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Rail Industry Standard for GSM-R Train Voice Radio

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Rail Industry Standard



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Rail Industry Standard for GSM-R Train Voice Radio

Issue record

Issue	Date	Comments
One	March 2013	The content of this document contains requirements and guidance for GSM-R train voice radio, for the rail industry to adopt if they so choose. It updates the superseded RIS-3082-CCS and incorporates related single duty holder requirements withdrawn from GE/RT8080, GE/RT8081 and GE/RT8082.

Superseded or replaced documents

The following Railway Group documents are superseded or replaced, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
RIS-3082-CCS issue one Rail Industry Standard for GSM-R Cab Mobile, Great Britain Open Interface Requirements (Rapid Response)	All	01 June 2013

RIS-3082-CCS issue one Rail Industry Standard for GSM-R Cab Mobile, Great Britain Open Interface Requirements, ceases to be in force and is withdrawn as of 01 June 2013.

Supply

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Part 1 Introduction

1.1 Purpose of this document

- 1.1.1 This Railway Industry Standard (RIS) provides requirements and guidance for GSM-R train voice radio, for the rail industry to adopt if they so choose. It supports railway undertakings by capturing single duty holder requirements relating to the design of train voice radio systems, and is associated with the Railway Group Standard (RGS) GK/RT0094 and Guidance Note (GN) GK/GN0694 for Train Voice Radio Systems.
- 1.1.2 It includes requirements for text messages, but not the use of GSM-R as a bearer for European Train Control System (ETCS) or other data based system use.
- 1.1.3 The document is set out in the form of requirements followed by guidance notes. Guidance notes are marked by a grey bar in the margin with the letters GN and sequential numbering, to differentiate them from the standard requirements to which they relate.

1.2 Application of this document

- 1.2.1 A member of RSSB may choose to adopt all or part of this document through company procedures or contract conditions. Where this is the case the member of RSSB will specify the nature and extent of application.
- 1.2.2 Specific compliance requirements and dates have therefore not been specified since these will be the subject of the internal procedures or contract conditions of the companies which choose to adopt this standard.
- 1.2.3 These requirements are in addition to, but consistent with, those mandated by the Technical Standard for Interoperability (TSI) and mandated by GK/RT0094 Train Voice Radio Systems.

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1.5 Approval and authorisation of this document

- 1.5.1 The content of this document was approved by Control Command and Signalling (CCS) Standards Committee on 24 January 2013, and was supported by Traffic Operation and Management (TOM) Standards Committee on 16 January 2013.
- 1.5.2 This document was authorised by RSSB on 01 February 2013.

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Part 2 GSM-R Train Voice Radio – Functional and Availability Requirements

2.1 Operation availability

- 2.1.1 The design target for the operational availability of the GSM-R train voice radio shall be 99.976%.

GN1 Rationale: This is based on a Mean Time Between Failures (MTBF) of 50,000 hours and a Mean Time To Repair (MTTR) of 12 hours.

GN2 This target is inclusive of unplanned and planned down time for maintenance.

2.2 Train interface – activation and deactivation of the Driver Machine Interface (DMI)

- 2.2.1 The GSM-R train voice radio shall provide the user with two methods for activation / deactivation of the DMI:

- a) The driver's key.
- b) An on / off button on the DMI.

GN3 Rationale: The Operational Concept: Section 5 Human Machine Interface Information.

GN4 The ability to activate the DMI without powering-up the train cab via the driver's key, allows the GSM-R train voice radio to be available for use by railway staff other than drivers.

- 2.2.2 The driver's key shall always take precedence over the DMI on / off button.

GN5 Rationale: Driver functions should be made available when the cab is set up for driver operation.

- 2.2.3 If the DMI on / off button has other associated functions, it shall only perform the DMI activation / deactivation function when the driver's key is in the off state.

GN6 Rationale: The DMI on / off button can only be used when the driver is not intending to use the GSM-R train voice radio.

- 2.2.4 When the DMI is activated, the configuration shall be determined by the time elapsed since the DMI was last deactivated:

- a) Less than t (elapsed time) minutes – the DMI shall activate with the same configuration as when it was last deactivated.
- b) Greater than t (elapsed time) minutes – the DMI shall activate with default settings.

GN7 Rationale: By retaining the configuration within a defined time period, this prevents introducing journey delays which would otherwise be caused by the need to re-enter the configuration

- 2.2.5 When the DMI has been activated using the DMI on / off button, it shall deactivate automatically after a configurable period of inactivity t_i .

GN8 Rationale: This safeguards inadvertent or unauthorised use.

- 2.2.6 When the DMI is in the deactivated state, all incoming calls, including text messages, shall be rejected automatically.

GN9 Rationale: This prevents signallers being misled into believing that the GSM-R train voice radio has received messages or instructions.

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2.2.7 For a GSM-R train voice radio that is configured with two attached DMIs, it shall not be possible for both DMIs to remain in the activated state at the same time.

GN10 Rationale: The Operational Concept: Section 6.6 Switch off Cab Mobile Human Machine Interface (Scenario 18).

GN11 This requirement is to stop calls and messages from appearing on both DMIs at the same time, leading to the possibility that a driver and guard could make and respond to calls or messages erroneously.

2.2.8 If one of the two attached DMIs has been activated by using the DMI on / off button, then it shall be possible to activate the other DMI only via the driver's key in the corresponding cab. This action shall deactivate the DMI, which has been activated using the DMI on / off button.

GN12 Rationale: The Operational Concept: Section 2.1.3 Trainborne Equipment (2.1.3.1 – up to two Human Machine Interfaces) and Section 6.6 Switch off Cab Mobile Human Machine Interface (Scenario 18).

GN13 The ability to switch on the DMI without powering-up the train cab via the driver's key, allows the cab mobile to be available for use by railway staff other than drivers.

2.3 Voice call functionality

2.3.1 Incoming railway emergency group call

2.3.1.1 The audible indication for a railway emergency call shall be the only audible indication presented as a result of the incoming group call establishment process.

GN14 Rationale: A single audible indication associated with the incoming call is provided so that the driver can immediately know what call type is being progressed and the time period that the alarm persists for, providing sufficient response time to answer the call.

GN15 The requirements for audible and visual indications of emergency call activation are set out in the EIRENE Functional Requirements Specification (FRS) section 13.2.2.

