Irish Railway Standard IRS-204-A

Requirements for analogue Ground-Train Cab Radio for IE (Republic of Ireland) network based on UIC 751-3 specification

Issue	Published by	Issue Date
A	CRR on behalf of the Irish Railway Industry	14/01/2022

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 Rule (NR) for the Republic of Ireland in conjunction with 2008/57/EC or 2016/797 (EU).

1.2   Where this document is called up as a NR, 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   This document sets out the requirements for analogue cab radios for use on the rail network in the Republic of Ireland. Specifically, the document outlines:
- Interface requirements between the Cab Radio and train systems;
- Interface requirements for the Cab Radio with the Infrastructure Manager (IM) Fixed Analogue Radio Infrastructure;
- Operational requirements between the IM and Railway Undertakings (RUs) in IE.

2.1.2   This document excludes requirements for analogue handheld radios, for example, shunting radios and other handheld radio applications. These may be covered in a future version of this standard.

2.1.3.   *Note for information: The IE-IM network analogue ground-train system is being progressively replaced by GSM-R, however it will remain in service until the complete network has migrated to GSM-R technology. The analogue train radio infrastructure will be fully decommissioned on completion of the migration to GSM-R technology.*

2.2   Application – Infrastructure Managers

2.2.1   The requirements of this document apply to all equipment used for the application of analogue cab radios from the general compliance date.

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

2.2.3   *Note for information: Due to EU legal requirements it is not possible to install Class B radio systems from new to any new infrastructure or any previously non-fitted infrastructure.*

2.3   Application – Railway Undertakings

2.3.1   The requirements of this document apply to all equipment used for the application of analogue cab radios 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   On completion of the deployment of GSM-R infrastructure, the IM will decommission the analogue radio system. At that time it will be required that all RUs operating on the network will have installed a GSM-R cab radio on their vehicles in accordance with Irish Railway Standards IRS-202-B GSM-R Voice Cab Radio – requirements for IE (Republic of Ireland) rail network.

2.5.2   Following decommissioning of the analogue train radio system this standard shall be withdrawn. Advance notice of 6 months shall be given prior to decommissioning. This timeframe may be reduced to a more suitable and sufficient timeframe where 6 months are not considered necessary.

2.6 NR Provisions

2.6.1 The following table identifies all sections of this IRS which are proposed as Irish NRs. The rationale is identified in line with section 1.2.

2.6.2 In each case the assessment of an Irish NR 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 NRs.

Table 1 NR Provisions

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

3   Normative References

RFU-STR-088	Recommendation for Use: Scope of Assessment Requirements for Conformity Assessment by NoBos
2015/1136	Commission Implementing Regulation (EU) 2015/1136 of 13 July 2015 amending Implementing Regulation (EU) No 402/2013 on the common safety method for risk evaluation and assessment
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. As amended by 2015/1136.
UIC 751-3	European Railway Analog Radio System

4   Terms and Definitions

Infrastructure	The IE railway network infrastructure, which comprises power supply system and signalling and telecommunication systems.
Signalling system	The system comprising train-borne and trackside circuits, cables, interlocking and control rooms, etc., for control of signalling.

5   Symbols and Abbreviated Terms

Term	Meaning
CCO	Command Control Onboard
CCT	Command Control Trackside
CRR	Commission for Rail Regulation
CTC	Central Traffic Control
DeBo	Designated Body
ECO	Electric Control Operator
ECP	Emergency Control Point
GSM-R	Global System for Mobile Communications – Railway
IE	Country Code for Republic of Ireland
IM	Infrastructure Management
NoBo	Notified Body
NR	National Rule
PA	Public Address
RU	Railway Undertaking
TRN	Train Running Number
TSI	Technical Specification for Interoperability
UIC	Union Internationale des Chemins de Fer

6   Requirements

6.1   Applicable Standards

6.1.1   The analogue ground-train radio system shall comply with the requirements specified in UIC 751-3, 4th edition, July 2005, with the exceptions/amendments outlined below.

