

CONFORMANCE STANDARD AND COMPLIANCE TEST PROCEDURE
FOR THE
UNITED STATES RADIO BROADCAST DATA SYSTEM (RBDS) STANDARD

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Conformance Standard

The United States Radio Broadcast Data System (RBDS) Standard describes the specifications for a digital subcarrier that is transmitted on a center frequency of 57 kHz in the baseband of an FM broadcast signal. The data rate for this subcarrier is 1187.5 bits per second. Its bits are transmitted in 104 bit groups, each of which contains four 26 bit blocks. Of the 26 bits in each block, 10 are used for error correction coding. This leaves four 16 bit blocks of information in each group. An illustration of this data structure is provided in Figure 1.

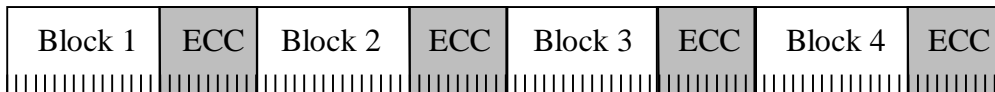


Figure 1: RBDS Group

The first four bits in the second

block of each group are used to identify the type of group being transmitted, and the fifth bit in the second block of each group defines what version of the particular group type is being transmitted. There are 16 different group types, numbered 0-15, each of which has two different versions, A and B. Different RBDS features are allocated to each group type — and a few features are common to all groups. The following is a list of RBDS features, their associated groups and blocks, and the number of bits that they utilize in these groups.

AF - Alternative Frequencies list

Group: 0A
Block: 3
Bits: 16
Section of U.S. RBDS Standard that defines coding: 3.2.1.6

Alternative frequency lists provide information on the various transmitters broadcasting the same program in the same or adjacent reception areas, and enable memory-equipped receivers to store the list(s) to reduce the time for switching to another transmitter as the receiver leaves one reception area and enters another.

CT - Clock Time and date

Group: 4A
Blocks: 2, 3 and 4
Bits: 34 (2 in block 2, 16 each in blocks 3 and 4)
Section of U.S. RBDS Standard that defines coding: 3.1.5.6

Time and date codes are used to update a clock in a receiver. Coordinated Universal Time (UTC) is transmitted in digital form along with an offset figure that enables receivers to display the correct local time. Modified Julian Day code is also transmitted.

DI - Decoder Identification and dynamic PTY indicator

Groups: 0A, 0B and 15B
Blocks: 2 (in Groups 0A, 0B and 15B) and 4 (in Group 15B)

Bits: 1 (but group is transmitted 4 times resulting in effective use of 4 bits)
Section of U.S. RBDS Standard that defines coding: 3.2.1.5

These bits indicate which operating modes are appropriate for use with the broadcast audio (*e.g.*, stereo/mono, compressed/uncompressed, etc.)

ECC - Extended Country Code

Group: 1A
Block: 3
Bits: 8

Section of U.S. RBDS Standard that defines coding: Annex D, Section D.2 and Annex N, Section N.3

The Program Identification (PI) code that is transmitted as part of every group contains four bits of data that identify the country in which the broadcast is originating. Because these four bits are not nearly enough to uniquely identify every country on Earth, Extended Country Codes are used to enable unique identification of all countries.

EON - Enhanced Other Networks information

Groups: 14A and 14B
Blocks: 2, 3 (in Group 14A) and 4
Bits: 33 (in Group 14A) and 18 (in Group 14B)
Section of U.S. RBDS Standard that defines coding: 3.2.1.8

This feature can be used to update the information stored in a receiver about radio signals other than the one being received. Alternative Frequencies, Program Service names, Traffic Program and Traffic Announcement identification as well as Program Types and Program Item Numbers for other signals can be transmitted in the Enhanced Other Networks data blocks. Receivers equipped to decode transmitted EON information can be programmed, for example, to automatically switch from the tuned frequency to a second frequency (identified in the EON data from the first frequency) whenever the second frequency is carrying a traffic announcement.

