JANUS MULTI-PROTOCOL READER VER 2.3 - LANE CONTROLLER INTERFACE

JANUS MULTI-PROTOCOL READER VER. 2.3 - INTERFACE CONTROL DOCUMENT

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28 Mar 2022	F	ECN 22021 address change for US office	B. Mac
14 Aug., 2017	E	ECN 17064 Approved	GT
1 Aug., 2017	E1	ECN 17064: §7.2.8 (Table 7.2-4), §7.2.9 (Table 7.2-5), §7.2.10 (Table 7.2-6), §7.2.20 (Table 7.2-12), §9.3.4 (Table 9.3-4), §9.3.5 (Table 9.3-5), §9.3.6 (Table 9.3-6), §9.3.9 (Table 9.3-9), §11.5.3 (Table 11.5-3), §11.5.4 (Table 11.5-4), §11.5.5 (Table 11.5-5), §11.5.6 (Table 11.5-6), §11.6.3 (Table 11.6-3), §11.6.4 (Table 11.6-4), §11.6.5 (Table 11.6-5), §11.6.6 (Table 11.6-6), §11.7.3 (Table 11.7-3), §11.7.4 (Table 11.7-4), §11.7.5 (Table 11.7-5), §11.7.6 (Table 11.7-6), §11.8.3 (Table 11.8-3), §11.8.4 (Table 11.8-4), §11.8.5 (Table 11.8-5), §11.8.6 (Table 11.8-6), §11.9.3 (Table 11.9-3), §11.9.4 (Table 11.9-4), §11.9.5 (Table 11.9-5), §11.9.6 (Table 11.9-6), §11.10.3 (Table 11.10-3), §11.10.4 (Table 11.10-4), §11.10.5 (Table 11.10-5), §11.10.6 (Table 11.10-6), §11.11.3 (Table 11.11-3), §11.11.4 (Table 11.11-4), §11.11.5 (Table 11.11-5), §11.11.6 (Table 11.11-6), §11.12.3 (Table 11.12-3), §11.12.4 (Table 11.12-4), §11.12.5 (Table 11.12-5), §11.12.6 (Table 11.12-6), §11.13.3 (Table 11.13-3), §11.13.4 (Table 11.13-4), §11.13.5 (Table 11.13-5), §11.13.6 (Table 11.13-6): Amended/Clarified wording of content descriptions for Assignment Reads and Total Reads message fields.	GT
27 April, 2017	D	ECN 17029 Approved	GT
18 April, 2017	D1	ECN 17029: - §2.3.5 (Table 2.3-7), §2.3.5.1 (Table 2.3-8), §2.4.5 (Table 2.4-5), §2.5.5 (Table 2.5-5): Added note clarifying that EPC/UII Memory CRC/PC bits are now available as an Extended Information field for ISO 18000-6C Transaction (Initial Read, Transponder, Post Capture, and Estimated Vehicle Speed) Reports. - §2.4.5 (Table 2.4-5): Fix incorrectly placed 'Note 1' reference for ISO 18000-6C Handshake Messages. - §11.2 (Table 11.2-1): Amend message applicability notes for {Tag} 5 – ISO 18000-6C EPC/UII Memory CRC/PC Bits Extended Information Field to now include all ISO 18000-6C messages. - §11.2 (Table 11.2-1): Amend message applicability notes regarding Range Rate, Zero Crossing, RSSI, and |I|/|Q| Extended Information Fields to add support for the ISO 18000-6B, ISO 18000-6C, and SeGo protocols.	GT
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11 Jan., 2017	C2	ECN 16089 - Incorporate feedback from reviewers: - Update copyright as per ECN16092 to allow distribution to customers without an NDA and add a second cover page.	GT

		- Update page numbering to account for additional cover page. - §2.3.5 (Table 2.3-7), §2.3.5.1 (Table 2.3-8), §2.4.5 (Table 2.4-5), §2.5.5 (Table 2.5-5): Re-ordered table entries alphabetically. - §11 – Clarify message transmission characteristics for all messages in Multi-Protocol Message Set.	
6 Dec., 2016	C1	<u>ECN 16089:</u> - §2.3.5 (Table 2.3-7), §2.3.5.1 (Table 2.3-8), §2.4.5 (Table 2.4-5), §2.5.5 (Table 2.5-5), §11.1 (Table 11.1-2), Added §11.6.7 (Table 11.6-7), Added §11.7.7 (Table 11.7-7), Added §11.10.7 (Table 11.10-7), Added §11.11.7 (Table 11.11-7), Added §11.12.7 (Table 11.12-7), Added §11.13.7 (Table 11.13-7): Added support for Estimated Vehicle Speed Messages for ISO 18000-6B, ISO 18000-6C and SeGo protocols. - §5.1 (Table 5.1-1, Table 5.1-2 – Note (4)), §5.2, §5.4: Updated clarification to indicate that Estimated Vehicle Speed Messages are now supported for ISO 18000-6B, ISO 18000-6C, and SeGo protocols as well as ATA. - §2.3.5 (Table 2.3-7), §2.3.5.1 (Table 2.3-8), §2.5.5 (Table 2.5-5): Fix capitalization typo for ATA Estimated Vehicle Speed Message(s).	GT
21 June, 2016	B	Initial Release	GT
21 June, 2016	B2	<u>Incorporated feedback from reviewers:</u> - Ensure consistent Reader nomenclature throughout document. - §1.1: Clarify that JANUS MPR2.3 Reader – Lane Controller Serial and Ethernet interfaces are also specified herein. - §2.5.1(Table 2.5-1): Lane Active (LA), Lane Offline (LO), Lane Guard (LG), and Transaction Number Reset (TR) messages are applicable to all protocols for MPR2.3. - Ensure consistent naming of Lane Controller Interface nomenclature throughout document. - §7.2.22: Remove restriction that Transaction Number Reset (TR) Message is only applicable to IAG protocol. - §7.2.1 (Table 7.2-1), §9.2.1(Table 9.2-1): Added note clarifying how Inter-Readre RF Synchronization Enable configuration status is reported. - §7.2.15 (Table 7.2-8), §9.3.8 (Table 9.3-8) :Added note clarifying how Inter-Reader RF Synchronization is configured and/or enabled. - §2.1, §2.2.1 (Table 2.2-1), §2.2.3 (Table 2.2-2), Added §2.2.4.1 (Table 2.2-5), §2.3.1 (Table.2.3-1), §2.3.2 (Table 2.3-2), §2.3.3 (Table 2.3-3), Added §2.3.4.1 (Table 2.3.6), Added §2.3.5.1 (Table 2.3-8): Updated / added tables to cover message compatibility with legacy versions of JANUS, JANUS MPR1, and JANUS MPR2 Readers. - §1.2.1 Added reference to JANUS Multi-Protocol Reader – Lane Controller Interface ICD 360450-101 for multi-protocol message compatibility purposes. - §1.3 Added UM (User Memory) and PC (Protocol Control) definitions. - §2.3.5 (Table 2.3-5), §2.3.5.1 (Table 2.3-8), §2.4.5 (Table 2.4-5) , §2.5.5 (Table 2.5-5), , §11.2 (Table 11.2-1): Added new Multi-Protocol Extended Information Field to support the transmission of ISO 18000-6C EPC/UII Memory Area CRC/PC bits (bits 0x00 – 0x1F).	GT

		Added Extended Information Field support to Basic and TRBA Message Sets: - §2.3.1(Table 2.3-1), §2.3.3.1 (Table 2.3-4), §2.4.1(Table 2.4-1), §2.4.3 (Table 2.4-3): Added notes regarding new Extended Information Timestamp field for Basic and TRBA Mode Message sets. - §7.1: Inserted / Added new section describing Basic Message Extended Information Field. - §7.2.14(Table 7.2-13): Correction – added Extended Information Field data element missing from prior release for Basic Message Set – Status Message. - §7.2.3(Table 7.2-2), §7.2.8(Table 7.2-7), §7.2.9(Table 7.2-8), §7.2.10(Table 7.2-9), §7.2.20(Table 7.2-19) Added Extended Information Field data element to Basic Message Set – Initial Read, Post Capture and Transponder Report Messages (both Interpolated and Majority Voting formats). - §9.2: Inserted / Added new section describing TRBA Mode Message Extended Information Field. - §9.3.7(Table 9.3-7): Correction – added Extended Information Field data element missing from prior release for TRBA Mode Message Set – Status Message. - §9.3.2(Table 9.3-2), §9.3.4(Table 9.3-4), §9.3.5(Table 9.3-5), §9.3.6(Table 9.3-6), §9.3.9(Table 9.3.9) Added Extended Information Field data element to TRBA Mode Message Set – Initial Read, Post Capture and Transponder Report Messages (both Interpolated and Majority Voting formats). Updates as a result of addressed Bugzilla Issues: - §2.6 (Table 2.6-1), §11.7.3(Table 11.7-3), §11.7.4(Table 11.7-4), §11.7.5(Table 11.7-5), §11.7.6(Table 11.7-6): Updated 6C Report Codes as a result of S/W modifications to address Issue#1446.	
11 May, 2015	B1	Initial Draft for Signoff	GT

Table of Contents

List of Figures

List of Tables

1. INTRODUCTION

1.1 Scope and Purpose

This document specifies the messaging protocol between the JANUS Multi-Protocol Reader Ver. 2.3 (MPR) and the attached Lane Controller(s) (LC's). The messages specified herein may be sent over either the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, also specified herein.

The JANUS MPR2.3 Reader and the attached Lane Controllers shall use a specific Serial Data Link Format / Protocol, specified herein, to send and receive messages over the JANUS Reader – Lane Controller Serial Interface.

The JANUS MPR2.3 Reader and the attached Lane Controllers shall use the Transmission Control Protocol (TCP) and Internet Protocol, version 4 (IPv4) protocols (hereafter referred to as "TCP/IP") to send and receive messages over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface.

In addition, the JANUS MPR2.3 Reader may be optionally configured to send a special class of messages – Handshake Messages – to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface. Handshake Messages shall be sent to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface using the User Datagram Protocol (UDP).

Only those messages applicable to the JANUS Multi-Protocol Reader Ver. 2.3 (MPR) configuration that has been purchased shall be available for use.

1.2 Applicable and Reference Documents

The following documents, at the revision listed, are referenced by, and are applicable to the Interface protocols and characteristics defined in this document.

Where there is no revision listed, the current revision at the time of issue of this document applies.

In the event of a conflict between the text of this document and the references cited herein, the references shall take precedence, unless otherwise indicated. When the references cited herein are superseded by an approved revision, the approved superseding revision shall apply.

1.2.1 Applicable Documents

The following documents and/or drawings are applicable to the interface specifications to the extent specified herein:

[AD1]	ICD 360467-111 Issue B	JANUS Multi-Protocol Reader Ver. 2.3 – Parameter Catalog
[AD2]	UM 360467-100 Issue B	JANUS Multi-Protocol Reader Ver. 2.3 – Operator And Maintenance Manual
[AD3]	TS 360408-310 Issue E	ISTHA Reader Software – Lane Controller Interface
[AD4]	ICD 360450-101 Issue B	JANUS Multi-Protocol Reader (MPR1) – Lane Controller Interface

1.2.2 Reference Documents

The following documents are referenced:

[RD1] RFC 0791	Internet Protocol, DARPA Internet Program Protocol Specification, September 1981
[RD2] RFC 0793	Transport Control Protocol, DARPA Internet Program Protocol Specification, September 1981
[RD3] RFC 0768	User Datagram Protocol, J. Postel, ISI, August 1980.
[RD4] IEEE 802.3 - 2008	IEEE Standard for Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements, Part 3: Carrier sense multiple access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

[RD5] *Internetworking with TCP/IP – Volume III (Client-Server Programming and Applications)*, Comer & Stevens, Prentice-Hall, 1993. ISBN 0-13-474222-2.

1.3 Definitions, Acronyms, Abbreviations

The following definitions, acronyms, abbreviations and interpretations apply throughout this document:

ACK	Acknowledge (Packet)
ASCII	American Standard Code for Information Interchange
bps	bits per second
BAT	Balance Adjustment Table
CGC	Channel Group Controller
CRC	Cyclic Redundancy Check
CTM	Control Module
EPC	Electronic Product Code
ETC	Electronic Toll Collection
FDM	Frequency Division Multiplexing
FIFO	First In, First Out
IAG	Inter-Agency Group
ICD	Interface Control Document
IP	Internet Protocol
IPv4	Internet Protocol (version 4)
ISO	International Standards Organization
LC	Lane Controller
LSB	Least Significant Bit

MFT	Multiple Fault Threshold
MPR	Multi-Protocol Reader
MRFM	Multi-Protocol Radio-Frequency Module
MSB	Most Significant Bit
NAK	Negative-Acknowledge (Packet)
ORT	Open-Road Tolling
PC	Protocol Control
PTO	Protocol Timeout
RF	Radio Frequency
RFID	Radio Frequency Identification
RR	Restart Request
RSN	Receive Sequence Number
RSSI	Received Signal Strength Indicator
SCP	Secure Copy
SFT	Single Fault Threshold
SSN	Send Sequence Number
S/W	Software
TBC	To Be Confirmed
TBD	To Be Determined
TCP	Transport Control Protocol
TCP/IP	Transport Control Protocol / Internet Protocol
TDM	Time Division Multiplexing
TID	Tag-Identification or Tag Identifier, depending on context
TRBA	Toll Rate / Balance Adjustment
UART	Universal Asynchronous Receiver/Transmitter
UDP	User Datagram Protocol
UID	Unique Identifier
UII	Unique Item Identifier
UM	User Memory
UML	Unified Modeling Language

2. INTERFACE DESCRIPTION

2.1 Backwards Compatibility

Certain messages included in the JANUS MPR2.3 *Basic Message Set* are backwards compatible with those of the legacy Badger and IAG Readers. As such, the JANUS MPR2.3 Reader can communicate with the existing lane controllers that have been designed to function with Badger/IAG Readers. Additionally, the JANUS MPR2.3 *Basic Message Set* is backwards compatible with legacy JANUS, JANUS MPR1, and JANUS MPR2 Readers as well. Please refer to §2.2.1 and §2.3.1 for additional details on the backwards compatibility of messages in the JANUS MPR2.3 *Basic Message Set*.

Since legacy Badger and IAG Readers did not support an Ethernet Interface to the lane controller, messages included in the JANUS MPR2.3 *Ethernet Message Set* are backwards compatible with legacy JANUS, JANUS MPR1, and JANUS MPR2 Readers only. Please refer to §2.2.2 and §2.3.2 for additional details on the backwards compatibility of messages in the JANUS MPR2.3 *Ethernet Message Set*.

Messages included in the JANUS MPR2.3 Reader *Toll Rate / Balance Adjustment Message Set* are backwards compatible with those of the ISTHA Reader. The JANUS MPR2.3 Reader is also compatible with legacy installations of Badger, JANUS, JANUS MPR1, and JANUS MPR2 Readers where those readers have been configured to run in *Toll Rate / Balance Adjustment Mode*. Please refer to §2.2.3 and §2.3.3 for additional details on the backwards compatibility of messages in the JANUS MPR2.3 Reader *Toll Rate / Balance Adjustment Message Set*.

The messages described in the JANUS MPR2.3 Reader *Reader Configuration and Software Management / Update Message Set* are backwards compatible with the JANUS MPR2 Reader only. Please refer to §2.2.4.1 and §2.3.4.1 for additional details on the backwards compatibility of the JANUS MPR2.3 Reader *Reader Configuration and Software Management / Update Message Set.*

The JANUS MPR2.3 Reader provides a super-set of the available Multi-Protocol messages that are used to report Multi-Protocol transactions to the Lane Controller. Certain messages included in the JANUS MPR2.3 Reader *Multi-Protocol Message Set* are backwards compatible with those of the legacy JANUS, JANUS MPR1, and JANUS MPR2 Readers. The messages defined in the *Multi-Protocol Message Set* are not compatible with Badger/IAG Readers. For additional details on the backwards compatibility of the JANUS MPR2.3 Reader *Multi-Protocol Message Set*, please refer to §2.3.5.1.

2.2 Summary of Lane Controller to Reader Messages

2.2.1 Lane Controller to Reader Messages – Basic Message Set

The messages shown in Table 2.2-1 define the Lane Controller to Reader messages that comprise the *Basic Message Set* of the JANUS MPR2.3 Reader. Depending on the Reader configuration, these messages may be accepted over either the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface.

Table 2.2-1: Lane Controller to Reader Messages – Basic Message Set

LC to Reader Message	Expected Reader (application) Response	IAG / Badger Compatible	JANUS / MPR1 / MPR2 Compatible
Configuration Request Message	Configuration Message	✓	✓
Lane Active Message	None (**See Note *1***)	✓	✓
Lane Guard Message	None (**See Note *1***)	✓	✓
Lane Off-Line Message	None (**See Note *1***)	✓	✓

Reboot Request Message	None (**See Note *2***)		✓
Re-Report Request Message	None (**See Note *3***)	✓	✓
[Precision] Read Time Message	[Precision] Time Message	✓ (**See Note *7***)	✓ (**See Note *7***)
Set Configuration Message	None (**See Note *4***)	✓	✓
Vehicle Speed Message	None (**See Note *5***)		✓
Status Request Message	Status Message	✓	✓
Set Time Message	None	✓	✓
Transaction Number Reset Message	None		✓
Voting Time Message *(Note: also reader to LC)*	None (**See Note *6***)		✓

Notes:

(1) - The JANUS MPR2.3 Reader will asynchronously transmit a Status Response Message if the Lane/Channel Status has changed.

(2) - As part of a successful Reader reboot, the JANUS MPR2.3 Reader will implicitly transmit an Initialization Message to the Lane Controller (see §7.2.4 and/or §9.3.3 for details).

(3) - If the given channel is configured to be either a guard channel or is off-line, the Reader will echo the Re-Report Request Message (with some additional information) to the Lane Controller. If a transponder is present in the capture zone, the Reader will transmit a Transponder message to the Lane Controller. If no transponder is present in the capture zone, there shall be no response from the Reader.

(4) - The JANUS MPR2.3 Reader will asynchronously transmit a Status Response Message if a change in Lane/Channel Status and/or a change Synchronization Status has occurred in response to the Set Configuration request.

(5) - The JANUS MPR2.3 Reader will asynchronously transmit a Voting Time Message if the new vehicle speed information results in a new dynamically computed voting time that is different from the previous voting time setting.

(6) - The JANUS MPR2.3 Reader will asynchronously transmit a Voting Time Message if the newly requested voting time is different from the previous voting time setting.

(7) - The optional Precision Read Time and optional Precision Time Message Response messages are fully supported in the JANUS MPR2.3 Reader and JANUS MPR2 Reader only.

2.2.2 Lane Controller to Reader Messages – Ethernet Interface Message Set

Please refer to §2.3.2 for a summary of additional messages defined for the Reader and Lane Controller when communicating over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface.

2.2.3 Lane Controller to Reader Messages – Toll Rate / Balance Adjustment Message Set

The Lane Controller to Reader messages that are defined in support of the JANUS MPR2.3 Reader *Toll Rate / Balance Adjustment* (TRBA) functionality are shown in Table 2.2-2. Depending on the Reader configuration, these messages may be accepted over either the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface.

Table 2.2-2: Lane Controller to Reader Messages – Toll Rate / Balance Adjustment Message Set

LC to Reader Message	Expected Reader (application) Response	IAG Compatible	Badger Compatible	JANUS / MPR1 / MPR2 Compatible
Balance Adjustment Transfer Initiate Message	None (**See Note *1***)		✓	✓
Balance Adjustment Record Message (Real-Time, Dense, or Sparse Format)	None (**See Note *1***)		✓	✓
Balance Adjustment Transfer Control Message	None (**See Note *1***)		✓	✓
Balance Adjustment Status Request Message	Balance Adjustment Status Response Message (**See Note *1***)		✓	✓
Toll Rate Table Record Message (Fixed Rate or Variable Rate Format)	None (**See Note *2***)		✓	✓
Toll Rate Table Configuration Request Message	Toll Rate Table Configuration Message (**See Note *2***)		✓	✓
Toll Rate Table Select Message	None (**See Note *2***)		✓	✓

Notes:

***(1)* -** The JANUS MPR2.3 Reader will respond with a Balance Adjustment Transfer Control Message if a Balance Adjustment error condition is detected.

***(2)* -** The JANUS MPR2.3 Reader will respond with a Toll Rate Transfer Control Message if a Toll Rate error condition is detected.

2.2.3.1 TRBA Mode – Lane Controller to Reader Modified Message Formats

When the Reader is operating in Toll Rate / Balance Adjustment Mode (selected by enabling "*Toll Rate / Balance Adjustment*" in the Toll Collection Programming (TCP) section on the Tag Programming Reader Configuration web page), the following Lane Controller to Reader message formats change (*primarily for backwards compatibility with the ISTHA Reader Lane Controller Interface Format* [AD3]).

The modified Lane Controller to Reader messages shown in Table 2.2-3 apply when the Reader is operating in Toll Rate / Balance Adjustment Mode (See §9.2 for details).

Table 2.2-3: TRBA Mode – Lane Controller to Reader Modified Message Formats

LC to Reader Message	Expected Reader (application) Response
Set Configuration Message (TRBA)	None

2.2.4 Lane Controller to Reader Messages – Reader Configuration and Software Management / Update Message Set

The Lane Controller to Reader Messages shown in Table 2.2-4 are defined for both the Reader and the Lane Controller in support of the JANUS MPR2.3 Reader Configuration and Software Management / Update functionality. Depending on the Reader configuration, these messages may be accepted over either the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface. *However, it is important to note that, for certain Software Management / Update functions (i.e. Configuration File Transfers and/or Software Update File Transfers), Ethernet connectivity is required.*

Table 2.2-4: Lane Controller to Reader Messages – Reader Configuration and Software Management / Update Message Set

LC to Reader Message	Expected Reader (application) Response
Configuration – Get Parameter Message	Configuration – Parameter Value Message (**See Note *1***)
Configuration – Set Parameter Message	None (**See Note *2***)
Software Update / Management – Get Free Space Message	Software Update / Management – Filesystem Space Available Message
Software Update / Management – Query Update Count Message	Software Update / Management –Available Update Count Message
Software Update / Management – Get Update Identifier Message	Software Update / Management – Identifier Reference Message (**See Note *3***)
Software Update / Management – Verify Update Message	Software Update / Management – Status Message
Software Update / Management – Activate Update Message	None (**See Notes *3* / *4***)
Software Update / Management – Delete Update Message	Software Update / Management – Status Message
Software Update / Management – Update (Bulk) Configuration Message	Software Update / Management – Status Message
Software Update / Management – Generate (Bulk) Configuration File Message	Software Update / Management – (Bulk) Configuration File Info Message (**See Note *3***)

Notes:

(1) - The JANUS MPR2.3 Reader will respond with a Configuration – Get/Set Error Message if a '*Configuration – Get*' error condition is detected.

(2) - The JANUS MPR2.3 Reader will respond with a Configuration – Get/Set Error Message if a '*Configuration – Set*' error condition is detected.

(3) - The JANUS MPR2.3 Reader will respond with a Software Update / Management – Status Message if an error condition is detected

(4) - As part of a successful software restart, the JANUS MPR2.3 Reader will implicitly transmit an Initialization Message to the Lane Controller (see §7.2.4 and/or §9.3.3 for details).

2.2.4.1 Lane Controller to Reader Messages – Reader Configuration and Software Management / Update Message

Set – Backwards Compatibility

The backwards compatibility of the Lane Controller to Reader Messages that comprise the *Reader Configuration and Software Management / Update Message Set* is shown in Table 2.2-5.

Table 2.2-5: Lane Controller to Reader Messages – Reader Configuration and Software Management / Update Message Set – Backwards Compatibility

LC to Reader Message	Badger / IAG Compatible	JANUS Compatible	JANUS MPR1 Compatible	JANUS MPR2 Compatible
Configuration – Get Parameter Message				✓
Configuration – Set Parameter Message				✓
Software Update / Management – Get Free Space Message				✓
Software Update / Management – Query Update Count Message				✓
Software Update / Management – Get Update Identifier Message				✓
Software Update / Management – Verify Update Message				✓
Software Update / Management – Activate Update Message				✓
Software Update / Management – Delete Update Message				✓
Software Update / Management – Update (Bulk) Configuration Message				✓
Software Update / Management – Generate (Bulk) Configuration File Message				✓

2.2.5 Lane Controller to Reader Messages – Multi-Protocol Message Set

There are currently no Lane Controller to Reader messages defined for the *Multi-Protocol Message Set*.

2.3 Summary of Reader to Lane Controller Messages

2.3.1 Reader to Lane Controller Messages – Basic Message Set

The messages shown in Table 2.3-1 define the Reader to Lane Controller messages that comprise the *Basic Message Set* of the JANUS MPR2.3 Reader. With the exception of the Reader Heartbeat (Sync) Message, for which a separate message/protocol is defined for use over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface (*c.f.* §2.3.2, §8.1.1), these messages may be transmitted to the Lane Controller over either the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, depending on Reader configuration.

Table 2.3-1: Reader to Lane Controller Messages – Basic Message Set

Reader to LC Message	Expected Lane Controller (application) Response	Badger/ IAG Compatible	JANUS / MPR1 / MPR2 Compatible
Configuration Message	None	✓	✓
IAG Initial Read (Majority / Interpolated Voting) Message (**See Note *1***)	None		✓
Initialization Message	None	✓	✓
IAG Transponder (Interpolated Voting) Message (**See Note *1***)	None		✓
IAG Post Capture (Majority Voting) Message (**See Note *1***)	None		✓
IAG Post Capture (Interpolated Voting) Message (**See Note *1***)	None		✓
Status Message	None	✓	✓
Reader Heartbeat (Sync) Message	None		✓
IAG Transponder (Majority Voting) Message (**See Note *1***)	None	✓	✓
[Precision] Time Message	None	✓ (**See Note *2***)	✓ (**See Note *2***)
Voting Time Message *(Note: also LC to reader)*	None		✓
IAG Transponder (RFP Compliant) Message	None		✓
IAG Initial Read (RFP Compliant) Message	None		✓
IAG Post Capture (RFP Compliant) Message	None		✓

Notes:

(1) - JANUS MPR2.3 Reader S/W versions dated ***2016feb09a***, or later, have the added capability of being able to report a timestamp as an optional trailing Extended-Information field for all IAG Transponder Transaction (Initial Read, Voting, and Post Capture) Messages (see §7.1 for details). *Extended-Information fields are not supported for RFP Compliant Message formats.*

(2) - The optional Precision Read Time and optional Precision Time Message Response messages are fully supported in JANUS MPR2.3 Reader and JANUS MPR2 Reader only.

2.3.2 Reader to Lane Controller Messages – Ethernet Interface Message Set

When communicating to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, additional messages are defined for both the Reader and the Lane Controller, as shown in Table 2.3-2 (See §4, §8 for details).

Table 2.3-2: Lane Controller to Reader Messages – Ethernet Interface Message Set

Reader to LC Message	Expected Lane Controller (application) Response	Badger/ IAG Compatible	JANUS / MPR1 / MPR2 Compatible
Sync Message	Sync Message		✓

When either the Reader or the Lane Controller receives a Sync Message, a sequence number will accompany it. The JANUS MPR2.3 Reader will increment the sequence number each time it originates a new Sync message. The Lane Controller must echo this sequence number back to the Reader by responding with a Sync message of its own.

2.3.3 Reader to Lane Controller Messages – Toll Rate / Balance Adjustment Message Set

The Reader to Lane Controller messages that are defined in support of the JANUS MPR2.3 Reader *Toll Rate / Balance Adjustment* (TRBA) functionality are shown in Table 2.3-3. Depending on the Reader configuration, these messages may be transmitted to the Lane Controller over either the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface.

Table 2.3-3: Reader to Lane Controller Messages – Toll Rate / Balance Adjustment Message Set

Reader to LC Message	Expected Lane Controller (application) Response	IAG Compatible	Badger Compatible	JANUS / MPR1 / MPR2 Compatible
Balance Adjustment Transfer Control Message	None		✓	✓
Balance Adjustment Status Response Message	None		✓	✓
(Balance Adjustment Table) Bad Block Message	None		✓	✓
Toll Rate Transfer Control Message	None		✓	✓
Toll Rate Table Configuration Message	None		✓	✓

2.3.3.1 TRBA Mode – Reader to Lane Controller Modified Message Formats

When the Reader is operating in Toll Rate / Balance Adjustment Mode (selected by enabling "*Toll Rate / Balance Adjustment*" in the Toll Collection Programming (TCP) section on the Tag Programming Reader Configuration web page), the following Reader to Lane Controller message formats change (*primarily for backwards compatibility with the ISTHA Reader Lane Controller Interface Format* [AD3]).

The modified Reader to Lane Controller messages shown in Table 2.3-4 apply when the Reader is operating in Toll Rate / Balance Adjustment Mode (See §9.2) for details).

Table 2.3-4: TRBA Mode - Reader to Lane Controller Modified Message Formats

Reader to LC Message	Expected Lane Controller (application) Response
Configuration Message – TRBA Mode	None
Initialization Message – TRBA Mode	None
Status Message – TRBA Mode	None
IAG Transponder (Majority Voting) Message – TRBA Mode (**See Note *1***)	None
Initial Read (Majority / Interpolated Voting) Message – TRBA Mode (**See Note *1***)	None
Post Capture (Majority Voting) Message – TRBA Mode (**See Note *1***)	None
Transponder (Interpolated Voting) Message – TRBA Mode (**See Note *1***)	None
Post Capture (Interpolated Voting) Message – TRBA Mode (**See Note *1***)	None

Notes:

(1) - JANUS MPR2.3 Reader S/W versions dated ***2016feb09a***, or later, have the added capability of being able to report a timestamp as an optional trailing Extended-Information field for all TRBA Mode Transaction (Initial Read, Voting, and Post Capture) Messages (see §9.2 for details).

2.3.4 Reader to Lane Controller Messages – Reader Configuration and Software Management / Update Message Set

The Reader to Lane Controller Messages shown in Table 2.3-5 are defined for both the Reader and the Lane Controller in support of the JANUS MPR2.3 Reader Configuration and Software Management / Update functionality. Depending on the Reader configuration, these messages may be transmitted to the Lane Controller over either the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface. *However, it is important to note that, for certain Software Management / Update functions (i.e. Configuration File Transfers and/or Software Update File Transfers), Ethernet connectivity is required.*

Table 2.3-5: Reader to Lane Controller Messages – Reader Configuration and Software Management / Update Message Set

Reader to LC Message	Expected Lane Controller (application) Response
Configuration – Parameter Value Message	None
Configuration – Get/Set Error Message	None
Software Update / Management – Filesystem Space Available Message	None
Software Update / Management – Available Update Count Message	None
Software Update / Management – Update Identifier-Reference Message	None
Software Update / Management – (Bulk) Configuration File Info Message	None

Reader to LC Message	Expected Lane Controller (application) Response
Software Update / Management – Status Message	None

2.3.4.1 Reader to Lane Controller Messages – Reader Configuration and Software Management / Update Message Set – Backwards Compatibility

The backwards compatibility of the Reader to Lane Controller Messages that comprise the *Reader Configuration and Software Management / Update Message Set* is shown in Table 2.3-6.

Table 2.3-6: Reader to Lane Controller Messages – Reader Configuration and Software Management / Update Message Set – Backwards Compatibility

LC to Reader Message	Badger / IAG Compatible	JANUS Compatible	JANUS MPR1 Compatible	JANUS MPR2 Compatible
Configuration – Parameter Value Message				✓
Configuration – Get/Set Error Message				✓
Software Update / Management – Filesystem Space Available Message				✓
Software Update / Management – Available Update Count Message				✓
Software Update / Management – Update Identifier-Reference Message				✓
Software Update / Management – (Bulk) Configuration File Info Message				✓
Software Update / Management – Status Message				✓

2.3.5 Reader to Lane Controller Messages – Multi-Protocol Message Set

The Reader to Lane Controller Messages shown in Table 2.3-7 are defined for both the Reader and the Lane Controller in support of the JANUS MPR2.3 Multi-Protocol capability. Depending on the Reader configuration, these messages may be transmitted to the Lane Controller over either the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface.

Table 2.3-7: Reader to Lane Controller Messages – Multi-Protocol Message Set

Reader to LC Message	Expected Lane Controller (application) Response
Allegro Handshake Message	None
Allegro Initial Read Message	None

Reader to LC Message	Expected Lane Controller (application) Response
Allegro Transponder (Majority Voting) Message	None
Allegro Post Capture (Majority Voting) Message	None
Allegro Transponder (Interpolated Voting) Message	None
Allegro Post Capture (Interpolated Voting) Message	None
ATA Handshake Message (8-Bit ASCII Alphanumeric Data)	None
ATA Initial Read Message (8-Bit ASCII Alphanumeric Data)	None
ATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)	None
ATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)	None
ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)	None
ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)	None
ATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)	None
ATA Handshake Message (8-Bit ASCII Hex Data)	None
ATA Initial Read Message (8-Bit ASCII Hex Data)	None
ATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)	None
ATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)	None
ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)	None
ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)	None
ATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)	None
IAG (Standard) Handshake Message	None
IAG (Toll Rate / Balance Adjustment) Handshake Message	None
ISO 18000-6B Handshake Message	None
ISO 18000-6B Initial Read Message	None
ISO 18000-6B Transponder (Majority Voting) Message	None
ISO 18000-6B Post Capture (Majority Voting) Message	None
ISO 18000-6B Transponder (Interpolated Voting) Message	None
ISO 18000-6B Post Capture (Interpolated Voting) Message	None
ISO 18000-6B Estimated Vehicle Speed Message	None
ISO 18000-6B eATA Handshake Message (8-Bit ASCII Alphanumeric Data)	None
ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Alphanumeric Data)	None

Reader to LC Message	Expected Lane Controller (application) Response
ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)	None
ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)	None
ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)	None
ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)	None
ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)	None
ISO 18000-6B eATA Handshake Message (8-Bit ASCII Hex Data)	None
ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Hex Data)	None
ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)	None
ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)	None
ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)	None
ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)	None
ISO 18000-6B eATA Estimated Vehicle Speed Message (8-bit ASCII Hex Data)	None
ISO 18000-6B Combined UID+eATA Handshake Message	None
ISO 18000-6B Combined UID+eATA Initial Read Message	None
ISO 18000-6B Combined UID+eATA Transponder (Majority Voting) Message	None
ISO 18000-6B Combined UID+eATA Post Capture (Majority Voting) Message	None
ISO 18000-6B Combined UID+eATA Transponder (Interpolated Voting) Message	None
ISO 18000-6B Combined UID+eATA Post Capture (Interpolated Voting) Message	None
ISO 18000-6B Combined UID+eATA Estimated Vehicle Speed Message	None
ISO 18000-6C Handshake Message (**See Note *1***)	None
ISO 18000-6C Initial Read Message (**See Note *2***)	None
ISO 18000-6C Transponder (Majority Voting) Message (**See Note *2***)	None
ISO 18000-6C Post Capture (Majority Voting) Message (**See Note *2***)	None
ISO 18000-6C Transponder (Interpolated Voting) Message (**See Note *2***)	None
ISO 18000-6C Post Capture (Interpolated Voting) Message (**See Note *2***)	None

Reader to LC Message	Expected Lane Controller (application) Response
ISO 18000-6C Estimated Vehicle Speed Message (**See Note *2***)	None
SeGo Handshake Message	None
SeGo Initial Read Message	None
SeGo Transponder (Majority Voting) Message	None
SeGo Post Capture (Majority Voting) Message	None
SeGo Transponder (Interpolated Voting) Message	None
SeGo Post Capture (Interpolated Voting) Message	None
SeGo Estimated Vehicle Speed Message	None

Notes:

(1) - JANUS MPR2.3 Reader S/W versions dated ***2016jun20a***, or later, have the added capability of being able to report ISO 18000-6C EPC/UII memory area CRC/PC bits (bits 0x00-0x1F) as an optional trailing Extended-Information field for ISO 18000-6C Multi-Protocol Handshake Messages (see §11.2 for details).

(2) - JANUS MPR2.3 Reader S/W versions dated ***2017mar29a***, or later, have the added capability of being able to report ISO 18000-6C EPC/UII memory area CRC/PC bits (bits 0x00-0x1F) as an optional trailing Extended-Information field for ISO 18000-6C Multi-Protocol Transaction (Initial Read, Voting, Post Capture and Estimated Vehicle Speed) Report Messages (see §11.2 for details).

2.3.5.1 Reader to Lane Controller Messages – Multi-Protocol Message Set – Backwards Compatibility

The backwards compatibility of the Reader to Lane Controller Messages that comprise the *Multi-Protocol Message Set* is shown in Table 2.3-8.

Table 2.3-8: Reader to Lane Controller Messages – Multi-Protocol Message Set – Backwards Compatibility

Reader to LC Message	Badger / IAG Compatible	JANUS Compatible	JANUS MPR1 Compatible	JANUS MPR2 Compatible
Allegro Handshake Message				✓
Allegro Initial Read Message				✓
Allegro Transponder (Majority Voting) Message				✓
Allegro Post Capture (Majority Voting) Message				✓
Allegro Transponder (Interpolated Voting) Message				✓
Allegro Post Capture (Interpolated Voting) Message				✓
ATA Handshake Message (8-Bit ASCII Alphanumeric Data)			✓	✓

Reader to LC Message	Badger / IAG Compatible	JANUS Compatible	JANUS MPR1 Compatible	JANUS MPR2 Compatible
ATA Initial Read Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)				✓
ATA Handshake Message (8-Bit ASCII Hex Data)			✓	✓
ATA Initial Read Message (8-Bit ASCII Hex Data)			✓	✓
ATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)			✓	✓
ATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)			✓	✓
ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)			✓	✓
ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)			✓	✓
ATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)				✓
IAG (Standard) Handshake Message		✓	✓	✓
IAG (Toll Rate / Balance Adjustment) Handshake Message		✓	✓	✓
ISO 18000-6B Handshake Message			✓	✓
ISO 18000-6B Initial Read Message			✓	✓
ISO 18000-6B Transponder (Majority Voting) Message			✓	✓
ISO 18000-6B Post Capture (Majority Voting) Message			✓	✓
ISO 18000-6B Transponder (Interpolated Voting) Message			✓	✓

Reader to LC Message	Badger / IAG Compatible	JANUS Compatible	JANUS MPR1 Compatible	JANUS MPR2 Compatible
ISO 18000-6B Post Capture (Interpolated Voting) Message			✓	✓
ISO 18000-6B Estimated Vehicle Speed Message				
ISO 18000-6B eATA Handshake Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)			✓	✓
ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)				
ISO 18000-6B eATA Handshake Message (8-Bit ASCII Hex Data)			✓	✓
ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Hex Data)			✓	✓
ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)			✓	✓
ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)			✓	✓
ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)			✓	✓
ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)			✓	✓
ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)				
ISO 18000-6B Combined UID+eATA Handshake Message				✓

Reader to LC Message	Badger / IAG Compatible	JANUS Compatible	JANUS MPR1 Compatible	JANUS MPR2 Compatible
ISO 18000-6B Combined UID+eATA Initial Read Message				✓
ISO 18000-6B Combined UID+eATA Transponder (Majority Voting) Message				✓
ISO 18000-6B Combined UID+eATA Post Capture (Majority Voting) Message				✓
ISO 18000-6B Combined UID+eATA Transponder (Interpolated Voting) Message				✓
ISO 18000-6B Combined UID+eATA Post Capture (Interpolated Voting) Message				✓
ISO 18000-6B Combined UID+eATA Estimated Vehicle Speed Message				
ISO 18000-6C Handshake Message (**See Note *2***)				✓
ISO 18000-6C Initial Read Message (**See Note *3***)				✓
ISO 18000-6C Transponder (Majority Voting) Message (**See Note *3***)				✓
ISO 18000-6C Post Capture (Majority Voting) Message (**See Note *3***)				✓
ISO 18000-6C Transponder (Interpolated Voting) Message (**See Note *3***)				✓
ISO 18000-6C Post Capture (Interpolated Voting) Message (**See Note *3***)				✓
ISO 18000-6C Estimated Vehicle Speed Message (**See Note *3***)				
MRFM ‘TTO-mode’ ISO 18000-6B Loop-through Handshake Message (**See Note *1***)			✓	
MRFM ‘TTO-mode’ ATA Loop-through Handshake Message (**See Note *1***)			✓	
SeGo Handshake Message				✓
SeGo Initial Read Message				✓
SeGo Transponder (Majority Voting) Message				✓
SeGo Post Capture (Majority Voting) Message				✓
SeGo Transponder (Interpolated Voting) Message				✓
SeGo Post Capture (Interpolated Voting) Message				✓

Reader to LC Message	Badger / IAG Compatible	JANUS Compatible	JANUS MPR1 Compatible	JANUS MPR2 Compatible
SeGo Estimated Vehicle Speed Message				

Notes:

(1) **-** MRFM 'TTO-mode' ISO 18000-6B and ATA Loop-though Handshake Messages are identified here for the sake of completeness only. These messages arose out of a particular requirement for the JANUS MPR1 Reader, and as such, are not supported by the JANUS MPR2.3 Reader. For additional information on these messages, please refer to [AD4].

(2) **-** JANUS MPR2.3 Reader S/W versions dated ***2016jun20a***, or later, have the added capability of being able to report ISO 18000-6C EPC/UII memory area CRC/PC bits (bits 0x00-0x1F) as an optional trailing Extended-Information field for ISO 18000-6C Multi-Protocol Handshake Messages (see §11.2 for details).

(3) - JANUS MPR2.3 Reader S/W versions dated ***2017mar29a***, or later, have the added capability of being able to report ISO 18000-6C EPC/UII memory area CRC/PC bits (bits 0x00-0x1F) as an optional trailing Extended-Information field for ISO 18000-6C Multi-Protocol Transaction (Initial Read, Voting, Post Capture and Estimated Vehicle Speed) Report Messages (see §11.2 for details).

2.4 Supported Messages by Software Release

This section, and the subsections that follow, provide a cross reference of availability and/or support for the messages defined herein, with respect to JANUS MPR2.3 software releases.

2.4.1 Supported Messages by Software Release – Basic Message Set

Table 2.4-1 shows the support/availability of messages by software release for the JANUS MPR2.3 *Basic Message Set*. Messages identified with a checkmark (✓) are available/supported in the specified JANUS MPR2.3 Reader software version(s).

Table 2.4-1: Supported Messages by Software Release – Basic Message Set

	Available in Version:
Message	**2015may09a, or later**
Configuration Message	✓
Configuration Request Message	✓
Initial Read (Majority / Interpolated Voting) Message (**See Note *1***)	✓
Initialization Message	✓
Lane Active Message	✓
Lane Guard Message	✓
Lane Off-Line Message	✓

Message	Available in Version: 2015may09a, or later
IAG Transponder (Interpolated Voting) Message (**See Note *1***)	✓
IAG Post Capture (Majority Voting) Message (**See Note *1***)	✓
IAG Post Capture (Interpolated Voting) Message (**See Note *1***)	✓
Reboot Request Message	✓
Re-Report Request Message	✓
[Precision] Read Time Message	✓
Status Message	✓
Set Configuration Message	✓
Vehicle Speed Message	✓
Status Request Message	✓
Set Time Message	✓
Reader Heartbeat (Sync) Message	✓
IAG Transponder (Majority Voting) Message (**See Note *1***)	✓
[Precision] Time Message	✓
Transaction Number Reset Message	✓
Voting Time Message	✓
IAG Transponder (RFP Compliant) Message	✓
IAG Initial Read (RFP Compliant) Message	✓
IAG Post Capture (RFP Compliant) Message	✓

Notes:

(1)* -** JANUS MPR2.3 Reader S/W versions dated ***2016feb09a, or later, have the added capability of being able to report a timestamp as an optional trailing Extended-Information field for all IAG Transponder Transaction (Initial Read, Voting, and Post Capture) Messages (see §7.1 for details). *Extended-Information fields are not supported for RFP Compliant Message formats.*

2.4.2 Supported Messages by Software Release – Ethernet Interface Message Set

The support/availability of messages by software release for the JANUS MPR2.3 *Ethernet Interface Message Set* is shown in Table 2.4-2. Messages identified with a checkmark (✓) are available/supported in the specified JANUS MPR2.3 Reader software version(s).

Table 2.4-2: Supported Messages by Software Release – Ethernet Interface Message Set

Message	Available in Version: 2015may09a, or later
Sync Message	✓

2.4.3 Supported Messages by Software Release – Toll Rate / Balance Adjustment Message Set

Table 2.4-3 shows the support/availability of messages by software release for the JANUS MPR2.3 *Toll Rate / Balance Adjustment Message Set*. Messages identified with a checkmark (✓) are available/supported in the specified JANUS MPR2.3 Reader software version(s).

Table 2.4-3: Supported Messages by Software Release – Toll Rate / Balance Adjustment Message Set

Message	Available in Version: 2015may09a, or later
Balance Adjustment Transfer Initiate Message	✓
Balance Adjustment Record Message (Real-Time, Dense, or Sparse Format)	✓
Balance Adjustment Transfer Control Message	✓
Balance Adjustment Status Request Message	✓
Balance Adjustment Status Response Message	✓
(Balance Adjustment Table) Bad Block Message	**See Note *1***
Configuration Message – TRBA Mode	✓
Initial Read (Majority / Interpolated Voting) Message – TRBA Mode (**See Note *2***)	✓
Initialization Message – TRBA Mode	✓
Transponder (Interpolated Voting) Message – TRBA Mode (**See Note *2***)	✓
Post Capture (Majority Voting) Message – TRBA Mode (**See Note *2***)	✓
Post Capture (Interpolated Voting) Message – TRBA Mode (**See Note *2***)	✓
Status Message – TRBA Mode	✓
Set Configuration Message (TRBA)	✓
IAG Transponder (Majority Voting) Message – TRBA Mode (**See Note *2***)	✓

Message	Available in Version: 2015may09a, or later
Toll Rate Table Record Message (Fixed Rate or Variable Rate Format)	✓
Toll Rate Transfer Control Message	✓
Toll Rate Table Configuration Request Message	✓
Toll Rate Table Configuration Message	✓
Toll Rate Table Select Message	✓

Notes:

(1) - As of the 2015may09a JANUS MPR2.3 Reader software release, the feature provided by this message is currently not implemented.

(2) - JANUS MPR2.3 Reader S/W versions dated ***2016feb09a***, or later, have the added capability of being able to report a timestamp as an optional trailing Extended-Information field for all TRBA Mode Transaction (Initial Read, Voting, and Post Capture) Messages (see §9.2 for details).

2.4.4 Supported Messages by Software Release – Reader Configuration and Software Management / Update Message Set

The support/availability of messages by software release for the JANUS MPR2.3 *Reader Configuration and Software Management / Update Message Set* is shown in Table 2.4-4. Messages identified with a checkmark (✓) are available/supported in the specified JANUS MPR2.3 Reader software version(s).

Table 2.4-4: Supported Messages by Software Release – Reader Configuration and Software Management / Update Message Set

Message	Available in Version: 2015may09a, or later
Configuration – Get/Set Error Message	✓
Configuration – Get Parameter Message	✓
Configuration – Set Parameter Message	✓
Configuration – Parameter Value Message	✓
Software Update / Management – Activate Update Message	✓
Software Update / Management – (Bulk) Configuration File Info Message	✓
Software Update / Management – Update (Bulk) Configuration Message	✓

Message	Available in Version: 2015may09a, or later
Software Update / Management – Delete Update Message	✓
Software Update / Management – Get Free Space Message	✓
Software Update / Management – Generate (Bulk) Configuration File Message	✓
Software Update / Management – Get Update Identifier Message	✓
Software Update / Management – Filesystem Space Available Message	✓
Software Update / Management – Available Update Count Message	✓
Software Update / Management – Query Update Count Message	✓
Software Update / Management – Update Identifier-Reference Message	✓
Software Update / Management – Status Message	✓
Software Update / Management – Verify Update Message	✓

2.4.5 Supported Messages by Software Release – Multi-Protocol Message Set

Table 2.4-5 shows the support/availability of messages by software release for the JANUS MPR2.3 *Multi-Protocol Message Set*. Messages identified with a checkmark (✓) are available/supported in the specified JANUS MPR2.3 Reader software version(s).

Table 2.4-5: Supported Messages by Software Release – Multi-Procotol Message Set

Message	Available in Version:	
	2015may09a, or later	2016dec02a, or later
Allegro Handshake Message	✓	✓
Allegro Initial Read Message	✓	✓
Allegro Transponder (Majority Voting) Message	✓	✓
Allegro Post Capture (Majority Voting) Message	✓	✓
Allegro Transponder (Interpolated Voting) Message	✓	✓
Allegro Post Capture (Interpolated Voting) Message	✓	✓

Message	Available in Version: 2015may09a, or later	2016dec02a, or later
ATA Handshake Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ATA Initial Read Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ATA Handshake Message (8-Bit ASCII Hex Data)	✓	✓
ATA Initial Read Message (8-Bit ASCII Hex Data)	✓	✓
ATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)	✓	✓
ATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)	✓	✓
ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)	✓	✓
ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)	✓	✓
ATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)	✓	✓
IAG (Standard) Handshake Message	✓	✓
IAG (Toll Rate / Balance Adjustment) Handshake Message	✓	✓
ISO 18000-6B Handshake Message	✓	✓
ISO 18000-6B Initial Read Message	✓	✓
ISO 18000-6B Transponder (Majority Voting) Message	✓	✓
ISO 18000-6B Post Capture (Majority Voting) Message	✓	✓
ISO 18000-6B Transponder (Interpolated Voting) Message	✓	✓
ISO 18000-6B Post Capture (Interpolated Voting) Message	✓	✓
ISO 18000-6B Estimated Vehicle Speed Message		✓

Message	Available in Version: 2015may09a, or later	2016dec02a, or later
ISO 18000-6B eATA Handshake Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)	✓	✓
ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)		✓
ISO 18000-6B eATA Handshake Message (8-Bit ASCII Hex Data)	✓	✓
ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Hex Data)	✓	✓
ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)	✓	✓
ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)	✓	✓
ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)	✓	✓
ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)	✓	✓
ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)		✓
ISO 18000-6B Combined UID+eATA Handshake Message	✓	✓
ISO 18000-6B Combined UID+eATA Initial Read Message	✓	✓
ISO 18000-6B Combined UID+eATA Transponder (Majority Voting) Message	✓	✓
ISO 18000-6B Combined UID+eATA Post Capture (Majority Voting) Message	✓	✓
ISO 18000-6B Combined UID+eATA Transponder (Interpolated Voting) Message	✓	✓
ISO 18000-6B Combined UID+eATA Post Capture (Interpolated Voting) Message	✓	✓

Message	Available in Version: 2015may09a, or later	Available in Version: 2016dec02a, or later
ISO 18000-6B Combined UID+eATA Estimated Vehicle Speed Message		✓
ISO 18000-6C Handshake Message (**See Note *1***)	✓	✓
ISO 18000-6C Initial Read Message (**See Note *2***)	✓	✓
ISO 18000-6C Transponder (Majority Voting) Message (**See Note *2***)	✓	✓
ISO 18000-6C Post Capture (Majority Voting) Message (**See Note *2***)	✓	✓
ISO 18000-6C Transponder (Interpolated Voting) Message (**See Note *2***)	✓	✓
ISO 18000-6C Post Capture (Interpolated Voting) Message (**See Note *2***)	✓	✓
ISO 18000-6C Estimated Vehicle Speed Message (**See Note *2***)		✓
SeGo Handshake Message	✓	✓
SeGo Initial Read Message	✓	✓
SeGo Transponder (Majority Voting) Message	✓	✓
SeGo Post Capture (Majority Voting) Message	✓	✓
SeGo Transponder (Interpolated Voting) Message	✓	✓
SeGo Post Capture (Interpolated Voting) Message	✓	✓
SeGo Post Capture (Interpolated Voting) Message		✓

Notes:

(1)* -** JANUS MPR2.3 Reader S/W versions dated ***2016jun20a, or later, have the added capability of being able to report ISO 18000-6C EPC/UII memory area CRC/PC bits (bits 0x00-0x1F) as an optional trailing Extended-Information field for ISO 18000-6C Multi-Protocol Handshake Messages (see §11.2 for details).

(2) - JANUS MPR2.3 Reader S/W versions dated ***2017mar29a***, or later, have the added capability of being able to report ISO 18000-6C EPC/UII memory area CRC/PC bits (bits 0x00-0x1F) as an optional trailing Extended-Information field for ISO 18000-6C Multi-Protocol Transaction (Initial Read, Voting, Post Capture and Estimated Vehicle Speed) Report Messages (see §11.2 for details).

2.5 Supported Messages by Protocol

The JANUS MPR2.3 Reader can support various transponder protocols, depending on factory configuration settings. This section, and the subsections that follow, provide a cross reference of availability and/or support for the messages defined herein, with respect to JANUS MPR2.3 Reader supported transponder protocols.

Only those messages applicable to the JANUS MPR2.3 Reader factory configuration that has been purchased shall be available for use.

2.5.1 Supported Messages by Protocol – Basic Message Set

Table 2.5-1 shows the support/availability of messages by protocol for the JANUS MPR2.3 *Basic Message Set*. Messages identified with a checkmark (✓) are available/supported for the specified protocol(s).

