# Introduction in RDS System

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**ABSTRACT**

This article aims to give a basic explanation of the process of bringing RDS broadcast traffic information to a new country or area. RDS makes possible to inform drivers, via their navigation systems, about delays, problems or dangerous events on their route and can therefore improve the efficiency and safety of road travel. RDS is an excellent example of ITS (Intelligent Transport Systems and Services) deployment and has been rolled out in many countries worldwide.

**Keywords:** radio data system, transmission systems, broadcasting

## 1.INTRODUCTION

RDS-TMC (The transmission system of data in radio channels from public broadcasting - dedicated channel for traffic messages) ensures traffic and transmits the information to users using digital transmission of text messages that contains the description of events, their location and status, information wich is transmitted through networks FM radio transmitters, if posibly exists. This enables the transmission of information of great accuracy, relevant and timely best in the language chosen by the user and without interrupting normal services. [1]

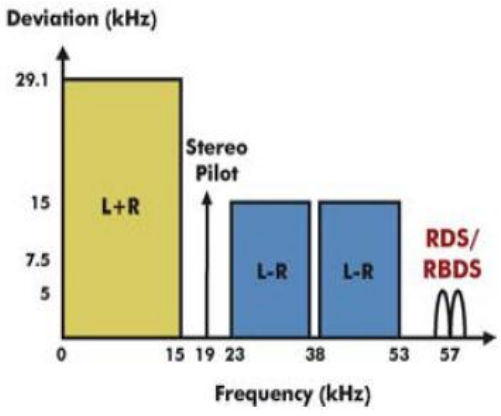
The conventional public FM radio transmission can provide additional services by using subcarriers placed in the free zone of the band left in the allocated channel for the transmission of multiplexe signals (eg. stereo transmision)

Using the facility described above, global organizations in the industry have preocupied about the development of systems that makes an addition to receive information for the receptor without that it could negatively feel additional service (costs or loss of quality, coverage and services).

## 2.STANDARDS ADOPTED

The transmission parameters for public FM radio in UKT band are established by ITU-R recommendation BS450 (3). The signal of radio-frequence is characterized by a central bear, a modulation of frequence and a multiplexing signal for stereo transmissions. The maximum accepted deviation (in Europe) is 75kHz/sent channel. The basic signal is a monophonic transmission or a stereo one based on complex multiplexing, situation in which it occupies about 90% of allocated deviation (the basic carrier signal together with adjacent subcarriers). The additional spectrum signals must fall within a band of 53 - 76kHz, in accordance with the report 1065 (4) of the CCIR.

The defined standard for RDS transmission occupies a band of 4.75 kHz, centered on the subcarrier of 57kHz.



As we see in the figure above, there is an "empty" space in the spectrum, in the area from 53 to 76 kHz, in which we may include additional transmissions. They can use a part of this spectrum, more than 15kHz, which is in accordance with ITU-R specification.

Allocated spectrum for data transmissions RDS was elected in this band, so that the use of bandwidth is minimum as possible. [2, 3]

## 3.DATA TRANSMISION PROTOCOL

RDS protocol is developed to be used in public and safety networks without being defferentiated depending on the area of application (metropolitan area or field), in which it is used a fixed infrastructure of public radio distribution (public radio posts), whatever is the ownership or type, with condition to respect the technical rules of standard transmission (band 87.5 to 18 MHz, FM stereo transmission).

At the physical level, the RDS concept is to ensure one direction transmission (from station to the customer), the data following to arrive safe and sure regardless the network condition (even in cases of spreading or weak signal), the type of protocol being sufficiently clear so the decoding would be simple to achieve, secure and also easy to implement.