EWS - Emergency Warning System

Groups: All
Blocks: 2 (in all Groups), 3 (in Groups 1A and 9A) and 4 (in Group 9A)
Bits: 34 (in Group 9A), 21 (in Group 1A) and 5 (in all other groups)
Section of U.S. RBDS Standard that defines coding: 3.2.7, 3.1.5.3, Annex F and Annex Q

The EWS feature is intended to provide for the coding of warning messages. The PTY code in all Groups is set to 31 for the duration of an emergency message. When this occurs, a receiver equipped with this feature will check Block 3 of Group 1A to see if the RBDS signal being received contains instructions for automatically switching to another frequency for information. If the signal being received does contain such instructions, then the receiver is automatically retuned. If no such alternate frequency is identified, then the receiver checks Group 9A for specific information about the current emergency.

M/S - Music/Speech switch

Group: 15B
Blocks: 2 and 4
Bits: 2 (1 in each block)
Section of U.S. RBDS Standard that defines coding: 3.2.1.4

This is a two-state signal to provide information on whether music or speech is being broadcast. This signal permits receivers to be equipped with two separate volume controls, one for music and one for speech, so that listeners can adjust the balance between them to suit their individual listening habits.

ODA - Open Data Applications

Groups: 3A, 3B, 4B, 5A, 5B, 6A, 6B, 7A, 7B, 8A, 8B, 9A, 9B, 10B, 11A, 11B, 12A, 12B, 13A and 13B
Blocks: 2, 3 and 4
Bits: 37 (in #A Groups, 5 in Block 2, 16 in Blocks 3 and 4) and 21 (in #B Groups, 5 in Block 2, 16 in Block 4)
Section of U.S. RBDS Standard that defines coding: 3.1.4

The Open Data Applications feature allows data applications not specifically defined in the United States Radio Broadcast Data System (RBDS) Standard to be incorporated into RBDS transmissions without having to modify the Standard. Open Data Applications are assigned registration numbers by the administrators of the U.S. National Radio Systems Committee. When an ODA is transmitted, information about its registration number and the Groups that it is using is transmitted in Group 3A. Receivers designed to work with a particular ODA will check the data in Group 3A of a particular RBDS transmission to determine if the transmission is carrying data for that particular ODA.

PI - Program Identification

Groups: All
Blocks: 1 (in all Groups) and 3 (in #B Groups)
Bits: 16 (in #A Groups) and 32 (in #B Groups)
Section of U.S. RBDS Standard that defines coding: Annex D, Section D.6

In the United States, PI codes are based on the transmitting station's call letters, and they are used to uniquely identify the transmissions from any particular station. PI codes are also assigned to networks, enabling, for example, receivers to search for a stronger signal of a particular network broadcast when the signal being received fades out.

PIN - Program Item Number

Groups: 1A and 1B
Block: 4
Bits: 16
Section of U.S. RBDS Standard that defines coding: 3.1.5.2 and 3.2.1.7

The PIN's purpose is to enable receivers and recorders to identify the start of a particular program.

PS - Program Service name

Groups: 0A and 0B
Block: 4
Bits: 16
Section of U.S. RBDS Standard that defines coding: 3.2.2 and Annex E

The PS name is comprised of eight characters that are intended for display on the receiver. Typically it will be something like "MIX 106" but it could also be the station's call letters, or any other text string.

PTY - Program Type

Groups: All

Block: 2
Bits: 5
Section of U.S. RBDS Standard that defines coding: Annex F

This is an identification number to be transmitted with each program item and which is intended to specify the current Program Type within 31 possibilities (see annex F). This code could be used for search tuning. The code will, moreover, enable suitable receivers and recorders to be pre-set to respond only to program items of the desired type. The last number, i.e. 31, is reserved for an alarm identification which is intended to switch on the audio signal when a receiver is operated in a waiting reception mode.

