

**ERTMS UNIT****START OF MISSION IN LEVEL 2 GUIDELINE**

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# **1. INTRODUCTION**

## **1.1 Foreword**

**1.1.1.1** The procedure of Start of mission is defined technically in chapter 5 of the SRS (see [1] and [2]) and operationally in the ETCS rules sections 6.3 and 6.11 (see [3]). However, the Start of mission in level 2 can be implemented in different ways.

**1.1.1.2** This guideline presents two clearly procedures of Start of mission in level 2 in order to simplify the ETCS system taking also into account different network scenarios.

## **1.2 Scope & field of application**

**1.2.1.1** It is strongly recommended that any entity using ETCS follows the principles defined in this guideline.

**1.2.1.2** This guideline is applicable for ETCS Level 2 based on ERTMS/ETCS baseline 2.

**1.2.1.3** The SoM in other levels than L2 is out of scope of this document.

**1.2.1.4** This document presents the SoM scenario. The preferred solution in ETCS due to safety and operational reasons is to start in FS, nevertheless this is not always possible. The document provides two alternative solutions, one in OS and another one in SR.

## **1.3 Document description**

Chapter 1 is an introduction to the content of the document

Chapter 2 provides the references, terms and abbreviations used in this document

Chapter 3 provides the guideline for start of mission in level 2 using Staff Responsible Mode

Chapter 4 provides the guideline for start of mission in level 2 using a Movement Authority

Appendix A.1 describes the technical considerations applied for the development of this guideline.

## **2. REFERENCES AND ABBREVIATIONS**

### **2.1 Reference documents**

*Table 1 : Reference documents*

<b>Ref. N°</b>	<b>Document Reference</b>	<b>Title</b>	<b>Last Issue</b>
[1]	SUBSET-026	ERTMS/ETCS Class 1 System Requirements Specification	2.3.0
[2]	SUBSET-108	Interoperability-related consolidation on TSI annex A documents	1.2.0
[3]	TSI OPE Annex A	Annex A, TSI OPE, 2008/231/EC, ETCS rules and Principles	1

### **2.2 Abbreviations**

ATP	Automatic Train Protection (national systems)
EoA	End of Authority
MA	Movement of Authority
RBC	Radio Block Centre
SoM	Start-of-Mission; procedure for start-up of an ETCS train
TSR	Temporary Speed Restrictions

### **3. START OF MISSION USING STAFF RESPONSIBLE MODE**

#### **3.1 PRINCIPLES**

**3.1.1.1** For a SoM in SR the following principles shall apply:

- The preferred solution in ETCS due to safety and operational reasons is to start in FS, nevertheless this is not always possible. This chapter provides an alternative solution, granting SR mode.
- This solution will allow the driver to begin L1 and L2 missions always in the same operating mode (i.e. SR) independently of whether the train position is valid or not, whether a route is set or not, whether a radio communication session with the RBC is established or not, or whether this train is the only one in the section or not.

**3.1.1.2** Specific locations will be protected by “Stop if in SR” balisesGuideline

**3.1.1.3** The guideline consists of the following elements:

- In case the RBC cannot grant FS (e.g. in case the track is not guaranteed as free, or no route is set, or not all the elements are locked or the train has no valid position), the RBC sends an SR authorisation in response to an MA request.
- To achieve the protection of specific locations, the information of “stop if in SR” is required in this guideline. In addition, further means for protection could be needed; they are described in the Appendix.
- The driver will always need additional authorisation to depart in SR mode either by a written order or a signal aspect.
- In nominal SoM situations, the use of written orders should be avoided mainly due to time consuming and potential misinterpretations during operation.

