

Revised: May 11, 1956

PROJECT STRETCH
INPUT-OUTPUT MEMO NO. 1

Subject: Proposed Characteristics for STRETCH High-Speed Tape

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Since it is too early at this time to set down specifications for a high-speed tape unit for STRETCH, this memo is a tentative outline of the objectives of the tape program.

It should be clearly understood that these characteristics are goals that seem worthy of accomplishment; they are not rigid specifications nor are they accomplished facts. This memo should not preclude consideration of better ways of achieving the overall performance desired.

1. Tape Drive

Speed - 300 inches/second, forward or backward

Width - 1 inch

Start Time - 6 milliseconds

Interrecord Gap - 2 inches

Tracks - 2 sets of 8 information tracks plus a timing track (plus possibly another control track), for a maximum of 20 tracks; one set writes in the forward direction and the other set in the backward direction; reading may be forward or backward on either set.

Reel Capacity - 2400 feet

Rewind - None; it is assumed that the end-of-file point will be near the starting point on the other half of the tape.

Loading - Automatic loading with access to any one of eight reels.

Operator can remove used reels or add new reels, at any time during the run, to the capacity of eight reels.

2. Recording

Method - NRZI inverted, with flux reversal for a zero.

Density - 10,000 bits/inch

Speed Tolerance - + 10%

Bit Rate - 3 megapulses/second in each track (=density x speed)

Word Length - 70 bits : 60 information bits and the internal check bit, plus an allowance for synch bits and additional redundancy; the

exact scheme remains to be determined.

Timing - Each track is independently timed from its own bits with extra synch bits added as needed. A common timing track is used to establish frequency, but not phase.

Recording - Words are recorded serially. A track contains every eighth word of a block (first word in track 1, second word in track 2, etc.).

Head Alignment - There will be no need for aligning heads in different tracks with each other. The only alignment required is to insure satisfactory single track operation.

Error Correction - Each block is written a second time immediately following the first recording, but starting with the first word in the fifth track. A short gap is left between blocks for identification.

Minimum Block Length - 2048 words, not counting the duplicate recording.

3. Performance

The following performance results from the preceding specifications.

(a) Not counting duplicate recording and interrecord gap:

Access rate to memory: 2.9 microseconds/word
Tape Capacity: 1150 words/inch

(b) Including effect of duplicate recording and interrecord gap, assuming a block of 8096 words:

Efficiency: 44%
Net Word Rate: 151,000 words/second
Reel Capacity: 29 million words
Reel Running Time: 3.2 minutes

(c) Comparison with 727

Assuming 10 characters (7 bits each) per word and no error correction, the 727 word rate is 1500 words/second and the reel capacity is 500,000 words.

This gives performance ratios of the high-speed tape over the 727 as follows:

Word Rate - 101
Reel Capacity - 58

With error correction on the 727, the ratios would be doubled.