PTYN - Program Type Name

Group: 10A
Blocks: 3 and 4
Bits: 32
Section of U.S. RBDS Standard that defines coding: 3.1.5.14 and Annex E

The PTYN feature is used to further describe current PTY. PTYN permits the display of a more specific PTY description that the broadcaster can freely decide (e.g. PTY=4: Sport and PTYN: Football). The PTYN is not intended to change the default eight characters of PTY that will be used during search or wait modes, but only to show in detail the program type once tuned to a program. If the broadcaster is satisfied with a default PTY name, it is not necessary to use additional data capacity for PTYN. The Program Type Name is not intended to be used for automatic PTY selection and must not be used for giving sequential information.

RP - Radio Paging

The RP feature is intended to provide radio paging using the existing VHF/FM broadcasts as a transport mechanism, thereby avoiding the need for a dedicated network of transmitters. Subscribers to a paging service will require a special paging receiver in which the subscriber address code is stored.

The detailed coding protocols are given in annex M.

RT - Radio Text

This refers to text transmissions coded in accordance with annex E, primarily addressed to consumer home receivers, which would be equipped with suitable display facilities (see 3.2.2).

TA - Traffic Announcement identification

This is an on/off switching signal to indicate when a traffic announcement is on air. The signal could be used in receivers to:

- a) switch automatically from any audio mode to the traffic announcement;
- b) switch on the traffic announcement automatically when the receiver is in a waiting reception mode and the audio signal is muted;
- c) switch from a program to another one carrying a traffic announcement, according to those possibilities which are given in 3.2.1.3 or 3.2.1.8.2.

After the end of the traffic announcement the initial operating mode will be restored

TMC - Traffic Message Channel

This feature is intended to be used for the coded transmission of traffic information. The coding is separately defined by a standard issued by CEN [prENV 12313].

TP - Traffic Program identification

This is a flag to indicate that the tuned program carries traffic announcements. The TP flag must only be set on programs which dynamically switch on the TA identification during traffic announcements. The signal shall be taken into account during automatic search tuning.

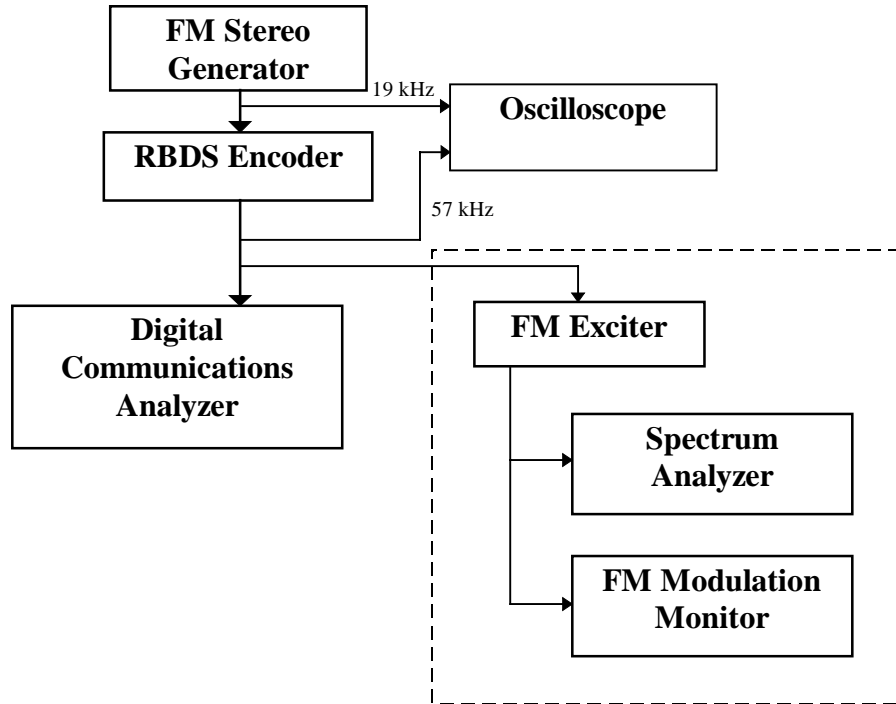
In order for an encoder to conform to the U.S. RBDS Standard, it must transmit at least one of the above RBDS features in a manner that complies with the U.S. RBDS Standard. This means that the encoder must produce a signal that complies with the modulation characteristics described in Section 1 of the Standard, and that this signal must comply with the baseband coding specifications in Section 2 of the Standard, and that this signal must comply with the message format requirements in the Standard for at least one of the RBDS features listed above.

