

Railway Group Standard

GERT8402

Issue Two

Date June 2016

ERTMS/ETCS DMI National Requirements

Synopsis

This document sets out requirements for ERTMS/ETCS Driver Machine Interface (DMI) equipment if a speed display in miles per hour is required and / or an alphanumeric train running number entry is required.

This document contains one or more pages which contain colour.

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ERTMS/ETCS DMI National Requirements

Issue record

Issue	Date	Comments
One	March 2012	Supports national deployment of the European Rail Traffic Management System (ERTMS).
Two	June 2016	Replaces issue one. Section 2.1 updated to include requirements related to a new method of controlling the switching of units used for the display of speed information on the ERTMS/ETCS DMI. Rationale included for all requirements.

Revisions have not been marked by a vertical black line in this issue because the document has been revised throughout

Superseded documents

The following Railway Group Standard is superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GERT8402 issue one ERTMS/ETCS DMI National Requirements	All	03 September 2016
GEGN8602 issue one Guidance on ERTMS/ETCS DMI National Requirements	All	04 June 2016

GERT8402 issue one ERTMS/ETCS DMI National Requirements, ceases to be in force as of 03 September 2016.

Supply

The authoritative version of this document is available at www.rssb.co.uk/railway-group-standards.
Enquiries on this document can be forwarded to enquirydesk@rssb.co.uk

ERTMS/ETCS DMI National Requirements

Railway Group Standard

GERT8402

Issue Two

Date June 2016

Contents

Section	Description	Page
Part 1	Purpose and Introduction	4
1.1	Purpose	4
1.2	Introduction	4
1.3	Approval and authorisation of this document	5
Part 2	Speed Dial Information	6
2.1	Determination of display of mph or km/h	6
2.2	Speed dial design	13
2.3	Current train speed digital	24
2.4	Release speed	24
Part 3	Guidance on Data Entry Windows	26
3.1	Train running number type selection window	26
3.2	Selection of type of train running number	26
3.3	Numeric train running number entry	29
3.4	Alphanumeric train running number entry	31
3.5	Display of train running number in the data view window	34
3.6	Conversion from alphanumeric to numeric train running number	34
3.7	Registration failure	36
Part 4	Application of this document	37
4.1	Application - infrastructure managers	37
4.2	Application - railway undertakings	37
4.3	General compliance date for railway undertakings	37
4.4	Exceptions to general compliance date	37
4.5	Deviations	37
4.6	Health and safety responsibilities	37
Tables		
Table 1	Level NTC default speed display units	8
Table 2	National train control systems currently defined for use in the UK	9
Table 3	Active function	10
Table 4	Accepted information depending on the mode	11
Table 5	What happens to stored Train Speed Units Override information when entering a given mode	12
Figures		
Figure 1	Area for the speed dial	13
Figure 2	Speed dial for maximum speed display of 248 mph	17
Figure 3	Speed dial for maximum speed display of 155 mph	19
Figure 4	Speed dial for maximum speed display of 111 mph	21
Figure 5	Speed dial for maximum speed display of 87 mph	23
Figure 6	Train running number type selection window	28
Figure 7	Numeric train running number window	30
Figure 8	Alphanumeric train running number window	32
Definitions and Abbreviations		38
References		40

Railway Group Standard
GERT8402
Issue Two
Date June 2016

ERTMS/ETCS DMI National Requirements

Part 1 Purpose and Introduction

1.1 Purpose

- 1.1.1 This document mandates requirements for the European Rail Traffic Management System / European Train Control System (ERTMS/ETCS) Driver Machine Interface (DMI) equipment if a speed display in miles per hour (mph) is required and / or an alphanumeric train running number entry is required.

