IRS
Irish Railway Standards

Irish Railway Standard IRS-202-A

GSM-R Voice Cab Radio – requirements for IE (Republic of Ireland) rail network

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1. Foreword

1.1. This Irish Railway Standard:

i. cannot replace any Technical Standard for Interoperability (TSI) or other legal requirements which may be applicable to a given project;
ii. is recommended to be chosen in accordance with RFU-STR-088 as an Alternative Solution in conjunction with a TSI Parameter to demonstrate conformity with the Essential Requirements;
iii. may be called up as a code of practice in conjunction with CSM-REA 352/2009 and 402/2013;
iv. may be called up as good industry practice in conjunction with Railway Safety Act 2005;
v. may be called up as a code of practice in conjunction with the safe integration of projects within the Railway System in the Republic of Ireland as defined under 2008/57/EC Art15 or 2016/797 (EU) Art 18;
vi. may in parts or in full be called up as a National Technical Rule (NTR) for the Republic of Ireland in conjunction with 2008/57/EC or 2016/797 (EU).

1.2. Where this document is called up as an NTR, the reason for its application shall be identified in line with EU 2016/797 Art 13(2):

i. where the TSIs do not cover, or do not fully cover, certain aspects corresponding to the essential requirements, including open points as referred to in 2016/797 Article 4(6);
ii. where non-application of one or more TSIs, or parts of them, has been notified under 2016/797 Article 7 or 2008/57/EC Art9 or Art20;
iii. where a specific case requires the application of technical rules not included in the relevant TSI;
iv. national rules used to specify existing systems, limited to the aim of assessing technical compatibility of the vehicle with the network;
v. networks and vehicles not covered by TSIs;
vi. as an urgent temporary preventive measure, in particular following an accident.

1.3. Terms in this standard:

No term in this standard is intended to be gender specific. If only the female or male form is used, it shall mean both.

2. Scope and Application

2.1. Scope

2.1.1. IE has a specific case to use alphanumeric Train Running Numbers (TRN). Furthermore, the TSI permits network specific options and parametrisation to be implemented for GSM-R.

2.1.2. This document sets out the requirements for Global System for Mobile communications – Railway (GSM-R) train voice Cab Radios for use on the rail network in the Republic of Ireland. Specifically, this document outlines:

- Interface requirements between the Cab Radio and train systems;
- Technical interface requirements for the Cab Radio with the IE GSM-R Fixed Infrastructure;
- Operational interface requirements between the Infrastructure Manager (IM) and Railway Undertakings (RUs) in IE.

2.1.3. This document excludes requirements for GSM-R shunting radios and other GSM-R hand held radios. It excludes use of GSM-R as a data bearer, for example for the European Train Control System (ETCS).

2.1.4. The requirements for hand held GSM-R radios have not currently been defined. A future version of this IRS may define this.

2.2. Application – Infrastructure Managers

2.2.1. The requirements of this document apply to all equipment used for the application of GSM-R voice radio systems from the general compliance date.

2.2.2. Details of the limits of GSM-R coverage provided by an Infrastructure Manager shall be set out in the IM Network Statement.

2.3. Application – Railway Undertakings

2.3.1. The requirements of this document apply to all equipment used for the application of GSM-R voice radio systems from the general compliance date.

2.4. General Compliance Date

2.4.1. This Irish Railway Standard comes into force and is to be complied with for all new authorisations from the date of issue.

2.5. Compliance dates for future changes of requirements

2.5.1. Based on the ongoing development of technology, technical or operational needs, necessary corrections or updates, it is envisaged that either:

- the requirements in this IRS, or
- the IM GSM-R network characteristics or parameters as defined in an IM Network Statement.

will from time to time be updated.

2.5.2. Unless in cases mentioned in section 1.2.vi, any new requirements of a future version of this IRS or relevant updates to an IM Network Statement shall be advised to RUs in advance to allow for continued compliance with these requirements from a specified date by giving 9 months notice. This timeframe may be reduced to a more suitable and sufficient timeframe where 9 months are not considered necessary.

