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DAT Errormonitor

Introduction.

The function of the DAT Errormonitor Mark II is to collect error and status information during recording or play-back and to process this into a report. The DAT Errormonitor is connected to a DAT recorder that uses the 'CXD2601 R-DAT Record/Playback Signal Processor', or a related type of processor. The status information is being extracted from the Sub-Code. The error status information is provided by the DSP processor which takes care of the error correction of the digital audio signal. Because some type of DAT recorders can have 4 heads the DAT Errormonitor can get its information from the 'Master' or 'Slave'-heads. In the case of a 4 head recorder there are 2 DSP processors installed, one for playback and another one for monitoring during recording. During playback the information from the 'Master'-DSP is being used, during recording information from the 'Slave-DSP' is being used. The electronics of the DAT-Errormonitor are assembled on 2 printed circuit boards: an interface board and a processor board. Both boards are connected with a 34 pole ribboncable. For a 2 head machine only the processor board is needed. An optical isolated (up to 1500 Volts) RS232 output is provided for connecting a serial printer or a PC which runs a special datacapturing program.

Interfaceboard description

The interface board is for selecting between the signals from the 'Master' or 'Slave' DSP and buffering the signals for transport to the processor board. Because the error status information is updated about 27,100 times per second a pre-selection is being made on the interface board, for 2 head machines the pre-selection is being made on the processor board. It is not possible for the processor to process all the information real-time, so a selection must be made. The error status information can be split up into 4 different types:

- C2 correction first: This is the first attempt made by the DAT recorder to correct any errors while reading data from the tape. Together with the digital audio data some extra information is being recorded, this information is used for correcting errors. During this attempt up to 5 errors can be detected.

- C1 correction second Data being corrected in the previous step is being fed into another errorcorrector which can correct up to 3 errors.

- C2 correction second This is the final errorcorrecting performed by the errorcorrector. Up to 6 errors can be corrected.

- SUBC1 correction This not digital audio data, but sub-code data. This data contains absolute time, track numbers and other control data. Normally you are not interested in this.

The sub-code data is stored twice on the tape and it is very robust. If you have a tape with some problems with the absolute time you may try this setting to check if there are problems with the sub-code information. Inside the errorcorrector is also a 'C1 errordetection' system. The order of errorcorrection is:

C1 (first) -> C2 (first) -> C1 (second) -> C2 (second)

The output from this system with the erroneous data is used by the 'C2'-corrector.

By means of a software option a selection from the following error types can be made:

- C2 correction first
- C1 correction second
- C2 correction second
- SUBC1 correction

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The software option can be programmed into the DAT Errormonitor with an optional configuration package which contains of a special program and a programming cable. For each error type there are 8 levels of severity. The error level is coded into a 3 bit signal which is being processed by the processor board.

Processor board

This board contains the following functions:

- The 3-bit coded error level is being decoded into 8 error levels. For each error level is a separate memory which signals the occurrence of that error level. The processor can read and clear this memory. With this extra memory the processor can not 'forget' the occurrence of a particular error.

- To be able to store the error information the clock signal from the DSP processor in the DAT recorder is converted into a clock signal for the error level memory.

- A reset circuit for initialising the processor when the power is being switched on.

- A circuit which can switch the processor into a special program mode which can be used for changing some options. The processor is switched into program mode by connecting a special cable to the RS232 interface.

- When used with a 2 head machine the processor board also contains the same Error signal processing logic as on the interface board.

- An isolated RS232 converter. This will eliminate the chance for groundloops and other problems.

The decoding of the Sub-code data is being taken care of by the processor on the DAT Errormonitor. The Sub-code data is assembled into 42 bytes. The Sub-code contains the following information:

- absolute time in hours, minutes, seconds and frames
- track number and index number
- ID status (START and SKIP)
- samplerate indication
- copy status (OK / PROHIBITED)
- LONG PLAY or STANDARD PLAY
- emphasis ON/OFF

Operating the DAT Errormonitor

Operating the DAT Errormonitor is quite simple and straightforward. To start an analyses: just start PLAY or RECORD on the DAT recorder. To stop: press the STOP button on the DAT recorder. (Any non PLAY- or RECORD function will stop the analyses after a predetermined amount of time).

