



EURO-INTERLOCKING ERTMS/ETCS

A Report concerning ERTMS/ETCS and EURO-INTERLOCKING

Version: 1.1

Created: 14.11.00

Saved: 26.05.03 15:04

Total Number of Pages: 44

Filing Name:

ERTMS ETCS Report v1.1 (26May2003)

Document Data Sheet

Filing name ERTMS ETCS Report.doc	Document Type	Last saved 26.05.03 15:05	This version 1.1	Last saved by Broersen	
Title of Document EURO-INTERLOCKING ERTMS/ETCS			Languages		
			Original English	Translations	
Subject A report concerning on ERTMS/ETCS and EURO-INTERLOCKING			Pages 44	Figures	Tables
Author(s) Broersen			Price		
			Document	Right of Use	
Performing Body			Sponsoring Body		
Approved by Performing Body		Approved by Sponsoring Body		Availability of Document	
Name		Name		Unrestricted	
Application Used Microsoft Word 9.0	Template Name EI Report.dot	Last Printed 26.05.03 15:05	Date of Publication May 2003		
Abstract text entered in "Comments" of the document properties will appear here					

Document Control Sheet

Name	Institution	Level	Task	Date
André Broersen	Core Team	CT Member	Write	11-4-2000
Helène Jarefors	Core Team	CT Member	Review	11-28-2000
André Broersen	Core Team	CT Member	Write	12-4-2000

Appendices

Table of Contents

Document Data Sheet.....	2
Document Control Sheet.....	3
Appendices	4
Table of Contents.....	5
Abbreviations	8
References to Cited Texts.....	9
1 General	10
1.1 Scope	10
1.2 Introduction	10
2 Overview of ERTMS/ETCS Systems	11
2.1 Introduction	11
2.2 Application levels	11
2.2.1 Level 0	11
2.2.2 Level STM.....	11
2.2.3 Level 1	12
2.2.4 Level 1 with Infill.....	12
2.2.5 Level 2	13
2.2.6 Level 3	14
2.3 Trackside equipment.....	14
2.4 Class 1 Specifications	15
3 Co-operation with interlocking	16
3.1 Architecture	16
3.2 Context Diagrams	17
3.2.1 Level 0/STM.....	17
3.2.2 Level 1	17
3.2.3 Level 2	18
3.2.4 Level 3	19
4 Functional Requirements Track-elements.....	20
4.1 Introduction	20
4.2 ERTMS/ETCS Trackside.....	20
4.2.1 Introduction	20

4.2.2	Eurobalise	21
4.2.2.1	Introduction	21
4.2.2.2	Domain Knowledge	21
4.2.2.3	Requirements	22
4.2.3	Euroloop.....	25
4.2.4	Radio Infill Unit.....	25
5	Interfaces	26
5.1	ERTMS/ETCS Trackside.....	26
5.1.1	General	26
5.1.2	Graphical presentation	26
5.1.3	Physical interface	27
5.1.3.1	Interface Integrated	27
5.1.3.2	Lineside Electronic Unit.....	28
5.1.4	Information exchange	29
5.1.4.1	Movement Authority	29
5.1.4.2	Mode Profile	29
5.1.4.3	Track description	29
5.1.4.4	Linking information	Error! Bookmark not defined.
5.1.5	Operation of the Interface	30
5.1.5.1	Normal.....	30
5.1.5.2	Failure	30
5.2	Radio Block Centre	31
5.2.1	General	31
5.2.2	Graphical presentation	31
5.2.3	Physical interface	32
5.2.3.1	Model 1	32
5.2.3.2	Model 2	32
5.2.4	Information exchange	33
5.2.4.1	Transmitted Data.....	34
5.2.4.2	Level 2.....	37
5.2.4.3	Level 3.....	38

6	Task list	39
	Appendix-A	40
	Appendix-B	42
	Glossary	43
	Amendment Sheet	44

Abbreviations

ATC	Automatic Train Control
ATP	Automatic Train Protection
ATO	Automatic Train Operation
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
FFFIS	Form Fit Function Interface Specification
FIS	Functional Interface Specification
LEU	Lineside Electronic Unit
MA	Movement Authority
RBC	Radio Block Centre
RIU	Radio Infill Unit
STM	Specific Transmission Module
TBD	To be determined
TCS	Traffic Control System

References to Cited Texts

	Document Name	Version Number	Date	Comments
1	ERTMS/ETCS Functional Requirements Specification	4.29	03.12.1999	
2	ERTMS/ETCS Class 1 Specifications	E001-V1	25.04.2000	
3	FFFS, Interface 'C', Eurobalise Transmission Sub-System	5.0.0	20.05.1998	
4	ERRI A201/DT 356 Functional interface: Interlocking – ERTMS/ETCS		12.1997	UIC I/92/C7/005
5	Context Diagram EURO-INTERLOCKING	0.5	27.11.2000	Option A
6	EURO-INTERLOCKING – Traffic Control System Functional Interface Specification	0.1	06.11.2000	Draft
7				
8				
9				
10				
11				
12				
13				
14				

1 General

1.1 Scope

This report presents an overview of ERTMS/ETCS systems and the co-operation with EURO-INTERLOCKING. It concerns also on the data transmission between Interlocking and ERTMS/ETCS systems. This includes the models of interfacing ERTMS/ETCS systems with future interlockings based on the EURO-INTERLOCKING standards.

1.2 Introduction

Chapter 2 specifies the different application levels of ERTMS/ETCS. Each application level is described and presented in a figure. Chapter 3 concerns on the co-operation between interlocking and ERTMS/ETCS systems. The track-element: ERTMS/ETCS Trackside is defined in chapter 4. All the states and transitions for ERTMS/ETCS Trackside are described here. The possible interfaces are described in chapter 5 and the last chapter contains a list of recommended possible tasks for project 3 and 4 for EURO-INTERLOCKING.

2 Overview of ERTMS/ETCS Systems

2.1 Introduction

Train control is an important part of any railway operations management system. In the past a number of different Automatic Train Control (ATC) or Automatic Train Operation (ATO) systems have evolved in different countries at different times. Only a few of these systems are used in more than one country, and even in those cases there have been differences in detailed development which have resulted in incompatible and not interoperable versions.

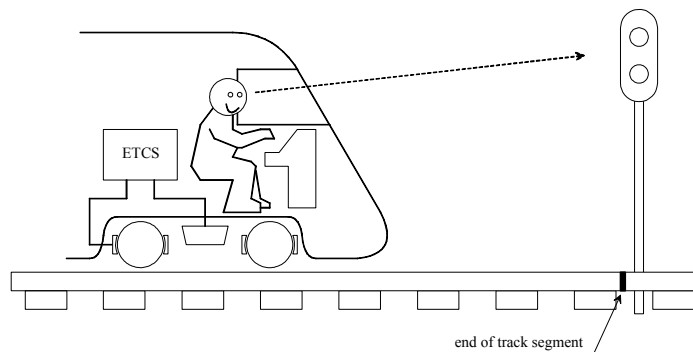
Many railways anticipate a significant increase in density of train traffic and rethink their infrastructure strategy, to accommodate high levels of traffic, in which ATC systems play an important part. Many railways would like to introduce standardised systems to reduce system costs. In order to establish international standardisation of ATC systems, the ERTMS/ETCS project was established. the following part gives an overview of the European Rail Traffic Management System/European Train Control System (ERTMS/ETCS).