Table 2.5-1: Supported Messages by Protocol – Basic Message Set

Message	Protocol					
	IAG	Allegro	ISO 18000-6B	ISO 18000-6C	ATA	SeGo
Configuration Message	✓	✓	✓	✓	✓	✓
Configuration Request Message	✓	✓	✓	✓	✓	✓
Initial Read (Majority / Interpolated Voting) Message	✓					
Initialization Message	✓	✓	✓	✓	✓	✓
Lane Active Message	✓	✓	✓	✓	✓	✓
Lane Guard Message	✓	✓	✓	✓	✓	✓
Lane Off-Line Message	✓	✓	✓	✓	✓	✓
IAG Transponder (Interpolated Voting) Message	✓					
IAG Post Capture (Majority Voting) Message	✓					
IAG Post Capture (Interpolated Voting) Message	✓					
Reboot Request Message	✓	✓	✓	✓	✓	✓
Re-Report Request Message	✓					
[Precision] Read Time Message	✓	✓	✓	✓	✓	✓
Status Message	✓	✓	✓	✓	✓	✓
Set Configuration Message	✓	✓	✓	✓	✓	✓
Vehicle Speed Message	✓	✓	✓	✓	✓	✓
Status Request Message	✓	✓	✓	✓	✓	✓
Set Time Message	✓	✓	✓	✓	✓	✓
Reader Heartbeat (Sync) Message	✓	✓	✓	✓	✓	✓
IAG Transponder (Majority Voting) Message	✓					
[Precision] Time Message	✓	✓	✓	✓	✓	✓
Transaction Number Reset Message	✓	✓	✓	✓	✓	✓
Voting Time Message	✓	✓	✓	✓	✓	✓
IAG Transponder (RFP Compliant) Message	✓					
IAG Initial Read (RFP Compliant) Message	✓					
IAG Post Capture (RFP Compliant) Message	✓					

2.5.2 Supported Messages by Protocol – Ethernet Interface Message Set

The support/availability of messages by protocol for the JANUS MPR2.3 *Ethernet Interface Message Set* is shown in Table 2.5-2. Messages identified with a checkmark (✓) are available/supported for the specified protocol(s).

Table 2.5-2: Supported Messages by Protocol – Ethernet Interface Message Set

Message	Protocol					
	IAG	Allegro	ISO 18000-6B	ISO 18000-6C	ATA	SeGo
Sync Message	✓	✓	✓	✓	✓	✓

2.5.3 Supported Messages by Protocol – Toll Rate / Balance Adjusment Message Set

Table 2.5-3 shows the support/availability of messages by protocol for the JANUS MPR2.3 *Toll Rate / Balance Adjustment Message Set*. Messages identified with a checkmark (✓) are available/supported for the specified protocol(s).

Table 2.5-3: Supported Messages by Protocol – Toll Rate / Balance Adjustment Message Set

Message	Protocol					
	IAG	Allegro	ISO 18000-6B	ISO 18000-6C	ATA	SeGo
Balance Adjustment Transfer Initiate Message	✓					
Balance Adjustment Record Message (Real-Time, Dense, or Sparse Format)	✓					
Balance Adjustment Transfer Control Message	✓					
Balance Adjustment Status Request Message	✓					
Balance Adjustment Status Response Message	✓					
(Balance Adjustment Table) Bad Block Message	***1***					
Configuration Message – TRBA Mode	✓					
Initial Read (Majority / Interpolated Voting) Message – TRBA Mode	✓					
Initialization Message – TRBA Mode	✓					
Transponder (Interpolated Voting) Message – TRBA Mode	✓					
Post Capture (Majority Voting) Message – TRBA Mode	✓					

	Protocol					
Message	**IAG**	**Allegro**	**ISO 18000-6B**	**ISO 18000-6C**	**ATA**	**SeGo**
Post Capture (Interpolated Voting) Message – TRBA Mode	✓					
Status Message – TRBA Mode	✓					
Set Configuration Message (TRBA)	✓					
IAG Transponder (Majority Voting) Message – TRBA Mode	✓					
Toll Rate Table Record Message (Fixed Rate or Variable Rate Format)	✓					
Toll Rate Transfer Control Message	✓					
Toll Rate Table Configuration Request Message	✓					
Toll Rate Table Configuration Message	✓					
Toll Rate Table Select Message	✓					

Notes:

(1) - As of the 2015may09a JANUS MPR2.3 Reader software release, the feature provided by this message is currently not implemented.

2.5.4 Supported Messages by Protocol – Reader Configuration and Software Management / Update Message Set

The support/availability of messages by protocol for the JANUS MPR2.3 *Reader Configuration and Software Management / Update Message Set* is shown in Table 2.5-4. Messages identified with a checkmark (✓) are available/supported for the specified protocol(s).

Table 2.5-4: Supported Messages by Protocol – Reader Configuration and Software Management / Update Message Set

	Protocol					
Message	**IAG**	**Allegro**	**ISO 18000-6B**	**ISO 18000-6C**	**ATA**	**SeGo**
Configuration – Get/Set Error Message	✓	✓	✓	✓	✓	✓
Configuration – Get Parameter Message	✓	✓	✓	✓	✓	✓
Configuration – Set Parameter Message	✓	✓	✓	✓	✓	✓
Configuration – Parameter Value Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Activate Update Message	✓	✓	✓	✓	✓	✓
Software Update / Management – (Bulk) Configuration File Info Message	✓	✓	✓	✓	✓	✓

Message	IAG	Allegro	ISO 18000-6B	ISO 18000-6C	ATA	SeGo
	Protocol					
Software Update / Management – Update (Bulk) Configuration Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Delete Update Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Get Free Space Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Generate (Bulk) Configuration File Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Get Update Identifier Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Filesystem Space Available Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Available Update Count Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Query Update Count Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Update Identifier-Reference Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Status Message	✓	✓	✓	✓	✓	✓
Software Update / Management – Verify Update Message	✓	✓	✓	✓	✓	✓

2.5.5 Supported Messages by Protocol – Multi-Protocol Message Set

Table 2.5-5 shows the support/availability of messages by protocol for the JANUS MPR2.3 *Multi-Protocol Message Set*. Messages identified with a checkmark (✓) are available/supported for the specified protocol(s).

Table 2.5-5: Supported Messages by Protocol – Multi-Protocol Message Set

Message	IAG	Allegro	ISO 18000-6B	ISO 18000-6C	ATA	SeGo
	Protocol					
Allegro Handshake Message		✓				
Allegro Initial Read Message		✓				
Allegro Transponder (Majority Voting) Message		✓				
Allegro Post Capture (Majority Voting) Message		✓				

Message	IAG	Allegro	ISO 18000-6B	ISO 18000-6C	ATA	SeGo
	Protocol					
Allegro Transponder (Interpolated Voting) Message		✓				
Allegro Post Capture (Interpolated Voting) Message		✓				
ATA Handshake Message (8-Bit ASCII Alphanumeric Data)					✓	
ATA Initial Read Message (8-Bit ASCII Alphanumeric Data)					✓	
ATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)					✓	
ATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)					✓	
ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)					✓	
ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)					✓	
ATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)					✓	
ATA Handshake Message (8-Bit ASCII Hex Data)					✓	
ATA Initial Read Message (8-Bit ASCII Hex Data)					✓	
ATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)					✓	
ATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)					✓	
ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)					✓	
ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)					✓	
ATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)					✓	
IAG (Standard) Handshake Message	✓					
IAG (Toll Rate / Balance Adjustment) Handshake Message	✓					
ISO 18000-6B Handshake Message			✓			
ISO 18000-6B Initial Read Message			✓			
ISO 18000-6B Transponder (Majority Voting) Message			✓			
ISO 18000-6B Post Capture (Majority Voting) Message			✓			

Message	IAG	Allegro	ISO 18000-6B	ISO 18000-6C	ATA	SeGo
	Protocol					
ISO 18000-6B Transponder (Interpolated Voting) Message			✓			
ISO 18000-6B Post Capture (Interpolated Voting) Message			✓			
ISO 18000-6B Estimated Vehicle Speed Message			✓			
ISO 18000-6B eATA Handshake Message (8-Bit ASCII Alphanumeric Data)			✓			
ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Alphanumeric Data)			✓			
ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)			✓			
ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)			✓			
ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)			✓			
ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)			✓			
ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)			✓			
ISO 18000-6B eATA Handshake Message (8-Bit ASCII Hex Data)			✓			
ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Hex Data)			✓			
ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)			✓			
ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)			✓			
ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)			✓			
ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)			✓			
ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)			✓			
ISO 18000-6B Combined UID+eATA Handshake Message			✓			
ISO 18000-6B Combined UID+eATA Initial Read Message			✓			
ISO 18000-6B Combined UID+eATA Transponder (Majority Voting) Message			✓			

Message	IAG	Allegro	ISO 18000-6B	ISO 18000-6C	ATA	SeGo
ISO 18000-6B Combined UID+eATA Post Capture (Majority Voting) Message			✓			
ISO 18000-6B Combined UID+eATA Transponder (Interpolated Voting) Message			✓			
ISO 18000-6B Combined UID+eATA Post Capture (Interpolated Voting) Message			✓			
ISO 18000-6B Combined UID+eATA Estimated Vehicle Speed Message			✓			
ISO 18000-6C Handshake Message (**See Note *1***)				✓		
ISO 18000-6C Initial Read Message (**See Note *2***)				✓		
ISO 18000-6C Transponder (Majority Voting) Message (**See Note *2***)				✓		
ISO 18000-6C Post Capture (Majority Voting) Message (**See Note *2***)				✓		
ISO 18000-6C Transponder (Interpolated Voting) Message (**See Note *2***)				✓		
ISO 18000-6C Post Capture (Interpolated Voting) Message (**See Note *2***)				✓		
ISO 18000-6C Estimated Vehicle Speed Message (**See Note *2***)				✓		
SeGo Handshake Message						✓
SeGo Initial Read Message						✓
SeGo Transponder (Majority Voting) Message						✓
SeGo Post Capture (Majority Voting) Message						✓
SeGo Transponder (Interpolated Voting) Message						✓
SeGo Post Capture (Interpolated Voting) Message						✓
SeGo Estimated Vehicle Speed Message						✓

Notes:

(1) **-** JANUS MPR2.3 Reader S/W versions dated ***2016jun20a***, or later, have the added capability of being able to report ISO 18000-6C EPC/UII memory area CRC/PC bits (bits 0x00-0x1F) as an optional trailing Extended-Information field for ISO 18000-6C Multi-Protocol Handshake Messages (see §11.2 for details).

(2) - JANUS MPR2.3 Reader S/W versions dated ***2017mar29a***, or later, have the added capability of being able to report ISO 18000-6C EPC/UII memory area CRC/PC bits (bits 0x00-0x1F) as an optional trailing Extended-Information field for ISO 18000-6C Multi-Protocol Transaction (Initial Read, Voting, Post Capture and Estimated Vehicle Speed) Report Messages (see §11.2 for details).

2.6 Transaction Report Codes

Whenever a transponder is reported to the Lane Controller, a transaction status code is provided with the result of the Reader's programming and/or read attempt (*c.f.* §7.2.20) for additional information). For diagnostic purposes, an equivalent JANUS transaction log entry is made. Table 2.6-1 lists the defined *Transaction Report Codes* for the JANUS MPR2.3 Reader.

Table 2.6-1: Transaction Report Codes

		Transponder Message Type / Transaction Status codes	
Condition	**JANUS Log Indication**	**Real-Time**	**Buffered**
Program Successful: Indicates the transponder was programmed successfully. *(This is the usual report type, unless the reader is configured in read-only mode)*	"Pgm"	**RS**	**BS**
Program Fail: Indicates the transponder was not programmed successfully.	"PF"	**RF**	**BF**
Program Unverified: Indicates the transponder programming could not be verified. The transponder's scratchpad memory may or may not be updated.	"PU"	**RU**	**BU**
Memory Locked (ISO 18000-6C Only): Indicates the specified memory (UM) location is locked and/or permalocked and is either not writeable or not readable.	"Locked"	**RL**	**BL**
Memory Overrun (ISO 18000-6C Only): Indicates the specified memory (UM) does not exist or the EPC/PC length field is not supported by the tag.	"OvrRun"	**RO**	**BO**
Initial Read of OBU in Capture Zone: Optional informational report. Arrival of new tag in capture zone.	"IRead"	**RR** **(See Note *1*)**	**BR** **(See Note *1*)**
Post Capture (new data): Optional informational report, if revised lane assignment or programming status is available.	"Post"	**R<x>** **(See Note *2*)**	**B<x>** **(See Note *2*)**
Decommissioned Tag: Tag read but is not commissioned. Reader does not attempt to program a decommissioned tag.	"Decom"	**RD**	**BD**
Non IAG Tag: Tag read but, not IAG-compatible. Reader does not attempt to program a non-IAG tag.	"NonIAG"	**RX**	**BX**

Condition	JANUS Log Indication	Transponder Message Type / Transaction Status codes	
		Real-Time	Buffered
Read Successful: Normal report when the reader is configured in "read-only" mode.	**"Read"**	**RR**	**BR**
Cross Reader Transaction: Optional informational report. Tag was reported and assigned by an **adjacent** Reader. This reporting allows the transaction number to be accounted for, if desired, for the purpose of reconciling transaction numbers assigned by the Reader. In some cases, the Reader will assign a transaction number to a cross-reader transaction. By default, this report is disabled (*c.f.* §7.2.20) for more details)	**"CrossR"**	**RC**	**BC**

Notes:

(1) - Initial Reads are reported via messages with a prefix of **'IA'** or **'IB'**, and are generally Real-Time Read messages. RFP Compliant Initial Read Messages have a Message Identifier of **'101'**. Multi-Protocol Initial Reads are reported via messages with a prefix of **'MA'** or **'MB'** and have a format code ending in **0x1** (hexadecimal). Initial Read messages are, by default, not buffered. *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*

(2) - Post Capture status codes are of the form **'R<x>'** or **'B<x>'** where **<x>** is one of the available Transaction Status codes (*i.e.* **S**, **F**, **U**, **R**, **D**, **X**, **C**). Post Captures are reported via messages with a prefix of **'PA'/'PB'** for "majority" voting, and 'QA'/'**QB**' for "interpolated" voting. For Multi-Protocol messages, Post Captures are reported with a prefix of **'MA'/'MB'** with a format code ending in **0x3** for 'majority' voting, and a format code ending in **0x5** for 'interpolated' voting. Post Capture messages are buffered, since the volume of these messages is expected to be low, and also since they provide valuable information.

2.7 Application Message Encapsulation

2.7.1 JANUS MPR2.3 Reader – Lane Controller Serial Interface

Messages that are exchanged between the JANUS MPR2.3 Reader and the Lane Controller over the JANUS MPR2.3 – Lane Controller Serial Interface are encapsulated according to the Serial Data-Link Format specified in §3. The application messages specified herein form the "*Application Message Payload*" field of the Serial Data-Link Packet Format specified in §3.2.

Furthermore, overall message length and error protection are handled at the Data-Link level, also as specified in §3.

2.7.2 JANUS MPR2.3 Reader – Lane Controller Ethernet Interface

Messages that are exchanged between the JANUS MPR2.3 Reader and the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface (including Handshake Messages sent over UDP) are encapsulated according to the Data Transport Format specified in §4. The application messages specified herein form the ”*Application Message Payload*” field of the Data Transport Application-Layer Message Format specified in §4.2.

Furthermore, overall message length and error protection are handled at the Data Transport level, as specified in §4.

2.8 Multiplexed Reporting Mode

2.8.1 JANUS MPR2.3 Reader – Lane Controller Serial Interface

By default (if using the JANUS MPR2.3 Reader – Lane Controller Serial Interface rather than the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface) the JANUS MPR2.3 Reader operates in “*Non-multiplexed Reporting Mode*” – transactions on RF Channel 1 go to COM1, transactions on RF channel 2 go to COM2, *etc*. The Reader can be re-configured to a *multiplexed* configuration by appropriate selections of the Reader’s Lane Controller “*Destination*” and “*Serial Port”* configuration parameters (*c.f.* [AD2]). Two examples of “*Multiplexed Reporting Mode*” are:

- A “many-to-1” configuration – all channels routed to COMx
- An “n-to-m” configuration – *e.g.* channel 1 and 2 to COM1, channel 3 and 4 to COM2, *etc.*

The reader is deemed to be in “*Multiplexed Reporting Mode*” for any configuration that is not 1-to-1. “*Multiplexed Reporting Mode*” basically populates the RF channel (1-8) number in certain messages (see message descriptions). The LC can examine the value of the “*RF Channel*” field in the Reader to Lane Controller messages to identify whether or not the reader is operating in “*Multiplexed Reporting Mode”, as follows*:

(1) If the application message “*RF Channel”* field is populated with a **<space>** character, the Reader is operating in “*Non-multiplexed Reporting Mode”*.

(2) If the application message “*RF Channel”* field is populated with a number between 1-8, inclusive, the Reader is operating in “*Multiplexed Reporting Mode*”.

<u>Special Notes for Multiplexed Reporting Mode – Serial Interface:</u>

(1) All messages sent by the JANUS MPR2.3 Reader to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Serial Interface shall have the “RF Channel” field populated (*i.e.* it shall contain a number, not a space) if the JANUS MPR2.3 Reader is running in “*Multiplexed Reporting Mode*”.

(2) The *Toll Rate / Balance Adjustment Message Set* (*c.f.* §9.1) operates independently of “RF Channel”. Therefore, ***it is not necessary to populate the “RF Channel” field when sending Toll Rate / Balance Adjustment messages to the JANUS MPR2.3 Reader over the JANUS MPR2.3 Reader – Lane Controller Serial Interface* while the reader is operating in “*Multiplexed Reporting Mode”***. *The value in the “*RF Channel*” field is ignored for the purposes of processing* Toll Rate / Balance Adjustment *messages when communicating with the JANUS MPR2.3 Reader over the JANUS MPR2.3 Reader – Lane Controller Serial Interface.*

(3) The *Reader Configuration – Get / Set Message* (*c.f.* §10.1) message sub-set operates independently of “RF Channel”. Therefore, ***it is not necessary to populate the “RF Channel” field when sending Reader Configuration – Get / Set Messages to the JANUS MPR2.3 Reader over the JANUS MPR2.3 Reader – Lane Controller Serial Interface* while the reader is operating in “*Multiplexed Reporting Mode”***. *The value in the “*RF Channel*” field is ignored for the purposes of processing* Configuration – Get / Set *messages when communicating with the JANUS MPR2.3 Reader over the JANUS MPR2.3 Reader – Lane Controller Serial Interface.*

2.8.2 JANUS MPR2.3 Reader – Lane Controller Ethernet Interface

Multiplexing mode is accomplished via a table that maps the Reader channel to the destination IP address / port of the Lane Controller. The Reader is considered to be in “Multiplexed Reporting Mode” *whenever an LC Ethernet destination is activated.* Ethernet destinations are activated by appropriate selection of the Reader’s Lane Controller “*Destination*” configuration parameter (*c.f.* [AD2]). “Multiplexed Reporting Mode” basically populates the RF Channel Number (1-8) in certain messages (see message descriptions).

The simple rule is that if the Lane Controller and the Reader are communicating over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, then the Reader is operating in “*Multiplexed Reporting Mode*”.

<u>Special Notes for Multiplexed Reporting Mode – Ethernet Interface:</u>

(1) All messages sent by the JANUS MPR2.3 Reader to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface shall have the “RF Channel” field populated (*i.e.* it shall contain a number, not a space).

(2) When using the *Toll Rate / Balance Adjustment Message Set* (*c.f.* *§*9.1) over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, the RF Channel Number field ***must be populated***. In addition, all *Toll Rate / Balance Adjustment* messages sent by the JANUS Reader to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface will have the “RF Channel” field populated (*i.e.* it will contain a number, not a space).

(3) When using the *Reader Configuration – Get / Set Message* (*c.f.* §10.1) message sub-set over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, the RF Channel Number field ***must be populated***. *If the RF Channel Field is missing or incorrectly populated, the* Configuration - Get / Set *request shall be ignored.* In addition, all *Reader Configuration – Get / Set* messages sent by the JANUS MPR2.3 Reader to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface shall have the “RF Channel” field populated (*i.e.* it shall contain a number, not a space).

2.9 Buffering of Transponder Messages

The JANUS MPR2.3 Reader buffers tag transaction messages when the communucations link to the Lane Controller is impaired. These buffered tag transaction messages are non-volatile across a Reader reset or power cycle event. If the buffer memory becomes full, new transactions will overwrite the oldest buffered transactions.

The memory available for tag transaction buffering is dynamically distributed between the JANUS MPR2.3 Reader – Lane Controller Serial and Ethernet interfaces. There is no fixed allocation for each reporting link. If only one (1) link is down, the entire memory buffer can be accessed for transactions on that link; if two links are down, both links share the entire transaction buffer space.

2.9.1 JANUS MPR2.3 Reader – Lane Controller Serial Interface

When communicating to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Serial Interface, the Reader starts buffering transactions if the Lane Controller does not acknowledge a reader transmission after three (3) attempts.

Note that the LC Retry Timeout (*i.e. Protocol Timeout*) is configurable on the JANUS MPR2.3 Reader.

2.9.2 JANUS MPR2.3 Reader – Lane Controller Ethernet Interface

When communicating to the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, the Reader starts buffering transaction reports if it detects a communications problem on a link. On the Ethernet link, a communication problem may occur due to the following error scenarios:

- Ethernet cable disconnect
- TCP/IP connection request failure and/or timeout
- TCP/IP message transmission failure and/or timeout

Note that the Lane Controller Ethernet TCP socket timeout is configurable on the JANUS MPR2.3 Reader.

2.9.2.1 Buffering and Dual-Destination Reporting

If *Dual Destination* reporting is *ENABLED* for the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, then transaction buffering will only occur if a communication problem is detected on ***both*** the Primary- and the Dual-Destination links for a given channel (*i.e. both links must have a fault condition for message buffering to occur*).

2.10 Reporting of Buffered Transactions

Transactions are reported on a *First-in, First-out* (FIFO) basis.

When a COM link between a Lane Controller and the Reader is re-established (if communicating over the JANUS MPR2.3 Reader – Lane Controller Serial Interface), or an Ethernet link between the Lane Controller and the Reader is re-established (if communicating over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface), the Reader begins transmitting its buffered transactions. Any new transaction that occurs on a given lane while the Reader is uploading buffered transactions will immediately be reported to the Lane Controller as a real time transaction. Reporting of buffered transactions will resume after transmission of the new transaction.

Buffered time transactions are tagged with a **"B"** in the type field of the *Transponder Message*; Real-time transactions are tagged with an **"R"** in the *Type Field* of the *Transponder Message.*

Messages from the Lane Controller shall continue to be acknowledged and acted upon during the buffered transaction upload process (*e.g. Set Time*, *Status Request*).

2.10.1 Reporting of Buffered Transactions and Dual-Destination Reporting

If *Dual Destination* reporting is *ENABLED* for the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, then reporting of buffered transactions will only occur if communications has been re-established on ***both*** the Primary- and the Dual- Destination links for a given channel (*i.e. both links must be clear of fault conditions for reporting of buffered messages to occur*).

2.11 JANUS MPR2.3 Reader – Lane Controller Ethernet Interface – TCP/IP Setup

While both serial ports and TCP/IP sockets are both bidirectional in nature, TCP/IP communications follow a client/server approach and thus both the Reader and the Lane Controller must have client and server abilities when communicating over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface. By using two sockets for both the Reader and the Lane Controller, neither side has to wait passively for the other end to initiate the connection. When either side is ready to send data to the other, they can establish a connection (client-side) on an established listening port (server-side) and then send their data. Each of the server-side sockets for the Reader and the Lane Controller will then process any data that was sent. A simplified diagram of this arrangement is shown in Figure 2.11-1:

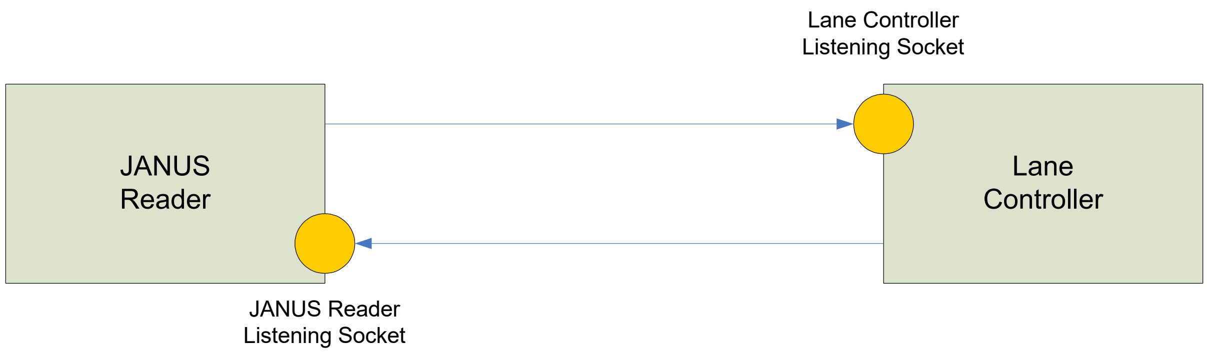

Figure 2.11-1: JANUS MPR2.3 Reader / Lane Controller Sockets

The JANUS MPR2.3 Reader listening socket will be configurable via the web interface. The default value for the listening port number shall be 6666.

The Reader will have a channel to IP address/port mapping table that will determine which IP address and port will be associated with a particular Lane Controller. This will allow any number of channels to be each mapped to unique Lane Controller destinations, to be mapped in multiplexed fashion to a common destination, or to be mapped to a combination thereof. For example, the table may look something like that as shown in Table 2.11-1:

Table 2.11-1: Example Reader IP-Address/Port Mapping Table

Channel	Host	Port
1	192.168.60.10	6030
2	192.168.60.30	6000
3	192.168.60.30	6000
4	192.168.60.40	3125
5	192.168.60.50	6030
6	192.168.60.50	6030
7	192.168.60.30	6000
8	192.168.60.30	6000

2.11.1 JANUS MPR2.3 Reader / Lane Controller Socket Connections

This section describes the mechanisms used by both the JANUS MPR2.3 Reader and the Lane Controller to send messages to and receive messages from one another. As shown in Figure 2.11-1, both the JANUS MPR2.3 Reader and the Lane Controller utilize:

- Server-side listening sockets to await incoming connection requests from the peer.
- Client-side originator sockets to connect to the peer and send a message to it (and await a reply, if required)

2.11.1.1 Iterative, Connection-Oriented Server (Receiver) Algorithm

The JANUS MPR2.3 Reader or the Lane Controller processes incoming connection/messaging requests in the same way. An iterative, connection-oriented server algorithm [RD3] is used, as follows:

(1) Create a socket and bind to the well-known address for the service being offered.

(2) Place the socket in passive mode, making it ready for use by a server.

(3) Accept the next connection request (from the peer client) from the socket, and obtain a new socket for the connection.

(4) Read the request message from the client, and if required, send a reply message back to the client according to the Application Message protocol.

(5) Close the connection and return to step (3) to accept a new connection.

2.11.1.2 Connection-Oriented Client (Originator) Algorithm

When either the JANUS MPR2.3 Reader or the Lane Controller needs to originate and send a message to the peer device, a connection-oriented client algorithm [RD3] is used as follows:

(1) Find the IP address and protocol port number of the peer server with which communication is desired.

(2) Allocate a Socket

(3) Specify that the connection needs an arbitrary, unused protocol port on the local machine, and allow TCP to choose one.

(4) Connect the socket to the server.

(5) Communicate to the server using the Application Message protocol (send request and await reply, if required)

(6) Close the connection.

2.12 JANUS MPR2.3 Reader – Lane Controller Ethernet Interface – Handshake Messaging UDP Setup

If the "*Raw Handshake Reporting*" option is enabled on the JANUS MPR2.3 Reader, Allegro, ISO 18000-6B/6C, ATA, SeGo and IAG ("*Standard*" and "*Toll Rate / Balance Adjustment*") Handshake Messages shall be reported to the Lane Controller. Due to the large volume of Handshake Messages that can be sent from the JANUS MPR2.3 Reader to the Lane Controller, ***the JANUS MPR2.3 Reader shall send all Handshake Messages to the Lane Controller using the* User Datagram Protocol *(UDP).***

UDP communications follow a client/server approach, and thus, ***the Lane Controller must have UDP server capabilities in order to receive JANUS MPR2.3 Reader Handshake Messages***. A simplified diagram of this arrangement is shown in Figure 2.12-1.

Figure 2.12-1: JANUS MPR2.3 Reader / Lane Controller Handshake Messaging (UDP) Sockets

The JANUS MPR2.3 Reader has a channel to IP address/port mapping table that determines which IP address and (TCP) port is associated with a particular Lane Controller (see §2.11 for details). JANUS MPR2.3 Reader Handshake Messages shall be sent to the Lane Controller on a UDP port with the same number as that currently specified on the Web Interface for (TCP-based) Lane Controller Ethernet messages. For example, if Channel 1 on the JANUS MPR2.3 Reader is configured to send Lane Controller Ethernet messages to a Lane Controller with IP Address 192.168.60.10 at (TCP) port 6030, then if "Handshake Reporting" is enabled, the JANUS MPR2.3 Reader shall send UDP Handshake Messages to *that same IP Address (192.168.60.10) on UDP Port 6030*.

2.12.1 JANUS MPR2.3 Reader / Lane Controller Handshake Messaging Socket Connections

This section describes the mechanisms used by both the JANUS MPR2.3 Reader and the Lane Controller to send Handshake Messages and receive Handshake Messages, respectively. As shown in Figure 2.12-1, the JANUS MPR2.3 Reader utilizes a Client-side originator socket to connect to the peer and send a Handshake Message to it, while the Lane Controller utilizes a UDP Server-side socket to await incoming Handshake Messages from the peer.

2.12.1.1 Iterative, Connectionless Server (Receiver) Algorithm

The Lane Controller should process incoming Handshake Messages by using an iterative, connectionless server algorithm [RD5], as follows:

(1) Create a socket and bind to the well-known address for the service being offered.

(2) Repeatedly read the next request from a client, and if required, formulate a response and send a reply back to the client according to the application protocol.

Note that the Lane Controller's server socket remains unconnected and can accept incoming UDP datagrams from any client.

2.12.1.2 Connectionless Client (Originator) Algorithm

When the JANUS MPR2.3 Reader originates Handshake Messages to the peer Lane Controller, a connectionless client algorithm [RD5] shall be used, as follows:

(1) Find the IP address and protocol port number of the peer server with which communication is desired.

(2) Allocate a Socket

(3) Specify that the connection needs an arbitrary, unused protocol port on the local machine, and allow UDP to choose one.

(4) Specify the server to which messages must be sent.

(5) Communicate to the server using the Application Message protocol (send request and await reply, if required)

3. JANUS MPR2.3 READER – LANE CONTROLLER SERIAL INTERFACE – DATA LINK FORMAT / PROTOCOL

This section describes the Data-link layer format / protocol for the transfer of application messages between the JANUS MPR2.3 Reader and the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Serial Interface.

All application messages transferred between the JANUS MPR2.3 Reader and the Lane Controller are encapsulated within a data link packet.

Note: The data link format is identical to that of IAGxxx and BGRxxx reader firmware.

3.1 Overview

Each packet sent by the Reader or Lane Controller must be acknowledged by the other end.

If not acknowledged within a certain time, the sender is expected to resend the packet.

If the reader cannot receive an *Acknowledge Packet* after three (3) attempts, it starts buffering transactions and starts sending out *Restart Requests* to the Lane Controller once per second.

3.2 Packet Format

The format of each JANUS MPR2.3 Reader – Lane Controller Serial Interface data link packet is shown in Figure 3.2-1.

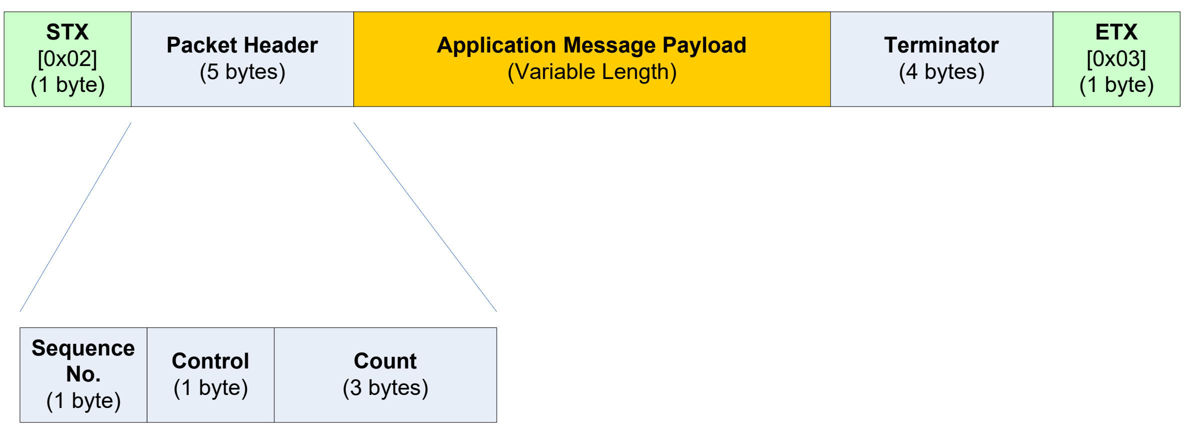

Figure 3.2-1: JANUS MPR2.3 Reader – Lane Controller Serial Interface – Data-Link Packet Format

3.2.1 Sequence Number Field

The *Sequence Number Field* contains the ASCII value of the Mod8 counter which orders the data packet sequence. The value transmitted is ASCII `'1'` to `'8'` which is (*nMod8 + 1*) where *n* is the current "send sequence number." **A value of `'0'` is only allowed for restart packets.**

Sequence number usage is detailed in §3.4.

3.2.2 Control Field

The *Control Field* indicates the packet type. The low order seven (7) bits contains a 7-bit ASCII *Type* code with the eight (8th) bit reserved for future use. Allowable type codes are shown in Table 3.2-1.

Table 3.2-1: JANUS MPR2.3 Reader – Lane Controller Serial Interface – Control Field Type Codes

Control Field Type Code	Description / Meaning
'A'	*Acknowledge* (ACK) Packet
'D'	Data Packet
'N'	*Negative-Acknowledge* (NAK) Packet
'R'	Restart Request. ***Either end of the link sends this with a sequence number of 0 to restart the link.***

3.2.3 Count Field

The *Count Field* is a 3-byte ASCII string indicating the size of the *Application Message Payload*.

The valid range is: **"000"** to **"192"**.

3.2.4 Application Message Payload Field

The *Application Message Payload Field* contains the application message to be sent from the Reader to the Lane Controller, or vice versa. This field shall contain a free-form message of no larger than 192 characters in length and shall be formatted according to the formatting rules for the specific application message to be transmitted.

3.2.5 Terminator Field

The *Terminator Field* is the 16-bit CRC-16-CCITT (Kermit) *Cyclic Redundancy Check* (CRC) code converted to the 4-byte Hex equivalent as an ASCII string (Range: **"0000"** to **"FFFF"**). The CRC-16-CCITT (Kermit) CRC has a generator polynomial of:

$$G(x) = x^{16} + x^{12} + x^{5} + 1$$

The range of the CRC is from the first byte of the header **(STX not included)** to the last byte of the Application Message Payload, inclusive.

Example:

Find the CRC over "**1D012SA_200-A0000**" *(Note: The underscore is intended only to show the position of a space character in the message)*

The string in hex format: **31 44 30 31 32 53 41 20 32 30 30 2D 41 30 30 30 30**

The resulting 16-bit CRC: **0xDF9F**

The reader sets the 4-character terminator field as **'DF9F'**.

3.3 Maximum Data Link Packet Size

The maximum packet size shall be 203 bytes. This is equivalent to a maximum of 192 bytes of *Application Message Payload* + 11 bytes of header/trailer.

3.4 Sequence Number Usage

(1) Each endpoint of the communications link maintains its current *Send Sequence Number* and *Receive Sequence Number* (SSN and RSN). The numbers are transmitted in the sequence number field of each packet header as the ASCII code for (***n*** *Mod8 + 1;* Range: `'1'` to `'8'`). The sequence number transmitted in Restart packets and data packets which indicate restart is ASCII `'0'`.

(2) Each *Data Packet* transmitted is numbered with the sender's SSN.

(3) When the receiver receives a valid *Data Packet*, the sequence number field must match its RSN. If it doesn't and is greater than `'0'`, the sender has committed a protocol violation and the link must be reset. If it doesn't and is equal to `'0'`, this is interpreted as a *Restart Request* (RR).

(4) The receiver responds to a valid *Data Packet* with an *Acknowledge Packet* (ACK) numbered with its RSN then increments its RSN.

(5) The original sender, upon receipt of the ACK, interprets the ACK's sequence number as the remote end saying: "*I have received your '**N**', you may send me your '**N+1**'*". If '***N***' is not what is expected, the other end has committed a protocol violation and the link must be *Restart*-ed. If '***N***' is `'0'` and the receiver has just done a *Restart* by sending a data packet with sequence number `'0'`, this indicates data may be transferred.

(6) If, while waiting for *Data Packets,* the original receiver detects a transmission error, it may respond with a *Negative-Acknowledge Packet* (NAK) with its current RSN.

(7) The original sender, upon receipt of the NAK, interprets the NAK's sequence number as the remote end saying: "*The next packet I am expecting is '**N**'*". This will invoke a retransmission of the *Data Packet* with SSN='***N***' which was held in store pending the valid ACK. If three (3) sequential NAK's are received, the original sender deems the remote end as no longer reliable and attempts to *Restart* the link.

(8) If while waiting for an ACK, if one is not received in time (within the *Protocol Timeout* (PTO) parameter), the sender must retransmit a copy of the last *Data Packet*.

(9) If after three (3) timeout events no response is received, the reader starts buffering tag transactions and starts to send out *Restart Packets*.

3.5 Link Start-up

Before a JANUS MPR2.3 Reader – Lane Controller Serial Interface communications link is established, each communication endpoint is in a *Restart* state, sending *Restart Packets* at a periodic interval. On the JANUS MPR2.3 Reader, this interval is one (1) second in duration.

3.5.1 Restart Request

A *Restart Packet* (whether a `'D'` or an `'R'` control byte – see §3.2.2) must have a zero (`'0'`) sequence number.

The Lane Controller can send either form of *Restart Request* to the Reader (*e.g.* **`<STX>0Rxxx<data>cccc<ETX>`** or **`<STX>0Dxxx<data>cccc<ETX>`**, where **`<data>`** is considered to be an information string and is not acted on by the reader).

The reader always sends out an `'R'` packet with the sequence number set to `'0'` (*e.g.* **`<STX>0R035<init-message><ETX>`**, where **`<init-message>`** is the *Initialization Message* (*c.f.* §7.2.4, §9.3.3).

3.5.2 Restart Confirmation

Both the Reader and the Lane Controller must confirm a *Restart Request Packet* by sending a *Restart Packet* with the control byte set to **`'A'`** and the sequence number set to zero (**`'0'`**) (*e.g.*, **`<STX>0A000<crc><ETX>`**).

Once a *Restart Confirmation* is received, the link layer goes into the *Data Transfer* [DATA_XFR] state.

3.6 Data Transmission

(1) Either endpoint of the JANUS MPR2.3 Reader – Lane Controller Serial Interface link transmits a packet with the proper sequence number.

(2) The sender then starts a timer waiting for an *Acknowledge Packet* (ACK) packet (*c.f.* §3.7).

(3) Either end shall not send a second data packet without the first having been acknowledged.

3.7 Protocol Timeout

The Reader and the Lane Controller shall have a *Protocol Timeout* (PTO) parameter which represents the maximum amount of time either communications endpoint waits for a *Data Packet* to be acknowledged.

On the JANUS MPR2.3 Reader, the default is 1 second. This can be changed via the configuration pages on the JANUS MPR2.3 Reader Web Interface. The timeout can also be changed via either a *Set Configuration Message* (*c.f.* §7.2.15, §9.3.8) or a *Configuration – Set Parameter Message* (*c.f.* §10.1.3).

If the *Protocol Timeout* expires, the Reader or Lane Controller shall resend the packet. After several attempts (three (3) on the Reader), the sender shall assume that the link is down and should go into the *Restart* state.

3.8 Protocol Violation

A Link Layer *Protocol Violation* results when the CRC passes, but within the header, one or more of the following error conditions are detected:

(1) The Sequence Number is not as expected; and/or

(2) The Control Field contains an unknown value; and/or

(3) The Count Field is invalid.

3.9 Sample Message Sequence

A sample sequence of JANUS MPR2.3 Reader – Lane Controller Serial Interface Messages illustrating various typical communications scenarios is shown in Figure 3.9-1. Please note that for this diagram, STX/ETX framing and *Terminator Fields* are not shown.

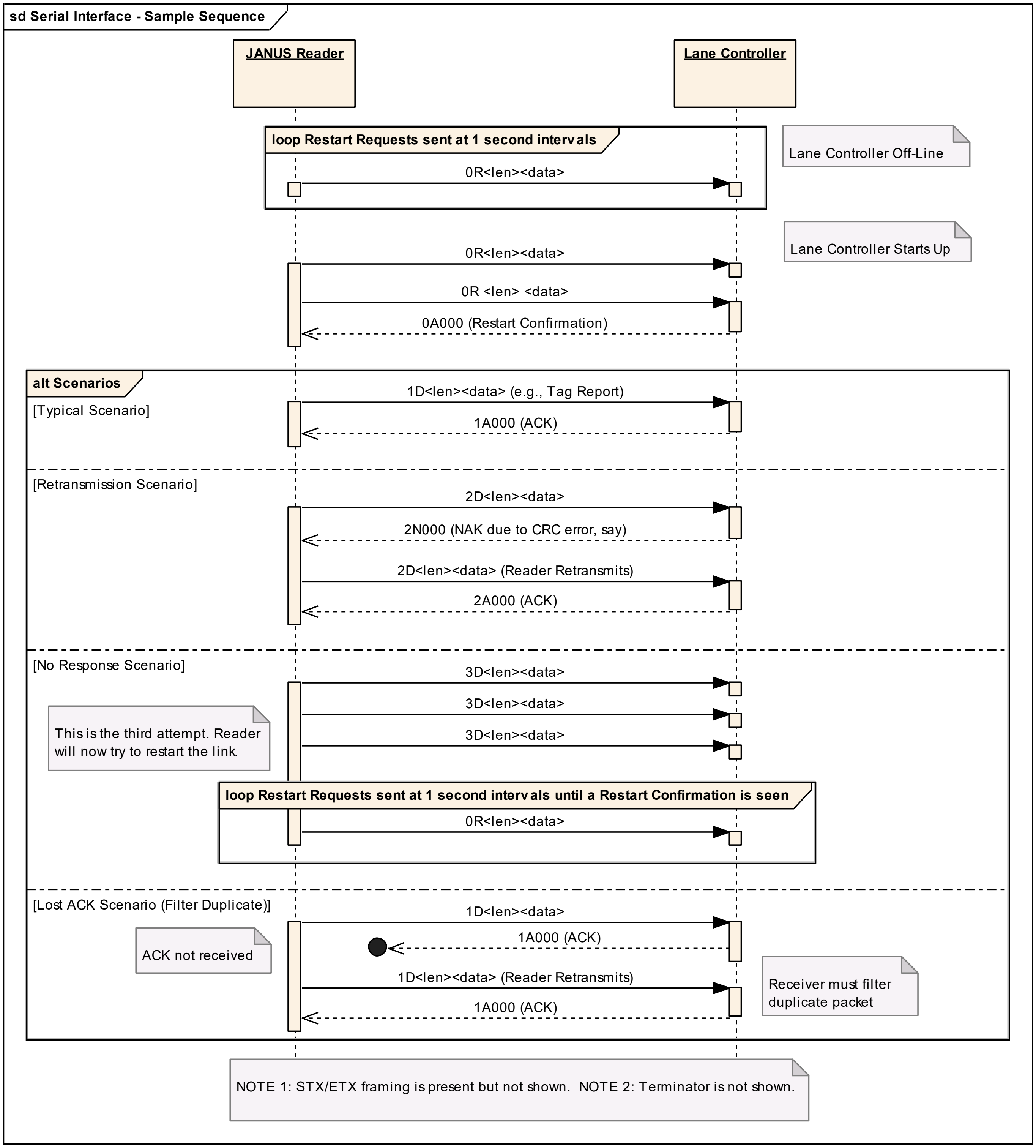

Figure 3.9-1: JANUS MPR2.3 Reader – Lane Controller Serial Interface - Sample Message Sequence

3.10 Maximum Serial Port Transmission Rate

Any combinations of supported transmission rates are allowed (*c.f. Set Configuration Message* defined in §7.2.15, §9.3.8), with the maximum transmission rate being 115,200 *bits per second* (bps).

The maximum speed is supported on all eight (8) serial links simultaneously.

Note: Baud rates on unused ports do not need to be set to 9600 baud as on the Badger Reader.

4. JANUS MPR2.3 READER – LANE CONTROLLER ETHERNET INTERFACE – DATA TRANSPORT FORMAT / PROTOCOL

The TCP/IP protocol possesses its own data-link / transport-layer protocol for sequencing, error detection and acknowledgement of messages. Therefore, the messaging format for the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface will be much simpler than that of the JANUS MPR2.3 Reader – Lane Controller Serial Interface.

This section describes the application-layer message format between the Reader and the Lane Controller, using the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface.

4.1 Overview

Each TCP/IP transport-layer packet sent by the Reader or Lane Controller must be acknowledged by the TCP/IP transport-layer of the receiving peer. If not acknowledged within a certain time, the sender is expected to resend the packet. The TCP/IP transport-layer protocol implicitly performs this packet acknowledgement function to provide a reliable stream-oriented connection between the Reader and the Lane Controller, and vice versa.

If a communications error is detected on the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, the Reader starts buffering transactions and tries to re-establish the link to the Lane Controller.

4.2 Application-Layer Message/Packet Format

The application-layer message/packet format for the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface is illustrated in Figure 4.2-1. All JANUS MPR2.3 Reader application messages communicated between the JANUS MPR2.3 Reader and the Lane Controller (and vice versa) over the JANUS MPR2.3 Reader – Lane Controller Ethernet Inferface shall be encapsulated as shown. Additional information on the specific fields within this application-layer message/packet can be found in the subsections that follow.

Count Field Length: 3 Bytes Format: decimal ASCII	Application Message Payload Field Length: Variable (1 – 192 bytes) Format: As per specific application message

Figure 4.2-1: JANUS MPR2.3 Reader – Lane Controller Ethernet Interface – Application-Layer Message/Packet Format

4.2.1 Count Field

The Count Field is a 3-byte field that specifies the size, in decimal ASCII, of the Application Message Payload that follows. The valid range of this field is “000” – “192”.

4.2.2 Application Message Payload Field

The Application Message Payload Field contains the application message to be sent from the Reader to the Lane Controller, or vice versa. This field will contain a free-form message of no larger than 192 characters in length and will be formatted according to the formatting rules for the specific application message to be transmitted.

4.3 Communication Considerations and Startup

4.3.1 Reducing Message Latency – Turning Off the Nagle Algorithm

The Nagle algorithm aggregates a sequence of small messages together into larger TCP packets to reduce network congestion and utilize network resources more efficiently. The Nagle algorithm was designed to alleviate the network overhead caused by floods of many small TCP packets on a network. Because it incorporates a wait-state, the Nagle algorithm often causes average latency to increase slightly, especially on lightly loaded networks.

The JANUS MPR2.3 Reader disables the Nagle Algorithm on all socket connections it establishes with the Lane Controller. It is recommended that the Lane Controller do the same on all socket connections established with the JANUS Reader.

The **`TCP_NODELAY`** socket option remains the standard mechanism for disabling the Nagle algorithm. Using this option (by passing it to **`setsockopt()`** or an equivalent function) disables Nagle.

4.3.2 Socket Timeout

The Reader and Lane Controller shall use a timeout parameter for connect, send and/or receive operations. This timeout will represent the maximum amount of time to wait before a TCP/IP connect, send, and/or receive operation will be considered to have failed.

For the JANUS MPR2.3 Reader, the *default Lane Controller Ethernet TCP-Socket Timeout* value is 500ms. This value is configurable.

If the Socket timeout expires, the Reader or Lane Controller will assume the link is down and can then attempt to re-establish the connection to the peer.

4.3.3 Protocol Violation

A message protocol violation results when the following header errors occur:

- Application Message Payload Field length does not correspond to the Count field

In the event that the Reader receives such a message, an error message will be written to the system log and the message will be discarded.

4.3.4 Startup

When the JANUS MPR2.3 Reader starts up, the first message that it will send is the Initialization Message (*c.f.* §7.2.4,§9.3.3), as is the case with the JANUS MPR2.3 Reader – Lane Controller Serial Interface.

4.4 Message Examples

Some example messages along with the application-layer message format, for reference, are shown in Figure 4.4-1.

Application Message Format:

Count Field Length: 3 Bytes Format: decimal ASCII	Application Message Payload Field Length: Variable (1 – 192 bytes) Format: As per specific application message

Example Sync Message:

005	SY101

Example Status Response Message:

012	SB2100-A0000

Example Time Message:

016	TM<space>100809<space>113724

Figure 4.4-1: JANUS MPR2.3 Reader – Lane Controller Ethernet Interface – Application-Layer Message Examples

4.5 Maximum Transfer Rates

The maximum data transfer rates between the JANUS MPR2.3 Reader and the attached Lane Controllers over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface are governed by the IEEE 802.3 (Ethernet) Standard [RD4].

5. MESSAGE PROTOCOL OVERVIEW

5.1 Overview

Note that all protocols described herein are independent of the lower level Data-Link Protocol specified for the JANUS MPR2.3 Reader – Lane Controller Serial Interface (described in §3) *and/or the Data Transport Format specified for the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface* (described in §4).

The JANUS MPR2.3 Reader Multi-Protocol Messaging has three "modes" of protocol behavior depending on the configuration parameters shown in Table 5.1-1.

Table 5.1-1: JANUS MPR2.3 Reader Multi-Protocol Message Mode Configuration Parameters

JANUS MPR2.3 Reader Multi-Protocol Message Mode Configuration Parameter	Description
Voting Report	Instructs the JANUS MPR2.3 Reader to send a Voting Report (*i.e.* Transponder Message) to the Lane Controller at voting time expiry.
Generate Initial Report	Instructs the JANUS MPR2.3 Reader to send an Initial Read Report to the Lane Controller the first time a new transponder is seen. A system integrator may use Initial Read messages to potentially optimize vehicle framing algorithms and overall ETC system performance.
Raw Handshake Report	Instructs the JANUS MPR2.3 Reader to send a Handshake Message to the Lane Controller (via the Ethernet UDP Interface) each time a transponder is read. ***The JANUS MPR2.3 Reader MUST be configured to use the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface option BEFORE the* Report Handshakes *parameter can be ENABLED.***
Generate Post-Capture-Zone Report	Instructs the JANUS MPR2.3 Reader to generate and send a Post Capture Report to the Lane Controller when the Reader detects a change in the programming status of the Transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report. Post Capture Reports may be used to potentially optimize ETC system performance.
Generate Estimated Vehicle Speed Report	Instructs the JANUS MPR2.3 Reader to generate and send an Estimated Vehicle Speed Report to the Lane Controller when the Reader deems that the transaction has completed (*i.e.* the transponder has left the Reader zone) and the vehicle speed regression analysis has completed. ***Note: The Estimated Vehicle Speed Report is currently only available for the ISO 18000-6B, ATA, ISO 18000-6C, and SeGo protocols.***

The three modes are selected by enabling the configuration parameters described in Table 5.1-1 in the specific combinations shown in Table 5.1-2. Specific details of each operational mode are discussed in the subsections that follow.

Table 5.1-2: JANUS MPR2.3 Reader Multi-Protocol Message Modes

JANUS MPR2.3 Reader Multi-Protocol Messaging Mode	***Voting Report* Parameter Setting**	***Generate Initial Report* Parameter Setting**	***Raw Handshake Report* Parameter Setting**	***Generate Post-Capture-Zone Report* Parameter Setting**	***Generate Estimated Vehicle Speed Report* Parameter Setting**	**Supported LC Destinations**
'Standard' Messaging Mode: Report Standard (Voting Report / Transponder Message, Initial Read Report, Post Capture Report, Estimated Vehicle Speed Report) Messages to the Lane Controller. *Raw Handshake Messages are NOT reported to the Lane Controller in 'Standard' Mode.*	***ENABLED***	*OPTIONAL*	***DISABLED***	*OPTIONAL*	*OPTIONAL* ***[See Note 4]***	Serial Ethernet (TCP)
'Raw Handshake Report' Messaging Mode: Report Transponder Handshakes Only to the Lane Controller	***DISABLED***	***DISABLED***	***ENABLED***	***DISABLED***	***DISABLED*** ***[See Note 4]***	Ethernet (TCP / UDP) ***[See Note 1]***
'Combined' Messaging Mode: Report Transponder Handshakes AND Standard (Voting Report / Transponder Message, Initial Read Report, Post Capture Report, Estimated Vehicle Speed Report) Messages to the Lane Controller.	*OPTIONAL* ***[See Note 3]***	*OPTIONAL* ***[See Note 3]***	***ENABLED***	*OPTIONAL* ***[See Note 3]***	*OPTIONAL* ***[See Note 3]*** ***[See Note 4]***	Ethernet (TCP / UDP) ***[See Note 2]***

Notes:

(1) - It is important to note that even though no Transponder Messages are sent to the Lane Controller over TCP in this mode, the Lane Controller MUST implement a TCP listening socket in order to correctly process the SYNC messages that are sent to the Lane Controller by the JANUS MPR2.3 Reader on the JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interface (see §4 for details).

(2) – '*Standard*' messages are transmitted over TCP; '*Raw Handshake Report*' messages are transmitted over UDP.

(3) – If the *Raw Handshake* Report parameter is enabled, at least one of *Voting Report, Generate Initial Report*, *Generate Post-Capture-Zone Report*, and/or *Generate Estimated Vehicle Speed Report* must be enabled for the Reader to be in '*Combined*' Messaging Mode.

