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National Transportation Communications for ITS Protocol

Object Definitions for Electrical and Lighting Management Systems (ELMS)

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FOREWORD

NTCIP 1213 v03 defines the generic reference model and conformance requirements for traffic management centers (TMCs) that wish to provide interfaces to external centers. NTCIP 1213 v03 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 v03 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 v03 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 v03 is an NTCIP Device Data Dictionary Standard. Device Data Dictionary 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 v03: AASHTO, ITE, NEMA, NTCIP, ELMS, data logger, electrical service, branch circuit, luminaire, data elements.

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Approvals

NTCIP 1213 v03 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 v03 as the following standard type, as of the date:

AASHTO—Standard Specification; June 2022
ITE—Software Standard; July 2022
NEMA—Standard; July 2022

History

In 1992, the NEMA Transportation Management Systems and Associated Control Devices Section (3TS) 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, and was published in June 2010.

NTCIP 1213 v03 development initiated in 2014, to reflect lessons learned and to support new identified user needs and other new systems engineering elements.

Compatibility of Versions

To distinguish NTCIP 1213 v03 (as published) from previous drafts, NTCIP 1213 v03 also includes NTCIP 1213 v03.XX on each page header. All NTCIP technical 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 v03 is designated, and should be cited as, NTCIP 1213 v03. Anyone using NTCIP 1213 v03 should seek information about the version number that is of interest to them in any given circumstance.

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CONTENTS

Page

Section 1 General [Informative] 1

1.1 Scope 1

1.2 References 1
1.2.1 Normative References 2
1.2.2 Other References 2
1.2.3 Contact Information 2

1.3 General Statements 3

1.4 Terms 3

1.5 Abbreviations 8

Section 2 Concept of Operations [Normative] 9

2.1 Tutorial [Informative] 9

2.2 Current Situation and Problem Statement [Informative] 10
2.2.1 Problem Statement 11
2.2.2 Current Situation 11

2.3 Reference Physical Architecture [Informative] 11

2.4 Architectural Needs 16

2.5 Features 16
2.5.1 Operational User Needs 16
2.5.2 Functional User Needs 18
2.5.3 Backward Compatibility Features 23

2.6 Security 23

2.7 Operational Policies and Constraints 24

2.8 Relationship to the ITS National Architecture [Informative] 24

Section 3 Functional Requirements [Normative] 26

3.1 Tutorial [Informative] 26

3.2 Scope of the Interface [Informative] 27

3.3 Protocol Requirements List (PRL) 27
3.3.1 Notation [Informative] 27
3.3.2 Instructions for Completing the PRL [Informative] 28
3.3.3 Protocol Requirements List (PRL) Table 29

3.4 Architectural Requirements 47

3.5 Data Exchange and Operational Environment Requirements 47
3.5.1 Provide Live Data 47
3.5.2 Provide Off-Line Log Data 47
3.5.3 Manage Exception Reporting 50
3.5.4 Configure ELMS Device 55
3.5.5 Control Device 70
3.5.6 Monitor Device Status 73
3.5.7 Backward Compatibility Requirements 76

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Section 4 Dialogs [Normative] 77

4.1 Tutorial [Informative] 77

4.2 Specified Dialogs 80
4.2.1 Configure Luminaire for Scheduled Operations 81
4.2.2 Configure Electrical Service for Scheduled Operations 81
4.2.3 Configure Branch Circuit for Scheduled Operations 82
4.2.4 Configure Devices in Zone for Scheduled Operations 82
4.2.5 Schedule ELMS Device Event 82
4.2.6 Retrieve a Schedule 84
4.2.7 Configure Luminaire Dim Level 85
4.2.8 Configure Electrical Service Dim Level 85
4.2.9 Configure Branch Circuit Dim Level 86
4.2.10 Configure Dim Level for Devices in Zone 86
4.2.11 Configure Branch Circuit Ground Fault Detector 87
4.2.12 Control Luminaire in Timed Override 87
4.2.13 Control Electrical Service in Timed Override 88
4.2.14 Control Branch Circuit in Timed Override 88
4.2.15 Control Devices in Zone in Timed Override 89
4.2.16 Configure Reporting/Logging Service 89
4.2.17 Retrieve Logged Data 90
4.2.18 Manage Tables 91
4.2.19 Configure Luminaire Switch State Log 92
4.2.20 Configure Luminaire Condition Log 93
4.2.21 Configure Luminaire Burn Condition Log 93
4.2.22 Configure Periodic Luminaire Burn Time Log 94
4.2.23 Configure Luminaire Temperature Log 96
4.2.24 Configure Luminaire Pole Condition Log 96
4.2.25 Configure Relay Switch State Log 97
4.2.26 Configure Energy Meter Switch State Log 98
4.2.27 Configure Periodic Energy Meter Measurement Log 99
4.2.28 Configure Energy Meter Condition Log 102
4.2.29 Configure Ground Fault Switch State Log 102
4.2.30 Configure Periodic Ground Fault Measurement Log 103

Section 5 Management Information Base (MIB) [Normative] 105

5.1 MIB Header 105

5.2 Data Elements 107

5.3 Schedule 107
5.3.1 Number of Schedule Events 107
5.3.2 Schedule Action Table 107

5.4 Luminaire 110
5.4.1 Luminaire Table 110

5.5 Electrical Service 125
5.5.1 Electrical Service Table 125

5.6 Branch Circuit 136
5.6.1 Branch Circuit Table 136

5.7 Zone 157
5.7.1 Zone Table 157

5.8 Zone Parameters 162
5.8.1 Maximum Number of Zones Per Device 162
5.8.2 Maximum Number of Devices Per Zone 163

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5.9 Zone Logical Device Identifier Table 163
5.9.1 Zone Logical Device ID Table 163
5.10 Photocell 165
5.10.1 Photocell State 165
5.10.2 Photocell Display Name 165
5.10.3 Photocell Table 165
5.11 Astronomical Clock 168
5.11.1 Latitude of Installation 168
5.11.2 Longitude of Installation 168
5.11.3 Date 168
5.11.4 Sunrise Time 168
5.11.5 Sunset Time 169
5.12 Connected Vehicle Sensor Information 169
5.12.1 Connected Vehicle Speed 169
5.12.2 Connected Vehicle Direction 169
5.12.3 Connected Vehicle Location 170
5.12.4 Connected Vehicle Ambient Light Level 170
5.12.5 Connected Vehicle Headlight Status 171
5.12.6 Connected Vehicle Road Friction 171
5.12.7 Connected Vehicle Speed Setpoint 171
5.12.8 Connected Vehicle Direction Setpoint 172
5.12.9 Connected Vehicle Latitude High Setpoint 172
5.12.10 Connected Vehicle Latitude Low Setpoint 172
5.12.11 Connected Vehicle Longitude High Setpoint 172
5.12.12 Connected Vehicle Longitude Low Setpoint 172
5.12.13 Connected Vehicle Altitude High Setpoint 173
5.12.14 Connected Vehicle Altitude Low Setpoint 173
5.12.15 Connected Vehicle Ambient Light Level Setpoint 173
5.12.16 Connected Vehicle Headlight Status Setpoint 173
5.12.17 Connected Vehicle Road Friction Setpoint 174
5.13 Electric Vehicle Charger Information 174
5.13.1 Electric Vehicle Charger Table 174
5.14 Energy Automatic Demand Response Information 180
5.14.1 Electricity Price 180
5.14.2 Energy Price 181
5.14.3 Demand Charge 182
5.14.4 Control Bid Price 183
5.14.5 Control Energy Storage 184
5.14.6 Load Dispatch 185
5.14.7 Load Control Capacity 186
5.14.8 Load Control Offset 186
5.14.9 Load Control Setpoint 186
5.14.10 Load Control Percent Offset 187
5.15 Ground Fault Interrupter 187
5.15.1 Ground Fault Interrupter Setpoint 187
5.15.2 Ground Fault Status 187
5.16 Power Outage Message 188
5.17 Adaptive Operation 188
5.18 Energy Meter Accuracy 189

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Annex A Requirements Traceability Matrix (RTM) [Normative] 190

A.1 Notation [Informative] 190
A.1.1 Functional Requirement Columns 190
A.1.2 Dialog Collumn 190
A.1.3 Object Columns 190
A.1.4 Additional Specifications 191

A.2 Instructions for Completing the RTM [Informative] 191

A.3 Requirements Traceability Matrix (RTM) Table 191

Annex B Object Tree [Informative] 235

Annex C Test Procedures [Normative] 236

Annex D Documentation of Revisions [Informative] 237

Annex E User Requests 238

Annex F Other Annexes 239

Annex G SNMP Interface [Normative] 240

G.1 Generic SNMP Get Interface 240

G.2 Generic SNMP GetNext Interface 240

G.3 Generic SNMP Set Interface 241

G.4 Variable Binding List Structure 242

G.5 Additional Requirements 243
G.5.1 Grouping of Objects in a Request 243
G.5.2 Support of Get 243
G.5.3 Support of GetNext 243
G.5.4 Support of Set 243
G.5.5 Performance 243

FIGURES

Page

Figure 1 Reference Architecture—ELMS Device with SNMP Agent 12
Figure 2 Data Logger with SNMP Agent Example Configuration 13
Figure 3 Luminaire with SNMP Agent Example Configuration 14
Figure 4 SNMP Agent with Zones Example Configuration 15
Figure 5 NTCIP 1213 as Part of the Roadside Lighting Service in National ITS Architecture 24
Figure 6 NTCIP 1213 as Part of the Electric Charging Station Management Service in National ITS Architecture 25
Figure 7 Sample Sequence Diagram for Schedule Feature 78
Figure 8 Sample VOPC Diagram for Schedule Feature 79
Figure 9 ISO Tree Structure 235
Figure 10 SNMP Get Interface 240
Figure 11 SNMP GetNext Interface 241
Figure 12 SNMP Set Interface 241
Figure 13 SNMP Interface—View of Participating Classes 242

TABLES

Page

Table 1 Status Symbols 27
Table 2 Predicate Notations 28
Table 3 Support Entries 28

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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 v03 is limited to the functionality related to ELMS within a transportation environment.

The remainder of NTCIP 1213 v03 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 structure for objects and the organization of the data defined in NTCIP 1213 v03
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 v03, 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 3 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 v03. Other references in NTCIP 1213 v03 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.

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1.2.1 Normative References

AASHTO / ITE / NEMA NTCIP 1103 v03	*Transportation Management Protocols (TMP)* published December 2016
AASHTO / ITE / NEMA NTCIP 1201 v03	*Global Object (GO) Definitions* published March 2011
AASHTO / ITE / NEMA NTCIP 1204 v04	*Environmental Sensor Station (ESS) Interface Protocol* published April 2022
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*
SAE J2735	*V2X Communications Message Set Dictionary*

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

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

1.2.3 Contact Information

1.2.3.1 NTCIP Standards

Copies of NTCIP standards may be obtained from:

NTCIP Coordinator
National Electrical Manufacturers Association
1300 N.17th Street, Suite 900
Rosslyn, Virginia 22209-3801
www.ntcip.org
email: ntcip@nema.org

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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.

1.2.3.2 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
New York, NY 10036
(212) 642-4900
www.ansi.org

1.2.3.3 IAB Documents

For Internet Architecture Board (IAB) documents, contact:

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

1.3 General Statements

There are no general statements associated with NTCIP 1213 v03.

1.4 Terms

For the purposes of NTCIP 1213 v03, the following terms, definitions, acronyms, and abbreviations apply, and 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.
adaptive	Allow control by inputs of schedule, astronomical clock, ambient light, and connected vehicle information.
ambient light level	The amount of light surrounding the luminaire location.
astronomical clock	Allow control by sunrise and sunset time as calculated by latitude, longitude, and day of year.
Automated Demand Response (ADR)	System functions that monitor and control the ELMS device in response to load and cost signals from the electric utility provider.
branch circuit	A local electrical circuit that provides power to the luminaires.
candela	An SI unit of measure for luminous intensity, abbreviated cd.

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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.
"connected vehicle" sensor and status information consistent	**includes vehicle, bicycle, and pedestrian data objects** 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.
Configure	The process of setting parameters within the ELMS device during installation. Note: These are typically set at time of installation and system commissioning.
Control	The process of setting or re-setting parameters within the ELMS device, during operation. Note: These are typically set as needed either manually or through external inputs, for example, electricity price information received automatically from the electric utility on a periodic basis.
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 one 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).

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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 a 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 a management station and ELMS device. Note: From a network perspective, this configuration is an “always on” connection, where a management station has access to the “current” information available in the ELMS device.
location referencing message specification (LRMS)	Location referencing as specified in SAE J2735 SE standard.

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logged data	A specific operational network configuration between a management station and the ELMS device, where a management station is required to execute a procedure for establishing a physical connection between a 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 a management station, is stored external to a management station until such time as a 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 control 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 photocell 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.

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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.
Protocol Requirements List (PRL)	The table that graphically represents the relationship between the user needs and functional requirements.
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.
Requirements Traceability Matrix (RTM)	The table that graphically represents the logical progression among the needs, requirements, and design details.
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 1201 v03 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.
Smart Grid device	A terminal device that provides electrical load information to the utility.
SNMP agent	This is a logical entity that is hosted on an ELMS device (e.g., a data logger) that manages the communications between a 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.

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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.

1.5 Abbreviations

Where appropriate, abbreviations are included in Section 1.4.

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Section 2
Concept of Operations [Normative]

Section 2 defines the detailed user needs that subsequent sections within NTCIP 1213 v03 address. Accepted systems engineering processes detail that requirements should only be developed to fulfill well-defined user needs. The first stage in this process is to identify the ways in which the system is intended to be used. In the case of NTCIP 1213 v03, this entails identifying the various ways in which transportation operations personnel may use ELMS information to fulfill their duties. The user needs are defined within the scope of NTCIP 1213 v03, 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.

This concept of operations (ConOps) provides the reader with:

a) A detailed description of the scope of NTCIP 1213 v03;
b) An explanation of how an ELMS is expected to fit into the larger context of an ITS network;
c) A starting point in the agency procurement process; and
d) An understanding of the perspective of the designers of NTCIP 1213 v03.

Section 2 is intended for all readers of NTCIP 1213 v03, including:

a) Transportation operations managers
b) Transportation operations personnel
c) Transportation, lighting design, or electrical engineers
d) System integrators
e) Device manufacturers

For the first three categories of readers, Section 2 is useful to understand how ELMS equipment can be used in their system. For this audience, Section 2 serves as the starting point in the agency procurement process, and enables these readers to become familiar with each feature covered by NTCIP 1213 v03 and determine whether that feature is appropriate for their implementation. If it is, then the procurement specification needs to require support for the 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 requirements that exist later in NTCIP 1213 v03, as they are derived directly from the user needs included in this concept of operations. The data elements in NTCIP 1213 v03 are in turn defined from these detailed requirements.

2.1 Tutorial [Informative]

A concept of operations describes a proposed system from the users' perspective. Typically, a concept of operations is used on a project to ensure that system developers understand users' needs. Within the context of NTCIP standards, a concept of operations documents the intent of each feature for which NTCIP 1213 v03 supports a communications interface. It also serves as the starting point for users to select which features may be appropriate for their project.

The concept of operations starts with a discussion of the current situation and issues that have led to the need to deploy systems covered by the scope of NTCIP 1213 v03 and to the development of NTCIP 1213 v03 itself. This discussion is presented in layman's terms such that both the potential users of the system and the system developers can understand and appreciate the situation.

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The concept of operations then documents key aspects about the proposed system, including:

a) **Reference Physical Architecture:** The reference physical architecture defines the overall context of the proposed system and defines which specific interfaces are addressed by NTCIP 1213 v03. The reference physical architecture is supplemented with one or more samples that describe how the reference physical architecture may be realized in an actual deployment.
b) **Architectural Needs:** The architectural needs section discusses the issues and needs relative to the system architecture that have a direct impact on NTCIP 1213 v03.
c) **Features:** The features identify and describe the various functions that users may want components of an ELMS system to perform. These features are derived from the high level user needs identified in the problem statement but are refined and organized into a more manageable structure that forms the basis of the traceability tables contained in Section 3 and Annex A.

The architectural needs and features are collectively called *user needs*. Section 3 uses these user needs in the analysis of the system to define the various functional requirements of an ELMS. Each user need shall be traced to one or more functional requirements, and each functional requirement shall be derived from at least one user need. This traceability is shown in the Protocol Requirements List (PRL) as provided in Section 3.3.

While NTCIP 1213 v03 is intended to standardize communications across a wide range of deployments, it is not intended to mandate support for every feature for every deployment. Therefore, the PRL also defines each user need and requirement as mandatory, optional, or conditional. The only items marked mandatory are those that relate to the most basic functionality of the device. To obtain a device that meets specific needs, the user first identifies which optional needs are necessary for the specific project.

Each requirement identified is then presented in the Requirements Traceability Matrix (RTM) in Annex A, which defines how the requirement is fulfilled through standardized dialogs and data element definitions provided in Section 4 and Section 5.

A conformant device may support other user needs, as long as they are conformant with the requirements of NTCIP 1213 v03 and its normative references (see Section 1.2.1). For example, a device may support data that has not been defined by NTCIP 1213 v03; however, when exchanged via one of the NTCIP 2301 v02 protocols, the data shall be properly registered with a valid OBJECT IDENTIFIER under the Global ISO Naming Tree.

> Note: Off-the-shelf interoperability and interchangeability can only be obtained by using well-documented user needs, along with their corresponding requirements and design, that are broadly supported by the industry as a whole. Designing a system that uses environments or features not defined in a standard or not typically deployed in combination with one another inhibits the goals of interoperability and interchangeability, especially if the documentation of these user needs is not available for distribution to system integrators. NTCIP 1213 v03 allows implementations to support additional user needs to support innovation, which is constantly needed within the industry, but users should be aware of the risks involved with using such environments or features.

The concept of operations concludes by describing the degree to which security issues have been addressed by NTCIP 1213 v03 and by providing a description of how NTCIP 1213 v03 relates to the National ITS Architecture. See Section 2.8 Relationship to the ITS National Architecture.

2.2 Current Situation and Problem Statement [Informative]

Section 2.2 provides an overview of ELMS and defines the problem area NTCIP 1213 v03 addresses.

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2.2.1 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, electric vehicle charging stations, 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 electric 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 v03 specifies the common data elements and dialogs used to exchange information between a management station and ELMS devices.

2.2.2 Current Situation

System managers use NTCIP 1213 v03 to control electrical and lighting systems on a roadway. This includes configuration, control, and monitoring of roadway lighting fixtures, electric meters, and ground fault equipment. These terminal devices are managed through direct control of particular parameters as well as through schedules and logical zones.

NTCIP 1213 v03 adds:

a) Support for connected vehicles, as well as connected pedestrians (and bicyclists) for safety as well as for the development of adaptive roadway applications.
b) Standardized communications protocols for electric vehicle charging stations, also known as Electric Vehicle Service Equipment (EVSEs), to create new revenue streams for local, state, and federal governments.
c) Electrical Demand Response support to facilitate greater integration to the intelligent electrical generation, distribution, and market efforts known informally as the "Smart Grid." This includes support for bidirectional communications needed to support Automated Demand Response activities by electric utilities as well as renewable electric such as wind- and solar-based photovoltaic distributed energy generation and storage.

Section 2.3 provides an overview of ELMS from both reference architecture and use case views.

2.3 Reference Physical Architecture [Informative]

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 v03 does not provide a "typical"

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architecture definition. Instead, a generic architecture model, as depicted in Figure 1, is used as a reference. Some additional example configurations are discussed in Section 2.3.

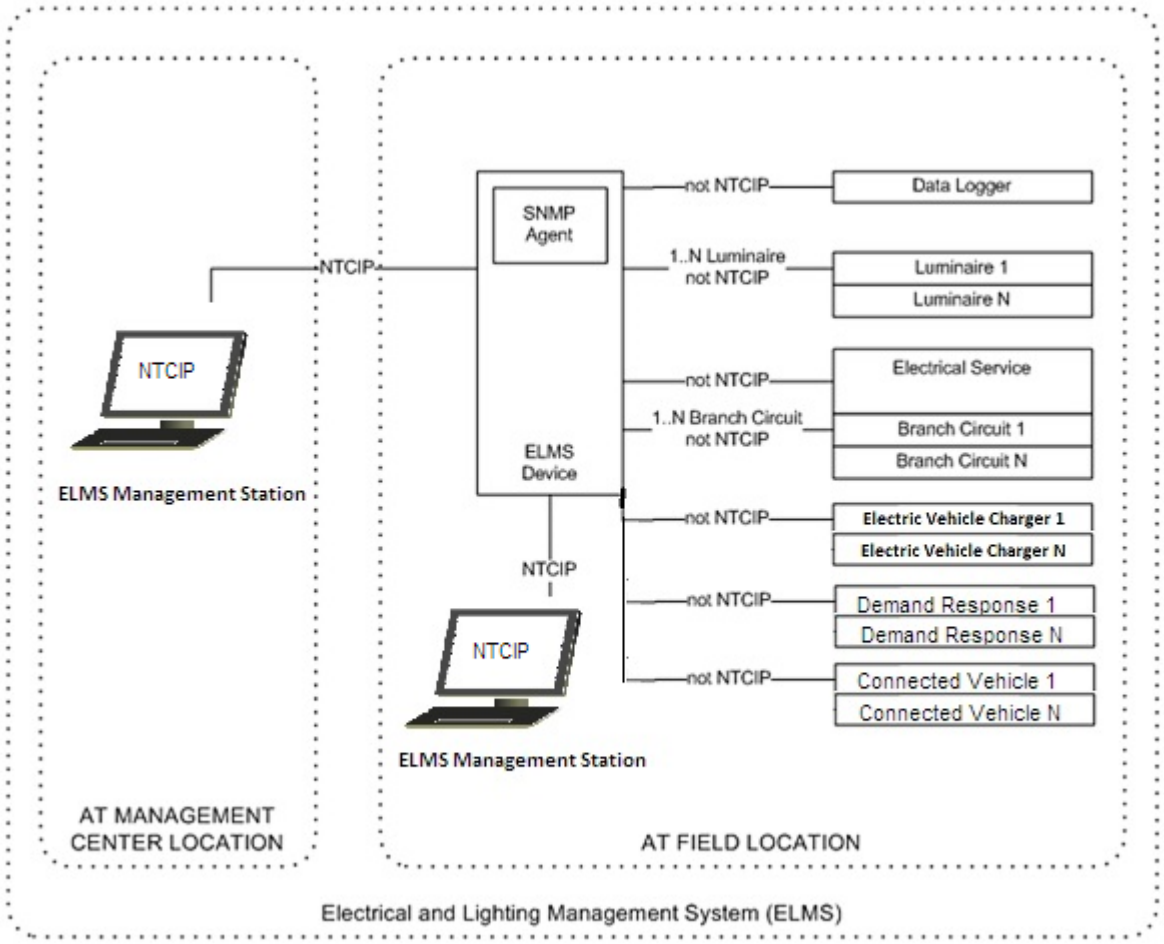


Figure 1 Reference Architecture—ELMS Device with SNMP Agent

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 the system and the NTCIP communication system, and may be integral to a component of the 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 a 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

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As depicted in Figure 1, the protocol between a management station and the ELMS device with SNMP is based on NTCIP, and is the basis of NTCIP 1213 v03. There are several configurations for how a 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 a 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 field device, either on demand or based on a pre-defined schedule (in this configuration, a network connection is established at the time a 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 a management station to signal that a certain emergency or exception situation exists for the device

There are different possible system environment configurations (architectures) for communications between a 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.

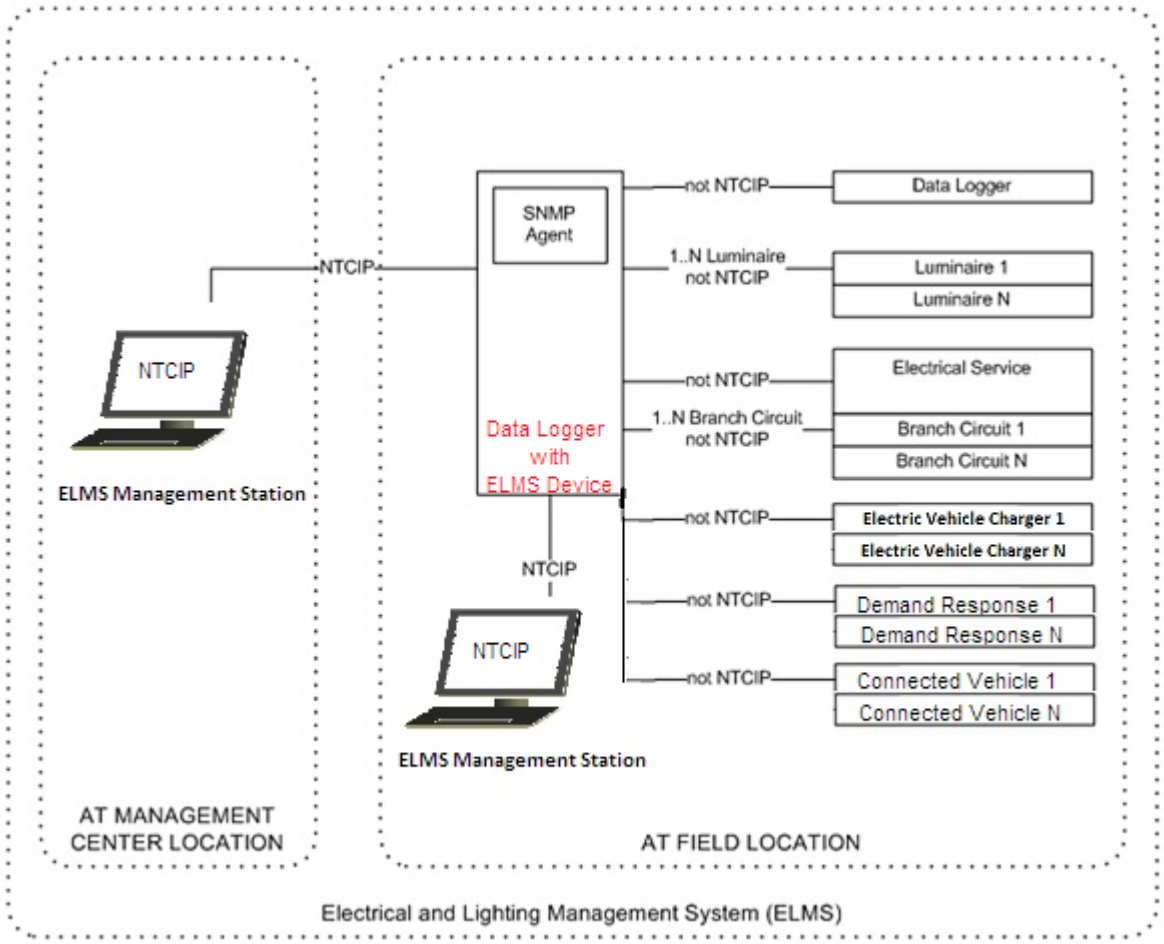


Figure 2 Data Logger with SNMP Agent Example Configuration

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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.

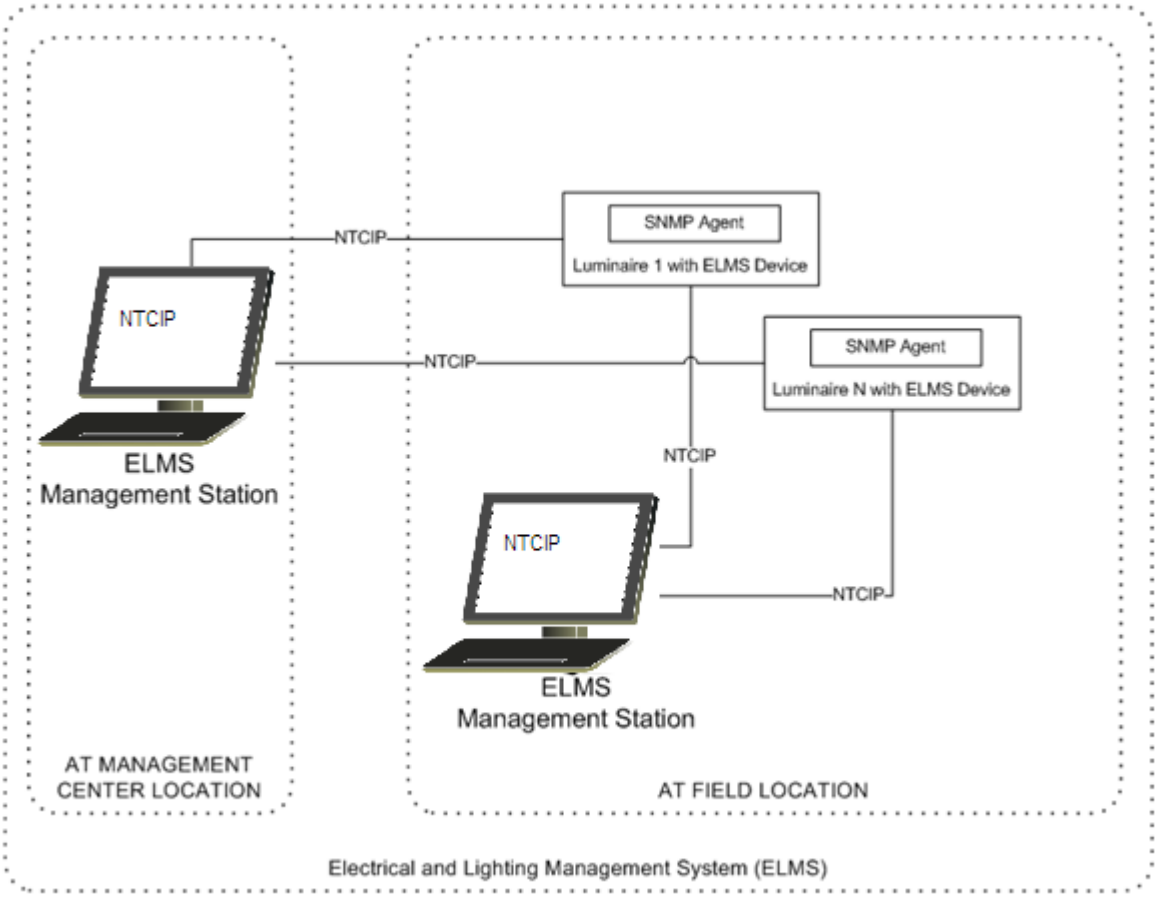


Figure 3 Luminaire with SNMP Agent Example Configuration

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 a 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 system.