2.2 Application levels

This chapter gives a basic description of the different application levels of ERTMS/ETCS systems.

2.2.1 Level 0

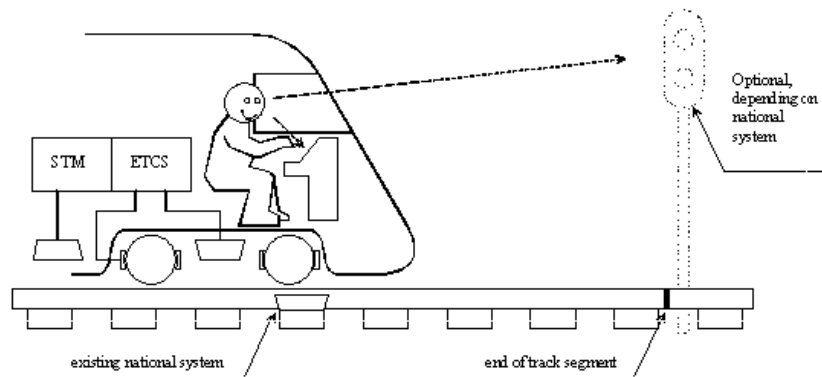
Train equipped with ERTMS/ETCS operating on a line without ERTMS/ETCS or national system or with the ERTMS/ETCS systems in commissioning.



Level 0 uses no ERTMS/ETCS track-train transmission except Eurobalises to announce/command level transitions. Therefore Eurobalises still have to be read by the train. No balise data except certain special commands are interpreted.

2.2.2 Level STM

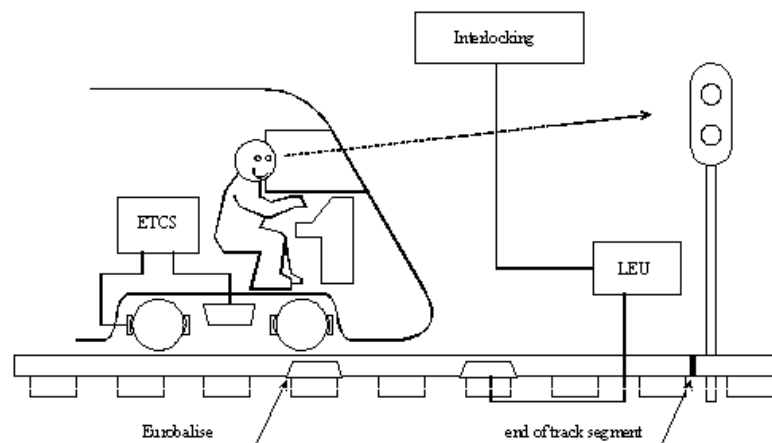
Train equipped with ERTMS/ETCS operating on a line equipped with a national system to which it interfaces by use of an STM.



Level STM uses no ERTMS/ETCS track-train transmission except to announce/command level transitions and specific commands related to balise transmission. Eurobalises therefore still have to be read. No data except level transition commands and certain special commands are interpreted.

2.2.3 Level 1

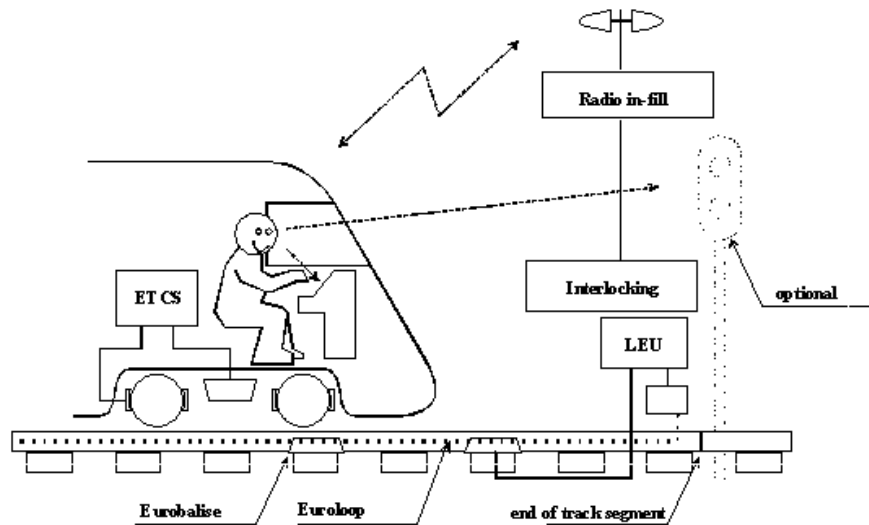
Train equipped with ERTMS/ETCS operating on a line equipped with Eurobalises and optionally Euroloop.



Level 1 is based on Eurobalises as spot transmission devices.

2.2.4 Level 1 with Infill

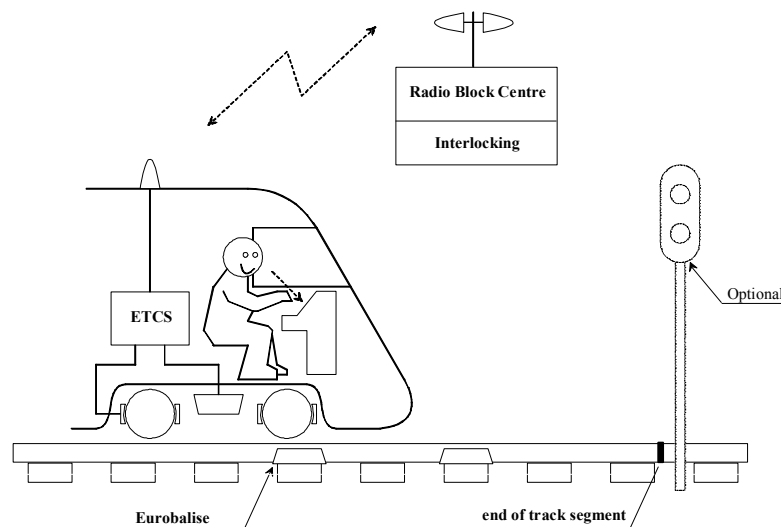
Train equipped with ERTMS/ETCS operating on a line equipped with Eurobalises and optionally Euroloop or Radio infill.



Level 1 with infill is based on Eurobalises as spot transmission devices and Euroloop or radio in-fill to improve the safety of a level 1 system as they allow the operation without release speed.

