

NTCIP 1207 v02.06b

National Transportation Communications for ITS Protocol Object Definitions for Ramp Meter Control (RMC) Units – Version 02

v02.06b June 2007

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This publication was prepared by the NTCIP Ramp Meter Control Working Group, which is a subdivision of the Joint Committee on the NTCIP. The Joint Committee is organized under a Memorandum of Understanding among the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), and the National Electrical Manufacturers Association (NEMA). The Joint Committee on the NTCIP consists of six representatives from each of the standards organizations, and provides guidance for NTCIP development.

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In addition to the many volunteer efforts, recognition is also given to those organizations which supported the efforts of the working group by providing comments and funding for the document, including:

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- Telvent Farradyne Inc. (formerly known as PB Farradyne)
- Texas Transportation Institute (TTI)
- TransCore Inc.
- Washington State Department of Transportation (WSDOT)

In addition to the many volunteer efforts, the U.S. Department of Transportation / Federal Highway Administration provided funding assistance for the development of the NTCIP standards and associated documents.

FOREWORD

This document uses only metric units.

The purpose of this publication is to identify and define how a management station may wish to interface with a field device in order to control and monitor ramp metering controllers. It defines requirements that are applicable to all NTCIP ramp metering controllers and it also contains optional and conditional sections that are applicable to specific environments for which they are intended.

There are 2 normative and 1 informative annexes to this document.

- 1.) Annex A is informative and contains the Operations Concept and basically the functional requirements of a ramp meter control unit..
- 2.) Annex B is normative and contains the Protocol Information Conformance Statement (PICS) list including each of the defined object definitions, their potential value ranges, an indication whether the object is a control, status, or database parameter, and a column allowing a user to enter project-specific information.
- 3.) Annex C is informative and contains the object tree showing the major nodes of the DMS object structure within the Global object tree.
- 4.) Annex D will be normative but does not currently any data. This annex will ultimately contain the test procedures for testing a device for conformance to this standard.
- 5.) Annex E is informative and contains all the changes that have been made between version 1 and vesion 2 of this standard.

This document is an NTCIP Data Dictionary Standard. Data Dictionary Standards provide definitions of data elements for use within NTCIP systems.

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Approvals

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

AASHTO – Standard Specification; monthHere 200X

ITE – Software Standard; monthHere 200X

NEMA – Standard; monthHere 200X

History

From 1996 to 1999, this document was referenced as TS 3.RMC. However, to provide an organized numbering scheme for the NTCIP documents, this document is now referenced as NTCIP 1207. The technical specifications of NTCIP 1207 are identical to the former reference, except as noted in the development history below:

TS 3.RMC version 98.01.10. October 1998 – Accepted as a User Comment Draft by the Joint Committee on the NTCIP. February 1999 - NTCIP Standards Bulletin B0029 distributed for user comment.

NTCIP 1207 v01.16. November 1999 – Accepted v01.15 as a Recommended Standard by the Joint Committee on the NTCIP. October 2000 - NTCIP Standards Bulletin B0056 referred v01.16 for balloting. Approved by AASHTO in February 2001, approved by ITE in May 2001, and approved by NEMA in May 2001.

NTCIP 1207:2001 v01.17. November 2001 – Prepared document for publication; updated document to NTCIP 8002 v04 Template format, added approvals and history to Foreword, and revised Foreword and Introduction.

NTCIP 1207 v02.06 – version 02 was prepared to address interoperability issues found during external testing and implementations. Additionally, the concept of block objects as well as a Protocol Implementation Conformance Statement (PICS) was added to the standard.

Compatibility of Versions

All NTCIP Standards Publications have a major and minor version number for configuration management. The version number syntax is "v00.00a," with the major version number before the period, and the minor version number and edition letter (if any) after the period.

Anyone using this document should seek information about the version number that is of interest to them in any given circumstance. The MIB and the PICS should all reference the version number of the standards publication that was the source of the excerpted material.

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

INTRODUCTION

This publication provides definitions of data elements for use within ramp meter control. The data is defined using the Simple Network Management Protocol (SNMP) object-type format as defined in RFC 1212.

This document defines requirements that are applicable to all NTCIP environments and also contains optional and conditional clauses that are applicable to specific environments for which they are intended.

The following keywords apply to this document: AASHTO, ITE, NEMA, NTCIP, rmc, ramp meter, ramp metering data dictionary, and object.

In 1992, the NEMA 3-TS Transportation Management Systems and Associated Control Devices Section began the effort to develop the NTCIP. The Transportation Section's purpose was to respond 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. The Joint Committee on the NTCIP formed a working group to develop a set of object definitions for Ramp Meter control units. The Working Group's first meeting was in February 1997.

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Section 1 INTRODUCTION

1.1 SCOPE

This standard assumes a model of RMC operation in which RMC units possess intelligence, and the data used for ramp management and data collection is resident at the RMC controller. We refer to the RMC unit's status, control, and configuration data as the "controller database"; the standard specifies interfaces whereby this data can be manipulated by the central system. There are no imperative commands such as "Activate a timing plan" or "Report status"; the central system controls the behavior of the RMC purely through queries of and changes to the controller database using a suite of communication protocols appropriate for the underlying communications infrastructure. These communications protocols are defined in the NTCIP 23xx series standards (Application Layer protocols), NTCIP 22xx series standards (Transport Layer protocols), and NTCIP 21xx series standards (Subnetwork Layer protocols).

The scope of this document is limited to the functionality related to RMC units used within a transportation environment. The limits and descriptions of the parameters are established to give the user maximum flexibility to operate devices that either exist at the time this document was authored or may exist in the future. This publication defines objects which are specific to RMC units and also defines standardized object Groups which can be used for conformance statements.

In order to achieve the functionality described in Annex A of this document, which describes the typical operation of an RMC unit, some or all of the objects described in other standards must be utilized.

The remainder of this standard will provide the following main sections, each building on the previous section(s):

- Management Information Base – This section defines the data exchanged during communications (an update of NTCIP 1207:2001 Section 2)
- Functional Requirements – Annex A defines the functional requirements which describe the typical operation of an RMC unit.
- Protocol Implementation Conformance Statement (PICS) – This annex depicts the definition of each of the object definition, its value range, an indication of whether the object definition is a control, status or database parameter, and a column to allow a user to enter project-specific information.

NOTES:

1. *This version of the document does not yet follow the new System Engineering Process (SEP) configuration used in other version 2 standards such as NTCIP 1203 and 1204.*
2. *This version of the RMC standard does not contain the test procedures that are needed for each functional requirement. This may be added in a future version of this standard.*

All of these sections will be of interest to the readers of this standard. The functional requirements in Annex A provide the user with details of the operations of a typical RMC unit, which is supported by the object definitions defined in Section 2. The parameter names used in the functional requirements section are used as the names of the parameter headers in Section 2 to ease the complexity of this standard.

Additional annexes provide information on certain topics such as Changes between Version 1 and this version, and the global object tree for the RMC-specific object definitions.

1.2 REFERENCES

For approved revisions, contact:

NTCIP Coordinator
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209-3806

For draft revisions of this document, which are under discussion by the relevant NTCIP Working Group, and recommended revisions of the NTCIP Joint Committee, visit the World Wide Web at <http://www.ntcip.org>.

The following standards (normative references) contain provisions, which, through reference in this text, constitute provisions of this Standard. Other documents and standards (other references) are referenced in these documents, which 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 below.

1.2.1 Normative References

NTCIP 1201:2005	<i>NATIONAL TRANSPORTATION COMMUNICATIONS FOR ITS PROTOCOL (NTCIP) Global Object Definitions – Version 02</i>
NTCIP 1201 v02.11	Amendment 2 : <i>NATIONAL TRANSPORTATION COMMUNICATIONS FOR ITS PROTOCOL (NTCIP) Global Object Definitions - Amendment 2</i>
NTCIP 1103 v02.10	National Transportation Communications for ITS Protocol (NTCIP) – Transportation Management Protocols (TMP) - version 2

1.2.2 Other References

NTCIP 2301 v02.12b	<i>NATIONAL TRANSPORTATION COMMUNICATIONS FOR ITS PROTOCOL (NTCIP) Simple Transportation Management Framework (STMF) Application Profile – Version 02 – User Comment Draft</i>
--------------------	--

1.3 CONTACT INFORMATION

1.3.1 ISO/IEC Standards

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

ANSI
11 West 42nd Street, 13th Floor
New York, NY 10036-8002
(212) 642-4900

1.3.2 RFC Documents

Obtain Request for Comment (RFC) electronic documents from several repositories on the World Wide Web, or by “anonymous” File Transfer Protocol (FTP) with several hosts. Browse or FTP to:

<http://www.ietf.org/rfc.html>
<http://www.rfc-editor.org/>
<http://www.rfc-editor.org/repositories.html>
 for FTP sites, read <ftp://ftp.isi.edu/in-notes/rfc-retrieval.txt>

1.4 DEFINITIONS

This subsection defines the terms used throughout this Standard. For additional explanations, please see Annex A.