***(4)* – *Estimated Vehicle Speed Reports* are currently only available for the ISO 18000-6B, ATA, ISO 18000-6C, and SeGo protocols.**

5.2 ‘Standard’ Messaging Mode

‘Standard’ Messaging Mode is the “standard” operational mode for the JANUS MPR2.3 Reader. Setting the “*Voting Report*” configuration parameter to be enabled and the “*Raw Handshake Reports*” configuration parameter to be disabled, places the Reader in “*Standard*” *Messaging Mode*. When operating in this mode, the JANUS Reader transmits the “standard” reports to the Lane Controller, as follows:

- Optional *Initial Read Reports* on the first read of a transponder, consisting of “IA”/”IB” messages as defined in §7.2.3 (§9.3.2 for TRBA Mode), or “MA”/”MB” – *n*1 format messages as defined in §11.
- *Transponder Messages*, at Voting Time expiration, consisting of “TA”/”TB” (majority voting) or “OA”/”OB” (interpolated voting) messages as defined in §7.2.20 or §7.2.8 (§9.3.9 or §9.3.4 for TRBA Mode), or “MA”/”MB” – *n*2/*n*4 format messages as defined in §11.
- Optional *Post Capture Reports,* on expiration of the optional Post Capture time, consisting of “PA”/”PB” (majority voting) or “QA”/”QB” (interpolated voting) messages as defined in §7.2.9 or §7.2.10 (§9.3.5 or §9.3.6 for TRBA Mode), or “MA”/”MB” – *n*3/*n*5 format messages as defined in §11.
- Optional *Estimated Vehicle Speed Reports* (for ISO 18000-6B, ATA, ISO 18000-6C, and SeGo protocols only), upon transaction/regression analysis completion, consisting of “MA”/”MB” – *n6* format messages as defined in §11.

Note that “standard” JANUS MPR2.3 Reader messages are sent to the Lane Controller either via the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interface, depending on Reader configuration. A simplified UML diagram of this interaction is illustrated in Figure 5.2-1.

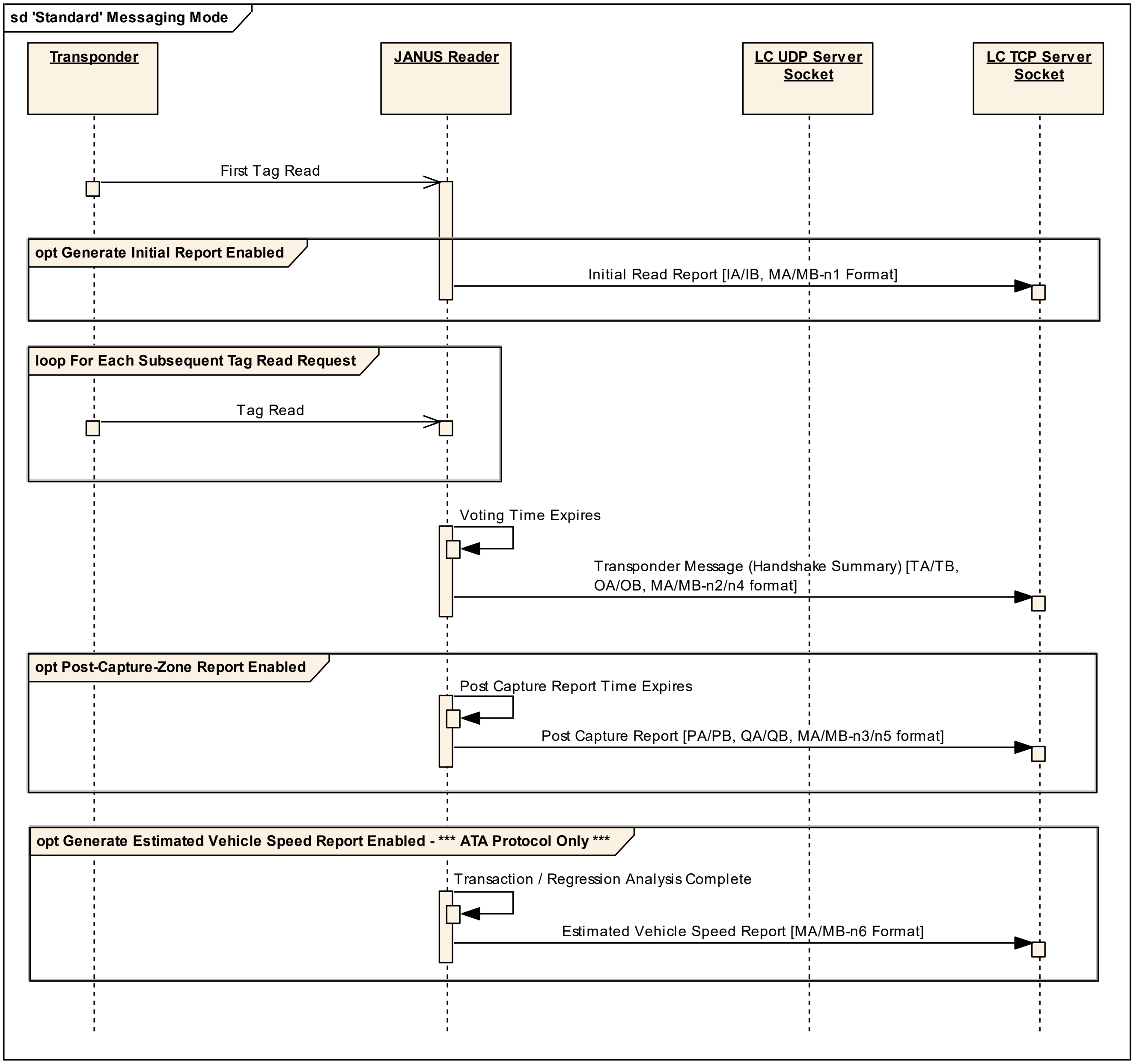

Figure 5.2-1: JANUS MPR2.3 Reader 'Standard' Messaging Mode

5.3 ‘Raw Handshake Report’ Messaging Mode

‘Raw Handshake Report’ Messaging Mode is activated when the “*Raw Handshake Reports”* configuration parameter is enabled. The *Voting Report, Generate Initial Report* and *Generate Post-Capture-Zone Report* parameters are all disabled in this mode. When operating in this mode, the JANUS MPR2.3 Reader transmits *only* Handshake Messages to the Lane Controller, as follows:

- Each time the Transponder is Read, a Handshake message is sent to the Lane Controller, consisting of an “MA”/”MB” – *n0* format message as defined in §11.

Note that JANUS MPR2.3 Reader Handshake Messages are transmitted to the Lane Controller via the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface. ***The JANUS MPR2.3 Reader MUST be configured to use the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface option BEFORE the* Report Handshakes *parameter can be ENABLED.*** A simplified UML diagram of this interaction is illustrated in Figure 5.3-1.

It is important to note that even though no Transponder Messages are sent to the Lane Controller over TCP in this mode, the Lane Controller MUST implement a TCP listening socket in order to correctly process the SYNC messages that are sent to the Lane Controller by the JANUS MPR2.3 Reader on the JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interface (see §4 for details).

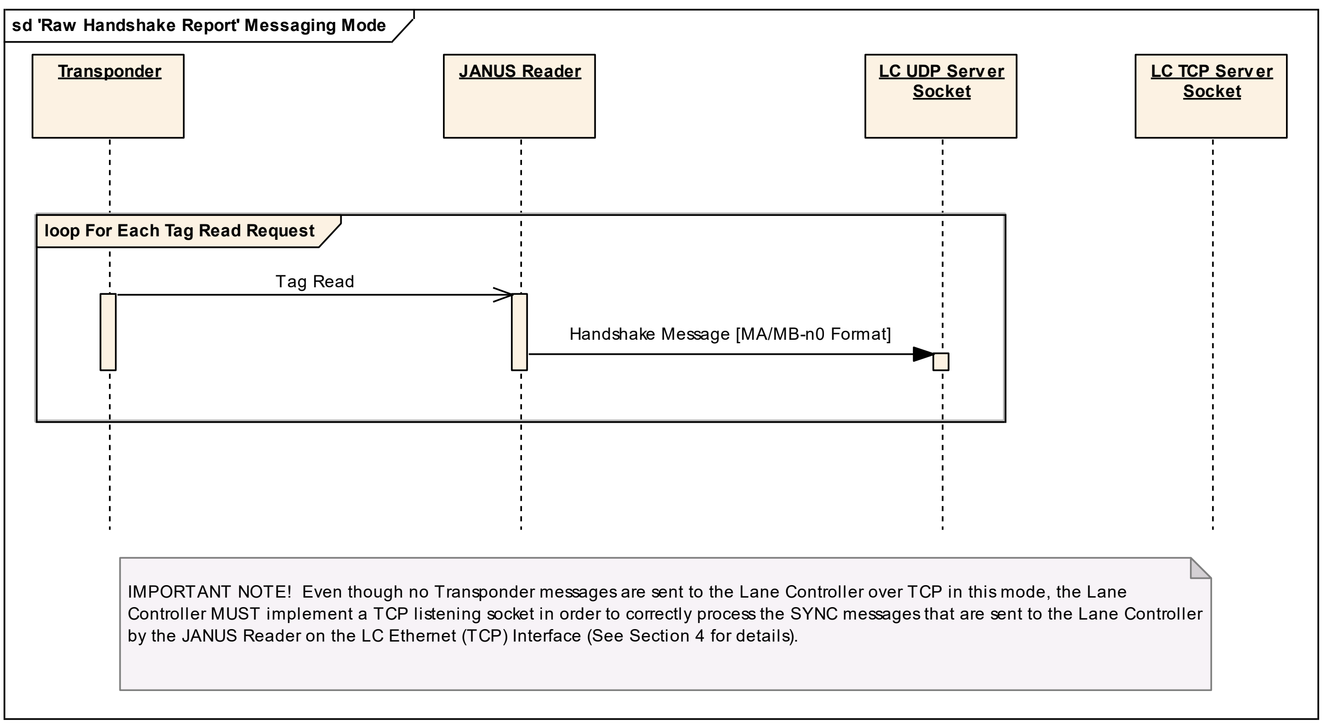

Figure 5.3-1: JANUS MPR2.3 Reader ‘Raw Handshake Report’ Messaging Mode

5.4 'Combined' Messaging Mode

'Combined' Messaging Mode (*i.e*. combines *'Standard'* Messaging Mode with *'Raw Handshake Report'* Messaging Mode) is activated when the *Raw Handshake Report* parameter is enabled and at least one of the *Voting Report, Generate Initial Report* and/or *Generate Post-Capture-Zone Report* parameters is enabled. When operating in this mode, the JANUS MPR2.3 Reader transmits both Handshake Messages and the enabled "standard" reports to the Lane Controller, as follows:

- Each time the Transponder is Read, a Handshake message is sent to the Lane Controller, consisting of an "MA"/"MB" – *n0* format message as defined in §11.
- Optional *Initial Read Reports* on the first read of a transponder, consisting of "IA"/"IB" messages as defined in §7.2.3 (§9.3.2 for TRBA Mode), or "MA"/"MB" – *n*1 format messages as defined in §11.
- Optional *Transponder Messages*, at Voting Time expiration, consisting of "TA"/"TB" (majority voting) or "OA"/"OB" (interpolated voting) messages as defined in §7.2.20 or §7.2.8 (§9.3.9 or §0 for TRBA Mode), or "MA"/"MB" – *n*2/*n*4 format messages as defined in §11.
- Optional *Post Capture Reports,* on expiration of the optional Post Capture time, consisting of "PA"/"PB" (majority voting) or "QA"/"QB" (interpolated voting) messages as defined in §7.2.9 or §7.2.10 (§9.3.5 or §9.3.6 for TRBA Mode), or "MA"/"MB" – *n*3/*n*5 format messages as defined in §11.
- Optional *Estimated Vehicle Speed Reports* (for ISO 18000-6B, ATA, ISO 18000-6C, and SeGo protocols only), upon transaction/regression analysis completion, consisting of "MA"/"MB" – *n6* format messages as defined in §11.

Note that JANUS MPR2.3 Reader Handshake Messages are transmitted to the Lane Controller via the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface. ***The JANUS MPR2.3 Reader MUST be configured to use the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface option BEFORE the*** **Report Handshakes** ***parameter can be ENABLED.*** JANUS MPR2.3 Reader "standard" messages are sent to the Lane Controller via the JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interface. A simplified UML diagram of this interaction is illustrated in Figure 5.4-1.

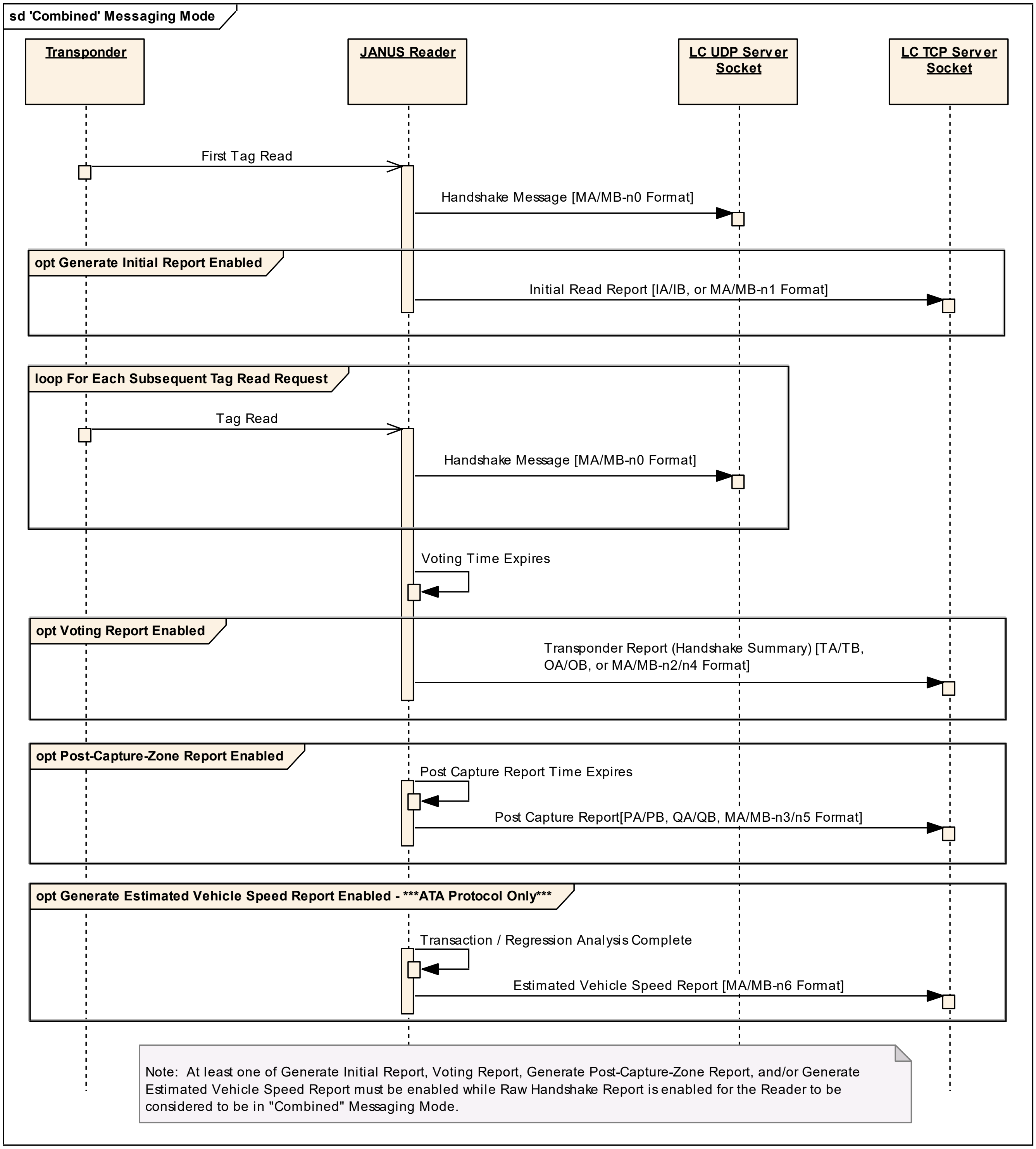

Figure 5.4-1: JANUS MPR2.3 Reader 'Combined' Messaging Mode

5.5 Toll Rate / Balance Adjustment Protocol Overview

5.5.1 Toll Rate Table Transfer

The Lane Controller is responsible for the transfer of Toll Rate Tables to the JANUS MPR2.3 Reader. When transferring Toll Rate information to the JANUS MPR2.3 Reader, the Lane Controller sends a single "Toll Rate Table Record" message for each toll rate table to be transferred. Each message contains the entire toll rate schedule:

- For the given *RF Channel* – when using Fixed Toll Rate Mode.
- For the given *Entry Plaza* – when using Variable Toll Rate Mode.

A UML sequence diagram, illustrating the Toll Rate Table Transfer from the Lane Controller to the JANUS MPR2.3 Reader, for both Fixed and Variable Tolling Modes, is shown in Figure 5.5-1. Also shown in Figure 5.5-1 is the recommended practice of validating the Toll Rate Table Transfer, once the transfer has completed.

Validation of the Toll Rate Table Transfer should always be done at the end of a transfer, and is especially important if communications connectivity issues are encountered while downloading Toll Rate Table Records to the JANUS MPR2.3 *Reader.*

To verify the Toll Rate Table Transfer, the Lane Controller issues a Toll Rate Table Configuration Request (T4) message to the Reader. The reader will respond with a Toll Rate Configuration (T5) message. The Lane Controller can then examine the "*Table n ID*" fields (see §9.1.13 for details) returned in the Toll Rate Configuration message from the Reader to verify that the correct Toll Rate Tables have been stored on the JANUS MPR2.3 Reader.

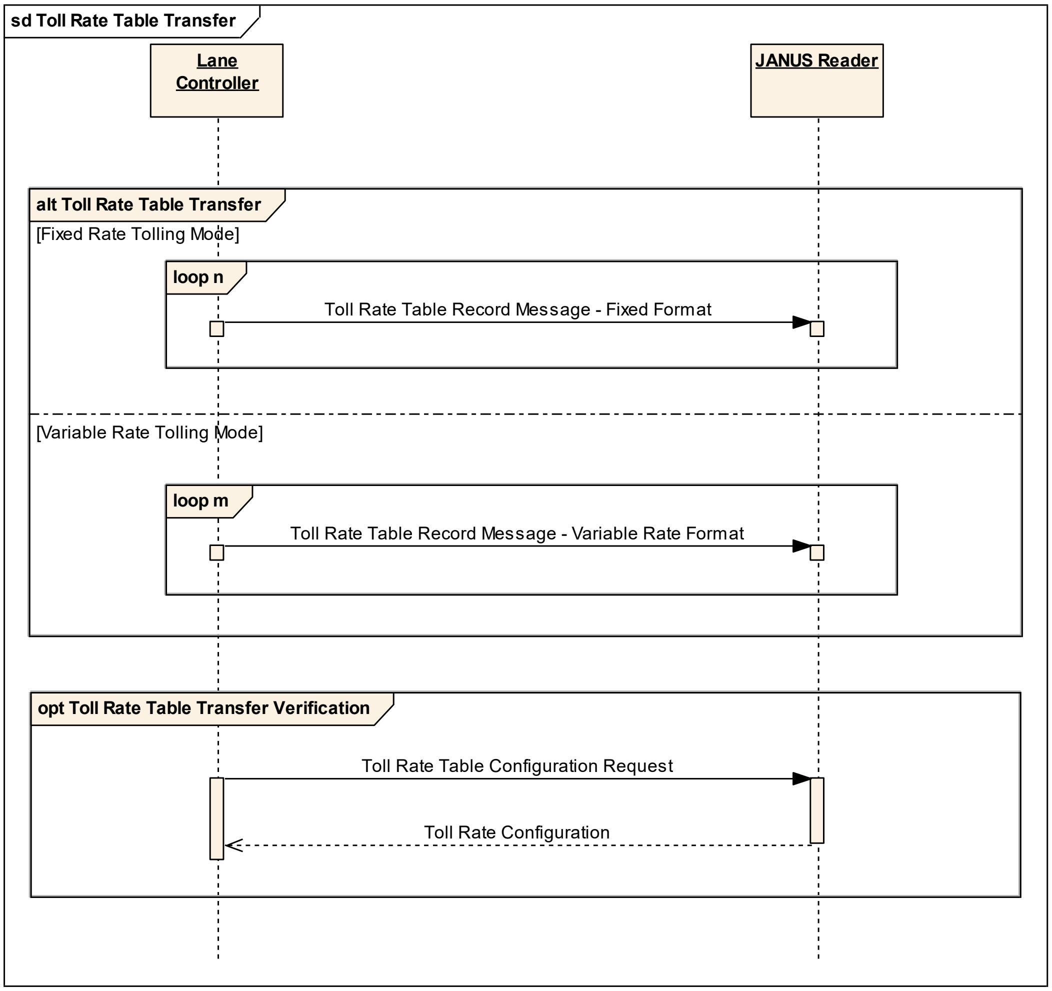

Figure 5.5-1: Toll Rate Table Transfer Message Sequence

5.5.2 Balance Adjustment Table Transfer

The JANUS MPR2.3 Reader maintains a Balance Adjustment Table in order to apply debits or credits to the balance image of transponders passing through the toll plaza. The Plaza Computer / Lane Controller is responsible for transferring a daily Balance Adjustment Table to the JANUS MPR2.3 Reader if Balance Adjustment processing is to occur. Two types of Balance Adjustment Table transfers are possible:

- A Nightly (Batch) Transfer
- Real-Time (Updates) Transfers made throughout the day.

5.5.2.1 Nightly (Batch) Transfer

A simplified UML sequence diagram, illustrating the Nightly (Batch) Transfer of Balance Adjustment Table records from the Lane Controller to the JANUS MPR2.3 Reader is shown in Figure 5.5-2.

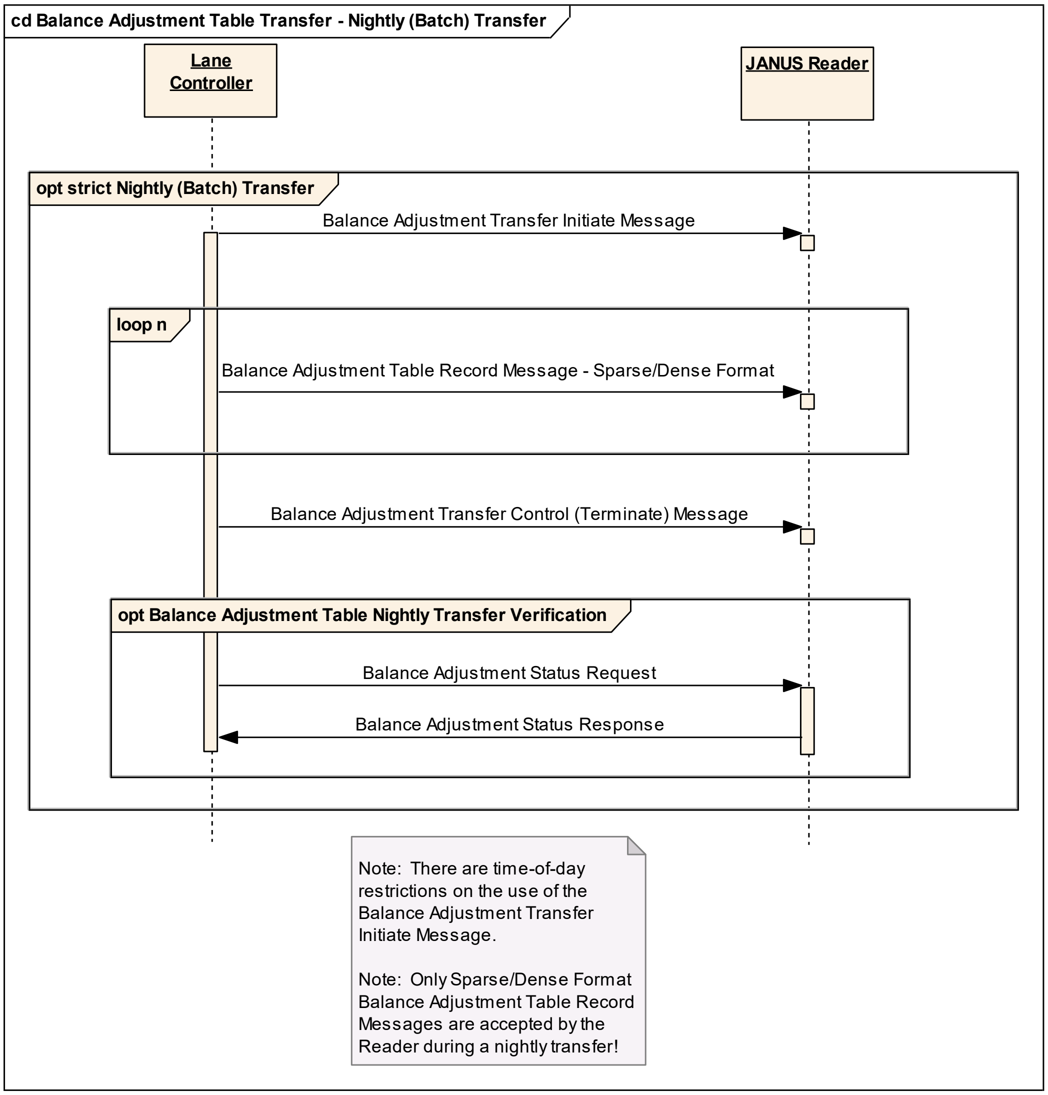

Figure 5.5-2: Nightly (Batch) Balance Adjustment Table Transfer Message Sequence

A nightly transfer is initiated when the Lane Controller sends a Balance Adjustment Transfer Initiate (B1) message to the JANUS MPR2.3 Reader via any one of the JANUS MPR2.3 Reader serial communication ports (COM1 – COM8) of the JANUS MPR2.3 Reader – Lane Controller Serial Interface, or the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface. ***Note that there are time-of-day restrictions on the use of the Balance Adjustment Transfer Initiate (B1) Message – See §9.1.1 for details.***

The Transfer Initiate message indicates the scope of the transfer to allow the reader to verify availability of required resources. If the operation cannot be completed, the Reader will reject the request by responding with a Balance Adjustment Transfer Control (B3) Message – a reason code field provides details of why the request was rejected (not shown in Figure).

The Lane Controller may then transmit a variable number of Balance Adjustment Table Record (B2 Sparse / Dense Format only) messages to the JANUS MPR2.3 Reader. The Reader updates its Balance Adjustment Table with data from the Balance Adjustment Table Record messages. The Reader will send a Balance Adjustment Transfer Control (B3) message to the Lane Controller if an error is encountered while processing Balance Adjustment Table

Record messages. ***Real-time Format Balance Adjustment Table Record messages are not allowed during a nightly transfer sequence – the Reader will reject them by responding with a Balance Adjustment Transfer Control (B3 – Balance Adjustment Transfer In Progress) Message***.

To complete / abort the nightly transfer, the Lane Controller sends a Balance Adjustment Transfer Control message (B3 – Normal Completion / Unspecified Abort, as the case may be) to the Reader. The message indicates whether it is a normal or premature termination. All previous Balance Adjustment Table Record messages will have been processed.

The JANUS MPR2.3 Reader can also terminate a transfer (not shown in Figure). After 5am, if a download has been initiated but no new B2 Sparse / Dense format messages have been received by the Reader in the last 65 minutes, the Reader will send out a Balance Adjustment Transfer Control (B3 – Abort, Download Timeout) message to terminate the transfer and clear the remaining Balance Adjustment Entries in the Balance Adjustment Table. If, at 5am, the Reader detects that no download has occurred since midnight, the Reader will send out a Balance Adjustment Transfer Control (B3 – Abort, Download Timeout) message, and clear the entire Balance Adjustment Table.

The JANUS MPR2.3 Reader nightly transfer state is maintained across JANUS MPR2.3 Reader – Lane Controller Serial or Ethernet Interface outages and/or disconnects. *It is a recommended practice that the Lane Controller request the Balance Adjustment Table status as soon as the communications link is restored after a disconnect while in the middle of a Balance Adjustment Table nightly transfer operation.* The Lane Controller can inspect the "*Download Flag*", "*Num. Download Entries Received*", and "*Last Tag ID*" fields (see §9.1.7 for details) of the B5 Balance Adjustment Status Response Message returned by the Reader to ascertain the state of the nightly transfer operation. Once Lane Controller connectivity is restored, the nightly transfer operation may then continue where it left off.

Validation of the Balance Adjustment Table nightly transfer should always be done at the end of a transfer, and is especially important if communications connectivity issues are encountered during the transfer.

To verify the nightly Balance Adjustment Table Transfer, the Lane Controller issues a Balance Adjustment Status Request (B4) message to the Reader. The reader will respond with a Balance Adjustment Status Response (B5) message. The Lane Controller can then examine the "*Download Flag*", "*Num. Download Entries Received*", and "*Last Tag ID*" fields (see §9.1.7 for details) returned in the Balance Adjustment Status Response message to verify that the nightly transfer completed as intended.

5.5.2.2 Real-Time (Updates) Transfer

The JANUS MPR2.3 Reader allows for Real-Time Transfers (Updates) of Balance Adjustment Table Entries. These updates allow for the transfer of one or more transponder Balance Adjustment Entries at any time during the day (other than during a nightly transfer).

Updates, for example could be a result of a cash payment at the business center (*i.e.* balance adjustment), or a report of a stolen tag (*i.e. balance clearing)*.

To perform Real-Time Balance Adjustment Table Updates, the Lane Controller need only send the requisite number of appropriately formatted Real-Time Balance Adjustment Table Record Messages (See §11.8.7) to the Reader. A simplified UML Sequence Diagram of this procedure is shown in Figure 5.5-3.

Note that the transponder Ids in the Real-Time Format message need not be consecutive or numerically ordered; the JANUS MPR2.3 Reader will NOT clear intervening entries. ***B2 Real-Time Balance Adjustment Record messages are NOT framed with B1/B3 messages.***

The JANUS MPR2.3 Reader will NOT accept Real-Time Balance Adjustment Record messages if a nightly download is in progress – the Reader will reject them by responding with a Balance Adjustment Transfer Control (B3 – Balance Adjustment Transfer In Progress) Message.

Real-Time Balance Adjustment Table Updates may only be performed when a valid Balance Adjustment Table has been previously transferred to the Reader via a nightly transfer operation. If the Lane Controller attempts to perform a Real-Time Balance Adjustment Table update when no valid Balance Adjustment Table is present, the Reader will respond with a Balance Adjustment Transfer Control (B3 – No Valid BAT Available) Message.

Validation of the Balance Adjustment Table real-time transfer should always be done at the end of a transfer, and is especially important if communications connectivity issues are encountered during the transfer.

To verify the real-time Balance Adjustment Table Transfer, the Lane Controller issues a Balance Adjustment Status Request (B4) message to the Reader. The reader will respond with a Balance Adjustment Status Response (B5) message. The Lane Controller can then examine the “Num. Real-Time Entries Received”, and “Last Tag ID” fields (see §9.1.7 for details) returned in the Balance Adjustment Status Response message to verify that the real-time transfer completed as intended.

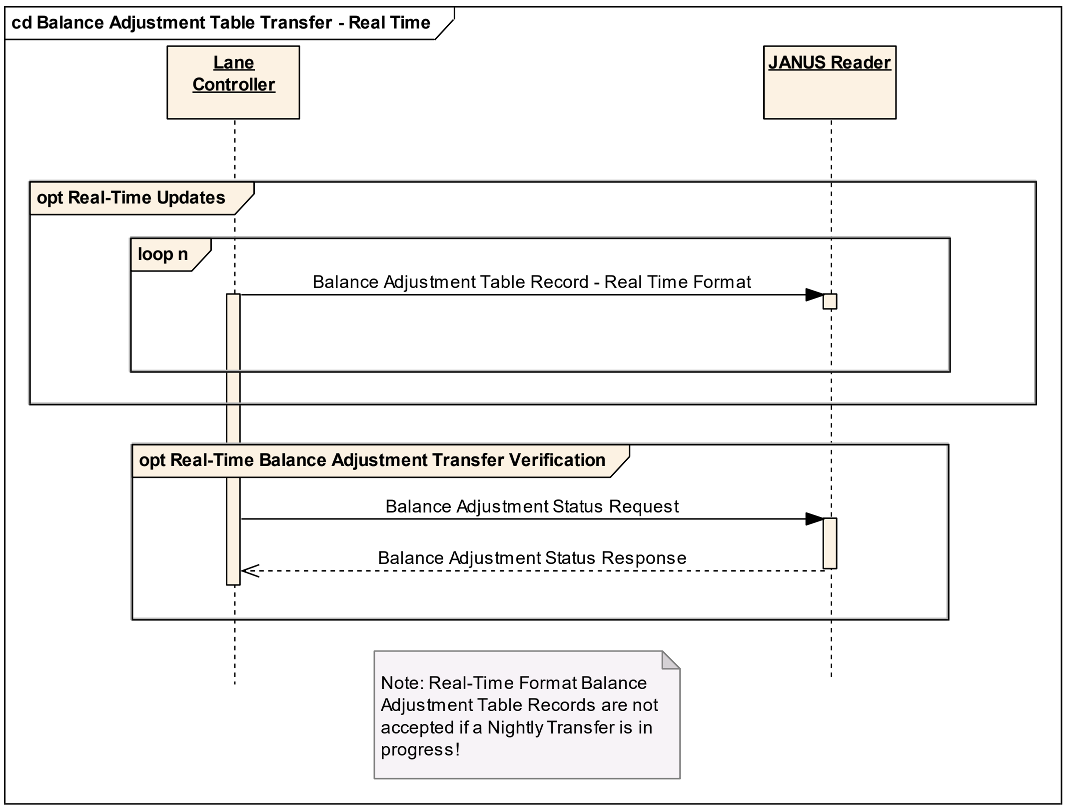

Figure 5.5-3: (Real-Time) Balance Adjustment Table Transfer Message Sequence

5.5.2.3 Balance Adjustment Record Flow Control

If the Reader detects an increasing backlog of unprocessed Sparse Format, and/or Dense Format B2 messages during a nightly transfer, or an increasing backlog of Real-Time Format B2 messages during a Real-Time update “burst”, the Reader may request the Lane Controller to stop transmission of Balance Adjustment Table Record messages (Sparse Format, Dense Format, or Real-Time Format). This is accomplished by sending a Balance Adjustment Transfer Control message (B3 – Reader Not Ready) message to the Lane Controller. This message indicates at what point the Reader has stopped processing Balance Adjustment Table Record (B2) messages. After sending this message, any Balance Adjustment Table Record (B2) messages that are received by the Reader from the Lane Controller are explicitly rejected by the JANUS MPR2.3 Reader – the Reader will send a Balance Adjustment Transfer Control (B3 – Reader Not Ready) message to the Lane Controller for each Balance Adjustment Table Record (B2) message received while in the “Not Ready” state.

When the Reader is ready to receive further Balance Adjustment Table Record (B2) messages from the Lane Controller, the reader will send a Balance Adjustment Transfer Control (B3 – Reader Ready) message to the Lane Controller. This signals the Lane Controller that transmission of Balance Adjustment Table Record (B2) messages to the JANUS MPR2.3 Reader may resume. ***Note that the Lane Controller may issue other messages (e.g. Set Time, Status Request, etc.) during a "Reader Not Ready" period – only Balance Adjustment Table Record (B2) messages are rejected.*** An illustration of this message sequence is shown in the simplified UML sequence diagram of Figure 5.5-4.

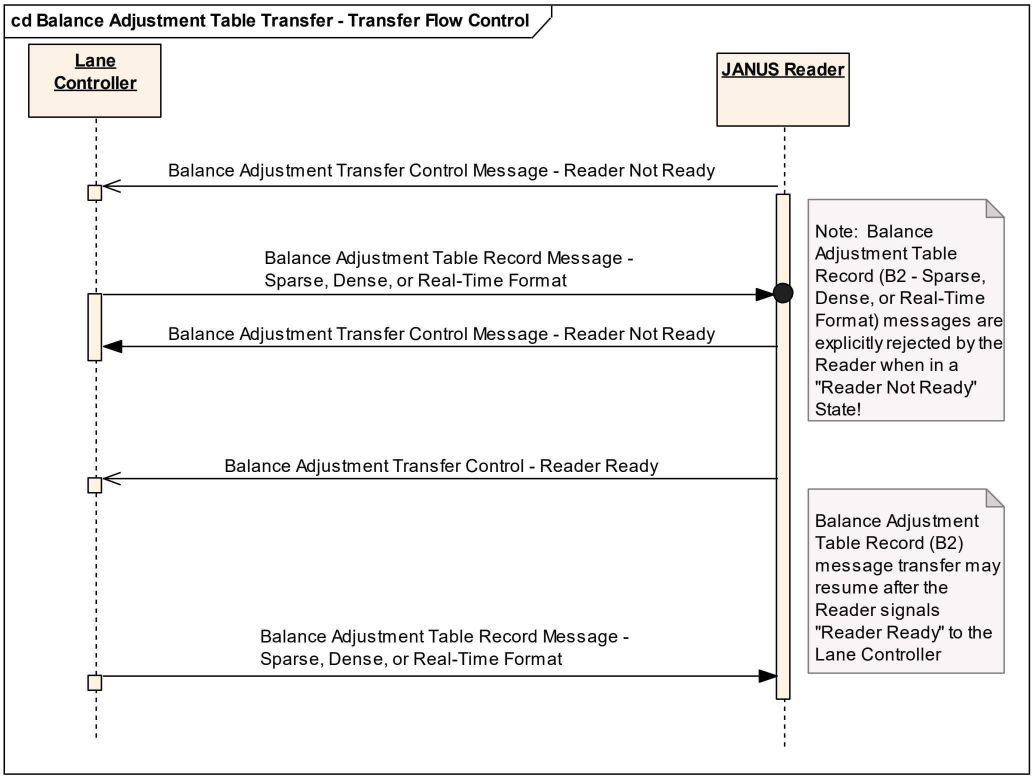

Figure 5.5-4: Balance Adjustment Table Transfer Flow Control

5.5.2.4 Balance Adjustment Table Entry Format

Each Balance Adjustment Table Record message (B2 – Sparse, Dense, or Real-Time Format – See §9.1.4, §9.1.3, or §11.8.7, respectively) message contains one, or more Balance Adjustment Table Entries. A Balance Adjustment Table Entry consists of 6 ASCII hex characters representing 24 bits, as shown in Table 5.5-1.

Table 5.5-1: Balance Adjustment Table Entry Format

Adjustment ID 2 Bits (Bits 23:22) Bit23 = MSB	**Sign Bit 1 Bit (Bit 21)**	**Low Balance Icon (*) 1 Bit (Bit 20)**	**Future Use 4 Bits (Bits 19:16)**	**Adjustment Amount 16 Bits (Bits 15:0) Bit 0 = LSB**
0 = No Change	Don't Care	No Change **(See Note *)**	Reserved (***Must be set to 0's***)	(*ID = 0*) Don't Care – No Adjustment
1 = Delta 1	• 0 = Positive Delta • 1 = Negative Delta	• 0 = Off • 1 = On **(See Note *)**	Reserved (***Must be set to 0's***)	(*ID = 1*) **Delta Value:** 0 – 65535 in units of nickels (*Max. equiv. = $3276.75*)

Adjustment ID 2 Bits (Bits 23:22) Bit23 = MSB	Sign Bit 1 Bit (Bit 21)	Low Balance Icon (*) 1 Bit (Bit 20)	Future Use 4 Bits (Bits 19:16)	Adjustment Amount 16 Bits (Bits 15:0) Bit 0 = LSB
2 = Delta 2	• 0 = Positive Delta • 1 = Negative Delta	• 0 = Off • 1 = On **(See Note *)**	Reserved (***Must be set to 0's***)	(*ID* = *2*) **Delta Value:** 0 – 65535 in units of nickels (*Max. equiv. = $3276.75*)
3 = Replacement	Don't Care	• 0 = Off • 1 = On **(See Note *)**	Reserved (***Must be set to 0's***)	(*ID* = *3*) **Replacement Value:** 0 – 65535 in units of nickels (*Max. equiv. = $3276.75*)

Special Notes:

(*) – The Low Balance Feature is applicable to a specific Tag Type and Agency and as such is currently not implemented in the JANUS MPR2.3 Reader firmware. Values set in this field have no effect.

5.5.2.5 Balance Adjustment Processing

Balance Adjustment Processing is performed in two different ways depending on the setting of the "*Enforce Adjustment ID Checking*" parameter on the JANUS MPR2.3 Reader Toll / Balance Web Configuration page. The details of the specific processing are outlined in the following subsections (Please refer to §5.5.2.4 for a description of *Adjustment ID*).

5.5.2.5.1 Enforcement of Adjustment ID Checking Enabled

This mechanism allows for a controlled update of the Balance Adjustment in the Transponder, allowing for up to 2 updates and/or a balance replacement per day. Balance Adjustment Processing when the "*Enforce Adjustment ID Checking*" parameter is enabled proceeds as follows:

- The Reader looks up the Balance Adjustment Entry in the Balance Adjustment Table based on the *Tag ID*. No Balance Adjustment occurs if the *Tag ID* is outside the Range of the Balance Adjustment Table.
- No Balance Adjustment is performed if the *Adjustment ID* in the Balance Adjustment Entry is 0.
- The Reader reads the *Previous Balance Adjustment Date* field from the Transponder.
- If the Balance Adjustment Table Date is different than the *Previous Balance Adjustment Date* in the Transponder, the Reader will apply the Balance Adjustment, regardless of the Transponder's *Adjustment ID*. The Reader then sets the Transponder's *Previous Balance Adjustment Date* to the Balance Adjustment Table date, and sets the Transponder's *Adjustment ID* to the *Adjustment ID* from the Balance Adjustment Table Entry.
- If the Transponder's *Previous Balance Adjustment Date* is the same as the Balance Adjustment Table date (*i.e.* The Transponder has already been updated at least once on the same day), the Reader will apply the Balance Adjustment if the *Adjustment ID* of the Balance Adjustment Table is greater than the current *Adjustment ID* of the Transponder. The Transponder's *Adjustment ID* is then set to the *Adjustment ID* from the Balance Adjustment Table Entry.

5.5.2.5.2 Enforcement of Adjustment ID Checking Disabled

When the "*Enforce Adjustment ID Checking*" parameter is disabled (unchecked) the JANUS MPR2.3 Reader performs the same processing as outlined in as described in §5.5.2.5.1, except that it supports multiple Balance

Adjustments and or Balance Replacements (> 2 Balance Adjustments plus one Balance Replacement) for the same Transponder per day (*i.e.* ***No checking of the Adjustment ID field is performed***).

Balance Adjustment Processing when the "*Enforce Adjustment ID Checking*" parameter is disabled proceeds as follows:

- The Reader looks up the Balance Adjustment Entry in the Balance Adjustment Table based on the *Tag ID*. No Balance Adjustment occurs if the *Tag ID* is outside the Range of the Balance Adjustment Table.
- No Balance Adjustment is performed if the *Adjustment ID* in the Balance Adjustment Entry is 0.
- The Reader reads the *Previous Balance Adjustment Date* field from the Transponder.
- If the Balance Adjustment Table Date is different than the *Previous Balance Adjustment Date* in the Transponder, the Reader will apply the Balance Adjustment, regardless of the Transponder's *Adjustment ID*. The Reader then sets the Transponder's *Previous Balance Adjustment Date* to the Balance Adjustment Table date, and sets the Transponder's *Adjustment ID* to the *Adjustment ID* from the Balance Adjustment Table Entry.
- If the Transponder's *Previous Balance Adjustment Date* is the same as the Balance Adjustment Table date (*i.e.* The Transponder has already been updated at least once on the same day), the Reader will apply the Balance Adjustment ***regardless of the Transponder's Adjustment ID***. The Transponder's *Adjustment ID* is then set to the *Adjustment ID* from the Balance Adjustment Table Entry.

5.6 Reader Software Update / Management Protocol Overview

The JANUS MPR2.3 Reader provides the capability of remote update and management of the Reader Software through the JANUS MPR2.3 Reader – Lane Controller Interfaces. A capability for performing a bulk upload and/or download of all of the JANUS MPR2.3 Reader configuration parameters is also provided.

5.6.1 Software Update / Management

Performing a JANUS MPR2.3 Reader Software Update is a multi-step process, an example of which is shown in Figure 5.6-1. In a typical update scenario, the following steps would be performed:

1. Obtain the amount of free space on the Reader Filesystem.
2. Obtain the number of versions currently installed on the Reader.
3. Obtain the Update Identifier (and Factory/Active status) of each version currently installed on the Reader.
4. If there is not enough free space on the Reader to accommodate the new software version, select one or more older versions and delete them from the Reader.
5. Secure copy the update to the Reader
6. Verify the update that has been uploaded to the Reader
7. Activate the update that has been successfully verified on the Reader.

5.6.1.1 Obtaining the Amount of Free Space on the Reader Filesystem

In order to obtain the amount of free space on the Reader Filesystem, the Lane Controller issues a *Get Free Space Message* [UF] to the Reader. The Reader will respond with a *Filesystem Space Available Message* [UM] indicating the amount of available free space, in bytes, on the Reader Filesystem.

5.6.1.2 Obtaining the Number of Versions Currently Installed on the Reader

To get the number of Software Versions that are currently installed on the Reader, the Lane Controller issues a *Query Update Count Message* [UQ] to the Reader. The Reader will respond with a *Number of Available Updates Message* [UN], indicating how many software versions *including the Factory Version*, are currently present on the Reader.

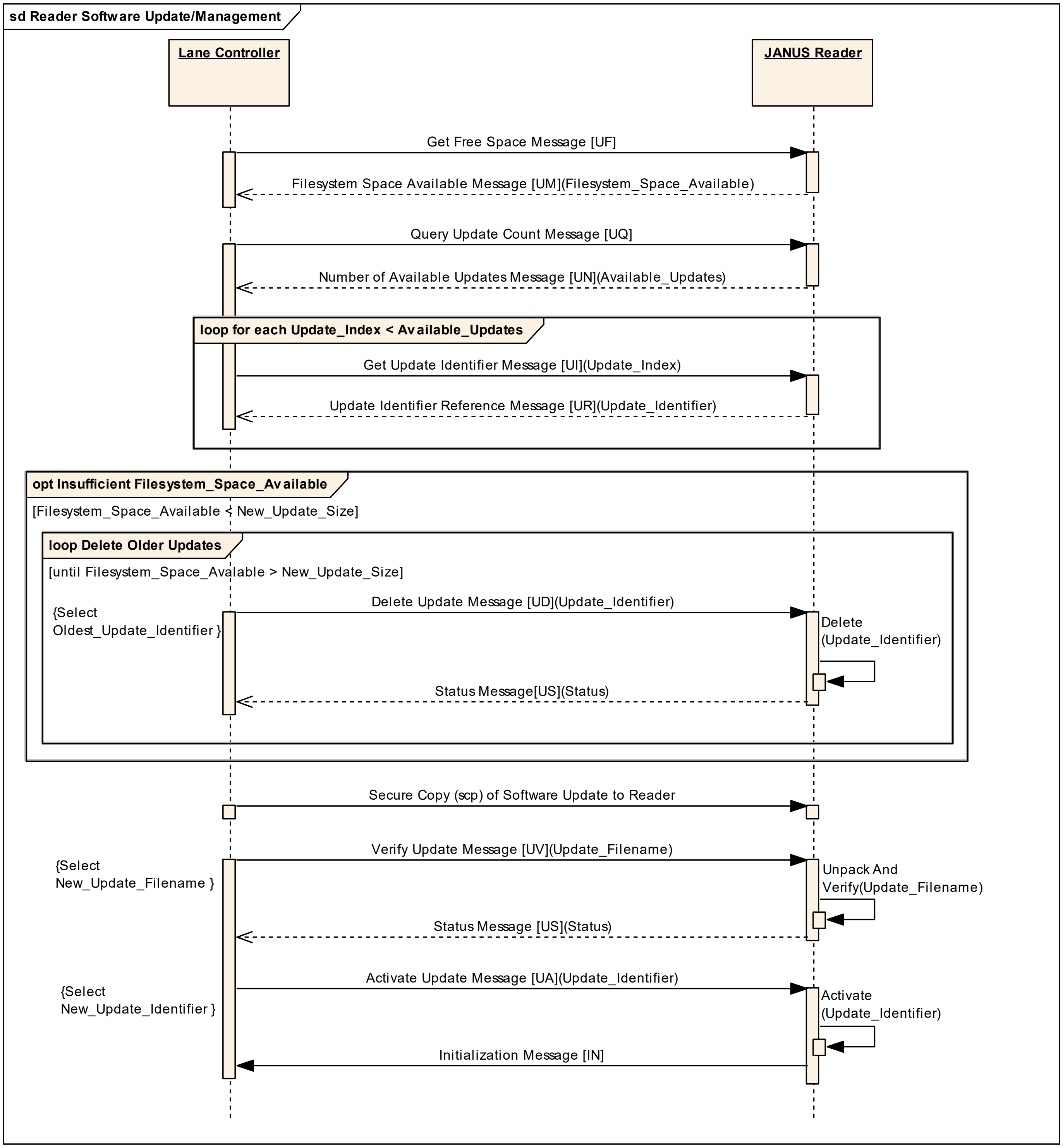

Figure 5.6-1: Example Software Update / Management Sequence

5.6.1.3 Obtaining the Update Identifier / Status of Each Version Currently Installed on the Reader

The next step is to retrieve from the Reader the Identifier and Factory / Activeness Status of each software version that is currently installed on the JANUS MPR2.3 Reader. To accomplish this, the Lane Controller sends to the Reader a *Get Update Identifier Message* [UI] with an *Update Index* field that references the unique index number for each software version present on the Reader. Allowable *Update Index* field values range from 0 to {*Number of Updates*} – 1.

For each *Get Update Identifier Message* received from the Lane Controller, the Reader will respond with an *Update Identifier Reference Message* [UR], which returns the Software Update Identifier of the software version corresponding to the associated *Update Index*, along with two status flags indicating whether the referenced software version is:

(a) The Factory installed software version; and/or

(b) The active (*i.e.* currently running) software version.

5.6.1.4 Deleting Older Versions if Insufficient Space is Available

If the new software update is larger than the amount of available space on the Reader Filesystem, then one or more older revisions of software must be deleted from the Reader in order to free up sufficient space on the Reader Filesystem to accommodate the new update. To accomplish this, the Lane Controller sends one or more *Delete Update Messages* [UD] with the Update Identifier field set to the identifier of the update that the Lane Controller wishes to delete.

Upon completion of the request, the Reader will respond with a *Software Update / Management Status Message* [US] signifying either a detected failure or an indication of successful completion.

Note that it is not permitted to either:

a) Delete the active (i.e. currently running) software version; and/or

b) Delete the Factory software version

from the JANUS MPR2.3 Reader. If such an operation is attempted, the Reader will reject the request and respond with a Software Update / Management Status Message [US]*, with the* Status *field set to:* "**`Delete identifier (n) points to factory or active software`**", *where* n *represents the* Update Identifier *in question.*

5.6.1.5 Secure Copy of the New Software Update to the Reader

To transfer the new software update from the Lane Controller to the Reader, the Lane Controller uploads a given software update file to the JANUS MPR2.3 Reader via Secure Copy (scp). This can be accomplished by issuing the following Secure Copy (scp) command on the Lane Controller:

```
scp <Software_Update_File> mpr2user@<Reader_IP_Address>:
```

where **`<Software_Update_File>`** is the name of the software update file to upload to the JANUS MPR2.3 Reader and **`<Reader_IP_Address>`** is IP Address of the JANUS MPR2.3 Reader.

5.6.1.6 Verification of the Uploaded Software Update

Before the new software update can be activated, the newly uploaded software update file must undergo a verification procedure. To initiate this verification, the Lane Controller issues a *Verify Update Message* [UV] with the *Update File Name* field set to the full file name of the software update file that was uploaded to the reader via Secure Copy (scp).

Upon completion of the verification procedure, the Reader will respond with a *Software Update / Management Status Message* [US] indicating whether an error was encountered during the verification procedure or the operation completed successfully.

After verification, the file uploaded by the Lane Controller via Secure Copy (scp) is either:

a) Relocated to the software update repository on the Reader if the verification was successful; or

b) Deleted from the Reader if the verification failed.

5.6.1.7 Activation of the New Software Update

The final step in the update process is the activation of the new software update. To activate a given software version, the Lane Controller Issues an *Activate Update Message* [UA] to the JANUS MPR2.3 Reader with the *Update Identifier* field set to the identifier of the software version to Activate. Optionally, the Lane Controller may set this field to 'FACTORY' or 'LATEST' to activate the base factory version of software on the Reader, or the latest version available on the Reader, respectively.

Upon successful completion of the Reader software activation, the Reader will implicitly transmit an *Initialization Message* [IN] (*c.f.* §7.2.4 and/or §9.3.3) to the Lane Controller. If, on the other hand, if an error condition is detected during the update, the JANUS MPR2.3 Reader will respond to the Lane Controller with a *Software Update / Management Status Message* [US] indicating the nature of the detected error.

5.6.2 Bulk Configuration Upload

Performing a Bulk Configuration upload is a two-step process as shown in Figure 5.6-2. The first step in the process is the uploading of a given configuration file to the JANUS MPR2.3 Reader via Secure Copy (scp). This can be accomplished by issuing the following Secure Copy (scp) command on the Lane Controller:

```
scp <Config_File> mpr2user@<Reader_IP_Address>:
```

where **`<Config_File>`** is the name of the configuration file to upload to the JANUS MPR2.3 Reader and **`<Reader_IP_Address>`** is the IP Address of the JANUS MPR2.3 Reader.

Once the Secure Copy of the configuration file to the Reader has completed, the Lane Controller issues an *Update (Bulk) Configuration* [UC] command to the JANUS MPR2.3 Reader that specifies which configuration file the Reader should load. This will instruct the Reader to load the configuration values from the specified file.