2.2.5 Level 2

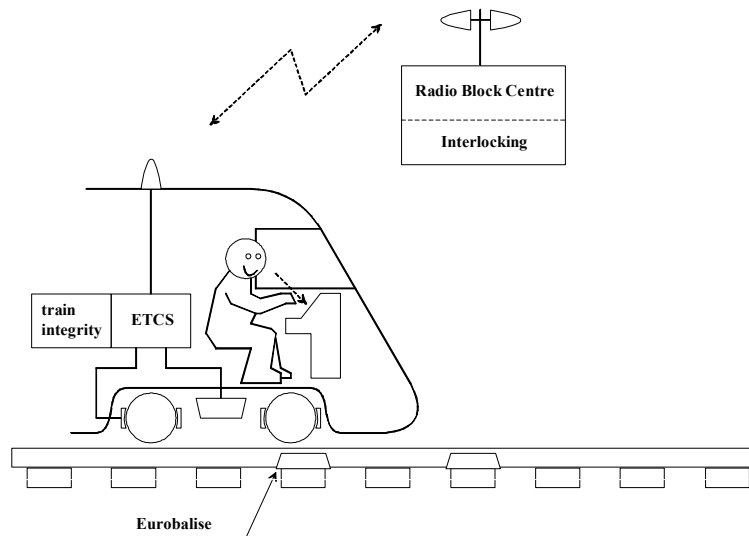
Train equipped with ERTMS/ETCS operating on a line controlled by a Radio Block Center and equipped with Eurobalises and Euroradio with train location and train integrity proving performed by the trackside equipment (interlocking, trackcircuits etc.).



Level 2 is based on Euroradio for track to train communication and on Eurobalises as spot transmission devices mainly for location referencing.

2.2.6 Level 3

Train equipped with ERTMS/ETCS operating on a line controlled by a Radio Block Center and equipped with Eurobalises and Euroradio with train location and train integrity supervision based on information received from the train.



Level 3 is based on Euroradio for track to train communication and on Eurobalises as spot transmission devices mainly for location referencing.

2.3 Trackside equipment

The relation between the trackside equipment and the application levels are shown in the table below.

ETCS Level	Eurobalise	Euroloop	Radio Infill Unit	RBC
Level 0				
Level STM				
Level 1	X	X ¹⁾		
Level 1 infill	X	X ²⁾	X	
Level 2	X ³⁾			X
Level 3	X ³⁾			X

1) To Give additional information,

2) Can also be used as Infill,

3) Location referencing.

The application level 1, with or without infill, uses the switchable Eurobalises. In the application level 2 and 3 non-switchable (fix-coded) Eurobalises are used.

2.4 Class 1 Specifications

In the beginning of 2000 the results of the ERTMS/ETCS project has been presented. The **ERTMS/ETCS Class 1 Specifications**, a set of technical documents, concerns mainly on the following aspects:

- Functional Requirements Specifications (FRS), the operational requirements for ERTMS/ETCS.
- System Requirements Specifications (SRS), a specification of ERTMS/ETCS from a technical point of view, based on the FRS.
- Functional Interface Specifications (FIS).
- Form Fit Functional Interface Specifications (FFFIS).
- Euroradio, the functional requirements specification and the system requirements specification for a digital radio standard for the European railways.

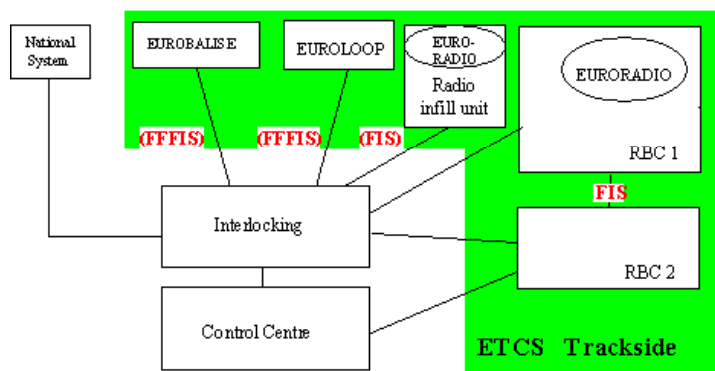
A full list of all documents of the Class 1 Specifications is presented in Appendix-A at the end of this report.

3 Co-operation with interlocking

This chapter defines the co-operation between ERTMS/ETCS equipment and an interlocking.

3.1 Architecture

The architecture related to the trackside ERTMS /ETCS equipment is shown in figure below.



From the architecture we can see the following elements:

- Eurobalise
- Euroloop
- Radio Infill Unit
- Radio Block Centre (RBC)

The co-operation of the elements is mainly with the interlocking, only the RBC operates also with the traffic control system. This results in that the position of the RBC is different from the other elements.

ERTMS/ETCS trackside equipment is the Eurobalise, Euroloop and Radio Infill Unit (RIU). Euroloop and RIU are optionally used for providing infill.

The communication with the ERTMS/ETCS trackside equipment will be bi-directional, but generally the information/data comes from the interlocking (Route information or Locking information).

The communication between the RBC and the interlocking and the Control Centre will be bi-directional. The RBC receives Information/data but also transmit data.

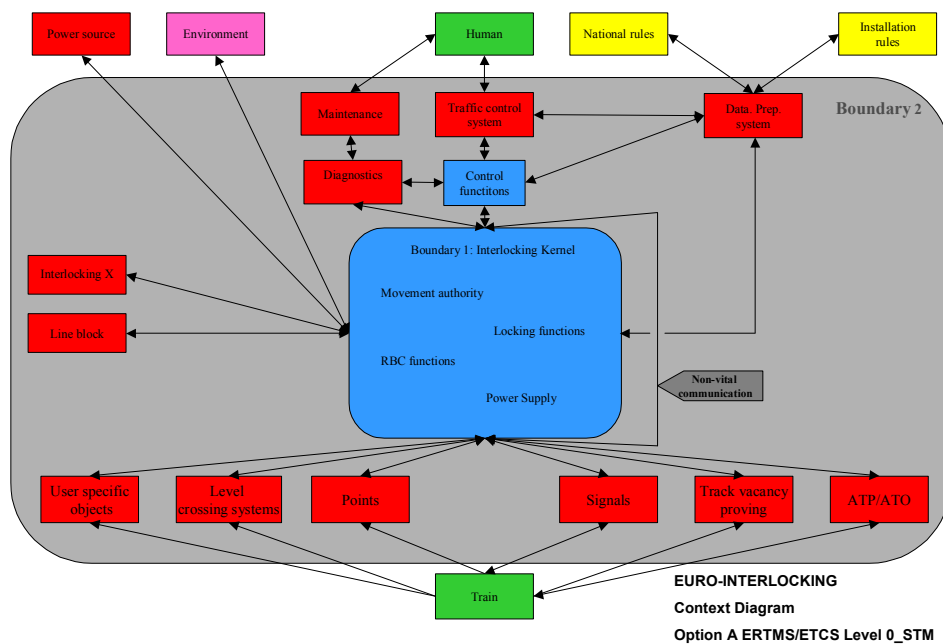
3.2 Context Diagrams

To understand the relationship of the trackside elements and the operation with an interlocking, different context diagrams are made for each application level.