Actuated	The detector state, which indicates the presence of a vehicle in the detection zone.
Advance Warning Sign	A sign which alerts motorists of ramp meter signal operation.
Calculation Interval	The period of time over which data analysis, data averaging and data processing is performed. The length of this period is usually a fraction of 60 seconds – many agencies use 10 s, 15 s, 20 s, or 30 s.
Fractional Offset Time	A value derived from dividing 1 hour by the value of the Active Metering Rate divided by the number of metered lanes. This value is expressed in tenth of seconds.
Demand Detector	The detector on the upstream side of the metered lane stop bar. Detects vehicles demanding a green interval. Used for signal sequencing. See Figure 2.
Dependency Group	A group of metered lanes in which the signal sequencing is dependent on the other lanes in the group.
Detection Zone	The sensing area of a detector.
Detector	A device used to sense vehicles, e.g. inductive loop, video image processor, etc.
Downstream	The direction in which vehicles depart.
Downstream Detection Station	Mainline Detection Station typically used to monitor the impacts of the metering operations.
Event Table	A set of events that are scheduled to occur at a given time-of-day, day(s)-of-week, month(s) and/or day(s)-of-month. Each event consists of parameter IDs and values.
Excessive Queue Detector	The detector at the entrance to the metered lane. Detects the intolerable queue from the ramp meter signal. Used for queue management. See Figure 2.
Flow Rate	The rate at which vehicles pass a detection zone, expressed in vehicles per hour per lane.
Intermediate Queue Detector	The detector midway between the metered lane stop bar and the entrance to the metered lane. Detects the queue forming from the ramp meter signal. Used for queue management. See Figure 2.
Interval	Each part of the signal cycle during which the signal indications do not change. Valid metered lane intervals are shown in Figure 3.

Lane Average	An average based on the number of lanes contributing data. Compare with Vehicle Average .
Leading Detection Zone	The detection zone of the upstream detector within a mainline detector station. See Figure 2.
Long Stop	The condition which occurs when a vehicle approaching the metered lane signal stops and actuates the passage detector as well as the demand detector. Compare with Short Stop .
Mainline	The principal roadway. Ramp meters are designed to manage congestion on the mainline. Compare with Metered Lane . See Figure 2 .
Maximum Metering Rate	The highest metering rate used by the RMC. Three maximums are defined: 1) absolute maximum, which identifies geometric and driver limitations; 2) operational maximum, which identifies mainline capacity and metered lane demand traffic constraints; and 3) system maximum, which identifies inter-agency agreements and policies. The lowest of these three metering rates will be the upper limit for the metered lane.
Merge Detector	The detector placed where the metered lane is absorbed into the mainline lanes. Used to detect a queue at the merge point. See Figure 2.
Merge Override	The process that freezes the red interval timer for each metered lane in a dependency group based upon traffic conditions at the merge detector to prevent additional vehicles from being released at the stop bar.
Metered Lane	A lane on the on-ramp that is equipped with a signal.
Metered Lane Dependency	The relationship between metered lanes under control of a single ramp meter controller. In multi-lane configurations, metered lanes may operate independently of each other, or the interval of one may depend on the interval of the others.
Metering Plan	A table of metering rates, and occupancy, speed and volume thresholds to be used for traffic responsive metering decisions.
Metering Rate	The rate at which vehicles are allowed to proceed through the metered lane signal, expressed in vehicles per hour per lane.
Minimum Metering Rate	The lowest metering rate used by the RMC. Three minimums are defined: 1) absolute minimum, which identifies geometric and driver limitations; 2) operational minimum, which identifies mainline capacity and metered lane demand traffic constraints; and 3) system minimum, which identifies inter-agency agreements and policies. The highest of these three metering rates will be the lower limit for the metered lane.
Occupancy	The percentage of time that vehicles are present in a detection zone, expressed in 0.1%.
Passage Detector	The detector on the downstream side of the metered lane stop bar. Detects vehicles passing the ramp meter. Used for signal sequencing and metered lane volume counts. See Figure 2.

Priority Lane	The designation for special purpose metered lanes usually reserved for vehicles with a minimum number of occupants such as transit vehicles and carpools. The green interval of the priority lane will be interleaved with the green intervals of the other metered lanes in a dependency group.
Priority Red Delay	The process that extends the red interval for all non-priority metered lanes in a dependency group upon actuation of the demand detector in the priority lane of that same dependency group.
Queue Override	The process that adjusts the metering rate based on traffic conditions at the queue detectors to shorten the length of the queue.
Ramp Meter Control	A system in which the entry of vehicles onto a freeway from an on-ramp is controlled by a traffic signal allowing a fixed number of vehicles to enter from each metered lane of the on-ramp during each cycle.
Red Violation	The process that extends the red interval timing for each metered lane in a dependency group upon actuation of the passage detector of the metered lane during its red interval.
Short Stop	The condition which occurs when a vehicle approaching the metered lane signal stops and fails to actuate the demand detector. Compare with Long Stop .
Shutdown Gap	The gap between vehicles at the demand detector required before the Shutdown Warning Interval.
Speed Trap	Two detectors in tandem that are used to measure speed of vehicles in a lane.
Speed Trap Spacing	The upstream edge-to-upstream edge spacing between the leading and trailing detectors within a mainline detection station used for measuring vehicle speed.
Startup Gap	The gap between vehicles at one queue detector required before the Startup Yellow Interval.
Station	A group of mainline lanes in the same direction of travel, used to collect composite traffic data.
Station Average Flow Rate	A lane average flow rate based on the flow rate averaged for all working mainline lanes in the station whose lane usage status contains flow rate.
Station Average Occupancy	A lane average occupancy based on the occupancy averaged for all working mainline lanes in the station whose lane usage status contains occupancy.
Station Average Speed	A vehicle average speed based on the speed averaged for all vehicles with valid speed values in all working mainline lanes in the station whose lane usage status contains speed.
Trailing Detection Zone	The detection zone of the downstream detector within a mainline detector station. See Figure 2.
Upstream	The direction from which vehicles arrive.
Upstream Detection Station	Mainline Detection Station typically used to serve as input into the metering algorithm.
Vehicle Average	An average based on the number of vehicles contributing data. See Lane Average .
Vehicle Count	The number of vehicle that pass a detection zone, expressed in vehicles per calculation interval.

1.5 TERMS AND ABBREVIATIONS

ISO	International Standards Organization
ITS	Intelligent Transportation Systems
km/h	kilometers per hour
m	meter (SI unit)
MIB	Management Information Base
min	Minute
NTCIP	National Transportation Communications for ITS Protocol
RMC	Ramp Meter Control
s	second (SI Unit)
TBC	Time Base Control
TMC	Transportation Management Center
TMS	Transportation Management Subsystem, term for TMC used in National Architecture
vph	vehicles per hour
vphpl	vehicles per hour per lane

1.6 SUPPLEMENTAL FIGURES

Four figures are shown in this section. These figures show the relationship of the RMCs in NTCIP terms, National Architecture terms and in RMC operations terms.

Figure 1 depicts the architecture that is a proposed component for the National Architecture. The architecture diagram identifies some of the terms and acronyms described above, and it identifies the focus of this standard.

Figure 2 shows the layout of a typical ramp meter installation.

Figure 3 indicates the Interval State Diagram, a visual depiction of the different intervals of a metered lane.