6.1.2   In the following section reference is made to particular sections of the UIC 751-3 standard and the specific requirements are specified where an option selection or deviation from the standard is required.

6.1.3   UIC 751-3 section 1.2.1 modes of operation:

6.1.4   'mode 1' type operation, described in the standard as 'duplex mode' has been adopted by the IM and implemented throughout the Central Traffic Control areas of the rail network. This operating mode is known as 'Mode A' in the IM's terminology.

6.1.5   'mode 2' type operation, described in the standard as 'semi-duplex mode' is not supported.

6.1.6   Two additional modes of operation are in use, namely:

- Mode C – operation on simplex channels described in section 3.10 of UIC 751-3 standard for local communications

- Mode C/A – operation on simplex channels for shunting operations while monitoring activity on Mode A

6.1.7   Note: The normal operating mode is Mode A. Mode C is used for local communications to signal cabins that are outside the area of coverage of the analogue train radio infrastructure. Mode C/A is used for shunting operations providing for monitoring of Mode A activity during the shunting operation.

6.1.7.1   In order to realise Mode C/A, the cab radio shall be equipped with two receivers.

6.1.7.2   In operating Mode A, one receiver shall be on the actual best receiving channel for the group while the second receiver shall always scan for a better channel. Switch over between the receivers shall be 200ms (+/- 20%).

6.1.7.3   In operating Mode C/A, one receiver shall operate on the selected Mode C channel while the other receiver shall operate on Mode A. Scanning for a useable Mode A channel on this receiver shall be triggered when the received signal level falls below a predefined squelch level.

6.1.8   UIC 751-3 section 2.5.1 and 2.5.2 Radiating power: The nominal radiating power on vehicles shall be 10 Watts. The radiating power of lineside stations shall be 10 Watts.

6.1.9   UIC 751-3 section 2.12.1 Quadrifrequency groups:

A duplex channel with a margin of 5.5 MHz shall be utilised with a transposition of the transmit and receive frequencies (refer to frequency chart below).

6.1.10   UIC 751-3 section 2.13.2 Automatic frequency switching of mobile receivers:

Switching criteria '1' is used in operating Mode C/A, while criteria '2' shall be used in operating Mode A.

6.1.11   UIC 751-3 section 3 Frequency chart:

6.1.11.1   The specific frequency allocations and channel numbering utilised on the network in the Republic of Ireland is shown below in Table 1.

6.1.11.2 Four quadruple channels are deployed throughout the network, namely channel Groups 61, 63, 71 and 75. The table depicts the cab radio transmit and receive frequencies in use.

Channel	Receive Frequency MHz	Group	Transmit Frequency MHz
13	456.175		461.675
14	456.200		461.700
15	456.225	61	461.725
16	456.250	71	461.750
17	456.275		461.775
18	456.300		461.800
23	456.325		461.825
24	456.350		461.850
25	456.375	75	461.875
26	456.400	63	461.900
27	456.425		461.925
28	456.450		461.950

Table 1: Cab Radio Transmit & Receive Frequencies

Modulation: Nominal ± 3.0 kHz
                        Max ± 5.0 kHz

Duplex Spacing: Δf 5.5 MHz

Mode C (CTCSS) PL: 210.7 Hz

6.1.11.3   Note: These four channel groups are used for all domestic and international traffic.

6.1.11.4   Lineside marker boards shall be provided to indicate the appropriate operating radio group channel for the area.

6.1.12   UIC 751-3 section 6 Links between tractive unit and RIC coaches

6.1.13   UIC 751-3 section 6 Links between leading unit and RIC coaches – the radio unit fitted on the leading unit shall be capable of providing an interface in accordance with UIC Leaflet 568 'Loudspeaker and telephone systems in RIC coaches' and interface to the coach systems (where provided)UIC 751-3 section 7.2 Transmission mode for telegrams

6.1.13.1   The acknowledgement telegram receipt automatically sent from control points must utilise option '1', i.e., the 'test' telegram.

