTCIP Working Group, and amendments recommended by the NTCIP Joint Committee are available.

1.2.4.2 ISO/IEC Standards

Members of the ISO maintain registers of currently valid ISO/IEC International Standards. For the U.S., the member of ISO is the American National Standards Institute (ANSI), which may be contacted as follows:

ANSI
25 West 43rd Street, 4th Floor
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1.2.4.3 IAB Documents

For Internet Architecture Board (IAB) documents, contact:

Internet Architecture Board (IAB)
www.rfc-editor.org
www.rfc-editor.org/repositories.html

1.3 TERMS

For the purposes of NTCIP 1213 v02, the following terms, definitions, acronyms, and abbreviations apply. are in accordance with their definitions in NTCIP 8004 v02. Electrical and electronic terms not defined here are used in accordance with their definitions in IEEE Std 100-2000. English words not defined here or in IEEE Std 100-2000 are used in accordance with their definitions in *Webster's New Collegiate Dictionary*.

action — An element of a day plan schedule.

ambient light level — The amount of light surrounding the luminaire location.

branch circuit — A local electrical circuit that provides power to the luminaires.

candela — An SI unit of measure for luminous intensity, abbreviated cd.

compatibility — The ability of two or more systems or components to exchange information.

NOTE—See IEEE *Standards Dictionary, Glossary of Terms and Definitions,* October, 2008.

consistent — The ability of two or more systems or components to exchange information and use the supported information that has been exchanged and gracefully reject any unsupported information according to defined rules.

data — Elements of information exchanged between a management station and an ELMS device used to configure, control, or monitor the operation of the ELMS device.

data logger — A unit that collects and stores information on the state and operation of ELMS devices.

day plan — A standard device schedule element that contains a set of at least 1 or more actions to be performed for a device on a given day.

determine	To read information from a device.
dim levels	The setting for the intensity of the light generated by the luminaire.
download	To transfer information from the central computer into the referenced field device.
electrical service	The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served. NOTE—See *National Electrical Code (NEC).*
Electrical and Lighting Management Systems (ELMS)	Any system capable of monitoring and controlling electrical and lighting systems using the National Transportation Communications for ITS Protocol (NTCIP).
ELMS device	A device, module, or piece of equipment that contains an SNMP Agent, and is the interface between a component of an illumination system and the NTCIP communication system. The device may be integral to a component of the illumination system.
ELMS management station	One or more host computing platforms that controls the field devices. NOTE—Management station(s) may be installed in a local Transportation Management Center (TMC), or can be field based.
feature	A behavior of an ELMS device.
interchangeable	A condition that exists when two or more items possess such functional and physical characteristics as to be equivalent in performance and durability, and are capable of being exchanged one for the other without alteration of the items themselves, or adjoining items, except for adjustment, and without selection for fit and performance. NOTE—See National Telecommunications and Information Administration, U.S. Department of Commerce
interface	A named set of operations that characterize the behavior of an element. NOTE—See Unified Modeling Language specification
interoperability	The ability of two or more systems or components to exchange information and use the information that has been exchanged. NOTE—See IEEE *Standards Dictionary, Glossary of Terms and Definitions,* October, 2008.

live data	A specific operational network configuration between the management station and the ELMS device where the information exchange can be performed without the need for initiating and terminating a physical network connection between the management station and ELMS device. NOTE—From a network perspective, this configuration is an 'always on' connection, where the management station has access to the 'current' information available in the ELMS device.
logged data	A specific operational network configuration between the management station and the ELMS device, where the management station is required to execute a procedure for establishing a physical connection between the management station and the ELMS device prior to being able to exchange data with the ELMS device. NOTE—In this configuration, information generated by the ELMS device, which is expected to be retrieved by the management station, is stored external to management station until such time as the management station initiates the network connection to access the stored (logged) data from the ELMS device.
lumen	The unit of luminous flux emitted in a solid angle of one steradian by a uniform point source that has an intensity of one candela.
luminaire	The light fixture and possibly associated sensors. NOTE—Luminaires may be organized into zones. Management functions can be performed on individual luminaires or on zones of luminaires (e.g., dimming).
luminance	The intensity of light per unit area at its source. Usually measured in candela per square foot or candela per square meter.
lux	A measurement of light. A unit of luminance produced on a surface area of one square meter by a luminous flux of one lumen uniformly distributed over the surface (1 lux = 1 lumen per square meter).
Management Information Base (MIB)	A structured collection or database of related managed objects defined using Abstract Syntax Notation One (ASN.1). NOTE—See NTCIP 8004 v02. MIBs are used to remotely monitor, configure, and controll devices on a network. ASN.1 is an international standard for defining objects.
object	A data structure used to monitor or control one feature, attribute, or controllable aspect of a manageable device.
operator	An individual who needs to interact with the device by either controlling or monitoring its operations.
photo sensor	A light-measuring device used to quantify the ambient light conditions at the luminaire. Also referred to as photo cell or photoelectric cell.

point-to-multipoint	A communications architecture that supports communications between a central system and many devices. Also called multi-drop communication.
point-to-point	A communications architecture that supports dedicated communications exclusively between two devices.
pole	Pole supporting a luminaire, electrical service, or branch circuit. NOTE—Poles may be categorized by their constituent material types and/or design configurations.
protocol	A specific set of rules, procedures, and conventions defining the format and timing of data transmissions between devices that are required to be accepted and used to understand each other.
requirement	A description of a condition or capability to which a system is obligated to conform; either derived directly from user needs, or stated in a contract, standard, specification, or other imposed document. A desired feature, property, or behavior of a system.
requirements traceability	The ability to follow or study the logical progression among the needs, requirements, and design details in a step-by-step fashion.
return	Data sent to the requester (in the context of device requirements for providing data requested by an external system).
schedule	A mechanism by which an operator can define times in the future at which the luminaire performs actions. NOTE—Refer to NTCIP 1103 v02 for information on global objects that support scheduling operations.
Simple Network Management Protocol (SNMP)	A communications protocol developed by the Internet Engineering Task Force, used for configuration and monitoring of network devices.
Simple Transportation Management Framework (STMF)	Describes the organization of the information within devices and the methods of retrieving or modifying any information within the device. STMF also explains how to generate and use computer readable information organization descriptions.
SNMP agent	This is a logical entity that is hosted on an ELMS device (e.g., a data logger) that manages the communications between the management station and other ELMS devices in the system.
stagger interval	The amount of time, in seconds, between switching individual luminaires, electrical services, or branches assigned to a given branch circuit. NOTE—The intent of the stagger interval is to minimize peak demand.
sub-feature	A specialization of a more generic feature.

Traffic Management Center (TMC)	The location of the central computer and equipment that allows operations staff to monitor and manage roadside lighting through field devices.
upload	To transfer information from the referenced field device to the central computer, or an attached portable computer.
user	A person who uses the system that is developed.
user needs	The business or operational problem (opportunity) to be fulfilled to justify procurement or use. NOTE--'User need,' as understood within the NTCIP community, reflects needs of all stakeholders.
validate	To ensure that an item of interest is as intended. For example, to ensure that the data associated with a set operation has been stored in a device without any errors.
zone	A logical grouping of luminaires and/or circuits; used for control and reporting purposes.

Section 2
CONCEPT OF OPERATIONS
[NORMATIVE]

Section 2 defines the detailed user needs that form the basis for NTCIP 1213 v02. The user needs are defined within the scope of NTCIP 1213 v02, which is the interface between an ELMS management station (e.g., a computing platform) and ELMS devices. The concept of operations also includes a discussion of the general architecture of an ELMS to provide a logical system context.

Section 2 is intended for all types of readers, including:

a) Transportation operations managers
b) Transportation operations personnel
c) Transportation engineers
d) Lighting engineers
e) System integrators
f) Device manufacturers

For the first four categories of readers, Section 2 is useful to understand the general problem scope addressed by an ELMS. For this audience, Section 2 may serve as the starting point in the agency procurement process. Familiarization with each feature covered by NTCIP 1213 v02 can determine whether that feature is appropriate for implementation. Agency specifications may require support for an implemented feature and all of the mandatory requirements related to that feature.

For the last two categories of readers, Section 2 provides a more thorough understanding of the basis for detailed NTCIP 1213 v02 requirements, as they are derived directly from the user needs included in this concept of operations. The data elements in NTCIP 1213 v02 are in turn defined from these detailed requirements.

2.1 CURRENT SITUATION AND PROBLEM STATEMENT

Section 2.1 provides an overview of ELMS and defines the problem area NTCIP 1213 v02 addresses.

2.1.1 Problem Statement

An ELMS is defined as any system that is able to automatically control and manage roadside electrical and lighting devices using NTCIP. In general, an ELMS is composed of a set of field devices (luminaires, electric circuits, etc.) that are controlled by one or more management stations (computing platforms).

Some of the key concerns for transportation agencies that may be addressed by implementing an ELMS are:

a) Citizen and maintenance personnel safety—reducing the potential for electrical shock hazards to citizens through automated detection of electrical and lighting equipment faults
b) Light pollution/trespass regulatory compliance—conforming to national/state/local laws, regulations, and voluntary programs on light pollution and light trespass reduction to improve citizens' quality of life
c) Operations and maintenance—reducing resources used to monitor roadside electrical and lighting devices through remote detection of equipment failures, and also to allow the ability to improve re-lamping programs
d) Energy utilization—optimizing energy consumption of electrical and lighting devices through automated monitoring and control of devices

e) Homeland security/incident/event management—providing flexible and timely control of roadside electrical and lighting devices to assist law enforcement officials in homeland security and/or specific incident or event management operations
f) Safety coordination—implementing coordinated lighting plans to improve safety

Currently, there are no standards that define how the roadside electrical and lighting devices communicate with a management station. ELMS device manufacturers developed custom protocols to meet particular needs. NTCIP 1213 v02 specifies the common data elements and dialogs used to exchange information between the management station and ELMS devices.

2.1.2 Current Situation

Section 2.1.2 provides an overview of ELMS from both reference architecture and use case views.

2.1.2.1 Typical Physical Architecture

There is a wide range of possible physical deployment topologies for combinations of various ELMS management stations and field devices. For this reason, NTCIP 1213 v02 does not provide a 'typical' architecture definition. Instead, a generic architecture model, as depicted in Figure 1, is used as a reference. Some additional example configurations are discussed in the system operational environment section (Section 2.3).

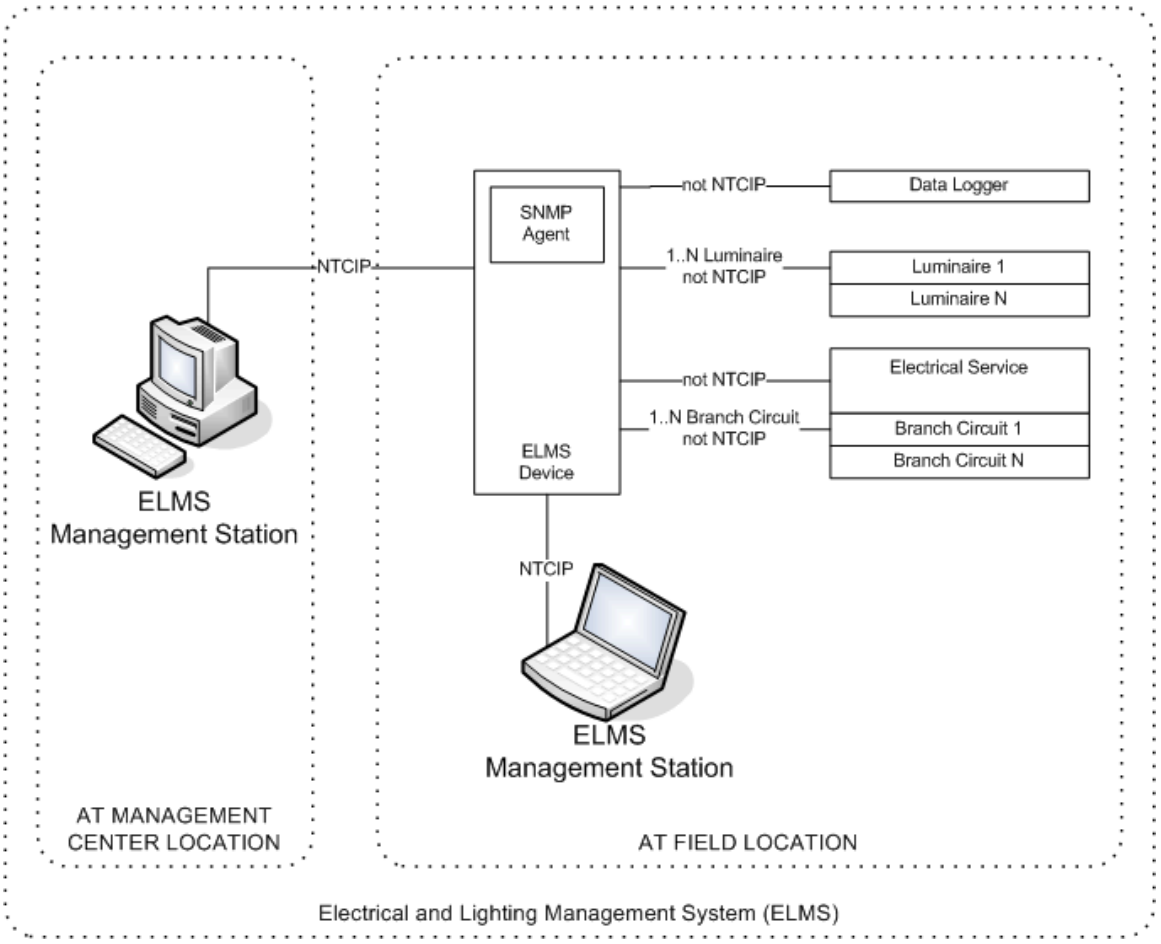

Figure 1 Reference Architecture

The major components of the system follow:

a) **Management Station**—one or more host computing platforms that control(s) the field devices, and that may be installed in a local Transportation Management Center (TMC) or be field based
b) **ELMS Device**—a device, module, or piece of equipment that contains an SNMP Agent, is the interface between a component of an illumination system and the NTCIP communication system, and may be integral to a component of the illumination system
c) **Simple Network Management Protocol (SNMP) Agent**—the logical entity that is hosted on an ELMS device (e.g., a data logger) that manages the communications between the management station and other ELMS devices in the system
d) **Data Logger**—a unit that collects and stores information on the state and operation of ELMS devices
e) **Luminaire**—the light fixture and possibly associated sensors, organized individually or in zones, on which management functions (e.g., dimming) can be performed
f) **Electrical Service**—the conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served
g) **Pole**—a roadside light pole (poles may be categorized by their constituent material types and/or design configurations)
h) **Branch Circuit**—a local electrical circuit that provides power to the luminaires

As depicted in Figure 1, the protocol between the Management Station and the ELMS device with SNMP is based on NTCIP, and is the basis of NTCIP 1213 v02. There are several configurations for how the management station and ELMS devices may communicate, which include:

a) An ‘online’ configuration where the data network for the ELMS is able to support continuously live data connections between the management station and field devices (in this configuration, information can flow between management station and field device without the need for establishing and tearing down a network connection)
b) An ‘offline’ configuration where the information flows between management station and the field device, either on demand or based on a pre-defined schedule (in this configuration, a network connection is established at the time the management station is requesting the data exchange with the field device)
c) A third configuration in which the field device may initiate establishing a connection to the management station to signal that a certain emergency or exceptional situation exists for the device

2.2 OPERATIONAL POLICIES AND ASSUMPTIONS

Operational policies are agency-specific and are determined and implemented by the agency operating the ELMS. NTCIP 1213 v02 does not cover this topic, but instead provides a set of common functions that can support an agency’s operational policies.

Where assumptions pertaining to ELMS operations have been made, these are stated clearly in the sections where they apply.

2.3 DESCRIPTION OF SYSTEM ENVIRONMENT

There are different possible system environment configurations for communications between the management station and ELMS devices. Figure 2, Figure 3, and Figure 4 show example views of how some of the basic system elements can be configured.

Figure 2 depicts a situation where management stations (center or field based) interact with a data logger located in the field that is hosting an SNMP agent. The data logger in turn communicates with other field devices using non-NTCIP based protocols.

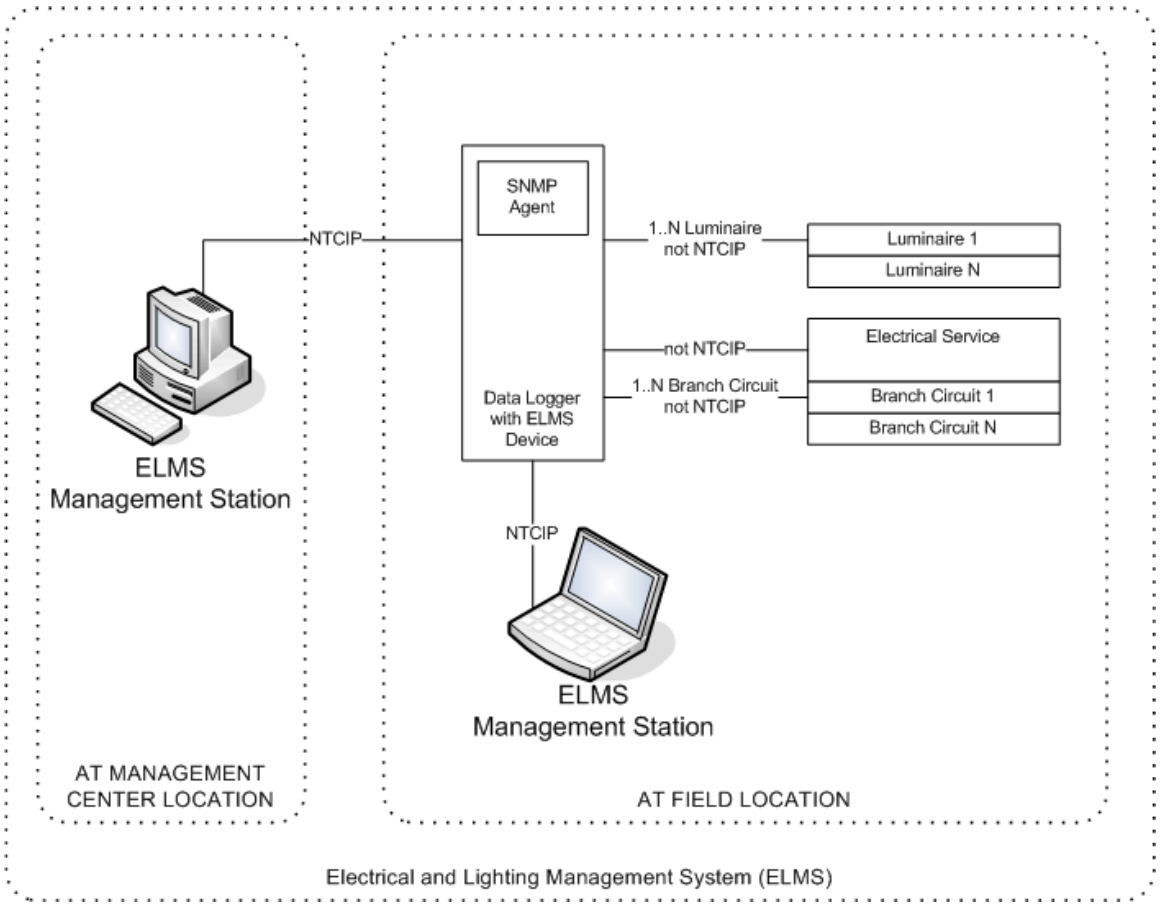

Figure 2 Data Logger with SNMP Agent Example Configuration

Figure 3 shows a different example configuration, in which the SNMP agent is hosted with the luminaire devices. Management stations (center or field based) interact directly with the SNMP agent hosted with the luminaires.

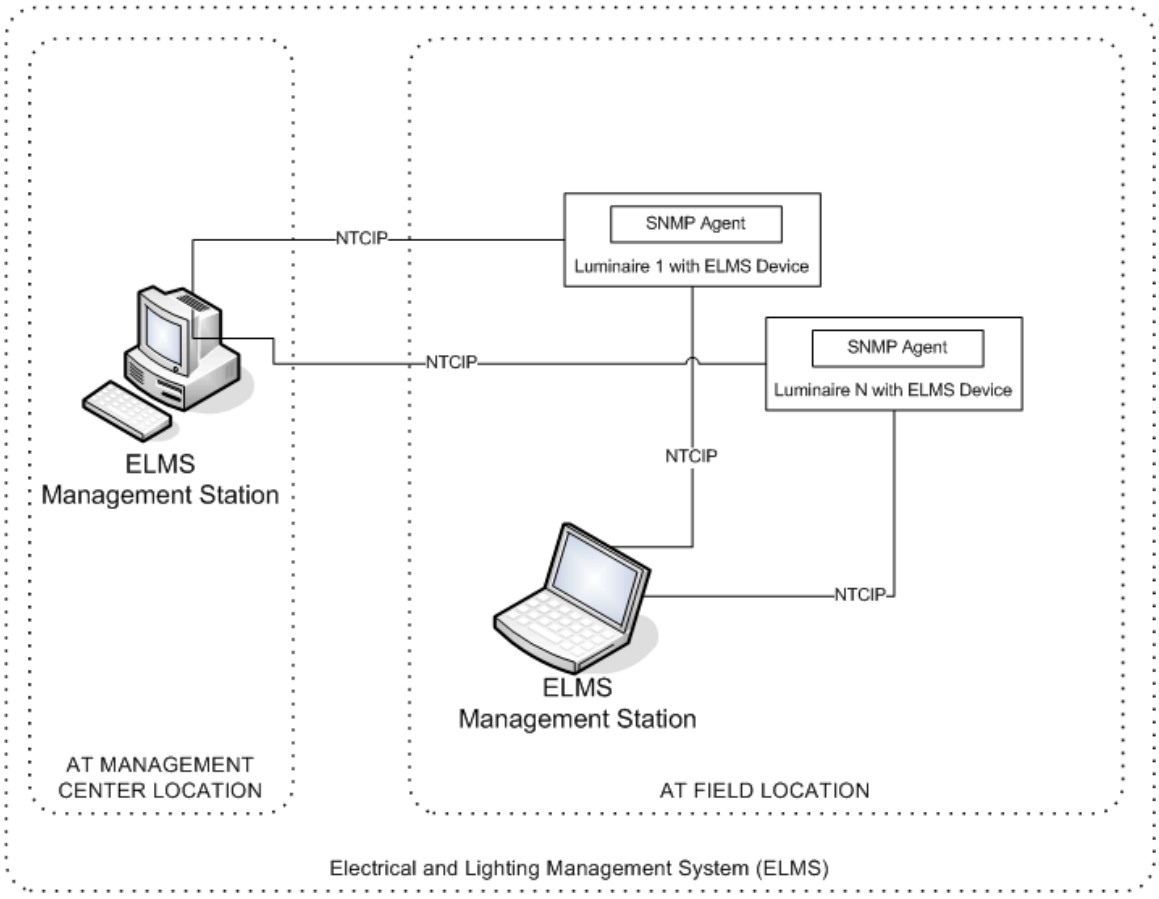

Figure 3 Luminaire with SNMP Agent Example Configuration

Management stations located in the TMC are typically used for controlling a network of ELMS devices. Field based management stations are used to support maintenance operations on one or more ELMS devices located in the field.

Figure 4 is another example configuration of an ELMS. In this case, the devices in the ELMS are managed in logical groups called zones. Configuration and control information for the set of ELMS devices assigned to the zones may be set by the management station using the SNMP agent on an ELMS device. Non-NTCIP protocols may be used by the ELMS device to relay the configuration information to other components of the illumination system.

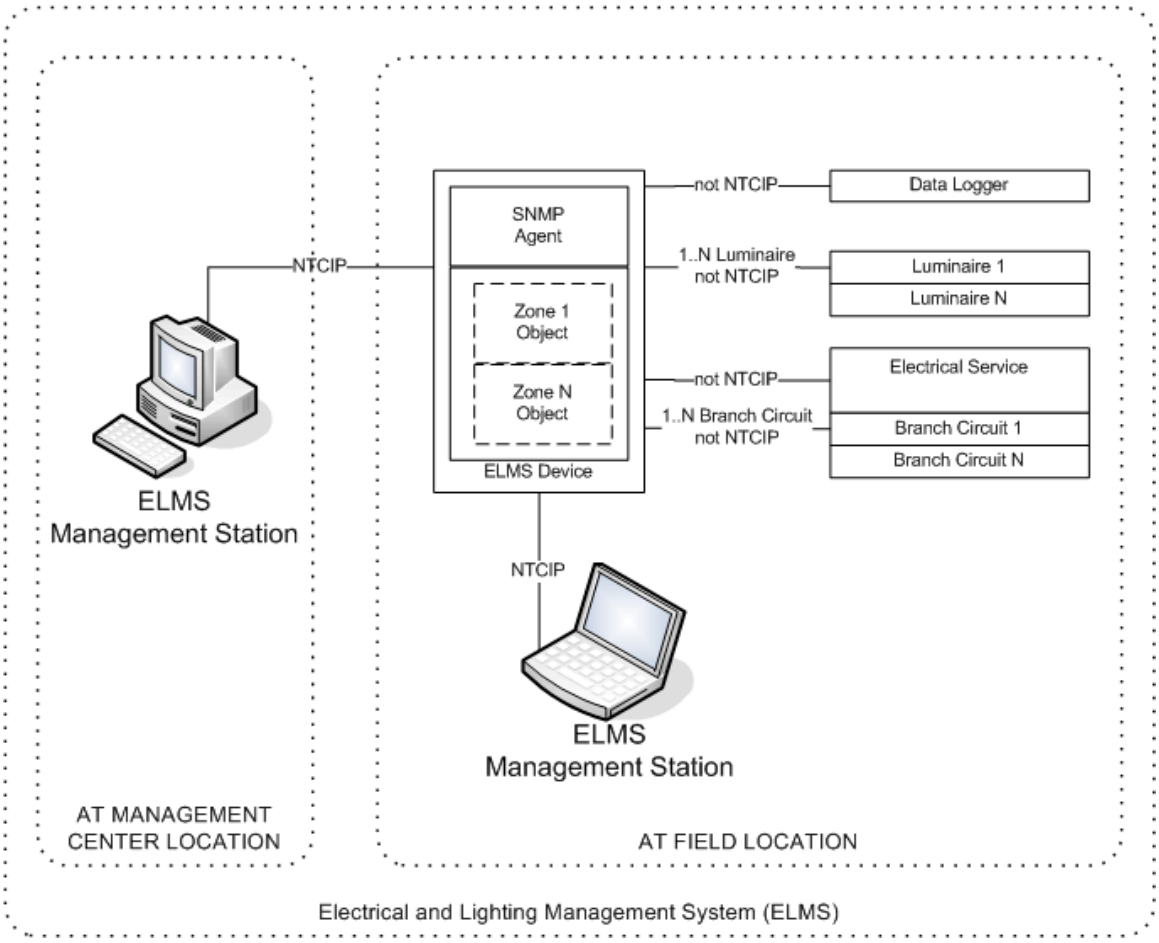

Figure 4 SNMP Agent with Zones Example Configuration

The primary operational constraints of how zones may be used within an ELMS follow:

a) The definition of zones and/or hierarchies of zones is expected to be performed on the management station, and not through the ELMS device interface.
b) The assignment of individual ELMS devices to one or more zones is expected to be performed on the management station and not through the ELMS device interface.
c) Definition and management of relative priorities of zone based operations is expected to be done on the management station and not through the ELMS device interface.
d) The capability to summarize device status reporting for the ELMS devices assigned to the zone is expected to be a function performed on the management station and not through the ELMS device interface.

The definition of a zone of ELMS devices may be based on several factors, including geography or specific operational needs.

2.4 USER NEEDS

Section 2.4 describes the major user needs that are related to the definition of the interface between the management station and an ELMS field device. The user needs are considered to be the ‘high level’ requirements for NTCIP 1213 v02, and form the basis for defining the detailed functional requirements of the interface.

The user needs are organized as follows:

a) Operational user needs—defining the basic modes of operation for communication between the management station and field devices
b) Features—describing essential data communication functions and message elements to be supported by the interface

2.4.1 Operational User Needs

NTCIP 1213 v02 addresses the interface between an ELMS field device and one or more management stations (e.g., central computers, laptops). The data collected by the field device may include data from multiple sensors. When communicating with a management station, each reading is clearly associated with a specific sensor with some form of unique identification.

Once the management station has retrieved the data of interest, the operator can use this information to make decisions and initiate other events to better manage the lighting elements of the system. To enable communications between these components, the transportation system manager needs to establish a communication system that links the ELMS field device with a management station.

To enable communications, the transportation system manager needs to establish a communication system that links the ELMS field device with a management station. Some systems may be designed for constant polling; other systems may be designed to minimize data exchanges.

2.4.1.1 Provide Live Data

One operational environment allows the management system to monitor and control the device by issuing requests (e.g., requests to access information, alter information, or control the device). In this environment, the device responds to requests from the management station immediately (e.g., through the provision of live data, success/failure notice of information alteration, or success/failure of the command).

2.4.1.2 Provide Off-Line Log Data

Some operational environments do not have always-on connections (e.g., dial-up links). In such environments, a transportation system operator may wish to define conditions under which data is placed into a log, which can then be uploaded at a later time. For example, the operator may wish to manage the ELMS device so that it autonomously maintains a log of whenever a specific luminaire is turned on or off.

2.4.1.2.1 Provide Luminaire Switch State Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the switch state for a luminaire changes.

2.4.1.2.2 Provide Luminaire Lamp Condition Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the lamp condition changes (e.g., cycling or inoperable).

2.4.1.2.3 Provide Luminaire Burn Condition Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the burn condition of a lamp changes (e.g., lamp turns on or off).

2.4.1.2.4 Provide Periodic Luminaire Burn Time Logging

The management station may need to configure the ELMS device to keep a local log of periodic measurements of the monthly burn time and the monthly expected burn time.

2.4.1.2.5 Provide Luminaire Temperature Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the measurement of the luminaire temperature is above or below specified values using hysteresis.

2.4.1.2.6 Provide Luminaire Pole Condition Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the pole condition changes (e.g., pole knocked down).

2.4.1.2.7 Provide Relay Switch State Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the switch state for a relay changes.

2.4.1.2.8 Provide Power Meter Switch State Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the switch state for a power meter changes (turning power meter on or off).

2.4.1.2.9 Provide Periodic Power Meter Measurement Logging

The management station may need to configure the ELMS device to keep a local log of periodic measurements of the voltage, current, power, and energy.

2.4.1.2.10 Provide Power Meter Condition Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the power meter condition changes.

2.4.1.2.11 Provide Ground Fault Switch State Logging

The management station may need to configure the ELMS device to keep a local log of an occurrence when the switch state for a ground fault detector changes.

2.4.1.2.12 Provide Periodic Ground Fault Measurement Logging

The management station may need to configure the ELMS device to keep a local log of periodic measurements of the ground fault leakage current.

2.4.1.2.13 Retrieve Logged Data

The management station may need to retrieve logged data from the ELMS device.

2.4.1.3 Monitor Exceptional Conditions

In some operational environments, it may be desirable to have the device automatically transmit data to the management station when certain conditions occur. Under this scenario, the transportation system operator can define conditions under which notification occurs, and the device automatically notifies the management station when the condition occurs.

2.4.2 Features

Section 2.4.2 describes the essential data communication functions and message elements to be supported by the interface.

2.4.2.1 Configure ELMS Device

A management station that is monitoring or controlling the ELMS may need to retrieve information about the configuration to properly communicate with the device. The management station may also need to alter the configuration of the device to produce expected operations.

2.4.2.1.1 Configure Luminaire

A management station that is controlling the ELMS device may need to manage the configuration of the connected luminaires. The following subsections describe the luminaire configuration features needed.

2.4.2.1.1.1 Retrieve Luminaire Information

A management station may need to retrieve basic information about the luminaire, such as its Pole Identifier, location, mode of operation, zone, and vendor information (make, model, and version of components).

2.4.2.1.1.2 Configure Luminaire Identification Information

A management station may need to configure information for a luminaire, including the luminaire location information and pole information.

2.4.2.1.1.3 Configure Luminaire Mode

A management station may need to configure the mode (on, off, schedule, light-activated) of a luminaire.

2.4.2.1.2 Configure Electrical Service

A management station that is controlling the ELMS device may need to manage the configuration of the electrical service. The following subsections describe the electrical service configuration features needed.

2.4.2.1.2.1 Retrieve Electrical Service Information

A management station may need to retrieve basic information about the electrical service, such as its location and pole identifier.

2.4.2.1.3 Configure for Light-Activated Operation

A management station that is controlling the ELMS device may need to configure a luminaire or an electrical service, branch circuit, or zone for operation based upon ambient light detection.

