REAL TIME TRANSMISSION SYSTEM OF COMMERCIAL MESSAGES IN RADIO BROADCASTING

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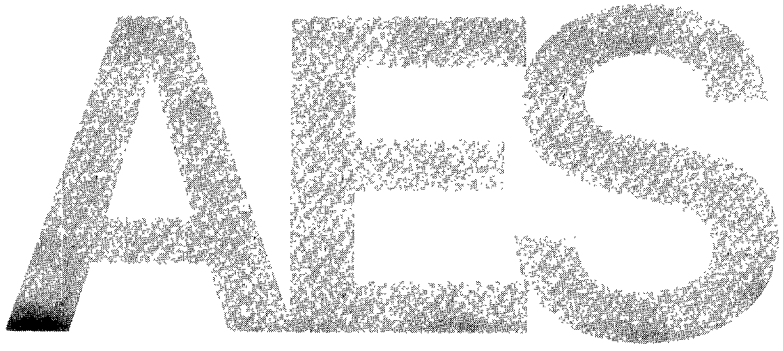

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Abstract

The Digital Audio File developed by TBS for strage and transmission of commercial message compries eight 200MB magnetic disks and micro processors.
It enables random selection and transmission of 4,000 stored CMs within 0.2 second, and digital condensation of Japanese letters from 12 to 8 bits.
We like to explain a reliable and automatic system using it and the operation.

1. Introduction

Japan's largest commercial broadcasting company, Tokyo Broadcasting System Inc (TBS) Radio Station, has a large stock of some 3,000 commercials and transmits about 900 every day.

Exhaustive checks by experienced staff were essential for correct transmission of so many commercials, and yet some mistakes in their handling operations were almost inevitable.

To get over the problem, the TBS Radio Station's technical team worked hard to develop a system integrating both Computer Data Processing System (CDPS) and Analogue System. In June 1978 the team succeeded in developing a Digital Audio File System and went into experiment for its commercialization.

The Digital Audio File functions as a system to store a large number of audio signals and as an audio signal transmission system highly responsive to transmission commands. Based on the performance and evaluation of the test equipment, the team further improved the Digital Audio File into a highly

efficient radio commercials operation system, namely, the Commercials Real-time Transmission System. It will go into full operation beginning this November.

2. The System

Having input of "commercial file information" and "commercials transmission information" in a form of two floppy disks output from the data processing system each day, the Commercials Real-time Transmission System is responsible for storing and broadcasting commercials. The set-up commercial scheduling data can be altered even just before transmission. Fig.1 shows the system configuration.

On the right is the Digital Audio File Section with dual systems, the one used for "on air" and for rehearsal, and the other for registration and back-up operations.

On the left is the Commercials Real-time Transmission Control Section, in which floppy disks are used to input commercials transmission information and to output transmission confirmation data. 20M Byte fixed magnetic disk stores various data including commercials transmission information.

Handling operations and the state of commercial scheduling can be confirmed through an operation box and colour CRT display installed in the studio.

Addition, deletion and changes in order of commercial scheduling data just ahead of broadcasting are carried out at the work station.

The Commercials Transmission Control Section and the Digital Audio File Section are linked by circuit through modems. A processing diagram of the Commercials Real-time Transmission System is shown in Fig. 2.

The operation to store commercials begins with setting up floppy disks with commercial file information. They contain both commercial data to be deleted and newly contracted commercial data to replace them. When the deleting operation starts, the Audio File Section receives commands for deleting unnecessary material, and the operation ends within a few minutes.

Following the commercial data indicated in the display, input of audio signals from the mother tape (with commercials already code-numbered) is performed. The system permits operators to make access to commercial material only at this stage of storing operation.

Commercials transmission starts with making "commercial

scheduling data file" by floppy disks for commercial transmission information. During the operation, the system confirms the commercial material stored in the Audio File as indicated in the data from floppy disks.

