

INTERNAL USE ONLY

INTERNATIONAL COMPUTERS AND TABULATORS LIMITED

Scientific Programming Department  
I.C.T. 1900 Series

FORTRAN NOTE 8  
21.6.65.

FORTRAN IV DATA STORAGE

This note describes the way in which data is stored internally for and by a FORTRAN object program.

The information on double-precision (4-word) floating point representation has not been published before. It should be noted that the same representation will be used in EMA and in PLAN subroutines (e.g. the scientific I/O system).

FORTRAN IV DATA STORAGE

1. General

According to the ASA specification, a variable is allocated one or more "storage units", depending upon its type. On the 1900 one storage unit will normally be two 24-bit words, even though one word would suffice for integers. Constants will never have such superfluous words.

2. Numerical and Logical Variables

<u>TYPES OF VARIABLE</u>	<u>NUMBER OF WORDS OCCUPIED</u>
INTEGER	2
REAL	2
DOUBLE PRECISION	4
COMPLEX	4
LOGICAL	2

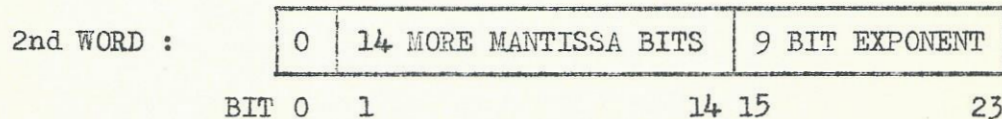
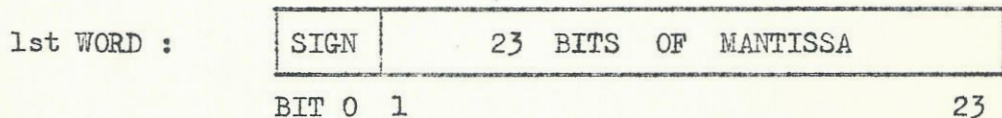
Note: A switch (set by the program description) exists to arrange that INTEGER and LOGICAL Variables be stored in one word. Certain restrictions will then be imposed upon the language.

INTEGER (2 words)

FIRST WORD : 24-bit signed integer in fixed-point form.  
SECOND WORD : ignored.

REAL (2 words)

A floating-point number in the usual 1900 form.



Mantissa = 37 bits + sign bit.

The Stored exponent = true (binary) exponent + 256.

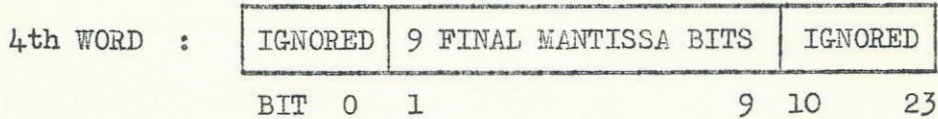
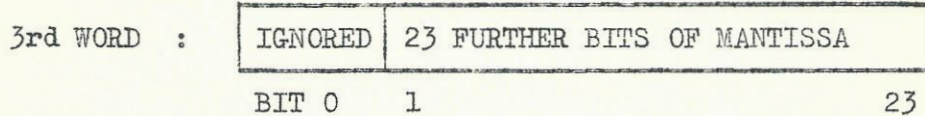
Floating point zero = two words cleared to zero.

Non-zero numbers are normalised (i.e. bit 1 of word 1 = 1).

DOUBLE-PRECISION (4 words)

A floating-point number with the same range as a REAL number but extended precision.

1st and 2nd WORDS : exactly as for REAL.



Double-precision mantissa = 69 bits + sign bit.

COMPLEX (4 words)

The real and imaginary parts of a complex number are each held as a single-precision floating point number (as described above under REAL).

WORDS 1 & 2 : Real part

WORDS 3 & 4 : Imaginary part.

LOGICAL (2 words)

A logical variable can assume one of two values, TRUE or FALSE.

1st WORD : TRUE ~~1 followed by~~ 23 zeros. *followed by 1*  
 FALSE 24 zeros.

2nd WORD : ignored.

3. Numerical and Logical Constants

These are stored in the same way as variables, except that integer and logical constants will always be one word only.

4. Text data

Text (or Hollerith) constants may appear only as actual arguments in function or subroutine references, and in DATA statements. They will be held as a string of 6-bit characters in 1900 internal code, with spaces added on the right to make an integral number of words.

A variable of any of the types listed in 2 above may be assigned a text value by a function or subroutine call or by a DATA statement. In either case, if the variable consists of more words than the constant, the values assigned to the excess words are undefined. Text values may also be assigned to the first two words of a variable by the A format specification on input.