

~~Why~~

"How the Multics Magnetic Tape Format got this way"

Basic assumption: Magnetic tape is unreliable ~~and~~  
~~very unpredictable way.~~

Moss: detect errors, which are certain to be there

Vassatsky: "No program which depends on magnetic tape has  
ever produced <sup>the</sup> correct answer."

(perhaps overreacted, but only  
slightly.)

Basic difficulty: the nature of the recording ~~medium~~  
is random, the ~~hardware~~ hardware  
cannot detect many errors!

Lack of parity check is not sufficient to be  
sure data was read or written.

~~examples~~

~~1. 2 bits may have changed; total parity still~~

~~2. 2 identical characters <sup>lines</sup> ~~characters~~ dropped;~~

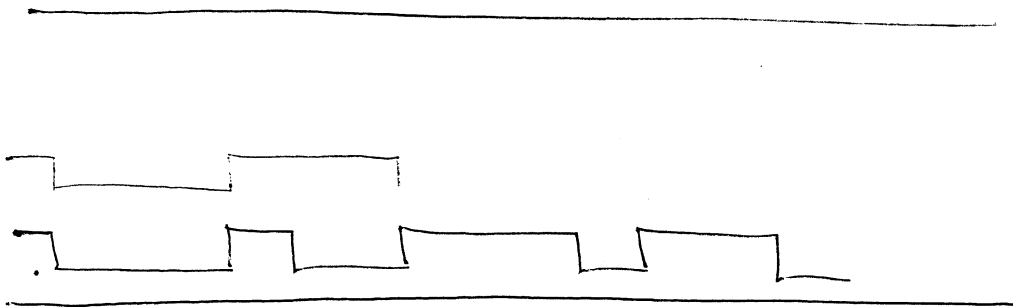
~~longitudinal parity still OK~~

Problem is dropped lines.

How?

NRZ notation

Non-Return to Zero



hi  
low

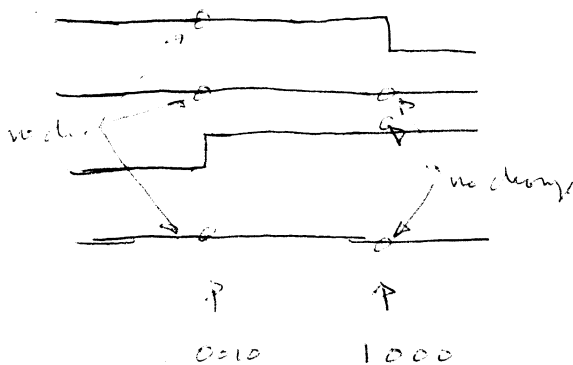
a change means a 1 bit.

no change means a 0 bit.

~~if no~~

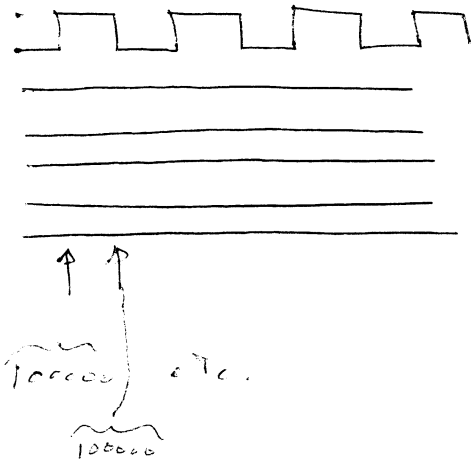
2nd Start, say, with all tracks low.

There is ~~not~~ <sup>no</sup> timing track



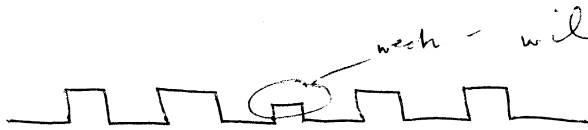
N.B. can't record 0000!

Solution: odd parity track



top track is parity, odd # of bits or, or clamp change.

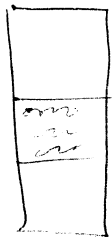
It works but it is error prone



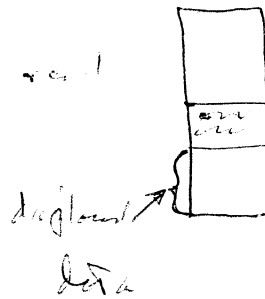
will miss two consecutive

loss of read!