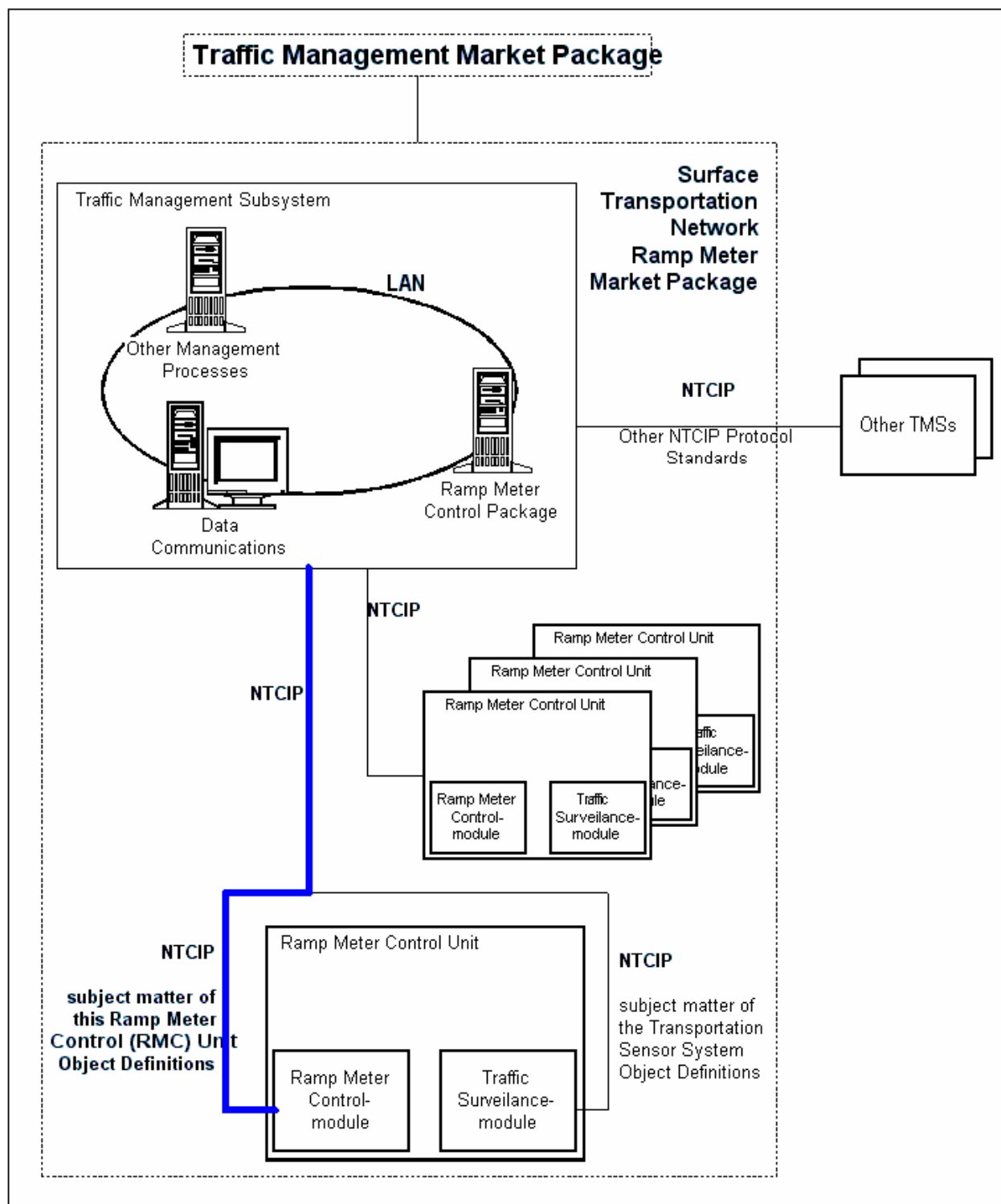


Figure 1
RMC Architectural Diagram within National Architecture

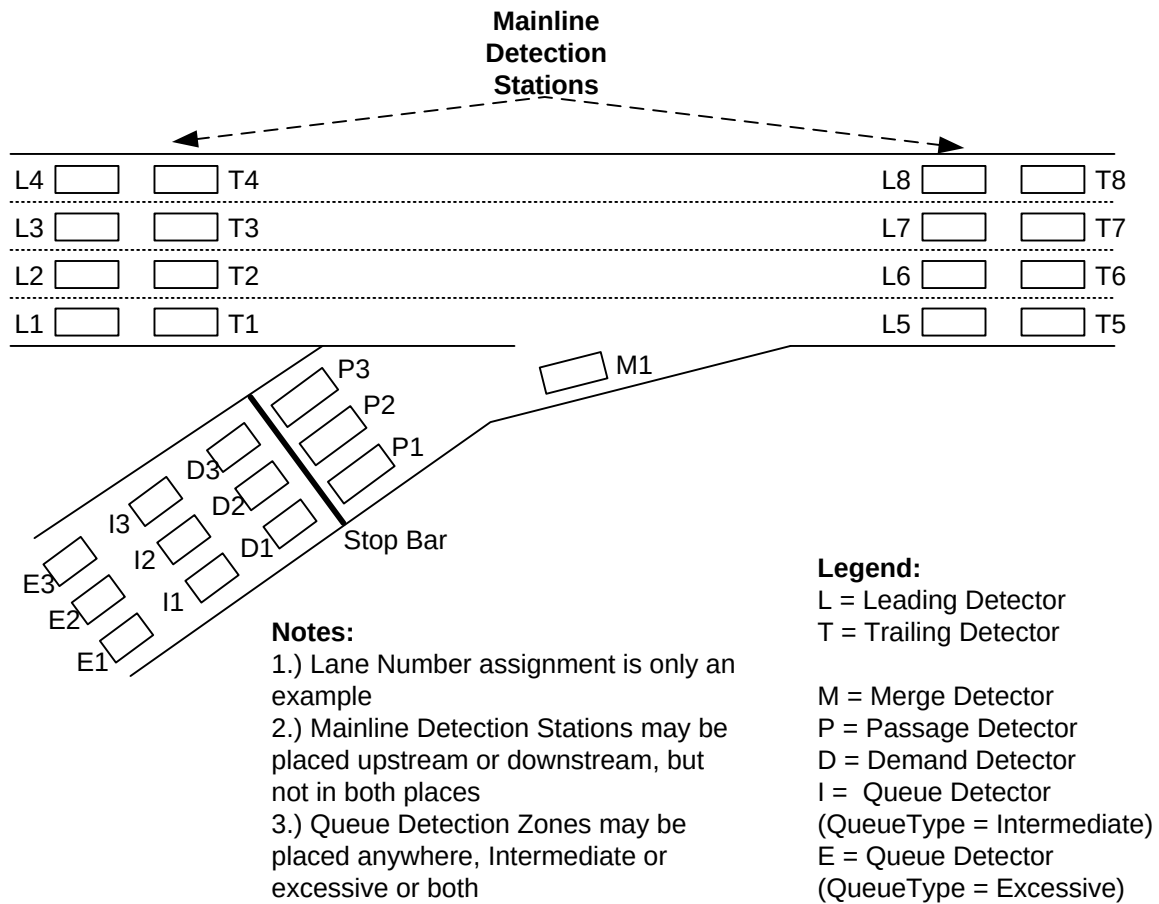


Figure 2
Typical Ramp Meter Layout

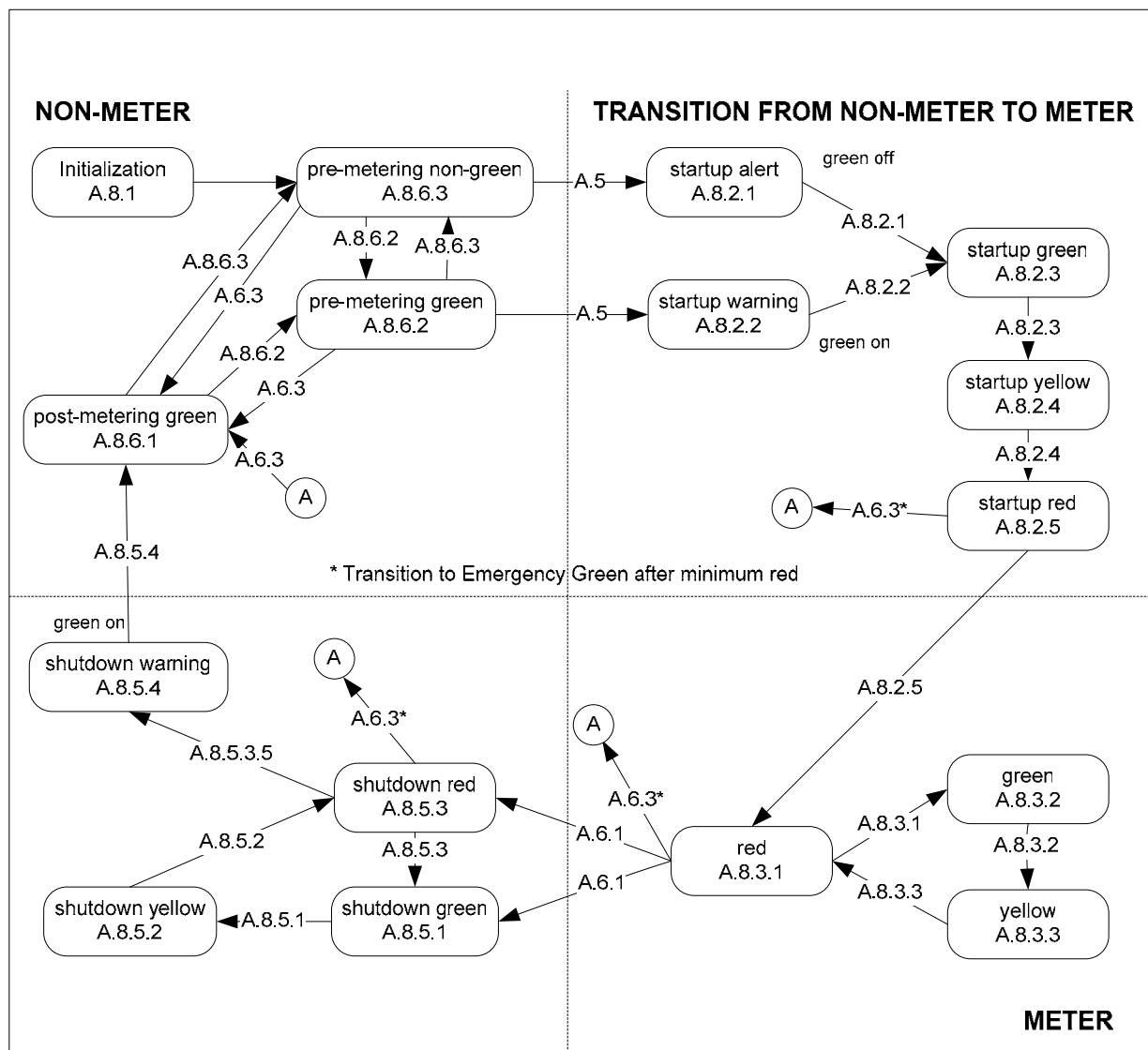


Figure 3
Metered Lane Interval State Diagram

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Section 2 GENERAL

2.1 INTRODUCTION

A Ramp Meter Control (RMC) unit consists of the field controller, its suite of sensors, and the warning signs and signals.

