

OCORA

Open CCS On-board Reference Architecture

Addendum to SUBSET-119

ETCS on-board to TCMS 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-027, ERTMS/ETCS – FIS Juridical Recording
- [12] SUBSET-035, ERTMS/ETCS – Specific Transmission Module FFFIS
- [13] SUBSET-058, ERTMS/ETCS – FFFIS STM Application Layer
- [14] SUBSET-119, ERTMS/ETCS – Train Interface FFFIS
- [15] SUBSET-147, ERTMS Data Applications – FFFIS part: CCS Consist Network Communication Layers
- [16] Document 97E2675B - ODOMETER FFFIS

1 Introduction

1.1 Purpose of the document

The purpose of this document is to define requirements that have not been considered or where different options have been documented in SUBSET-119 [14], this with the intention to get a standardised and unambiguous implementation of the integration between ETCS 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-119 [14] is a mandatory specification of the TSI-CCS 2023 release which aims at defining the standardised interface between the ETCS 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 integration of ETCS on-board into vehicles with a SUBSET-119 compliant TCMS but also for legacy vehicles where the TCMS is not compliant to SUBSET-119. In the latter case, the vehicle (TCMS) shall implement a solution based on Functional Vehicle Adapter (FVA) and Wired I/O Control (WIOC) to communicate with the SUBSET-119 compliant ETCS on-board. In this case, refer also to the document OCORA-TWS04-010 "Functional Vehicle Adapter – Introduction" [8]. Furthermore, a protocol converter gateway for the lower OSI layers might be needed.

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-119

2.1 Definition of the lower layers of the interface

1. The interface between the ETCS on-board and the rollingstock shall be implemented with ECN serial interface as defined in chapter 4.6 of SUBSET-119 [14].

Note: The ETCS on-board shall directly implement this requirement, The vehicle side to be compatible by means of a project specific solution. For legacy trains a solution based on a gateway (as indicated in SUBSET-147 [15]) and a Functional Vehicle Adapter (FVA) as described in document OCORA-TWS04-010 [8] can be realised.

2. The interface between the ETCS on-board and the rollingstock shall be implemented including the definitions of the document OCORA-TWS02-030 - Addendum to SUBSET-147 [7].

Note: This is applicable to rollingstock implementing the ECN serial interface.

2.2 Way of transmission for I/O variables

3. The I/O variables of the interface between the ETCS on-board and the rollingstock shall only be transmitted via the mandatory interface (marked with "M") as defined in table 2-1 of SUBSET-119 [14].

Note: The ETCS on-board shall directly implement this requirement, The vehicle side to be compatible by means of a project specific solution. For legacy trains a solution based on Functional Vehicle Adapter (FVA) and Wired I/O Control (WIOC) as described in document OCORA-TWS04-010 [8] can be realised.

2.3 Additional signals to be transmitted

This chapter defines variables that have not been considered in SUBSET-119 [14].

2.3.1 Odometry data

This chapter defines variables in terms of odometry data where the source is the ETCS on-board.

Rationale for the data: the information is published to the vehicle to reduce to a minimum the number of odometer subsystems, and the information is used by the vehicle to improve or replace the speed evaluation within the TCMS. Furthermore, it may be used to evaluate the exact position for track conditions.

Note: this is related to the function ID "F-ETCS-Out-19" of the document OCORA-TWS04-012 [9].

2.3.1.1 Speed

4. The ETCS on-board shall provide the current speed (as used by the ETCS on-board) to the TCMS. The current speed to be provided as variable OBU_TR_Speed. The variable shall be encoded with 16 bits as defined for the "V_EST" in SUBSET-058 [13]. Positive value indicates that current travel direction relative to the active cabin is forward. Negative value indicates that current travel direction relative to the active cabin is backward.

Rationale for variable selection: SUBSET-026 defines V_TRAIN for speed value with a limited resolution of 5 km/h, but no direction information is available. Therefore, an additional variable for the direction indication would have to be introduced. By using the V_EST this information is included (positive or negative value) and the resolution is more appropriate. Furthermore, it is assumed that this variable is mostly already implemented in the ETCS on-board as it is defined for STM integration.

5. The ETCS on-board shall provide to the TCMS the maximum speed based on the speed confidence interval (the highest possible speed).