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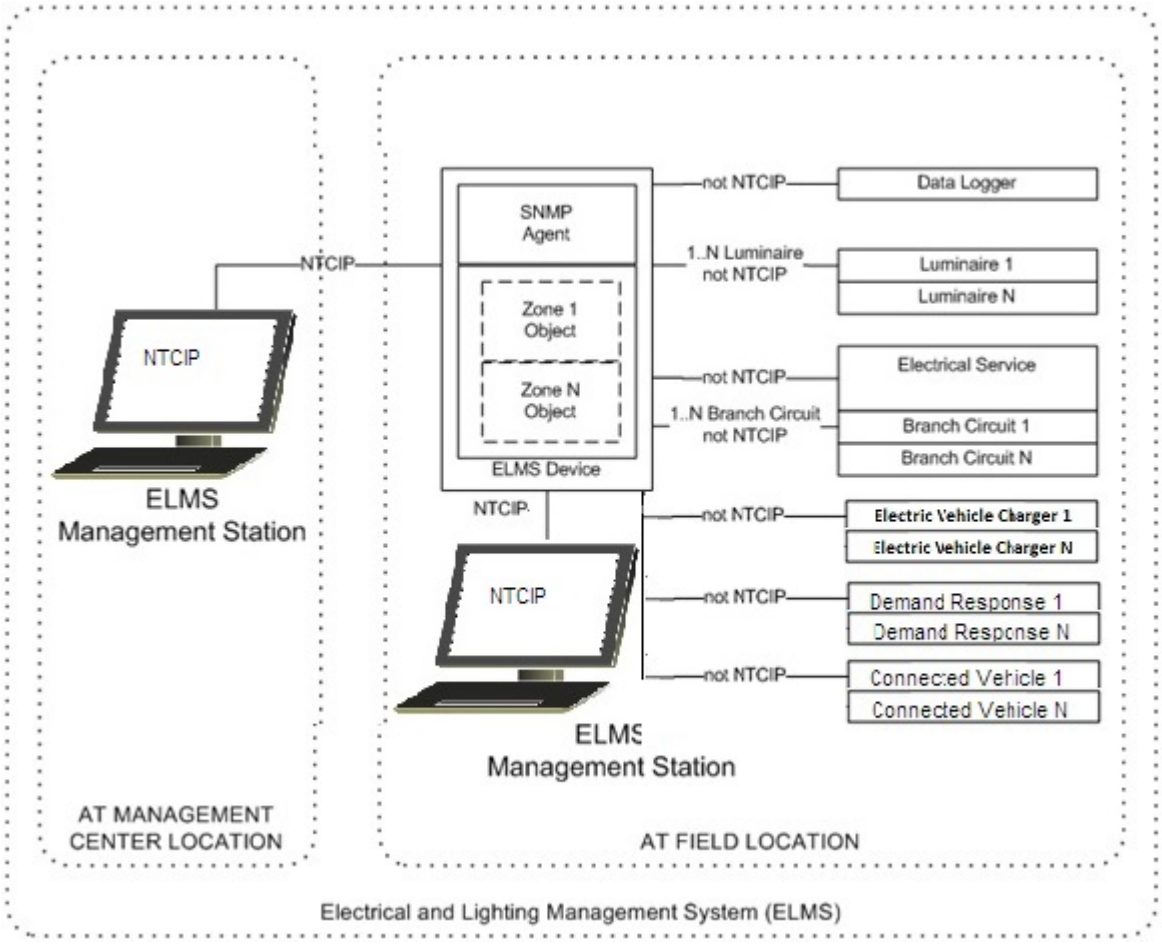


Figure 4 SNMP Agent with Zones Example Configuration

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 a 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 a 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 a 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 a 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.

NTCIP 1213 v03 addresses the interface between an ELMS and one or more management stations (e.g., central computers, laptops).

A management station needs to monitor the status of the ELMS, manage the database in the ELMS, and control the ELMS. A management station also needs to retrieve data that has been collected by the ELMS. After a management station has retrieved the data of interest, the operator can use the retrieved

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data to make decisions and initiate other events (such as changes to the ELMS schedule) to better manage the transportation system.

To enable communications between these components, the system manager needs to establish a communication system that links the ELMS with a management station. For some systems, the resources required for communications may be minimal and as such the system may be designed for constant polling; other systems may require significant resources for communicating with the ELMS and as such the system may be designed to minimize data exchanges. When deploying an ELMS, the system designer needs to consider which of the following operational environments need to be supported.

2.4 Architectural Needs

Depending on the project specific requirements of a particular installation, a variety of system architectures can be supported. A number of examples are described in Section 2.3.

2.5 Features

Section 2.5 describes the major user needs that are related to the definition of the interface between a management station and an ELMS field device. The user needs are considered to be the “high level” requirements for NTCIP 1213 v03, 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 a management station and field devices
b) Features—describing essential data communication functions and message elements to be supported by the interface

2.5.1 Operational User Needs

NTCIP 1213 v03 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 a 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, energy, and Smart Grid elements of the system. To enable communications between these components, the system manager needs to establish a communication system that links the ELMS field device with a management station.

To enable communications, the 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.

2.5.1.1 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 a management station immediately (e.g., through the provision of live data, success/failure notice of information alteration, or success/failure of the command).

2.5.1.2 Provide Off-Line Log Data

Some operational environments do not have always-on connections (e.g., dial-up links). In such environments, a system operator may wish to define conditions under which data is placed into a log,

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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 lighting or Smart Grid device status change has occurred.

2.5.1.2.1 Provide Luminaire Switch State Logging

A 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.

2.5.1.2.2 Provide Luminaire Condition Logging

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

2.5.1.2.3 Provide Luminaire Operating Hours Condition Logging

A management station may need to configure the ELMS device to keep a local log of an occurrence when the operating hours condition of a luminaire changes.

2.5.1.2.4 Provide Periodic Luminaire Operating Hours Time Logging

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

2.5.1.2.5 Provide Luminaire Temperature Logging

A management station may need to configure the ELMS device to keep a local log of the measurement of the luminaire temperature.

2.5.1.2.6 Provide Luminaire Pole Condition Logging

A 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).

2.5.1.2.7 Provide Relay Switch State Logging

A 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.

2.5.1.2.8 Provide Energy Meter Switch State Logging

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

2.5.1.2.9 Provide Periodic Energy Meter Measurement Logging

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

2.5.1.2.10 Provide Energy Meter Condition Logging

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

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2.5.1.2.11 Provide Ground Fault Switch State Logging

A 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.

2.5.1.2.12 Provide Periodic Ground Fault Measurement Logging

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

2.5.1.2.13 Retrieve Logged Data

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

2.5.1.3 Monitor Exception Conditions

In some operational environments, it may be desirable to have the ELMS device automatically transmit data to the management station when certain conditions occur. Under this scenario, a manager can program the conditions that will trigger a transmission and the information that is reported to the management station when the specified condition occurs. An example is a manager that needs to know when a threshold value approaching a dangerous condition is detected, or when a cabinet door is opened. These conditions can be programmed to cause the transmission of the alarm objects, thus providing the management station with information regarding a change of state detected by an ELMS device sensor or at the ELMS device cabinet.

2.5.2 Functional User Needs

Section 2.5.2 describes the essential data communication functions and message elements to be supported by the interface.

2.5.2.1 Configure ELMS Device

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

2.5.2.1.1 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.

2.5.2.1.1.1 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) as well as light source, rated wattage, rated voltage, type of ballast/driver, and the communication protocol between ballast/driver and light source (0-10 V, on/off, DALI, DMX, NTCIP).

2.5.2.1.1.2 Configure Luminaire Identification Information

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

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2.5.2.1.1.3 Configure Luminaire Mode

A management station may need to configure the mode (on, off, schedule, light activated, adaptive) of a luminaire. On/off only includes digital switching of the respective electrical loads. Schedule includes time based operation. Light activated include photocell controlled operation. Adaptive includes switching responses based upon time, light activation, and connected vehicle sensor information.

2.5.2.1.1.4 Manage Luminaire Color Temperature

A management station may need to configure the color temperature of a luminaire. The intent is to enhance spectral performance. For example, the effects of certain portions of the spectrum are preferred for visibility. Also, certain portions of the spectrum are more beneficial for the operation of astronomical observatories.

2.5.2.1.2 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.

2.5.2.1.2.1 Retrieve Electrical Service Information

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

2.5.2.1.3 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.

2.5.2.1.4 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. Controlling actions are to operate on a schedule to: turn on, turn off, adjust light level, or control by adaptive means.

2.5.2.1.5 Configure Zones

A management station that is controlling the ELMS device may need to configure the zone(s) to which the ELMS device is assigned (e.g., luminaire, electric vehicle charger, branch circuit, or electrical service).

2.5.2.1.6 Configure for Manual Operation

A 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.

2.5.2.1.7 Configure Stagger Interval

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

2.5.2.1.8 Configure Light Levels

A management station may need to configure a luminaire to set light levels, or a management station may need to adjust light output levels of all luminaires on a circuit or assigned to a zone.

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2.5.2.1.9 Configure Electrical Service Monitoring and Metering Equipment

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

2.5.2.1.10 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.

2.5.2.1.10.1 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.

2.5.2.1.10.2 Configure Branch Circuit

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

2.5.2.1.11 Manage Configuration of Astronomical Clock

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

2.5.2.1.11.1 Configure Astronomical Clock

A management station may need to configure the astronomical clock by setting the latitude, longitude, and date. This allows automatic calculation of sunset and sunrise time for a particular location.

2.5.2.1.11.2 Retrieve Astronomical Clock Information

A management station may need to retrieve sunrise and sunset time from the ELMS device. This information can be used to switch lighting fixtures, circuits, and services.

2.5.2.1.12 Manage Configuration of Photocells

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

2.5.2.1.12.1 Configure Photocells

The photocell may need to be configured for analog, digital, and reverse operation applications. Reverse operation is defined as additional lighting required for daytime tunnel operations. The intent is to support both analog and digital (on/off) photocells.

2.5.2.1.12.2 Retrieve Photocell Configuration

The photocell information and configuration status may need to be retrieved for digital, analog, and reverse operations.

2.5.2.1.13 Configure Energy Meter

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

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2.5.2.1.13.1 Configure Energy Meter Accuracy

As various jurisdictions require different meter accuracies, the management station may need to configure meter accuracy of the ELMS device.

2.5.2.1.13.2 Retrieve Energy Meter Accuracy

As various jurisdictions require different accuracies, the management station may need to retrieve meter accuracy from the ELMS device.

2.5.2.1.14 Retrieve Connected Vehicle Sensor Information

A management station may need to retrieve information from the ELMS device such as speed, direction, location, ambient light level, headlight status, and road friction from sensors present in connected vehicles, pedestrians, and bicyclists, to control adaptive roadway lighting. The data to be retrieved from within the ELMS device originates in the sensors of the connected vehicle, pedestrian, or bicyclist.

2.5.2.1.15 Retrieve Electric Vehicle Charger Information

A management station may need to retrieve information from the ELMS device, such as electric vehicle charger energy usage, and manufacturer specific information.

2.5.2.1.16 Retrieve Energy Automatic Demand Response Information

A management station may need to identify and describe information retrieved from an Automatic Demand Response system, including energy price and forecasted energy usage.

2.5.2.1.17 Configure Ground Fault Interrupter Setpoint

A management station may need to configure the setpoint of the ground fault interrupter to allow the ELMS device to remove power from the luminaire, branch circuit, or electrical service, when the ground fault leakage level exceeds the setpoint level.

2.5.2.1.18 Retrieve Ground Fault Setpoint

A management station may need to retrieve the setpoint of the ground fault interrupter. The ground fault interrupter setpoint allows the ELMS device to remove power from the luminaire, branch circuit, or electrical service, when the ground fault leakage level exceeds the setpoint level.

2.5.2.1.19 Retrieve Ground Fault Status

A management station may need to retrieve the status of the ground fault sensor (whether above or below the ground fault setpoint).

2.5.2.1.20 Configure Power Outage Message

A management station that is controlling the ELMS device may need to manage the configuration of the power outage message. This message is a report of last known state of the ELMS device.

2.5.2.1.21 Configure ELMS Device for Adaptive Operation

A management station may need to configure the ELMS device for adaptive operation. Adaptive operation includes adjusting light levels based on ambient light levels, as well as connected vehicle sensor and status information.

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2.5.2.1.22 Retrieve ELMS Device Adaptive Operation Configuration

A management station may need to retrieve the ELMS device configuration information for adaptive operation. Adaptive operation is a need that includes adjusting light levels based on ambient light levels, as well as connected vehicle sensor and status information.

2.5.2.2 Control Device

Section 2.5.2.2 describes the major categories of services a management station may need to use to control an ELMS device.

2.5.2.2.1 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 operation, or control by adaptive means. A management station may need to control the luminaire to allow or disallow the schedule control by one of four states:

a) **Continuous control:** not allowing the schedule to control current settings for the luminaire
b) **Transitory control:** not allowing 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
d) **Adaptive control:** allowing the schedule to control the luminaire in conjunction with connected vehicle sensor and status information

2.5.2.2.2 Control Electrical Service

A management station may need to control an electrical service directly or by enabling/disabling the staggered operation 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 four 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
d) **Adaptive control:** allowing the schedule to control the electrical service in conjunction with connected vehicle sensor and status information

2.5.2.2.3 Control Branch Circuit

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

a) **Continuous control:** not allowing the schedule to control current settings for the 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
d) **Adaptive control:** allowing the schedule to control the branch circuit in conjunction with connected vehicle sensor and status information

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2.5.2.2.4 Control Electric Vehicle Charger

A management station may need to identify and describe various electric vehicle charger features that may need to be controlled from a management station, including activation status and faults.

2.5.2.3 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, a 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 four 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
d) **Adaptive control:** allowing the schedule to control each ELMS device configured in the zone in conjunction with connected vehicle sensor and status information

2.5.2.4 Monitor Device Status

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

2.5.2.4.1 Monitor Luminaire

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

2.5.2.4.2 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.

2.5.2.4.3 Monitor Branch Circuit

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

2.5.3 Backward Compatibility Features

The following sub-features were modified within NTCIP 1213 v02 and needed to be specifically spelled out to achieve backward compatibility for certain features within an ASC conforming to NTCIP 1213 v03.

2.5.3.1 Backward Compatible with NTCIP 1213 v02

A newer transportation system component may need to communicate with other components that conform to NTCIP 1213 v02.

2.6 Security

NTCIP 1213 v03 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.

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2.7 Operational Policies and Constraints

Operational policies are agency-specific and are determined and implemented by the agency operating the ELMS. NTCIP 1213 v03 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 NTCIP 1213 v03 sections where they apply.

2.8 Relationship to the ITS National Architecture [Informative]

NTCIP 1213 v03 is part of the National ITS Architecture promoted by USDOT, part of the Roadside Lighting service (ST04). Specifically, NTCIP 1213 v03 covers the interface between the ITS Roadway Equipment and Traffic Management Center. See Figure 5 and https://www.arc-it.net/html/servicepackages/sp99.html#tab-3.

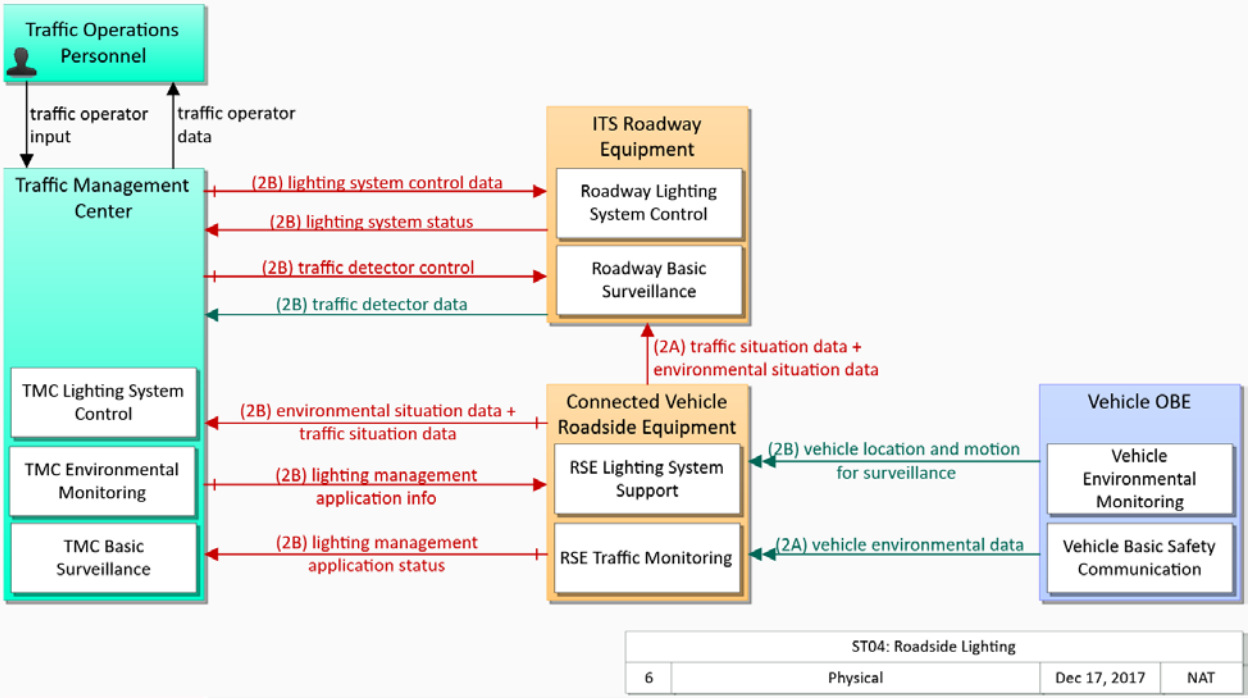


Figure 5 NTCIP 1213 as Part of the Roadside Lighting Service in National ITS Architecture

In addition, NTCIP 1213 v03 is part of the Electric Charging Station Management service (ST05). Specifically, NTCIP 1213 v03 covers the interface between the Electric Charging Station and Traffic Information Center. See Figure 6 and https://www.arc-it.net/html/servicepackages/sp22.html#tab-3.

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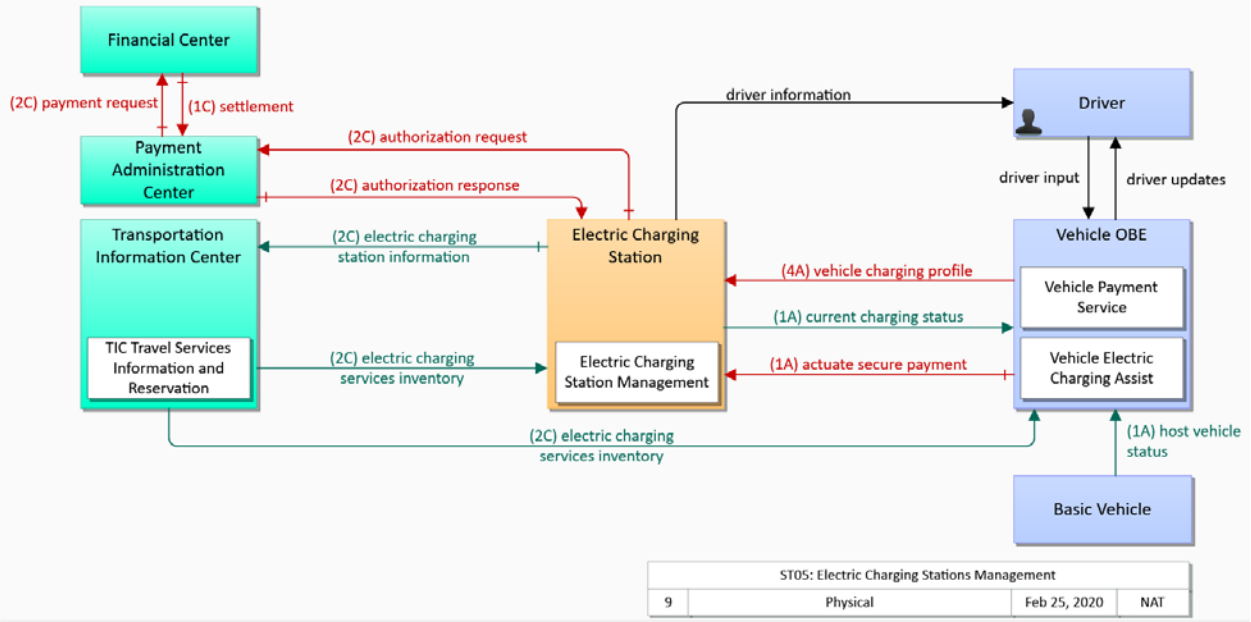


Figure 6 NTCIP 1213 as Part of the Electric Charging Station Management Service in National ITS Architecture

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Section 3
Functional Requirements [Normative]

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 3.3.3). 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 2.5.1
d) Functional requirements—requirements related to the features identified in Section 2.5.2 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 v03 requires of an ELMS device. Section 3.3.3 (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 v03. The PRL in Section 3.3.3 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 3.3.3 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 v03. 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.

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3.2 Scope of the Interface [Informative]

Section 3.2 does not apply in the context of NTCIP 1213 v03.

3.3 Protocol Requirements List (PRL)

The PRL, provided in Section 3.3.3, 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 v03 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

3.3.1 Notation [Informative]

The following notations and symbols are used to indicate status and conditional status in the PRL within all NTCIP standards. Not all of these notations and symbols may be used within NTCIP 1213 v03.

3.3.1.1 Conformance Symbols

The symbols in Table 1 are used to indicate status in the PRL table (Section 3.3.3).

Table 1 Status Symbols

Symbol	Status
M	Mandatory
M.#	Support of every item of the group labeled by the same numeral # required, but only one is active at a 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
NA	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.”

3.3.1.2 Conditional Status Notation

The predicate notations in Table 2 may be used.

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Table 2 Predicate Notations

Predicate	Notation
<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 v03.

3.3.1.3 Support Column Symbols

The Support (project requirement) 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 NA) in the Support column. See Table 3.

Table 3 Support Entries

Entry	Identifier
Yes	Supported by the implementation
No	Not supported by the implementation
NA	Not applicable

3.3.2 Instructions for Completing the PRL [Informative]

In the Support 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 (NA) 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 3.3.1.1), 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 v03, an implementation shall satisfy the mandatory requirements as identified in the PRL.

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3.3.3 Protocol Requirements List (PRL) Table

Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.1	Operational User Needs			M	Yes	
2.5.1.1	Provide Live Data			M	Yes	
		3.5.1.1	Retrieve Data	M	Yes	
		3.5.1.2	Deliver Data	M	Yes	
		3.5.1.3	Data Retrieval and Data Delivery Action Performance	M	Yes	
		3.5.1.4	Live Data Response Time	M	Yes	
2.5.1.2	Provide Off-Line Log Data			O	Yes / No	
		3.5.2.1	Retrieve Configuration of Logging Service	M	Yes	
		3.5.2.2	Configure Logging Service	M	Yes	
		3.5.2.2.1	Configure Number of Events in Event Log	M	Yes / No	The ELMS Device shall support at least _____ (1..255) events.
		3.5.2.2.2	Configure Number of Event Classes	M	Yes / No	The ELMS Device shall support at least _____ (1..255) classes.
		3.5.2.2.3	Configure Number of Event Types	M	Yes / No	The ELMS Device shall support at least _____ (1..255) event types.
		3.5.2.3	Retrieve Logged Data			
		3.5.2.4	Clear Log	M	Yes	
		3.5.2.5	Retrieve Capabilities of Event Logging Services	M	Yes	
		3.5.2.6	Retrieve Number of Events Currently Logged	M	Yes	
		3.5.2.7	Set Time	M	Yes	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.2.8	Retrieve Current Time	M	Yes	
		3.5.2.9	Set Daylight Saving Time Mode	M	Yes	
		3.5.2.10	ELMS Pre-Defined Event Configurations	M	Yes	
		3.5.2.10.1	Supported Event Classes	M	Yes	
2.5.1.2.1	Provide Luminaire Switch State Logging			O	Yes / No	
		3.5.2.10.2	Luminaire Switch State Log	O	Yes / No	
2.5.1.2.2	Provide Luminaire Condition Logging			O	Yes / No	
		3.5.2.10.3	Luminaire Condition Log	O	Yes / No	
2.5.1.2.3	Provide Luminaire Operating Hours Condition Logging			O	Yes / No	
		3.5.2.10.4	Luminaire Operating Hours Condition Log	O	Yes / No	
2.5.1.2.4	Provide Periodic Luminaire Operating Hours Time Logging			O	Yes / No	
		3.5.2.10.5	Periodic Luminaire Operating Hours Time Log	O	Yes / No	
2.5.1.2.5	Provide Luminaire Temperature Logging			O	Yes / No	
		3.5.2.10.6	Luminaire Temperature Log	O	Yes / No	
2.5.1.2.6	Provide Luminaire Pole Condition Logging			O	Yes / No	
		3.5.2.10.7	Luminaire Pole Condition Log	O	Yes / No	
2.5.1.2.7	Provide Relay Switch State Logging			O	Yes / No	
		3.5.2.10.8	Relay Switch State Log	O	Yes / No	
2.5.1.2.8	Provide Energy Meter Switch State Logging			O	Yes / No	
		3.5.2.10.9	Energy Meter Switch State Log	O	Yes / No	
2.5.1.2.9	Provide Periodic Energy Meter Measurement Logging			O	Yes / No	
		3.5.2.10.10	Periodic Energy Meter Measurement Log	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.1.2.10	Provide Energy Meter Condition Logging			O	Yes / No	
		3.5.2.10.11	Energy Meter Condition Log	O	Yes / No	
2.5.1.2.11	Provide Ground Fault Switch State Logging			O	Yes / No	
		3.5.2.10.12	Ground Fault Switch State Log	O	Yes / No	
2.5.1.2.12	Provide Periodic Ground Fault Measurement Logging			O	Yes / No	
		3.5.2.10.13	Periodic Ground Fault Measurement Log	O	Yes / No	
2.5.1.2.13	Retrieve Logged Data			M	Yes	
		3.5.2.3	Retrieve Logged Data	M	Yes	
2.5.1.3	Monitor Exception Conditions			O	Yes / No	
		3.5.3.1	Enable/Disable Exception Reporting	M	Yes	
		3.5.3.2.1	Configure a Monitored (Watch) Object	M	Yes	
		3.5.3.2.2 (Watch)	Configure a Monitored Group of Objects (Watch Block)	M	Yes	
		3.5.3.3.1	Configure a Report Object	M	Yes	
		3.5.3.3.2 (Report)	Configure a Report Group of Objects (Block)	O	Yes / No	
		3.5.3.4	Configure Exception Reporting Destination	M	Yes	
		3.5.3.5	Configure Exception Reporting Community	M	Yes	
		3.5.3.6.1	Configure Exception Reporting Acknowledgement	O.x (1..*)	Yes / No	
		3.5.3.6.2	Configure Exception Reporting Aggregation	O.x (1..*)	Yes / No	
		3.5.3.6.3 (TrapQueue)	Configure Exception Reporting Queue	O.x (1..*)	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.3.6.4	Configure Exception Reporting (Forced)	O.x (1..*)	Yes / No	
		3.5.3.6.5	Configure Exception Reporting Communications	M	Yes	
		3.5.3.6.6 (AntiStream)	Configure Exception Reporting—Maximum Rate	O	Yes / No	
		3.5.3.7	Determine Watch Block Capabilities	Watch:M	Yes / NA	
		3.5.3.8	Determine Report Block Capabilities	Report:M	Yes / NA	
		3.5.3.9	Determine Exception Reporting Trap Channel Capabilities	M	Yes	
		3.5.3.10	Determine Exception Reporting Trap Channel Capabilities	M	Yes	
		3.5.3.11	Monitor Communications Link State	M	Yes	
		3.5.3.12.1	Monitor Exception Based Communications Link Error	M	Yes	
		3.5.3.12.2	Monitor Exception Based Maximum Rate Exceeded	AntiStream:M	Yes / NA	
		3.5.3.12.3	Monitor Exception Based Queue Full Error	TrapQueue:M	Yes / NA	
		3.5.3.13	Monitor Exception Based Transmissions	M	Yes	
		3.5.3.14	Monitor Number of Lost Queued Exception Based Reports	TrapQueue:M	Yes / NA	
		3.5.3.15	Monitor Number of Exception Based Events	M	Yes	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.3.16	Monitor Exception Based Data	M	Yes	
		3.5.3.17	Clear Event Class	O	Yes / No	
		3.5.3.18	Clear Event Configuration	O	Yes / No	
		3.5.3.19	Clear Event Log Table	O	Yes / No	
		3.5.3.20	Clear Report Objects	O	Yes / No	
		3.5.3.21	Clear Report Blocks	O	Yes / No	
		3.5.3.22	Clear Watch Objects	O	Yes / No	
		3.5.3.23	Clear Watch Blocks	O	Yes / No	
		3.5.3.24	Clear Exception Based Reporting	O	Yes / No	
		3.6.29	Maximum Transmission Start Time	M	Yes / NA	The Maximum Transmission Start Time for all reports shall be ___ seconds (Default=10).
2.5.2	Functional User Needs			M	Yes	
2.5.2.1	Configure ELMS Device			M	Yes	
2.5.2.1.1	Configure Luminaire			O	Yes / No	
2.5.2.1.1	Retrieve Luminaire Information			O	Yes / No	
		3.5.4.1.1.1	Retrieve Luminaire Pole Identifier	O	Yes / No	
		3.5.4.1.1.2	Retrieve Luminaire Location	M	Yes	
		3.5.4.1.1.3	Retrieve Luminaire Mode	M	Yes	
		3.5.4.1.1.4	Retrieve Luminaire Zone	O	Yes / No	
		3.5.4.1.1.5	Retrieve Luminaire Vendor Information	M	Yes	
		3.5.4.1.1.6	Retrieve Luminaire Light Source Type	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.1.1.7	Retrieve Luminaire Wattage	O	Yes / No	
		3.5.4.1.1.8	Retrieve Luminaire Voltage	O	Yes / No	
		3.5.4.1.1.9	Retrieve Luminaire Ballast / Driver Description	O	Yes / No	
		3.5.4.1.1.10	Retrieve Luminaire Communications Protocol	O	Yes / No	
2.5.2.1.1.2	Configure Luminaire Identification Information			O	Yes / No	
		3.5.4.1.1.2.1	Specify Location in Longitude/Latitude Coordinates	O	Yes / No	
		3.5.4.1.1.2.2	Specify Location Information Using Textual Description of a Road / Street / Block Name / Number	O	Yes / No	The ELMS Device shall support a location name of at least _____ (8..255) Characters.
		3.5.4.1.1.2.3	Specify Location in Local Reference Coordinate Grid	O	Yes / No	
		3.5.4.1.2.1	Configure Luminaire Pole Identifier	O	Yes / No	
		3.5.4.1.2.2	Configure Luminaire Location	M	Yes	
2.5.2.1.1.3	Configure Luminaire Mode			O	Yes	
		3.5.4.1.3	Configure Luminaire Mode	M	Yes	
2.5.2.1.1.4	Manage Luminaire Color Temperature			O		
		3.5.4.1.4	Manage Luminaire Color Temperature	O	Yes / No	
2.5.2.1.2	Configure Electrical Service			O	Yes	
2.5.2.1.2.1	Retrieve Electrical Service Information			O	Yes / No	
		3.5.4.2.1.1	Retrieve Electrical Service Location	M	Yes	
		3.5.4.2.1.2	Retrieve Electrical Service Zone	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.2.1.3	Retrieve Electrical Service Pole Identifier	O	Yes / No	
		3.5.4.3.1	Configure Electrical Service Location	M	Yes	
		3.5.4.3.2	Configure Electrical Service Pole Identifier	O	Yes / No	
2.5.2.1.3	Configure for Light Activated Operation			O	Yes / No	
		3.5.4.4.1	Configure Luminaire for Light Activated Operations	M	Yes	
		3.5.4.4.2	Configure Electrical Service for Light Activated Operations	O	Yes / No	
		3.5.4.4.3	Configure Branch Circuit for Light Activated Operations	O	Yes / No	
		3.5.4.4.4	Configure Devices in Zone for Light Activated Operations	O	Yes / No	
2.5.2.1.4	Configure for Scheduled Operation			O	Yes / No	
		3.5.4.5.1	Configure Luminaire for Scheduled Operations	O.1 (1..*)	Yes / No	
		3.5.4.5.2	Configure Electrical Service for Scheduled Operations	O.2 (1..*)	Yes / No	
		3.5.4.5.3	Configure Branch Circuit for Scheduled Operations	O.3 (1..*)	Yes / No	
		3.5.4.5.4	Configure Devices in Zone for Scheduled Operations	O.4 (1..*)	Yes / No	
		3.5.4.5.5	Schedule ELMS Device Event	M	Yes	
		3.5.4.5.6	Retrieve a Schedule	M	Yes	
		3.5.4.5.7	Support a Number of Actions	M	Yes	The ELMS Device shall support at least _____ (1..255) Actions.