1.2 Introduction

1.2.1 Background

- 1.2.1.1 The European Rail Agency (ERA) has prepared a specification for the ERTMS/ETCS DMI, ERA_ERTMS_015560. The specification is for a speed display in kilometres per hour (km/h) and entry of train running numbers in an all-numeric format.
- 1.2.1.2 Where compatibility with existing Great Britain (GB) operation is required, a speed display in mph and the capability to use alphanumeric train running numbers is needed.
- 1.2.1.3 Great Britain requested the ERA to include the facility to display speed in mph and permit entry of alphanumeric train running numbers, but this was declined as the need is only relevant to a single European Member State and the ERA did not wish to mandate the functionality on all Member States. The ERA recommended GB to propose Specific Cases in the Control Command and Signalling Technical Specifications for Interoperability (CCS TSI) to address compatibility with GB operation in mph and the use of alphanumeric train running numbers. The Specific Case for GB operation in mph only applies to the display of speed information. Other speed-related information, for example for train data entry, remains in km/h as defined in ERA_ERTMS_015560.
- 1.2.1.4 This document has been prepared to support the Specific Cases in the CCS TSI.

1.2.2 Principles

- 1.2.2.1 Neither the provision of a speed display in mph, nor the facility to enter alphanumeric train running numbers, is mandatory. However, if either is to be provided, then the relevant requirements of this document apply.
- 1.2.2.2 The requirements and specific wording of parts of this document are based on ERA_ERTMS_015560 and are designed to be read in conjunction with that specification. This has resulted in wording that would not have otherwise been used in a Railway Group Standard, but consistency with ERA_ERTMS_015560 is considered very important, to minimise the potential for misinterpretation.

1.2.3 Structure of this document

- 1.2.3.1 This document sets out a series of requirements that are sequentially numbered.
- 1.2.3.2 This document also sets out the rationale for the requirement, where available. The rationale explains why the requirement is needed and its purpose. Where relevant, guidance supporting the requirement is also set out in this document. The rationale and the guidance are indicated by prefixing the clause number with the letter 'G'.
- 1.2.3.3 The national rules relating to relevant TSI parameters have been identified, together with the relevant clause from the TSI.

ERTMS/ETCS DMI National Requirements

Railway Group Standard

GERT8402

Issue Two
Date June 2016

1.2.4 Related requirements in other documents

- 1.2.4.1 The following Railway Group Standard contains requirements that are relevant to the scope of this document:

GERT8064 European Train Control System: The Management of Packet 44

1.3 Approval and authorisation of this document

- 1.3.1 The content of this document was approved by Control Command and Signalling (CCS) Standards Committee on 14 April 2016.
- 1.3.2 This document was authorised by RSSB on 28 April 2016.

Railway Group Standard
GERT8402
Issue Two
Date June 2016

ERTMS/ETCS DMI National Requirements

Part 2 Speed Dial Information

2.1 Determination of display of mph or km/h

2.1.1 The onboard ERTMS/ETCS operating level shall be used to determine the units, mph or km/h, for the display of speed information on the ERTMS/ETCS DMI.

G 2.1.1.1 **Rationale for 2.1.1:** The switching of the onboard speed display units based on operating level provides the flexibility to display speed information in different units for different operating levels on the same line.

G 2.1.1.2 This requirement defines how the UK Specific Case in the CCS TSI related to a speed display in mph will be met.

G 2.1.1.3 The speed information within scope of the UK Specific Case is:

- a) The speed dial (see 2.2).
- b) Digital display of current train speed (see 2.3).
- c) Digital display of release speed (see 2.4).

G 2.1.1.4 An example of where the switching of the onboard speed display units might be required is on a line fitted with ERTMS Level 2 and signals where ERTMS/ETCS fitted trains are permitted to operate in Level 2 or Level National Train Control (NTC).

2.1.2 The units associated with each supported ERTMS/ETCS operating level for the display of speed information on the ERTMS/ETCS DMI shall be determined from an onboard configured default speed unit allocation for each onboard supported ERTMS/ETCS operating level that is required for operations in the UK, unless this allocation has been overridden by stored and applied Packet 44-based Train Speed Units Override information.