2.3.1.2 The visual indication for a railway emergency call shall include the text 'STOP EMERGENCY' with the word 'STOP' flashing.

GN16 Rationale: Upper case and flashing text is used to maximise the visual effectiveness of the indication for the driver's attention.

GN17 Details of presentation formats for audible and visual indications are set out in Part 3.

2.3.1.3 By means of a single user action on the DMI, the flashing text set out in 2.3.1.2 shall be converted to a steady indication.

GN18 Rationale: Provision of an easy method to acknowledge receipt of the audible and visual indication, and changing the visual message to steady, provides the driver with a visual reminder of the instruction without distracting the driver, which would occur if the flashing remains.

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- GN19 The flashing text can be made steady, for example, by means of a generic 'clear' or 'cancel' function on the DMI, that is to say, a dedicated railway emergency group call acknowledgement button is not essential.
- 2.3.1.4 If the press-to-talk (PTT) function has not been activated by the GSM-R train voice radio user the 'use PTT indication', as set out in CLC/TS 50459-5:2005, shall be presented.
- GN20 Rationale: A visual indication is presented to the driver as a reminder that, for incoming emergency group calls, the PTT function should be depressed and held to obtain a communications channel in order to talk with the signaller.
- GN21 A PTT function is required for members receiving a railway emergency group call to enter into a conversation on an individual basis with the initiator of that call. Use of the PTT function will become an infrequent practice, so that the driver will need a visual reminder to use the PTT function.
- 2.3.1.5 From activation of the PTT function by the user until the radio channel uplink has been accessed, an audible indication shall be presented. Once the radio channel uplink has been accessed, a visual indication shall be presented which informs the user that they are able to speak.
- GN22 Rationale: Provision of an audible indication informs the driver that the communication link is not ready for speech and the visual indication informs the driver when they can start to speak.
- 2.3.1.6 If the PTT function is activated by the user when the uplink is already in use by another mobile subscriber, the generic 'called party busy' indication shall be presented.
- GN23 Rationale: A busy indication informs the driver that another driver is currently talking to the signaller and cannot be interrupted.
- GN24 It is expected that through driver training, drivers will become familiar with the meaning 'busy indication', for example, that the call is still ongoing and the current user should finish their conversation before they can converse within the call.
- 2.3.2 Outgoing railway emergency group call**
- 2.3.2.1 The railway emergency group call function shall be available to the GSM-R train voice radio user via a dedicated button on the DMI.
- GN25 Rationale: This provides the driver with an easy method to send the associated call, which is always available.
- 2.3.2.2 When this button is activated by the GSM-R train voice radio user, its illumination intensity shall flash and continue to flash until the railway emergency group call has been cleared.
- GN26 Rationale: The visual indication provides a reminder to the driver that the associated action is ongoing.
- GN27 The rate, duty cycle and relative intensities of flashing are set out in Part 3.
- 2.3.2.3 In addition to 2.3.2.2, on initiation of the railway emergency group call by the GSM-R train voice radio user, the DMI shall present specific visual and audible indications, as set out in 3.7.3, which differ from those presented during an incoming railway emergency group call.
- GN28 Rationale: The driver is given cues that this is an outgoing rather than incoming emergency call to stimulate appropriate driver action.

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2.3.2.4 The visual indication set out in 2.3.2.3 shall include the words 'emergency group' instead of the numeric group identity.

GN29 Rationale: This indicates to the driver that the call will go out to other drivers within the same geographic location.

2.3.2.5 The PTT functions set out in sections 2.3.1.4, 2.3.1.5 and 2.3.1.6 shall also apply to outgoing railway emergency group calls.

GN30 Rationale: This provides consistency with incoming railway emergency group calls. See rationales for sections 2.3.1.4, 2.3.1.5 and 2.3.1.6.

2.3.3 Incoming high-priority point-to-point (PTP) voice call

2.3.3.1 On receipt of an incoming PTP call with enhanced Multi-Level Precedence and Pre-emption (eMLPP) 2, the GSM-R train voice radio shall present a specific visual indication on the DMI to identify the call as high priority, as set out in 3.7.3.

GN31 Rationale: The Operational Concept: Section 9 – Emergencies and High-Priority Calls – section 9.8 Signaller Initiated Urgent Point-to-Point Call.

2.3.3.2 The visual indication set out in 2.3.3.1 shall include the word 'urgent'.

GN32 Rationale: The specific visual indication 'urgent' prompts the driver to quickly recognise that a high-priority call is being set up.

2.3.3.3 The visual indication set out in 2.3.3.1 shall be presented as soon as possible during the incoming call establishment process and shall remain displayed until the connection is cleared.

GN33 Rationale: The visual indication informs the driver early in the call process that a high-priority call is being set up and will remain connected awaiting driver action.

2.3.3.4 Audible indications for the incoming PTP call shall not differ from those applied to other PTP call types.

GN34 Rationale: Consistent audible indications enable the driver to quickly recognise this type of call over other call types.

2.3.3.5 Call progress indications for the incoming high-priority PTP call shall be consistent with the generic call handling indications set out in Part 3.

GN35 Rationale: Further indications are provided to help the driver through the call process.

2.3.4 Outgoing high-priority PTP voice call

2.3.4.1 The GSM-R train voice radio shall provide the facility for the user to initiate immediately a high-priority PTP voice call for the purposes of contacting the signaller.

GN36 Rationale: The Operational Concept: Section 9.7 Driver Initiated Urgent PTP Call.

GN37 In this case 'immediately' means without the introduction of additional delay in the context of a system that has a demonstrable but potentially variable reaction time.

2.3.4.2 A button on the DMI shall be dedicated to the high-priority PTP voice call set out in 2.3.4.1.

GN38 Rationale: This provides the driver with an easy method to set up and send the associated call which is always available.

2.3.4.3 When this button is activated by the GSM-R train voice radio user, its illumination intensity shall flash and continue to flash until the outgoing urgent PTP call has been cleared.

