OCORA

Open CCS On-board Reference Architecture

Addendum to SUBSET-139

ATO on-board to Rolling stock Interface

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References

Reader's note: please be aware that the numbers in square brackets, e.g. [1], as per the list of referenced documents below, is used throughout this document to indicate the references to external documents. Wherever a reference to a TSI-CCS SUBSET is used, the SUBSET is referenced directly (e.g. SUBSET-026). OCORA always reference to the latest available official version of the SUBSET, unless indicated differently.

[1] OCORA-BWS01-010 – Release Notes

[2] OCORA-BWS01-020 – Glossary

[3] OCORA-BWS01-040 – Feedback Form

[4] OCORA-BWS02-030 – Technical Slide Deck

[5] OCORA-TWS01-030 – System Architecture

[6] OCORA-TWS01-035 – CCS On-Board (CCS-OB) – Architecture

[7] OCORA-TWS02-030 – OCORA Addendum to SUBSET-147

[8] OCORA-TWS04-010 – Functional Vehicle Adapter – Introduction

[9] OCORA-TWS04-012 – TCMS – Standard Communication Interface Specification

[10] SUBSET-026, ERTMS/ETCS – System Requirements Specification

[11] SUBSET-125, ERTMS/ATO – System Requirements Specification

[12] SUBSET-126, ERTMS/ATO – ATO-OB / ATO-TS FFFIS Application Layer

[13] SUBSET-139, ERTMS/ATO – ATO-OB / Rolling Stock FFFIS Application Layer

[14] SUBSET-147, ERTMS Data Applications – FFFIS part: CCS Consist Network Communication Layers

1 Introduction

1.1 Purpose of the document

The purpose of this document is to define requirements that have not been considered in SUBSET-139 [13], this with the intention to get a standardised and unambiguous implementation of the integration between ATO on-board and the vehicle. The document is based on content elaborated in former phases of the OCORA collaboration, most content originates from the OCORA-TWS04-012 [9] document. The SUBSET-139 [13] is a mandatory specification of the TSI-CCS 2023 release which aims at defining the standardised interface between the ATO on-board and the vehicle.

This OCORA Addendum is intended to be used in tenders for CCS on-board systems or one of its building blocks, either as part of a new vehicle or as enhancement or replacement in existing legacy vehicles. This document is based on the architecture described in the System Requirements Specification [10].

If you are an organization interested in developing on-board CCS building blocks according to OCORA standard, information provided in this document needs to be considered in your development to be compliant with the OCORA specifications.

The reader is invited to provide feedback to the OCORA collaboration. Feedback to this document and to any other OCORA documentation can be given by using the feedback form [3].

1.2 Applicability of the document

This document is applicable for integrations of ATO on-board into vehicles with a SUBSET-139 [13] compliant TCMS but also for legacy vehicles that do not contain a SUBSET-139 [13] compliant TCMS. In the latter case, the vehicle (TCMS) shall communicate through a Functional Vehicle Adapter (FVA) with the ATO on-board to comply with the SUBSET-139 [13] compliant ATO on-board system. In this case, refer also to the document “Functional Vehicle Adapter – Introduction” [8].

1.3 Context of the document

This document is published as part of an OCORA Release, together with the documents listed in the Release Notes [1]. All abbreviations and terms used are defined in the Glossary [2].

2 Additional requirements to SUBSET-139

2.1 Definition of the lower layers of the interface

1. The interface between the ATO on-board and the Rolling stock shall be implemented including the definitions of the document OCORA-TWS02-030 - Addendum to SUBSET-147 [7].

2.2 Additional variables to be transmitted

This chapter defines variables that have not been considered in SUBSET-139 [13].

2.2.1 ATO on-board diagnostic information

This chapter defines variables in terms of ATO on-board diagnostic information. The intention is to define a generic set of variables that can be implemented by all different suppliers.

Rationale for the data: The published diagnostic information is used by the vehicle as diagnostic information that is centrally collected (and eventually displayed) for the whole vehicle. The information can then be logged and / or used for specific operational processes.

Note: this chapter 2.2.1 is related to the function ID “F-ATO-Out-15” of the document OCORA-TWS04-012 [9].