In order for a receiver to conform to the U.S. RBDS Standard, it must accurately decode at least one conformant RBDS feature being transmitted by a conformant RBDS encoder.

Recommended Compliance Test Procedure

Encoders

In order to ascertain compliance with the U.S. RBDS Standard, RBDS encoders should be tested as follows:

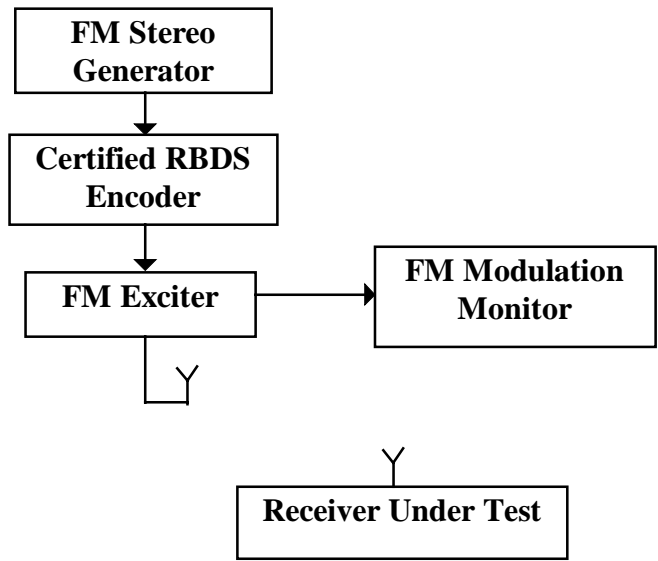


In order to perform this test, the equipment illustrated above is required. The test is performed as follows:

1. The equipment is connected together as shown above and turned on. *Note:* The exciter, spectrum analyzer and FM modulation monitor are only needed if the laboratory RBDS transmission setup is going to be used to certify an RBDS decoder.
2. The oscilloscope is used to test the RBDS waveform and its phase relationship with the 19 kHz stereo pilot.
3. The digital communications analyzer is used to determine whether or not the actual data bits being transmitted by the encoder conform to the bit structure defined in the U.S. RBDS Standard for the particular RBDS feature being tested.
4. If the laboratory RBDS transmission setup is going to be used to test an RBDS decoder, then the exciter must be connected to the RBDS generator, and the output of the exciter must be connected to both the modulation monitor and the spectrum analyzer. The modulation monitor is used to determine the modulation level of the laboratory test signal, and the spectrum analyzer is used to ascertain the exciter's compliance with the emissions mask specified by the FCC in Section 73.317 of its rules.

Decoders

In order to ascertain compliance with the U.S. RBDS Standard, RBDS decoders should be tested as follows:



In order to perform this test, the equipment illustrated above is required. The test is performed as follows:

1. The receiver is connected to an antenna and turned on, and the laboratory transmission system is powered up.
2. The RBDS transmission setup must be certified as being compliance with the U.S. RBDS Standard and the FCC rules. To do this, the procedure described above for the encoder should be used.
3. The RBDS encoder is programmed to transmit the feature that is being used to test the receiver for compliance with the U.S. RBDS Standard. The receiver is observed to determine whether or not it is receiving the transmitted RBDS signal correctly.