To date, there have not been standards defining how these devices communicate with other related equipment. As a result, each manufacturer has developed its own protocol to meet its particular needs. To integrate systems manufactured by different companies, considerable extra work must be performed resulting in increased costs. This shortcoming limits interchangeability of components from different vendors and restricts information sharing within and between agencies.

These problems have not been limited to ramp meter control devices. Many other devices also need to exchange information. In surface transportation, examples include traffic signal controllers, dynamic message signs, bus priority sensors, etc. To address these problems, NTCIP is developing a family of open standards for communications among field devices and between field devices and TMCs.

2.2 BENEFITS OF STANDARDIZATION

As transportation systems become more sophisticated, planners, agencies, and equipment manufacturers recognize the need for system interoperability and integration. Currently, there is no common protocol with which different types of equipment can communicate. If RMC units are to be integrated with ITS, common communications standards must be established.

Before the NTCIP development started, each electronic transportation-device vendor adopted a different protocol for data communications. This made it very difficult to mix equipment from different vendors in the same system, and to communicate between systems operated by adjacent agencies. NTCIP provides a common standard that can be used by all vendors.

NTCIP offers increased flexibility and choice for agencies operating transportation systems such as RMC units. NTCIP removes barriers to inter-jurisdictional coordination and allows equipment of different types and manufacturers to be mixed on the same communications line. For these reasons, operating agencies will benefit by specifying NTCIP equipment in all future purchases and upgrades.

Benefits of adopting open standards based on the NTCIP include:

- *Avoiding Early Obsolescence:* Though it may not be practical to retrofit NTCIP support in some legacy equipment, most RMC unit vendors will offer NTCIP support in current and future products. An agency can ensure that its equipment remains useful and compatible long into the future by requiring NTCIP support for all future purchases and upgrades.
- *Providing Choice of Vendor:* Once an agency has RMC units that support NTCIP, RMCs from any manufacturer offering NTCIP-compatible products which will communicate with the agency's existing equipment.
- *Allowing Inter-jurisdictional Coordination:* In the future, an agency may want to communicate with RMC units owned by other users and/or procured from different vendors. Under NTCIP, these units can be added onto an existing communications channel and mixed with different types of devices on the same line.

- *Using one Communications Network for All Devices:* NTCIP also allows a TMC to communicate with a range of field devices on the same communications channel. For example, if a dynamic message sign (DMS) is installed near an RMC unit, the TMC could communicate with the DMS controller using the communications channel already in place for the RMC unit. The communications network is usually the most expensive component of a transportation management system, and the use of NTCIP maximizes that investment.

2.3 EXISTING STANDARDS

There are great benefits of adopting existing standards where possible. These include:

- reuse of software modules during development
- faster implementations
- reducing risks
- ability to integrate components from different manufacturers
- unambiguous meanings of terminology
- building on proven technologies

2.3.1 Internet Standards

The Internet Engineering Task Force (IETF) is responsible for developing and maintaining the standards, guidelines and procedures for communications over the Internet. This group has become increasingly important over the last few years as the Internet has gained popularity. A wide range of Internet standards exist, including:

- Point-to-Point Protocol (PPP) - which may be used for NTCIP dial-up links
- Internet Protocol (IP) - which may be used for NTCIP communications over networks
- Transport Control Protocol (TCP) - which may be used to provide connection-oriented services over NTCIP networks
- User Datagram Protocol (UDP) - which may be used to provide connectionless transport services over NTCIP networks
- Simple Network Management Protocol (SNMP) - which may be used to exchange NTCIP data elements such as those defined within this document.

2.3.2 International Standards Organization Standards

The International Standards Organization (ISO) also develops various communication standards among a wide variety of other standards. The Open Systems Interconnect Reference Model (OSI RM) is a widely-referenced ISO standard which defines the standard seven-layered communications model. While most implementations do not strictly conform to this standard, virtually all modern communications schemes, including NTCIP, use many of the concepts defined within the standard. In addition, NTCIP communications may use the High-Level Data Link Control (HDLC) protocol, another ISO standard, in specifying how to send a message over a single communications link.

2.3.3 NTCIP

To support ITS developments, US DOT funded the design of a National ITS Architecture. This architecture defines major ITS subsystems and the needs for information exchange among them. The Joint AASHTO, ITE, and NEMA Committee on the NTCIP, and its working groups are now developing standards for some of these information exchanges. NTCIP recognizes that ramp meter control and monitoring information is vital for efficient and safe traffic operations. The family of NTCIP standards will support RMC unit procurement and support information sharing between the various data users. The development of NTCIP, including this standard, makes use of existing standards as appropriate.

2.4 NTCIP SYSTEM DESIGN

NTCIP was initially designed to support traffic signal controllers because that was seen by the FHWA as an area of most pressing need. However, the development process planned that the protocol would be extended to other transportation environments (e.g., ITS) and, where appropriate, to other environments such as meteorology.

The NTCIP family of protocols is continually expanding to address additional needs. Work is in progress on additional protocols for computer-to-computer or center-to-center data exchange, transit communications, and communications with or between moving vehicles. NTCIP along with other US DOT standards efforts will eventually provide a comprehensive family of communications protocols covering all appropriate ITS applications.

There may also be a future demand to use the system for communications to field devices that are not transportation related; for example air quality monitors for the Environmental Protection Agency (EPA), weather stations for the National Weather Service (NWS), or reservoir monitoring systems for the U.S. Army Corps of Engineers (USACE). The ultimate scope of NTCIP cannot be rigidly determined. The keys are to determine how those changes might affect the system design, and to provide flexible standards to accommodate these changes.

Where possible, NTCIP uses existing telecommunications and computer industry standards.

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Section 3 RMC OBJECT DEFINITIONS

This section defines those objects, which are specifically used by Ramp Meter Control (RMC) units. The objects are defined using the OBJECT-TYPE macro as specified in RFC 1212. The text provided from Section 3.1 through the end of the section (except the section headings) constitutes the standard management information base (MIB) for RMC units, which is termed "1207v0206-MIB1".

The section below present the objects in lexicographical order of their OBJECT IDENTIFIERS that correspond to their physical location within the global naming tree. All of the objects defined in this document reside under the "ramp" node of the global naming tree. To aid in object management, the "ramp" node has been subdivided into logical categories, each defined by a node under the "ramp" node. The individual objects are then located under the appropriate node.

Nodes should not be confused with Conformance Groups, which are defined in Section 4. A Conformance Group is a logical grouping of objects, which is used for conformance statements. While Conformance Groups will frequently correspond to the nodal structure, a Conformance Group may contain objects, which are not lexicographically ordered or which might not even be defined in this standard.

Text preceded by a double hyphen in the MIB definitions represent normative text for this standard.

All management applications shall reference the specific device MIB as provided by the device manufacturer for support and constraints (sub-ranges).

The DESCRIPTION field of certain object definitions contains the term 'Suggested Usable Range'. This term indicates a value range that has been used over a broad range of installations and represents the domain expertise of the WG members to provide those implementers who are new to ramp metering with guidance. However, these values are purely advisory and do not restrict the object (any more than explicitly constrained in the ASN notation).

