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Edition 1.0 2018-10

INTERNATIONAL STANDARD

Radio data system (RDS) – VHF/FM sound broadcasting in the frequency range from 64,0 MHz to 108,0 MHz –
Part 2: Message format: Coding and definitions of RDS features

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International Standard IEC 62106-2 has been prepared by technical area 1: Terminals for audio, video and data services and contents, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This first edition, together with IEC 62106-1, IEC 62106-3, IEC 62106-4, IEC 62106-5 and IEC 62106-6, cancels and replaces IEC 62106:2015, and constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 62106:2015:

- Provision has been made to carry RDS on multiple data-streams (RDS2).
- Data in the additional data-streams is using a newly defined group type C data structure.
- AF coding below 87,6 MHz (down to 64,1 MHz) using ODA-AID 0x6365 (see IEC 62106-6).

- Long PS (UTF-8) support has been added using group type 15A.
- Coding for the following applications is no longer detailed in the RDS standard as these can use in future the ODA concept: EWS, TDC, IH and RP.
- Obsolete and no longer part of the RDS standard are: MS (Group 0A, 0B and 15B) certain DI codes (mono/stereo, artificial head, compression), Language code, and PIN (Group 1A).

The text of this International Standard is based on the following documents:

CDV	Report on voting
100/2910/CDV	100/3056/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62106 series, published under the general title *Radio data system (RDS) – VHF/FM sound broadcasting in the frequency range from 64,0 MHz to 108,0 MHz*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Since the mid-1980s a fascinating development has taken place. Most of the multimedia applications and standards have been created or redefined significantly. Hardware has become extremely powerful with dedicated software and middleware. In the mid-1980s, Internet as well as its protocols did not exist. Navigation systems became affordable in the late 1990s, and a full range of attractive smartphones now exist. The computing power of all these new products is comparable with that of the mainframe installations in that era.

Listener expectations have grown faster than the technology. Visual experience is now very important, like the Internet look and feel. Scrolling text or delivering just audio is nowadays perceived as insufficient for FM radio, specifically for smart phone users. New types of radio receivers with added value features are therefore required. RDS has so far proven to be very successful.

FM radio with RDS is an analogue-digital hybrid system, which is still a valid data transmission technology and only the applications need adaptation. Now the time has come to solve the only disadvantage, the lack of sufficient data capacity. With RDS2, the need to increase the data capacity can be fulfilled.

RDS was introduced in the early 1980s. During the introductory phase in Europe, the car industry became very involved and that was the start of an extremely successful roll-out. Shortly afterwards, RDS (RBDS) was launched in the USA [1, 2, 3, 4, 5][1].

The RDS Forum has investigated a solution to the issue of limited data capacity. For RDS2, both sidebands around the RDS 57 kHz subcarrier can be repeated a few times, up to three, centred on additional subcarriers higher up in the FM multiplex still remaining compatible with the ITU Recommendations.

The core elements of RDS2 are the additional subcarriers, which will enable a significant increase of RDS data capacity to be achieved, and then only new additional data applications will have to be created, using the RDS-ODA feature, which has been part of the RDS standard IEC 62106 for many years.

In order to update IEC 62106:2015 to the specifications of RDS2, IEC 62106 has been restructured as follows:

Part 1: Modulation characteristics and baseband coding

Part 2: RDS message format, coding and definition of RDS features

Part 3: Usage and registration of Open Data Applications ODAs

Part 4: Registered code tables

Part 5: Marking of RDS and RDS2 devices

Part 6: Compilation of technical specifications for Open Data Applications in the public domain

The following future parts are planned:

Part 7: RBDS

Part 8: Universal Encoder Communication Protocol UECP

The original specifications of the RDS system have been maintained and the extra functionalities of RDS2 have been added.

Obsolete or unused functions from the original RDS standard IEC 62106:2015 have been deleted. The presentation in Parts 1, 2 and 3 follows the OSI basic reference model for information processing systems [6].

_____

1 Numbers in square brackets refer to the Bibliography.

RADIO DATA SYSTEM (RDS) – VHF/FM SOUND BROADCASTING IN THE FREQUENCY RANGE FROM 64,0 MHz TO 108,0 MHz –

Part 2: Message format: Coding and definitions of RDS features

1 Scope

This part of IEC 62106 defines the coding and definition of features for the Radio Data System (RDS).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62106 (all parts), *Radio Data System (RDS) – VHF/FM sound broadcasting in the frequency range from 64,0 MHz to 108,0 MHz*

ISO/IEC 10646, *Information technology – Universal Coded Character Set (UCS)*

ISO 14819 (all parts), *Intelligent transport systems – Traffic and travel information messages via traffic message coding*

3 Terms, definitions, abbreviated terms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62106-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Abbreviated terms

For the purposes of this document, the abbreviated terms given in IEC 62106-1 and the following apply.

