

ERTMS/ETCS

**Error CRs Compatibility Assessment
Art10 Report**

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1. INTRODUCTION

1.1 Background

- 1.1.1.1 The Commission Regulation (EU) 2016/919 enforcing the Baseline 3 Release 2 (B3R2) of the ERTMS/ETCS specifications states in its article 10 that: *“If errors that do not allow the system to provide a normal service are detected the Agency shall publish as early as possible the respective solutions to correct them as well as the evaluation of their impact in the compatibility and stability of the existing ERTMS deployment. Within one year of the date of application of this Regulation, the Agency shall send to the Commission a technical opinion on the state of the findings logged in the ERTMS Change Request Database. The Commission shall analyse the technical opinion, assisted by the committee referred to in Article 29(1) of Directive 2008/57/EC. As set out in the second paragraph of Article 7 of Directive 2008/57/EC, if these errors do not justify immediate revision, the Commission may recommend that the technical opinion be used pending the review of the TSI”*
- 1.1.1.2 This report is therefore to be incorporated in the Technical Opinion submitted to the Commission pursuant to the above mentioned article 10.

1.2 Scope and Purpose

- 1.2.1.1 The scope of this document is to report on the analysis of the compatibility between trackside and on-board within the existing baselines (i.e. B3R2, B3MR1 and B2), in the light of the problem description of all the error CRs that were logged in the ERA database at the date of 31 December 2016, that were neither packaged in any of the three existing baselines nor in the state “rejected” or “superseded”. For the error CRs whose consequences of the described problem do not allow the system to provide a normal service, trackside mitigation measures are defined for each existing baseline.
- 1.2.1.2 Since the article 10 of the Commission Regulation (EU) 2016/919 requests that solutions are sought for these errors preventing the normal service, this compatibility analysis also checks the compatibility on the one hand between a “B3R2 + Art10SP” trackside and an on-board compliant with an existing baseline (B3R2, B3MR1 or B2) and on the other hand between a “B3R2 + Art10SP” on-board and a trackside compliant with an existing baseline (B3R2, B3MR1 or B2). When relevant specific trackside mitigation measures are also defined for these on-board/trackside combinations.
- 1.2.1.2.1 Note: The term “B3R2 + Art10SP (Article 10 Service Pack)” subsystem (on-board or trackside) must be understood as a B3R2 subsystem that has implemented the solutions of all error CRs whose consequences of the described problem do not allow the system to provide a normal service.
- 1.2.1.3 It must be noted that for the errors identified in this report as potentially preventing the normal service within the B3R2 baseline, the solutions of the related CRs have been derived against this baseline only, no matter when and how they will be incorporated later in the TSI CCS annex A.
- 1.2.1.4 As long as on-board and trackside subsystems will be designed against one of the existing baselines B3R2, B3MR1 or B2, the purpose of this document is therefore to

identify/describe the potential safety hazards and/or the operational shortcomings that would prevent the normal service and to recommend mitigation measures to cope with them.

- 1.2.1.5 Note: The compatibility analysis will be referred with the term “BCA”, which had been created in the past to refer to a similar analysis and that is still used by the parties working on this topic.

2. COMPATIBILITY ASSESSMENT

2.1 Methodology

- 2.1.1.1 This BCA is carried out with individual CR assessments, each of them consisting in answering questions based on the provisions laid down in the SUBSET-104 and in the annex A.1 of the ERA CCM procedure (ERA_ERTMS_0001).
- 2.1.1.2 To perform the CR individual assessments, a strict focus on the content of the specifications has been observed. Project or product specific considerations, quantified or not, were on purpose not considered.
- 2.1.1.3 Compatibility is considered to be achieved for a particular combination of on-board and trackside when the on-board is able to run a normal service on that trackside. The expression “train is running a normal service” shall be understood as “a train not penalised because of a reduction of performance or safety” (see SUBSET-104 clause 5.1.1.5).
- 2.1.1.4 The BCA is made of the following steps:
- Check whether each error CR identifies potential compatibility issue(s) inherent to the B3R2, B3MR1 or B2 existing baselines (see questions Q4 in the annex A.1)
 - In case the assessment of an individual error CR identifies a potential compatibility issue within an existing baseline, define the mitigation measure to be applied by the trackside (see mitigations for questions Q4 in the annex A.1)
 - In case the assessment of an individual error CR identifies a potential compatibility issue within the B3R2, check whether the CR solution, when applied to only one of two B3R2 subsystems, does not create any further potential compatibility issue with the other subsystem compliant with an existing baseline B3R2, B3MR1 or B2 (see questions Q1 and Q2 in the annex A.1). If necessary, the corresponding mitigation measures are defined too (see mitigations for questions Q1 and Q2 in the annex A.1).
- 2.1.1.5 For the formulation of the questions allowing to perform the BCA, see sheet “Explanation” in the Excel file embedded in the annex A.1.