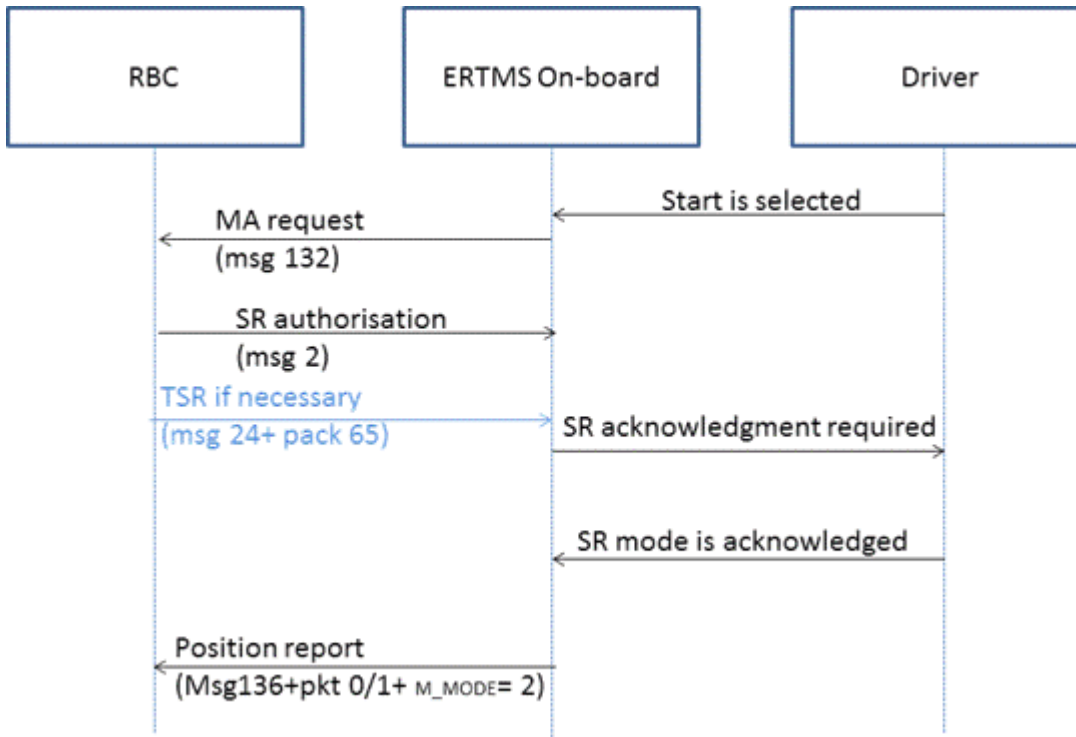
**3.1.1.4** SoM will occur without a valid position, a balise group should be in rear of and sufficiently far away from the Marker Board for positioning. This will enable the train to obtain a valid position soon enough for getting an MA.

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#### INTERACTION DIAGRAM



1. Driver selects start
2. The Onboard sends an MA request to the RBC
3. In case the RBC cannot reply with a FS MA, the RBC sends an SR authorisation in response to an MA request.
4. Onboard requires the driver to acknowledge SR mode
  - a. Lineside signal, the driver will obey the aspect of the signal and applies national operational rule
  - b. No lineside signal, driver contacts signalman and applies operational rules (see [4])
5. Driver acknowledges SR mode
6. Train sends a position report to inform about the change to SR mode

## **4. START OF MISSION USING MA WITH OS PROFILE**

### **4.1 PRINCIPLES**

- 4.1.1.1** This solution will prevent that for level 2 without signals the driver always requires a written order to depart
- 4.1.1.2** This solution allows that after start of mission a Marker Board can be passed without a written order to use “override EoA”
- 4.1.1.3** When running without lineside signals, the use of written orders will be limited to exceptional situations helping to retain the required alertness of the driver for entering and running in SR mode.

### **4.2 GUIDELINE**

- 4.2.1.1** Issue MA at start of mission wherever possible:
  - After SoM, a train with an unambiguous valid position will receive a Movement Authority if all elements between the train and the start of the route are locked for this train and this route is set from the Marker Board or signal.
  - If it is not guaranteed that the track between train and the start of the route is unoccupied, the MA will contain an OS mode profile. If can be guaranteed that the track between train and the start of the route is unoccupied, then an MA directly starting with FS can be issued.
  - To minimize the distance in OS mode when the position is valid, a block division (Marker Board) can be positioned in short distance in advance of locations where SoM is likely to occur. Ideally, the starting train has not yet reached the OS speed (national value) at the Marker Board.

