FP6000 PROJECT MEMORANDUM #23

October 3, 1963

Revised - ~~March 24, 1964~~ Sept 22 1964

System Specification for FP6000 Magnetic Tape Channel Control (FP6501)

and Magnetic Tape Unit Control (FP6520)

The following specification has been drawn up by Product Planning in conjunction with Engineering. It completely replaces tge issue of December 19, 1963.

Revisions have been underlined.

W. R. Whittall
Product Planning
Computer Systems

DISTRIBUTION LIST:

D. K. Ritchie

ICT Australia

ICT West Gorton

ICT Bracknell

File

Engineering
P. Stevens
H. Reddering
E. Strain
J. Parsonage
V. Caldwell
G. Orgusaar
W. Joyner
G. Freel
B. Ovenell
J. Davidson
K. Bower

Marketing
J. McKenzie
A. Adams
J. Chapman
L. Cragg
A. Illes
L. Lawry

M. Marcotty
P. Adams
H. Foulds

I. Sharp
B. Daly
M. Lucas
R. Moore ✓
A. Sharp
D. Smith

F. Longstaff
V. Taylor
W. Whittall (3)

Specification for FP6000 Magnetic Tape System

1. General

The magnetic tape control system consists of one unit control for each magnetic tape unit (Burroughs BC422) together with one or more channel controls. Each unit control has its own special register address for communication with executive and an associated control word in the store for use by hesitation control. The special register address is determined by the wiring of a decoder card in the unit control (the unit number switch on the BC422 is not used). All tape operations except rewind require exclusive use of a channel control. Provision is made for connecting each unit control to three channel controls. At least twelve unit controls can be connected to the same channel control. The unit control automatically selects a free channel control when the operation is initiated by executive and releases it at the end of the operation. A special register bit will be set in the unit control if all the channel controls connected to it are busy.

2. Tape Format

The FP6000 Magnetic Tape System will read and write IBM compatible 1/2" 7-track tapes at 120" per second, with variable length blocks of up to 131,072 6-bit characters separated by gaps of not less than 5/8" on reading, or 3/4", +5/32", -1/16" on writing. Each 6-bit character will be written across the tape, one bit per track, with an odd or even parity bit in the seventh track. At the end of each block there is an even longitudinal parity bit for each of the 7 tracks.

3. Density

The recording density can be either 200 or 555.6 characters per inch as selected by the High/Low switch on each magnetic tape unit. This corresponds to a transfer rate of 24 Kc/s or 66.7 Kc/s at 120" per second.

Continued ...

4. Coding

Odd or even character parity will be selected by executive. The four most significant bits of each character will be inverted before being written on tape and inverted again when read. Computer character octal 74 cannot be written on the tape with even parity and is therefore used as a stop character in even parity mode. Binary data must therefore be written with odd parity and for this reason the modes are called "Binary" and "BCD".

5. Checking

During a write operation the parity bits are generated by the channel control and written on the tape with the data. When the information passes the read heads it is checked for correct parity. During an erase operation the read heads are used to check for complete erasure. During a read operation (forward or backward) the information is checked for correct parity.

6. Tape Operations

The following tape operations can be initiated by executive by writing to the unit control special register

BOUT Ø to 14			N (used only with Read, Write, Erase and Backward Rea
15, 16, 17	Coded	0	Read (N words) (forward)
		1	Write (N words) (forward)
		2	Backward Read (N words)
		3	Erase (about N words) (forward)
		4	File skip forward
		5	Write end of file block
		6	File skip backward
		7	Rewind
BOUT 18			BCD mode (Ignored with rewind)
BOUT 19			START (always 1)

In the case of Read, Write, Backward Read and Erase, N can have any value up to 32,767 and the 9 least significant bits of N should be placed in the control word with the starting address for the transfer before writing to the special register. N = 0 signifies 32,768

Continued...

7. Read (forward or backward

A block containing any number of characters from 1 to 131,072 can be read by choosing a large enough value of N. Stop characters (octal 74) will be used to fill up the last word transferred if necessary. The number of data characters in the last word transferred (modulo 4) will be available to executive by reading the special register. In BCD mode, if the number of words (including any partword) in a block on tape is less than N, an extra word of stop characters is transferred to store and a special "Stop Word" bit is set in the special register. If the block on tape is longer than N words the first N words only are transferred, the rest of the block is read and checked, and a special "Long Block" bit is set in the special register.