These context diagrams are based on the context diagram presented in the domain knowledge of EURO-INTERLOCKING standards.

3.2.1 Level 0/STM

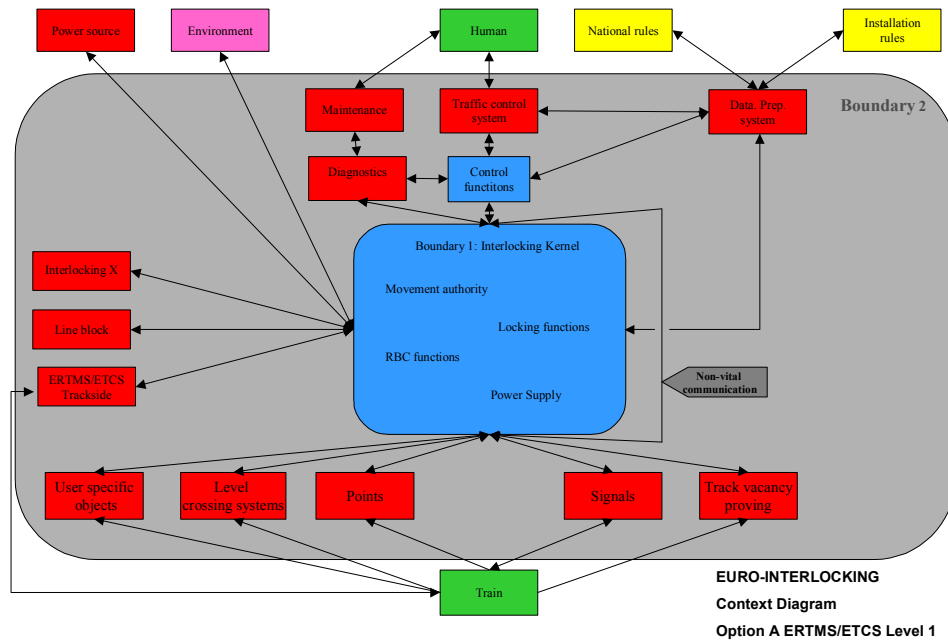
In this ERTMS/ETCS level 0/STM we have no ERTMS/ETCS trackside equipment and Radio. In the interlocking kernel (boundary 1) the RBC functionality will not be used. The interlocking kernel checks the conditions for movement authority and passes them to the Signals and ATP/ATO-system.



3.2.2 Level 1

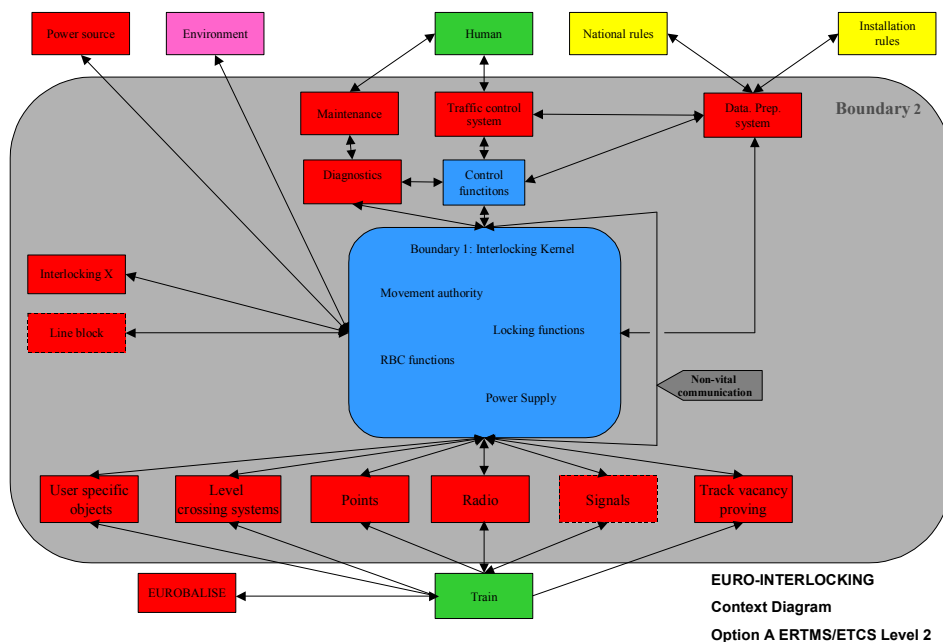
For level 1, ERTMS/ETCS trackside is available. If a Radio infill unit is used, then it is also covered inside the trackside equipment.

ATP/ATO will not be used for this level and not for levels 2 and 3 either. And Radio is not available. The data will be transmitted via balises.



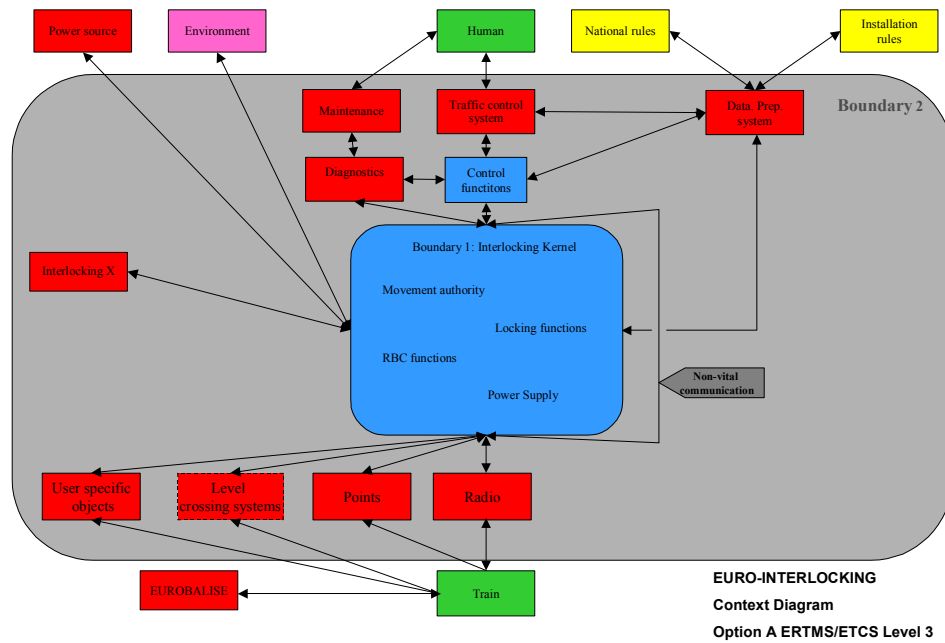
3.2.3 Level 2

The interlocking kernel contains RBC functionality for Level 2. The conditions for movement authority will be checked by the RBC functionality and the interlocking kernel passes the MA thru Radio to the train. Optional, dependent on the situation outside, signals can be used. If the lineblock has been replaced by an ERTMS/ETCS system, then this element will also not be used. The Eurobalise will be used as reference for train location.