Note: The Reader parses and validates the configuration file on a line-by-line basis. Configuration values are extracted and loaded from each configuration parameter line that has been successfully parsed and validated. The Reader skips any configuration parameter line that either fails to parse or fails its validation checks. When the Reader reaches the end of the configuration file and the Reader has detected that one or more configuration parameter lines have either failed to parse or have failed validation checking, the Reader shall respond with a Software Update / Management Status [US] *message with the* Status *field set to indicate that an error has occurred (See §10.2.12).*

Note: The Reader will only update its configuration with parameters that are present in the uploaded configuration file specified in the Update (Bulk) Configuration *[IUC] command. To prevent the Reader from modifying one or more specific configuration parameter(s), simply delete the respective configuration parameter line(s) from the configuration file before uploading it to the Reader.*

Special Case Note: To prevent a potential 'lock-out' situation, the Reader will NOT allow an update to either the* Ethernet 1 (LC 1Gbps) IP Address *and/or the* Default Gateway IP *parameters, if they are present in the specified configuration file.

The JANUS MPR2.3 Reader will respond with a *Software Update / Management Status* [US] message that will either confirm success or report detected errors for the requested operation.

Note: When the Update Configuration processing is complete, the configuration file that was uploaded to the Reader will be deleted from the JANUS MPR2.3 Reader Filesystem.

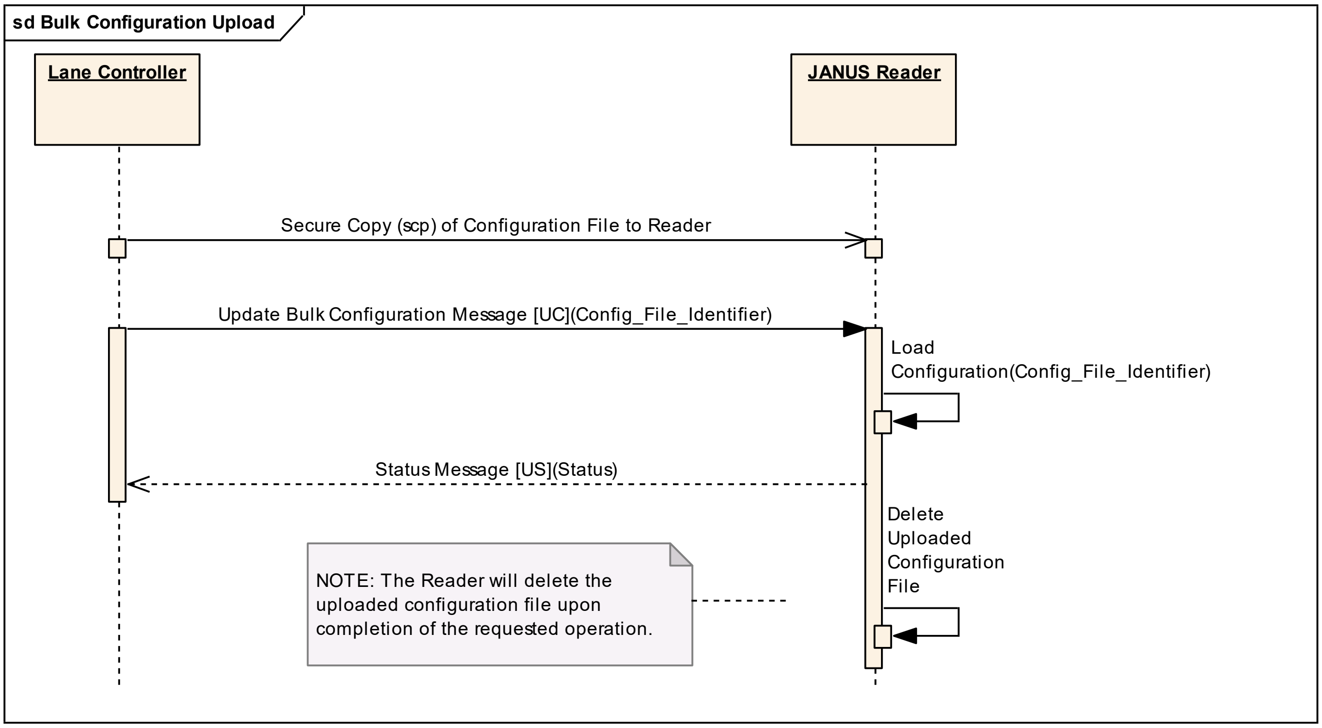

Figure 5.6-2: Bulk Configuration Upload

5.6.3 Bulk Configuration Download

Performing a Bulk Configuration download is a two-step process as shown in Figure 5.6-3. The Lane Controller first issues a *Generate (Bulk) Configuration File Message* [UG] to the JANUS MPR2.3 Reader to generate a new (Bulk) Configuration File on the Reader, suitable for download by the Lane Controller. *Note that the Reader will delete any previously existing (Bulk) Configuration Files present on the Reader Filesystem prior to the generation of the new (Bulk) Configuration File.*

Upon completion of the (Bulk) Configuration File generation process, the Reader will respond to the Lane Controller with a *(Bulk) Configuration File Info Message* [UB] with the *Configuration File Name* field set to the name of the newly generated (Bulk) Configuration file. If, on the other hand, an error was encountered, the Reader will instead respond with a *Software Update / Management Status Message* [US], describing the nature of the error.

The second and final step is the downloading of the newly generated configuration file from the JANUS MPR2.3 Reader to the Lane Controller via Secure Copy (scp). This can be accomplished by issuing the following Secure Copy (scp) command on the Lane Controller:

```
scp mpr2user@<Reader_IP_Address>:<Config_File> <LC_Dest_Path>
```

where **<Reader_IP_Address>** is the IP Address of the JANUS MPR2.3 Reader, **<Config_File>** is the name of the configuration file to download from the JANUS MPR2.3 Reader (supplied by the Reader in the *(Bulk) Configuration File Info Message*) , and **<LC_Dest_Path>** is the copy destination path on a local directory on the Lane Controller.

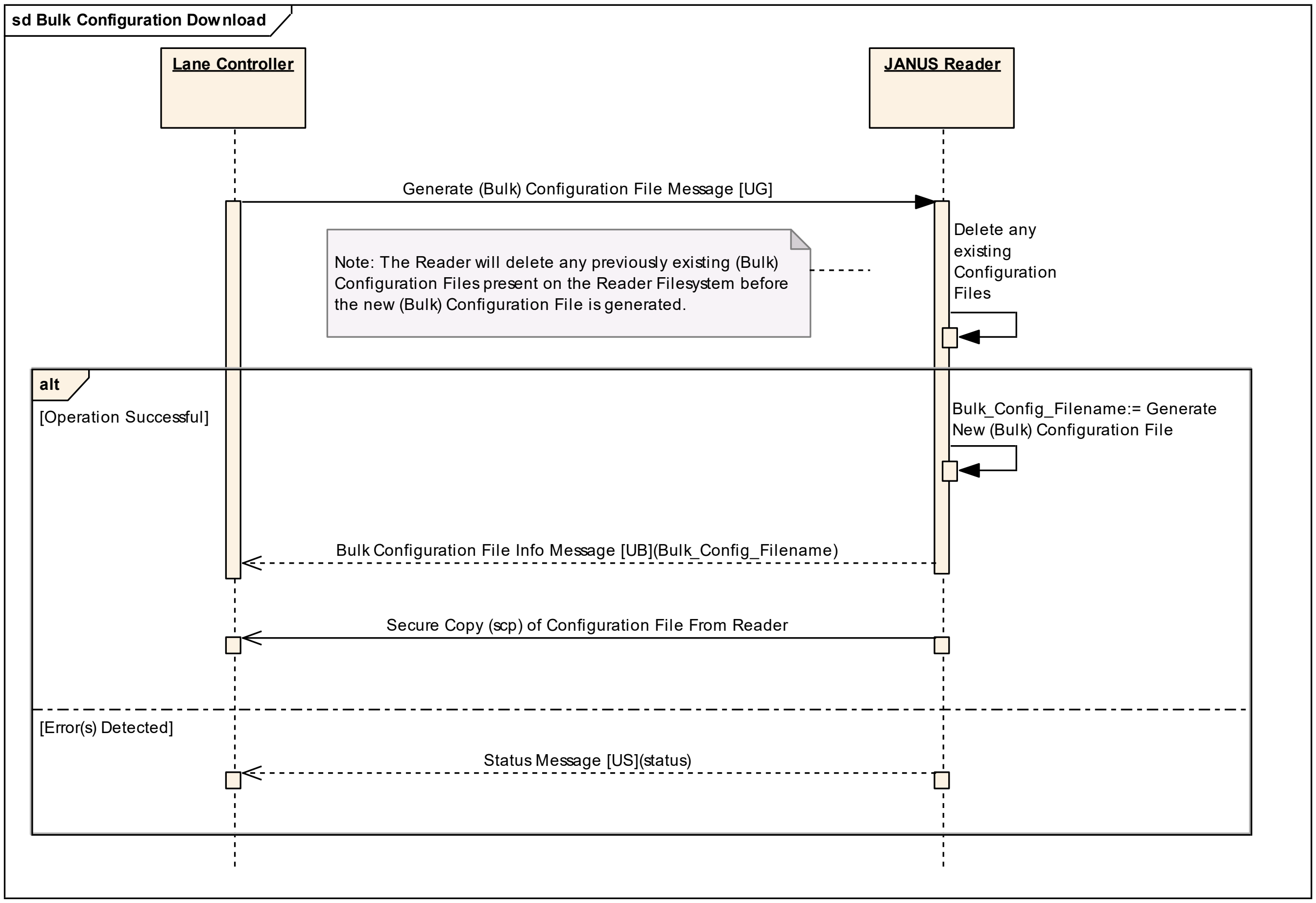

Figure 5.6-3: Bulk Configuration Download

6. APPLICATION MESSAGE ATTRIBUTES

For all messages defined in *Message Set* sections that follow, the following rules apply:

- All messaging shall be transmitted using packed ASCII-based message structures
- Square brackets indicate an optional message (or message component) that may, or may not be transmitted.

The information provided for each message is shown in Table 5.6-1:

Table 5.6-1: Reader / Lane Controller Application Message Attributes

Message Attribute	Description
Direction	Indicates the sender and receiver of the message
Description	A description of what the message contains and its intended use.
Format	How the message is assembled. All messages consist of printable characters. The following shorthand symbols are used: • An underscore character ("_") or the notation "<space>" indicates an ASCII space character. • 'alpha' denotes an ASCII alphabetic character ('A' – 'Z'). • 'dec' denotes an ASCII numeric character ('0' – '9'). • 'hex' denotes an ASCII hexadecimal character ('0' – '9', 'A' – 'F'). • 'alnum' denotes an ASCII alphanumeric character between **0x20** (32dec) and **0x5F** (95dec) in value (*i.e.* {**<space> ! " # $ % & ' ( ) * + , - . /**}, '**0**' – '**9**', {**: ; < = > ? @**}, '**A**' – '**Z**', {**[\ ] ^** _}) Square brackets denote optional parameters that may be omitted. Time fields are shown as follows: • MM = month (01 – 12) • DD = day (01 – 31) • YY = year (00 – 99); 00 = 2000, 01 = 2001, etc. (covers the years 1970-2069) • HH = hour (00 – 23) • mm = minutes (00 – 59) • SS = seconds (00 – 59) • sss = milliseconds (000 – 999) All field lengths are specified in bytes.
Response	Indicates the receiver (Reader or Lane Controller) application response.

7. BASIC MESSAGE SET

This section specifies the basic application messages used for communication between the JANUS MPR2.3 Reader and the Lane Controller that are supported by the JANUS MPR2.3 Reader – Lane Controller Serial and Ethernet Interfaces.

The *Basic Message Set* primarily deals with messaging originally conceived to support the IAG Protocol. Many messages are backwards compatible with older IAG and Badger Readers (*c.f.* §2.1 for additional details). Also included in the *Basic Message Set* are messages dealing with, but not limited to:

- Getting and setting of basic configuration parameters
- Basic status reporting
- Getting and setting of Reader time (for non-NTP configurations)
- Lane RF control (for active [*i.e.* IAG / TDM] protocols)
- Voting Time Control

7.1 Basic Message Extended Information Field

The *Extended Information* field is an optional, variable-length field that conveys additional message information depending upon the configuration of the JANUS MPR2.3 Reader. If the JANUS MPR2.3 Reader is configured to report extended information, this field will be populated with those values that have been chosen to be reported in the Reader configuration. **If no extended information has been requested in the Reader configuration, the *Extended Information* field *WILL NOT BE PRESENT* in JANUS MPR2.3 Reader-to-Lane Controller messages.**

Prefix (2 Bytes)	RF Channel (1 Byte)	Type (1 Byte)	. . .	Read Section (24 Bytes)	Pre-Write Section (40 bytes)	Post Write Section (40 Bytes)	Extended Information (Optional, Variable)

Count (1 Byte)	*Tag_0* (1 Byte)	*Value_0* (Tag Specific)	*Tag_1* (1 Byte)	*Value_1* (Tag Specific)	. . .	*Tag_n* (1 Byte)	*Value_n* (Tag Specific)

Figure 7.1-1: Basic Message Extended Information Format

Figure 7.1-1, above illustrates the *Extended Information* field appended to the end of a typical IAG Transponder (Majority Voting) Message. As shown in Figure 7.1-1, data is encoded into the *Extended Information* field in the form of **`{Tag, Value}`** pairs. Each **`{Tag}`** is encoded as one (1) ASCII hexadecimal character. **`{Value}`** data is encoded in a tag-specific fashion. The first byte of the *Extended Information* field is the *Count* sub-field (encoded in ASCII decimal), which specifies the total number of **`{Tag, Value}`** pairs encoded within the *Extended Information* field, if present.

Table 7.1-1 specifies the defined **`{Tag, Value}`** encodings for the *Extended Information* field of the Basic Message Set. (*Please note that any* **`{Tag}`** *values not explicitly listed in* Table 7.1-1 *are considered RESERVED*).

Table 7.1-1: Basic Message Extended Information `{Tag, Value}` Encodings

`{Tag}`	`{Value}` Name	`{Value}` Length & Format	`{Value}` Range	`{Value}` Contents	Message Applicability
0	*Timestamp*	16 dec	0 – 4294967295999999	The number of microseconds since the Epoch (1970-01-01 00:00:00 +0000 [UTC]) corresponding to the successful read event.	All Basic Message Set Initial Read, Transponder, Post Capture, and Status Messages. (*RFP-Compliant messages **DO NOT** support this feature*)
All other values	*RESERVED*	*N/A*	*N/A*	*N/A*	*N/A*

7.2 Basic Messages

7.2.1 Configuration (CA/CB/CN) Message

Direction: Reader to Lane Controller.

Description: Message sent by the Reader in response to a Configuration Request message from the Lane Controller.

Note that there are two components reported: the *Global Reader Configuration* and the *RF Channel* ("lane") *Configuration*.

The *RF Channel Configuration* reported varies according to the reporting mode (default or multiplexed). For example, the configuration message reported by the reader on COM1 contains the configuration for RF channel 1 (in the non-multiplexed reporting mode). If the multiplexed reporting mode is enabled, the RF channel configuration is for the channel specified by the Lane Controller.

The Lane Controller can use this message to establish whether the Reader it is communicating with is either in TRBA Mode or Non-TRBA Mode (see §5.5 and §9 for more details on TRBA Mode). The Lane Controller can then use this information to tailor the message sets used when communicating with a given Reader. Specifically, if the Lane Controller issues a *Configuration Request* (CR) message, the Lane controller can examine the length of the *Configuration Message* received from the JANUS MPR2.3 Reader to determine if the Reader is in TRBA Mode:

- ***The Reader is in Non-TRBA mode if the received Configuration Message (CA/CB/CN) is 59 bytes in length.***
- ***The Reader is in TRBA mode if the received Configuration Message (CA/CB/CN) message is 74 bytes in length*** (as per §9).

Format:

Table 7.2-1: Configuration (CA/CB/CN) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{CA, CB, CN}	Configuration Message: • CA = Primary CTM Configuration • CB = Secondary CTM Configuration • CN = Non-Redundant CTM Configuration
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §<<TODO>> for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
TIME	13 dec	MMDDYY <space> HHmmSS	Reader Time
AID	3 dec	000 – 127	Agency identification number.
PID	3 dec	000 – 127	Plaza identification number.
RID	4 dec	0000 – 4095	Reader ID – Traffic Management reader identification number.

Field Name	Length & Format	Range	Contents
TYPE	1 alpha	{M, S, N}	Reader type: • M = primary • S = secondary • N = standalone / non-redundant
SYNC	1 dec	0 – 1	Inter-Reader RF Synchronization: • 0 = sync feature disabled • 1 = sync feature enabled (**See Note *1***)
TTO	3 dec	001 – 300	Number of seconds before a transponder can be re-reported.
TMP	1 dec	0 – 1	Traffic Management Programming: • 0 = don't program Traffic Management section with reader ID & timestamp • 1 = program Traffic Management section with reader ID & timestamp
TFRM	1 dec	0 – 3	Specifies handling of transaction field: • 0 = Do not reprogram transaction field. • 1 = reprogram with 16 bit random number. • 2 = reprogram with 16 bit sequential txn number • 3 = reprogram with 8 bit random number and 8 bit sequential number
TTP	2 dec	10 – 99	Number of seconds between test tag interrogations.
SFT	2 dec	01 – 99	Single RF-module fault threshold. Number of consecutive test tag errors before a lane is considered bad.
MFT	1 dec	0 – 8	Multiple RF-module fault threshold. Number of RF modules that must be simultaneously bad (*i.e.* in SFT state) before causing a switchover to the slave reader. Normally set to the number of lanes equipped with test tags.
PTO	1 dec	0 – 9	Protocol time-out. Number of 100 ms time units (less one) in which a ACK must be received before the reader re-transmits a message to the lane controller (9 = 1 second)
Reserved	7 alnum	<space>	*Reserved section ignored by JANUS*
CC	1 dec	0 – 1	COM port configuration: • 0 = don't allow remote reader configuration • 1 = allow remote reader configuration
Separator	1 alnum	'-' (<dash>)	A <dash> character separator separates the Global Configuration Elements from the Lane Configuration Elements

Field Name	Length & Format	Range	Contents
LANE ST	1 alpha	{A, G, O}	Lane status: • A = active • G = guard • O = off-line
LANE NUM	2 dec	00 – 31	Lane number programmed into transponder
LANE TTAG	1 dec	0 – 1	Test Tag configuration: • 0 = no Test Tag in lane • 1 = Test Tag in lane
COM ST	1 dec	0 – 1	COM port: • 0 = off-line • 1 = on-line
COM BR	2 dec	{96, 19, 57, 11}	COM port bit rate: • 96 = 9600 bps • 19 = 19200 bps • 57 = 57600 bps • 11 = 115200 bps
COM PA	1 alpha	{N, O, E}	COM port parity: • N = none • O = odd • E = even
COM CS	1 dec	5 – 8	COM port – number of bits per character
COM SB	1 dec	{1, 5, 2}	COM port – number of stop bits (*5 = 1.5 stop bits*)
COM FC	1 alpha	{N, H, X}	COM port flow control: • N = none • H = hardware • X = xon / xoff

Notes:

(1)- For the Inter-Reader RF Synchronization to be considered *ENABLED* (*i.e.* to report a '**1**' in the SYNC field), the following conditions apply:

(a) The JANUS MPR2.3 Reader must have at least one (1) Sync block configured within its Frame Sequence Configuration; *and*

(b) The JANUS MPR2.3 Reader parameter *Reader-to-Reader Sync. Enable* must be enabled.

Inter-Reader RF Synchronization is considered to be *DISABLED* if these two conditions are not met. Please refer to [AD2] for details on how to configure Inter-Reader RF Synchronization on the JANUS MPR2.3 Reader.

Response: No response expected from Lane Controller

Sample configuration message ('_' indicates an ASCII <space> character):

CA 030180 0000220000000000M130002300589_______1-A010119N81N

7.2.2 Configuration Request (CR) Message

Direction: Lane Controller to Reader.

Description: This message is sent by the lane controller in order to obtain the current configuration of the reader (both global and RF channel specific).

Format: There are two formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode*), as follows:

- **Non-Multiplexed Reporting Mode:**

  CR

- **Multiplexed Reporting Mode:**

  CR**<channel>**

  Where **<channel> =** RF channel number (1-8).

Response: The Reader responds with a *Configuration Message* (*c.f.* §7.2.1).

7.2.3 IAG Initial Read (IA/IB – Majority / Interpolated Voting) Message

Direction: Reader to Lane Controller.

Description: Optional informational message sent to the Lane Controller when an IAG transponder first enters the capture zone.

This message applies when the "*Generate Initial Report*" configuration parameter option is enabled on the JANUS MPR2.3 Reader. This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel may differ from the transaction report generated at voting time*.

Format:

Table 7.2-2: IAG Initial Read (IA/IB – Majority / Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{IA, IB}	IAG Initial Read Message: • IA = Report from Primary CTM • IB = Report from Secondary CTM
RF Channel	1 alpha or 1 dec	<space> or 1-8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
Read Section	24 hex	N / A	Contents of IAG transponder read-only section (12 bytes encoded in ASCII HEX = 96 bits)
Pre-write Section	40 hex	N / A	Contents of IAG transponder write section before programming (20 bytes encoded in ASCII HEX = 160 bits)
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §7.1 for details on this field)

Response: No response expected from Lane Controller.

7.2.4 Initialization (IN) Message

Direction: Reader to Lane Controller

Description: After power-up or reset, the Initialization Message is sent within a restart packet on all configured COM ports. In the case of communication error (remote time-out, protocol violation, or consecutive NAKs) on a particular COM port, the Reader issues the Initialization Message only on that particular COM port.

The Reader reports the contents of the Reader real-time clock, and the JANUS MPR2.3 Reader firmware version.

Format:

Table 7.2-3: Initialization (IN) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{IN}	Initialization Message • IN = Initialization Message
RF Channel	1 alpha or 1 dec	<space> or 1-8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Cause	2 alpha	{TO, RS, PV, NK, OL}	2 character string indicating the reason for the initialization message: • TO **=** Remote time out. Reader attempted to transmit a packet 3 times with no response from the lane controller. • RS = Reader power up or reset • PV = Protocol Violation (bad message header: sequence number, control byte, or length) • NK **=** Reader NAKed consecutively by the lane controller • OL = The COM port has been set on-line via a SET COMx STATUS 1 on the diagnostic port.
Date / Time	14 dec	MMDDYY <space> HHmmSS <space>	Contents of Reader Real-Time clock
Firmware Version	15 alnum	N / A	JANUS MPR2.3 Reader Firmware Version. *A 15-character, fixed-length firmware version string (padded with trailing blanks if needed)*

Response: No response expected from Lane Controller.

7.2.5 Lane Active (LA) Message

Direction: Lane Controller to Reader.

Description: Sent by the Lane Controller to set an RF channel ("lane") active.

This turns on the specified RF Module. Transponders are interrogated by the reader and are reported to the lane controller.

Transponder fields are reprogrammed according to the parameters (RW, TMP, TCP, AID, PID, RID, TIME, TFRM, LANE NUM).

Format: There are two formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode*), as follows:

- **Non-Multiplexed Reporting Mode:**

  LA[<space>**<channel>**]

  Where **<channel> =** RF channel number (1-8)

  e.g., **LA** (makes RF channel associated with this COM port active)

  e.g., **LA_4** (makes RF Channel 4 active)

- **Multiplexed Reporting Mode:**

  LA**<channel>**

  Where **<channel> =** RF channel number (1-8)

  e.g., **LA4** (makes RF Channel 4 active)

Response: [The Reader shall transmit an asynchronous *Status Message* (*c.f.* §7.2.14) to the Lane Controller if and only if the lane status has changed.]

7.2.6 Lane Guard (LG) Message

Direction: Lane Controller to Reader.

Description: Sent by the Lane Controller to make a channel a *Guard Channel*. Any transponders assigned to a *Guard Channel* are not reported to the Lane Controller.

Transponder user fields (*e.g.*, timestamp, Plaza ID, etc.) are not modified.

Format: There are two formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode*), as follows:

- **Non-Multiplexed Reporting Mode:**

  LG[<space>**<channel>**]

  Where **<channel> =** RF channel number (1-8)

  e.g., **LG** (makes RF channel associated with this COM port a *Guard Channel*)

  e.g., **LG_2** (makes RF Channel 2 a *Guard Channel*)

- **Multiplexed Reporting Mode:**

  LG**<channel>**

  Where **<channel> =** RF channel number (1-8)

  e.g., **LG2** (makes RF Channel 2 a *Guard Channel*)

Response: [The Reader shall transmit an asynchronous *Status Message* (*c.f.* §7.2.14) to the Lane Controller if and only if the lane status has changed.]

7.2.7 Lane Off-Line (LO) Message

Direction: Lane Controller to Reader.

Description: Sent by the Lane Controller to set an RF channel (“lane”) offline.

This message turns off the RF interrogation in the lane. Transponders are not interrogated, reported, or re-programmed.

Unlike the IAG reader, setting an RF channel from active to offline does not clear the memory of the last three (3) transponders assigned to that lane. If the RF channel is then set active again, those tags are not re-reported if they reappear in the channel within the timeout period.

Format: There are two formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode*), as follows:

- **Non-Multiplexed Reporting Mode:**

  LO[<space>**<channel>**]

  Where **<channel> =** RF channel number (1-8)

  e.g., **L0** (sets the RF channel associated with this COM port to offline)

  e.g., **L0_2** (sets RF Channel 2 to offline)

- **Multiplexed Reporting Mode:**

  LO**<channel>**

  Where **<channel> =** RF channel number (1-8)

  e.g., **L02** (sets RF Channel 2 to offline)

Response: [The Reader shall transmit an asynchronous *Status Message* (*c.f.* §7.2.14) to the Lane Controller if and only if the lane status has changed.]

7.2.8 IAG Transponder (OA/OB – Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*". This message is issued by the Reader after an IAG transponder has been read and assigned to a channel (after voting time expires).

Format:

Table 7.2-4: IAG Transponder (OA/OB – Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{OA, OB}	IAG Transponder (Interpolated Voting) Message: • OA = Report from Primary CTM • OB = Report from Secondary CTM
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Transaction Status	1 alpha	{S, F, U, R, X, D, C}	Transaction Status: • S = Successful • F = Programming Failed • U = Programming Unverified • R = Read Only • X = Non-IAG Transponder • D = Decommissioned Transponder • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled.*
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction. *First report after reset or power-up indicates 00. An RPV counts as 1 read.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS TDM transaction on the same RF channel. *First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*

Field Name	Length & Format	Range	Contents
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left ‘L’, center ‘C’, right ‘R’ (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: ‘a’ – ‘f’, <space>} OR {‘xx’}	Estimated OBU sub-zone location: Two characters (‘ab’), or one character with trailing space (‘a<space>’); ‘xx’ = undefined sub-zone
Read Section	24 hex	N/A	Contents of IAG transponder read-only section (12 bytes encoded in ASCII HEX = 96 bits)
Pre-write Section	40 hex	N/A	Contents of IAG transponder write section before programming (20 bytes encoded in ASCII HEX = 160 bits)
Post-write Section	40 hex	N/A	Contents of IAG transponder write section if programming is attempted (20 bytes encoded in ASCII HEX = 160 bits)
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §7.1 for details on this field)

Response: No response expected from Lane Controller.

7.2.9 IAG Post Capture (PA/PB – Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*". This message is generated if the "*Generate Post-Capture-Zone Report*" feature is enabled, and the Reader detects a change in the programming status of the transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (*the volume of post capture messages is expected to be low relative to normal transaction messages).*

Format:

Table 7.2-5: IAG Post Capture (PA/PB – Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{PA, PB}	IAG Post Capture (Majority Voting) Message: • PA = Report from Primary CTM • PB = Report from Secondary CTM
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Transaction Status	1 alpha	{S, F, U, R, X, D, C}	(Revised) Transaction Status: • S = Successful • F = Programming Failed • U = Programming Unverified • R = Read Only • X = Non-IAG Transponder • D = Decommissioned Transponder • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled.*
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*
Read Section	24 hex	N/A	Contents of IAG transponder read-only section (12 bytes encoded in ASCII HEX = 96 bits)
Pre-write Section	40 hex	N/A	Contents of IAG transponder write section before programming (20 bytes encoded in ASCII HEX = 160 bits)
Post-write Section	40 hex	N/A	Contents of IAG transponder write section if programming is attempted (20 bytes encoded in ASCII HEX = 160 bits)
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §7.1 for details on this field)

Response: No response expected from Lane Controller.

7.2.10 IAG Post Capture (QA/QB – Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*". This message is generated if the "*Generate Post-Capture-Zone Report*" feature is enabled, and the Reader detects a change in the programming status of the transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (*the volume of post capture messages is expected to be low relative to normal transaction messages).*

Format:

Table 7.2-6: IAG Post Capture (QA/QB – Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{QA, QB}	IAG Post Capture (Interpolated Voting) Message: • QA = Report from Primary CTM • QB = Report from Secondary CTM
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Transaction Status	1 alpha	{S, F, U, R, X, D, C}	(Revised) Transaction Status: • S = Successful • F = Programming Failed • U = Programming Unverified • R = Read Only • X = Non-IAG Transponder • D = Decommissioned Transponder • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled.*
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone
Read Section	24 hex	N/A	Contents of IAG transponder read-only section (12 bytes encoded in ASCII HEX = 96 bits)
Pre-write Section	40 hex	N/A	Contents of IAG transponder write section before programming (20 bytes encoded in ASCII HEX = 160 bits)
Post-write Section	40 hex	N/A	Contents of IAG transponder write section if programming is attempted (20 bytes encoded in ASCII HEX = 160 bits)
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §7.1 for details on this field)

Response: No response expected from Lane Controller.

7.2.11 Reboot Request (RB) Message

Direction: Lane Controller to Reader

Description: Issues a request to the Reader (CTM) to reboot.

To prevent loss of transactions in redundant JANUS MPR2.3 Reader configurations, **a CTM reboot is allowed only if the peer CTM is running** (*e.g.* The primary-side CTM will not be allowed to reboot if the secondary-side power supply, and hence the secondary side CTM, is switched off).

If the primary-side CTM is active when the reboot request is received, control of the RF Modules will automatically be switched to the secondary side during the length of time it takes to reboot the primary side. The reader by default is set up for “automatic recovery mode” so that the primary side can automatically resume reporting of tags after the reboot is complete.

Format: RB

Response: [If the *Reboot Request* is successful, the Reader will implicitly transmit an *Initialization Message* [IN] to the Lane Controller as part of the JANUS MPR2.3 Reader software startup sequence (see §3.5 and/or §4.3.4 for additional details.]

7.2.12 Re-Report Request (RR) Message

Direction: Lane Controller to Reader

Description: Used by the Lane Controller in certain lane-based (non-open road) customer configurations to force the reader to re-report a transponder if it happens to be under the associated antenna. When this feature is used, the Lane Controller typically ignores any tag report received before the *Re-Report Request Message* is sent from the Lane Controller to the Reader.

As this feature was developed initially for a lane-based system, please contact Kapsch TrafficCom before using this feature in an Open-Road Tolling *(ORT) environment.*

Format: There are two formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode*), as follows:

- **Non-Multiplexed Reporting Mode:**

  RR

- **Multiplexed Reporting Mode:**

  RR**<channel>**

  Where **<channel> =** RF channel number (1-8).

  e.g., **RR2** (request a Re-Report for RF channel 2)

Response: [**'RR<space**>O' – If the *Re-Report Request Message* was issued against a channel that is configured to be offline.]

[**'RR<space>G'** – If the *Re-Report Request Message* was issued against a channel that is configured to be a *Guard Lane*.]

[If a transponder is present, the reader will asynchronously transmit a *Transponder Message* to the Lane Controller. The toll collection timestamp will be updated, along with the transaction number.]

Note that the Reader shall not transmit any messages to the Lane Controller if no transponder is present in the capture zone.

7.2.13 [Precision] Read Time (RT) Message

Direction: Lane Controller to Reader

Description: Request the JANUS MPR2.3 Reader to report its current time. The standard format of this message is backwards compatible with IAG and Badger Readers. This message supports an optional extended version of the standard Read Time (RT) message. The extended message supports the option of requesting the JANUS MPR2.3 Reader time with millisecond resolution.

Format: RT**[**<space>**<precision>]**

where:

<precision> = ‘P’ to request Reader time with millisecond resolution

e.g. **RT** (to request Reader time in (standard) second resolution. *This request is compatible with legacy IAG and Badger readers*).

RT<space>P (to request Reader time in (precision) millisecond resolution)

Response: The Reader shall respond with a *[Precision] Time Message* (*c.f.* §7.2.21).

7.2.14 Status (SA/SB) Message

Direction: Reader to Lane Controller.

Description: The JANUS MPR2.3 Reader transmits this message to the Lane Controller under the following circumstances:

- In direct response to a *Status* Request (solicited) from the Lane Controller; and/or
- Whenever any of the applicable fields in the *Status Message* have changed, either as a result of a Reader configuration change, or as the result of a change in Reader status due to some event or condition (*e.g.*, channel active to offline, sync error).

Format:

Table 7.2-7: Status (SA/SB) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{SA, SB}	Status Message: • SA = Report from Primary CTM • SB = Report from Secondary CTM
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Reader Active Flag	1 dec	0 – 1	Reader Active Flag: • 0 = inactive, reader not processing tags • 1 = active, reader processing (and reporting) tags *Note: It is recommended that the lane controller assume that the reader CTM that is reporting transponder transaction messages is the active reader.*
Sync Status	1 dec	0 – 1	Synchronization Status: • 0 = no sync error (or sync not configured) • 1 = loss of synchronization (sync cable may be cut) *Setting synchronization off while sync is active does not generate a status message.*
CGC Status	1 dec	0 – 1	CGC Status: • 0 = CGC board operational • 1 = CGC board failure (not responding to health checks)
Separator	1 alnum	'-' <dash>	<dash> character separator
Lane Status	1 alpha	{A, G, O}	Lane Status: • A = Lane Active • G =Lane Guard • O = Lane Off-Line
Reserved	1 dec	0	The Reader shall report a '0' in this field.

Field Name	Length & Format	Range	Contents
Lane Fault	1 dec	0 – 1	Lane Fault Status: • 0 = lane OK • 1 = number of consecutive test tag faults in this lane greater than or equal to SFT
Num Faults	2 dec	00 – 99	Provides a running count of the **total* test tag errors on the RF Channel, consecutive or not. After reaching 99, this field wraps around to 00. *Set to 00 after power-up or reset.*
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §7.1 for details on this field)

Response: No response expected from Lane Controller.

Note: On the Secondary CTM, the first read of a standard tag or test tag will cause a "reader active" status message to be delivered to all Lane Controllers. The Lane Controller associated with the RF Channel on which the tag was read will first receive the Transponder Message first, then the Status Message.

7.2.15 Set Configuration (SC) Message

Direction: Lane Controller to Reader.

Description: Allows a Lane Controller to remotely configure the reader (*if remote configuration is enabled*). Remote configuration can be enabled or disabled via the Reader Configuration Web Interface. If remote configuration is disabled, the *Set Configuration* Message is ignored.

Before sending a* Set Configuration *(SC) message to the JANUS MPR2.3 Reader, the Lane Controller must establish whether the Reader is operating in TRBA Mode or Non-TRBA Mode (see §9.3.1 on how to do this). The JANUS MPR2.3 Reader will ignore any Set Configuration messages that are not congruent with the current mode of operation. Therefore, the Lane Controller must only send the applicable Set Configuration message based on the current Reader operational Mode:

- ***If the Reader is operating in Non-TRBA mode, the Lane Controller must send the Set Configuration message as defined herein.***
- ***If the Reader is operating in TRBA mode, the Lane Controller must send the Set Configuration message as defined in §9.3.8.***

Format: There are two formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode*), as follows:

- ***Non-Multiplexed Reporting Mode:***

  SC<space>[**<global-config>**] [**<lane-config>**]

  Where:

  <global-config> is defined as shown in Table 7.2-8.

  <lane-config> is defined as shown in Table 7.2-9.

- ***Multiplexed Reporting Mode:***

  SC**<channel>**[**<global-config>**] [**<lane-config>**]

  Where:

  <channel> = Serial COM Port / Ethernet Connection Instance = 1 – 8

  <global-config> is defined as shown in Table 7.2-8.

  <lane-config> is defined as shown in Table 7.2-9.

Either global or lane configuration is optional. A lane can thus be reconfigured without modifying global reader parameters. To reconfigure the lane parameters only, the Lane Controller can issue a shorter “SC<space>**<lane-config>**“ command.

Table 7.2-8 defines the Message Elements for the **<global-config>** portion of the *Set Configuration* Message; Table 7.2-9 defines the Message Elements for the **<lane-config>** portion of the *Set Configuration* Message.

Table 7.2-8: Set Configuration (SC) Message <global-config> Elements

Field Name	Length & Format	Range	Contents
TIME	13 dec	MMDDYY <space> HHmmSS	Reader Time
AID	3 dec	000 – 127	Agency identification number.
PID	3 dec	000 – 127	Plaza identification number.
RID	4 dec	0000 – 4095	Reader ID – Traffic Management reader identification number.
TYPE	1 alpha	{M, S, N}	Reader type: • M = primary • S = secondary • N = standalone / non-redundant *This field is included for backwards compatibility only. This field is ignored by the JANUS MPR2.3 Reader.*
SYNC	1 dec	0 – 1	Inter-Reader RF synchronization: • 0 = sync feature disabled • 1 = sync feature enabled (**See Note *1***)
TTO	3 dec	001 – 300	Number of seconds before a transponder can be re-reported.
TMP	1 dec	0 – 1	Traffic Management Programming: • 0 = don't program Traffic Management section with reader ID & timestamp • 1 = program Traffic Management section with reader ID & timestamp
TFRM	1 dec	0 – 3	Specifies handling of transaction field: • 0 = Do not reprogram transaction field. • 1 = reprogram with 16 bit random number. • 2 = reprogram with 16 bit sequential txn number • 3 = reprogram with 8 bit random number and 8 bit sequential number
TTP	2 dec	10 – 99	Number of seconds between test tag interrogations.
SFT	2 dec	01 – 99	Single RF-module fault threshold. Number of consecutive test tag errors before a lane is considered bad.
MFT	1 dec	0 – 8	Multiple RF-module fault threshold. Number of RF modules that must be simultaneously bad (*i.e.* in SFT state) before causing a switchover to the slave reader. Normally set to the number of lanes equipped with test tags.

Field Name	Length & Format	Range	Contents
PTO	1 dec	0 – 9	Protocol time-out. Number of 100 ms time units (less one) in which a ACK must be received before the reader re-transmits a message to the lane controller (9 = 1 second)
Reserved	7 alnum	X (don't care)	*Reserved section ignored by the JANUS MPR2.3 Reader*
CC	1 dec	0 – 1	COM port configuration: • 0 = don't allow remote reader configuration • 1 = allow remote reader configuration

Notes:

(1)- The SYNC field controls the state of the JANUS MPR2.3 Reader parameter *Reader-to-Reader Sync. Enable*. However, it is not sufficient merely to set this field to '1' in order to enable Inter-Reader RF Synchronization. For the Inter-Reader RF Synchronization to be considered *ENABLED*, the following conditions apply:

(a) The JANUS MPR2.3 Reader must have at least one (1) Sync block configured within its Frame Sequence Configuration; *and*

(b) The JANUS MPR2.3 Reader parameter *Reader-to-Reader Sync. Enable* must be enabled.

Inter-Reader RF Synchronization is considered to be *DISABLED* if these two conditions are not met. Please refer to [AD2] for details on how to configure Inter-Reader RF Synchronization on the JANUS MPR2.3 Reader.

Table 7.2-9: Set Configuration (SC) Message <lane-config> Elements

Field Name	Length & Format	Range	Contents
Separator	1 alnum	'-' (<dash>)	A <dash> character separator separates the Global Configuration Elements from the Lane Configuration Elements
LANE ST	1 alpha	{A, G, O}	Lane status: • A = active • G = guard • O = off-line
LANE NUM	2 dec	00 – 31	Lane number programmed into transponder
LANE TTAG	1 dec	0 – 1	Test Tag configuration: • 0 = no Test Tag in lane • 1 = Test Tag in lane
COM ST	1 dec	0 – 1	COM port: • 0 = off-line • 1 = on-line
COM BR	2 dec	{96, 19, 57, 11}	COM port bit rate: • 96 = 9600 bps • 19 = 19200 bps • 57 = 57600 bps • 11 = 115200 bps

Field Name	Length & Format	Range	Contents
COM PA	1 alpha	{N, O, E}	COM port parity: • N = none • O = odd • E = even
COM CS	1 dec	5 – 8	COM port – number of bits per character
COM SB	1 dec	{1, 5, 2}	COM port – number of stop bits (*5 = 1.5 stop bits*)
COM FC	1 alpha	{N, H, X}	COM port flow control: • N = none • H = hardware • X = xon / xoff

Special Note: Range Errors:

A range error in a field of the Set Configuration *message causes the Reader to stop parsing the remainder of the message. The Reader sends no error messages in the event of a range error. A range error encountered during parsing of the host parameters will leave the host port in an off-line state. A range error encountered during parsing of the COM port parameters will leave the COM port in an off-line state.*

Response: [The Reader shall transmit an asynchronous *Status Message* (*c.f.* §7.2.14) to the Lane Controller if and only if the Reader status has changed as a result of the new configuration.]

The Lane Controller can issue a Configuration Request message to the Reader to verify that the settings have been applied.

7.2.16 Vehicle Speed (SP) Message

Direction: Lane Controller to Reader

Description: Sent by the Lane Controller to assist the Reader in determining the optimum voting time.

The message contains the measured speed of a single vehicle going through the specified channel's Capture Zone. *Note that this measurement is provided at some unspecified time after the vehicle is outside the communication zone; the Reader does not use this message to trigger reporting of a tag transaction).*

If configured to do so, the Reader converts the vehicle speed into a voting time that maximizes the use of the Capture Zone. This is performed with a moving average with the number of samples specified in the Reader configuration.

Vehicle Speed messages are optional and are not needed for fixed voting time configurations. *This message is ignored by the Reader if it is configured to use a fixed Voting Time.*

Expected Frequency: The Reader shall support the receipt of this message for every vehicle identified by a Lane Controller.

Format:

Table 7.2-10: Vehicle Speed (SP) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{SP}	Vehicle Speed Message: • SP = Vehicle Speed Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Speed	3 dec	000 – 199	The value of the vehicle speed
Units	3 alpha	{KMH, MPH}	Units of Vehicle Speed Measurement: • KMH = kilometers per hour • MPH = miles per hour

Response: [The Reader will asynchronously transmit a *Voting Time* Message (*c.f.* §7.2.23) to the Lane Controller if the Voting Time changes as a result of any updates in Vehicle Speed.]

7.2.17 Status Request (SR) Message

Direction: Lane Controller to Reader

Description: Used by the Lane Controller in order to obtain the current Reader status.

Note that the Reader may also send Status Messages *asynchronously (*i.e. *at any time) without the Lane Controller having requested it* (see §7.2.14).

Format: There are two formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode*), as follows:

- **Non-Multiplexed Reporting Mode:**

  SR

- **Multiplexed Reporting Mode:**

  SR**<channel>**

  Where **<channel> =** RF channel number (1-8).

  e.g., **SR2** (requests channel 2 status)

Response: The Reader shall respond with a *Status Message* (*c.f.* §7.2.14).

7.2.18 Set Time (ST) Message

Direction: Lane Controller to Reader

Description: This message sets the current Reader time.

Format: ST<space>MMDDYY<space>HHMMSS

Where:

MM = month (01 – 12)

DD = day (01 – 31)

YY = year (70 – 37) [*i.e.* 70 = 1970 … 99 = 1999, 00 = 2000, 01 = 2001, *etc*.]

(Note Badger reader difference: Badger allowed up to 2069)

HH = hour (00 – 23)

MM = minutes (00 – 59)

SS = seconds (00 – 59)

(*Note: HHMMSS Set-Time value is in UTC*)

Response: No response from Reader.

7.2.19 Reader Heartbeat/Sync (SY) Message – Serial

Direction: Reader to Lane Controller

Description: *This message is applicable to the JANUS MPR2.3 Reader – Lane Controller Serial Interface, only. If using the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface, please refer to §8.1.1.* The Reader sends this message asynchronously if the "*Send Heartbeat Messages*" function is enabled. This message will be sent out at configurable periodic intervals (*e.g.* every 2 seconds) if there is no activity on the communications channel.

Format:

Table 7.2-11: Reader Heartbeat/Sync (SY) Message – Serial Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{SY}	Reader Heartbeat Message: • SY = Reader Heartbeat Message
COM Port	1 dec	1 – 8	COM Port Number
Sequence Number	2 dec	00 – 99	A sequence number incremented by the JANUS MPR2.3 Reader between successive Heartbeat/Sync messages.

Response: No response expected from Lane Controller

(Note that this differs from the Sync Message *defined as part of the* Ethernet Interface Message Set *for the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface as described in §8.1.1, where a response message *is* expected.*)

7.2.20 IAG Transponder (TA/TB – Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and the "*Voting Report*" feature is enabled. This message is issued by the Reader after an IAG transponder has been read and assigned to a channel (*i.e.* after voting time expires). The reporting latency can be controlled by adjusting the *Voting Time* and/or the *Reporting Delay Time*.

Format:

Table 7.2-12: IAG Transponder (TA/TB – Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{TA, TB}	IAG Transponder (Majority Voting) Message: • TA = Report from Primary CTM • TB = Report from Secondary CTM
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Transaction Status	1 alpha	{S, F, U, R, X, D, C}	Transaction Status: • S = Successful • F = Programming Failed • U = Programming Unverified • R = Read Only • X = Non-IAG Transponder • D = Decommissioned Transponder • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled.*
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*
Read Section	24 hex	N/A	Contents of IAG transponder read-only section (12 bytes encoded in ASCII HEX = 96 bits)

Field Name	Length & Format	Range	Contents
Pre-write Section	40 hex	N/A	Contents of IAG transponder write section before programming (20 bytes encoded in ASCII HEX = 160 bits)
Post-write Section	40 hex	N/A	Contents of IAG transponder write section if programming is attempted (20 bytes encoded in ASCII HEX = 160 bits)
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §7.1 for details on this field)

Response: No response expected from Lane Controller

7.2.21 [Precision] Time (TM) Message

Direction: Reader to Lane Controller

Description: This message contains the current time stored in the JANUS MPR2.3 Reader, and is the JANUS MPR2.3 Reader response to a *[Precision] Read Time* message (*c.f.* §7.2.13). The standard format of this message is backwards compatible with IAG and Badger Readers. This message supports an optional extended version of the standard *Time* (TM) message. This message now supports the option of reporting the JANUS MPR2.3 Reader time with millisecond resolution.

Format: TM<space>**[P]**MMDDYY<space>HHmmSS**[.sss]**

Where:

MM = month (01 – 12)

DD = day (01 – 31)

YY = year (00 – 99)

HH = hour (00 – 23)

mm = minutes (00 – 59)

SS = seconds (00 – 59)

sss = milliseconds (000 – 999)

(*Note: The **[P]** identifier and **[.sss]** fields are optional and will only be present if a Read Precision Time (*i.e.* `RT<space>P`) command is sent to the Reader. Please refer to the description of the [Precision] Read Time command in §7.2.13 for additional details)

(*Note: The reported **[P]**MMDDYY<space>HHmmSS**[.sss]** time value depends on which time zone the Reader is configured to be in. If NTP is disabled, the Reader will report time in UTC. If NTP is enabled, the Reader will report the time in the configured time-zone)

Response: No response expected from Lane Controller.

7.2.22 Transaction Number Reset (TR) Message

Direction: Lane Controller to Reader

Description: Resets the transaction counter maintained by the JANUS MPR2.3 Reader.

The JANUS MPR2.3 Reader maintains a transaction counter which, by default, is programmed into a 16-bit area of the transponder. The transaction number increments every time the Reader attempts to program a new tag. The first tag programmed after a "*Transaction Reset*" command is transaction number 1.

*Note: The "*Transaction Number Programming*" configuration parameter controls how the transaction number is actually programmed into a transponder.*

Format: TR

Response: No response from Reader.

7.2.23 Voting Time (VT) Message

Direction: Bidirectional (Lane Controller to Reader and/or Reader to Lane Controller, depending on context)

Description: **Lane Controller to Reader:**

The Lane Controller can set a specific voting time by sending this message to the Reader.

Reader to Lane Controller:

This message is issued by the Reader to report a change in the current voting time, as a result of either:

- A User-Initiated and/or Lane Controller directed configuration change; or
- An update to the voting time via the JANUS MPR2.3 Reader dynamic voting algorithm.

Format: There are two Lane Controller to Reader formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode*), as follows:

- **Lane Controller to Reader (Non-Multiplexed Mode):**

  VT<space>[**<value>**]

  Where:

  <value>, if present, instructs the Reader to set a new voting time for the implied channel. The **<value>** field is a 4-digit decimal value with the new voting time in milliseconds between (**0050 – 9999**) milliseconds. A **<value>** of **0000** instructs the Reader to disable voting for lane assignment for the implied channel.

  *Note: If **<value>** is omitted, the Reader shall interpret this as a request from the Lane Controller for the Reader to report the current voting time setting for the implied channel. The Reader shall then respond with a Voting Time Message to report the requested voting time setting.*

- **Lane Controller to Reader (Multiplexed Mode):**

  VT**<channel>**[**<value>**] (new voting time for specific channel)

  Where:

  <channel> specifies the RF channel (**1 – 8**) for which to either set or request the voting time;

  <value>, if present, instructs the Reader to set a new voting time for the specified **<channel>**. The **<value>** field is a 4-digit decimal value with the new voting time in milliseconds between (**0050 – 9999**) milliseconds. A **<value>** of **0000** instructs the Reader to disable voting for lane assignment for the specified **<channel>**.

  *Note: If **<value>** is omitted, the Reader shall interpret this as a request from the Lane Controller for the Reader to report the current voting time setting for the specified **<channel>**. The Reader shall then respond with a Voting Time Message to report the requested voting time setting.*

- **Reader to Lane Controller:**

  The Reader to Lane Controller *Voting Time* message format is show in Table 7.2-13.

Table 7.2-13: Voting Time (VT) Message Format – Reader to Lane Controller

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{VT}	Voting Time Message: • VT = Voting Time Message (*Reader is reporting a change in voting time*)
RF Channel	1 dec	1 – 8	RF Channel Number
Voting Time	4 dec	{0000, 0050 – 9999}	A 4-digit decimal value with the new voting time in milliseconds (between **'0050'** – **'9999'** ms). A '0000' indicates that voting for lane assignment is disabled.

Response:

- **Lane Controller to Reader:**

  [If the **<value>** field is present in the Lane Controller Request, the Reader shall asynchronously transmit a *Voting Time Message* (*c.f.* Table 7.2-13) to the Lane Controller if the new Voting Time is different from the current setting.]

  [If the **<value>** field is absent from the Lane Controller Request, the Reader shall asynchronously transmit a *Voting Time Message* (*c.f.* Table 7.2-13) to the Lane Controller indicating the current voting time setting.]

- **Reader to Lane Controller:**

  No response expected from Lane Controller.

7.2.24 IAG Transponder (100 – RFP Compliant) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Use RFP-Compliant Message Format*" feature is enabled. This message is issued by the Reader after an IAG transponder has been read and assigned to a channel (*i.e.* after voting time expires). The reporting latency can be controlled by adjusting the *Voting Time* and/or the *Reporting Delay Time*.

(There are several issues regarding incompatibilities and/or "conflicts" between the data as stored on the Transponder and the data as reported in this message. See the relevant notes at the end of Table 7.2-14 for more information.)

Format: *Note: For the* "Type" *column shown in Table 7.2-14, the* "Type*" values indicated fall into two categories:*

- *"A" – Alphanumeric; and*
- *"N" - Numeric*

Table 7.2-14: IAG Transponder (100 - RFP Compliant) Message Format

Field Name	Length	Format	Type	Values
Message Identifier	3	999	N	100 = Transponder Message (format 1)
Message Type	1	X	A	• R = Real-Time Message (tag has just gone through lane) • B = Buffered Message (report is from transaction buffer)
Channel	1	9	N	Channel number (1 – 8)
Antenna Number	2	99	N	00 – 31
Transaction Number	4	9999	N	Same value as reported in post-write section. ***(See Note *1*)***
Txn Day	3	DDD	N	001 – 366
Txn Year	2	YY	N	92 – 90
Txn Time	6	HHMMSS	N	Transaction time
RSE Component ID	4	9999	N	RSE Component Location (Reader ID)
RSE Identification	8	XXXXXXXX	A	RSE factory identification
Read Status	1	X	A	• N = Normal • X = Non-IAG / un-programmed OBU • D = Decommissioned
Write Status	1	X	A	• S = OBU successful write • F = OBU failed write • U = OBU unverified write • X = not attempted (e.g. read only mode)
Unused	1	X	A	0
Read Performance	2	99	N	00 – 99 = Total handshakes for previous transaction
Unused	2	99	N	00
Write Performance	2	99	N	00 – 99 = Number of successful program attempts (usually 01).