G 2.1.2.1 **Rationale for 2.1.2:** The switching of the onboard speed display units based on a default allocation per ERTMS/ETCS operating level and the ability to override this by a Packet 44-based Train Speed Units Override message provides the maximum flexibility to display speed information in different units for different operating levels on the same line at the current location or a distant location, as set out in 2.1.8 and 2.1.9.

G 2.1.2.2 The Train Speed Units Override message is a UK Packet 44-based message with NID_XUSER = 9 and NID_UKSYS = 11, that can be transmitted by Eurobalise or Radio Block Centre (RBC). The Train Speed Units Override message is used to override the default speed display units that are configured for each operating level within the ERTMS/ETCS onboard equipment. Details of the packet structure and variables for the Train Speed Units Override message are available from RSSB.

ERTMS/ETCS DMI National Requirements

Railway Group Standard

GERT8402

Issue Two

Date June 2016

G 2.1.2.3 The structure of the Train Speed Units Override message provides the ability to define an immediate override of display units, or to announce an override of display units to occur at a distant location, for a particular operating level or levels. Accepted Train Speed Units Override information can therefore be in one of two states:

- a) Stored and pending – Train Speed Units Override information that is stored onboard but which has yet to be applied due to the override being defined to occur at a distant location.

Or

- b) Stored and applied – Train Speed Units Override information that is stored onboard and has already been applied, in conjunction with the onboard configured default values, for determining the units for the display of speed information.

G 2.1.2.4 There are ERTMS/ETCS fitted trains currently in, or soon to enter, GB operation that do not have the means to configure a default set of units per operating level and cannot utilise the Train Speed Units Override message, for example:

- a) Class 158 or Class 97 trains equipped for operations on the Cambrian Level 2 line are configured to display mph when in Level 0 (baseline 2 definition) and km/h when in Level 2. The units on the DMI switch automatically when the level changes.
- b) Class 700 trains being supplied for the Thameslink project are configured to select mph or km/h for all ERTMS/ETCS operating levels based on the value of NID_C (the country or region code) last received by the train from a balise group. The default is that the train displays km/h unless the value of NID_C received corresponds to an mph area in an onboard list. If the train enters an area where the balises have an NID_C value which does not correspond with mph, then the display will change to km/h in all ERTMS/ETCS operating levels.

Future implementations of ERTMS will need to take into account compatibility with ETCS fitted trains that do not conform to this Standard where these trains are expected to operate.

G 2.1.2.5 Examples of locations where the Train Speed Units Override message might be used include:

- a) At the entrance to lines where the default speed units do not apply.
- b) At the entrance to lines where the default speed units do apply from lines where they do not apply.
- c) To cancel a previously received Train Speed Units Override message that is stored and pending, for example if a train has accepted a Train Speed Units Override message and is subsequently routed away from the line where the message was to apply.
- d) At start of mission in ERTMS/ETCS operating Levels 2 or 3 if the ERTMS/ETCS onboard reports a valid position to the Radio Block Centre (RBC) and the reported position is on a line where the default speed units are required to be overridden.

Railway Group Standard

GERT8402

Issue Two

Date June 2016

ERTMS/ETCS DMI National Requirements

- G 2.1.2.6 The actual speed display units to be applied for each ERTMS/ETCS operating level in a particular operating area is determined as part of the implementation of ERTMS in that area. The process of determining the units appropriate to an operating level should consider the driveability and safety of movements through areas where the speed units change frequently in a short period of time.

- 2.1.3 The default units for the display of speed information on the ERTMS/ETCS DMI in ERTMS/ETCS operating Levels 0, 1, 2 and 3 shall be km/h.

- G 2.1.3.1 **Rationale for 2.1.3:** Defaulting to km/h for the display of speed information in ERTMS/ETCS Levels 0, 1, 2 and 3:

- a) Minimises the risk of erroneously starting in mph on ERTMS/ETCS fitted infrastructure without conventional signalling, which will be the predominant method of implementation on the GB mainline railway.