2.6. NTR Provisions

2.6.1. The following table identifies all sections of this IRS which are proposed as Irish NTRs. The rationale is identified in line with section i.

2.6.2. In each case the conformity assessment of an Irish NTR shall be performed by an IE recognised DeBo employing the Modules stated. The assessment Modules are defined in 2010/713/EC. In this regard, the term NoBo (as used in 2010/713/EC) shall be understood to mean DeBo and references to TSIs shall be understood to mean references to Irish NTRs.

Table 1 - NTR Provisions

Section	**Rationale (as defined in section 1.2)**		**Module to 2010/713/EC**
6	Absence of TSI requirements	i	CCO (on-board equipment): (SB+SD) or (SB+SF) or (SH1) CCT (trackside equipment): (SB+SD) or (SB+SF) or (SG) or (SH1)
	Non-application of TSIs	ii	
	Specific Case requires NTR	iii	
	Technical Compatibility between on-board and trackside equipment	iv	
	Networks/ vehicles not covered by TSIs	v	

3. Normative References

EIRENE FRS	UIC project European Integrated Railway Radio Enhanced Network Functional Requirements Specification, version 7.0.
EIRENE SRS	UIC project European Integrated Railway Radio Enhanced Network System Requirements Specification, version 15.3.
ETSI TS 102 610 v1.3.0	Usage of the User to User Information Element for GSM Operation on Railways.
402/2013	Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009. This shall include all amendments.

For information only:

RFU-STR-088	Recommendation for Use: Scope of Assessment Requirements for Conformity Assessment by NoBos.
EN 50129:2018	Railway applications - Communication, signalling and processing systems - Safety related electronic systems for signalling.

4. Terms and Definitions

Access Matrix	A network system file that sets permission for connectivity between various users.
Cab Radio	The fixed radio and associated user interface and other interfaces installed in the driving cab for transmission of ground to train radio communication. This has to be distinguished from hand held radios used for any other radio communication.
Controller	Individual at a fixed location responsible for the conduct and co-ordination of some aspect of train operations.
Electrical Control Operator	A Controller responsible for the management of the electrical traction power supply.
Fixed Infrastructure	A term to describe the fixed ground based GSM-R network, including the BSS, NSS and Fixed Terminal Subsystem (FTS).
Fixed Terminal Subsystem	The Fixed Terminal Subsystem provides access to the GSM-R network via controller equipment, in general referred to as Fixed Terminals.
Instruction	A term used in this standard for pre-defined operational information messages used in IE, exchanged between the FTS and the Cab Radio using UUIE.

Regulator	A Controller who has responsibility for the scheduling of trains and the 'flow' of trains over the network.
Signalman	A Controller responsible for the control and safe running of trains on a designated area of track.
Train Number	Term used in TSI and EIRENE for the number given to a train by operational staff.
Train Running Number	Term used in IE for the Alphanumeric code given to a train by operational staff as used in IE.

5. Symbols and Abbreviated Terms

BSS	Base Station Sub-System
CCO	Command Control Onboard
CCT	Command Control Trackside
CN	Coach Number
CR	Cab Radio
CT	Call Type
DeBo	Designated Body
DSD	Driver Safety Device
ECO	Electrical Control Operator
ECP	Emergency Control Panel
EIRENE	European Integrated Railway radio Enhanced Network
eLDA	enhanced Location Dependant Addressing
eMLPP	Enhanced Multi-Level Precedence and Pre-emption
EN	Engine Number
ePFN	enhanced Presentation of Functional Numbering
ETCS	European Train Control System
ETSI	European Telecommunications Standards Institute
FC	Function Code
FRS	EIRENE Functional Requirements Specification
FTS	Fixed Terminal Subsystem
GPS	Global Positioning System
GSM	Global System for Mobile Communications