Field Name	Length	Format	Type	Values
OBU Section				
OBU Type	1	X	A	• I = Interior OBU / FPT • L = Exterior LPT / Exterior OBU • R = Exterior FPT (roof-mount) • C = CVO • F = Feedback OBU
Application ID	1	X	A	• T = Tolls (tag encoding 1) • O = other (tag encoding other than 1)
Group ID	2	99	N	65 (IAG group)
Operator/ Consortia ID	3	999	N	000 – 999 (“agency ID”)
Serial Number	8	99999999	N	00000001 – 99999999
Check Digit	1	9	N	0 – 9 (over operator ID & serial number) ***(See Note *2*)***
Vehicle Type	1	X	A	• A = Undefined • B = Automobile • C = Motorcycle • D = Pickup Truck • E = Van (seats 1-9) • F = Minibus (seats 10-15) • G = Bus (seats 16 or over) • H = Recreational Vehicle • I = Truck • J = Auto Transporter (65ft or under) • K = Auto Transporter (over 65ft) • L = Tractor w/single trailer (<= 48ft) • M = Tractor w/single trailer (> 48ft) • N = Tractor w/dual trailers (each <= 28.5ft) • O = Tractor w/dual trailers (each > 28.5ft) • P = Tractor w/dual trailers (one <=28.5ft, other > 28.5ft) • Q = Undefined • R = Tractor / Mobile Home Combination • S and higher = Undefined *Undefined values in the field that result in a field value higher than ‘Z’ shall be clamped to ‘Z’.*
Vehicle Profile	1	X	A	• 0 = (<= 7000lbs) / Single Rear Tires • 1 = (<= 7000lbs) / Dual Rear Tires • 2 = (> 7000lbs) / Single Rear Tires • 3 = (> 7000lbs) / Dual Rear Tires
Vehicle Axles	1	X	A	0 – 9, A – F (*i.e.* A single Hexadecimal digit)
Revenue Type	1	X	N	0 – 9

Field Name	Length	Format	Type	Values
Operator Data	5	99999	N	00000 – 99999 ***(See Note *3*)***
Pre-Write Data Section				
RSE Component ID	4	9999	N	0000 – 9999
Julian Date	3	DDD	N	001 – 366 traffic management
TM Hour	2	HH	N	00 – 23 traffic management
TM Minute	2	MM	N	00 – 59 traffic management
TM Second	2	SS	N	00 – 59 traffic management
Operator / Consortia ID	3	999	N	000 – 999 (agency ID)
Plaza ID	2	99	N	00 – 99 ***(See Note *4*)***
Lane ID	2	99	N	00 – 29
Julian Date	3	DDD	N	001 – 366
Hour	2	HH	N	00 – 23
Minute	2	MM	N	00 – 59
Second	2	SS	N	00 – 59
Transaction Number	4	9999	N	0000 – 9999 ***(See Note *1*)***
Vehicle Type	1	X	A	• A = Undefined • B = Automobile • C = Motorcycle • D = Pickup Truck • E = Van (seats 1-9) • F = Minibus (seats 10-15) • G = Bus (seats 16 or over) • H = Recreational Vehicle • I = Truck • J = Auto Transporter (65ft or under) • K = Auto Transporter (over 65ft) • L = Tractor w/single trailer (<= 48ft) • M = Tractor w/single trailer (> 48ft) • N = Tractor w/dual trailers (each <= 28.5ft) • O = Tractor w/dual trailers (each > 28.5ft) • P = Tractor w/dual trailers (one <=28.5ft, other > 28.5ft) • Q = Undefined • R = Tractor / Mobile Home Combination • S and higher = Undefined *Undefined values in the field that result in a field value higher than ‘Z’ shall be clamped to ‘Z’.*

Field Name	Length	Format	Type	Values
Vehicle Profile	1	X	A	• 0 = (<= 7000lbs) / Single Rear Tires • 1 = (<= 7000lbs) / Dual Rear Tires • 2 = (> 7000lbs) / Single Rear Tires • 3 = (> 7000lbs) / Dual Rear Tires
Vehicle Axles	1	X	A	0 – 9, A – F (*i.e.* A single Hexadecimal digit)
Value or Trips	5	$$$cc	N	00000 – 99999
Checksum	4	XXXX	A	0000 – FFFF ***(See Note *5*)***
Post-Write Data Section				
RSE Component ID	4	9999	N	0000 – 9999
Julian Date	3	DDD	N	001 – 366 traffic management
TM Hour	2	HH	N	00 – 23 traffic management
TM Minute	2	MM	N	00 – 59 traffic management
TM Second	2	SS	N	00 – 59 traffic management
Operator / Consortia ID	3	999	N	000 – 999 (agency ID)
Plaza ID	2	99	N	00 – 99 ***(See Note *4*)***
Lane ID	2	99	N	00 – 29
Julian Date	3	DDD	N	001 – 366
Hour	2	HH	N	00 – 23
Minute	2	MM	N	00 – 59
Second	2	SS	N	00 – 59
Transaction Number	4	9999	N	0000 – 9999 ***(See Note *1*)***

Field Name	Length	Format	Type	Values
Vehicle Type	1	X	A	• A = Undefined • B = Automobile • C = Motorcycle • D = Pickup Truck • E = Van (seats 1-9) • F = Minibus (seats 10-15) • G = Bus (seats 16 or over) • H = Recreational Vehicle • I = Truck • J = Auto Transporter (65ft or under) • K = Auto Transporter (over 65ft) • L = Tractor w/single trailer (<= 48ft) • M = Tractor w/single trailer (> 48ft) • N = Tractor w/dual trailers (each <= 28.5ft) • O = Tractor w/dual trailers (each > 28.5ft) • P = Tractor w/dual trailers (one <=28.5ft, other > 28.5ft) • Q = Undefined • R = Tractor / Mobile Home Combination • S and higher = Undefined *Undefined values in the field that result in a field value higher than 'Z' shall be clamped to 'Z'.*
Vehicle Profile	1	X	A	• 0 = (<= 7000lbs) / Single Rear Tires • 1 = (<= 7000lbs) / Dual Rear Tires • 2 = (> 7000lbs) / Single Rear Tires • 3 = (> 7000lbs) / Dual Rear Tires
Vehicle Axles	1	X	A	0 – 9, A – F (*i.e.* A single Hexadecimal digit)
Value or Trips	5	$$$cc	N	00000 – 99999
Checksum	4	XXXX	A	0000 – FFFF ***(See Note *5*)***

Notes:

(1) - Current Transponders have a 16-bit field for encoding the "Transaction Number", resulting in a 5-digit decimal reporting range up to a maximum value of 65535. The RFP-Compliant Format requires a 4-digit decimal reporting range. This field is currently populated with the four (4) least significant decimal digits of the Transponder Transaction Number.

(2) - This field is populated with a standard Luhn check-digit applied over the three (3) digits of the Operator/Consortia ID, followed by the eight (8) digits of the Transponder Serial Number.

(3) - The current Agency Data field is a 31-bit value, allowing a value from 0 to 2147483647. The RFP-Compliant Format states that the format of this field is five (5) decimal digits, allowing a range of values only from 00000 – 99999. This field is currently populated with the five (5) least-significant decimal digits of the Transponder Agency Data Field.

(4) - The current Plaza ID field encoding size is 7 bits, resulting in a 3-digit decimal reporting range of 000 – 127. The RFP-Compliant format, however, defines only a 2-digit reporting range. This field is currently clamped to values between 00 – 99 (*i.e.* values higher than 99 are reported as 99).

(5) - The Checksum value is computed over the contents of the relevant section data (i.e. Pre-Write Data Section / Post-Write Data Section) and is computed by using the 16-bit CCITT CRC polynomial:

$$G(x) = x^{16} + x^{12} + x^{5} + 1$$

consistent with the current ETC subsystem, converted to the 4-byte ASCII Hexadecimal equivalent (*i.e.* 0000 – FFFF).

Response: No response expected from Lane Controller.

7.2.25 IAG Initial Read (101 – RFP Compliant) Message

Direction: Reader to Lane Controller

Description: This message applies when both the "*Use RFP-Compliant Message Format*" and the "*Generate Initial Report*" configuration parameter options are enabled on the JANUS MPR2.3 Reader. This message is an optional informational message sent to the Lane Controller when the transponder first enters the capture zone. This message is generated for both "*Majority*" and "*Interpolated*" voting. *Note that the initial read channel may differ from the transaction report generated at voting time.*

(There are several issues regarding incompatibilities and/or "conflicts" between the data as stored on the Transponder and the data as reported in this message. See the relevant notes at the end of Table 7.2-15 for more information.)

Format: *Note: For the* "Type" *column shown in Table 7.2-15, the* "Type" *values indicated fall into two categories:*

- *"A" – Alphanumeric; and*
- *"N" – Numeric*

Table 7.2-15: IAG Initial Read (101 – RFP Compliant) Message Format

Field Name	Length	Format	Type	Values
Message Identifier	3	999	N	101 = Initial Read / Capture Zone Entry (informational, optional)
Message Type	1	X	A	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Channel	1	9	N	Channel number (1 – 8)
Antenna Number	2	99	N	00 – 31
Transaction Number	4	9999	N	Transponder Transaction Number ***(See Note *1*)***
Txn Day	3	DDD	N	001 – 366
Txn Year	2	YY	N	92 – 90
Txn Time	6	HHMMSS	N	Transaction time
RSE Component ID	4	9999	N	RSE Component Location (Reader ID)
RSE Identification	8	XXXXXXXX	A	RSE factory identification
Read Status	1	X	A	N = Normal
Write Status	1	X	A	X = not attempted (e.g. read only mode)
Unused	1	X	A	0
Read Performance	2	99	N	00 – 99 = Total handshakes for previous transaction
Unused	2	99	N	00
Write Performance	2	99	N	00 – 99 = Number of successful program attempts (usually 00).

Field Name	Length	Format	Type	Values
OBU Section				
OBU Type	1	X	A	• I = Interior OBU / FPT • L = Exterior LPT / Exterior OBU • R = Exterior FPT (roof-mount) • C = CVO • F = Feedback OBU
Application ID	1	X	A	• T = Tolls (tag encoding 1) • O = other (tag encoding other than 1)
Group ID	2	99	N	65 (IAG group)
Operator/ Consortia ID	3	999	N	000 – 999 (“agency ID”)
Serial Number	8	99999999	N	00000001 – 99999999
Check Digit	1	9	N	0 – 9 (over operator ID & serial number) ***(See Note *2*)***
Vehicle Type	1	X	A	• A = Undefined • B = Automobile • C = Motorcycle • D = Pickup Truck • E = Van (seats 1-9) • F = Minibus (seats 10-15) • G = Bus (seats 16 or over) • H = Recreational Vehicle • I = Truck • J = Auto Transporter (65ft or under) • K = Auto Transporter (over 65ft) • L = Tractor w/single trailer (<= 48ft) • M = Tractor w/single trailer (> 48ft) • N = Tractor w/dual trailers (each <= 28.5ft) • O = Tractor w/dual trailers (each > 28.5ft) • P = Tractor w/dual trailers (one <=28.5ft, other > 28.5ft) • Q = Undefined • R = Tractor / Mobile Home Combination • S and higher = Undefined *Undefined values in the field that result in a field value higher than ‘Z’ shall be clamped to ‘Z’.*
Vehicle Profile	1	X	A	• 0 = (<= 7000lbs) / Single Rear Tires • 1 = (<= 7000lbs) / Dual Rear Tires • 2 = (> 7000lbs) / Single Rear Tires • 3 = (> 7000lbs) / Dual Rear Tires
Vehicle Axles	1	X	A	0 – 9, A – F (*i.e.* A single Hexadecimal digit)
Revenue Type	1	X	N	0 – 9

Field Name	Length	Format	Type	Values
Operator Data	5	99999	N	00000 – 99999 ***(See Note *3*)***
Pre-Write Data Section				
RSE Component ID	4	9999	N	0000 – 9999
Julian Date	3	DDD	N	001 – 366 traffic management
TM Hour	2	HH	N	00 – 23 traffic management
TM Minute	2	MM	N	00 – 59 traffic management
TM Second	2	SS	N	00 – 59 traffic management
Operator / Consortia ID	3	999	N	000 – 999 (agency ID)
Plaza ID	2	99	N	00 – 99 ***(See Note *4*)***
Lane ID	2	99	N	00 – 29
Julian Date	3	DDD	N	001 – 366
Hour	2	HH	N	00 – 23
Minute	2	MM	N	00 – 59
Second	2	SS	N	00 – 59
Transaction Number	4	9999	N	0000 – 9999 ***(See Note *1*)***
Vehicle Type	1	X	A	• A = Undefined • B = Automobile • C = Motorcycle • D = Pickup Truck • E = Van (seats 1-9) • F = Minibus (seats 10-15) • G = Bus (seats 16 or over) • H = Recreational Vehicle • I = Truck • J = Auto Transporter (65ft or under) • K = Auto Transporter (over 65ft) • L = Tractor w/single trailer (<= 48ft) • M = Tractor w/single trailer (> 48ft) • N = Tractor w/dual trailers (each <= 28.5ft) • O = Tractor w/dual trailers (each > 28.5ft) • P = Tractor w/dual trailers (one <=28.5ft, other > 28.5ft) • Q = Undefined • R = Tractor / Mobile Home Combination • S and higher = Undefined *Undefined values in the field that result in a field value higher than 'Z' shall be clamped to 'Z'.*

Field Name	Length	Format	Type	Values
Vehicle Profile	1	X	A	• 0 = (<= 7000lbs) / Single Rear Tires • 1 = (<= 7000lbs) / Dual Rear Tires • 2 = (> 7000lbs) / Single Rear Tires • 3 = (> 7000lbs) / Dual Rear Tires
Vehicle Axles	1	X	A	0 – 9, A – F (*i.e.* A single Hexadecimal digit)
Value or Trips	5	$$$cc	N	00000 – 99999
Checksum	4	XXXX	A	0000 – FFFF ***(See Note *5*)***

Notes:

(1) - Current Transponders have a 16-bit field for encoding the "Transaction Number", resulting in a 5-digit decimal reporting range up to a maximum value of 65535. The RFP-Compliant Format requires a 4-digit decimal reporting range. This field is currently populated with the four (4) least significant decimal digits of the Transponder Transaction Number.

(2) - This field is populated with a standard Luhn check-digit applied over the three (3) digits of the Operator/Consortia ID, followed by the eight (8) digits of the Transponder Serial Number.

(3) - The current Agency Data field is a 31-bit value, allowing a value from 0 to 2147483647. The RFP-Compliant Format states that the format of this field is five (5) decimal digits, allowing a range of values only from 00000 – 99999. This field is currently populated with the five (5) least-significant decimal digits of the Transponder Agency Data Field.

(4) - The current Plaza ID field encoding size is 7 bits, resulting in a 3-digit decimal reporting range of 000 – 127. The RFP-Compliant format, however, defines only a 2-digit reporting range. This field is currently clamped to values between 00 – 99 (*i.e.* values higher than 99 are reported as 99).

(5) - The Checksum value is computed over the contents of the relevant section data (i.e. Pre-Write Data Section / Post-Write Data Section) and is computed by using the 16-bit CCITT CRC polynomial:

$$G(x) = x^{16} + x^{12} + x^{5} + 1$$

consistent with the current ETC subsystem, converted to the 4-byte ASCII Hexadecimal equivalent (*i.e.* 0000 – FFFF).

Response: No response expected from Lane Controller.

7.2.26 IAG Post Capture (102 – RFP compliant) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Use RFP-Compliant Message Format*" feature is enabled. This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of an IAG transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post capture messages are buffered.

(There are several issues regarding incompatibilities and/or "conflicts" between the data as stored on the Transponder and the data as reported in this message. See the relevant notes at the end of Table 7.2-15 for more information.)

Format: *Note: For the* "Type" *column shown in Table 7.2-15, the* "Type" *values indicated fall into two categories:*

- *"A" – Alphanumeric; and*
- *"N" – Numeric*

Table 7.2-16: IAG Post Capture (102 - RFP Compliant) Message Format

Field Name	Length	Format	Type	Values
Message Identifier	3	999	N	102 = Post Capture Zone Report (informational, optional)
Message Type	1	X	A	• R = Real-Time Message (tag has just gone through lane) • B = Buffered Message (report is from transaction buffer)
Channel	1	9	N	Channel number (1 – 8)
Antenna Number	2	99	N	00 – 31
Transaction Number	4	9999	N	Same value as reported in post-write section. ***(See Note *1*)***
Txn Day	3	DDD	N	001 – 366
Txn Year	2	YY	N	92 – 90
Txn Time	6	HHMMSS	N	Transaction time
RSE Component ID	4	9999	N	RSE Component Location (Reader ID)
RSE Identification	8	XXXXXXXX	A	RSE factory identification
Read Status	1	X	A	• N = Normal • X = Non-IAG / un-programmed OBU • D = Decommissioned
Write Status	1	X	A	• S = OBU successful write • F = OBU failed write • U = OBU unverified write • X = not attempted (e.g. read only mode)
Unused	1	X	A	0
Read Performance	2	99	N	00 – 99 = Total handshakes for previous transaction
Unused	2	99	N	00

Field Name	Length	Format	Type	Values
Write Performance	2	99	N	00 – 99 = Number of successful program attempts (usually 01).
OBU Section				
OBU Type	1	X	A	• I = Interior OBU / FPT • L = Exterior LPT / Exterior OBU • R = Exterior FPT (roof-mount) • C = CVO • F = Feedback OBU
Application ID	1	X	A	• T = Tolls (tag encoding 1) • O = other (tag encoding other than 1)
Group ID	2	99	N	65 (IAG group)
Operator/ Consortia ID	3	999	N	000 – 999 ("agency ID")
Serial Number	8	99999999	N	00000001 – 99999999
Check Digit	1	9	N	0 – 9 (over operator ID & serial number) ***(See Note *2*)***
Vehicle Type	1	X	A	• A = Undefined • B = Automobile • C = Motorcycle • D = Pickup Truck • E = Van (seats 1-9) • F = Minibus (seats 10-15) • G = Bus (seats 16 or over) • H = Recreational Vehicle • I = Truck • J = Auto Transporter (65ft or under) • K = Auto Transporter (over 65ft) • L = Tractor w/single trailer (<= 48ft) • M = Tractor w/single trailer (> 48ft) • N = Tractor w/dual trailers (each <= 28.5ft) • O = Tractor w/dual trailers (each > 28.5ft) • P = Tractor w/dual trailers (one <=28.5ft, other > 28.5ft) • Q = Undefined • R = Tractor / Mobile Home Combination • S and higher = Undefined *Undefined values in the field that result in a field value higher than 'Z' shall be clamped to 'Z'.*
Vehicle Profile	1	X	A	• 0 = (<= 7000lbs) / Single Rear Tires • 1 = (<= 7000lbs) / Dual Rear Tires • 2 = (> 7000lbs) / Single Rear Tires • 3 = (> 7000lbs) / Dual Rear Tires

Field Name	Length	Format	Type	Values
Vehicle Axles	1	X	A	0 – 9, A – F (*i.e.* A single Hexadecimal digit)
Revenue Type	1	X	N	0 – 9
Operator Data	5	99999	N	00000 – 99999 ***(See Note *3*)***
Pre-Write Data Section				
RSE Component ID	4	9999	N	0000 – 9999
Julian Date	3	DDD	N	001 – 366 traffic management
TM Hour	2	HH	N	00 – 23 traffic management
TM Minute	2	MM	N	00 – 59 traffic management
TM Second	2	SS	N	00 – 59 traffic management
Operator / Consortia ID	3	999	N	000 – 999 (agency ID)
Plaza ID	2	99	N	00 – 99 ***(See Note *4*)***
Lane ID	2	99	N	00 – 29
Julian Date	3	DDD	N	001 – 366
Hour	2	HH	N	00 – 23
Minute	2	MM	N	00 – 59
Second	2	SS	N	00 – 59
Transaction Number	4	9999	N	0000 – 9999 ***(See Note *1*)***
Vehicle Type	1	X	A	• A = Undefined • B = Automobile • C = Motorcycle • D = Pickup Truck • E = Van (seats 1-9) • F = Minibus (seats 10-15) • G = Bus (seats 16 or over) • H = Recreational Vehicle • I = Truck • J = Auto Transporter (65ft or under) • K = Auto Transporter (over 65ft) • L = Tractor w/single trailer (<= 48ft) • M = Tractor w/single trailer (> 48ft) • N = Tractor w/dual trailers (each <= 28.5ft) • O = Tractor w/dual trailers (each > 28.5ft) • P = Tractor w/dual trailers (one <=28.5ft, other > 28.5ft) • Q = Undefined • R = Tractor / Mobile Home Combination • S and higher = Undefined *Undefined values in the field that result in a field value higher than 'Z' shall be clamped to 'Z'.*

Field Name	Length	Format	Type	Values
Vehicle Profile	1	X	A	• 0 = (<= 7000lbs) / Single Rear Tires • 1 = (<= 7000lbs) / Dual Rear Tires • 2 = (> 7000lbs) / Single Rear Tires • 3 = (> 7000lbs) / Dual Rear Tires
Vehicle Axles	1	X	A	0 – 9, A – F (*i.e.* A single Hexadecimal digit)
Value or Trips	5	$$$cc	N	00000 – 99999
Checksum	4	XXXX	A	0000 – FFFF ***(See Note *5*)***
Post-Write Data Section				
RSE Component ID	4	9999	N	0000 – 9999
Julian Date	3	DDD	N	001 – 366 traffic management
TM Hour	2	HH	N	00 – 23 traffic management
TM Minute	2	MM	N	00 – 59 traffic management
TM Second	2	SS	N	00 – 59 traffic management
Operator / Consortia ID	3	999	N	000 – 999 (agency ID)
Plaza ID	2	99	N	00 – 99 ***(See Note *4*)***
Lane ID	2	99	N	00 – 29
Julian Date	3	DDD	N	001 – 366
Hour	2	HH	N	00 – 23
Minute	2	MM	N	00 – 59
Second	2	SS	N	00 – 59
Transaction Number	4	9999	N	0000 – 9999 ***(See Note *1*)***

Field Name	Length	Format	Type	Values
Vehicle Type	1	X	A	• A = Undefined • B = Automobile • C = Motorcycle • D = Pickup Truck • E = Van (seats 1-9) • F = Minibus (seats 10-15) • G = Bus (seats 16 or over) • H = Recreational Vehicle • I = Truck • J = Auto Transporter (65ft or under) • K = Auto Transporter (over 65ft) • L = Tractor w/single trailer (<= 48ft) • M = Tractor w/single trailer (> 48ft) • N = Tractor w/dual trailers (each <= 28.5ft) • O = Tractor w/dual trailers (each > 28.5ft) • P = Tractor w/dual trailers (one <=28.5ft, other > 28.5ft) • Q = Undefined • R = Tractor / Mobile Home Combination • S and higher = Undefined *Undefined values in the field that result in a field value higher than 'Z' shall be clamped to 'Z'.*
Vehicle Profile	1	X	A	• 0 = (<= 7000lbs) / Single Rear Tires • 1 = (<= 7000lbs) / Dual Rear Tires • 2 = (> 7000lbs) / Single Rear Tires • 3 = (> 7000lbs) / Dual Rear Tires
Vehicle Axles	1	X	A	0 – 9, A – F (*i.e.* A single Hexadecimal digit)
Value or Trips	5	$$$cc	N	00000 – 99999
Checksum	4	XXXX	A	0000 – FFFF ***(See Note *5*)***

Notes:

(1) - Current Transponders have a 16-bit field for encoding the "Transaction Number", resulting in a 5-digit decimal reporting range up to a maximum value of 65535. The RFP-Compliant Format requires a 4-digit decimal reporting range. This field is currently populated with the four (4) least significant decimal digits of the Transponder Transaction Number.

(2) - This field is populated with a standard Luhn check-digit applied over the three (3) digits of the Operator/Consortia ID, followed by the eight (8) digits of the Transponder Serial Number.

(3) - The current Agency Data field is a 31-bit value, allowing a value from 0 to 2147483647. The RFP-Compliant Format states that the format of this field is five (5) decimal digits, allowing a range of values only from 00000 – 99999. This field is currently populated with the five (5) least-significant decimal digits of the Transponder Agency Data Field.

(4) - The current Plaza ID field encoding size is 7 bits, resulting in a 3-digit decimal reporting range of 000 – 127. The RFP-Compliant format, however, defines only a 2-digit reporting range. This field is currently clamped to values between 00 – 99 (*i.e.* values higher than 99 are reported as 99).

(5) - The Checksum value is computed over the contents of the relevant section data (i.e. Pre-Write Data Section / Post-Write Data Section) and is computed by using the 16-bit CCITT CRC polynomial:

$$G(x) = x^{16} + x^{12} + x^{5} + 1$$

consistent with the current ETC subsystem, converted to the 4-byte ASCII Hexadecimal equivalent (*i.e.* 0000 – FFFF).

Response: No response expected from Lane Controller.

8. JANUS MPR2.3 READER – LANE CONTROLLER ETHERNET INTERFACE – MESSAGE SET

This section describes specific JANUS MPR2.3 Reader – Lane Controller Ethernet Interface application messages used for communication between the JANUS MPR2.3 Reader and the Lane Controller over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface.

The *Ethernet Interface Message Set* deals with specific messaging used over the JANUS MPR2.3 Reader – Lane Controller Ethernet Interface that differs from the *Basic Message Set* (which was originally conceived to support the IAG Protocol over a legacy serial interface).

8.1 JANUS MPR2.3 Reader – Lane Controller Ethernet Interface Messages

8.1.1 Sync (SY) Message – Ethernet

Direction: Reader to Lane Controller

Description: Message sent to all Lane Controllers that are configured to communicate via the JANUS MPR2.3 Reader – Lane Controller Ethernet interface.

This message shall be sent periodically to ensure that the Lane Controller software is still alive. This message will be sent to the Lane Controller if there has been no message sent to the Lane Controller for at least one (1) second.

The Reader shall increment its own sequence numbers between successful *Sync Message* exchanges (see example below). The Lane Controller shall echo the sequence number that it receives.

Format:

Table 8.1-1: Sync (SY) Message – Ethernet Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	SY	SY = Sync Message
<instance>	1 dec	1 – 8	Lane controller destination instance – for internal Reader use only
<sequence number>	2 dec	00 – 99	A number incremented by the JANUS Reader between successful Sync messages

Response: The Lane Controller shall echo in its entirety, any *Sync Message* it receives back to the JANUS Reader within the configured Lane Controller Ethernet TCP-Socket Timeout period.

(Note that this differs from the Heartbeat/Sync Message *defined as part of the* Basic Message Set *for the JANUS MPR2.3 Reader Lane Controller – Serial Interface as described in §7.2.19, where a response message *is not* expected.*)

Example: A typical sequence of *Sync Messages* between a JANUS MPR2.3 Reader and an Ethernet connected Lane Controller would appear as shown in Figure 8.1-1:

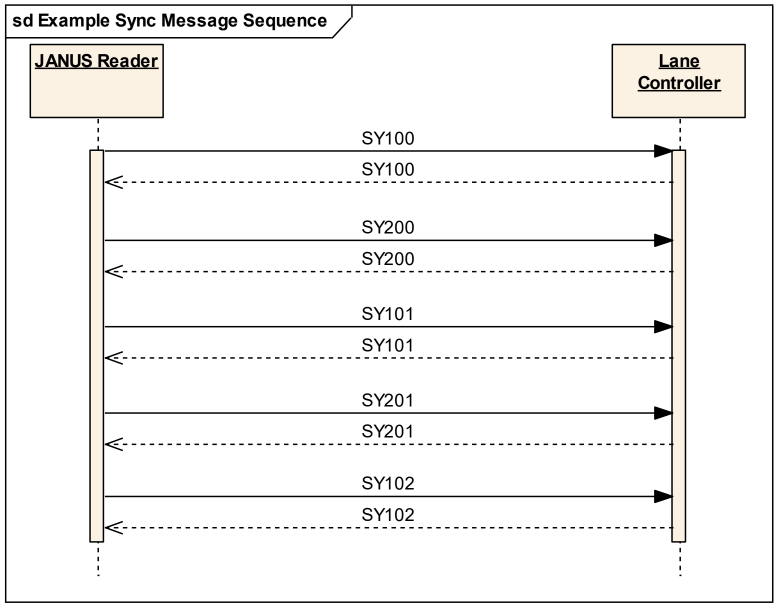

Figure 8.1-1: Example Sync Message Sequence

9. TOLL RATE / BALANCE ADJUSTMENT MESSAGE SET

This section describes the messages that are supported by the JANUS MPR2.3 Reader – Lane Controller Serial and Ethernet Interfaces that are used to control the JANUS MPR2.3 Reader TRBA functionality. Described in this section are:

- *Toll Rate Balance Adjustment Messages*: Messages that have been defined to support configuration and control of Toll Rate / Balance Adjustment functionality (See §11.1 for details).
- *Modified JANUS MPR2.3 Reader Messages*: Messages that have modified formats (for backwards compatibility purposes) when the JANUS MPR2.3 Reader is operating in Toll Rate / Balance Adjustment Mode (See §9.2 for details).

9.1 Toll Rate / Balance Adjustment Messages

9.1.1 Balance Adjustment Transfer Initiate (B1) Message

Direction: Lane Controller to Reader

Frequency: Once per nightly batch download attempt. A new attempt means re-loading the entire Balance Adjustment Table.

Description: This message is used by the Lane Controller to initiate the nightly transfer of the JANUS MPR2.3 Reader Balance Adjustment Table. The “File Date” field is treated as the version identifier of the Balance Adjustment Table (updated when the download completes).

The B1 Balance Adjust Transfer Initiate message is used for the nightly (sparse or dense) download only. ***The download may only be initiated between midnight and 5am*** (such that the download is completed before the morning rush hour). ***The JANUS MPR2.3 Reader will reject any B1 Balance Adjust Transfer Initiate requests outside of the midnight – 5am time window.***

Once a Balance Adjustment Table transfer has been initiated on a given COM Port / Ethernet Connection Instance, the download must continue on the given COM Port / Ethernet Connection Instance. To switch COM Ports / Ethernet Connection Instances, the Lane Controller must terminate the transfer, and initiate a transfer on another COM port / Ethernet Connection Instance.

Format:

Table 9.1-1: Balance Adjustment Table Transfer Initiate (B1) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	B1	B1 = Balance Adjustment Table Transfer Initiate Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format A
Total Entries	7 dec	0000000 – 2000000	Total number of transponder entries to be transmitted
Last Tag ID	6 hex	000000 – FFFFFF	Highest numbered tag ID to be transferred in all subsequent B2 (sparse / dense format) messages.

Field Name	Length & Format	Range	Contents
File Date	6 dec	MMDDYY	Date of the file to be transferred to the Reader.

Response: [If an error condition is detected, the JANUS MPR2.3 Reader will respond with a B3 (Balance Adjustment Table Transfer Control) message within 500 ms. The B3 message "Action Code" field will be set to "Reject", and the "Reason Code" field will indicate the error number. See §9.1.5 for details.]

9.1.2 Balance Adjustment Record (B2 – Real Time Format) Message

Direction: Lane Controller to Reader

Description: Used by the Lane Controller to transfer one or more transponder Balance Adjustment Entries at any time throughout the day (*i.e.* other than during a nightly download). For example, this could be a result of a cash payment at the business center (adjust balance), or a report of a stolen tag (clear balance).

The transponder Ids in the Real-Time Format message need not be consecutive or numerically ordered; the JANUS MPR2.3 Reader will NOT clear intervening entries. ***B2 Real-Time Balance Adjustment Record messages are NOT framed with B1/B3 messages.***

Format:

Table 9.1-2: Balance Adjustment Record (B2 – Real-Time) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	B2	B2 = Balance Adjustment Record Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format Code A – Real-Time Format
Num. Entries (N)	2 dec	00 – 10	Number of Balance Adjustment Table entries in this record
Tag ID 1	6 hex	000000 – FFFFFF	Tag ID of Adjustment 1
Adjustment 1	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for Tag ID 1 (See §5.5.2.4 for format)
Tag ID 2	6 hex	000000 – FFFFFF	Tag ID of Adjustment 2
Adjustment 2	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for Tag ID 2 (See §5.5.2.4 for format)
…	…	…	…
Tag ID N	6 hex	000000 – FFFFFF	Tag ID of Adjustment *N* (where *N* = 10 max.)
Adjustment N	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for Tag ID *N* (where *N* = 10 max.) (See §5.5.2.4 for format)

Response: [If an error condition is detected, the JANUS MPR2.3 Reader will respond with a B3 (Balance Adjustment Table Transfer Control) message within 500 ms. The B3 message “Action Code” field will be set to “Reject”, and the “Reason Code“ field will indicate the error number. See §9.1.5 for details.]

9.1.3 Balance Adjustment Record (B2 – Dense Format) Message

Direction: Lane Controller to Reader

Description: This message is used by the Lane Controller to transfer a block of ***consecutive*** Balance Adjustment Table entries during the nightly transfer (*which must have been previously initiated with a B1 message*). A transfer may contain a mix of Sparse Format B2 and Dense Format B2 messages; ***Real-Time Format B2 messages are disallowed during a nightly transfer operation.***

This message will be sent by the Lane Controller at a frequency of up to approximately 105,000 times during the nightly transfer (assuming 2,000,000 entries transferred, at 19 entries per message).

The starting Tag ID must be greater than, but not necessarily consecutive with, the last Tag ID for which data was received (via either a Dense Format or Sparse Format B2 message).

The JANUS MPR2.3 Reader will automatically clear its Balance Adjustment Table entries as follows:

- The first Dense Format B2 message after a transfer initiate (B1): the Reader clears all entries from the start of the Balance Adjustment Table to the entry prior to the first specified Tag ID.
- For subsequent Dense Format B2 messages: the Reader clears entries from the last updated Tag ID to the entry prior to the specified starting Tag ID. ***Within a Dense Format B2 message there is no clearing of Balance Adjustment Table Entries***.
- When a transfer terminate (B3) message is received, entries after the last updated Tag ID to the end of the Balance Adjustment Table are cleared.

Format:

Table 9.1-3: Balance Adjustment Record (B2 – Dense) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	B2	B2 = Balance Adjustment Record Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	B	Format Code B – Dense Format
Num. Entries (N)	2 dec	00 – 19	Number of Balance Adjustment Table entries in this record
Start Tag ID	6 hex	000000 – FFFFFF	Tag ID of Adjustment 1
Adjustment 1	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for (Start Tag ID) (See §5.5.2.4 for format)
Adjustment 2	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for (Start Tag ID + 1) (See §5.5.2.4 for format)
Adjustment 3	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for (Start Tag ID + 2) (See §5.5.2.4 for format)

Field Name	Length & Format	Range	Contents
…	…	…	…
Adjustment N	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for (Start Tag ID + (*N* – 1) (where *N* = 19 max.) (See §5.5.2.4 for format)

Response: [If an error condition is detected, the JANUS MPR2.3 Reader will respond with a B3 (Balance Adjustment Table Transfer Control) message within 500 ms. The B3 message “Action Code” field will be set to “Reject”, and the “Reason Code“ field will indicate the error number. See §9.1.5 for details.]

9.1.4 Balance Adjustment Record (B2 – Sparse Format) Message

Direction: Lane Controller to Reader

Description: This message is used by the Lane Controller to transfer a block of ***non-consecutive*** Balance Adjustment Table entries during the nightly transfer (*which must have been previously initiated with a B1 message*). A transfer may contain a mix of Sparse Format B2 and Dense Format B2 messages; ***Real-Time Format B2 messages are disallowed during a nightly transfer operation.***

This message will be sent by the Lane Controller at a frequency of up to approximately 10,000 – 20,000 records per nightly transfer (assuming 1/20th, or 5%, to 1/10th, or 10% of a tag population of 2,000,000 requires updates = 100,000 to 200,000 entries, at 10 updates per record).

Each Tag ID must be greater than, but not necessarily consecutive with the previous Tag ID, both within a given B2 message and any previous Dense Format or Sparse Format B2 record.

The reader will automatically clear its balance adjustment table entries as follows:

- The first Sparse Format B2 message after an initiate (B1): the Reader clears all entries from the start of the Balance Adjustment Table to the entry prior to the first specified Tag ID.
- For subsequent Sparse Format B2 messages: the Reader clears entries from the last updated Tag ID to the entry prior to the specified starting Tag ID. ***Within a Sparse Format B2 message, the Reader clears intervening entries for unspecified Tag Ids.***
- When a transfer terminate (B3) message is received, entries after the last updated Tag ID to the end of the Balance Adjustment Table are cleared.

Format:

Table 9.1-4: Balance Adjustment Record (B2 – Sparse) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	B2	B2 = Balance Adjustment Record Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	C	Format Code C – Sparse Format
Num. Entries (N)	2 dec	00 – 10	Number of Balance Adjustment Table entries in this record
Tag ID 1	6 hex	000000 – FFFFFF	Tag ID of Adjustment 1
Adjustment 1	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for Tag ID 1 (See §5.5.2.4 for format)
Tag ID 2	6 hex	000000 – FFFFFF	Tag ID of Adjustment 2
Adjustment 2	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for Tag ID 2 (See §5.5.2.4 for format)
…	…	…	…
Tag ID N	6 hex	000000 – FFFFFF	Tag ID of Adjustment *N* (where *N* = 10 max.)

Field Name	Length & Format	Range	Contents
Adjustment N	6 hex	000000 – FFFFFF	Balance Adjustment Table Entry for Tag ID *N* (where *N* = 10 max.) (See §5.5.2.4 for format)

Response: [If an error condition is detected, the JANUS MPR2.3 Reader will respond with a B3 (Balance Adjustment Table Transfer Control) message within 500 ms. The B3 message “Action Code” field will be set to “Reject”, and the “Reason Code“ field will indicate the error number. See §9.1.5 for details.]

9.1.5 Balance Adjustment Transfer Control (B3) Message

Direction: Bi-directional (depending on context, see *Description* for details).

Description: Either the Lane Controller, or the JANUS MPR2.3 Reader may issue this message, depending on the context of the operation being performed, as follows:

- ***Issued by Lane Controller:***
  - To indicate normal completion of a Balance Adjustment Table transfer operation – the Lane Controller sends this message to the Reader 5 seconds (nominal) after the last Dense Format B2, or Sparse Format B2 message has been sent to the Reader (this allows for proper flow control handling).
  - To terminate the Balance Adjustment Table transfer at any time.

  The Reader clears all Balance Adjustment Table entries from the last processed Tag ID to the end of the Balance Adjustment Table after receiving this message.

- ***Issued by JANUS MPR2.3 Reader:***
  - In response to an error condition detected during processing of a received B1 Balance Adjustment Table Transfer Initiate message – *the Balance Adjustment Table is not affected*.
  - In response to an error condition detected during processing of a received Real-Time, Sparse, or Dense Format B2 message. ***The JANUS MPR2.3 Reader may have processed some of the Balance Adjustment Table entries received in the last received (error generating) B2 message*** (See Table 9.1-6 for details).

    Balance Adjustment Table entry processing resumes with the next B2 message.
  - Asynchronously, to perform transmission flow control of Dense Format or Sparse Format B2 messages during a nightly transfer (See Table 9.1-6 for details)
  - Asynchronously, at 05:00 if no nightly transfer operation has been initiated since midnight – ***the Balance Adjustment Table is cleared when this occurs***.
  - Asynchronously, at any point after 05:00 *if a nightly transfer is in progress, and no new Sparse Format or Dense Format B2 messages have been received by the Reader in the last 65 minutes* – ***the Balance Adjustment Table is cleared from the point of the last processed Tag ID when this occurs.***

- ***Flow control:***

  If the Reader detects an increasing backlog of unprocessed Sparse Format, and/or Dense Format B2 messages during a nightly transfer, or an increasing backlog of Real-Time Format B2 messages during say a Real-Time update "burst", the Reader will signal the Lane Controller to suspend the current nightly transfer by transmitting a B3 message to the Lane Controller with the "Action Code" field set to "*Flow Control*" and the "Reason Code" field set to "*Not Ready*". When the backlog of unprocessed Sparse Format, and/or Dense Format B2 messages is processed by the Reader some time later, the Reader will indicate to the Lane Controller that the current nightly transfer may resume by transmitting a B3 message to the Lane Controller with the "Action Code" field to "*Flow Control*", and the "Reason Code" field set to "*Ready*".
  - In a "*Not Ready*" condition, the Reader will reference the point at which Balance Adjustment Table records were discarded by setting the "Reference ID" field to the Tag ID of the first discarded record. The Lane Controller should stop sending B2 messages until the Reader sends a B3 – *Ready* message.

- After sending a B2 "*Not Ready*" message to the Lane Controller, the Reader shall ignore any intervening B2 messages sent by the Lane Controller to the Reader.
- When the lane controller receives a "*Ready*" B3 message**, it must resume the nightly transfer with the Tag ID specified in the last "*Not Ready*" B3 message that was sent by the Reader.** *The reader ignores any B2 message until this condition is met.*

Format:

Table 9.1-5: Balance Adjustment Transfer Control (B3) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	B3	B3 = Balance Adjustment Transfer Control Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format Code A
Action Code	1 alpha	{F, C, A, R}	• F = Flow Control (Reader to Lane Controller) • C = Normal Completion (Lane Controller to Reader) • A = Abort (Bi-Directional) • R = Reject (Reader to Lane Controller)
Reason Code	2 hex	00 – FF	Indicates reason, or purpose of message (See Table 9.1-6 for details)
Reference ID	6 hex	000000 – FFFFFF	00000 or Tag ID from a Real-Time, Sparse, or Dense Format B2 message (see table below) for flow control or error reporting
Date / Time	13 dec	MMDDYY<space> HHmmSS	Date / Time of message issuance

Response: No response required.

Table 9.1-6: Balance Adjustment Transfer Control (B3) Message – Action / Reason Codes

Action Code	Reason Code	Description	Reference ID
R	21	**Balance Adjustment Transfer in Progress:** (Reader to Lane Controller) *A B1 message or Real-Time B2 message was received during an in-progress nightly transfer.*	000000
R	22	**Tag ID not in Balance Adjustment Table:** (Reader to Lane Controller) *A B1 or B2 message specifies a Tag ID that is outside the range of the Balance Adjustment Table (Range is BASEID to BASEID + 2,000,000 – 1). B2 entries are processed up to the detected entry in error.*	Tag ID
R	23	**Balance Adjustment Transfer Initiation Outside of Allowable Nightly Transfer Time Window:** (Reader to Lane Controller) *The Lane Controller attempted to initiate a nightly Balance Adjustment Table transfer outside of the allowable midnight – 5am time window.*	000000
R	24	**Invalid File Date:** (Reader to Lane Controller) *The B1 message specifies a file date which does not match the current internal date of the Reader.*	000000
A	25	**Unspecified Abort:** (Reader to Lane Controller) *An error occurred which cannot be classified as any of the other error types.*	000000
R	26	**Invalid Format Code:** (Reader to Lane Controller) *An invalid format code value was detected in the "Format Code" field of a B1 or B2 message. No B2 entries processed.*	000000
R	27	**Invalid Message Format:** (Reader to Lane Controller) *A badly formatted field was detected in a B1 or B2 message (e.g. a 'P' character is seen when a hexadecimal digit is expected). No B2 entries processed.*	000000
R	28	**Field Range Error:** (Reader to Lane Controller) *A field value was detected that was outside of its specified limits. No B2 entries processed.*	000000
R	29	**Invalid Tag Id Sequence:** (Reader to Lane Controller) *A Tag ID in a Sparse / Dense Format B2 message is not greater than the previous Tag ID. B2 entries processed up to entry in error.*	Tag ID

Action Code	Reason Code	Description	Reference ID
A	30	**Download Timeout:** (Reader to Lane Controller) • *Sent asynchronously, at 5am if no nightly transfer has occurred since midnight.* ***The entire Balance Adjustment Table is cleared.*** • *Sent asynchronously, after 5am if a nightly transfer was initiated but never completed (no Sparse or Dense Format B2 messages have been received by the reader within the last 65 minutes).* ***The Reader clears the table from the last received Tag ID to the end of the Balance Adjustment Table.***	• 000000 if no nightly transfer has occurred • Tag ID from last successful B2 message
R	31	**Download Not Initiated:** (Reader to Lane Controller) *A Dense / Sparse Format B2 message was received without a prior B1 Transfer Initiate message.*	000000
R	32	**Write to Memory Block Failed:** (Reader to Lane Controller) • *A memory block verification operation failed after updating a particular Tag ID from a B2 message* • *A attempt was made to write into a block that has previously failed a memory test. B2 entries processed up to entry in error.*	Tag ID which could not be updated
R	33	**No Valid BAT Available:** (Reader to Lane Controller) *A Real-Time Balance Adjustment Table Record (B2A) message was received but no valid Balance Adjustment Table is present in Reader memory (i.e. the Lane Controller did not initiate a nightly transfer during the allowable time window for that day)*	000000
F	40	**Reader Ready** (Flow Control – Reader to Lane Controller) *Sent after a Reader Not Ready message.*	Tag ID reported in last B3 Reader Not Ready message
F	41	**Reader Not Ready** (Flow Control – Reader to Lane Controller) *May be sent before, during, and/or after a nightly transfer operation. Lane controller must stop sending any type of B2 messages.*	Tag ID of first B2 message discarded
C	80	**Normal Completion:** (Lane Controller to Reader) *Sent by the Lane Controller to indicate normal completion of the Balance Adjustment Table nightly transfer.*	Don’t care
A	81	**Unspecified Abort:** (Lane Controller to Reader) *Sent by the Lane Controller to abort a nightly transfer.*	Don’t care

9.1.6 Balance Adjustment Status Request (B4) Message

Direction: Lane Controller to Reader

Description: The Lane Controller uses this message to request the JANUS MPR2.3 Reader Balance Adjustment Table status information.

Format:

Table 9.1-7: Balance Adjustment Status Request (B4) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	B4	B4 = Balance Adjustment Status Request Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)

Response: Reader responds with Balance Adjustment Status Response (B5) message (See §9.1.7).

9.1.7 Balance Adjustment Status Response (B5) Message

Direction: Reader to Lane Controller

Description: The JANUS MPR2.3 Reader sends this message in response to the Balance Adjustment Status Request (B4) message (See §9.1.6) from the Lane Controller.

Format:

Table 9.1-8: Balance Adjustment Status Response (B5) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	B5	B5 = Balance Adjustment Status Response Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format Code A
Download Flag	1 dec	{0, 1}	• 0 = No nightly transfer operation in progress • 1 = A Balance Adjustment Table nightly transfer has been initiated and/or is in progress.
Download Port	1 dec	1 – 8	Indicates the COM Port / Ethernet Connection Instance currently in use (or which was last used) for the Balance Adjustment Table nightly transfer.
File Date	6 dec	000000 or MMDDYY	A “000000” in this field indicates that the Balance Adjustment Table is not present / initialized (*e.g.* after power-up) or has been cleared (*e.g.* at 5am if no nightly transfer has occurred), otherwise it contains the file date of the last nightly transfer. The date is updated upon completion of a nightly transfer.
Num. Download Entries Received	8 dec	00000000 – 02000000	• If nightly transfer is in progress: number of entries received in current download • If no nightly transfer is in progress: number of entries received in last download. Cleared at start of a nightly transfer.
Num. Real-Time Entries Received	5 dec	00000 – 65535	Number of real-time entries received since last nightly transfer. Cleared when nightly transfer starts or at 5 am if no nightly transfer occurred.
Last Tag Id	6 hex	000000 – FFFFFF	Last transferred Tag ID from a Sparse / Dense Format B2 message.
Cumulative Bad Blocks	4 dec	0000 – 9999	Cumulative number of bad block reports since last power-up. Set to 0000 at power-up.

Response: No response expected.

9.1.8 (Balance Adjustment Table) Bad Block (B6) Message

Direction: Reader to Lane Controller

Description: The reader continually verifies the contents of its Balance Adjustment Table on a block-by-block basis. Each block is a fixed size. The Reader checks a block by computing its checksum and comparing it to a previously stored value. If the two values are different, the block is considered bad. If a bad block is detected, the Reader will issue this message to all COM ports that are online and set the entries of the block to zero.

Each block that contains an error is reported individually. The Reader will issue multiple B6 messages if multiple blocks are affected.

The Lane Controller has the option of re-loading the specified area of the balance adjustment table using B2 real-time messages, or to wait until the next nightly transfer.

Format:

Table 9.1-9: (Balance Adjustment Table) Bad Block (B6) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	B6	B6 = (Balance Adjustment Table) Bad Block Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format Code A
Cumulative Bad Blocks	4 dec	0000 – 9999	Cumulative number of bad block reports since last power-up. Set to 0000 at power-up.
Start Tag ID	6 hex	000000 – FFFFFF	Starting Tag ID of bad block
End Tag ID	6 hex	000000 – FFFFFF	Ending Tag ID of bad block

Response: No response expected.

9.1.9 Toll Rate Table Record (T2 – Fixed-Rate Tolling Format) Message

Direction: Lane Controller to Reader

Description: This message is used by the Lane Controller to transfer a single complete (Fixed-Rate) Toll Rate Table to the Reader. The Reader maintains 4 Fixed-Rate Toll Rate tables in non-volatile memory (*i.e.* Toll Rate Table data is retained across resets or power outages). The Lane Controller may select which Fixed-Rate Toll Rate Table is in use for each RF channel by using the Toll Rate Table Select (T6) message (See §9.1.14). Typically, multiple channels use the same toll rate table.

The Toll Rate Table Index value (1 – 4) specifies which of the 4 Fixed-Rate Toll Rate Tables to update with the new contents. All Toll Rate Table Entries are unsigned.

This message allows for a variable number of Toll Rate Classes – up to 16. ***The first Toll Rate Table Entry is always for Toll Class 0*** (*even though class 0 may not be defined by the toll agency*). ***The Reader will automatically set to 0 those Toll Rate Table Entries that are not specified by the Lane Controller*** (*e.g.* If Toll Classes 0 through 9 are specified, the Toll Rate entries for Toll Classes 10 through 15 are set to zero by the Reader).

Format:

Table 9.1-10: Toll Rate Table Record (T2 – Fixed-Rate Tolling Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	T2	T2 = Toll Rate Table Record Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format Code A – Fixed-Rate Format
Toll Rate Table Index	1 dec	1 – 4	Specifies which of the 4 Fixed-Rate Toll Rate Tables to update.
Toll Rate Table ID	2 hex	01 – FF	Version number attached to this table. ***The value 00 is reserved.***
Num Classes (N)	2 dec	01 – 16	Number of Toll Rate Table entries (1 – 16). ***The first entry is the Toll Rate for class 0.***
Class 0 Toll	3 hex	000 – 7FF	Toll Amount applied to Toll Class 0 in units of nickels (*max. equiv. = $102.35*)
Class 1 Toll	3 hex	000 – 7FF	Toll Amount applied to Toll Class 1 in units of nickels (*max. equiv. = $102.35*)
…	…	…	Toll amount entries for Toll Class 2 through Toll Class (*N* – 1) (*max. equiv = $102.35*)
Class (N – 1) Toll	3 hex	000 – 7FF	Toll Amount applied to Toll Class (*N* – 1) in units of nickels (*max. equiv. = $102.35*)

Response: [If an error condition is detected, the JANUS MPR2.3 Reader will respond with a T3 (Toll Rate Transfer Control) message within 500 ms. The T3 message “Action Code” field will be set to “Reject”, and the “Reason Code“ field will indicate the error number. See §9.1.11 for details.]

9.1.10 Toll Rate Table Record (T2 – Variable-Rate Tolling Format) Message

Direction: Lane Controller to Reader

Description: This message is used by the Lane Controller to transfer a single complete (Entrance-Plaza-based) Variable-Rate Toll Rate Table to the JANUS MPR2.3 Reader. The reader maintains 20 Variable-Rate Toll Rate Tables in non-volatile memory (*i.e.* Toll Rate Table data is retained across resets or power outages).

The Toll Rate Table Index value (01 – 20) specifies which of the 20 Variable-Rate Toll Rate Tables to update with the new contents. All Toll Rate Table Entries are unsigned.

This message allows for a variable number of Toll Rate Classes – up to 16. ***The first Toll Rate Table Entry is always for Toll Class 0*** (*even though class 0 may not be defined by the toll agency*). ***The Reader will automatically set to 0 those Toll Rate Table Entries that are not specified by the Lane Controller*** (*e.g.* If Toll Classes 0 through 9 are specified, the Toll Rate entries for Toll Classes 10 through 15 are set to zero by the Reader).

Format:

Table 9.1-11: Toll Rate Table Record (T2 – Variable-Rate Tolling Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	T2	T2 = Toll Rate Table Record Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	B	Format Code B – Variable-Rate Format
Toll Rate Table Index	2 dec	01 – 20	Specifies which of the 20 Variable-Rate Toll Rate Tables to update.
Toll Rate Table ID	2 hex	01 – FF	Version number attached to this table. ***The value 00 is reserved.***
Plaza ID	3 dec	000 – 128	• 000 – 127: Plaza ID for Regular Plazas • 128: Special (*default*) Plaza ID
Num Classes (N)	2 dec	01 – 16	Number of Toll Rate Table entries (1 – 16). ***The first entry is the Toll Rate for class 0.***
Class 0 Toll	3 hex	000 – 7FF	Toll Amount applied to Toll Class 0 in units of nickels (*max. equiv. = $102.35*)
Class 1 Toll	3 hex	000 – 7FF	Toll Amount applied to Toll Class 1 in units of nickels (*max. equiv. = $102.35*)
…	…	…	Toll amount entries for Toll Class 2 through Toll Class (*N* – 1) (*max. equiv = $102.35*)
Class (N – 1) Toll	3 hex	000 – 7FF	Toll Amount applied to Toll Class (*N* – 1) in units of nickels (*max. equiv. = $102.35*)

Response: [If an error condition is detected, the JANUS MPR2.3 Reader will respond with a T3 (Toll Rate Transfer Control) message within 500 ms. The T3 message “Action Code” field will be set to “Reject”, and the “Reason Code“ field will indicate the error number. See §9.1.11 for details.]

9.1.11 Toll Rate Transfer Control (T3) Message

Direction: Reader to Lane Controller

Description: This message is issued by the JANUS MPR2.3 Reader in response to an error condition detected during processing of a received Toll Rate message.

Format:

Table 9.1-12: Toll Rate Transfer Control (T3) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	T3	T3 = Toll Rate Transfer Control Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format Code A
Action Code	1 alpha	R	R = Reject
Reason Code	2 hex	01 – FF	Indicates reason, or purpose of message (See Table 9.1-13 for details)

Response: No response expected.

Table 9.1-13: Toll Rate Transfer Control (T3) Message - Action / Reason Codes

Action Code	Reason Code	Description
R	26	**Invalid Format Code:** *An invalid format code value was detected in a Toll Rate Table Record or Toll Rate Table Select Message.*
R	27	**Invalid Message Format:** *A badly formatted field was detected in a Toll Rate Table Record or a Toll Rate Table Select message (e.g. a 'P' character is seen when a hexadecimal digit is expected).*
R	28	**Field Range Error:** *A field value was detected that was outside of its specified limits.*

9.1.12 Toll Rate Table Configuration Request (T4) Message

Direction: Lane Controller to Reader

Description: This message is used by the Lane Controller to request the configuration of the Toll Rate Tables currently present on the Reader.