3.1 RAMP METER CONTROL (RMC) MIB HEADER INFORMATION

```
-- *****
-- Filename:      1207v0206.MIB
-- Description:   This MIB defines the object definitions for ramp meter control
--               (RMC) units
-- Source:        NTCIP 1207:2001
-- MIB Revision History:
-- 2001           NTCIP 1207:2001 approved
-- 04/30/07      Changed filename and updated copyright years
--               Modified header format and wording of copyright and MIB
--               Distribution Notice
--               Incorporated NTCIP 8004 and NTCIP 8005 formats/requirements
--               Addressed User Comments
--
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--

1207v0206-MIB1 DEFINITIONS ::= BEGIN

IMPORTS

OBJECT-TYPE, TIMETICKS
FROM RFC-1212

ramp

-- Deleted devices to reference from TMIB-II
-- and added references to ramp
FROM NTCIP8004-A-2004;

3.2 RMC GENERAL CONFIGURATION NODE

rmcCfg OBJECT IDENTIFIER ::= { ramp 1 }

-- This node is an identifier used to group all objects for the configuration
-- of general parameters that are common to all ramp meter control units.

3.2.1 Communication Refresh Threshold

rmcCommRefreshThreshold OBJECT-TYPE

SYNTAX INTEGER (0..65535)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"<Definition> This is an RMC parameter that is being used for each metered lane. If no successful SET command communication has been issued to the rmcCommActionMode object of a metered lane for the time indicated in this threshold, the value of the rmcCommActionStatus-object for that metered lane shall be set to 'noComm'.

This value shall be expressed in 1-second increments.

A suggested usable range is 0, 20 to 14400.

A value of zero (0) shall inhibit communications refresh timing.

<Unit>second

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.1.1"

REFERENCE

"see Clause A.3"

DEFVAL { 0 }

::={ rmcCfg 1 }

3.2.2 Calculation Interval

rmcCalcInterval OBJECT-TYPE

SYNTAX INTEGER (1..255)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"Indicates the duration of a single calculation interval consisting of data analysis, averaging and processing.

This value shall be expressed in 1-second increments.

A suggested usable range is 10 to 30.

<Unit> second

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.1.2"

REFERENCE

"See Clause A.2.1, A.2.2.1, A.2.2.2, A.2.2.3, A.2.3.1, A.4, A.8.3.1.4.2, A.8.5.3.4.2, and A.9.1"

DEFVAL { 30 }

::={ rmcCfg 2 }

3.3 MAINLINE LANE CONFIGURATION, CONTROL AND STATUS NODE

rmcML OBJECT IDENTIFIER ::= { ramp 2 }

-- This node is an identifier used to group all objects for the configuration,
-- control and status of the mainline lanes that are common to all ramp meter
-- control units.

3.3.1 Averaging Periods

rmcAveragingPeriods OBJECT-TYPE

SYNTAX INTEGER (1..255)

ACCESS read-write

STATUS mandatory

DESCRIPTION

"This value indicates the number of calculation intervals over which the
mainline station averages will be calculated.

This value shall be expressed in 1-interval increments.

A suggested usable range is 1 to 60.

<Unit> interval

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.1"

REFERENCE

"See Clause A.4"

DEFVAL { 2 }

::= { rmcML 1 }

3.3.2 Maximum Number of Mainline Lanes

rmcMaxNumML OBJECT-TYPE

SYNTAX INTEGER (1..255)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates the maximum number of mainline lanes that can be stored in the
Mainline Lane Configuration and Control Table, and, by association, in all
other mainline lane tables.

<Unit> number

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.2"

REFERENCE

"See Clause A.2.1"

::= { rmcML 2 }

-- Note that the INTEGER range was changed to start at 1 instead of 0. This

-- does not cause backwards compatibility problems because this object would

-- not have been supported, if the function was not supported in the device.

3.3.3 Number of Mainline Lanes

rmcNumML OBJECT-TYPE

SYNTAX INTEGER (1..255)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates the actual number of mainline lanes that are present in the
Mainline Lane Configuration and Control Table, and, by association, in all
other mainline lane tables.

This value shall not exceed the value of the rmcMaxNumML-object.

<Unit> number

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.3"

::= { rmcML 3 }

-- Note that the INTEGER range was changed to start at 1 instead of 0. This
-- does not cause backwards compatibility problems because this object would
-- not have been supported, if the function was not supported in the device.

3.3.4 Mainline Lane Configuration and Control Table

rmcMLCtrlTable OBJECT-TYPE

SYNTAX SEQUENCE OF RmcMLCtrlEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A table containing the configuration and control information for the mainline lanes.

<Table Type> static

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4"

::={ rmcML 4 }

rmcMLCtrlEntry OBJECT-TYPE

SYNTAX RmcMLCtrlEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"Configuration and control parameters of the mainline lane table. A particular row of this table can be managed using the rmMLMode-object.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1"

INDEX { rmcMLNumber }

::={ rmcMLCtrlTable 1 }

RmcMLCtrlEntry ::=SEQUENCE {

rmcMLNumber INTEGER,

rmcMLMode INTEGER,

rmcMLLeadZoneLength INTEGER,

rmcMLTrailZoneLength INTEGER,

rmcMLUsageMode INTEGER,

rmcMLSpeedTrapSpacing INTEGER,

rmcMLErraticCount INTEGER,

rmcMLMaxPresence INTEGER,

rmcMLNoActivity INTEGER,

rmcVehicleLength INTEGER

}

3.3.4.1 Lane Number

rmcMLNumber OBJECT-TYPE

SYNTAX INTEGER (1..255)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Enumerated listing of the mainline lanes.

This value shall not exceed the value of the rmcMaxNumML object nor that of the rmcNumML-object.

<Unit> number

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.1"

REFERENCE

"See Clause A.2.1"

::={ rmcMLCtrlEntry 1 }

-- Note that the INTEGER range was changed to start at 1 instead of 0. This
-- does not cause backwards compatibility problems because this object would
-- not have been supported, if the function was not supported in the device.

3.3.4.2 Lane Mode

rmcMLMode OBJECT-TYPE

SYNTAX INTEGER {
disabled (1),
singleEnabledLead (2),
singleEnabledTrail (3),
dualEnabled (4),
preprocessedEnabled (5)
}

ACCESS read-write

STATUS mandatory

DESCRIPTION

"Indicates the mode of the mainline lane. The values are:

disabled - indicates that no detector is enabled. When set to this value, the content of the entire row shall be invalidated; however, the row shall not be deleted.

singleEnabledLead - indicates that only the leading detector shall be enabled. The trailing detector status shall be disabled.

singleEnabledTrail - indicates that only the trailing detector shall be enabled. The leading detector status shall be disabled.

dualEnabled - indicates that both the leading and trailing detectors shall be enabled.

preprocessedEnabled - indicates that no detector shall be enabled but traffic data is provided by another process / device.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.2"

REFERENCE

"See Clause A.2.1"

DEFVAL { 2 }

::={ rmcMLCtrlEntry 2 }

3.3.4.3 Leading Detection Zone Length

rmcMLLeadZoneLength OBJECT-TYPE

SYNTAX INTEGER (0..255)

ACCESS read-write

STATUS optional

DESCRIPTION

"Indicates the detection zone length of the leading detector.

This value shall be expressed in 0.1-meter increments (i.e, 40 = 4.0 meters).

A suggested usable range is 0 to 5.0.

<Unit> tenth of meter

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.3"

REFERENCE

"See Clause A.2.1"

DEFVAL { 30 }

::={ rmcMLCtrlEntry 3 }

3.3.4.4 Trailing Detection Zone Length

rmcMLTrailZoneLength OBJECT-TYPE

SYNTAX INTEGER (0..255)

ACCESS read-write

STATUS optional

DESCRIPTION

"Indicates the detection zone length of the trailing detector.

This value shall be expressed in 0.1-meter increments (i.e, 40 = 4.0 meters).

A suggested usable range is 0 to 5.0.

<Unit> tenth of meter

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.4"

REFERENCE