2.2 Results

- 2.2.1.1 For 18 out of the 40 analysed Change Requests, the analysis demonstrated that the concerned issue does not prevent the system from providing a normal service in any of the existing baselines, i.e. they do not need any mitigation measure.
- 2.2.1.2 For the other CRs (i.e. those which have identified issues potentially preventing the normal service by applying the clause 2.1.1.2), mitigation measures are defined for most of them.

However, the issues identified for the following 6 CRs could not be fully mitigated:

- CR1146 (Euroradio HDLC parameters): no realistic trackside mitigation measure could be defined in case low values of T_NVCONTACT are used. It must also be noted that so far no solution enabling interoperability could be derived.

- CR1267 (Acquiring the list of available networks whilst communication session is established): although no trackside mitigation measure could be derived (B3MR1 and B2 only), in practice it is expected that only on-board equipment able to handle two radio communication sessions at a time can be put on the market, i.e. it is expected that the issue is not encountered.
 - CR1282 (Subset-044 chapter on safety is inconsistent with Subset-026 regarding handling of EOLM info): the issue had been previously assessed as not preventing the system from providing a normal service, but then a hazardous scenario was identified just before the present report was due for publication, thus not allowing time to derive neither a mitigation measure nor a solution.
 - CR1300 (Follow-up to CR977): this CR only concerns a B3 feature, for which one of the issues spotted by the CR could not be mitigated. It is however expected that only ETCS on-board equipment already compliant with the solution to this CR or implementing an alternative solution preventing this issue from occurring are put on the market.
 - CR1304 (Missing Level 3 safety requirements): no assessment could be performed, because the whole safety analysis for a level 3 implementation (on-board and trackside safety integration) has to be done in a proprietary way without harmonised and apportioned safety requirements. In addition, the resolution of such CR is pending, waiting the further developments of the level 3 game changer project.
 - CR1309 (Enhancement of HDLC to handle retransmission of SABME messages): although no mitigation measure could be derived, the implementation of the CR solution in the RBC only is sufficient because in B3R2 there are no longer RBC initiated calls and in B3MR1 or B2 the numerous functional shortcomings of the RBC initiated calls prevent in practice any interoperable use of this function (see BCA B3R2 report clause 2.2.1.3 3rd bullet).
- 2.2.1.3 Important note: Depending on the functionality impacted by the CR, the analysis can be slightly different for the previous baselines e.g. in case a B3 functionality does not exist in B2 or in case a B2 functionality has been removed in B3. It must however be kept in mind that the majority of these error CRs do concern the functions which existed already in B2.
- 2.2.1.4 The detailed analysis is given in the annex A.1. Note: all the safety related issues and their corresponding mitigations referred to in this report are described as excerpts from the SUBSET-113 (ETCS Hazard Log) in annex A.2.
- 2.2.1.5 The mitigation measures recommended in the embedded file identify which set of specifications is applicable (B3R2, B3MR1 or B2) and ensure that the negative consequences resulting from the issues spotted by the CRs will not occur. However, it will be the responsibility of each individual trackside implementation of ERTMS/ETCS to check whether or not a particular mitigation is applicable, suitable, or necessary, depending on its implemented ETCS functions, engineering/operational rules, safety analysis, etc.

- 2.2.1.6 In order to ease these checks, the Agency has also launched a survey consisting of individual questionnaires to the UNISIG on-board suppliers and to the Infrastructure Managers members of CER and EIM. By crossing their respective answers to the ad-hoc questions for each of the CRs whose problem is potentially preventing the normal service, it should be possible to narrow down the number of potential issues that could be encountered taking into account the current status of the ETCS on-board and trackside implementations. See annex A.3. for further information.