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.5.8	Support a Number of Day Plans	M	Yes	The ELMS Device shall support at least _____ (1..255) Day Plans.
		3.5.4.5.9	Perform Action at a Scheduled Time	M	Yes	
2.5.2.1.5	Configure Zones			O	Yes / No	
		3.5.4.6.1	Configure Luminaire Zone [DEPRECATED]	M	Yes	
		3.5.4.6.2	Configure Electrical Service Zone [DEPRECATED]	O	Yes / No	
		3.5.4.6.3	Configure Branch Circuit Zone [DEPRECATED]	O	Yes / No	
		3.5.4.6.4	Define Zones	M	Yes	
		3.5.4.6.5	Define Number of Zones Supported by an ELMS Device	M	Yes / No	The ELMS Device shall support at least _____ (0..65535) Zones.
		3.5.4.6.6	Define Number of ELMS Devices for a Zone	M	Yes / No	At least _____ (0..65535) ELMS Devices shall be able to be assigned to a single zone.
2.5.2.1.6	Configure for Manual Operation			M	Yes	
		3.5.4.9.1	Configure Luminaire for Manual Operation	O	Yes	
		3.5.4.9.2	Configure Electrical Service for Manual Operations	O	Yes / No	
		3.5.4.9.3	Configure Branch Circuit for Manual Operations	O	Yes / No	
		3.5.4.9.4	Configure Devices in Zone for Manual Operations	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.1.7	Configure Stagger Interval			O	Yes / No	
		3.5.4.7.1	Configure Luminaire Stagger Interval	O	Yes	The ELMS Device shall support a stagger interval with a maximum value of _____ (0..255) seconds.
		3.5.4.7.2	Configure Branch Circuit Stagger Interval	O	Yes / No	The ELMS Device shall support a stagger interval with a maximum value of _____ (0..255) seconds.
		3.5.4.7.3	Configure Electrical Service Stagger Interval	O	Yes / No	The ELMS Device shall support a stagger interval with a maximum value of _____ (0..255) seconds.
2.5.2.1.8	Configure Light Levels			O	Yes / No	
		3.5.4.8.1	Configure Luminaire Light Level	O	Yes	
		3.5.4.8.2	Configure Electrical Service Light Level	O	Yes / No	
		3.5.4.8.3	Configure Branch Circuit Light Level	O	Yes / No	
		3.5.4.8.4	Configure Light Level for Devices in Zone	O	Yes / No	
2.5.2.1.9	Configure Electrical Service Monitoring and Metering Equipment			O	Yes / No	
		3.5.4.10.1	Configure Branch Circuit Ground Fault Detector	O	Yes / No	
		3.5.4.10.2	Configure Branch Circuit Power Meter	O	Yes / No	
		3.5.4.10.3	Configure Branch Circuit Arc Fault Detector	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.1.10	Configure Branch Circuit			O	Yes / No	
2.5.2.1.10.1	Retrieve Branch Circuit Information			O	Yes / No	
		3.5.4.11.1.1	Retrieve Branch Circuit Zone	O	Yes / No	
		3.5.4.11.1.2	Retrieve Branch Circuit Location	O	Yes / No	
		3.5.4.11.1.3	Retrieve Branch Circuit Pole Identifier	O	Yes / No	
		3.5.4.11.1.4	Retrieve Branch Circuit Electrical Parameters	O	Yes / No	
2.5.2.1.10.2	Configure Branch Circuit			O	Yes / No	
		3.5.4.11.2.1	Configure Branch Circuit Location	O	Yes / No	
		3.5.4.11.2.2	Configure Branch Circuit Pole Identifier	O		
2.5.2.1.11	Manage Configuration of Astronomical Clock			O	Yes / No	
2.5.2.1.11.1	Configure Astronomical Clock			O	Yes / No	
		3.5.4.12.1	Configure Latitude of Installation	O	Yes / No	
		3.5.4.12.2	Configure Longitude of Installation	O	Yes / No	
		3.5.4.12.3	Configure Date	O	Yes / No	
2.5.2.1.11.2	Retrieve Astronomical Clock Information			O	Yes / No	
		3.5.4.13.1	Retrieve Latitude of Installation	O	Yes / No	
		3.5.4.13.2	Retrieve Longitude of Installation	O	Yes / No	
		3.5.4.13.3	Retrieve Date	O	Yes / No	
		3.5.4.13.4	Retrieve Sunrise Time	O		
		3.5.4.13.5	Retrieve Sunset Time	O		

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.1.12	Manage Configuration of Photocells			O	Yes / No	
2.5.2.1.12.1	Configure Photocells			O	Yes / No	
		3.5.4.14.1	Configure Photocell for Analog, Digital, or Reverse Operations	O	Yes / No	
2.5.2.1.12.2	Retrieve Photocell Configuration			O	Yes / No	
		3.5.4.14.2	Retrieve Configuration of Photocell	O	Yes / No	
2.5.2.1.13	Configure Energy Meter			O	Yes / No	
2.5.2.1.13.1	Configure Energy Meter Accuracy			O	Yes / No	
		3.5.4.15.1	Configure Accuracy of Energy Meter	M	Yes / No	
2.5.2.1.13.2	Retrieve Energy Meter Accuracy			O	Yes / No	
		3.5.4.15.2	Retrieve Accuracy of Energy Meter	M	Yes / No	
2.5.2.1.14	Retrieve Connected Vehicle Sensor Information			O	Yes / No	
		3.5.4.16.1	Retrieve Connected Vehicle Speed	O	Yes / No	
		3.5.4.16.2	Retrieve Connected Vehicle Direction	O	Yes / No	
		3.5.4.16.3	Retrieve Connected Vehicle Location	O	Yes / No	
		3.5.4.16.4	Retrieve Connected Vehicle Ambient Light Level	O	Yes / No	
		3.5.4.16.5	Retrieve Connected Vehicle Headlight Status	O	Yes / No	
		3.5.4.16.6	Retrieve Connected Vehicle Road Friction	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.1.15	Retrieve Electric Vehicle Charger Information			O	Yes / No	
		3.5.4.17.1	Retrieve Electric Vehicle Charger Location	M	Yes / No	
		3.5.4.17.2	Retrieve Electric Vehicle Charger Manufacturer Name	O	Yes / No	
		3.5.4.17.3	Retrieve Electric Vehicle Charger Model Number	O	Yes / No	
		3.5.4.17.4	Retrieve Electric Vehicle Charger Serial Number	O	Yes / No	
		3.5.4.17.5	Retrieve Electric Vehicle Charger Ground Fault Current Status	O	Yes / No	
		3.5.4.17.6	Retrieve Electric Vehicle Charger Charge Current	O	Yes / No	
		3.5.4.17.7	Retrieve Electric Vehicle Charger Proximity Resistance	O	Yes / No	
		3.5.4.17.8	Retrieve Electric Vehicle Charger Temperature	O	Yes / No	
		3.5.4.17.9	Retrieve Electric Vehicle Charger Activation	O	Yes / No	
		3.5.4.17.10	Retrieve Electric Vehicle Charger Operational Status	O	Yes / No	
		3.5.4.17.11	Retrieve Electric Vehicle Charger Total Energy Consumed	O	Yes / No	
		3.5.4.17.12	Retrieve Electric Vehicle Charger Energy Delivered for Current Charging Session	O	Yes / No	
		3.5.4.17.13	Retrieve Electric Vehicle Charger Energy Delivered for Previous Charging Session	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.4.17.14	Retrieve Electric Vehicle Charger Energy Loss	O	Yes / No	
2.5.2.1.16	Retrieve Energy Automatic Demand Response Information			O	Yes / No	
		3.5.4.18.1	Retrieve Electricity Price	O	Yes / No	
		3.5.4.18.2	Retrieve Energy Price	O	Yes / No	
		3.5.4.18.3	Retrieve Demand Charge	O	Yes / No	
		3.5.4.18.4	Retrieve Bid Price	O	Yes / No	
		3.5.4.18.5	Retrieve Bid Load	O	Yes / No	
		3.5.4.18.6	Retrieve Bid Energy	O	Yes / No	
		3.5.4.18.7	Retrieve Load Dispatch	O	Yes / No	
		3.5.4.18.8	Retrieve Load Control Capacity	O	Yes / No	
		3.5.4.18.9	Retrieve Load Control Offset	O	Yes / No	
		3.5.4.18.10	Retrieve Load Control Setpoints	O	Yes / No	
		3.5.4.18.11	Retrieve Load Control Percent Offset	O	Yes / No	
2.5.2.1.17	Configure Ground Fault Interrupter Setpoint			O	Yes / No	
		3.5.4.19	Configure Ground Fault Setpoint	O	Yes / No	
2.5.2.1.18	Retrieve Ground Fault Setpoint			O	Yes / No	
		3.5.4.20	Retrieve Ground Fault Setpoint	O	Yes / No	
2.5.2.1.19	Retrieve Ground Fault Status			O	Yes / No	
		3.5.4.21	Retrieve Ground Fault Status	O	Yes / No	
2.5.2.1.20	Configure Power Outage Message			O	Yes / No	
		3.5.4.22	Configure Power Outage Message	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.1.21	Configure ELMS Device for Adaptive Operation			O	Yes / No	
		3.5.4.23	Configure ELMS Device for Adaptive Operation	O	Yes / No	
		3.5.4.23.1	Configure Connected Vehicle Speed Setpoint	O		
		3.5.4.23.2	Configure Connected Vehicle Direction Setpoint	O		
		3.5.4.23.3	Configure Connected Vehicle Location Setpoint	O		
		3.5.4.23.4	Configure Connected Vehicle Ambient Light Level Setpoint	O		
		3.5.4.23.5	Configure Connected Vehicle Headlight Status Setpoint	O		
		3.5.4.23.6	Configure Connected Vehicle Road Friction Setpoint	O		
2.5.2.1.22	Retrieve ELMS Device Adaptive Operation Configuration			O	Yes / No	
		3.5.4.24	Retrieve ELMS Device Adaptive Operation Configuration	O	Yes / No	
		3.5.4.24.1	Retrieve Connected Vehicle Speed Setpoint	O		
		3.5.4.24.2	Retrieve Connected Vehicle Direction Setpoint	O		
		3.5.4.24.3	Retrieve Connected Vehicle Location Setpoint	O		
		3.5.4.24.4	Retrieve Connected Vehicle Ambient Light Level Setpoint	O		
		3.5.4.24.5	Retrieve Connected Vehicle Headlight Status Setpoint	O		
		3.5.4.24.6	Retrieve Connected Vehicle Road Friction Setpoint	O		

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.2	Control Device			M	Yes	
2.5.2.2.1	Control Luminaire			O	Yes / No	
		3.5.5.1.1	Control Luminaire by Permanent/Continuous Override	M	Yes	
		3.5.5.1.2	Control Luminaire by Transitory Override	O	Yes / No	
		3.5.5.1.3	Control Luminaire by Timed Override	O	Yes / No	
		3.5.5.1.4	Control Luminaire in Stagger Mode	O	Yes / No	
		3.5.5.1.5	Control Luminaire by Photocell	O	Yes / No	
		3.5.5.1.6	Control Luminaire by Adaptive Means	O	Yes / No	
2.5.2.2.2	Control Electrical Service			O	Yes / No	
		3.5.5.2.1	Control Electrical Service by Permanent/Continuous Override	M	Yes	
		3.5.5.2.2	Control Electrical Service by Transitory Override	O	Yes / No	
		3.5.5.2.3	Control Electrical Service by Timed Override	O	Yes / No	
		3.5.5.2.4	Control Electrical Service in Stagger Mode	O	Yes / No	
		3.5.5.2.5	Control Electrical Service by Photocell	O	Yes / No	
		3.5.5.2.6	Control Electrical Service by Adaptive Means	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
2.5.2.2.3	Control Branch Circuit			O	Yes / No	
		3.5.5.3.1	Control Branch Circuit by Permanent/Continuous Override	M	Yes	
		3.5.5.3.2	Control Branch Circuit by Transitory Override	O	Yes / No	
		3.5.5.3.3	Control Branch Circuit by Timed Override	O	Yes / No	
		3.5.5.3.4	Control Branch Circuit in Stagger Mode	O	Yes / No	
		3.5.5.3.5	Control Branch Circuit by Photocell	O	Yes / No	
		3.5.5.3.6	Control Branch Circuit by Adaptive Means	O	Yes / No	
2.5.2.2.4	Control Electric Vehicle Charger			O	Yes / No	
		3.5.5.4.1	Control Soft Start	O	Yes / No	
		3.5.5.4.2	Control Automatic Reclosure on Fault Time	O	Yes / No	
		3.5.5.4.3	Control Power-Up Delay Minimum Time	O	Yes / No	
		3.5.5.4.4	Control Power-Up Delay Maximum Time	O	Yes / No	
		3.5.5.4.5	Control Electric Vehicle Charger Activation	O	Yes / No	
2.5.2.3	Control Devices by Zone			O	Yes / No	
		3.5.5.5.1	Control Devices in Zone by Permanent/Continuous Override	O	Yes	
		3.5.5.5.2	Control Devices in Zone by Transitory Override	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.5.5.3	Control Devices in Zone by Timed Override	O	Yes / No	
		3.5.5.5.4	Control Devices in Zone by Photocell	O	Yes / No	
		3.5.5.5.5	Control Devices in Zone by Adaptive Means	O	Yes / No	
2.5.2.4	Monitor Device Status			M	Yes	
2.5.2.4.1	Monitor Luminaire			O	Yes / No	
		3.5.6.1.1	Retrieve Luminaire Switch Status	M	Yes / No	
		3.5.6.1.2	Retrieve Luminaire Temperature	O	Yes / No	Units are in tenths of degrees Celsius
		3.5.6.1.3	Retrieve Luminaire Operating Time Statistics	O	Yes / No	
		3.5.6.1.4	Retrieve Luminaire Pole Status	O	Yes / No	
		3.5.6.1.5	Retrieve Luminaire Light Level Output	O	Yes / No	
		3.5.6.1.6	Retrieve Luminaire Status	O	Yes / No	
		3.5.6.1.7	Retrieve Luminaire Power Usage Statistics	O	Yes / No	
		3.5.6.1.9	Retrieve Luminaire Ballast/Driver Status	O	Yes / No	
		3.5.6.1.9	Retrieve Luminaire Starter Status	O	Yes / No	
2.5.2.4.2	Monitor Electrical Service			O	Yes / No	
		3.5.6.2.1	Retrieve Electrical Service Ground Fault Status	O	Yes / No	
		3.5.6.2.2	Retrieve Electrical Service Hours	O	Yes / No	

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Protocol Requirements List (PRL) Table						
User Need ID	**User Need**	**FR ID**	**Functional Requirement**	**Conformance**	**Support**	**Additional Specifications**
		3.5.6.2.3	Retrieve Electrical Service Operational Status	M	Yes	
		3.5.6.2.4	Retrieve Electrical Service Energy Readings	O	Yes / No	
		3.5.6.2.5	Retrieve Electrical Service Main Breaker Status	O	Yes / No	
		3.5.6.2.6	Retrieve Electrical Service Arc Fault Status	O	Yes / No	
2.5.2.4.3	Monitor Branch Circuit			O	Yes / No	
		3.5.6.3.1	Retrieve Branch Circuit Energy Readings	O	Yes / No	
		3.5.6.3.2	Retrieve Branch Circuit Arc Fault Status	O	Yes / No	
		3.5.6.3.3	Retrieve Branch Circuit Breaker Status	O	Yes / No	
		3.5.6.3.4	Retrieve Branch Circuit Operational Status	M	Yes	
		3.5.6.3.5	Retrieve Branch Circuit Hours	O	Yes / No	
		3.5.6.3.6	Retrieve Branch Circuit Ground Fault Status	O	Yes / No	
2.5.3.1	Backward Compatible with NTCIP 1213 v02			O	Yes / No	
		3.5.7.1	NTCIP 1213 v02—Retrieve Photocell State	O	Yes / No	
		3.5.7.2	NTCIP 1213 v02—Retrieve Photocell Description	O	Yes / No	

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3.4 Architectural Requirements

Section 3.4 does not apply in the context of NTCIP 1213 v03, as Architectural Requirements are included in Section 3.5.

3.5 Data Exchange and Operational Environment Requirements

Requirements for communication capabilities follow.

3.5.1 Provide Live Data

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

3.5.1.1 Retrieve Data

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

3.5.1.2 Deliver Data

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

3.5.1.3 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 a management station on the ELMS device in accordance with the performance criteria for the SNMP commands established in NTCIP 1103 v03 Section 3.2.4.

3.5.1.4 Live Data Response Time

The ELMS device shall process the data request in accordance with all of the rules of NTCIP 1103 v03, 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 v03 Section 3.2.4.

3.5.2 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 a management station, but is instead storing data off-line for periodic retrieval by a management station.

3.5.2.1 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).

3.5.2.2 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.

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3.5.2.2.1 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.

3.5.2.2.2 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.

3.5.2.2.3 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.

3.5.2.3 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.

3.5.2.4 Clear Log

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

3.5.2.5 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.

3.5.2.6 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.

3.5.2.7 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 2.5.1.

3.5.2.8 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 2.5.1.

3.5.2.9 Set Daylight Saving Time Mode

The ELMS device shall allow a 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 2.5.1.

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3.5.2.10 ELMS Pre-Defined Event Configurations

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

3.5.2.10.1 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

3.5.2.10.2 Luminaire Switch State Log

The ELMS device shall allow a 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.

3.5.2.10.3 Luminaire Condition Log

The ELMS device shall allow a 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.

3.5.2.10.4 Luminaire Operating Hours Condition Log

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

3.5.2.10.5 Periodic Luminaire Operating Hours Time Log

The ELMS device shall allow a 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 operating time for a luminaire on an interval specified by a management station operator, typically on a 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.

3.5.2.10.6 Luminaire Temperature Log

The ELMS device shall allow a 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.

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3.5.2.10.7 Luminaire Pole Condition Log

The ELMS device shall allow a 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.

3.5.2.10.8 Relay Switch State Log

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

3.5.2.10.9 Energy Meter Switch State Log

The ELMS device shall allow a 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.

3.5.2.10.10 Periodic Energy Meter Measurement Log

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

3.5.2.10.11 Energy Meter Condition Log

The ELMS device shall allow a management station to configure the ELMS device to generate log entries within the ELMS device based on any change of the energy 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.

3.5.2.10.12 Ground Fault Switch State Log

The ELMS device shall allow a 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.

3.5.2.10.13 Periodic Ground Fault Measurement Log

The ELMS device shall allow a 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.

3.5.3 Manage Exception Reporting

The required functions for supporting the capability of an ELMS device to communicate exceptional conditions to an ELMS management station follow. A detailed explanation of how the design content (that are traced from these requirements) works can be found in Section 6 of NTCIP 1103 v03.

3.5.3.1 Enable/Disable Exception Reporting

The management station shall be able to enable and disable exception based reporting for an ELMS device when user-specified conditions are met.

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3.5.3.2 Configure Exception Reporting Condition Requirements

If exception based reporting is supported, a management station needs to specify the conditions under which the ELMS device is to automatically transmit data to the management station. The requirements to configure the user-specified conditions that the ELMS device will monitor upon which the ELMS device will transmit data to a management station follow.

3.5.3.2.1 Configure a Monitored (Watch) Object

Upon request from a management station, the ELMS device shall store the data element to be monitored for a specified change. The allowable changes, if supported by the ELMS device, are:

a) On-Change Event—monitor the data element for changes in value
b) Greater Than Event—monitor the data element for values exceeding a defined threshold
c) Less Than Event—monitor the data element for values falling below a defined threshold
d) Hysteresis Event—montor the data element for values exceeding an upper limit or dropping below a lower limit
e) Periodic Event—monitor the data element and create a log entry at user-defined intervals
f) Bit Flag Event—monitor the data element for one or more bits of a value becoming true (i.e., obtaining a value of one)

3.5.3.2.2 Configure a Monitored Group of Objects (Watch Block)

Upon request from a management station, the ELMS device shall store a group of one or more data elements (watch block) to be monitored to determine if a change has occurred to any data element in the group. This requirement allows an ELMS device to monitor two or more objects such that a change to any of the data elements in the group will trigger the ELMS device to transmit preconfigured data value(s) to a management station. Monitoring a group of data elements provides the ELMS device with flexibility for supporting event logging and exception based reporting with a wide variety of possible triggers.

3.5.3.3 Configure Exception Reporting Data Transmission Requirements

If exception based reporting is supported, a management station needs to specify the data to be automatically transmitted by the ELMS device if user-specified conditions are satisfied. The requirements to configure the data to be automatically transmitted by the ELMS device to a management station when a monitored condition occurs follow.

3.5.3.3.1 Configure a Report Object

Upon request from a management station, the ELMS device shall store a data element whose value is to be transmitted to a management station when a user-specified condition occurs.

3.5.3.3.2 Configure a Report Group of Objects (Block)

Upon request from a management station, the ELMS device shall store a group of one or more data elements whose values are to be transmitted to a management station when a user-specified condition occurs. Creating a block object, called a report block, containing this group of data to be transmitted reduces the transmission overhead.

3.5.3.4 Configure Exception Reporting Destination

Upon request from a management station, the ELMS device shall store the destination(s), in the form of a logical name and an IP address, that pre-configured data is to be transmitted when the user-specified conditions are met. This requirement allows the management station to specify the destination(s) that the pre-configured data is to be transmitted when a user-specified condition occurs.

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3.5.3.5 Configure Exception Reporting Community

Upon request from a management station, the ELMS device shall store the community name to use when pre-configured data is transmitted when the user-specified conditions are met. This requirement allows the management station to specify the community to use for each destination that the pre-configured data is transmitted when a user-specified condition occurs.

3.5.3.6 Configure Exception Reporting Operational Mode Requirements

A management station needs to configure the operation of how and when the pre-configured data is transmitted from the ELMS device to its destination and the response of the destination management station when the data transmission is received. The requirements to configure the operations for exception based reporting follow.

3.5.3.6.1 Configure Exception Reporting Acknowledgement

Upon request from a management station, the ELMS device shall store if an acknowledgement is expected from the destination management station when pre-configured data is transmitted when user-specified conditions are met. If an acknowledgement is expected, the destination management station is expected to acknowledge receipt of the pre-configured data back to the ELMS device. If an acknowledgement from the destination management station is not received, the ELMS device will retransmit (retry) the data until an acknowledgement is received or the maximum number of retries is reached.

3.5.3.6.2 Configure Exception Reporting Aggregation

Upon request from a management station, the ELMS device shall configure whether the pre-configured data to be transmitted when user-specified conditions are met is aggregated before actual transmission. If enabled, pre-configured data to be transmitted is aggregated until a configurable number of events is exceeded, a configurable data transmission size is exceeded, a configurable period of time, or a specific event occurs. Support for aggregated data transmissions allows the reduction of data transmissions, reduces message overhead, and aggregates the data transmissions until the communications channel to the management station is available.

3.5.3.6.3 Configure Exception Reporting Queue

Upon request from a management station, the ELMS device shall configure whether the pre-configured data to be transmitted when user-specified conditions are met is queued until the communications link between the ELMS device and the destination management station is available for transmission. If enabled, pre-configured data to be transmitted to a destination management station is queued until an acknowledgement is received (if acknowledgement is expected) and other previously transmitted pre-configured data in the queue is acknowledged (if acknowledgement is expected), OR an error condition for the communications link between the ELMS device and destination management station is cleared.

3.5.3.6.4 Configure Exception Reporting (Forced)

Upon request from a management station, the ELMS device shall store whether the pre-configured data is transmitted immediately (forced) when user-specified conditions are met. If a data transmission is “forced,” the data transmission is not queued and is transmitted regardless of the current link state between the ELMS device and the destination management station. “Forced” data transmissions do not require any acknowledgement from the destination management station.

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3.5.3.6.5 Configure Exception Reporting Communications

Upon request from a management station, the ELMS device shall store the communications protocols to be used to transmit pre-configured data to a destination. The communications procotols consist of the application layer protocol (SNMP v1, SFMP), transport profile (T2 encapsulation, UDP), and port of the destination management station.

3.5.3.6.6 Configure Exception Reporting—Maximum Rate

Upon request from a management station, the ELMS device shall store the maximum number of data transmissions that can be generated in one minute for a specific trap channel. This requirement prevents an ELMS device from flooding the communications network with exception based messages.

3.5.3.7 Determine Watch Block Capabilities

Upon request from a management station, the ELMS device shall report the maximum number of data elements that the ELMS device can include in the watch blocks and the maximum number of watch blocks that can be configured in the ELMS device.

3.5.3.8 Determine Report Block Capabilities

Upon request from a management station, the ELMS device shall report the maximum number of data elements that the ELMS device can log in the report blocks and the maximum number of report blocks that can be configured in the ELMS device.

3.5.3.9 Determine Exception Reporting Trap Channel Capabilities

Upon request from a management station, the ELMS device shall report the maximum number of “trap channels” supported by the ELMS device. Each trap channel defines the destination management station, the communications protocols to be used, and an operational configuration for how and when the pre-configured data is transmitted from the ELMS device to its destination, and the response of the destination management station when the data transmission is received.

Note: The concept of a trap channel is introduced here for clarity.

3.5.3.10 Determine Exception Reporting Aggregation Capabilities

Upon request from a management station, the ELMS device shall report the capabilities of the ELMS device to aggregate pre-configured data for transmission. The ELMS device’s capabilities for exception reporting data are defined by the maximum number of events (user-defined conditions that are met) and the maximum size (in bytes) of aggregated data (for transmission).

3.5.3.11 Monitor Communications Link State

Upon request from a management station, the ELMS device shall return the state of the communications link for a specific trap channel. The valid status values are as follows:

Ready—any exception report data can be sent to the destination management station
Pending—waiting for an acknowledgement from the destination management station for the last transmitted exception report data
Error—an acknowledgement has not been received from the destination management station for the last transmitted exception report data and the allowed number of retries (to resend the exception report data) has been exceeded
Other—state not defined by this standard

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3.5.3.12 Monitor Exception Based Reporting Status

The requirements to determine the status of an alarm for a specific trap channel follow.

3.5.3.12.1 Monitor Exception Based Communications Link Error

Upon request from a management station, the ELMS device shall return an alarm value when there is an error in the communications link of a specific trap channel.

3.5.3.12.2 Monitor Exception Based Maximum Rate Exceeded

Upon request from a management station, the ELMS device shall return an alarm value when the number of data transmissions generated exceeds the maximum number of allowable data transmissions in a minute for a specific trap channel.

3.5.3.12.3 Monitor Exception Based Queue Full Error

Upon request from a management station, the ELMS device shall return an alarm value when the queue for pre-configured data to be transmitted on a specific trap channel is full.

3.5.3.13 Monitor Exception Based Transmissions

Upon request from a management station, the ELMS device shall return the sequence number assigned to the last data transmission on a specific trap channel. This requirement allows a management station to determine if a data transmission on the trap channel is a duplicate or if a data transmission has been lost.

3.5.3.14 Monitor Number of Lost Queued Exception Based Reports

Upon request from a management station, the ELMS device shall return the number of exception based reports that have been discarded due to a queue full error for a specific trap channel. This requirement allows a management station to determine if exception based reports have been lost because of a queue full error.

3.5.3.15 Monitor Number of Exception Based Events

Upon request from a management station, the ELMS device shall return the number of occurrences of a user-specified condition for a specific trap channel since the last reset of the ELMS device.

3.5.3.16 Monitor Exception Based Data

Upon request from a management station, the ELMS device shall return the contents of a trap message. A trap message consists of the user-specified condition that triggered the exception based report and the pre-configured data. If the pre-configured data is aggregated, the trap message also contains a sequence number assigned to the aggregated data.

3.5.3.17 Clear Event Class

Upon request from a management station, the ELMS device shall clear all information related to the requested event class from the report node.

3.5.3.18 Clear Event Configuration

Upon request from a management station, the ELMS device shall clear all information related to the requested event configuration from the report node.

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3.5.3.19 Clear Event Log Table

Upon request from a management station, the ELMS device shall clear all the log entries from the event logs.

3.5.3.20 Clear Report Objects

Upon request from a management station, the ELMS device shall clear all report block definitions and report block identifiers in the ELMS device.

3.5.3.21 Clear Report Blocks

Upon request from a management station, the ELMS device shall delete all report block definitions in the ELMS device.

3.5.3.22 Clear Watch Objects

Upon request from a management station, the ELMS device shall clear all watch objects and watch block definitions in the ELMS device.

3.5.3.23 Clear Watch Blocks

Upon request from a management station, the ELMS device shall delete all watch block definitions in the ELMS device.

3.5.3.24 Clear Exception Based Reporting Tables

Upon request from a management station, the ELMS device shall clear all the user-specified conditions for automatically transmitting data to the management station.

3.5.4 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.

3.5.4.1 Configure Luminaire

The following present requirements for retrieving information from a luminaire.