"See Clause A.2.1"

DEFVAL { 30 }

::={ rmcMLCtrlEntry 4 }

3.3.4.5 Lane Usage Mode

rmcMLUsageMode OBJECT-TYPE

SYNTAX INTEGER {
notUsed (1),
schemeF (2),
schemeO (3),
schemeFO (4),
schemeS (5),
schemeFS (6),
schemeOS (7),
schemeFOS (8),
determinedByOther (9)
}

ACCESS read-write

STATUS mandatory

DESCRIPTION

"Indicates which mainline station traffic parameters will use the data from this lane. The values are:

notUsed - the lane data will not be used to calculate any mainline station parameter.

schemeF - the lane data will be used to calculate the mainline station flow rate

schemeO - the lane data will be used to calculate the mainline station average occupancy

schemeFO - the lane data will be used to calculate the mainline station flow rate and average occupancy

schemeS - the lane data will be used to calculate the mainline station average speed

schemeFS - the lane data will be used to calculate the mainline station flow rate and average speed

schemeOS - the lane data will be used to calculate the mainline station average occupancy and occupancy speed

schemeFOS - the lane data will be used to calculate the mainline station flow rate, average occupancy and average speed

determinedByOther - the rmcMLUsageStatus-object will determine the mainline lane data usage.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.5"

REFERENCE

"See Clause A.2.1"

DEFVAL { 4 }

::={ rmcMLCtrlEntry 5 }

3.3.4.6 Speed Trap Spacing

rmcMLSpeedTrapSpacing OBJECT-TYPE

SYNTAX INTEGER (0..255)

ACCESS read-write

STATUS optional

DESCRIPTION

"Indicates the spacing between the leading and trailing detector measured from upstream edge to upstream edge of the detectors.

This value shall be expressed in 0.1-meter increments (i.e, 40 = 4.0 meters).

A suggested usable range is 2.0 to 15.0.

A value of zero (0) shall inhibit the calculation of speed.

<Unit> tenth of meter
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.6"
REFERENCE
"See Clause A.2.1"
DEFVAL { 61 }
::={ rmcMLCtrlEntry 6 }

3.3.4.7 Mainline Erratic Count Threshold

rmcMLErraticCount OBJECT-TYPE
SYNTAX INTEGER (0..255)
ACCESS read-write
STATUS optional
DESCRIPTION
"If the vehicle count, over the most recently completed calculation interval, on a mainline lane detector exceeds this threshold, the rmcMLLeadStatus (or rmcMLTrailStatus) object for that detector shall be set to a value of 'erraticCount'.
This value shall be expressed in 1-vehicle increments.
A suggested usable range is 0 to 30.
A value of zero (0) shall inhibit the erratic count testing.
<Unit> number
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.7"
REFERENCE
"See Clause A.2.1"
DEFVAL { 30 }
::={ rmcMLCtrlEntry 7 }

3.3.4.8 Mainline Maximum Presence Threshold

rmcMLMaxPresence OBJECT-TYPE
SYNTAX INTEGER (0..65535)
ACCESS read-write
STATUS optional
DESCRIPTION
"If the input of a mainline lane detector has been continuously actuated for longer than this threshold, the rmcMLLeadStatus (or rmcMLTrailStatus) object for that detector shall be set to a value of 'maxPresence'.
This value shall be expressed in 1-minute increments.
A suggested usable range is 0 to 1500.
A value of zero (0) shall inhibit the maximum presence testing.
<Unit> minute
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.8"
REFERENCE
"See Clause A.2.1"
DEFVAL { 2 }
::={ rmcMLCtrlEntry 8 }

3.3.4.9 Mainline No Activity Threshold

rmcMLNoActivity OBJECT-TYPE
SYNTAX INTEGER (0..65535)
ACCESS read-write
STATUS optional
DESCRIPTION
"If the input of a mainline lane detector has not been actuated for longer than this threshold, the rmcMLLeadStatus (or rmcMLTrailStatus) object for that detector shall be set to a value of 'noActivity'.
This value shall be expressed in 1-minute increments.

A suggested usable range is 0 to 1500.
A value of zero (0) shall inhibit the no activity testing.
<Unit> minute
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.9"
REFERENCE
"See Clause A.2.1"
DEFVAL { 0 }
::={ rmcMLCtrlEntry 9 }

3.3.4.10 Typical Vehicle Length

rmcVehicleLength OBJECT-TYPE
SYNTAX INTEGER (0..255)
ACCESS read-write
STATUS optional
DESCRIPTION
"Indicates the length of a typical vehicle in 0.1 m, which is used for
mainline lane speed estimation with a single working detector per mainline
lane .
This value shall be expressed in 0.1-meter increments (i.e, 40 = 4.0 meters).
A suggested usable range is 0, 1.5 to 10.0.
A value of zero (0) shall inhibit speed estimation.
<Unit> tenth of meter
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.4.1.10"
REFERENCE
"See Clause A.2.1"
DEFVAL { 0 }
::={ rmcMLCtrlEntry 10 }

3.3.5 Maximum Number of Mainline Flow-based No Activity Table Entries

rmcMaxNumFlowNoActivityTableEntries OBJECT-TYPE
SYNTAX INTEGER (1..255)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"Indicates the maximum number of entries in the Mainline Flow-based No
Activity Table.
A suggested minimum number of entries in the table is two (2).
<Unit> number
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.9"
REFERENCE
"See Clause A.4.2"
::={ rmcML 9 }

3.3.6 Number of Mainline Flow-based No Activity Table Entries

rmcNumFlowNoActivityTableEntries OBJECT-TYPE
SYNTAX INTEGER (1..255)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"Indicates the actual number of entries in the Mainline Flow-based No
Activity Table.
<Unit> number
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.10"
REFERENCE
"See Clause A.4.2"
::={ rmcML 10 }

3.3.7 Mainline Flow-based No Activity Table

rmcMLFlowBasedNoActivityTable OBJECT-TYPE
SYNTAX SEQUENCE OF RmcMLFlowBasedNoActivityEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION

"A table containing the configuration information for an entry in the Mainline Flow-based No Activity Table. The purpose of this table is to define the duration for the flow-based no activity diagnostic test. The duration will vary with the Average Station Flow Rate.

Flow-based No Activity Threshold value in the first entry shall be the maximum threshold.

If the Average Mainline Station Flow Rate value is less than the Flow-based No Activity Threshold value in this entry row and greater than the following entry, then the Flow-based No Activity Duration defined in the same entry shall be used.

If the Average Mainline Station Flow Rate value is less than the value defined in the last entry, then the Flow-based No Activity Duration of the last entry shall be used.

If the Average Mainline Station Flow Rate value is greater than the maximum flow-based no activity threshold defined in the table, then the Mainline Flow-based No Activity test shall be disabled.

The first instance of the rmcFlowRateNoActivityThreshold-object whose value is zero indicates the end of the valid table contents. Rows prior to the end of the valid rows that contain a value of zero (0) for the rmcFlowBasedNoActivityDuration object indicate that this row shall NOT be used for flow-based no activity testing.

Additionally, the following rules shall be used when configuring this table:

- All Flow-based No Activity Threshold entries in the table shall be decreasing for increasing indices.
- All Flow-based No Activity Duration entries in the table shall be non-decreasing for increasing indices.
- if the number of flow-rate lanes (rmcNumFlowRateLanes) is '0', then the rmcFlowRateNoActivityDuration-object shall have a value of '0'.

<Table Type> static.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.11"
::={ rmcML 11 }

rmcMLFlowBasedNoActivityEntry OBJECT-TYPE
SYNTAX RmcMLFlowBasedNoActivityEntry
ACCESS not-accessible
STATUS mandatory
DESCRIPTION

"Configuration parameters for a row of the table. A particular entry/row of this table

can be managed using the rmcMLFlowBasedNoActivityDuration object. When this object is set to zero, then the associated row shall be ignored for the determination of the duration value for the flow-based no activity diagnostic test.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.11.1"
INDEX { rmcMLFlowBasedNoActivityIndex }
::={ rmcMLFlowBasedNoActivityTable 1 }

RmcMLFlowBasedNoActivityEntry ::=SEQUENCE {