Output description

```
-------------------------------------------------------------------------
DAT Error monitor V2.0 Machine #1
(1)    00:13:26.29 Track -- Start playback
(2)    00:13:28.17 Track -- Start analysis Fs=44.1kHz Emphasis_off Standard_Play
(1)    00:22:42.31 Track -- Start recording
(2)    00:22:43.32 Track -- Start analysis Fs=44.1kHz Emphasis_off Standard_Play
(3) ** 00:22:56.27 Track -- Non-valid-data count 150
(4)  * 00:24:08.33 Track -- CRC error 04
(5)*** 00:25:20.07 Track -- Mute_On
(5)*** 00:25:21.13 Track -- Mute_Off
```

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```
(6)*** 00:26:20.19 Track -- Fs=44.1kHz
(6)*** 00:30:54.20 Track -- Fs=32kHz
(6)*** 00:32:27.04 Track -- Long_Play
(6)*** 00:34:56.01 Track -- Emphasis_off
(7)*** 01:39:34.20 Track -- End of audiodata
(8)  - 01:40:28.19 Track 01 Start ID
(8)  - 01:41:41.15 Track 01 Skip ID
(9)    01:55:30.24 Track 01 Stop analysis

(10)
Error count:
Non-valid-data count 150
Mutes 1
CRC 1
* End of report *
--------------------------------------------------------
```

1. This line shows the operating mode of the recorder (Play or Record)

2. When a valid audio signal is available, this line will be printed. The track number can only be reported after reading of a 'Start ID' with a track number.

3. When a non correctable error will be reported by raising the 'V bit in the digital output data, the numbers of errors will be counted and reported. The severity-level will be indicated with 2 stars.

4. This line reports a correctable error. The number indicates the type of error. The severity-level is 1 star.

5. This line indicates a mute condition which has a severity-level of 3 stars.

6. These lines indicate status changes and they are also reported with 3 stars.

7. When there is no digital audio present on the tape for some time it will be reported with this line. Normally a 'Mute-on' condition will be reported before this line.

8. 'Start IDs' and 'SKIP IDs' are indicated on this line. This events are no errors but might be of interest and are marked with a '-'.

9. When the operating mode changes, the analysis will be stopped.

10. The error totals are reported on these lines. The maximum 'Non-valid-data' count is 65535. When there are more errors it will be indicated with a '>' - symbol.

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Sample output DAT Errormonitor:

```
PCM2300 DAT Error analyser. Ver. 1.4 Machine #1

                    Start playback
    00:10:30 Track 02 Start analysis Fs=44.1kHz Emphasis_on Standard_Play
  - 00:10:30 Track 02 Start ID
*** 00:10:56 Track 02 Emphasis_off
  - 00:10:56 Track 03 Start ID
  - 00:11:29 Track 04 Start ID
 ** 00:11:54 Track 04 Non-valid-data count 406
  - 00:12:02 Track 05 Start ID
  * 00:12:23 Track 05 CRC error 04
 ** 00:12:23 Track 05 Non-valid-data count 213
  * 00:12:23 Track 05 CRC error 08
 ** 00:12:24 Track 05 Non-valid-data count 449
 ** 00:12:29 Track 05 Non-valid-data count 147
  * 00:12:29 Track 05 CRC error 04
 ** 00:12:29 Track 05 Non-valid-data count 378
  - 00:12:33 Track 06 Start ID
 ** 00:12:54 Track 06 Non-valid-data count 178
 ** 00:12:54 Track 06 Non-valid-data count 483
 ** 00:12:59 Track 06 Non-valid-data count 199
  * 00:12:59 Track 06 CRC error 04
 ** 00:12:59 Track 06 Non-valid-data count 435
*** 00:13:43 Track 06 Mute_On
*** 00:13:43 Track 06 Fs=48kHz
*** 00:13:44 Track 06 Mute_Off
  - 00:13:44 Track 07 Start ID
*** 00:14:20 Track 07 Mute_On
 ** 00:14:20 Track 07 Non-valid-data count 325
*** 00:14:20 Track 07 Fs=44.1kHz
*** 00:14:21 Track 07 Mute_Off
  - 00:14:21 Track 08 Start ID
 ** 00:14:54 Track 08 Non-valid-data count 142
  * 00:14:54 Track 08 CRC error 04
*** 00:14:54 Track 08 Mute_On
 ** 00:14:54 Track 08 Non-valid-data count 556
  * 00:14:54 Track 08 CRC error 04
*** 00:14:54 Track 08 Fs=32kHz
 ** 00:14:54 Track 08 Non-valid-data count 277
*** 00:14:55 Track 08 Mute_Off
  - 00:14:56 Track 09 Start ID
*** 00:15:26 Track 09 Mute_On
 ** 00:15:26 Track 09 Non-valid-data count 161
 ** 00:15:27 Track 09 Non-valid-data count 743
*** 00:15:27 Track 09 Long_Play
 ** 00:15:27 Track 09 Non-valid-data count 652
*** 00:15:27 Track 09 Mute_Off
  - 00:15:29 Track 10 Start ID
    00:15:29 Track 10 Stop analysis

Error count:
Non-valid-data count 5744
Mutes 4
CRC 6
* End of report *
--------------------------------------------------------------------------
```