3.5.4.1.1 Retrieve Luminaire Information

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

3.5.4.1.1.1 Retrieve Luminaire Pole Identifier

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

3.5.4.1.1.2 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.

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3.5.4.1.1.2.1 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.

3.5.4.1.1.2.2 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.

3.5.4.1.1.2.3 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.

3.5.4.1.1.3 Retrieve Luminaire Mode

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

3.5.4.1.1.4 Retrieve Luminaire Zone

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

3.5.4.1.1.5 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.

3.5.4.1.1.6 Retrieve Luminaire Light Source Type

A management station shall be able to retrieve the information on the technology type of the light source (HID, HPS, LED, MV) of the luminaire from the ELMS device.

3.5.4.1.1.7 Retrieve Luminaire Wattage

A management station shall be able to retrieve the rated wattage of the luminaire from the ELMS device.

3.5.4.1.1.8 Retrieve Luminaire Voltage

A management station shall be able to retrieve the information on the rated voltage of the luminaire from the ELMS device.

3.5.4.1.1.9 Retrieve Luminaire Ballast / Driver Description

A management station shall be able to retrieve the information on rated voltage, rated wattage, manufacturer, and model number of ballast / driver of the luminaire from the ELMS device.

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3.5.4.1.1.10 Retrieve Luminaire Communications Protocol

A management station shall be able to retrieve the information on the communications protocol between the ballast / driver and the light source of the luminaire from the ELMS device.

3.5.4.1.2 Configure Luminaire Identification Information

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

3.5.4.1.2.1 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.

3.5.4.1.2.2 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.

3.5.4.1.3 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.

3.5.4.1.4 Manage Luminaire Color Temperature

The following describes information that a management station uses to manage spectral attributes of the luminaire from the ELMS device.

3.5.4.1.4.1 Configure Luminaire Color Temperature

A management station shall be able to configure the spectral distribution of the luminaire within the ELMS device.

3.5.4.2 Configure Electrical Service

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

3.5.4.2.1 Retrieve Electrical Service Information

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

3.5.4.2.1.1 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.

3.5.4.2.1.2 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.

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3.5.4.2.1.3 Retrieve Electrical Service Pole Identifier

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

3.5.4.3 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.

3.5.4.3.1 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.

3.5.4.3.2 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.

3.5.4.4 Configure for Light Activated Operation

Section 3.5.4.4 describes the detailed requirements for how a management station configures components of an illumination system for operations based on ambient light detection.

3.5.4.4.1 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—illumination level
b) LightHysteresis—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)

3.5.4.4.2 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—illumination level
b) LightHysteresis—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)

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3.5.4.4.3 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—illumination level
b) LightHysteresis—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 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)

3.5.4.4.4 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—illumination level
b) LightHysteresis—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.

3.5.4.5 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.

3.5.4.5.1 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.

3.5.4.5.2 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.

3.5.4.5.3 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.

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3.5.4.5.4 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 the zone.

3.5.4.5.5 Schedule ELMS Device Event

An ELMS device shall allow a 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.

3.5.4.5.6 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.

3.5.4.5.7 Support a Number of Actions

The ELMS device shall support the number of actions as defined in the Additional Specifications column in the PRL. If the Additional Specifications 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.

3.5.4.5.8 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 Specifications 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.

3.5.4.5.9 Perform Action at a Scheduled Time

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

3.5.4.6 Configure Zones

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

3.5.4.6.1 Configure Luminaire Zone [DEPRECATED]

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

> Note: This requirement was used in NTCIP 1213 v01 to v02, but has been deprecated in NTCIP 1213 v03.

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3.5.4.6.2 Configure Electrical Service Zone [DEPRECATED]

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

> Note: This requirement was used in NTCIP 1213 v01 to v02, but has been deprecated in NTCIP 1213 v03.

3.5.4.6.3 Configure Branch Circuit Zone [DEPRECATED]

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

> Note: This requirement was used in NTCIP 1213 v01 to v02, but has been deprecated in NTCIP 1213 v03.

3.5.4.6.4 Define Zones

The ELMS device shall allow a management station to define and store zone definitions within the ELMS device. Each device can be assigned to one or more zones.

3.5.4.6.5 Define Number of Zones Supported by an ELMS Device

A management station shall be able to configure an ELMS device to include (0..65535) zones.

3.5.4.6.6 Define Number of ELMS Devices for a Zone

A management station shall be able to configure an ELMS device (0..65535) for the number of ELMS devices in a single zone.

3.5.4.7 Configure Stagger Interval

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

3.5.4.7.1 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.

3.5.4.7.2 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.

3.5.4.7.3 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.

3.5.4.8 Configure Light Levels

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

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3.5.4.8.1 Configure Luminaire Light Level

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

3.5.4.8.2 Configure Electrical Service Light Level

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

3.5.4.8.3 Configure Branch Circuit Light Level

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

3.5.4.8.4 Configure Light Level for Devices in Zone

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

3.5.4.9 Configure for Manual Operation

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

3.5.4.9.1 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.

3.5.4.9.2 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).

3.5.4.9.3 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).

3.5.4.9.4 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.

3.5.4.10 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.

3.5.4.10.1 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.

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

3.5.4.10.2 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), a management station should be notified if it changes by plus or minus 20% (goes up or down by 3 A). A management station shall be able to set the baseline current level, and the levels above and below baseline that trigger a notification for in the ELMS device.

3.5.4.10.3 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.

3.5.4.11 Configure Branch Circuit

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

3.5.4.11.1 Retrieve Branch Circuit Information

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

3.5.4.11.1.1 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.

3.5.4.11.1.2 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.

3.5.4.11.1.3 Retrieve Branch Circuit Pole Identifier

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

3.5.4.11.1.4 Retrieve Branch Circuit Electrical Parameters

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

3.5.4.11.2 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.

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3.5.4.11.2.1 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 3.5.4.1.1.2.

3.5.4.11.2.2 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.

3.5.4.12 Configure Astronomical Clock

The ELMS device shall allow a management station to configure an astronomical clock within the ELMS device.

3.5.4.12.1 Configure Latitude of Installation

The ELMS device shall allow a management station to assign and store a latitude value for an astronomical clock within the ELMS device, as per SAE J2735.

3.5.4.12.2 Configure Longitude of Installation

The ELMS device shall allow a management station to assign and store a longitude value for an astronomical clock within the ELMS device, as per SAE J2735.

3.5.4.12.3 Configure Date

The ELMS device shall allow a management station to assign and store a date value for an astronomical clock within the ELMS device, as per NTCIP 1201 v03.

3.5.4.13 Retrieve Astronomical Clock Data

The following requirements allow a management station to retrieve astronomical clock data.

3.5.4.13.1 Retrieve Latitude of Installation

The ELMS device shall allow a management station to retrieve a latitude value for an astronomical clock within the ELMS device.

3.5.4.13.2 Retrieve Longitude of Installation

The ELMS device shall allow a management station to retrieve a longitude value for an astronomical clock within the ELMS device.

3.5.4.13.3 Retrieve Date

The ELMS device shall allow a management station to retrieve a date value for an astronomical clock within the ELMS device, as per NTCIP 1201 v03.

3.5.4.13.4 Retrieve Sunrise Time

The ELMS device shall allow a management station to retrieve a sunrise time for an astronomical clock within the ELMS device, as per NTCIP 1201 v03.

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3.5.4.13.5 Retrieve Sunset Time

The ELMS device shall allow a management station to retrieve a sunset time for an astronomical clock within the ELMS device, as per NTCIP 1201 v03.

3.5.4.14 Configure Photocell

The ELMS device shall allow a management station to manage a photocell within the ELMS device using the following requirements.

3.5.4.14.1 Configure Photocell for Analog, Digital, or Reverse Operations

The ELMS device shall allow a management station to configure the photocell control algorithm within the ELMS device with the parameters of digital, analog, or reverse analog operation. Digital operation is on/off operation. Analog operation is defined as increasing the commanded light level as a percentage of maximum light output in response to a decrease in the ambient light level. Reverse analog operation is defined as decreasing the commanded light level as a percentage of maximum light output in response to a decrease in the ambient light level. Reverse analog operation is often used for tunnel lighting applications.

3.5.4.14.2 Retrieve Configuration of Photocell

The ELMS device shall allow a management station to retrieve the configuration of a photocell within the ELMS device with the parameters of digital, analog, or reverse analog operation. Digital operation is on/off operation. Analog operation is defined as increasing the commanded light level as a percentage of maximum light output in response to a decrease in the ambient light level. Reverse analog operation is defined as decreasing the commanded light level as a percentage of maximum light output in response to a decrease in the ambient light level. Reverse analog operation is often used for tunnel lighting applications.

3.5.4.15 Configure Energy Meter

The ELMS device shall allow a management station to manage an energy meter within the ELMS device using the following requirements.

3.5.4.15.1 Configure Accuracy of Energy Meter

The ELMS device shall allow a management station to configure the accuracy of the energy meter within the ELMS device.

3.5.4.15.2 Retrieve Accuracy of Energy Meter

The ELMS device shall allow a management station to retrieve the accuracy of the energy meter from within the ELMS device.

3.5.4.16 Retrieve Connected Vehicle Sensor Information

The ELMS device shall allow a management station to retrieve connected vehicle parameters within the ELMS device using the following requirements.

3.5.4.16.1 Retrieve Connected Vehicle Speed

The ELMS device shall allow a management station to retrieve the connected vehicle speed within the ELMS device in SAE J2735 format.

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3.5.4.16.2 Retrieve Connected Vehicle Direction

The ELMS device shall allow a management station to retrieve the connected vehicle direction within the ELMS device in SAE J2735 format.

3.5.4.16.3 Retrieve Connected Vehicle Location

The ELMS device shall allow a management station to retrieve the connected vehicle location (latitude, longitude in SAE J2735 format) from within the ELMS device.

3.5.4.16.4 Retrieve Connected Vehicle Ambient Light Level

The ELMS device shall allow a management station to retrieve the connected vehicle ambient light level (as defined by SAE J2735) within the ELMS device.

3.5.4.16.5 Retrieve Connected Vehicle Headlight Status

The ELMS device shall allow a management station to retrieve the connected vehicle headlight status (off, low-beam, or high-beam as defined by SAE J2735) within the ELMS device.

3.5.4.16.6 Retrieve Connected Vehicle Road Friction

The ELMS device shall allow a management station to retrieve the connected vehicle road friction (as defined by SAE J2735) within the ELMS device.

3.5.4.17 Retrieve Electric Vehicle Charger Information

The ELMS device shall allow a management station to retrieve the electric vehicle charger information within the ELMS device, according to the requirements listed below:

3.5.4.17.1 Retrieve Electric Vehicle Charger Location

The ELMS device shall allow a management station to retrieve the electric vehicle charger location from within the ELMS device.

3.5.4.17.2 Retrieve Electric Vehicle Charger Manufacturer Name

The ELMS device shall allow a management station to retrieve the electric vehicle charger manufacturer name within the ELMS device.

3.5.4.17.3 Retrieve Electric Vehicle Charger Model Number

The ELMS device shall allow a management station to retrieve the electric vehicle charger model number within the ELMS device.

3.5.4.17.4 Retrieve Electric Vehicle Charger Serial Number

The ELMS device shall allow a management station to retrieve the electric vehicle charger serial number within the ELMS device.

3.5.4.17.5 Retrieve Electric Vehicle Charger Ground Fault Current Status

The ELMS device shall allow a management station to retrieve the electric vehicle charger ground fault current status from within the ELMS device.

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3.5.4.17.6 Retrieve Electric Vehicle Charger Charge Current

The ELMS device shall allow a management station to retrieve the electric vehicle charger charge current from within the ELMS device.

3.5.4.17.7 Retrieve Electric Vehicle Charger Proximity Resistance

The ELMS device shall allow a management station to retrieve the electric vehicle charger proximity resistance within the ELMS device.

3.5.4.17.8 Retrieve Electric Vehicle Charger Temperature

The ELMS device shall allow a management station to retrieve the electric vehicle charger temperature within the ELMS device.

3.5.4.17.9 Retrieve Electric Vehicle Charger Activation

The ELMS device shall allow a management station to retrieve the electric vehicle charger activation within the ELMS device.

3.5.4.17.10 Retrieve Electric Vehicle Charger Operational Status

The ELMS device shall allow a management station to retrieve the electric vehicle charger operational status within the ELMS device.

3.5.4.17.11 Retrieve Electric Vehicle Charger Total Energy Consumed

The ELMS device shall allow a management station to retrieve the electric vehicle charger total energy delivered over the functional life of the charger from within the ELMS device.

3.5.4.17.12 Retrieve Electric Vehicle Charger Energy Delivered for Current Charging Session

The ELMS device shall allow a management station to retrieve the electric vehicle charger energy for the current session from within the ELMS device.

3.5.4.17.13 Retrieve Electric Vehicle Charger Energy Delivered for Previous Charging Session

The ELMS device shall allow a management station to retrieve the electric vehicle charger energy for the previous charging session from within the ELMS device.

3.5.4.17.14 Retrieve Electric Vehicle Charger Energy Loss

The ELMS device shall allow a management station to retrieve the electric vehicle charger energy loss from within the ELMS device.

3.5.4.18 Retrieve Energy Automatic Demand Response Information

The ELMS device shall allow a management station to retrieve the energy automatic demand response information within the ELMS device, according to the requirements listed below:

3.5.4.18.1 Retrieve Electricity Price

The ELMS device shall allow a management station to retrieve the electricity price information (as specified in OpenADR) from within the ELMS device.

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3.5.4.18.2 Retrieve Energy Price

The ELMS device shall allow a management station to retrieve the energy price information (as specified in OpenADR) from within the ELMS device.

3.5.4.18.3 Retrieve Demand Charge

The ELMS device shall allow a management station to retrieve the demand charge information (as specified in OpenADR) from within the ELMS device.

3.5.4.18.4 Retrieve Bid Price

The ELMS device shall allow a management station to retrieve the bid price information (as specified in OpenADR) from within the ELMS device.

3.5.4.18.5 Retrieve Bid Load

The ELMS device shall allow a management station to retrieve the bid load information (as specified in OpenADR) from within the ELMS device.

3.5.4.18.6 Retrieve Bid Energy

The ELMS device shall allow a management station to retrieve the bid energy information (as specified in OpenADR) from within the ELMS device.

3.5.4.18.7 Retrieve Load Dispatch

The ELMS device shall allow a management station to retrieve the load dispatch information (as specified in OpenADR) from within the ELMS device.

3.5.4.18.8 Retrieve Load Control Capacity

The ELMS device shall allow a management station to retrieve the load control capacity information (as specified in OpenADR) from within the ELMS device.

3.5.4.18.9 Retrieve Load Control Offset

The ELMS device shall allow a management station to retrieve the load control offset (as specified in OpenADR) from within the ELMS device.

3.5.4.18.10 Retrieve Load Control Setpoints

The ELMS device shall allow a management station to retrieve the load control setpoints (as specified in OpenADR) from within the ELMS device.

3.5.4.18.11 Retrieve Load Control Percent Offset

The ELMS device shall allow a management station to retrieve the load control percent offset (as specified in OpenADR) from within the ELMS device.

3.5.4.18.12 Retrieve Energy Storage

The ELMS device shall allow a management station to retrieve energy storage information (as specified in OpenADR) from within the ELMS device.

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3.5.4.19 Configure Ground Fault Setpoint

The ELMS device shall allow a management station to configure a ground fault interrupter setpoint from within the ELMS device.

3.5.4.20 Retrieve Ground Fault Setpoint

The ELMS device shall allow a management station to retrieve a ground fault interrupter setpoint from within the ELMS device.

3.5.4.21 Retrieve Ground Fault Status

The ELMS device shall allow a management station to retrieve a ground fault status from within the ELMS device.

3.5.4.22 Configure Power Outage Message

The ELMS device shall allow a management station to configure a power outage message within the ELMS device.

3.5.4.23 Configure ELMS Device for Adaptive Operation

The ELMS device shall allow a management station to configure adaptive operation configuration information from the ELMS device. Adaptive operation configuration information is defined in FRs 3.5.4.16.1 – 3.5.4.16.6 Connected Vehicle Sensor and Status Information.

3.5.4.23.1 Configure Connected Vehicle Speed Setpoint

The ELMS device shall allow a management station to configure the connected vehicle speed setpoint from within the ELMS device.

3.5.4.23.2 Configure Connected Vehicle Direction Setpoint

The ELMS device shall allow a management station to configure the connected vehicle direction setpoint from within the ELMS device.

3.5.4.23.3 Configure Connected Vehicle Location Setpoint

The ELMS device shall allow a management station to configure the connected vehicle location setpoint from within the ELMS device.

3.5.4.23.4 Configure Connected Vehicle Ambient Light Level Setpoint

The ELMS device shall allow a management station to configure the connected vehicle ambient light level setpoint from within the ELMS device.

3.5.4.23.5 Configure Connected Vehicle Headlight Status Setpoint

The ELMS device shall allow a management station to configure the connected vehicle headlight status setpoint from within the ELMS device.

3.5.4.23.6 Configure Connected Vehicle Road Friction Setpoint

The ELMS device shall allow a management station to configure the connected vehicle road friction setpoint from within the ELMS device.

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3.5.4.24 Retrieve ELMS Device Adaptive Operation Configuration

The ELMS device shall allow a management station to retrieve adaptive operation configuration information from the ELMS device. Adaptive operation configuration information is defined in FRs 3.5.4.16.1 – 3.5.4.16.6 Connected Vehicle Sensor and Status Information.

3.5.4.24.1 Retrieve Connected Vehicle Speed Setpoint

The ELMS device shall allow a management station to retrieve the connected vehicle speed setpoint from within the ELMS device.

3.5.4.24.2 Retrieve Connected Vehicle Direction Setpoint

The ELMS device shall allow a management station to retrieve the connected vehicle direction setpoint from within the ELMS device.

3.5.4.24.3 Retrieve Connected Vehicle Location Setpoint

The ELMS device shall allow a management station to retrieve the connected vehicle location setpoint from within the ELMS device.

3.5.4.24.4 Retrieve Connected Vehicle Ambient Light Level Setpoint

The ELMS device shall allow a management station to retrieve the connected vehicle ambient light level setpoint from within the ELMS device.

3.5.4.24.5 Retrieve Connected Vehicle Headlight Status Setpoint

The ELMS device shall allow a management station to retrieve the connected vehicle headlight status setpoint from within the ELMS device.

3.5.4.24.6 Retrieve Connected Vehicle Road Friction Setpoint

The ELMS device shall allow a management station to retrieve the connected vehicle road friction setpoint from within the ELMS device.

3.5.5 Control Device

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

3.5.5.1 Control Luminaire

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

3.5.5.1.1 Control Luminaire by Permanent/Continuous Override

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

3.5.5.1.2 Control Luminaire by Transitory Override

The ELMS device shall allow a 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.

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3.5.5.1.3 Control Luminaire by Timed Override

The ELMS device shall allow a 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.

3.5.5.1.4 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 a management station, or in cases of power failure, upon resumption of power to the luminaire. Stagger interval shall be expressed in seconds.

3.5.5.1.5 Control Luminaire by Photocell

A management station shall be able to control a luminaire by use of a photocell.

3.5.5.1.6 Control Luminaire by Adaptive Means

A management station shall be able to control a luminaire in an adaptive mode of operations, such as when the luminaire turns on or off based on connected vehicle sensor and status information.

3.5.5.2 Control Electrical Service

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

3.5.5.2.1 Control Electrical Service by Permanent/Continuous Override

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

3.5.5.2.2 Control Electrical Service by Transitory Override

The ELMS device shall allow a 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.

3.5.5.2.3 Control Electrical Service by Timed Override

The ELMS device shall allow a 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.

3.5.5.2.4 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).

3.5.5.2.5 Control Electrical Service by Photocell

A management station shall be able to control a luminaire by use of a photocell.

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3.5.5.2.6 Control Electrical Service by Adaptive Means

A management station shall be able to control a luminaire in an adaptive mode of operations, such as when the electrical service turns on or off based on connected vehicle sensor and status.

3.5.5.3 Control Branch Circuit

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

3.5.5.3.1 Control Branch Circuit by Permanent/Continuous Override

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

3.5.5.3.2 Control Branch Circuit by Transitory Override

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

3.5.5.3.3 Control Branch Circuit by Timed Override

The ELMS device shall allow a 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 is expressed in seconds.

3.5.5.3.4 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 a management station, or in cases of power failure, upon resumption of power to the branch circuit. Stagger intervals are expressed in seconds.

3.5.5.3.5 Control Branch Circuit by Photocell

A management station shall be able to control a branch circuit by use of a photocell.

3.5.5.3.6 Control Branch Circuit by Adaptive Means

A management station shall be able to control a branch circuit in an adaptive mode of operations, such as when the branch circuit turns on or off based on connected vehicle sensor and status information. Adaptive mode includes scheduled control functions.

3.5.5.4 Control Electric Vehicle Charger

A management station shall be able to control an electric vehicle charger according to the requirements that follow:

3.5.5.4.1 Control Soft Start

A management station shall be able to control electric vehicle charger soft start functionality within the ELMS device so that electrical amperage inrush effects are minimized.

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3.5.5.4.2 Control Automatic Reclosure on Fault Time

A management station shall be able to control electric vehicle charger automatic reclosure on fault time within the ELMS device so that after a fault has been detected the unit restarts into a corrected mode.

3.5.5.4.3 Control Power-Up Delay Minimum Time

A management station shall be able to control electric vehicle charger power-up minimum delay time within the ELMS device.

3.5.5.4.4 Control Power-Up Delay Maximum Time

A management station shall be able to control electric vehicle charger power-up maximum delay time within the ELMS device.

3.5.5.4.5 Control Electric Vehicle Charger Activation

A management station shall be able to control electric vehicle charger activation within the ELMS device.

3.5.5.5 Control Devices by Zone

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

3.5.5.5.1 Control Devices in Zone by Permanent/Continuous Override

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

3.5.5.5.2 Control Devices in Zone by Transitory Override

The ELMS device shall allow a management station to remotely turn on or off the ELMS devices assigned to the zone and disable 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.

3.5.5.5.3 Control Devices in Zone by Timed Override

The ELMS device shall allow a 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.

3.5.5.5.4 Control Devices in Zone by Photocell

A management station shall be able to control a luminaire by use of a photocell.

3.5.5.5.5 Control Devices in Zone by Adaptive Means

A management station shall be able to control devices in a zone in an adaptive mode of operations, such as when the zone turns on or off based on connected vehicle sensor and status information.

3.5.6 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.

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3.5.6.1 Monitor Luminaire

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

3.5.6.1.1 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.

3.5.6.1.2 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.

3.5.6.1.3 Retrieve Luminaire Operating 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 a 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.

3.5.6.1.4 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.

3.5.6.1.5 Retrieve Luminaire Light Level Output

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

3.5.6.1.6 Retrieve Luminaire Status

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

3.5.6.1.7 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.

3.5.6.1.8 Retrieve Luminaire Ballast/Driver Status

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

3.5.6.1.9 Retrieve Luminaire Starter Status

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

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3.5.6.2 Monitor Electrical Service

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

3.5.6.2.1 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.

3.5.6.2.2 Retrieve Electrical Service Hours

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

3.5.6.2.3 Retrieve Electrical Service Operational Status

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

3.5.6.2.4 Retrieve Electrical Service Energy 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).

3.5.6.2.5 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.

3.5.6.2.6 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.

3.5.6.3 Monitor Branch Circuit

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

3.5.6.3.1 Retrieve Branch Circuit Energy Readings

A management station shall be able to retrieve the current, voltage, and energy 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.

3.5.6.3.2 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.

3.5.6.3.3 Retrieve Branch Circuit Breaker Status

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

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3.5.6.3.4 Retrieve Branch Circuit Operational Status

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

3.5.6.3.5 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 2.5.1.

3.5.6.3.6 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.

3.5.7 Backward Compatibility Requirements

The following defines the requirements for backward compatibility.

3.5.7.1 NTCIP 1213 v02—Retrieve Photocell State

A management station shall be able to retrieve current state of the photocell.

3.5.7.2 NTCIP 1213 v02—Retrieve Photocell Description

A management station shall be able to retrieve a description of the photocell.

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Section 4
Dialogs [Normative]

Section 4 is intended for the developers of management stations and ELMS devices. Other readers might find Section 3 and Section 5 helpful to gain a full understanding of NTCIP 1213 v03 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]

Section 4.2 defines 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 4.2 describes specific dialogs for most of the functional requirements listed in Section 3.5. 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 7.

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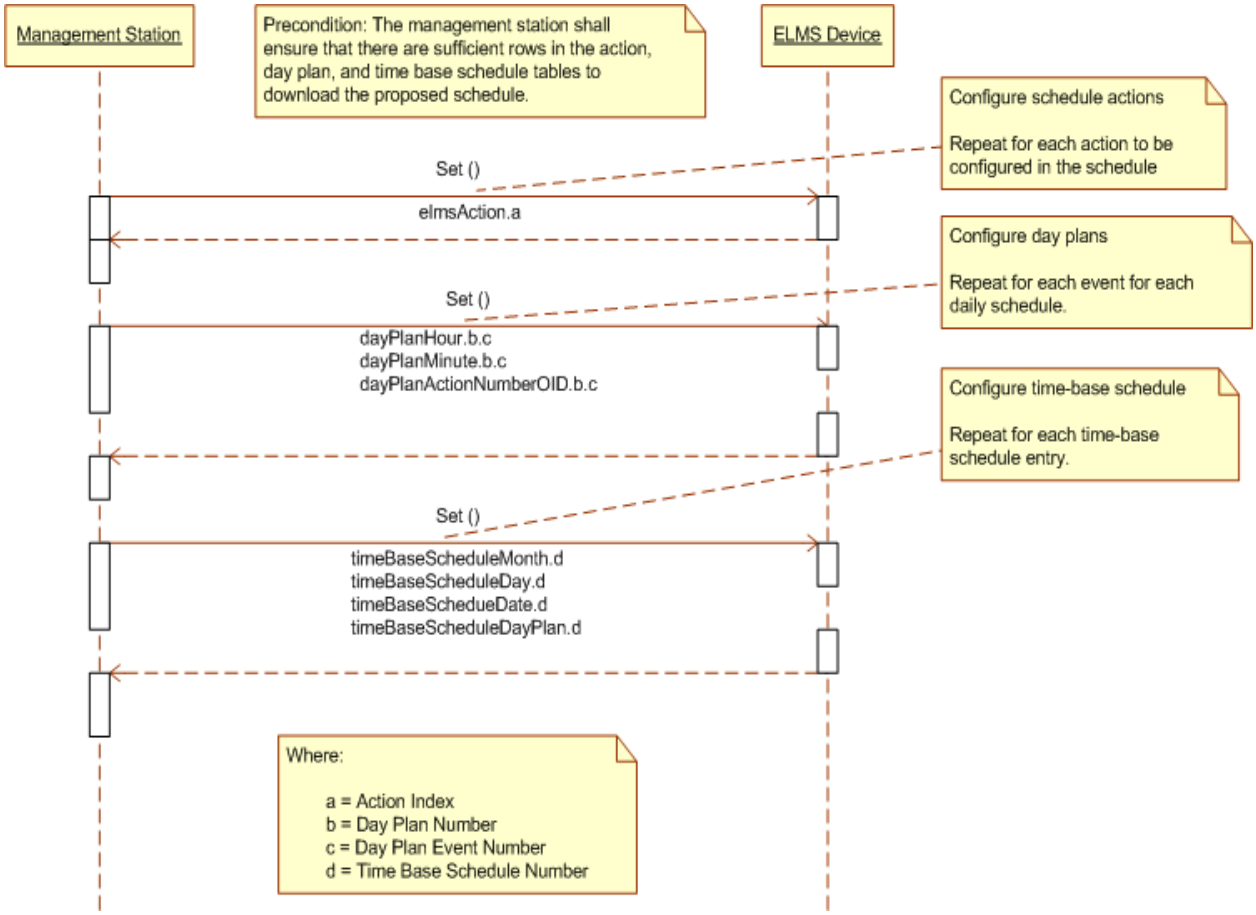


Figure 7 Sample Sequence Diagram for Schedule Feature

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 8 provides a sample VOPC diagram.

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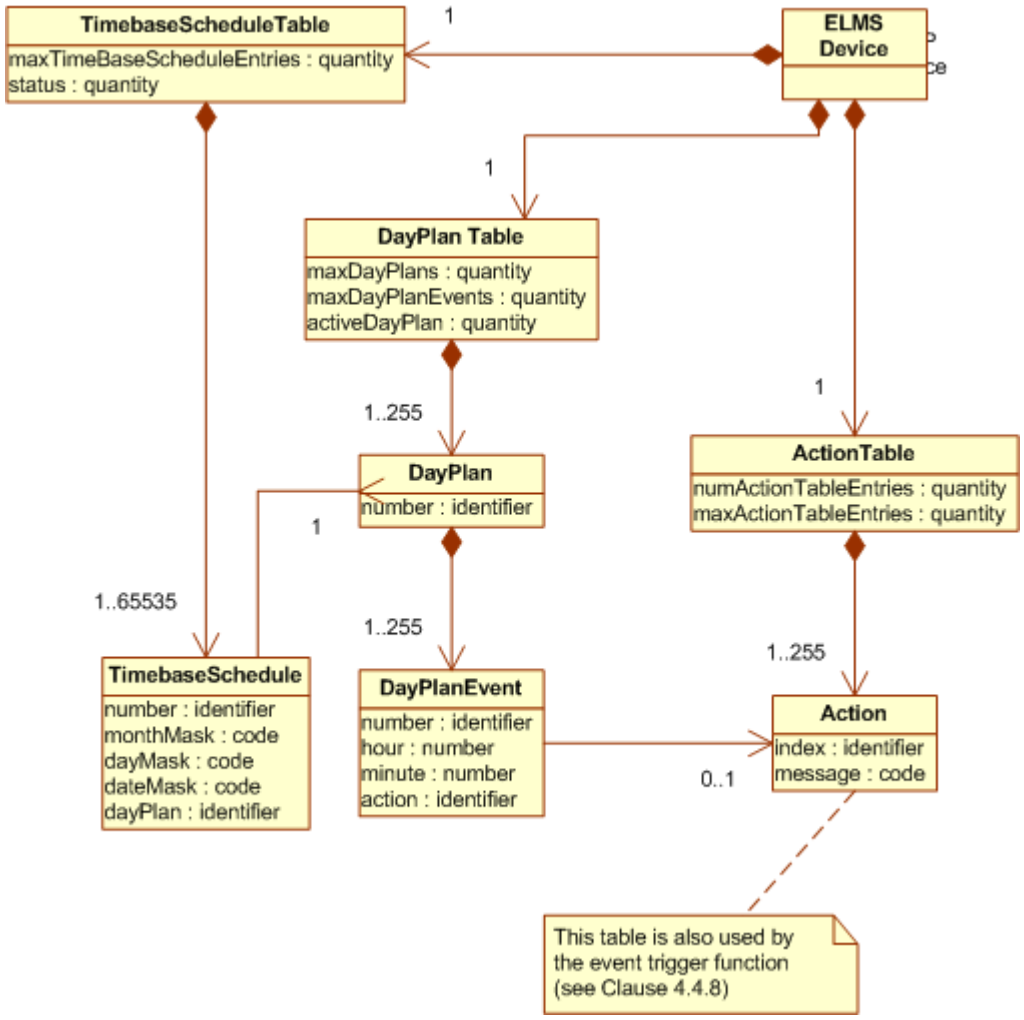


Figure 8 Sample VOPC Diagram for Schedule Feature

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 canceled.