```
    rmcMLFlowBasedNoActivityIndex    INTEGER,  
    rmcFlowRateNoActivityThreshold    INTEGER,  
    rmcFlowBasedNoActivityDuration    INTEGER  
}
```

3.3.7.1 Mainline Flow Based No Activity Index Parameter

rmcMLFlowBasedNoActivityIndex OBJECT-TYPE
SYNTAX INTEGER (1..255)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"Key into this table defining an enumerated listing of row entries
that indicate the number of flow-based no activity threshold /
duration pairs stored for this RMC unit
This value shall not exceed the value of the
rmcMaxNumFlowNoActivityTableEntries - object.
<Unit> number
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.x.1.1"
REFERENCE
"See Clause A.7.1"
::={ rmcMLFlowBasedNoActivityEntry 1 }

3.3.7.2 Flow Rate No Activity Threshold Parameter

rmcFlowRateNoActivityThreshold OBJECT-TYPE
SYNTAX INTEGER (0..65535)
ACCESS read-write
STATUS mandatory
DESCRIPTION
"Indicates the flow based no activity threshold which will be used
to determine the no activity duration value.
This value shall be expressed in 1-vph increments.
A suggested usable range is 0, 200-3600 .
The first instance of a value of zero (0) indicates that this is the last
valid entry of the table. Additional rows of the table, regardless of the
value, shall be ignored.
<Unit> vehicles per hour
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.x.1.2"
REFERENCE
"See Clause A.7.1"
::={ rmcMLFlowBasedNoActivityEntry 2 }

3.3.7.3 Flow-Based No Activity Duration Interval Parameter

rmcFlowBasedNoActivityDuration OBJECT-TYPE
SYNTAX INTEGER (0..65535)
ACCESS read-write
STATUS mandatory
DESCRIPTION
"Indicates the flow based no activity duration, which is associated with the
flow based no activity threshold defined in the same row.
This value shall be expressed in 1-minute increments.
A suggested usable range is 0, 1-240 minutes.
<Unit> minute
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.x.1.3"
REFERENCE
"See Clause A.7.1"
::={ rmcMLFlowBasedNoActivityEntry 3 }

3.3.8 Average Mainline Station Flow Rate

rmcAverageFlowRate OBJECT-TYPE

SYNTAX INTEGER (0..65535)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates the flow rate measured over the rmcAveragingPeriods-object number of preceding calculation intervals. The flow rate shall be determined by calculating the average of all mainline lanes whose rmcMLStatus-object value is NOT 'total failure' or 'disabled' at any time during the previous averaging periods number of calculation intervals, AND whose rmcLaneUsageStatus-object has a value of 'schemeF', 'schemeFO', 'schemeFS', or 'schemeFOS'. Any mainline lane whose rmcMLStatus-object had a value of 'totalFailure' during the Averaging Periods shall not be used for the calculation.

The value of this object shall be calculated using a lane average.

The value shall be expressed in vph in 1-vph increments.

<Unit> vehicles per hour

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.5"

REFERENCE

"See Clause A.4"

::={ rmcML 5 }

3.3.9 Average Mainline Station Occupancy

rmcAverageOccupancy OBJECT-TYPE

SYNTAX INTEGER (0..65535)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates the occupancy measured over the rmcAveragingPeriods-object number of preceding calculation intervals. The occupancy shall be determined by calculating the average of all mainline lanes whose rmcMLStatus-object value is NOT 'total failure' or 'disabled' at any time during the previous averaging periods number of calculation intervals, AND whose rmcLaneUsageStatus-object has a value of 'schemeO', 'schemeFO', 'schemeOS', or 'schemeFOS'. Any mainline lane whose rmcMLStatus-object had a value of 'totalFailure' during the Averaging Periods shall not be used for the calculation.

The value of this object shall be calculated using a lane average.

The value shall be expressed in 0.1-percent increments (i.e, 40 = 4.0 percent).

<Unit> tenth of percent

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.6"

REFERENCE

"See Clause A.4"

::={ rmcML 6 }

3.3.10 Average Mainline Station Speed

rmcAverageSpeed OBJECT-TYPE

SYNTAX INTEGER (0..255)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates the speed measured over the rmcAveragingPeriods-object number of preceding calculation intervals. The speed shall be determined by calculating the average of all mainline lanes using

- those mainline lanes whose rmcMLStatus-object value is NOT 'total failure' or 'disabled' at any time during the previous averaging periods number

of calculation intervals,
OR
- those mainline lanes whose rmcMLStatus-object value is 'partial failure'
and whose rmcVehicleLength is NOT '0',
AND
- whose rmcLaneUsageStatus-object as a value of 'schemeS', 'schemeFS',
'schemeOS', or 'schemeFOS'.
Any mainline lane whose rmcMLStatus-object had:
a value of 'totalFailure' during the Averaging Periods,
or
a value of 'partialFailure' during the Averaging Periods and whose rmcMLMode
is 'singleEnabledLead' or 'singleEnabledTrail' (only one detector is used and
speed estimation is disabled),
shall not be used for the calculation.
The value of this object shall be calculated using a lane average.
The value shall be expressed in 1-km/h increments.
<Unit> kilometers per hour
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.7"
REFERENCE
"See Clause A.4"
::={ rmcML 7 }

3.3.11 Number of Flow Rate Lanes

rmcNumFlowRateLanes OBJECT-TYPE
SYNTAX INTEGER (0..255)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"Indicates the number of mainline lanes used to calculate the rmcFlowRate-
object during the last calculation interval.
This value shall not exceed the value of the rmcMaxNumML object.
<Unit> number
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.12"
REFERENCE
"See Clause A.4"
::={ rmcML 12 }

3.3.12 Number of Occupancy Lanes

rmcNumAverageOccupancyLanes OBJECT-TYPE
SYNTAX INTEGER (0..255)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"Indicates the number of mainline lanes used to calculate the
rmcAverageOccupancy-object during the last calculation interval.
This value shall not exceed the value of the rmcMaxNumML object.
<Unit> number
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.13"
REFERENCE
"See Clause A.4"
::={ rmcML 13 }

3.3.13 Number of Average Speed Lanes

rmcNumAverageSpeedLanes OBJECT-TYPE
SYNTAX INTEGER (0..255)
ACCESS read-only
STATUS mandatory

DESCRIPTION

"Indicates the number of mainline lanes used to calculate the rmcAverageSpeed-object during the last calculation interval.

This value shall not exceed the value of the rmcMaxNumML object.

<Unit> number

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.14"

REFERENCE

"See Clause A.4"

::={ rmcML 14 }

3.3.14 Mainline Lane Status Table

rmcMLStatTable OBJECT-TYPE

SYNTAX SEQUENCE OF RmcMLStatEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A table containing the status information for a mainline lane.

<Table Type> static

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.8"

::={ rmcML 8 }

rmcMLStatEntry OBJECT-TYPE

SYNTAX RmcMLStatEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"Status parameters of the mainline lane status table. This table is directly correlated to the Mainline Lane Configuration and Control Table, which means that the number of rows in this table is exactly the same as the number of rows in the Mainline Lane Configuration and Control Table (AUGMENT TABLE in SNMPv2terminology). Table management can only take place through the Mainline Lane Configuration and Control Table, while this table provides only status information about the mainline lanes.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.8.1"

INDEX { rmcMLNumber }

::={ rmcMLStatTable 1 }

