BS EN 62634:2015

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Radio data system (RDS) — Receiver products and characteristics — Methods of Measurement

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The UK participation in its preparation was entrusted to Technical Committee EPL/100, Audio, video and multimedia systems and equipment.

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English Version

Radio data system (RDS) - Receiver products and characteristics - Methods of Measurement (IEC 62634:2015)

Système de radiodiffusion de données (RDS) - Récepteurs et caractéristiques - Méthodes de mesure (IEC 62634:2015)

RDS-Empfänger-Produkte und -Eigenschaften - Messverfahren (IEC 62634:2015)

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Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 100/2121/CDV, future edition 2 of IEC 62634, prepared by Technical Area 1 "Terminals for audio, video and data services and contents" of IEC/TC 100 "Audio, video and multimedia systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62634:2015.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-02-04
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2018-05-04

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In the official version, for Bibliography, the following note has to be added for the standard indicated :

ISO 14819 Series NOTE Harmonized as EN ISO 14819 Series.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 62106	-	Specification of the Radio Data System (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 to 108,0 MHz	EN 62106	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIO DATA SYSTEM (RDS) – RECEIVER PRODUCTS AND CHARACTERISTICS – METHODS OF MEASUREMENT

FOREWORD

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International Standard IEC 62634 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 second edition cancels and replaces the first edition published in 2011. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- the ±100 kHz test measurement case from Clause 8 of IEC 62634:2011 was deleted as it did not permit to achieve stable and reproducible measurement results;
- an error has been corrected. The term "de-emphasis" shall read correctly "pre-emphasis".

The text of this standard is based on the following documents:

CDV	Report on voting
100/2121/CCDV	100/2419/RVC

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

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

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

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

INTRODUCTION

This International Standard gives commonly agreed measuring methods to complement the RDS standard IEC 62106 and the RBDS standard (NRSC-4-A) in the USA.

The RDS measuring methods presented here are directed at all manufacturers of RDS receiver products, and in particular tuner modules with embedded RDS functionality, including TMC (see ISO 14819 series of standards).

RADIO DATA SYSTEM (RDS) – RECEIVER PRODUCTS AND CHARACTERISTICS – METHODS OF MEASUREMENT

1 Scope

This International Standard describes how to measure minimum RDS receiver performance requirements which concern three RDS receiver product categories. However, it should be noted that there are also RDS receiver products on the market that significantly out-perform the minimum RDS receiver performance requirements quoted.

Methods and algorithms to achieve automatic programme service-following by means of AF lists are, however, very customer- and manufacturer-specific, and are therefore not covered in this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62106, *Specification of the Radio Data System (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 MHz to 108,0 MHz*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Terms and definitions of the RDS features used shall be found in IEC 62106.

3.1.1
RDS product category 1
RDS receiver product with high-ohmic input impedance

EXAMPLE For portable devices.

3.1.2
RDS product category 2
RDS receiver product with 50 Ω input impedance

EXAMPLE Car radio optimized for active antenna.

3.1.3
RDS product category 3
RDS receiver product with 75 Ω input impedance

EXAMPLE Car radio optimized for rod antenna or home receiver.

3.1.4
RDS reception
the signal at which the RDS signal is received with 50 % non-corrected error-free blocks

Note 1 to entry: In practice, the level at which the TP bit is immediately detected.

3.1.5
large signal behaviour
capability of the RDS receiver to fulfil its function at or in the neighbourhood of strong FM signals

3.1.6
RDS selectivity
capability of the RDS receiver to cope with adjacent signals at both sides of the tuning frequency: ± 200 kHz

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

AF	Alternative Frequency
dBμV	Signal level in μV; 0 dBμV = 1 μV, 6 dBμV = 2 μV, 20 dBμV = 10 μV
EON	Enhanced Other Networks information
FM	Frequency Modulation
GUI	Graphic User Interface
IPR	Intellectual Property Rights
PI	Programme Identification
PND	Personal Navigation Device
PS	Programme Service name
PTY	Programme TYpe
RDS	Radio Data System
RBDS	USA Radio Data System[1]
S+200	Unwanted signal, +200 kHz offset from the wanted signal
S−200	Unwanted signal, −200 kHz offset from the wanted signal
TA/TP	Traffic Announcement/Traffic Programme
TMC	Traffic Message Channel

4 Measuring method

4.1 Standard measuring signal

Unless otherwise stated, the following measuring signal shall be applied.