2.2.1.1 ATO on-board Condition

2. The ATO on-board shall provide the condition information of the ATO on-board indicating the severity of an active event or the currently executed process.
   The ATO on-board condition to be provided as variable Q_ATO_Condition. The variable shall be encoded as follows:

Variable Name	**Size**	**Meaning**	
Q_ATO_Condition	4 bits	0	Spare value
		1	Initialising
		2	Auto test
		3	Updating
		4	Maintenance mode
		5	Running (OK) *Note: ATO on-board can be engaged or not engaged.*
		6	Warning issue
		7	Error issue
		8	Critical issue
		9	Shutting down
		10..15	Spare values

Table 1 Definition for variable “ATO on-board condition”

The variable Q_ATO_Condition is used for diagnostic purposes. This variable is different from the variable M_ATO_STATE which represents the standardised ATO on-board state machine introduced in SUBSET-125 [11] and transmitted to trackside according to SUBSET-126 [12].

The “ATO on-board Condition” value is indicated according to the event or process with the highest severity.

Note I: the ATO on-board of the different suppliers might not provide all the “ATO on-board Condition” variable values as defined here. Each specific ATO on-board shall only provide the condition values that are available by default from the product. The supplier to provide a description of the implemented condition values.

Note II: the “ATO on-board Condition” variable is not intended for use in safety relevant functions.

Definition of the different conditions:

Condition information	Definition
Initialising	ATO on-board is starting up, initialising, possibly performing some internal tests, and will soon come into operation (if no issue persists). The ATO on-board is not operational yet and has only reduced communication capability.
Auto test	ATO on-board is performing some automated tests and will soon come into operation (if no issue persists). The ATO on-board is not operational but has the full communication capability available.
Updating	ATO on-board is busy while installing one or more new configuration items. The ATO on-board is not operational and might only have a reduced communication capability.
Maintenance mode	ATO on-board is in maintenance mode, it will come into operation once it exits the maintenance mode. The ATO on-board is not operational and might only have a reduced communication capability.
Running (OK)	ATO on-board works normally, no misbehaviour or anomaly has been detected.
Warning issue	ATO on-board has detected an abnormal operation of a component within itself. The ATO on-board continues to function but there is a medium-to-low impact on operations (non-critical). This includes that for the ATO on-board to function it may include the use of a procedural workaround. Service measures should be initiated. If no action is taken, an operation might fail in the future.
Error issue	ATO on-board has detected the failure of a component within itself. The ATO on-board continues to function but there is a high impact to at least portions of operations (ATO on-board use is severely reduced) and no procedural workaround exists. Service measures must be initiated.
Critical issue	ATO on-board has detected the catastrophic failure of a component within itself. The ATO on-board does no longer function and halts operations, no procedural workaround exists. Substitution of a line replaceable unit (LRU) and its repair in the workshop is required.
Shutting down	ATO on-board is shutting down. The ATO on-board is no longer operational and has only a reduced communication capability.

2.2.1.2 ATO on-board Event Code

3. The ATO on-board shall provide a numerical value that corresponds to an event code for the whole ATO on-board subsystem. The meaning of the event code (each value) is specific to the installed equipment. The supplier of the equipment has the freedom to make use of the 8 variables in the way that best suits to him (technically the one variable of size 256 bits has been split into 8 smaller variables). The supplier shall provide the documentation describing the specific meaning of each event code.
   The ATO on-board condition to be provided as variable M_ATO_Event_Code_n. The variable shall be encoded as follows:

Variable Name	Size	Meaning	
M_ATO_Event_Code_1	32 bits	0.. 4’294’967’295	Project specific

M_ATO_Event_Code_2	32 bits	0.. 4’294’967’295	Project specific
M_ATO_Event_Code_3	32 bits	0.. 4’294’967’295	Project specific
M_ATO_Event_Code_4	32 bits	0.. 4’294’967’295	Project specific
M_ATO_Event_Code_5	32 bits	0.. 4’294’967’295	Project specific
M_ATO_Event_Code_6	32 bits	0.. 4’294’967’295	Project specific
M_ATO_Event_Code_7	32 bits	0.. 4’294’967’295	Project specific
M_ATO_Event_Code_8	32 bits	0.. 4’294’967’295	Project specific

Table 2 Definition for variable “ATO on-board event code”

The “ATO on-board Event Code” variables can be used in different manners:

- Each numerical value has a specific meaning.
- The variable can be regarded as a bit field where each bit is specific for a component.
- The variable can be regarded as a bit field, where a specific number of bits are grouped for a specific component. This group of bits has then a specific meaning for the particular component.
- A combination of the above variants is thinkable, where the assignment is distributed over the different variables.
- Other possible use of the available variables.