AF	Alternative Frequency
	NOTE 1 Alternative Frequencies are given in the form of lists (method A or B or mapped).
AID	Application IDentification for ODAs
CI	Country Identifier
CRC	Cyclic Redundancy Check
CT	Clock Time

NOTE 2 In RDS, Clock Time includes the date.

DI Decoder Identification

ECC Extended Country Code

EG Extended Generic indicator

EON Enhanced Other Network information

eRT enhanced RadioText

EWS Emergency Warning System

NOTE 3 EWS was used in previous editions of IEC 62106. It can now be an ODA.

FH Function Header in group type C composed of FID and FN

FID Function Identifier

FN Function Number

hex hexadecimal

IH In-House application

NOTE 4 IH was used in previous editions of IEC 62106. It can now be an ODA.

ILS International Linkage Set indicator

LA Linkage Actuator

LI Linkage Indicator

LPS Long Programme Service name

lsb least significant bit or least significant byte

LSN Linkage Set Number

MS Music Speech switch

NOTE 5 MS was used in previous editions of IEC 62106. It is now obsolete.

msb most significant bit or most significant byte

ODA Open Data Application

ON Other Network

PI Programme Identification

PIN Programme Item Number

NOTE 6 PIN was used in previous editions of IEC 62106. It is now obsolete.

PS Programme Service name

PTY Programme Type

PTYI Programme Type Indicator

PTYN Programme Type Name

rfu reserved for future use

RP Radio Paging

NOTE 7 RP was used in previous editions of IEC 62106. It is now obsolete.

RT RadioText

RT+ RadioText plus

TA Traffic Announcement

TDC Transparent Data Channel

NOTE 8 TDC was used in previous editions of IEC 62106. It can now be an ODA.

TMC	Traffic Message Channel
TN	Tuned Network
TP	Traffic Programme

3.3 Notation and conventions

The notation and conventions given in IEC 62106-1 apply.

4 Message format

4.1 Design principles

The basic design principles underlying the message format and addressing structure are as follows:

a) The original single RDS data-stream (now referred to as data-stream 0) has been supplemented by three new RDS data-streams referred to as data-streams 1, 2 and 3. Data-stream 0 will continue to only carry group types A and B (referred to as legacy data). Data-streams 1, 2 and 3 will only carry a new group type C. Legacy data groups A and B can be carried on data-streams 1, 2 and 3, but first need to be packaged within a type C group using a mechanism referred to as “tunnelling”.

b) The mixture of different kinds of messages within any type A or B group is minimized. For example one group type is reserved for basic tuning information, another for RadioText, etc. This is important so that broadcasters, who do not wish to transmit messages of certain kinds, are not forced to waste channel capacity by transmitting groups with unused blocks. Instead, they are able to repeat more frequently those group types which contain the messages they want to transmit.

c) Data that has to be acquired quickly for receiver operation and for which a short acquisition time is required, for example Programme Identification (PI), Programme Type (PTY), and Traffic Programme flag (TP) are transmitted frequently and are always transmitted in data-stream 0. In data-stream 0, these features are present in every group and occupy the same fixed positions. They can therefore be decoded without reference to any block outside the one which contains the information.

d) The Programme Service name (PS), a fundamental feature of RDS, is also always transmitted in data-stream 0, using a fixed group type – 0A or 0B for the short form, 15A for the longer (UTF-8) form. By having a fixed group type (i.e. not an ODA), the PS name can be decoded without reference to any other group.

e) For compatibility with existing receivers, other RDS features will continue to use fixed group types and be transmitted in data-stream 0. These include Slow-labelling (1A), Clock-time (4A), RadioText (2A or 2B), PTYN (10A), EON (14A and 14B) and TA status control bursts (15B).

f) The practice of allowing future applications to be defined by using an Open Data Application has been extended, and the data formatting has been made more flexible. In addition to an Open Data Application (see IEC 62106-3) using legacy group types A or B in data-stream 0 (see Table 2), a new group type C Open Data Application has been specified to allow greater data capacity in data-streams 1, 2 and 3.

g) Open Data Applications defined by group types A or B can be carried in any data-stream 1, 2 and 3, although use of data-streams 1 – 3 requires the use of tunnelling.

h) Open Data Applications defined by group type C can only be carried in data-streams 1, 2 and 3. The essential core RDS features (PI, PTY, PS, etc.) will always be transmitted in data-stream 0 in every programme service using group types A or B.

i) The application identification AID which identifies an Open Data Application shall be sent at least once every 5 seconds.

j) There is no fixed rhythm of repetition of the various types of groups, i.e. there is ample flexibility to interleave the various kinds of messages to suit the needs of the user at any given time and to allow for future developments. However, on data-stream 0 the main RDS features need to use minimum repetition rates specified in Clause 8.