Tuning frequency	97,1 MHz
Signal input level V_i	60 dBμV
Deviation Δf	22,5 kHz
Modulation frequency F_{mod}	1 kHz
Pilot 19 kHz deviation	6,75 kHz
Modulation method	$L = R$
Deviation RDS carrier Δf_{RDS}	2 kHz
Pre-emphasis	50 μs (USA: 75 μs)

Where an unwanted signal will be added, for RDS car radio selectivity measurements, this will be done with the coupling circuit shown in Figure 1. The circuit shows how to couple two

1 See NRSC-4-A, RBDS standard cited in the Bibliography.

generators with 50 Ω output so that the total output impedance remains 50 Ω. Depending on the input impedance, one of the matching circuits shown in Figure 2 should be applied in addition.

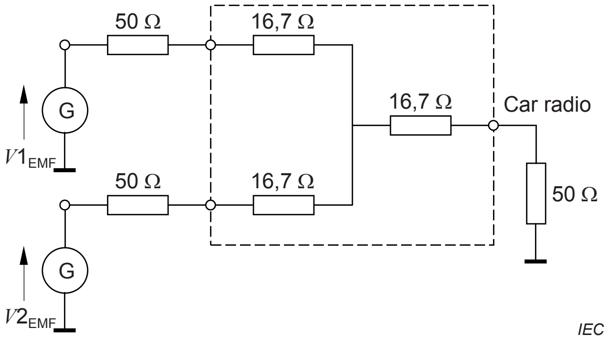

Figure 1 – Coupling circuit

4.2 RDS data conditions

4.2.1 General

The RDS data shall consist of an appropriate PI code, a PS name, one or more AFs and chosen values for, e.g. TP (=1), DI (=0000), TA (=0), PTY (=00001) and M/S (=1), with a maximum repetition rate for group type 0A of four groups per second. Use group type A only.

4.2.2 Matching circuit

For the three types of RDS product devices (modules for portable devices, car radio and home receiver), the matching circuit is given in Figure 2.

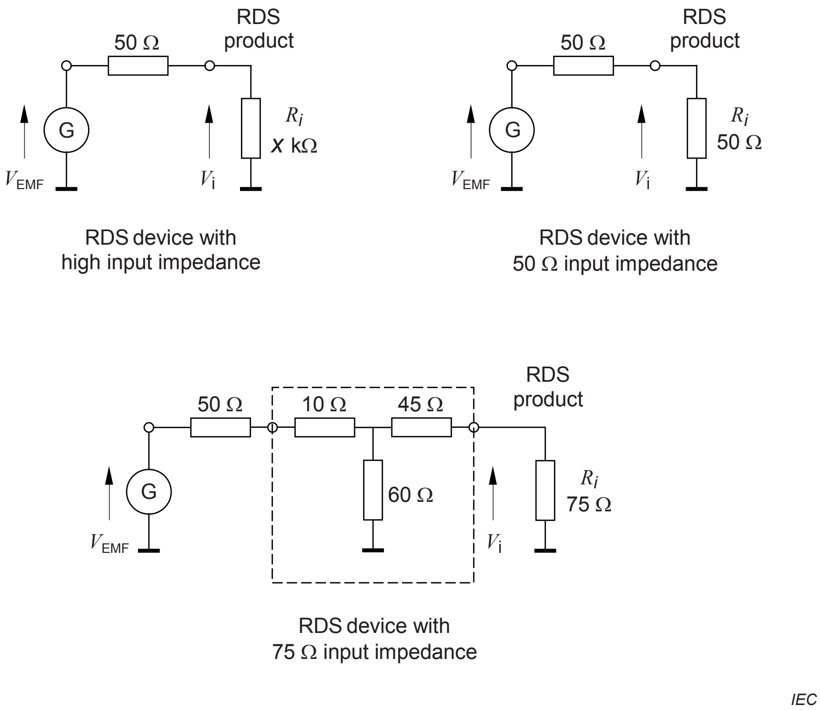

Figure 2 – Matching circuits for RDS product devices with three different input impedances

RF generators have a characteristic impedance of 50 Ω. For a device with an input impedance of 50 Ω, no additional matching circuit is needed. The antenna input signal V_i is then V_{EMF} – 6 dB. In case of a category 1 device like a PND, which generally has a high input impedance, V_i is then almost equal to the generator voltage V_{EMF}. When the input impedance cannot be ignored in relation to the 50 Ω generator impedance, the correction shall be calculated separately.