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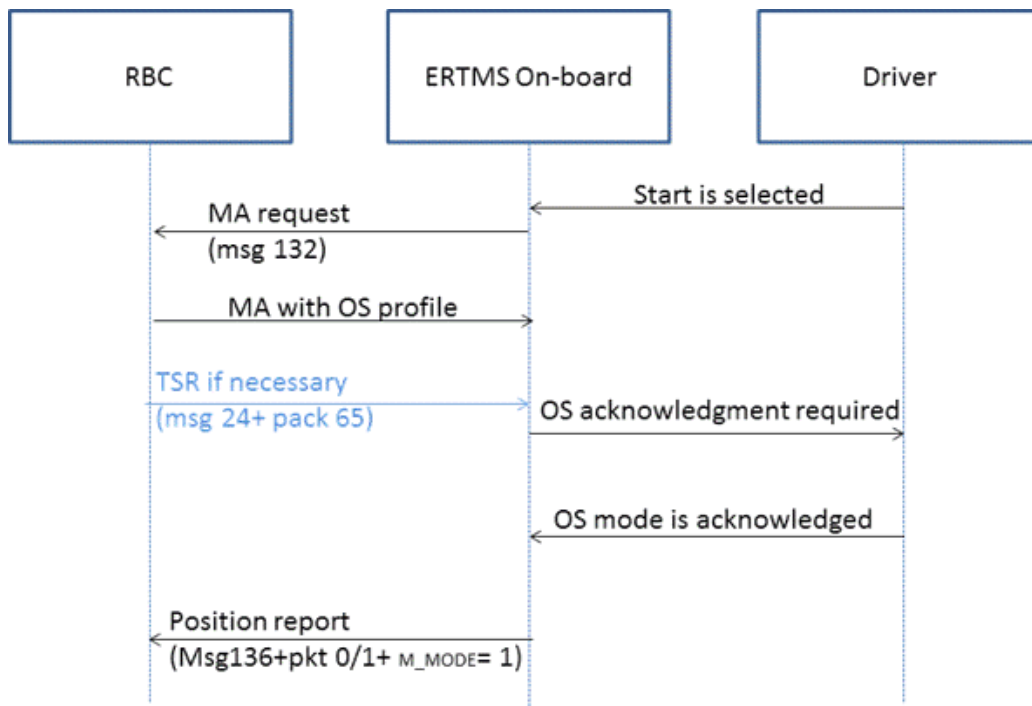
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#### 4.2.1.2 Provide SR mode for departure where no MA is issued:

- If the RBC is not able to send an MA (e.g. in case the route is not set, or not all elements are locked or the train has no valid position) at SoM, RBC will authorize SR mode (see section 3).
- If it is likely that SoM will occur without a valid position, the balise group should be in rear of and sufficiently far away from the Marker Board for positioning. This will enable the train to obtain a valid position soon enough for getting an MA.

### 4.3 INTERACTION DIAGRAM



Sequence:

1. Driver selects start
2. The Onboard sends an MA request to the RBC
3. In case the RBC cannot reply with a FS MA, the RBC sends MA in OS (in addition the following information can be sent: national values, a level transition order containing the list of supported levels and TSR's)
4. Onboard requires the driver to acknowledge OS mode
5. Driver acknowledges OS mode
6. Train sends a position report to inform about the change to OS mode

When no MA can be sent see **Error! Reference source not found..**

## APPENDICES

### A.1 TECHNICAL CONSIDERATIONS FOR START OF MISSION USING STAFF RESPONSIBLE MODE

#### A.1.1. Protection of specific location

A1.1.1 To achieve the protection of specific location in the track, the information of stop if in SR is proposed in this guideline.

#### A.1.2. Technical considerations

A1.2.1 The onboard in SR mode supervises permitted distance received from the trackside in the SR authorisation (D\_SR), received in the national values (D\_NVSTFF) or introduced by the driver. In this scenario only the protection of specific location in the line is analysed.