And

- b) Eliminates the need to change the onboard default configurations once the conventional signalling equipment in areas where ERTMS/ETCS is overlaid on conventional signalling is removed.

- G 2.1.3.2 The current strategy for the rollout of ERTMS/ETCS on the GB mainline railway is to implement ERTMS/ETCS Level 2 without signals. The cross-industry ERTMS Programme has agreed that operations in Levels 0, 1, 2 and 3 on the GB mainline railway will predominantly be carried out in km/h, but where ERTMS/ETCS will be overlaid on conventional signalling it might be considered appropriate to operate in mph in Levels 0, 1, 2 and 3.

- 2.1.4 The default units for the display of speed information on the ERTMS/ETCS DMI in ERTMS/ETCS operating level NTC shall be as set out in Table 1.

National Train Control System	Default speed display units
KVB	km/h
TVM	km/h
TPWS/AWS	mph
TPWS/AWS SA	mph
Chiltern ATP (SELCAB)	mph
GW-ATP (TBL)	mph
Mechanical trainstop	mph

Table 1 Level NTC default speed display units

ERTMS/ETCS DMI National Requirements

Railway Group Standard

GERT8402

Issue Two

Date June 2016

- G 2.1.4.1 **Rationale for 2.1.4:** Defaulting to mph for the display of speed information in ERTMS/ETCS operating levels where train protection is provided by TPWS and AWS in combination (NID_NTC = 20 and 21), or mechanical trainstop, supports compatibility with the non-TSI conforming network which uses speed in mph. Defaulting to mph for the display of speed information in these ERTMS/ETCS operating levels additionally minimises the likelihood of unintentional display of speed information in km/h in these levels.
- G 2.1.4.2 **Rationale for 2.1.4:** Defaulting to km/h for the display of speed information in ERTMS/ETCS operating levels where train protection is provided by systems also used in other countries avoids introducing requirements on the Control Command and Signalling (CCS) systems in those countries.
- G 2.1.4.3 Table 2 sets out the national train control systems currently in use in the UK. The European Rail Agency (ERA) document ERA_ERTMS_040001 allocates the following NID_NTC values for UK use:

NID_NTC	National Train Control System
Open Point	KVB
14	TVM
20	TPWS/AWS
21	TPWS/AWS SA
35	SELCAB (Chiltern ATP)
37	TBL (GW-ATP)
Open Point	Mechanical trainstop

Table 2 National train control systems currently defined for use in the UK

- G 2.1.4.4 During operations in the ERTMS/ETCS operating levels associated with National Train Control Systems, an agreed system name is displayed on the ETCS DMI within the National Train Control level symbols (symbol numbers LE02, LE08 and LE09 in ERA_ERTMS_015560). The entries in the 'National Train Control Systems' column in Tables 1 and 2 are consistent with those in ERA_040001, and do not necessarily define the system names for display purposes; these are defined in the applicable standard for the National Train Control System concerned when they are agreed.
- G 2.1.4.5 NID_NTC values for KVB and mechanical trainstop in the UK are still to be allocated. It is possible that the NID_NTC = 8, currently defined for the use of KVB in France, could additionally be allocated to the UK.
- G 2.1.4.6 'TPWS/AWS SA' (TPWS/AWS Specific Application) is technically equivalent to 'TPWS/AWS' except that, when a train is operating in TPWS/AWS SA, the ERTMS/ETCS onboard equipment will, in combination with an appropriately configured RBC, prevent a transition from Level NTC operation to Level 2/3 operation. This functionality has been included to support managed migration to ERTMS/ETCS and in particular driver training.
- G 2.1.4.7 Guidance on the GB process for managing national identities, including NID_NTC, is given in GEGN8672.