In this sense, since the design phase (1990) the RDS concept imposed the following characteristics:

- Field station (transmitter) provides exclusive transmission of data, both in continuous and discontinuous mode, this remains the availability of the radio operator for choosing (except for emergency situations in which the operator will provide data transmission from a hierarchically superior dispatch);
- Transmission will be made with the help of a special equipment, adaptable to classical transmitters that operates in public bands of public radio broadcasting;
- Transmission is always safe, radio-only enviroment expecting capsulate data, the risk of error being less than 10-2 (statistically) before applying the encryption or correction algorithms;
- Transmission is made in "clear" and the message shouldn’t be key encrypted;
- Retransmission of data between radio-relays is also encrypted, so that in radio no information is’nt clear;
- For reasons of operational reliability, messages will be transmitted twice, one afer other, (receiver considering that a message is valid in condition in which it receives at least two consecutive identical messages). To increase the safety of transmission in areas with difficult spreading conditions operators may choose for triple consecutive transmission;
- Receiver will have the feature of continuous reception, considering that it is always started to "listen" the transmission band of the signal.

At the Data Link Layer RDS broadcast is made in a form of a synchronous serial sequences, organized in a group structure, each group being made up of 4 successive blocks, of 26 bits each (total 104-bits), of data and synchronization. Groups are continuously transmited, without existing breaks between successive blocks or groups.

## 4.STANDARD SERVICES AND FEATURES

The RDS group has defined a series of information services and standard features imposed for operators, services that serve listeners and which are required for the services provider and on the other hand are transparent to clients.

According to recommendation for defining (ITU), functions and services (called channels) are divided in:
- Required functions (imposed to the operator)
- Additional functions (imposed to the operator, but, in most of the cases are not used by oscilator, they mostly are having an optional character and are addressing to a specific segment of listeners)
- Optional functions (such traffic functions, warnings, meteorological, etc.).
- Specialized channels (predefined programs - similar with "Teletext" service adopted in television - which is addressed to a selective public, generally a professional one).

The main functions according standards, are:
- Program Identification code (PI): a code used as part of the automatic tuning feature which uniquely identifies each radio service in the reception area in which it is transmitted; this

is implemented to assist receiver memory management. This is a 4 character hexadecimal code that identifies the country of origin and whether the transmission is of a national, regional, supra regional or local type service.

- Program Service name (PS): used for receiver displays of an 8 character alpha numeric Program Service name which may use Upper or Lower case characters, eg {BBC_4_FM}, {Classic_}.
- Program Type code (PTY): a code defining the type of program being broadcast (eg News or Rock). There are 32 different program type possibilities, some have been defined for RBDS and others have been defined for RDS. This is in fact the main difference between RBDS and RDS. The receiver may utilize the PTY code by being made to search for a particular type of program.
- Alternative Frequency lists (AF): lists of Alternative Frequencies for the same program service. Used in conjunction with the PI code to assist automatic tuning. Using this information, a radio can automatically search out another station that is playing the same material. This is useful when the station you are listening to is fading out.
- Traffic Program flag (TP): a flag indicating whether the station broadcasts traffic announcements at some time in the day.
- Traffic Announcement flag (TA): a flag indicating when a traffic announcement is actually on air. The TP and TA flag may be used by receivers for automatic switching to traffic announcements from another service, such as tape cassette or a muted condition. This allows you to listen to the information and will revert back to the previous receiver state when the message is over.
- Decoder Identification flag (DI): indicates one of up to 16 different operating modes for the receiver (eg mono, stereo, binaural).
- Music/Speech flag (MS): a flag indicating whether music or speech is being broadcast. May be used by the receiver to give independent volume settings of music or speech.
- Program Item Number (PIN): a code identifying a particular program (by its date and time) to enable automatic on/off switching of receivers. The receiver will be set to respond to the published start time, however, the receiver will only respond when the PIN is transmitted (which coincides with the actual start of the program) thus allowing for timing inaccuracies.
- Radio text information (RT): a message of 32 or 64 characters of text for display by receivers. The display is alpha numeric.
- Enhanced Other Networks (EON): the Enhanced Other Networks feature provides a set of additional data about other networks to give RDS radios the ability to respond very intelligently to user requests, such as "finding" travel announcements on other stations.
- Clock Time (CT): time data is usually originated from standard time transmissions and is sent in the RDS data stream once per minute, to enable receivers to display the current time and date and used to synchronize Paging receivers. It is recommended that unless the clock is synchronized to an accurate source, then the CT feature should not be used.
- Transparent Data Channel (TDC): provides the possibility of a continuous data stream to receivers and associated peripherals (eg printer or home computer).
- In House data channel (IH): a data channel for use only by the broadcaster.
- Radio Paging (RP): a complete feature offering the possibility of mobile pocket pagers with alphanumeric display of messages and alerting beeps.
- Emergency Warning System (EWS): a feature using a very small amount of data for emergency warning services such as national disasters and hazardous chemical spills.
- Traffic Message Channel (TMC): a feature to transmit compact data to control a voice synthesizer to reproduce predetermined traffic messages, in the users own language.
- Location and Navigation (LN): a feature to provide data about the transmitter site, giving city and state name and to provide DGPS navigation data.
- Program Type Name (PTYN): a feature to extend the PTY information for additional displays but not for automatic search tuning. [2, 3]