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.

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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) dictates 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 Specified Dialogs

Section 4.2 presents the standardized dialogs (i.e., sequence of data exchanges) that fulfill various requirements. As a management station largely drives SNMP communications, most of the requirements define how the use of the interface affects a management station.

NTCIP standards are based on SNMP. This protocol offers a high degree of flexibility as to how a management station structures its requests. For example, with SNMP, a 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, Annex G 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

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conformant management station. Thus, fully testing a management station for conformance is a relatively straightforward 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 and Annex G 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 a 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, a management station shall not transmit any other data across the communications channel until the earlier of:
    1) A management station receives a response from the device; or
    2) The expiration of the response time.
g) If the response indicates an error occurred in the operation, a 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.

4.2.1 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) A 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 4.2.5 describes the dialog used to configure the actions, day plan events, day plans, and time base schedule table entries for the luminaire schedule.

4.2.2 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:

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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) A 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 4.2.5 describes the dialog used to configure the actions, day plan events, day plans, and time base schedule table entries for the electrical schedule.

4.2.3 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) A management station shall SET the following object to the desired value for the ELMS device:

branchcircuitSwitchMode.x

Where:
x = branchcircuitindex

Note: This dialog is used to configure the operating mode for the branch circuit to use the schedule. Section 4.2.5 describes the dialog used to configure the actions, day plan events, day plans, and time base schedule table entries for the branch circuit schedule.

4.2.4 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) A 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 4.2.5 describes the dialog used to configure the actions, day plan events, day plans, and time base schedule table entries for the device schedule.

4.2.5 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:

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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) a 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 a 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: 4.2.1, 4.2.2, 4.2.3, or 4.2.4.
e) For each action to be defined in the action table, a 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, a 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).

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g) For each time base schedule entry, a 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).

4.2.6 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) a 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, a 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, a 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, a management station shall GET the following objects from the ELMS device;

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

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Where:
a = scheduleActionIndex

4.2.7 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) a management station shall be able to establish communication with the ELMS device that has access to the luminaire dim level value.
b) A 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 luminaire 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, a 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.

4.2.8 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) a management station shall be able to establish communication with the ELMS device that has access to the dimming parameters identified in this dialog.
b) A 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 luminaires 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, a management station shall SET the following object:

electricalserviceDimWarmUpInterval.x

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

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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.

4.2.9 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) a management station shall be able to establish communication with the ELMS device that has access to the dimming parameters identified in this dialog.
b) A 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 luminaires 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.

4.2.10 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) a 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 a management station prior to execution of this dialog.
c) A 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

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d) The ability to dim requires that the luminaires 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.

4.2.11 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) a management station shall be able to establish communication with the ELMS device that has access to the ground fault detector configuration information.
b) A 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) A management station operator manually determines any adjustments to the ground fault detector leakage current threshold.
d) A 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

4.2.12 Control Luminaire in Timed Override

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

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

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luminaireSwitchModeTime.x

Where:
x = luminaireIndex

c) A 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

4.2.13 Control Electrical Service in Timed Override

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

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

electricalserviceSwitchModeTime.x

Where:
x = electricalserviceIndex

c) A 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

4.2.14 Control Branch Circuit in Timed Override

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

a) (As a precondition) a management station shall be able to establish communication with the ELMS device that has access to the branch circuit switch mode.
b) A management station shall SET the following object in the ELMS device to the desired value to set up 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

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Where:
x = branchcircuitIndex

4.2.15 Control Devices in Zone in Timed Override

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 set up 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.

4.2.16 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:

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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 the device had an unknown error.

4.2.17 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

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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.

4.2.18 Manage Tables

Standardized dialogs for managing tables are defined in the following subsections.

4.2.18.1 Generic Retrieve Table Dialog

Note: This is a generic dialog that is referenced by requirements in the RTM with specific object names.

The list of objects provided by the specific dialog shall include:

a) An object that indicates the number of rows in the table;
b) The object(s) that serve as the index field of the table row; and
c) The list of columnar objects to be retrieved from the table.

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

a) The management station shall GET the number of rows in the table.
b) For each row of the table, the management station shall GET all objects referenced by the specific dialog that references this generic dialog, except for the number of rows object and the index object(s).

For example, the standardized dialog for a management station to identify the hardware and software configuration of an NTCIP device would be as follows:

a) The management station shall GET the object globalMaxModules.0.
b) For each row in the module table, the management station shall GET the following objects:
    1) moduleDeviceNode.x;
    2) moduleMake.x;
    3) moduleModel.x;
    4) moduleVersion.x;
    5) moduleType.x.

Where:

x = module number

4.2.18.2 Generic Retrieve Table Row Dialog

Note: This is a generic dialog that is referenced by other dialogs with specific object names.

The list of objects provided by the specific dialog shall include:

a) The object(s) that serve as the index field of the table row; and
b) The list of columnar objects to be retrieved from the table.

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

a) (Precondition) The management station shall be aware of which row of the table is to be retrieved.
b) For the specified row, the management station shall GET all objects referenced by the specific dialog that references this generic dialog, except for the index object(s).

4.2.18.3 Generic Configure Table Row

Note: This is a generic dialog that is referenced by other dialogs with specific object names.

The list of objects provided by the specific dialog shall include:

a) The object(s) that serve as the index field of the table row; and
b) The list of columnar objects to be configured and their desired values.

The standardized dialog for a management station to configure a table row shall be as follows:

a) (Precondition) The management station shall be aware of which row in the table is to be configured.
b) For the specified row, the management station shall SET all objects (to their desired values) referenced by the specific dialog that references this generic dialog, except for the index object(s).

4.2.19 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.

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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.

4.2.20 Configure Luminaire 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 luminaire 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.

4.2.21 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:

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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.

4.2.22 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

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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.

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4.2.23 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.

4.2.24 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:

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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.

4.2.25 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:

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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.

4.2.26 Configure Energy 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 branch circuit 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.

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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.

4.2.27 Configure Periodic Energy 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

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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:

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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

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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.

4.2.28 Configure Energy 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.

4.2.29 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.

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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.

4.2.30 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"

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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.

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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 v03 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 indicates 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:    1213v0337c.MIB
-- Description: This MIB defines electrical and lighting management
--              systems (ELMS) objects
-- Source:      NTCIP 1213 v03.37c
-- MIB Revision History:
-- 03/08/22     Created MIB following corrections to enumerations in
--              NTCIP 1213 v02 so it can compile, and the Standards
--              Verification Tester (SVT).
-- 03/12/22     Updated MIB to correct compilation errors.
-- 05/23/22     Updated object definitions from STATUS optional to STATUS
--              mandatory
--
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```

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--or software products intended for field implementation;
--c) use of the DD or MIB is restricted in that the syntax fields may only
--be modified to define: 1) a more restrictive subrange; or 2) a subset of
--the standard enumerated values; or 3) a set of retired and defined
--enumerated values for systems supporting multiversion interoperability;
--d) the description field may be modified but only to the extent that:
--1) the more restrictive subrange is defined; and 2) only those bit values
--orenumerated values that are supported are listed; and
--e) each derivative work of the MIB uses the same module name followed
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```
--
*********************************************************************
```

5.2 Data Elements

```
NTCIP1213v03 DEFINITIONS ::= BEGIN
IMPORTS
  OBJECT-TYPE
      FROM RFC-1212
  IpAddress, Counter, Gauge, Opaque
    FROM RFC1155-SMI
  profiles, devices
    FROM NTCIP8004-v2;
--
-- Type definitions
--
PositionReference ::= OCTET STRING (SIZE (0..4))
--
-- Node definitions
--
elms OBJECT IDENTIFIER ::= { devices 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      mandatory
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,
```

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```
  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      mandatory
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),
                astronomical-control (6),
                adaptive (7)}
ACCESS      read-write
STATUS      mandatory
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 luminaire is NOT controlled by photo-control, a dim value is
specified.
photo-control - The ELMS Device is controlled by photo-control.
on - The luminaire is on.
off - The luminaire is off.
non-schedule - The ELMS Device is not controlled by schedule.
astronomical-control - The ELMS Device is controlled by astronomical clock
functionality.
adaptive - allow control by inputs of schedule, astronomical clock, ambient
light light and connected vehicle information.

<Data Concept Type>
ENUMERATION {
                dim (1),
                photo-control (2),
                on (3),
                off (4),
                non-schedule (5),
                astronomical-control (6),
```

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```
                adaptive (7)}"
::= {elmsScheduleActionEntry 2}
```

5.3.2.3 Schedule Action Type

```
scheduleActionType OBJECT-TYPE
SYNTAX      INTEGER {
                luminaire (1),
                branchCircuit (2),
                electricalService (3),
                zone (4),
                evcharger (5)
                }
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the device that this row is to control. An action can
control a luminaire, branch circuit, electrical service, electric vehicle
charger 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 an 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),
                evcharger (5)
                }"
::= {elmsScheduleActionEntry 3}
```

5.3.2.4 Schedule Action Number

```
scheduleActionNumber OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-write
STATUS      mandatory
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      mandatory
```

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```
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      mandatory
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

5.4.1 Luminaire Table

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

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,
  luminaireCond                   INTEGER,
  luminaireBurnCond               INTEGER,
  luminairePoleCond               INTEGER,
  luminaireTemp                   INTEGER,
  luminaireMonthlyBurnTime        Counter,
  luminaireMonthlyExpectedBurnTime INTEGER,
  luminaireTotalBurnTime          Counter,
  luminaireLocationProfile        INTEGER,
  luminaireLightThreshold         INTEGER,
  luminaireHoldInterval           INTEGER,
  luminaireLightHysteresis        INTEGER,
```

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```
  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,
  luminairePhotocellIndex          INTEGER,
  luminaireLightSourceType         INTEGER,
  luminaireWattage                 INTEGER,
  luminaireSupplyVoltage           INTEGER,
  luminaireBallastDriverDescription OCTET STRING,
  luminaireCommProtocol            INTEGER,
  luminaireUnitsOfReading          OCTET STRING,
  luminairespectraloutput          INTEGER
}
```

5.4.1.1 Luminaire Index

```
luminaireIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      mandatory
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      mandatory
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}
```

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5.4.1.3 Luminaire Mode

```
luminaireMode OBJECT-TYPE
SYNTAX      INTEGER {
        twentyFourHr(1),
        photcell(2),
        astronomical(3),
        adaptive (4)}
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the operating mode of the luminaire.
<DescriptiveName>luminaireTable.mode:code
<Valid Value Rule>
value - description
twentyFourHr - the luminaire's primary mechanism of control is the defined by
Luminaire Switch Mode
photocell - The luminaire's primary mechanism of control is the photocell
astronomical - The luminaire's primary mechanism of control is the
astronomical clock
adaptive - the primary mechanism of control is through connected vehcile
information

<Data Concept Type>
ENUMERATION {
        twentyFourHr(1),
        photcell(2),
        astronomical(3),
        adaptive 4}"
::= {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),
        adaptive (9)
}
ACCESS      read-write
STATUS      mandatory
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
```

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```
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
adaptive - allow control by inputs of schedule, astronomical clock, ambient
light light and connected vehicle information
<Data Concept Type>
ENUMERATION {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8),
        adaptive (9)}"
::= {luminaireEntry 4}
```

5.4.1.5 Luminaire Switch State

```
luminaireSwitchState OBJECT-TYPE
SYNTAX      INTEGER {
        on(1),
        off(2) }
ACCESS      read-only
STATUS      mandatory
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 Condition

```
luminaireCond OBJECT-TYPE
SYNTAX      INTEGER {
        ok(1),
        noOp(2),
        cyclingOn(3),
        cyclingOff(4),
        noDataComm(5)}
ACCESS      read-only
STATUS      mandatory
```

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```
DESCRIPTION "Describes the present condition of the luminaire.
<DescriptiveName>luminaireTable.luminaireCond: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 luminaire 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 Burn Condition

```
luminaireBurnCond OBJECT-TYPE
SYNTAX      INTEGER {
--      On(1), originally
--      Off(2), originally
        on(1),
        off(2),
        noDataComm(3)}
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Describes the present burn condition of the luminaire.
<DescriptiveName>luminaireTable.luminaireburnCond:code
<Valid Value Rule>
value - description
on - The luminaire  is burning (on)
off - The luminaire  is off
noDataComm - unable to determine burning state of the luminaire 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      mandatory
DESCRIPTION "Describes the present condition of the pole.
<DescriptiveName>luminaireTable.poleCond:code
<Valid Value Rule>
```

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```
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      mandatory
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 Celsius"
::= {luminaireEntry 9}
```

5.4.1.10 Luminaire Monthly Burn Time

```
luminaireMonthlyBurnTime OBJECT-TYPE
SYNTAX      Counter
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the luminaire'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 {
        sec-2419200 (1),
        sec-2505600 (2),
        sec-2592000 (3),
        sec-2678400 (4)
--      2419200 (1), originally
--      2505600 (2), originally
--      2592000 (3), originally
--      2678400 (4)  originally
```

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```
            }
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the luminaire'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 {
        sec-2419200 (1),
        sec-2505600 (2),
        sec-2592000 (3),
        sec-2678400 (4)}"
::= {luminaireEntry 11}
```

5.4.1.12 Luminaire Total Burn Time

```
luminaireTotalBurnTime OBJECT-TYPE
SYNTAX      Counter
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the luminaire'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      mandatory
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 {
```

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```
                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      mandatory
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 luminaire 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
luminaire to turn on.
<DescriptiveName>luminaireTable.lightThreshold:quantity
<Data Concept Type>
INTEGER (0..100,000)
<Unit>none"
::= {luminaireEntry 14}
```

5.4.1.15 Luminaire Hold Interval

```
luminaireHoldInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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>none"
```

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```
::= {luminaireEntry 16}
```

5.4.1.17 Luminaire Delay Interval

```
luminaireDelayInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      mandatory
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      mandatory
DESCRIPTION "Indicates the present dim level of the device. This value shall
be from 0 to 100 percent of maximum luminaire 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      mandatory
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      mandatory
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)
```

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```
<Unit>millivolts (mV) RMS"
::= {luminaireEntry 20}
```

5.4.1.21 Luminaire Current

```
luminaireCurrent OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-only
STATUS      mandatory
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      mandatory
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      mandatory
DESCRIPTION "Indicates the status of the luminaire starter.
<DescriptiveName>luminaireTable.starterStatus:code
<Valid Value Rule>
value - description
ok - indicates the starter is operating correctly
```

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```
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      mandatory
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      mandatory
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      mandatory
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      mandatory
```

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```
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      mandatory
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      mandatory
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      mandatory
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
```

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```
STATUS      mandatory
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      mandatory
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}
```

5.4.1.33 Luminaire Photocell Index

```
luminairePhotocellIndex OBJECT-TYPE
SYNTAX INTEGER (0..8)
ACCESS read-write
STATUS mandatory
DESCRIPTION "Photocell identifier for an ELMS device. This number references
the index of the Photocell table
<DescriptiveName>luminairePhotocellIndex:quantity
<Data Concept Type>
INTEGER (1..8)"
::= {luminaireEntry 33}
```

5.4.1.34 Luminaire Light Source Type

```
luminaireLightSourceType OBJECT-TYPE
SYNTAX      INTEGER {
        hID(1),
        hPS (2),
        lED (3),
        mV (4)}
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the luminaire light source type, high intensity
discharge (HID), high pressure sodium (HPS), light emitting diode (LED) or
mercury vapor (MV).
<DescriptiveName>luminaireTable.luminaireLightSourceType
:code
<Valid Value Rule>
value - description
hID(1),
hPS (2),
```

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```
lED (3),
mV (4)}
<Data Concept Type>
ENUMERATION {
        hID(1),
        hPS (2),
        lED (3),
        mV (4)}
::= {luminaireEntry 34}
```

5.4.1.35 Luminaire Wattage

```
luminaireWattage OBJECT-TYPE
SYNTAX      INTEGER (0.. 65535)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates supply wattage to luminaire"
The value 0 shall indicate the value is not in use.
<DescriptiveName> luminaireWattage
:quantity
<Data Concept Type>
INTEGER (0.. 65535)"
::= {luminaireEntry 35}
```

5.4.1.36 Luminaire Supply Voltage

```
luminaireSupplyVoltage OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " Indicates supply voltage to luminaire).
The value 0 shall indicate the value is not in use.
<DescriptiveName>luminaireSupplyVoltage
<Data Concept Type>
INTEGER (0..65535)"
::= {luminaireEntry 36}
```

5.4.1.37 Luminaire Ballast / Driver Description

```
luminaireBallastDriverDescription OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..255))
ACCESS      read-only
STATUS      mandatory
DESCRIPTION
"<Definition>This object specifies a description of the ballast / drive in
ASCII characters, including rated voltage, rated wattage, manufacture and
model number.
<DescriptiveName> luminaireBallastDriverType
:text
<Data Concept Type>
OCTET STRING (SIZE (0..255))"
::= { luminaireEntry 37 }
```

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5.4.1.38 Luminaire Communications Protocol

```
luminaireCommProtocol OBJECT-TYPE
SYNTAX      INTEGER {
        relay (1),
        zerototenvolt (2),
        dALI (3),
        other (4)}
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the communications protocol between the ballast /
driver and the light source.
<DescriptiveName> luminaireCommProtocol
<Valid Value Rule>
value - description
relay- indicates the communications is by on/off relay
zerototenvolt - indicates the communications is by a zero to ten volt dimming
control signal
dALI- indicates the communciations is by the Digital Addressable Lighting
Interface standard known as DALI
other - indicates other form of communciations
<Data Concept Type>
ENUMERATION {
        relay (1),
        zerototenvolt (2),
        dALI (3),
        other (4)}
::= {luminaireEntry 38}
```

5.4.1.39 Luminaire Light Level Units of Reading

```
luminaireUnitsOfReading OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "A textual description of the luminaire's light level units of
reading.
<DescriptiveName>luminaireTable.UnitsOfReading:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {luminaireEntry 39}
```

5.4.1.40 Luminaire Spectral Output

```
luminairespectraloutput OBJECT-TYPE
SYNTAX      INTEGER (0..10001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is the mean spectral output of the luminaire in degrees
Kelvin. Acceptable range is 0 to 10001. The value 10001 shall indicate an
error condition or missing value.
<DescriptiveName> luminairespectraloutput
:quantity
<Data Concept Type>
INTEGER (0..10001)
<Unit>degrees Kelvin"
::= { luminaireEntry 40}
```

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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 mandatory
DESCRIPTION "A table containing electrical service parameters."
::= { elmsElectricalService 1 }

electricalserviceEntry OBJECT-TYPE
SYNTAX ElectricalserviceEntry
ACCESS not-accessible
STATUS mandatory
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,
  electricalservicePhotocellIndex    INTEGER,
  electricalserviceUnitsOfReading    OCTET STRING
}
```

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5.5.1.1 Electrical Service Index

```
electricalserviceIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      mandatory
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      mandatory
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      mandatory
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}
```

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5.5.1.4 Electrical Service Pole Identifier

```
electricalservicePoleIdentifier OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      mandatory
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 {
        twentyFourHr(1),
        photcell(2),
        astronomical(3),
        adaptive (4)}
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the operating mode of the electricalService.
<DescriptiveName>electricalServiceTable.mode:code
<Valid Value Rule>
value - description
twentyFourHr - 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 clockadaptive - the primary mechanism of control is through
inputs of schedule, astronomical clock, ambient light light and connected
vehicle information.

<Data Concept Type>
ENUMERATION {
        twentyFourHr(1),
        photcell(2),
        astronomical(3),
        adaptive(4)} }"
::= {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),
       adaptive (9)
}
```

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```
ACCESS      read-write
STATUS      mandatory
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 specified 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
adaptive - the primary mechanism of control is through inputs of schedule,
astronomical clock, ambient light light and connected vehicle information.

<Data Concept Type>
ENUMERATION {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8),
        adaptive(9) }"
::= {electricalserviceEntry 6}
```

5.5.1.7 Electrical Service Switch Mode Time

```
electricalserviceSwitchModeTime OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      mandatory
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}
```

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5.5.1.8 Electrical Service Operation Hours

```
electricalserviceOpHours OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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      mandatory
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}
```

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5.5.1.11 Electrical Service Voltage BC

```
electricalserviceVoltageBC OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      mandatory
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      mandatory
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      mandatory
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      mandatory
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)
```

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```
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      mandatory
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      mandatory
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      mandatory
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}
```

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5.5.1.18 Electrical Service Light Threshold

```
electricalserviceLightThreshold OBJECT-TYPE
SYNTAX      INTEGER (0..100000)
ACCESS      read-write
STATUS      mandatory
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>none"
::= {electricalserviceEntry 18}
```

5.5.1.19 Electrical Service Hold Interval

```
electricalserviceHoldInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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 conditions.
<DescriptiveName>electricalServiceTable.LightHysteresis:quantity
<Data Concept Type>
-- was INTEGER (0..100000)
INTEGER (0..10000)
<Unit>none"
::= {electricalserviceEntry 20}
```

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5.5.1.21 Electrical Service Delay Interval

```
electricalserviceDelayInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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      mandatory
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      mandatory
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
```

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```
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      mandatory
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      mandatory
DESCRIPTION "Indicates the present arc fault 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 {
```

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```
        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      mandatory
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      mandatory
DESCRIPTION "Describes the present state of the electrical service's relay.
Note: The OBJECT-TYPE was changed from electricalserviceStaggerIntervale to
electricalserviceSwitchState at some point in object development. NTCIP 1213
v03 reflects electricalserviceSwitchState in both Section 5.5.1.28 and the
RTM.
<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}
```

5.5.1.29 Electrical Service Photocell Index

```
electricalservicePhotocellIndex OBJECT-TYPE
SYNTAX INTEGER (0..8)
ACCESS read-write
STATUS mandatory
DESCRIPTION "Photocell identifier for an ELMS device. This number references
the index of the Photocell table
<DescriptiveName> electricalserviceTable.PhotocellIndex:quantity
<Data Concept Type>
INTEGER (1..8)"
::= {electricalserviceEntry 29}
```

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5.5.1.30 Electrical Service Light Level Units of Reading

```
electricalserviceUnitsOfReading OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "A textual description of the electrical service's light level
units of reading.
<DescriptiveName>electricalserviceTable.UnitsOfReading:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {electricalserviceEntry 30}
```

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 mandatory
DESCRIPTION "A table containing branch circuit parameters."
::= { elmsBranchCircuit 1 }

branchcircuitEntry OBJECT-TYPE
SYNTAX BranchcircuitEntry
ACCESS not-accessible
STATUS mandatory
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,
```

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```
  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,
  branchcircuitPhotocellIndex                   INTEGER,
  branchcircuitUnitsOfReading                   OCTET STRING
}
```

5.6.1.1 Branch Circuit Index

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

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

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5.6.1.5 Branch Circuit Mode

```
branchcircuitMode OBJECT-TYPE
SYNTAX      INTEGER {
        twentyFourHr(1),
        photocell(2),
        astronomical(3),
        adaptive (4)}
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the operating mode of the branchCircuit.
<DescriptiveName>branchCircuitTable.mode:code
<Valid Value Rule>
value - description
twentyFourHr - 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
adaptive - the primary mechanism of control is through inputs of schedule,
astronomical clock, ambient light light and connected vehicle information.

<Data Concept Type>
ENUMERATION {
        twentyFourHr(1),
        photcell(2),
        astronomical(3),
        adaptive (4)}"
::= {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),
       adaptive (9)
}
ACCESS      read-write
STATUS      mandatory
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>
```

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```
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
adaptive - allow control by inputs of schdule, astronomical clock, ambient
light light and connected vehicle information.
<Data Concept Type>
ENUMERATION {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8),
        adaptive (9)}"
::= {branchcircuitEntry 6}
```

5.6.1.7 Branch Circuit Switch Mode Time

```
branchcircuitSwitchModeTime OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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}
```

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5.6.1.9 Branch Circuit Operational Condition

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

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5.6.1.12 Branch Circuit VoltageCA

```
branchcircuitVoltageCA OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      mandatory
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      mandatory
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      mandatory
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      mandatory
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)
```

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```
<Unit>millivolts (mV) RMS"
::= {branchcircuitEntry 15}
```

5.6.1.16 Branch Circuit Current

```
branchcircuitCurrent OBJECT-TYPE
SYNTAX      INTEGER (0..100001)
ACCESS      read-only
STATUS      mandatory
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      mandatory
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      mandatory
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>none"
::= {branchcircuitEntry 18}
```

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5.6.1.19 Branch Circuit Hold Interval

```
branchcircuitHoldInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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>none"
::= {branchcircuitEntry 20}
```

5.6.1.21 Branch Circuit Delay Interval

```
branchcircuitDelayInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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>
```

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```
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      mandatory
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      mandatory
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      mandatory
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"
```

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```
::= {branchcircuitEntry 25}
```

5.6.1.26 Branch Circuit Ground Fault Leakage Current Threshold

```
branchcircuitGroundFaultLeakageCurrentThreshold OBJECT-TYPE
SYNTAX      INTEGER (0..100001)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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      mandatory
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
```

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```
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      mandatory
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      mandatory
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}
```

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5.6.1.31 Branch Circuit Power Meter Condition

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

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5.6.1.34 Branch Circuit Power Meter Voltage BC

```
branchcircuitPowerMeterVoltageBC  OBJECT-TYPE
SYNTAX      INTEGER (0..660001)
ACCESS      read-only
STATUS      mandatory
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      mandatory
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      mandatory
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      mandatory
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)
```

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```
<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      mandatory
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      mandatory
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      mandatory
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 {
```

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```
        on(1),
        off(2) }
ACCESS      read-only
STATUS      mandatory
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      mandatory
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  mandatory
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  mandatory
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)
```

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```
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  mandatory
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  mandatory
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  mandatory
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}
```

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5.6.1.48 Branch Circuit Energy PosSum

```
branchcircuitEnergyPosSum OBJECT-TYPE
SYNTAX  INTEGER (-1000000000..1000000001)
ACCESS  read-write
STATUS  mandatory
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 results 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  mandatory
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  mandatory
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  mandatory
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.
```

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```
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  mandatory
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  mandatory
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  mandatory
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}
```

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5.6.1.55 Branch Circuit Current B

```
branchcircuitCurrentB OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS  read-only
STATUS  mandatory
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  mandatory
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  mandatory
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  mandatory
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"
```

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```
::= {branchcircuitEntry 58}
```

5.6.1.59 Branch Circuit Peak Leakage Current

```
branchcircuitPeakLeakageCurrent OBJECT-TYPE
SYNTAX  INTEGER (-10000000..10000000)
ACCESS  read-write
STATUS  mandatory
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  mandatory
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      mandatory
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 }
```

5.6.1.62 Branch Circuit Photocell Index

```
branchcircuitPhotocellIndex OBJECT-TYPE
SYNTAX INTEGER (0..8)
ACCESS read-write
STATUS mandatory
DESCRIPTION "Photocell identifier for an ELMS device. This number references
the index of the Photocell table
<DescriptiveName>.branchcircuitPhotocellIndex:quantity
<Data Concept Type>
INTEGER (1..8)"
::= { branchcircuitEntry 62}
```

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5.6.1.63 Branch Circuit Level Units of Reading

```
branchcircuitUnitsOfReading OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "A textual description of the branch circuit's light level units
of reading.
<DescriptiveName>branchcircuitTable.UnitsOfReading:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {branchcircuitEntry 63}
```

5.7 Zone

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

5.7.1 Zone Table

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

zoneEntry OBJECT-TYPE
SYNTAX ZoneEntry
ACCESS not-accessible
STATUS mandatory
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,
   zonePhotocellIndex     INTEGER,
   zoneUnitsOfReading     OCTET STRING}
```

5.7.1.1 Zone Index

```
zoneIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "
```

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```
<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      mandatory
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      mandatory
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>E
OCTET STRING (SIZE (0..64))"
::= {zoneEntry 3}
```

5.7.1.4 Zone Mode

```
zoneMode OBJECT-TYPE
SYNTAX      INTEGER {
      twentyFourHr (1),
      photocell(2),
      astronomical(3),
      adaptive (4)}
ACCESS      read-write
STATUS      mandatory
```

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```
DESCRIPTION "Indicates the operating mode of the zone.
<DescriptiveName>zoneTable.mode:code
<Valid Value Rule>
value - description
twentyFourHr - The zone's primary mechanism of control is the defined by Zone
Switch Mode
photocell - The zone's primary mechansim of control is the photocell
astronomical - The primary mechansim of control for zone is the astronomical
clock
adaptive - the primary mechanism of control is through connected vehcile
information
<Data Concept Type>
ENUMERATION {
        twentyFourHr (1),
        photocell(2),
        astronomical(3),
        adaptive (4)}"
::= {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),
       adaptive (9)
}
ACCESS      read-write
STATUS      mandatory
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
none - No schedule should be applied
```

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```
<Data Concept Type>
ENUMERATION {
        permanentOn(1),
        permanentOff(2),
        schedule(3),
        transitoryOn(4),
        transitoryOff(5),
        timedOn(6),
        timedOff(7),
        none(8),
        adaptive (9)}"
::= {zoneEntry 5}
```

5.7.1.6 Zone Switch Mode Time

```
zoneSwitchModeTime OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      mandatory
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      mandatory
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>none"
::= {zoneEntry 7}
```

5.7.1.8 Zone Hold Interval

```
zoneHoldInterval OBJECT-TYPE
SYNTAX      INTEGER (0..1000)
ACCESS      read-write
STATUS      mandatory
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.
```

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```
<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      mandatory
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>none"
::= {zoneEntry 9}
```

5.7.1.10 Zone Delay Interval

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

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```
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      mandatory
DESCRIPTION "A textual description of the purpose of the zone.
<DescriptiveName>zoneTable.functionalprofile:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {zoneEntry 13}
```

5.7.1.14 Zone Photocell Index

```
zonePhotocellIndex OBJECT-TYPE
SYNTAX INTEGER (0..8)
ACCESS read-write
STATUS mandatory
DESCRIPTION "Photocell identifier for an ELMS device. This number references
the index of the Photocell table
<DescriptiveName>.zonePhotocellIndex:quantity
<Data Concept Type>
INTEGER (1..8)"
::= {zoneEntry 14}
```

5.7.1.15 Zone Light Level Units of Reading