GSM-R	Global System for Mobile Communications – Railways
IE	Country Code for Republic of Ireland
IM	Infrastructure Manager
JRU	Juridical Recorder Unit
LDA	Location Dependant Addressing
MCB	Miniature Circuit Breaker
MMI	Man Machine Interface
Module	Refer to 2010/713/EC
NoBo	Notified Body
NSS	Network Switching Subsystem
NTR	National Technical Rule
OPH	Operational Purpose Handheld
OPS	Operational Purpose Handheld Shunting
OTA	Over the Air
SIM	Subscriber Identity Module
SMS	Short Message Service
SRS	EIRENE System Requirements Specification
TLV	Tag Length Value
TRN	Train Running Number
TSI OPE	TSI for the functional subsystem Operations
UIC	International Union of Railways
UUIE	User-to-User Information Element
UUS1	User-User Signalling service no. 1

6. Requirements

6.1. Applicable Standards

6.1.1. The following standards and requirements shall apply to both the GSM-R Fixed Infrastructure (CCT) and the Cab Radio (CCO), as appropriate, to ensure overall end-to-end compliance with these requirements:

6.1.1.1. The standards referenced in Section 0;

6.1.1.2. EIRENE FRS v7.0 and EIRENE SRS v15.3 (or later versions, if these are backward compatible with the required versions) with following specifications:

- All EIRENE Mandatory features (M);
- All EIRENE Optional features (O) selected for the GSM-R network in IE as specified in Section 6.2 and listed in Table 2;

6.1.1.3. All IE specific requirements (separately specified in this IRS).

6.1.2. The GSM- R network coverage shall be in accordance with EIRENE SRS v15.3 Section 3.2.2, i.e., for 'voice and non-critical data'. Suitable operating rules shall be established by the IM for the use of the network for the communication of safety critical information (via voice or Predefined Information Messages) in accordance with the Railway Safety Directive and TSI OPE.

6.2. EIRENE Optional features (O) selected for IE network

6.2.1. Table 2 defines the optional features which are required for the IE network implementation. The right-hand column of the table is for noting only and indicates whether the feature is required for the current implementation of GSM-R or whether it is required to support future applications on the IE network.

6.2.2. The GSM-R Fixed Infrastructure and the Cab Radios, as appropriate, shall realise all of the current feature requirements specified (Yes), and also be capable of supporting the remaining features specified (Yes, for future use).

Table 2 - Selected EIRENE Optional Features

EIRENE IE Options Features		FRS	SRS	Description of Feature	Note: Current Requirements
1	Short Message Service	2.3.1 - 2.3.3	2.2.1	SMS Message	Yes (for future use)
2	Other Data transmission	2.3.1	2.3.1	Data bearer services for vehicle management and other on-board applications	Yes (for future use)
3	Call forwarding	2.4.12	2.4.1	To implement call forwarding to driver hand-portable automatically/signaller booked off	Yes (for future use)
4	Operating Plan	3.5.4	3.3	Optimising the handover and avoiding excessive cell overlap in order to ensure best performance from LDA	Yes
5	Data applications	4.2.2	2.3.1	Data bearer services for vehicle management and other on-board applications	Yes (for future use)
6	Call related services	4.2.3	2.3.2	GSM supplementary services to support on board closed user groups	Yes (for future use)
7	EIRENE features	4.2.4	7.3.4 / Section 11	OPH calls to signaller using LDA	Yes (for future use)
8	EIRENE features	4.2.4	7.3.9 / Section 1	Shunting Mode in OPH	Yes (for future use)