Format:

Table 9.1-14: Toll Rate Table Configuration Request Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	T4	T4 = Toll Rate Configuration Request Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)

Response: The Reader responds with a Toll Rate Configuration (T5) message (See §9.1.13).

9.1.13 Toll Rate Configuration (T5) Message

Direction: Reader to Lane Controller

Description: The JANUS MPR2.3 Reader sends this message in response to the Toll Rate Configuration Request (T4) message (See §9.1.12) from the Lane Controller. ***A Table ID field of 00 indicates an unassigned toll rate table.***

Format:

Table 9.1-15: Toll Rate Configuration (T5) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	T5	T5 = Toll Rate Configuration Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format Code A
Table 1 ID	2 hex	00 – FF	Reference ID of Toll Rate Table 1 (*00 = unassigned*)
Table 2 ID	2 hex	00 – FF	Reference ID of toll rate table 2 00 = unassigned
Table 3 ID	2 hex	00 – FF	Reference ID of toll rate table 3 00 = unassigned
Table 4 ID	2 hex	00 – FF	Reference ID of toll rate table 4 00 = unassigned
Channel 1 Table Index	1 dec	0 – 4	Toll Rate Table used by RF Channel 1 *0 = unassigned*)
Channel 2 Table Index	1 dec	0 – 4	Toll Rate Table used by RF Channel 2 (*0 = unassigned*)
Channel 3 Table Index	1 dec	0 – 4	Toll Rate Table used by RF Channel 3 (*0 = unassigned*)
Channel 4 Table Index	1 dec	0 – 4	Toll Rate Table used by RF Channel 4 (*0 = unassigned*)
Channel 5 Table Index	1 dec	0 – 4	Toll Rate Table used by RF Channel 5 (*0 = unassigned*)
Channel 6 Table Index	1 dec	0 – 4	Toll Rate Table used by RF Channel 6 (*0 = unassigned*)
Channel 7 Table Index	1 dec	0 – 4	Toll Rate Table used by RF Channel 7 (*0 = unassigned*)
Channel 8 Table Index	1 dec	0 – 4	Toll Rate Table used by RF Channel 8 (*0 = unassigned*)

Response: No response expected.

9.1.14 Toll Rate Table Select (T6) Message

Direction: Lane Controller to Reader

Description: Allows the Lane Controller to select the active (Fixed-Rate) Toll Rate Table for RF Channels 1 through 8. The setting for a given RF Channel can be left unchanged by specifying a table index of 0 (The reader continues to use the previously selected table).

If desired, the Lane Controller can elect to disable tolling by selecting a previously downloaded table that contains null entries (*i.e.* zeroes).

The Reader stores the Toll Rate Table selections in non-volatile memory (*i.e.* The Reader maintains the Toll Rate Table selections across resets or power outages).

Format:

Table 9.1-16: Toll Rate Table Select (T6) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	T6	T6 = Toll Rate Table Select Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)
Format Code	1 alpha	A	Format Code A
Channel 1 Table Index	1 dec	0 – 4	Toll Rate Table to be used by RF Channel 1 (*0 = no change*)
Channel 2 Table Index	1 dec	0 – 4	Toll Rate Table to be used by RF Channel 2 (*0 = no change*)
Channel 3 Table Index	1 dec	0 – 4	Toll Rate Table to be used by RF Channel 3 (*0 = no change*)
Channel 4 Table Index	1 dec	0 – 4	Toll Rate Table to be used by RF Channel 4 (*0 = no change*)
Channel 5 Table Index	1 dec	0 – 4	Toll Rate Table to be used by RF Channel 5 (*0 = no change*)
Channel 6 Table Index	1 dec	0 – 4	Toll Rate Table to be used by RF Channel 6 (*0 = no change*)
Channel 7 Table Index	1 dec	0 – 4	Toll Rate Table to be used by RF Channel 7 (*0 = no change*)
Channel 8 Table Index	1 dec	0 – 4	Toll Rate Table to be used by RF Channel 8 (*0 = no change*)

Response: [If an error condition is detected, the JANUS MPR2.3 Reader will respond with a T3 (Toll Rate Transfer Control) message within 500 ms. The T3 message “Action Code” field will be set to “Reject”, and the “Reason Code“ field will indicate the error number. See §9.1.11 for details.]

9.2 TRBA Mode Message Extended Information Field

The *Extended Information* field is an optional, variable-length field that conveys additional message information depending upon the configuration of the JANUS MPR2.3 Reader. If the JANUS MPR2.3 Reader is configured to report extended information, this field will be populated with those values that have been chosen to be reported in the Reader configuration. **If no extended information has been requested in the Reader configuration, the *Extended Information* field *WILL NOT BE PRESENT* in JANUS Reader-to-Lane Controller messages.**

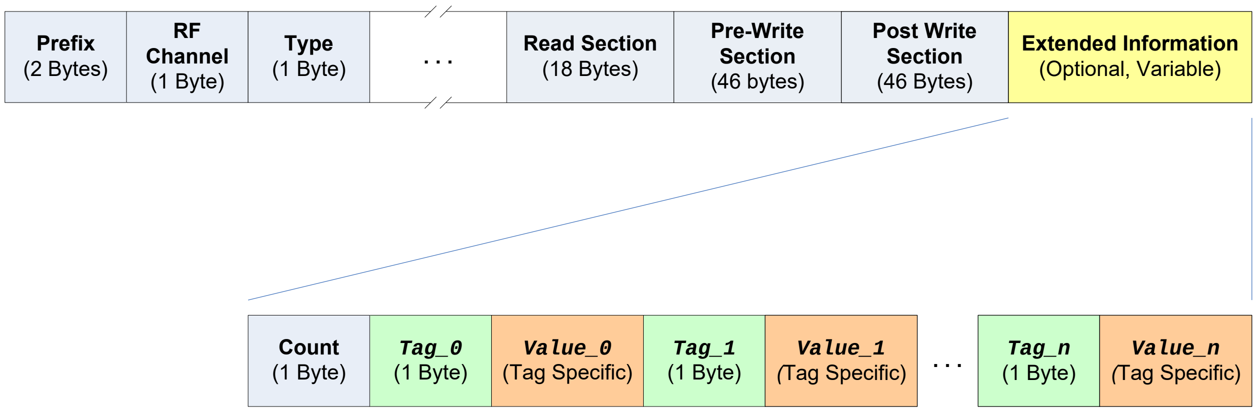

Figure 9.2-1: TRBA Mode Message Extended Information Format

Figure 9.2-1, ci-dessus, illustrates the *Extended Information* field appended to the end of a typical TRBA Mode IAG Transponder (Majority Voting) Message. As shown in Figure 9.2-1, data is encoded into the *Extended Information* field in the form of **`{Tag, Value}`** pairs. Each **`{Tag}`** is encoded as one (1) ASCII hexadecimal character. **`{Value}`** data is encoded in a tag-specific fashion. The first byte of the *Extended Information* field is the *Count* sub-field (encoded in ASCII decimal), which specifies the total number of **`{Tag, Value}`** pairs encoded within the *Extended Information* field, if present.

Table 9.2-1 specifies the defined **`{Tag, Value}`** encodings for the *Extended Information* field of the TRBA Mode Message Set. (*Please note that any* **`{Tag}`** *values not explicitly listed in* Table 9.2-1 *are considered RESERVED*).

Table 9.2-1: TRBA Mode Message Extended Information `{Tag, Value}` Encodings

`{Tag}`	`{Value}` Name	`{Value}` Length & Format	`{Value}` Range	`{Value}` Contents	Message Applicability
0	*Timestamp*	16 dec	0 – 4294967295999999	The number of microseconds since the Epoch (1970-01-01 00:00:00 +0000 [UTC]) corresponding to the successful read event.	All TRBA Mode Initial Read, Transponder, Post Capture, Estimated and Status Messages (*RFP-Compliant messages* ***DO NOT*** *support this feature*)
All other values	*RESERVED*	*N/A*	*N/A*	*N/A*	*N/A*

9.3 TRBA Mode JANUS MPR2.3 Reader Messages

9.3.1 Configuration (CA/CB/CN – TRBA Mode) Message

Direction: Reader to Lane Controller.

Description: Message sent by the Reader in response to a Configuration Request message from the Lane Controller.

Note that there are two components reported: the *Global Reader Configuration* and the *RF Channel* ("lane") *Configuration*.

The *RF Channel Configuration* reported varies according to the reporting mode (default or multiplexed). For example, the configuration message reported by the reader on COM1 contains the configuration for RF channel 1 (in the non-multiplexed reporting mode). If the multiplexed reporting mode is enabled, the RF channel configuration is for the channel specified by the Lane Controller.

The "*Special Notes*" column of Table 9.3-1 describes the differences between the standard JANUS format and this new modified Toll Rate / Balance Adjustment Mode format. In addition, any special considerations are also noted.

The Lane Controller can use this message to establish whether the Reader it is communicating with is either in TRBA Mode or Non-TRBA Mode. The Lane Controller can then use this information to tailor the messages sets used when communicating with a given Reader. Specifically, if the Lane Controller issues a Configuration Request (CR) message, the Lane controller can examine the length of the Configuration Message received from the JANUS MPR2.3 Reader to determine if the Reader is in TRBA Mode:

- ***The Reader is in TRBA mode if the received Configuration Message (CA/CB/CN) message is 74 bytes in length***
- ***The Reader is in Non-TRBA mode if the received Configuration Message (CA/CB/CN) is 59 bytes in length*** (as per §7.2.1).

Format:

Table 9.3-1: Configuration (CA/CB/CN – TRBA Mode) Message Format

Field Name	Length & Format	Range	Contents	Special Notes
Prefix	2 alpha	{CA, CB, CN}	Configuration Message: • CA = Primary CTM Configuration • CB =Secondary CTM Configuration • CN = Non-Redundant CTM Configuration	
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)	
TIME	13 dec	MMDDYY <space> HHmmSS	Reader Time	
AID	3 dec	000 – 127	Agency identification number.	
PID	3 dec	000 – 127	Plaza identification number.	
RID	4 dec	0000 – 4095	Reader ID - Traffic mgt. reader identification number.	

Field Name	Length & Format	Range	Contents	Special Notes
TYPE	1 alpha	{M, S, N}	Reader type: • M = primary • S = secondary • N = standalone / non-redundant	
SYNC	1 dec	0 – 1	Inter-Reader RF synchronization: • 0 = sync feature disabled • 1 = sync feature enabled (**See Note *1***)	
SLTXIAG	1 dec	0 – 1	Sync Loss Action: • 1 = continue IAG transmission on sync loss • 0 = don't transmit on sync loss.	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report 1 for this field***
PTGONE	4 dec	0050 – 5000	If programming is not successful, forces a transaction report PTGONE milliseconds after the initial read of a tag.	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report 0 for this field***
BAT	1 dec	1 – 2	Balance Adjustment Processing Type: • 1 = perform balance adjustments in Fixed-rate (RF Channel based) mode • 2 = perform balance adjustments in Variable-Rate (Entry plaza based) mode	*New field for TRBA Mode.* ***Note new values reported by JANUS MPR2.3 Reader***
BASEID	8 dec	00000000 – 14277215	Indicates the serial number of the first entry (offset 0) in the Balance Adjustment Table.	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report 0 for this field***
EXP	1 dec	0 – 1	Express Lane Reader: • 1 = express lane reader (*RF channels 5 through 8 disabled*) • 0 = non-express lane reader	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report 0 for this field***
TTO	3 dec	001 – 300	Number of seconds before a transponder can be re-reported.	
TMP	1 dec	0 – 1	Traffic Management Programming: • 0 = don't program Traffic Management section with reader ID & timestamp • 1 = program Traffic Management section with reader ID & timestamp	
TFRM	1 dec	0 – 3	Specifies handling of transaction field: • 0 = Do not reprogram transaction field. • 1 = reprogram with 16 bit random number. • 2 = reprogram with 16 bit sequential txn number • 3 = reprogram with 8 bit random number and 8 bit sequential number	

Field Name	Length & Format	Range	Contents	Special Notes
TTP	2 dec	10 – 99	Number of seconds between test tag interrogations.	
SFT	2 dec	01 – 99	Single RF-module fault threshold. Number of consecutive test tag errors before a lane is considered bad.	
MFT	1 dec	0 – 8	Multiple RF-module fault threshold. Number of RF modules that must be simultaneously bad (*i.e.* in SFT state) before causing a switchover to the slave reader. Normally set to the number of lanes equipped with test tags.	
PTO	1 dec	0 – 9	Protocol time-out. Number of 100 ms time units (less one) in which a ACK must be received before the reader re-transmits a message to the lane controller (9 = 1 second)	
HOST ST	1 dec	0 – 1	• 0 = don't echo transponder messages on host port • 1 = echo transponder messages on host port	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report <space> for this field***
HOST BR	2 dec	{12, 24, 48, 96, 19}	Host port bit rate: • 12 = 1200 bps • 24 = 2400 bps • 48 = 4800 bps • 96 = 9600 bps • 19 = 19200 bps	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report <space> for this field***
HOST PA	1 alpha	{N, O, E}	Host port parity: • N = none • O = odd • E = even	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report <space> for this field***
HOST CS	1 dec	5 – 8	Host port – number of bits per character	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report <space> for this field***
HOST SB	1 dec	{1, 5, 2}	Host port – number of stop bits. (*5 = 1.5 stop bits*)	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report <space> for this field***
HOST FC	1 alpha	{N, H, X}	Host flow control: • N = none, • H = hardware • X = xon / xoff	*New field for TRBA Mode.* ***JANUS MPR2.3 Reader will always report <space> for this field***

Field Name	Length & Format	Range	Contents	Special Notes
CC	1 dec	0 – 1	COM port configuration: • 0 = don't allow remote reader configuration • 1 = allow remote reader configuration	
Separator	1 alpha	-	A <dash> character separator separates the Global Configuration Elements from the Lane Configuration Elements	
LANE ST	1 alpha	{A, G, O}	Lane status: • A = active • G = guard • O = off-line	
LANE NUM	2 dec	00 – 31	Lane number programmed into transponder	
LANE TTAG	1 dec	0 – 1	Test Tag configuration: • 0 = no Test Tag in lane • 1 = Test Tag in lane	
COM ST	1 dec	0 – 1	COM port: • 0 = off-line • 1 = on-line	
COM BR	2 dec	{96, 19, 57, 11}	COM port bit rate: • 96 = 9600 bps • 19 = 19200 bps • 57 = 57600 bps • 11 = 115200 bps	
COM PA	1 alpha	{N, O, E}	COM port parity: • N = none • O = odd • E = even	
COM CS	1 dec	5 – 8	COM port - number of bits per character	
COM SB	1 dec	{1, 5, 2}	COM port - number of stop bits (*5 = 1.5 stop bits*)	
COM FC	1 alpha	{N, H, X}	COM port flow control: • N = none • H = hardware • X = xon / xoff	

Notes:

(1)- For the Inter-Reader RF Synchronization to be considered *ENABLED* (*i.e.* to report a '**1**' in the SYNC field), the following conditions apply:

(a) The JANUS MPR2.3 Reader must have at least one (1) Sync block configured within its Frame Sequence Configuration; *and*

(b) The JANUS MPR2.3 Reader parameter *Reader-to-Reader Sync. Enable* must be enabled.

Inter-Reader RF Synchronization is considered to be *DISABLED* if these two conditions are not met. Please refer to [AD2] for details on how to configure Inter-Reader RF Synchronization on the JANUS MPR2.3 Reader.

Response: No response expected from Lane Controller.

9.3.2 IAG Initial Read (IA/IB – Majority / Interpolated Voting – TRBA Mode) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the transponder first enters the capture zone.

This message applies when:

(1) The "*Initial Read*" option is enabled on the web interface,

(2) The Reader is operating in Toll Rate / Balance Adjustment Mode, *and*

(3) The Reader is processing a Toll Rate / Balance Adjustment Transponder.

Note that if condition (1) and (2) are satisfied and condition (3) is NOT MET, the Reader will issue a "standard" Initial Read Message as defined in §7.2.3.

This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

Format: *This new format is required due to the size differences of the Read / Write sections of an ISTHA formatted internal transponder.*

Table 9.3-2: IAG Initial Read (IA/IB – Majority / Interpolated Voting – TRBA Mode) Message Format

Field Name	Length & Format	Range	Contents	Special Notes
Prefix	2 alpha	{IA, IB}	Initial Read Message (Majority / Interpolated Voting): • IA = Report from Primary CTM • IB = Report from Secondary CTM	
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)	
Format Code	1 alpha	A	Format Code A – ISTHA Formatted (Interior) Transponder	*New field for TRBA Mode.*
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*	
Trans. Status	1 alpha	R	Transaction Status: • R = read	
Txn Number	5 dec	00000 – 65535	Transaction Number	

Field Name	Length & Format	Range	Contents	Special Notes
Read Section	18 hex	N / A	Contents of tag read-only section (9 bytes encoded in ASCII HEX = 72 bits)	*Modified Length for TRBA Mode.* ***This field is 18 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
Pre-write section	46 hex	N / A	Contents of write section before programming (23 bytes encoded in ASCII HEX = 184 bits)	*Modified Length for TRBA Mode.* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §9.2 for details on this field)	

Response: No response expected from Lane Controller.

9.3.3 Initialization (IN – TRBA Mode) Message

Direction: Reader to Lane Controller

Description: After power-up or reset, the Initialization Message is sent within a restart packet on all configured COM ports. In the case of communication error (remote time-out, protocol violation, or consecutive NAKs) on a particular COM port, the Reader issues the Initialization Message only on that particular COM port.

The Reader reports the contents of the Reader real-time clock, and the JANUS MPR2.3 Reader firmware version.

Format:

Table 9.3-3: Initialization (IN – TRBA Mode) Message Format

Field Name	Length & Format	Range	Contents	Special Notes
Prefix	2 alpha	IN	IN = Initialization Message:	
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)	
Format Code	1 alpha	A	Format Code A	*New field for TRBA Mode.*
Cause	2 alpha	{TO, RS, PV, NK, OL}	2 character string indicating the reason for the initialization message: • TO **=** Remote time out. Reader attempted to transmit a packet 3 times with no response from the lane controller. • RS = Reader power up or reset • PV = Protocol Violation (bad message header: sequence number, control byte, or length) • NK **=** Reader NAKed consecutively by the lane controller • OL = The COM port has been set on-line via a SET COMx STATUS 1 on the diagnostic port.	
Date / Time	14 alpha	MMDDYY <space> HHmmSS <space>	Contents of Reader Real-Time clock	
Firmware Version	15 alpha		JANUS MPR2.3 Reader Firmware Version. *A 15-character, fixed-length firmware version string (padded with trailing blanks if needed)*	

Response: No response expected from Lane Controller.

9.3.4 IAG Transponder (OA/OB – Interpolated Voting – TRBA Mode) Message

Direction: Reader to Lane Controller

Description: This message applies when:

(1) Lane Assignment is set to "*Interpolated Voting*",

(2) The Reader is operating in Toll Rate / Balance Adjustment Mode, *and*

(3) The Reader is processing a Toll Rate / Balance Adjustment Transponder.

Note that if condition (1) and (2) are satisfied and condition (3) is NOT MET, the Reader will issue a "standard" Transponder (Interpolated Voting) Message as defined in §7.2.8.

The Reader issues this message after a Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

Format: *This new format is required due to the size differences of the Read / Write sections of an ISTHA formatted internal transponder.*

Table 9.3-4: IAG Transponder (OA/OB – Interpolated Voting – TRBA Mode) Message Format

Field Name	Length & Format	Range	Contents	Special Notes
Prefix	2 alpha	{OA, OB}	Transponder Message (Interpolated Voting): • OA = Report from Primary CTM • OB = Report from Secondary CTM	
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)	
Format Code	1 alpha	A	Format Code A – ISTHA Formatted (Interior) Transponder	*New field for TRBA Mode.*
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)	
Trans. Status	1 alpha	{S, F, U, R, X, D, C}	Transaction Status: • S = successful • F =program failed • U = program unverified • R = read only • X = non-IAG tag • D = decommissioned tag • C = Cross-Reader Report (informational, optional) Tag reported by adjacent reader). *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the web interface.*	
Assign. Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*	

Field Name	Length & Format	Range	Contents	Special Notes
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS TDM transaction on the same RF channel. *First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read,*	
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*	
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left ‘L’, center ‘C’, right ‘R’ (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)	
Hand shakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.	
Sub-zone	2 alpha	a – f, xx,	Estimated OBU sub-zone location: Two characters (‘ab’), or one character with trailing space (‘a<space>’), or ‘xx’ = undefined sub-zone	
Read Section	18 hex	N / A	Contents of tag read-only section (9 bytes encoded as ASCII HEX = 72 bits)	*Modified Length for TRBA Mode.* ***This field is 18 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
Pre-write section	46 hex	N / A	Contents of write section before programming (23 bytes encoded in ASCII HEX = 184 bits)	*Modified Length for TRBA Mode.* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***

Field Name	Length & Format	Range	Contents	Special Notes
Post-write section	46 hex	N / A	Contents of write section if programming is attempted (23 bytes encoded in ASCII HEX = 184 bits)	*Modified Length for TRBA Mode* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §9.2 for details on this field)	

Response: No response expected from Lane Controller.

9.3.5 IAG Post Capture (PA/PB – Majority Voting – TRBA Mode) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when:

(1) Lane Assignment is set to "*Majority Voting*",

(2) The Reader is operating in Toll Rate / Balance Adjustment Mode, *and*

(3) The Reader is processing a Toll Rate / Balance Adjustment Transponder.

Note that if condition (1) and (2) are satisfied and condition (3) is NOT MET, the Reader will issue a "standard" Post Capture (Majority Voting) Message as defined in §7.2.9.

This message is generated if the "*Post Capture*" feature is enabled on the Web Interface, and the Reader detects a change in the programming status (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (*the volume of post capture messages is expected to be low relative to normal transaction messages).*

Format: *This new format is required due to the size differences of the Read / Write sections of an ISTHA formatted internal transponder.*

Table 9.3-5: IAG Post Capture (PA/PB – Majority Voting – TRBA Mode) Message Format

Field Name	Length & Format	Range	Contents	Special Notes
Prefix	2 alpha	{PA, PB}	Post Capture Message (Majority Voting): • PA = Report from Primary CTM • PB = Report from Secondary CTM	
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)	
Format Code	1 alpha	A	Format Code A – ISTHA Formatted (Interior) Transponder	*New field for TRBA Mode.*
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)	

Field Name	Length & Format	Range	Contents	Special Notes
Trans. Status	1 alpha	{S, F, U, R, X, D, C}	Transaction Status: • S = successful • F =program failed • U = program unverified • R = read only • X = non-IAG tag • D = decommissioned tag • C = Cross-Reader Report (informational, optional) Tag reported by adjacent reader). *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the web interface.*	
Assign. Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*	
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS TDM transaction on the same RF channel. *First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*	
Read Section	18 hex	N / A	Contents of tag read-only section (9 bytes encoded in ASCII HEX = 72 bits)	*Modified Length for TRBA Mode.* ***This field is 18 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
Pre-write section	46 hex	N / A	Contents of write section before programming (23 bytes encoded in ASCII HEX = 184 bits)	*Modified Length for TRBA Mode.* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
Post-write section	46 hex	N / A	Contents of write section if programming is attempted (23 bytes encoded in ASCII HEX = 184 bits)	*Modified Length for TRBA Mode* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***

Field Name	Length & Format	Range	Contents	Special Notes
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §9.2 for details on this field)	

Response: No response expected from Lane Controller.

9.3.6 IAG Post Capture (QA/QB – Interpolated Voting – TRBA Mode) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when:

(1) Lane Assignment is set to "*Interpolated Voting*",

(2) The Reader is operating in Toll Rate / Balance Adjustment Mode, *and*

(3) The Reader is processing a Toll Rate / Balance Adjustment Transponder

Note that if condition (1) and (2) are satisfied and condition (3) is NOT MET, the Reader will issue a "standard" Post Capture (Interpolated Voting) Message as defined in §7.2.10.

This message is generated if the "*Post Capture*" feature is enabled on the Web Interface, and the Reader detects a change in the programming status (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

Format: *This new format is required due to the size differences of the Read / Write sections of an ISTHA formatted internal transponder.*

Table 9.3-6: IAG Post Capture (QA/QB – Interpolated Voting – TRBA Mode) Message Format

Field Name	Length & Format	Range	Contents	Special Notes
Prefix	2 alpha	{QA, QB}	Post Capture Message (Interpolated Voting): • QA = Report from Primary CTM • QB = Report from Secondary CTM	
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)	
Format Code	1 alpha	A	Format Code A – ISTHA Formatted (Interior) Transponder	*New field for TRBA Mode.*
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)	

Field Name	Length & Format	Range	Contents	Special Notes
Trans. Status	1 alpha	{S, F, U, R, X, D, C}	Transaction Status: • S = successful • F =program failed • U = program unverified • R = read only • X = non-IAG tag • D = decommissioned tag • C = Cross-Reader Report (informational, optional) Tag reported by adjacent reader. *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the web interface.*	
Assign. Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*	
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS TDM transaction on the same RF channel. *First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*	
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*	
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)	
Hand shakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.	
Sub-zone	2 alpha	a – f, xx,	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'), or 'xx' = undefined sub-zone	

Field Name	Length & Format	Range	Contents	Special Notes
Read Section	18 hex	N / A	Contents of tag read-only section (9 bytes encoded in ASCII HEX = 72 bits)	*Modified Length for TRBA Mode.* ***This field is 18 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
Pre-write section	46 hex	N / A	Contents of write section before programming (23 bytes encoded in ASCII HEX = 184 bits)	*Modified Length for TRBA Mode.* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
Post-write section	46 hex	N / A	Contents of write section if programming is attempted (23 bytes encoded in ASCII HEX = 184 bits)	*Modified Length for TRBA Mode.* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §9.2 for details on this field)	

Response: No response expected from Lane Controller.

9.3.7 Status (SA/SB – TRBA Mode) Message

Direction: Reader to lane controller.

Description: The Reader sends this message in response to a Status Request message (solicited), or on any of the fields changing values (*e.g.*, channel active to offline, sync error).

The "*Special Notes*" column of Table 9.3-7 describes the differences between the standard JANUS MPR2.3 Reader format and this new modified Toll Rate / Balance Adjustment Mode format. In addition, any special considerations are also noted.

Format:

Table 9.3-7: Status Response (SA/SB – TRBA Mode) Message Format

Field Name	Length & Format	Range	Contents	Special Notes
Prefix	2 alpha	{SA, SB}	Status Response Message: • SA = primary / non-redundant CTM • SB = secondary CTM	
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)	
Reader Active Flag	1 dec	0 – 1	• 0 = inactive, reader not processing tags • 1 = active, reader processing tags *Note: It is recommended that the lane controller assume that the reader side reporting transponder transaction messages is the active reader.*	
Sync status	1 dec	0 – 1	• 0 = no sync error (or sync not configured) • 1 = loss of synchronization (sync cable may be cut) *Setting synchronization off (via a web or COM port) while sync is active does not generate a status message.*	
CGC status	1 dec	0 – 1	• 0 = CGC board operational • 1 = CGC board failure (not responding to health checks)	
Toll Rate Table status	1 hex	0 – F	This field contains a bitmap of Toll Rate Tables with checksum errors, as follows: • 00 = no error • 1 = table 1 corrupted • 3 = table 1 & 2 corrupted • ...(etc.) • F = all 4 tables in error	*New field for TRBA Mode.*
Separator	1 alpha	-	<dash> character separator	
Lane status	1 dec	{A, G, O}	• A = active • G =guard	

Field Name	Length & Format	Range	Contents	Special Notes
			• O = off-line	
Maint. Mode Flag	1 dec	0 – 1	Maintenance Mode: • 0 = maintenance mode disabled • 1 = maintenance mode enabled	
Lane Fault	1 dec	0 – 1	• 0 = lane OK • 1 = number of consecutive test tag faults in this lane equal to SFT	
Num Faults	2 dec	00 – 99	Provides a running count of the **total** test tag errors on the RF Channel, consecutive or not. After reaching 99, this field wraps around to 00. *Set to 00 after power-up or reset.*	
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §9.2 for details on this field)	

Response: No response expected from lane controller.

Note: On the Secondary Reader, the first read of a standard tag or test tag will cause a “reader active” status message to be delivered to all Lane Controllers. The Lane Controller associated with the RF Channel on which the tag was read will first receive the TB Transponder Program message first, then the Status message.

9.3.8 Set Configuration (SC – TRBA Mode) Message

Direction: Lane Controller to Reader.

Description: Allows a Lane Controller to remotely configure the reader (*if remote configuration is enabled*). Remote configuration can be enabled or disabled via the Reader Configuration Web Interface. If remote configuration is disabled, the Set Configuration Message is ignored.

Before sending a Set Configuration (SC) message to the JANUS MPR2.3 Reader, the Lane Controller must establish whether the Reader is operating in TRBA Mode or Non-TRBA Mode (see §9.3.1 on how to do this). The JANUS MPR2.3 Reader will ignore any Set Configuration messages that are not congruent with the current mode of operation. Therefore, the Lane Controller must only send the applicable Set Configuration message based on the current Reader operational Mode:

- ***If the Reader is operating in TRBA mode, the Lane Controller must send the Set Configuration message as defined herein.***
- ***If the Reader is operating in Non-TRBA mode, the Lane Controller must send the Set Configuration message as defined in §7.2.15.***

Format: There are two formats depending on whether (or not) the Reader is configured to use *Multiplexed Reporting Mode* (*See* §2.8 *for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages*), as follows:

- ***Non-Multiplexed Reporting Mode:***

  SC<space>[**<global-config>**] [**<lane-config>**]

  Where:

  <global-config> is defined as shown in Table 9.3-8.

  <lane-config> is defined as shown in Table 9.3-9.

- ***Multiplexed Reporting Mode:***

  SC**<channel>**[**<global-config>**] [**<lane-config>**]

  Where:

  <channel> = Serial COM Port / Ethernet Connection Instance = 1 – 8

  <global-config> is defined as shown in Table 9.3-8.

  <lane-config> is defined as shown in Table 9.3-9.

Either global or lane configuration is optional. A lane can thus be reconfigured without modifying global reader parameters. To reconfigure the lane parameters only, the Lane Controller can issue a shorter “SC<space>**<lane-config>**“ command.

Table 9.3-8 defines the Message Elements for the **<global-config>** portion of the Set Configuration Message. The “*Special Notes*” column of this table describes differences between the standard JANUS MPR2.3 Reader format and this new modified Toll Rate / Balance Adjustment Mode format. In addition, any special considerations are also noted.

Table 9.3-8: Set Configuration (SC – TRBA Mode) Message <global-config> Elements

Field Name	Length & Format	Range	Contents	Special Notes
TIME	13 dec	MMDDYY <space> HHmmSS	Reader Time	
AID	3 dec	000 – 127	Agency identification number.	
PID	3 dec	000 – 127	Plaza identification number.	
RID	4 dec	0000 – 4095	Reader ID - Traffic mgt. reader identification number.	
TYPE	1 alpha	{M, S, N}	Reader type: • M = primary • S = secondary • N = non-redundant	***Setting value ignored by JANUS MPR2.3 Reader.***
SYNC	1 dec	0 – 1	Inter-Reader RF synchronization: • 0 = sync feature disabled • 1 = sync feature enabled (**See Note *1***)	
SLTXIAG	1 dec	0 – 1	Sync Loss Action: • 1 = continue IAG transmission on sync loss • 0 = don't transmit on sync loss.	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
PTGONE	4 dec	0050 – 5000	If programming is not successful, forces a transaction report PTGONE milliseconds after the initial read of a tag.	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
BAT	1 dec	0 – 1	Balance Adjustment Processing Type: • 1 = perform balance adjustments • 0 = disable balance adjustment processing	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
BASEID	8 dec	00000000 – 14277215	Indicates the serial number of the first entry (offset 0) in the Balance Adjustment Table.	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
EXP	1 dec	0 – 1	Express Lane Reader: • 1 = express lane reader (*RF channels 5 through 8 disabled*) • 0 = non-express lane reader	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
TTO	3 dec	001 – 300	Number of seconds before a transponder can be re-reported.	

Field Name	Length & Format	Range	Contents	Special Notes
TMP	1 dec	0 – 1	Traffic Management Programming: • 0 = don't program Traffic Management section with reader ID & timestamp • 1 = program Traffic Management section with reader ID & timestamp	
TFRM	1 dec	0 – 3	Specifies handling of transaction field: • 0 = Do not reprogram transaction field. • 1 = reprogram with 16 bit random number. • 2 = reprogram with 16 bit sequential txn number • 3 = reprogram with 8 bit random number and 8 bit sequential number	
TTP	2 dec	10 – 99	Number of seconds between test tag interrogations.	
SFT	2 dec	01 – 99	Single RF-module fault threshold. Number of consecutive test tag errors before a lane is considered bad.	
MFT	1 dec	0 – 8	Multiple RF-module fault threshold. Number of RF modules that must be simultaneously bad (*i.e.* in SFT state) before causing a switchover to the slave reader. Normally set to the number of lanes equipped with test tags.	
PTO	1 dec	0 – 9	Protocol time-out. Number of 100 ms time units (less one) in which a ACK must be received before the reader re-transmits a message to the lane controller (9 = 1 second)	
HOST ST	1 dec	0 – 1	• 0 = don't echo transponder messages on host port • 1 = echo transponder messages on host port	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
HOST BR	2 dec	{12, 24, 48, 96, 19}	Host port bit rate: • 12 = 1200 bps • 24 = 2400 bps • 48 = 4800 bps • 96 = 9600 bps • 19 = 19200 bps	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
HOST PA	1 alpha	{N, O, E}	Host port parity: • N = none • O = odd • E = even	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
HOST CS	1 dec	5 – 8	Host port – number of bits per character	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***

Field Name	Length & Format	Range	Contents	Special Notes
HOST SB	1 dec	{1, 5, 2}	Host port – number of stop bits. (*5 = 1.5 stop bits*)	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
HOST FC	1 alpha	{N, H, X}	Host flow control: • N = none, • H = hardware • X = xon / xoff	*New field for TRBA Mode.* ***Setting value ignored by JANUS MPR2.3 Reader***
CC	1 dec	0 – 1	COM port configuration: • 0 = don't allow remote reader configuration • 1 = allow remote reader configuration	

Notes:

(1)- The SYNC field controls the state of the JANUS MPR2.3 Reader parameter *Reader-to-Reader Sync. Enable*. However, it is not sufficient merely to set this field to '1' in order to enable Inter-Reader RF Synchronization. For the Inter-Reader RF Synchronization to be considered *ENABLED*, the following conditions apply:

(a) The JANUS MPR2.3 Reader must have at least one (1) Sync block configured within its Frame Sequence Configuration; *and*

(b) The JANUS MPR2.3 Reader parameter *Reader-to-Reader Sync. Enable* must be enabled.

Inter-Reader RF Synchronization is considered to be *DISABLED* if these two conditions are not met. Please refer to [AD2] for details on how to configure Inter-Reader RF Synchronization on the JANUS MPR2.3 Reader.

Table 9.3-9: Set Configuration (SC – TRBA Mode) Message <lane-config> Elements

Field Name	Length & Format	Range	Contents	Special Notes
Separator	1 alpha	-	A <dash> character separator separates the Global Configuration Elements from the Lane Configuration Elements	
LANE ST	1 alpha	{A, G, O}	Lane status: • A = active • G = guard • O = off-line	
LANE NUM	2 dec	00 – 31	Lane number programmed into transponder	
LANE TTAG	1 dec	0 – 1	Test Tag configuration: • 0 = no Test Tag in lane • 1 = Test Tag in lane	

Field Name	Length & Format	Range	Contents	Special Notes
COM ST	1 dec	0 – 1	COM port: • 0 = off-line • 1 = on-line	
COM BR	2 dec	{96, 19, 57, 11}	COM port bit rate: • 96 = 9600 bps • 19 = 19200 bps • 57 = 57600 bps • 11 = 115200 bps	
COM PA	1 alpha	{N, O, E}	COM port parity: • N = none • O = odd • E = even	
COM CS	1 dec	5 – 8	COM port - number of bits per character	
COM SB	1 dec	{1, 5, 2}	COM port - number of stop bits (*5 = 1.5 stop bits*)	
COM FC	1 alpha	{N, H, X}	COM port flow control: • N = none • H = hardware • X = xon / xoff	

Special Note: Range Errors:

A range error in a field of the Set Configuration message causes the reader to stop parsing the remainder of the message. The reader sends no error messages in the event of a range error. A range error encountered during parsing of the host parameters will leave the host port in an off-line state. A range error encountered during parsing of the COM port parameters will leave the COM port in an off-line state.

Response: No response from reader.

9.3.9 IAG Transponder (TA/TB – Majority Voting – TRBA Mode) Message

Direction: Reader to Lane Controller

Description: This message applies when:

(1) Lane Assignment is set to "*Majority Voting*",

(2) The Reader is operating in Toll Rate / Balance Adjustment Mode, *and*

(3) The Reader is processing a Toll Rate / Balance Adjustment Transponder.

Note that if condition (1) and (2) are satisfied and condition (3) is NOT MET, the Reader will issue a "standard" Transponder (Majority Voting) Message as defined in §7.2.20.

The Reader issues this message after a Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

Format: *This new format is required due to the size differences of the Read / Write sections of an ISTHA formatted internal transponder.*

Table 9.3-10: IAG Transponder (TA/TB – Majority Voting – TRBA Mode) Message Format

Field Name	Length & Format	Range	Contents	Special Notes
Prefix	2 alpha	{TA, TB}	Transponder Message (Majority Voting): • TA = Report from Primary CTM • TB = Report from Secondary CTM	
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> : reader in non-multiplexed reporting mode • 1 – 8: reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode for Toll Rate / Balance Adjustment Messages)	
Format Code	1 alpha	A	Format Code A – ISTHA Formatted (Interior) Transponder	*New field for TRBA Mode.*
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)	
Trans. Status	1 alpha	{S, F, U, R, X, D, C}	Transaction Status: • S = successful • F =program failed • U = program unverified • R = read only • X = non-IAG tag • D = decommissioned tag • C = Cross-Reader Report (informational, optional) Tag reported by adjacent reader). *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the web interface.*	

Field Name	Length & Format	Range	Contents	Special Notes
Assign. Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*	
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS TDM transaction on the same RF channel. *First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*	
Read Section	18 hex	N / A	Contents of tag read-only section (9 bytes encoded in ASCII HEX = 72 bits)	*Modified Length for TRBA Mode.* ***This field is 18 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
Pre-write section	46 hex	N / A	Contents of write section before programming (23 bytes encoded in ASCII HEX = 184 bits)	*Modified Length for TRBA Mode.* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
Post-write section	46 hex	N / A	Contents of write section if programming is attempted (23 bytes encoded in ASCII HEX =184 bits)	*Modified Length for TRBA Mode* ***This field is 46 chars. in length when the JANUS MPR2.3 Reader is configured for TRBA Mode and a TRBA Transponder is read.***
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §9.2 for details on this field)	

Response: No response expected from Lane Controller.

10. READER CONFIGURATION AND SOFTWARE UPDATE / MANAGEMENT MESSAGE SET

This section describes the messages that are supported by the JANUS MPR2.3 Reader – Lane Controller Serial and Ethernet Interfaces that are used to provide the JANUS MPR2.3 Reader (Remote) Configuration and Software Update / Management functionality. Described in this section are:

- *Reader Configuration – Get/Set Messages*: Messages that have been defined to support, in a generic way, the reading/writing of individual configuration parameters from/to the JANUS MPR2.3 Reader. (See §10.1 for details).
- *Reader Software Update/Management Messages*: Messages that have been defined to support the updating and management of the JANUS MPR2.3 Reader software. Also included as part of this functionality is a '*Bulk Configuration'* upload/download feature that allows for the transfer of entire configuration parameter sets to/from the JANUS MPR2.3 Reader (See §10.2 for details).

10.1 Reader Configuration – Get / Set Messages

10.1.1 Configuration – Get / Set Error (CE) Message

Direction: Reader to Lane Controller

Description: This message is issued by the JANUS MPR2.3 Reader in response to an error condition detected during processing of a received Configuration – *Get Parameter* or Configuration – *Set Parameter* message.

Format:

Table 10.1-1: Configuration – Get / Set Error (CE) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{CE}	Configuration Message: • CE = Configuration – Get / Set Error Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Parameter ID	6 alnum	{Valid Parameter ID's specified in [AD1]}	The 6-character string specified in [AD1] that uniquely identifies a JANUS MPR2.3 Reader configuration parameter. **This field will be set to match the *Parameter ID* field of the *Get / Set Parameter* request for which the error condition was detected.**
(Opening) Instance Delimiter	1 alnum	'['	(Opening) Parameter Instance Delimiter consisting of an open square bracket ('[')
Parameter Instance	2 dec	00 – 99	The zero-padded, 2-character parameter instance identifier. **This field will be set to match the *Parameter Instance* field of the *Get / Set Parameter* request for which the error condition was detected.**

(Closing) Instance Delimiter	1 alnum	‘]’	(Closing) Parameter Instance Delimiter consisting of a close square bracket (‘]’)
Error Message	100 alnum	-	A fixed-length string (padded with <space> (0x20) characters as appropriate) indicating the nature of the detected error.

Response: No response expected from Lane Controller.

10.1.2 Configuration – Get Parameter (CG) Message

Direction: Lane Controller to Reader

Description: This message is issued by the Lane Controller in order to obtain the current value of a specific JANUS MPR2.3 Reader configuration parameter.

Format:

Table 10.1-2: Configuration – Get Parameter (CG) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{CG}	Configuration Message: • CG = Configuration – Get Parameter Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Parameter ID	6 alnum	{Valid Parameter ID's specified in [AD1]}	The 6-character string specified in [AD1] that uniquely identifies a JANUS MPR2.3 Reader configuration parameter
(Opening) Instance Delimiter	1 alnum	'['	(Opening) Parameter Instance Delimiter consisting of an open square bracket ('[')
Parameter Instance	2 dec	00 – 99	The zero-padded, 2-character parameter instance identifier.
(Closing) Instance Delimiter	1 alnum	']'	(Closing) Parameter Instance Delimiter consisting of a close square bracket (']')

Response: The JANUS MPR2.3 Reader responds with a Configuration – *Parameter Value Message* (See §10.1.4).

[If an error condition is detected in the Configuration – *Get Parameter Message*, the JANUS MPR2.3 Reader will respond with a Configuration – *Get / Set Error Message* with *Parameter ID* and *Parameter Instance* fields set to match the offending *Get* request (See §10.1.1).]

10.1.3 Configuration – Set Parameter (CS) Message

Direction: Lane Controller to Reader

Description: This message is issued by the Lane Controller in order to modify the current value of a specific JANUS MPR2.3 Reader configuration parameter.

Format:

Table 10.1-3: Configuration – Set Parameter (CS) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{CS}	Configuration Message: • CS = Configuration – Set Parameter Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Parameter ID	6 alnum	{Valid Parameter ID's specified in [AD1]}	The 6-character string specified in [AD1] that uniquely identifies a JANUS MPR2.3 Reader configuration parameter.
(Opening) Instance Delimiter	1 alnum	'['	(Opening) Parameter Instance Delimiter consisting of an open square bracket ('[')
Parameter Instance	2 dec	00 – 99	The zero-padded, 2-character parameter instance identifier.
(Closing) Instance Delimiter	1 alnum	']'	(Closing) Parameter Instance Delimiter consisting of a close square bracket (']')
Parameter Data **`{Type}`**	1 dec	{0, 1, 2}	The data type of the configuration parameter specified in [AD1]. Identifies the type of data that is present in the variable length *Parameter Value* field, as follows: • 0 = unsigned integer • 1 = string • 2 = IP Address / Port See Table 10.1-4 for a list of *Parameter Data* **`{Type}`** values and their associated *Parameter Data* **`{Value}`** encodings.
Parameter Data **`{Value}`**	Variable	See Table 10.1-4	Variable Length Parameter **`{Value}`** field. Contains the *Parameter Data* **`{Value}`** specified by the preceding *Parameter* **`{Type}`** field. See Table 10.1-4 for a list of *Parameter Data* **`{Type}`** values and their associated *Parameter Data* **`{Value}`** encodings.

Table 10.1-4: Configuration – Set Command Parameter Data {Type, Value} Encodings

{Type}	{Value} Type	{Value} Length & Format	{Value} Range	{Value} Contents
0	unsigned integer	10 dec	0000000000 – 4294967295	32-bit, zero padded, unsigned integer value.
1	string	64 alnum	-	64-byte, <space>-padded string. If contained {**Value**} is less than 64 bytes in length, {**Value**} will be padded with <space> (0x20) characters.
2	IP Address / Port	21 alnum	aaa.bbb.ccc.ddd:ppppp	Dotted decimal IP Address / Port notation. • Dotted decimal IP Address fields (aaa /bbb / ccc / ddd) = 000 – 255 • Port number field (ppppp) = 00000 – 65535
All other values	*RESERVED*	*N/A*	*N/A*	*N/A*

Response: [If an error condition is detected in the Configuration – *Set Parameter Message*, the JANUS MPR2.3 Reader will respond with a Configuration – *Get / Set Error Message* with *Parameter ID* and *Parameter Instance* fields set to match the offending *Set* request (See §Table 10.1-1).]

10.1.4 Configuration – Parameter Value (CV) Message

Direction: Reader to Lane Controller

Description: This message is issued by the JANUS Reader in response to a successful Configuration – *Get Parameter* request message from the Lane Controller. The JANUS MPR2.3 Reader returns the value of the requested configuration parameter in this message.

Format:

Table 10.1-5: Configuration – Parameter Value (CV) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{CV}	Configuration Message: • CV = Configuration – Parameter Value Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Parameter ID	6 alnum	{Valid Parameter ID's specified in [AD1]}	The 6-character string specified in [AD1] that uniquely identifies a JANUS MPR2.3 Reader configuration parameter. **This field will be set to match the *Parameter ID* field of the respective *Get Parameter* request.**
(Opening) Instance Delimiter	1 alnum	'['	(Opening) Parameter Instance Delimiter consisting of an open square bracket ('[')
Parameter Instance	2 dec	00 – 99	The zero-padded, 2-character parameter instance identifier. **This field will be set to match the *Parameter Instance* field of the respective *Get Parameter* request.**
(Closing) Instance Delimiter	1 alnum	']'	(Closing) Parameter Instance Delimiter consisting of a close square bracket (']')
Parameter Data **`{Type}`**	1 dec	{0, 1, 2}	The data type of the configuration parameter specified in [AD1]. Identifies the type of data that is present in the variable length *Parameter Value* field, as follows: • 0 = unsigned integer • 1 = string • 2 = IP Address / Port See Table 10.1-6 for a list of *Parameter Data* **`{Type}`** values and their associated *Parameter Data* **`{Value}`** encodings.
Parameter Data **`{Value}`**	Variable	See Table 10.1-6	Variable Length Parameter **`{Value}`** field. Contains the *Parameter Data* **`{Value}`** specified by the preceding *Parameter* **`{Type}`** field. See Table 10.1-6 for a list of *Parameter Data* **`{Type}`** values and their associated *Parameter Data* **`{Value}`** encodings.

Table 10.1-6: Configuration – Parameter Value Data `{Type, Value}` Encodings

`{Type}`	`{Value}` Type	`{Value}` Length & Format	`{Value}` Range	`{Value}` Contents
0	unsigned integer	10 dec	0000000000 – 4294967295	32-bit, zero padded, unsigned integer value.
1	string	64 alnum	-	64-byte, <space>-padded string. If contained {**`Value`**} is less than 64 bytes in length, {**`Value`**} will be padded with <space> (0x20) characters.
2	IP Address / Port	21 alnum	aaa.bbb.ccc.ddd:ppppp	Dotted decimal IP Address / Port notation. • Dotted decimal IP Address fields (aaa /bbb / ccc / ddd) = 000 – 255 • Port number field (ppppp) = 00000 – 65535
All other values	*RESERVED*	*N/A*	*N/A*	*N/A*

Response: No response expected from Lane Controller.

10.2 Reader Software Update / Management Messages

10.2.1 Activate Update (UA) Message

Direction: Lane Controller to Reader

Description: This command instructs the JANUS MPR2.3 Reader to activate the selected (pre-verified) software version available on the Reader.

Format:

Table 10.2-1: Software Update / Management – Activate Update (UA) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UA}	Software Update / Management Message: • UA= Software Update / Management – Activate Update Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Update Identifier	50 alnum	-	A fixed-length string (padded with <space> (0x20) characters as appropriate) identifying the software version that the Reader should activate. (*e.g.* **`2012nov03a-MPR2-lb735`**) Special Identifiers: • Set to 'FACTORY' to activate the base factory version of software on the Reader • Set to 'LATEST' to activate the latest version available on the Reader *NOTE: This field is case-sensitive.*

Response: [If an error condition is detected during the update activation process, the JANUS MPR2.3 Reader will respond with a Software Update / Management – *Status Message* [US] with *Status* field set to indicate the nature of the error (See §10.2.12).]

[If the activation request is successful, the Reader will implicitly transmit an *Initialization Message* [IN] to the Lane Controller as part of the JANUS Reader software startup sequence (see §7.2.4 and/or §9.3.3 for additional details.]

10.2.2 (Bulk) Configuration File Info (UB) Message

Direction: Reader to Lane Controller

Description: Response message sent by the Reader to inform the Lane Controller that the generation of the JANUS MPR2.3 Reader configuration file (in response to the *Generate (Bulk) Configuration File* [UG] Message) has completed successfully, and that the Lane Controller may now retrieve the Reader configuration by transferring the file with the specified *Configuration File Name*.

In order to complete the transfer of (Bulk) Configuration Data from the JANUS MPR2.3 Reader to the Lane Controller, it becomes the responsibility of the Lane Controller, after receiving this message from the JANUS MPR2.3 Reader, to Secure Copy (scp) the newly generated (Bulk) Configuration File from the Reader to the Lane Controller.

Format:

Table 10.2-2: Software Update / Management – (Bulk) Configuration File Info (UB) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UB}	Software Update / Management Message: • UB = Software Update / Management – (Bulk) Configuration File Info Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Configuration File Name	65 alnum	-	A fixed-length string (padded with <space> (0x20) characters as appropriate) specifying the file name of the (Bulk) Configuration file generated by the Reader in response to the *Generate (Bulk) Configuration File* request from the Lane Controller. *NOTE: This field is case-sensitive.*

Response: No response expected from Lane Controller.

10.2.3 Update (Bulk) Configuration (UC) Message

Direction: Lane Controller to Reader

Description: This message is issued by the Lane Controller upon completion of a secure copy (scp) of a given software configuration file to the Reader. This command instructs the JANUS MPR2.3 Reader to load the configuration values stored in the configuration file that has just been uploaded to the Reader.

Note: The Reader parses and validates the configuration file on a line-by-line basis. Configuration values are extracted and loaded from each configuration parameter line that has been successfully parsed and validated. The Reader skips any configuration parameter line that either fails to parse or fails its validation checks. When the Reader reaches the end of the configuration file and the Reader has detected that one or more configuration parameter lines have either failed to parse or have failed validation checking, the Reader shall respond with a Software Update / Management Status [US] *message with the* Status *field set to indicate that an error has occurred (See §10.2.12).*

Note: The Reader will only update its configuration with parameters that are present in the uploaded configuration file specified by Configuration File Name*. To prevent the Reader from modifying one or more specific configuration parameter(s), simply delete the respective configuration parameter line(s) from the configuration file before uploading it to the Reader.*

Special Case Note: To prevent a potential 'lock-out' situation, the Reader will NOT allow an update to either the* Ethernet 1 (LC 1Gbps) IP Address*, the* Ethernet 1 (LC 1Gbps) Subnet Mask*, and/or the* Default Gateway IP *parameters, if they are present in the specified configuration file.

When the Update Configuration processing is complete, the configuration file that was uploaded to the Reader will be deleted from the JANUS Reader Filesystem

Format:

Table 10.2-3: Software Update / Management – Update (Bulk) Configuration (UC) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UC}	Software Update / Management Message: • UC = Software Update / Management – Update (Bulk) Configuration Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Configuration File Name	65 alnum	-	A fixed-length string (padded with <space> (0x20) characters as appropriate) specifying the name of the configuration file that the Reader will use to update its configuration. *NOTE: This field is case-sensitive.*

Response: [If successful, the Reader will respond with a Software Update / Management – *Status Message* [US] with the *Status* field set to "OK" (See §10.2.12).]

[If an error condition is detected during the Update (Bulk) Configuration process, the JANUS MPR2.3 Reader will respond with a Software Update / Management – *Status Message* [US] with *Status* field set to indicate the nature of the error (See §10.2.12).]

10.2.4 Delete Update (UD) Message

Direction: Lane Controller to Reader

Description: This command instructs the JANUS MPR2.3 Reader to delete the selected (pre-verified) software version available on the Reader.

It is not permitted to either:

a) Delete the active (**i.e.** currently running) software version; and/or

b) Delete the Factory software version

from the JANUS MPR2.3 Reader.

Format:

Table 10.2-4: Software Update / Management – Delete Update (UD) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UD}	Software Update / Management Message: • UD= Software Update / Management – Delete Update Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Update Identifier	50 alnum	-	A fixed-length string (padded with <space> (0x20) characters as appropriate) identifying the software version that the Reader should delete. (*e.g.* **`2012nov03a-MPR2-lb735`**) *NOTE: This field is case-sensitive.*

Response: [If successful, the Reader will respond with a Software Update / Management – *Status Message* [US] with the *Status* field set to “OK” (See §10.2.12).]

[If an error condition is detected during the update delete process, the JANUS MPR2.3 Reader will respond with a Software Update / Management – *Status Message* [US] with *Status* field set to indicate the nature of the error (See §10.2.12).]