```
zoneUnitsOfReading OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "A textual description of the zone's light level units of
reading.
<DescriptiveName>zoneTable.UnitsOfReading:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= {zoneEntry 15}
```

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)
```

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```
ACCESS      read-write
STATUS      mandatory
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      mandatory
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 mandatory
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 ElmsZoneLogicalDeviceIDEntry
ACCESS not-accessible
STATUS mandatory
INDEX { elmsZoneLogicalDeviceIDIndex }
::= { 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      mandatory
DESCRIPTION "Index into table that contains list of logical identifiers for
the devices assigned to a zone
<DescriptiveName>elmsZoneLogicalDeviceIDTable.index:identifier
```

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```
<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      mandatory
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),
                photocell (4),
                electricvehiclecharger (5)}
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the device that this row is to reference. An row in
this table can reference a luminaire, branch circuit,  electrical service,
photocell or electric vehcile charger.
<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),
                photocell (4),
                electricvehiclecharger (5)}"
::= {elmsZoneLogicalDeviceIDEntry 3}
```

5.9.1.4 Zone Logical Device ID Device ID

```
elmsZoneLogicalDeviceIDDeviceID OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      mandatory
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>
```

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```
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      deprecated
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      deprecated
DESCRIPTION
"<Definition>This object specifies a description of the photocell in ASCII
characters.
<DescriptiveName>elmsPhotocellDisplayName:text
<DataConceptType>Data Element"
::= { elmsPhotocell 2 }
```

5.10.3 Photocell Table

```
photocellTable OBJECT-TYPE
SYNTAX SEQUENCE OF PhotocellEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION "A table containing photocell parameters."
::= { elmsPhotocell 3 }

photocellEntry OBJECT-TYPE
```

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```
SYNTAX PhotocellEntry
ACCESS not-accessible
STATUS mandatory
INDEX { photocellIndex }
::= { photocellTable 1 }

PhotocellEntry ::= SEQUENCE {
  photocellIndex                INTEGER,
  photocellState2               INTEGER,
  photocellDisplayName2         OCTET STRING,
  photocellReading              INTEGER,
  photocellReverseOperation     INTEGER,
  photocellUnitsOfReading       OCTET STRING }
```

5.10.3.1 Photocell Index

```
photocellIndex OBJECT-TYPE
SYNTAX INTEGER (1..256)
ACCESS read-only
STATUS mandatory
DESCRIPTION "
<DescriptiveName>photocellTable.index:identifier
<Data Concept Type>
INTEGER (1..256)"
::= {photocellEntry 1}
```

5.10.3.2 Photocell State 2

```
photocellState2 OBJECT-TYPE
SYNTAX INTEGER {
day (1),
night (2),
noDataComm (3)}
ACCESS read-only
STATUS mandatory
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.)
reverse operation.
<Data Concept Type>
ENUMERATION {
day (1),
night (2),
noDataComm (3),
reverse operation (4)}"
::= { photocellEntry 2 }
```

5.10.3.3 Photocell Display Name 2

```
photocellDisplayName2 OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..255))
```

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```
ACCESS read-write
STATUS mandatory
DESCRIPTION
"<Definition>This object specifies a description of the photocell in ASCII
characters.
<DescriptiveName>elmsPhotocellDisplayName:text
<DataConceptType>Data Element
OCTET STRING (SIZE (0..255))"
::= { photocellEntry 3 }
```

5.10.3.4 Photocell Reading

```
photocellReading OBJECT-TYPE
SYNTAX INTEGER (0..100000)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"<Definition>indicates the current light level reading by the photocell
device
<DescriptiveName>elmsPhotocell.LuminanceReading:int
<DataConceptType>Data Element"
::= { photocellEntry 4 }
```

5.10.3.5 Photocell Reverse Operation

```
photocellReverseOperation OBJECT-TYPE
SYNTAX INTEGER {
normal(1),
reverse(2),
noDataComm (3)}
ACCESS read-write
STATUS mandatory
DESCRIPTION "Indicates the normal or reverse operational state of the
photodetector.
<DescriptiveName> photocellRO:code
<Valid Value Rule>
value - description
normal - value increases as light level increases.
reverse- value increases as light level decreases.
noDataComm - Unable to evaluate current state (not available yet,
communication problem etc.).
<Data Concept Type>
ENUMERATION {
normal(1),
reverse (2),
noDataComm (3),
}"
::= { photocellEntry 5 }
```

5.10.3.6 Photocell Units of Reading

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

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```
DESCRIPTION "A textual description of the photocell's light level units of
reading.
<DescriptiveName>photocellTable.UnitsOfReading:code
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= { photocellEntry 6 }
```

5.11 Astronomical Clock

```
elmsDevice OBJECT IDENTIFIER ::= { elms 11 }
```

5.11.1 Latitude of Installation

```
deviceLatitude OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(4))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the latitude defined in 1/10th of a microdegree
<DescriptiveName>deviceLatitude:quantity
<Data Concept Type>
OCTET STRING (SIZE(4))"
::= { elmsDevice 1 }
```

5.11.2 Longitude of Installation

```
deviceLongitude OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(4))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the longitude defined in 1/10th of a microdegree
<DescriptiveName>deviceLongitude:quantity
<Data Concept Type>
OCTET STRING (SIZE(4))"
::= { elmsDevice 2 }
```

5.11.3 Date

```
deviceDate OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the date in YYYYMMDD format where YYYY is four
numerical characters descring the year, MM is two numerical characters
describing the month, and DD is two numerical characters describing the day.
<DescriptiveName>deviceLongitude:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsDevice 3 }
```

5.11.4 Sunrise Time

```
deviceSunriseTime OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
```

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```
DESCRIPTION "Indicates the sunrise time in HH:MM:SS format where HH is two
numerical characters descring the year, MM is two numerical characters
describing the minutes, and SS is two numerical characters describing the
seconds.
<DescriptiveName>deviceSunriseTime:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsDevice 4 }
```

5.11.5 Sunset Time

```
deviceSunsetTime OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the sunset time in HH:MM:SS format where HH is two
numerical characters descring the year, MM is two numerical characters
describing the minutes, and SS is two numerical characters describing the
seconds.
<DescriptiveName>deviceSunsetTime:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsDevice 5 }
```

5.12 Connected Vehicle Sensor Information

```
elmsCvSupport OBJECT IDENTIFIER ::= { elms 12 }
```

5.12.1 Connected Vehicle Speed

```
cvSpeed OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "connected vehicle speed in meters per second.
<DescriptiveName> cvSpeed:quantity
<Data Concept Type>
INTEGER (1..65535)"
::= { elmsCvSupport 1 }
```

5.12.2 Connected Vehicle Direction

```
cvDirection OBJECT-TYPE
SYNTAX      INTEGER (0..360)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "connected vehicle direction of travel in degrees.
<DescriptiveName> cvDirection:quantity
<Data Concept Type>
INTEGER (1..360)"
::= { elmsCvSupport 2 }
```

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5.12.3 Connected Vehicle Location

5.12.3.1 Connected Vehicle Latitude

```
cvLatitude OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the connected vehicle latitude defined in 1/10th of a
microdegree
<DescriptiveName> cvLatitude:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 3 }
```

5.12.3.2 Connected Vehicle Longitude

```
cvLongitude OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the connected vehicle longitude defined in 1/10th of a
microdegree
<DescriptiveName> cvLongitude:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 4 }
```

5.12.3.3 Connected Vehicle Altitude

```
cvAltitude OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the connected vehicle altitude defined in 1/10th of a
meter
<DescriptiveName> cvAltitude:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 5 }
```

5.12.4 Connected Vehicle Ambient Light Level

```
cvAmbientLightLevel OBJECT-TYPE
SYNTAX      INTEGER (0..7)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "connected vehicle ambient light level where zero is no light and
7 is full sunlight.
<DescriptiveName> cvDirection:quantity
<Data Concept Type>
INTEGER (1..360)"
::= { elmsCvSupport 6 }
```

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5.12.5 Connected Vehicle Headlight Status

```
cvHeadlightStatus OBJECT-TYPE
SYNTAX      INTEGER {
                allLightsOff (1),
                lowBeamHeadlightsOn (2),
                highBeamHeadlightsOn (3),
                noDataComm (4)}
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the current state of headlights.
<DescriptiveName> cvHeadlightStatus:code
<Valid Value Rule>
value - description
1 - Headlights are Off.
2 - Low beam headlights are On.
3 - High beam headlights are On.
4 - noDataComm - Unable to evaluate current state (not available yet,
communication problem etc.).
<Data Concept Type>
ENUMERATION {
                off(1),
                lowbeam(2),
                highbeam (3)
                noDataComm (4),
                }"
::= { elmsCvSupport 7 }
```

5.12.6 Connected Vehicle Road Friction

```
cvFriction OBJECT-TYPE
SYNTAX      INTEGER (0..50)
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "connected vehicle road friction.
<DescriptiveName> cvFriction:quantity
<Data Concept Type>
INTEGER (1..50)
<Unit>none"
::= { elmsCvSupport 8 }
```

5.12.7 Connected Vehicle Speed Setpoint

```
cvSpeedSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..65535)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "connected vehicle speed setpoint in meters per second.
<DescriptiveName> cvSpeedSetpoint:quantity
<Data Concept Type>
INTEGER (1..65535)"
::= { elmsCvSupport 9 }
```

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5.12.8 Connected Vehicle Direction Setpoint

```
cvDirectionSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..360)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "connected vehicle direction setpoint of travel in degrees.
<DescriptiveName> cvDirectionSetpoint:quantity
<Data Concept Type>
INTEGER (1..360)"
::= { elmsCvSupport 10 }
```

5.12.9 Connected Vehicle Latitude High Setpoint

```
cvLatitudeHighSetpoint OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the connected vehicle latitude high setpoint defined
in 1/10th of a microdegree
<DescriptiveName> cvLatitudeHighSetpoint:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 11 }
```

5.12.10 Connected Vehicle Latitude Low Setpoint

```
cvLatitudeLowSetpoint OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the connected vehicle latitude low setpoint defined in
1/10th of a microdegree
<DescriptiveName> cvLatitudeHLowSetpoint:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 12 }
```

5.12.11 Connected Vehicle Longitude High Setpoint

```
cvLongitudeHighSetpoint OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the connected vehicle longitude high setpoint defined
in 1/10th of a microdegree
<DescriptiveName> cvLongitudeHighSetpoint:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 13 }
```

5.12.12 Connected Vehicle Longitude Low Setpoint

```
cvLongitudeLowSetpoint OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
```

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```
DESCRIPTION "Indicates the connected vehicle longitude low setpoint defined
in 1/10th of a microdegree
<DescriptiveName> cvLongitudeLowSetpoint:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 14 }
```

5.12.13 Connected Vehicle Altitude High Setpoint

```
cvAltitudeHighSetpoint OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the connected vehicle altitude high setpoint defined
in 1/10th of a meter
<DescriptiveName> cvAltitudeHighSetpoint:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 15 }
```

5.12.14 Connected Vehicle Altitude Low Setpoint

```
cvAltitudeLowSetpoint OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the connected vehicle altitude low setpoint defined in
1/10th of a meter
<DescriptiveName> cvAltitudeLowSetpoint:quantity
<Data Concept Type>
OCTET STRING (SIZE(0..255))"
::= { elmsCvSupport 16 }
```

5.12.15 Connected Vehicle Ambient Light Level Setpoint

```
cvAmbientLightLevelSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..7)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "connected vehicle ambient light level setpoint where zero is no
light and 7 is full sunlight.
<DescriptiveName> cvDirection:quantity
<Data Concept Type>
INTEGER (1..360)"
::= { elmsCvSupport 17 }
```

5.12.16 Connected Vehicle Headlight Status Setpoint

```
cvHeadlightStatusSetpoint OBJECT-TYPE
SYNTAX      INTEGER {
                allLightsOff (1),
                lowBeamHeadlightsOn (2),
                highBeamHeadlightsOn (3),
                noDataComm (4)}
ACCESS      read-only
STATUS      mandatory
```

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```
DESCRIPTION "Indicates the setpoint of headlights.
<DescriptiveName> cvHeadlightStatus:code
<Valid Value Rule>
value - description
1 - Headlights are Off.
2 - Low beam headlights are On.
3 - High beam headlights are On.
4 - noDataComm - Unable to evaluate current state (not available yet,
communication problem etc.).
<Data Concept Type>
ENUMERATION {
                off(1),
                lowbeam(2),
                  highbeam (3)
                noDataComm (4),
                }"
::= { elmsCvSupport 18 }
```

5.12.17 Connected Vehicle Road Friction Setpoint

```
cvFrictionSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..50)
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "connected vehicle road friction setpoint
<DescriptiveName> cvFriction:quantity
<Data Concept Type>
INTEGER (1..50)
<Unit>none"
::= { elmsCvSupport 19 }
```

5.13 Electric Vehicle Charger Information

```
elmsEvCharger OBJECT IDENTIFIER ::= { elms 13 }
```

5.13.1 Electric Vehicle Charger Table

```
evChargerTable OBJECT-TYPE
SYNTAX SEQUENCE OF EvChargerEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION "A table containing electric vehicle charger parameters."
::= { elmsEvCharger 1 }

evChargerEntry OBJECT-TYPE
SYNTAX EvChargerEntry
ACCESS not-accessible
STATUS mandatory
INDEX { evChargerIndex }
::= { evChargerTable 1 }

EvChargerEntry ::= SEQUENCE {
  evChargerIndex                    INTEGER,
  evChargerMfrName                  OCTET STRING,
  evChargerModelNumber              OCTET STRING,
  evChargerSerialNumber             OCTET STRING,
```

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```
  evChargerGroundFaultCurrentStatus  INTEGER,
  evChargerChargeCurrent             INTEGER,
  evChargerTemperature               INTEGER,
  evChargerActivation                INTEGER,
  evChargerOperationalStatus         INTEGER,
  evChargerTotalEnergyDelivered      INTEGER,
  evCurrentChargingSession           INTEGER,
  evPreviousChargingSession          INTEGER,
  evChargerEnergyLoss                INTEGER,
  evSoftStart                        INTEGER,
  evARFT                             INTEGER,
  evPUDMinTime                       INTEGER,
  evPUDMaxTime                       INTEGER,
  evProximityResistance              INTEGER }
```

5.13.1.1 Electric Vehicle Charger Index

```
evChargerIndex OBJECT-TYPE
SYNTAX      INTEGER (1..65535)
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the row of the evChargerTable entry.
<DescriptiveName>evTable.index:identifier
<Data Concept Type>
INTEGER (1..65535)"
::= { evChargerEntry 1 }
```

5.13.1.2 Electric Vehicle Charger Manufacturer Name

```
evChargerMfrName OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-only
STATUS      mandatory
DESCRIPTION
"<Definition>This object specifies the manufacturer name in ASCII characters.
<DescriptiveName> evMfrName:text
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= { evChargerEntry 2 }
```

5.13.1.3 Electric Vehicle Charger Model Number

```
evChargerModelNumber OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-only
STATUS      mandatory
DESCRIPTION
"<Definition>This object specifies the model number in ASCII characters.
<DescriptiveName> evChargerModelNumber:text
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= { evChargerEntry 3 }
```

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5.13.1.4 Electric Vehicle Charger Serial Number

```
evChargerSerialNumber OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..64))
ACCESS      read-only
STATUS      mandatory
DESCRIPTION
"<Definition>This object specifies the serial number in ASCII characters.
<DescriptiveName> evChargerSerialNumber:text
<Data Concept Type>
OCTET STRING (SIZE (0..64))"
::= { evChargerEntry 4 }
```

5.13.1.5 Electric Vehicle Charger Ground Fault Current Status

```
evChargerGroundFaultCurrentStatus OBJECT-TYPE
SYNTAX      INTEGER (0..1)
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the  present value of the Charger Ground Fault Current
Status. 0 represents normal operating functionality. 1 represnts an a ground
fauilt trip condition.
<DescriptiveName> evChargerGroundFaultCurrentStatus:quantity
<Data Concept Type>
INTEGER (0..1)
<Unit>milliamps (mA) RMS"
::= { evChargerEntry 5 }
```

5.13.1.6 Electric Vehicle Charger Charge Current

```
evChargerChargeCurrent  OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the  present value of the Charge Current measurement
of the charger. Acceptable range is 0 to 10000001. (0 to 10,000.001 Amps).
The value 10000001 shall indicate an error condition or missing value.
<DescriptiveName> evChargerChargeCurrent:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>milliamps (mA) RMS"
::= { evChargerEntry 6 }
```

5.13.1.7 Electric Vehicle Charger Temperature

```
evChargerTemperature   OBJECT-TYPE
SYNTAX      INTEGER (0..10000)
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the  present value of the temperature measurement of
the charger. Acceptable range is 0 to 10000. (0 to 10000 Kelvin). The value
1000 shall indicate an error condition or missing value.
<DescriptiveName> evChargerTemperature:quantity
<Data Concept Type>
INTEGER (0..10000)
<Unit>degrees Kelvin"
::= { evChargerEntry 7 }
```

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5.13.1.8 Electric Vehicle Charger Activation

```
evChargerActivation OBJECT-TYPE
SYNTAX      INTEGER {
                off(1),
                on(2),
                noDataComm (3)}
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the current state of charger activation.
<DescriptiveName> evChargerActivation:code
<Valid Value Rule>
value - description
1 - off.
2- on.
3 -noDataComm - Unable to evaluate current state (not available yet,
communication problem etc.).
<Data Concept Type>
ENUMERATION {
                off(1),
                on (2),
                noDataComm (3),
                }"
::= { evChargerEntry 8  }
```

5.13.1.9 Electric Vehicle Charger Operational Status

```
evChargerOperationalStatus OBJECT-TYPE
SYNTAX      INTEGER {
                operational(1),
                non-operational(2),
                noDataComm (3)}
ACCESS      read-only
STATUS      mandatory
DESCRIPTION "Indicates the current state of charger activation.
<DescriptiveName> evChargerOperationalStatus:code
<Valid Value Rule>
value - description
1 - operational.
2- non-operational.
3 -noDataComm - Unable to evaluate current state (not available yet,
communication problem etc.).
<Data Concept Type>
ENUMERATION {
                operational(1),
                non-operational (2),
                noDataComm (3),
                }"
::= { evChargerEntry 9 }
```

5.13.1.10 Electric Vehicle Charger Total Energy Delivered

```
evChargerTotalEnergyDelivered   OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
```

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```
STATUS      mandatory
DESCRIPTION "Indicates the  present value of the total energy delivered to
the charger. Acceptable range is 0 to 10000001. The value 10000001 shall
indicate an error condition or missing value.
<DescriptiveName> evChargerTotalEnergyDelivered:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>Kilowatt Hours"
::= { evChargerEntry 10  }
```

5.13.1.11 Electric Vehicle Charger Energy Delivered for the Current Charging Session

```
evCurrentChargingSession   OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the  present value of the total energy delivered to
the charger for the current charging session. Acceptable range is 0 to
10000001. The value 10000001 shall indicate an error condition or missing
value.
<DescriptiveName> evCurrentChargingSession:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>Tenths of Kilowatt Hours"
::= { evChargerEntry 11 }
```

5.13.1.12 Electric Vehicle Charger Energy Delivered for the Previous Charging Session

```
evPreviousChargingSession  OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the  present value of the total energy delivered to
the charger for the previous charging session. Acceptable range is 0 to
10000001. The value 10000001 shall indicate an error condition or missing
value.
<DescriptiveName> evPreviousChargingSession
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>Kilowatt Hours"
::= { evChargerEntry 12 }
```

5.13.1.13 Electric Vehicle Charger Energy Loss

```
evChargerEnergyLoss   OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the  present value of the total energy loss.
Acceptable range is 0 to 10000001. The value 10000001 shall indicate an error
condition or missing value.
<DescriptiveName> evChargerEnergyLoss
:quantity
<Data Concept Type>
INTEGER (0..10000001)
```

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```
<Unit>Tenths of Kilowatt Hours"
::= { evChargerEntry 13 }
```

5.13.1.14 Soft Start

```
evSoftStart OBJECT-TYPE
SYNTAX      INTEGER {
                enabled(1),
                disabled(2),
                noDataComm (3)}
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the current state of charger activation.
<DescriptiveName> evSoftStart:code
<Valid Value Rule>
value - description
1 - enabled.
2- disabled.
3 -noDataComm - Unable to evaluate current state (not available yet,
communication problem etc.).
<Data Concept Type>
ENUMERATION {
                enabled (1),
                disabled (2),
                noDataComm (3),
                }"
::= { evChargerEntry 14 }
```

5.13.1.15 Automatic Reclosure on Fault Time

```
evARFT  OBJECT-TYPE
SYNTAX      INTEGER (0..255)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the delay period in seconds after a fault before the
charger is turned on.
<DescriptiveName> evARFT :quantity
<Data Concept Type>
INTEGER (0..255)
<Unit>seconds"
::= { evChargerEntry 15 }
```

5.13.1.16 Power-Up Delay Minimum Time

```
evPUDMinTime OBJECT-TYPE
SYNTAX      INTEGER (0..255)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the minimum delay period in seconds after a fault
before the charger is turned on.
<DescriptiveName> evPUDMinTime:quantity
<Data Concept Type>
INTEGER (0..255)
<Unit>seconds"
::= { evChargerEntry 16 }
```

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5.13.1.17 Power-Up Delay Maximum Time

```
evPUDMaxTime  OBJECT-TYPE
SYNTAX      INTEGER (0..255)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the maximum delay period in seconds after a fault
before the charger is turned on.
<DescriptiveName> evPUDMaxTime:quantity
<Data Concept Type>
INTEGER (0..255)
<Unit>seconds"
::= { evChargerEntry 17 }
```

5.13.1.18 Electric Vehicle Charger Proximity Resistance

```
evProximityResistance  OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the resistance to ground from the ev charger to earth
<DescriptiveName> evPR:quantity
<Data Concept Type>
INTEGER (0..255)
<Unit>milliohms"
::= { evChargerEntry 18 }
```

5.14 Energy Automatic Demand Response Information

```
elmsDr OBJECT IDENTIFIER ::= { elms 14 }
```

5.14.1 Electricity Price

5.14.1.1 Electricity Price Price

```
adrElectricityPricePrice OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the cost of electricity
expressed in absolute
terms. Acceptable range is 0 to 10000001. The value 10000001 shall indicate
an error condition or missing value.
<DescriptiveName> adrElectricityPricePrice:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>1/100ths of a dollar/kWh"
::= { elmsDr 1 }
```

5.14.1.2 Electricity Price Relative

```
adrElectricityPriceRelative OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is a delta change to
```

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```
the existing price of electricity. Acceptable range is 0 to 10000001. The
value 10000001 shall indicate an error condition or missing value.
<DescriptiveName> adrElectricityPriceRelative:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>1/100ths of a dollar/kWh"
::= { elmsDr 2 }
```

5.14.1.3 Electricity Price Multiplier

```
adrElectricityPriceMultiplier OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is a multiplier to the
existing cost of electricity. Acceptable range is 0 to 10000001. The value
10000001 shall indicate an error condition or missing value.
<DescriptiveName> adrElectricityPriceMultiplier:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit> None, 1/100ths of the integer "
::= { elmsDr 3 }
```

5.14.2 Energy Price

5.14.2.1 Energy Price Price

```
adrEnergyPricePrice OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the cost of energy
expressed in absolute
terms. Acceptable range is 0 to 10000001. The value 10000001 shall indicate
an error condition or missing value.
<DescriptiveName> adrEnergyPricePrice:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>1/100ths of a dollar/kWh"
::= { elmsDr 4 }
```

5.14.2.2 Energy Price Relative

```
adrEnergyPriceRelative OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is a delta change to
the existing price of energy. Acceptable range is 0 to 10000001. The value
10000001 shall indicate an error condition or missing value.
<DescriptiveName> adrEnergyPriceRelative:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>1/100ths of a dollar/kWh"
::= { elmsDr 5 }
```

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5.14.2.3 Energy Price Multiplier

```
adrEnergyPriceMultiplier OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is a multiplier to the
existing cost of energy. Acceptable range is 0 to 10000001. The value
10000001 shall indicate an error condition or missing value.
<DescriptiveName> adrEnergyPriceMultiplier:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit> None, 1/100ths of the integer "
::= { elmsDr 6 }
```

5.14.3 Demand Charge

5.14.3.1 Demand Charge Price

```
adrDemandChargePrice OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is the demand charge
expressed in absolute
terms. Acceptable range is 0 to 10000001. The value 10000001 shall indicate
an error condition or missing value.
<DescriptiveName> adrDemandChargePrice:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>1/100ths of a dollar/kWh"
::= { elmsDr 7 }
```

5.14.3.2 Demand Charge Relative

```
adrDemandChargeRelative OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is a delta change to the existing demand
charge. Acceptable range is 0 to 10000001. The value 10000001 shall indicate
an error condition or missing value.
<DescriptiveName> adrDemandChargeRelative:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>1/100ths of a dollar/kWh"
::= { elmsDr 8 }
```

5.14.3.3 Demand Charge Multiplier

```
adrDemandChargeMultiplier OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is a multiplier to the
existing demand charge. Acceptable range is 0 to 10000001. The value 10000001
shall indicate an error condition or missing value.
```

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```
<DescriptiveName> adrDemandChargeMultiplier:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>None, 1/100ths of the integer"
::= { elmsDr 9 }
```

5.14.4 Control Bid Price

5.14.4.1 Bid Price Price

```
adrBidPricePrice OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is the price that was
bid by the resource. Acceptable range is 0 to 10000001. The value 10000001
shall indicate an error condition or missing value.
<DescriptiveName> adrBidPricePrice
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>1/100ths of a dollar/kWh "
::= { elmsDr 10 }
```

5.14.4.2 Bid Load Setpoint

```
adrBidLoadSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is the amount of load
that was bid by a resource
into a program. Acceptable range is 0 to 10000001. The value 10000001 shall
indicate an error condition or missing value.
<DescriptiveName> adrBidLoadSetpoint
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>Kilowatts "
::= { elmsDr 11 }
```

5.14.4.3 Bid Energy Setpoint

```
adrBidEnergySetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is the amount of energy
from a resource that
was bid into a program. Acceptable range is 0 to 10000001. The value 10000001
shall indicate an error condition or missing value.
<DescriptiveName> adrBidEnergySetpoint
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>kWh "
::= { elmsDr 12 }
```

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5.14.5 Control Energy Storage

5.14.5.1 Charge State Setpoint

```
adrChargeStateSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is used to either charge or discharge a
certain amount of energy from a storage resource until its charge state
reaches a certain level.. Acceptable range is 0 to 10000001. The value
10000001 shall indicate an error condition or missing value.
<DescriptiveName> adrChargeStateSetpoint
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>kWh "
::= { elmsDr 13 }
```

5.14.5.2 Charge State Delta

```
adrChargeStateDelta OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is the delta amount of energy that should be contained
in a storage resource from where it currently
is. Acceptable range is 0 to 10000001. The value 10000001 shall indicate an
error condition or missing value.
<DescriptiveName> adrChargeStateDelta
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>kWh "
::= { elmsDr 14 }
```

5.14.5.3 Charge State Multiplier

```
adrChargeStateMultiplier OBJECT-TYPE
SYNTAX      INTEGER (0..100)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is the percentage of full charge that the storage
resource should be at. Acceptable range is 0 to 100. The value 10000001 shall
indicate an error condition or missing value.
<DescriptiveName> adrChargeStateMultiplier
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>1/100ths of integer value, no units"
::= { elmsDr 15 }
```

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5.14.6 Load Dispatch

5.14.6.1 Load Dispatch Setpoint

```
adrLoadDispatchSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is used to dispatch
loads to a specific amount. Acceptable range is 0 to 10000001. The value
10000001 shall indicate an error condition or missing value.
<DescriptiveName> adrLoadDispatchSetpoint
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>kWh "
::= { elmsDr 16 }
```

5.14.6.2 Load Dispatch Delta

```
adrLoadDispatchDelta OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is used to dispatch loads to some offset from
an agreed upon baseline. Note that the baseline may
be the current power consumption.. Acceptable range is 0 to 10000001. The
value 10000001 shall indicate an error condition or missing value.
<DescriptiveName> adrLoadDispatchDelta
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>kWh "
::= { elmsDr 17 }
```

5.14.6.3 Load Dispatch Multipler

```
adrLoadDispatchMultiplier OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is used to dispatch loads as some multiple of
power against some agreed upon baseline. Note that the baseline may
be the current power consumption.. Acceptable range is 0 to 10000001. The
value 10000001 shall indicate an error condition or missing value.
<DescriptiveName> adrLoadDispatchMultiplier
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>no units, 1/100th of integer value"
::= { elmsDr 18 }
```

5.14.6.4 Load Dispatch Level

```
adrLoadDispatchLevel OBJECT-TYPE
SYNTAX      INTEGER (0..21)
ACCESS      read-write
```

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```
STATUS      mandatory
DESCRIPTION " This is used to specify the
load in terms of discrete
levels.. Acceptable range is 0 to 20. The value 21 shall indicate an error
condition or missing value.
<DescriptiveName> adrLoadDispatchLevel
:quantity
<Data Concept Type>
INTEGER (0..21)
<Unit>kWh "
::= { elmsDr 19 }
```

5.14.7 Load Control Capacity

```
adrLoadControlCapacity OBJECT-TYPE
SYNTAX      INTEGER (0..101)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is an instruction for the load controller to operate
at a level that is some percentage of its maximum load consumption
capacity. This can be mapped to specific load controllers to do things
like duty cycling. Acceptable range is 0 to 100. The value 101 shall indicate
an error condition or missing value.
<DescriptiveName> adrLoadControlCapacity
:quantity
<Data Concept Type>
INTEGER (0..101)
<Unit>1/100ths of integer value, no units"
::= { elmsDr 20 }
```

5.14.8 Load Control Offset

```
adrLoadControlOffset OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " Discrete integer levels that are relative to normal operations
where 0 is normal operations. There is no requirement to link the
setpoints to specific load consumption values, but the intention is that the
higher the setpoint the less load is consumed. Acceptable range is 0 to
10000001. The value 10000001 shall indicate an error condition or missing
value.
<DescriptiveName> adrLoadControlOffset
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>no units"
::= { elmsDr 21 }
```

5.14.9 Load Control Setpoint

```
adrLoadControlSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " There is no requirement to link the setpoints to specific
```

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```
load consumption values. Note that these are generic controller set
points and can be mapped to something as simple as specific thermostat
temperature set points. Acceptable range is 0 to 10000001. The value 10000001
shall indicate an error condition or missing value.
<DescriptiveName> adrLoadControlSetpoint
:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>no units"
::= { elmsDr 22 }
```