A1.2.2 Specific locations can be protected in several ways in SR mode:

##### **Stop if in SR information.**

A1.2.3 For onboards without communication session established, this is the only protection possible for specific locations.

A1.2.4 Balises with the packet of stop if in SR are installed in all the specific locations that have to be protected. The train which passes the balises sending this information will be tripped and stopped before the critical location. The speed at which the train can pass these balises shall be taken into account. A1.2.5 For operational reasons, these balises are recommended to be located at the signal or the Marker Board such that a trip when running in SR with authorization is prevented. When a Marker Board passed in SR according to [4] a written order is required and via the override procedure the transition to trip mode is prevented. For safety reasons, a balise providing the "Stop if in SR" information will be located such that a train in SR mode, which passes this balise will be tripped and stopped before the critical location. The location of the "Stop if in SR" balise will result from a safety and operational analysis..

A1.2.6 For a level 2 project with lineside signals, to minimize the installation of balises, they should be installed only in signals that are able to show a non-proceed aspect. If operationally preferred to avoid the need of override procedure when showing proceed aspect from the lineside signal, switchable balises must be used.

##### **List of expected balises in SR mode.**

A1.2.7 Certain locations can be protected by means of the list of balises in SR mode if there are balise groups in the proper positions. Once this information has been received, the onboard will be tripped if a balise group not included in the list is read

A1.2.8 The solution involves the installation of balises in the specific locations that have to be protected. The installation of these balises can be minimized by a safety analysis of the locations where a start of mission is likely to occur.

A1.2.9 This solution is not recommended as a standalone protection in the guideline because it does not cover the degraded SoM in Level 2 when there is no connection to the RBC. But it could be used as add-on to the Stop if in SR protection.

**Permitted distance (D\_SR) included in the message SR authorisation, which the RBC sends to the onboard.**

A1.2.10 The onboard supervises braking curves with a target speed of zero to the end of the distance included in this packet and trips if it is over passed.

A1.2.11 This solution would oblige the RBC to process the information of the route in advance to the sending of the SR authorisation.

This solution does not cover any scenario in which the location of the train is unknown. Consequently this way of protecting a specific location is not recommended because anyway the Stop if in SR information has to be used to cover all the situations.

#### **Permitted SR speed**

A1.2.12 When the distance between the balise group with stop if in SR and the danger point is insufficient to stop a train in rear of the danger location, depending on the risk of a unauthorised depart in SR, the permitted SR speed can be lowered in the approach area e.g with national value V\_NVSTFF. Note: this value is retained also if the train is restarted after No Power mode.

### **A.1.3. Protection of speed**

A1.3.1 In case there is a speed limitation with a value lower than the permitted SR speed, the RBC could send if necessary, a TSR with the specific speed value. The onboard will accept this information both in SB and SR modes

A1.3.2 When the train starts to move, the most restrictive permitted speed applies. This solution does not cover any scenario in which the location of the train is unknown.

A1.3.3 Alternatively the TSR can be sent by balise.

### **A.1.4. Loss of the communication session**

A1.4.1 Permission to run in level 2 with no communication session depends on the national rules. This recommendation only deals with scenarios in which the train is allowed to run in Level 2 without a communication session.

A1.4.2 After the on-board unsuccessful attempts to connect to RBC, the driver can enter train data (as specified in [2] and [3]) and perform the override procedure (as described in [4]). Subsequently, the train will be in level 2 mode SR with no radio connection to the RBC and with the distance allowed to run in SR as defined in the

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national values, or if not available, in the default values. To re-establish a communication session with the RBC, the onboard has to receive from the trackside a packet 42 with an order to establish such a connection session.

A1.4.3 To protect specific points in the network, the information stop if in SR shall be programmed in balises (switchable if to avoid using override at signals showing proceed).

## **A.2 UNAMBIGUOUS TRAIN POSITION.**

A2.1.1 To guarantee an unambiguous train position when the SoM is performed close to points, additional engineering methods might be necessary.