The maximum speed to be provided as variable OBU_TR_Speed_ConfMax. The variable shall be encoded with 16 bits as defined for the "V_MAX" in SUBSET-058 [13].

Positive value indicates that current travel direction relative to the active cabin is forward. Negative value indicates that current travel direction relative to the active cabin is backward.

Rationale for variable selection: SUBSET-026 defines V_TRAIN for the speed value with a limited resolution of 5 km/h but no direction information is available. Therefore, an additional variable for the direction indication would have to be introduced. By using the V_MAX this information is included (positive or negative value) and the resolution is more appropriate. Furthermore, it is assumed that this variable is mostly already implemented in the ETCS on-board as it is defined for STM integration.

6. The ETCS on-board shall provide to the TCMS the minimum speed based on the speed confidence interval (the lowest possible speed).

The minimum speed to be provided as variable OBU_TR_Speed_ConfMin. The variable shall be encoded with 16 bits as defined for the "V_MIN" in SUBSET-058 [13].

Positive value indicates that current travel direction relative to the active cabin is forward. Negative value indicates that current travel direction relative to the active cabin is backward.

Rationale for variable selection: SUBSET-026 defines V_TRAIN for the speed value with a limited resolution of 5 km/h but no direction information is available. Therefore, an additional variable for the direction indication would have to be introduced. By using the V_MIN this information is included (positive or negative value) and the resolution is more appropriate. Furthermore, it is assumed that this variable is mostly already implemented in the ETCS on-board as it is defined for STM integration.

2.3.1.2 Acceleration

7. The ETCS on-board shall provide the current acceleration to the TCMS.

The current acceleration to be provided as variable OBU_TR_Acceleration. The variable shall be encoded with 11 bits:

Variable Name	Size	Value		
		Minimum	Maximum	Resolution
OBU_TR_Acceleration	11 bits	-3 m/s ²	3 m/s ²	0.003 m/s ²
		Meaning		
		Train acceleration in the longitudinal axis of the train.		
		The acceleration indication to be provided in positive and negative values.		
		Positive value indicates positive acceleration, speed is increasing.		
		Negative value indicates negative acceleration (deceleration), speed is dropping.		
		The first bit indicates the sign of the acceleration (1 = negative; 0 = positive)		
		1000000000	Not used	
		x1111101001 to x1111111111	Value out of range, not used	
		1111111111	Data not available	

Table 1 Definition for variable "Odometry data - Acceleration"

The variable OBU_TR_Acceleration shall be encoded as defined for the "A_TRAIN" in document ODOMETER FFFIS [16].

2.3.1.3 Distance

8. The ETCS on-board shall provide a measured distance counter to the TCMS.

The measured distance counter to be provided as variable OBU_TR_Dist_Counter. The variable shall be encoded with 32 bits as defined for the "D_EST" in SUBSET-058 [13].

Positive value indicates that travelled distance in terms of direction relative to the active cabin is forward. Negative value indicates that travelled distance in terms of direction relative to the active cabin is backward.

9. The ETCS on-board shall provide to the TCMS the maximum measured distance counter based on the distance confidence interval (the highest possible position of the vehicle in the vehicle coordinates system).
The maximum measured distance counter to be provided as variable OBU_TR_Dist_Counter_Max. The variable shall be encoded with 32 bits as defined for the "D_MAX" in SUBSET-058 [13].
Positive value indicates that travelled distance in terms of direction relative to the active cabin is forward. Negative value indicates that travelled distance in terms of direction relative to the active cabin is backward.
It is expected that at times the confidence interval is reset by the ETCS on-board based on specific means in place. Distance computation can be implemented based on §12.3.1.7 of SUBSET-035 [12].
10. The ETCS on-board shall provide to the TCMS the minimum measured distance counter based on the distance confidence interval (the lowest possible position of the vehicle in the vehicle coordinates system).
The minimum measured distance counter to be provided as variable OBU_TR_Dist_Counter_Min. The variable shall be encoded with 32 bits as defined for the "D_MIN" in SUBSET-058 [13].
Positive value indicates that travelled distance in terms of direction relative to the active cabin is forward. Negative value indicates that travelled distance in terms of direction relative to the active cabin is backward.
It is expected that at times the confidence interval is reset by the ETCS on-board based on specific means in place. Distance computation can be implemented based on §12.3.1.7 of SUBSET-035 [12].

