Addendum

to the

Introduction to Modula-2

Section 2. Declarations / 2. Constant Declarations

e) Floating Point Numbers / REALs

Floating point constants in Modula-2 are similar to Pascal floating point constants.

The syntax of a REAL constant as accepted by the compiler is:

```
RealConstant    = Sign Number '.' [Number] ['E' Sign Number].
Sign            = ['+'|'-'].
Number          = Digit {Digit}.
Digit           = '0'|..|'9'.
```

NOTE - The **decimal point ('.')** is a required part of a REAL constant. This ensures that the compiler can detect REAL numbers in the INTEGER or CARDINAL range as such. Modula-2 does no implicit type conversions between INTEGER, CARDINAL and REAL.

Examples:

1.0 10.5 0.7689432101 1.05E10 1.1009809E-20

but NOT 1E1 14 1E1.7 .05

REAL constants may be in the range 0.0 up to $1.7014118*10^{38}$, for negative as well as positive numbers. The smallest representable floating point number is $2.94*10^{-39}$. So, the range is 2^{-128} up to, but not including, 2^{127}. The resolution of the chosen format is one part out of 2^{24}, or about 7.2 decimal digits. Consider that the difference between two representable numbers near the maximum REAL number is about maxReal/mantissa-range. The mantissa range is 24 bits or 2^{24} possible values. This means, that $2^{(127-24)} = 2^{103}$ or about 10^{31} is the difference between two adjacent representable numbers. Adding 1 to a number near MAX(REAL) doesn't make any sense, though.

WARNING - No REAL constant expressions may be specified. The compiler does not include the code to evaluate such expressions.