2.4.2.1.4 Configure for Scheduled Operation

A management station that is controlling the ELMS device may need to configure a luminaire, electrical service, branch circuit, or zone to operate on a schedule to turn on, off, or dim.

2.4.2.1.5 Configure Zones

A management station that is controlling the ELMS device may need to configure the zone(s) to which the luminaire, branch circuit, or electrical service belongs.

2.4.2.1.6 Configure for Manual Operation

The management station may need to configure an ELMS device to support manual operations. Examples are configuring an ELMS device to support manual operation of a luminaire, electrical service, branch circuit, or zone.

2.4.2.1.7 Configure Stagger Interval

A management station may need to alter the interval at which luminaires, branch circuits, or electrical services are staggered in operation.

2.4.2.1.8 Configure Dim Levels

A management station may need to configure a luminaire to set dim levels, or a management station may need to adjust light output levels of all luminaires on a circuit or assigned to a zone, by adjusting the power levels supplied to the circuit or to the devices assigned to the zone.

2.4.2.1.9 Configure Electrical Service Monitoring and Metering Equipment

A management station may need to calibrate sensors and meters associated with the electrical service.

2.4.2.1.10 Configure Branch Circuit

A management station that is controlling the ELMS device may need to manage the configuration of the branch circuit. The following subsections describe the branch circuit configuration features needed.

2.4.2.1.10.1 Retrieve Branch Circuit Information

A management station may need to retrieve basic information about the branch circuit, such as its location, pole identifier, and zone.

2.4.2.1.10.2 Configure Branch Circuit

The management station may need to configure a branch circuit for location and pole status.

2.4.2.2 Control Device

Section 2.4.2.2 describes the major categories of services the management station may need to use to control an ELMS device.

2.4.2.2.1 Control Luminaire

A management station may need to control a luminaire by turning it on or off either directly (individual basis) or in a staggered mode of operation. A management station may need to control the luminaire to allow or disallow the schedule control by one of three states:

a) Continuous control—not allowing the schedule to control current settings for the luminaire
b) Transitory control—not allowinh the schedule to control the luminaire until the next event in the schedule
c) Timed control—not allowing the schedule to control the luminaire until after a period of time specified in the timed control dialog for the luminaire

2.4.2.2.2 Control Electrical Service

A management station may need to control an electrical service directly or by enabling/disabling the stagger mode for branch circuits served by the electrical service. A management station may need to control the electrical service to allow or disallow the schedule control by one of three states:

a) Continuous control—not allowing the schedule to control current settings for electrical service
b) Transitory control—not allowing the schedule to control the electrical service until the next event in the schedule
c) Timed control—not allowing the schedule to control the electrical service until after a period of time specified in the timed control dialog for the electrical service

2.4.2.2.3 Control Branch Circuit

A management station may need to control a branch circuit directly or in a staggered mode of operation. A management station may need to control a branch circuit to allow or disallow the schedule control by one of three states:

a) Continuous control—not allowing the schedule to control current settings for branch circuit
b) Transitory control—not allowing the schedule to control the branch circuit until the next event in the schedule
c) Timed control—not allowing the schedule to control the branch circuit until after a period of time specified in the timed control dialog for the branch circuit

2.4.2.3 Control Devices by Zone

A management station may need to control multiple ELMS devices by a zone by minimizing data exchanges (e.g., instead of controlling 10 luminaires and 5 branch circuits, the management station can control 1 zone to which 10 luminaires and 5 branch circuits belong). A management station may need to control the ELMS devices configured in the zone to allow or disallow the schedule control by one of three states:

a) Continuous control—not allowing the schedule assigned to each ELMS device configured in the zone to control the operation of the ELMS device

b) Transitory control—not allowing the schedule for each ELMS device configured in the zone to resume control until the next event in the schedule for each device
c) Timed control—not allowing the schedule for each ELMS device configured in the zone to resume control of the ELMS device until after a period of time specified in the timed control dialog for the zone of devices

2.4.2.4 Monitor Device Status

A management station may need to monitor an ELMS device for status of various subsystems.

2.4.2.4.1 Monitor Luminaire

A management station may need to monitor a luminaire for status of various features of a luminaire.

2.4.2.4.2 Monitor Electrical Service

A management station may need to monitor an electrical service for status of various features of the electrical service, including the status of the branch circuits associated with the electrical service.

2.4.2.4.3 Monitor Branch Circuit

A management station may need to monitor branch circuit for status of various features of the circuit.

2.5 SECURITY

NTCIP 1213 v02 does not address any security issues. Any security pertaining to protecting the communications with ELMS devices should be implemented either physically by protecting the communications access points, or logically by enabling security features associated with the underlying communications protocols.

Section 3
FUNCTIONAL REQUIREMENTS

Section 3 defines the requirements based on the user needs identified in Section 2. A requirement is only required to be implemented if the associated functionality (i.e., user need) is selected through the use of the Protocol Requirements List (PRL, see Section 3.2.5). The PRL can be used by agency personnel to specify the desired interfaces to be supported by the ELMS device or can be used by a system developer to document the features supported by their implementation.

Section 3 includes:

a) A tutorial
b) The Protocol Requirements List—indicating which of the items (i.e., user needs and requirements) are mandatory, conditional, or optional
c) Operational environment requirements—requirements related to the operational environment user needs defined in Section 2.4.1
d) Functional requirements—requirements related to the features identified in Section 2.4.2 that can be realized through a data exchange or imply some other operational functionality (e.g., the requirement to be able to request an inventory of equipment)
e) Supplemental requirements—additional requirements derived from the Concept of Operations that do not fall into categories c) or d) (e.g., requirements related to the data contained in an inventory report)

Section 3 is intended for all readers, including:

a) Transportation operations managers
b) Transportation operations personnel
c) Transportation engineers
d) Lighting engineers
e) System integrators
f) System developers

Section 3 is useful to the first three categories of readers for understanding the details of what NTCIP 1213 v02 requires of an ELMS device. Section 3.2.5 (the PRL) can be particularly useful in preparing agency specifications and maps the various rows of the PRL to the more detailed user needs and requirements.

Section 3 is useful to the last three categories of readers for understanding what is required of systems meeting NTCIP 1213 v02. The PRL in Section 3.2.5 can also be used to document the capabilities of implementations.

3.1 TUTORIAL [INFORMATIVE]

Requirements are based on user needs. An implementation only needs to support the requirements corresponding to the user needs that a particular agency specification addresses. However, several requirements may exist to satisfy a particular user need. The PRL in Section 3.2.5 maps the user needs identified in Section 2 with the functional requirements defined in Section 3, indicating whether each item is mandatory or optional for conformance to NTCIP 1213 v02. Additionally, some requirements need project specific details to be completely defined (e.g., the process required to approve a requested command). A user needs to provide this additional information, as identified in the PRL, to fully specify the desired ELMS functionality.

3.2 PROTOCOL REQUIREMENTS LIST (PRL)

The PRL, provided in Section 3.2.5, maps the user needs defined in Section 2 to the requirements defined in Section 3. The PRL can be used by:

a) A user or agency specification writer to indicate which requirements are to be implemented in a project specific implementation
b) The protocol implementer, as a checklist to reduce the risk of failure to conform to NTCIP 1213 v02 through oversight
c) The supplier and user, as a detailed indication of the capabilities of the implementation
d) The user, as a basis for initially checking potential interoperability with another implementation

3.2.1 User Needs Column

The user needs are defined in Section 2, and the PRL is based on those user needs. The section identifier and section name are indicated within these columns.

3.2.2 Requirements Column

The requirements are defined in Section 3 and the PRL traces user needs to these requirements. The section identifier and section name are indicated within these columns.

3.2.3 Conformance Column

The following notations and symbols are used to indicate status and conditional status in the PRL. Not all of these notations and symbols may be used in NTCIP 1213 v02.

3.2.3.1 Status Symbols

The symbols in Table 1 are used to indicate status:

Table 1 Status Symbols

M	Mandatory
M.#	Support of every item of the group labeled by the same numeral # required, but only one is active at time
O	Optional
O.# (range)	Part of an option group. Support of the number of items indicated by the '(range)' is required from all options labeled with the same numeral # is required
C	Conditional
N/A	Not applicable (i.e., logically impossible)
X	Excluded or prohibited

The O.# (range) notation is used to show a set of selectable options (e.g., O.2 (1..*) would indicate that one or more of the option group 2 options is required to be implemented). Two character combinations are used for dynamic requirements. In this case, the first character refers to the static (implementation) status, and the second refers to the dynamic (use); thus 'MO' means 'mandatory to be implemented, optional to be used.'

3.2.3.2 Conditional Status Notation

The predicate notations in Table 2 may be used:

Table 2 Predicate Notations

<predicate>:	This notation introduces a single item that is conditional on the <predicate>.
<predicate>::	This notation introduces a table or a group of tables, all of which are conditional on the <predicate>.

The <predicate>: notation means that the status following it applies only when the PRL states that the feature or features identified by the predicate are supported. In the simplest case, <predicate> is the identifying tag of a single PRL item. The <predicate>:: notation may precede a table or group of tables in a section. When the group predicate is true then the associated section shall be completed. The symbol <predicate> also may be a Boolean expression composed of several indices. 'AND', 'OR', and 'NOT' shall be used to indicate the Boolean logical operations.

There are no predicates used in NTCIP 1213 v02.

3.2.3.3 Project Requirement Column

The Project Requirement (support) column can be used in an agency specification to identify the required features for the given procurement or by an implementer to identify which features have been implemented. In either case, the user circles the appropriate answer (Yes, No, or N/A) in the Project Requirement column. See Table 3.

Table 3 Project Requirement Column Options

Yes	Supported by the implementation
No	Not supported by the implementation
N/A	Not applicable

3.2.4 Instructions for Completing the PRL

In the 'project requirements' column, each response shall be selected either from the indicated set of responses (for example: Yes / No / NA), or it shall reference additional items that are to be attached.

If a conditional requirement is not applicable, use the Not Applicable (N/A) choice. If a mandatory requirement is not satisfied, exception information shall be supplied by entering a reference Xi, where i is a unique identifier, to an accompanying rationale for the non-conformance. When the status is expressed as a two-character combination (as defined in Section 3.2.3.1), the response shall address each element of the requirement; e.g., for the requirement 'mo,' the possible compliant responses are 'yy' or 'yn.'

To claim conformance with NTCIP 1213 v02, an implementation shall satisfy the mandatory requirements as identified in the PRL.

3.2.5 Protocol Requirements List (PRL)

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Project Requirement	Additional Project Requirements
2.4.1	Operational User Needs			M	Yes	
2.4.1.1	Provide Live Data			M	Yes	
		3.3.1.1	Retrieve Data	M	Yes	
		3.3.1.2	Deliver Data	M	Yes	
		3.3.1.3	Data Retrieval and Data Delivery Action Performance	M	Yes	
		3.5.5.1	Live Data Response Time	M	Yes	
2.4.1.2	Provide Off-line Log Data			O	Yes / No	
		3.3.2.1	Retrieve Configuration of Logging service	M	Yes	
		3.3.2.2	Configure Logging Service	M	Yes	
		3.3.2.4	Clear Log	M	Yes	
		3.3.2.5	Retrieve Capabilities of Event Logging Services	M	Yes	
		3.3.2.6	Retrieve Number of Events Currently Logged	M	Yes	
		3.3.2.7	Set Time	M	Yes	
		3.3.2.8	Retrieve Current Time	M	Yes	
		3.3.2.9	Set Daylight Saving Time Mode	M	Yes	
		3.3.2.10	ELMS Pre-defined Event Configurations	M	Yes	
		3.3.2.10.1	Supported Event Classes	M	Yes	
		3.5.4	Supplemental Requirements for Event Logs	M	Yes	
2.4.1.2.1	Provide Luminaire Switch State Logging			O	Yes / No	
		3.3.2.10.2	Luminaire Switch State Log	O	Yes / No	
2.4.1.2.2	Provide Luminaire Lamp Condition Logging			O	Yes / No	
		3.3.2.10.3	Luminaire Lamp Condition Log	O	Yes / No	
2.4.1.2.3	Provide Luminaire Burn Condition Logging			O	Yes / No	
		3.3.2.10.4	Luminaire Burn Condition Log	O	Yes / No	

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Project Requirement	Additional Project Requirements
2.4.1.2.4	Provide Periodic Luminaire Burn Time Logging			O	Yes / No	
		3.3.2.10.5	Periodic Luminaire Burn Time Log	O	Yes / No	
2.4.1.2.5	Provide Luminaire Temperature Logging			O	Yes / No	
		3.3.2.10.6	Luminaire Temperature Log	O	Yes / No	
2.4.1.2.6	Provide Luminaire Pole Condition Logging			O	Yes / No	
		3.3.2.10.7	Luminaire Pole Condition Log	O	Yes / No	
2.4.1.2.7	Provide Relay Switch State Logging			O	Yes / No	
		3.3.2.10.8	Relay Switch State Log	O	Yes / No	
2.4.1.2.8	Provide Power Meter Switch State Logging			O	Yes / No	
		3.3.2.10.9	Power Meter Switch State Log	O	Yes / No	
2.4.1.2.9	Provide Periodic Power Meter Measurement Logging			O	Yes / No	
		3.3.2.10.10	Periodic Power Meter Measurement Log	O	Yes / No	
2.4.1.2.10	Provide Power Meter Condition Logging			O	Yes / No	
		3.3.2.10.11	Power Meter Condition Log	O	Yes / No	
2.4.1.2.11	Provide Ground Fault Switch State Logging			O	Yes / No	
		3.3.2.10.12	Ground Fault Switch State Log	O	Yes / No	
2.4.1.2.12	Provide Periodic Ground Fault Measurement Logging			O	Yes / No	
		3.3.2.10.13	Periodic Ground Fault Measurement Log	O	Yes / No	
2.4.1.2.13	Retrieve Logged Data			M	Yes	
		3.3.2.3	Retrieve Logged Data	M	Yes	
2.4.1.3	Monitor Exceptional Conditions			O	Yes / No	
		3.3.3.1	Retrieve Current Configuration of Exception Reporting Service	M	Yes	
		3.3.3.2	Configure Events	M	Yes	
		3.3.3.3	Provide Automatic Reporting of Events (SNMP Traps)	M	Yes	
		3.3.3.4	Manage Exception Reporting	M	Yes	
		3.3.3.5	Retrieve Capabilities of Exception Reporting Service	M	Yes	

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Project Requirement	Additional Project Requirements
		3.3.3.6	Retrieve Current Number of Exception Events	M	Yes	
		3.3.3.7	Record and Timestamp Events	M	Yes	
2.4.2	Features			M	Yes	
2.4.2.1	Configure ELMS Device			M	Yes	
2.4.2.1.1	Configure Luminaire			M	Yes	
2.4.2.1.1.1	Retrieve Luminaire Information			M	Yes	
		3.4.1.1.1.1	Retrieve Luminaire Pole Identifier	O	Yes / No	
		3.4.1.1.1.2	Retrieve Luminaire Location	M	Yes	
		3.4.1.1.1.3	Retrieve Luminaire Mode	M	Yes	
		3.4.1.1.1.4	Retrieve Luminaire Zone	O	Yes / No	
		3.4.1.1.1.5	Retrieve Luminaire Vendor Information	M	Yes	
2.4.2.1.1.2	Configure Luminaire Identification Information			M	Yes	
		3.4.1.1.1.2.1	Specify Location in Longitude/Latitude Coordinates	O	Yes / No	
		3.4.1.1.1.2.2	Specify Location Information Using Textual Description of a Road/Street/Block Name/Number	M	Yes	The ELMS device shall support a location name of at least _____ (8..255) Characters.
		3.4.1.1.1.2.3	Specify Location in local reference coordinate grid	O	Yes / No	
		3.4.1.1.2.1	Configure Luminaire Pole Identifier	O	Yes / No	
		3.4.1.1.2.2	Configure Luminaire Location	M	Yes	
2.4.2.1.1.3	Configure Luminaire Mode			M	Yes	
		3.4.1.1.3	Configure Luminaire Mode	M	Yes	
2.4.2.1.2	Configure Electrical Service			O	Yes	
2.4.2.1.2.1	Retrieve Electrical Service Information			O	Yes / No	
		3.4.1.2.1.1	Retrieve Electrical Service Location	M	Yes	
		3.4.1.2.1.2	Retrieve Electrical Service Zone	O	Yes / No	
		3.4.1.2.1.3	Retrieve Electrical Service Pole Identifier	O	Yes / No	
		3.4.1.2.2.1	Configure Electrical Service Location	M	Yes	

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Project Requirement	Additional Project Requirements
		3.4.1.2.2.2	Configure Electrical Service Pole Identifier	O	Yes / No	
2.4.2.1.3	Configure for Light-Activated Operation			O	Yes / No	
		3.4.1.3.1	Configure Luminaire for Light Activated Operations	M	Yes	
		3.4.1.3.2	Configure Electrical Service for Light Activated Operations	O	Yes / No	
		3.4.1.3.3	Configure Branch Circuit for Light Activated Operations	O	Yes / No	
		3.4.1.3.4	Configure Devices in Zone for Light Activated Operations	O	Yes / No	
2.4.2.1.4	Configure for Scheduled Operation			O	Yes / No	
		3.4.1.4.1.	Configure Luminaire for Scheduled Operations	O.1 (1..*)	Yes / No	
		3.4.1.4.2	Configure Electrical Service for Scheduled Operations	O.2 (1..*)	Yes / No	
		3.4.1.4.3.	Configure Branch Circuit for Scheduled Operations	O.3 (1..*)	Yes / No	
		3.4.1.4.4.	Configure Devices in Zone for Scheduled Operations	O.4 (1..*)	Yes / No	
		3.4.1.4.5	Schedule ELMS Device Event	M	Yes	
		3.4.1.4.6	Retrieve a Schedule	M	Yes	
		3.5.1	Supplemental Requirements for Scheduled Operations	M	Yes	
2.4.2.1.5	Configure Zones			O	Yes / No	
		3.4.1.5.1	Configure Luminaire Zone	M	Yes	
		3.4.1.5.2	Configure Electrical Service Zone	O	Yes / No	
		3.4.1.5.3	Configure Branch Circuit Zone	O	Yes / No	
		3.4.1.5.4	Define Zones	M	Yes	
		3.5.2	Supplemental Requirements for Zones	M	Yes	
2.4.2.1.6	Configure for Manual Operation			M	Yes	
		3.4.1.8.1	Configure Luminaire for Manual Operation	M	Yes	

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Project Requirement	Additional Project Requirements
		3.4.1.8.2	Configure Electrical Service for Manual Operations	O	Yes / No	
		3.4.1.8.3	Configure Branch Circuit for Manual Operations	O	Yes / No	
		3.4.1.8.4	Configure Devices in Zone for Manual Operations	O	Yes / No	
2.4.2.1.7	Configure Stagger Interval			O	Yes / No	
		3.4.1.6.1	Configure Luminaire Stagger Interval	M	Yes	The ELMS device shall support a stagger interval with a maximum value of _____ (0..255) seconds.
		3.4.1.6.2	Configure Branch Circuit Stagger Interval	O	Yes / No	The ELMS device shall support a stagger interval with a maximum value of _____ (0..255) seconds.
2.4.2.1.8	Configure Dim Levels			O	Yes / No	
		3.4.1.7.1	Configure Luminaire Dim Level	M	Yes	
		3.4.1.7.2	Configure Electrical Service Dim Level	O	Yes / No	
		3.4.1.7.3	Configure Branch Circuit Dim Level	O	Yes / No	
		3.4.1.7.4	Configure Dim Level for Devices in Zone	O	Yes / No	
		3.5.3	Supplemental Requirements for Dim Levels	M	Yes	
2.4.2.1.9	Configure Electrical Service Monitoring and Metering Equipment			O	Yes / No	
		3.4.1.9.1	Configure Branch Circuit Ground Fault Detector	O	Yes / No	
		3.4.1.9.2	Configure Branch Circuit Power Meter	O	Yes / No	
		3.4.1.9.3	Configure Branch Circuit Arc Fault Detector	O	Yes / No	
2.4.2.1.10	Configure Branch Circuit			O	Yes / No	
2.4.2.1.10.1	Retrieve Branch Circuit Information			O	Yes / No	
		3.4.1.10.1.1	Retrieve Branch Circuit Zone	O	Yes / No	
		3.4.1.10.1.2	Retrieve Branch Circuit Location	O	Yes / No	
		3.4.1.10.1.3	Retrieve Branch Circuit Pole Identifier	O	Yes / No	
2.4.2.1.10.2	Configure Branch Circuit			O	Yes / No	

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Project Requirement	Additional Project Requirements
		3.4.1.10.2.1	Configure Branch Circuit Location	O	Yes / No	
		3.4.1.10.2.2	Configure Branch Circuit Pole Identifier	O	Yes / No	
2.4.2.2	Control Device			M	Yes	
2.4.2.2.1	Control Luminaire			M	Yes	
		3.4.2.1.1	Control Luminaire by Permanent/Continuous Override	M	Yes	
		3.4.2.1.2	Control Luminaire by Transitory Override	O	Yes / No	
		3.4.2.1.3	Control Luminaire by Timed Override	O	Yes / No	
		3.4.2.1.4	Control Luminaire in Stagger Mode	O	Yes / No	
2.4.2.2.2	Control Electrical Service			O	Yes / No	
		3.4.2.2.1	Control Electrical Service by Permanent/Continuous Override	M	Yes	
		3.4.2.2.2	Control Electrical Service by Transitory Override	O	Yes / No	
		3.4.2.2.3	Control Electrical Service by Timed Override	O	Yes / No	
		3.4.2.3.4	Control Electrical Service in Stagger Mode	O	Yes / No	
2.4.2.2.3	Control Branch Circuit			O	Yes / No	
		3.4.2.3.1	Control Branch Circuit by Permanent/Continuous Override	M	Yes	
		3.4.2.3.2	Control Branch Circuit by Transitory Override	O	Yes / No	
		3.4.2.3.3	Control Branch Circuit by Timed Override	O	Yes / No	
		3.4.2.3.4	Control Branch Circuit in Stagger Mode	O	Yes / No	
2.4.2.3	Control Devices by Zone			O	Yes / No	
		3.4.2.4.1	Control Devices in Zone by Permanent/Continuous Override	M	Yes	
		3.4.2.4.2	Control Devices in Zone by Transitory Override	O	Yes / No	
		3.4.2.4.3	Control Devices in Zone by Timed Override	O	Yes / No	
2.4.2.4	Monitor Device Status			M	Yes	
2.4.2.4.1	Monitor Luminaire			M	Yes	

User Need ID	User Need	FR ID	Functional Requirement	Conformance	Project Requirement	Additional Project Requirements
		3.4.3.1.1	Retrieve Luminaire Switch Status	M	Yes	
		3.4.3.1.2	Retrieve Luminaire Temperature	O	Yes / No	Units are in tenths of degrees Celsius
		3.4.3.1.3	Retrieve Luminaire Burn Time Statistics	O	Yes / No	
		3.4.3.1.4	Retrieve Luminaire Pole Status	O	Yes / No	
		3.4.3.1.5	Retrieve Luminaire Dimming Level Output	O	Yes / No	
		3.4.3.1.6	Retrieve Luminaire Lamp Status	O	Yes / No	
		3.4.3.1.7	Retrieve Luminaire Power Usage Statistics	O	Yes / No	
		3.4.3.1.8	Retrieve Luminaire Ballast Status	O	Yes / No	
		3.4.3.1.9	Retrieve Luminaire Starter Status	O	Yes / No	
2.4.2.4.2	Monitor Electrical Service			O	Yes / No	
		3.4.3.2.1	Retrieve Electrical Service Ground Fault Status	O	Yes / No	
		3.4.3.2.2	Retrieve Electrical Service Hours	O	Yes / No	
		3.4.3.2.3	Retrieve Electrical Service Operational Status	M	Yes	
		3.4.3.2.4	Retrieve Electrical Service Power Readings	O	Yes / No	
		3.4.3.2.5	Retrieve Electrical Service Main Breaker Status	O	Yes / No	
		3.4.3.2.6	Retrieve Electrical Service Arc Fault Status	O	Yes / No	
2.4.2.4.3	Monitor Branch Circuit			O	Yes / No	
		3.4.3.3.1	Retrieve Branch Circuit Power Readings	O	Yes / No	
		3.4.3.3.2	Retrieve Branch Circuit Arc Fault Status	O	Yes / No	
		3.4.3.3.3	Retrieve Branch Circuit Breaker Status	O	Yes / No	
		3.4.3.3.4	Retrieve Branch Circuit Operational Status	M	Yes	
		3.4.3.3.5	Retrieve Branch Circuit Hours	O	Yes / No	
		3.4.3.3.6	Retrieve Branch Circuit Ground Fault Status	O	Yes / No	

3.2.6 Supplemental Requirements Table

This table includes all supplemental requirements that are referenced in the PRL. Some supplemental requirements require input from the user to further specify ranges or values of specific features.

Supplemental Requirement ID	Supplemental Requirement	Conformance	Project Requirement	Additional Project Requirements
3.5	Supplemental Requirements	M	Yes	
3.5.1	Supplemental Requirements for Scheduled Operations	M	Yes	
3.5.1.1	Support a Number of Actions	M	Yes	The ELMS Device shall support at least _____ (1..255) Actions.
3.5.1.2	Support a Number of Day Plans	M	Yes	The ELMS Device shall support at least _____ (1..255) Day Plans.
3.5.1.3	Perform Action at Scheduled Time	M	Yes	
3.5.2	Supplemental Requirements for Zones	M	Yes	
3.5.2.1	Define Number of Zones Supported by an ELMS Device	O	Yes / No	The ELMS Device shall support at least _____ (0..65535) Zones.
3.5.2.2	Define Number of ELMS Devices for a Zone	O	Yes / No	At least _____ (0..65535) ELMS devices shall be able to be assigned to a single zone.
3.5.3	Supplemental Requirements for Dim Levels	M	Yes	
3.5.3.1	Define Dim Levels as a percentage of maximum brightness	O	Yes / No	
3.5.4	Supplemental Requirements for Event Logs	M	Yes	
3.5.4.1	Configure Number of Events in Event Log	O	Yes / No	The ELMS device shall support at least _____ (1..255) events.
3.5.4.2	Configure Number of Event Classes	O	Yes / No	The ELMS device shall support at least _____ (1..255) classes.
3.5.4.3	Configure Number of Event Types	O	Yes / No	The ELMS device shall support at least _____ (1..255) event types.

Supplemental Requirement ID	Supplemental Requirement	Conformance	Project Requirement	Additional Project Requirements
3.5.5	Supplemental Requirements for Live Data	M	Yes	
3.5.5.1	Live Data Response Time	M	Yes	The device shall initiate the transmission of the appropriate response (assuming that the device has permission to transmit) within _____ millisecond(s) of receiving the last byte of the request, plus 1 millisecond for each byte in the response variable-bindings field

3.3 OPERATIONAL ENVIRONMENT REQUIREMENTS

Requirements for communication capabilities follow.

3.3.1 Provide Live Data

Requirements for specifying capabilities of an ELMS device to provide live data to an ELMS management station follow.

3.3.1.1 Retrieve Data

The ELMS device shall allow the management station to retrieve data from the device.

3.3.1.2 Deliver Data

The management station shall be able to deliver data to an ELMS device.

3.3.1.3 Data Retrieval and Data Delivery Action Performance

The ELMS device shall process SNMP Get/Set/GetNext commands in response to data retrieval and data delivery actions performed by the management station on the ELMS device in accordance with the performance criteria for the SNMP commands established in NTCIP 1103 v02 Section 3.2.4.

3.3.2 Provide Off-Line Log Data

The following requirements define the functions needed to support the exchange of data between the ELMS management station and an ELMS device for the case where the ELMS device is not sharing a live data connection with the management station, but is instead storing data offline for periodic retrieval by the management station.

3.3.2.1 Retrieve Configuration of Logging Service

The ELMS device shall allow a management station to retrieve the current configuration of the event logging service, (e.g., the classes and types of events that the ELMS device is currently configured to log).

3.3.2.2 Configure Logging Service

The ELMS device shall allow a management station to configure the event logging service, (e.g., configuration of the event classes and event types to log). An example of an event class for an ELMS device is the luminaire switch state class (ECLASS_LSWITCH_STATE), which is configured to monitor the state of the luminaire on/off switch.

3.3.2.3 Retrieve Logged Data

The ELMS device shall allow a management station to retrieve one or more (including all) available log data from the event log.

3.3.2.4 Clear Log

The ELMS device shall allow the management station to clear any or all log entries of a given event class.

3.3.2.5 Retrieve Capabilities of Event Logging Services

The ELMS device shall allow a management station to retrieve the capabilities of the event logging service, including the number of classes, number of event types, and number of events that can be supported by the ELMS device.

3.3.2.6 Retrieve Number of Events Currently Logged

The ELMS device shall allow a management station to retrieve the current number of events that the ELMS device has logged.

3.3.2.7 Set Time

The ELMS device shall allow a management station to set the current time on the ELMS device. The current time value shall be defined in accordance with the Global Time Object defined in NTCIP 1201 v03 Section 2.4.1.

3.3.2.8 Retrieve Current Time

An ELMS device shall allow a management station to retrieve the current time from the ELMS device. The current time value shall be defined in accordance with the Global Time Object defined in NTCIP 1201 v03 Section 2.4.1.

3.3.2.9 Set Daylight Saving Time Mode

The ELMS device shall allow the management station to configure the ELMS device time for Daylight Saving Time. The current time value shall be defined in accordance with the Global Time Object defined in NTCIP 1201 v03 Section 2.4.1.

3.3.2.10 ELMS Pre-Defined Event Configurations

The following define the requirements for the event logging service of an ELMS device.

3.3.2.10.1 Supported Event Classes

The following minimum set of event classes shall be supported by the event logging service of an ELMS device:

a) ECLASS_LSWITCH_STATE—Luminaire Switch State
b) ECLASS_LCOND—Luminaire Condition
c) ECLASS_LBURNCOND—Luminaire Burn Condition
d) ECLASS_LBURNTIME—Luminaire Burn Time
e) ECLASS_LTEMP—Luminaire Temperature
f) ECLASS_LPOLE—Luminaire Pole Status
g) ECLASS_RSWITCH_STATE—Electrical Service or Branch Circuit Relay Switch state
h) ECLASS_PMSWITCH_STATE—Branch Circuit Power Meter Switch state
i) ECLASS_PMLOG—Branch Circuit Power Meter Log
j) ECLASS_PMCOND—Branch Circuit Power Meter Condition
k) ECLASS_GFSWITCH_STATE—Branch Circuit Ground Fault State
l) ECLASS_GFLOG—Branch Circuit Ground Fault Log

3.3.2.10.2 Luminaire Switch State Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on any change of the luminaire switch state. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.3 Luminaire Lamp Condition Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on any change of the luminaire condition. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.4 Luminaire Burn Condition Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on any change of the luminaire burn condition. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.5 Periodic Luminaire Burn Time Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on periodic reporting of the expected, actual, and total burn time for a luminaire on an interval specified by the management station operator, typically on monthly basis. The

log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.6 Luminaire Temperature Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on the temperature of the luminaire rising above or falling below hysteresis-bound thresholds. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.7 Luminaire Pole Condition Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on any change of the pole on which the luminaire is mounted. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.8 Relay Switch State Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on any change of relay switch for a branch circuit. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.9 Power Meter Switch State Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on any change of the power meter switch for a branch circuit. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.10 Periodic Power Meter Measurement Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on periodic reporting of the power meter voltage, power meter current, power meter power, and/or power meter energy.

3.3.2.10.11 Power Meter Condition Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on any change of the power meter condition. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.12 Ground Fault Switch State Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on any change of the switch state of the ground fault detector. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.2.10.13 Periodic Ground Fault Measurement Log

The ELMS device shall allow the management station to configure the ELMS device to generate log entries within the ELMS device based on periodic reporting of the ground fault leakage current. The log entries shall contain the data element logged, the time and date of the event, and the value of the data element.

3.3.3 Monitor Exceptional Conditions

The required functions for supporting the capability of an ELMS device to communicate exceptional conditions to an ELMS management station follow.

3.3.3.1 Retrieve Current Configuration of Exception Reporting Service

The ELMS device shall allow the management station to determine the current configuration of the exception reporting service, including the types of events that are configured to result in an exception report. The device shall comply with NTCIP 1103 v02 for retrieving the current configuration of the exception reporting service.

NOTE—NTCIP 1213 v02 references NTCIP 1103 v02 as it was anticipated that NTCIP 1103 v02 would provide exception reporting requirements. As published, however, NTCIP 1103 v02 does not support an exception reporting service.