## 5.THE FUTURE OF RDS

RDS will remain unchallenged in the market of FM broadcasting for many years to come, and today one can say with some confidence that no competitor to RDS is really on the horizon. The international scene for system standards

Outlook: RDS and Other Broadcast Data Systems for Radio 237 clearly requires that other subcarrier systems used in FM broadcasting be fully compatible with RDS. This being a fact that cannot be easily changed, RDS will most probably remain in service as long as analogue FM broadcasting exists; that is, definitely for another 20 years. RDS receivers have been marketed since 1987. The largest proportion have been car radios, and many of them are now also supplied as a standard-fit radio within a newly purchased car. The number of these receivers is steadily increasing, and there were more than 50 million in use by the end of 1997, as can be seen from Figure 13.1. However, many of these first-generation receivers only implemented the so-called five basic RDS features - PI, PS, AF, and TP/TA—for the simple reason that broadcasters using transmitter networks have first implemented these features for economic reasons.

In the second generation, these five basic RDS features were combined with EON. For some time, this situation has been changing, and we can already speak of a third generation. Broadcasters now give more attention to using the programme-related RDS features, such as RadioText and PTY.Therefore, more and more RDS receivers now come onto the market that also implement these features. Originally, these were mainly home receivers, but now car radios will also implement RadioText. For safety reasons, however, there must be a switch with which the user can enable or disable RadioText—as a default, RadioText must be switched off in car radios.

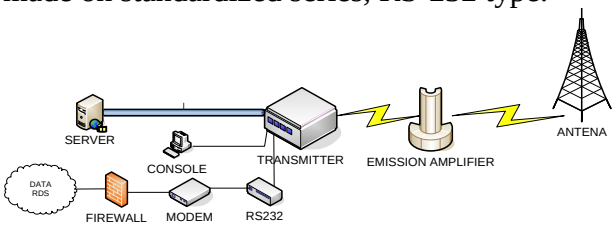
The large majority of consumer electronic manufacturers around the world support RDS technology. In Europe, prices for the RDS option are now only slightly higher than for a radio without RDS. There are already many manufacturers that equip almost all their FM radio products for the European market with an RDS module. Therefore, if the development continues with the same speed as in the past, we should soon reach the state where almost all new radios are equipped for RDS performance. [4]

## 6.PROPOSED SOLUTION

Radio transmission in the RDS data territory is made through radio trasmitters existing in territory. It is preferable that in crowded areas and where are enable more public radios (typically in metropolitan areas) emergency RDS broadcast (emergency messages or professional, non-commercial) would be realised on more frequencies simultaneously, so messages can reach at destination on many as possible ways, ensuring in this way the operational redundancy of system.

Now, the radio coverage of FM stations with public transmission is generally known and regulated, the technical characteristics of each transmitter being known and kept in records permanently updated.

In the vast majority, transmitters that now are operating in Romania are made on digital platforms. Thus, a large part of broadcasters currently implemented have already RDS transmission systems, their connection being made on standardized series, RS-232 type.




The typical schedule of emission chain with digital ways and RDS

## 7.CONCLUSIONS

In selecting the emission stations, it is recommended to consider a wide coverage of national roads and high ways, and the relevant traffic studies, thus ensuring the highest quality possible in delivering the system to the “target” audience.

The first stage of the nationwide implementation of this project will be performed by cooptation of a nationwide public radio operator, as they already have their own well established infrastructures supporting RDS transmissions.

## REFERENCES

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