Railway Group Standard

GERT8402

Issue Two

Date June 2016

ERTMS/ETCS DMI National Requirements

- 2.1.5 The onboard function of determining the units for the display of speed information shall be active in ERTMS/ETCS operating modes, as set out in Table 3 (X = active, empty = inactive):

	ERTMS/ETCS mode																
Onboard function	NP	SB	PS	SH	FS	LS	SR	OS	SL	NL	UN	TR	PT	SF	IS	SN	RV
Determine units for display of speed information		X		X	X	X	X	X		X	X	X	X			X	X

Table 3 Active function

- G 2.1.5.1 **Rationale for 2.1.5:** The onboard function of determining the units for the display of speed information is active in ERTMS/ETCS operating modes Stand-By (SB), Shunting (SH), Full Supervision (FS), Limited Supervision (LS), Staff Responsible (SR), On Sight (OS), Non-leading (NL), Unfitted (UN), Trip (TR), Post Trip (PT), National System (NS) and Reversing (RV), as speed information is displayed on the ERTMS/ETCS DMI in these modes.
- G 2.1.5.2 **Rationale for 2.1.5:** The onboard function of determining the units for the display of speed information is inactive in ERTMS/ETCS operating modes No-Power (NP), Sleeping (SL) and Passive Shunting (PS) modes, as there is no display of speed information by ERTMS/ETCS in these modes. In System Failure (SF) and Isolation (IS) modes, the ERTMS/ETCS DMI outputs cannot be determined.
- G 2.1.5.3 For convenience, the information set out in Table 3 is provided in the same format as the Active Functions table in section 4.5 of Subset-026.
- G 2.1.5.4 Although the onboard function of determining the units for the display of speed information is inactive in ERTMS/ETCS operating modes SL and PS, Train Speed Units Override messages are still accepted in these modes and are applied, as appropriate, when exiting these modes.

- 2.1.6 The ERTMS/ETCS onboard equipment shall accept received Train Speed Units Override messages in all ERTMS/ETCS onboard operating levels and from all transmission media.

- G 2.1.6.1 **Rationale for 2.1.6:** To maximise the availability of the 'Determine units for display of speed information' onboard function without constraining the trackside design.
- G 2.1.6.2 Section 7.4.1.1 of Subset-026 states that Packet 44 is to be used for the transmission of 'Data to be used by applications outside ERTMS/ETCS' and defines the criteria for the acceptance of that data. While the 'Determine units for display of speed information' is functionally outside the scope of the ERTMS/ETCS specifications, it is permissible for this function to be performed by the ERTMS/ETCS onboard equipment.
- G 2.1.6.3 Section 4.8 of Subset-026 defines the ERTMS/ETCS onboard equipment requirements for the filtering and acceptance of received information depending on ERTMS/ETCS operating level and transmission media.

ERTMS/ETCS DMI National Requirements

Railway Group Standard

GERT8402

Issue Two

Date June 2016

- 2.1.7 The ERTMS/ETCS onboard equipment shall accept received Train Speed Units Override messages in ERTMS/ETCS operating modes, as set out in Table 4 (A = Accepted, NR = Not Relevant):

	ERTMS/ETCS mode																
Information	NP	SB	PS	SH	FS	LS	SR	OS	SL	NL	UN	TR	PT	SF	IS	SN	RV
Train Speed Units Override	NR	A	A	A	A	A	A	A	A	A	A	A	A	NR	NR	A	A

Table 4 Accepted information depending on the mode

- G 2.1.7.1 **Rationale for 2.1.7:** To maximise the availability of the 'Determine units for display of speed information' onboard function so that the ERTMS/ETCS onboard equipment is displaying speed information in the correct units.
- G 2.1.7.2 Subset-026 states that Packet 44 is to be used for the transmission of 'Data to be used by applications outside ERTMS/ETCS' and defines the criteria for the acceptance of that data. While the 'Determine units for display of speed information' is functionally outside the scope of the ERTMS/ETCS specifications, it is permissible for this function to be performed by the ERTMS/ETCS onboard equipment.
- G 2.1.7.3 Section 4.8 of Subset-026 defines the ERTMS/ETCS onboard equipment requirements for the filtering and acceptance of received information depending on the ERTMS/ETCS operating mode.