3.3.3.2 Configure Events

The ELMS device shall allow a management station to configure event classes, linked to monitored device data parameters, which when used, generate an exception report. The device shall comply with NTCIP 1103 v02 for configuring events of the exception reporting service.

NOTE—NTCIP 1213 v02 references NTCIP 1103 v02 as it was anticipated that NTCIP 1103 v02 would provide exception reporting requirements. As published, however, NTCIP 1103 v02 does not support an exception reporting service.

3.3.3.3 Provide Automatic Reporting of Events (SNMP Traps)

The ELMS device shall notify the management station when an exceptional event is detected. Exception reporting control shall be implemented in accordance with the rules and procedures defined in NTCIP 1103 v02 Section 6. These procedures are designed to restrict the number of event traps generated by a device.

NOTE—NTCIP 1213 v02 references NTCIP 1103 v02 as it was anticipated that NTCIP 1103 v02 would provide exception reporting requirements. As published, however, NTCIP 1103 v02 does not support an exception reporting service.

3.3.3.4 Manage Exception Reporting

The ELMS device shall allow the management station to control the exception-reporting feature to prevent an overloading of the communications infrastructure. Exception reporting control shall be implemented in accordance with the rules and procedures defined in NTCIP 1103 v02 Section 6. These procedures are designed to restrict the number of event traps generated by a device.

NOTE—NTCIP 1213 v02 references NTCIP 1103 v02 as it was anticipated that NTCIP 1103 v02 would provide exception reporting requirements. As published, however, NTCIP 1103 v02 does not support an exception reporting service.

3.3.3.5 Retrieve Capabilities of Exception Reporting Service

The ELMS device shall allow a management station to determine the capacity of the exception reporting service, including the total number of classes, total number of event types, and total number of events that can be supported by the ELMS device. The device shall comply with NTCIP 1103 v02 for retrieving the capabilities of the exception reporting service.

NOTE—NTCIP 1213 v02 references NTCIP 1103 v02 as it was anticipated that NTCIP 1103 v02 would provide exception reporting requirements. As published, however, NTCIP 1103 v02 does not support an exception reporting service.

3.3.3.6 Retrieve Current Number of Exception Events

A management station shall be able to retrieve the current number of exception events generated by an ELMS device. The device shall comply with NTCIP 1103 v02 or retrieving the current number of exception events of the exception reporting service.

NOTE—NTCIP 1213 v02 references NTCIP 1103 v02 as it was anticipated that NTCIP 1103 v02 would provide exception reporting requirements. As published, however, NTCIP 1103 v02 does not support an exception reporting service.

3.3.3.7 Record and Timestamp Events

Each exception event, retrieved by the management station, shall specify the type of event and the time the event was detected by the ELMS device. The generation time value shall be defined in accordance with the Global Time Object defined in NTCIP 1201 v03 Section 2.4.1.

3.4 FUNCTIONAL REQUIREMENTS

Section 3.4 presents the detailed functional requirements that describe the interface between a management station and an ELMS device.

3.4.1 Configure ELMS Device

The following specify the information exchanges between a management station and an ELMS device to support the configuration of the ELMS device.

3.4.1.1 Configure Luminaire

The following present requirements for retrieving information from a luminaire.

3.4.1.1.1 Retrieve Luminaire Information

The following requirements describe the detailed information elements that a management station shall be able to retrieve from a luminaire.

3.4.1.1.1.1 Retrieve Luminaire Pole Identifier

A management station shall able to retrieve from the ELMS device the pole identifier to which a luminaire is attached.

3.4.1.1.1.2 Retrieve Luminaire Location

A management station shall be able to retrieve the location of the luminaire from the ELMS device. The location information shall be in one of the following forms.

3.4.1.1.1.2.1 Specify Location in Longitude/Latitude Coordinates

A management station shall be able to configure location information of an ELMS device using Longitude/Latitude Coordinates. The coordinate information shall be specified in accordance with the Location Reference Message Specification (LRMS) geometry or geographic profiles.

3.4.1.1.1.2.2 Specify Location Information Using Textual Description of a Road / Street / Block Name / Number

A management station shall be able to configure the location of an ELMS device using road/street/block name/number information. The location information shall be specified in accordance with the Location Reference Message Specification (LRMS) address profile.

3.4.1.1.1.2.3 Specify Location in Local Reference Coordinate Grid

A management station shall be able to configure location information for ELMS devices using a coordinate grid defined by the local agency. The coordinate information shall be specified in accordance with the Location Reference Message Specification (LRMS) grid profile.

3.4.1.1.1.3 Retrieve Luminaire Mode

A management station shall be able to retrieve the current operating mode of the luminaire from the ELMS device.

3.4.1.1.1.4 Retrieve Luminaire Zone

A management station shall be able to retrieve the zone identifier(s) for a luminaire from the ELMS device.

3.4.1.1.1.5 Retrieve Luminaire Vendor Information

A management station shall be able to retrieve the information on the version, make, and model of the luminaire from the ELMS device.

3.4.1.1.2 Configure Luminaire Identification Information

The following requirements define the functions that a management station can perform to configure identifying information for a luminaire.

3.4.1.1.2.1 Configure Luminaire Pole Identifier

The ELMS device shall allow a management station to assign and store a pole identifier value for a luminaire within the ELMS device.

3.4.1.1.2.2 Configure Luminaire Location

The ELMS device shall allow a management station to assign and store location information for a luminaire within the ELMS device. The location information shall conform to the LRMS .

3.4.1.1.3 Configure Luminaire Mode

The ELMS device shall allow a management station to assign and store the operating mode number value for a luminaire within the ELMS device. The mode shall consist of day, night, and 24 hour. The switch mode of the luminaire shall consist of on, off, and schedule.

3.4.1.2 Configure Electrical Service

The following define the functions that support the configuration of an electrical service that controls the operation of luminaires.

3.4.1.2.1 Retrieve Electrical Service Information

The following describe information that a management station shall be able to retrieve for an electrical service.

3.4.1.2.1.1 Retrieve Electrical Service Location

A management station shall be able to retrieve the location of an Electrical Service from the ELMS device. The location information shall conform to the LRMS.

Recommended location profiles are discussed in the Section 3.4.1.1.1.2 requirement.

3.4.1.2.1.2 Retrieve Electrical Service Zone

A management station shall be able to retrieve the zone identifier(s) from the ELMS device to which an electrical service has been assigned.

3.4.1.2.1.3 Retrieve Electrical Service Pole Identifier

A management station shall be able to retrieve the pole identifier for an electrical service from the ELMS device.

3.4.1.2.2 Configure Electrical Service Information

The following describe the requirements for the information exchange between a management station and an ELMS device for the purpose of configuring an electrical service.

3.4.1.2.2.1 Configure Electrical Service Location

The ELMS device shall allow a management station to assign and store a location information value for an electrical service within the ELMS device. The location information shall conform to the LRMS.

3.4.1.2.2.2 Configure Electrical Service Pole Identifier

The ELMS device shall allow a management station to assign and store a pole identifier value for an electrical service within the ELMS device.

3.4.1.3 Configure for Light Activated Operation

Section 3.4.1.3 describes the detailed requirements for how the management station configures components of an illumination system for operations based on ambient light detection.

3.4.1.3.1 Configure Luminaire for Light Activated Operations

The ELMS device shall allow a management station to assign and store the following elements within an ELMS device to configure a luminaire for light-activated operations:

a) AmbientLightThreshold (lux)—illumination level
b) LightHysteresis (lux)—a deadband providing greater stability for lighting control, and used in conjunction with the AmbientLightThreshold (added/subtracted to establish the deadband range)
c) HoldInterval (seconds)—time interval required for device to warm up prior to accepting control changes (values of the Holdinterval vary based on physical characteristics of the luminaire, e.g., high intensity discharge lighting hold intervals are different from fluorescent lighting)
d) DelayInterval (seconds)—time interval used to prevent switching the luminaire on/off because of transient lighting conditions (e.g., lightning)

3.4.1.3.2 Configure Electrical Service for Light Activated Operations

The ELMS device shall allow a management station to assign and store the following elements within an ELMS device to configure an electrical service for light-activated operations:

a) AmbientLightThreshold (lux)—illumination level
b) LightHysteresis (lux)—a deadband providing greater stability for lighting control, and used in conjunction with the AmbientLightThreshold (added/subtracted to establish the deadband range)
c) HoldInterval (seconds)—time interval required for device to warm up prior to accepting control changes (values of the Holdinterval vary based on physical characteristics of the luminaires served by the electrical service, e.g., high intensity discharge lighting hold intervals are different from fluorescent lighting)
d) DelayInterval (seconds)—time interval used to prevent switching the electrical service on/off because of transient lighting conditions (e.g., lightning)

3.4.1.3.3 Configure Branch Circuit for Light Activated Operations

The ELMS device shall allow a management station to assign and store the following elements within an ELMS device to configure a branch circuit for light-activated operations:

a) AmbientLightThreshold (lux)—illumination level;
b) LightHysteresis (lux)—a dead band to provide greater stability for lighting control, and used in conjunction with the AmbientLightThreshold.(added/subtracted to establish the deadband range)
c) HoldInterval (seconds)—time interval required for device to warm up prior to accepting control changes (values of the Holdinterval vary based on physical characteristics of the luminaires served by the branch circuit, e.g., high intensity discharge lighting hold intervals are different from fluorescent lighting)
d) DelayInterval (seconds)—time interval used to prevent switching the branch circuit on/off because of transient lighting conditions (e.g., lightning)

3.4.1.3.4 Configure Devices in Zone for Light Activated Operations

The ELMS device shall allow a management station to assign and store the following elements within an ELMS device to support configuration of the ELMS devices assigned to a zone for light-activated operations:

a) AmbientLightThreshold (lux)—illumination level
b) LightHysteresis (lux)—a deadband to provide greater stability for lighting control, and used in conjunction with the AmbientLightThreshold (added/subtracted to establish the deadband range)
c) HoldInterval (seconds)—time interval required for device to warm up prior to accepting control changes (values of the Holdinterval vary based on physical characteristics of the luminaires contained in the zone, e.g., high intensity discharge lighting hold intervals are different from fluorescent lighting)
d) DelayInterval (seconds)—time interval used to prevent switching the devices in the zone on/off because of transient lighting conditions (e.g., lightning)

NOTE—The ELMS device that contains the parameter information to be transferred to the devices assigned in the zone may use non-NTCIP protocols to accomplish the data transfer.

3.4.1.4 Configure for Scheduled Operation

The requirements for information exchange between a management station and an ELMS device for purposes of configuring components of an illumination system for scheduled operations follow.

3.4.1.4.1 Configure Luminaire for Scheduled Operations

The ELMS device shall allow a management station to assign and store a schedule for a luminaire within the ELMS device. The schedule shall be defined in conformance with the Global Timebase Schedule Node objects defined in NTCIP 1201 v03.

3.4.1.4.2 Configure Electrical Service for Scheduled Operations

The ELMS device shall allow a management station to assign and store a schedule for an electrical service within the ELMS device. The schedule shall be defined in conformance with the Global Timebase Schedule Node objects defined in NTCIP 1201 v03.

3.4.1.4.3 Configure Branch Circuit for Scheduled Operations

The ELMS device shall allow a management station to assign and store a schedule for a branch circuit within the ELMS device. The schedule shall be defined in conformance with the Global Timebase Schedule Node objects defined in NTCIP 1201 v03.

3.4.1.4.4 Configure Devices in Zone for Scheduled Operations

The ELMS device shall allow a management station to assign and store a schedule for a zone within the ELMS device. The schedule shall be defined in conformance with the Global Timebase Schedule Node objects defined in NTCIP 1201 v03. As per the operations concepts defined in Section 2, the ELMS device that contains the schedule for the devices for the zone may use non-NTCIP protocols to communicate the schedule information to the devices in zone.

3.4.1.4.5 Schedule ELMS Device Event

An ELMS device shall allow management station to define daily schedules of actions with a time resolution of one minute; the rules for selecting a daily schedule to run shall allow schedule configuration for at least one year in advance. The daily schedules and actions shall be defined in conformance with the Global Timebase Schedule Node objects defined in NTCIP 1201 v03.

3.4.1.4.6 Retrieve a Schedule

An ELMS device shall allow a management station to retrieve the current values of the operating schedule parameters. The schedule shall be defined in conformance with the Global Timebase Schedule Node objects defined in NTCIP 1201 v03.

3.4.1.5 Configure Zones

The requirements for configuring components of an illumination system into zones follow.

3.4.1.5.1 Configure Luminaire Zone

The ELMS device shall allow a management station to assign and store zone identifier(s) for a luminaire within the ELMS device.

3.4.1.5.2 Configure Electrical Service Zone

The ELMS device shall allow a management station to assign and store zone identifier(s) for an electrical service within the ELMS device.

3.4.1.5.3 Configure Branch Circuit Zone

The ELMS device shall allow a management station to assign and store zone identifier(s) for a branch circuit within the ELMS device.

3.4.1.5.4 Define Zones

The ELMS device shall allow a management station to define and store zone definitions within the ELMS device. Each device shall be allowed to be assigned to multiple zones.

3.4.1.6 Configure Stagger Interval

The requirements for controlling ELMS devices in a staggered mode of operations follow.

3.4.1.6.1 Configure Luminaire Stagger Interval

The ELMS device shall allow a management station to assign and store a stagger interval value for a luminaire within the ELMS device. Stagger interval shall be expressed in units of seconds.

3.4.1.6.2 Configure Branch Circuit Stagger Interval

The ELMS device shall allow a management station to assign and store a stagger interval value for a branch circuit within the ELMS device. Stagger interval shall be expressed in units of seconds.

3.4.1.6.3 Configure Electrical Service Stagger Interval

The ELMS device shall allow a management station to assign and store a stagger interval value for an electrical service within the ELMS device. Stagger interval shall be expressed in units of seconds.

3.4.1.7 Configure Dim Levels

Requirements describing the interactions between a management station and an ELMS device for configuring the dimming levels follow.

3.4.1.7.1 Configure Luminaire Dim Level

The ELMS device shall allow a management station to assign and store a dim level value for a luminaire within the ELMS device.

3.4.1.7.2 Configure Electrical Service Dim Level

The ELMS device shall allow a management station to assign and store a dim level value for an electrical service within the ELMS device.

3.4.1.7.3 Configure Branch Circuit Dim Level

The ELMS device shall allow a management station to assign and store a dim level value for a branch circuit within the ELMS device.

3.4.1.7.4 Configure Dim Level for Devices in Zone

The ELMS device shall allow a management station to assign and store a dim level value for a set of devices assigned to a zone in an ELMS device.

3.4.1.8 Configure for Manual Operation

Requirements for configuring an ELMS device to be controlled manually from a management station are described as follows.

3.4.1.8.1 Configure Luminaire for Manual Operation

The ELMS device shall allow a management station to set parameters within the ELMS device to configure the luminaire for manual operations.

3.4.1.8.2 Configure Electrical Service for Manual Operations

The ELMS device shall allow a management station to set parameters in the ELMS device to configure the electrical service for manual operations (e.g., remote enabling/disabling of the electrical service).

3.4.1.8.3 Configure Branch Circuit for Manual Operations

The ELMS device shall allow a management station to set parameters in the ELMS device to configure the branch circuit for manual operations (e.g., remote enabling/disabling of the branch circuit).

3.4.1.8.4 Configure Devices in Zone for Manual Operations

The ELMS device shall allow a management station to set parameters in the ELMS device to configure a zone of devices for manual operations.

3.4.1.9 Configure Electrical Service Monitoring and Metering Equipment

Requirements defining the information exchange between a management station and an ELMS device for purposes of configuring the service monitoring and metering equipment for an electrical service and branch circuits follow.

3.4.1.9.1 Configure Branch Circuit Ground Fault Detector

A management station shall be able to configure the operation of the ground fault detector for a branch circuit within an ELMS device, by setting the level at which the ground fault detector sets an alarm, and by enabling/disabling the ground fault detector.

For example, the device may be set to notify the management station if it sees a fault larger than 5 milliamps (mA). The units for the alarm threshold level are mA.

3.4.1.9.2 Configure Branch Circuit Power Meter

A management station shall be able to configure the operation of a power meter for a branch circuit within an ELMS device, by setting the allowable variation from baseline current or power. For example, if a circuit normally draws 15 amps (A), the management station should be notified if it changes by plus or minus 20%, (goes up or down by 3 A). The management station shall be able to set the baseline current level, and the levels above and below baseline that triggers a notification for in the ELMS device.

3.4.1.9.3 Configure Branch Circuit Arc Fault Detector

A management station shall be able to enable/disable the arc fault detector for a branch circuit within an ELMS device.

3.4.1.10 Configure Branch Circuit

The functions that support the configuration a branch circuit that controls the operation of branch circuit follow.

3.4.1.10.1 Retrieve Branch Circuit Information

The information that a management station retrieves for a branch circuit follows.

3.4.1.10.1.1 Retrieve Branch Circuit Zone

A management station shall be able to retrieve the zone identifier(s) from the ELMS device to which a branch circuit has been assigned.

3.4.1.10.1.2 Retrieve Branch Circuit Location

A management station shall be able to retrieve the location of a branch circuit from the ELMS device. The location information shall conform to the LRMS specification.

3.4.1.10.1.3 Retrieve Branch Circuit Pole Identifier

A management station shall be able to retrieve the Pole Identifier for a branch circuit from the ELMS device.

3.4.1.10.2 Configure Branch Circuit Information

The requirements for the information exchange between a management station and an ELMS device for the purpose of configuring a branch circuit follow.

3.4.1.10.2.1 Configure Branch Circuit Location

The ELMS device shall allow a management station to assign and store location information for a branch circuit within the ELMS device. The location information shall conform to the LRMS specification. Recommended profiles are discussed in Section 3.4.1.1.1.2.

3.4.1.10.2.2 Configure Branch Circuit Pole Identifier

The ELMS device shall allow a management station to assign and store a Pole Identifier value for a branch circuit within the ELMS device.

3.4.2 Control Device

The requirements specifying the information exchanged between a management station and an ELMS device for purposes of controlling the ELMS device follow.

3.4.2.1 Control Luminaire

The requirements describing the ways in which a management station controls a luminaire follow.

3.4.2.1.1 Control Luminaire by Permanent/Continuous Override

The ELMS device shall allow the management station to remotely turn on or off the luminaire and disable any scheduled operations currently configured in the device until the management station selects another mode.

3.4.2.1.2 Control Luminaire by Transitory Override

The ELMS device shall allow the management station to remotely turn on or off the luminaire and disable any scheduled operations currently configured in the device. The ELMS device shall allow the schedule to resume upon the next schedule event time.

3.4.2.1.3 Control Luminaire by Timed Override

ELMS device shall allow the management station to remotely turn on or off the luminaire and disable any scheduled operations currently configured in the device until a specified override time. Override time shall be specified in seconds.

3.4.2.1.4 Control Luminaire in Stagger Mode

A management station shall be able to control a luminaire in a staggered mode of operations, such as when the luminaire turns on or off at the specified stagger interval time. For example, if the stagger interval is configured to be 60 seconds, then the luminaire turns on or off 60 seconds after the on/off command was received from the management station, or in cases of power failure, upon resumption of power to the luminaire. Stagger interval shall be expressed in seconds.

3.4.2.2 Control Electrical Service

The requirements that define the ways in which a management station controls an ELMS electrical service component follow.

3.4.2.2.1 Control Electrical Service by Permanent/Continuous Override

The ELMS device shall allow the management station to remotely turn on or off the electrical service and disable any scheduled operations currently configured in the device until the management station selects another mode.

3.4.2.2.2 Control Electrical Service by Transitory Override

The ELMS device shall allow the management station to remotely turn on or off the electrical service and disable any scheduled operations currently configured in the device. The ELMS device shall allow the schedule to resume upon the next schedule event time.

3.4.2.2.3 Control Electrical Service by Timed Override

The ELMS device shall allow the management station to remotely turn on or off the electrical service and disable any scheduled operations currently configured in the device until a specified override time. Override time shall be expressed in seconds.

3.4.2.2.4 Control Electrical Service in Stagger Mode

A management station shall be able to alter the interval at which services are staggered in operation (e.g., the service is enabled/disabled at the specified stagger interval time).

3.4.2.3 Control Branch Circuit

The requirements that define the ways in which a management station controls a branch circuit follow.

3.4.2.3.1 Control Branch Circuit by Permanent/Continuous Override

The ELMS device shall allow the management station to remotely turn on or off the branch circuit and disabling any scheduled operations currently configured in the device until the management station selects another mode.

3.4.2.3.2 Control Branch Circuit by Transitory Override

The ELMS device shall allow the management station to remotely turn on or off the branch circuit and disable any scheduled operations currently configured in the device. The ELMS device shall allow the schedule to resume upon the next schedule event time.

3.4.2.3.3 Control Branch Circuit by Timed Override

The ELMS device shall allow the management station to remotely turn on or off the branch circuit and disable any scheduled operations currently configured in the device until a specified override time. Override time shall be expressed in seconds.

3.4.2.3.4 Control Branch Circuit in Stagger Mode

A management station shall be able to control the interval at which branch circuits are staggered in operation (e.g., the branch circuit is turned on or off at the specified stagger interval time).
For example, if the stagger interval is configured to be 60 seconds, then the branch circuit is turned on or off 60 seconds after the on/off command was received from the management station, or in cases of power failure, upon resumption of power to the branch circuit. Stagger interval shall be expressed in seconds.

3.4.2.4 Control Devices by Zone

The requirements that define the ways in which a management station controls a zone of ELMS devices follow.

3.4.2.4.1 Control Devices in Zone by Permanent/Continuous Override

The ELMS device shall allow the management station to remotely turn on or off the ELMS devices assigned to the zone and disabling any scheduled operations currently configured in the ELMS devices assigned to the zone.

3.4.2.4.2 Control Devices in Zone by Transitory Override

The ELMS device shall allow the management station to remotely turn on or off the ELMS devices assigned to the zone and disabling any scheduled operations currently configured in the devices assigned to the zone. The ELMS device shall allow the schedule configured in the ELMS devices assigned to the zone to resume upon the next schedule event time.

3.4.2.4.3 Control Devices in Zone by Timed Override

The ELMS device shall allow the management station to remotely turn on or off the ELMS devices assigned to the zone, disabling any scheduled operations currently configured in the devices assigned to the zone until a specified override time. Override time shall be expressed in seconds.

3.4.3 Monitor Device Status

The requirements specifying the information exchanged between a management station and an ELMS device for purposes of monitoring the ELMS device follow.

3.4.3.1 Monitor Luminaire

The requirements for monitoring a luminaire by a management station follow.

3.4.3.1.1 Retrieve Luminaire Switch Status

A management station that is controlling the ELMS device shall be able to retrieve the status (on, off) of a luminaire relay from the ELMS device.

3.4.3.1.2 Retrieve Luminaire Temperature

A management station that is controlling the ELMS device shall be able to retrieve the luminaire temperature from the ELMS device, expressed in tenths of degrees Celsius.

3.4.3.1.3 Retrieve Luminaire Burn Time Statistics

A management station that is controlling the ELMS device shall be able to retrieve the actual monthly burn time and expected monthly burn time, the total burn time (measured from time total value was last reset by the management station) from the ELMS device. Burn times shall be reported in elapsed seconds since the start of the current month, where the month start is midnight local time of the first day of the month.

3.4.3.1.4 Retrieve Luminaire Pole Status

A management station that is controlling the ELMS device shall be able to retrieve the tilt status of the luminaire pole from the ELMS device.

3.4.3.1.5 Retrieve Luminaire Dimming Level Output

A management station shall be able to retrieve the current dimming level of the luminaire from the ELMS device.

3.4.3.1.6 Retrieve Luminaire Lamp Status

A management station shall be able to retrieve the status of the lamp within the luminaire to see if the lamp is operating normally or is cycling.

3.4.3.1.7 Retrieve Luminaire Power Usage Statistics

A management station shall be able to retrieve the voltage and current readings for a luminaire. The voltage reading shall be expressed in millivolts (mV) root mean square (RMS). The current reading shall be expressed in mA.

3.4.3.1.8 Retrieve Luminaire Ballast Status

A management station shall be able to retrieve the status (OK, Fault, NoDataComm) of the ballast for the luminaire.

3.4.3.1.9 Retrieve Luminaire Starter Status

A management station shall be able to retrieve the status (OK, Fault, NoDataComm) of the starter for the luminaire.

3.4.3.2 Monitor Electrical Service

The requirements for monitoring an electrical service by a management station follow.

3.4.3.2.1 Retrieve Electrical Service Ground Fault Status

A management station shall be able to retrieve the ground fault status (OK, Fault, NoDataComm) of an electrical service.

3.4.3.2.2 Retrieve Electrical Service Hours

A management station shall be able to retrieve the accumulated number of hours the electrical service has been in operation.

3.4.3.2.3 Retrieve Electrical Service Operational Status

A management station shall be able to retrieve the electrical service operational status (OK, Fault, NoDataComm).

3.4.3.2.4 Retrieve Electrical Service Power Readings

A management station shall be able to retrieve the current, voltage, and power readings of the electrical service. The current reading value shall be expressed in mA. The voltage reading value shall be expressed in mV RMS. The power reading value shall be expressed in milliwatts (mW).

3.4.3.2.5 Retrieve Electrical Service Main Breaker Status

A management station shall be able to retrieve the main breaker status (OK, Fault, Trip, NoDataComm) for an electrical service.

3.4.3.2.6 Retrieve Electrical Service Arc Fault Status

A management station shall be able to retrieve the arc fault status (OK, Fault, NoDataComm) of an electrical service.

3.4.3.3 Monitor Branch Circuit

The requirements for monitoring a branch circuit by a management station follow.

3.4.3.3.1 Retrieve Branch Circuit Power Readings

A management station shall be able to retrieve the current, voltage, and power readings of the branch circuit. The current reading value shall be expressed in mA. The voltage reading value shall be expressed in mV RMS. The power reading value shall be expressed in mW.

3.4.3.3.2 Retrieve Branch Circuit Arc Fault Status

A management station shall be able to retrieve the arc fault status (OK, Fault, NoDataComm) of a branch circuit.

3.4.3.3.3 Retrieve Branch Circuit Breaker Status

A management station shall be able to retrieve the breaker status (on, off, trip, NoDataComm) for a branch circuit.

3.4.3.3.4 Retrieve Branch Circuit Operational Status

A management station shall be able to retrieve the branch circuit operational status (OK, Fault, NoDataComm).

3.4.3.3.5 Retrieve Branch Circuit Hours

A management station shall be able to retrieve the accumulated number of hours the branch circuit has been in operation. The time value for the accumulated hours shall be defined in accordance with the Global Time Object defined in NTCIP 1201 v03 Section 2.4.1.

3.4.3.3.6 Retrieve Branch Circuit Ground Fault Status

A management station shall be able to retrieve the ground fault status (OK, Fault, NoDataComm) of a branch circuit.

3.5 SUPPLEMENTAL REQUIREMENTS

The supplemental requirements for an interface between a management station and an ELMS device follow.

3.5.1 Supplemental Requirements for Scheduled Operations

Supplemental requirements for defining a time-based schedule follow.

3.5.1.1 Support a Number of Actions

The ELMS device shall support the number of actions as defined in the Additional Project Requirements column in the PRL. If the Additional Project Requirements column in the PRL does not define the number of actions, the ELMS device shall support at least two actions

NOTE—An action is defined as being a unique command that might be called by a day plan event. For example, turning on a luminaire is an action, turning off a luminaire is a second action.

3.5.1.2 Support a Number of Day Plans

A management station shall be able to define the number of Day Plans in the ELMS device to be used to control the scheduled operation of the device, defined in the Additional Project Requirements column in the PRL. If the number of Day Plans is not defined in the PRL, the ELMS device shall be able to support at least one day plan.

3.5.1.3 Perform Action at Scheduled Time

The ELMS device shall perform the actions configured in the events of the day plan schedule at the times identified.

3.5.2 Supplemental Requirements for Zones

Supplemental requirements for zones follow.

3.5.2.1 Define Number of Zones Supported by an ELMS Device

An ELMS device shall be able to configure up to (0..65535) zones.

3.5.2.2 Define Number of ELMS Devices for a Zone

An ELMS device shall be able to configure up to (0..65535) for the number of ELMS devices in a single zone.

3.5.3 Supplemental Requirements for Dim Levels

Supplemental requirements for dim levels follow.

3.5.3.1 Define Dim Level as a percentage of maximum brightness

The types of dim levels supported by an ELMS device shall include an option to support percentage of maximum brightness (illumination output, measured in lux).

3.5.4 Supplemental Requirements for Event Logs

The supplemental requirements for event logs of an ELMS device follow.

3.5.4.1 Configure Number of Events in Event Log

A management station shall be able to configure in the ELMS device the maximum number of events that can be stored in an event log.

3.5.4.2 Configure Number of Event Classes

A management station shall be able to configure in the ELMS device the maximum number of event classes to be used in an event logging service for the ELMS device.

3.5.4.3 Configure Number of Event Types

A management station shall be able to configure in the ELMS device the maximum number of event types logged for the ELMS device.

3.5.5 Supplemental Requirement for Live Data

The supplemental requirement for live data response of an ELMS device follows.

3.5.5.1 Live Data Response Time

The ELMS device shall process the data request in accordance with all of the rules of NTCIP 1103 v02, which stipulates in Section 3.2.4 that if the SNMP agent does not specify the maximum response time, the maximum response time shall be 100 milliseconds plus one millisecond for each byte in the response variable binding list. The project column provides the requirement for a more stringent maximum response time for the device and supersedes this requirement if it is less than the maximum response time stipulated by NTCIP 1103 v02 Section 3.2.4.

Section 4
DIALOGS
[NORMATIVE]

Section 4 is intended for the developers of management stations and ELMS devices. Other readers might find Section 4 and Section 5 helpful to gain a full understanding of NTCIP 1213 v02 design details.

Section 4 provides a detailed definition of the required processes to implement the various functional requirements defined in previous section. Section 4 is divided into two parts:

a) Tutorial—an overview of the Section 4 contents
b) Dialogs—the standardized data exchange sequences used to ensure interoperable implementations for the various functional requirements

The Requirements Traceability Matrix (RTM) contained in Annex A provides tracing from each functional requirement to the dialogs.

NOTE—To fully and clearly describe the design of the system, an object-oriented approach is adopted; however, this object-oriented design in no way imposes a requirement for an object-oriented implementation. Figures are solely intended to show the details of the interface logic and static structures; the implementation may follow an object-oriented or structured approach.

4.1 TUTORIAL [INFORMATIVE]

Sections 4.2 and 4.3 define how the system is designed to work for a given functional requirement. Section 4.2 describes the generic Simple Network Management Protocol (SNMP) commands used across the interface between a management station and an ELMS device. Section 4.3 describes specific dialogs for most of the functional requirements listed in Section 3.3. Each dialog indicates the sequence of actions that the management station and ELMS device follow to provide the specific service and may be described in list form or shown through a sequence diagram.

A solid line with an arrowhead indicates an initiation of a request from one entity to another. A dashed-line with an arrowhead indicates a return value to a request. Generally, the entities that initiate requests are on the left of those receiving the request; solid lines that travel right-to-left typically represent call-back operations. The flow of events can be followed by looking at the message lines between objects as they move across and down the page. An example sequence diagram is provided in Figure 5.