5.14.10 Load Control Percent Offset

```
adrLoadControlPercentOffset OBJECT-TYPE
SYNTAX      INTEGER (0..101)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " Percentage change from normal operations. The percentage does
not refer to specific load consumptions values, but to load control operation
levels. The lower the percentage the less load is consumed. Acceptable range
is 0 to 10000001. The value 101 shall indicate an error condition or missing
value.
<DescriptiveName> adrLoadControlPercentOffset
:quantity
<Data Concept Type>
INTEGER (0..101)
<Unit>no units"
::= { elmsDr 23 }
```

5.15 Ground Fault Interrupter

```
elmsGfi OBJECT IDENTIFIER ::= { elms 15 }
```

5.15.1 Ground Fault Interrupter Setpoint

```
gfiSetpoint OBJECT-TYPE
SYNTAX      INTEGER (0..10000001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the threshold of the ground fault interrupter leakage
current. If gfiSetpoint exceeds this value, gfiStatus 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> gfiSetpoint:quantity
<Data Concept Type>
INTEGER (0..10000001)
<Unit>milliamps (mA) RMS"
::= { elmsGfi 1 }
```

5.15.2 Ground Fault Status

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

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```
ACCESS      read-only
STATUS      mandatory
DESCRIPTION " Indicates the status of the ground fault interrupter. If the
sensed current flow exceeds gfiSetpoint, gfiStatus indicates Fault.
<DescriptiveName> gfiStatus:code
<Valid Value Rule>
value - description
ok - curent flow is below setpoint
fault - current flow is above setpoint
<Data Concept Type>
ENUMERATION {
        ok(1),
        fault(2)}"
::= { elmsGfi 2 }
```

5.16 Power Outage Message

```
elmsPo OBJECT IDENTIFIER ::= { elms 16 }

poMessage OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..255))
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the power outage message for this device.
<DescriptiveName> poMessage:number
<Data Concept Type>
OCTET STRING (SIZE (0..255))"
::= { elmsPo 1}
```

5.17 Adaptive Operation

```
elmsAdaptive OBJECT IDENTIFIER ::= { elms 17 }

adaptiveConfig OBJECT-TYPE
SYNTAX      INTEGER {
        enabled(1),
        disabled (2),
        noDataComm (3)}
ACCESS      read-write
STATUS      mandatory
DESCRIPTION "Indicates the state of the adaptive operation configuration.
<DescriptiveName> adaptiveConfig:code
<Valid Value Rule>
value - description
enabled - indicates the function is operational
fault - indicates the function is non-operational
noDataComm - unable to determine state of the ballast due to communications
error
<Data Concept Type>
ENUMERATION {
        enabled(1),
        disabled (2),
        noDataComm (3)}"
::= { elmsAdaptive 1}
```

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5.18 Energy Meter Accuracy

```
elmsMeter OBJECT IDENTIFIER ::= { elms 18 }

energymeterAccuracy OBJECT-TYPE
SYNTAX      INTEGER (0..1001)
ACCESS      read-write
STATUS      mandatory
DESCRIPTION " This is the accuracy percentage of energy meter. Acceptable
range is 0 to 1001. The value 1001 shall indicate an error condition or
missing value.
<DescriptiveName> energymeterAccuracy
:quantity
<Data Concept Type>
INTEGER (0..1001)
<Unit>1/1000ths of value, no units"
::= { elmsMeter 1}