8. Write and Erase

These operations can be carried out in the forward direction only. Erase is identical to Write except that the tape is erased and the read check detects any unerased 1 bit and sets parity fail if any are found. The length of tape erased depends on N and density selected on the magnetic tape unit and is only approximate, due to tape speed fluctuations.

An operator attention interrupt will occur if an attempt is made to write or erase on a reel without a Write Permit ring. About 2 1/2 inches of tape will be automatically erased before the first write operation at beginning of tape. When writing or erasing in BCD mode the first stop character (Octal 74) will cause the operation to be terminated and the "Long Block" and "Number of data characters in last word" bits to be set in the special register.

9. Backward Read

This is similar to the Read operation except that the tape is moved backwards and the characters are placed in the store in decreasing address sequence starting with character 3 of the word addressed by the control word. An attempt to perform a Backward Read operation at Beginning of Tape will result in an Operator Attention interrupt without

moving tape.

10. End of File Blocks

The End of File block consists of an IBM tape-mark (octal 17) character followed by its longitudinal check bits. When read into the computer it will be converted into octal 63. A special End of File bit will be set in the special register whenever an End of File block passes the read heads in either direction except during a rewind. (Revised)

11. Rewind

This causes the tape to rewind at high speed (2,400 feet in 90 seconds) until the beginning of tape marker is sensed when an interrupt will be generated. The Rewind operation does not use a channel control.

12. Simultaneous Transfers

The channel control will be double buffered so that up to three (6 us machine) or seven (2 us machine) READ, WRITE, BACKWARD READ or ERASE operations can take place simultaneously if there is a free channel control for each transfer and if there are no other fast peripherals in use.

13. Accept Facility

If the "Remote" (On-Line) button on the magnetic tape unit is pressed while the unit is in "Local", at the beginning of tape, and otherwise ready, an interrupt will be generated with the "Accept" bit set in the special register.

14. Information Available to Executive

BIN	0	End (reason for interrupt) (See note 1)
	1	Operator Attention (reason for interrupt) (See note 2)
	2	* Parity Error
	3	* Hesitation Overdue
	4	Accept (See paragraph 13) (reason for interrupt)
	5	Unit Busy

continued...

6	All Channels Busy (See paragraph 1)	
7	Spare	
8	TREL	See note 6
9	TWRL	
10	Beginning of Tape	(see note 3)
11	End of Tape	(See note 4)
12	Spare	
13	Spare	
14	Off Line	(See note 5)
15	* Long Block (See paragraph 7 & 8)	
16	* Fill Word (See paragraph 7)	
17	* End of File (See paragraph 10)	
18	Spare	
19	Spare	
20	Spare	
21	Spare	
22	* Number of data characters in last word	(modulo 4)
23		

Notes

* These bits will only be set while END is set.

1. End is set at the end of any operation (including rewind)

2. Operator Attention is set:-

   (a) If any operation is initiated when the unit is off-line.

   (b) If the unit goes off-line while busy.

   (c) If an attempt is made to write on a reel without a write permit ring.

   (d) If an attempt is made to Backward Read or File Skip Backward at beginning of tape.

   (e) If Beginning of tape is reached during a Backward Read or File Skip Backward.

3. Beginning of Tape is set when the tape reaches the Beginning of Tape marker moving backwards and remains set until the tape is moved forwards

4. End of Tape is set when the tape reaches the End of Tape marker moving forwards and remains set until the tape is moved backwards. Approximately 8 feet of tape can be used beyond the End of Tape marker in its normal position.

5. The unit can be set On-Line (Remote) or Off-Line (Local) by a switch on the unit.

Continued

6. TREI is set during any operation, other than REWIND, except for about 5ms. after the end of any previous operation. TWRL is set only if TREI is set and the tape supply reel mounted on the unit is fitted with a write permit ring. TREI will only be used to define when TWRL is dependent only on the presence or absence of the write permit ring.