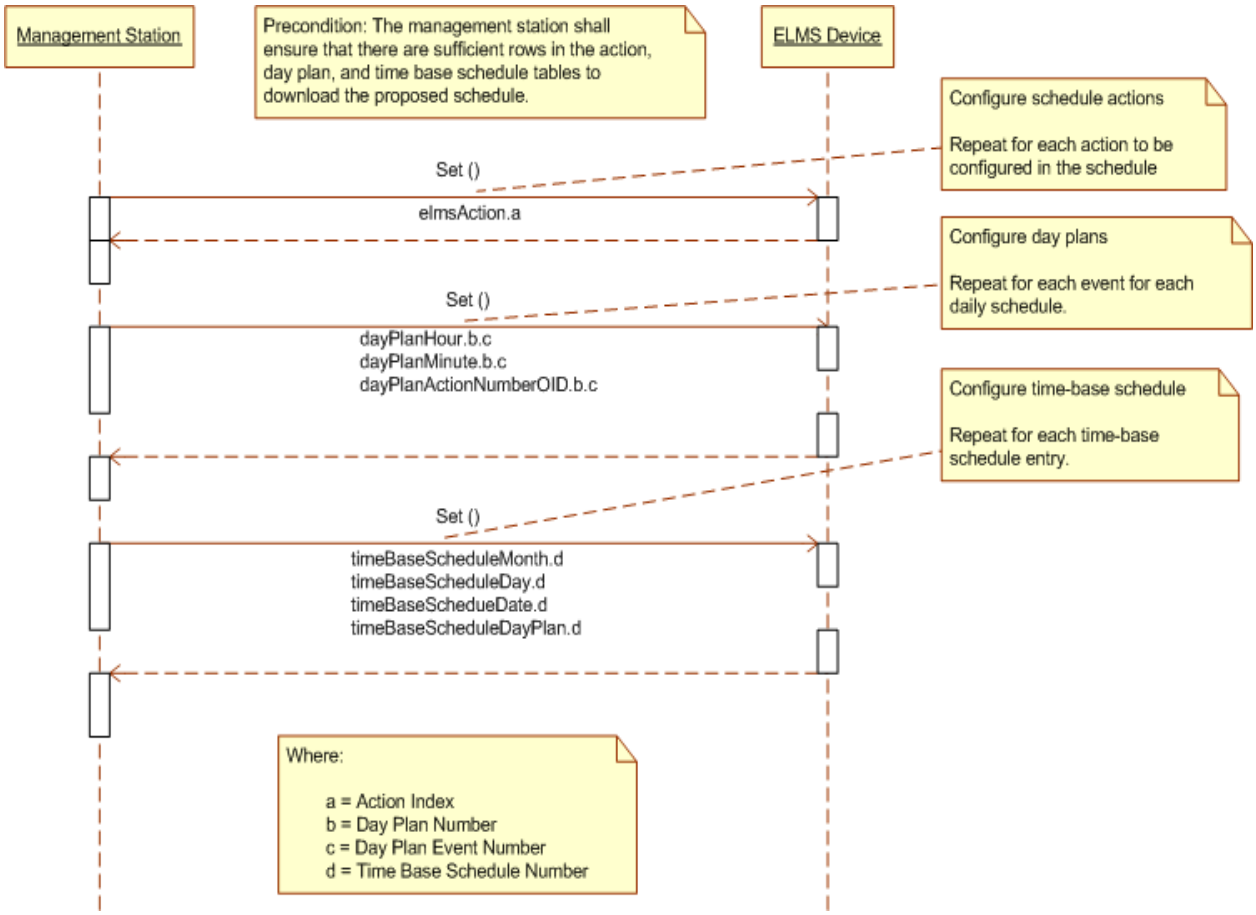

Figure 5 Sample Sequence Diagram for Schedule Feature

In addition to sequence diagrams for a given dialog, there may also be a View of Participating Classes (VOPC) diagram that depicts the interrelationships among the various entities identified in the sequence diagrams. For the vast majority of cases, the dialogs for an ELMS device are simplistic enough to be described in simple list form without sequence or class diagrams.

Figure 6 provides a sample VOPC diagram.

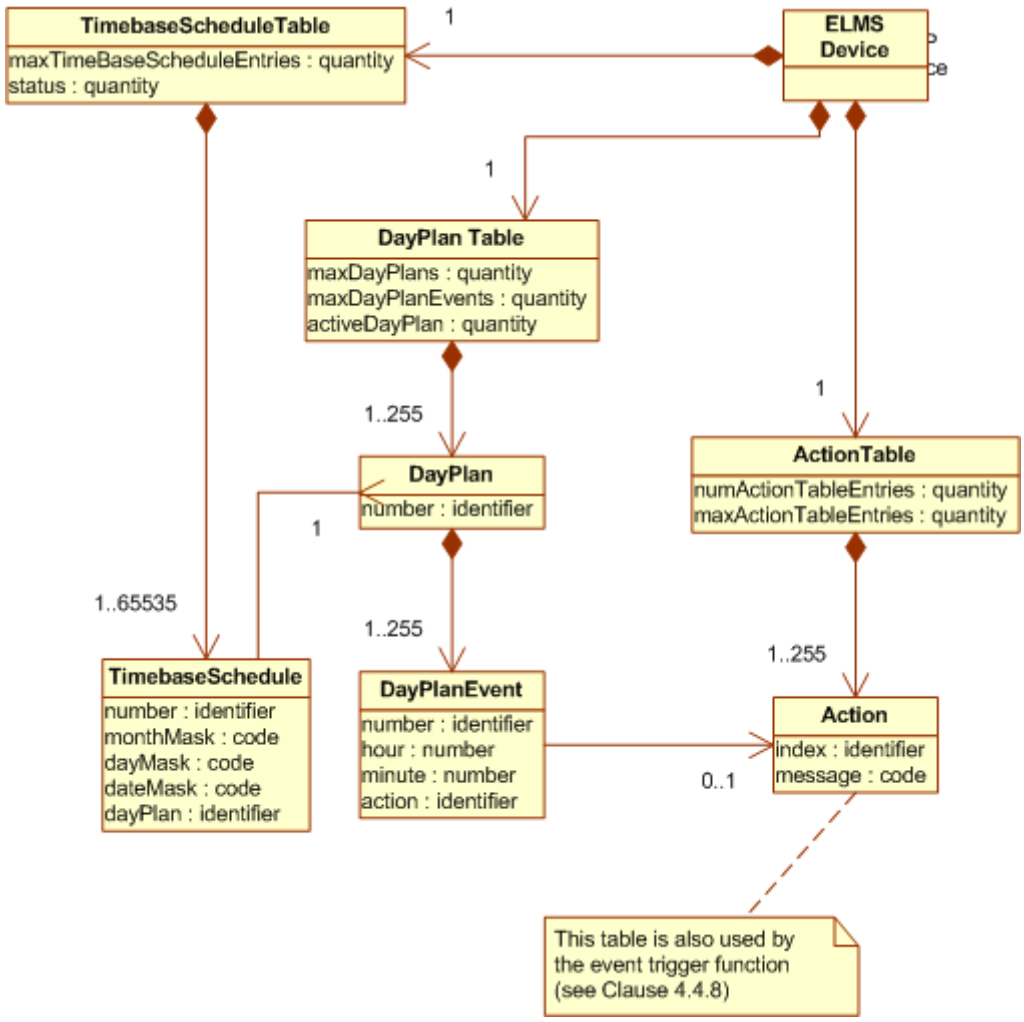

Figure 6 Sample VOPC Diagram for Schedule Feature

Each box represents a logical class (grouping) of data. The box contains a name in the upper compartment and a list of any applicable attributes (i.e., individual pieces of information to describe the class) in the lower compartment. Lines between classes indicate that the classes have a relationship.

A diamond on the end of a line indicates aggregation. The class that has the diamond is the whole; the other class represents a part. If the diamond is filled-in it indicates composition, meaning that the part may only be owned by one whole and when the whole is deleted, all of its parts are automatically deleted. However, a part of an aggregate relationship that is not a composition can exist without the whole or may be part of several wholes. At a university, for example, a course would be considered to be an aggregation of students. A student may be enrolled in several courses at once and the student is not 'deleted' if the course is cancelled.

A number at the end of a relationship line indicates the number of those classes that may exist in relation to the other class. An asterisk (*) indicates an infinite number. A range of values may be indicated in the format of a number followed by two periods followed by another number.

A circle connected by a line indicates an interface for the class. An interface is one or more operations that may be performed. Within the context of NTCIP 1213 v02, there is one interface, the SNMP Interface, which is described in Section 4.2.

NOTE—A more detailed discussion of interpreting class and sequence diagrams can be found in *The Unified Modeling Language User Guide, 2nd Edition* by Booch, Rumbaugh, and Jacobson.

After the diagram, there are one or more descriptions of:

a) The important rules depicted in the diagram
b) Which data from the subject diagram require support
c) Which operations may be performed on each piece of data

The selection of user needs and requirements (from the PRL in Section 3) dictate which dialog and interface section(s) apply to a given deployment. The precise relationships between requirements, dialogs, interfaces, and objects are indicated in the Requirements Traceability Matrix (RTM) provided in Annex A.

4.2 SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)

To promote interoperability NTCIP 1213 v02 requires support for the Simple Network Management Protocol (SNMP). Section 4.2 defines how the management station and ELMS device shall respond to each request using SNMP.

The ELMS device shall conform to the requirements for the Simple Network Management Protocol (SNMP) as defined in NTCIP 1103 v02. Sections 4.2.1 through 4.2.4 provide a description of the key services offered by SNMP assuming no errors. The precise rules and procedures are defined in NTCIP 1103 v02. Section 4.2.5 provides additional requirements that supplement but do not replace any requirements of NTCIP 1103 v02.

4.2.1 Generic SNMP Get Interface

SNMP defines a generic process by which a management station can retrieve data from a device. This process consists of a Get request (GET) and a GetResponse as depicted in Figure 7. Both the Get request and the GetResponse messages contain a list of objects as defined by the varBindingList structure (see Section 4.2.4).

Figure 7 SNMP Get Interface

This generic process is customized by subsequent sections of NTCIP 1213 v02, by referencing the 'GET' operation, and directly by the RTM, by section number, to fulfill a wide range of the requirements defined in Section 3.

4.2.2 Generic SNMP Get-Next Interface

SNMP defines a process by which a management station can explore data within a device. This process consists of a GetNext request and a GetResponse as depicted in Figure 8. Both the GetNext request and the GetResponse messages contain a list of objects as defined by the varBindingList structure (see Section 4.2.4).

Figure 8 SNMP GetNext Interface

4.2.3 Generic SNMP Set Interface

SNMP defines a generic process by which a management station can send data to a device. This process consists of a Set request and a GetResponse (sic) as depicted in Figure 9. Both the Set request and the GetResponse messages contain a list of objects as defined by the varBindingList structure (see Section 4.2.4).

Figure 9 SNMP Set Interface

NOTE—The response message issued to an SNMP Set request is the same message structure as used to respond to an SNMP Get request. The SNMP standard calls this response message a GetResponse, but it is in fact a response to either a GET or a SET.

This generic process is customized by subsequent sections of NTCIP 1213 v02, by referencing the ‘SET’ operation, and directly by the RTM, by section number, to fulfill a wide range of the requirements defined in Section 3.

4.2.4 Variable Binding List Structure

The requests and responses for the Get, Get Next and Set operations, all use the varBindingList structure. NTCIP 1103 v02 defines this structure as containing zero or more varBindings, where each varBinding is defined to consist of an object name (as indicated by an Object Identifier (oid)) and the associated object value. This relationship is depicted in Figure 10.

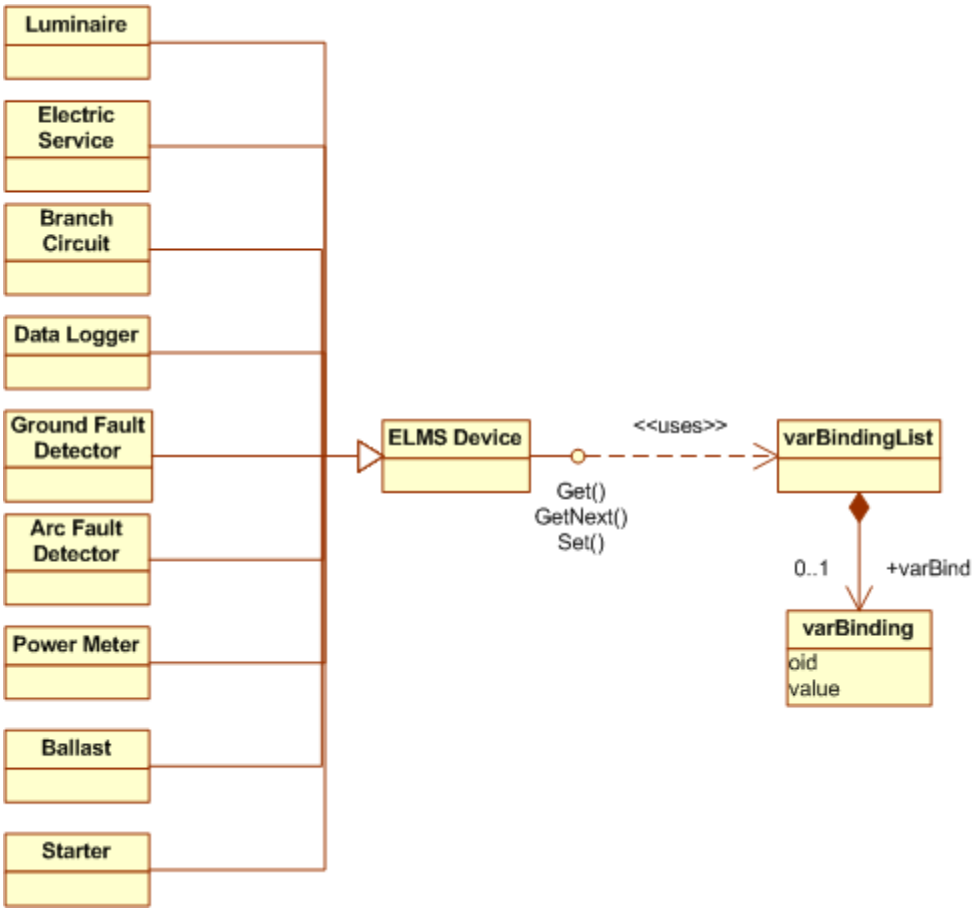

Figure 10 SNMP Interface—View of Participating Classes

4.2.5 Additional Requirements

4.2.5.1 Grouping of Objects in a Request

The ELMS device shall allow the management station to perform a single Get, GetNext, or Set operation on any combination of supported objects with the objects listed in any order within the message, unless otherwise restricted by NTCIP 1213 v02.

The ELMS device shall not associate any semantics to the ordering of objects within the varBindingsList. As required by RFC 1157 Clause 4.1.5, each object shall be affected “as if simultaneously set with respect to all other assignments specified in the same message.”

4.2.5.2 Support of Get

The ELMS device shall allow the management station to perform the Get operation on any supported object for which support for the Get Operation is indicated in Section 4.2.1.

4.2.5.3 Support of GetNext

The ELMS device shall allow the management station to perform the GetNext operation on any OBJECT IDENTIFIER.

4.2.5.4 Support of Set

The ELMS device shall allow the management station to perform the Set operation on any supported object for which support for the Set Operation is indicated in Section 4.2.3.

4.2.5.5 Performance

The ELMS device shall process the Get, GetNext, or Set request in accordance with all of the rules of NTCIP 1103 v02.

4.3 SPECIFIED DIALOGS

Section 4.3 presents the standardized dialogs (i.e., sequence of data exchanges) that fulfill various requirements. As the management station largely drives SNMP communications, most of the requirements define how the use of the interface affects the management station.

NTCIP standards are based on SNMP. This protocol offers a high degree of flexibility as to how the management station structures its requests. For example, with SNMP, the management station can do any of the following:

a) Send only those requests that are critical at the current time (whereas a standardized dialog typically sends requests relating to all associated data, regardless of whether it is critical for current purposes)
b) Combine a number of requests in a single packet (whereas a standardized dialog dictates the exact contents of each packet)
c) Separate a group of requests into multiple packets (whereas a standardized dialog dictates the exact contents of each packet)
d) Interweave requests from multiple dialogs (whereas a standardized dialog dictates the exact ordering of messages, which are not interrupted with other messages)

This flexibility can be a powerful tool allowing a management system to optimize the use of communication facilities, which is the primary reason that SNMP was chosen as the core NTCIP protocol. However, the flexibility also means that there are numerous allowable variations in the management process that a management station may choose to use.

Unfortunately, this flexibility presents a challenge to ensuring interoperability. Most agencies only require that the device be tested to a standard set of procedures, which would use standardized dialogs. Without more extensive testing, a given management station may attempt to use non-standard dialogs (e.g., to improve communication efficiency) against which a device has never been tested, which raises the potential for an interoperability issue.

To overcome this complication Section 4.3 defines a lowest common denominator approach to communications between a management station and an ELMS device. It defines the standardized dialog for most of the Functional Requirements, as defined in Section 3.4. Management stations may support other dialogs to fulfill these same requirements, as long as these dialogs are consistent with the rules defined in NTCIP 1213 v02. Such a management station is termed a ‘consistent management station.’ A consistent management station interoperates with any ‘conformant’ device. However, since an agency cannot be certain that a device is conforming to every possible scenario (given practical constraints), interoperability problems could still arise.

A ‘conformant management station’ is required to offer a mode in which it only uses the standardized dialogs as defined. With this limited definition, there is relatively little variability in what constitutes a conformant management station. Thus, fully testing a management station for conformance is a relatively straight forward process that can be done within the practical constraints faced by most procuring agencies. Thus, a conformant management station provides an agency with a much greater chance of achieving interoperability with off-the-shelf devices that have been tested against NTCIP 1213 v02 and the designation of such a system is intended to provide a guaranteed base level of interoperability.

The rules for the standardized dialogs follow:

a) The dialogs are defined by a sequence of GET or SET requests. These requests shall equate to the GET and SET operations defined in Section 4.2.2 and Section 4.2.4 and shall be transmitted as a single message.

b) The contents of each request are identified by an object name. Each object name consists of an object type and an instance identifier. Definitions of each object type are provided in Section 5 of NTCIP 1213 v02 and NTCIP 1201 v03. The meaning of the instance identifier is provided by these same definitions coupled with standard SNMP rules (see RFC 1212).
c) Each message shall contain all of the objects as shown, unless otherwise indicated.
d) A message shall not contain any other objects.
e) The contents of each message sent by the management station may appear in any order.

   NOTE—Ideally, the order of objects should match the order as shown in NTCIP 1213 v02 to provide for the highest probability of interoperability. However, it is recognized that many implementations may use off-the-shelf software, which may prevent the designation of an exact ordering of objects and as a result, this ordering is not a requirement of NTCIP 1213 v02.

f) After sending a message, the management station shall not transmit any other data across the communications channel until the earlier of:
   1) The management station receiving a response from the device, or
   2) The expiration of the response time.
g) If the response indicates an error occurred in the operation, the management station shall exit the process, unless specific error-handling rules are specified by the dialog.
h) Dialogs containing a sequence of only GET requests may request objects in any order.

4.3.1 Configure Luminaire for Scheduled Operations

The standardized dialog for a management station to configure the operation of an ELMS device for scheduled operations shall be as follows:

a) (As a precondition) the ELMS device has been configured previously to set the maximum number of actions, day plans, and time base schedule table entries that may be configured in the ELMS device.
b) The Management Station shall SET the following object to the desired value for the ELMS device:

   luminaireSwitchMode.x

   Where:
   x = luminaireIndex

NOTE—This dialog is used to configure the operating mode for the luminaire to use the schedule. Section 4.3.5 describes the dialog used to configure the actions, day plan events, day plans, and timebase schedule table entries for the luminaire schedule.

4.3.2 Configure Electrical Service for Scheduled Operations

The standardized dialog for a management station to configure the operation of an ELMS device for scheduled operations shall be as follows:

a) (As a precondition) the ELMS device has been configured previously to set the maximum number of actions, day plan events, day plans, and time base schedule table entries that may be configured in the ELMS device;
b) The Management Station shall SET the following object to the desired value for the ELMS device:

   electricalserviceSwitchMode.x

   Where:
   x = electricalserviceIndex

NOTE—This dialog is used to configure the operating mode for the electrical service to use the schedule. Section 4.3.5 describes the dialog used to configure the actions, day plan events, day plans, and timebase schedule table entries for the electrical schedule.

4.3.3 Configure Branch Circuit for Scheduled Operations

The standardized dialog for a management station to configure the operation of an ELMS device for scheduled operations shall be as follows:

a) (As a precondition) the ELMS device has been configured previously to set the maximum number of actions, day plan events, day plans, and time base schedule table entries that may be configured in the ELMS device.
b) The Management Station shall SET the following object to the desired value for the ELMS device:

branchcircuitSwitchMode.x

Where:
x = Branch Circuit Index

NOTE—This dialog is used to configure the operating mode for the branch circuit to use the schedule. Section 4.3.5 describes the dialog used to configure the actions, day plan events, day plans, and timebase schedule table entries for the branch circuit schedule.

4.3.4 Configure Devices in Zone for Scheduled Operations

The standardized dialog for a management station to configure the operation of an ELMS device for scheduled operations shall be as follows:

a) (As a precondition) the ELMS device has been configured previously to set the maximum number of actions, day plan events, day plans, and time base schedule table entries that may be configured in the ELMS device.
b) The Management Station shall SET the following object to the desired value for the ELMS device:

zoneSwitchMode.x

Where:
x = zoneIndex

NOTE—This dialog is used to configure the operating mode for the devices in the zone to use the schedule. Section 4.3.5 describes the dialog used to configure the actions, day plan events, day plans, and timebase schedule table entries for the device schedule.

4.3.5 Schedule ELMS Device Event

The standardized dialog for a management station to schedule events to control the operation of an ELMS device shall be as follows:

a) (As a precondition) the ELMS device has been configured previously to set the maximum number of actions, day plans, and time base schedule table entries that may be configured in the ELMS device.
b) (As a precondition) the management station shall ensure that there are sufficient rows in the action, day plan, and time base schedule tables to download the proposed schedule to the ELMS device.
c) (As a precondition) the values for the actions, day plan events, day plans, and time base schedule entries to be configured in the ELMS device are defined on the management station prior to executing any SET operations in the ELMS device.
d) (As a precondition) the ELMS device has been configured for scheduled operations, as described in the dialogs from one of the following Sections: 4.3.1, 4.3.2, 4.3.3, or 4.3.4.
e) For each action to be defined in the action table, the management station shall SET the following objects to the desired values in the ELMS device:

scheduleAction.a
scheduleActionType.a
scheduleActionNumber.a

scheduleActionParameter.a
scheduleActionParameter2.a

Where:
a = scheduleActionIndex

The scheduleAction allows a choice of one of the following:

dim
photocontrol
on
off
non-schedule

The scheduleActionType allows a choice of one of the following:

luminaire
branch circuit
electrical service
zone

The scheduleActionNumber allows a choice of the index into the luminaire, branch circuit, electrical service, or zone table. The scheduleActionParameter defines the dim level when the action is defined as dim. The ScheduleActionParameter2 contains the zone Id for the device when the schedule action type is defined as zone.

f) For each event within each day plan, the management station shall SET the following objects to the desired values in the ELMS device:

dayPlanHour.b.c
dayPlanMinute.b.c
dayPlanActionNumberOID.b.c = Object identifier for scheduleActionIndex.a

Where:
a = scheduleActionIndex
b = dayPlanNNumber
c = dayPlanEventNumber

NOTE—A day plan specifies a static schedule for a 24-hour period (see NTCIP 1201 v03 Section 4 for object descriptions).

g) For each time-base schedule entry, the management station shall SET the following objects to the desired values in the ELMS device:

timeBaseScheduleMonth.d
timeBaseScheduleDay.d
timeBaseScheduleDate.d
timeBaseScheduleDayPlan.d

Where:
d = timeBaseScheduleNumber

NOTE—A time base schedule entry specifies which day plan to use for a particular month, date, and day of the week (see NTCIP 1201 v03 Section 4 for object descriptions).

4.3.6 Retrieve a Schedule

The standardized dialog for a management station to obtain the current schedule that is used to control the operation of an ELMS device shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the device schedule.
b) For each time-base schedule entry configured in the ELMS device, the management station shall GET the following data from the ELMS device:

timeBaseScheduleMonth.d
timeBaseScheduleDay.d
timeBaseScheduleDate.d
timeBaseScheduleDayPlan.d

Where:
d = timeBaseScheduleNumber

NOTE—A time-base schedule entry specifies which day plan to use for a particular month, date, and day of the week (see NTCIP 1201 v03 Section 4 for object descriptions).
c) For each event within each day plan, the management station shall GET the following data from the ELMS device:

dayPlanHour.b.c
dayPlanMinute.b.c
dayPlanActionNumberOID.b.c

Where:
b = dayPlanNumber
c = dayPlanEventNumber

NOTE—A day plan specifies a static schedule for a 24-hour period (see NTCIP 1201 v03 Section 4 for object descriptions).
d) For each action to be defined in the action table, the management station shall GET the following objects from the ELMS device;

scheduleAction.a
scheduleActionType.a
scheduleActionNumber.a
scheduleActionParameter.a
scheduleActionParameter2.a

Where:
a = scheduleActionIndex

4.3.7 Configure Luminaire Dim Level

The standardized dialog for a management station to configure a dim level in an ELMS device for a luminaire shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the luminaire dim level value.
b) The management station shall SET the following object in the ELMS device:

luminaireDimLevel.x

Where:
x = luminaireIndex
the value of the DimLevel is 0..100 percent of maximum luminaire power

c) The ability to Dim requires that the lamp be sufficiently ‘warmed up’. This requires that the ballast be kept at full voltage output for a minimum time, before being allowed to dim. To fulfill this constraint, management station shall SET the following object:

luminaireDimWarmUpInterval.x

Where:
x = luminaireIndex
the value of the luminaireDimWarmUpInterval is in seconds

NOTE—The required warm-up period varies based on the physical characteristics of the luminaire. 15 minutes is considered, in general, to be sufficient time for the majority of luminaires.

4.3.8 Configure Electrical Service Dim Level

The standardized dialog for a management station to configure a dim level in an ELMS device for an electrical service shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the dimming parameters identified in this dialog.
b) The management station shall SET the following object in the ELMS device:

electricalserviceDimLevel.x

Where:
x = electricalserviceIndex
the value of the DimLevel is 0..100 percent of the maximum power of the electrical service

c) The ability to dim requires that the lamps served by the electrical service be sufficiently ‘warmed up’. This requires that the ballasts be kept at full voltage output for a minimum time, before being allowed to dim. To fulfill this constraint, management station shall SET the following object:

electricalserviceDimWarmUpInterval.x

Where:
x = electricalserviceIndex
the value of the electricalserviceDimWarmUpInterval is in seconds

NOTE—The required warm-up period varies based on the physical characteristics of the luminaire. 15 minutes is considered, in general, to be sufficient time for the majority of luminaires.

NOTE—Since the DimWarmUpInterval is set at the Electrical Service level, the branch circuit ELMS device may use non-NTCIP communications protocols to configure the DimWarmUpInterval for each luminaire on the branch circuit.

4.3.9 Configure Branch Circuit Dim Level

The standardized dialog for a management station to configure a dim level in an ELMS device for a branch circuit shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the dimming parameters identified in this dialog.
b) The management station shall SET the following object in the ELMS device:

branchcircuitDimLevel.x

Where:
x = branchcircuitIndex
the value of the DimLevel is 0..100 percent of the maximum power of the branch circuit

c) The ability to Dim requires that the lamps on the branch circuit be sufficiently 'warmed up'. This requires that the ballasts be kept at full voltage output for a minimum time, before being allowed to dim. To fulfill this constraint, management station shall SET the following object:

branchcircuitDimWarmUpInterval.x

Where:
x = branchcircuitIndex
the value of the luminaireDimWarmUpInterval is in seconds

NOTE—The required warm-up period varies based on the physical characteristics of the luminaire. 15 minutes is considered, in general, to be sufficient time for the majority of luminaires.

NOTE—Since the DimWarmUpInterval is set at the branch circuit level, the branch circuit ELMS device may use non-NTCIP communications protocols to configure the DimWarmUpInterval for each luminaire on the branch circuit.

4.3.10 Configure Dim Level For Devices in Zone

The standardized dialog for a management station to configure a dim level for ELMS devices assigned to a zone shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the dimming parameters identified in this dialog.
b) (As a precondition) the configuration to assign ELMS devices to the zone has been performed on the management station prior to execution of this dialog.
c) The management station shall SET the following object in the ELMS device:

zoneDimLevel.x

Where:
x = zoneIndex
the value of the DimLevel is 0..100 percent of the maximum power

d) The ability to dim requires that the lamps on the branch circuit be sufficiently 'warmed up'. This requires that the ballasts be kept at full voltage output for a minimum time, before being allowed to dim. To fulfill this constraint, management station shall SET the following object:

zoneDimWarmUpInterval.x

Where:
x = zoneIndex
the value of the luminaireDimWarmUpInterval is in seconds

NOTE—The required warm-up period varies based on the physical characteristics of the luminaire. 15 minutes is considered, in general, to be sufficient time for the majority of luminaires.

NOTE—As per the operations concepts defined in Section 2 of NTCIP 1213 v02, the ELMS device that contains the dim level for the devices for the zone may use non NTCIP protocols to communicate the DimLevel and DimLevelWarmUpInterval information to the devices in zone.

4.3.11 Configure Branch Circuit Ground Fault Detector

The standardized dialog for a management station to calibrate a branch circuit ground fault detector via an ELMS device shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the ground fault detector configuration information.
b) The management station shall retrieve the current state information for the ground fault detector by performing a GET operation on the following objects:

branchcircuitGroundFaultCond.x
branchcircuitGroundFaultLeakageCurrent.x
branchcircuitGroundFaultLeakageCurrentThreshold.x
branchcircuitGroundFaultDetectorSwitchState.x

Where:
x = branchcircuitIndex
the branchcircuitGroundFaultLeakageCurrentThreshold is expressed in milliamperes (mA) RMS

c) The management station operator manually determines any adjustments to the ground fault detector leakage current threshold.
d) The management station shall SET the following objects in the ELMS device to recalibrate the ground fault detector for the branch circuit:

branchcircuitGroundFaultLeakageCurrentThreshold.x

Where:
x = branchcircuitIndex
the branchcircuitGroundFaultLeakageCurrentThreshold is expressed in milliamperes (mA) RMS

4.3.12 Control Luminaire in Timed Mode

The standardized dialog for a management station to control a luminaire via an ELMS device shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the luminaire switch mode.
b) The management station shall SET the following object in the ELMS device to the desired value to setup the time out period for the timed override:

luminaireSwitchModeTime.x

Where:
x = luminaireIndex

c) The management station shall SET the following object in the ELMS device to the desired value to turn the luminaire on (timed on) or off (timed off):

luminaireSwitchMode.x

Where:
x = luminaireIndex

4.3.13 Control Electrical Service in Timed Mode

The standardized dialog for a management station to control an electrical service via an ELMS device shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the electrical service switch mode.
b) The management station shall SET the following object in the ELMS device to the desired value to setup the time out period for the timed override:

electricalserviceSwitchModeTime.x

Where:
x = electricalserviceIndex

c) The management station shall SET the following object in the ELMS device to the desired value to enable (Timed on) or disable (Timed off) the electrical service:

electricalserviceSwitchMode.x

Where:
x = electricalserviceIndex

4.3.14 Control Branch Circuit in Timed Mode

The standardized dialog for a management station to control a branch circuit via an ELMS device shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the branch circuit switch mode.
b) The management station shall SET the following object in the ELMS device to the desired value to setup the time out period for the timed override:

branchcircuitSwitchModeTime.x

Where:
x = branchcircuitIndex

c) The management station shall SET the following object in the ELMS device to the desired value to enable (Timed on) or disable (Timed off) the branch circuit:

branchcircuitSwitchMode.x

Where:
x = branchcircuitIndex

4.3.15 Control Devices in Zone in Timed Mode

The standardized dialog for a management station to control the devices assigned to a zone shall be as follows:

a) (As a precondition) the management station shall be able to establish communication with the ELMS device that has access to the zone switch mode.
b) (As a precondition) the configuration to assign ELMS devices to the zone has been performed on the management station prior to execution of this dialog.
c) The management station shall SET the following object in the ELMS device to the desired value to setup the time out period for the timed override of the devices assigned to the zone:

zoneSwitchModeTime.x

Where:
x = zoneIndex

d) The management station shall SET the following object in the ELMS device to the desired value to enable (Timed on) or disable (Timed off) operation for the devices assigned to the zone:

zoneSwitchMode.x

Where:
x = zoneIndex

NOTE—As per the operations concepts defined in Section 2 of NTCIP 1213 v02, the ELMS device that contains the timed override parameter information for the devices for the zone may use non NTCIP protocols to communicate the timed override parameter information to the devices in zone.

4.3.16 Configure Reporting/Logging Service

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x

Where:
x = EventClassNumber

Step (b) defines the structure of each class of events.
c) The management station shall SET the following data to the desired values to configure each desired event to be monitored:

eventConfigClass.y
eventConfigMode.y
eventConfigCompareValue.y
eventConfigCompareValue2.y
eventConfigCompareOID.y
eventConfigLogOID.y
eventConfigAction.y

Where:
y = EventConfigID

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.
d) The management station shall GET eventConfigStatus.y to ensure that there is not an error in the configuration.

NOTE—If step (d) results in an error, the device either doesn't support the configured log or there device had an unknown error.

4.3.17 Retrieve Logged Data

The standardized dialog for a management station to retrieve logged data shall be as follows:

a) (As a precondition) the management station shall be aware of the number of events that had previously been reported for the device for the subject event class (e.g., from the previous performance of this operation).
b) The management station shall GET the following data:

eventClassNumRowsInLog.x
eventClassNumEvents.x

Where:
x = eventLogClass

c) If eventClassNumEvents.x has not changed since the previous reading, the management station shall exit the process. Otherwise, the management station shall determine the additional number of events that have occurred since the last read.