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- GN39 Rationale: The visual indication provides a reminder to the driver that the associated action is ongoing.
- 2.3.4.4 The rate, duty cycle and relative intensities of flashing are set out in Part 3.
- 2.3.4.5 In addition to 2.3.4.3, on initiation of an outgoing high-priority PTP call by the GSM-R train voice radio user, the GSM-R train voice radio shall present a specific visual indication on the DMI.
- GN40 Rationale: Specific visual and audible indications are provided which give instructions as a reminder for further driver actions; this provides a consistent approach for DMIs for drivers.
- 2.3.4.6 The visual indication set out in 2.3.4.5 shall include the word 'urgent'.
- GN41 Rationale: The specific visual indication 'urgent' prompts the driver to quickly recognise that a high-priority call is being set up.
- 2.3.4.7 The visual indication set out in 2.3.4.5 shall be presented as soon as possible during the outgoing call establishment process and shall remain displayed until the connection is cleared.
- GN42 Rationale: The visual indication informs the driver early in the call process that a high-priority call is being set up and will remain connected awaiting driver action.
- 2.3.4.8 Audible indications for the outgoing high-priority PTP call shall not differ from those applied to other PTP call types.
- GN43 Rationale: Consistent audible indications enable the driver to quickly recognise this type of call over other call types.
- 2.3.4.9 Call progress indications for the outgoing high-priority PTP call shall be consistent with the generic call handling indications set out in Part 3.
- GN44 Rationale: Further indications are provided to help the driver through the call process.
- 2.3.4.10 When the GSM-R train voice radio user initiates an outgoing urgent PTP call (yellow button – priority two), then the GSM-R train voice radio shall terminate any ongoing calls of a lower priority, including Failure to Stop (FTS) initiated held calls and any GSM-R train voice radio initiated held calls, prior to attempting to dial the urgent call. The implementation of this requirement shall not negatively impact on the EIRENE arbitration rules for other call types and priorities (see EIRENE SRS v15 Table 5A-1).
- GN45 Rationale: The Operational Concept: Section 9.7 Driver Initiated Urgent PTP Call. The measure reflects that all calls of a lower priority than two are terminated, regardless of where the call was initiated.
- GN46 The call handling indications set out in Part 3 allow the user to recognise this function as an outgoing high-priority call.
- 2.3.5 Incoming berth-triggered PTP call**
- 2.3.5.1 On receipt of a berth-triggered PTP call, the GSM-R train voice radio shall provide a visual indication which replicates that produced by an incoming Voice Broadcast Service (VBS) call, by utilising the identity of the originator of the incoming call, as set out in 3.7.3.
- GN47 Rationale: The Operational Concept: Section 4.1.3.2 Berth Triggered Broadcast Voice Calls.
- GN48 The GB network supports a specific national function, which enables the signaller to record a voice message and designate it to a specific signal berth. When a train enters the

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designated berth, the recorded voice message is automatically delivered by means of a PTP call. Both VBS and berth-triggered calls are recorded and delivered by equipment that is centrally located.

2.4 Predefined text messages

2.4.1 General

GN49 The specific predefined text message function provides the facility for text-based communications between, typically, the signaller and the GSM-R train voice radio; offering advantages in speed of operation, reduced driver workload and, in particular, signaller workload.

GN50 Further details are set out in GK/RT0094.

2.4.2 Future proofing for messages

2.4.2.1 The GSM-R train voice radio shall support changes and additions to message content definitions and the addition of further messages by means of a secure interface, as set out in 2.10.11.1.

GN51 Rationale: Changes to UUS1: references should be controlled in order not to update the message content incorrectly, leading to the possibility of displaying the wrong operational instructions. The form of the messages is set out in GK/RT0094. Any attempt to change them would be in contravention of GK/RT0045. However, this facility may be cost effective if GK/RT0094 measures are changed in a further issue of GK/RT0094.

2.4.3 Incoming predefined text messages

2.4.3.1 Message text shall be displayed on the DMI within five seconds of receipt of the SETUP message from the network.

GN52 Rationale: Message sent promptly to provide confidence to the signaller that the driver will receive the message / instruction in a timely manner.

2.4.3.2 For the incoming Contact Signaller message and the Contact Fixed Terminal message, the GSM-R train voice radio DMI shall present the identity of the caller.

GN53 Rationale: Part 3 requires that the identity of the originator of the message should be displayed, this gives the driver confidence that the message has come from an authorised source.

2.4.3.3 For the incoming Contact Signaller message and the Contact Fixed Terminal message, the GSM-R train voice radio shall enable the user to initiate, by means of a single button press, a PTP voice call to the terminal that originated the message.

GN54 Rationale: Provision of an easy method to set up a call response.

2.4.3.4 The GSM-R train voice radio shall decode the optional enhanced Presentation of Functional Number (ePFN) UUS tag, if present, into the textual representation of the sending party of the operational message. This shall be limited to 17 characters maximum length. If present, the ePFN textual description shall be displayed as the calling party ID. If not present, the functional number of the sending party shall be displayed numerically or textually where a phonebook lookup identifies a match.

GN55 Rationale: The ePFN, if present, provides information about the sender which is more readily recognisable to the driver than the alternative of a number or more limited length text.

2.4.3.5 The function set out in 2.4.3.3 shall not be available once the incoming predefined text message has been cleared from the display by the GSM-R train voice radio user.

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GN56 Rationale: The driver taking action to clear the text message means the driver no longer needs to contact the originator, and therefore the single button facility is no longer required and should be disabled to ensure it is not used accidentally.

2.4.4 Outgoing predefined text messages

2.4.4.1 The GSM-R train voice radio shall provide the facility for the GSM-R train voice radio user to initiate, by means of a single button press, the sending of the 'Standing at signal' predefined text message.

GN57 Rationale: Provision of an easy method for the driver to send the message.

2.4.4.2 The button on the DMI shall be dedicated to the 'Standing at signal' predefined text message set out in 2.4.4.1.

GN58 Rationale: A dedicated button suitably labelled provides the driver with the facility to send the associated message at all times.

2.4.4.3 The 'Standing at signal' predefined text message shall only be sent if the DMI has been activated by a driver's key and a successful journey registration has been undertaken.

GN59 Rationale: This is to prevent other than the driver sending this message to the signaller and to prevent an unregistered train sending it, as the signaller will not receive train identifier data.

2.4.4.4 On initiation of an outgoing predefined text message by the GSM-R train voice radio user, the predefined text shall be displayed on the DMI.

GN60 Rationale: The message is displayed to the driver to provide visual feedback that the required message is being sent.

2.4.4.5 The identity of the called party shall not be displayed on the GSM-R train voice radio DMI for an outgoing predefined text message.

