

Again, the "\$" signs enclosing the $\langle AE \rangle$ may be omitted if the $\langle AE \rangle$ is a simple variable or integer number.

2. Print statement form: PRINT (\langle format list \rangle)

2.1 \langle format list $\rangle ::= \langle$ format list element $\rangle |$

\langle format list \rangle , \langle format list element \rangle

\langle format list element $\rangle ::= \langle$ format program $\rangle |$

\langle replicator \rangle \langle format program $\rangle |$

\langle replicator \rangle (\langle format list \rangle)

2.2 Replicators in print statements have the same form and effect as replicators in NAME statements and are therefore described by Section 1.2 above with " \langle name list \rangle " replaced by " \langle format list \rangle ".

2.3 \langle format program \rangle is a list of one or more format instructions separated by commas; the list is enclosed in $\langle \rangle$ brackets.

Example: " \langle 2C, 'X=', 3D.4Z, 2E \rangle "

Format instructions may be control, string, numeric, or alphanumeric instructions; these will now be summarized.

2.4 Control Instructions.

In the following control instructions, n is an unsigned integer number which may be omitted if its value is 1. Also, "CP" stands for the column pointer in the print buffer.

nW : print n copies of the print buffer contents on n successive lines, upspacing the paper by n lines.

nE : print one copy of the contents of the print buffer; upspace paper n lines; clear the print buffer to 120 blanks; reset CP to column 1.

- nC set CP to column n.
- nR set $CP \leftarrow CP + n$.
- nL set $CP \leftarrow CP - n$.
- nB load n blanks into n successive positions of the print buffer.
- P upspace paper to the top of the next page.
- nQ load a string of n quote marks into the print buffer.

2.5 String Instruction.

Any string of G=20 characters other than the quote mark may be enclosed in a pair of quote marks, to form a string instruction. This causes the string (without the quotes) to be loaded into the print buffer.

2.6 Numeric Instruction.

$\langle \text{Numeric Instruction} \rangle ::= \langle \text{sign part} \rangle \langle \text{numeric primary} \rangle \langle \text{suffix} \rangle$

2.6.1 $\langle \text{numeric primary} \rangle$: Specifies basic number format.

For example, the $\langle \text{numeric primary} \rangle$ "3D.4D" enters a number into the print buffer with three digits before the decimal point and 4 digits after, using $3+1+4 = 8$ columns. The letter D before (after) the period causes leading (trailing) zero digits, respectively, to be printed as blanks; if Z is used instead of D, then leading (trailing) zero digits will instead be printed as 0's. The following are examples of other legal forms of $\langle \text{numeric primary} \rangle$'s:

2Z. (no digits after decimal point) ,

.1Z (no digits before decimal point),

5D (no decimal point printed) .

2.6.2 <sign part> : Specifies the form for printing the sign of the number, as follows:

+ Print the sign as + or -, immediately to the left of the first non-blank digit formed by the <numeric primary> . In any case, leave one extra column.

- Same as +, except only a - is actually entered into the print buffer; a + is replaced by a blank.

<empty> The sign of the number is ignored, no column is taken for a sign, and no sign is entered into the print buffer.

2.6.3 <suffix> . May be empty, or may contain one or more of following modifiers:

L The number is entered into the print buffer left-justified in the field specified by the <numeric primary> , and is followed by an exponent part of the form $10^{\pm XX}$, which requires 5 extra print columns. Here X represents a digit. In other words, with the position of the decimal point fixed by the <numeric primary> , the integer XX is chosen so that the leftmost digit of the number is non-zero.

- S+n Same as L, except the exponent part is forced to have the value n while the position of the decimal point is shifted so that the highest order digit is non-zero. Here n is an integer constant.
- T The least significant digit is formed by truncation instead of by rounding (rounding is normally used).
- H All conversion is performed to the base instead of 10, so that the number is printed in octal instead of decimal. The exponent part formed by the suffixes L and S+n will be powers of 8.
- N Ignore overflow digits. Normally, if the number to be printed is too large to fit into the field specified by the <numeric primary> (possibly modified by a suffix of S+n), then the number will be printed in "overflow format" as if it had a suffix L. A suffix of N causes the high order digits which don't fit into the print field in the case of overflow to be simply discarded and the rest entered in the specified format.

2.7 Alphanumeric Instruction

- nA load n alphanumeric characters into the print buffer, using the next $\lfloor (n+3)/4 \rfloor$ names from the NAME statement. The names must be of type logic.

3. Further Commands

A number of further commands and forms are (or soon will be) available in name and print statements, mostly for the sophisticated user. Until a complete ALGOL-20 Input/Output description has been produced, staff members can describe the other features to you. The numeric instructions follow the GATE manual, which contains a more detailed description of the numeric instruction forms given above.