MAGNETIC TAPE SYSTEM FOR NORD-1

Preliminary Programming Specifications

June 1970

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1 SYSTEM ORGANIZATION

Four tape units may be connected to NORD-1 via a tape controller, organized as one master unit and zero to three slave units. Data are transferred in variable block lengths directly between tape unit and core memory. Transfers are started by means of IOT instructions, specifying transfer mode and actual core- and unit addresses. See fig. 1.
Recording format is 7 or 9 bits NRZI (Non-return to zero IBM) and with IBM compatible track and gap spacing.

2 READING MAGNETIC TAPE

If the magnetic tape has been previously written by a similar type of magnetic tape unit (7 track vs. 9 track) and the bit density has been properly selected (200, 556, or 800 bits per inch), then the MT unit should be ready to READ a record.

Because the MT hardware is a record-oriented device, a READ request passes over a complete physical record of the magnetic tape (an End-Of-File is always considered to be a complete record) regardless of the actual record length or number of words requested by the program. The entire record or only a portion is transmitted to the memory buffer.

If the physical record length on the magnetic tape is unknown, then an extremely large I/O request (limited to 16383 words for HP3030) may be used to READ in the entire record. If only part of the record is to be transmitted to the memory buffer, then the READ request need only specify that part; but the remainder of the record is passed over by the magnetic tape unit regardless. After a READ request, the magnetic tape unit halts between records.

3 TAPE SPECIFICATIONS

Word format:	8 data bits + 1 parity bit. (1 core word contains 2 tape characters)
Tape speed:	75 ips.
Recording density:	200/556/800 bpi
Recording format:	NRZI (Non-Return to Zero IBM)
Rewind time:	< 3 min. for 2400' reel.
Byte transfer rates:	15/41.6/60kHz
Word transfer rates:	67/24/16.7 μs/word

In addition to lateral parity check for each byte there is longitudinal bit by bit parity check for each record.

4 STARTING A TRANSFER

Before a transfer can be started, IOT instructions to be described in the next section, are used to load certain registers in the tape controller:

a. Load the "core address register" (TCAR) with the first core address to or from which the transfer is to be directed.

b. Load the "word count register" (TWCR) with the length of the record.

c. Load the A-register with the modus code of the desired operation.

The transfer will now be performed by executing the IOT ACT MT instruction.

5 IOT INSTRUCTIONS

Two device numbers are used, one for load and read instructions and one (IOT MT) for starting a transfer. The former type decodes bits 8 and 10 in the instruction code (normally ACT and PIN) to provide up to 4 functions. Regarding the IOT MT instruction, ACT, SKA and PIN are to be used in manner analogous to low speed devices.

5.1 Load register instructions

Load register instructions are executed only if the Transfer off bit of the status register (bit no. 14) is off. If SKA is specified in the load instruction next instruction in the program sequence is skipped for transfer off, which means that a new address word is transferred to the register.

5.1.1 Load core address register (TCAR)

IOT LTCA % (A) → TCAR

5.1.2 Load word count register (TWCR)

IOT LTWC % (A) → TWCR

5.2 Read register instructions

5.2.1 Read status register (TSTR) and skip if no error on SKA

IOT RTST % (TSTR) → A

The "status word" gives information about the state of the tape controller and selected tape unit.

Bit no.	Function	RTST skip	Inter-rupt	Bit reset by IOT ACT MT	Reset by CLEAR button
15	Transfer completion			1	1
14	Transfer off		1	1	1
13	Ready				
12					
11	Modus bit 3				
10	" " 2				
9	" " 1				
8	" " 0				
7	Selected unit				
6	" "				
5	" "				
4	Parity error			1	1
3	Overflow in read			1	1
2	End of Tape				
1	End of File				
0	No assignment				

Next instruction will be skipped if bits 1-4 all are zero and SKA specified.

15 Transfer completion

A transfer has been successfully completed.

14 Transfer off

Data are being transferred between core and tape, when bit 14 is zero.

13 Ready

The tape unit is ready for data transfer.

11-8 Modus

Transfer modus as specified for the last accepted IOT ACT MT instruction.

7-5 Selected unit

Unit number read from selected unit.

4 Parity error

A parity error has been detected during a READ operation.

3 Overflow in read

Specified word count was to small to encompass complete record in read operation.

2 End of Tape

Last transfer reached End of Tape mark.

1 End of File

Last transfer reached End of File mark.

5.3 The transfer instruction

IOT MT

A data transfer is performed between core and tape as specified by (TCAR) and (TWCR). ACT, SKA, PIN and SNI are used in the customary manner.

Before executing the instruction, the A-register should be loaded with the "modus code" for the operation:

1 = BACKSPACE 1 RECORD

2 = READ ONE RECORD

3 = WRITE ONE RECORD

4 = ADVANCE TO END OF FILE

5 = WRITE END OF FILE

6 = REWIND

7 = WRITE SKIP

10 = STOP OPERATION

A SKA test will give "skip", or interrupt request is generated (in case PIN has been specified) when status bit 15 becomes a "1".

An IOT ACT MT instruction will clear status bits 2-3 and 14-15. Pushing the CLEAR button will also clear these bits.

100 = M TEST % Check tape unit interface and memory access with one 256 word record of prewired data words. Tape unit not in operation.

APPENDIX 1, FIGURES