GN61 Rationale: The identity associated with the signaller does not at this stage need to be known by the driver, only that a signaller within the geographical area is being sent the message.

2.4.4.6 Once the outgoing message has been successfully received by the called terminal, the GSM-R train voice radio shall present a visual indication on its DMI.

GN62 Rationale: Confirmation that the message has been received by the signaller is provided in order to give the driver confidence not to immediately respond by making unnecessary calls.

2.4.4.7 The DMI indications set out in 2.4.4.5 and 2.4.4.6 shall be based on interpretation of the UUS1 acknowledgement responses provided by the network, as set out in Part 4.

GN63 Rationale: Part 4 sets out where and how the appropriate acknowledge messages are displayed to the driver as confirmation that the signaller has received the message.

2.5 Driver safety device (DSD) alarm message

2.5.1 General operation

2.5.1.1 The GSM-R train voice radio shall only react to the DSD input if the GSM-R train voice radio DMI in the corresponding cab has been activated using the driver's key and the DSD is not isolated.

GN64 Rationale: The Operational Concept: Section 7.7 Drivers Safety Device (DSD) Activation and Appendix 1 – Part 11 DSD Activation – Scenario SCN/AOC/021.

GN65 In a train voice radio with two DMIs and one DSD the locomotive should react to the DSD input if either cab has been activated using the driver's key.

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GN66 The GSMR train voice radio has the capacity to provide an audible alarm when the DSD is initiated. The following sections specify various configurable time periods. The ranges and default values of these time periods shall be as set out in 2.10.11.

2.5.1.2 If the DSD input to the GSM-R train voice radio is activated, the GSM-R train voice radio shall automatically send a 'DSD alarm' message to the network after a total time period of t_{dsd} seconds.

GN67 Rationale: A delay period is provided to allow the driver time to cancel the DSD alarm if activated inadvertently.

2.5.1.3 The DSD alarm message shall include location information. This is FRS option 5.7.3 c).

GN68 Rationale: This information helps the signaller to rapidly identify the location of the train which has the incapacitated driver, thereby speeding up the response to the incident.

2.5.1.4 The period of t_{dsd} seconds shall consist of an initial delay period t_d , followed by a warning period t_w .

GN69 Rationale: Period t_d allows the driver to cancel the DSD alarm without being warned that it will be sent.

GN70 Rationale: Period t_w is to give the driver warning that it will be sent if it is not cancelled by the driver.

2.5.1.5 The durations of periods t_d and t_w shall each be independently configurable.

GN71 Rationale: Periods t_d and t_w can be changed (made longer) for different classes of train or operating conditions, to eliminate false alarm activation should a pattern emerge that this situation is occurring.

2.5.1.6 The GSM-R train voice radio shall allow the audible alert associated with period t_w , as set out in 2.5.1.5, to be enabled or disabled as a configurable parameter.

GN72 Rationale: Disabling of the GSM-R audible alert is required to account for those vehicles already fitted with audible DSD alarms.

GN73 Care should be taken not to disconnect the physical DSD connection to the GSM-R train voice radio, as this is still required to send the DSD alarm to the signaller.

2.5.2 Normal operation with successful outcome

2.5.2.1 Throughout delay period t_d , the status of indications presented by the DMI shall remain unchanged and the GSM-R train voice radio shall remain capable of making and receiving calls.

GN74 Rationale: The GSM-R train voice radio does not inhibit the call functionality during the delay period, as the driver may be in a situation where they need to inform the signaller of an incident.

2.5.2.2 On commencement of warning period t_w , the DMI shall present a visual indication informing the user that the DSD alarm function has been activated.

GN75 Rationale: A visual indication is presented to inform the driver a DSD alarm is in the process of being sent, in which case the driver may wish to make a voice call to inform the signaller in advance that an impending DSD alarm has been activated inadvertently.

2.5.2.3 The visual indication set out in 2.5.2.2 shall include the words 'DSD Alarm'.

GN76 Rationale: Easy-to-read text enabling the driver to quickly assimilate the meaning and take the appropriate action.

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2.5.2.4 In addition to the indication set out in 2.5.2.2, on commencement of warning period t_w , the DMI shall also present an audible and a visual indication informing the user that the GSM-R train voice radio is preparing to send the DSD alarm message to the network. These audible and visual indications shall persist for the duration of period t_w . If an outgoing REC is made, the DSD shall be cancelled and picked up again after the REC.

GN77 Rationale: An additional audible warning with an appropriate message is presented to reinforce the driver's awareness of the situation.

GN78 Detailed visual indication formats and specific audible tones associated with the DSD process are set out in Part 4.

2.5.2.5 The visual indication set out in 2.5.2.4 shall include the word 'Preparing', which shall flash.

GN79 Rationale: 'Preparing' is displayed with the main DSD alarm message to inform the driver that the GSM-R train voice radio is still within the period where the message is being set up and not yet sent.

2.5.2.6 The visual and audible indications set out in 2.5.2.2 and 2.5.2.4 shall remain displayed until the DSD input to the GSM-R train voice radio is reset, or the GSM-R train voice radio user cancels the DSD process by means of the DMI. Procedures for aborting the DSD alarm process are set out in 2.5.4.

GN80 Rationale: The indications remain visible to the driver as a prompt to deal with a DSD alarm message which may have been sent inadvertently.

2.5.2.7 Throughout period t_w , the GSM-R train voice radio shall automatically reject all incoming and outgoing calls of lower priority than the imminent DSD transmission.

GN81 Rationale: Lower priority calls or messages are rejected to allow the driver to concentrate on dealing with the DSD message alarm situation and not become distracted elsewhere.

2.5.2.8 On expiry of period t_w , the GSM-R train voice radio shall send the DSD alarm message and shall indicate on the DMI that it is sending the message and the audible indication shall cease.

GN82 Rationale: When the DSD alarm message is presented with the 'sent' message, this is retained as a reminder to the driver, and the audible indication stops because the process is now complete.

2.5.2.9 On successful receipt of the DSD alarm message by the fixed terminal, the DMI shall present a specific indication to this effect.

GN83 Rationale: The driver is advised that the signaller has received the DSD alarm message and is aware of the situation.

2.5.2.10 The visual indication set out in 2.5.2.9 shall remain displayed on the DMI until cleared by either a reset of the DSD input to the GSM-R train voice radio or by pressing the Cancel button on the DMI.