write:



read:



misses 2 lines

no parity failure

no read error

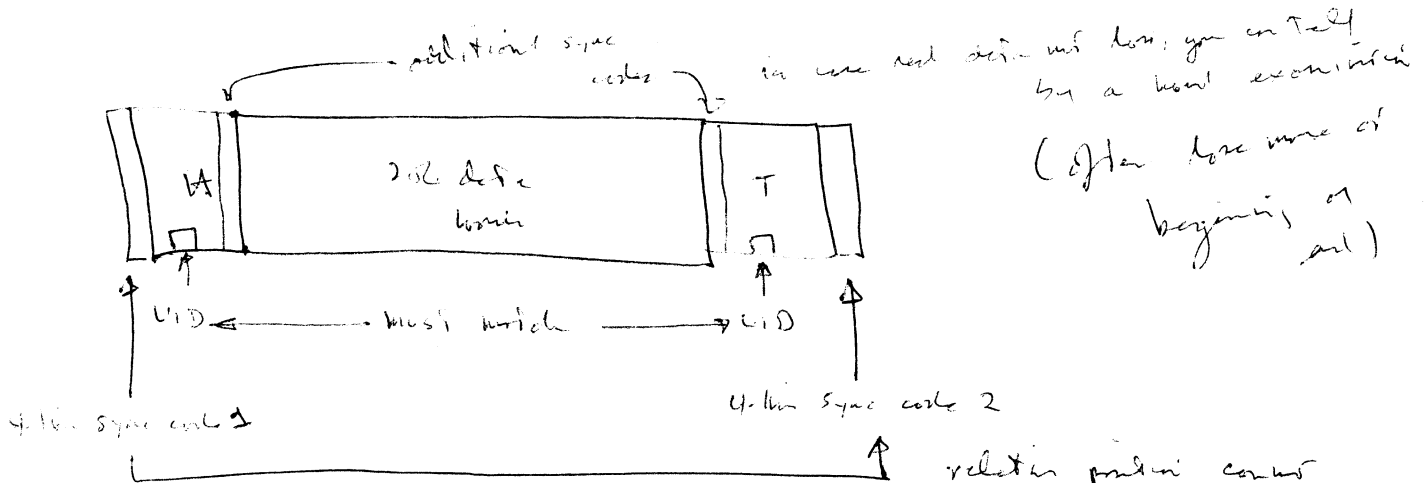
Conclusion: to know if you have read a record correctly, you must know its intended length.

Media format is:

1. All records 272 words  
 record header, record trailer which  
 include, and are identifiable.

$\frac{275}{2.8}$

Enough info to untangle easily by hand,  
 if it is uncorruptible by hardware.

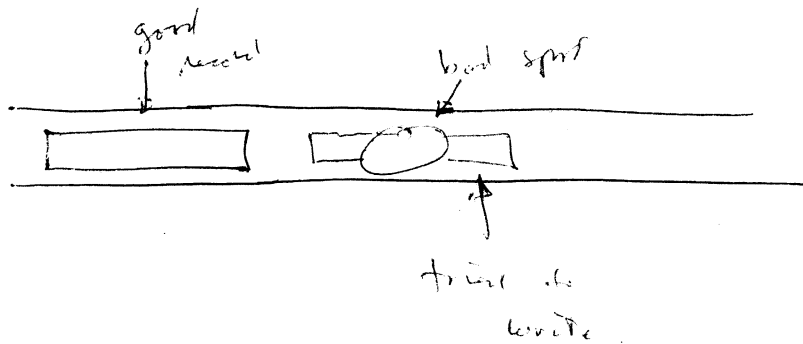


+ header + trailer checksum!

relative position cannot  
 be mistaken even if  
 1 bit transmission errors  
 occur on every line  
 ↑ sync code.

2. Write error recovery

Problem: if you detect a write error,  
probably a bad spot on tape.

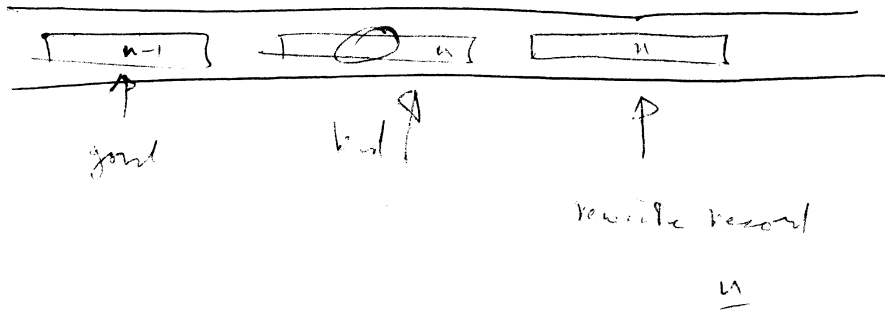


If try to backspace, maybe

1. bad spot looks like a record gap,  
will rewrite from there.
2. bad spot on big record, looks empty,  
will backspace over previous record!
3. could work.

Chances of back -

Multimedia strategy (controllable in format)



Header has record #.

On read, if ~~parity~~ always read 1 record ahead.

If next record has correct record #, use it instead, since write side of even.

If parity failure on unduplicated record, backup

to tape again, but no more than 10 times - then

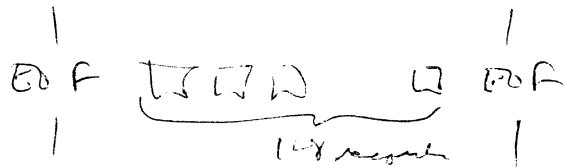
kick tape forward till something reads w/o parity failure + right length.  
(otherwise will loop forever)

EOF marks. (1 character read of special pattern)

(Used for rapid spacing to a desired position on tape)

To be sure you got one, must know where they are.

Multiple format:



Always know, when reading, exactly what is expected.

Can then check to see if actually gotten.