2.2.1.3 ATO on-board Hardware version

4. The ATO on-board shall provide the version(s) of the hardware for the different Line Replaceable Unit (LRU) components running within the ATO on-board. The supplier of the equipment must provide the description how his LRU component discloses the hardware version by means of this variable. Furthermore, the supplier must document the version of each supplied LRU hardware component. The ATO on-board hardware version to be provided as variable M_ATO_HW_Version_n. The variable shall be encoded as follows:

Variable Name	**Size**	**Meaning**	
M_ATO_HW_Version_1	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 3 Definition for variable “ATO on-board Hardware Version - 1”

Variable Name	**Size**	**Meaning**	
M_ATO_HW_Version_2	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.

		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 4 Definition for variable “ATO on-board Hardware Version - 2”

Variable Name	**Size**	**Meaning**	
M_ATO_HW_Version_3	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 5 Definition for variable “ATO on-board Hardware Version - 3”

Variable Name	**Size**	**Meaning**	
M_ATO_HW_Version_4	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 6 Definition for variable “ATO on-board Hardware Version - 4”

Variable Name	**Size**	**Meaning**	
M_ATO_HW_Version_5	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 7 Definition for variable “ATO on-board Hardware Version - 5”

Variable Name	Size	Meaning	
M_ATO_HW_Version_6	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 8 Definition for variable “ATO on-board Hardware Version - 6”

Variable Name	Size	Meaning	
M_ATO_HW_Version_7	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 9 Definition for variable “ATO on-board Hardware Version - 7”

Variable Name	Size	Meaning	
M_ATO_HW_Version_8	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 10 Definition for variable “ATO on-board Hardware Version - 8”

The definition allows to disclose the hardware version for up to 8 different line replaceable unit components within the ATO on-board. The numerical values and the ASCII character of each “ATO on-board Hardware Version” variable (variables 1 to 8) can be compiled into the following format: “xxx.yyy.zzz/A”.

Example of one compiled ATO on-board LRU component hardware version variable: 34.8.25/F

2.2.1.4 ATO on-board Software version

5. The ATO on-board shall provide the version(s) of the software for the different Line Replaceable Unit (LRU) components running within the ATO on-board. The supplier of the equipment must provide the description how his LRU component discloses the software version by means of this variable. Furthermore, the supplier must document the version of each released LRU component software. The ATO on-board software version to be provided as variable M_ATO_SW_Version_n. The variable shall be encoded as follows:

Variable Name	**Size**	**Meaning**	
M_ATO_SW_Version_1	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 11 Definition for variable “ATO on-board Software Version - 1”

Variable Name	**Size**	**Meaning**	
M_ATO_SW_Version_2	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 12 Definition for variable “ATO on-board Software Version - 2”

Variable Name	**Size**	**Meaning**	
M_ATO_SW_Version_3	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 13 Definition for variable “ATO on-board Software Version - 3”

Variable Name	Size	Meaning	
M_ATO_SW_Version_4	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 14 Definition for variable “ATO on-board Software Version - 4”

Variable Name	Size	Meaning	
M_ATO_SW_Version_5	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 15 Definition for variable “ATO on-board Software Version - 5”

Variable Name	Size	Meaning	
M_ATO_SW_Version_6	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 16 Definition for variable “ATO on-board Software Version - 6”

Variable Name	Size	Meaning	
M_ATO_SW_Version_7	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.

		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 17 Definition for variable “ATO on-board Software Version - 7”

Variable Name	**Size**	**Meaning**	
M_ATO_SW_Version_8	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 18 Definition for variable “ATO on-board Software Version - 8”

The definition allows to disclose the software version for up to 8 different line replaceable unit components within the ATO on-board. The numerical values and the ASCII character of each “ATO on-board Software Version” variable (variables 1 to 8) can be compiled into the following format: “xxx.yyy.zzz/A”.