GN84 Rationale: The indications remain visible to the driver as a reminder that appropriate actions should be carried out if the DSD alarm message has been sent inadvertently. If the driver had been incapacitated and has now recovered, the driver will be able to see that a DSD message has been sent to a signaller.

2.5.2.11 On completion of the period t_w , the GSM-R train voice radio shall be able to make and receive calls of all types.

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GN85 Rationale: The GSM-R train voice radio resumes full operation automatically as soon as possible should the driver wish to make calls with any level of priority.

2.5.3 Operation with unsuccessful outcome

2.5.3.1 If the first DSD alarm transmission attempt fails for any reason, the GSM-R train voice radio shall retry with up to two further transmission attempts.

GN86 Rationale: This resolves any temporary problems with sending the DSD message while the driver is unable to operate the train radio.

2.5.3.2 During further transmission attempts, the GSM-R train voice radio shall present an indication informing the user that it is attempting to send the message.

GN87 Rationale: When the DSD alarm message is presented with the 'sent' message, this is retained as a reminder to the driver and the audible indication stops because the process is now complete; this happens for the two further transmission attempts.

2.5.3.3 If after a total of three call attempts the transmission is still unsuccessful, then a specific indication shall be presented on the DMI.

GN88 Rationale: A further visual indication 'DSD failed' alerts the driver's attention to the DSD alarm message having failed and acts as a reminder to the driver that further action should be carried out by the driver if contact with the signaller is required, assuming the driver recovers from incapacity. The reason there is no attempt to try to send the alarm message after three attempts is that the signaller will notice the train has not moved after a short time and will then try to establish the situation on the train.

2.5.4 Procedures for aborting the DSD alarm process

2.5.4.1 If at any time during period t_{dsd} , the DSD input to the GSM-R train voice radio is reset or the driver's key is removed, the GSM-R train voice radio shall abort the DSD alarm process.

GN89 Rationale: Provides one means to stop the DSD message being sent by the driver's intervention.

2.5.4.2 It shall be possible for the GSM-R train voice radio user to abort the DSD alarm process by means of a single button press on the DMI at any time during period t_w .

GN90 Rationale: Provides further means to stop the DSD message being sent by the driver's intervention.

2.5.4.3 If the process is aborted, as set out in 2.5.4.1 or 2.5.4.2, the GSM-R train voice radio shall return to its state prior to the activation of the DSD alarm process. Any indications presented by the DMI because of the DSD alarm process shall be cleared.

GN91 Rationale: This requires that the GSM-R train voice radio is returned to the normal state with full functionality ready for the driver to continue use.

2.6 Network registration

2.6.1 The GSM-R train voice radio shall be capable of selecting the mobile radio network automatically from a list of suitable networks.

GN92 Rationale: This is option 5.2.3.25 vi) in the FRS. It has been adopted for GB use to reduce driver workload.

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2.7 Journey registration and preregistration

2.7.1 Preregistration function

2.7.1.1 The GSM-R train voice radio shall provide a function available via the menu to preregister as 'leading driver', which enables the GSM-R train voice radio user to store the functional number in the GSM-R train voice radio in advance of the journey registration transaction with the network taking place.

GN93 Rationale: The Operational Concept: Section 6.1.2 Cab Mobile Registration and Appendix 1: Part 2 Cab Mobile Registration – Scenario SCN/NOC/002.

GN94 The intention of this function is to provide a simple means of registration on the move.

GN95 If the train voice radio is capable of processing alphanumeric format train head codes, the functional number should be displayed in the form of the head code plus location code.

2.7.1.2 The registration of the stored number shall be activated by means of a single button press by the GSM-R train voice radio user.

GN96 Rationale: This provides the driver with an easy method to return the stored registration number, ready for journey registration.

2.7.1.3 The preregistration function shall be independent of the availability of network coverage.

GN97 Rationale: Preregistration prevents the need for the driver to stop the train and register en route when entering an area of operational GSM-R and network coverage is established.

2.7.1.4 The preregistration function shall only be available if the DMI has been activated using the driver's key.

GN98 Rationale: The preregistration facility can only be set up by the driver.

2.7.1.5 When the DMI is deactivated using the driver's key, the stored number shall be stored and re-presented on re-insertion of a driver's key.

GN99 Rationale: Storing and re-presenting the preregistration facility supports crew changes when a train is in the preregistered state.

2.7.1.6 When the GSM-R train voice radio is in the preregistered state, the audible alerts associated with loss and recovery of network coverage shall not be presented on the DMI. The associated visual indications shall be provided.

GN100 Rationale: This allows the driver to see when network coverage is available without being disturbed by audible alarms that could cause an unnecessary distraction

GN101 The preregistered state covers the period of time between storing the functional number and subsequent registration.

2.7.1.7 The preregistration number entered by the user shall be displayed on the DMI and an indication shall be presented to inform the user that the number has been temporarily retained.

GN102 Rationale: The DMI message confirms the driver's action and indicates that the GSM-R train voice radio is ready to register.

2.7.2 Preregistration with no network coverage, pending journey registration

2.7.2.1 If the DMI has been activated using the driver's key and journey registration is attempted when no network coverage is available, the GSM-R train voice radio shall store the functional number that was entered by the user.

GN103 Rationale: This means that the driver does not need to enter the registration details

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again during the journey, saving time and possible re-registration errors when coverage is encountered.

2.7.3 Automatic journey registration from preregistration with no network coverage

2.7.3.1 When coverage is acquired from a network, the GSM-R train voice radio shall automatically register the lead driver using the stored functional number, following its connection to the network. The stored number shall then be deleted and any error indications (if sent) shall be cleared from the DMI.

GN104 Rationale: This allows the driver to set up the train voice radio with the registration details at the start of the journey and leave the train voice radio to automatically register as soon as network coverage is obtained.

2.7.3.2 If the user attempts to undertake journey registration while in a PTP call, the GSM-R train voice radio shall be able to store the functional number that has been entered by the user.

GN105 Rationale: This function enables the user to enter the journey registration into the DMI during a call, which is saved so that no further re-entry is required by the driver.

2.7.3.3 The number entered by the user shall be displayed on the DMI and an indication shall be presented to inform the user that the number has been temporarily retained.

