PDP-X Technical Memorandum # 11

Title: DECtape Tape Format Considerations

Author(s): S. Booth

Index Keys: DECtape Format
DECtape
I/O
Peripherals

Distribution Keys: A, B, C

Obsolete: None

Revision: None

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I. Introduction

A. This memo contains come comments and suggestions concerning the PDP-X Dectape Tape format. It does not consider I/O commands or status words.

B. Three points are considered

1. Basic quantum of parallel transfer

2. Data Block Structure

3. Other considerations related to 1. & 2.

II. Basic Quantum of Parallel Transfer

A. The 8 bit-byte is a unit compatible with the Multiplexor Channel, I/O Bus, and other I/O devices. Therefore, it could be desirable for Dectape.

B. Assuming the 8 bit-byte as the basic unit of transfer, a format which uses three lines of tape to record 8 bits (plus parity if desirable) seems desirable for reasons stated later. The Figure 1. compares PDP-8 format, PDP-9 format, and the proposed PDP-X format.

C. Given the format suggested in Sec. II.B., two Read/Write Modes of assembly/disassembly are desirable.

1. Mode 1 - Three lines of tape are assembled for transfer as one byte. This would be the normal mode and would be used for all PDP-X non-maintenance, interchange, or formatting operations.

2. Mode 2 - Two lines of tape are assembled for transfer as one byte in the following format:

Ø - MR	TRK	BIT			4 - MR	TRK	BIT	
1 - INFO	TRK	BIT	Ø		5 - INFO	TRK	BIT	Ø
2 - "	"	"	1		6 - "	"	"	1
3 - "	"	"	2		7 - "	"	"	2

D. The two modes allow all necessary read/write operations to be performed for inter- and intra-PDP-X transfers, PDP-X tape formatting, PDP-X diagnostics, and PDP-X to other PDP transfers with all information obtainable.

1. PDP-X System Usage - Mode 1
2. PDP-X Tape Formatting - Mode 2
3. PDP-X Diagnostics - Modes 1 & 2
4. PDP-X Write, Other PDP Read - Mode 1 or 2 (probably Mode 1)
5. PDP-X Read, Other PDP Write - Mode 2

III. Data Block Structure

A. Based on PDP-8 & PDP-9 usage and the PDP-X field size, blocks of 128 or 256 words appears desirable. Other considerations include new programming file structures for other mass storage devices (e.g., disc, mag tape, drum).

IV. Related Considerations

A. Data Density Reduction - The 11% of unusable storage (1 bit unused out of 9) is traded for a reduction in hardware for assembly/disassembly. This seems like a reasonable trade off since the dollars per bit of Dectape storage is "low". An 11% decrease in the time to access a given block is still a "long" time and would not be realized if very many turnarounds were required.

B. Assembly for Mode 1 and Mode 2-additional logic is required for two modes of assembly, however, this buys:

1. A smooth appearance to the program.
2. A method to format tape.
3. A method for tape communication with non-PDP-X machines. Other methods cost in density (e.g. 33 % using two tracks only) and hardware (e.g. 8 bit→18 bit transform) also.

With a ROS program running the tape control the additional hardware cost may not be significant. When available, a clearer definition of the I/O Processor could clear up this point.

C. Transfer Timing - With single byte buffering in the control the maximum time between byte transfers in Mode 1 is (3 lines X 33.3 μs/line)-30% = 100 μs - 30% = approx. 70 μs. In Mode 2 this time is approx 46 μs. System usage should be Mode 1, and 70 μs worst case should present no unreasonable restrictions. The TCØ1 & TCØ2 require the 46 μs limit.

D. Write/Read in Opposite Directions - Would a ROS controller provide this feature cheaply? Would the system and users make use of it?

Timing Track → - - - - - -

Mark Track → - - - - - -

PDP-8	Information Track 0 →	0	3	6	9	0	3	6	9	0	3	6	9
	1 →	1	4	7	10	1	4	7	10	1	4	7	10
	2 →	2	5	8	11	2	5	8	11	2	5	8	11
PDP-9	0 →	0	3	6	9	12	15	0	3	6	9	12	15
	1 →	1	4	7	10	13	16	1	4	7	10	13	16
	2 →	2	5	8	11	14	17	2	5	8	11	14	17
PDP-X	0 →	P	10	13	P	2	5	P	10	13	P	2	5
	1 →	8	11	14	0	3	6	8	11	14	0	3	6
	2 →	9	12	15	1	4	7	9	12	15	1	4	7
		Byte 1			Byte 2								

Figure 1