EIRENE IE Options Features		FRS	SRS	Description of Feature	Note: Current Requirements
9	Driver related functions	5.2.3.1 / 5.2.3.6	5.4.1	Self-test failures to be recorded on the JRU (event recorder)	Yes (for future use)
10	Driver related functions	5.2.3.8	5.4	Retention of Cab Radio configuration following power interruptions - timer settings	Yes
11	Network Selection	5.2.3.25vi	5.6.3	Cab Radio shall be directed to the IE GSM-R network whatever other GSM networks are available	Yes
12	Driver related functions	5.2.3.36	5.4.10 / 5.4.11	Driver control shall be enabled for registering / deregistering on-train functions linked to the Cab Radio	Yes
13	Driver related functions	5.2.3.42	2.4.1	Use of GSM supplementary service to reach driver hand held unit when the driver leaves the cab, e.g. to inspect train	Yes (for future use)
14	Handling of call priorities	5.2.4.8	5.5.2	Indication to pre-empted party	Yes
15	Run time diagnostics	5.2.4.10 / 5.2.4.12	5.7.22	Cab Radio system test on demand	Yes (for future use)
16	Driver Safety Device (DSD) Alarm	5.7.1	5.8	Activation of the DSD shall trigger a message to the controlling signaller	Yes
17	GPH functional requirements	6.2.1.2	6.2.2	E-SRS specifies a standard data interface as (M)	Yes (for future use)
18	Environmental and physical requirements	6.3.3 - 6.3.6	6.4	Requirement for ease and security of use and weight limits vs battery life.	Yes
19	Controls	6.4.2.1/2	6.3	General requirements for use of GPH	Yes
20	OPH functions	7.2.1.2 / 7.2.2.25	7.3.9	OPH variant shall be equipped for shunting mode (OPS)	Yes
21	Call Controllers - ECRs	7.2.2.2	Section 8	The power supply controller shall have separate terminal. There is no specific SRS entry for ECO terminals	Yes
22	Controller Equipment Specifications	8.2.2	Section 8	All voice calls and information messages involving drivers or Signalman shall be recorded by the FTS and/or external voice recording system.	Yes
23	Subscriber Management	10.3.1	10.3	Access Classes and the Access Matrix shall be used to provide restrictions	Yes
24	Subscriber Management	11.3.2.2.i	11.3.6	SRS requirement is (M) to prevent some types of user from registering functional numbers (TRNs, drivers of trains, shunting team leader)	Yes
25	Enhanced Location Dependent Addressing	11.4.7	11.7.4 - 11.7.6	eLDA, using GPS, shall be provided	Yes
26	Definition of Text Service (see also 2.3.1 - 2.3.3)	12.2	12.2	Where implemented the service shall be based on GSM SMS	Yes (for future use)
27	Shunting Mode	14.2.13	Section 14	Shunting mode requirements shall be defined, when necessary, in a future version of this standard.	Yes (for future use)

6.3. IE Specific Requirements

6.3.1. IE Train Running Numbers (TRN)

6.3.1.1. Train Running Numbers used on the IE rail network consist of one alpha character and one to five digits, e.g. A123. This is a Specific Case according to TSI OPE 2019/773 sections 7.2.2.3 in combination with 4.2.3.2.1.

6.3.1.2. Cab Radios for use in the IE GSM-R network shall accept the input of IE train running numbers entered for registration in alphanumeric format and translate them to numeric values as defined in Section 6.3.1.5.

6.3.1.3. The Cab Radio MMI shall display the TRN in its original alphanumeric format.

6.3.1.4. In GSM-R the Train Function Number consists of a Train Number and a Function Code (according to section 9.5.3 and 9.5.2 of the EIRENE SRS v15.3) and is a CT2 Functional Number. Within the IE GSM-R System, the full range of CT2 numbers as specified in the EIRENE SRS v15.3 shall be supported.

6.3.1.5. The IE TRN shall be encoded in the GSM-R system (i.e., in the Cab Radio and FTS) within the numeric Train Number of a CT2 number as follows:

- The first three digits of the numeric Train Number represent the first character of the Alphanumeric Train Running Number which is coded as defined in Table 3, the remaining digits are appended.
- If the resulting numeric Train Number has less than 5 digits (i.e. one character plus one digit) padding with leading zeros according to the EIRENE SRS shall apply.
- A specific algorithm shall be used for 5 digit numeric part of Train Running Numbers when translated from/to the Train Number. This is necessary as EIRENE ignores leading "0" digit on Train Numbers with 5 digits length as they are just used as a filler. In order to avoid ambiguous situations, the following rules shall apply:
  - An Alphanumeric Train Running Number with the first character "A" must have a numeric part of at least 3 digits to be clearly identified. Only this allows a clear identification of the corresponding code "099" used for the prefix "A".
  - All other prefix characters support a numeric part of at least 1 digit.

6.3.1.6. Example: National Functional Number 2 099101 01 means:

- Call Type 2;
- Alphanumeric Train Number A101;
- Driver 1.

