

EXTRA PROGRAMMING FACILITIES.

1.4.1. General

Computers in the 1900 series are designed to be "upwards compatible", which means that any program written and tested for a 1902 should run on a 1903, 4, 5, 6, 7, 9, & 1904E etc. Any program written and tested for a 1904 should run on a 1905, 6, 7, 9, 1904E etc, but may not necessarily run on a 1902 or 1903.

* NOTE. Further references to 1904E, in these notes, imply 1904E,F, 1905E,F, unless otherwise stated.

The 1904E computers due to their increased store size may accept programs written for more than 32K words of store. However, to ensure upwards compatibility, the 1904E are capable of only allowing a program to use 32K words of store if the programmer desires. This means that a program written for a machine of the 1904 type with 32K words of store, will give the same results on the 1904E.

The 1904E have a slightly larger order code than the smaller machines in the series, and the orders 066, 076, 116, 117, and the odd numbered jump orders are legal under certain conditions.

1.4.2. Modes of Operation.

In order to allow the additional facilities to be used if desired by the Programmer the 1904E can operate in several modes.

The programmer has the following choices of modes:-

Either Compact Store mode or Extended Store mode, and either Extended Jump mode or not.

The mode required by each program must be specified in the header information, and Executive sets the required mode when the program is entered. If no mode is specified the program will be run in Compact Store mode and not Extended Jump mode.

There is no reason why all the programs in the machine at any time should operate in the same modes, as the mode is set by Executive when a program is entered and stored by Executive when a program is suspended.

1.4.3. Compact Store Mode.

This mode is sometimes referred to as "Small Store" mode.

When in Compact Store mode and not Extended Jump mode, the 1904E is fully compatible with 1904/5 and each program is limited to 32K words.

However certain instructions are legal which were illegal on 1904/5. These are :-

066, 076, 116, 117.

1.4.4. Extended Store Mode.

This mode is sometimes referred to as "Large Store" mode, and is the alternative to "Compact Store" mode. When in Extended Store mode the limit of 32K words per program is removed.

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Function 066 may be used in Compact Store mode if required.

1.4.6. Function 076.

This order is used to perform conditional jumps on the state of the floating point accumulator, and may be used in any mode.

Function 076 is defined as follows:-

- If X = 0, jump to N if a = 0 (argument & exponent)
- X = 1, jump to N if a ≠ 0 (argument & exponent)
- X = 2, jump to N if a (argument) +ve
- X = 3, jump to N if a (argument) -ve
- X = 4, jump to N if floating-point overflow is clear
- X = 5, jump to N if floating-point overflow is set.
- X = 6, unassigned
- X = 7, unassigned

Where 'a' denotes the contents of the floating-point accumulator.

1.4.7. Function 116.

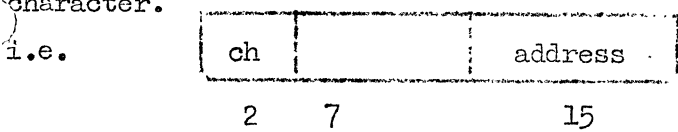
This is a Field Transfer order used for transferring blocks of characters within the store. It may be used in any mode.

Function 116 is defined as follows:-

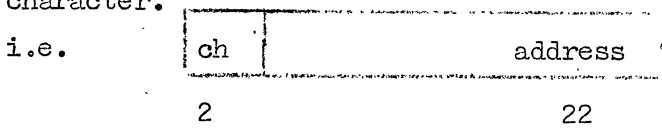
Transfer N characters, the first reading address being in x_k and the first writing address in x_k^* . Max. number of characters = 512

x_k and x_k^* are defined as the character address in accumulators X and X+1 respectively.

In Compact Store mode x_k is 15 bits for the address and 2 bits for the character.



In Extended Store mode x_k is 22 bits for the address and 2 bits for the character.



1.4.8. Function 117.

This is a "Premodification " order and may be used in any mode.

It is used to modify the next instruction by the least significant 15 bits (Compact Store mode) or 22 bits (Extended Store mode) in N (m).

Example.

- 117 0 / PREM
- 010 2 1/ JACK

(Assume PREM contains 253 and X1 contains 24)

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1.4.11. Replaced Jumps

Odd-numbered jump orders in Extended Jump mode cause jumps to the address contained in location N. The odd-numbered orders have the same interpretation as the lower even-numbered orders except that they are "replaced" instead of "relative".

e.g. 074 0 /261

means jump unconditionally (X=0) forwards 261 locations.

and 075 0 /261 (Assume location 261 contains 83)

means jump unconditionally (X=0) to location 83 of this program.

1.4.12. Example using Extended Jump mode.

Consider the example in 1.4.5., this time using Extended Jump mode and Large Store mode.

Example :- Sum 143 words contained in addresses 40,136 to 40,278 putting the result in accumulator 5.