3.2.4 Level 3

Level 3 looks almost the same as Level 2 with the difference that train vacancy proving and signals are not available. Train location is based on information received from the train (via radio).



4 Functional Requirements Track-elements

4.1 Introduction

Track elements are trackside equipment being monitored or directly controlled by the interlocking. The track-element ERTMS/ETCS Trackside is described in the chapter below:

This element has a standard set of status values, which can convey to an interlocking, and a standard set of requests, which can be received from an interlocking.

The status values coming from the track element are normally called physical status values.

Besides giving status values to and receiving requests from an interlocking, the track element can have status values, which are not part of the physical equipment. These values are functions within the interlocking specific for each type of track element. Status values for a track element, which is exclusively done within the interlocking are called logical status values.

Override of the physical state value of a track element by artificially setting will not affect the operation of the track element. The physical state value of the track element remains.

4.2 ERTMS/ETCS Trackside

4.2.1 Introduction

ERTMS/ETCS Trackside is a track-element which covers the following trackside equipment of ERTMS/ETCS: Eurobalise, Euroloop and the Radio Infill Unit.

Common for these trackside equipments are:

- They provide movement authority to the trains,
- They provide instructions to the drivers of the trains,
- They provide speed profile information to the train,
- They provide gradient information to the train,
- They provide temporary speed restrictions and can be used as an in-fill device (only Euroloop and RIU).

4.2.2 Eurobalise

4.2.2.1 Introduction

There are two types of Eurobalises:

- The non-switchable (fix-coded), not connected to the Interlocking.
- The switchable, connected to the Interlocking.

The physical and logical state values, described in the domain knowledge, are only for the switchable Eurobalise.

4.2.2.2 Domain Knowledge

Physical

A Eurobalise has the physical status values: activated, not-activated and faulty. If there is a failure in the technical system of the Eurobalise the physical status goes automatically to faulty. A Eurobalise which is not-activated or faulty will not affect the route setting, it only results in that no information/instruction will be provided to the train.

A not-activated or faulty Eurobalise will result in restricted movement authority (low speed), for the area covered by the Eurobalise. The physical value of the Eurobalise is conveyed to the interlocking at regular intervals. It is not possible for an Eurobalise to be activated and faulty at the same time.

Logical

For a Eurobalise there will be no logical state values available.

The status values of the Eurobalise are not used to clear a signal. The Eurobalise will not be in the conditions for a signal or other trackside equipment.

4.2.2.3 Requirements

ERTMS/ETCS Trackside shall have the following states:

A) Activated.

B) Faulty.

Activated and faulty shall not be active (true) at the same time. The state faulty shall only be used when the ERTMS/ETCS Trackside cannot be activated.

4.2.2.3.1 Possible States

State	Activated	Faulty
A001	FALSE	FALSE
A002	THRU	FALSE
A003	FALSE	THRU
A004	THRU	THRU

4.2.2.3.2 Allowable States

State	Activated	Faulty
A001	FALSE	FALSE
A002	TRUE	FALSE
A003	FALSE	TRUE

4.2.2.3.3 Allowable transitions

From / To	A001	A002	A003
A001	TRUE	TRUE	TRUE
A002	TRUE	TRUE	TRUE
A003	TRUE	FALSE	TRUE

4.2.2.3.4 Individual commands

The IL-K shall be able to receive following request from an outside systems:

- ACTIVATE ERTMS/ETCS Trackside,
- NOT-ACTIVATE ERTMS/ETCS Trackside.

4.2.2.3.5 Monitoring of states

4.2.2.3.6 Conditions for allowing transitions

Remaining in current state

Transition	Conditions
A001 to A001	If an ERTMS/ETCS Trackside's registrates no change in physical state then the IL-K shall keep the ERTMS/ETCS Trackside in its current state.
A002 to A002	Ditto
A003 to A003	Ditto

Setting an ERTMS/ETCS Trackside to activated

Transitions	Conditions
A001 to A002	If an ERTMS/ETCS Trackside gives the status value activated then the IL-K shall set the ERTMS/ETCS Trackside to activated.

Setting an ERTMS/ETCS Trackside to not activated

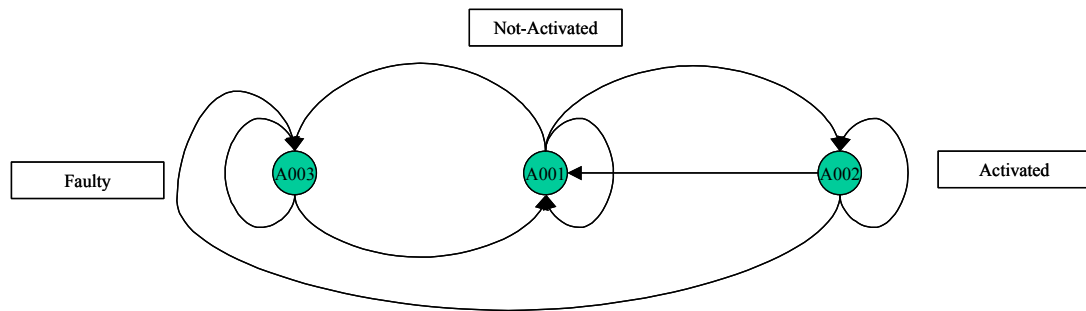
Transitions	Conditions
A002 to A001	If an ERTMS/ETCS Trackside gives the status value not activated then the IL-K shall set the ERTMS/ETCS Trackside to not activated.
A003 to A001	Ditto

Setting an ERTMS/ETCS Trackside to faulty

Transitions	Conditions
A001 to A003	If the ERTMS/ETCS Trackside gives the status value faulty then the IL-K shall set the ERTMS/ETCS Trackside to faulty.
A002 to A003	Ditto

4.2.2.3.7 State Diagram

Allowable transitions for ERTMS/ETCS Trackside



4.2.3 Euroloop

TDB. It is assumed that the domain description for Eurobalise also will apply here.

4.2.4 Radio Infill Unit

TDB. It is assumed that the domain description for Eurobalise also will apply here.

5 Interfaces

This chapter describes the functional interfaces for ERTMS/ETCS. It concerns generally on the data transmission between interlocking and ERTMS/ETCS systems. The first part defines it for ERTMS/ETCS Trackside and the second part for the Radio Block Centre.