Of the data sored in the commercial scheduling data file for a day, about 30 commercials to be duly broadcast stand by in the Audio File ready for transmission. Final checks on the material is carried out at this stage and deletion of "stand-by" material is no longer allowed. Then, commercials are broadcast one after another, following commercials transmission signals from studio or the APS.

The state of commercial scheduling is monitored in colour CRT display. The display indicates the state of material registration, reddening in the colour of commercials section of on air, the time to complete the transmission of specified commercials, and the remaining seconds.

The commercial data broadcast as well as the time of broadcasting are recorded in the Confirmation Data File. The next morning floppy disk output is transferred to the Data Processing System.

3. Digital Audio File

The Digital Audio File is an audio data filing system, in which a massive number of commercials converted into digital signals are stored in a large magnetic disk digital memory. It makes use of the high speed random access capability of magnetic disk. The system configuration is shown in Fig. 3.

(1) In the Audio Signal Processing Section, audio signals of commercials converted into 12-bit linear quantiser PCM signals by A-D converter, are reduced into 8-bits through ADPCM coding, without spoiling the audio quality.

Data from the Audio Signal Processing Section is recorded in the magnetic disk through buffer memory, which works to adjust a disparity between the sampling frequency and the magnetic disk data transfer speed.

In the case of playback, 8-bit data is converted back into 12-bit linear quantiser PCM data. Analogue signals decoded by D/A converter output through LPF. Fig.4 shows a data format of the data conversion process, and Fig.5 disk recording format.

(2) One magnetic disk is capable of storing about 500 commercials, each being 20 seconds, and up to 8 magnetic

disks can be connected. A magnetic disk has 15,352 tracks, each being 13K Byte. Each of them can store 0.65 second-long audio data. The data is recorded into an empty track through the floating point number system. Fig. 6 shows the magnetic disk's filing format.

In the track control information a flag for used and/or error track represents 2 bits per track, and in the material file control information the number of material indices are written into tracks. The material information and used track addresses are registered in the head track of audio data.

(3) Input and output of audio signals are extensible up to four systems in a digital audio file unit. It can playback the specified audio signals of commercials at a high speed access time of only about 0.2 seconds. Fig. 7 shows its timing chart.

(4) Audio signals of commercials along with their related information are recorded in the magnetic disk. The information consists of the coded material number, name of sponsor, length and kind of the material, and can output whenever necessary.

The coded material number is composed of 7 digit figures, through which the Digital Audio File inputs and outputs audio signals and material information.

(5) The Commercials Transmission Control System and Digital Audio File are linked by circuit through modems. Upon reception of transmission commands, the Digital Audio File starts operation, and when finished, informs it to the control system. Table 1 shows part of 34 kinds of commands in use.

(6) The Audio File Section has dual system using two digital audio file units. If one system breaks down, the other can take over the function easily.

(7) With sampling frequency 20KHz, frequency bandwidth 50Hz -9KHz, and signal quantiser noise ratio being 55dB at a 1kHz standard level, the system has, as shown in Fig. 8, sufficient capability to work as an AM broadcasting station.

4. Conclusion

An integrated control system combining the analogue system and data processing system in one unit has been a dream long held by electronics engineers. The development of the Audio File System by the TBS team has now opened up

a way for commercialization of at least audio signal file system.

In view of further development in computer memory technology and improvement in data transmission speed in the future, the newly developed Audio File System is expected to be of extensibly wide application.

Table 1-1

Table of Commands

Command Code	Processing Operation
RS	Begin recording audio data
RT	Complete recording audio data
FE	Edit recorded audio data
FR	Register recorded audio data in the material file
FD	Delete the material registered in the material file
IC	Change the material information provided for the material
OT	Register commercial break data (a specified section of commercials transmission data) in the on-line table
FA	Rehearse commercials file
F3	Conduct 3-second rehearsal for the head and tail of the material file
OS	Transmit a commercial break (a specified section of commercials) following the on-line table
OA	Rehearse a commercial break (a specified section of commercials) following the on-line table
O3	Conduct 3-second rehearsal for the head part of the commercial break (a specified section of commercials) according to the on-line table

