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REPORT OF RDS FIELD TEST IN KOREA

1. Introduction

In 1989, Korean Broadcasting System(KBS) began to study the radio data systems of the world including RDS and ARI in Europe, FM data broadcasting in Japan, and SCA in USA. After initial study, KBS decided further investigation into RDS and visited the nations, Great Britain, Sweden, and Switzerland that were performing the RDS broadcasting, in 1990. From 1991, KBS conducted several laboratory experiments. Also with the permission of the Ministry of Communications for the temporary testing of the FM multiplexing, KBS transmitted the test signal of the standard FM frequency and performed the field test using a car equipped with a RDS decoder(displaying broadcasting system id, radio paging, and traffic message channel, etc.) in 1992.

In 1993, KBS developed a set of RDS encoder and receiver, and the national technical standard of FM multiplexing was established by the Ministry of Communications. KBS selected the RDS as a standard transmission method of the VHF broadcasting, and compared it with the recently developed systems of other countries such as RDS(Radio Data System, Europe), DARC(Data Radio Channel, Japan), and RBDS(Radio Broadcast Data System, USA). Then the application of Global Positioning System(GPS) was investigated in 1994 and the indoor test has been going on.

This document includes the results of RDS field test and explains briefly the radio paging experiment and the presentation of Korean characters using a RT or a TDC.

2. RDS field test

KBS performed the subjective estimation, with the receiver which has the functions of displaying the programming service id, traffic announcement information, radio paging, and the Korean character information. Also we measured the block-error ratio using the electric field strength and the RDS service area.

1) Test period

1st: '93. 9. 15-17

2nd: '93. 11. 2-4

2) Media used

KBS Standard FM

3) Transmitting station

1st : Kwanak Mt.(97.3MHz, 10kW), Yongmoon Mt.(90.3MHz, 1kW),

Heuksong Mt.(89.9MHz, 1kW), Gyeryong Mt.(94.7MHz, 1kW)

2nd: Kwanak Mt.(97.3MHz, 10kW), Yongmoon Mt.(90.3MHz, 1kW),

Heuksong Mt.(89.9MHz, 1kW), Gyeryong Mt.(94.7MHz, 1kW)

Hwaak Mt.(99.5MHz, 5kW)

4) Tested receiver

AFK9417(Daewoo Electronics Co.)

HC-3902(Hyundai Electronics Co.)

CR-3500(Dongkook Electronics Co.)

5) The method of transmission

PI:E201

E:Country identification code

2:Program type in terms of area coverage

1:Program reference number(1-255)

AF

Method A:tuning frequency and 24 alternative frequency

Method B:tuning frequency and 12 alternative frequency pairs

Test example

PI	E201	E201	E201	E201	E201
AF	97.3	90.3	89.9	94.7	99.5
	89.9	89.9	90.3	89.9	89.9
	90.3	94.7	94.7	90.3	90.3
	94.7	97.3	97.3	97.3	94.7
	99.5	99.5	99.5		97.3
PS	KWANAK	YONGMOON	HEUKSONG	GYERYONG	HWAAK

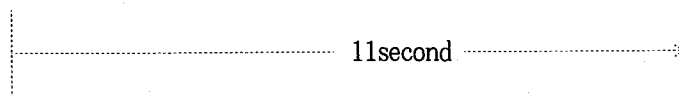
Transmission of the group 0A

Sequential transmission

Ratio:40% (PI, TA, TP, PS, AF)

