

Duffell

May 22, 1957

FILE MEMO

SUBJECT: Multiple Record Instructions-STRETCH

Proposal:

That READ carry across inter-record gaps on tape, that both READ and WRITE carry across from card to card on card equipment, and that WRITE carry from line-to-line on printers.

Technique:

- Programming:
1. The word count in the control word can specify more than one record, card, or line.
 2. A tag bit in the first control word will choose between this proposal and the conventional approach.

Hardware: The Exchange will examine this bit and, if it is a one, will prohibit termination of execution of the instruction on normal end-of-message signal from the external unit.

Considerations:

Subject proposal permits any channel of the Exchange to be occupied for the time it takes the slowest I/O device to pass 2^{15} words. For a 100 cpm card device carrying 15 words per card this amounts to about 22 minutes. (Of course, a manual station on a medium speed channel could occupy it for hours.)

If all or a large part of the channels were so loaded, one might expect serious delays in recognizing channel assignment requests, interrupt requests and abnormal I/O unit conditions.

Each such channel, however, would be servicing 32,768 words* of main memory. This implies some limit to the number of channels so loaded.

*Fifteen words of memory could suffice, if one were doing a card-to-tape operation and if some means of synchronizing the two units were provided.

May 22, 1957

The above probably represents the worst situation. A situation more to be expected is that where a 1000 cpm card reader is passing 2,048 words. This would take about 8.5 seconds.

Example:

It is desired to transfer the data from 22,500 fully punched cards to tape in 2040 word blocks.

Procedure P1: Does not use subject proposal

Procedure P2: Does use subject proposal.

NOTE: 22,500 cards represents (15) (22,500) or 337,500 words which is 165 and a fraction blocks of 2040 words each. An average computer time of 20 us per I/O instruction is assumed.

Number of cycles means Number of I/O instruction executions.

	No. of Cycles		MS		
	Card	Tape	Card	Tape	Total
P1	22,500	166	720.00	4.98	724.98
P2	166	166	4.65	4.65	9.30

See Charts on following pages.

Advantages.

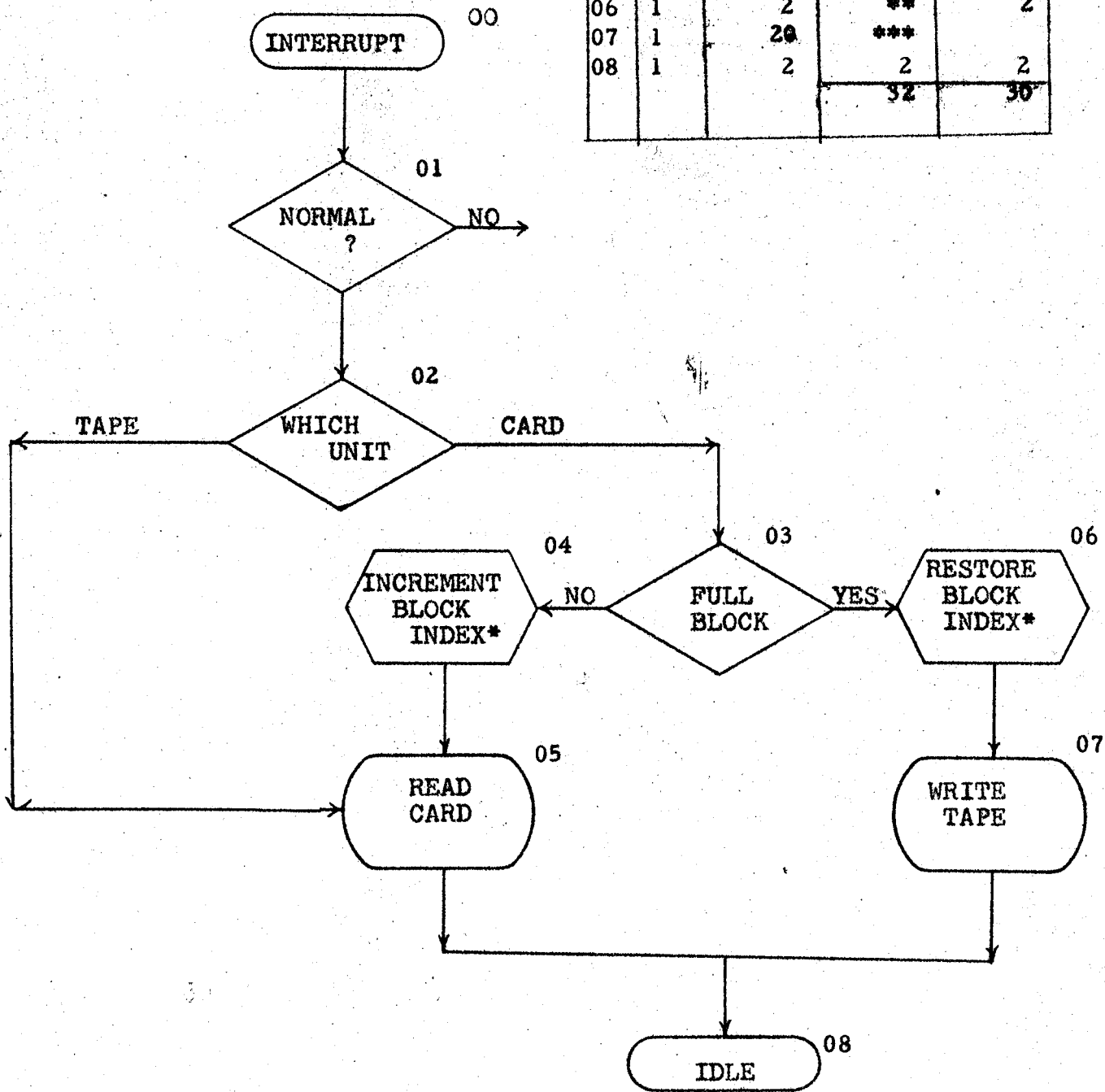
1. Fewer instructions need be written, tested, and stored.
2. Considerably less computer time is devoted to I/O instructions because fewer are executed.
3. Fewer "interrupt" cycles need be taken. (This relieves timing pressures on the Exchange and in the computer program).