NOTE—This is generally determined by subtracting the previous number of events from eventClassNumEvents; however, since this object wraps at 65535, the management station should be prepared to determine the differential if eventClassNumEvents is less than the previous number.
d) The management station shall determine the lesser of eventClassNumRowsInLog and the additional number of events that have occurred since the last read. This number shall be termed the Events to Read.
e) Starting with y = eventClassNumRowsInLog and working down until y = (eventClassNumRowsInLog - Events to Read), the management station shall GET the following data:

eventLogID.x.y
eventLogTime.x.y
eventLogValue.x.y

Where:
x = eventLogClass
y = eventLogNumber

f) Repeat the same GET operation with y decremented by one (1) for each set of duplicated values (until y reaches a value of zero (0)).

NOTE—If the event class is full and another event occurs, the new event is recorded in the last entry and all previously logged data is moved to one index lower with index 1 being deleted from the table. Thus, if a duplicate row is detected (i.e., same event at same time), it is likely an indication that the same event is being read and that a new event was added to the log.

NOTE—The management station may wish to clear the event log after the read to minimize the above problem.

4.3.18 Automatic Reporting of Events (SNMP Traps)

See NTCIP 1103 v02 Section 6 for the definition of how events shall be reported.

NOTE—NTCIP 1213 v02 references NTCIP 1103 v02 as it was anticipated that NTCIP 1103 v02 would provide exception reporting requirements. As published, however, NTCIP 1103 v02 does not support an exception reporting service.

4.3.19 Configure Luminaire Switch State Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_LSWITCH_STATE"

Where:
x = eventClassNumber = 1

Step (b) defines the structure of each class of events.
c) The management station shall SET the following data to the desired values to configure the luminaire switch state event to be monitored:

eventConfigClass.y = 1
eventConfigMode.y = 2 (onChange)
eventConfigCompareValue.y = 0
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.6.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.6.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = luminaireIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.
d) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE—If step (d) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.20 Configure Luminaire Lamp Condition Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_LCOND"

Where:
x = eventClassNumber = 2

Step (b) defines the structure of each class of events.
c) The management station shall SET the following data to the desired values to configure the lamp condition event to be monitored:

eventConfigClass.y = 2
eventConfigMode.y = 2 (onChange)
eventConfigCompareValue.y = 0
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.7.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.7.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = luminaireIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

d) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE:—If step (d) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.21 Configure Luminaire Burn Condition Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_LBURNCOND"

Where:
x = eventClassNumber = 3

Step (b) defines the structure of each class of events.

c) The management station shall SET the following data to the desired values to configure the luminaire burn condition event to be monitored:

eventConfigClass.y = 3
eventConfigMode.y = 2 (onChange)
eventConfigCompareValue.y = 0
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.8.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.8.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigurationID
z = luminaireIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

d) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE—If step (d) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.22 Configure Periodic Luminaire Burn Time Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following object to set the number of seconds between log periods for logging the burn time measurements

luminaire.PeriodicBurnTimesLogInterval.z

Where:
z = luminaireIndex

c) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_LBURNTIME"

Where:
x = eventClassNumber = 4

Step (c) defines the structure of each class of events.
d) The management station shall SET the following data to the desired values to configure the monthly burn time event to be monitored:

eventConfigClass.y = 4
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = luminairePeriodicBurnTimesLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.11.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.11.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = luminaireIndex

e) The management station shall SET the following data to the desired values to configure the monthly expected burn time event to be monitored:

eventConfigClass.y = 4
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = luminaire.PeriodicBurnTimesLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.12.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.12.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = luminaireIndex

f) The management station shall SET the following data to the desired values to configure the total burn time event to be monitored:

eventConfigClass.y = 4
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = luminaire.PeriodicBurnTimesLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.13.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.13.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = luminaireIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

g) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE—If step (g) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.23 Configure Luminaire Temperature Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following objects to establish the hysteresis range for logging the luminaire temperature

luminaireTempLogHysteresisUpperBound.z
luminaireTempLogHysteresisLowerBound.z

Where:
z = luminaireIndex

c) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_LTEMP"

Where:
x = eventClassNumber = 5

Step (c) defines the structure of each class of events.

d) The management station shall SET the following data to the desired values to configure the luminaire temperature event to be monitored:

eventConfigClass.y = 5

eventConfigMode.y = 5 (hysteresisBound)
eventConfigCompareValue.y = luminaireTempLogHysteresisLowerBound.z
eventConfigCompareValue2.y = luminaireTempLogHystereisUpperBound.z
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.10.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.10.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = luminaireIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

e) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE—If step (e) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.24 Configure Luminaire Pole Condition Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_LPOLE"

Where:
x = eventClassNumber = 6

Step (b) defines the structure of each class of events.

c) The management station shall SET the following data to the desired values to configure each desired event to be monitored:

eventConfigClass.y = 6
eventConfigMode.y = 2 (onChange)
eventConfigCompareValue.y = 0
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.9.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.2.1.1.9.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = luminaireIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

d) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE—If step (d) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.25 Configure Relay Switch State Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_RSWITCH_STATE"

Where:
x = eventClassNumber = 7

Step (b) defines the structure of each class of events.
c) The management station shall SET the following data to the desired values to configure the branch circuit relay switch state event to be monitored:

eventConfigClass.y = 7
eventConfigMode.y = 2 (onChange)
eventConfigCompareValue.y = 0
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.42.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.42.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.
d) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE—If step (d) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.26 Configure Power Meter Switch State Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_PMSWITCH_STATE"

Where:
x = eventClassNumber = 8

Step (b) defines the structure of each class of events.

c) The management station shall SET the following data to the desired values to configure the branchcircuit power meter switch state event to be monitored:

eventConfigClass.y = 8
eventConfigMode.y = 2 (onChange)
eventConfigCompareValue.y = 0
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.40.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.40.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

d) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE—If step (d) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.27 Configure Periodic Power Meter Measurement Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following object to configure the period of time between log events for the power meter measurement readings.

branchcircuitPowerMeterMeasLogInterval.z

Where:
z = branchcircuitIndex

c) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_PMLOG"

Where:
x = eventClassNumber = 9

Step (c) defines the structure of each class of events.

d) The management station shall SET the following data to the desired values to configure the branch circuit power meter voltage phase AB measurement event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.34.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.34.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

e) The management station shall SET the following data to the desired values to configure the branch circuit power meter voltage measurement phase BC event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.35.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.35.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

f) The management station shall SET the following data to the desired values to configure the branch circuit power meter voltage measurement phase CA event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.36.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.36.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

g) The management station shall SET the following data to the desired values to configure the branch circuit power meter voltage measurement phase AN event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.37.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.37.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

h) The management station shall SET the following data to the desired values to configure the branch circuit power meter voltage measurement phase BN event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.38.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.38.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

i) The management station shall SET the following data to the desired values to configure the branch circuit power meter voltage measurement phase CN event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.39.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.39.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

j) The management station shall SET the following data to the desired values to configure the branch circuit power meter current measurement event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.33.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.33.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

k) The management station shall SET the following data to the desired values to configure the power measurement event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.18.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.18.z.
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

l) The management station shall SET the following data to the desired values to configure the power factor event to be monitored:

eventConfigClass.y = 9
eventConfigMode.y = 6 (periodic)
eventConfigCompareValue.y = branchcircuitPowerMeterMeasLogInterval.z
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.45.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.45.z.
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

m) The management station shall GET eventConfigStatus.y to ensure that there is not an error in the configuration.

NOTE—If step (m) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.28 Configure Power Meter Condition Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_PMCOND"

Where:
x = eventClassNumber = 10

Step (b) defines the structure of each class of events.

c) The management station shall SET the following data to the desired values to configure the branch circuit power meter condition event to be monitored:

eventConfigClass.y = 10
eventConfigMode.y = 2 (onChange)
eventConfigCompareValue.y = 0
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.32.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.32.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

d) The management station shall GET eventConfigStatus.y to ensure that there is no error in the configuration.

NOTE—If step (d) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.29 Configure Ground Fault Switch State Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following data to the desired values to configure each desired event class:

eventClassLimit.x
eventClassClearTime.x
eventClassDescription.x = "ECLASS_GFSWITCH_STATE"

Where:
x = eventClassNumber = 11

Step (b) defines the structure of each class of events.

c) The management station shall SET the following data to the desired values to configure the branch circuit ground fault detector switch state event to be monitored:

eventConfigClass.y = 11
eventConfigMode.y = 2 (onChange)
eventConfigCompareValue.y = 0
eventConfigCompareValue2.y = 0
eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.28.z
eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.28.z
eventConfigAction.y = 3 (log)

Where:
y = eventConfigID
z = branchcircuitIndex

NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.

d) The management station shall GET eventConfigStatus.y to ensure that there is not an error in the configuration.

NOTE—If step (d) results in an error, the device either does not support the configured log or the device had an unknown error.

4.3.30 Configure Periodic Ground Fault Measurement Log

The standardized dialog for a management station to configure the logging service or events to be reported shall be as follows:

a) (As a precondition) the management station shall ensure that there are sufficient rows in the event configuration and event class tables to download the proposed configuration.
b) The management station shall SET the following object to establish the interval period between log events for the ground fault measurements.

    branchcircuit.GroundFaultMeasLogInterval.z

    Where:
    z = branchcircuitIndex

c) The management station shall SET the following data to the desired values to configure each desired event class:

    eventClassLimit.x
    eventClassClearTime.x
    eventClassDescription.x = "ECLASS_GFLOG"

    Where:
    x = eventClassNumber = 12

    Step (c) defines the structure of each class of events.
d) The management station shall SET the following data to the desired values to configure the branch circuit ground fault leakage current event to be monitored:

    eventConfigClass.y = 12
    eventConfigMode.y = 6 (periodic)
    eventConfigCompareValue.y = branchcircuit.GroundFaultMeasLogInterval.z
    eventConfigCompareValue2.y = 0
    eventConfigCompareOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.26.z
    eventConfigLogOID.y = 1.3.6.1.4.1.1206.4.2.13.4.1.1.26.z
    eventConfigAction.y = 3 (log)

    Where:
    y = eventConfigID
    z = branchcircuitIndex

    NOTE—Depending on the value of eventConfigMode, not all other objects may be necessary for the event to be defined; however, they shall always be SET as a part of the standardized dialog.
e) The management station shall GET eventConfigStatus.y to ensure that there is not an error in the configuration.

    NOTE—If step (e) results in an error, the device either does not support the configured log or the device had an unknown error.

Section 5
MANAGEMENT INFORMATION BASE (MIB)
[NORMATIVE]

Section 5 defines those data elements that may be used by electrical and lighting management system devices. The data elements (objects) are described in terms of the ASN.1 (defined in ISO/IEC 8824-1, ISO/IEC 8824-2, ISO/IEC 8824-3, and ISO/IEC 8824-4) macro OBJECT-TYPE. The OBJECT-TYPE macro is defined in RFC 1212. The text provided from Section 5.2 through the end of Section 5 (except the section headings) constitutes the NTCIP 1213 v02 ELMS MIB.

Section 5 presents the data elements in lexicographical order of their OBJECT IDENTIFIERS that correspond to their physical location within the global naming tree. The data elements defined in NTCIP 1213 v02 reside under the ‘elms’ node of the global naming tree. To aid in data element management, the ‘elms’ node has been subdivided into logical categories, each defined by a node under the ‘elms’ node. The individual data elements are then located under the appropriate node.

Nodes should not be confused with conformance groups. A conformance group is a logical grouping of data elements that is used for conformance statements. While conformance groups frequently correspond to the nodal structure, a conformance group may contain data elements that are not lexicographically ordered. For example, a schedule conformance group may contain both ‘global’ and ‘elms’ specific data elements.

A data element status of optional should not be confused with a conformance status of optional or mandatory. The status of optional or mandatory in dictates whether the data element is required or not.

All management applications shall reference the specific device MIB as provided by the device manufacturer for support and constraints (sub-ranges). See Annex B for a graphical representation of the branch and tree structure identified for NTCIP 1213 v02 objects.

5.1 MIB HEADER

```
--
********************************************************************************
-- Filename:    1213v0220.MIB
-- Source:      NTCIP 1213 v02.20
-- Description: This MIB defines electrical and lighting management
--              systems (ELMS) objects
-- MIB Revision History:
-- 03/31/11     Following NTCIP 1213 v02 publication, created MIB.
--
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-- products and services.
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--*****************************************************************************
```

5.2 DATA ELEMENTS

```
NTCIP 1213v02.20  DEFINITIONS ::= BEGIN
  IMPORTS
```



```
    Counter
       FROM RFC1155-SMI
    OBJECT-TYPE
       FROM RFC-1212
    DisplayString
       FROM RFC1213-MIB
    globalSetIDParameter, globalMaxModules, moduleNumber, moduleDeviceNode,
    moduleMake, moduleModel, moduleVersion, moduleType, globalTime,
    globalDaylightSaving, globalLocalTimeDifferential
       FROM GLOBAL
    elms, OerString
        FROM NTCIP8004v02;
--
-- Type definitions
--
PositionReference ::= OCTET STRING (SIZE (0..4))
--
-- Node definitions
--
elms OBJECT IDENTIFIER ::= { devices 13 } 1.3.6.1.4.1.1206.4.2.13
```

5.3 SCHEDULE

```
elmsSchedule OBJECT IDENTIFIER ::= { elms 1 }
-- node for schedule elements
```

5.3.1 Number of Schedule Events

```
elmsScheduleActionNumEntries OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the number of rows that are stored in the
elmsScheduleActionTable.
<DescriptiveName>schedule.actionNumEntries:quantity"
::= {elmsSchedule 1}
```

5.3.2 Schedule Action Table

```
elmsScheduleActionTable OBJECT-TYPE
SYNTAX SEQUENCE OF ElmsScheduleActionEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION "A table containing ELMS schedule actions events."
::= { elmsSchedule 2 }

elmsScheduleActionEntry OBJECT-TYPE
SYNTAX ElmsScheduleActionEntry
ACCESS not-accessible
STATUS mandatory
INDEX { scheduleActionIndex }
::= { elmsScheduleActionTable 1 }

ElmsScheduleActionEntry ::= SEQUENCE {
  scheduleActionIndex     INTEGER,
  scheduleAction          INTEGER,
  scheduleActionType      INTEGER,
  scheduleActionNumber    INTEGER,
```



```
  scheduleActionParameter INTEGER,
  scheduleActionParameter2 INTEGER
}
```

5.3.2.1 Schedule Action Index

```
scheduleActionIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Enumerated listing of row entries. The value of this object
cannot exceed the value of the elmsScheduleActionNumEntries object.
<DescriptiveName>schedule.actionTable.index:identifier
<Data Concept Type>
INTEGER (1..65535)"
::= {elmsScheduleActionEntry 1}
```

5.3.2.2 Schedule Action

```
scheduleAction OBJECT-TYPE
SYNTAX      INTEGER {
                dim (1),
                photo-control (2),
                on (3),
                off (4),
                non-schedule (5)
                }
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the action that is to be performed for this row dim,
photo-controlled dim, on, off, non-schedule
<DescriptiveName>schedule.actionTable.Action:code
<Valid Value Rule>
value - description
dim - The lamp is NOT controlled by photo-control, a dim value is specified.
photo-control - The ELMS Device is controlled by photo-control.
on - The lamp is on.
off - The lamp is off.
non-schedule - The ELMS Device is not controlled by schedule.
<Data Concept Type>
ENUMERATION {
                dim (1),
                photo-control (2),
                on (3),
                off (4),
                non-schedule (5)
                }"
::= {elmsScheduleActionEntry 2}
```

5.3.2.3 Schedule Action Type

```
scheduleActionType OBJECT-TYPE
SYNTAX      INTEGER {
                luminaire (1),
                branchCircuit (2),
                electricalService (3),
                zone (4)
                }
ACCESS      read-write
```



```
STATUS      optional
DESCRIPTION "Indicates the device that this row is to control. An action can
control a luminaire, branch circuit, electrical service or a zone of ELMS
devices.
<DescriptiveName>schedule.actionTable.Type:code
<Valid Value Rule>
value - description
luminaire - This scheduled event is for a luminaire.
branchCircuit - This scheduled event is for a branch circuit.
electricalService - This scheduled event is for a electrical service.
zone - This scheduled event is for a zone of ELMS devices
<Data Concept Type>
ENUMERATION {
                luminaire (1),
                branchCircuit (2),
                electricalService (3),
                  zone(4)
                }"
::= {elmsScheduleActionEntry 3}
```

5.3.2.4 Schedule Action Number

```
scheduleActionNumber OBJECT-TYPE
SYNTAX      INTEGER (1..255)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the table that this action item entry is to trigger.
An action item can trigger a luminaire, branch circuit, or electrical
service. The number here references the index to the table of the schedule
action type.
<DescriptiveName>schedule.actionTable.Number:code
<Data Concept Type>
INTEGER (1..65535)"
::= {elmsScheduleActionEntry 4}
```

5.3.2.5 Schedule Action Parameter

```
scheduleActionParameter OBJECT-TYPE
SYNTAX      INTEGER (0..255)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the dim level when the action is defined as dim.
<DescriptiveName>schedule.actionTable.Parameter:code
<Data Concept Type>
INTEGER (0..255)"
::= {elmsScheduleActionEntry 5}
```

5.3.2.6 Schedule Action Parameter 2

```
scheduleActionParameter2 OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Zone Identifier for the schedule action when schedule action
type is set to zone.
<DescriptiveName>schedule.actionTable.Parameter2:code
<Data Concept Type>
INTEGER (0..65535)"
::= {elmsScheduleActionEntry 6}
```

5.4 LUMINAIRE

```
elmsLuminaire OBJECT IDENTIFIER ::= { elms 2 }
```

5.4.1 Luminaire Table

```
luminaireTable OBJECT-TYPE
SYNTAX SEQUENCE OF LuminaireEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION "A table containing luminaire parameters. The number of rows in
this table are dynamic"
::= { elmsLuminaire 1 }

luminaireEntry OBJECT-TYPE
SYNTAX LuminaireEntry
ACCESS not-accessible
STATUS mandatory
INDEX { luminaireIndex }
::= { luminaireTable 1 }

LuminaireEntry ::= SEQUENCE {
  luminaireIndex                   INTEGER,
  luminaireLocation                OCTET STRING,
  luminaireMode                    INTEGER,
  luminaireSwitchMode              INTEGER,
  luminaireSwitchState             INTEGER,
  luminaireLampCond                INTEGER,
  luminaireLampBurnCond            INTEGER,
  luminairePoleCond                INTEGER,
  luminaireTemp                    INTEGER,
  luminaireMonthlyBurnTime         Counter,
  luminaireMonthlyExpectedBurnTime INTEGER,
  luminaireTotalBurnTime           Counter,
  luminaireLocationProfile         INTEGER,
  luminaireLightThreshold          INTEGER,
  luminaireHoldInterval            INTEGER,
  luminaireLightHysteresis         INTEGER,
  luminaireDelayInterval           INTEGER,
  luminaireDimLevel                INTEGER,
  luminaireDimWarmUpInterval       INTEGER,
  luminaireVoltage                 INTEGER,
  luminaireCurrent                 INTEGER,
  luminaireBallastCond             INTEGER,
  luminaireStarterStatus           INTEGER,
  luminaireSwitchModeTime          INTEGER,
  luminairePoleIdentifier          OCTET STRING,
  luminaireStaggerInterval         INTEGER,
  luminaireEnergy                  INTEGER,
  luminaireCycleCount              INTEGER,
  luminaireDisplayName             OCTET STRING,
  luminaireprimaryCommStrength         INTEGER,
  luminaireSecondaryCommStrength   INTEGER,
  luminaireRampTime                INTEGER
}
```

5.4.1.1 Luminaire Index

```
luminaireIndex OBJECT-TYPE
```



```
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the row of the luminaireTable entry.
<DescriptiveName>luminaireTable.index:identifier
<Data Concept Type>
INTEGER (1..65535)"
::= {luminaireEntry 1}
```

5.4.1.2 Luminaire Location

```
luminaireLocation OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      optional
DESCRIPTION "A textual description of the luminaire's location. The octet
string shall adhere to the location referencing standard, SAE J2374. The
format of the string shall be indicated by the luminaireLocationProfile
object.
<DescriptiveName>luminaireTable.location:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {luminaireEntry 2}
```

5.4.1.3 Luminaire Mode

```
luminaireMode OBJECT-TYPE
SYNTAX      INTEGER {
        24hr(1),
        Photcell(2)
}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the operating mode of the luminaire.
<DescriptiveName>luminaireTable.mode:code
<Valid Value Rule>
value - description
24hr - the lamp's primary mechanism of control is defined by Luminaire Switch
Mode
Photocell - The lamp's primary mechanism of control is the photocell
<Data Concept Type>
ENUMERATION {
        24hr(1),
        Photcell(2)}"
::= {luminaireEntry 3}
```

5.4.1.4 Luminaire Switch Mode

```
luminaireSwitchMode OBJECT-TYPE
SYNTAX      INTEGER {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8)
}
```

```
ACCESS      read-write
STATUS      optional
DESCRIPTION "An enumeration that describes the mode of switching for this
luminaire. This parameter allows control of the luminaire to be permanent
on/off (not allow schedule to control), schedule, transitory on/off (allow
schedule to control upon next scheduled event), timed on/off (not allow
schedule to control for a time set by luminaireSwitchModeTime). These switch
modes can be used in conjunction with LuminaireMode if it is set to Photocell
to provide a combination of Photcell and a Scheduled operation.
<DescriptiveName>luminaireTable.switchMode:code
<Valid Value Rule>
value - description
permanentOn - turn on luminaire, do not allow schedule to control luminaire
permanentOff - turn off luminaire, do not allow schedule to control luminaire
schedule - allow only the schedule to control the luminaire
transitoryOn - turn on luminaire, do not allow schedule to control until next
scheduled event
transitoryOff - turn off luminaire, do not allow schedule to control until
next scheduled event
timedOn - turn on the luminaire, do not allow schedule to control for a time
specified by luminaireSwitchModeTime
timedOff - turn off the luminaire, do not allow schedule to control for a
time specified by luminaireSwitchModeTime
none - no schedule should be applied
<Data Concept Type>
ENUMERATION {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8) }"
::= {luminaireEntry 4}
```

5.4.1.5 Luminaire Switch State

```
luminaireSwitchState OBJECT-TYPE
SYNTAX      INTEGER {
        on(1),
        off(2) }
ACCESS      read-only
STATUS      optional
DESCRIPTION "Describes the present state of the Luminaire's relay.
<DescriptiveName>luminaireTable.switchState:code
<Valid Value Rule>
value - description
on - The luminaire relay is switched on
off - The luminaire relay is switched off
<Data Concept Type>
ENUMERATION {
        on(1),
        off(2) }"
::= {luminaireEntry 5}
```


5.4.1.6 Luminaire Lamp Condition

```
luminaireLampCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok(1),
        noOp(2),
        cyclingOn(3),
        cyclingOff(4),
        noDataComm(5)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Describes the present condition of the lamp.
<DescriptiveName>luminaireTable.lampCond:code
<Valid Value Rule>
value - description
ok - The luminaire is operating properly
noOp - The luminaire is not operating properly
cyclingOn - The luminaire is cycling and is currently on
cyclingOff - The luminaire is cycling and is currently off
noDataComm - unable to determine state of the lamp due to communications
error.
<Data Concept Type>
ENUMERATION {
        ok(1),
        noOp(2),
        cyclingOn(3),
        cyclingOff(4),
        noDataComm(5)}"
::= {luminaireEntry 6}
```

5.4.1.7 Luminaire Lamp Burn Condition

```
luminaireLampBurnCond OBJECT-TYPE
SYNTAX      INTEGER {
        On(1),
        Off(2),
        noDataComm(3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Describes the present burn condition of the lamp.
<DescriptiveName>luminaireTable.lampburnCond:code
<Valid Value Rule>
value - description
On - The luminaire lamp is burning (on)
Off - The luminaire lamp is off
noDataComm - unable to determine burning state of the lamp due to
communications error.
<Data Concept Type>
ENUMERATION {
        On(1),
        Off(2),
        noDataComm(3)}"
::= {luminaireEntry 7}
```

5.4.1.8 Luminaire Pole Condition

```
luminairePoleCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok(1),
```



```
        tilt(2),
        noDataComm(3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Describes the present condition of the pole.
<DescriptiveName>luminaireTable.poleCond:code
<Valid Value Rule>
value - description
ok - The pole is ok
tilt - The pole is tilted or knocked over
noDataComm - unable to determine tilt state of the pole due to communications
error.
<Data Concept Type>
ENUMERATION {
        ok(1),
        tilt(2),
        nodatacomm(3)}"
::= {luminaireEntry 8}
```

5.4.1.9 Luminaire Temperature

```
luminaireTemp OBJECT-TYPE
SYNTAX      INTEGER (-700..1501)
ACCESS      read-only
STATUS      optional
DESCRIPTION "The temperature of the luminaire at the location of the
temperature sensor in tenths of degrees Celsius. Acceptable range is -700 to
1501 (-70 degrees Celsius to 150 degress Celsius).
The value 1501 shall indicate an error condition or missing value.
<DescriptiveName>luminaireTable.temperature:quantity
<Data Concept Type>
INTEGER (-700..1501)
<Unit>tenths of degrees Celcius"
::= {luminaireEntry 9}
```

5.4.1.10 Luminaire Monthly Burn Time

```
luminaireMonthlyBurnTime OBJECT-TYPE
SYNTAX      Counter
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the lamp's actual burn time for the current Month.
Each tick of the counter represents 1 second of elapsed burn time.
Field is automatically reset to 0 at the beginning of each month.
<DescriptiveName>luminaireTable.monthlyBurnTime:quantity
<Data Concept Type>
Counter
<Unit>seconds"
::= {luminaireEntry 10}
```

5.4.1.11 Luminaire Monthly Expected Burn Time

```
luminaireMonthlyExpectedBurnTime OBJECT-TYPE
SYNTAX      INTEGER {
        2419200 (1),
        2505600 (2),
        2592000 (3),
        2678400 (4) }
ACCESS      read-write
```



```
STATUS      optional
DESCRIPTION "Indicates the lamp's expected burn time per month.
The value of this parameter is the number of seconds in the current calendar
month, depending on the number of days in the month.
<DescriptiveName>luminaireTable.monthlyExpectedBurnTime:quantity
<Valid Value Rule>
value - description
2419200 - Number of seconds in a 28 day month
2505600 - Number of seconds in a 29 day month
2592000 - Number of seconds in a 30 day month
2678400 - Number of seconds in a 31 day month
<Data Concept Type>
ENUMERATION {
        2419200 (1),
        2505600 (2),
        2592000 (3),
        2678400 (4)}"
::= {luminaireEntry 11}
```

5.4.1.12 Luminaire Total Burn Time

```
luminaireTotalBurnTime OBJECT-TYPE
SYNTAX      Counter
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the lamp's total burn time.
Each tick of the counter represents 1 second of elapsed burn time.
The total burn time can be reset by setting this value to 0.
<DescriptiveName>luminaireTable.totalBurnTime:quantity
<Data Concept Type>
Counter
<Unit>seconds"
::= {luminaireEntry 12}
```

5.4.1.13 Luminaire Location Profile

```
luminaireLocationProfile OBJECT-TYPE
SYNTAX      INTEGER {
                geometry (1),
                geographic (2),
                grid (3),
                address (4)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the format of the luminaireLocation object by
referencing the location referencing standard SAE J2374.
<DescriptiveName>luminaireTable.locationProfile:code
<Valid Value Rule>
value - description
geometry - luminaireLocation is formatted in LRMS geometry format
geographic - luminaireLocation is formatted in LRMS geographic format
grid - luminaireLocation is formatted in LRMS grid format
address - luminaireLocation is formatted in LRMS address format
<Data Concept Type>
ENUMERATION {
                geometry (1),
                geographic (2),
                grid (3),
```



```
                address (4)}"
::= {luminaireEntry 13}
```

5.4.1.14 Luminaire Light Threshold

```
luminaireLightThreshold OBJECT-TYPE
SYNTAX      INTEGER (0..100000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the threshold of the light measurement that triggers
the luminaire to turn on or off. This measurement is supplemented by the
luminaireLightHysteresis. If the light measurements are rising, then the
measurement is required to be equal or above luminaireLightThreshold plus
luminaireLightHysteresis to trigger the lamp to turn off. If the light
measurements are falling, then the measurement is required to be equal or
below luminaireLightThreshold minus luminaireLightHysteresis to trigger the
lamp to turn on.
<DescriptiveName>luminaireTable.lightThreshold:quantity
<Data Concept Type>
INTEGER (0..100,000)
<Unit>lux"
::= {luminaireEntry 14}
```

5.4.1.15 Luminaire Hold Interval

```
luminaireHoldInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates a time (in seconds) that the luminaire continues to
monitor the luminaireLightThreshold before triggering the luminaire to turn
on or off.
<DescriptiveName>luminaireTable.holdInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {luminaireEntry 15}
```

5.4.1.16 Luminaire Light Hysteresis

```
luminaireLightHysteresis OBJECT-TYPE
SYNTAX      INTEGER (0..10000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "This maximum value is ten percent of the
luminaireLightThreshold. Indicates the Hysteresis used with
luminaireLightThreshold to trigger the luminaire to turn on or off. This
Hysteresis is used to offset different values for turning on and off the
luminaire so that the luminaire does not cycle on or off.
<DescriptiveName>luminaireTable.LightHysteresis:quantity
<Data Concept Type>
INTEGER (0..10000)
<Unit>lux"
::= {luminaireEntry 16}
```

5.4.1.17 Luminaire Delay Interval

```
luminaireDelayInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
```



```
STATUS      optional
DESCRIPTION "Indicates the delay from when a luminaire is triggered by the
luminaireLightThreshold and turning on or off.
<DescriptiveName>luminaireTable.delayInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {luminaireEntry 17}
```

5.4.1.18 Luminaire Dim Level

```
luminaireDimLevel OBJECT-TYPE
SYNTAX      INTEGER (0..100)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the present dim level of the device. This value shall
be from 0 to 100 percent of maximum lamp power.
<DescriptiveName>luminaireTable.dimLevel:quantity
<Data Concept Type>
INTEGER (0..100)"
::= {luminaireEntry 18}
```

5.4.1.19 Luminaire Dim Warm Up Interval

```
luminaireDimWarmUpInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the time (in seconds) that the ballast be kept at full
wattage before going to the specified dim level (luminaireDimLevel).
<DescriptiveName>luminaireTable.dimWarmUpInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {luminaireEntry 19}
```

5.4.1.20 Luminaire Voltage

```
luminaireVoltage OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Voltage measurement of the luminaire.
Voltage parameter, in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001
Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>luminaireTable.voltage:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {luminaireEntry 20}
```

5.4.1.21 Luminaire Current

```
luminaireCurrent OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-only
STATUS      optional
```

```
DESCRIPTION "Indicates the  present value of the Current measurement of the
luminaire. Acceptable range is 0 to 10000001. (0 to 10,000.001 Amps). The
value 10000001 shall indicate an error condition or missing value.
<DescriptiveName>luminaireTable.current:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>milliamps (mA) RMS"
::= {luminaireEntry 21}
```

5.4.1.22 Luminaire Ballast Condition

```
luminaireBallastCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the condition of the ballast.
<DescriptiveName>luminaireTable.ballastCond:code
<Valid Value Rule>
value - description
ok - indicates the ballast is operating correctly
fault - indicates the ballast is not operating correctly
noDataComm - unable to determine state of the ballast due to communications
error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {luminaireEntry 22}
```

5.4.1.23 Luminaire Starter Status

```
luminaireStarterStatus OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the status of the luminaire starter.
<DescriptiveName>luminaireTable.starterStatus:code
<Valid Value Rule>
value - description
ok - indicates the starter is operating correctly
fault - indicates the starter is not operating correctly
noDataComm - unable to determine state of the starter due to communications
error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {luminaireEntry 23}
```

5.4.1.24 Luminaire Switch Mode Time

```
luminaireSwitchModeTime OBJECT-TYPE
SYNTAX      INTEGER (0...65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the value of the time out period for the timed
override mode. The mode is controlled by the luminaireSwitchMode object.
<DescriptiveName>luminaireTable.switchModeTime:quantity
<Data Concept Type>
INTEGER (0..65535)
<Unit>seconds"
::= {luminaireEntry 24}
```

5.4.1.25 Luminaire Pole Identifier

```
luminairePoleIdentifier OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the Pole Identifier for this device.
<DescriptiveName>luminaireTable.PoleIdentifier:number
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {luminaireEntry 25}
```

5.4.1.26 Luminaire Stagger Interval

```
luminaireStaggerInterval OBJECT-TYPE
SYNTAX      INTEGER (0..255)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the time period in seconds between any consecutive
luminaires being turned on.
<DescriptiveName>luminaireStaggerInterval:quantity
<Data Concept Type>
INTEGER (0..255)
<Unit>seconds"
::= {luminaireEntry 26}
```