Table 3 - Character to digits mapping

Prefix	digits	Prefix	digits	Prefix	digits
A	099	J	909	S	990
B	199	K	919	T	991
C	299	L	929	U	992
D	399	M	939	V	993
E	499	N	949	W	994
F	599	O	959	X	995
G	699	P	969	Y	996
H	799	Q	979	Z	997
I	899	R	989		

6.3.1.7. In case of a CT2 functional number which contains a 6 to 8 digit converted Train Running Number which does not match the encoding listed in Table 3 above, any system and Controller terminal shall not reject such a functional number but handle and display it without decoding / conversion.

6.3.2. IE GSM-R Network Call Priority - eMLPP

6.3.2.1. Table 4 defines the call priorities for use in the IE GSM-R network:

- 0 is the highest priority;
- Priority 4 is reserved for possible future use.

Table 4 - Network Call Priorities

Call Priorities	
Priority	**GSM-R Call type**
0	Railway Emergency Call (REC)
1	GSM-R Data Instructions (Danger Stop, Hot Box)
2	GSM-R Voice Broadcast Call (VBC)
	GSM-R Voice Group Call (VGC)
3	GSM-R Instructions (Voice Call & Data)
	GSM-R Voice Point-to-Point call
4	Reserved

6.3.3. IE GSM-R Network Function Codes and Short Codes

6.3.3.1. The Call Type (CT) prefix consists of 1 or 2 digits and it defines how to interpret the User Number that follows (refer to the SRS). The following tables define the Function Code (FC) designations for the required Call Types as applied in the IE IM GSM-R network.

6.3.3.2. Call Type 1 (CT1) designates that the User Number is a Short Code; the codes are listed below (see Table 5).

Table 5 - Call Type 1 Short Codes

Short Codes	FC destination
1200	Signalman
1300	Regulator
1400	ECO
1500	ECP Extn (this role is a role which can take complete control of a specific Line Section thereby removing operational control from the Signalman)
1600	ECP Basic (this role is a role that shares access to the radio network over a specific Line Section
1700 (reserved for the DSD alarm))	Signalman
1800 (reserved for the Network Loading functionality from the Cab Radio, which is routed to the maintainer)	Network Loading
1900	Instruction

6.3.3.3. Call Type 2 (CT2) designates that the User Number is the Function Number (i.e. TRN + FC) (see Table 6).

Table 6 - Call Type 2 Function Codes

CT2 Function Codes	FC designation
01	Driver 1 (to be used for the Cab Radio)
02	Driver 2
07	Intercom
08	PA
10	Conductor
20	Catering
30	Security
99	Instruction

6.3.3.4. Call Type 3 (CT3) designates that the User Number is the Engine Function Number (i.e. EN + FC) (see Table 7).

Table 7 - Call Type 3 Function Codes

CT3 Function Codes	FC designation
01	Driver 1
02	Driver 2
07	Intercom
08	PA
50	Train-borne Recorder

6.3.3.5. Call Type 4 (CT4) designates that the User Number is the Coach Number (i.e. CN + FC) (see Table 8).

Table 8 - Call Type 4 Function Codes

CT4 Function Codes	FC designation
52	Train data bus
60	Pre-recorded passenger info
61	Displayed Passenger Info. Unit

6.3.3.6. Call Type 7 (CT7) designates that the User Number is a Train Controller (see Table 9).

Table 9 - Call Type 7 Function Codes

CT7 Function Codes	FC designation
01	Signalman
02	Regulator
03	ECO
11	District Manager
12	Level Crossing Controller
14	Telecom's Maintenance
15	ECP_Extn
16	ECP_Basic
99	Instruction

6.3.4. Pre-defined Information Messages

6.3.4.1. There are a number of predefined information messages required to be exchanged between the FTS and the Cab Radio. These messages are referred to as Instructions to maintain operational compatibility with legacy train radio system and procedures. These Instructions are divided into:

- Voice Call Instructions
- Data Instructions

6.3.4.2. Instructions are exchanged between FTS and GSM-R Cab Radio using UUS1.

6.3.4.3. A voice call instruction sent from the Cab Radio to the FTS is displayed in the Active Call Queue of the FTS and when selected will initiate a voice call to the Cab Radio. A data Instruction will be displayed in the message display of the FTS.