2.3.2 ETCS on-board diagnostic information

This chapter defines variables in terms of ETCS 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 2.3.2 is related to the function ID "F-ETCS-Out-22" of the document OCORA-TWS04-012 [9].

2.3.2.1 ETCS on-board Condition

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

Variable Name	Size	Meaning	
OBU_TR_ETCS_Condition	4 bits	0	Spare value
		1	Initialising
		2	Auto test
		3	Updating
		4	Maintenance mode
		5	Running (OK)
		6	Warning issue
		7	Error issue
		8	Critical issue
		9	Shutting down
		10..15	Spare values

Table 2 Definition for variable "ETCS on-board condition"

The "ETCS on-board Condition" value is indicated according to the event or process with the highest severity.

Note-1: the ETCS on-board of the different suppliers might not provide all the “ETCS on-board Condition” variable values as defined here. Each specific ETCS 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-2: the “ETCS on-board Condition” variable is not intended for use in safety relevant functions.

Definition of the different conditions:

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

2.3.2.2 ETCS on-board Event Code

- The ETCS on-board shall provide a numerical value that corresponds to an event code for the whole ETCS 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 had to be split into 8 smaller variables). The supplier must provide the documentation describing the specific meaning of each event code.

The ETCS on-board condition to be provided as variable OBU_TR_Event_Code_n. The variable shall be encoded as follows:

Variable Name	Size	Meaning	
OBU_TR_Event_Code_1	32 bits	0.. 4'294'967'295	Project specific
OBU_TR_Event_Code_2	32 bits	0.. 4'294'967'295	Project specific
OBU_TR_Event_Code_3	32 bits	0.. 4'294'967'295	Project specific
OBU_TR_Event_Code_4	32 bits	0.. 4'294'967'295	Project specific
OBU_TR_Event_Code_5	32 bits	0.. 4'294'967'295	Project specific
OBU_TR_Event_Code_6	32 bits	0.. 4'294'967'295	Project specific
OBU_TR_Event_Code_7	32 bits	0.. 4'294'967'295	Project specific
OBU_TR_Event_Code_8	32 bits	0.. 4'294'967'295	Project specific

Table 3 Definition for variable "ETCS on-board event code"

The "ETCS 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.

2.3.2.3 ETCS on-board Hardware version

13. The ETCS on-board shall provide the version(s) of the hardware for the different Line Replaceable Unit (LRU) components running within the ETCS 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 ETCS on-board hardware version to be provided as variable OBU_TR_ETCS_HW_Version_n. The variable shall be encoded as follows:

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 4 Definition for variable "ETCS on-board Hardware Version - 1"

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 5 Definition for variable “ETCS on-board Hardware Version - 2”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 6 Definition for variable “ETCS on-board Hardware Version - 3”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 7 Definition for variable “ETCS on-board Hardware Version - 4”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 8 Definition for variable “ETCS on-board Hardware Version - 5”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 9 Definition for variable “ETCS on-board Hardware Version - 6”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 10 Definition for variable “ETCS on-board Hardware Version - 7”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 11 Definition for variable “ETCS on-board Hardware Version - 8”

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

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

2.3.2.4 ETCS on-board Software version

14. The ETCS on-board shall provide the version(s) of the software for the different Line Replaceable Unit (LRU) components running within the ETCS 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 ETCS on-board software version to be provided as variable OBU_TR_ETCS_SW_Version_n. The variable shall be encoded as follows:

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 12 Definition for variable “ETCS on-board Software Version - 1”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 13 Definition for variable “ETCS on-board Software Version - 2”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 14 Definition for variable “ETCS on-board Software Version - 3”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 15 Definition for variable “ETCS on-board Software Version - 4”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 16 Definition for variable “ETCS on-board Software Version - 5”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 17 Definition for variable “ETCS on-board Software Version - 6”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 18 Definition for variable “ETCS on-board Software Version - 7”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 19 Definition for variable “ETCS on-board Software Version - 8”