Table 1-2

Command Code	Processing Operation
SA	Rehearse back-up material file
SE	Register the material recorded in the material file into the back-up material file as back-up material
SD	Delete back-up material recorded in the back-up material file
DI	Initialize disk pack for the main system
DC	Copy the disk pack in the material file
IQ	Transfer the material information registered in the material file
TF	Transfer the material information registered in a specified disk pack
TD	Transfer the information on error tracks in the disk pack
CN	Suspend transmitting commands
RG	Obtain the right to record for terminals
RF	Abandon the right to record for terminals

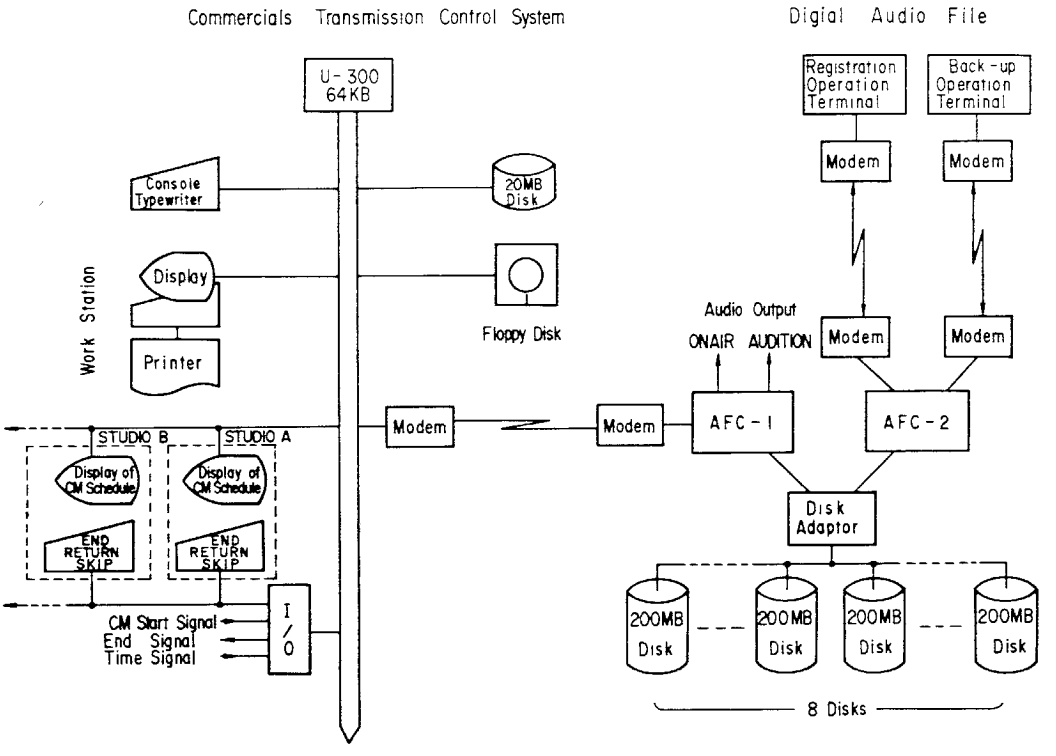

Fig. 1. Real-Time Commercials Transmission System Configuration

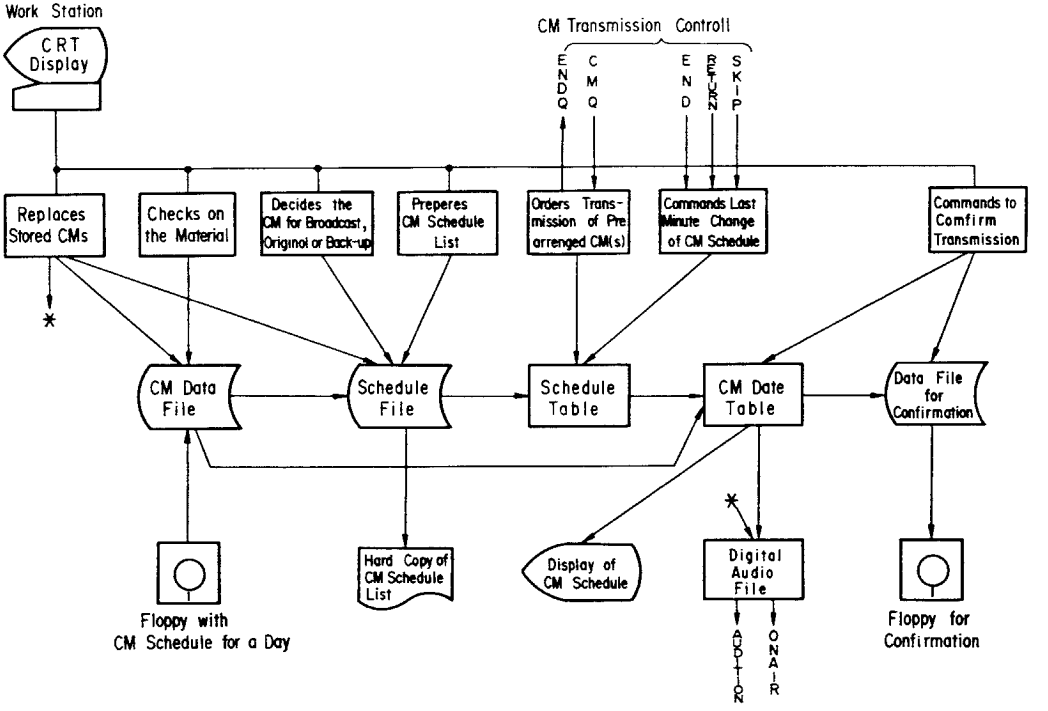