6.3.4.4. The FTS shall have the ability to route the incoming voice calls by function code and Instruction to the appropriate FTS Controller.

6.3.4.5. The UUIE carrying an Instruction shall include the functional number identification of the transmitter.

6.3.4.6. The Cab Radio shall send call SETUP messages carrying either a Voice Call Instruction or a Data Instruction to short code destination address ("called party number") 1900. The GSM-R network translates this short code to the destination address CT 7<area number>99 (i.e. the called function code shall be 99).

6.3.4.7. Voice Call Instructions will reach the CONNECT status for voice communication.

6.3.4.8. Data Instructions are released in Alerting state.

6.3.4.9. Successful transmission of a Data Instruction shall be signalled with Release Clause No. 17 – User busy in the call DISCONNECT message of the same call flow.

6.3.5. Voice Call Instructions

6.3.5.1. Information for Voice Call Instructions are provided in the UUIE of a call SETUP message within the establishment message flow of a voice call.

6.3.5.2. The Voice Call Instruction record uses the tag 10 (0xA) “Plain Text” with Alphabetic Indicator set to 247 (0xF7).

6.3.5.3. The Voice Call Instruction record follows the functional number part in an UUIE.

6.3.5.4. The type of a Voice Call Instruction is coded in one octet of the Plain Text information field.

6.3.5.5. Voice Call Instructions are sent with default voice call priority, which is priority 3.

6.3.5.6. The Voice Call Instructions are coded as shown in the example listed in Table 10.

Table 10 - Extended UUIE Format for Voice Instructions (tag 10)

B8	b7	b6	b5	b4	b3	b2	b1	
0	1	1	1	1	1	1	0	
user to user information element identifier								Octet 1
length of user to user contents								Octet 2
0	0	0	0	0	0	0	0	
Protocol discriminator – user specific protocol								Octet 3
0	0	0	0	0	1	0	1	
Tag representing Presentation of Functional Number =5								Octet 4
0	0	0	0	0	1	1	0	
Functional number length =6 (in octets)								Octet 5
0	1	0	1	0	0	1	1	
BCD coded FN digit #2 =5				BCD coded FN digit #1 =3				Octet 6
0	0	1	0	0	0	1	1	
BCD coded FN digit #4 =2				BCD coded FN digit #3 =3				Octet 7
1	0	0	1	1	0	0	1	
BCD coded FN digit #6 =9				BCD coded FN digit #5 =9				Octet 8
0	1	0	0	0	0	1	0	
BCD coded FN digit #8 =4				BCD coded FN digit #7 =2				Octet 9
0	1	0	0	0	0	1	0	
BCD coded FN digit #10 =4				BCD coded FN digit #9 =2				Octet 10
0	0	0	1	0	0	0	0	
BCD coded FN digit #12 =1				BCD coded FN digit #11 =0				Octet 11
0	0	0	0	1	0	1	0	
Tag representing Plain Text = 10								Octet 12
0	0	0	0	0	0	1	0	
Plain text length								Octet 13
Alphabetic Indicator =0xf7 (Class 3, 8 bit data)								Octet 14
Instruction Number (see Table 11)								Octet 15

6.3.5.7. The configuration of Voice Call Instructions within the FTS is shown in Table 11. The FTS allows any modification to the Instruction Number and the corresponding message text.

6.3.5.8. The Cab Radio shall display the voice call Instructions message in a text format as shown in Table 11.

Table 11 - Configuration of Voice Call Instructions

Instruction Number (hex)	Message	Direction
02	Obstruction on line	from Cab Radio to FTS
03	Driver to Operator 3	from Cab Radio to FTS
04	Driver to ECP	from Cab Radio to FTS
05	Driver to Operator 1	from Cab Radio to FTS
08	Driver	from Cab Radio to FTS
09	Security alert	from Cab Radio to FTS
0B	Driver to Operator 4	from Cab Radio to FTS
0C	Regulator	from Cab Radio to FTS
0D	Driver to Operator 2	from Cab Radio to FTS

6.3.5.9. In case of present eLDA, a similar order of data, as for the DSD alarm, should be used, i.e., Tag 05 “Presentation of Functional Number” followed by Tag 06 “eLDA Train Position” and finally Tag 10 “Voice Call Instruction”.