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

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

2.3.2.5 ETCS on-board Parametrisation file version

- The ETCS on-board shall provide the version(s) of the parametrisation file (configuration) for the different Line Replaceable Unit (LRU) components running within the ETCS 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 ETCS 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 ETCS on-board parametrisation file version to be provided as variable OBU_TR_ETCS_Cfg_Version_n. The variable shall be encoded as follows:

Variable Name	Size	Meaning	
OBU_TR_ETCS_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.
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Table 20 Definition for variable “ETCS on-board Parametrisation File Version - 1”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 21 Definition for variable “ETCS on-board Parametrisation File Version - 2”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 22 Definition for variable “ETCS on-board Parametrisation File Version - 3”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 23 Definition for variable “ETCS on-board Parametrisation File Version - 4”

Variable Name	Size	Meaning
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OBU_TR_ETCS_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 24 Definition for variable “ETCS on-board Parametrisation File Version - 5”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 25 Definition for variable “ETCS on-board Parametrisation File Version - 6”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 26 Definition for variable “ETCS on-board Parametrisation File Version - 7”

Variable Name	Size	Meaning	
OBU_TR_ETCS_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 27 Definition for variable “ETCS 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 ETCS on-board. The numerical values and the ASCII character of each “ETCS 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 ETCS 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.

2.3.3 Driver identifier number

16. The ETCS on-board shall import the operational driver identifier number from the TCMS.

The driver identifier number to be imported as variable TR_OBU_Driver_ID_n. The variable shall be encoded with 128 bits as defined for the “DRIVER_ID” in SUBSET-027 [10].

The 128 bits allow to define 16 alphanumeric characters in ISO 8859-1 (also known as Latin Alphabet #1).

Due to the length (128 bits) of the DRIVER_ID variable, this is split for transmission into 4 smaller variables (32 bits each): TR_OBU_Driver_ID_1 to TR_OBU_Driver_ID_4. At receiver the 4 variables shall be merged again to the original variable DRIVER_ID.

Rationale for the data: The driver identifier number is used by the TCMS for identification of the driver: driving permission, immobilizer, driver’s logbook, seat adjustment, etc. Furthermore, in TSI OPE it is defined that the driver identifier shall be recorded (independent definition from the ETCS juridical recording).

The ETCS on-board uses the driver identifier number for the purpose of juridical recording. Publishing this information from TCMS to ETCS on-board prevents the driver from having to enter his ID twice: in the TCMS and in the ETCS on-board.

Note: this variable is related to the function ID “F-ETCS-In-19” of document OCORA-TWS04-012 [9].

2.4 Interface and packets definition

The interface between ETCS on-board and the Rolling stock is defined in SUBSET-119 [14].

Accordingly, all signals are transmitted in packets.

The packets on the serial bus shall provide for each signal a specific validity bit to be set at source side.

A variable has its validity bit set to false if it is not used on the source side i.e. the variable is spare (the part of a packet is not used) or the variable value is not trustable due to a problem on the source side.

Variables not provided from the defined source shall be marked as not used by setting the related validity bit to FALSE at source side.

2.4.1 List of packets

The following packets are used for the communication between ETCS on-board and the Train (TR):

Packet Name	Database ID	Source	Sink	Maximum cycle time ECN [ms]	Data Class [15]
TR_OBU_Driver Identifier	Configurable	TR	OBU	200	Process Data
OBU_TR_Odometry Data	Configurable	OBU	TR	100	Process Data
OBU_TR_Condition and Event_1	Configurable	OBU	TR	200	Process Data
OBU_TR_Condition and Event_2	Configurable	OBU	TR	200	Process Data
OBU_TR_Hardware Version_1	Configurable	OBU	TR	200	Process Data
OBU_TR_Hardware Version_2	Configurable	OBU	TR	200	Process Data
OBU_TR_Software Version_1	Configurable	OBU	TR	200	Process Data
OBU_TR_Software Version_2	Configurable	OBU	TR	200	Process Data
OBU_TR_Parametrisation Version_1	Configurable	OBU	TR	200	Process Data
OBU_TR_Parametrisation Version_2	Configurable	OBU	TR	200	Process Data