5.1 ERTMS/ETCS Trackside

5.1.1 General

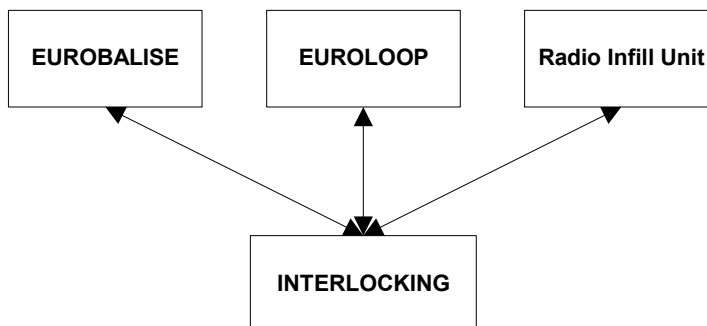
The interface between Interlocking and ERTMS/ETCS trackside equipment will only be used for application level 1 either without or with infill function.

For application level 1 without infill, the trackside equipment is the Eurobalise.

For application level 1 with infill, trackside equipment consists of the Eurobalise and either a Euroloop or a Radio Infill Unit used for the infill function. The interface for Euroloop and Radio Infill Unit transmit the same information as given to the Eurobalise.

5.1.2 Graphical presentation

The figure below gives a graphical presentation of the interface for application level 1.



5.1.3 Physical interface

The physical interface between ERTMS/ETCS trackside and the interlocking is bi-directional. Generally the data will be transmitted from the interlocking.

The interface can be integrated in the interlocking or it is a Lineside Electronic Unit (LEU) connected to the interlocking.

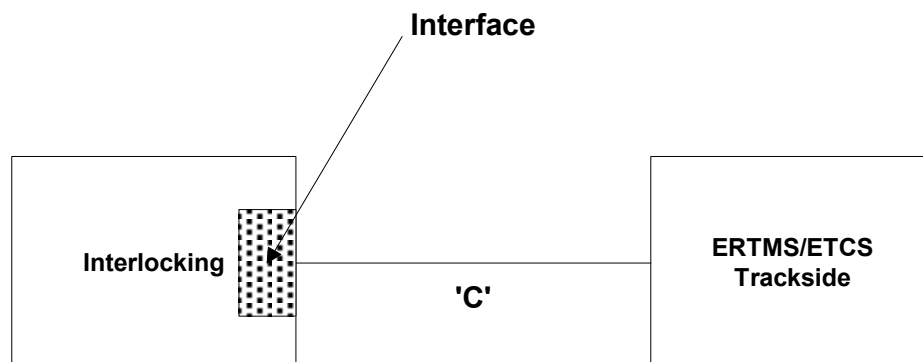
5.1.3.1 Interface Integrated

The trackside equipment is connected to the Interlocking, a Lineside Electronic Unit will not be used.

The functionality of the LEU is integrated in the Interlocking. This interface is already defined in the following existing specifications:

- Form Fit Function Specifications, Interface 'C', Eurobalise Transmission Sub-System, Issue 5, Date 20-5-1998.
- Radio In-Fill FIS with LEU/interlocking, Ref. SUBSET-049, Version 2.0.0, Date 30-03-2000.
- FFFIS for Eurobalise, Ref. SUBSET-036, Version 2.0.0, Date 30-03-2000.
- FFFIS 'CI' Euroloop, Ref. SUBSET-045, Version 2.0.0, Date 30-03-2000.
- ERTMS/ETCS SSRS, Part 3, Trackside Subsystem Requirements Specification, Ref. SUBSET-032, Version 2.0.0, Date 30-03-2000.

In the figure below there is a model of this situation.



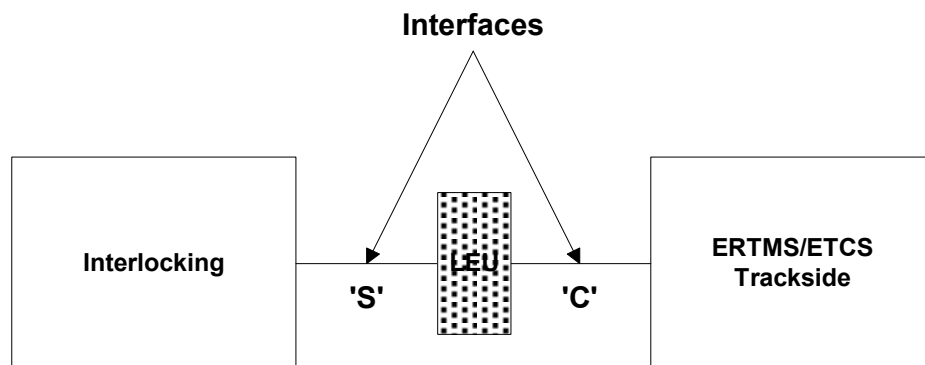
5.1.3.2 Lineside Electronic Unit

The second alternative is a Lineside Electronic Unit (LEU) used as an interface between ERTMS/ETCS Trackside equipment and the interlocking.

The interface between LEU and Trackside equipment is defined in the standards mentioned in 5.1.3.1.

The interface between LEU and the Interlocking will be mainly based on transmitting the already available data to the LEU. This depends on the signalling of the railways.

The LEU can be fitted next to the Interlocking (centralised) or fitted closed to the ERTMS/ETCS Trackside (decentralised). The figure below shows a model of this situation.



5.1.4 Information exchange

Information transmitted from the interlocking to the ERTMS/ETCS Trackside:

- Movement Authority information,
- Movement Authority Mode Profile (if provided),
- Track description,

5.1.4.1 Movement Authority

The information will be derived from the signal aspect. The data from the interlocking that goes to the Signal will also go to the interface on which the ERTMS/ETCS Trackside equipment is connected.

5.1.4.2 Mode Profile

If it is provided the information about the operation of the movement authority will be transmitted:

- On Sight mode,
- Shunting mode.

5.1.4.3 Track description

Track description includes the following information:

- Static Speed Profile information,
- Gradient information,
- Additional information dependent on the rules of the railways.

5.1.5 Operation of the Interface

The interface can operate under two different modes:

- Normal mode,
- Failure mode.

Normal mode means there are no failures in the communication, there are no problems in the interlocking and there are no problems in the ERTMS/ETCS trackside equipment.

Failure mode means that there could be a failure in the communication or in the interlocking, or that the ERTMS/ETCS trackside equipment has some technical failures.

5.1.5.1 Normal Mode

In normal mode operation of the interface, data from the interlocking will be transmitted to the trackside equipment. After the interlocking has locked the elements as requested by the Traffic Control System and all the conditions are fulfilled, the movement authority is given to the ERTMS/ETCS trackside equipment.

5.1.5.2 Failure Mode

In case of a failure, caused by the interlocking, the trackside equipment or by the communication, then the movement authority will not be given to the trackside equipment.