END
```

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Annex A
Requirements Traceability Matrix (RTM) [Normative]

The Requirements Traceability Matrix (RTM) links the functional requirements as presented in Section 3 with the corresponding Dialogs (Section 4) on the same (gray) line. Each functional requirement/Dialog relates/uses one or more groups of Objects. The Objects (also known as Data Elements) are listed to the side; the formal definition of each object is contained within Section 5. Using this table, each functional requirement can thus be traced in a standardized way.

> Note: The INDEX objects in any of the tables are not explicitly exchanged but are used as index values for other objects that are exchanged.

The audience for the RTM is implementers (vendors and central system developers) and conformance testers. Additionally, other interested parties might use the RTM table to determine how particular functions are to be implemented using the standardized dialogs, interfaces, and object definitions.

To conform to a functional requirement, an ELMS shall implement all Objects and Dialogs traced from that functional requirement; a Management Station shall implement all Dialogs traced from the functional requirement. To be consistent with a functional requirement, a Management Station shall be able to fulfill the functional requirement using only Objects and Dialogs that a conforming ESS is required to support.

A.1 Notation [Informative]

A.1.1 Functional Requirement Columns

The functional requirements are defined within Section 3 and the RTM is based upon the requirements within that section. The section number and the functional requirement name are indicated within these columns.

A.1.2 Dialog Collumn

The standardized dialogs are defined within Section 4 and the RTM references the traces from requirements to this dialog. The section number of the dialog is indicated within this column.

A.1.3 Object Columns

The objects are defined within Section 5 of NTCIP 1204 v04 and Section 2 of NTCIP 1201 v03. The RTM references the data objects that are referenced by the dialog. The section number and object name are indicated within these columns.

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A.1.4 Additional Specifications

The “Additional Specifications” column may (and should) be used to provide additional notes and requirements about the dialog or may be used by an implementer to provide any additional details about the implementation.

A.2 Instructions for Completing the RTM [Informative]

To find the standardized design content for a functional requirement, search for the requirement identification number and functional requirement under the functional requirements columns. Next to the functional requirements column is a dialog identification number, identifying either a generic dialog or a specified dialog (found in Section 4) to be used to fulfill that requirement. To the right of the dialog identification number are the identification number and name of the data objects that are referenced or used by the dialog to fulfill the functional requirement. Object definitions specific to NTCIP 1213 v03 can be found in Section 5. If an object is defined in a different standard, that standard shall be listed first, followed by the section number where the object definition can be found. The “Additional Specifications” column will provide additional notes or details about the design content.

A.3 Requirements Traceability Matrix (RTM) Table

Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.4	Architectural Requirements				
3.5	Data Exchange and Operational Environment Requirements				
3.5.1	Provide Live Data				
3.5.1.1	Retrieve Data	G.1			
3.5.1.2	Deliver Data	G.3			
3.5.1.3	Data Retrieval and Data Delivery Action Performance	G.1			
		G.2			
		G.3			
3.5.1.4	Live Data Response Time	G.3			
3.5.2	Provide Off-Line Log Data				
3.5.2.1	Retrieve Configuration of Logging Service	G.1			
			1103v03 A.7.2	maxEventClasses	
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.3.5	eventClassNumRowsInLog	
			1103v03 A.7.3.6	eventClassNumEvents	
			1103v03 A.7.4	maxEventLogConfigs	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.2	Configure Logging Service	4.2.16			
			1103v03 A.7.3.1	eventClassNumber	3.5.2.2.1 Configure Number of Events in Event Log
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.2.1	Configure Number of Events in Event Log	G.3			
			1103v03 A.7.3.2	eventClassLimit	
3.5.2.2.2	Configure Number of Event Classes	G.3			
			1103v03 A.7.2	maxEventClasses	
3.5.2.2.3	Configure Number of Event Types	G.3			
			1103v03 A.7.4	maxEventLogConfigs	
3.5.2.3	Retrieve Logged Data	4.2.17			
			1103v03 A.7.3.5	eventClassNumRowsInLog	
			1103v03 A.7.3.6	eventClassNumEvents	
			1103v03 A.7.7.1	eventLogClass	
			1103v03 A.7.7.2	eventLogNumber	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.7.3	eventLogID	
			1103v03 A.7.7.4	eventLogTime	
			1103v03 A.7.7.5	eventLogValue	
3.5.2.4	Clear Log	G.3			
			1103v03 A.7.3.3	eventClassClearTime	
3.5.2.5	Retrieve Capabilities of Event Logging Services	G.1			
			1103v03 A.7.2	maxEventClasses	
			1103v03 A.7.4	maxEventLogConfigs	
			1103v03 A.7.6	maxEventLogSize	
3.5.2.6	Retrieve Number of Events Currently Logged	G.1			
			1103v03 A.7.3.5	eventClassNumRowsInLog	
			1103v03 A.7.3.6	eventClassNumEvents	
3.5.2.7	Set Time	G.3			
			1201v03 2.4.1	globalTime	
			1201v03 2.4.2	globalDaylightSaving	
			1201v03 2.4.6	controllerStandardTimeZone	
3.5.2.8	Retrieve Current Time	G.1			
			1201v03 2.4.1	globalTime	
			1201v03 2.4.2	globalDaylightSaving	
			1201v03 2.4.6	controllerStandardTimeZone	
			1201v03 2.4.7	controllerLocalTime	
3.5.2.9	Set Daylight Saving Time Mode	G.3			
			1201v03 2.4.2	globalDaylightSaving	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.2.10	ELMS Pre-Defined Event Configurations				
3.5.2.10.1	Supported Event Classes	G.3			
			1103v03 A.7.5.2	eventConfigClass	
3.5.2.10.2	Luminaire Switch State Log	4.2.19			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.10.3	Luminaire Condition Log	4.2.20			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.10.4	Luminaire Operating Hours Condition Log	4.2.21			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.10.5	Periodic Luminaire Operating Hours Time Log	4.2.22			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
			5.4.1.28	luminaireCycleCount	
3.5.2.10.6	Luminaire Temperature Log	4.2.23			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
			5.4.1.29	luminaireDisplayName	
			5.4.1.30	luminairePrimaryCommStrength	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.2.10.7	Luminaire Pole Condition Log	4.2.24			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.10.8	Relay Switch State Log	4.2.25			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.10.9	Energy Meter Switch State Log	4.2.26			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.10.10	Periodic Energy Meter Measurement Log	4.2.27			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
			5.6.1.43	branchcircuitPowerLineFequency	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.2.10.11	Energy Meter Condition Log	4.2.28			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.10.12	Ground Fault Switch State Log	4.2.29			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
3.5.2.10.13	Periodic Ground Fault Measurement Log	4.2.30			
			1103v03 A.7.3.1	eventClassNumber	
			1103v03 A.7.3.2	eventClassLimit	
			1103v03 A.7.3.3	eventClassClearTime	
			1103v03 A.7.3.4	eventClassDescription	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.7.5.9	eventConfigStatus	
			5.6.1.44	branchcircuitRealPowerA	
3.5.3	Manage Exception Reporting				
3.5.3.1	Enable/Disable Exception Reporting	G.3			
			1103v03 A.9.3.1	trapControl	
3.5.3.2	Configure Exception Reporting Condition Requirements				
3.5.3.2.1	Configure a Monitored (Watch) Object	4.2.18.3			
			1103v03 A.7.5	eventLogConfigTable	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.3.2.2	Configure a Monitored Group of Objects (Watch Block)	4.2.18.3			
			1103v03 A.7.5	eventLogConfigTable	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.2	eventConfigClass	
			1103v03 A.7.5.3	eventConfigMode	
			1103v03 A.7.5.4	eventConfigCompareValue	
			1103v03 A.7.5.5	eventConfigCompareValue2	
			1103v03 A.7.5.6	eventConfigCompareOID	
			1103v03 A.9.1.3	watchObjectDefinitionTable	
			1103v03 A.9.1.4	watchID	
			1103v03 A.9.1.5	watchStatus	
			1103v03 A.9.1.6	watchBlock	
			1103v03 A.9.1.7	watchOID	
			1103v03 A.9.1.8	watchBlockTable	
			1103v03 A.9.1.9	watchBlockNumber	
			1103v03 A.9.1.10	watchBlockStatus	
			1103v03 A.9.1.11	watchBlockDescription	
			1103v03 A.9.1.12	watchBlockValue	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.3.3	Configure Exception Reporting Data Transmission Requirements				
3.5.3.3.1	Configure a Report Object	4.2.18.3			
			1103v03 A.7.5	eventLogConfigTable	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.9.3.24	trapTable	
			1103v03 A.9.3.25	trapDestEnable	
3.5.3.3.2	Configure a Report Group of Objects (Block)	4.2.18.3			
			1103v03 A.7.5	eventLogConfigTable	
			1103v03 A.7.5.1	eventConfigID	
			1103v03 A.7.5.7	eventConfigLogOID	
			1103v03 A.7.5.8	eventConfigAction	
			1103v03 A.9.2.3	reportObjectDefinitionTable	
			1103v03 A.9.2.4	reportID	
			1103v03 A.9.2.5	reportStatus	
			1103v03 A.9.2.6	reportBlock	
			1103v03 A.9.2.7	reportOID	
			1103v03 A.9.2.8	reportBlockTable	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.9.2.9	reportBlockNumber	
			1103v03 A.9.2.10	reportBlockStatus	
			1103v03 A.9.2.11	reportBlockDescription	
			1103v03 A.9.2.12	reportBlockValue	
			1103v03 A.9.3.24	trapTable	
			1103v03 A.9.3.25	trapDestEnable	
3.5.3.4	Configure Exception Reporting Destination	4.2.18.3			
			1103v03 A.6.2	logicalNameTranslationTable	
			1103v03 A.6.2.1	logicalNameTranslationIndex	
			1103v03 A.6.2.2	logicalNameTranslationLogicalName	
			1103v03 A.6.2.3	logicalNameTranslationNetworkAddress	
			1103v03 A.6.2.4	logicalNameTranslationStatus	
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.8	trapMgmtManagerPointer	
3.5.3.5	Configure Exception Reporting Community	4.2.18.3			
			1103v03 A.8.3	communityNameTable	
			1103v03 A.8.3.1	communityNameIndex	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.8.3.2	communityNameUser	
			1103v03 A.8.3.3	communityNameAccessMask	
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.9	trapMgmtCommunityNamePointer	
3.5.3.6	Configure Exception Reporting Operational Mode Requirements				
3.5.3.6.1	Configure Exception Reporting Acknowledgement	4.2.18.3			
			1103v03 A.9.3.24	trapTable	
			1103v03 A.9.3.26	trapMode	
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.13	trapMgmtMaxRetries	
			1103v03 A.9.3.14	trapMgmtRepeatInterval	
			1103v03 A.9.3.15	trapMgmtDelta	
3.5.3.6.2	Configure Exception Reporting Aggregation	4.2.18.3			
			1103v03 A.9.3.24	trapTable	
			1103v03 A.9.3.26	trapMode	
			1103v03 A.9.3.6	trapMgmtTable	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.13	trapMgmtMaxRetries	
			1103v03 A.9.3.14	trapMgmtRepeatInterval	
			1103v03 A.9.3.15	trapMgmtDelta	
3.5.3.6.3	Configure Exception Reporting Queue	4.2.18.3			
			1103v03 A.9.3.24	trapTable	
			1103v03 A.9.3.26	trapMode	
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.16	trapMgmtQueueDepth	
3.5.3.6.4	Configure Exception Reporting (Forced)	4.2.18.3			
			1103v03 A.9.3.24	trapTable	
			1103v03 A.9.3.26	trapMode	
3.5.3.6.5	Configure Exception Reporting Communications	4.2.18.3			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.10	trapMgmtApplicationProtocol	
			1103v03 A.9.3.11	trapMgmtTransportProtocol	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1103v03 A.9.3.12	trapMgmtPortNum	
3.5.3.6.6	Configure Exception Reporting—Maximum Rate	4.2.18.3			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.18	trapMgmtAntiStreamRate	
3.5.3.7	Determine Watch Block Capabilities	G.1			
			1103v03 A.9.1.1	maxWatchObjects	
			1103v03 A.9.1.2	maxWatchBlocks	
3.5.3.8	Determine Report Block Capabilities	G.1			
			1103v03 A.9.2.1	maxReportObjects	
			1103v03 A.9.2.2	maxReportBlocks	
3.5.3.9	Determine Exception Reporting Trap Channel Capabilities	G.1			
			1103v03 A.9.3.3	trapMgmtMaxEntries	
3.5.3.10	Determine Exception Reporting Aggregation Capabilities	G.1			
			1103v03 A.9.3.4	trapMaxAggregationEvents	
			1103v03 A.9.3.5	trapMaxAggregationSize	
3.5.3.11	Monitor Communications Link State	4.2.18.2			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.17	trapMgmtLinkStateStatus	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.3.12	Monitor Exception Based Reporting Status				
3.5.3.12.1	Monitor Exception Based Communications Link Error	4.2.18.1			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.19	trapMgmtErrStatus	
3.5.3.12.2	Monitor Exception Based Maximum Rate Exceeded	4.2.18.1			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.19	trapMgmtErrStatus	
3.5.3.12.3	Monitor Exception Based Queue Full Error	4.2.18.1			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.19	trapMgmtErrStatus	
3.5.3.13	Monitor Exception Based Transmissions	4.2.18.1			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.22	trapMgmtSeqNum	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.3.14	Monitor Number of Lost Queued Exception Based Reports	4.2.18.1			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.20	trapMgmtLostTraps	
3.5.3.15	Monitor Number of Exception Based Events	4.2.18.1			
			1103v03 A.9.3.6	trapMgmtTable	
			1103v03 A.9.3.7	trapMgmtManagerIndex	
			1103v03 A.9.3.28	trapCounter	
3.5.3.16	Monitor Exception Based Data	G.3			
			1103v03 A.9.3.2	trapData	
3.5.3.17	Clear Event Class	G.3			
			1103v03 A.9.5.1	eventClearClasses	
3.5.3.18	Clear Event Configuration	G.3			
			1103v03 A.9.5.2	eventClearConfiguration	
3.5.3.19	Clear Event Log Table	G.3			
			1103v03 A.9.5.3	eventClearLog	
3.5.3.20	Clear Report Objects	G.3			
			1103v03 A.9.5.4	clearReportObjects	
3.5.3.21	Clear Report Blocks	G.3			
			1103v03 A.9.5.5	clearReportBlockTable	
3.5.3.22	Clear Watch Objects	G.3			
			1103v03 A.9.5.6	clearWatchObjects	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.3.23	Clear Watch Blocks	G.3			
			1103v03 A.9.5.7	clearWatchBlockTable	
3.5.3.24	Clear Exception Based Reporting Tables	G.3			
			1103v03 A.9.5.8	clearTrapMgmtTable	
3.5.4	Configure ELMS Device				
3.5.4.1	Configure Luminaire	G.1			
			5.4.1.1	luminaireIndex	
3.5.4.1.1	Retrieve Luminaire Information				
3.5.4.1.1.1	Retrieve Luminaire Pole Identifier	G.1			
			5.4.1.1	luminaireIndex	
			5.4.1.25	luminairePoleIdentifier	
3.5.4.1.1.2	Retrieve Luminaire Location	G.1			
			5.4.1.2	luminaireLocation	
			5.4.1.13	luminaireLocationProfile	
3.5.4.1.1.2.1	Specify Location in Longitude/Latitude Coordinates				
3.5.4.1.1.2.2	Specify Location Information Using Textual Description of a Road / Street / Block Name / Number				
3.5.4.1.1.2.3	Specify Location in Local Reference Coordinate Grid				
3.5.4.1.1.3	Retrieve Luminaire Mode	G.1			
			5.4.1.3	luminaireMode	
			5.4.1.4	luminaireSwitchMode	
3.5.4.1.1.4	Retrieve Luminaire Zone	G.1			
			5.4.1.5	luminaireSwitchState	
3.5.4.1.1.5	Retrieve Luminaire Vendor Information	G.1			
			1201v03 2.2.3.1	moduleNumber	
			1201v03 2.2.3.2	moduleDeviceNode	
			1201v03 2.2.3.3	moduleMake	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1201v03 2.2.3.4	moduleModel	
			1201v03 2.2.3.5	moduleVersion	
			1201v03 2.2.3.6	moduleType	
3.5.4.1.1.6	Retrieve Luminaire Light Source Type	G.1			
			5.4.1.34	luminaireLightSourceType	
3.5.4.1.1.7	Retrieve Luminaire Wattage	G.1			
			5.4.1.35	luminaireWattage	
3.5.4.1.1.8	Retrieve Luminaire Voltage	G.1			
			5.4.1.36	luminaireSupplyVoltage	
3.5.4.1.1.9	Retrieve Luminaire Ballast / Driver Description	G.1			
			5.4.1.37	luminaireBallastDriverDescription	
3.5.4.1.1.10	Retrieve Luminaire Communications Protocol	G.1			
			5.4.1.38	luminaireCommProtocol	
3.5.4.1.2	Configure Luminaire Identification Information				
3.5.4.1.2.1	Configure Luminaire Pole Identifier	G.3			
			5.4.1.25	luminairePoleIdentifier	
3.5.4.1.2.2	Configure Luminaire Location	G.3			
			5.4.1.2	luminaireLocation	
			5.4.1.13	luminaireLocationProfile	
3.5.4.1.3	Configure Luminaire Mode	G.3			
			5.4.1.3	luminaireMode	
			5.4.1.4	luminaireSwitchMode	
3.5.4.1.4	Manage Luminaire Color Temperature				
3.5.4.1.4.1	Configure Luminaire Color Temperature	G.3			
			5.4.1.40	luminairespectraloutput	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.4.2	Configure Electrical Service				
3.5.4.2.1	Retrieve Electrical Service Information				
3.5.4.2.1.1	Retrieve Electrical Service Location	4.2.18.1			
			5.5.1	electricalserviceTable	
			5.5.1.1	electricalserviceIndex	
			5.5.1.2	electricalserviceLocationProfile	
			5.5.1.3	electricalserviceLocation	
3.5.4.2.1.2	Retrieve Electrical Service Zone	G.1			
3.5.4.2.1.3	Retrieve Electrical Service Pole Identifier	G.1			
			5.5.1.4	electricalservicePoleIdentifier	
3.5.4.3	Configure Electrical Service Information				
3.5.4.3.1	Configure Electrical Service Location	G.3			
			5.5.1.2	electricalserviceLocationProfile	
			5.5.1.3	electricalserviceLocation	
3.5.4.3.2	Configure Electrical Service Pole Identifier	G.3			
			5.5.1.4	electricalservicePoleIdentifier	
3.5.4.4	Configure for Light Activated Operation				
3.5.4.4.1	Configure Luminaire for Light Activated Operations	G.3			
			5.4.1.3	luminaireMode	
			5.4.1.14	luminaireLightThreshold	
			5.4.1.15	luminaireHoldInterval	
			5.4.1.16	luminaireLightHysteresis	
			5.4.1.17	luminaireDelayInterval	
3.5.4.4.2	Configure Electrical Service for Light Activated Operations	G.3			
			5.5.1.5	electricalserviceMode	
			5.5.1.18	electricalserviceLightThreshold	
			5.5.1.19	electricalserviceHoldInterval	
			5.5.1.20	electricalserviceLightHysteresis	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			5.5.1.21	electricalserviceDelayInterval	
3.5.4.4.3	Configure Branch Circuit for Light Activated Operations	G.3			
			5.6.1.5	branchcircuitMode	
			5.6.1.18	branchcircuitLightThreshold	
			5.6.1.19	branchcircuitHoldInterval	
			5.6.1.20	branchcircuitLightHysteresis	
			5.6.1.21	branchcircuitDelayInterval	
3.5.4.4.4	Configure Devices in Zone for Light Activated Operations	G.3			
			5.7.1.4	zoneMode	
			5.7.1.7	zoneLightThreshold	
			5.7.1.8	zoneHoldInterval	
			5.7.1.9	zoneLightHysteresis	
			5.7.1.10	zoneDelayInterval	
3.5.4.5	Configure for Scheduled Operation				
3.5.4.5.1	Configure Luminaire for Scheduled Operations	4.2.1			
			5.4.1.4	luminaireSwitchMode	
3.5.4.5.2	Configure Electrical Service for Scheduled Operations	4.2.2			
			5.5.1.6	electricalserviceSwitchMode	
3.5.4.5.3	Configure Branch Circuit for Scheduled Operations	4.2.3			
			5.6.1.6	branchcircuitSwitchMode	
3.5.4.5.4	Configure Devices in Zone for Scheduled Operations	4.2.4			
			5.7.1.5	zoneSwitchMode	
3.5.4.5.5	Schedule ELMS Device Event	4.2.5			
			5.3.2	elmsScheduleActionTable	
			5.3.2.1	scheduleActionIndex	
			5.3.2.2	scheduleAction	
			5.3.2.3	scheduleActionType	
			5.3.2.4	scheduleActionNumber	
			5.3.2.5	scheduleActionParameter	
			5.3.2.6	scheduleActionParameter2	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1201v03 2.4.3.1	maxTimeBaseScheduleEntries	
			1201v03 2.4.3.2.1	timeBaseScheduleNumber	
			1201v03 2.4.3.2.2	timeBaseScheduleMonth	
			1201v03 2.4.3.2.3	timeBaseScheduleDay	
			1201v03 2.4.3.2.4	timeBaseScheduleDate	
			1201v03 2.4.3.2.5	timeBaseScheduleDayPlan	
			1201v03 2.4.3.3	timeBaseScheduleTableStatus	
			1201v03 2.4.4.1	maxDayPlans	
			1201v03 2.4.4.2	maxDayPlanEvents	
			1201v03 2.4.4.3.1	dayPlanNumber	
			1201v03 2.4.4.3.2	dayPlanEventNumber	
			1201v03 2.4.4.3.3	dayPlanHour	
			1201v03 2.4.4.3.4	dayPlanMinute	
			1201v03 2.4.4.3.5	dayPlanActionNumberOID	
			1201v03 2.4.4.4	dayPlanStatus	
3.5.4.5.6	Retrieve a Schedule	4.2.6			
			5.3.2.1	scheduleActionIndex	
			5.3.2.2	scheduleAction	
			5.3.2.3	scheduleActionType	
			5.3.2.4	scheduleActionNumber	
			5.3.2.5	scheduleActionParameter	
			5.3.2.6	scheduleActionParameter2	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			1201v03 2.4.3.1	maxTimeBaseScheduleEntries	
			1201v03 2.4.3.2.1	timeBaseScheduleNumber	
			1201v03 2.4.3.2.2	timeBaseScheduleMonth	
			1201v03 2.4.3.2.3	timeBaseScheduleDay	
			1201v03 2.4.3.2.4	timeBaseScheduleDate	
			1201v03 2.4.3.2.5	timeBaseScheduleDayPlan	
			1201v03 2.4.3.3	timeBaseScheduleTableStatus	
			1201v03 2.4.4.1	maxDayPlans	
			1201v03 2.4.4.2	maxDayPlanEvents	
			1201v03 2.4.4.3.1	dayPlanNumber	
			1201v03 2.4.4.3.2	dayPlanEventNumber	
			1201v03 2.4.4.3.3	dayPlanHour	
			1201v03 2.4.4.3.4	dayPlanMinute	
			1201v03 2.4.4.3.5	dayPlanActionNumberOID	
			1201v03 2.4.4.4	dayPlanStatus	
3.5.4.5.7	Support a Number of Actions	G.3			
			5.3.1	elmsScheduleActionNumEntries	
3.5.4.5.8	Support a Number of Day Plans	G.3			
			1201v03 2.4.4.1	maxDayPlans	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.4.5.9	Perform Action at a Scheduled Time	G.3			
			1201v03 2.4.4.3.1	dayPlanNumber	
			1201v03 2.4.4.3.2	dayPlanEventNumber	
			1201v03 2.4.4.3.3	dayPlanHour	
			1201v03 2.4.4.3.4	dayPlanMinute	
			1201v03 2.4.4.3.5	dayPlanActionNumberOID	
3.5.4.6	Configure Zones				
3.5.4.6.1	Configure Luminaire Zone [DEPRECATED]	G.3			
					Note: the object definitions that this requirement originally traced to are not in the published NTCIP 1213 v02 MIB.
3.5.4.6.2	Configure Electrical Service Zone [DEPRECATED]	G.3			
					Note: the object definitions that this requirement originally traced to are not in the published NTCIP 1213 v02 MIB.
3.5.4.6.3	Configure Branch Circuit Zone [DEPRECATED]	G.3			
					Note: the object definitions that this requirement originally traced to are not in the published NTCIP 1213 v02 MIB.
3.5.4.6.4	Define Zones	4.2.18.3			
			5.7.1	zoneTable	
			5.7.1.1	zoneIndex	
			5.7.1.2	zoneLocationProfile	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			5.7.1.3	zoneLocation	
			5.7.1.4	zoneMode	
			5.7.1.13	zoneFunctionalProfile	
3.5.4.6.5	Define Number of Zones Supported by an ELMS Device	4.2.18.3			
			5.9.1	elmsZoneLogicalDeviceIDTable	
			5.9.1.1	elmsZoneLogicalDeviceIDIndex	
			5.9.1.2	elmsZoneLogicalDeviceIDZoneID	
			5.9.1.3	elmsZoneLogicalDeviceIDDeviceTyp e	
			5.9.1.4	elmsZoneLogicalDeviceIDDeviceID	
3.5.4.6.6	Define Number of ELMS Devices for a Zone	G.3			
			5.9.1.1	elmsZoneLogicalDeviceIDIndex	
			5.9.1.2	elmsZoneLogicalDeviceIDZoneID	
			5.9.1.3	elmsZoneLogicalDeviceIDDeviceTyp e	
			5.9.1.4	elmsZoneLogicalDeviceIDDeviceID	
3.5.4.7	Configure Stagger Interval				
3.5.4.7.1	Configure Luminaire Stagger Interval	G.3			
			5.4.1.26	luminaireStaggerInterval	
3.5.4.7.2	Configure Branch Circuit Stagger Interval	G.3			
			5.6.1.40	branchcircuitStaggerInterval	
3.5.4.7.3	Configure Electrical Service Stagger Interval	G.3			
			5.5.1.27	electricalserviceStaggerInterval	
3.5.4.8	Configure Light Levels				
3.5.4.8.1	Configure Luminaire Light Level	4.2.7			
			5.4.1.18	luminaireDimLevel	
			5.4.1.19	luminaireDimWarmUpInterval	
3.5.4.8.2	Configure Electrical Service Light Level	4.2.8			
			5.5.1.22	electricalserviceDimLevel	
			5.5.1.23	electricalserviceDimWarmUpInterval	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.4.8.3	Configure Branch Circuit Light Level	4.2.9			
			5.6.1.22	branchcircuitDimLevel	
			5.6.1.23	branchcircuitDimWarmUpInterval	
3.5.4.8.4	Configure Light Level for Devices in Zone	4.2.10			
			5.7.1.11	zoneDimLevel	
			5.7.1.12	zoneDimWarmUpInterval	
3.5.4.9	Configure for Manual Operation				
3.5.4.9.1	Configure Luminaire for Manual Operation	G.3			
			5.4.1.4	luminaireSwitchMode	
3.5.4.9.2	Configure Electrical Service for Manual Operations	G.3			
			5.5.1.6	electricalserviceSwitchMode	
3.5.4.9.3	Configure Branch Circuit for Manual Operations	G.3			
			5.6.1.6	branchcircuitSwitchMode	
3.5.4.9.4	Configure Devices in Zone for Manual Operations	G.3			
			5.7.1.5	zoneSwitchMode	
3.5.4.10	Configure Electrical Service Monitoring and Metering Equipment				
3.5.4.10.1	Configure Branch Circuit Ground Fault Detector	4.2.11			
			5.6.1.24	branchcircuitGroundFaultCond	
			5.6.1.25	branchcircuitGroundFaultLeakageCurrent	
			5.6.1.26	branchcircuitGroundFaultLeakageCurrentThreshold	
			5.6.1.27	branchcircuitGroundFaultDetectorSwitchState	
3.5.4.10.2	Configure Branch Circuit Power Meter	G.1			
			5.6.1.31	branchcircuitPowerMeterCond	
			5.6.1.32	branchcircuitPowerMeterCurrent	
			5.6.1.33	branchcircuitPowerMeterVoltageAB	
			5.6.1.34	branchcircuitPowerMeterVoltageBC	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			5.6.1.35	branchcircuitPowerMeterVoltageCA	
			5.6.1.36	branchcircuitPowerMeterVoltageAN	
			5.6.1.37	branchcircuitPowerMeterVoltageBN	
			5.6.1.38	branchcircuitPowerMeterVoltageCN	
			5.6.1.39	branchcircuitPowerMeterSwitchState	
3.5.4.10.3	Configure Branch Circuit Arc Fault Detector	G.3			
			5.6.1.30	branchcircuitArcFaultDetectorSwitchState	
3.5.4.11	Configure Branch Circuit				
3.5.4.11.1	Retrieve Branch Circuit Information				
3.5.4.11.1.1	Retrieve Branch Circuit Zone	G.1			
			5.6.1	branchcircuitTable	
			5.6.1.1	branchcircuitIndex	
			5.6.1.2	branchcircuitLocationProfile	
3.5.4.11.1.2	Retrieve Branch Circuit Location	G.1			
			5.6.1.2	branchcircuitLocationProfile	
			5.6.1.3	branchcircuitLocation	
3.5.4.11.1.3	Retrieve Branch Circuit Pole Identifier	G.1			
			5.6.1.4	branchcircuitPoleIdentifier	
3.5.4.11.1.4	Retrieve Branch Circuit Electrical Parameters	G.1			
			5.6.1.41	branchcircuitSwitchState	
			5.6.1.42	branchcircuitPowerFactor	
			5.6.1.44	branchcircuitRealPowerA	
			5.6.1.45	branchcircuitRealPowerB	
			5.6.1.46	branchcircuitRealPowerC	
			5.6.1.47	branchcircuitEnergySum	
			5.6.1.48	branchcircuitEnergyPosSum	
			5.6.1.49	branchcircuitEnergySumNR	
			5.6.1.50	branchcircuitEnergyPosSumNR	
			5.6.1.51	branchcircuitPowerFactorA	
			5.6.1.52	branchcircuitPowerFactorB	
			5.6.1.53	branchcircuitPowerFactorC	
			5.6.1.54	branchcircuitCurrentA	
			5.6.1.55	branchcircuitCurrentB	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			5.6.1.56	branchcircuitCurrentC	
			5.6.1.57	branchcircuitPowerCountFailure	
			5.6.1.58	branchcircuitAverageVoltage	
			5.6.1.59	branchcircuitPeakLeakageCurrent	
			5.6.1.60	branchcircuitValleyLeakageCurrent	
			5.6.1.61	branchcircuitDisplayName	
			5.6.1.63	branchcircuitUnitsOfReading	
3.5.4.11.2	Configure Branch Circuit Information				
3.5.4.11.2.1	Configure Branch Circuit Location	G.3			
			5.6.1.2	branchcircuitLocationProfile	
			5.6.1.3	branchcircuitLocation	
3.5.4.11.2.2	Configure Branch Circuit Pole Identifier	G.3			
			5.6.1.4	branchcircuitPoleIdentifier	
3.5.4.12	Configure Astronomical Clock				
3.5.4.12.1	Configure Latitude of Installation	G.3			
			5.11.1	deviceLatitude	
3.5.4.12.2	Configure Longitude of Installation	G.3			
			5.11.2	deviceLongitude	
3.5.4.12.3	Configure Date	G.3			
			5.11.3	deviceDate	
3.5.4.13	Retrieve Astronomical Clock Data				
3.5.4.13.1	Retrieve Latitude of Installation	G.1			
			5.11.1	deviceLatitude	
3.5.4.13.2	Retrieve Longitude of Installation	G.1			
			5.11.2	deviceLongitude	
3.5.4.13.3	Retrieve Date	G.1			
			5.11.3	deviceDate	
3.5.4.13.4	Retrieve Sunrise Time	G.1			
			5.11.4	deviceSunriseTime	
3.5.4.13.5	Retrieve Sunset Time	G.1			
			5.11.5	deviceSunsetTime	
3.5.4.14	Configure Photocell				
3.5.4.14.1	Configure Photocell for Analog, Digital, or Reverse Operations	4.2.18.3			
			5.10.3	photocellTable	
			5.10.3.1	photocellIndex	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			5.10.3.2	photocellState2	
			5.10.3.3	photocellDisplayName2	
			5.10.3.5	photocellReverseOperation	
3.5.4.14.2	Retrieve Configuration of Photocell	4.2.18.1			
			5.10.3	photocellTable	
			5.10.3.1	photocellIndex	
			5.10.3.2	photocellState2	
			5.10.3.3	photocellDisplayName2	
			5.10.3.4	photocellReading	
			5.10.3.5	photocellReverseOperation	
			5.10.3.6	photocellUnitsOfReading	
3.5.4.15	Configure Energy Meter				
3.5.4.15.1	Configure Accuracy of Energy Meter	G.3			
			5.18	energymeterAccuracy	
3.5.4.15.2	Retrieve Accuracy of Energy Meter	G.1			
			5.18	energymeterAccuracy	
3.5.4.16	Retrieve Connected Vehicle Sensor Information				
3.5.4.16.1	Retrieve Connected Vehicle Speed	G.1			
			5.12.1	cvSpeed	
3.5.4.16.2	Retrieve Connected Vehicle Direction	G.1			
			5.12.2	cvDirection	
3.5.4.16.3	Retrieve Connected Vehicle Location	G.1			
			5.12.3.1	cvLatitude	
			5.12.3.2	cvLongitude	
			5.12.3.3	cvAltitude	
3.5.4.16.4	Retrieve Connected Vehicle Ambient Light Level	G.1			
			5.12.4	cvAmbientLightLevel	
3.5.4.16.5	Retrieve Connected Vehicle Headlight Status	G.1			
			5.12.5	cvHeadlightStatus	
3.5.4.16.6	Retrieve Connected Vehicle Road Friction	G.1			
			5.12.6	cvFriction	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.4.17	Retrieve Electric Vehicle Charger Information				
3.5.4.17.1	Retrieve Electric Vehicle Charger Location	4.2.18.1			
			5.13.1	evChargerTable	
			5.13.1.1	evChargerIndex	
3.5.4.17.2	Retrieve Electric Vehicle Charger Manufacturer Name	G.1			
			5.13.1.2	evChargerMfrName	
3.5.4.17.3	Retrieve Electric Vehicle Charger Model Number	G.1			
			5.13.1.3	evChargerModelNumber	
3.5.4.17.4	Retrieve Electric Vehicle Charger Serial Number	G.1			
			5.13.1.4	evChargerSerialNumber	
3.5.4.17.5	Retrieve Electric Vehicle Charger Ground Fault Current Status	G.1			
			5.13.1.5	evChargerGroundFaultCurrentStatus	
3.5.4.17.6	Retrieve Electric Vehicle Charger Charge Current	G.1			
			5.13.1.6	evChargerChargeCurrent	
3.5.4.17.7	Retrieve Electric Vehicle Charger Proximity Resistance	G.1			
			5.13.1.18	evProximityResistance	
3.5.4.17.8	Retrieve Electric Vehicle Charger Temperature	G.1			
			5.13.1.7	evChargerTemperature	
3.5.4.17.9	Retrieve Electric Vehicle Charger Activation	G.1			
			5.13.1.8	evChargerActivation	
3.5.4.17.10	Retrieve Electric Vehicle Charger Operational Status	G.1			
			5.13.1.9	evChargerOperationalStatus	
3.5.4.17.11	Retrieve Electric Vehicle Charger Total Energy Consumed	G.1			
			5.13.1.10	evChargerTotalEnergyDelivered	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.4.17.12	Retrieve Electric Vehicle Charger Energy Delivered for Current Charging Session	G.1			
			5.13.1.11	evCurrentChargingSession	
3.5.4.17.13	Retrieve Electric Vehicle Charger Energy Delivered for Previous Charging Session	G.1			
			5.13.1.12	evPreviousChargingSession	
3.5.4.17.14	Retrieve Electric Vehicle Charger Energy Loss	G.1			
			5.13.1.13	evChargerEnergyLoss	
3.5.4.18	Retrieve Energy Automatic Demand Response Information				
3.5.4.18.1	Retrieve Electricity Price	G.1			
			5.14.1.1	adrElectricityPricePrice	
			5.14.1.2	adrElectricityPriceRelative	
			5.14.1.3	adrElectricityPriceMultiplier	
3.5.4.18.2	Retrieve Energy Price	G.1			
			5.14.2.1	adrEnergyPricePrice	
			5.14.2.2	adrEnergyPriceRelative	
			5.14.2.3	adrEnergyPriceMultiplier	
3.5.4.18.3	Retrieve Demand Charge	G.1			
			5.14.3.1	adrDemandChargePrice	
			5.14.3.2	adrDemandChargeRelative	
			5.14.3.3	adrDemandChargeMultiplier	
3.5.4.18.4	Retrieve Bid Price	G.1			
			5.14.4.1	adrBidPricePrice	
3.5.4.18.5	Retrieve Bid Load	G.1			
			5.14.4.2	adrBidLoadSetpoint	
3.5.4.18.6	Retrieve Bid Energy	G.1			
			5.14.4.3	adrBidEnergySetpoint	
3.5.4.18.7	Retrieve Load Dispatch	G.1			
			5.14.6.1	adrLoadDispatchSetpoint	
			5.14.6.2	adrLoadDispatchDelta	
			5.14.6.3	adrLoadDispatchMultiplier	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			5.14.6.4	adrLoadDispatchLevel	
3.5.4.18.8	Retrieve Load Control Capacity	G.1			
			5.14.7	adrLoadControlCapacity	
3.5.4.18.9	Retrieve Load Control Offset	G.1			
			5.14.8	adrLoadControlOffset	
3.5.4.18.10	Retrieve Load Control Setpoints	G.1			
			5.14.9	adrLoadControlSetpoint	
3.5.4.18.11	Retrieve Load Control Percent Offset	G.1			
			5.14.10	adrLoadControlPercentOffset	
3.5.4.18.12	Retrieve Energy Storage	G.1			
			5.14.5.1	adrChargeStateSetpoint	
			5.14.5.2	adrChargeStateDelta	
			5.14.5.3	adrChargeStateMultiplier	
3.5.4.19	Configure Ground Fault Setpoint	G.3			
			5.15.1	gfiSetpoint	
3.5.4.20	Retrieve Ground Fault Setpoint	G.1			
			5.15.1	gfiSetpoint	
3.5.4.21	Retrieve Ground Fault Status	G.3			
			5.15.2	gfiStatus	
3.5.4.22	Configure Power Outage Message	G.3			
			5.16	poMessage	
3.5.4.23	Configure ELMS Device for Adaptive Operation	G.3			
			5.17	adaptiveConfig	
3.5.4.23.1	Configure Connected Vehicle Speed Setpoint	G.3			
			5.12.7	cvSpeedSetpoint	
3.5.4.23.2	Configure Connected Vehicle Direction Setpoint	G.3			
			5.12.8	cvDirectionSetpoint	
3.5.4.23.3	Configure Connected Vehicle Location Setpoint	G.3			
			5.12.9	cvLatitudeHighSetpoint	
			5.12.10	cvLatitudeLowSetpoint	
			5.12.11	cvLongitudeHighSetpoint	
			5.12.12	cvLongitudeLowSetpoint	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
			5.12.13	cvAltitudeHighSetpoint	
			5.12.14	cvAltitudeLowSetpoint	
3.5.4.23.4	Configure Connected Vehicle Ambient Light Level Setpoint	G.3			
			5.12.15	cvAmbientLightLevelSetpoint	
3.5.4.23.5	Configure Connected Vehicle Headlight Status Setpoint	G.3			
			5.12.16	cvHeadlightStatusSetpoint	
3.5.4.23.6	Configure Connected Vehicle Road Friction Setpoint	G.3			
			5.12.17	cvFrictionSetpoint	
3.5.4.24	Retrieve ELMS Device Adaptive Operation Configuration				
3.5.4.24.1	Retrieve Connected Vehicle Speed Setpoint	G.1			
			5.12.7	cvSpeedSetpoint	
3.5.4.24.2	Retrieve Connected Vehicle Direction Setpoint	G.1			
			5.12.8	cvDirectionSetpoint	
3.5.4.24.3	Retrieve Connected Vehicle Location Setpoint	G.1			
			5.12.9	cvLatitudeHighSetpoint	
			5.12.10	cvLatitudeLowSetpoint	
			5.12.11	cvLongitudeHighSetpoint	
			5.12.12	cvLongitudeLowSetpoint	
			5.12.13	cvAltitudeHighSetpoint	
			5.12.14	cvAltitudeLowSetpoint	
3.5.4.24.4	Retrieve Connected Vehicle Ambient Light Level Setpoint	G.1			
			5.12.15	cvAmbientLightLevelSetpoint	
3.5.4.24.5	Retrieve Connected Vehicle Headlight Status Setpoint	G.1			
			5.12.16	cvHeadlightStatusSetpoint	
3.5.4.24.6	Retrieve Connected Vehicle Road Friction Setpoint	G.1			
			5.12.17	cvFrictionSetpoint	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.5	Control Device				
3.5.5.1	Control Luminaire				
3.5.5.1.1	Control Luminaire by Permanent/Continuous Override	G.3			
			5.4.1.4	luminaireSwitchMode	
3.5.5.1.2	Control Luminaire by Transitory Override	G.3			
			5.4.1.4	luminaireSwitchMode	
3.5.5.1.3	Control Luminaire by Timed Override	4.2.12			
			5.4.1.4	luminaireSwitchMode	
			5.4.1.24	luminaireSwitchModeTime	
3.5.5.1.4	Control Luminaire in Stagger Mode	G.3			
			5.4.1.26	luminaireStaggerInterval	
3.5.5.1.5	Control Luminaire by Photocell	G.3			
			5.4.1.33	luminairePhotocellIndex	
3.5.5.1.6	Control Luminaire by Adaptive Means	G.3			
			5.17	adaptiveConfig	
3.5.5.2	Control Electrical Service				
3.5.5.2.1	Control Electrical Service by Permanent/Continuous Override	G.3			
			5.5.1.6	electricalserviceSwitchMode	
3.5.5.2.2	Control Electrical Service by Transitory Override	G.3			
			5.5.1.6	electricalserviceSwitchMode	
3.5.5.2.3	Control Electrical Service by Timed Override	4.2.13			
			5.5.1.6	electricalserviceSwitchMode	
			5.5.1.7	electricalserviceSwitchModeTime	
3.5.5.2.4	Control Electrical Service in Stagger Mode	G.3			
			5.5.1.28	electricalserviceSwitchState	
3.5.5.2.5	Control Electrical Service by Photocell	G.3			
			5.5.1.29	electricalservicePhotocellIndex	
			5.5.1.30	electricalserviceUnitsOfReading	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.5.2.6	Control Electrical Service by Adaptive Means	G.3			
			5.5.1.6	electricalserviceSwitchMode	
3.5.5.3	Control Branch Circuit				
3.5.5.3.1	Control Branch Circuit by Permanent/Continuous Override	G.3			
			5.6.1.6	branchcircuitSwitchMode	
3.5.5.3.2	Control Branch Circuit by Transitory Override	G.3			
			5.6.1.6	branchcircuitSwitchMode	
3.5.5.3.3	Control Branch Circuit by Timed Override	4.2.14			
			5.6.1.6	branchcircuitSwitchMode	
			5.6.1.7	branchcircuitSwitchModeTime	
3.5.5.3.4	Control Branch Circuit in Stagger Mode	G.3			
			5.6.1.40	branchcircuitStaggerInterval	
3.5.5.3.5	Control Branch Circuit by Photocell	G.3			
			5.6.1.62	branchcircuitPhotocellIndex	
3.5.5.3.6	Control Branch Circuit by Adaptive Means	G.3			
			5.6.1.6	branchcircuitSwitchMode	
3.5.5.4	Control Electric Vehicle Charger				
3.5.5.4.1	Control Soft Start	G.3			
			5.13.1.14	evSoftStart	
3.5.5.4.2	Control Automatic Reclosure on Fault Time	G.3			
			5.13.1.15	evARFT	
3.5.5.4.3	Control Power-Up Delay Minimum Time	G.3			
			5.13.1.16	evPUDMinTime	
3.5.5.4.4	Control Power-Up Delay Maximum Time	G.3			
			5.13.1.17	evPUDMaxTime	
3.5.5.4.5	Control Electric Vehicle Charger Activation	G.3			
			5.13.1.8	evChargerActivation	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.5.5	Control Devices by Zone				
3.5.5.5.1	Control Devices in Zone by Permanent/Continuous Override	G.3			
			5.7.1.5	zoneSwitchMode	
3.5.5.5.2	Control Devices in Zone by Transitory Override	G.3			
			5.7.1.5	zoneSwitchMode	
3.5.5.5.3	Control Devices in Zone by Timed Override	4.2.15			
			5.7.1.5	zoneSwitchMode	
			5.7.1.6	zoneSwitchModeTime	
3.5.5.5.4	Control Devices in Zone by Photocell	G.3			
			5.7.1.14	zonePhotocellIndex	
			5.7.1.15	zoneUnitsOfReading	
3.5.5.5.5	Control Devices in Zone by Adaptive Means	G.3			
			5.8.1	elmsMaxNumZonesPerDevice	
			5.8.2	elmsMaxNumDevicesPerZone	
3.5.6	Monitor Device Status				
3.5.6.1	Monitor Luminaire				
3.5.6.1.1	Retrieve Luminaire Switch Status	G.1			
			5.4.1.5	luminaireSwitchState	
3.5.6.1.2	Retrieve Luminaire Temperature	G.1			
			5.4.1.9	luminaireTemp	
3.5.6.1.3	Retrieve Luminaire Operating Time Statistics	G.1			
			5.4.1.10	luminaireMonthlyBurnTime	
			5.4.1.11	luminaireMonthlyExpectedBurnTime	
			5.4.1.12	luminaireTotalBurnTime	
			5.4.1.7	luminaireBurnCond	
3.5.6.1.4	Retrieve Luminaire Pole Status	G.1			
			5.4.1.8	luminairePoleCond	
3.5.6.1.5	Retrieve Luminaire Light Level Output	G.1			
			5.4.1.18	luminaireDimLevel	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.6.1.6	Retrieve Luminaire Status	G.1			
			5.4.1.6	luminaireCond	
			5.4.1.31	luminaireSecondaryCommStrength	
			5.4.1.32	luminaireRampTime	
			5.4.1.39	luminaireUnitsOfReading	
3.5.6.1.7	Retrieve Luminaire Power Usage Statistics	G.1			
			5.4.1.20	luminaireVoltage	
			5.4.1.21	luminaireCurrent	
			5.4.1.27	luminaireEnergy	
3.5.6.1.8	Retrieve Luminaire Ballast/Driver Status	G.1			
			5.4.1.22	luminaireBallastCond	
3.5.6.1.9	Retrieve Luminaire Starter Status	G.1			
			5.4.1.23	luminaireStarterStatus	
3.5.6.2	Monitor Electrical Service				
3.5.6.2.1	Retrieve Electrical Service Ground Fault Status	G.1			
			5.5.1.24	electricalserviceGroundFaultCond	
3.5.6.2.2	Retrieve Electrical Service Hours	G.1			
			5.5.1.8	electricalserviceOpHours	
3.5.6.2.3	Retrieve Electrical Service Operational Status	G.1			
			5.5.1.9	electricalserviceOpCond	
			5.5.1.30	electricalserviceUnitsOfReading	
3.5.6.2.4	Retrieve Electrical Service Energy Readings	G.1			
			5.5.1.10	electricalserviceVoltageAB	
			5.5.1.11	electricalserviceVoltageBC	
			5.5.1.12	electricalserviceVoltageCA	
			5.5.1.13	electricalserviceVoltageAN	
			5.5.1.14	electricalserviceVoltageBN	
			5.5.1.15	electricalserviceVoltageCN	
			5.5.1.16	electricalserviceCurrent	
			5.5.1.17	electricalservicePower	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.6.2.5	Retrieve Electrical Service Main Breaker Status	G.1			
			5.5.1.25	electricalserviceMainBreakerCond	
3.5.6.2.6	Retrieve Electrical Service Arc Fault Status	G.1			
			5.5.1.26	electricalserviceArcFaultCond	
3.5.6.3	Monitor Branch Circuit				
3.5.6.3.1	Retrieve Branch Circuit Energy Readings	G.1			
			5.6.1.10	branchcircuitVoltageAB	
			5.6.1.11	branchcircuitVoltageBC	
			5.6.1.12	branchcircuitVoltageCA	
			5.6.1.13	branchcircuitVoltageAN	
			5.6.1.14	branchcircuitVoltageBN	
			5.6.1.15	branchcircuitVoltageCN	
			5.6.1.16	branchcircuitCurrent	
			5.6.1.17	branchcircuitPower	
3.5.6.3.2	Retrieve Branch Circuit Arc Fault Status	G.1			
			5.6.1.29	branchcircuitArcFaultCond	
3.5.6.3.3	Retrieve Branch Circuit Breaker Status	G.1			
			5.6.1.28	branchcircuitBreakerCondition	
3.5.6.3.4	Retrieve Branch Circuit Operational Status	G.1			
			5.6.1.9	branchcircuitOpCond	
3.5.6.3.5	Retrieve Branch Circuit Hours	G.1			
			5.6.1.8	branchcircuitOpHours	
3.5.6.3.6	Retrieve Branch Circuit Ground Fault Status	G.1			
			5.6.1.24	branchcircuitGroundFaultCond	
3.5.7	Backward Compatibility Requirements				
3.5.7.1	NTCIP 1213 v02—Retrieve Photocell State	G.1			
			5.10.1	photocellState	

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Requirements Traceability Matrix (RTM) Table					
FR ID	**Functional Requirement**	**Dialog ID**	**Object ID**	**Object Name**	**Additional Specifications**
3.5.7.2	NTCIP 1213 v02—Retrieve Photocell Description	G.1			
			5.10.2	photocellDisplayName	

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Annex B
Object Tree [Informative]

Figure 9 provides a graphical representation of the branch and tree structure for objects and the organization of the data defined in NTCIP 1213 v03.

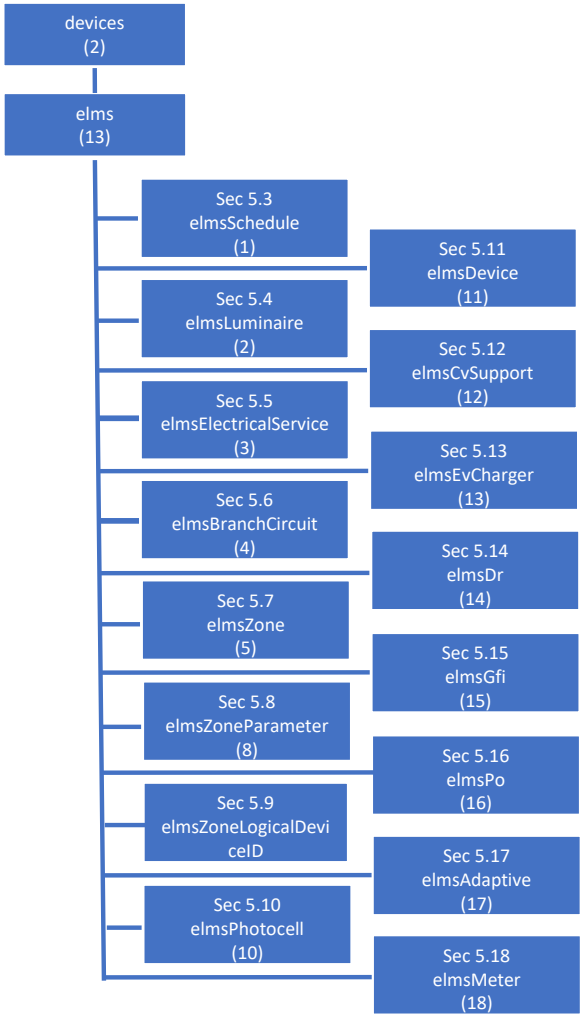


Figure 9 ISO Tree Structure

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Annex C
Test Procedures [Normative]

It is anticipated that Test Procedures may be developed as part of a future revision of NTCIP 1213 v03. Annex C is a placeholder, at present.

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Annex D
Documentation of Revisions [Informative]

It is anticipated that Documentation of Revisions may be developed as part of a future revision of NTCIP 1213 v03. Annex D is a placeholder, at present.

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Annex E
User Requests

It is anticipated that User Requests may be developed as part of a future revision of NTCIP 1213 v03. Annex E is a placeholder, at present.

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Annex F
Other Annexes

Annex F is a placeholder, at present.

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Annex G
SNMP Interface [Normative]

To promote interoperability, NTCIP 1213 v02 requires support for the Simple Network Management Protocol (SNMP). Annex G defines how a 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 v03. Annex G.1 through G.5.5 provide a description of the key services offered by SNMP assuming no errors. The precise rules and procedures are defined in NTCIP 1103 v03.

G.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 10. Both the Get request and the GetResponse messages contain a list of objects as defined by the varBindingList structure (see Figure 10).



Figure 10 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.

G.2 Generic SNMP GetNext 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 11. Both the GetNext request and the GetResponse messages contain a list of objects as defined by the varBindingList structure (see Figure 11).

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Figure 11 SNMP GetNext Interface

G.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 12. Both the Set request and the GetResponse messages contain a list of objects as defined by the varBindingList structure (see Figure 12).



Figure 12 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.

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G.4 Variable Binding List Structure

The requests and responses for the Get, GetNext, and Set operations all use the varBindingList structure. NTCIP 1103 v03 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 13.

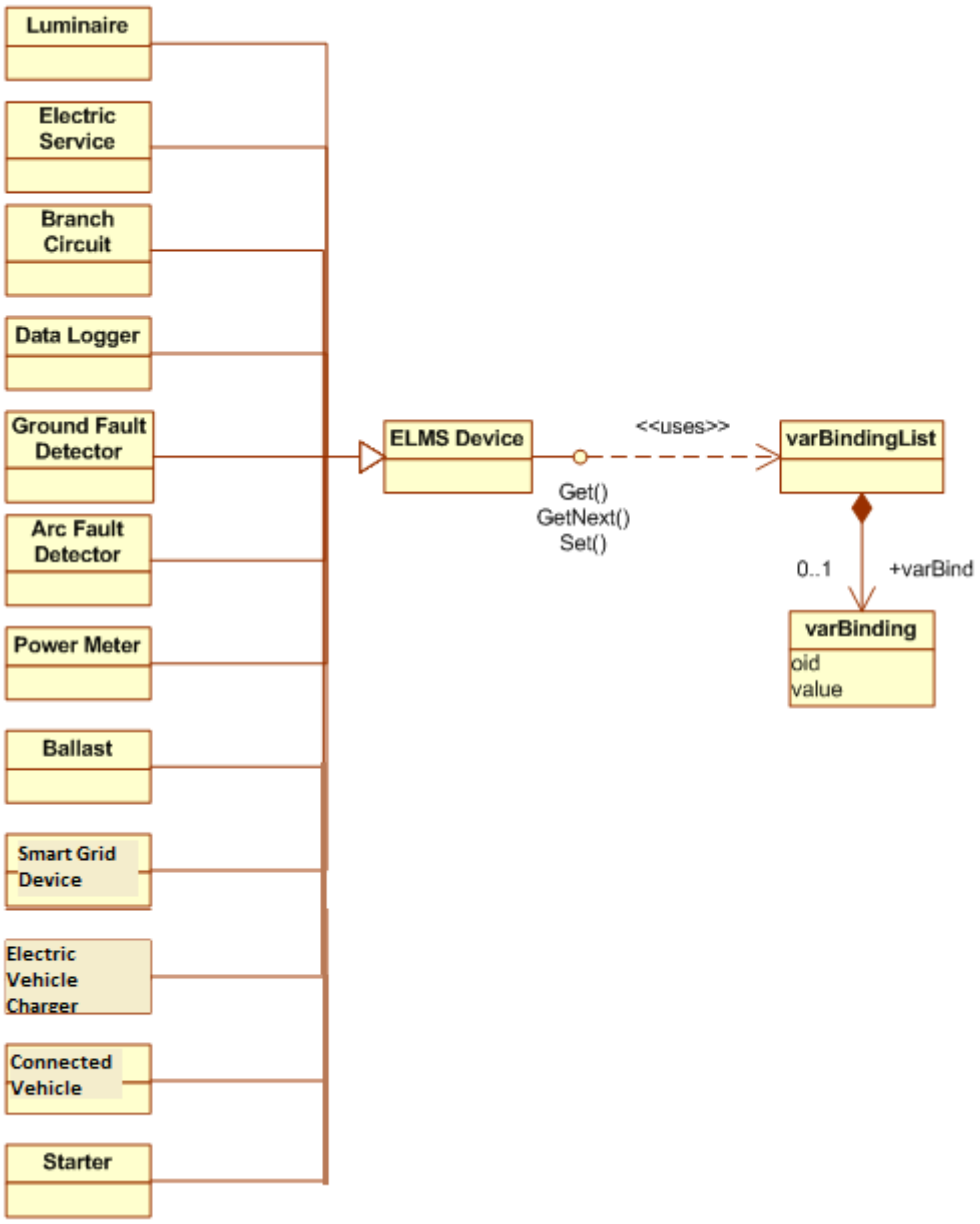


Figure 13 SNMP Interface—View of Participating Classes

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G.5 Additional Requirements

G.5.1 Grouping of Objects in a Request

The ELMS device shall allow a 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 varBindingList. 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.”

G.5.2 Support of Get

The ELMS device shall allow a management station to perform the Get operation on any supported object for which support for the Get Operation is indicated in Annex G.1.

G.5.3 Support of GetNext

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

G.5.4 Support of Set

The ELMS device shall allow a management station to perform the Set operation on any supported object for which support for the Set Operation is indicated in Annex G.3.

G.5.5 Performance

The ELMS device shall process the Get, GetNext, or Set request in accordance with all of the rules of NTCIP 1103 v03.

§

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