EXAMPLE For a device with 2 kΩ input impedance this will give $V_i = V_{EMF} \times 2\,000/(2\,000 + 50)$ and in dBμV this yields V_i dBμV = V_{EMF} dBμV – 0,2 dBμV.

5 Measurement of the RDS sensitivity

5.1 General

The lowest FM input signal is determined for which RDS reception is obtained.

5.2 Method of measurement

The receiver and the signal source are operated under standard measuring conditions, according to 4.1.

a) When a GUI is available, which is capable of measuring good and bad blocks, then a reading of 50 % good blocks is an accurate result for the sensitivity measurement. The ratio should be calculated over at least 2 000 receivable blocks.
b) A good alternative in the case, where a GUI and statistical read-out is not available to measure the level of correctly received RDS blocks, is the TP flag.

Turn the signal level up until 50 % error free RDS blocks are received. Alternatively, turn the signal level up until the TP flag lights up. Repeat this three times and take the average value of these three observations.

If the TP flag cannot be displayed, then the complete PS can be used instead. However, care should be taken that a new programme service name is entered into the RDS encoder each time a new measurement is done. The new programme service name shall differ from the previous one in all eight characters.

5.3 Presentation of the results

The result is presented in dBμV.

Minimum receiver sensitivity requirement:	RDS product category 1	21 dBμV
	RDS product category 2	18 dBμV
	RDS product category 3	18 dBμV

6 Measurement of the RDS data acquisition

6.1 General

Particularly for tuner modules or circuits with RDS fully integrated for mobile use, it is important to know the time to synchronize after a re-tune. Strongly related to this is the time to receive the PI code for the first time.

6.2 Time to synchronise

When tuned to an FM-RDS station, it is important to have RDS synchronisation immediately.

Taking into account the synchronising time of the system and the recognition of at least two consecutive RDS blocks, the time to synchronise RDS shall be maximum 120 ms, 80 % over 100 measurements.

6.3 Time to detect a first PI

In addition to the time to synchronise, it is often required to specify the time to detect the PI code for the first time. There is a fixed relationship between both, the PI code is present in block A of all groups and in block C’ of the B groups. The maximum time shall not exceed 180 ms. A value of 160 ms shall not be exceeded in 80 % over 100 measurements.

6.4 Method of measurement

The tuner module or receiver and the signal source are operated under standard measuring conditions, according to 4.1.

The RDS monitor program on the PC screen shall provide the information of time needed to synchronise. Tune from a frequency higher and a frequency lower than the wanted frequency of 97,1 MHz. (Tuning should be from both sides of the wanted frequency, because the behaviour can be different). Read out the value for the time needed to synchronise and the time needed to read the PI code.

Repeat this at least 100 times. 80 % of the results shall then be below the minimum requirements.

The following minimum requirements apply.

Time to synchronise	120 ms
Time to PI detection	160 ms

7 Measurement of the large signal capabilities

7.1 General

The two issues to be dealt with are the following.

a) The product shall be resistant to high signal levels of the wanted frequency.
b) RDS decoding shall work correctly in the presence of strong FM signals other than the wanted one.

7.2 Resistance to high wanted signal levels

7.2.1 Method of measurement

The tuner module or receiver and the signal source are operated under standard measuring conditions, according to 4.1; turn the input signal level up until 120 dBμV.

7.2.2 Large wanted signal requirement

No defects shall occur.

7.3 RDS performance at large unwanted signal

7.3.1 Method of measurement

The tuner module or receiver and the signal source are operated under standard measuring conditions according to 4.1. In addition, one of the signals according to Table 1 is added.

Table 1 – Presentation of the measurement result

Wanted frequency	Unwanted frequency	Result
97,1 MHz RDS sensitivity level +6 dB	91,1 MHz	____ dBµV
	103,1 MHz	____ dBµV

The wanted and unwanted signals are applied simultaneously by means of a combining network in accordance with 4.1. Adjust the RF level of the wanted frequency to the RDS sensitivity level (50 % correct RDS blocks) without the unwanted signal. Add 6 dB to this level. Adjust the unwanted strong signal until the RDS sensitivity level of 50 % correct blocks is reached again.