FRED = T	100	5	/0	Clear for sum
	100	3	/143	Set count
	000	2	/T+5	Load modifier
	001	5	2/0	Form sum
	060	2	/1	Add 1 to modifier
	067	3	/T+3	Count and repeat
	074	0	/3	Jump round modifier
	+40,136			Modifier
	/FRED +3			Jump address for 067

1.4.13. Premodification of Jump Orders.

Jump orders can not be modified because they have no room for modified bits, but they can be premodified by a 117 order. The 117 order always premodifies the final jump address.

Example 117 0 /FRED
 075 0 /JACK

Assume ISM and EJM, and assume FRED contains 321 and JACK contains 479.

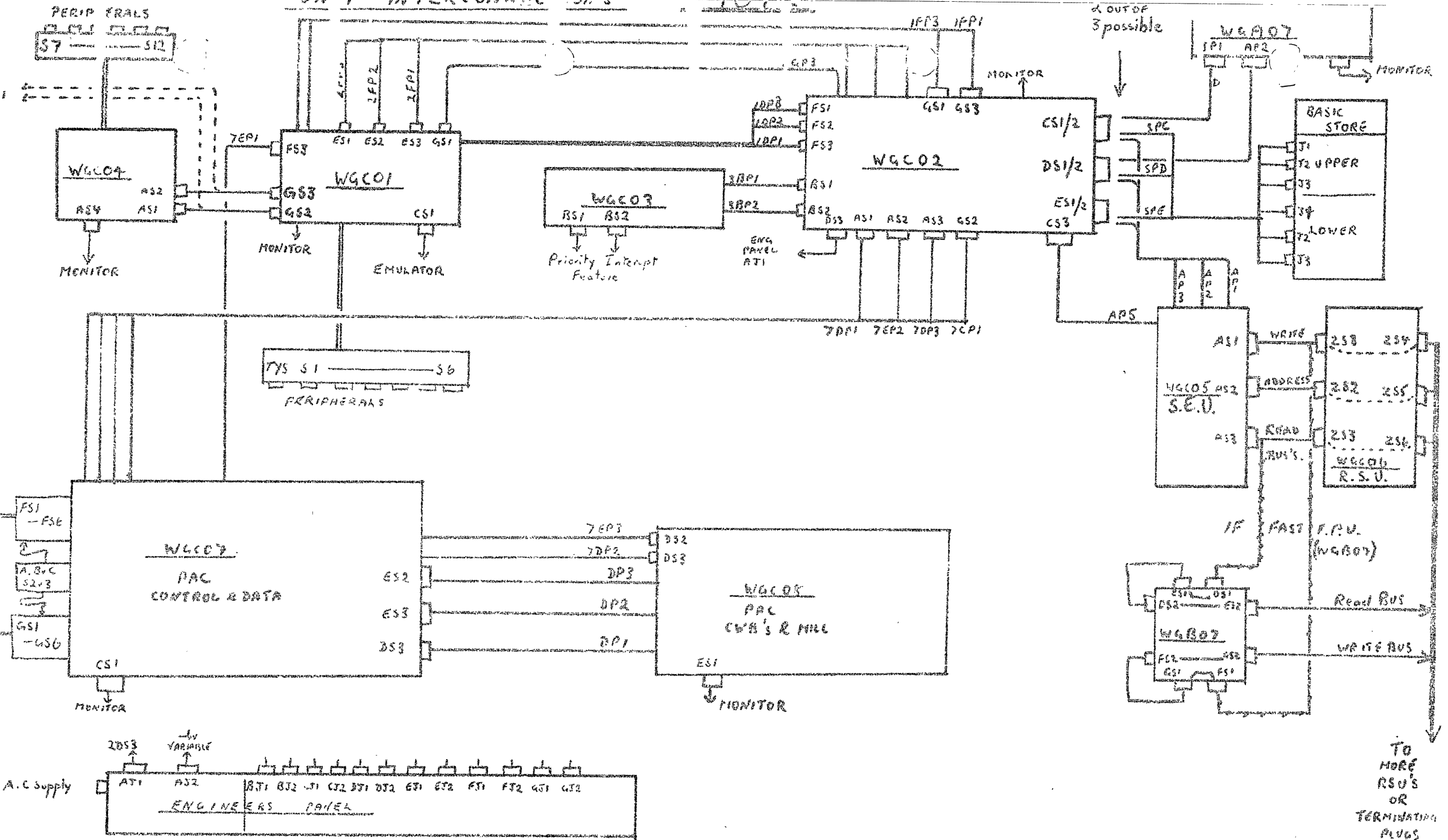
The 075 order will cause a jump to location Datum+479+321, i.e. location 800 of this program.

1.4.14. Datum and Limit.

Although these quantities do not concern the programmer, they are included here to show how a store larger than 32K can be used.

In 1904/5 Datum and Limit are 15 bit quantities of which the least significant 6 bits are zeros and only the m.s. 9 bits are stored. These allow 32K words of store to be used, with each program having a multiple of 64 words of storage.

In 1904E Datum and Limit are 22 bit quantities of which the l.s.6 bits are
Contd.



1904E UNIT INTERCONNECTIONS.