10.2.5 Get Free Space (UF) Message

Direction: Lane Controller to Reader

Description: This message is issued by the Lane Controller in order to obtain the current amount of free space available for additional Reader software updates.

Format:

Table 10.2-5: Software Update / Management – Get Free Space (UF) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UF}	Software Update / Management Message: • UF = Software Update / Management – Get Free Space Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)

Response: The JANUS MPR2.3 Reader responds with a Software Update / Management – *Filesystem Space Available Message* [UM] (See §10.2.8).

10.2.6 Generate (Bulk) Configuration File (UG) Message

Direction: Lane Controller to Reader

Description: This command instructs the JANUS MPR2.3 Reader to generate a configuration file suitable for transfer to the Lane Controller, based on the current Reader configuration values.

Any (Bulk) Configuration files present on the Reader will be automatically deleted when the Reader executes the request to generate the (Bulk) Configuration file.

Format:

Table 10.2-6: Software Update / Management – Generate (Bulk) Configuration File (UG) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UG}	Software Update / Management Message: • UG = Software Update / Management – Generate (Bulk) Configuration File Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)

Response: [If successful, the Reader will respond with a Software Update / Management – *(Bulk) Configuration File Info Message* [UB] with the *Configuration File Name* field set to the name of the newly generated (Bulk) Configuration File (See §10.2.2).]

[If an error condition is detected during the (Bulk) Configuration File generation process, the JANUS MPR2.3 Reader will respond with a Software Update / Management – *Status Message* [US] with *Status* field set to indicate the nature of the error (See §10.2.12).]

10.2.7 Get Update Identifier (UI) Message

Direction: Lane Controller to Reader

Description: This message is issued by the Lane Controller in order to obtain the identifier of a given software version that is available on the Reader.

Format:

Table 10.2-7: Software Update / Management – Get Update Identifier (UI) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UI}	Software Update / Management Message: • UI = Software Update / Management Get Update Identifier Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Update Index	1 dec	0 – (*n*-1)	Update Index. An index number between 0 and {*Number of Available Updates*} – 1.

Response: The JANUS MPR2.3 Reader responds with a Software Update / Management – *Update Identifier-Reference Message* [UR] (See §10.2.11).

[If an error condition is detected in *the* Software Update / Management – *Get Update Identifier Message*, the JANUS MPR2.3 Reader will respond with a Software Update / Management – *Status Message* [US] with *Status* field set to indicate the nature of the error (See §10.2.12).]

10.2.8 Filesystem Space Available (UM) Message

Direction: Reader to Lane Controller

Description: This message is issued by the JANUS MPR2.3 Reader in response to a successful Software Update / Management – *Get Free Space* [UF] request message from the Lane Controller. The JANUS MPR2.3 Reader reports the amount of filesystem space available for additional software updates in this message.

Format:

Table 10.2-8: Software Update / Management – Filesystem Space Available (UM) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UM}	Software Update / Management Message: • UM = Software Update / Management – Filesystem Space Available Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Filesystem Space Available	20 dec	00000000000000000000 – 18446744073709551615	The filesystem space available for additional software updates, in bytes.

Response: No response expected from Lane Controller

10.2.9 Available Update Count (UN) Message

Direction: Reader to Lane Controller

Description: This message is issued by the JANUS MPR2.3 Reader in response to a successful Software Update / Management – *Query Update Count* [UQ] request message from the Lane Controller. The JANUS MPR2.3 Reader reports the number of currently available software versions present on the Reader.

Format:

Table 10.2-9: Software Update / Management – Available Update Count (UN) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UN}	Software Update / Management Message: • UN = Software Update / Management – Available Update Count Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Available Updates	1 dec	0 – 9	The number of available software versions present on the Reader. *The Factory software version is included in this count*.

Response: No response expected from Lane Controller

10.2.10 Query Update Count (UQ) Message

Direction: Lane Controller to Reader

Description: This message is issued by the Lane Controller in order to obtain the number of currently available software versions that are present on the Reader.

Format:

Table 10.2-10: Software Update / Management – Query Update Count (UQ) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UQ}	Software Update / Management Message: • UQ = Software Update / Management Query Update Count Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)

Response: The JANUS MPR2.3 Reader responds with a Software Update / Management – *Available Update Count Message* [UN] (See §10.2.9).

10.2.11 Update Identifier-Reference (UR) Message

Direction: Reader to Lane Controller

Description: This message is issued by the JANUS MPR2.3 Reader in response to a successful Software Update / Management – *Get Update Identifier* [UI] request message from the Lane Controller. The JANUS MPR2.3 Reader reports the identifier of the available software version on the Reader associated with the requested update index.

Format:

Table 10.2-11: Software Update / Management – Update Identifier-Reference (UR) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UR}	Software Update / Management Message: • UR = Software Update / Management – Update Identifier-Reference Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Update Index	1 dec	0 – 9	Update Index. An index number between 0 and {*Number of Available Updates*} – 1.
Factory Software Version	1 dec	0 – 1	Identifies whether or not the specified version is the Factory Software Version: • 0 = Specified update is NOT the Reader Factory Version • 1 = Specified update is the Reader Factory Version
Active Software Version	1 dec	0 – 1	Identifies whether or not the specified version is the currently running Active Software Version: • 0 = Specified update is NOT the currently running Active Software Version • 1 = Specified update is the currently running Active Software Version
Update Identifier	50 alnum	-	A fixed-length string (padded with <space> (0x20) characters as appropriate) containing the identifier of the software version associated with the specified *Update Index*. (*e.g.* **`2012nov03a-MPR2-lb735`**) *NOTE: This field is case-sensitive.*

Response: No response expected from Lane Controller

10.2.12 Software Update / Management Status (US) Message

Direction: Reader to Lane Controller

Description: This message is issued by the JANUS MPR2.3 Reader in response to operation successfully completed, or an error condition detected during processing of a received Software Update / Management message, depending on conditions.

Format:

Table 10.2-12: Software Update / Management Status (US) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{US}	Software Update / Management Message: • US = Software / Update Management Status Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Status	100 alnum	-	A fixed-length string (padded with <space> (0x20) characters as appropriate) indicating the status of the detected error. Set to “OK” if the requested operation was successful. Otherwise, this field will be populated with a text string indicating the nature of the error.

Response: No response expected from Lane Controller.

10.2.13 Verify Update (UV) Message

Direction: Lane Controller to Reader

Description: This message is issued by the Lane Controller upon completion of a secure copy (scp) of a given software update to the Reader. This command instructs the JANUS MPR2.3 Reader to perform verification of the software version specified by the *Update File Name* field.

After verification, the file uploaded by the Lane Controller via Secure Copy (scp) is either:

a) Relocated to the software update repository on the Reader if the verification was successful; or

b) Deleted from the Reader if the verification failed.

Format:

Table 10.2-13: Software Update / Management – Verify Update (UV) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{UV}	Software Update / Management Message: • UV = Software Update / Management – Verify Update Message
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Update File Name	62 alnum	-	A fixed-length string (padded with <space> (0x20) characters as appropriate) specifying the file name of software version that the Reader should verify. (*e.g.* **`2012nov03a-MPR2-lb735.en.sign.md5`**) *NOTE: This field is case-sensitive.*

Response: [If successful, the Reader will respond with a Software Update / Management – *Status Message* [US] with the *Status* field set to "OK" (See §10.2.12).]

[If an error condition is detected during the update verification process, the JANUS MPR2.3 Reader will respond with a Software Update / Management – *Status Message* [US] with *Status* field set to indicate the nature of the error (See §10.2.12).]

11. MULTI-PROTOCOL MESSAGE SET

This section specifies the Multi-Protocol application messages sent by the JANUS Reader that are supported by the JANUS MPR2.3 Reader – Lane Controller Serial and Ethernet Interfaces. All JANUS MPR2.3 Reader Multi-Protocol Messages share a common message format.

Messages are grouped according to the relevant function / protocol, as follows:

- Allegro Multi-Protocol Messages
- ISO 18000-6B Multi-Protocol Messages
- ISO 18000-6C Multi-Protocol Messages
- ATA Multi-Protocol Messages
- ISO 18000-6B eAta Multi-Protocol Messages
- SeGo Multi-Protocol Messages
- ISO 18000-6B Combined UID+eATA Multi-Protocol Messages
- IAG Multi-Protocol Messages

Note: *Please refer to §2.3.5.1 on how the Multi-Protocol application messages specified herein are encapsulated into their respective Data-Link Layer (JANUS MPR2.3 Reader – Lane Controller Serial Interface) and/or Data-Transport Layer (JANUS MPR2.3 Reader – Lane Controller Ethernet Interface) protocol packets. For additional information on message timestamping, please refer to §11.2.*

11.1 Multi-Protocol Common Message Format

All JANUS MPR2.3 Reader Multi-Protocol Messages are derived from the Multi-Protocol Common Message Format as illustrated in Figure 11.1-1. There are four (4) invariant fields across all JANUS MPR2.3 Reader Multi-Protocol Messages:

- Prefix
- RF Channel
- Type
- Format

The *Format* field serves as an identifier that informs the Lane Controller of the specific contents that are contained within the *Multi-Protocol Specific Message Payload* field. Table 11.1-1 describes, in detail, the common message fields of the Multi-Protocol Common Message Format.

Prefix (2 Bytes)	**RF Channel** (1 Byte)	**Type** (1 Byte)	**Format** (2 Bytes)	**Multi-Protocol Specific Message Payload** (Variable)	**Extended Information** (Optional, Variable)

Figure 11.1-1: Multi-Protocol Common Message Format

Table 11.1-1: Multi-Protocol Common Message Fields

Common Message Field	Length (bytes) & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{B, R}	• B = buffered message (report is from transaction buffer) • R = real-time message (tag has just gone through lane)
Format	2 hex	00 - FF	Message Format Identifier. Identifies format of Multi-Protocol Specific Message Payload that follows. (see Table 11.1-2 for details)
Multi-Protocol Specific Message Payload	Multi-Protocol Message Dependent	Multi-Protocol Message Dependent	A varying length field containing various Multi-Protocol specific data. The *Format* field identifies this field's contents.
Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Table 11.1-2 lists the defined values for the *Format* field of the Multi-Protocol Common Message Format (*Please note that any value not explicitly listed in Table 11.1-2 is considered RESERVED*)

Table 11.1-2: Multi-Protocol Format Codes

Multi-Protocol Format Code (ASCII Hex)	Description
00	Allegro Handshake Message
01	Allegro Initial Read Message
02	Allegro Transponder (Majority Voting) Message
03	Allegro Post Capture (Majority Voting) Message
04	Allegro Transponder (Interpolated Voting) Message
05	Allegro Post Capture (Interpolated Voting) Message
10	ISO 18000-6B Handshake Message
11	ISO 18000-6B Initial Read Message
12	ISO 18000-6B Transponder (Majority Voting) Message
13	SO 18000-6B Post Capture (Majority Voting) Message

Multi-Protocol Format Code (ASCII Hex)	Description
14	ISO 18000-6B Transponder (Interpolated Voting) Message
15	ISO 18000-6B Post Capture (Interpolated Voting) Message
16	ISO 18000-6B Estimated Vehicle Speed Message
20	ISO 18000-6C Handshake Message
21	ISO 18000-6C Initial Read Message
22	ISO 18000-6C Transponder (Majority Voting) Message
23	ISO 18000-6C Post Capture (Majority Voting) Message
24	ISO 18000-6C Transponder (Interpolated Voting) Message
25	ISO 18000-6C Post Capture (Interpolated Voting) Message
26	ISO 18000-6C Estimated Vehicle Speed Message
30	ATA Handshake Message (8-Bit ASCII Hex Data)
31	ATA Initial Read Message (8-Bit ASCII Hex Data)
32	ATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)
33	ATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)
34	ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)
35	ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)
36	ATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)
40	ATA Handshake Message (8-Bit ASCII Alphanumeric Data)
41	ATA Initial Read Message (8-Bit ASCII Alphanumeric Data)
42	ATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)
43	ATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)
44	ATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)
45	ATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)
46	ATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)
50	ISO 18000-6B eATA Handshake Message (8-Bit ASCII Hex Data)
51	ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Hex Data)
52	ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Hex Data)
53	ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Hex Data)
54	ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Hex Data)
55	ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Hex Data)
56	ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Hex Data)
60	ISO 18000-6B eATA Handshake Message (8-Bit ASCII Alphanumeric Data)
61	ISO 18000-6B eATA Initial Read Message (8-Bit ASCII Alphanumeric Data)

Multi-Protocol Format Code (ASCII Hex)	Description
62	ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)
63	ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit ASCII Alphanumeric Data)
64	ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)
65	ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-Bit ASCII Alphanumeric Data)
66	ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit ASCII Alphanumeric Data)
70	SeGo Handshake Message
71	SeGo Initial Read Message
72	SeGo Transponder (Majority Voting) Message
73	SeGo Post Capture (Majority Voting) Message
74	SeGo Transponder (Interpolated Voting) Message
75	SeGo Post Capture (Interpolated Voting) Message
76	SeGo Estimated Vehicle Speed Message
80	ISO 18000-6B Combined UID+eATA Handshake Message
81	ISO 18000-6B Combined UID+eATA Initial Read Message
82	ISO 18000-6B Combined UID+eATA Transponder (Majority Voting) Message
83	ISO 18000-6B Combined UID+eATA Post Capture (Majority Voting) Message
84	ISO 18000-6B Combined UID+eATA Transponder (Interpolated Voting) Message
85	ISO 18000-6B Combined UID+eATA Post Capture (Interpolated Voting) Message
86	ISO 18000-6B Combined UID+eATA Estimated Vehicle Speed Message
A0	IAG (Standard) Handshake Message
B0	IAG (Toll Rate / Balance Adjustment) Handshake Message
All other values	*RESERVED*

11.2 Multi-Protocol Message Extended Information Field

The *Extended Information* field is an optional, variable-length field that conveys additional message information depending upon the configuration of the JANUS MPR2.3 Reader. If the JANUS MPR2.3 Reader is configured to report extended information, this field will be populated with those values that have been chosen to be reported in the Reader configuration. **If no extended information has been requested in the Reader configuration, the *Extended Information* field *WILL NOT BE PRESENT* in JANUS MPR2.3 Reader-to-Lane Controller messages.**

Prefix (2 Bytes)	**RF Channel** (1 Byte)	**Type** (1 Byte)	**Format** (2 Bytes)	**Multi-Protocol Specific Message Payload** (Variable)	**Extended Information** (Optional, Variable)

Count (1 Byte)	***Tag_0*** (1 Byte)	***Value_0*** (Tag Specific)	***Tag_1*** (1 Byte)	***Value_1*** (Tag Specific)	. . .	***Tag_n*** (1 Byte)	***Value_n*** (Tag Specific)

Figure 11.2-1: Multi-Protocol Extended Information Format

As shown in Figure 11.2-1, data is encoded into the *Extended Information* field in the form of **`{Tag, Value}`** pairs. Each **`{Tag}`** is encoded as one (1) ASCII hexadecimal character. **`{Value}`** data is encoded in a tag-specific fashion. The first byte of the *Extended Information* field is the *Count* sub-field (encoded in ASCII decimal), which specifies the total number of **`{Tag, Value}`** pairs encoded within the *Extended Information* field, if present.

Table 11.2-1 specifies the defined **`{Tag, Value}`** encodings for the *Extended Information* field of the Multi-Protocol Common Message Format (*Please note that any* **`{Tag}`** *values not explicitly listed in Table 11.2-1 are considered RESERVED*).

Table 11.2-1: Multi-Protocol Extended Information `{Tag, Value}` Encodings

`{Tag}`	`{Value}` Name	`{Value}` Length & Format	`{Value}` Range	`{Value}` Contents	Message Applicability
0	*Timestamp*	16 dec	0 – 4294967295999999	The number of microseconds since the Epoch (1970-01-01 00:00:00 +0000 [UTC]) corresponding to the successful read event.	All Multi-Protocol Initial Read, Transponder, Post Capture, Estimated Vehicle Speed, Handshake and Status Messages
1	*Transponder RSSI*	5 dec	00000 – 99999	Received signal strength indicator (RSSI) for tag data	Multi-Protocol Handshake Messages Only (***This feature is currently only available for the IAG, ISO 18000-6B, ISO 18000-6C, ATA, and SeGo protocols***)
2	*Envelope Reference Point*	1 hex	Bit-Mapped	• Bit 0 (LSB): Set to 1 if Handshake occurs at a point where the tag is passing, or has passed directly under center of antenna, 0 otherwise.	Multi-Protocol Handshake Messages Only (***This feature is currently not implemented***)
3	*Range Change Rate*	3 dec	000 – 127	Set to '127' if not measured or unavailable.	Multi-Protocol Handshake Messages Only (***This feature is currently only available for the ISO 18000-6B, ISO 18000-6C, ATA and SeGo protocols***)
4	*Average |I|, |Q| Data*	11 alnum	{00000 – 65535} / {00000 – 65535}	Magnitudes |I| and |Q| of average I signal and Q signal channel values, respectively. |I| and |Q| values are separated by a slash ('/') character	Multi-Protocol Handshake Messages Only (***This feature is currently only available for the ISO 18000-6B, ISO 18000-6C, ATA, and Sego protocols***)

`{Tag}`	`{Value}` Name	`{Value}` Length & Format	`{Value}` Range	`{Value}` Contents	Message Applicability
5	*ISO 18000-6C EPC/UII Memory CRC/PC bits*	8 hex	0x00000000 – 0xFFFFFFFF	The contents of the ISO 18000-6C Transponder EPC/UII Memory (Memory Bank 01) CRC and tag *Protocol Control* (PC) bits. [32 bits from 0x00 – 0x1F, inclusive]	All ISO 18000-6C Multi-Protocol Initial Read, Transponder, Post Capture, Estimated Vehicle Speed, and Handshake Messages (***This feature is only available for the ISO 18000-6C protocol***)
All other values	*RESERVED*	*N/A*	*N/A*	*N/A*	*N/A*

11.3 Multi-Protocol Handshake Message Payload Common Fields

The JANUS MPR2.3 Reader Multi-Protocol Handshake messages (Format = '*n*0', where '`0`' ≤ *n* ≤ '`B`') all contain a common Multi-Protocol Specific Message Payload that is encapsulated within the Multi-Protocol Common Message Format as shown in Figure 11.3-1 and described in detail in Table 11.3-1. There is one (1) invariant field that is common to these Handshake Messages:

- Frame Number Field

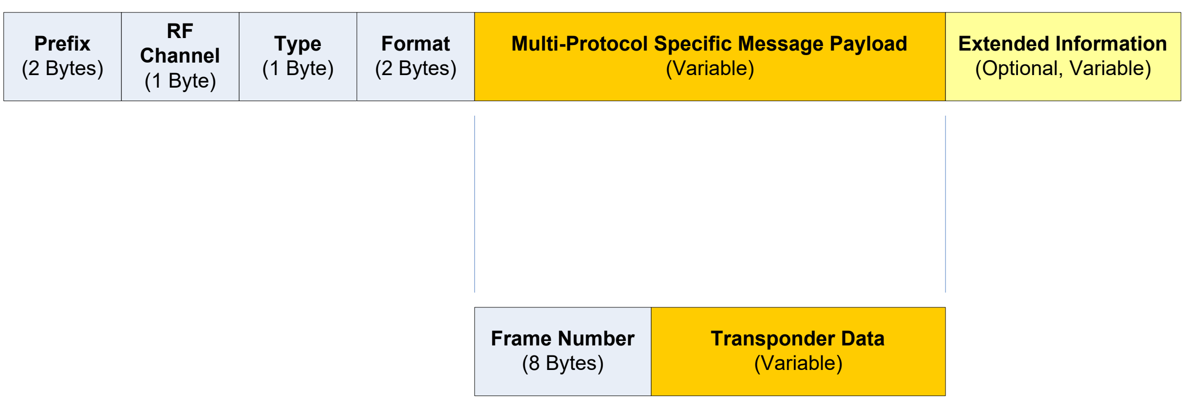

Figure 11.3-1: JANUS MPR2.3 Reader Handshake Message Payload Encapsulation and Format

Table 11.3-1: JANUS MPR2.3 Reader Handshake Message Payload Format Fields

<table>
<tr><th>Common Message Format Field</th><th>Length & Format</th><th>Range</th><th>Contents</th></tr>
<tr><td>Frame Number</td><td>8 hex</td><td>00000000 – FFFFFFFF</td><td>The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached.</td></tr>
<tr><td>Transponder Data</td><td>Transponder Data Dependent</td><td>Transponder Data Dependent</td><td>The Transponder Data that was read.

For Allegro Tags: The contents of the Allegro transponder default memory page.
For ISO 18000-6B Tags: The contents of the ISO 18000-6B transponder default memory page (UID).
For ISO 18000-6B eATA Tags: Depending on Reader configuration, either:

The contents of the ISO 18000-6B transponder default memory page (UID); or
The contents of the eATA transponder data (memory pages 0x70,0x78) in either 8-bit ASCII hexadecimal representation or 8-bit ASCII alphanumeric format (See §11.4 for details); or
The contents of the ISO 18000-6B transponder default memory page (UID) together with the contents of the eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format format (See §11.4 for details).

For ISO 18000-6C Tags: The contents of the ISO 18000-6C transponder EPC/UII and either the contents of the ISO 18000-6C tranponder TID or UM memory banks, depending on the configured ISO 18000-6C Read Mode.
For ATA Tags: The contents of the ATA transponder data in either 8-bit ASCII hexadecimal representation or 8-bit ASCII alphanumeric format (See §11.4 for details)
For IAG Tags: The contents of the IAG (Standard or Toll Rate / Balance Adjustment) transponder read section followed by the contents of the IAG (Standard or Toll Rate / Balance Adjustment) transponder write section
For SeGo Tags: The contents of the SeGo transponder default memory page.
</td></tr>
</table>

11.4 ATA / ISO 18000-6B eATA Transponder Data Formats

11.4.1 ATA Transponder Data Formats

ATA transponders have their data encoded in 6-bit ASCII format. The JANUS MPR2.3 Reader allows for two ways of encoding this information when transmitting it to the Lane Controller based on the setting of the '*ATA Data Reporting Format*' configuration parameter, as follows:

- *Option 1 – 8-bit ASCII Hexadecimal Representation (of ATA Transponder data)* – When Option 1 is selected, the ATA Transponder data shall be presented to the Lane Controller using the ATA 8-bit Hexadecimal Format (Format=0x3*n*) series of messages (*c.f.* §11.8). For each ATA message sent to the Lane Controller using this message set, the *ATA Transponder* Data field contains the 40-byte ASCII hexadecimal representation of the decoded 20-byte (8-bit) binary mapping of the 16 bytes of transponder ATA data originally encoded in 6-bit ASCII.
- *Option 2 – 8-bit ASCII Alphanumeric Representation (of ATA Transponder data)* – When Option 2 is selected, the ATA Transponder data shall be presented to the Lane Controller using the ATA 8-bit Alphanumeric Format (Format=0x4*n*) series of messages (*c.f.* §11.9). For each ATA message sent to the Lane Controller using this message set, the *ATA Transponder* Data field contains the 20-byte (8-bit) ASCII alphanumeric representation of the decoded 20-byte (8-bit) binary mapping of the 16 bytes of transponder ATA data originally encoded in 6-bit ASCII.

The differences between Option 1 and Option 2 representation are best illustrated through an example, as shown below:

Example:

For an ATA Transponder printed with the following identifier: `CPFI01052229`

The 16 bytes of Transponder Raw Data (note that ***underlined*** *nybbles are not utilized in the decode process) gathered by JANUS MPR2.3 Reader MRFM is:*

```
8F 09 A9 41 14 15 49 2B 49 95 A6 38 E3 81 B4 43
```

Breaking this value into 6-bit chunks, we obtain the following decoding as shown in Table 11.4-1:

Table 11.4-1: ATA Transponder Data Representation Format Example

6-Bit (Binary) Raw Transponder Data	8-Bit (Binary) Hexadecimal Equivalent	Option 1 – 8-Bit ASCII Hex Representation	Option 2 – 8-Bit ASCII Alphanumeric Representation
100011	0x23	“23”	‘C’
110000	0x30	“30”	‘P’
100110	0x26	“26”	‘F’
101001	0x29	“29”	“I’
010000	0x10	“10”	‘0’
010001	0x11	“11”	‘1’
010000	0x10	“10”	‘0’
010101	0x15	“15”	‘5’
010010	0x12	“12”	‘2’
010010	0x12	“12”	‘2’
10 *(FRAME CHECKSUM – Not Used in Decode)*	*N/A*	*N/A*	*N/A*
11 *(FRAME MARKER – Not Used in Decode)*	*N/A*	*N/A*	*N/A*
010010	0x12	“12”	‘2’
011001	0x19	“19”	‘9’
010110	0x16	“16”	‘6’
100110	0x26	“26”	‘F’
001110	0x0E	“0E”	‘.’
001110	0x0E	“0E”	‘.’
001110	0x0E	“0E”	‘.’
000001	0x01	“01”	‘!’
101101	0x2D	“2D”	‘M’
000100	0x04	“04”	‘$’
00 *(FRAME CHECKSUM – Not Used in Decode*	*N/A*	*N/A*	*N/A*
11 *(FRAME MARKER – Not Used in Decode*	*N/A*	*N/A*	*N/A*

Therefore, for this particular ATA Transponder:

- *If Option 1 were selected, the Reader would transmit ATA 8-bit Hexadecimal messages (Format = 0x3n) with the ATA* Transponder Data *field set to the following 40-byte ASCII string:*

  "**2330262910111015121212191626 0E0E0E012D04**"

- *If Option 2 were selected, the Reader would transmit ATA 8-bit Alphanumeric messages (Format=0x4n) with the ATA* Transponder Data *field set to the following 20-byte ASCII string:*

  "**CPFI010522296F...!M$**"

11.4.2 ISO 18000-6B eATA Transponder Data Formats

Similarly for ISO 18000-6B eATA transponders, the JANUS MPR2.3 Reader allows for multiple ways of encoding the transponder ID information when transmitting it to the Lane Controller based on the setting of the '*ISO 18000-6B Data Reporting Format*' configuration parameter, as follows:

- *Option 0 – Standard UID Representation (of ISO 18000-6B Transponder data)* – When Option 0 is selected, the ISO 18000-6B UID data shall be presented to the Lane Controller using the ISO 18000-6B Format (Format=0x1*n*) series of messages (*c.f.* §11.6). For each ISO 18000-6B message sent to the Lane Controller using this message set, the *ISO 18000-6B Transponder Data* field contains the 16-byte ASCII hexadecimal representation of the contents of the ISO 18000-6B transponder default memory page (UID). ***Note: Clone tag filtering is not performed if Option 0 is selected for ISO 18000-6B reporting.***
- *Option 1 – 8-bit ASCII Hexadecimal Representation (of ISO 18000-6B eATA Transponder data)* – When Option 1 is selected, the ISO 18000-6B eATA data shall be presented to the Lane Controller using the ISO 18000-6B eATA Report 8-Bit Hexadecimal Format (Format=0x5*n*) series of messages (*c.f.* §11.10). For each ISO 18000-6B eATA message sent to the Lane Controller using this message set, the *eATA Transponder Data* field contains the 40-byte ASCII hexadecimal representation of the decoded 20-byte (8-bit) binary mapping of the 16 bytes of transponder eATA data originally encoded in 6-bit ASCII. ***Note: Clone tag filtering is enabled when Option 1 is selected for ISO 18000-6B reporting.***
- *Option 2 – 8-bit ASCII Alphanumeric Representation (of ISO 18000-6B eATA Transponder data)* – When Option 2 is selected, the ISO 18000-6B eATA data shall be presented to the Lane Controller using the ISO 18000-6B eATA Report 8-Bit Alphanumeric Format (Format=0x6*n*) series of messages (*c.f.* §11.11). For each ISO 18000-6B eATA message sent to the Lane Controller using this message set, the *eATA Transponder Data* field contains the 20-byte (8-bit) ASCII alphanumeric representation of the decoded 20-byte (8-bit) binary mapping of the 16 bytes of transponder eATA data originally encoded in 6-bit ASCII. ***Note: Clone Tag filtering is enabled when Option 2 is selected for ISO 18000-6B reporting.***
- *Option 3 – Combined UID+eATA (8-bit ASCII Alphanumeric Representation of ISO 18000-6B eATA Transponder data)* – When Option 3 is selected, both the ISO 18000-6B UID *and* eATA data shall be presented to the Lane Controller using the ISO 18000-6B Combined UID+eATA Report Format (Format=0x8*n*) series of messages (*c.f.* §11.13). For each ISO 18000-6B Combined UID+eATA message sent to the Lane Controller using this message set:
  - The *ISO 18000-6B Transponder (UID) Data* field contains the 16-byte ASCII hexadecimal representation of the contents of the ISO 18000-6B transponder default memory page (UID), ***and***;
  - The *eATA Transponder Data* field contains the 20-byte (8-bit) ASCII alphanumeric representation of the decoded 20-byte (8-bit) binary mapping of the 16 bytes of transponder eATA data originally encoded in 6-bit ASCII.

Note: Clone Tag filtering is enabled when Option 3 is selected for ISO 18000-6B reporting.

The differences between the different representation options are best illustrated through an example, as shown below:

Example:

For an ISO-18000 6B (eATA) Transponder printed with the following identifiers:

`CPFI01054583 / E022494700101777`

The 8 byte UID from the contents of the transponder default memory page is: `E022494700101777`

*For Option 1 and Option 2 settings, the 16 bytes of eATA Transponder Raw Data (note that **underlined** nybbles are not utilized in the decode process) gathered by JANUS MPR2.3 Reader MRFM is:*

`8F 09 A9 41 14 15 51 5`**F**` 61 35 99 38 E3 81 B4 4`**0**

Breaking this value into 6-bit chunks, we obtain the following decoding as shown in Table 11.4-2.

Table 11.4-2: ISO 18000-6B eATA Transponder Data Representation Format Example

6-Bit (Binary) Raw Transponder Data	8-Bit (Binary) Hexadecimal Equivalent	Option 1 – 8-Bit ASCII Hex Representation	Option 2 – 8-Bit ASCII Alphanumeric Representation
100011	0x23	"23"	'C'
110000	0x30	"30"	'P'
100110	0x26	"26"	'F'
101001	0x29	"29"	"I'
010000	0x10	"10"	'0'
010001	0x11	"11"	'1'
010000	0x10	"10"	'0'
010101	0x15	"15"	'5'
010100	0x14	"14"	'4'
010101	0x15	"15"	'5'
11 *(FRAME CHECKSUM – Not Used in Decode)*	*N/A*	*N/A*	*N/A*
11 *(FRAME MARKER – Not Used in Decode)*	*N/A*	*N/A*	*N/A*
011000	0x18	"18"	'8'
010011	0x13	"13"	'3'
010110	0x16	"16"	'6'
101001	0x19	"19"	'9'
001110	0x0E	"0E"	'.'
001110	0x0E	"0E"	'.'
001110	0x0E	"0E"	'.'
000001	0x01	"01"	'!'
101101	0x2D	"2D"	'M'
000100	0x04	"04"	'$'
00 *(FRAME CHECKSUM – Not Used in Decode*	*N/A*	*N/A*	*N/A*
11 *(FRAME MARKER – Not Used in Decode*	*N/A*	*N/A*	*N/A*

Therefore, for this particular ISO 18000-6B Transponder:

- *If Option 0 is selected, the Reader would transmit ISO 18000-6B Format messages (Format=0x1n) with the* ISO 18000-6B Transponder Data *field set to the following 16-byte ASCII hexadecimal equivalent of the contents of the transponder default memory page (UID):*

  "**E022494700101777**"

- *If Option 1 were selected, the Reader would transmit ISO 18000-6B eATA Report 8-bit Hexadecimal Format messages (Format=0x5n) with the eATA* Transponder Data *field set to the following 40-byte ASCII string:*

  "**2330262910111015141518131619 0E0E0E012D04**"

- *If Option 2 were selected, the Reader would transmit ISO 18000-6B eATA Report 8-bit Alphanumeric Format messages (Format = 0x6n) with the eATA* Transponder Data *field set to the following 20-byte ASCII string:*

  "**CPFI0105458369...!M$**"

- *If Option 3 were selected, the Reader would transmit ISO 18000-6B Combined UID+eATA Format messages (Format=0x8n) with the* ISO 18000-6B UID Transponder Data *field set to the following 16-byte ASCII hexadecimal equivalent of the contents of the transponder default memory page (UID):*

  "**E022494700101777**";

  ***And** the eATA* Transponder Data *field set to the following 20-byte ASCII string:*

  "**CPFI0105458369...!M$**"

11.5 Allegro Multi-Protocol Messages

11.5.1 Allegro Handshake (00 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when "*Raw Handshake Report*" configuration parameter is enabled on the JANUS MPR2.3 Reader. The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface after an Allegro Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.5-1: Allegro Handshake (00 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	00	Format Code 00 – Allegro Handshake Message
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
Allegro *Transponder Data*	66 hex	N/A	The contents of the Allegro transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.5.2 Allegro Initial Read (01 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the Allegro transponder first enters the capture zone.

This message applies when the "*Generate Initial Report*" configuration parameter option is enabled on the JANUS MPR2.3 Reader. This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.5-2: Allegro Initial Read (01 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Format	2 hex	01	Format Code 01 – Allegro Initial Read Message
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
Allegro *Transponder Data*	66 hex	N/A	The contents of the Allegro transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.5.3 Allegro Transponder (02 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*". The Reader issues this message after an Allegro Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.5-3: Allegro Transponder (02 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	02	Format Code 02 – Allegro Transponder (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Allegro *Transponder Data*	66 hex	N/A	The contents of the Allegro transponder default memory page.

Field Name	Length & Format	Range	Contents
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.5.4 Allegro Post Capture (03 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of an Allegro transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.5-4: Allegro Post Capture (03 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	03	Format Code 03 – Allegro Post Capture (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Allegro *Transponder Data*	66 hex	N/A	The contents of the Allegro transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.5.5 Allegro Transponder (04 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*". The Reader issues this message after an Allegro Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.5-5: Allegro Transponder (04 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	04	Format Code 04 – Allegro Transponder (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*

Field Name	Length & Format	Range	Contents
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left ‘L’, center ‘C’, right ‘R’ (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: ‘a’ – ‘f’, <space>} OR {‘xx’}	Estimated OBU sub-zone location: Two characters (‘ab’), or one character with trailing space (‘a<space>’); ‘xx’ = undefined sub-zone
Allegro *Transponder Data*	66 hex	N/A	The contents of the Allegro transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.5.6 Allegro Post Capture (05 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of an Allegro transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.5-6: Allegro Post Capture (05 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	05	Format Code 05 – Allegro Post Capture (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone
Allegro *Transponder Data*	66 hex	N/A	The contents of the Allegro transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.6 ISO 18000-6B Multi-Protocol Messages

11.6.1 ISO 18000-6B Handshake (10 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Raw Handshake Reports*" configuration parameter is enabled and '*ISO 18000-6B Reporting*' is set to '*Standard UID Format*'. The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface after an ISO 18000-6B Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.6-1: ISO 18000-6B Handshake (10 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	10	Format Code 10 – ISO 18000-6B Handshake Message
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
ISO 18000-6B *Transponder Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.6.2 ISO 18000-6B Initial Read (11 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the ISO 18000-6B transponder first enters the capture zone.

This message applies when the JANUS MPR2.3 Reader “*Generate Initial Report*” configuration parameter is enabled and ‘*ISO 18000-6B Reporting*’ is set to ‘*Standard UID Format*’. This message is generated for both “*Majority*” and ‘*Interpolated*’ voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.6-2: ISO 18000-6B Initial Read (11 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* ‘Initial Read Report Message Buffering’ *is ENABLED.*
Format	2 hex	11	Format Code 11 – ISO 18000-6B Initial Read Message
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
ISO 18000-6B *Transponder Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.6.3 ISO 18000-6B Transponder (12 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and '*ISO 18000-6B Reporting*' is set to '*Standard UID Format*'. The Reader issues this message after an ISO 18000-6B Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.6-3: ISO 18000-6B Transponder (12 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	12	Format Code 12 – ISO 18000-6B Transponder (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
ISO 18000-6B *Transponder Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.6.4 ISO 18000-6B Post Capture (13 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*". This message is generated if the '*ISO 18000-6B Reporting*' is set to '*Standard UID Format*' and "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ISO 18000-6B transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.6-4: ISO 18000-6B Post Capture (13 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	13	Format Code 13 – ISO 18000-6B Post Capture (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
ISO 18000-6B *Transponder Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.6.5 ISO 18000-6B Transponder (14 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and '*ISO 18000-6B Reporting*' is set to '*Standard UID Format*'. The Reader issues this message after an ISO 18000-6B Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.6-5: ISO 18000-6B Transponder (14 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	14	Format Code 14 – ISO 18000-6B Transponder (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
ISO 18000-6B *Transponder Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.6.6 ISO 18000-6B Post Capture (15 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and '*ISO 18000-6B Reporting*' is set to '*Standard UID Format*'. This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ISO 18000-6B transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (*the volume of post capture messages is expected to be low relative to normal transaction messages).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.6-6: ISO 18000-6B Post Capture (15 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	15	Format Code 15 – ISO 18000-6B Post Capture (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
ISO 18000-6B *Transponder Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.6.7 ISO 18000-6B Estimated Vehicle Speed (16 – Format) Message

Direction: Reader to Lane Controller

Description: This message is generated if the "*Generate Estimated Vehicle Speed Report*" feature is enabled, and the Reader has completed calculating the estimated vehicle speed values for the transponder in question.

The reported Sample Count values used in the calculation of Estimated Vehicle Speed may be less than the total number of handshakes reported for the same transaction in the Voting and/or Post-Capture reports. This is more likely to occur at low vehicle speeds.

Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).

Note: A Zero Crossing Point value of 9999ms is indicative of a data set error (*i.e. *Rx Noise and/or data clipping). The LC must ignore the Estimated Vehicle Speed provided in this message if a Zero Crossing Point value of 9999ms is reported.

Estimated Vehicle Speed messages are buffered.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.6-7: ISO 18000-6B Estimated Vehicle Speed (16 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	16	Format Code 16 – ISO 18000-6B Estimated Vehicle Speed Message
Txn Number	5 dec	00000 – 65535	Transaction Number
Number of Valid Channel Data Sets	1 dec	1 – 3	The number of channels for which an Estimated Vehicle Speed / Envelope Reference Point Channel Data Set was calculated. ***Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).***
Channel Data Set #1 – Channel Number	1 dec	1 – 8	The channel number for the 1st Channel Data Set

Field Name	Length & Format	Range	Contents
Channel Data Set #1 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 1st Channel Data Set.
Channel Data Set #1 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 1st Channel Data Set.
Channel Data Set #1 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 1st Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #1 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 1st Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #2– Channel Number	1 dec	1 – 8	The channel number for the 2nd Channel Data Set.
Channel Data Set #2 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 2nd Channel Data Set.
Channel Data Set #2 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 2nd Channel Data Set.
Channel Data Set #2 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 2nd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #2 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 2nd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #3 – Channel Number	1 dec	1 – 8	The channel number for the 3rd Channel Data Set.
Channel Data Set #3 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 3rd Channel Data Set.
Channel Data Set #3 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 3rd Channel Data Set.

Field Name	Length & Format	Range	Contents
Channel Data Set #3 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 3rd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #3 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 3rd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
ISO 18000-6B *Transponder Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.7 ISO 18000-6C Multi-Protocol Messages

11.7.1 ISO 18000-6C Handshake (20 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader “*Raw Handshake Report*” configuration parameter is enabled. The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface after an ISO 18000-6C Tag has been read.

Note that the contents of the ISO 18000-6C Transponder Data (TID) *and* ISO 18000-6C Transponder Data (UM) *fields are dependent on the selection of the “*ISO 18000-6C Read Mode” *and* “6C Read Only-Mode” *configuration parameters. The user may elect to receive ISO 18000-6C messages using one of the following four (4) options:*

- “EPC Only” Read – *Reading of EPC data only; or*
- “EPC + TID” Read – *Reading of EPC plus TID data; or*
- “EPC + UM” Read – *Reading of EPC plus UM data (96 bits); or*
- “EPC + UM” Read/Write – *Reading of EPC plus reading/writing of UM data (64 bits).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.7-1: ISO 18000-6C Handshake (20 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	20	Format Code 20 – ISO 18000-6C Handshake Message
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
ISO 18000-6C Transponder Data (EPC/UII)	32 hex	N/A	The contents of the ISO 18000-6C Transponder EPC/UII Memory (Memory Bank 01) [128 bits from 0x20 – 0x9F, inclusive]

Field Name	Length & Format	Range	Contents
ISO 18000-6C Transponder Data (TID)	48 hex	N/A	The contents of the ISO 18000-6C Transponder TID Memory (Memory Bank 10) [192 bits from 0x00 – 0xBF, inclusive] (**See Notes *1*, *2*, *3*, *4***)
ISO 18000-6C Transponder Data (UM)	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Notes:

(1) - *To read* EPC *data only, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC Only"*; while in "*EPC Only Read" *mode, the JANUS MPR2.3 Reader shall populate the* TID *and* UM *message fields with zeroes [0's].*

(2) - *To read* EPC *and* TID *data, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC + TID"*; while in "*EPC + TID Read" *mode, the JANUS MPR2.3 Reader shall populate the* UM *message field with zeroes [0's].*

(3) - *To read* EPC and *96 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be enabled****; while in "*EPC + UM*" read mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(4) - *To read EPC and read/write 64 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be disabled****; while in "*EPC + UM*" read/write mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

Response: No response expected from Lane Controller.

11.7.2 ISO 18000-6C Initial Read (21 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the ISO 18000-6C transponder first enters the capture zone.

This message applies when the JANUS MPR2.3 Reader "*Generate Initial Report*" configuration parameter is enabled. This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

Note that the contents of the ISO 18000-6C Transponder Data (TID) *and* ISO 18000-6C Transponder Data (UM) *fields are dependent on the selection of the "*ISO 18000-6C Read Mode" *and* "6C Read Only-Mode" *configuration parameters. The user may elect to receive ISO 18000-6C messages using one of the following four (4) options:*

- "EPC Only" Read – *Reading of EPC data only; or*
- "EPC + TID" Read – *Reading of EPC plus TID data; or*
- "EPC + UM" Read – *Reading of EPC plus UM data (96 bits); or*
- "EPC + UM" Read/Write – *Reading of EPC plus reading/writing of UM data (64 bits).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.7-2: ISO 18000-6C Initial Read (21 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Format	2 hex	21	Format Code 21 – ISO 18000-6C Initial Read Message
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
ISO 18000-6C Transponder Data (EPC/UII)	32 hex	N/A	The contents of the ISO 18000-6C Transponder EPC/UII Memory (Memory Bank 01) [128 bits from 0x20 – 0x9F, inclusive]

Field Name	Length & Format	Range	Contents
ISO 18000-6C Transponder Data (TID)	48 hex	N/A	The contents of the ISO 18000-6C Transponder TID Memory (Memory Bank 10) [192 bits from 0x00 – 0xBF, inclusive] (**See Notes *1*, *2*, *3*, *4***)
ISO 18000-6C Transponder Data (UM)	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Notes:

(1) - *To read* EPC *data only, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC Only*"; while in "*EPC Only Read*" mode, the JANUS MPR2.3 Reader shall populate the* TID *and* UM *message fields with zeroes [0's].*

(2) - *To read* EPC *and* TID *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + TID*"; while in "*EPC + TID Read*" mode, the JANUS MPR2.3 Reader shall populate the* UM *message field with zeroes [0's].*

(3) - *To read* EPC and *96 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*"* ***and the*** "6C Read-Only Mode" ***parameter must be enabled****; while in "*EPC + UM*" read mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(4) - *To read EPC and read/write 64 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*"* ***and the*** "6C Read-Only Mode" ***parameter must be disabled****; while in "*EPC + UM*" read/write mode, the JANUS MPR2.3 Reader shall populate the* TID *field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

Response: No response expected from Lane Controller.

11.7.3 ISO 18000-6C Transponder (22 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader “*Lane Assignment*” configuration parameter is set to “*Majority Voting*”. The Reader issues this message after an ISO 18000-6C Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

Note that the contents of the ISO 18000-6C Transponder Data (TID) *and* ISO 18000-6C Transponder Data (UM) *fields are dependent on the selection of the* “ISO 18000-6C Read Mode” *and* “6C Read Only-Mode” *configuration parameters. The user may elect to receive ISO 18000-6C messages using one of the following four (4) options:*

- “EPC Only” Read – *Reading of EPC data only; or*
- “EPC + TID” Read – *Reading of EPC plus TID data; or*
- “EPC + UM” Read – *Reading of EPC plus UM data (96 bits); or*
- “EPC + UM” Read/Write – *Reading of EPC plus reading/writing of UM data (64 bits).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.7-3: ISO 18000-6C Transponder (22 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	22	Format Code 22 – ISO 18000-6C Transponder (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • S = Successful (**See Note *5***) • O = Memory Overrun (**See Notes *5*, *6***) • L = Memory Locked (**See Notes *5*, *7***) • F = General (unspecified) Programming Failure (**See Notes *5*, *8***) • R = Read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a “C” report the “Cross-reader reporting” option must be enabled in the Web Interface.*

Field Name	Length & Format	Range	Contents
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*
ISO 18000-6C Transponder Data (EPC/UII)	32 hex	N/A	The contents of the ISO 18000-6C Transponder EPC/UII Memory (Memory Bank 01) [128 bits from 0x20 – 0x9F, inclusive]
ISO 18000-6C Transponder Data (TID)	48 hex	N/A	The contents of the ISO 18000-6C Transponder TID Memory (Memory Bank 10) [192 bits from 0x00 – 0xBF, inclusive] (**See Notes *1*, *2*, *3*, *4***)
ISO 18000-6C Transponder Pre-Write (UM) Data	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) prior to programming [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*
ISO 18000-6C Transponder Post-Write (UM) Data	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) subsequent to programming [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes*1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Notes:

(1) - *To read* EPC *data only, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC Only"*; while in "*EPC Only Read" *mode, the JANUS MPR2.3 Reader shall populate the* TID *and* UM *message fields with zeroes [0's].*

(2) - *To read* EPC *and* TID *data, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC + TID"*; while in "*EPC + TID Read" *mode, the JANUS MPR2.3 Reader shall populate the* UM *message field with zeroes [0's].*

(3) - *To read* EPC and *96 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be enabled****; while in "*EPC + UM*" read mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(4) - *To read EPC and read/write 64 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*"* ***and the*** "6C Read-Only Mode" ***parameter must be disabled****; while in "*EPC + UM*" read/write mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(5) - Transaction status codes 'S', 'O', 'L', 'F' will only be reported if the JANUS MPR2.3 Reader is configured to read/write 64 bits of UM data (**See Note *4***)

(6) - A transaction status code 'O' (Memory Overrun) indicates that the specifed UM memory location does not exist or the EPC/PC length field is not supported by the tag.

(7) - A transaction status code 'L' (Memory Locked) indicates that the specified UM memory location is locked and/or permalocked and is either not writeable or not readable.

(8) - The transactions status code 'F' (General Programming Failure) is a catch-all for errors not covered by other codes.

Response: No response expected from Lane Controller.

11.7.4 ISO 18000-6C Post Capture (23 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ISO 18000-6C transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (*the volume of post capture messages is expected to be low relative to normal transaction messages).*

Note that the contents of the ISO 18000-6C Transponder Data (TID) *and* ISO 18000-6C Transponder Data (UM) *fields are dependent on the selection of the "*ISO 18000-6C Read Mode" *and* "6C Read Only-Mode" *configuration parameters. The user may elect to receive ISO 18000-6C messages using one of the following four (4) options:*

- "EPC Only" Read – *Reading of EPC data only; or*
- "EPC + TID" Read – *Reading of EPC plus TID data; or*
- "EPC + UM" Read – *Reading of EPC plus UM data (96 bits); or*
- "EPC + UM" Read/Write – *Reading of EPC plus reading/writing of UM data (64 bits).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.7-4: ISO 18000-6C Post Capture (23 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	23	Format Code 23 – ISO 18000-6C Post Capture (Majority Voting) Message

Field Name	Length & Format	Range	Contents
Transaction Status	1 alpha	{R, C}	Transaction Status: • S = Successful (**See Note *5***) • O = Memory Overrun (**See Notes *5*, *6***) • L = Memory Locked (**See Notes *5*, *7***) • F = General (unspecified) Programming Failure (**See Notes *5*, *8***) • R = Read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*
ISO 18000-6C Transponder Data (EPC/UII)	32 hex	N/A	The contents of the ISO 18000-6C Transponder EPC/UII Memory (Memory Bank 01) [128 bits from 0x20 – 0x9F, inclusive]
ISO 18000-6C Transponder Data (TID)	48 hex	N/A	The contents of the ISO 18000-6C Transponder TID Memory (Memory Bank 10) [192 bits from 0x00 – 0xBF, inclusive] (**See Notes *1*, *2*, *3*, *4***)
ISO 18000-6C Transponder Pre-Write (UM) Data	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) prior to programming [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*
ISO 18000-6C Transponder Post-Write (UM) Data	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) subsequent to programming [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*

Field Name	Length & Format	Range	Contents
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Notes:

(1) - *To read* EPC *data only, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC Only"*; while in "*EPC Only Read" *mode, the JANUS MPR2.3 Reader shall populate the* TID *and* UM *message fields with zeroes [0's].*

(2) - *To read* EPC *and* TID *data, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC + TID"*; while in "*EPC + TID Read" *mode, the JANUS MPR2.3 Reader shall populate the* UM *message field with zeroes [0's].*

(3) - *To read* EPC and *96 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be enabled****; while in "*EPC + UM*" read mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(4) - *To read EPC and read/write 64 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be disabled****; while in "*EPC + UM*" read/write mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(5) - Transaction status codes 'S', 'O', 'L', 'F' will only be reported if the JANUS MPR2.3 Reader is configured to read/write 64 bits of UM data (**See Note *4***)

(6) - A transaction status code 'O' (Memory Overrun) indicates that the specifed UM memory location does not exist or the EPC/PC length field is not supported by the tag.

(7) - A transaction status code 'L' (Memory Locked) indicates that the specified UM memory location is locked and/or permalocked and is either not writeable or not readable.

(8) - The transactions status code 'F' (General Programming Failure) is a catch-all for errors not covered by other codes.

Response: No response expected from Lane Controller.

11.7.5 ISO 18000-6C Transponder (24 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*". The Reader issues this message after an ISO 18000-6C Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

Note that the contents of the ISO 18000-6C Transponder Data (TID) *and* ISO 18000-6C Transponder Data (UM) *fields are dependent on the selection of the* "ISO 18000-6C Read Mode" *and* "6C Read Only-Mode" *configuration parameters. The user may elect to receive ISO 18000-6C messages using one of the following four (4) options:*

- "EPC Only" Read – *Reading of EPC data only; or*
- "EPC + TID" Read – *Reading of EPC plus TID data; or*
- "EPC + UM" Read – *Reading of EPC plus UM data (96 bits); or*
- "EPC + UM" Read/Write – *Reading of EPC plus reading/writing of UM data (64 bits).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.7-5: ISO 18000-6C Transponder (24 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	24	Format Code 24 – ISO 18000-6C Transponder (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • S = Successful (**See Note *5***) • O = Memory Overrun (**See Notes *5*, *6***) • L = Memory Locked (**See Notes *5*, *7***) • F = General (unspecified) Programming Failure (**See Notes *5*, *8***) • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*

Field Name	Length & Format	Range	Contents
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone
ISO 18000-6C Transponder Data (EPC/UII)	32 hex	N/A	The contents of the ISO 18000-6C Transponder EPC/UII Memory (Memory Bank 01) [128 bits from 0x20 – 0x9F, inclusive]
ISO 18000-6C Transponder Data (TID)	48 hex	N/A	The contents of the ISO 18000-6C Transponder TID Memory (Memory Bank 10) [192 bits from 0x00 – 0xBF, inclusive] (**See Notes *1*, *2*, *3*, *4***)
ISO 18000-6C Transponder Pre-Write (UM) Data	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) prior to programming [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*

Field Name	Length & Format	Range	Contents
ISO 18000-6C Transponder Post-Write (UM) Data	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) subsequent to programming [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Notes:

(1) - *To read* EPC *data only, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC Only"*; while in "*EPC Only Read" *mode, the JANUS MPR2.3 Reader shall populate the* TID *and* UM *message fields with zeroes [0's].*

(2) - *To read* EPC *and* TID *data, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC + TID"*; while in "*EPC + TID Read" *mode, the JANUS MPR2.3 Reader shall populate the* UM *message field with zeroes [0's].*

(3) - *To read* EPC and *96 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be enabled****; while in "*EPC + UM*" read mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(4) - *To read EPC and read/write 64 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be disabled****; while in "*EPC + UM*" read/write mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(5) - Transaction status codes 'S', 'O', 'L', 'F' will only be reported if the JANUS MPR2.3 Reader is configured to read/write 64 bits of UM data (**See Note *4***)

(6) - A transaction status code 'O' (Memory Overrun) indicates that the specifed UM memory location does not exist or the EPC/PC length field is not supported by the tag.

(7) - A transaction status code 'L' (Memory Locked) indicates that the specified UM memory location is locked and/or permalocked and is either not writeable or not readable.

(8) - The transactions status code 'F' (General Programming Failure) is a catch-all for errors not covered by other codes.

Response: No response expected from Lane Controller.