- 2.1.8 Where a newly accepted Train Speed Units Override message demands an override of display units 'now', it shall immediately:

a) Replace all stored and pending Train Speed Units Override information.

And

b) Update all already stored and applied Train Speed Units Override information.

- G 2.1.8.1 **Rationale for 2.1.8:** The structure of the Train Speed Units Override message permits the definition of an immediate override of display units, or for an override at a distant location. This requirement specifies the behaviour associated with the immediate override.

- G 2.1.8.2 The replacement of a stored Train Speed Units Override message that has yet to be applied (stored and pending) is aligned with the ERTMS/ETCS onboard equipment behaviour for ERTMS/ETCS messages associated with a level transition specified in Subset-026, and provides a means to negate an accepted Train Speed Units Override announcement message if trains are subsequently routed away from the line where the message was to apply.

- 2.1.9 Where a newly accepted Train Speed Units Override message demands an override of display units to occur at a distant location and the reference balise group is known, it shall:

a) Immediately replace all stored and pending Train Speed Units Override information.

And

Railway Group Standard

GERT8402

Issue Two

Date June 2016

ERTMS/ETCS DMI National Requirements

- b) Update all already stored and applied Train Speed Units Override information when the estimated front end of the train reaches the distant location.

- G 2.1.9.1 **Rationale for 2.1.9:** The structure of the Train Speed Units Override message permits the definition of an immediate override of display units, or for the override at a distant location. This requirement specifies the behaviour when the message defines the override at a distant location.
- G 2.1.9.2 **Rationale for 2.1.9:** If the train speed units override message announces an override of display units to occur at a distant location the reference balise group has to be known. There are situations where a reference balise group may not be known, for example if the Train Speed Units Override message is received in an RBC message and the Last Relevant Balise Group (LRBG) is set to 'Unknown'.
- G 2.1.9.3 The use of the estimated front end of the train to initiate the change in speed display units resulting from a Train Speed Units Override message defining an override at a distant location is consistent with the ERTMS/ETCS onboard behaviour associated with an announced level transition, as set out in Subset-026 clause 5.10.1.5.
- G 2.1.9.4 The replacement of accepted Train Speed Units Override messages that have yet to be applied (stored and pending) is in keeping with the ERTMS/ETCS onboard equipment behaviour for ERTMS/ETCS messages associated with a level transition specified in Subset-026, and provides a means to negate an accepted Train Speed Units Override announcement message if trains are subsequently routed away from the area where the message was to apply.
- G 2.1.9.5 The use of the estimated front end of the train enables the change in the display units to be designed to be coincident with an ERTMS/ETCS level transition, so that the change in units displayed on the ERTMS/ETCS DMI and the change in ERTMS/ETCS operating level occur at the same time.

- 2.1.10 Transitions between ERTMS/ETCS operating levels shall have no effect on stored and pending or stored and applied Train Speed Units Override information.

- G 2.1.10.1 **Rationale for 2.1.10:** Retaining Train Speed Units Override information across level transitions means that Train Speed Units Override messages do not need to be retransmitted every time a level transition takes place.

- 2.1.11 The effect of entering a given ERTMS/ETCS operating mode on stored Train Speed Units Override information shall be as set out in Table 5 (U = Unchanged, NR = Not Relevant):

	Entered Mode																
	NP	SB	PS	SH	FS	LS	SR	OS	SL	NL	UN	TR	PT	SF	IS	SN	RV
Train Speed Units Override information	U (1)	U (1)	U	U	U	U	U	U	U (1)	U	U	U	U	NR	NR	U	U (1)

- (1) Exception – Deleted if the Train Speed Units Override information is stored and pending.

Table 5 What happens to stored Train Speed Units Override information when entering a given mode