5.2 Radio Block Centre

5.2.1 General

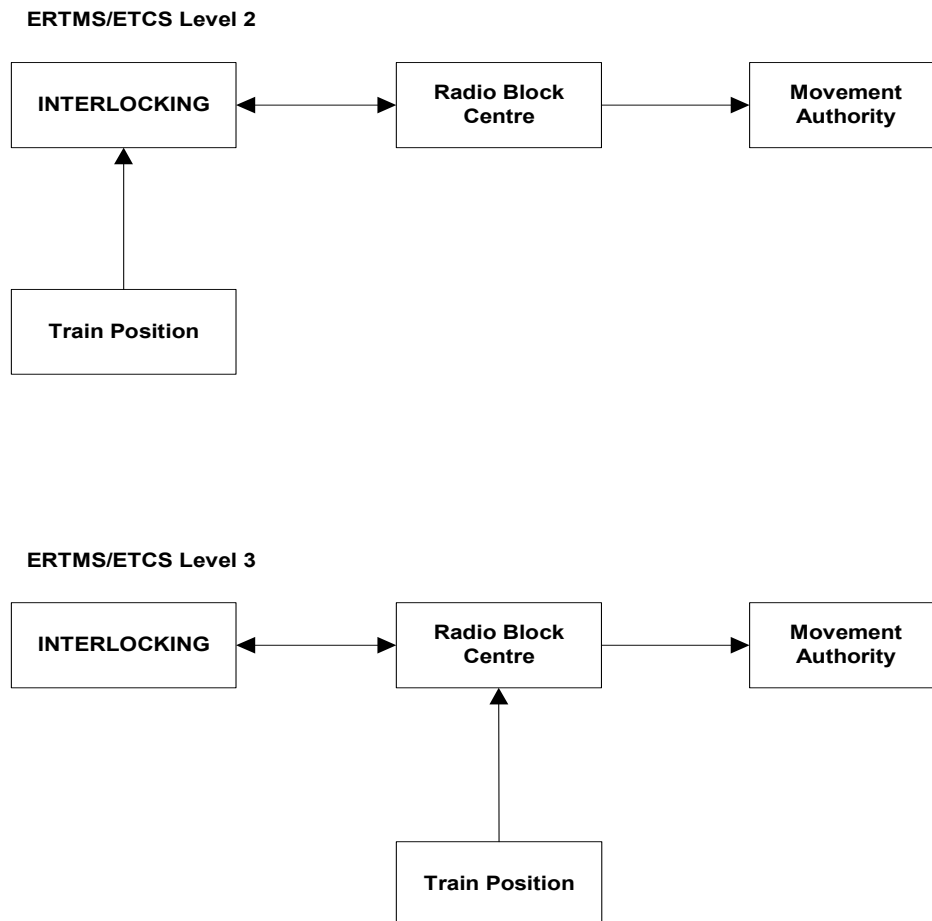
The interface between Interlocking and Radio Block Centre (RBC) will only be used for application level 2 and level 3.

Dependent on the application level, a number of functions are performed by the interlocking or by the RBC.

For application level 2 the interlocking performs most of the route related functions. In application level 3 the RBC performs the route monitoring (route proving) and the permission to release the route related elements.

5.2.2 Graphical presentation

For application level 2 and level 3 the relationship between the interlocking and the RBC is given in the figures below:



5.2.3 Physical interface

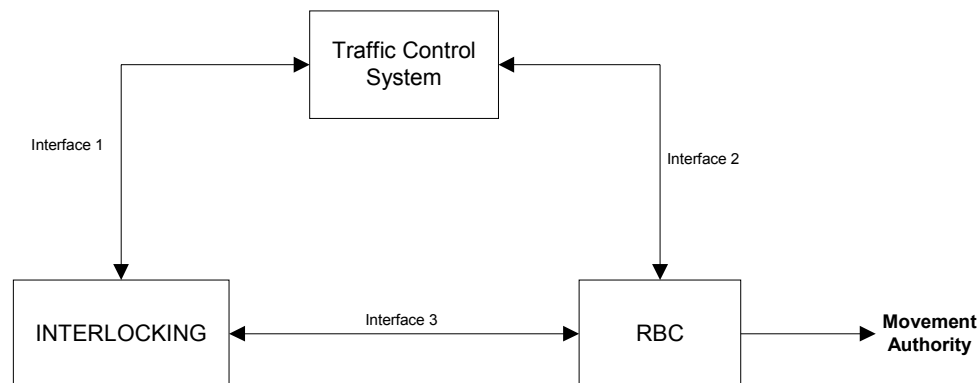
Two models are possible for the interface between the RBC and the interlocking: a separate RBC connected to an interlocking or integrated within the interlocking. The following modules describe also the co-operation with a Traffic Control system.

5.2.3.1 Model 1

This model contains three physical Interfaces: one interface between TCS and the interlocking (interface 1), described in the EURO-INTERLOCKING – Traffic Control System Functional Interface Specifications, one interface between TCS and the RBC (interface 2) and one interface between the interlocking and the RBC.

These interfaces are bi-directional. Generally there will be an extensive data exchange between interlocking and the RBC.

The model is described in below:

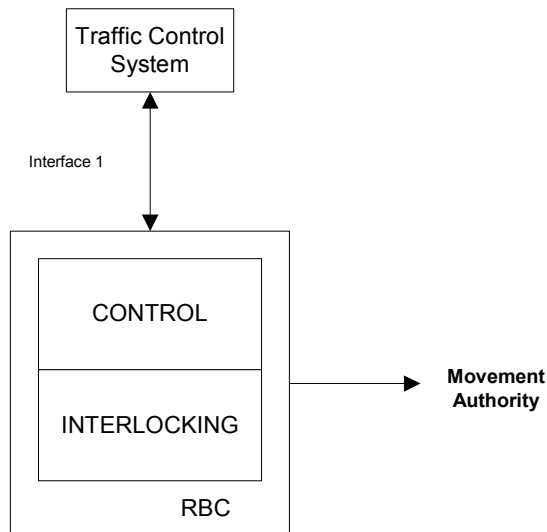


5.2.3.2 Model 2

In this model the RBC is integrated in the interlocking. The functions of the RBC are inside the interlocking, described in subset-032 of the ERTMS/ETCS Class 1 Specifications.

The model contains one physical interface between the TCS and interlocking (interface 1), but there is a logical interface within the interlocking.

The model is described below:



5.2.4 Information exchange

The information exchange defines the information, which shall be transmitted between the interlocking and the RBC and between the TCS and the RBC for module 1, described in chapter 5.2.3.

The information can be transmitted from:

- the interlocking to the RBC,
- the RBC to the interlocking
- the TCS to the RBC,
- the RBC to the TCS.

The information that is transmitted depends on the application level of the RBC. The information exchange for both application levels are described below.