7.3.2 Large unwanted signal requirements

The following are minimum large unwanted signal requirements:

RDS product category 1	RDS reception at 50 % correct blocks	60 dBµV
RDS product category 2 and 3	RDS reception at 50 % correct blocks	88 dBµV

8 Measurement of the RDS selectivity

8.1 General

RDS selectivity: The capability of the RDS receiver to cope with adjacent signals at both sides of the tuning frequency: ± 200 kHz.

8.2 Method of measurement

The wanted and unwanted signals are applied simultaneously by means of a combining network in accordance with Figure 1. Adjust the RF level of the wanted frequency without the unwanted signal to the RDS sensitivity level (50 % correct RDS blocks).

Add 6 dB to this level.

Add the unwanted frequency: Tuned wanted frequency with a distance of ± 200 kHz

Deviation Δf	22,5 kHz
Modulation frequency F_{mod}	1 kHz
Modulation method	$L = R$
Pre-emphasis	50 µs (USA: 75 µs)

Check the RDS reception. Adjust the unwanted signal until the RDS sensitivity level of 50 % error-free blocks is reached again.

The level of the unwanted signal related to the wanted signal in dB is presented as

S+200, S-200 RDS selectivity.

The following are minimum RDS selectivity requirements:

- RDS product category 1: $S \pm 200$ 32 dB
- RDS product category 2: $S \pm 200$ 50 dB
- RDS product category 3: $S \pm 200$ 50 dB

9 Considerations and guidelines for evaluation of the dynamic RDS performance

9.1 General

The issues in this clause are highly significant for a well performing RDS product, mostly car radios. However, clear performance values and levels cannot be given, because of manufacturer and/or customer specific implementations. Therefore a set of general considerations and guidelines is given here with the view to help to evaluate the dynamic RDS performance in the products concerned.

9.2 RDS dynamic behaviour

An ideal RDS radio switches in time inaudibly over to an alternative frequency (AF) with the best audio quality. Variations in sound should not occur.

Car radio manufacturers have developed algorithms to achieve this in the best possible way. Therefore objective criteria or switching levels will not be specified, as they are often subject to IPR. In this standard a few key criteria are nevertheless given, which will need to be taken into account, where applicable, in order to ensure a proper dynamic behaviour of the RDS product.

a) Signal level of an AF in relation to the tuned frequency.
b) Multipath distortion: Distortion of the audio, caused by reflections, like in mountainous areas.
c) Noise: Unwanted signals in higher parts of the audio spectrum, generally coming from adjacent FM channels.
d) RDS reception: The number of correctly received RDS blocks; valid for the tuned frequency only. This is also relevant for TMC reception.

A radio will receive either single (Method A) or multiple (Method B) AF list(s). The order, in which these AFs are stored and used, is manufacturer specific. Important is, however, that the radio checks these AFs at certain intervals, to identify their quality, taking those first three criteria mentioned above into account. All modern tuners nowadays offer the possibility of doing these AF checks in an almost “inaudible” way. When the overall signal quality of an AF from the list becomes better than the currently tuned frequency, then the radio shall switch to this better AF.

Correct processing of the PI code: Before releasing the audio of the new frequency however, first a PI check shall be made in order to verify that the new frequency carries indeed the same wanted radio programme.

Manufacturers of car radios have developed and optimized over the years algorithms to adapt the dynamic RDS performance to most challenging receiving conditions. We have to consider here mountainous areas, tunnel roads and areas with a poor coverage. Quite often the AF lists are exceeding 25 AF or sometimes even 30 AFs.

RDS car radios that are capable to cope with these complex receiving conditions, can well make the difference in comparison to more average or poor and not so well performing radios. The car industry has been deeply involved in evaluating this process.

Simulations on the bench may give only a first impression and show, if the most basic functions will work properly. However, the real dynamic RDS performance at these challenging conditions can only be validated at critical locations and on the roads, where such critical receiving conditions then really occur.

A simple bench test can start with only two or three generators with programmable AF lists, to make sure that the radio will at least “recognise” each generator, when tuned to just one of them. By varying the signal level or introducing multipath or noise distortion to the tuned frequency (= generator), the radio shall look for the best alternative frequency (= one of the other generators) and then switch accordingly.

