INTERNAL USE ONLY

INTERNATIONAL COMPUTERS AND TABULATORS LIMITED

Programming Language Division
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FORTRAN NOTE 18
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PERIPHERAL ROUTINES

This note gives a brief summary of the action of the currently available peripheral routines for FORTRAN 4, namely:-

- % FIOPT Paper Tape.
- % FIOLP Lineprinter.
- % FIOCARD Cards.
- % FIOMT Unformatted magnetic tape.
- % FIOMTF Formatted magnetic tape.

A knowledge of FORTRAN NOTES 7 and 5 (shortly to be replaced) is assumed.

PERIPHERAL ROUTINE

%FIOPT

Input

This routine reads, in shift mode, 124 characters or to terminator and converts the block to graphic mode.
α and β shift characters are ignored so that l.c. letters becomes u.c. and - (UL) becomes @. Translation terminates on TC4, NL, FF, CR, LF and any of these except TC4 indicates end of record. DC4, TC0 and ERASE are ignored. Other δ shifts become ! except], ←, ↑ which become their graphic equivalents. Initially, single NL characters are ignored, until the first non-empty block is read in. After that, all records are space-filled to 80 characters if necessary. A record may contain any number of blocks, so there is no maximum record size.

Output

Punches in graphic mode. When %FINOUT indicates end of records a NL character and 3 runout characters are punched. A record may contain any number of blocks, so there is no maximum record size.
On ENDFILE a block consisting of FF, TC4, DC4, 3 Erases and NL is punched, followed by 12" of runout.
RUNOUT gives 4" of runout.

%FIOLP

For formatted records the first character in the buffer is taken as the paper control character translated as follows:-

0	Two line feed
1 - 7	Throw to Channel 1 - 7
+	No advance
space	1 line feed

Any other character is treated as space.

For unformatted records, single line feed is inserted. The buffer is space-filled to 120 character positions to allow for buffered and unbuffered printers. Long lines are continued, using the first character of the continuation as a control character.

ENDFILE and RUNOUT will throw to head of form.

%FIOCARD

Input This routine reads 80 column of a card in normal mode for both formatted and unformatted records. Initially blank cards are ignored for formatted records.

Output The buffer is space-filled if necessary and 80 characters are punched.

ENDFILE punches 1 blank card.

RUNOUT punches 2 blank cards.

%FIØMT (unformatted) and %FIØMTF (formatted)

One reel holds one simple file. The layout is:-

i) Header label

ii) Start of data sentinel

iii) Data blocks

iv) End of file trailer label

For details of the layout of individual blocks see Appendix 1

The tape is opened when the first read, write or end file instruction is given. Checks are made to prevent an attempt to input from an output only tape. An input tape must be named in the program description, If no name is given for an output tape, a scratch tape is found. Input only tapes are checked for the absence of a WP ring, output and use tapes for the presence of a WP ring.

A marker is kept in the information block (see Appendix 2) of the last instruction to be given to the tape, and this is checked for appropriate action and to prevent illegal combinations, i.e. READ after WRITE or ENDFILE, and WRITE after ENDFILE. Most combinations are straightforward except:

BACKSPACE. If the tape is not open, or the data block count is zero this instruction is ignored. If the previous instruction was WRITE, an end-of-file trailer label is written and backspaced. over before the normal procedure is carried out. This is to backspace two blocks, read forward and check the block read:

i) tape mark - i.e. last instruction ENDFILE - straight exit.

ii) start of data sentinel - i.e. only one data block - one is subtracted from data block count and then exit.

iii) data block - a) formatted tape: one subtracted from data block count and exit.

b) unformatted tape: word 3 of the block is checked to see if last block of record. If it is, as a). otherwise n + 1 blocks are backspaced where n is the block number relative to the start of the record (given in word 2), and one block is read forward. Then n + 1 is subtracted from the data block count and exit.

REWIND. If the tape is not opened, the instruction is ignored, If the last instruction was WRITE, an end-of-file trailer label is written, then a rewind instruction is given and exit. When the next READ, WRITE or ENDFILE instruction is encountered, before being carried out the tape will be positioned after the start of data sentinel. This allows time sharing as the tape is rewinding.

For a summary of tape instructions, see Appendix 3.

Alison Finch.

Appendix 1

Magnetic tape layout

FORMATTED		UNFORMATTED
	Header block	
Standard		Standard
Generation no. zero on o/p ignored on i/p		
	Start of data sentinel	
B0 = 1, B22 = 1 Other bits = 0	wd 0	B0 = 1, B22 = 1 Other bits = 0
BL size = 42	wd 1	BL size = 124
0	wd 2, 3	0
B0 = 1 Other bits = 0	wd 4	0
Reserved for FORTRAN	wds 5-9	Reserved for FORTRAN
zero on o/p Ignored on i/p	wds 10-19	zero on o/p Ignored on i/p
	Data blocks	
no. of wds in record ($2 \leq n \leq 42$)	wd 0	no. of wds in block ($5 \leq n \leq 124$)
chars 0, 1 zero char 2 = I char 3 = 1st char of rec.	wd 1	block no.
RECORD	wd 2	Block no. rel to start of rec.
	wd 3	B0 = 1: last bl of rec. B0 = 0 otherwise. last 12 bits: no of information
	wd 4	RECORD.

Trailer label

wd 0	B0 = 1, other bits = 0
wd 1	Data blocks count
wds 2, 3	0
wd 4 - 9	reserved for FORTRAN
wd 5 -19	zero on o/p
	ignored on i/p

A formatted tape has one record per block.

An unformatted tape has 1 or more blocks per record.

Both magnetic tape formats are compatible with MTH convention.

Appendix 2

Structure of Information block for magnetic tape (see FORTRAN NOTE 5)

Wd 0	Address of %FIØMT or %FIØMTF
Wd 1)	Device details
)	
Wd 2)	
Wd 3	B0 - B5 : instruction type
	rest of wd: data block count
Wd 4	zero : scratch tape
	non-zero : named tape
Wd 5 onwards	File name and other parenthesised information from Program Description line in character form '(terminated by right parenthesis.)

Instruction type		
	0	read
	1	write
	3	endfile
	4	backspace
	#40	rewind

Appendix 3

CURRENT	PREVIOUS OPERATION					
OPERATION	None	Read	Write	Backspace	Rewind	Endfile
READ	Open then OK	OK	ERROR	OK	RF2B OK	Error
WRITE	Open then OK	OK	OK	OK	RF2B OK	ERROR
BACKSPACE	Ignore	OK	Endfile Backspace OK	OK	Ignore	OK
REWIND	Ignore	OK	Endfile OK	OK	Ignore	OK
ENDFILE	Open then OK	OK	OK	OK	RF2B OK	Ignore

FORTRAN 4 Magnetic tape operations.

RF2B : skip to tape mark and read start of data sentinel.

Certain of the above combinations will give unpredictable results if an input tape was not produced either by a FORTRAN program or to FORTRAN standards.