5.4.1.27 Luminaire Electric Energy

```
luminaireEnergy OBJECT-TYPE
SYNTAX      INTEGER (-1000000000..1000000001)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the accumulated energy consumption for the object.
Acceptable range is -1000000000 to 1000000001 (-1,000,000,000 to
1,000,000,001 Watt-hours)
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>luminaireEnergy:quantity
<Data Concept Type>
INTEGER (-1000000000..1000000001)
<Unit>watt-hours (Wh)"
::= {luminaireEntry 27}
```

5.4.1.28 Luminaire Cycle Count

```
luminaireCycleCount OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
```

```
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates count of times the current has follow below limit.
<DescriptiveName>luminaireCycleCount:quantity
<Data Concept Type>
INTEGER (0..65535)"
::= {luminaireEntry 28}
```

5.4.1.29 Luminaire Display Name

```
luminaireDisplayName OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-only
STATUS      optional
DESCRIPTION
"<Definition>This object specifies a description of the luminaire in ASCII
characters.
<DescriptiveName>luminaireDisplayName:text
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= { luminaireEntry 29 }
```

5.4.1.30 Luminaire Primary Communication Strength

```
luminairePrimaryCommStrength OBJECT-TYPE
SYNTAX      INTEGER (0..16)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Primary communication signal strength in dB:
20*log10(Vreceive/Vtransmit). 0 means no loss, if the value gets down toward
0, then the node is losing ground.
The value 16 shall indicate an error condition or missing value.
<DescriptiveName>luminairePrimaryCommStrength:quantity
<Data Concept Type>
INTEGER (0..16)"
::= {luminaireEntry 30}
```

5.4.1.31 Luminaire Secondary Communication Strength

```
luminaireSecondaryCommStrength OBJECT-TYPE
SYNTAX      INTEGER (0..16)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Secondary communication signal strength in dB:
20*log10(Vreceive/Vtransmit). 0 means no loss, if the value gets down toward
0, then the node is losing ground.
The value 16 shall indicate an error condition or missing value.
<DescriptiveName>luminairePrimaryCommStrength:quantity
<Data Concept Type>
INTEGER (0..16)"
::= {luminaireEntry 31}
```

5.4.1.32 Luminaire Ramp Time

```
luminaireRampTime OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Ramp time from 0% to 100% in tenths of seconds. Default is 3
seconds (30). (0.0 to 6553,5 seconds).
```

```
The value 0 shall indicate the value is not in use.
<DescriptiveName>luminaireRampTime:quantity
<Data Concept Type>
INTEGER (0..65535)"
::= {luminaireEntry 32}
```

5.5 ELECTRICAL SERVICE

```
elmsElectricalService OBJECT IDENTIFIER ::= { elms 3 }
```

5.5.1 Electrical Service Table

```
electricalserviceTable OBJECT-TYPE
SYNTAX SEQUENCE OF ElectricalserviceEntry
ACCESS not-accessible
STATUS optional
DESCRIPTION "A table containing electrical service parameters."
::= { elmsElectricalService 1 }

electricalserviceEntry OBJECT-TYPE
SYNTAX ElectricalserviceEntry
ACCESS not-accessible
STATUS optional
INDEX { electricalserviceIndex }
::= { electricalserviceTable 1 }

ElectricalserviceEntry ::= SEQUENCE {
  electricalserviceIndex             INTEGER,
  electricalserviceLocationProfile   INTEGER,
  electricalserviceLocation          OCTET STRING,
  electricalservicePoleIdentifier    OCTET STRING,
  electricalserviceMode              INTEGER,
  electricalserviceSwitchMode        INTEGER,
  electricalserviceSwitchModeTime    INTEGER,
  electricalserviceOpHours           INTEGER,
  electricalserviceOpCond            INTEGER,
  electricalserviceVoltageAB         INTEGER,
  electricalserviceVoltageBC         INTEGER,
  electricalserviceVoltageCA         INTEGER,
  electricalserviceVoltageAN         INTEGER,
  electricalserviceVoltageBN         INTEGER,
  electricalserviceVoltageCN         INTEGER,
  electricalserviceCurrent           INTEGER,
  electricalservicePower             INTEGER,
  electricalserviceLightThreshold    INTEGER,
  electricalserviceHoldInterval      INTEGER,
  electricalserviceLightHysteresis   INTEGER,
  electricalserviceDelayInterval     INTEGER,
  electricalserviceDimLevel          INTEGER,
  electricalserviceDimWarmUpInterval INTEGER,
  electricalserviceGroundFaultCond   INTEGER,
  electricalserviceMainBreakerCond   INTEGER,
  electricalserviceArcFaultCond      INTEGER,
  electricalserviceStaggerInterval   INTEGER,
  electricalserviceSwitchState       INTEGER
}
```

5.5.1.1 Electrical Service Index

```
electricalserviceIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the row of the electricalServiceTable entry.
<DescriptiveName>electricalServiceTable.index:identifier
<Data Concept Type>
INTEGER (1..65535)"
::= {electricalserviceEntry 1}
```

5.5.1.2 Electrical Service Location Profile

```
electricalserviceLocationProfile OBJECT-TYPE
SYNTAX      INTEGER {
        geometry (1),
        geographic (2),
        grid (3),
        address (4)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the format of the electricalServiceLocation object by
referencing the location referencing standard SAE J2374.
<DescriptiveName>electricalServiceTable.locationProfile:code
<Valid Value Rule>
value - description
geometry - electricalserviceLocation is formatted in LRMS geometry format
geographic - electricalserviceLocation is formatted in LRMS geographic format
grid - electricalserviceLocation is formatted in LRMS grid format
address - electricalserviceLocation is formatted in LRMS address format
<Data Concept Type>
ENUMERATION {
        geometry (1),
        geographic (2),
        grid (3),
        address (4)}"
::= {electricalserviceEntry 2}
```

5.5.1.3 Electrical Service Location

```
electricalserviceLocation OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      optional
DESCRIPTION "A textual description of the electrical service location. The
octet string shall adhere to the location referencing standard SAE J2374. The
format of the string shall be indicated by the
electricalServiceLocationProfile object.
<DescriptiveName>electricalServiceTable.location:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {electricalserviceEntry 3}
```

5.5.1.4 Electrical Service Pole Identifier

```
electricalservicePoleIdentifier OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      optional
```



```
DESCRIPTION "Indicates the Pole Identifier for this device.
<DescriptiveName>electricalServiceTable.PoleIdentifier:number
<Data Concept Type>
OCTET STRING (SIZE (0..64)) "
::= {electricalserviceEntry 4}
```

5.5.1.5 Electrical Service Mode

```
electricalserviceMode OBJECT-TYPE
SYNTAX      INTEGER {
        24hr(1),
        Photocell(2)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the operating mode of the electricalService.
<DescriptiveName>electricalServiceTable.mode:code
<Valid Value Rule>
value - description
24hr - The electricalService's primary mechanism of control is the defined by
ElectricalService Switch Mode
Photocell – The electricalService's primary mechanism of control is the
photocell
<Data Concept Type>
ENUMERATION {
        24hr(1),
        Photcell(2)}"
::= {electricalserviceEntry 5}
```

5.5.1.6 Electrical Service Switch Mode

```
electricalserviceSwitchMode OBJECT-TYPE
SYNTAX      INTEGER {
       permanentOn(1),
       permanentOff(2),
       schedule(3),
       transitoryOn(4),
       transitoryOff(5),
       timedOn(6),
       timedOff(7),
       none(8)
}
ACCESS      read-write
STATUS      optional
DESCRIPTION "An enumeration that describes the mode of switching for this
electricalService. This parameter allows control of the electricalService to
be permanent on/off (not allow schedule to control), schedule, transitory
on/off (allow schedule to control upon next scheduled event), timed on/off
(not allow schedule to control for a time set by
electricalServiceSwitchModeTime). These switch modes can be used in
conjunction with ElectricalServiceMode if it is set to Photocell to provide a
combination of Photcell and a Scheduled operation.
<DescriptiveName>electricalServiceTable.switchMode:code
<Valid Value Rule>
value - description
permanentOn - turn on electricalService, do not allow schedule to control
electricalService
permanentOff - turn off electricalService, do not allow schedule to control
electricalService
```

```
schedule - allow only the schedule to control the electricalService
transitoryOn - turn on electricalService, do not allow schedule to control
until next scheduled event
transitoryOff - turn off electricalService, do not allow schedule to control
until next scheduled event
timedOn - turn on the electricalService, do not allow schedule to control for
a time specificed by electricalServiceSwitchModeTime
timedOff - turn off the electricalService, do not allow schedule to control
for a time specified by electricalServiceSwitchModeTime
none – No schedule should be applied
<Data Concept Type>
ENUMERATION {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
none(8) }"
::= {electricalserviceEntry 6}
```

5.5.1.7 Electrical Service Switch Mode Time

```
electricalserviceSwitchModeTime OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the value of the time out period for the timed
override mode. The mode is controlled by the electricalServiceSwitchMode
object.
<DescriptiveName>electricalServiceTable.switchModeTime:quantity
<Data Concept Type>
INTEGER (0..65535)
<Unit>seconds"
::= {electricalserviceEntry 7}
```

5.5.1.8 Electrical Service Operation Hours

```
electricalserviceOpHours OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the number of hours this electrical service has been
on.
<DescriptiveName>electricalServiceTable.operationHours:quantity
<Data Concept Type>
INTEGER (0..65535)
<Unit>hours"
::= {electricalserviceEntry 8}
```

5.5.1.9 Electrical Service Operation Condition

```
electricalserviceOpCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3)}
ACCESS      read-only
```

```
STATUS      optional
DESCRIPTION "Indicates the current operation condition of the electrical
service. (OK, Fault, NoDataComm)
<DescriptiveName>electricalServiceTable.operationCondition:code
<Valid Value Rule>
value - description
ok - indicates the electrical service is operating correctly
fault - indicates the electrical service is not operating correctly
noDataComm - unable to determine state of the electrical service due to
communications error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {electricalserviceEntry 9}
```

5.5.1.10 Electrical Service Voltage AB

```
electricalserviceVoltageAB OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Voltage measurement of the electrical
service for the AB phase, in mV RMS. Acceptable range is 0 to 660001. (0 to
660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>electricalServiceTable.voltageAB:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {electricalserviceEntry 10}
```

5.5.1.11 Electrical Service Voltage BC

```
electricalserviceVoltageBC OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Voltage measurement of the electrical
service BC phase in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001
Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>electricalServiceTable.voltageBC:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {electricalserviceEntry 11}
```

5.5.1.12 Electrical Service Voltage CA

```
electricalserviceVoltageCA OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Voltage measurement of the electrical
service for the CA phase in mV RMS. Acceptable range is 0 to 660001. (0 to
660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
```

```
<DescriptiveName>electricalServiceTable.voltageCA:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {electricalserviceEntry 12}
```

5.5.1.13 Electrical Service Voltage AN

```
electricalserviceVoltageAN OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Voltage measurement of the electrical
service AN phase in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001
Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>electricalServiceTable.voltageAN:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {electricalserviceEntry 13}
```

5.5.1.14 Electrical Service Voltage BN

```
electricalserviceVoltageBN OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Voltage measurement of the electrical
service BN phase in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001
Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>electricalServiceTable.voltageBN:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {electricalserviceEntry 14}
```

5.5.1.15 Electrical Service Voltage CN

```
electricalserviceVoltageCN OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Voltage measurement of the electrical
service CN phase in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001
Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>electricalServiceTable.voltageCN:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {electricalserviceEntry 15}
```

5.5.1.16 Electrical Service Current

```
electricalserviceCurrent OBJECT-TYPE
SYNTAX      INTEGER (0..100001)
ACCESS      read-only
STATUS      optional
```

```
DESCRIPTION "Indicates the present value of the Current measurement of the
electrical service. Acceptable range is 0 to 10000001. (0 to 10,000.001
Amps). Current parameter, in mA RMS. The value 10000001 shall indicate an
error condition or missing value.
<DescriptiveName>electricalServiceTable.current:quantity
<Data Concept Type>
INTEGER (0..100001)
<Unit>milliamps (mA) RMS"
::= {electricalserviceEntry 16}
```

5.5.1.17 Electrical Service Power

```
electricalservicePower OBJECT-TYPE
SYNTAX      INTEGER (0..1000000001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Power measurement of the electrical
service. Power parameter, in mWatts. Acceptable range is 0 to 1000000001. (0
to 1,000,000.001 Watts)
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>electricalServiceTable.power:quantity
<Data Concept Type>
INTEGER (0..1000000001)
<Unit>milliwatts (mW)"
::= {electricalserviceEntry 17}
```

5.5.1.18 Electrical Service Light Threshold

```
electricalserviceLightThreshold OBJECT-TYPE
SYNTAX      INTEGER (0..100000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the threshold of the light measurement that triggers
the electrical service to turn on or off. This measurement is supplemented by
the electricalServiceLightHysteresis. If the light measurements are rising,
then the measurement is required to be equal or above
electricalServiceLightThreshold plus electricalServiceLightHysteresis to
trigger the electrical service to turn off. If the light measurements are
falling, then the measurement is required to be equal or below
electricalServiceLightThreshold minus electricalServiceLightHysteresis to
trigger the electrical service to turn on.
<DescriptiveName>electricalServiceTable.lightThreshold:quantity
<Data Concept Type>
INTEGER (0..100000)
<Unit>lux"
::= {electricalserviceEntry 18}
```

5.5.1.19 Electrical Service Hold Interval

```
electricalserviceHoldInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates a time (in seconds) that the electrical service
continues to monitor the electricalServiceLightThreshold before triggering
the electrical service to turn on or off.
<DescriptiveName>electricalServiceTable.holdInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
```

```
<Unit>seconds"
::= {electricalserviceEntry 19}
```

5.5.1.20 Electrical Service Light Hysteresis

```
electricalserviceLightHysteresis OBJECT-TYPE
SYNTAX      INTEGER (0..10000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "This maximum value is ten percent of the
electricalserviceLightThreshold. Indicates the hysteresis used with
electricalserviceLightThreshold to trigger the electrical service to turn on
or off. This hysteresis is used to offset different values for turning on and
off the electrical service so that the luminaire does not cycle in ambiguous
lighting condictions.
<DescriptiveName>electricalServiceTable.LightHysteresis:quantity
<Data Concept Type>
-- was INTEGER (0..100000)
INTEGER (0..10000)
<Unit>lux"
::= {electricalserviceEntry 20}
```

5.5.1.21 Electrical Service Delay Interval

```
electricalserviceDelayInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the delay from when an electrical service is triggered
by the electricalServiceLightThreshold and turning on or off.
<DescriptiveName>electricalServiceTable.delayInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {electricalserviceEntry 21}
```

5.5.1.22 Electrical Service Dim Level

```
electricalserviceDimLevel OBJECT-TYPE
SYNTAX      INTEGER (0..100)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the present dim level of the device. This value shall
be from 0 to 100 percent of maximum power.
<DescriptiveName>electricalServiceTable.dimLevel:quantity
<Data Concept Type>
INTEGER (0..100)"
::= {electricalserviceEntry 22}
```

5.5.1.23 Electrical Service Dim Warm Up Interval

```
electricalserviceDimWarmUpInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the time (in seconds) that the ballasts of the
luminaires served by the electrical service be kept at full voltage before
going to the specified dim level (electricalServiceDimLevel).
<DescriptiveName>electricalServiceTable.dimWarmUpInterval:quantity
```

```
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {electricalserviceEntry 23}
```

5.5.1.24 Electrical Service Ground Fault Condition

```
electricalserviceGroundFaultCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present ground fault status for the electrical
service. (OK, Fault, NoDataComm)
<DescriptiveName>electricalServiceTable.groundFaultCond:code
<Valid Value Rule>
value - description
ok - indicates the electrical service is operating correctly
fault - indicates the electrical service is not operating correctly due to a
ground fault condition
noDataComm - unable to determine state due to communications error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {electricalserviceEntry 24}
```

5.5.1.25 Electrical Service Main Breaker Condition

```
electricalserviceMainBreakerCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3),
        trip(4)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the condition of the main breaker for this electrical
service.
<DescriptiveName>electricalServiceTable.mainBreakerCond:code
<Valid Value Rule>
value - description
ok - indicates the circuit breaker is operating correctly
fault - indicates the circuit breaker is not operating correctly
noDataComm - unable to determine state due to communications error
trip - breaker has been tripped
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3),
        trip(4)}"
::= {electricalserviceEntry 25}
```


5.5.1.26 Electrical Service Arc Fault Condition

```
electricalserviceArcFaultCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present arc facult status for the electrical
service.
<DescriptiveName>electricalServiceTable.arcFaultCond:code
<Valid Value Rule>
value - description
ok - indicates the electrical service is operating correctly
fault - indicates the electrical service is not operating correctly due to an
arc fault condition
noDataComm - unable to determine state due to communications error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {electricalserviceEntry 26}
```

5.5.1.27 Electrical Service Stagger Interval

```
electricalserviceStaggerInterval OBJECT-TYPE
SYNTAX      INTEGER (0..255)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the time period in seconds between any consecutive
electrical services being turned on.
<DescriptiveName>electricalserviceTable.StaggerInterval:quantity
<Data Concept Type>
INTEGER (0..255)
<Unit>seconds"
::= {electricalserviceEntry 27}
```

5.5.1.28 Electrical Service Switch State

```
electricalserviceSwitchState OBJECT-TYPE
SYNTAX      INTEGER {
        on(1),
        off(2) }
ACCESS      read-only
STATUS      optional
DESCRIPTION "Describes the present state of the electrical service's relay.
<DescriptiveName>electricalserviceTable.switchState:code
<Valid Value Rule>
value - description
on - The electrical service relay is switched on
off - The electrical service relay is switched off
<Data Concept Type>
ENUMERATION {
        on(1),
        off(2) }"
::= {electricalserviceEntry 28}
```


5.6 BRANCH CIRCUIT

```
elmsBranchCircuit OBJECT IDENTIFIER ::= { elms 4 }
```

5.6.1 Branch Circuit Table

```
branchcircuitTable OBJECT-TYPE
SYNTAX SEQUENCE OF BranchcircuitEntry
ACCESS not-accessible
STATUS optional
DESCRIPTION "A table containing branch circuit parameters."
::= { elmsBranchCircuit 1 }

branchcircuitEntry OBJECT-TYPE
SYNTAX BranchcircuitEntry
ACCESS not-accessible
STATUS optional
INDEX { branchcircuitIndex }
::= { branchcircuitTable 1 }

BranchcircuitEntry ::= SEQUENCE {
  branchcircuitIndex                              INTEGER,
  branchcircuitLocationProfile                    INTEGER,
  branchcircuitLocation                           OCTET STRING,
  branchcircuitPoleIdentifier                     OCTET STRING,
  branchcircuitMode                                   INTEGER,
  branchcircuitSwitchMode                         INTEGER,
  branchcircuitSwitchModeTime                     INTEGER,
  branchcircuitOpHours                            INTEGER,
  branchcircuitOpCond                             INTEGER,
  branchcircuitVoltageAB                          INTEGER,
  branchcircuitVoltageBC                          INTEGER,
  branchcircuitVoltageCA                          INTEGER,
  branchcircuitVoltageAN                          INTEGER,
  branchcircuitVoltageBN                          INTEGER,
  branchcircuitVoltageCN                          INTEGER,
  branchcircuitCurrent                            INTEGER,
  branchcircuitPower                              INTEGER,
  branchcircuitLightThreshold                     INTEGER,
  branchcircuitHoldInterval                       INTEGER,
  branchcircuitLightHysteresis                    INTEGER,
  branchcircuitDelayInterval                      INTEGER,
  branchcircuitDimLevel                           INTEGER,
  branchcircuitDimWarmUpInterval                  INTEGER,
  branchcircuitGroundFaultCond                    INTEGER,
  branchcircuitGroundFaultLeakageCurrent          INTEGER,
  branchcircuitGroundFaultLeakageCurrentThreshold INTEGER,
  branchcircuitGroundFaultDetectorSwitchState     INTEGER,
  branchcircuitBreakerCondition                   INTEGER,
  branchcircuitArcFaultCond                       INTEGER,
  branchcircuitArcFaultDetectorSwitchState        INTEGER,
  branchcircuitPowerMeterCond                     INTEGER,
  branchcircuitPowerMeterCurrent                  INTEGER,
  branchcircuitPowerMeterVoltageAB                INTEGER,
  branchcircuitPowerMeterVoltageBC                INTEGER,
  branchcircuitPowerMeterVoltageCA                INTEGER,
  branchcircuitPowerMeterVoltageAN                INTEGER,
  branchcircuitPowerMeterVoltageBN                INTEGER,
```



```
  branchcircuitPowerMeterVoltageCN              INTEGER,
  branchcircuitPowerMeterSwitchState            INTEGER,
  branchcircuitStaggerInterval                  INTEGER,
  branchcircuitSwitchState                        INTEGER,
  branchcircuitPowerFactor                      INTEGER,
  branchcircuitPowerLineFequency                INTEGER,
  branchcircuitRealPowerA                       INTEGER,
  branchcircuitRealPowerB                       INTEGER,
  branchcircuitRealPowerC                       INTEGER,
  branchcircuitEnergySum                        INTEGER,
  branchcircuitEnergyPosSum                     INTEGER,
  branchcircuitEnergySumNR                      INTEGER,
  branchcircuitEnergyPosSumNR                   INTEGER,
  branchcircuitPowerFactorA                     INTEGER,
  branchcircuitPowerFactorB                     INTEGER,
  branchcircuitPowerFactorC                     INTEGER,
  branchcircuitCurrentA                         INTEGER,
  branchcircuitCurrentB                         INTEGER,
  branchcircuitCurrentC                         INTEGER,
  branchcircuitPowerCountFailure                INTEGER,
  branchcircuitAverageVoltage                   INTEGER,
  branchcircuitPeakLeakageCurrent               INTEGER,
  branchcircuitValleyLeakageCurrent             INTEGER,
  branchcircuitDisplayName                                  OCTET STRING
}
```

5.6.1.1 Branch Circuit Index

```
branchcircuitIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      optional
DESCRIPTION "
<DescriptiveName>branchcircuitTable.index:identifier
<Data Concept Type>
INTEGER (1..65535)"
::= {branchcircuitEntry 1}
```

5.6.1.2 Branch Circuit Location Profile

```
branchcircuitLocationProfile OBJECT-TYPE
SYNTAX      INTEGER {
        geometry (1),
        geographic (2),
        grid (3),
        address (4)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the format of the branchCircuitLocation object by
referencing the location referencing standard SAE J2374.
<DescriptiveName>branchcircuitTable.locationProfile:code
<Valid Value Rule>
value - description
geometry - branchcircuitLocation is formatted in LRMS geometry format
geographic - branchcircuitLocation is formatted in LRMS geographic format
grid - branchcircuitLocation is formatted in LRMS grid format
address - branchcircuitLocation is formatted in LRMS address format
<Data Concept Type>
```



```
ENUMERATION {
        geometry (1),
        geographic (2),
        grid (3),
        address (4)}"
::= {branchcircuitEntry 2}
```

5.6.1.3 Branch Circuit Location

```
branchcircuitLocation OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      optional
DESCRIPTION "A textual description of the branch circuit location. The octet
string shall adhere to the location referencing standard SAE J2374. The
format of the string shall be indicated by the branchCircuitLocationProfile
object.
<DescriptiveName>branchcircuitTable.location:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {branchcircuitEntry 3}
```

5.6.1.4 Branch Circuit Pole Identifier

```
branchcircuitPoleIdentifier OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the Pole Identifier for this device.
<DescriptiveName>branchcircuitTable.PoleIdentifier:code
<Data Concept Type>
OCTET STRING (SIZE (0..64)) "
::= {branchcircuitEntry 4}
```

5.6.1.5 Branch Circuit Mode

```
branchcircuitMode OBJECT-TYPE
SYNTAX      INTEGER {
        24hr(1),
        Photocell(2)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the operating mode of the branchCircuit.
<DescriptiveName>branchCircuitTable.mode:code
<Valid Value Rule>
value - description
24hr - The branchCircuit’s primary mechanism of control is the defined by
BranchCircuit Switch Mode
Photocell – The branchCircuit’s primary mechanism of control is the photocell
<Data Concept Type>
ENUMERATION {
        24hr(1),
        Photcell(2)}"
::= {branchcircuitEntry 5}
```

5.6.1.6 Branch Circuit Switch Mode

```
branchcircuitSwitchMode OBJECT-TYPE
SYNTAX      INTEGER {
       permanentOn(1),
```



```
        permnentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8)
}
ACCESS      read-write
STATUS      optional
DESCRIPTION "An enumeration that describes the mode of switching for this
branchCircuit. This parameter allows control of the branchCircuit to be
permanent on/off (not allow schedule to control), schedule, transitory on/off
(allow schedule to control upon next scheduled event), timed on/off (not
allow schedule to control for a time set by branchCircuitSwitchModeTime).
These switch modes can be used in conjunction with BranchCircuitMode if it is
set to Photocell to provide a combination of Photcell and a Scheduled
operation.
<DescriptiveName>branchCircuitTable.switchMode:code
<Valid Value Rule>
value - description
permanentOn - turn on branchCircuit, do not allow schedule to control
branchCircuit
permanentOff - turn off branchCircuit, do not allow schedule to control
branchCircuit
schedule - allow only the schedule to control the branchCircuit
transitoryOn - turn on branchCircuit, do not allow schedule to control until
next scheduled event
transitoryOff - turn off branchCircuit, do not allow schedule to control
until next scheduled event
timedOn - turn on the branchCircuit, do not allow schedule to control for a
time specificed by branchCircuitSwitchModeTime
timedOff - turn off the branchCircuit, do not allow schedule to control for a
time specified by branchCircuitSwitchModeTime
none – No schedule should be applied
<Data Concept Type>
ENUMERATION {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8)}"
::= {branchcircuitEntry 6}
```

5.6.1.7 Branch Circuit Switch Mode Time

```
branchcircuitSwitchModeTime OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the value of the time out period for the timed
override mode. The mode is controlled by the branchCircuitSwitchMode object.
<DescriptiveName>branchcircuitTable.switchModeTime:quantity
```



```
<Data Concept Type>
INTEGER (0..65535)
<Unit>seconds"
::= {branchcircuitEntry 7}
```

5.6.1.8 Branch Circuit Operational Hours

```
branchcircuitOpHours OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the number of hours this branch circuit has been on.
<DescriptiveName>branchcircuitTable.operationHours:quantity
<Data Concept Type>
INTEGER (0..65535)
<Unit>hours"
::= {branchcircuitEntry 8}
```

5.6.1.9 Branch Circuit Operational Condition

```
branchcircuitOpCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current operation condition of the branch circuit.
(OK, Fault, NoDataComm)
<DescriptiveName>branchcircuitTable.operationCond:code
<Valid Value Rule>
value - description
ok - indicates the branch circuit is operating correctly
fault - indicates the branch circuit is not operating correctly
noDataComm - unable to determine state due to communications error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {branchcircuitEntry 9}
```

5.6.1.10 Branch Circuit VoltageAB

```
branchcircuitVoltageAB OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present Voltage measurement of the branch circuit
AB phase in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.voltageAB:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 10}
```

5.6.1.11 Branch Circuit VoltageBC

```
branchcircuitVoltageBC OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present Voltage measurement of the branch circuit
BC phase, in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.voltageBC:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 11}
```

5.6.1.12 Branch Circuit VoltageCA

```
branchcircuitVoltageCA OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present Voltage measurement of the branch circuit
CA phase, in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.voltageCA:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 12}
```

5.6.1.13 Branch Circuit VoltageAN

```
branchcircuitVoltageAN OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present Voltage measurement of the branch circuit
AN phase, in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.voltageAN:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 13}
```

5.6.1.14 Branch Circuit VoltageBN

```
branchcircuitVoltageBN OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present Voltage measurement of the branch circuit
BN phase, in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.voltageBN:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 14}
```

5.6.1.15 Branch Circuit VoltageCN

```
branchcircuitVoltageCN OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present Voltage measurement of the branch circuit
CN phase, in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.voltageCN:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 15}
```

5.6.1.16 Branch Circuit Current

```
branchcircuitCurrent OBJECT-TYPE
SYNTAX      INTEGER (0..100001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present value of the Current measurement of the
branch circuit in mA RMS. Acceptable range is 0 to 10000001. (0 to 10,000.001
Amps). The value 10000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.current:quantity
<Data Concept Type>
INTEGER (0..100001)
<Unit>milliamps (mA) RMS"
::= {branchcircuitEntry 16}
```

5.6.1.17 Branch Circuit Power

```
branchcircuitPower OBJECT-TYPE
SYNTAX      INTEGER (0..1000000001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current Power measurement of the branch circuit in
mWatts. Acceptable range is 0 to 1000000001. (0 to 1,000,000.001 Watts)
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.power:quantity
<Data Concept Type>
INTEGER (0..1000000001)
<Unit>milliwatts (mW)"
::= {branchcircuitEntry 17}
```

5.6.1.18 Branch Circuit Light Threshold

```
branchcircuitLightThreshold OBJECT-TYPE
SYNTAX      INTEGER (0..100000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the threshold of the light measurement that triggers
the branch circuit to turn on or off. This measurement is supplemented by the
branchCircuitLightHysteresis. If the light measurements are rising, then the
measurement is required to be equal or above branchCircuitLightThreshold plus
branchCircuitLightHysteresis to trigger the branch circuit to turn off. If
the light measurements are falling, then the measurement is required to be
equal or below branchCircuitLightThreshold minus branchCircuitLightHysteresis
to trigger the branch circuit to turn on.
<DescriptiveName>branchcircuitTable.lightThreshold:quantity
```

```
<Data Concept Type>
INTEGER (0..100000)
<Unit>lux"
::= {branchcircuitEntry 18}
```

5.6.1.19 Branch Circuit Hold Interval

```
branchcircuitHoldInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates a time (in seconds) that the branch circuit continues
to monitor the branchCircuitLightThreshold before triggering the branch
circuit to turn on or off.
<DescriptiveName>branchcircuitTable.holdInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {branchcircuitEntry 19}
```

5.6.1.20 Branch Circuit Light Hysteresis

```
branchcircuitLightHysteresis OBJECT-TYPE
SYNTAX      INTEGER (0..10000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "This maximum value is ten percent of the
branchcircuitLightThreshold. Indicates the hysteresis used with
LightThreshold to trigger the branch circuit to turn on or off. This
hysteresis is used to offset different values for turning on and off the
branch circuit so that the devices served by the branch circuit do not cycle
on or off.
<DescriptiveName>branchcircuitTable.LightHysteresis:quantity
<Data Concept Type>
INTEGER (0..10000)
<Unit>lux"
::= {branchcircuitEntry 20}
```

5.6.1.21 Branch Circuit Delay Interval

```
branchcircuitDelayInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the delay from when a branch circuit is triggered by
the branchCircuitLightThreshold and turning on or off.
<DescriptiveName>branchcircuitTable.delayInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {branchcircuitEntry 21}
```

5.6.1.22 Branch Circuit Dim Level

```
branchcircuitDimLevel OBJECT-TYPE
SYNTAX      INTEGER (0..100)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the current dim level of the device. This value shall
be from 0 to 100 percent of maximum branch circuit power.
```

```
<DescriptiveName>branchcircuitTable.dimLevel:quantity
<Data Concept Type>
INTEGER (0..100)"
::= {branchcircuitEntry 22}
```

5.6.1.23 Branch Circuit Dim Warm Up Interval

```
branchcircuitDimWarmUpInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the time (in seconds) that the ballasts for all
luminaires on this branch circuit be kept at full voltage before going to the
specified dim level (branchCircuitDimLevel).
<DescriptiveName>branchcircuitTable.dimWarmUpInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {branchcircuitEntry 23}
```

5.6.1.24 Branch Circuit Ground Fault Condition

```
branchcircuitGroundFaultCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current operation condition of ground fault for
the branch circuit. (OK, Fault, NoDataComm)
<DescriptiveName>branchcircuitTable.groundFaultCond:code
<Valid Value Rule>
value - description
ok - indicates the circuit is operating correctly
fault - indicates the circuit is not operating correctly due to a ground
fault condition
noDataComm - unable to determine state due to communications error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {branchcircuitEntry 24}
```

5.6.1.25 Branch Circuit Ground Fault Leakage Current

```
branchcircuitGroundFaultLeakageCurrent OBJECT-TYPE
SYNTAX      INTEGER (0..100001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the leakeage current of the branch circuit. Acceptable
range is 0 to 10000001. (0 to 10,000.001 Amps). The value 10000001 shall
indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.groundFaultLeakageCurrent:quantity
<Data Concept Type>
INTEGER (0..100001)
<Unit>milliamps (mA) RMS"
::= {branchcircuitEntry 25}
```