6.3.6. Data Instructions

6.3.6.1. Information for Data Instructions are provided in in the UUIE of a call SETUP message while the establishment message flow of a voice call.

6.3.6.2. The Data Instruction record uses the tag 145 (0x91).

6.3.6.3. The Data Instruction record follows the functional number part in an UUIE.

6.3.6.4. The type of a Data Instruction type is coded in one octet of the Data Instruction record.

6.3.6.5. The action required for a Data Instruction is coded in a sub-tag of the Data Instruction Record. This sub-tag is always be set to 0 (“deliver”).

6.3.6.6. Data Instructions shall be sent with the priority indicated in Table 4. Instruction no. 4 (Hot Box) and Instruction no. 09 (Danger Stop) shall be sent with Priority 1, while other data instructions shall be sent with Priority 3.

6.3.6.7. The Data Instructions are coded as shown in the example listed in Table 12.

Table 12 - Extended UUIE Format for Data Instructions (tag 145)

B8	b7	b6	b5	b4	b3	b2	b1	
0	1	1	1	1	1	1	0	
user to user information element identifier								Octet 1
length of user to user contents								Octet 2
0	0	0	0	0	0	0	0	
Protocol discriminator – user specific protocol								Octet 3
0	0	0	0	0	1	0	1	
Tag representing Presentation of Functional Number =5								
0	0	0	0	0	1	1	0	
Functional number length =6 (in octets)								
0	1	0	1	0	0	1	1	
BCD coded FN digit #2 =5				BCD coded FN digit #1 =3				
0	0	1	0	0	0	1	1	
BCD coded FN digit #4 =2				BCD coded FN digit #3 =3				
1	0	0	1	1	0	0	1	
BCD coded FN digit #6 =9				BCD coded FN digit #5 =9				
0	1	0	0	0	0	1	0	
BCD coded FN digit #8 =4				BCD coded FN digit #7 =2				
0	1	0	0	0	0	1	0	
BCD coded FN digit #10 =4				BCD coded FN digit #9 =2				
0	0	0	1	0	0	0	0	
BCD coded FN digit #12 =1				BCD coded FN digit #11 =0				
1	0	0	1	0	0	0	1	
Tag indicating Data Instruction =145								Octet 12
0	0	0	0	0	0	1	1	
Length of Data Instruction								Octet 13
Sub Tag =0 (Deliver)								Octet 14
Instruction number (see Table 13)								Octet 15
Sequence Number								Octet 16

6.3.6.8. The Instruction Number is the number sent in the UUS1 information field. Table 13 lists the assigned numbers.

6.3.6.9. The sequence number is used for FTS internal correlation of messages. The number must be increased by 1 when a message was sent successfully. There is no requirement for a specific starting value after power on of the terminal. After the value 255, the value should restart by 0.

6.3.6.10. The Cab Radio shall display the data Instructions message in a text format as shown in Table 13.

Table 13 - List of Instruction Numbers

Instruction Number (hex)	Message	Direction	Priority
01	Running release	from Cab Radio to FTS	3
06	Ready to start**	from Cab Radio to FTS	3
07	Reserved message C	from Cab Radio to FTS	3
0A	Acknowledge	from Cab Radio to FTS	3
0E	By-pass	from Cab Radio to FTS	3
01	Instru no.7	from FTS to Cab Radio	3
02	Stop at nxt sig	from FTS to Cab Radio	3
03	Resv msg C	from FTS to Cab Radio	3
04	Hot box	from FTS to Cab Radio	1
05	Resv msg A	from FTS to Cab Radio	3
06	Instru no.5	from FTS to Cab Radio	3
07	Resv msg E	from FTS to Cab Radio	3
09	Danger Stop	from FTS to Cab Radio	1
0A	Stop at nxt stat	from FTS to Cab Radio	3
0D	Resv msg B	from FTS to Cab Radio	3
0E	Instru no.6	from FTS to Cab Radio	3
0F	Resv msg F	from FTS to Cab Radio	3

All other instructions shall be reserved for future use.