GN106 Rationale: The DMI message confirms the driver's action and indicates that the GSM-R train voice radio is ready to register after the call.

2.7.3.4 Immediately after the ongoing voice call has been cleared, the GSM-R train voice radio shall attempt to register the stored number, at which point the stored number shall be deleted and the indication set out in 2.7.3.2 cleared from the DMI.

GN107 Rationale: Allows the preregistered number to be used.

2.7.4 Unused preregistration

2.7.4.1 If the DMI is deactivated, prior to the successful registration of any stored functional number, the stored functional number shall be deleted from the GSM-R train voice radio's memory.

GN108 Rationale: The memory of the train voice radio is cleared, avoiding the possibility of false registration on the next power-up.

2.7.5 Preregistration failure conditions

2.7.5.1 If the user is attempting to register on a network which uses a different format entry code to that which was entered, for example an alphanumeric train running number (ATRN) format head code was preregistered but the network is now not GB GSM-R or vice versa, then an indication shall be given to the user and the preregistration shall be aborted.

GN109 Rationale: This identifies to the driver that there is a mismatch with the preregistration code, and the driver will be required to re-register on the new network.

2.7.6 Failure of PA registration

2.7.6.1 If the PA registration fails, a suitable message shall be displayed in the reminder field of the train voice radio DMI.

GN110 Rationale: This provides a reminder to the driver that the PA has not been registered.

GN111 For example, 'No PA reg'd'. The reminder message only applies to PA failure, not other functional codes (FCs), as PA is the only function code considered operationally important.

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2.7.7 Failure of journey registration using alphanumeric entry

2.7.7.1 When a journey registration has failed, the GSM-R train voice radio shall display the failed head code, location code and function identity with a space delimiter between each.

GN112 Rationale: This indicates to the driver that registration has failed for alphanumeric head code entry.

2.7.8 Failure of journey registration using numeric entry

2.7.8.1 When a journey registration has failed, the GSM-R train voice radio shall display the failed EIRENE number and function identity with a space delimiter between each.

GN113 Rationale: This indicates to the driver that journey registration has failed for normal EIRENE train number entry.

2.7.9 Journey registration facilities: single button press

2.7.9.1 If the DMI has been switched on by means of the driver's key, the registration function shall be available to the GSM-R train voice radio user via a single button press.

GN114 Rationale: The Operational Concept: Section 4.3.4 Special Dialling Buttons and Appendix 1 – Part 2 Cab Mobile Registration – Scenario SCN/NOC/002.

2.7.9.2 If the registration function is accessed via the single button, the function code shall automatically be designated as 'leading driver'.

GN115 Rationale: The single button is only intended for use by the driver.

2.7.9.3 Registration as 'leading driver' shall automatically register all equipment attached to the GSM-R train voice radio that has a function code.

GN116 Rationale: Registration with the lead driver code provides the services the driver requires.

2.7.10 Alphanumeric journey registration

2.7.10.1 While the train alphanumeric head code and signal number are being entered, they shall be displayed on the DMI in two separate fields, the first of four and the second of three characters respectively, separated by a single space.

GN117 Rationale: This provides the driver with a screen view that helps to avoid subsequent data input errors occurring.

2.7.10.2 While the train alphanumeric head code is being entered on the DMI in the four characters space, the keyboard shall automatically change into an alphabetical keyboard for the second character and into a numeric keypad for the first, third and fourth character.

GN118 Rationale: This provides the driver with a screen view that limits data entry to the specific type of character required which helps to avoid data input errors occurring.

2.7.11 Deregistration prior to journey registration

2.7.11.1 Deregistration of all attached systems shall be complete before the lead driver is allowed to register.

GN119 Rationale: This ensures that any registered functionality is cleared from the GSM-R train voice radio so that only the functionality associated with a driver is enabled.

2.7.12 Bulk journey registration

2.7.12.1 There shall be a means to have a bulk registration facility, which shall be configurable for an 'on' state and an 'off' state as a maintenance function.

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- GN120 Rationale: Bulk registration provides the opportunity for traincrew GSM-R train voice radio users to register together, say at the beginning of the journey, to avoid individual registrations throughout the journey and thus save time and potential re-registration problems.
- 2.7.13 Journey registration facilities: menu access**
- 2.7.13.1 The journey registration function shall be available via a menu facility, irrespective of the means by which the DMI has been activated.
- GN121 Rationale: The Operational Concept: Section 5 Human Machine Interface Information 5.1 Driver: p) Menu access to other functions.
- 2.7.13.2 Access to the registration function via the menu facility shall allow the GSM-R train voice radio user to:
- a) Select the function code by manual entry.
 - b) Enter an eight digit numeric journey registration via the 'reg / dereg' button.
- GN122 Rationale: An optional menu driven registration facility is available, generally for non-driving crew to manually enter their functional codes.
- GN123 Rationale: Numeric journey registration entry allows for registering two cab radios to the same unique eight digit journey code.
- 2.7.14 Deregistration facilities: single button and menu access**
- 2.7.14.1 If the DMI has been activated by means of the driver's key, the deregistration function shall be available to the GSM-R train voice radio user via a single button press.
- GN124 Rationale: The Operational Concept: 6.6 Switch off Cab Mobile Human Machine Interface and Appendix 1 Part 8 Switch off Cab Mobile Human Machine Interface – Scenario SCN/NOC/018.
- 2.7.14.2 The deregistration function shall also be available via a menu facility.
- GN125 Rationale: An optional menu driven deregistration facility is available generally for non-driving crew to manually remove their registration from the network, for example, a guard in a non-driving cab.
- 2.7.14.3 Activation of the deregistration function by the single button for leading driver deregistration shall cause all registered function codes associated with the train number to be deregistered and the displayed train number to be cleared from the DMI.
- GN126 Rationale: This ensures that any registered functionality is cleared from the GSM-R train voice radio so that no additional functionality will be associated with the next registration.
- 2.7.14.4 If any DMI attached to the GSM-R train voice radio is activated, having been activated using the DMI on / off button, then activating the DMI using the driver's key shall cause any function codes associated with the train number to be deregistered.
- GN127 Rationale: This ensures that any registered functionality is cleared from the GSM-R train voice radio so that only the functionality associated with a driver is enabled.
- 2.7.14.5 When the DMI of a registered GSM-R train voice radio is deactivated using the driver's key it shall present a visual indication providing the GSM-R train voice radio user with an option to retain registration. The prompt shall remain displayed for a time period t_p .