5.6.1.26 Branch Circuit Ground Fault Leakage Current Threshold

```
branchcircuitGroundFaultLeakageCurrentThreshold OBJECT-TYPE
SYNTAX      INTEGER (0..100001)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the threshold of the ground fault leakage current. If
branchCircuitLeakageCurrent exceeds this value, branchCircuitFaultCondition
indicates Fault. Acceptable range is 0 to 10000001. (0 to 10,000.001 Amps).
The value 10000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.groundFaultLeakegeCurrentThreshold:quanti
ty
<Data Concept Type>
INTEGER (0..100001)
<Unit>milliamps (mA) RMS"
::= {branchcircuitEntry 26}
```

5.6.1.27 Branch Circuit Ground Fault Detector Switch State

```
branchcircuitGroundFaultDetectorSwitchState OBJECT-TYPE
SYNTAX      INTEGER {
        enabled (1),
        disabled (2)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Allows the ground fault detector to be enabled or disabled.
<DescriptiveName>branchcircuitTable.groundFaultDetectorSwitchState:code
<Valid Value Rule>
value - description
enabled - ground fault detector is enabled
disabled - ground fault detector is disabled
<Data Concept Type>
ENUMERATION {
        enabled (1),
        disabled (2)}"
::= {branchcircuitEntry 27}
```

5.6.1.28 Branch Circuit Breaker Condition

```
branchcircuitBreakerCondition OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3),
        trip(4)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present operation condition of circuit breaker for
the branch circuit. (OK, Fault, NoDataComm, trip)
<DescriptiveName>branchcircuitTable.breakerCond:code
<Valid Value Rule>
value - description
ok - indicates the circuit breaker is operating correctly
fault - indicates the circuit breaker is not operating correctly
noDataComm - unable to determine state due to communications error
trip - breaker has been tripped
```



```
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3),
        trip(4)}"
::= {branchcircuitEntry 28}
```

5.6.1.29 Branch Circuit Arc Fault Condition

```
branchcircuitArcFaultCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
        noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present operation condition of arc fault for the
branch circuit. (OK, Fault, NoDataComm)
<DescriptiveName>branchcircuitTable.arcFaultCond:code
<Valid Value Rule>
value - description
ok - indicates the circuit is operating correctly
fault - indicates the circuit is not operating correctly due to an arc fault
condition
noDataComm - unable to determine state due to communications error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {branchcircuitEntry 29}
```

5.6.1.30 Branch Circuit Arc Fault Detector Switch State

```
branchcircuitArcFaultDetectorSwitchState OBJECT-TYPE
SYNTAX      INTEGER {
        enabled (1),
        disabled (2)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the present state of the arc fault detector switch.
<DescriptiveName>branchcircuitTable.arcFaultDetectorSwitchState:code
<Valid Value Rule>
value - description
enabled - arc fault detector is enabled
disabled - arc fault detector is disabled
<Data Concept Type>
ENUMERATION {
        enabled (1),
        disabled (2)}"
::= {branchcircuitEntry 30}
```

5.6.1.31 Branch Circuit Power Meter Condition

```
branchcircuitPowerMeterCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok (1),
        fault (2),
```



```
        noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present operation condition of power meter for the
branch circuit. (OK, Fault, NoDataComm)
<DescriptiveName>branchcircuitTable.powerMeterCond:code
<Valid Value Rule>
value - description
ok - indicates the power meter for the branch circuit is operating correctly
fault - indicates the power meter for the branch circuit is not operating
correctly
noDataComm - unable to determine state due to communications error
<Data Concept Type>
ENUMERATION {
        ok (1),
        fault (2),
        noDataComm (3)}"
::= {branchcircuitEntry 31}
```

5.6.1.32 Branch Circuit Power Meter Current

```
branchcircuitPowerMeterCurrent OBJECT-TYPE
SYNTAX      INTEGER (0..100001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present current value as measured by the power
meter. Acceptable range is 0 to 10000001. (0 to 10,000.001 Amps). The value
10000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.powerMeterCurrent:quantity
<Data Concept Type>
INTEGER (0..100001)
<Unit>milliamps (mA) RMS"
::= {branchcircuitEntry 32}
```

5.6.1.33 Branch Circuit Power Meter Voltage AB

```
branchcircuitPowerMeterVoltageAB OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present voltage value AB phase as measured by the
power meter. in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.powerMeterVoltageAB:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 33}
```

5.6.1.34 Branch Circuit Power Meter Voltage BC

```
branchcircuitPowerMeterVoltageBC  OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present voltage value BC phase as measured by the
power meter. in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.powerMeterVoltageBC:quantity
```

```
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 34}
```

5.6.1.35 Branch Circuit Power Meter Voltage CA

```
branchcircuitPowerMeterVoltageCA  OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present voltage value CA phase as measured by the
power meter. in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.powerMeterVoltageCA:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 35}
```

5.6.1.36 Branch Circuit Power Meter Voltage AN

```
branchcircuitPowerMeterVoltageAN  OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present voltage value BC phase as measured by the
power meter. in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.powerMeterVoltageAN:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 36}
```

5.6.1.37 Branch Circuit Power Meter Voltage BN

```
branchcircuitPowerMeterVoltageBN  OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present voltage value BN phase as measured by the
power meter. in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.powerMeterVoltageBN:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 37}
```

5.6.1.38 Branch Circuit Power Meter Voltage CN

```
branchcircuitPowerMeterVoltageCN  OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the present voltage value CN phase as measured by the
power meter. in mV RMS. Acceptable range is 0 to 660001. (0 to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.powerMeterVoltageBN:quantity
```

```
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 38}
```

5.6.1.39 Branch Circuit Power Meter Switch State

```
branchcircuitPowerMeterSwitchState OBJECT-TYPE
SYNTAX      INTEGER {
        enabled (1),
        disabled (2)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Allows the power meter to be enabled or disabled.
<DescriptiveName>branchcircuitTable.powerMeterSwitchState:code
<Valid Value Rule>
value - description
enabled - power meter is enabled
disabled - power meter is disabled
<Data Concept Type>
ENUMERATION {
        enabled (1),
        disabled (2)}"
::= {branchcircuitEntry 39}
```

5.6.1.40 Branch Circuit Stagger Interval

```
branchcircuitStaggerInterval OBJECT-TYPE
SYNTAX      INTEGER (0..255)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the time period in seconds between any consecutive
branch circuits being turned on.
<DescriptiveName>branchcircuitStaggerInterval:quantity
<Data Concept Type>
INTEGER (0..255)
<Unit>seconds"
::= {branchcircuitEntry 40}
```

5.6.1.41 Branch Circuit Switch State

```
branchcircuitSwitchState OBJECT-TYPE
SYNTAX      INTEGER {
        on(1),
        off(2) }
ACCESS      read-only
STATUS      optional
DESCRIPTION "Describes the present state of the branch circuit's relay.
<DescriptiveName>branchcircuitTable.switchState:code
<Valid Value Rule>
value - description
on - The branch circuit relay is switched on
off - The branch circuit relay is switched off
<Data Concept Type>
ENUMERATION {
        on(1),
        off(2) }"
::= {branchcircuitEntry 41}
```

5.6.1.42 Branch Circuit Power Factor

```
branchcircuitPowerFactor OBJECT-TYPE
SYNTAX      INTEGER (0..101)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Reading multiplied by the branchcircuitPower reading to derive
the present energy value of the branch circuit. The Power factor has range
0..100, measured in hundredths. For example, a power factor reading of 95
would equate to a power factor of 0.95.
The value 101 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.Powerfactor:quantity
<Data Concept Type>
INTEGER (0..101)"
::= {branchcircuitEntry 42}
```

5.6.1.43 Branch Circuit Power Line Frequency

```
branchcircuitPowerLineFequency OBJECT-TYPE
SYNTAX  INTEGER (0..1001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "Power line frequency in tenths of Hertz. Acceptable range is 0
to 1001. (0 to 100.1 Hz)
The value 1001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.PowerLineFequency:quantity
<Data Concept Type>
INTEGER (0..1001)
<Unit>tenths of Hertz (0.1 Hz)"
::= {branchcircuitEntry 43}
```

5.6.1.44 Branch Circuit Real Power A

```
branchcircuitRealPowerA OBJECT-TYPE
SYNTAX      INTEGER (0..1000000001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "Indicates the current Power Phase A measurement of the branch
circuit in mWatts. Acceptable range is 0 to 1000000001. (0 to 1,000,000.001
Watts)
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.RealPowerA:quantity
<Data Concept Type>
INTEGER (0..1000000001)
<Unit>milliwatts (mW)"
::= {branchcircuitEntry 44}
```

5.6.1.45 Branch Circuit Real Power B

```
branchcircuitRealPowerB OBJECT-TYPE
SYNTAX      INTEGER (0..1000000001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "Indicates the current Power Phase B measurement of the branch
circuit in mWatts. Acceptable range is 0 to 1000000001. (0 to 1,000,000.001
Watts)
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.RealPowerB:quantity
```

```
INTEGER (0..1000000001)
<Unit>milliwatts (mW)"
::= {branchcircuitEntry 45}
```

5.6.1.46 Branch Circuit Real Power C

```
branchcircuitRealPowerC OBJECT-TYPE
SYNTAX      INTEGER (0..1000000001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "Indicates the current Power Phase C measurement of the branch
circuit in mWatts. Acceptable range is 0 to 1000000001 (0 to 1,000,000.001
Watts)
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.RealPowerC:quantity
INTEGER (0..1000000001)
<Unit>milliwatts (mW)"
::= {branchcircuitEntry 46}
```

5.6.1.47 Branch Circuit Energy Sum

```
branchcircuitEnergySum OBJECT-TYPE
SYNTAX  INTEGER (-1000000000..1000000001)
ACCESS  read-write
STATUS  optional
DESCRIPTION "Total net (bidirectional) energy. Acceptable range is -
1000000000 to 1000000001 (-1,000,000,000 to 1,000,000,001 Watt-hours). The
only value allowed to write is 0 (null) and it results in resetting
branchcircuitEnergySum and branchcircuitEnergyPosSum objects to 0.
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.EnergySum:quantity
INTEGER (-1000000000..1000000001)
<Unit>watt-hours (Wh)"
::= {branchcircuitEntry 47}
```

5.6.1.48 Branch Circuit Energy PosSum

```
branchcircuitEnergyPosSum OBJECT-TYPE
SYNTAX  INTEGER (-1000000000..1000000001)
ACCESS  read-write
STATUS  optional
DESCRIPTION "Total positive energy. Acceptable range is -1000000000 to
1000000001 (-1,000,000,000 to 1,000,000,001 Watt-hours). The only value
allowed to write is 0 (null) and it will result in resetting
branchcircuitEnergySum and branchcircuitEnergyPosSum objects to 0.
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.EnergyPosSum:quantity
<Data Concept Type>
INTEGER (-1000000000..1000000001)
<Unit>watt-hours (Wh)"
::= {branchcircuitEntry 48}
```

5.6.1.49 Branch Circuit Energy Sum NR

```
branchcircuitEnergySumNR OBJECT-TYPE
SYNTAX  INTEGER (-1000000000..1000000001)
ACCESS  read-only
STATUS  optional
DESCRIPTION " Total net (bidirectional) energy - non resettable. Acceptable
range is -1000000000 to 1000000001 (-1,000,000,000 to 1,000,000,001 Watt-
```



```
hours). The value 1000000001 shall indicate an error condition or missing
value.
<DescriptiveName>branchcircuitTable.EnergySumNR:quantity
<Data Concept Type>
INTEGER (-1000000000..1000000001)
<Unit>watt-hours (Wh)"
::= {branchcircuitEntry 49}
```

5.6.1.50 Branch Circuit Energy PosSum NR

```
branchcircuitEnergyPosSumNR OBJECT-TYPE
SYNTAX  INTEGER (-1000000000..1000000001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "Total positive energy - non resettable. Acceptable range is
-1000000000 to 1000000001. (-1,000,000,000 to 1,000,000,001 Watt-hours)
The value 1000000001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.EnergyPosSumNR:quantity
<Data Concept Type>
INTEGER (-1000000000..1000000001)
<Unit>watt-hours (Wh)"
::= {branchcircuitEntry 50}
```

5.6.1.51 Branch Circuit Power Factor A

```
branchcircuitPowerFactorA OBJECT-TYPE
SYNTAX  INTEGER (0..101)
ACCESS  read-only
STATUS  optional
DESCRIPTION "Power factor: phase A. The Power factor has range 0..100,
measured in hundredths. For example, a power factor reading of 95 would
equate to a power factor of 0.95.
The value 101 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.PowerFactorA:quantity
<Data Concept Type>
INTEGER (0..101)
<Unit>0.01"
::= {branchcircuitEntry 51}
```

5.6.1.52 Branch Circuit Power Factor B

```
branchcircuitPowerFactorB OBJECT-TYPE
SYNTAX  INTEGER (0..101)
ACCESS  read-only
STATUS  optional
DESCRIPTION "Power factor: phase B. The Power factor has range 0..100,
measured in hundredths. For example, a power factor reading of 95 would
equate to a power factor of 0.95.
The value 101 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.PowerFactorB:quantity
<Data Concept Type>
INTEGER (0..101)
<Unit>0.01"
::= {branchcircuitEntry 52}
```

5.6.1.53 Branch Circuit Power Factor C

```
branchcircuitPowerFactorC OBJECT-TYPE
SYNTAX  INTEGER (0..101)
ACCESS  read-only
```

```
STATUS  optional
DESCRIPTION "Power factor: phase C. The Power factor has range 0..100,
measured in hundredths. For example, a power factor reading of 95 would
equate to a power factor of 0.95.
The value 101 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.PowerFactorC:quantity
<Data Concept Type>
INTEGER (0..101)
<Unit>0.01"
::= {branchcircuitEntry 53}
```

5.6.1.54 Branch Circuit Current A

```
branchcircuitCurrentA OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "RMS current, phase A. Acceptable range is 0 to 10000001. (0 to
10,000.001 Amps). The value 10000001 shall indicate an error condition or
missing value.
<DescriptiveName>branchcircuitTable.CurrentA:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>milliamps (mA) RMS"
::= {branchcircuitEntry 54}
```

5.6.1.55 Branch Circuit Current B

```
branchcircuitCurrentB OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "RMS current, phase B. Acceptable range is 0 to 10000001. (0 to
10,000.001 Amps). The value 10000001 shall indicate an error condition or
missing value.
<DescriptiveName>branchcircuitTable.CurrentB:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>milliamps (mA) RMS"
::= {branchcircuitEntry 55}
```

5.6.1.56 Brach Circuit Current C

```
branchcircuitCurrentC OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "RMS current, phase C. Acceptable range is 0 to 10000001. (0 to
10,000.001 Amps). The value 10000001 shall indicate an error condition or
missing value.
<DescriptiveName>branchcircuitTable.CurrentC:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>milliamps (mA) RMS"
::= {branchcircuitEntry 56}
```

5.6.1.57 Branch Circuit Power Count Failure

```
branchcircuitPowerCountFailure OBJECT-TYPE
SYNTAX  INTEGER (0..32767)
```



```
ACCESS  read-only
STATUS  optional
DESCRIPTION "Power failure count
<DescriptiveName>branchcircuitTable.PowerCountFailure:quantity
<Data Concept Type>
INTEGER (0..32767)"
::= {branchcircuitEntry 57}
```

5.6.1.58 Branch Circuit Average Voltage

```
branchcircuitAverageVoltage OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS  read-only
STATUS  optional
DESCRIPTION "This is the average line-to-line voltage in mV RMS (average of
VoltageAB, VoltageBC, and VoltageCA).
All phases are included in the average. Acceptable range is 0 to 660001. (0
to 660.001 Volts)
The value 660001 shall indicate an error condition or missing value.
<DescriptiveName>branchcircuitTable.AverageVoltage:quantity
<Data Concept Type>
INTEGER (0..660001)
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 58}
```

5.6.1.59 Branch Circuit Peak Leakage Current

```
branchcircuitPeakLeakageCurrent OBJECT-TYPE
SYNTAX  INTEGER (-10000000..10000000)
ACCESS  read-write
STATUS  optional
DESCRIPTION "Leakage current peak value. It is allowed to write 0 to reset
value.
<DescriptiveName>branchcircuitTable.PeakLeakageCurrent:quantity
<Data Concept Type>
INTEGER (-2147483648..2147483647)"
::= {branchcircuitEntry 59}
```

5.6.1.60 Branch Circuit Valley Leakage Current

```
branchcircuitValleyLeakageCurrent OBJECT-TYPE
SYNTAX  INTEGER (-10000000..10000000)
ACCESS  read-write
STATUS  optional
DESCRIPTION "Leakage current valley value. It is allowed to write 0 to reset
value.
<DescriptiveName>branchcircuitTable.ValleyLeakageCurrent:quantity
<Data Concept Type>
INTEGER (-2147483648..2147483647)"
::= {branchcircuitEntry 60}
```

5.6.1.61 Branch Circuit Display Name

```
branchcircuitDisplayName OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-only
STATUS      optional
DESCRIPTION
"<Definition>This object specifies a description of the branchcircuit in
ASCII characters.
```

```
<DescriptiveName>branchcircuitDisplayName:text
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= { branchcircuitEntry 61 }
```

5.7 ZONE

```
elmsZone OBJECT IDENTIFIER ::= { elms 5 }
```

5.7.1 Zone Table

```
zoneTable OBJECT-TYPE
SYNTAX SEQUENCE OF ZoneEntry
ACCESS not-accessible
STATUS optional
DESCRIPTION "A table containing parameters for a zone of ELMS devices."
::= { elmsZone 1 }

zoneEntry OBJECT-TYPE
SYNTAX zoneEntry
ACCESS not-accessible
STATUS optional
INDEX { zoneIndex }
::= { zoneTable 1 }

zoneEntry ::= SEQUENCE {
   zoneIndex                    INTEGER,
   zoneLocationProfile        INTEGER,
   zoneLocation           OCTET STRING,
   zoneMode                     INTEGER,
   zoneSwitchMode           INTEGER,
   zoneSwitchModeTime         INTEGER,
   zoneLightThreshold         INTEGER,
   zoneHoldInterval               INTEGER,
   zoneLightHysteresis        INTEGER,
   zoneDelayInterval          INTEGER,
   zoneDimLevel                   INTEGER,
   zoneDimWarmUpInterval      INTEGER,
   zoneFunctionalProfile      OCTET STRING }
```

5.7.1.1 Zone Index

```
zoneIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      optional
DESCRIPTION "
<DescriptiveName>ZoneTable.index:identifier
<Data Concept Type>
INTEGER (1..65535)"
::= {zoneEntry 1}
```

5.7.1.2 Zone Location Profile

```
zoneLocationProfile OBJECT-TYPE
SYNTAX      INTEGER {
        geometry (1),
        geographic (2),
        grid (3),
        address (4)}
```



```
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the format of the zoneLocation object by referencing
the location referencing standard SAE J2374.
<DescriptiveName>zoneTable.locationProfile:code
<Valid Value Rule>
value - description
geometry - zoneLocation is formatted in LRMS geometry format
geographic - zoneLocation is formatted in LRMS geographic format
grid - zoneLocation is formatted in LRMS grid format
address - zoneLocation is formatted in LRMS address format
<Data Concept Type>
ENUMERATION {
        geometry (1),
        geographic (2),
        grid (3),
        text (4)}"
::= {zoneEntry 2}
```

5.7.1.3 Zone Location

```
zoneLocation OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      optional
DESCRIPTION "A textual description of the zone location. The octet string
shall adhere to the location referencing standard SAE J2374. The format of
the string shall be indicated by the zoneLocationProfile object.
<DescriptiveName>zoneTable.location:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {zoneEntry 3}
```

5.7.1.4 Zone Mode

```
zoneMode OBJECT-TYPE
SYNTAX      INTEGER {
      24hr(1),
      Photocell(2)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the operating mode of the zone.
<DescriptiveName>zoneTable.mode:code
<Valid Value Rule>
value - description
24hr - The zone’s primary mechanism of control is the defined by Zone Switch
Mode
Photocell – The zone’s primary mechanism of control is the photocell
<Data Concept Type>
ENUMERATION {
        24hr(1),
        Photcell(2)}"
::= {zoneEntry 4}
```

5.7.1.5 Zone Switch Mode

```
zoneSwitchMode OBJECT-TYPE
SYNTAX      INTEGER {
```



```
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8)
}
ACCESS      read-write
STATUS      optional
DESCRIPTION "An enumeration that describes the mode of switching for this
zone. This parameter allows control of the zone to be permanent on/off (not
allow schedule to control), schedule, transitory on/off (allow schedule to
control upon next scheduled event), timed on/off (not allow schedule to
control for a time set by zoneSwitchModeTime). These switch modes can be used
in conjunction with ZoneMode if it is set to Photocell to provide a
combination of Photcell and a Scheduled operation.
<DescriptiveName>zoneTable.switchMode:code
<Valid Value Rule>
value - description
permanentOn - turn on zone, do not allow schedule to control zone
permanentOff - turn off zone, do not allow schedule to control zone
schedule - allow only the schedule to control the zone
transitoryOn - turn on zone, do not allow schedule to control until next
scheduled event
transitoryOff - turn off zone, do not allow schedule to control until next
scheduled event
timedOn - turn on the zone, do not allow schedule to control for a time
specificed by zoneSwitchModeTime
timedOff - turn off the zone, do not allow schedule to control for a time
specified by zoneSwitchModeTime
Section 6none – No schedule should be applied
<Data Concept Type>
ENUMERATION {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8)}"
::= {zoneEntry 5}
```

5.7.1.6 Zone Switch Mode Time

```
zoneSwitchModeTime OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the value of the time out period for the timed
override mode. The mode is controlled by the zoneSwitchMode object.
<DescriptiveName>zoneTable.switchModeTime:quantity
<Data Concept Type>
INTEGER (0..65535)
```



```
<Unit>seconds"
::= {zoneEntry 6}
```

5.7.1.7 Zone Light Threshold

```
zoneLightThreshold OBJECT-TYPE
SYNTAX      INTEGER (0..100000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the threshold of the light measurement that triggers
the ELMS devices in the zone to turn on or off. This measurement is
supplemented by the zoneLightHysteresis. If the light measurements are
rising, then the measurement is required to be equal or above
zoneLightThreshold plus zoneLightHysteresis to trigger the ELMS devices in
the zone to turn off. If the light measurements are falling, then the
measurement is required to be equal or below zoneLightThreshold minus
zoneLightHysteresis to trigger the ELMS devices in the zone to turn on.
<DescriptiveName>zoneTable.lightThreshold:quantity
<Data Concept Type>
INTEGER (0..100000)
<Unit>lux"
::= {zoneEntry 7}
```

5.7.1.8 Zone Hold Interval

```
zoneHoldInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates a time (in seconds) that the ELMS devices in the zone
continues to monitor the zoneLightThreshold before triggering the ELMS
devices to turn on or off.
<DescriptiveName>zoneTable.holdInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {zoneEntry 8}
```

5.7.1.9 Zone Light Hysteresis

```
zoneLightHysteresis OBJECT-TYPE
SYNTAX      INTEGER (0..10000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "This maximum value is ten percent of the zoneLightThreshold.
Indicates the hysteresis used with zoneLightThreshold to trigger the ELMS
devices in the zone to turn on or off. This Hysteresis is used to offset
different values for turning on and off the ELMS devices in the zone so that
the devices do not cycle on or off.
<DescriptiveName>zoneTable.LightHysteresis:quantity
<Data Concept Type>
INTEGER (0..10000)
<Unit>lux"
::= {zoneEntry 9}
```

5.7.1.10 Zone Delay Interval

```
zoneDelayInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
```

```
STATUS      optional
DESCRIPTION "Indicates the delay from when the ELMS devices in a zone are
triggered by the zoneLightThreshold for turning on or off.
<DescriptiveName>electricalServiceTable.delayInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {zoneEntry 10}
```

5.7.1.11 Zone Service Dim Level

```
zoneDimLevel OBJECT-TYPE
SYNTAX      INTEGER (0..100)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the present dim level of the device. This value shall
be from 0 to 100 percent of maximum of ELMS device luminosity output
<DescriptiveName>zoneTable.dimLevel:quantity
<Data Concept Type>
INTEGER (0..100)"
::= {zoneEntry 11}
```

5.7.1.12 Zone Dim Warm Up Interval

```
zoneDimWarmUpInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the time (in seconds) that the ballasts of the
luminaires in the zone be kept at full voltage before going to the specified
dim level (zoneDimLevel).
<DescriptiveName>zoneTable.dimWarmUpInterval:quantity
<Data Concept Type>
INTEGER (0..1000)
<Unit>seconds"
::= {zoneEntry 12}
```

5.7.1.13 Zone Functional Profile

```
zoneFunctionalProfile OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      optional
DESCRIPTION "A textual description of the purpose of the zone.
<DescriptiveName>zoneTable.functionalprofile:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {zoneEntry 13}
```

5.8 ZONE PARAMETERS

```
elmsZoneParameter  OBJECT IDENTIFIER ::= { elms 8 }
-- node for elms zone general parameter elements
```

5.8.1 Maximum Number of Zones Per Device

```
elmsMaxNumZonesPerDevice OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
```



```
DESCRIPTION "Indicates the maximum number of zones supported by an ELMS
Device.
<DescriptiveName>:elmsMaxNumZonesPerDevice:quantity"
::= {elmsZoneParameter 1}
```

5.8.2 Maximum Number of Devices Per Zone

```
elmsMaxNumDevicesPerZone OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the maximum number of devices that can be assigned to
a zone.
<DescriptiveName>:elmsMaxNumDevicesPerZone quantity"
::= {elmsZoneParameter 2}
```

5.9 ZONE LOGICAL DEVICE IDENTIFIER TABLE

```
elmsZoneLogicalDeviceID OBJECT IDENTIFIER ::= { elms 9 }
-- node for table containing list of which ELMS devices are assigned to which
zones
```

5.9.1 Zone Logical Device ID Table

```
elmsZoneLogicalDeviceIDTable OBJECT-TYPE
SYNTAX SEQUENCE OF elmsZoneLogicalDeviceIDEntry
ACCESS not-accessible
STATUS optional
DESCRIPTION "A table containing the set of logical identifiers for the ELMS
devices that have been assigned to a zone"
::= { elmsZoneLogicalDeviceID 1 }

elmsZoneLogicalDeviceIDEntry OBJECT-TYPE
SYNTAX elmsZoneLogiclDeviceIDEntry
ACCESS not-accessible
STATUS optional
INDEX { elmsZoneDeviceIDIndex }
::= { elmsZoneLogicalDeviceIDTable 1 }

elmsZoneLogicalDeviceIDEntry ::= SEQUENCE {
 elmsZoneLogicalDeviceIDIndex      INTEGER,
 elmsZoneLogicalDeviceIDZoneID     INTEGER,
 elmsZoneLogicalDeviceIDDeviceType INTEGER,
 elmsZoneLogicalDeviceIDDeviceID   INTEGER }
```

5.9.1.1 Zone Logical Device ID Index

```
elmsZoneLogicalDeviceIDIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      optional
DESCRIPTION "Index into table that contains list of logical identifiers for
the devices assigned to a zone
<DescriptiveName>elmsZoneLogicalDeviceIDTable.index:identifier
<Data Concept Type>
INTEGER (1..65535)"
::= {elmsZoneLogicalDeviceIDEntry 1}
```


5.9.1.2 Zone Logical Device ID Zone ID

```
elmsZoneLogicalDeviceIDZoneID OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Zone identifier for an ELMS device. This number references the
index of the Zone table
<DescriptiveName>elmsZoneLogical.DeviceID.zoneID:quantity
<Data Concept Type>
INTEGER (1..65535)"
::= {elmsZoneLogicalDeviceIDEntry 2}
```

5.9.1.3 Zone Logical Device ID DeviceType

```
elmsZoneLogicalDeviceIDDeviceType  OBJECT-TYPE
SYNTAX      INTEGER {
                luminaire (1),
                branchCircuit (2),
                electricalService (3)}
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the device that this row is to reference. An row in
this table can reference a luminaire, branch circuit,  or electrical service.
<DescriptiveName>elmsZoneLogicalDeviceID.deviceType:quantity
<Valid Value Rule>
value - description
luminaire –This reference is for a luminaire.
branchCircuit - This reference is for a branch circuit.
electricalService - This  reference is for an electrical service.
<Data Concept Type>
ENUMERATION {
                luminaire (1),
                branchCircuit (2),
                electricalService (3),
                }"
::= {elmsZoneLogicalDeviceIDEntry 3}
```

5.9.1.4 Zone Logical Device ID Device ID

```
elmsZoneLogicalDeviceIDDeviceID OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      optional
DESCRIPTION "Identifier of the ELMS device. The number here references the
index in the table of the Device Type.
<DescriptiveName>elmsZoneLogicalDeviceIDDeviceID:quantity
<Data Concept Type>
INTEGER (1..65535)"
::= {elmsZoneLogicalDeviceIDEntry 4}
```

5.10 PHOTOCELL

```
elmsPhotocell OBJECT IDENTIFIER ::= { elms 10 }
-- node for schedule elements
```

5.10.1 Photocell State

```
photocellState OBJECT-TYPE
SYNTAX      INTEGER {
```



```
                day (1),
                night (2),
                noDataComm (3)}
ACCESS      read-only
STATUS      optional
DESCRIPTION "Indicates the current state of photodetector.
<DescriptiveName>elmsPhotocellState:code
<Valid Value Rule>
value - description
day  - Day is detected.
night - Night is detected.
noDataComm - Unable to evaluate current state (not available yet,
communication problem etc.).
<Data Concept Type>
ENUMERATION {
                day (1),
                night (2),
                noDataComm (3),
                }"
::= { elmsPhotocell 1 }
```

5.10.2 Photocell Display Name

```
photocellDisplayName OBJECT-TYPE
SYNTAX      OCTET STRING
ACCESS      read-only
STATUS      optional
DESCRIPTION
"<Definition>This object specifies a description of the photocell in ASCII
characters.
<DescriptiveName>elmsPhotocellDisplayName:text
<DataConceptType>Data Element"
::= { elmsPhotocell 2 }

END
```


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ANNEX A
REQUIREMENTS TRACEABILITY MATRIX (RTM)
[NORMATIVE]

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
3.3	Operational Environment Requirements				
3.3.1	Provide Live Data				
3.3.1.1	Retrieve Data				
		4.2.1	Generic SNMP Get Interface		
3.3.1.2	Deliver Data				
		4.2.3	Generic SNMP Set Interface		
3.3.1.3	Data Retrieval and Data Delivery Action Performance				
		4.2.1	Generic SNMP Get Interface		
		4.2.2	Generic SNMP Get-Next Interface		
		4.2.3	Generic SNMP Set Interface		
3.3.2	Provide Off-line Log Data				
3.3.2.1	Retrieve Configuration of Logging service				
		4.2.1	Generic SNMP Get Interface		
				NTCIP1201.2.5.1	maxEventClasses
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.2.5	eventClassNumRowsInLog
				NTCIP1201.2.5.2.6	eventClassNumEvents

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.3	maxEventLogConfigs
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.2	Configure Logging Service				
		4.3.16	Configure Reporting/Logging Service		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.3	Retrieve Logged Data				

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
		4.3.17	Retrieve Logged Data		
				NTCIP1201.2.5.2.5	eventClassNumRowsInLog
				NTCIP1201.2.5.2.6	eventClassNumEvents
				NTCIP1201.2.5.6.1	eventLogClass
				NTCIP1201.2.5.6.2	eventLogNumber
				NTCIP1201.2.5.6.3	eventLogID
				NTCIP1201.2.5.6.4	eventLogTime
				NTCIP1201.2.5.6.5	eventLogValue
3.3.2.4	Clear Log				
		4.2.3	Generic SNMP Set Interface		
				NTCIP1201.2.5.2.3	eventClassClearTime
3.3.2.5	Retrieve Capabilities of Event Logging Services				
		4.2.1	Generic SNMP Get Interface		
				NTCIP1201.2.5.1	maxEventClasses
				NTCIP1201.2.5.3	maxEventLogConfigs
				NTCIP1201.2.5.5	maxEventLogSize
3.3.2.6	Retrieve Number of Events Currently Logged				
		4.2.1	Generic SNMP Get Interface		
				NTCIP1201.2.5.2.5	eventClassNumRowsInLog
				NTCIP1201.2.5.2.6	eventClassNumEvents
3.3.2.7	Set Time				
		4.2.3	Generic SNMP Set Interface		
				NTCIP1201.2.4.1	globalTime
				NTCIP1201.2.4.2	globalDaylightSaving
				NTCIP1201.2.4.6	controllerStandardTimeZone
3.3.2.8	Retrieve Current Time				