Fig. 2 Real Time CM Transmission System Processing Diagram

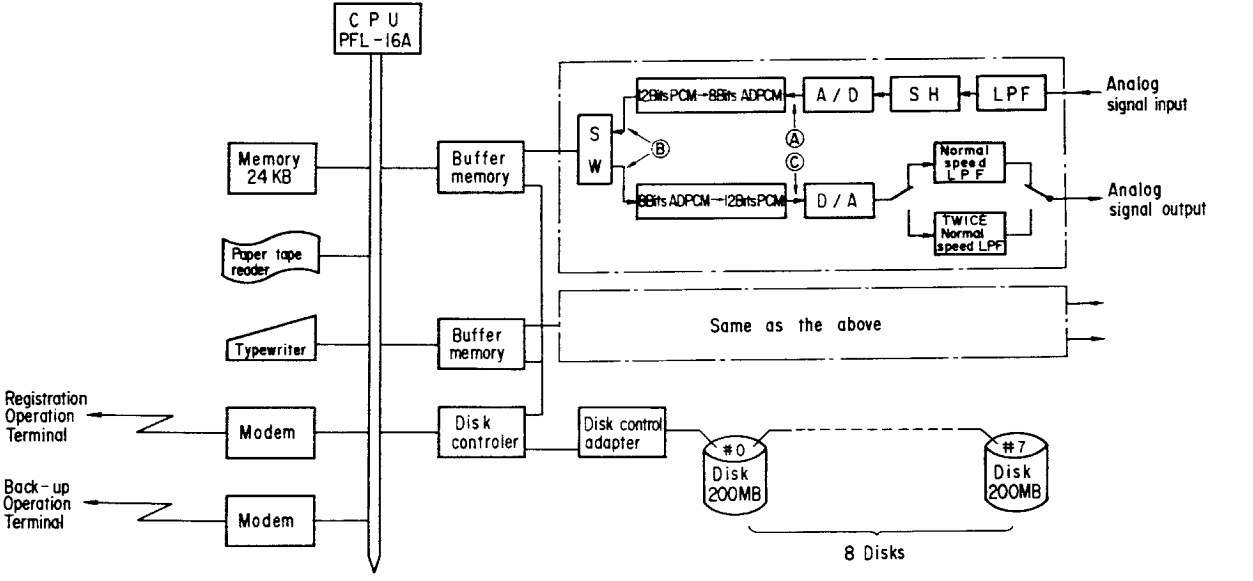

Fig. 3. Digital Audio File

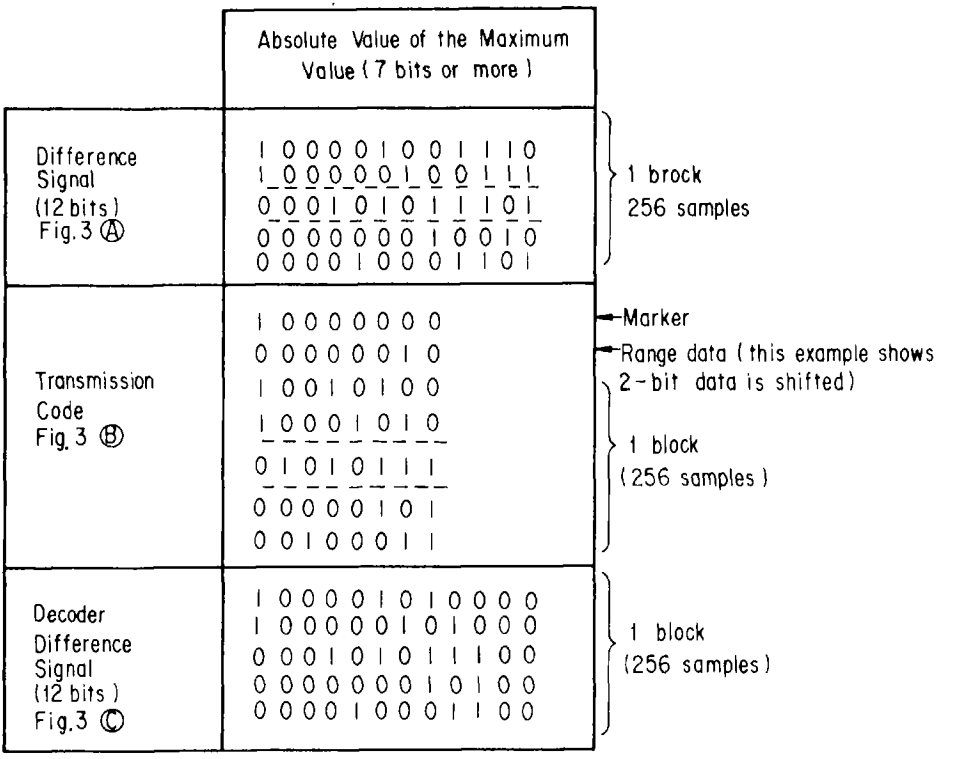

Fig. 4 ADPCM Data Conversion

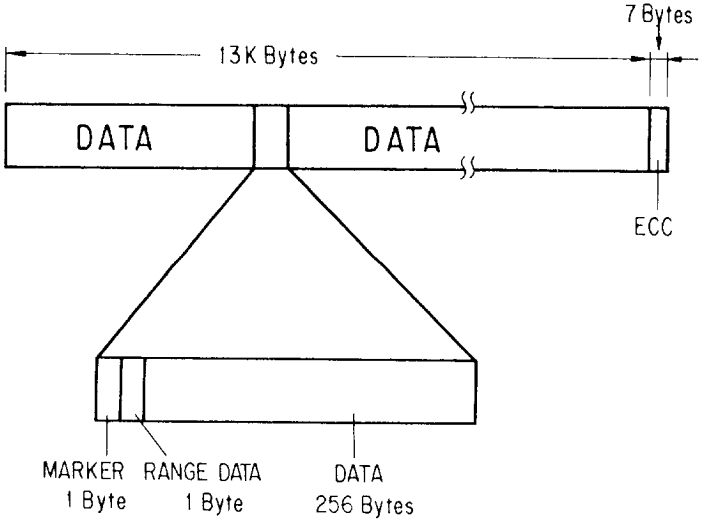