Example of one compiled ATO on-board LRU component software version variable: 2.23.16/B

2.2.1.5 ATO on-board Parametrisation file version

6. The ATO on-board shall provide the version(s) of the parametrisation file (configuration) for the different Line Replaceable Unit (LRU) components running within the ATO on-board. The parametrisation file (configuration) version information exposes the version of the parametrisation file that is currently being applied by the software of the different LRU components of the ATO on-board. The parametrisation file defines all configurable parameters of the specific component. The supplier of the equipment must provide the description how his component discloses the parametrisation file version by means of this variable. Furthermore, the supplier must document the version of each released LRU component parametrisation file (configuration).
The ATO on-board parametrisation file version to be provided as variable M_ATO_Cfg_Version_n. The variable shall be encoded as follows:

Variable Name	**Size**	**Meaning**	
M_ATO_Cfg_Version_1	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.

		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 19 Definition for variable “ATO on-board Parametrisation File Version - 1”

Variable Name	**Size**	**Meaning**	
M_ATO_Cfg_Version_2	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 20 Definition for variable “ATO on-board Parametrisation File Version - 2”

Variable Name	**Size**	**Meaning**	
M_ATO_Cfg_Version_3	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 21 Definition for variable “ATO on-board Parametrisation File Version - 3”

Variable Name	**Size**	**Meaning**	
M_ATO_Cfg_Version _4	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 22 Definition for variable “ATO on-board Parametrisation File Version - 4”

Variable Name	**Size**	**Meaning**

M_ATO_Cfg_Version_5	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 23 Definition for variable “ATO on-board Parametrisation File Version - 5”

Variable Name	**Size**	**Meaning**	
M_ATO_Cfg_Version_6	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 24 Definition for variable “ATO on-board Parametrisation File Version - 6”

Variable Name	**Size**	**Meaning**	
M_ATO_Cfg_Version_7	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.
		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 25 Definition for variable “ATO on-board Parametrisation File Version - 7”

Variable Name	**Size**	**Meaning**	
M_ATO_Cfg_Version_8	32 bits	0..7	xxx major version Reserved value: 127, if the major version is not used.
		8..15	yyy minor version Reserved value: 127, if the minor version is not used.

		16..23	zzz patch version Reserved value: 127, if the patch version is not used.
		24..31	1 ASCII character Reserved value: “-“ (decimal=45, hex=2D), if the ASCII character is not used.

Table 26 Definition for variable “ATO on-board Parametrisation File Version - 8”

The definition allows to disclose the parametrisation file (configuration) version for up to 8 different line replaceable unit components within the ATO on-board. The numerical values and the ASCII character of each “ATO on-board Parametrisation File Version” variable (variables 1 to 8) can be compiled into the following format: “xxx.yyy.zzz/A”.

Example of one compiled ATO on-board LRU component parametrisation file version variable: 15.48.3/H

Note: not all equipment from the different suppliers makes use of a parametrisation file (configuration). In case no parametrisation file (configuration) is used, then the version of the parametrisation inserted by other means into the component shall be provided. In case no parametrisation version is managed, then in all sections the reserved values for “not used” shall be applied.

2.3 Interface and packets definition

The interface of ATO on-board to the Rolling stock is defined in SUBSET-139 [13].

Accordingly, the packets are structured with the header, the user data, and the checksum.

The header used in the packets of this document is the same as defined in SUBSET-139 [13].

The checksum for error detection used in the packets of this document is the same as defined in SUBSET-139 [13]: CRC32.

2.3.1 User data – List of packets

The following user data packets are used for communication between ATO on-board and the Rolling stock (RST):

Packet Name	Packet ID	Source	Sink	Transmitting cycle [ms] (max)	Data Class [14]	Timeout [ms]
ATO_RST_Condition and Event	41	ATO	RST	500	Process Data	2500
ATO_RST_Hardware Version	42	ATO	RST	500	Process Data	2500
ATO_RST_Software Version	43	ATO	RST	500	Process Data	2500
ATO_RST_Parametrisation Version	44	ATO	RST	500	Process Data	2500