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
		4.2.1	Generic SNMP Get Interface		
				NTCIP1201.2.4.1	globalTime
				NTCIP1201.2.4.2	globalDaylightSaving
				NTCIP1201.2.4.6	controllerStandardTimeZone
				NTCIP1201.2.4.7	controllerLocalTime
3.3.2.9	Set Daylight Saving Time Mode				
		4.2.3	Generic SNMP Set Interface		
				NTCIP1201.2.4.2	globalDaylightSaving
3.3.2.10	ELMS Pre-defined Event Configurations				
3.3.2.10.1	Supported Event Classes				
		4.2.3	Generic SNMP Set Interface		
				NTCIP1201.2.5.4.2	eventConfigClass
3.3.2.10.2	Luminaire Switch State Log				
		4.3.19	Configure Luminaire Switch State Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.10.3	Luminaire Lamp Condition Log				
		4.3.20	Configure Luminaire Lamp Condition Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.10.4	Luminaire Burn Condition Log				
		4.3.21	Configure Luminaire Burn Condition Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.10.5	Periodic Luminaire Burn Time Log				
		4.3.22	Configure Periodic Luminaire Burn Time Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
				5.4.1.28	luminairePeriodicBurnTimesLogInterval
3.3.2.10.6	Luminaire Temperature Log				
		4.3.23	Configure Luminaire Temperature Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
				5.4.1.29	luminaireTempLogHysteresisUpperBound
				5.4.1.30	luminaireTempLogHysteresisLowerBound
3.3.2.10.7	Luminaire Pole Condition Log				
		4.3.24	Configure Luminaire Pole Condition Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.10.8	Relay Switch State Log				
		4.3.25	Configure Relay Switch State Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.10.9	Power Meter Switch State Log				
		4.3.2.26	Configure Power Meter Switch State Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.10.10	Periodic Power Meter Measurement Log				
		4.3.27	Configure Periodic Power Meter Measurement Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
				5.6.1.43	branchcircuitPowerMeterMeasLogInterval
3.3.2.10.11	Power Meter Condition Log				
		4.3.28	Configure Power Meter Condition Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.10.12	Ground Fault Switch State Log				
		4.3.29	Configure Ground Fault Switch State Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.2.10.13	Periodic Ground Fault Measurement Log				

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
		4.3.30	Configure Periodic Ground Fault Measurement Log		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
				5.6.1.44	branchcircuitGroundFaultMeasLogInterval
3.3.3	Monitor Exceptional Conditions				
3.3.3.1	Retrieve Current Configuration of Exception Reporting Service				
		4.2.1	Generic SNMP Get Interface		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.3.2	Configure Events				
		4.3.16	Configure Reporting/Logging Service		
				NTCIP1201.2.5.2.1	eventClassNumber
				NTCIP1201.2.5.2.2	eventClassLimit
				NTCIP1201.2.5.2.3	eventClassClearTime
				NTCIP1201.2.5.2.4	eventClassDescription
				NTCIP1201.2.5.4.1	eventConfigID
				NTCIP1201.2.5.4.2	eventConfigClass
				NTCIP1201.2.5.4.3	eventConfigMode
				NTCIP1201.2.5.4.4	eventConfigCompareValue
				NTCIP1201.2.5.4.5	eventConfigCompareValue2
				NTCIP1201.2.5.4.6	eventConfigCompareOID
				NTCIP1201.2.5.4.7	eventConfigLogOID
				NTCIP1201.2.5.4.8	eventConfigAction
				NTCIP1201.2.5.4.9	eventConfigStatus
3.3.3.3	Provide Automatic Reporting of Events (SNMP Traps)				
		4.3.18	Automatic Reporting of Events (SNMP Traps)		
3.3.3.4	Manage Exception Reporting				
		4.3.18	Automatic Reporting of Events (SNMP Traps)		
3.3.3.5	Retrieve Capabilities of Exception Reporting Service				
		4.2.1	Generic SNMP Get Interface		

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.5.1	maxEventClasses
				NTCIP1201.2.5.3	maxEventLogConfigs
				NTCIP1201.2.5.5	maxEventLogSize
3.3.3.6	Retrieve Current Number of Exception Events				
		4.2.1	Generic SNMP Get Interface		
				NTCIP1201.2.5.2.5	eventClassNumRowsInLog
				NTCIP1201.2.5.2.6	eventClassNumEvents
3.3.3.7	Record and Timestamp Events				
		4.3.17	Retrieve Logged Data		
				NTCIP1201.2.5.2.5	eventClassNumRowsInLog
				NTCIP1201.2.5.2.6	eventClassNumEvents
				NTCIP1201.2.5.6.1	eventLogClass
				NTCIP1201.2.5.6.2	eventLogNumber
				NTCIP1201.2.5.6.3	eventLogID
				NTCIP1201.2.5.6.4	eventLogTime
				NTCIP1201.2.5.6.5	eventLogValue
3.4	Functional Requirements				
3.4.1	Configure ELMS Device				
3.4.1.1	Configure Luminaire				
3.4.1.1.1	Retrieve Luminaire Information				
3.4.1.1.1.1	Retrieve Luminaire Pole Identifier				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.26	luminairePoleIdentifier
3.4.1.1.1.2	Retrieve Luminaire Location				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.2	luminaireLocation

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				5.4.1.14	luminaireLocationProfile
3.4.1.1.1.2.1	Specify Location in Longitude/Latitude Coordinates				
3.4.1.1.1.2.2	Specify Location Information Using Textual Description of a Road/Street/Block Name/Number				
3.4.1.1.1.2.3	Specify Location in local reference coordinate grid				
3.4.1.1.1.3	Retrieve Luminaire Mode				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.3	luminaireMode
				5.4.1.4	luminaireSwitchMode
3.4.1.1.1.4	Retrieve Luminaire Zone				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.5	luminaireZoneIDList
3.4.1.1.1.5	Retrieve Luminaire Vendor Information				
		4.2.1	Generic SNMP Get Interface		
				NTCIP1201.2.2.3.1	moduleNumber
				NTCIP1201.2.2.3.2	moduleDeviceNode
				NTCIP1201.2.2.3.3	moduleMake
				NTCIP1201.2.2.3.4	moduleModel
				NTCIP1201.2.2.3.5	moduleVersion
				NTCIP1201.2.2.3.6	moduleType
3.4.1.1.2	Configure Luminaire Identification Information				
3.4.1.1.2.1	Configure Luminaire Pole Identifier				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.26	luminairePoleIdentifier
3.4.1.1.2.2	Configure Luminaire Location				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.2	luminaireLocation

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				5.4.1.14	luminaireLocationProfile
3.4.1.1.3	Configure Luminaire Mode				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.3	luminaireMode
				5.4.1.4	luminaireSwitchMode
3.4.1.2	Configure Electrical Service				
3.4.1.2.1	Retrieve Electrical Service Information				
3.4.1.2.1.1	Retrieve Electrical Service Location				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.2	electricalserviceLocationProfile
				5.5.1.3	electricalserviceLocation
3.4.1.2.1.2	Retrieve Electrical Service Zone				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.4	electricalserviceZoneIDList
3.4.1.2.1.3	Retrieve Electrical Service Pole Identifier				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.5	electricalservicePoleIdentifier
3.4.1.2.2	Configure Electrical Service Information				
3.4.1.2.2.1	Configure Electrical Service Location				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.2	electricalserviceLocationProfile
				5.5.1.3	electricalserviceLocation
3.4.1.2.2.2	Configure Electrical Service Pole Identifier				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.5	electricalservicePoleIdentifier
3.4.1.3	Configure for Light Activated Operation				

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
3.4.1.3.1	Configure Luminaire for Light Activated Operations				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.3	luminaireMode
				5.4.1.15	luminaireLightThreshold
				5.4.1.16	luminaireHoldInterval
				5.4.1.17	luminaireLightHysteresis
				5.4.1.18	luminaireDelayInterval
3.4.1.3.2	Configure Electrical Service for Light Activated Operations				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.6	electricalserviceMode
				5.5.1.19	electricalserviceLightThreshold
				5.5.1.20	electricalserviceHoldInterval
				5.5.1.21	electricalserviceLightHysteresis
				5.5.1.22	electricalserviceDelayInterval
3.4.1.3.3	Configure Branch Circuit for Light Activated Operations				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.6	branchcircuitMode
				5.6.1.19	branchcircuitLightThreshold
				5.6.1.20	branchcircuitHoldInterval
				5.6.1.21	branchcircuitLightHysteresis
				5.6.1.22	branchcircuitDelayInterval
3.4.1.3.4	Configure Devices in Zone for Light Activated Operations				
		4.2.3	Generic SNMP Set Interface		
				5.7.1.5	zoneMode
				5.7.1.8	zoneLightThreshold
				5.7.1.9	zoneHoldInterval

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				5.7.1.10	zoneLightHysteresis
				5.6.1.11	zoneDelayInterval
3.4.1.4	Configure for Scheduled Operation				
3.4.1.4.1	Configure Luminaire for Scheduled Operations				
		4.3.1	Configure Luminaire for Scheduled Operations		
				5.4.1.4	luminaireSwitchMode
3.4.1.4.2	Configure Electrical Service for Scheduled Operations				
		4.3.2	Configure Electrical Service for Scheduled Operations		
				5.5.1.7	electricalserviceSwitchMode
3.4.1.4.3	Configure Branch Circuit for Scheduled Operations				
		4.3.3	Configure Branch Circuit for Scheduled Operations		
				5.6.1.7	branchcircuitSwitchMode
3.4.1.4.4	Configure Devices in Zone for Scheduled Operations				
		4.3.4	Configure Devices in Zone for Scheduled Operations		
				5.7.1.6	zoneSwitchMode
3.4.1.4.5	Schedule ELMS Device Event				
		4.3.5	Schedule ELMS Device Event		
				5.3.4.1	scheduleActionIndex
				5.3.4.2	scheduleAction
				5.3.4.3	scheduleActionType
				5.3.4.4	scheduleActionNumber
				5.3.4.5	scheduleActionParameter
				5.3.4.6	scheduleActionParameter2
				NTCIP1201.2.4.3.1	maxTimeBaseScheduleEntries
				NTCIP1201.2.4.3.2.1	timeBaseScheduleNumber
				NTCIP1201.2.4.3.2.2	timeBaseScheduleMonth

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.4.3.2.3	timeBaseScheduleDay
				NTCIP1201.2.4.3.2.4	timeBaseScheduleDate
				NTCIP1201.2.4.3.2.5	timeBaseScheduleDayPlan
				NTCIP1201.2.4.3.3	timeBaseScheduleTablestatus
				NTCIP1201.2.4.4.1	maxDayPlans
				NTCIP1201.2.4.4.2	maxDayPlanEvents
				NTCIP1201.2.4.4.3.1	dayPlanNumber
				NTCIP1201.2.4.4.3.2	dayPlanEventNumber
				NTCIP1201.2.4.4.3.3	dayPlanHour
				NTCIP1201.2.4.4.3.4	dayPlanMinute
				NTCIP1201.2.4.4.3.5	dayPlanActionNumberOID
				NTCIP1201.2.4.4.4	dayPlanStatus
3.4.1.4.6	Retrieve a Schedule				
		4.3.6	Retrieve a Schedule		
				5.3.4.1	scheduleActionIndex
				5.3.4.2	scheduleAction
				5.3.4.3	scheduleActionType
				5.3.4.4	scheduleActionNumber
				5.3.4.5	scheduleActionParameter
				5.3.4.6	scheduleActionParameter2
				NTCIP1201.2.4.3.1	maxTimeBaseScheduleEntries
				NTCIP1201.2.4.3.2.1	timeBaseScheduleNumber
				NTCIP1201.2.4.3.2.2	timeBaseScheduleMonth
				NTCIP1201.2.4.3.2.3	timeBaseScheduleDay
				NTCIP1201.2.4.3.2.4	timeBaseScheduleDate
				NTCIP1201.2.4.3.2.5	timeBaseScheduleDayPlan

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				NTCIP1201.2.4.3.3	timeBaseScheduleTableStatus
				NTCIP1201.2.4.4.1	maxDayPlans
				NTCIP1201.2.4.4.2	maxDayPlanEvents
				NTCIP1201.2.4.4.3.1	dayPlanNumber
				NTCIP1201.2.4.4.3.2	dayPlanEventNumber
				NTCIP1201.2.4.4.3.3	dayPlanHour
				NTCIP1201.2.4.4.3.4	dayPlanMinute
				NTCIP1201.2.4.4.3.5	dayPlanActionNumberOID
				NTCIP1201.2.4.4.4	dayPlanStatus
3.4.1.5	Configure Zones				
3.4.1.5.1	Configure Luminaire Zone				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.5	luminaireZoneIDList
3.4.1.5.2	Configure Electrical Service Zone				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.4	electricalserviceZoneIDList
3.4.1.5.3	Configure Branch Circuit Zone				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.4	branchcircuitZoneIDList
3.4.1.5.4	Define Zones				
		4.2.3	Generic SNMP Set Interface		
				5.7.1.2	zoneLocationProfile
				5.7.1.3	zoneLocation
				5.7.1.4	zoneZoneID
				5.7.1.14	zoneFunctionalProfile
				5.7.1.15	zoneListofDevices

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
3.4.1.6	Configure Stagger Interval				
3.4.1.6.1	Configure Luminaire Stagger Interval				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.27	luminaireStaggerInterval
3.4.1.6.2	Configure Branch Circuit Stagger Interval				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.41	branchcircuitStaggerInterval
3.4.1.6.3	Configure Electrical Service Stagger Interval				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.28	electricalserviceStaggerInterval
3.4.1.7	Configure Dim Levels				
3.4.1.7.1	Configure Luminaire Dim Level				
		4.3.7	Configure Luminaire Dim Level		
				5.4.1.18	luminaireDimLevel
				5.4.1.19	luminaireDimWarmUpInterval
3.4.1.7.2	Configure Electrical Service Dim Level				
		4.3.8	Configure Electrical Service Dim Level		
				5.5.1.23	electricalserviceDimLevel
				5.5.1.24	electricalserviceDimWarmUpInterval
3.4.1.7.3	Configure Branch Circuit Dim Level				
		4.3.9	Configure Branch Circuit Dim Level		
				5.6.1.23	branchcircuitDimLevel
				5.6.1.24	branchcircuitDimWarmUpInterval
3.4.1.7.4	Configure Dim Level for Devices in Zone				
		4.3.10	Configure Dim Level for Devices in Zone		
				5.7.1.12	zoneDimLevel

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				5.7.1.13	zoneDimWarmUpInterval
3.4.1.8	Configure for Manual Operation				
3.4.1.8.1	Configure Luminaire for Manual Operation				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.4	luminaireSwitchMode
3.4.1.8.2	Configure Electrical Service for Manual Operations				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.7	electricalserviceSwitchMode
3.4.1.8.3	Configure Branch Circuit for Manual Operations				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.7	branchcircuitSwitchMode
3.4.1.8.4	Configure Devices in Zone for Manual Operations				
		4.2.3	Generic SNMP Set Interface		
				5.7.1.6	zoneSwitchMode
3.4.1.9	Configure Electrical Service Monitoring and Metering Equipment				
3.4.1.9.1	Configure Branch Circuit Ground Fault Detector				
		4.3.11	Configure Branch Circuit Ground Fault Detector		
				5.6.1.25	branchcircuitGroundFaultCond
				5.6.1.26	branchcircuitGroundFaultLeakageCurrent
				5.6.1.27	branchcircuitGroundFaultLeakageCurrentThreshold
				5.6.1.28	branchcircuitGroundFaultDetectorSwitchState
3.4.1.9.2	Configure Branch Circuit Power Meter				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.32	branchcircuitPowerMeterCond
				5.6.1.33	branchcircuitPowerMeterCurrent
				5.6.1.34	branchcircuitPowerMeterVoltageAB

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				5.6.1.35	branchcircuitPowerMeterVoltageBC
				5.6.1.36	branchcircuitPowerMeterVoltageCA
				5.6.1.37	branchcircuitPowerMeterVoltageAN
				5.6.1.38	branchcircuitPowerMeterVoltageBN
				5.6.1.39	branchcircuitPowerMeterVoltageCN
				5.6.1.40	branchcircuitPowerMeterSwitchState
3.4.1.9.3	Configure Branch Circuit Arc Fault Detector				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.31	branchcircuitArcFaultDetectorSwitchState
3.4.1.10	Configure Branch Circuit				
3.4.1.10.1	Retrieve Branch Circuit Information				
3.4.1.10.1.1	Retrieve Branch Circuit Zone				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.4	branchcircuitZoneIDList
3.4.1.10.1.2	Retrieve Branch Circuit Location				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.2	branchcircuitLocationProfile
				5.6.1.3	branchcircuitLocation
3.4.1.10.1.3	Retrieve Branch Circuit Pole Identifier				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.5	branchcircuitPoleIdentifier
3.4.1.10.2	Configure Branch Circuit Information				
3.4.1.10.2.1	Configure Branch Circuit Location				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.2	branchcircuitLocationProfile
				5.6.1.3	branchcircuitLocation

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
3.4.1.10.2.2	Configure Branch Circuit Pole Identifier				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.5	branchcircuitPoleIdentifier
3.4.2	Control Device				
3.4.2.1	Control Luminaire				
3.4.2.1.1	Control Luminaire by Permanent/Continuous Override				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.4	luminaireSwitchMode
3.4.2.1.2	Control Luminaire by Transitory Override				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.4	luminaireSwitchMode
3.4.2.1.3	Control Luminaire by Timed Override				
		4.3.12	Control Luminaire in Timed Mode		
				5.4.1.4	luminaireSwitchMode
				5.4.1.25	luminaireSwitchModeTime
3.4.2.1.4	Control Luminaire in Stagger Mode				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.27	luminaireStaggerInterval
3.4.2.2	Control Electrical Service				
3.4.2.2.1	Control Electrical Service by Permanent/Continuous Override				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.7	electricalserviceSwitchMode
3.4.2.2.2	Control Electrical Service by Transitory Override				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.7	electricalserviceSwitchMode
3.4.2.2.3	Control Electrical Service by Timed Override				

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
		4.3.13	Control Electrical Service in Timed Mode		
				5.5.1.7	electricalserviceSwitchMode
				5.5.1.8	electricalserviceSwitchModeTime
3.4.2.2.4	Control Electrical Service in Stagger Mode				
		4.2.3	Generic SNMP Set Interface		
				5.5.1.28	electricalserviceStaggerIntervale
3.4.2.3	Control Branch Circuit				
3.4.2.3.1	Control Branch Circuit by Permanent/Continuous Override				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.7	branchcircuitSwitchMode
3.4.2.3.2	Control Branch Circuit by Transitory Override				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.7	branchcircuitSwitchMode
3.4.2.3.3	Control Branch Circuit by Timed Override				
		4.3.14	Control Branch Circuit in Timed Mode		
				5.6.1.7	branchcircuitSwitchMode
				5.6.1.8	branchcircuitSwitchModeTime
3.4.2.3.4	Control Branch Circuit in Stagger Mode				
		4.2.3	Generic SNMP Set Interface		
				5.6.1.41	branchcircuitStaggerInterval
3.4.2.4	Control Devices by Zone				
3.4.2.4.1	Control Devices in Zone by Permanent/Continuous Override				
		4.2.3	Generic SNMP Set Interface		
				5.7.1.6	zoneSwitchMode
3.4.2.4.2	Control Devices in Zone by Transitory Override				
		4.2.3	Generic SNMP Set Interface		

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				5.7.1.6	zoneSwitchMode
3.4.2.4.3	Control Devices in Zone by Timed Override				
		4.3.15	Control Zone in Timed Mode		
				5.7.1.6	zoneSwitchMode
				5.7.1.7	zoneSwitchModeTime
3.4.3	Monitor Device Status				
3.4.3.1	Monitor Luminaire				
3.4.3.1.1	Retrieve Luminaire Switch Status				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.6	luminaireSwitchState
3.4.3.1.2	Retrieve Luminaire Temperature				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.10	luminaireTemp
3.4.3.1.3	Retrieve Luminaire Burn Time Statistics				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.11	luminaireMonthlyBurnTime
				5.4.1.12	luminaireMonthlyExpectedBurnTime
				5.4.1.13	luminaireTotalBurnTime
3.4.3.1.4	Retrieve Luminaire Pole Status				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.9	luminairePoleCond
3.4.3.1.5	Retrieve Luminaire Dimming Level Output				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.19	luminaireDimLevel
3.4.3.1.6	Retrieve Luminaire Lamp Status				
		4.2.1	Generic SNMP Get Interface		

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				5.4.1.7	luminaireLampCond
3.4.3.1.7	Retrieve Luminaire Power Usage Statistics				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.21	luminaireVoltage
				5.4.1.22	luminaireCurrent
3.4.3.1.8	Retrieve Luminaire Ballast Status				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.23	luminaireBallastCond
3.4.3.1.9	Retrieve Luminaire Starter Status				
		4.2.1	Generic SNMP Get Interface		
				5.4.1.24	luminaireStarterStatus
3.4.3.2	Monitor Electrical Service				
3.4.3.2.1	Retrieve Electrical Service Ground Fault Status				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.25	electricalserviceGroundFaultCond
3.4.3.2.2	Retrieve Electrical Service Hours				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.9	electricalserviceOpHours
3.4.3.2.3	Retrieve Electrical Service Operational Status				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.10	electricalserviceOpCond
3.4.3.2.4	Retrieve Electrical Service Power Readings				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.11	electricalserviceVoltageAB
				5.5.1.12	electricalserviceVoltageBC
				5.5.1.13	electricalserviceVoltageCA

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
				5.5.1.14	electricalserviceVoltageAN
				5.5.1.15	electricalserviceVoltageBN
				5.5.1.16	electricalserviceVoltageCN
				5.5.1.17	electricalserviceCurrent
				5.5.1.18	electricalservicePower
3.4.3.2.5	Retrieve Electrical Service Main Breaker Status				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.26	electricalserviceMainBreakerCond
3.4.3.2.6	Retrieve Electrical Service Arc Fault Status				
		4.2.1	Generic SNMP Get Interface		
				5.5.1.27	electricalserviceArcFaultCond
3.4.3.3	Monitor Branch Circuit				
3.4.3.3.1	Retrieve Branch Circuit Power Readings				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.11	branchcircuitVoltageAB
				5.6.1.12	branchcircuitVoltageBC
				5.6.1.13	branchcircuitVoltageCA
				5.6.1.14	branchcircuitVoltageAN
				5.6.1.15	branchcircuitVoltageBN
				5.6.1.16	branchcircuitVoltageCN
				5.6.1.17	branchcircuitCurrent
				5.6.1.18	branchcircuitPower
3.4.3.3.2	Retrieve Branch Circuit Arc Fault Status				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.30	branchcircuitArcFaultCond
3.4.3.3.3	Retrieve Branch Circuit Breaker Status				

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
		4.2.1	Generic SNMP Get Interface		
				5.6.1.29	branchcircuitBreakerCondition
3.4.3.3.4	Retrieve Branch Circuit Operational Status				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.10	branchcircuitOpCond
3.4.3.3.5	Retrieve Branch Circuit Hours				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.9	branchcircuitOpHours
3.4.3.3.6	Retrieve Branch Circuit Ground Fault Status				
		4.2.1	Generic SNMP Get Interface		
				5.6.1.25	branchcircuitGroundFaultCond
3.5.1	Supplemental Requirements for Scheduled Operations				
3.5.1.1	Support a Number of Actions				
		4.2.3	Generic SNMP Set Interface		
				5.3.1	ScheduleActionNumEntries
3.5.1.2	Support a Number of Day Plans				
		4.2.3	Generic SNMP Set Interface		
				NTCIP1201.2.4.4.1	MaxDayPlans
3.5.1.3	Perform Action at the scheduled Time				
		4.2.3	Generic SNMP Get Interface		
				NTCIP1201.2.4.4.3.1	DayPlanNumber
				NTCIP1201.2.4.4.3.2	DayPlanEventNumber
				NTCIP1201.2.4.4.3.3	DayPlanHour
				NTCIP1201.2.4.4.3.4	DayPlanMinute
				NTCIP1201.2.4.4.3.5	DayPlanActionNumberOID
3.5.2	Supplemental Requirements for Zones				

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
3.5.2.1	Define Number of Zones Supported by an ELMS Device				
		4.2.3	Generic SNMP Set Interface		
				5.8.1	MaxNumZonesPerDevice
3.5.2.2	Define Number ELMS Devices for a Zone				
		4.2.3	Generic SNMP Set Interface		
				5.8.2	MaxNumDevicesPerZone
3.5.3	Supplemental Requirements for Dim Levels				
3.5.3.1	Define Dim Levels as a percentage of maximum brightness				
		4.2.3	Generic SNMP Set Interface		
				5.4.1.19	LuminaireDimLevel
				5.5.1.23	ElectricalServiceDimLevel
				5.6.1.23	BranchCircuitDimLevel
				5.7.1.12	ZoneDimLevel
3.5.4	Supplemental Requirements for Event Logs				
3.5.4.1	Configure Number of Events in Event Log				
		4.2.3	Generic SNMP Set Interface		
				NTCIP1201.2.5.2.2	EventClassLimit
3.5.4.2	Configure Number of Event Classes				
		4.2.3	Generic SNMP Set Interface		
				NTCIP1201.2.5.1	MaxEventClasses
3.5.4.3	Configure Number of Events in Event Types				
		4.2.3	Generic SNMP Set Interface		
				NTCIP1201.2.5.3	MaxEventLogConfigs
3.5.5	Supplemental Requirements for Live Data				
3.5.5.1	Live Data Response Time				
		4.2.1	Generic SNMP Get Interface		

Requirement ID	Requirement	Dialog ID	Dialog	Object ID	Object
		4.2.2	Generic SNMP Get Next Interface		
		4.2.3	Generic SNMP Set Interface		

ANNEX B
OBJECT TREE
[INFORMATIVE]

Figure 11 provides a graphical representation of the branch and tree structure for objects and the organization of the data defined in NTCIP 1213 v02.

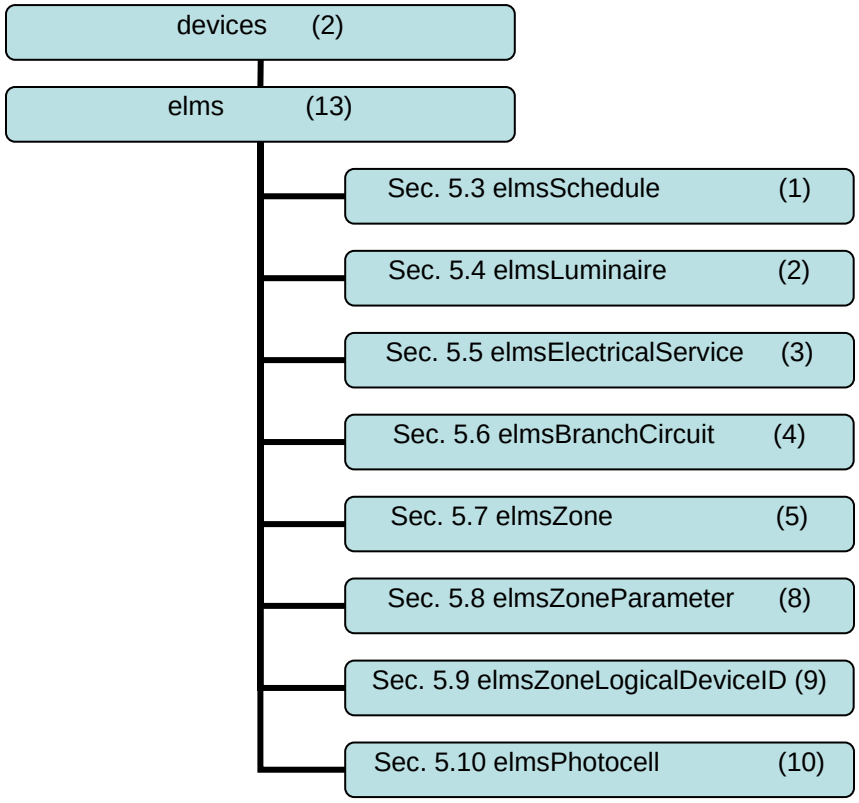

Figure 11 ISO Tree Structure

ANNEX C
REVISED OBJECT DEFINITIONS FOR ASTRONOMICAL CLOCK
[INFORMATIVE]

While drafting NTCIP 1213 v02, the ELMS Working Group discussed astronomical clock control of a luminaire, branch circuit, electrical service, and zone, both by directly changing the Mode attribute of each object and also by using astronomical clock as a Scheduled Action. The object definitions in Section 5, however, do not include astronomical clock as this feature was not on the original list of user needs and had not undergone the systems engineering process needed for inclusion. To include astronomical clock control features, modify attributes as follows:

5.3.2.2 Schedule Action

```
scheduleAction OBJECT-TYPE
SYNTAX      INTEGER {
                dim (1),
                photo-control (2),
                on (3),
                off (4),
                non-schedule (5),
                astronomical-control (6)
                }
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the action that is to be performed for this row dim,
photo-controlled dim, on, off, non-schedule, or astronomical-control.
<DescriptiveName>schedule.actionTable.Action:code
<Valid Value Rule>
value - description
dim - The lamp is NOT controlled by photo-control, a dim value is specified.
photo-control - The ELMS Device is controlled by photo-control.
on - The lamp is on.
off - The lamp is off.
non-schedule - The ELMS Device is not controlled by schedule.
astronomical-control - The ELMS Device is controlled by astronomical-control.
<Data Concept Type>
ENUMERATION {
                dim (1),
                photo-control (2),
                on (3),
                off (4),
                non-schedule (5),
                astronomical-control (6)
                }"
::= {elmsScheduleActionEntry 2}
```

5.4.1.3 Luminaire Mode

```
luminaireMode OBJECT-TYPE
SYNTAX      INTEGER {
        24hr(1),
        Photcell(2),
        Astronomical(3) }
ACCESS      read-write
STATUS      optional
```

```
DESCRIPTION "Indicates the operating mode of the luminaire.
<DescriptiveName>luminaireTable.mode:code
<Valid Value Rule>
value - description
24hr - the lamp's primary mechanism of control is the defined by Luminaire
Switch Mode
Photocell - The lamp's primary mechanism of control is the photocell
Astronomical - The lamp's primary mechanism of control is the astronomical
clock
<Data Concept Type>
ENUMERATION {
        24hr(1),
        Photcell(2),
        Astronomical(3) }"
::= {luminaireEntry 3}
```

5.5.1.5 Electrical Service Mode

```
electricalserviceMode OBJECT-TYPE
SYNTAX      INTEGER {
        24hr(1),
        Photocell(2),
        Astronomical(3) }
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the operating mode of the electricalService.
<DescriptiveName>electricalServiceTable.mode:code
<Valid Value Rule>
value - description
24hr - The primary mechanism of control for electricalService is defined by
ElectricalService Switch Mode
Photocell – The primary mechanism of control for electricalService is the
photocell
Astronomical –The primary mechanism of control for electricalService is the
astronomical clock
<Data Concept Type>
ENUMERATION {
        24hr(1),
        Photcell(2),
        Astronomical(3) }"
```

5.6.1.5 Branch Circuit Mode

```
branchcircuitMode OBJECT-TYPE
SYNTAX      INTEGER {
        24hr(1),
        Photocell(2),
Astronomical(3) }
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the operating mode of the branchCircuit.
<DescriptiveName>branchCircuitTable.mode:code
<Valid Value Rule>
value - description
24hr - The primary mechanism of control for branchCircuit is defined by
BranchCircuit Switch Mode
Photocell – The primary mechanism of control for branchCircuit is the
photocell
```

```
Astronomical –The primary mechanism of control for branchCircuit is the
astronomical clock
<Data Concept Type>
ENUMERATION {
        24hr(1),
        Photcell(2),
        Astronomical(3) }"
::= {branchcircuitEntry 5}
```

5.7.1.4 Zone Mode

```
zoneMode OBJECT-TYPE
SYNTAX      INTEGER {
      24hr(1),
      Photocell(2),
      Astronomical(3) }
ACCESS      read-write
STATUS      optional
DESCRIPTION "Indicates the operating mode of the zone.
<DescriptiveName>zoneTable.mode:code
<Valid Value Rule>
value - description
24hr - The zone’s primary mechanism of control is the defined by Zone Switch
Mode
Photocell – The zone’s primary mechanism of control is the photocell
Astronomical –The primary mechanism of control for zone is the astronomical
clock
<Data Concept Type>
ENUMERATION {
        24hr(1),
        Photcell(2),
        Astronomical(3) }"
::= {zoneEntry 4}
```

§