11.7.6 ISO 18000-6C Post Capture (25 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ISO 18000-6C transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

Note that the contents of the ISO 18000-6C Transponder Data (TID) *and* ISO 18000-6C Transponder Data (UM) *fields are dependent on the selection of the "*ISO 18000-6C Read Mode" *and* "6C Read Only-Mode" *configuration parameters. The user may elect to receive ISO 18000-6C messages using one of the following four (4) options:*

- "EPC Only" Read – *Reading of EPC data only; or*
- "EPC + TID" Read – *Reading of EPC plus TID data; or*
- "EPC + UM" Read – *Reading of EPC plus UM data (96 bits); or*
- "EPC + UM" Read/Write – *Reading of EPC plus reading/writing of UM data (64 bits).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.7-6: ISO 18000-6C Post Capture (25 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	25	Format Code 25 – ISO 18000-6C Post Capture (Interpolated Voting) Message

Field Name	Length & Format	Range	Contents
Transaction Status	1 alpha	{R, C}	Transaction Status: • S = Successful (**See Note *5***) • O = Memory Overrun (**See Notes *5*, *6***) • L = Memory Locked (**See Notes *5*, *7***) • F = General (unspecified) Programming Failure (**See Notes *5*, *8***) • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00. An RPV counts as 1 read.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99. An RPV counts as 1 read.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone

Field Name	Length & Format	Range	Contents
ISO 18000-6C Transponder Data (EPC/UII)	32 hex	N/A	The contents of the ISO 18000-6C Transponder EPC/UII Memory (Memory Bank 01) [128 bits from 0x20 – 0x9F, inclusive]
ISO 18000-6C Transponder Data (TID)	48 hex	N/A	The contents of the ISO 18000-6C Transponder TID Memory (Memory Bank 10) [192 bits from 0x00 – 0xBF, inclusive] (**See Notes *1*, *2*, *3*, *4***)
ISO 18000-6C Transponder Pre-Write (UM) Data	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) prior to programming [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*
ISO 18000-6C Transponder Post-Write (UM) Data	28 hex	N/A	The contents of the ISO 18000-6C Transponder UM Memory (Memory Bank 11) subsequent to programming [Up to 112 bits from 0x00 – 0x6F, inclusive] (**See Notes *1*, *2*, *3*, *4***) *Unused bits in this field are populated with zeros [0's].*
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Notes:

(1) - *To read* EPC *data only, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC Only"*; while in "*EPC Only Read" *mode, the JANUS MPR2.3 Reader shall populate the* TID *and* UM *message fields with zeroes [0's].*

(2) - *To read* EPC *and* TID *data, the "*ISO 18000-6C Read Mode" *parameter must be set to "*EPC + TID"*; while in "*EPC + TID Read" *mode, the JANUS MPR2.3 Reader shall populate the* UM *message field with zeroes [0's].*

(3) - *To read* EPC and *96 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be enabled****; while in "*EPC + UM*" read mode, the JANUS MPR2.3 Reader shall populate the* TID *message field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(4) - *To read EPC and read/write 64 bits of* UM *data, the "*ISO 18000-6C Read Mode*" parameter must be set to "*EPC + UM*" **and the*** "6C Read-Only Mode" ***parameter must be disabled****; while in "*EPC + UM*" read/write mode, the JANUS MPR2.3 Reader shall populate the* TID *field with zeroes [0's]. Any unused bits in the* UM *message field shall be populated with zeroes [0's].*

(5) - Transaction status codes 'S', 'O', 'L', 'F' will only be reported if the JANUS MPR2.3 Reader is configured to read/write 64 bits of UM data (**See Note *4***)

(6) - A transaction status code 'O' (Memory Overrun) indicates that the specifed UM memory location does not exist or the EPC/PC length field is not supported by the tag.

(7) - A transaction status code 'L' (Memory Locked) indicates that the specified UM memory location is locked and/or permalocked and is either not writeable or not readable.

(8) - The transactions status code 'F' (General Programming Failure) is a catch-all for errors not covered by other codes.

Response: No response expected from Lane Controller.

11.7.7 ISO 18000-6C Estimated Vehicle Speed (26 – Format) Message

Direction: Reader to Lane Controller

Description: This message is generated if the “*Generate Estimated Vehicle Speed Report*” feature is enabled, and the Reader has completed calculating the estimated vehicle speed values for the transponder in question.

The reported Sample Count values used in the calculation of Estimated Vehicle Speed may be less than the total number of handshakes reported for the same transaction in the Voting and/or Post-Capture reports. This is more likely to occur at low vehicle speeds.

Note: Any unused Channel Data Set Fields shall be populated with zeroes (0’s).

Note: A Zero Crossing Point value of 9999ms is indicative of a data set error (i.e. Rx Noise and/or data clipping). The LC must ignore the Estimated Vehicle Speed provided in this message if a Zero Crossing Point value of 9999ms is reported.

Estimated Vehicle Speed messages are buffered.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.7-7: ISO 18000-6C Estimated Vehicle Speed (26 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	26	Format Code 26 – ISO 18000-6B Estimated Vehicle Speed Message
Txn Number	5 dec	00000 – 65535	Transaction Number
Number of Valid Channel Data Sets	1 dec	1 – 3	The number of channels for which an Estimated Vehicle Speed / Envelope Reference Point Channel Data Set was calculated. ***Note: Any unused Channel Data Set Fields shall be populated with zeroes (0’s).***
Channel Data Set #1 – Channel Number	1 dec	1 – 8	The channel number for the 1st Channel Data Set

Field Name	Length & Format	Range	Contents
Channel Data Set #1 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 1st Channel Data Set.
Channel Data Set #1 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 1st Channel Data Set.
Channel Data Set #1 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 1st Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #1 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 1st Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #2– Channel Number	1 dec	1 – 8	The channel number for the 2nd Channel Data Set.
Channel Data Set #2 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 2nd Channel Data Set.
Channel Data Set #2 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 2nd Channel Data Set.
Channel Data Set #2 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 2nd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #2 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 2nd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #3 – Channel Number	1 dec	1 – 8	The channel number for the 3rd Channel Data Set.
Channel Data Set #3 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 3rd Channel Data Set.
Channel Data Set #3 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 3rd Channel Data Set.

Field Name	Length & Format	Range	Contents
Channel Data Set #3 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 3rd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #3 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 3rd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
ISO 18000-6C Transponder Data (EPC/UII)	32 hex	N/A	The contents of the ISO 18000-6C Transponder EPC/UII Memory (Memory Bank 01) [128 bits from 0x20 – 0x9F, inclusive]
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response:		No response expected from Lane Controller.

11.8 ATA (8-Bit Hexadecimal Format) Multi-Protocol Messages

11.8.1 ATA Handshake (30 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Raw Handshake Report*" configuration parameter is enabled and "*ATA Reporting*" is set to "*8-bit Hexadecimal Format*". The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface when an ATA Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.8-1: ATA Handshake (30 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	30	Format Code 30 – ATA Handshake Message (8-Bit Hexadecimal Format)
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
ATA Transponder Data	40 hex	N/A	The contents of the ATA transponder data in 8-bit ASCII hexadecimal representation (See §11.4 for details). **(See Notes *1*, *2*)**
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Notes:

(1) - If the Reader detects invalid ATA frame checksums and/or the Reader is unable to extract a valid transponder serial number from the incoming data stream, a 'Phantom' read handshake is reported by replacing the last four bytes of the ATA Transponder Data Field with ASCII Hex {0x23,0x23} (representing two (2) '#' signs).

(2) - If the Reader is configured to perform ATA Data CRC verification and the verification of the ATA Data CRC fails, a 'Bad ATA Data CRC' handshake is reported by replacing the last four bytes of the ATA Transponder Data Field with ASCII Hex {0x40, 0x40} (representing two (2) '@' signs).

Response: No response expected from Lane Controller.

11.8.2 ATA Initial Read (31 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the ATA transponder first enters the capture zone.

This message applies when the JANUS MPR2.3 Reader "*Generate Initial Report*" configuration parameter is enabled and "*ATA Reporting*" is set to "*8-bit Hexadecimal Format*". This message is generated for both "*Majority*" and '*Interpolated*' voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.8-2: ATA Initial Read (31 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Format	2 hex	31	Format Code 31 – ATA Initial Read Message (8-Bit Hexadecimal Format)
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
ATA Transponder Data	40 hex	N/A	The contents of the ATA transponder data in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.8.3 ATA Transponder (32 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ATA Reporting*" is set to "*8-bit Hexadecimal Format*". The Reader issues this message after an ATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.8-3: ATA Transponder (32 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	32	Format Code 32 – ATA Transponder (Majority Voting) Message (8-Bit Hexadecimal Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
ATA Transponder Data	40 hex	N/A	The contents of the ATA transponder data in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.8.4 ATA Post Capture (33 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ATA Reporting*" is set to "*8-bit Hexadecimal Format*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (*the volume of post capture messages is expected to be low relative to normal transaction messages).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.8-4: ATA Post Capture (33 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	33	Format Code 33 – ATA Post Capture (Majority Voting) Message (8-Bit Hexadecimal Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
ATA Transponder Data	40 hex	N/A	The contents of the ATA transponder data in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.8.5 ATA Transponder (34 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ATA Reporting*" is set to "*8-bit Hexadecimal Format*". The Reader issues this message after an ATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.8-5: ATA Transponder (34 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	34	Format Code 34 –ATA Transponder (Interpolated Voting) Message (8-bit Hexadecimal Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
ATA Transponder Data	40 hex	N/A	The contents of the ATA transponder data in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.8.6 ATA Post Capture (35 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ATA Reporting*" is set to "*8-bit Hexadecimal Format*". This message is generated if the "*Generate Post-Capture-Zone Report*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.8-6: ATA Post Capture (35 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	35	Format Code 35 – ATA Post Capture (Interpolated Voting) Message (8-bit Hexadecimal Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
ATA Transponder Data	40 hex	N/A	The contents of the ATA transponder data in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.8.7 ATA Estimated Vehicle Speed (36 – Format) Message

Direction: Reader to Lane Controller

Description: This message is generated if the "*Generate Estimated Vehicle Speed Report*" feature is enabled, and the Reader has completed calculating the estimated vehicle speed values for the transponder in question.

The reported Sample Count values used in the calculation of Estimated Vehicle Speed may be less than the total number of handshakes reported for the same transaction in the Voting and/or Post-Capture reports. This is more likely to occur at low vehicle speeds.

Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).

Note: A Zero Crossing Point value of 9999ms is indicative of a data set error (*i.e. *Rx Noise and/or data clipping). The LC must ignore the Estimated Vehicle Speed provided in this message if a Zero Crossing Point value of 9999ms is reported.

Estimated Vehicle Speed messages are buffered.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.8-7: ATA Estimated Vehicle Speed (36 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	36	Format Code 36 – ATA Estimated Vehicle Speed Message (8-bit Hexadecimal Format)
Txn Number	5 dec	00000 – 65535	Transaction Number
Number of Valid Channel Data Sets	1 dec	1 – 3	The number of channels for which an Estimated Vehicle Speed / Envelope Reference Point Channel Data Set was calculated. ***Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).***
Channel Data Set #1 – Channel Number	1 dec	1 – 8	The channel number for the 1st Channel Data Set

Field Name	Length & Format	Range	Contents
Channel Data Set #1 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 1st Channel Data Set.
Channel Data Set #1 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 1st Channel Data Set.
Channel Data Set #1 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 1st Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #1 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 1st Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #2– Channel Number	1 dec	1 – 8	The channel number for the 2nd Channel Data Set.
Channel Data Set #2 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 2nd Channel Data Set.
Channel Data Set #2 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 2nd Channel Data Set.
Channel Data Set #2 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 2nd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #2 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 2nd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #3 – Channel Number	1 dec	1 – 8	The channel number for the 3rd Channel Data Set.
Channel Data Set #3 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 3rd Channel Data Set.
Channel Data Set #3 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 3rd Channel Data Set.

Field Name	Length & Format	Range	Contents
Channel Data Set #3 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 3rd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #3 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 3rd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
ATA Transponder Data	40 hex	N/A	The contents of the ATA transponder data in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.9 ATA (8-Bit Alphanumeric Format) Multi-Protocol Messages

11.9.1 ATA Handshake (40 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Raw Handshake Report*" configuration parameter is enabled and "*ATA Reporting*" is set to "*8-bit ASCII Alphanumeric Format*". The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface when an ATA Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.9-1: ATA Handshake (40 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	40	Format Code 40 – ATA Handshake Message (8-Bit Alphanumeric Format)
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
ATA Transponder Data	20 alnum	N/A	The contents of the ATA transponder data in 8-bit ASCII alphanumeric format (See §11.4 for details). **(See Notes *1*, *2*)**
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

<u>**Notes:**</u>

(1) - If the Reader detects invalid ATA frame checksums and/or the Reader is unable to extract a valid transponder serial number from the incoming data stream, a 'Phantom' read handshake is reported by replacing the last two bytes of the ATA Transponder Data Field with two (2) '#' signs (ASCII Hex 0x23).

(2) - If the Reader is configured to perform ATA Data CRC verification and the verification of the ATA Data CRC fails, a 'Bad ATA Data CRC' handshake is reported by replacing the last two bytes of the ATA Transponder Data Field with two (2) '@' signs (ASCII Hex 0x40).

Response: No response expected from Lane Controller.

11.9.2 ATA Initial Read (41 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the ATA transponder first enters the capture zone.

This message applies when the JANUS MPR2.3 Reader "*Generate Initial Report*" configuration parameter is enabled and "*ATA Reporting*" is set to "*8-bit ASCII Alphanumeric Format*". This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.9-2: ATA Initial Read (41 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Format	2 hex	41	Format Code 41 – ATA Initial Read Message (8-Bit Alphanumeric Format)
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
ATA Transponder Data	20 alnum	N/A	The contents of the ATA transponder data in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.9.3 ATA Transponder (42 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ATA Reporting*" is set to "*8-bit ASCII Alphanumeric Format*". The Reader issues this message after an ATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.9-3: ATA Transponder (42 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	42	Format Code 42 – ATA Transponder (Majority Voting) Message (8-Bit Alphanumeric Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
ATA Transponder Data	20 alnum	N/A	The contents of the ATA transponder data in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.9.4 ATA Post Capture (43 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ATA Reporting*" is set to "*8-bit Alphanumeric Format*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.9-4: ATA Post Capture (43 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	43	Format Code 43 – ATA Post Capture (Majority Voting) Message (8-Bit Alphanumeric Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
ATA Transponder Data	20 alnum	N/A	The contents of the ATA transponder data in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.9.5 ATA Transponder (44 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ATA Reporting*" is set to "*8-bit Alphanumeric Format*". The Reader issues this message after an ATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.9-5: ATA Transponder (44 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	44	Format Code 44 –ATA Transponder (Interpolated Voting) Message (8-bit Alphanumeric Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
ATA Transponder Data	20 alnum	N/A	The contents of the ATA transponder data in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.9.6 ATA Post Capture (45 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ATA Reporting*" is set to "*8-bit Alphanumeric Format*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.9-6: ATA Post Capture (45 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	45	Format Code 45 – ATA Post Capture (Interpolated Voting) Message (8-bit Alphanumeric Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left ‘L’, center ‘C’, right ‘R’ (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: ‘a’ – ‘f’, <space>} OR {‘xx’}	Estimated OBU sub-zone location: Two characters (‘ab’), or one character with trailing space (‘a<space>’); ‘xx’ = undefined sub-zone.
ATA Transponder Data	20 alnum	N/A	The contents of the ATA transponder data in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.9.7 ATA Estimated Vehicle Speed (46 – Format) Message

Direction: Reader to Lane Controller

Description: This message is generated if the "*Generate Estimated Vehicle Speed Report*" feature is enabled, and the Reader has completed calculating the estimated vehicle speed values for the transponder in question.

The reported Sample Count values used in the calculation of Estimated Vehicle Speed may be less than the total number of handshakes reported for the same transaction in the Voting and/or Post-Capture reports. This is more likely to occur at low vehicle speeds.

Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).

Note: A Zero Crossing Point value of 9999ms is indicative of a data set error (i.e. Rx Noise and/or data clipping). The LC must ignore the Estimated Vehicle Speed provided in this message if a Zero Crossing Point value of 9999ms is reported.

Estimated Vehicle Speed messages are buffered.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.9-7: ATA Estimated Vehicle Speed (46 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	36	Format Code 46 – ATA Estimated Vehicle Speed Message (8-bit Alphanumeric Format)
Txn Number	5 dec	00000 – 65535	Transaction Number
Number of Valid Channel Data Sets	1 dec	1 – 3	The number of channels for which an Estimated Vehicle Speed / Envelope Reference Point Channel Data Set was calculated. ***Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).***
Channel Data Set #1 – Channel Number	1 dec	1 – 8	The channel number for the 1st Channel Data Set

Field Name	Length & Format	Range	Contents
Channel Data Set #1 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 1st Channel Data Set.
Channel Data Set #1 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 1st Channel Data Set.
Channel Data Set #1 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 1st Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #1 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 1st Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #2– Channel Number	1 dec	1 – 8	The channel number for the 2nd Channel Data Set.
Channel Data Set #2 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 2nd Channel Data Set.
Channel Data Set #2 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 2nd Channel Data Set.
Channel Data Set #2 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 2nd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #2 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 2nd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #3 – Channel Number	1 dec	1 – 8	The channel number for the 3rd Channel Data Set.
Channel Data Set #3 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 3rd Channel Data Set.
Channel Data Set #3 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 3rd Channel Data Set.

Field Name	Length & Format	Range	Contents
Channel Data Set #3 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 3rd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #3 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 3rd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
ATA Transponder Data	20 alnum	N/A	The contents of the ATA transponder data in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.10 ISO 18000-6B eATA Report (8-Bit Hexadecimal Format) Multi-Protocol Messages

11.10.1 ISO 18000-6B eATA Handshake (50 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Raw Handshake Report*" configuration parameter is enabled and "*ISO 18000-6B Reporting*" is set to "*eATA 8-bit Hexadecimal Format*". The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface when an ISO 18000-6B eATA Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.10-1: ISO 18000-6B eATA Handshake (50 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	50	Format Code 50 – ISO 18000-6B eATA Handshake Message (8-Bit Hexadecimal Format)
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
eATA Transponder Data	40 hex	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.10.2 ISO 18000-6B eATA Initial Read (51 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the ISO 18000-6B eATA transponder first enters the capture zone.

This message applies when the JANUS MPR2.3 Reader "*Generate Initial Report*" configuration parameter is enabled and "*ISO 18000-6B Reporting*" is set to "*eATA 8-bit Hexadecimal Format*". This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.10-2: ISO 18000-6B eATA Initial Read (51 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Format	2 hex	51	Format Code 51 – ISO 18000-6B eATA Initial Read Message (8-Bit Hexadecimal Format)
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
eATA Transponder Data	40 hex	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.10.3 ISO 18000-6B eATA Transponder (52 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ISO 18000-6B Reporting*" is set to "*eAta 8-bit Hexadecimal Format*". The Reader issues this message after an ISO 18000-6B eATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.10-3: ISO 18000-6B eATA Transponder (52 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	52	Format Code 52 – ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit Hexadecimal Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
eATA Transponder Data	40 hex	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.10.4 ISO 18000-6B eATA Post Capture (53 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ISO 18000-6B Reporting*" is set to "*eATA 8-bit Hexadecimal Format*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.10-4: ISO 18000-6B eATA Post Capture (53 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	53	Format Code 53 – ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit Hexadecimal Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
eATA Transponder Data	40 hex	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.10.5 ISO 18000-6B eATA Transponder (54 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ISO 18000-6B Reporting*" is set to "*eATA 8-bit Hexadecimal Format*". The Reader issues this message after an ISO 18000-6B eATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.10-5: ISO 18000-6B eATA Transponder (54 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	54	Format Code 54 –ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-bit Hexadecimal Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left ‘L’, center ‘C’, right ‘R’ (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: ‘a’ – ‘f’, <space>} OR {‘xx’}	Estimated OBU sub-zone location: Two characters (‘ab’), or one character with trailing space (‘a<space>’); ‘xx’ = undefined sub-zone.
eATA Transponder Data	40 hex	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.10.6 ISO 18000-6B eATA Post Capture (55 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ISO 18000-6B Reporting*" is set to "*eATA 8-bit Hexadecimal Format*". This message is generated if the "*Generate Post-Capture-Zone Report*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.10-6: ISO 18000-6B eATA Post Capture (55 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	55	Format Code 55 – ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-bit Hexadecimal Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
eATA Transponder Data	40 hex	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.10.7 ISO 18000-6B eATA Estimated Vehicle Speed (56 – Format) Message

Direction: Reader to Lane Controller

Description: This message is generated if the “*Generate Estimated Vehicle Speed Report*” feature is enabled, and the Reader has completed calculating the estimated vehicle speed values for the transponder in question.

The reported Sample Count values used in the calculation of Estimated Vehicle Speed may be less than the total number of handshakes reported for the same transaction in the Voting and/or Post-Capture reports. This is more likely to occur at low vehicle speeds.

Note: Any unused Channel Data Set Fields shall be populated with zeroes (0’s).

Note: A Zero Crossing Point value of 9999ms is indicative of a data set error (i.e. Rx Noise and/or data clipping). The LC must ignore the Estimated Vehicle Speed provided in this message if a Zero Crossing Point value of 9999ms is reported.

Estimated Vehicle Speed messages are buffered.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.10-7: ISO 18000-6B eATA Estimated Vehicle Speed (56 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	56	Format Code 56 – ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit Hexadecimal Format)
Txn Number	5 dec	00000 – 65535	Transaction Number
Number of Valid Channel Data Sets	1 dec	1 – 3	The number of channels for which an Estimated Vehicle Speed / Envelope Reference Point Channel Data Set was calculated. ***Note: Any unused Channel Data Set Fields shall be populated with zeroes (0’s).***
Channel Data Set #1 – Channel Number	1 dec	1 – 8	The channel number for the 1st Channel Data Set

Field Name	Length & Format	Range	Contents
Channel Data Set #1 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 1st Channel Data Set.
Channel Data Set #1 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 1st Channel Data Set.
Channel Data Set #1 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 1st Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #1 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 1st Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #2– Channel Number	1 dec	1 – 8	The channel number for the 2nd Channel Data Set.
Channel Data Set #2 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 2nd Channel Data Set.
Channel Data Set #2 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 2nd Channel Data Set.
Channel Data Set #2 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 2nd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #2 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 2nd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #3 – Channel Number	1 dec	1 – 8	The channel number for the 3rd Channel Data Set.
Channel Data Set #3 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 3rd Channel Data Set.
Channel Data Set #3 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 3rd Channel Data Set.

Field Name	Length & Format	Range	Contents
Channel Data Set #3 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 3rd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #3 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 3rd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
eATA Transponder Data	40 hex	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII hexadecimal representation (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.11 ISO 18000-6B eATA Report (8-Bit Alphanumeric Format) Multi-Protocol Messages

11.11.1 ISO 18000-6B eATA Handshake (60 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Raw Handshake Report*" configuration parameter is enabled and "*ISO 18000-6B Reporting*" is set to "*eATA 8-bit ASCII Alphanumeric Format*". The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface when an ISO 18000-6B eATA Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.11-1: ISO 18000-6B eATA Handshake (60 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	60	Format Code 60 – ISO 18000-6B eATA Handshake Message (8-Bit Alphanumeric Format)
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.11.2 ISO 18000-6B eATA Initial Read (61 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the ISO 18000-6B eATA transponder first enters the capture zone.

This message applies when the JANUS MPR2.3 Reader "*Generate Initial Report*" configuration parameter is enabled and "*ISO 18000-6B Reporting*" is set to "eATA *8-bit ASCII Alphanumeric Format*". This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.11-2: ISO 18000-6B eATA Initial Read (61 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Format	2 hex	61	Format Code 61 – ISO 18000-6B eATA Initial Read Message (8-Bit Alphanumeric Format)
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.11.3 ISO 18000-6B eATA Transponder (62 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ISO 18000-6B Reporting*" is set to "eATA *8-bit ASCII Alphanumeric Format*". The Reader issues this message after an ISO 18000-6B eATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.11-3: ISO 18000-6B eATA Transponder (62 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	62	Format Code 62 – ISO 18000-6B eATA Transponder (Majority Voting) Message (8-Bit Alphanumeric Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.11.4 ISO 18000-6B eATA Post Capture (63 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ISO 18000-6B Reporting*" is set to "eATA *8-bit Alphanumeric Format*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.11-4: ISO 18000-6B eATA Post Capture (63 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	63	Format Code 63 – ISO 18000-6B eATA Post Capture (Majority Voting) Message (8-Bit Alphanumeric Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.11.5 ISO 18000-6B eATA Transponder (64 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ISO 18000-6B Reporting*" is set to "eATA *8-bit Alphanumeric Format*". The Reader issues this message after an ISO 18000-6B eATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.11-5: ISO 18000-6B eATA Transponder (64 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	64	Format Code 64 – ISO 18000-6B eATA Transponder (Interpolated Voting) Message (8-bit Alphanumeric Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 180000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.11.6 ISO 18000-6B eATA Post Capture (65 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ISO 18000-6B Reporting*" is set to "*eATA 8-bit Alphanumeric Format*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (*the volume of post capture messages is expected to be low relative to normal transaction messages).*

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or Ethernet (TCP) Interface only.

Format:

Table 11.11-6: ISO 18000-6B eATA Post Capture (65 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	65	Format Code 65 – ISO 18000-6B eATA Post Capture (Interpolated Voting) Message (8-bit Alphanumeric Format)
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.11.7 ISO 18000-6B eATA Estimated Vehicle Speed (66 – Format) Message

Direction: Reader to Lane Controller

Description: This message is generated if the "*Generate Estimated Vehicle Speed Report*" feature is enabled, and the Reader has completed calculating the estimated vehicle speed values for the transponder in question.

The reported Sample Count values used in the calculation of Estimated Vehicle Speed may be less than the total number of handshakes reported for the same transaction in the Voting and/or Post-Capture reports. This is more likely to occur at low vehicle speeds.

Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).

Note: A Zero Crossing Point value of 9999ms is indicative of a data set error (*i.e.* Rx Noise and/or data clipping). The LC must ignore the Estimated Vehicle Speed provided in this message if a Zero Crossing Point value of 9999ms is reported.

Estimated Vehicle Speed messages are buffered.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.11-7: ISO 18000-6B eATA Estimated Vehicle Speed (56 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	66	Format Code 66 – ISO 18000-6B eATA Estimated Vehicle Speed Message (8-Bit Alphanumeric Format)
Txn Number	5 dec	00000 – 65535	Transaction Number
Number of Valid Channel Data Sets	1 dec	1 – 3	The number of channels for which an Estimated Vehicle Speed / Envelope Reference Point Channel Data Set was calculated. ***Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).***
Channel Data Set #1 – Channel Number	1 dec	1 – 8	The channel number for the 1st Channel Data Set

Field Name	Length & Format	Range	Contents
Channel Data Set #1 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 1st Channel Data Set.
Channel Data Set #1 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 1st Channel Data Set.
Channel Data Set #1 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 1st Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #1 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 1st Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #2– Channel Number	1 dec	1 – 8	The channel number for the 2nd Channel Data Set.
Channel Data Set #2 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 2nd Channel Data Set.
Channel Data Set #2 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 2nd Channel Data Set.
Channel Data Set #2 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 2nd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #2 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 2nd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #3 – Channel Number	1 dec	1 – 8	The channel number for the 3rd Channel Data Set.
Channel Data Set #3 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 3rd Channel Data Set.
Channel Data Set #3 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 3rd Channel Data Set.

Field Name	Length & Format	Range	Contents
Channel Data Set #3 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 3rd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #3 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 3rd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.12 SeGo Multi-Protocol Messages

11.12.1 SeGo Handshake (70 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Raw Handshake Reports*" configuration parameter is enabled. The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface after a SeGo Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.12-1: SeGo Handshake (70 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	70	Format Code 70 – SeGo Handshake Message
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
SeGo *Transponder Data*	32 hex	N/A	The contents of the SeGo transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.12.2 SeGo Initial Read (71 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the SeGo transponder first enters the capture zone.

This message applies when the JANUS MPR2.3 Reader "*Generate Initial Report*" configuration parameter is enabled. This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.12-2: SeGo Initial Read (71 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Format	2 hex	71	Format Code 71 – SeGo Initial Read Message
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
SeGo *Transponder Data*	32 hex	N/A	The contents of the SeGo transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.12.3 SeGo Transponder (72 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*". The Reader issues this message after a SeGo Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.12-3: SeGo Transponder (72 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	72	Format Code 72 – SeGo Transponder (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
SeGo *Transponder Data*	32 hex	N/A	The contents of the SeGo transponder default memory page.

Field Name	Length & Format	Range	Contents
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.12.4 SeGo Post Capture (73 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the SeGo transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.12-4: SeGo Post Capture (73 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	73	Format Code 73 – SeGo Post Capture (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
SeGo *Transponder Data*	32 hex	N/A	The contents of the SeGo transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.12.5 SeGo Transponder (74 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*". The Reader issues this message after a SeGo Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.12-5: SeGo Transponder (74 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	74	Format Code 74 – SeGo Transponder (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*

Field Name	Length & Format	Range	Contents
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone
SeGo *Transponder Data*	32 hex	N/A	The contents of the SeGo transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.12.6 SeGo Post Capture (75 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the SeGo transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.12-6: SeGo Post Capture (75 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	75	Format Code 75 – SeGo Post Capture (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone
SeGo *Transponder Data*	32 hex	N/A	The contents of the SeGo transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.12.7 SeGo Estimated Vehicle Speed (76 – Format) Message

Direction: Reader to Lane Controller

Description: This message is generated if the “*Generate Estimated Vehicle Speed Report*” feature is enabled, and the Reader has completed calculating the estimated vehicle speed values for the transponder in question.

The reported Sample Count values used in the calculation of Estimated Vehicle Speed may be less than the total number of handshakes reported for the same transaction in the Voting and/or Post-Capture reports. This is more likely to occur at low vehicle speeds.

Note: Any unused Channel Data Set Fields shall be populated with zeroes (0’s).

Note: A Zero Crossing Point value of 9999ms is indicative of a data set error (*i.e. *Rx Noise and/or data clipping). The LC must ignore the Estimated Vehicle Speed provided in this message if a Zero Crossing Point value of 9999ms is reported.

Estimated Vehicle Speed messages are buffered.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.12-7: SeGo Estimated Vehicle Speed (76 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	76	Format Code 76 – SeGo Estimated Vehicle Speed Message
Txn Number	5 dec	00000 – 65535	Transaction Number
Number of Valid Channel Data Sets	1 dec	1 – 3	The number of channels for which an Estimated Vehicle Speed / Envelope Reference Point Channel Data Set was calculated. ***Note: Any unused Channel Data Set Fields shall be populated with zeroes (0’s).***
Channel Data Set #1 – Channel Number	1 dec	1 – 8	The channel number for the 1st Channel Data Set

Field Name	Length & Format	Range	Contents
Channel Data Set #1 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 1st Channel Data Set.
Channel Data Set #1 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 1st Channel Data Set.
Channel Data Set #1 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 1st Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #1 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 1st Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #2– Channel Number	1 dec	1 – 8	The channel number for the 2nd Channel Data Set.
Channel Data Set #2 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 2nd Channel Data Set.
Channel Data Set #2 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 2nd Channel Data Set.
Channel Data Set #2 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 2nd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #2 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 2nd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #3 – Channel Number	1 dec	1 – 8	The channel number for the 3rd Channel Data Set.
Channel Data Set #3 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 3rd Channel Data Set.
Channel Data Set #3 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 3rd Channel Data Set.

Field Name	Length & Format	Range	Contents
Channel Data Set #3 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 3rd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #3 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 3rd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
SeGo Transponder Data	32 hex	N/A	The contents of the SeGo transponder default memory page.
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.13 ISO 18000-6B Combined UID+eATA Report Multi-Protocol Messages

11.13.1 ISO 18000-6B Combined UID+eATA Handshake (80 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Raw Handshake Report*" configuration parameter is enabled and "*ISO 18000-6B Reporting*" is set to "*Combined UID+eATA Format*". The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface when an ISO 18000-6B eATA Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.13-1: ISO 18000-6B Combined UID+eATA Handshake (80 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	80	Format Code 80 – ISO 18000-6B Combined UID+eATA Handshake Message
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
ISO 18000-6B *Transponder (UID) Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.13.2 ISO 18000-6B Combined UID+eATA Initial Read (81 – Format) Message

Direction: Reader to Lane Controller

Description: Optional informational message sent to the Lane Controller when the ISO 18000-6B eATA transponder first enters the capture zone.

This message applies when the JANUS MPR2.3 Reader "*Generate Initial Report*" configuration parameter is enabled and "*ISO 18000-6B Reporting*" is set to "*Combined UID+eATA Format*". This message is generated for both "*Majority*" and '*Interpolated*" voting. *Note that the initial read channel might differ from the transaction report generated at voting time*.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.13-2: ISO 18000-6B Combined UID+eATA Initial Read (81 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (tag has just gone through lane) • B = buffered message (*report is from transaction buffer*) *Note: Buffered Initial Read messages will only be sent to the Lane Controller if* 'Initial Read Report Message Buffering' *is ENABLED.*
Format	2 hex	81	Format Code 81 – ISO 18000-6B Combined UID+eATA Initial Read Message
Transaction Status	1 alpha	R	Transaction Status: • R = read
Txn Number	5 dec	00000 – 65535	Transaction Number
ISO 18000-6B *Transponder (UID) Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.13.3 ISO 18000-6B Combined UID+eATA Transponder (82 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ISO 18000-6B Reporting*" is set to "*Combined UID+eATA Format*". The Reader issues this message after an ISO 18000-6B eATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.13-3: ISO 18000-6B Combined UID+eATA Transponder (82 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	82	Format Code 82 – ISO 18000-6B Combined UID+eATA Transponder (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
ISO 18000-6B *Transponder (UID) Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.13.4 ISO 18000-6B Combined UID+eATA Post Capture (83 – Format: Majority Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Majority Voting*" and "*ISO 18000-6B Reporting*" is set to "*Combined UID+eATA Format*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.13-4: ISO 18000-6B Combined UID+eATA Post Capture (83 – Format: Majority Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	83	Format Code 83 – ISO 18000-6B Combined UID+eATA Post Capture (Majority Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
ISO 18000-6B *Transponder (UID) Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.13.5 ISO 18000-6B Combined UID+eATA Transponder (84 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ISO 18000-6B Reporting*" is set to "*Combined UID+eATA Format*". The Reader issues this message after an ISO 18000-6B eATA Tag has been read and assigned to a channel (after voting time expires). Adjusting the voting time or the reporting delay time can control the reporting latency.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.13-5: ISO 18000-6B Combined UID+eATA Transponder (84 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	84	Format Code 84 – ISO 18000-6B Combined UID+eATA Transponder (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*

Field Name	Length & Format	Range	Contents
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left 'L', center 'C', right 'R' (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: 'a' – 'f', <space>} OR {'xx'}	Estimated OBU sub-zone location: Two characters ('ab'), or one character with trailing space ('a<space>'); 'xx' = undefined sub-zone.
ISO 18000-6B *Transponder (UID) Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 180000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.13.6 ISO 18000-6B Combined UID+eATA Post Capture (85 – Format: Interpolated Voting) Message

Direction: Reader to Lane Controller

Description: This message is an optional informational message that applies when the JANUS MPR2.3 Reader "*Lane Assignment*" configuration parameter is set to "*Interpolated Voting*" and "*ISO 18000-6B Reporting*" is set to "*Combined UID+eATA Format*". This message is generated if the "*Generate Post-Capture-Zone Reports*" feature is enabled, and the Reader detects a change in the programming status of the ATA transponder (*e.g.* from fail to success), or a lane assignment change. This report is generated at a multiple of the voting time (configurable) after the normal transaction report.

Post Capture messages are buffered (the volume of post capture messages is expected to be low relative to normal transaction messages).

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.13-6: ISO 18000-6B Combined UID+eATA Post Capture (85 – Format: Interpolated Voting) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	85	Format Code 85 – ISO 18000-6B Combined UID+eATA Post Capture (Interpolated Voting) Message
Transaction Status	1 alpha	{R, C}	Transaction Status: • R = read only • C = Cross-Reader Report (informational, optional) – Tag reported by adjacent reader *Note: To receive a "C" report the "Cross-reader reporting" option must be enabled in the Web Interface.*
Txn Number	5 dec	00000 – 65535	Transaction Number
Assignment Reads	2 dec	00 – 99	The number of handshakes (reads) that occurred on the assigned channel up to voting time for the CURRENT transaction.*First report after reset or power-up indicates 00.*

Field Name	Length & Format	Range	Contents
Total Reads	2 dec	00 – 99	The total number of handshakes (reads) that occurred on the assigned channel for the PREVIOUS non-TDM transaction on the same RF channel.*First report after reset or power-up indicates 00. Total reads greater than 99 indicated as 99.*
Lane number	2 dec	00 – 31	Antenna / Lane number of assigned channel. *May be different that what is programmed into transponder.*
Master Set	8 alpha	Xn-Xn-Xn	<reader><channel>-<reader><channel>-<reader><channel> Identifies group of 3 adjacent channels with the most handshakes. Reader is identified as left ‘L’, center ‘C’, right ‘R’ (relative to reader reporting) Channel is 1-8, relative to identified reader. *e.g.* C1-C2-C3 (center reader, channel 1, 2, 3)
Handshakes	8 alpha	NN-NN-NN	Handshake counts corresponding to the Master Set field *e.g.* 00-00-09 with above Master Set example would indicate 9 handshakes on center reader, channel 3.
Sub-zone	2 alpha	{Two-character combinations of: ‘a’ – ‘f’, <space>} OR {‘xx’}	Estimated OBU sub-zone location: Two characters (‘ab’), or one character with trailing space (‘a<space>’); ‘xx’ = undefined sub-zone.
ISO 18000-6B *Transponder (UID) Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.13.7 ISO 18000-6B Combined UID+eATA Estimated Vehicle Speed (86 – Format) Message

Direction: Reader to Lane Controller

Description: This message is generated if the "*Generate Estimated Vehicle Speed Report*" feature is enabled, and the Reader has completed calculating the estimated vehicle speed values for the transponder in question.

The reported Sample Count values used in the calculation of Estimated Vehicle Speed may be less than the total number of handshakes reported for the same transaction in the Voting and/or Post-Capture reports. This is more likely to occur at low vehicle speeds.

Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).

Note: A Zero Crossing Point value of 9999ms is indicative of a data set error (i.e. Rx Noise and/or data clipping). The LC must ignore the Estimated Vehicle Speed provided in this message if a Zero Crossing Point value of 9999ms is reported.

Estimated Vehicle Speed messages are buffered.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Serial or JANUS MPR2.3 Reader – Lane Controller Ethernet (TCP) Interfaces.

Format:

Table 11.13-7: ISO 18000-6B Combined UID+eATA Estimated Vehicle Speed (86 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	{R, B}	• R = real-time message (*tag has just gone through lane*) • B = buffered message (*report is from transaction buffer*)
Format	2 hex	86	Format Code 86 – ISO 18000-6B Combined UID+eATA Estimated Vehicle Speed Message (8-Bit Alphanumeric Format)
Txn Number	5 dec	00000 – 65535	Transaction Number
Number of Valid Channel Data Sets	1 dec	1 – 3	The number of channels for which an Estimated Vehicle Speed / Envelope Reference Point Channel Data Set was calculated. ***Note: Any unused Channel Data Set Fields shall be populated with zeroes (0's).***
Channel Data Set #1 – Channel Number	1 dec	1 – 8	The channel number for the 1st Channel Data Set

Field Name	Length & Format	Range	Contents
Channel Data Set #1 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 1st Channel Data Set.
Channel Data Set #1 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 1st Channel Data Set.
Channel Data Set #1 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 1st Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #1 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 1st Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #2– Channel Number	1 dec	1 – 8	The channel number for the 2nd Channel Data Set.
Channel Data Set #2 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 2nd Channel Data Set.
Channel Data Set #2 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 2nd Channel Data Set.
Channel Data Set #2 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 2nd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #2 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 2nd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
Channel Data Set #3 – Channel Number	1 dec	1 – 8	The channel number for the 3rd Channel Data Set.
Channel Data Set #3 – Estimated Vehicle Speed	2 dec	00 –99	Estimated Vehicle Speed (mph) for the 3rd Channel Data Set.
Channel Data Set #3 – Sample Count	3 dec	000 – 999	The number of handshake samples used in calculating the speed estimation for the 3rd Channel Data Set.

Field Name	Length & Format	Range	Contents
Channel Data Set #3 – Correlation Coefficient	5 alnum	0.000 – 1.000	A measure of the quality of the estimation of vehicle speed for the 3rd Channel Data Set. The higher the value, the better the quality of the estimate.
Channel Data Set #3 – Zero Crossing Point	4 dec	0000 – 9999	Zero Crossing Point. Indicates the time offset, measured in milliseconds from first read of transponder, where the tag is passing, or has passed directly under the centre of the antenna for the 3rd Channel Data Set. ***Note: A Zero Crossing Point value of 9999 indicates a data set error.***
ISO 18000-6B *Transponder (UID) Data*	16 hex	N/A	The contents of the ISO 18000-6B transponder default memory page (UID).
eATA Transponder Data	20 alnum	N/A	The contents of the ISO 18000-6B eATA transponder data (memory pages 0x70, 0x78) in 8-bit ASCII alphanumeric format (See §11.4 for details).
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.14 IAG (Standard) Multi-Protocol Messages

11.14.1 IAG (Standard) Handshake (A0 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Raw Handshake Report*" configuration parameter is enabled. The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface when an IAG (Standard) Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.14-1: IAG (Standard) Handshake (A0 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	A0	Format Code A0 – IAG (Standard) Handshake Message
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
IAG Transponder (Read Section) Data	24 hex	N/A	The contents of the IAG (Standard) transponder read-only section (12 bytes / 96 bits)
IAG Transponder (Write Section) Data	40 hex	N/A	The contents of the IAG (Standard) transponder write section (20 bytes / 160 bits)
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

11.15 IAG (Toll Rate / Balance Adjustment) Multi-Protocol Messages

11.15.1 IAG (Toll Rate / Balance Adjustment) Handshake (B0 – Format) Message

Direction: Reader to Lane Controller

Description: This message applies when the JANUS MPR2.3 Reader "*Handshake Reporting*" and "*Toll Rate / Balance Adjustment*" configuration parameters are enabled. The Reader issues this message over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface when an IAG (Toll Rate / Balance Adjustment) Tag has been read.

This message is sent over the JANUS MPR2.3 Reader – Lane Controller Ethernet (UDP) Interface only.

Format:

Table 11.15-1: IAG (Toll Rate / Balance Adjustment) Handshake (B0 – Format) Message Format

Field Name	Length & Format	Range	Contents
Prefix	2 alpha	{MA, MB}	Multi-Protocol Message: • MA = Report from Primary Reader • MB = Report from Secondary Reader
RF Channel	1 alpha or 1 dec	<space> or 1 – 8	• <space> = reader in non-multiplexed reporting mode • 1 – 8 = reader in multiplexed reporting mode (See §2.8 for additional information on multiplexed reporting mode)
Type	1 alpha	R	• R = real-time message (tag has just gone through lane) *(Handshake Messages are NEVER buffered*)
Format	2 hex	B0	Format Code B0 – IAG (Toll Rate / Balance Adjustment) Handshake Message
Frame Number	8 hex	00000000 – FFFFFFFF	The frame count corresponding to the successful read event. This counter automatically rolls over when FFFFFFFF is reached. *Note: the frame count is global across all Reader channels AND protocols.*
IAG Transponder (Read Section) Data	18 hex	N/A	The contents of the IAG (Toll Rate / Balance Adjustment) transponder read-only section (9 bytes / 72 bits)
IAG Transponder (Write Section) Data	46 hex	N/A	The contents of the IAG (Toll Rate / Balance Adjustment) transponder write section (23 bytes / 184 bits)
(Optional) Extended Information	Optional, Variable	Reader Configuration Dependent	An optional varying length field containing additional extended message information. (See §11.2 for details on this field)

Response: No response expected from Lane Controller.

12. APPENDIX A – TCP/IP SOCKET LIFECYCLES

12.1 JANUS MPR2.3 Reader to Lane Controller Socket-Lifecycle

The JANUS MPR2.3 Reader to Lane Controller socket-lifecycle is shown inFigure 12.1-1. Note that a new client socket (and correspondingly a new server socket on the peer) is created for each message that is sent from the Reader to the Lane Controller. If a (mandatory) reply message is expected, then the Reader will wait for it before closing the socket. Upon completion of the messaging cycle, both the Reader client socket and the Lane Controller server socket to which it is connected are closed.

Note that the Lane Controller server listening socket remains open for as long as the Lane Controller is operational.

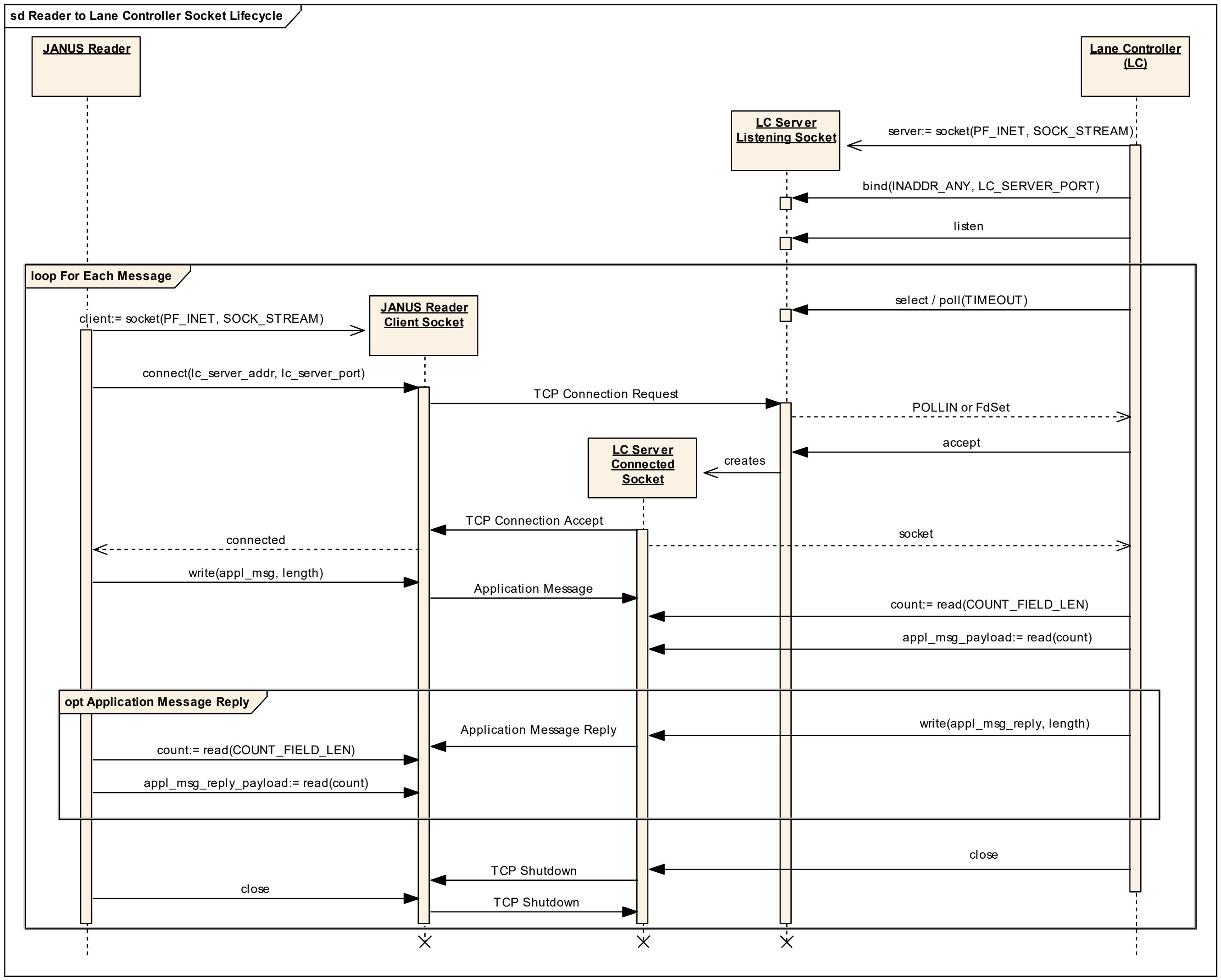

Figure 12.1-1: JANUS MPR2.3 Reader to Lane Controller Socket Lifecycle

12.2 Lane Controller to JANUS MPR2.3 Reader Socket-Lifecycle

The Lane Controller to JANUS MPR2.3 Reader socket-lifecycle is the exact inverse of the JANUS MPR2.3 Reader to Lane Controller socket lifecycle described in §12.1. That is, when the Lane Controller wishes to send a message to the JANUS MPR2.3 Reader, the client/server roles are reversed from that shown in Figure 12.1-1. In this instance, the Lane Controller becomes the client, and the Reader becomes the server (refer to Figure 12.1-1, with the client and server roles reversed). Note that a new client socket is created for each message that is sent from the Lane Controller to the Reader. If a (mandatory) reply message is expected, then the Lane Controller will wait for it before closing the socket. Upon completion of the messaging cycle, both the Lane Controller client socket and the Reader server socket to which it is connected are closed.

Note that the JANUS MPR2.3 Reader server listening socket remains open for as long as the Reader is operational.

13. APPENDIX B – UDP SOCKET LIFECYCLES

13.1 JANUS MPR2.3 Reader to Lane Controller UDP Socket-Lifecycle

The JANUS MPR2.3 Reader to Lane Controller UDP socket-lifecycle is shown in Figure 13.1-1. Note that on both the client (JANUS MPR2.3 Reader) and the server (Lane Controller) a UDP socket is created only once, and remains in existence for as long as the device remains operational.

Furthermore, unlike it's TCP cousin (*c.f.* §12), the UDP client `connect` call does not initiate any packet exchange. Instead, it merely records the remote endpoint (LC Server) information in the client socket data structure for later use. Hence, even if the `connect` call succeeds, it does not mean that the remote endpoint address is valid or that the server (*i.e.* Lane Controller) is reachable.

Each time the JANUS MPR2.3 Reader calls `send` on its client socket, UDP sends a single Handshake Message to the peer Lane Controller. Similarly, each call of `recvfrom` by the Lane Controller on its server socket returns one complete Handshake Message, assuming the Lane Controller has specified a sufficiently large enough receive buffer. Unlike TCP, the Lane Controller UDP server does not need to make repeated calls to `recvfrom` in order to obtain a single Handshake Message.

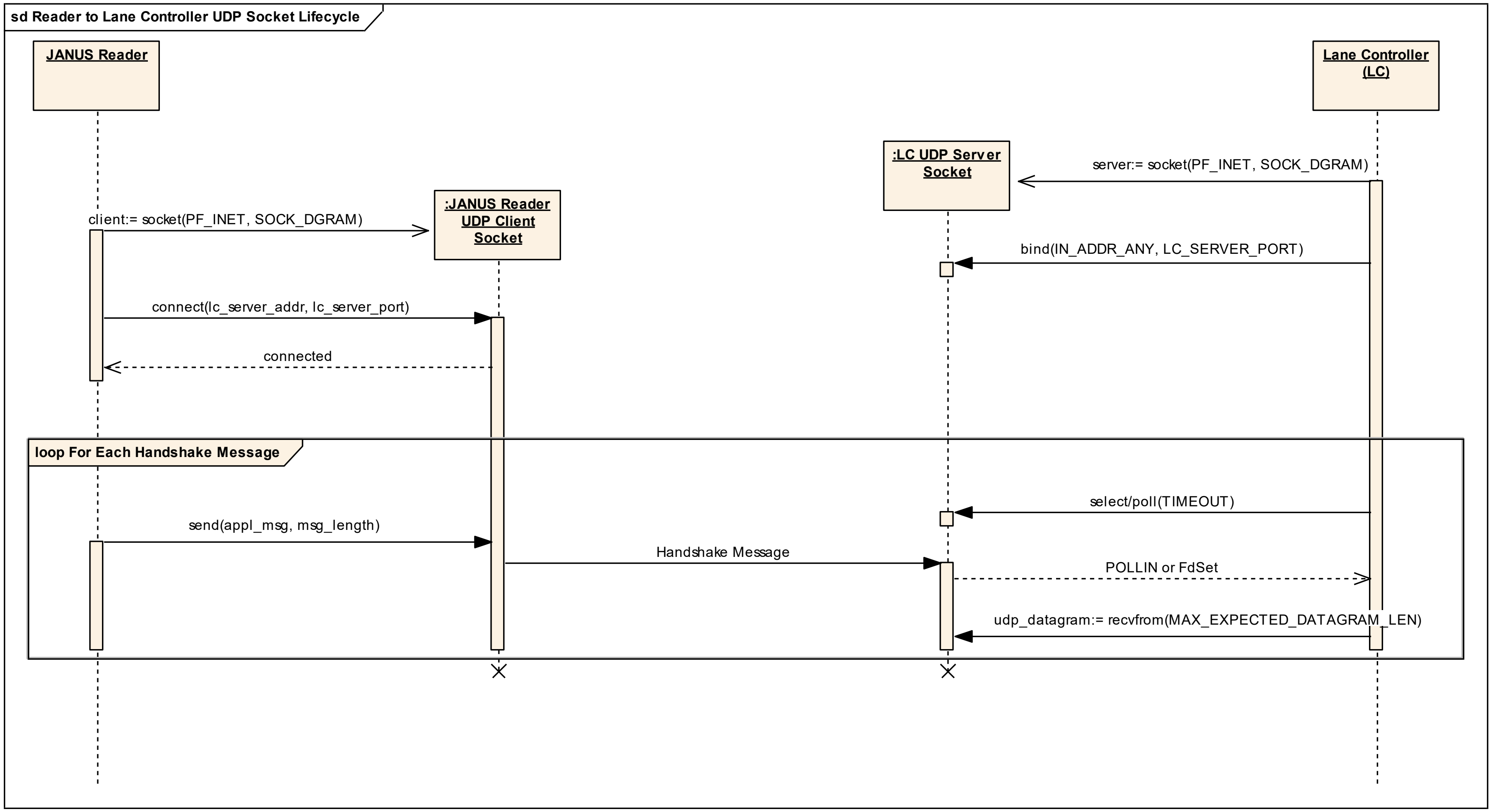

Figure 13.1-1: JANUS MPR2.3 Reader to Lane Controller UDP Socket Lifecycle