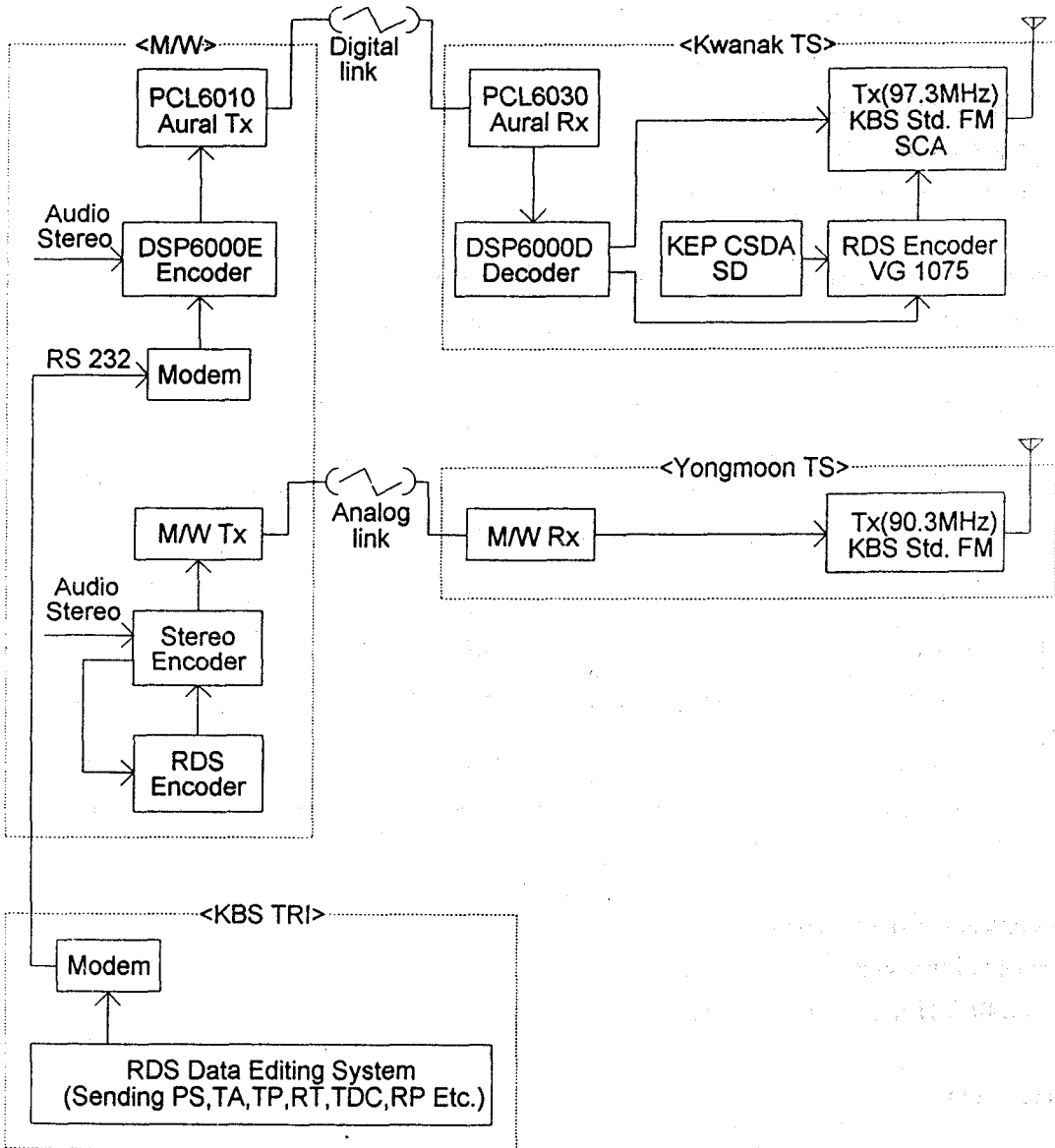
Test example

2A 2A 2A 2A 2A 0A 0A 0A 2A 2A 2A 2A 0A



Deviation of sub-carrier : $\pm 2.0\text{KHz}$

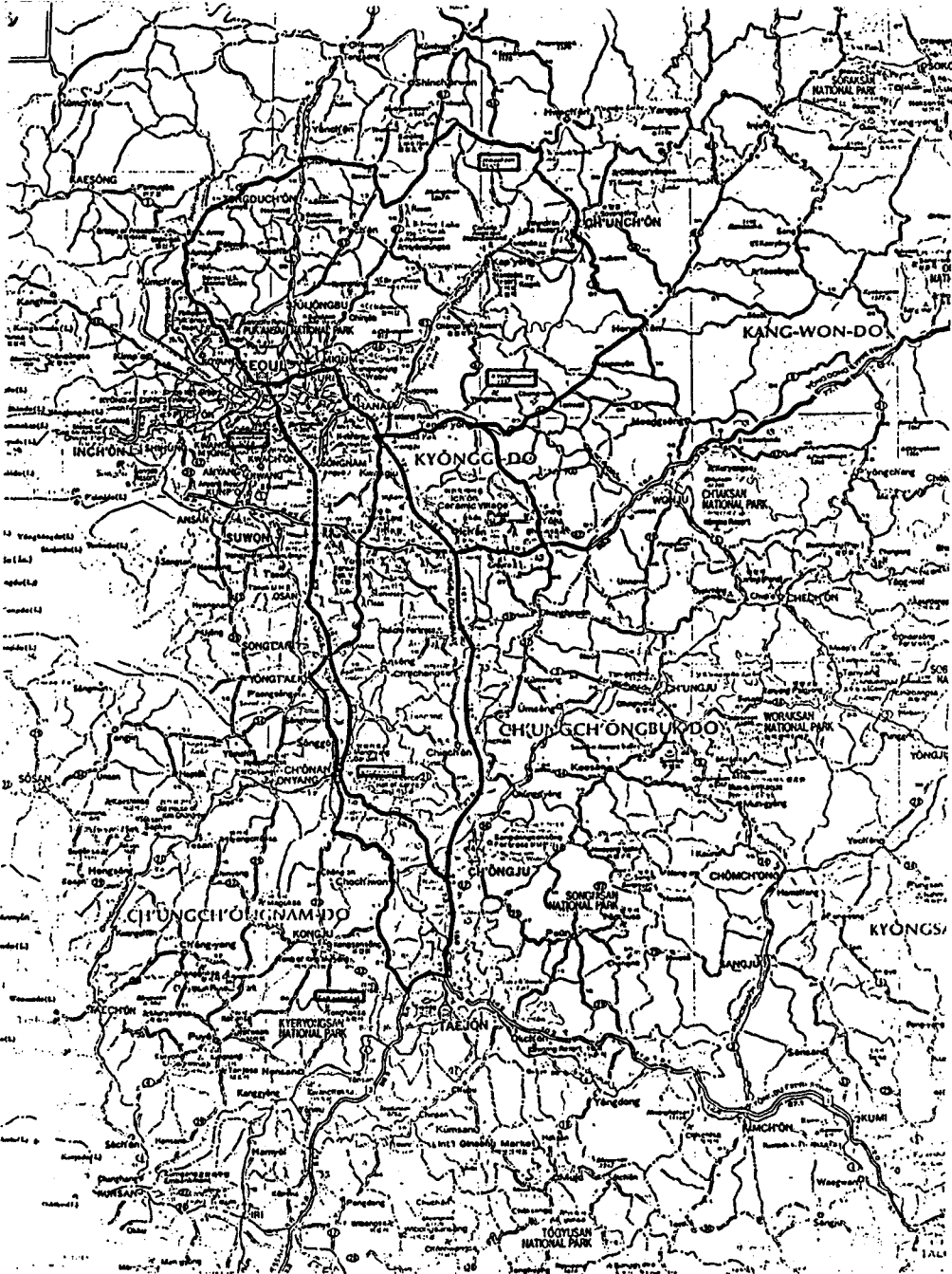
3. Block Diagram of the test system



Picture 1. Block diagram of the testing system

A digital link was used between a microwave room and Kwanak TS. Also an analog link was used between a microwave room and Yongmoon TS. Heuksong TS, Gyeryong TS, and Hwaak TS have the same organization as Yongmoon TS.

4. Path of measurement



Picture 2. Path of measurement(1:1,400,000)

5. Radio paging

The radio paging system consists of a paging server, an encoder, and a transmitter.

1) Paging server

The paging server is connected to a public telephone network. It receives paging messages and transmits them to the encoder.

2) Encoder

The encoder codes the paging messages by the radio paging protocol. In case of RDS, we use the group 7A as a radio paging. The radio paging protocol is defined by the CENELEC(Comite Europeen de Normalisation Electrotechnique).

