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Identification

Data Representation
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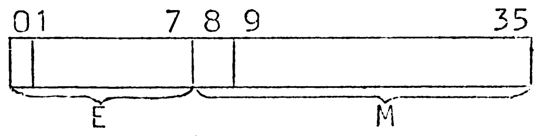
Purpose

The actual machine representations of the PL/I data is implementation dependent. These representations are specified in this section.

Arithmetic Data

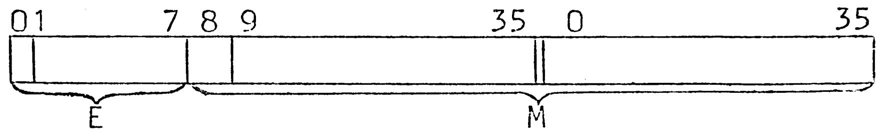
1) Real Binary Floating-Point

   i) For precision 27, the datum is stored as a 645 single-word precision (binary) floating-point number, i.e.,



   where E is a signed integral exponent and M is a signed fractional mantissa. Both M and E are in 2's complement form.

   ii) For 28 precision 63, the datum is stored as a 645 double-word precision (binary) floating point number, i.e.,



   which is always located at an even/odd pair of addresses.

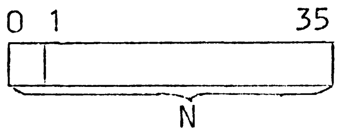
2) Real Decimal Floating-Point

   i) For precision 8, the datum is stored as a 645 single-word precision (binary) floating-point number.

ii) For 9 ≤ precision ≤ 18, the datum is stored as a 645 double-word precision (binary) floating-point number.

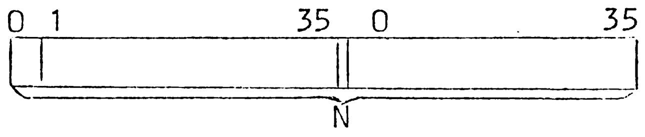
3) Real Binary Fixed-Point

i) For precision ≤ 35, the datum is stored as a 645 single-word precision (binary) fixed-point number, i.e.,



where N is a signed integer in 2's complement form.

ii) For 36 ≤ precision ≤ 71, the datum is stored as a 645 double-word precision fixed-point (binary) number, i.e.,



which are always located at an even/odd pair of addresses.

4) Real Decimal Fixed-Point

i) For precision ≤ 10, the datum is stored as a 645 single-word precision (binary) fixed-point number.

ii) For 11 ≤ precision ≤ 21, the datum is stored as a 645 double-word precision fixed (binary) number.

5) Scaling of Fixed Point

Fixed point data with scale factors different from zero, will be represented as integers of the appropriate precision and the necessary scaling instructions will be compiled.

5) Complex

Complex data will be stored as pairs of the corresponding real data in their appropriate representation. The part is first and the imaginary part is second.

String Data

1) Bit String

A bit string may begin at any bit in a word and extends into as many consecutive words as are required for its length. All words, except possibly the first and last, contain 36 bits of the string.

2) Character String

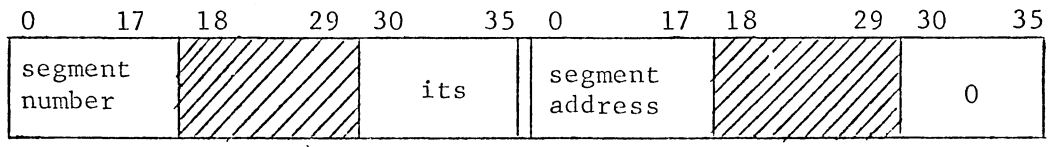
Individual characters are coded in 7 bits, as specified in BC.2.01, right justified in 9-bit bytes with leading zeroes. A character string may begin at any one of the four 9-bit bytes in a word and extends into as many consecutive words as are required for its length. All words, except possibly the first and last, contain four characters of the string.

Program Control Data

1) Pointer

i) "Absolute" Pointer

A pointer datum is stored as an <u>its</u> pair, i.e.,



which is always located at an even/odd pair of addresses. Since this type of pointer contains a segment number it is process dependent.

ii) "Relative" Pointer

A relative pointer is an 18 bit integer, stored in the left half of a full word. A relative pointer is relative to some absolute pointer and is process independent.

2) Label and Procedure Entry

A label is represented by a block of six words. The first two are an <u>its</u> pair which specifies the program point. The second two words are an <u>its</u> pair which identifies the generation of automatic storage appropriate to that program point. This is in fact the value of the stack pointer (base pair sb←sp) at the time the label was defined. The last two words are special error-checking information which is yet to be specified. Procedure entry points are represented exactly like labels.

3) Area

An area is represented by a 1-dimensional array. An n-dimensional array of areas is represented by an n+1-dimensional array, of which the last dimension represents a single area.

4) File

A file name is represented by an <u>its</u> pair which specifies the data origin of the file control structure for that file.

<u>Aggregates</u>

1) Array

An array is stored contiguously in row major order (right-most subscript varying most rapidly). An array of structures is a repetition of structures. If the elementary data item of an array occupies more than one word, then the elementary data items always begin on <u>even</u> word boundaries.

2) Structures

The elements of a structure are stored contiguously in the order of their declaration. If an element of a structure is itself an aggregate, then all the members of that aggregate taken together constitute the storage for that element. If the origin of a structure requires an even word boundary (i.e., the structure is an elementary data item which occupies more than one word), then the origins of <u>all</u> containing structures are also even. A maximal structure of character or bit class (but not mixed) always begins at a word boundary. For any two consecutive items in a packed structure, which are not character or bit class, the second item starts at the next boundary natural to that element type. In an aligned structure every item starts on a word boundary.