TAMPER PROOF RECORDING

Hette Mollema

3M Australia Pty

1. INTRODUCTION. The TPR System is a method of recording oral evidence so that when it is played back the authenticity of the recording can be demonstrated. The system is primarily oriented towards official law enforcement agencies worldwide, to assist them in their operations and to minimise the questioning of recorded evidence.

2. SYSTEM. The basic system consists of a recorder with inbuilt encoder and a Verifier with inbuilt decoder. There will also be ancillary units.

3. METHOD. The TPR system developed by 3M can demonstrate if an original tape recording has been interfered with in any of the traditional ways. The system is based on comparing a representative digital value of the analogue when recording with an identical representative digital value upon playback. Any difference between these two digital values will signify an inconsistency between the recorded and played back information. It must be appreciated that any information divulged on the methods of deriving the representative digital code of the original analogue will be a breach of one of the security barriers built into the system. Hence a limited amount of detail on the method in which the digital code is derived is given. A number of parameters can be utilised in identifying certain characteristics of speech.

Extensive discussions have taken place, particularly in Australia, where TPR was invented and is being developed, with Law Enforcement agencies in many countries including England and Scotland. Their views have been largely incorporated in design of the equipment.

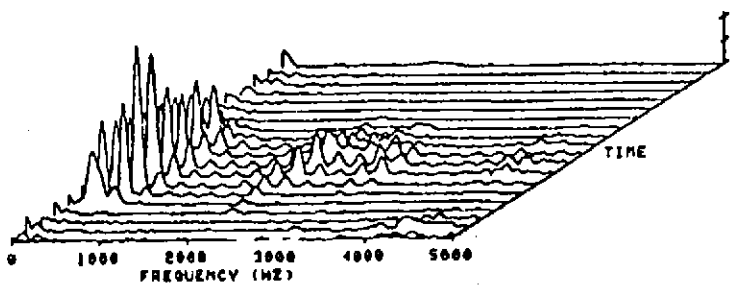

Figure 1

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Figure 1. shows a 3-dimensional plot of time versus frequency versus amplitude of the human spoken word. It will be noted that there are distinct frequency bands and amplitude magnitudes formed by the formants that can be categorised on every word uttered. The characterisation can take place both in amplitude, frequency and time content and is different between words and between persons saying the same word. An algorithm can be written to make use of this property which is distinctly different from speech recognition and voice prints by the number of data bits necessary to record but still provides a code that will signify if there are differences between the characteristics of the analogue between two recordings.

4. SECURITY. There are substantial barriers within the system to prevent anyone emulating the encoding and characterising scheme of the system with the intent of interfering with a tape so that it cannot be detected by the Verifier. These barriers include security over the method of characterising the speech, security over the devices used to do the characterisation and providing security over the method in which this information is written on the tape.

5. ACCOUNTABILITY. In addition to providing a security code characterising the analogue, other information is recorded that will facilitate the accountability of tapes from the time of recording to the time when such recorded evidence is necessary in Court. The TPR recorder records the time and date of the recording as well as providing a unique identification number for every recorder.

Keeping in mind that we are dealing with a worldwide product and that there are time changes in many countries, either between time zones within the country or differences between summer and winter time or daylight saving, the TPR clock is based on GMT and is kept alive in a similar manner as a digital watch. It will be programmed in manufacture to set the time. Time accuracy will be around ± 2 minutes per year under normal operating conditions.

A unique identification number, different in every recorder, is entered into the memory during manufacture. The time, date and part of the I.D. number is not even accessible to 3M personnel as part of the security to avoid any entry into the device of an unauthorised nature. Hence part of the identification number is decided upon by the recorder on a number of random events. The time and date may only be altered by a limited amount. If exceeded the encoder will reset and disable the recorder. The provision of time and date will identify when a recording took place and may be critical in evidence where time plays an important part. The I.D. number of the recorder will be marked externally on the recorder, for logging purposes and identifies the person using the particular recorder at that time. The source of recording can be identified by assigning blocks of I.D. numbers to the recording authority.

Provision of these two features will assist in the accountability of any particular tape recording from thetime that the recording was made.

Each cassette will also be indelibly marked with a serial number as an added identification factor. To ensure recovery of a cassette from a filing system and to locate a cassette, a specified file management system should be implemented.

6. VERIFIER. A TPR recorded tape can be played back through the Verifier which displays, on a continuous basis, the time of the original recording adjusted to local time, if necessary, by a time offset that is available to the operator.

The Verifier will also display the identification number of the Recorder on which the recording was made, as well as providing a part in the screen showing the start of the recording, any inconsistencies found at the end of the recording.

Pertinent data like a time offset, the start, inconsistencies and end of recording are also printed on a hard copy printer in a manner that can be kept with the cassette for filing and identification purposes.

The criteria of inconsistencies is based on finding differences between the recorded digital data and the data generated by the Verifier. Any such inconsistency can be caused by a number of influences which depend on how much the tape has been interfered with. Errors caused by transmission via the recording media are detected and corrected prior to the evaluation for authenticity.

7. FREQUENCY RESPONSE. The aim of the audio design is towards recording a voice in as an intelligible a manner as possible. Many noises present in our normal working environment are unconsciously filtered out by the human hearing system. A recorder does not have that capability and therefore the Field Recorder is fitted with a specially tailored-response microphone to concentrate on those areas where the intelligibility content resides, such as the 2nd and 3rd formants. See figure 2.

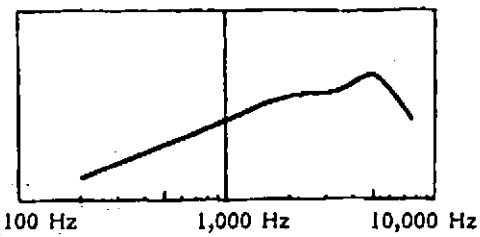

Figure 2

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To provide sufficient length of recording time, the recorder will be running at 1.2cm per second, with a frequency response exceeding 5kHz which is more than adequate for typical human voice recording even if later enhancement is required because of poor acoustics during recording.

8. ALARMS/WARNINGS. An alarm has been provided to indicate the 3-5 minutes prior to the end of the tape, to signal to the interviewer that he should be changing the tape before continuing the interview. Low battery levels and total system failure are signalled to the operator.

The system provides a method of recording with dedicated equipment designed for that use. The recording will be made in such a way that no question will exist on the originality of the recording. While this may not be a serious matter at present and can be more than adequately coped for by the technical department, should wholesale recording be introduced, then the TPR system provides a method that will alleviate the loading of technical departments by proportional increases in verification of tapes which in some cases may take weeks to verify.

The system has been designed with the help of, and dedicated for use by the world's law enforcement agencies. The equipment is ruggedly designed to withstand operational field requirements. In particular, attention has been placed to the quality of recording which is distinctly different from that of recording a hi-fi audio.

9. CONCLUSION. While this forum is not intended to judge if tape recordings are, or are not necessary, we are concerned with the implementation of the wholesale introduction of recording. The load of such an implementation will fall heavily on technical departments. Another benefit that is derived from the system, if properly implemented, is a reduction of the clerical duties of the police. For successful wholesale introduction of tape recording, proper procedures and instructions need to be established. Operational training in the use of recording devices under varying acoustic conditions and in the methods of interviewing are essential. Transcription of recorded tapes can take place on word processors or by other methods of transcription that need not occupy valuable police manpower.

Overall, the benefits of the system will be an increase in productivity, improvement of the standing of the police force in the community, assistance in tape accountability and safeguarding the rights of the citizen being interviewed or questioned by the police. Finally, TPR enhances the overall integrity of a police force as seen by the public.