3) Transmitter

The transmitter receives the coded digital data and modulates them digitally, and then sends it as an electrical wave. We use PSK or FSK as a modulation method.

The figure 3 is a block diagram of the radio paging test system in RDS.

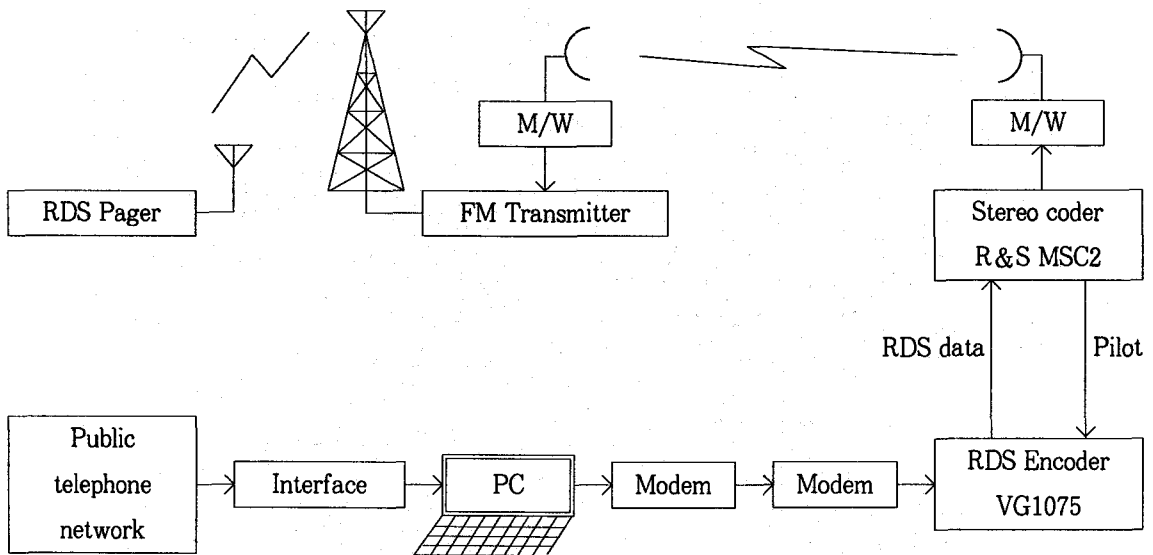


Figure 3. Block diagram of the radio paging test system

Instead of using a paging server, we used a PC that equipped with a paging interface card and assigned one telephone line to it. The PC was used as an editing system of the RDS functions such as PI, PS, TP, TA, etc. The data transmission between the PC and the encoder was done by a modem. Also we used the microwave as a data transmission media of the multiplexed signal of a baseband between the stereo coder and the transmitter. Consequently, we could confirm that the radio paging system acted satisfactorily.

6. Transmission of a text in RDS

The main function of the RDS are receiving control signals and displaying them. We use the receiver control signal, we can use PS, RT, and TDC.

1) PS(Program Service name)

PS is used for displaying broadcasting station name. It is included in the group 0A and 0B.

2) RT(Radio Text)

RT is used for displaying character string concerned with program. It is included in the group 2A and 2B.

3) TDC(Transparent Data Channel)

TDC is used for sending arbitrary data. The difference between TDC and RT is that RT is sent many times during fixed time, but TDC is sent only once.

4) Sending a Korean character or a string

A Korean character or a string can be sent using RT or TDC, and there may be some problems to receive the character, because a Korean character is composed of 2-byte code. During the test, there was no problem if the receiving conditions of the FM were good.

7. Conclusion

The RDS field test, which checks the functions of the auto tuning, the program service name, the traffic identification, the radio text of the Korean character, and the radio paging, has been performed satisfactorily. Also we tested a block error ratio by the electric field strength and measured a RDS service area in Korea.

Consequently, if the receiving conditions of the FM were good (electric field strength: 45dBuV, receiving quality: 3 above), there was no problem to adopt the RDS in Korea.

Hereafter, KBS is going to test the RDS system including a GPS system.