6.1.14   UIC 751-3 section 7.3 Structure of the telegram and synchronisation:

Four character alphanumeric Train Running Numbers shall be used throughout the network, in the form of a leading alpha character followed by three numeric digits, e.g., A123. It is required that the train driver enters the Train Running Number into the cab radio in this alphanumeric format and that it is displayed on the radio control panel.

6.1.14.1   The fixed infrastructure supports the standard 6 numeric digit format and it is required to translate the entered four character alphanumeric number into the six digit numeric format within the cab radio for transmission over the network, in accordance with Table 2, below:

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		

Table 2: Conversion of leading alpha character to numerics

6.1.14.2   The leading alpha character shall be automatically replaced by its equivalent three digit numeric and prefixed to the remaining three numeric digits for transmission over the network.

- Example: A123 would be translated to 099123

6.1.15   UIC 751-3 section 7.6.1 Messages sent to the train by central control

6.1.15.1   The following fixed messages shall be supported:

Hex	Messages sent to the train by the control centre			
00	"Test"	Code	0000	0000
01	"Instruction No. 7"	Code	0000	0001
02	"Stop at next Signal"	Code	0000	0010
03	"Reserved message C"	Code	0000	0011
04	"Hot Box"	Code	0000	0100
05	"Reserved message A"	Code	0000	0101
06	"Instruction No. 5"	Code	0000	0110
07	"Reserved message E"	Code	0000	0111
08	"Driver" (speech)	Code	0000	1000
09	"Danger Stop"	Code	0000	1001
0A	"Stop at next Station"	Code	0000	1010
0B	unassigned	Code	0000	1011
0C	"PA Announcement"	Code	0000	1100
0D	"Reserved message B"	Code	0000	1101
0E	"Instruction No. 6"	Code	0000	1110
0F	"Reserved message F"	Code	0000	1111

6.1.16   UIC 751-3 section 7.6.2 Messages sent to central control by the train

6.1.16.1   The following fixed messages shall be supported:

Hex	Messages sent to central control by train			
00	"Test"	Code	0000	0000
01	"Running Release"	Code	0000	0001
02	"Obstruction on Line"	Code	0000	0010
03	"Reserved message A"	Code	0000	0011
04	"Driver to ECP"	Code	0000	0100
05	"Driver to Operator 1"	Code	0000	0101
06	"Ready to Start"	Code	0000	0110
07	"Reserved message C"	Code	0000	0111
08	"Driver"	Code	0000	1000
09	"Security Alert"	Code	0000	1001
0A	"Acknowledge"	Code	0000	1010
0B	"Reserved message B"	Code	0000	1011
0C	"Regulator"	Code	0000	1100
0D	"Driver to Operator 2"	Code	0000	1101
0E	"By-pass"	Code	0000	1110
0F	unassigned	Code	0000	1111

6.1.17   UIC 751-3 section 8 Radiotelephone system with simultaneous digital message transmission: This mode of operation is not supported.

6.2   On-Board Train Interfaces

6.2.1   A Cab Radio shall be provided in each driving cab that is required to be used as a driving cab of a train in service.

6.2.2   A train fitted with an analogue Cab Radio shall only operate over rail lines where compatible analogue Fixed Infrastructure is available, as outlined in the IM Network Statement.

6.2.3   The analogue Cab Radio shall be equipped with the interfaces defined in UIC Leaflet 568 'Loudspeaker and telephone systems in RIC coaches'.

6.2.4   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.

6.3   Operating Rules

6.3.1   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.

6.4   Testing

6.4.1   The applicant 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.

6.4.2   The compatibility tests are to be performed for the functions that are installed in accordance with this IRS. The tests may thus include (but not limited to) verification of the following:

- Voice calls
- Emergency Calls
- Point to point calls
- Modes of Operation
- Predefined Messages
- Functional Addressing utilising Train Running Number
- 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 in Table 3.

Table 3 List of Participants by Revision

Participant Name and Organisation		Involved in IRS-204-A		
Ronan Finlayson	IÉ-IM	✓		
George Keenan	IÉ-IM	✓		
Maik Wuttke	CRR	✓		
Mary Molloy	CRR	✓		