Table 28 Packet overview

2.4.2 Packet description

2.4.2.1 TR to OBU packet: Driver Identifier

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	TR_OBU_Driver_ID_1	First 32 bits of DRIVER_ID.	UINT32	§ 2.3.3
4	0	TR_OBU_Driver_ID_2	Second 32 bits of DRIVER_ID.	UINT32	§ 2.3.3
8	0	TR_OBU_Driver_ID_3	Third 32 bits of DRIVER_ID.	UINT32	§ 2.3.3
12	0	TR_OBU_Driver_ID_4	Forth 32 bits of DRIVER_ID.	UINT32	§ 2.3.3
16	0	Spare 1		INT32	
20	0	Spare 2		INT32	
24	0	Spare 3		INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 6.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 29 TR to OBU packet: Driver Identifier

2.4.2.2 OBU to TR packet: Odometry Data

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_Speed	Current speed in 1 cm/s.	INT16	Req. 4
2	0	OBU_TR_Speed_ConfMax	Maximum speed in 1 cm/s (based on confidence interval).	INT16	Req. 5
4	0	OBU_TR_Speed_ConfMin	Minimum speed in 1 cm/s (based on confidence interval).	INT16	Req. 6
6	0	OBU_TR_Dist_Counter	Distance counter in 1 cm.	INT32	Req. 8
10	0	OBU_TR_Dist_Counter_Max	Maximum distance counter in 1 cm (based on confidence interval).	INT32	Req. 9
14	0	OBU_TR_Dist_Counter_Min	Minimum distance counter in 1 cm (based on confidence interval).	INT32	Req. 10
18	0	OBU_TR_Acceleration	Current acceleration in 0.003 m/s ² .	11 bits	Req. 7
19	3	Padding		5 bits	
20	0	Spare 1		INT32	
24	0	Spare 2		INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 8.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119 [14].		

Table 30 OBU to TR packet: Odometry Data

2.4.2.3 OBU to TR packet: Condition and Event (2 packets)

The definition of the OBU_TR_Condition_and_Event_1 packet is as follows:

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_ETCS_Condition	ETCS on-board condition information.	4 bits	Table 2
0	3	Padding		4 bits	
1	0	OBU_TR_Event_Code_1	ETCS on-board event code.	UINT32	Table 3
5	0	OBU_TR_Event_Code_2	ETCS on-board event code.	UINT32	Table 3
9	0	OBU_TR_Event_Code_3	ETCS on-board event code.	UINT32	Table 3
13	0	OBU_TR_Event_Code_4	ETCS on-board event code.	UINT32	Table 3
17	0	OBU_TR_Event_Code_5	ETCS on-board event code.	UINT32	Table 3

21	0	OBU_TR_Event_Code_6	ETCS on-board event code.	UINT32	Table 3
25	0	Spare 1	Spare variable as trailer needs to start at 4-byte alignment.	INT8	
26	0	Validity	Validity of value of variables contained in bytes 0 to 25 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 25.0 is in bit 7.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 31 OBU to TR packet: Condition and Event Nr. 1

The definition of the OBU_TR_Condition_and_Event_2 packet is as follows:

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_Event_Code_7	ETCS on-board event code.	UINT32	Table 3
4	0	OBU_TR_Event_Code_8	ETCS on-board event code.	UINT32	Table 3
8	0	Spare 1		INT32	
12	0	Spare 2		INT32	
16	0	Spare 3		INT32	
20	0	Spare 4		INT32	
24	0	Spare 5		INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 6.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 32 OBU to TR packet: Condition and Event Nr. 2

2.4.2.4 OBU to TR packet: Hardware Version (2 packets)

The definition of the OBU_TR_Hardware_Version_1 packet is as follows:

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_ETCS_HW_Version_1	Hardware version of the LRU number 1.	UINT32	Table 4
4	0	OBU_TR_ETCS_HW_Version_2	Hardware version of the LRU number 2.	UINT32	Table 5
8	0	OBU_TR_ETCS_HW_Version_3	Hardware version of the LRU number 3.	UINT32	Table 6
12	0	OBU_TR_ETCS_HW_Version_4	Hardware version of the LRU number 4.	UINT32	Table 7
16	0	OBU_TR_ETCS_HW_Version_5	Hardware version of the LRU number 5.	UINT32	Table 8

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
20	0	OBU_TR_ETCS_HW_Version_6	Hardware version of the LRU number 6.	UINT32	Table 9
24	0	Spare 1	Spare variable as trailer needs to start at 4-byte alignment.	INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 6.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 33 OBU to TR packet: Hardware Version Nr. 1