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- GN128 Rationale: Drivers are given the option to retain their registration, if they are going to be away from their cab for a short length of time during the journey, which saves time and avoids possible re-registration errors.
- 2.7.14.6 The GSM-R train voice radio shall deregister or remain registered in accordance with the GSM-R train voice radio user's response to the prompt set out in 2.7.14.5, as follows:
- a) If the GSM-R train voice radio user responds positively to the prompt within the time period t_p , then the current registration shall be retained for a time period t_r .
 - b) If the GSM-R train voice radio user responds negatively to the prompt within the time period t_p , or if the GSM-R train voice radio user does not respond within the time period t_p , then the GSM-R train voice radio shall automatically deregister all registered function codes associated with the GSM-R train voice radio.
- GN129 Rationale: By retaining the registration within a defined time period, this prevents introducing journey delays which would otherwise be caused by the need to re-enter the registration.
- 2.7.14.7 The time periods t_p and t_r shall be independently configurable. Ranges and default values shall be as set out in 2.10.11.
- GN130 Rationale: Periods t_p and t_r can be changed to eliminate premature deregistration if different classes of train or particular operating conditions necessitate a longer registration retention time.
- 2.7.14.8 If the DMI is deactivated using the DMI on / off button, or automatically after expiry of inactivity period t_i , as set out in 2.2.5, then any function codes associated with the train number shall be deregistered.
- GN131 Rationale: This ensures that any registered functionality is cleared from the GSM-R train voice radio so that only the functionality associated with the next user's registration is enabled.
- 2.7.14.9 The DMI 'Deregistration menu' shall allow the driver the option of deregistering any and all attached systems.
- GN132 Rationale: An optional menu-driven deregistration facility is available to the driver to manually remove their registration from the network, but still keep the driver's key functionality enabled.
- 2.7.14.10 If a deregistration fails when the driver's key is removed – on reapplication of the key, the radio shall automatically attempt deregistration again.
- GN133 Rationale: This ensures that any registered functionality is cleared from the GSM-R train voice radio so that only the functionality associated with a driver is enabled.
- 2.7.14.11 If 'reg / dereg' is pressed while a function code, for example, PA registered, is present without corresponding lead driver registration, the radio shall deregister the function code before allowing head code entry.
- GN134 Rationale: This ensures that any registered functionality is cleared from the GSM-R train voice radio and that the driver registration sequence correctly determines the required functions.
- 2.7.14.12 If the radio is CT2 registered and the driver's key removed, in an area without GSM-R coverage, then the GSM-R train voice radio shall automatically attempt to deregister when moving back into an area of GSM-R coverage.

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GN135 Rationale: The GSM-R train voice radio shall complete the deregistration process initiated by the driver when the next opportunity arises, that is to say, the next area of GSM-R coverage.

GN136 The Call Type (CT) prefix is used to distinguish between the different types of User Numbers that are allowed within the national EIRENE numbering plan. Refer to EIRENE SRS for the CT field formats.

2.7.14.13 If power is removed and reapplied to a CT2 registered GSM-R train voice radio, then, on power-up, the cab radio shall interrogate the network to identify if the previously registered CT2 number(s) are still valid. If still valid, the GSM-R train voice radio shall re-display the train number in the same format as it was displayed prior to the power being removed.

GN137 Rationale: If the power to the GSM-R train voice radio is restored, it attempts to re-establish a previously valid 'driver's key' registration, thus saving re-registration time.

2.7.14.14 There shall be a means to have a bulk deregistration facility, which shall be configurable to have an 'on' state and an 'off' state as a maintenance function.

GN138 Rationale: This provides a time-saving facility for any train crew to deregister the GSM-R train voice radio without the need to have the presence of the crew member who registered.

2.7.14.15 Where an on-train bus is connected to the GSM-R train voice radio, deregistration of functional numbers can be performed on an individual basis by any registered user (including the driver) by one action for all users, when the train number is no longer associated with the train.

GN139 Rationale: This provides a time-saving facility for any train crew to deregister all GSM-R train voice radio(s) user functions on a train at the end of the journey at the same time.

2.8 Telephone number directories

2.8.1 General characteristics

2.8.1.1 The GSM-R train voice radio shall support two independent telephone number directories, known as the 'menu accessed' directory and the 'button accessed' directory respectively. The attributes of each shall be as set out in Table 1.

Directory type	Minimum capacity	Data stored	Identity presentation
Menu accessed	1200 numbers	National and international numbers: CT7 eMLPP call priority	Alphanumeric text and symbols
Button accessed	240 numbers	National and international numbers: CT7, CT8, CT9, CT0	Alphanumeric text and symbols

Table 1 Main attributes of the telephone directories

GN140 Rationale: The Operational Concept: Section 4.3.3 Telephone book Dialling

GN141 The 'menu accessed directory' would be typically used if the driver needs to contact a particular signaller when the train is not journey registered. The 'button accessed directory' represents a set of individual train operating company preferred numbers for general operational applications, although this might also include numbers of frequently contacted signallers.

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- 2.8.1.2 The GSM-R train voice radio shall support changes and additions to the contents of the telephone number directories by means of a secure maintenance interface, as set out in 2.10.11.1.

GN142 Rationale: Changes to telephone directories should be controlled in order to avoid the possibility of calling invalid numbers.

- 2.8.1.3 When a call connects, the GSM-R train voice radio shall give preference to the textual name of the connected fixed terminal by decoding the UUS information element.

GN143 Rationale: Preference is given to displaying the most meaningful name of a caller, where possible, which may not be simply a telephone number.

- 2.8.1.4 GSM-R train voice radios shall only have telephone directories updated when they are unregistered and not being used to make a call.

GN144 Rationale: Changes to telephone directories should be controlled, in order to avoid the possibility of calling invalid numbers.

2.8.2 User access to telephone directories

- 2.8.2.1 One telephone directory shall be accessible to the GSM-R train voice radio user via a single button press on the DMI; the other shall be accessible via the menu facility.

GN145 Rationale: The most frequently used directory can be quickly accessed by use of the single button, and the other directory can be searched through the menu option.

- 2.8.2.2 The allocation of the directory access method shall be configurable as a maintenance function.