4.2 Group structure

4.2.1 Group type A structure

The group type A structure is illustrated in Figure 1. The main features are the following.

a) The first block in every group always contains a Programme Identification (PI) code.

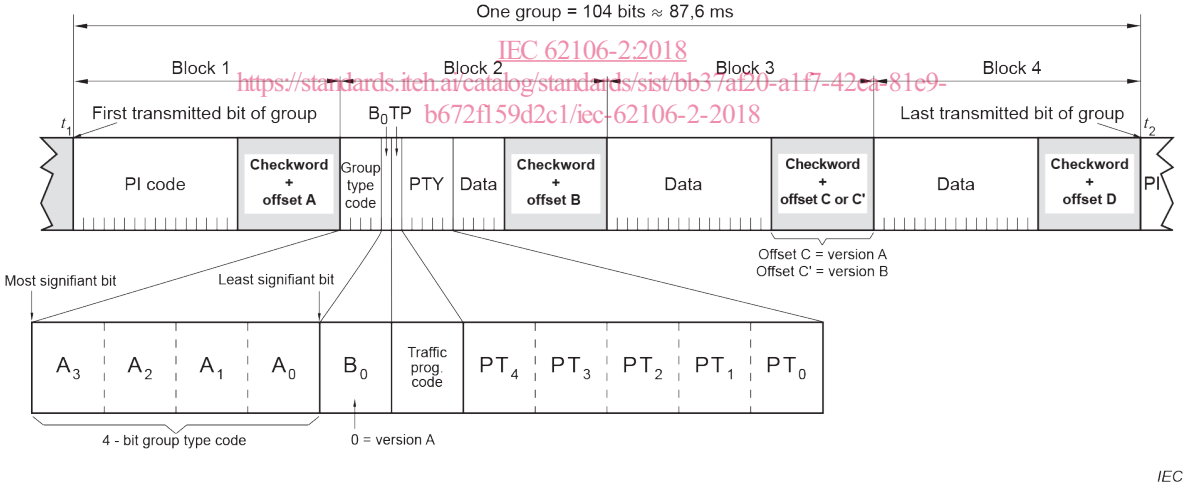
b) The first four bits of the second block of every group are allocated to a 4-bit code which specifies the application of the group. Groups will be referred to as 0 to 15 according to the binary weighting $A_3 = 8$, $A_2 = 4$, $A_1 = 2$, $A_0 = 1$. For each group (0 to 15) two 'versions' can be defined. The 'version' is specified by the fifth bit (B_0) of block 2 as follows:

   $B_0 = 0$: Defines group type A. The PI code is inserted in block 1 only. This will be called version A, for example group type 0A, 1A, etc.

   $B_0 = 1$: Defines group type B (see 4.2.2).

c) The Programme Type code (PTY) and Traffic Programme identification (TP) occupy fixed locations in block 2 of every group.

Within the group type A structure, the PI, PTY and TP codes can be decoded without reference to any block outside the one that contains the information. This is essential to minimize acquisition time for these kinds of messages and to retain the advantages of the short (26-bit) block length.



NOTE 1 Block size = 26 bits.

NOTE 2 Checkword + offset 'N' = 10 bit added to provide error protection and block and group synchronization information (see IEC 62106-1).

NOTE 3 $t_1 < t_2$: block 1 of any particular group is transmitted first and block 4 last.

Figure 1 – Group type A structure

Group type A can be used directly in data-stream 0 and has an application data capacity of 37 bits. To use group type A in the upper data-streams 1, 2 and 3, the PI code in block 1 needs to be replaced by 0x0000 to re-define the group as type C utilizing the tunnelling mechanism (see 4.4.1).

4.2.2 Group type B structure

The group type B structure is illustrated in Figure 2. It is similar to the group type A structure with the following differences.

a) The first and third block in every group always contains the Programme Identification (PI) code.

b) The 'version' is specified by bit B_0 of block 2 as follows:

B_0 = 0: Defines group type A (see 4.2.1).

B_0 = 1: Defines group type B.

c) In addition to B_0 = 1 a special offset word (which is called C') is used in block 3 of version B groups. The occurrence of offset C' in block 3 of any group can then be used to indicate directly that block 3 is a PI code, without any reference to the value of B_0 in block 2.