Fig. 5 Data Format

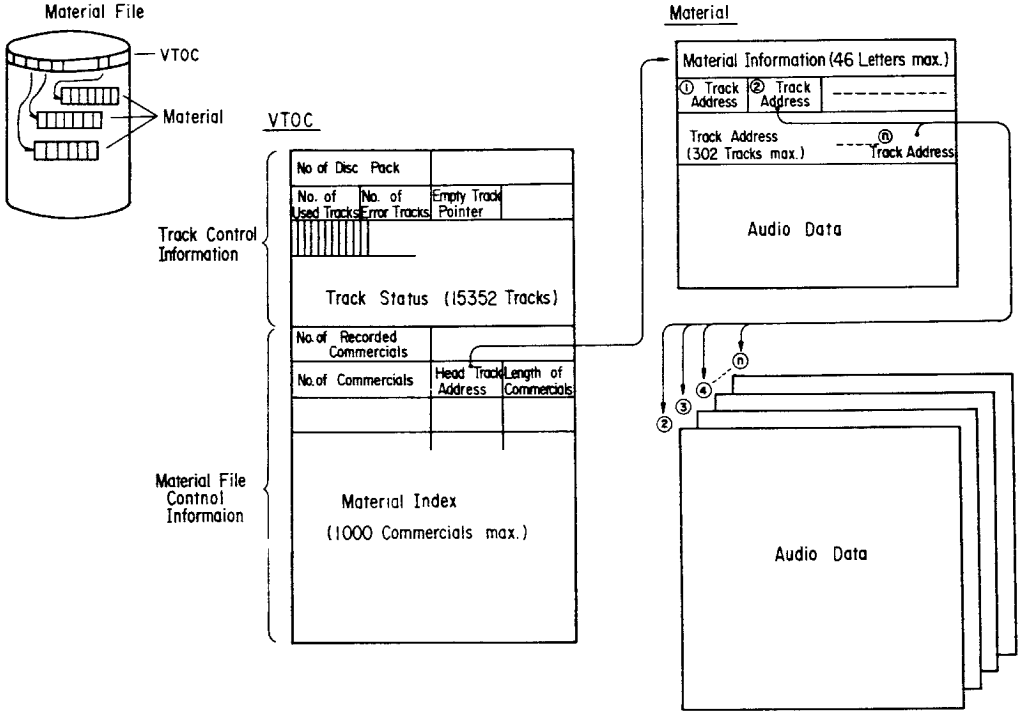

Fig. 6. File Format

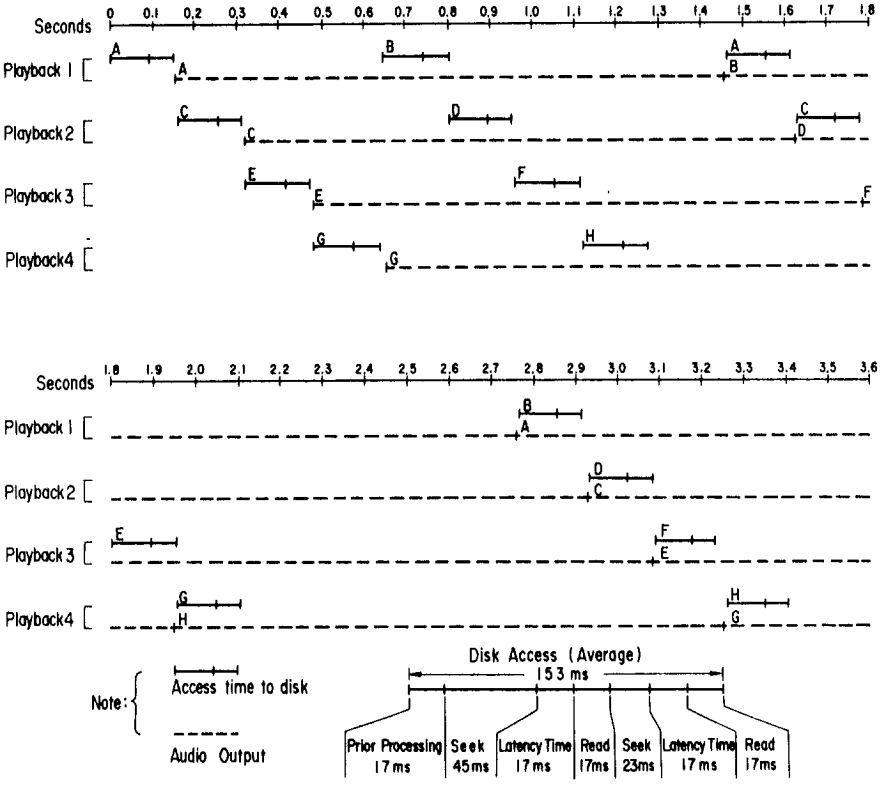

Fig.7. Time Chart Showing How to Process Commands at The Same Time

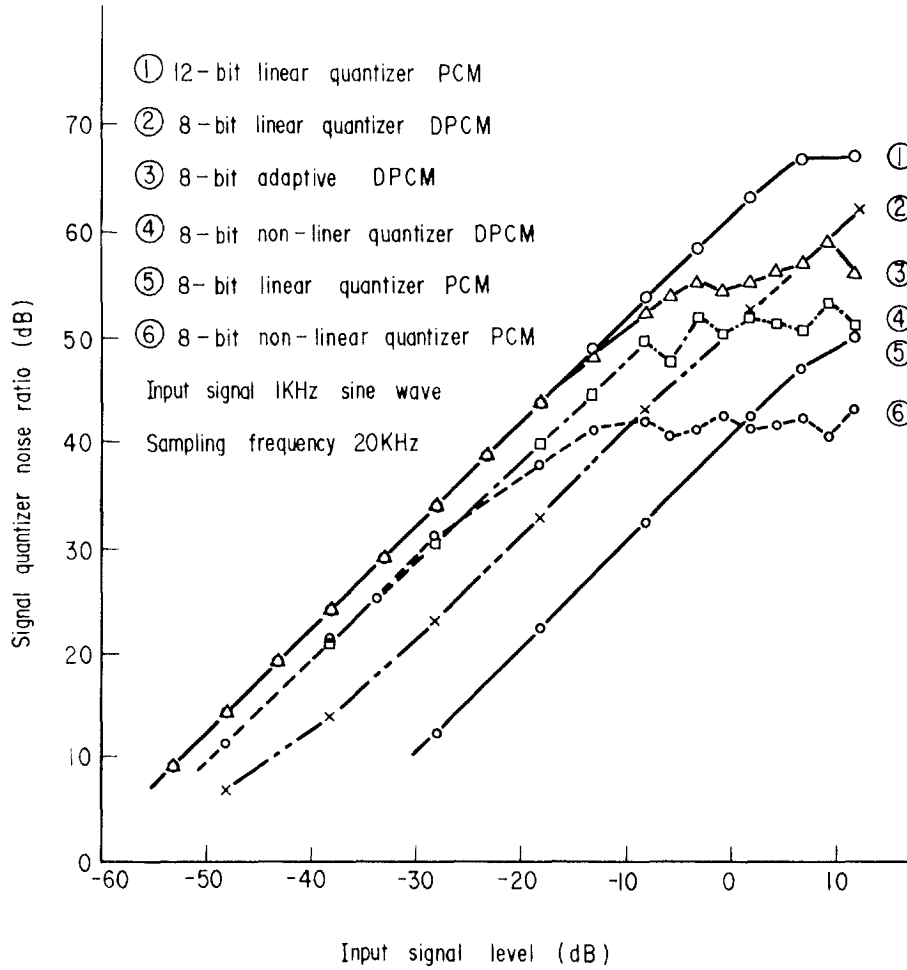

Fig. 8 Signal quantizer noise ratios