ANNEXES

A.1. Compatibility Analysis



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A.2. Compatibility Analysis: safety related issues

- A.2.1.1 This Annex contains all the “hazard log entries” that are referred to in A.1: collectively they describe all the safety related issues resulting from the compatibility analysis of the specifications, and the corresponding mitigations.
- A.2.1.2 The entries here presented will be part of the version of document SUBSET-113 “ETCS Hazard Log” that is being prepared for inclusion, as Index 47, in the “List of supporting informative specifications” part of the TSI CCS Application Guide. Since this version of SUBSET-113 is not available at the time of the release of the present report, the relevant extracts - that materialize the results of the BCA for the safety related items - are transferred here.
- A.2.1.3 It is to be noted that the entries are here presented in numerical order, with the IDs they have in the SUBSET-113. The correspondence between the hazard log entries and the CRs analysed can be found in the file embedded in Annex A.1.
- A.2.1.4 It is also to be noted that in this annex only the hazard sheets are presented. For information about the background of their production and for details about the meaning of all the fields, the reader is directed to the SUBSET-113 which will be issued as informative specification via the TSI CCS Application Guide.



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A.3. Questionnaires about the current status of the ETCS implementations

A.3.1. Methodology

- A.3.1.1 For each of the 22 CRs which have identified issues potentially preventing the normal service by applying the clause 2.1.1.2 (with the exception of CRs 940, 1146, 1267, 1282, 1304), two specific sets of questions have been addressed to the on-board suppliers and to the Infrastructure Managers, respectively.
- A.3.1.2 These questions do not consist in asking whether on-board suppliers or Infrastructure Managers have already implemented the solution of the CR. Their aim is rather to identify whether, according to the current status of their implementation with regards to each of the three current referential (B2, B3MR1 and B3R2) a specific on-board behaviour, when combined with a specific trackside implementation, can lead to the operational or safety

related negative consequences identified in section 2 as preventing the normal service. The questions are therefore not standardised and are specific to each CR.

A.3.2. Preliminary results

A.3.2.1 The six on-board suppliers from UNISIG and up to thirteen Infrastructure Managers from EIM and CER have replied to the questionnaires, which were circulated in April and May 2017 (with the exception of CR1120 and 1306 which were amended and re-circulated on 18/08/17). See details in the embedded file below.



Overview_answers_ER
A_Art10_questionnaire

A.3.2.2 Even if not all the CR questionnaires have been fully replied by all the European stakeholders, it is however already possible to make some preliminary observations:

- For the CR1288 and 1300 the answers provided by the 6 on-board suppliers show that no issue can be encountered, regardless of any trackside implementation. For the CR1300, it confirms the assumption made in the clause 2.2.1.2 4th bullet.
- For the CR 1295 the answers provided by the 13 Infrastructure Managers having responded show that no issue can be encountered on their lines, regardless of any on-board implementation.
- For the CR 1263 the answers provided by the Infrastructure Managers having responded (not all the 13) show that no issue can be encountered on their lines, regardless of any on-board implementation.
- For the CR1252 the answers provided by the Infrastructure Managers having responded (not all the 13) show that no issue can be encountered on their lines considering the answers provided by the 6 on-board suppliers.
- For the CR1120 the answers provided by the Infrastructure Managers having responded (not all the 13) show that no issue can be encountered on their lines considering the answers provided by 5 out of the 6 on-board suppliers.
- For the CR1170, 1251, 1259 and 1296 the answers provided by both the 6 on-board suppliers and by the 13 Infrastructure Managers show that on some Infrastructures, the issue(s) can be encountered with some on-board suppliers.
- For the CR994, 1166, 1264 and 1293 the answers provided by both the 6 on-board suppliers and by some of the 13 Infrastructure Managers show that on some Infrastructures, the issue(s) can be encountered with some on-board suppliers.
- For the CR887, the answers provided by both the 5 out of 6 on-board suppliers and by some of the 13 Infrastructure Managers show that on some Infrastructures, the issue(s) can be encountered with some on-board suppliers.