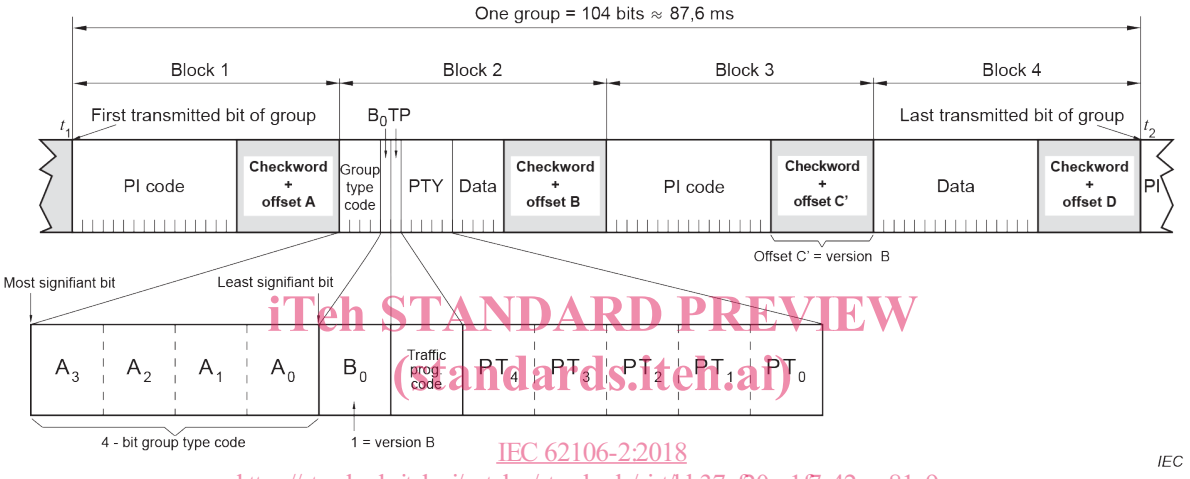
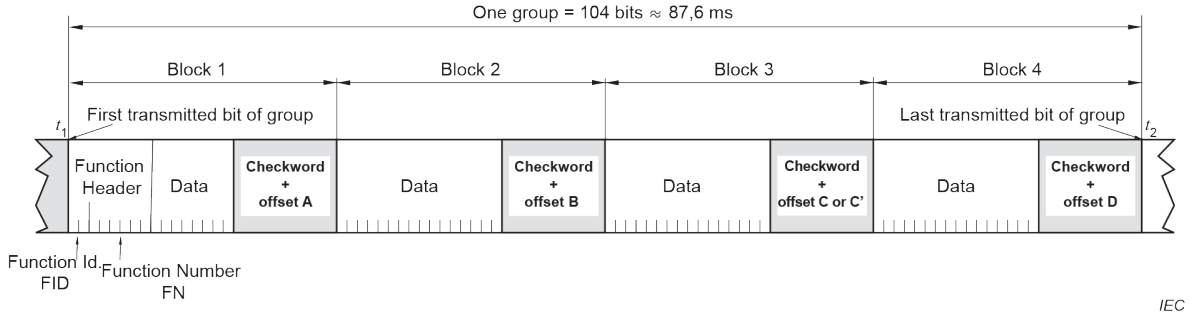


Figure 2 – Group type B structure

The group type B can be used directly in data-stream 0 and has an application data capacity of 21 bits. To use group type B in the upper data-streams 1, 2 and 3, the PI code in block 1 needs to be replaced by 0x0000 to re-define the group as type C utilizing the tunnelling mechanism (see 4.4.1). The PI code in block 3 will be left unchanged.

4.2.3 Group type C structure

The group type C structure is illustrated in Figure 3.



NOTE The Function Header (FH) fully determines the identification of the group.

Figure 3 – Group type C structure

The group type C can only be used on data-streams 1, 2 and 3 and has an application data capacity of 56 bits considered as a 7-byte contiguous data group.

The Function Header (FH) consists of two elements, see Table 1.

– Function Identifier (FID) (2 bits) indicates one of four types of usage (Functions) of the accompanying data contained in the group.
– Function Number (FN) (6 bits) indicates a sub-function of the main Function Identifier and allows for different features of each function. For a given Function Identifier, not all Function Numbers are defined. Undefined Function Numbers are reserved for future use.

Table 1 – Group type C Function Header definition

FID		FN						Meaning of Function Header (FH) FID and FN
b_{15}	b_{14}	b_{13}	b_{12}	b_{11}	b_{10}	b_9	b_8	
0	0	0	0	0	0	0	0	Legacy group type A or B transmission, see 4.4.1
0	1	y	y	y	y	y	y	Group type C ODA channel, see 4.4.2 64 channels (6 bit: yyyyyy) are available across data-streams 1 to 3
1	0	0	0	0	0	0	0	AID and channel number assignment for group type C ODAs, see 4.4.3
1	1	x	x	x	x	x	x	rfu