Table 27 User data packet overview

2.3.2 User data – Packet description

2.3.2.1 User data – ATO to RST packet 41: Condition and Event

Byte	Bit	Variable name	Variable / Description	Data	Table

Offset	Offset			Type	reference
0	0	Q_ATO_Condition	ATO on-board condition	ENUM4	Table 1
1	0	M_ATO_Event_Code_1	ATO on-board event code 1	UINT32	Table 2
5	0	M_ATO_Event_Code_2	ATO on-board event code 2	UINT32	Table 2
9	0	M_ATO_Event_Code_3	ATO on-board event code 3	UINT32	Table 2
13	0	M_ATO_Event_Code_4	ATO on-board event code 4	UINT32	Table 2
17	0	M_ATO_Event_Code_5	ATO on-board event code 5	UINT32	Table 2
21	0	M_ATO_Event_Code_6	ATO on-board event code 6	UINT32	Table 2
25	0	M_ATO_Event_Code_7	ATO on-board event code 7	UINT32	Table 2
29	0	M_ATO_Event_Code_8	ATO on-board event code 8	UINT32	Table 2

Table 28 ATO to RST packet 41: Condition and Event

2.3.2.2 User data – ATO to RST packet 42: Hardware version

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Table reference
0	0	M_ATO_HW_Version_1	ATO on-board Hardware Version of LRU 1	UINT32	Table 3
4	0	M_ATO_HW_Version_2	ATO on-board Hardware Version of LRU 2	UINT32	Table 4
8	0	M_ATO_HW_Version_3	ATO on-board Hardware Version of LRU 3	UINT32	Table 5
12	0	M_ATO_HW_Version_4	ATO on-board Hardware Version of LRU 4	UINT32	Table 6
16	0	M_ATO_HW_Version_5	ATO on-board Hardware Version of LRU 5	UINT32	Table 7
20	0	M_ATO_HW_Version_6	ATO on-board Hardware Version of LRU 6	UINT32	Table 8
24	0	M_ATO_HW_Version_7	ATO on-board Hardware Version of LRU 7	UINT32	Table 9
28	0	M_ATO_HW_Version_8	ATO on-board Hardware Version of LRU 8	UINT32	Table 10

Table 29 ATO to RST packet 42: Hardware version

2.3.2.3 User data – ATO to RST packet 43: Software version

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Table reference
0	0	M_ATO_SW_Version_1	ATO on-board Software Version of LRU 1	UINT32	Table 11
4	0	M_ATO_SW_Version_2	ATO on-board Software Version of LRU 2	UINT32	Table 12
8	0	M_ATO_SW_Version_3	ATO on-board Software Version of LRU 3	UINT32	Table 13
12	0	M_ATO_SW_Version_4	ATO on-board Software Version of LRU 4	UINT32	Table 14

16	0	M_ATO_SW_Version_5	ATO on-board Software Version of LRU 5	UINT32	Table 15
20	0	M_ATO_SW_Version_6	ATO on-board Software Version of LRU 6	UINT32	Table 16
24	0	M_ATO_SW_Version_7	ATO on-board Software Version of LRU 7	UINT32	Table 17
28	0	M_ATO_SW_Version_8	ATO on-board Software Version of LRU 8	UINT32	Table 18

Table 30 ATO to RST packet 43: Software version

2.3.2.4 User data – ATO to RST packet 44: Parametrisation version

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Table reference
0	0	M_ATO_Cfg_Version_1	ATO on-board Parametrisation Version of LRU 1	UINT32	Table 19
4	0	M_ATO_Cfg_Version_2	ATO on-board Parametrisation Version of LRU 2	UINT32	Table 20
8	0	M_ATO_Cfg_Version_3	ATO on-board Parametrisation Version of LRU 3	UINT32	Table 21
12	0	M_ATO_Cfg_Version_4	ATO on-board Parametrisation Version of LRU 4	UINT32	Table 22
16	0	M_ATO_Cfg_Version_5	ATO on-board Parametrisation Version of LRU 5	UINT32	Table 23
20	0	M_ATO_Cfg_Version_6	ATO on-board Parametrisation Version of LRU 6	UINT32	Table 24
24	0	M_ATO_Cfg_Version_7	ATO on-board Parametrisation Version of LRU 7	UINT32	Table 25
28	0	M_ATO_Cfg_Version_8	ATO on-board Parametrisation Version of LRU 8	UINT32	Table 26

Table 31 ATO to RST packet 44: Parametrisation version