6.3.6.11. In case of present eLDA, a similar order of data, as for the DSD alarm, should be used, i.e. Tag 05 “Presentation of Functional Number” followed by Tag 06 “eLDA Train Position” and finally Tag 145 “Data Instructions”.

6.4. Enhanced Location Dependent Addressing (eLDA)

6.4.1. The Cab Radio shall utilise eLDA in the form of GPS and append location information to all point to point calls and instructions.

6.5. Enhanced presentation of Functional Numbers (ePFN)

6.5.1. The Cab Radio shall utilise ePFN.

6.6. Operational Interface Requirements

The following operational interface requirements shall apply between the IM and RUs in relation to operational compatibility of the Cab Radio with the Fixed Infrastructure.

6.6.1. SIM Card & Subscriber Management

6.6.1.1. SIM cards shall be issued by the IM for use in the GSM-R voice Cab Radio. Only SIM cards issued by the IM shall be used.

6.6.1.2. The RU shall maintain a register of the allocation of SIM cards and request the IM to disable cards when they are no longer required.

6.6.1.3. The RU shall report any misuse of the SIM cards for a purpose for which they are not intended, or have been lost, stolen or damaged to the IM.

6.6.1.4. The connectivity allowed for the GSM-R voice Cab Radio shall be in accordance with the Network Access Matrix as defined by the IM.

6.6.2. Phonebook

6.6.2.1. Note: The IM should maintain a register of phone book entries for the GSM-R Cab Radio.

6.6.2.2. It shall not be possible for the Cab Radio user to modify phone book entries.

6.6.2.3. Note: The RU shall make an application to the IM to modify or add additional entries to the phonebook.

6.6.3. On-Board Train Interfaces

6.6.3.1. A GSM-R voice Cab Radio shall be provided in each driving cab that is required to be used as a driving cab of a train in service.

6.6.3.2. A train fitted with a GSM-R only Cab Radio shall only operate over rail lines where compatible GSM-R Fixed Infrastructure is available, as outlined in the IM Network Statement.

6.6.3.3. The GSM-R Cab Radio shall be equipped with the interfaces as they are defined in EIRENE for interfacing to following on-board systems:

- PA
- JRU
- Passenger intercom
- DSD

6.6.3.4. The Cab Radio shall be connected to the vehicle battery supply via a dedicated MCB and not be subject to any power interruption (e.g., automatic load shedding) while the cab is active.

6.7. Testing

6.7.1. The RU shall, in conjunction with an IM in IE organise compatibility tests with the Fixed Infrastructure to demonstrate and verify that the Cab Radio successfully operates with the Fixed Infrastructure and fulfils the interface requirements as defined in this IRS.

6.7.2. These tests shall include (but not limited to) verification of the following:

- Functioning with IM supplied SIM card
- Voice calls
- Railway Emergency Calls
- Point to point calls
- Predefined Instructions
- Functional Addressing utilising Train Running Number
- eLDA functionality
- ePFN functionality
- Phonebook of IM
- Call priorities
- Dynamic test on representative live Fixed Infrastructure

7. Further Clarification

Further clarification on these guidelines can be sought from the CRR by phone at +353 1 206 8110 or by email info@crr.ie.

8. List of Participants

The participants for each revision of this IRS are shown below.

Table 14 - List of Participants by Revision

Participant Name and Organisation		Involved in IRS-202-A		
Ronan Finlayson	IÉ-IM	✓		
George Keenan	IÉ-IM	✓		
Rinaldo Paolozzi	IÉ-IM	✓		
Barry Kelly	RPSI	✓		
Richard Popplestone	CRR	✓		
Maik Wuttke	CRR	✓		
Michael Neale	CRR	✓		
Mary Molloy	CRR	✓		