The definition of the OBU_TR_Hardware Version_2 packet is as follows:

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_ETCS_HW_Version_7	Hardware version of the LRU number 7.	UINT32	Table 10
4	0	OBU_TR_ETCS_HW_Version_8	Hardware version of the LRU number 8.	UINT32	Table 11
8	0	Spare 1		INT32	
12	0	Spare 2		INT32	
16	0	Spare 3		INT32	
20	0	Spare 4		INT32	
24	0	Spare 5		INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 6.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 34 OBU to TR packet: Hardware Version Nr. 2

2.4.2.5 OBU to TR packet: Software Version (2 packets)

The definition of the OBU_TR_Software Version_1 packet is as follows:

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_ETCS_SW_Version_1	Software version of the LRU number 1.	UINT32	Table 12
4	0	OBU_TR_ETCS_SW_Version_2	Software version of the LRU number 2.	UINT32	Table 13

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
8	0	OBU_TR_ETCS_SW_Version_3	Software version of the LRU number 3.	UINT32	Table 14
12	0	OBU_TR_ETCS_SW_Version_4	Software version of the LRU number 4.	UINT32	Table 15
16	0	OBU_TR_ETCS_SW_Version_5	Software version of the LRU number 5.	UINT32	Table 16
20	0	OBU_TR_ETCS_SW_Version_6	Software version of the LRU number 6.	UINT32	Table 17
24	0	Spare 1	Spare variable as trailer needs to start at 4-byte alignment.	INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 6.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 35 OBU to TR packet: Software Version Nr. 1

The definition of the OBU_TR_Software Version_2 packet is as follows:

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_ETCS_SW_Version_7	Software version of the LRU number 7.	UINT32	Table 18
4	0	OBU_TR_ETCS_SW_Version_8	Software version of the LRU number 8.	UINT32	Table 19
8	0	Spare 1		INT32	
12	0	Spare 2		INT32	
16	0	Spare 3		INT32	
20	0	Spare 4		INT32	
24	0	Spare 5		INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 6.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 36 OBU to TR packet: Software Version Nr. 2

2.4.2.6 OBU to TR packet: Parametrisation Version (2 packets)

The definition of the OBU_TR_Parametrisation Version_1 packet is as follows:

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_ETCS_Cfg_Version_1	Parametrisation version of the LRU number 1.	UINT32	Table 20
4	0	OBU_TR_ETCS_Cfg_Version_2	Parametrisation version of the LRU number 2.	UINT32	Table 21
8	0	OBU_TR_ETCS_Cfg_Version_3	Parametrisation version of the LRU number 3.	UINT32	Table 22
12	0	OBU_TR_ETCS_Cfg_Version_4	Parametrisation version of the LRU number 4.	UINT32	Table 23
16	0	OBU_TR_ETCS_Cfg_Version_5	Parametrisation version of the LRU number 5.	UINT32	Table 24
20	0	OBU_TR_ETCS_Cfg_Version_6	Parametrisation version of the LRU number 6.	UINT32	Table 25
24	0	Spare 1	Spare variable as trailer needs to start at 4-byte alignment.	INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 6.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 37 OBU to TR packet: Parametrisation Version Nr. 1

The definition of the OBU_TR_Parametrisation Version_2 packet is as follows:

Byte Offset	Bit Offset	Variable name	Variable / Description	Data Type	Reference
0	0	OBU_TR_ETCS_Cfg_Version_7	Parametrisation version of the LRU number 7.	UINT32	Table 26
4	0	OBU_TR_ETCS_Cfg_Version_8	Parametrisation version of the LRU number 8.	UINT32	Table 27
8	0	Spare 1		UINT32	
12	0	Spare 2		UINT32	
16	0	Spare 3		UINT32	
20	0	Spare 4		UINT32	
24	0	Spare 5		INT16	
26	0	Validity	Validity of value of variables contained in bytes 0 to 24 of the packet. The validity of the signal with offset 0.0 is in bit 0. The validity of the signal with offset 24.0 is in bit 6.	UINT16	[14]
28	0	Trailer	Trailer as defined in SS-119.		[14]

Table 38 OBU to TR packet: Parametrisation Version Nr. 2