```
RmcMLStatEntry ::=SEQUENCE {
    rmcMLLeadStatus      INTEGER,
    rmcMLTrailStatus     INTEGER,
    rmcMLStatus          INTEGER,
    rmcMLUsageStatus     INTEGER,
    rmcMLHistLeadStatus  INTEGER, -- added in version 2
    rmcMLHistTrailStatus INTEGER -- added in version 2
}
```

3.3.14.1 Leading Detector Status

rmcMLLeadStatus OBJECT-TYPE

```
SYNTAX INTEGER {
    disabled (1),
    working (2),
    otherError (3),
    erraticCount (4),
    maxPresence (5),
    noActivity (6),
    errorAtSensor (7),
    flowBasedNoActivity (8) -- added in version 2
}
```

ACCESS read-only
STATUS optional
DESCRIPTION
"Indicates the status of the leading detector. The values are:
disabled - indicates that this detector is not used.
working - indicates that this detector has no error.
otherError - indicates an error not defined here. See Operator's Manual.
erraticCount - indicates that the vehicle count for this detector has exceeded the value of the rmcMLErraticCount-object.
maxPresence - indicates a continuous actuation for this detector that has exceeded the value of the rmcMLMaxPresence-object.
noActivity - indicates a continuous non-actuation for this detector that has exceeded the value of the rmcMLNoActivity-object.
errorAtSensor - indicates that the sensor for this detector has reported an error. See Operator's manual
flowBasedNoActivity - indicates a continuous non-actuation for this detector that has exceeded the value of the rmcMLFlowBasedNoActivity-object.
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.8.1.1"
REFERENCE
"See Clause A.2.1"
::={ rmcMLStatEntry 1 }

3.3.14.2 Trailing Detector Status

rmcMLTrailStatus OBJECT-TYPE
SYNTAX INTEGER {
disabled (1),
working (2),
otherError (3),
erraticCount (4),
maxPresence (5),
noActivity (6),
errorAtSensor (7),
flowBasedNoActivity (8) -- added in version 2
}
ACCESS read-only
STATUS optional
DESCRIPTION
"Indicates the status of the trailing detector. The values are:
disabled - indicates that this detector is not used.
working - indicates that this detector has no error.
otherError - indicates an error notdefined here. See Operator's manual.
erraticCount - indicates that the vehicle count for this detector has exceeded the value of the rmcMLErraticCount-object.
maxPresence - indicates a continuous actuation for this detector that has exceeded the value of the rmcMLMaxPresence-object.
noActivity - indicates a continuous non-actuation for this detector that has exceeded the value of the rmcMLNoActivity-object.
errorAtSensor - indicates that the sensor for this detector has reported an error. See Operator's manual.
flowBasedNoActivity - indicates a continuous non-actuation for this detector that has exceeded the value of the rmcMLFlowBasedNoActivity-object.
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.8.1.2"
REFERENCE
"See Clause A.2.1"
::={ rmcMLStatEntry 2 }

3.3.14.3 Lane Status

rmcMLStatus OBJECT-TYPE

SYNTAX INTEGER {
 working (1),
 disabled (2),
 partialFailure (3),
 totalFailure (4)
}
ACCESS read-only
STATUS mandatory
DESCRIPTION
"Indicates the status of the mainline lane. The values are:
working - indicates that the rmcMLMode-object has a value of either:
 a.) 'dualEnabled', and both the rmcMLLeadStatus-object and the
 rmcMLTrailStatus-object have the value of 'working', or
 c.) 'singleEnabledLead', and the rmcMLLeadStatus-object has the value of
 'working', or
 d.) 'singleEnabledTrail', and the rmcMLTrailStatus-object has the value
 of 'working', or
 e.) 'preprocessedEnabled', and the device providing the traffic data has
 reported no error.
disabled - indicates that the rmcMLMode-object has a value of either:
 a.) 'disabled', or
 b.) 'singleEnabledLead', and the rmcMLLeadStatus-object has the value of
 'disabled', or
 c.) 'singleEnabledTrail', and the rmcMLTrailStatus-object has the value
 of 'disabled', or
 d.) partialFailure - indicates that the rmcMLMode-object has a value of
 'dualEnabled', but the value of one of rmcMLLeadStatus-object and
 rmcMLTrailStatus-object is NOT 'working', while the value of the
 other is 'working'.
totalFailure - indicates that the rmcMLMode-object has a value of either:
 a.) 'dualEnabled', but the rmcMLLeadStatus-object and the
 rmcMLTrailStatus-object both have the value of NOT 'working', or
 b.) 'singleEnabledLead', and the rmcMLLeadStatus-object has the value of
 'error', or
 c.) 'singleEnabledTrail', and the rmcMLTrailStatus-object has the value
 of 'error', or
 d.) 'preprocessedEnabled', and the device providing the traffic data has
 reported an error.
<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.8.1.3"
REFERENCE
"See Clause A.2.1"
::={ rmcMLStatEntry 3 }

3.3.14.4 Lane Usage Status

rmcMLUsageStatus OBJECT-TYPE
SYNTAX INTEGER {
 notUsed (1),
 schemeF (2),
 schemeO (3),
 schemeFO (4),
 schemeS (5),
 schemeFS (6),
 schemeOS (7),
 schemeFOS (8)
}
ACCESS read-only
STATUS mandatory
DESCRIPTION

"Indicates which mainline station traffic parameters use the data from this lane. If the value of the rmcMLUsageMode-object is NOT 'determinedByOthers', then the value is determined directly by that mode object. If, however, the value is 'determinedByOthers', then the value is determined by the TimeBaseControl mechanism. The values are:

notUsed - the mainline lane traffic parameters are not used for averaging calculation.

schemeF - the lane data will be used to calculate the mainline lane station flow rate.

schemeO - the lane data will be used to calculate the mainline lane station average occupancy.

schemeFO - the lane data will be used to calculate the mainline lane station flow rate and average occupancy

schemeS - the lane data will be used to calculate the mainline lane station average speed.

schemeFS - the lane data will be used to calculate the mainline lane station flow rate and average speed.

schemeOS - the lane data will be used to calculate the mainline lane station average occupancy and occupancy speed.

schemeFOS - the lane data will be used to calculate the mainline lane station flow rate, average occupancy and average speed.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.8.1.4"

REFERENCE

"See Clause A.2.1 and A.4"

::={ rmcMLStatEntry 4 }

3.3.14.5 Historic Leading Detector Status

rmcMLHistLeadStatus OBJECT-TYPE

SYNTAX INTEGER (0..65535) -- BITMAP16

ACCESS read-only

STATUS optional

DESCRIPTION

"Indicates the cumulative status of the leading detector. The values are:

<FORMAT>

Bit Number	Name	Description
Bit 15:	reserved.	
Bit 14:	reserved.	
Bit 13:	reserved.	
Bit 12:	reserved.	
Bit 11:	reserved.	
Bit 10:	reserved.	
Bit 09:	reserved.	
Bit 08:	reserved.	
Bit 07:	Flow-based No Activity	- the rmcMLLeadStatus-object has or has been 'flowBasedNoActivity' since reset.
Bit 06:	Error at Sensor	- the rmcMLLeadStatus-object has or has been 'ErrorAtSensor' since reset.
Bit 05:	No activity	- the rmcMLLeadStatus-object has or has been 'noActivity' since reset.
Bit 04:	Max presence	- the rmcMLLeadStatus-object has or has been 'maxPresence' since reset.
Bit 03:	Erratic count	- the rmcMLLeadStatus-object has or has been 'erraticCount' since reset.
Bit 02:	Other error	- the rmcMLLeadStatus-object has or has been 'otherError' since reset.
Bit 01:	Working	- the rmcMLLeadStatus-object has or has been 'Working' since reset.
Bit 00:	Disabled	- the rmcMLLeadStatus-object has or has been

'Disabled' since reset.

In the context of this object, 'reset' means either an initialization of the RMC or a successful SET of the rmcHistDetectorReset-object. When a 'reset' occurs, all bits shall be set to 0.

If a bit is set to 0, the condition indicated by the bit is false; if it is set to 1, the condition is true.

All reserved bits shall always be set to 'zero' (0). A bad value error shall be returned, if a management application writes a one (1) to any of the reserved bits.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.8.1.5"

REFERENCE

"See Clause A.2.1"

::={ rmcMLStatEntry 5 }

3.3.14.6 Historical Trailing Detector Status

rmcMLHistTrailStatus OBJECT-TYPE

SYNTAX INTEGER (0..65535) -- BITMAP16

ACCESS read-only

STATUS optional

DESCRIPTION

"Indicates the cumulative status of the trailing detector. The status are:

<Format>

Bit Number	Name	Description
Bit 15:	reserved.	
Bit 14:	reserved.	
Bit 13:	reserved.	
Bit 12:	reserved.	
Bit 11:	reserved.	
Bit 10:	reserved.	
Bit 09:	reserved.	
Bit 08:	reserved.	
Bit 07:	Flow-based No Activity	- the rmcMLTrailStatus-object is or has been 'flowBasedNoActivity' since reset.
Bit 06:	Error at Sensor	- the rmcMLTrailStatus-object is or has been 'Disabled' since reset.
Bit 05:	No activity	- the rmcMLTrailStatus-object is or has been 'noActivity' since reset.
Bit 04:	Max presence	- the rmcMLTrailStatus-object is or has been 'maxPresence' since reset.
Bit 03:	Erratic count	- the rmcMLTrailStatus-object is or has been 'erraticCount' since reset.
Bit 02:	Other error	- the rmcMLTrailStatus-object is or has been 'otherError' since reset.
Bit 01:	Working	- the rmcMLTrailStatus-object is or has been 'Working' since reset.
Bit 00:	Disabled	- the rmcMLTrailStatus-object is or has been 'Disabled' since reset.

In the context of this object, 'reset' means either an initialization of the RMC or a successful SET of the rmcHistDetectorReset-object. When a 'reset' occurs, all bits shall be set to 0.

If a bit is set to 0, the condition indicated by the bit is not true; if it is set to 1, the condition is true.

All reserved bits shall always be set to zero (0)'. A bad value error shall

be returned, if a management application writes a one (1) to any of the reserved bits.

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.2.8.1.6"

REFERENCE

"See Clause A.2.1"

::={ rmcMLStatEntry 6 }

3.4 METERED LANE CONFIGURATION, CONTROL AND STATUS NODE

rmcMeter OBJECT IDENTIFIER ::= { ramp 3 }

-- This node is an identifier used to group all objects for the configuration,
-- control and status of the metered lanes that are common to all ramp
-- meter control units.

3.4.1 Metered Lane Main Configuration node

rmcMeterMain OBJECT IDENTIFIER ::= { rmcMeter 1 }

-- This node is an identifier used to group the main objects for the
-- configuration, control and status of the metered lanes that are
-- common to all ramp meter control units.

3.4.1.1 Maximum Number of Metered Lanes

rmcMaxNumMeteredLanes OBJECT-TYPE

SYNTAX INTEGER (1..255)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates the maximum number of metered lanes that can be stored in the Metered Lane Configuration Table, and, by association, in all other metered lane tables.

<Unit> number

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.3.1.1"

REFERENCE

"See Clause A.2.2"

::={ rmcMeterMain 1 }

-- Note that the INTEGER range was changed to start at 1 instead of 0. This
-- does not cause backwards compatibility problems because this object would
-- not have been supported, if the function was not supported in the device.

3.4.1.2 Number of Metered Lanes

rmcNumMeteredLanes OBJECT-TYPE

SYNTAX INTEGER (1..255)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"Indicates the actual number of metered lanes that are present in the Metered Lane Configuration Table, and, by association, in all other metered lane tables. This value shall not exceed the value of the rmcMaxNumMeteredLanes - object.

<Unit> number

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.3.1.2"

REFERENCE

"See Clause A.2.2"

::={ rmcMeterMain 2 }

-- Note that the INTEGER range was changed to start at 1 instead of 0. This
-- does not cause backwards compatibility problems because this object would
-- not have been supported, if the function was not supported in the device.

3.4.1.3 Metered Lane Configuration Table

rmcMeterCfgTable OBJECT-TYPE

SYNTAX SEQUENCE OF RmcMeterCfgEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"A table containing the configuration information for a metered lane.

<Table Type> static

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.3.1.3"

::={ rmcMeterMain 3 }

rmcMeterCfgEntry OBJECT-TYPE

SYNTAX RmcMeterCfgEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"Configuration parameters of the metered lane table. This table is directly correlated to the Metered Lane Control Table, which means that the number of rows in this table is exactly the same as the number of rows in the Metered Lane Control Table (AUGMENT TABLE in SNMPv2 terminology). Table management can only take place through the Metered Lane Control Table, while this table provides configuration parameters for the associated metered lane.

<TableType> static

<Object Identifier> 1.3.6.1.4.1.1206.4.2.2.3.1.3.1"

INDEX { rmcMeterNumber }

::={ rmcMeterCfgTable 1 }

RmcMeterCfgEntry ::=SEQUENCE {

rmcMeterNumber INTEGER,

rmcDependGroupNumber INTEGER,

rmcDependGroupSeqNumber INTEGER,

rmcCmdSourcePriorityOrder INTEGER,

rmcDemandErraticCount INTEGER,

rmcDemandMaxPresence INTEGER,

rmcDemandNoActivity INTEGER,

rmcMinMeterTime INTEGER,