5.2.4.1 Transmitted Data

This chapter describes the variables, which are used in the data transmission for level 2 and level 3.

Route information

Route information includes:

- Locking information of the route, all the used track-elements are locked.
- Type of the route (normal, shunting or emergency).
- Entry point of the route.
- Exit point of the route.
- Via points of the route, in case several routes are possible.
- State information of the route, new or used route.
- Route direction.
- Route cancellation.
- Overlap information (if provided).
- Time aspects for the route (if provided).

Occupation Data

Occupation data includes:

- State information of occupation of the elements used in the route.

Emergency Data

Emergency data includes:

- Route cancellation.
- Emergency stop.

Border Data

Emergency data includes:

- Maximum speed at the border to an area with no ERTMS/ETCS.
- Specific border information.

Route release

Route release includes:

- Permission to release or cancel the route

Request of train characteristics

Request of train characteristics includes:

- Identification of the train.
- Request of train characteristics.
- Type of the route (normal, shunting or emergency).
- Route direction.

Request to issue movement authority

Request to issue movement authority includes:

- Identification of the train.
- Type of the route (normal, shunting or emergency).
- Permission to issue movement authority
- Route direction.

Train characteristics

Train characteristics includes:

- Identification of the train.
- Actual train position.
- Train length.
- Maximum axle load.
- Train category.
- Route direction.

Train position

Train position includes:

- Identification of the train.
- Actual train position.

5.2.4.2 Level 2

The following data is transmitted from the interlocking to the RBC:

- Route information,
- Emergency data,
- Border data.

For level 2 there will be no data transmitted from the RBC to the interlocking.

The following data is transmitted from the TCS to the RBC:

- Request of train characteristics,
- Request to issue movement authority,

The following data is transmitted from the RBC to the TCS:

- Train characteristics,
- Train position,

5.2.4.3 Level 3

The following data is transmitted from the interlocking to the RBC:

- Route information,
- Emergency data,
- Border data.

For level 3 the following data will be transmitted from the RBC to the interlocking:

- Route release,
- Train position.

The following data is transmitted from the TCS to the RBC:

- Request of train characteristics,
- Request to issue movement authority,

The following data is transmitted from the RBC to the TCS:

- Train characteristics,
- Train position.

6 Task list

A list of tasks is presented in Appendix-B at the end of this report.

Appendix-A

Document Name	Reference Number	Version Number	Normative/ Informative
ERTMS/ETCS Functional Requirements Specification	---	4.29	Normative
ERTMS/ETCS Functional Statements	99E5362-	2.00	Normative
ERTMS/ETCS System Requirements Specification	SUBSET-026	2.0.0	Normative
Clarification and amendment specification	SUBSET-055	2.0.0	Normative
ERTMS/ETCS SSRS Part 1: System Macro functions overview	SUBSET-030	2.0.0	Informative
ERTMS/ETCS SSRS Part 2: On board Sub-system Requirements Specification	SUBSET-031	2.0.0	Informative
ERTMS/ETCS SSRS Part 3: Trackside Sub-system Requirements Specification	SUBSET-032	2.0.0	Informative
FFFIS for Eurobalise	SUBSET-036	2.0.0	Normative
Description of the Euroloop Sub-system	SUBSET-050	2.0.0	Informative
FFFS for Euroloop subsystem	SUBSET-043	2.0.0	Normative
FFFIS 'A _L ' Euroloop Subsystem	SUBSET-044	2.0.0	Normative
FFFIS 'C _L ' Euroloop Subsystem	SUBSET-045	2.0.0	Normative
Euroradio FIS	SUBSET-037	2.0.0	Normative
Transmission of the MSISDN number to the application	037_0022a	29/03/2000	Informative
Version Upgrade	037_0023a	29/03/2000	Informative
Euroradio FFFIS Class 1 requirements	SUBSET-052	2.0.0	Normative
Radio In-Fill FFFS	SUBSET-046	2.0.0	Normative
FIS for the Man-Machine Interface	SUBSET-033	2.0.0	Normative
FIS for the Train Interface	SUBSET-034	2.0.0	Normative
Trackside-Trainborne FIS for Radio In-Fill	SUBSET-047	2.0.0	Normative
Trainborne FFFIS for Radio In-fill	SUBSET-048	2.0.0	Normative
Radio In-Fill FIS with LEU/interlocking	SUBSET-049	2.0.0	Normative

Specific Transmission Module FFFIS	SUBSET-035	2.0.0	Normative
STM FFFIS Safe Time Layer	SUBSET-056	2.0.0	Normative
STM FFFIS Safe Link Layer	SUBSET-057	2.0.0	Normative
FFFIS STM Application Layer Supervision Connection	SUBSET-058	2.0.0	Normative
Performance Requirements for STMs	SUBSET-059	2.0.0	Normative
Key Management FIS	SUBSET-038	2.0.0	Normative
FIS Key Management Second Phase	SUBSET-051	2.0.0	Informative
Key management migration	SUBSET-060	1.1.1	Informative
FIS for RBC/RBC Handover	SUBSET-039	2.0.0	Normative
Dimensioning and Engineering rules	SUBSET-040	2.0.0	Normative
Performance Requirements for Interoperability	SUBSET-041	2.0.0	Normative
FFFIS Juridical Recorder Downloading Tool	SUBSET-027	2.0.0	Normative
Assignment of values to ETCS variables	SUBSET-054	2.0.0	Normative
Glossary of Terms and Abbreviations	SUBSET-023	2.0.0	Normative
Radio Transmission FFFIS for EURORADIO	A11 T6001 3	3	Normative
ERTMS Driver Machine Interface Part I Ergonomic arrangement of ERTMS/ETCS Information	V21.doc	12/04/2000	Informative
ERTMS Driver Machine Interface Part II EIRENE information shown on an integrated ERTMS/EIRENE DMI	V05.doc	27/03/2000	Informative
ERTMS Driver Machine Interface Part III Data entry Procedure	V11.doc	12/04/2000	Informative
ERTMS Driver Machine Interface Part IV Symbols	V06.doc	12/01/2000	Informative
ERTMS Driver Machine Interface Part V Audible information	V08ns.doc	27/03/2000	Informative
ERTMS Driver Machine Interface Part VI Specific Transmission Modules	V04.doc	27/03/2000	Informative
RAM requirements	02S1266-	6	Informative
Environmental conditions	97S0665-	5	Informative

Appendix-B

Task	Description	Comment
1	Research on ERTMS/ETCS. Results of pilot projects.	
2	Further development of data transmission between interlocking and RBC.	
3	Further development of data transmission between TCS and RBC.	
4	Create FFFIS between ERTMS/ETCS equipment and interlocking.	
5	Establish RBC requirements onto interlocking.	
6		
7		
8		
9		
10		
11		
12		
13		
14		

Glossary

Amendment Sheet

No.	Version	Section Amended	By Whom	Amendment	Date