GN146 Rationale: The Operational Concept: Section 4.3.3.3 Access to the directories.

GN147 The assignment of the particular directory to the menu and button is set out in 2.8.1.1.

- 2.8.2.3 It shall not be possible for the GSM-R train voice radio user to modify, via the driver's DMI, data stored within either directory.

GN148 Rationale: Directory data cannot be modified by users; this maintains the integrity of the telephone numbers.

2.8.3 Manual number searching

- 2.8.3.1 The DMI shall provide an alphanumeric interface, for the purposes of allowing the GSM-R train voice radio user to search the telephone directories by direct manual entry of letters.

GN149 Rationale: This provides an easy search method for drivers.

- 2.8.3.2 The DMI shall allow the GSM-R train voice radio user to perform a search of the identity fields of either directory by means of manual entry of up to three characters or more.

GN150 Rationale: Up to three characters should distinguish or at least reduce the search list.

- 2.8.3.3 The DMI shall display an ordered list of identities (based on the order stored in the phonebook and not necessarily alphabetically).

GN151 Rationale: The telephone numbers can be listed in order of most frequent use.

- 2.8.3.4 The GSM-R train voice radio user shall be able to scroll up or down through the ordered list to search for the required identity.

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GN152 Rationale: As all the predicted numbers may be too long to fit on the screen a scroll facility is provided.

2.8.3.5 The DMI facilities shall enable the GSM-R train voice radio user to find any number from either directory within 10 seconds from the default screen condition, for at least 90% of cases.

GN153 Rationale: A performance indicator within which time the driver should reasonably be expected to find the telephone number without causing any operational impact.

2.8.4 Handling of directory data by the GSM-R train voice radio

2.8.4.1 Calls made from the menu accessed directory shall be established at the eMLPP call priority defined within the directory for the particular identity selected.

GN154 Rationale: The Operational Concept: Section 4.5 Call Priorities.

2.8.4.2 If the textual name of the connected fixed terminal is not present in the UUS information element of the call, the GSM-R train voice radio shall:

- a) Utilise the data stored within the phone directories, in order to display on the DMI the identity of the connected subscriber for all incoming PTP voice calls and for certain specified predefined text messages.
- b) Use the identity listed in the menu accessed directory for all outgoing PTP voice calls.

GN155 Rationale: To aid the driver to identify callers easily, drivers should always be provided with the most relevant caller identity information.

GN156 Requirements for the display of called and calling party identities are set out in Part 3.

2.8.4.3 When undertaking a data search, the GSM-R train voice radio shall interrogate and use the contents of the menu accessed directory. If the required data cannot be found, then the GSM-R train voice radio shall interrogate and use the contents of the button accessed directory.

GN157 Rationale: The GSM-R train voice radio searches the menu accessed directory, which data is subject to national configuration control processes and is more likely to contain the signaller contacts, before moving on to search the button accessed directory.

2.8.4.4 The presentation of data extracted from the directory shall be achieved within three seconds from the initiation of the search task.

GN158 Rationale: A performance indicator within which time the driver should reasonably be expected to find the telephone number without causing any operational impact.

2.8.4.5 The GSM-R train voice radio shall store data in the order in which it has been loaded, with no additional sorting.

GN159 Rationale: The data is pre-sorted to avoid processing delays in the GSM-R train voice radio.

2.9 International Phonebook (IP): home GB network and non-GB network

2.9.1 Home GB network – incoming calls

2.9.1.1 The GSM-R train voice radio shall disregard the priority prefix and any breakout code (for example, 90X) where present, and compare the remaining dial string with the phonebook entries.

GN160 Rationale: To enable the received functional number to be matched to a text entry in the phonebook.

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- 2.9.1.2 If the number in the Caller Line Identification Presentation (CLIP) of the incoming call is to be used because UUIE is not present, then this received number shall be presented to the GSM-R train voice radio in an E.164 (International Telecommunication Union Telephone Standardisation Sector (ITU-T) directory) compliant format.

GN161 Rationale: If the UUIE is not present, then, through the use of CLIP, this provides an alternative means of receiving numbers in an internationally recognised format, where the GSM-R train voice radio will still have the opportunity to match the functional code of the caller.

GN162 The incoming call may be presented with tag09 enhanced Presentation of Functional Number (ePFN) in addition to tag05 Presentation of Functional Number (PFN) in which case the ePFN text should be displayed and the PFN value ignored.

2.9.2 Home GB network – outgoing calls stored in the phonebook

- 2.9.2.1 Numbers in the phonebook shall be dialled as stored. Stored numbers shall include 900 + IC + CT + UIN + FC or full E.164 (ITU-T directory), which may or may not have a breakout prefix (for example, 908). A call priority indicator shall be required as part of the stored number.

GN163 Rationale: This presents a complete description of the complete outgoing call format for standardisation purposes across Europe.

2.9.3 Home GB network – outgoing free dialled calls

- 2.9.3.1 When free dialling, the phonebook lookup performed on the SIM phonebook, and the extended phonebook, shall only be performed on the initial outgoing set-up phase.

GN164 Rationale: This prevents possible aliasing (associating to a duplicate number) on other non-GB networks when a country code is not available, regardless of whether the driver enters the country code.

GN165 The phonebook lookup is determined by comparing the Mobile Country Code (MCC) of the current network to that of the home GB network as defined on the SIM card, which in the case for GB is '234'.

- 2.9.3.2 For the purposes of phonebook lookup, the GSM-R train voice radio shall compare the dialled number against the last number of dialled digits of the phonebook numbers only. When received, the connected party information in the order UUIE, then CLI (Caller Line Identification), shall be used in preference to any outgoing dial information.

GN166 Rationale: UUIE connected party information is displayed in preference to dialled number information, because numbers stored in the phonebook are controlled and will be associated with the correct functional identity. If UUIE does not contain the connected party information, then CLI is used.

2.9.4 Home GB network – return call from a contact signaller or contact Fixed Terminal (FT) message

- 2.9.4.1 Where a user returns a call from a received contact signaller or contact FT User-to-User Signalling (UUS) message, the GSM-R train voice radio shall extract the functional number from the UUIE, and shall prefix '900' to the dialled number.

GN167 Rationale: This process enables the GSM-R train voice radio to extract the number to be called, identified from information associated with the received message, and prepare the number ready for the driver to return a call.