9.3 Traffic announcements TA/TP

9.3.1 TA message

The following customer requirements apply.

The radio shall detect a Traffic announcement (TA) on the tuned programme (TP) or one of the cross-linked programmes via EON. The radio shall switch to the TA message from any source currently in use.

During a TA, the display indication and the volume level are either product specific or customer adjustable.

9.3.2 End of TA message

After the TA message, the radio shall return to the previous status.

When, during the traffic message, RDS synchronization is lost, the radio shall return to the previous situation within a fixed period. A practical value is 2 min.

9.3.3 TP search

When a TP or TP/EON search is started, it will be done according to the following criteria.

The radio stops at the first station, which corresponds to TP = 1 being present in all groups or TP/EON being signalled in the type 0A group.

According to the following status of the TP and TA flags in the 0A group, i.e. TP = 1 and TA = 0, or TP = 0 and TA = 1 or TP = 1 and TA = 1, a traffic announcement is currently on air, or not.

NOTE A TP search action can typically be initiated in 3 different ways:

a) the user switches on the TP or TP/EON function and the radio is currently not tuned to a TP or TP/EON station;

b) the user starts a search action while the TP or TP/EON function is active;

c) the radio is tuned to a TP or TP/EON station and the RF signal level drops below the RDS synchronization level AND the current audio source is not the radio, but, for instance, a CD or MP3 or....

If in case c) the audio source is radio, the search action may not be automatically initiated by the radio itself as the audio quality may well be at an acceptable level when RDS synchronization is lost. When this situation occurs it might be very confusing to the customer if the radio would start a search action while the audio quality is still at an acceptable level.

9.3.4 TA announcement skip

A current TA message can be interrupted at customer request. The next TA message will, however, be passed on, when the TA receiving mode remains on.

9.4 Regionalisation

9.4.1 Implementations

Regional services use PI codes that are identical in the first, third and fourth-nibbles, but have different second-nibbles in the range 4 to F (Region 1 to 12). Broadcasters may split during certain periods of the day their supra-regional network into a maximum of 12 regional networks. In Austria, Germany and Switzerland this regionalisation feature is very widely used. The PI code structure will be x3yz, and when regionalized, the second PI segment may change then from 3 into 4 to F. Often the PS name also changes dynamically, to communicate the regional status to the listener, i.e. BAYERN1 becomes BR1 MUN, when regional.

Another public broadcaster in Germany uses the concept of regionalisation completely static, i.e. the area codes in the second PI segment are kept as one value from the code range 4 to F and the PS name also remains unchanged and refers to the region. In this configuration there can be a supra-regional common radio programme for certain hours of the day, without using the supra-regional code 3 at all in the second PI segment.

AF method B lists give all AFs in frequency pairs, with the parent frequency in ascending or descending order, indicating then also the regional variants for that radio tuned programme. The tuning frequency is given in the header of the list. Table 2 illustrates this issue.

Table 2 – AF example

F_1	F_2	
# 11	89,3	Total number (11) of frequencies for tuning frequency (89,3)
89,3	99,5	$F_2 > F_1$ hence 99,5 is an AF of tuned 89,3 and is the same programme
89,3	101,7	$F_2 > F_1$ hence 101,7 is an AF of tuned 89,3 and is the same programme
88,7	89,3	$F_2 > F_1$ hence 88,7 is an AF of tuned 89,3 and is the same programme
102,5	89,3	$F_2 < F_1$ hence 102,5 is an AF of the regional programme variant for tuned 89,3
89,5	89,1	$F_2 < F_1$ hence 89,1 is an AF of the regional programme variant for tuned 89,5

9.4.2 Requirement

Although various product and customer specific implementations may exist, RDS radios shall manage and store PI codes and dynamically change their structure into regional programme variants in a proper way.

The AF list shall be structured in such a way that a distinction is given between the AFs belonging really to the same supra-regional PI and the ones belonging to the associated programmes, whose PI differs then only in the second PI segment.

Bibliography

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

NRSC-4-A, National Radio Systems Committee: *United States RBDS standard – Specification of the radio broadcast data system (RBDS)*

Kopitz, D. and Marks,B., *RDS – The Radio Data System*, published by Artech House Publishers, Boston and London, 1999, ISBN 0-89006-744-9

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