Remarks:

The second advantage is by far the most significant. The example illustrates a situation where a 7250 percent improvement is realized with the proposed equipment. This example is typical and frequent in any installation.

P 1

	No. Steps	us	Card	Tape
00	1	2	2	2
01	1	2	2	2
02	1	2	2	2
03	1	2	2	
04	1	2	2	
05	1	20	20	20
06	1	2	**	2
07	1	20	***	
08	1	2	2	2
			32	30

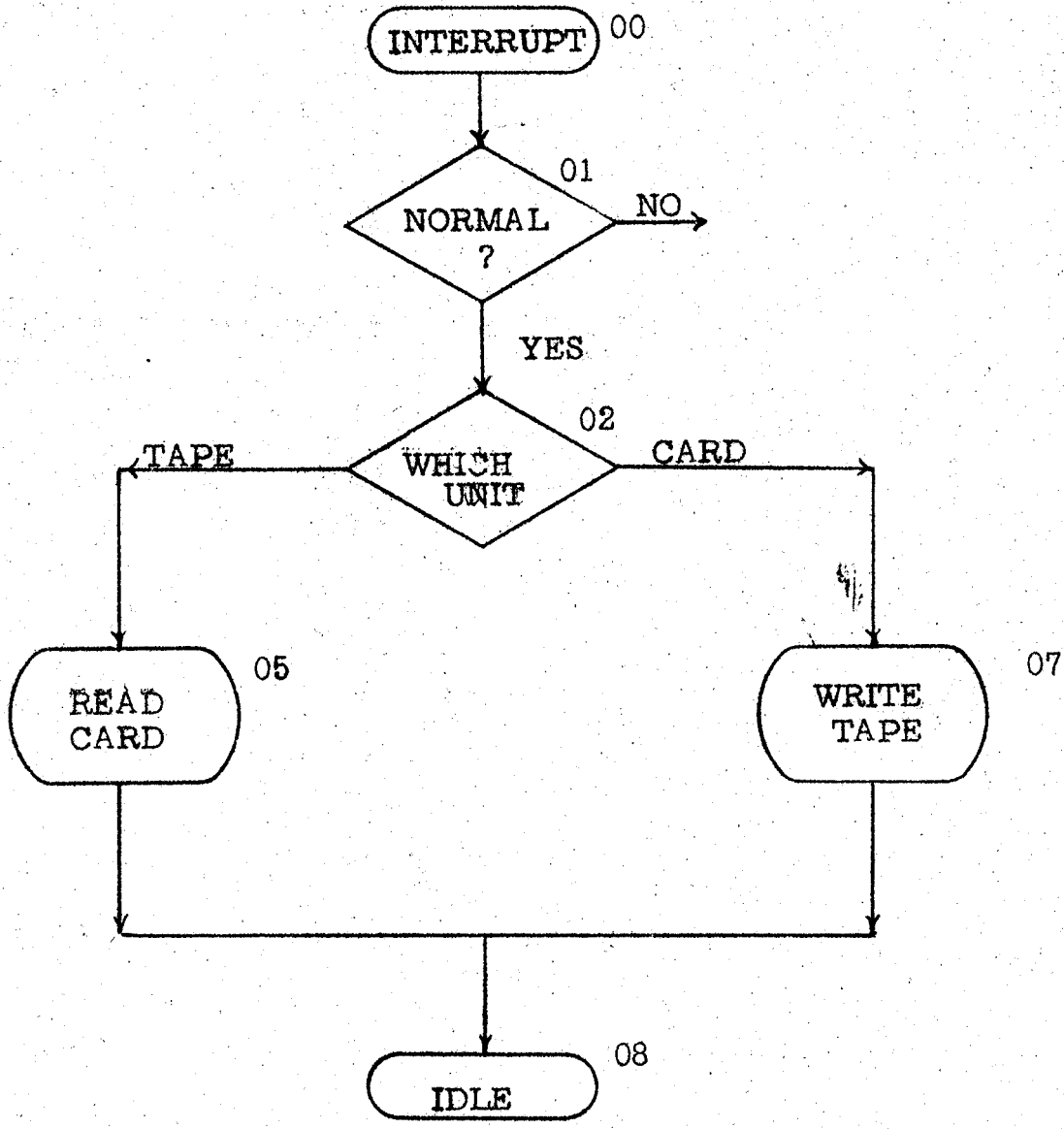


*Actually this is the dataword address in the control-word.

** This will occur instead of step 04 on some cycles.

*** This will occur instead of step 05 on some cycles.

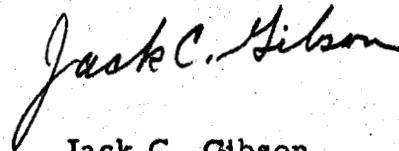
	No Steps	us	Card	Tape
00	1	2	2	2
01	1	2	2	2
02	1	2	2	2
05	1	20	20	
07	1	20		20
08	1	2	2	2
			28	28



May 22, 1957

Proposal:

That writing on tape be included with the main proposal of this memo. Inter-record gaps should be forced on the occasion of a new control-word. The same bit in the first control-word can choose the multiple record mode as before.



Jack C. Gibson

JCG/jv