

PL/I-80^{T.M} REFERENCE MANUAL

Appendix D: Picture Format Item

This appendix describes an added feature, the PICTURE output data format item, which is implemented in PL/I-80 beginning with Version 1.3. This feature is implemented in conformity with the ANSI Committee X3J PL/I Subset G Standard together with the full ANSI PL/I Standard.

D.0 Picture Syntax

The PICTURE data format item is used on output to edit numeric data in fixed point decimal form. The value resulting from such an edit is a character string whose form is determined by the numeric value and the picture specification occurring in the PICTURE format item. The syntax of a PICTURE format item is:

P<picspec>

where <picspec> is a character string constant describing the picture specification. Such a format item may be used in a PUT EDIT statement in the same manner as any other data format item (see Section 10.6). The character string constant used to describe the picture specification must consist of one or more of the following characters:

\$ + - S	static or drifting characters
* Z	conditional digit characters
9	digit character
V	decimal point position character
/ , . : B	insertion characters
CR DB	credit and debit characters

and must satisfy certain rules of syntax. First, insertion characters may occur anywhere in a valid <picspec>, except they may not separate the characters of either of the picture character pairs, CR and DB. If all insertion characters of a picture specification are removed, the resulting string must be acceptable to the (non-deterministic) finite state machine recognizer which is illustrated in Figure D.1. It must be possible, beginning with the START node to trace through this diagram to ACCEPT, where transitions across an edge are allowed if the edge is unlabelled, or if the edge is labeled by the next character(s) in the <picspec>.

For example, the following character string constants define valid picture specifications:

```

`BBS***,***V.99BB`
`$----,999V.99BCR`
`99:99:99`
`**/**/**`
`:BBSSSSSS,SSS.VSSBBB:`

```

D.1 Picture Semantics

The manner in which a picture specification edits a numeric value into a character string value is determined by the types of picture characters appearing in the specification. The characters '\$', '+', '-', and 'S' occur as either 'static' characters, or 'drifting characters'. Such a character is static if it appears only once in the picture specification; otherwise it is drifting. If it is drifting, all its occurrences except for one correspond to conditional digit positions. In either case, these picture characters, together with the sign of the numeric value, will determine an output character, given by the following table, which will occupy one position in the output.

STATIC/DRIFTING CHARACTERS				
SIGN	S	+	-	\$
pos	+	+	' '	\$
neg	-	' '	-	\$

If the picture character is static, the output character will appear in the corresponding position of the output. If the picture character is drifting, then the output character will appear exactly one position ahead of the first non-zero digit over which the picture character drifts, or in the last position over which it drifts. All other occurrences of the drifting character will be replaced by spaces, corresponding to the suppression of a zero digit in the numeric value.

The characters '*' and 'Z' are called 'conditional digit' picture characters or 'zero suppression' characters. Each such character in the picture specification is associated with a digit in the numeric value. On output, if the corresponding digit is a zero, the output character will be a '*' or ' ', respectively. If the corresponding digit is non-zero, the output will be the digit character.

The picture characters 'B', '/', '.', ':', and ',' are called insertion characters (the character ':' is not an insertion character defined in the ANSI Standard but has been added in PL/I-80 for the purpose of displaying numeric data which represents time). Insertion characters result in that character occurring in the corresponding output position (B results in a space), unless the insertion character occurs within the field of a drifting character, or zero suppression character. If the insertion character occurs in the field of a drifting or zero suppression character which is causing the suppression of numeric digits, the insertion character will also be suppressed following the rules above.

Note: In some implementations, the 'B' is an unconditional insertion character, i.e. it always causes a space in the corresponding position of the output. However, by the ANSI Standard, such a space in the output can be overwritten by a drifting character or the zero suppression character '*'.

The picture character '9' in a picture specification specifies that the corresponding digit in the numeric value will occur in the corresponding position of the output. Thus '9' is an unconditional digit position.

The correspondence between digits in the numeric value and the numeric digit positions in the picture specification is established by the 'V' picture character. This character serves only to specify the position where integral digits end and fractional digits begin, and thus specifies the alignment of the picture specification to the numeric value. If this character does not occur, it is assumed that all the digit positions implied by the picture specification refer to integral digit positions (no fractional) and thus any fractional digits in the numeric value will not appear in the result. Note that the 'V' picture character is the only character which does not correspond to a character position in the result. Thus the length of the result equals the length of the picture specification if 'V' does not appear, but is one character less if 'V' appears. The 'V' character also has an effect on suppression of characters. The fractional digits, i.e. digits corresponding to positions past the 'V', are never suppressed unless all of them are suppressed (in which case everything is suppressed). Generally, beyond the 'V', suppression is turned OFF if it is ON. As a result an insertion character which occurs beyond the 'V' picture character, for example a decimal point, is not suppressed unless everything is suppressed.

The character pairs 'CR' and 'DB', representing 'credit' and 'debit', are viewed as sign characters. If either of these appear in the picture specification, and if the sign of the numeric value is negative, then the specified pair will occur in the result. If the numeric value is positive, then the positions corresponding to these character pairs will be replaced by two spaces.

In addition to the above rules, there are some general rules for default cases. If the numeric value is zero, and if the picture

specification does not contain a '9' picture character, then the resulting output will be all *'s if the picture character '*' occurs at all, and all spaces otherwise. This rule takes precedence over the above rules. Also, if the sign of the numeric value is negative, and if none of the sign picture characters S,+,-,CR, or DB occur in the specification, then ERROR(1), a conversion error, is signalled.

Each picture specification implies a precision and scale for the numeric value in the result according to the following rules. Insertion characters and the character pairs CR and DB have no effect on precision and scale. Except for this, the precision of the result will equal one less than the number of static/drifted characters, or the number of zero suppression characters, plus the number of '9' characters. The scale of the result will be zero if no 'V' occurs. If 'V' occurs, the scale of the result equals the number of drifting characters, or the number of zero suppression characters, or the number of '9' characters occurring after the 'V' character.

Figure D.2 illustrates some of the rules involving the use of PICTURE data format items.

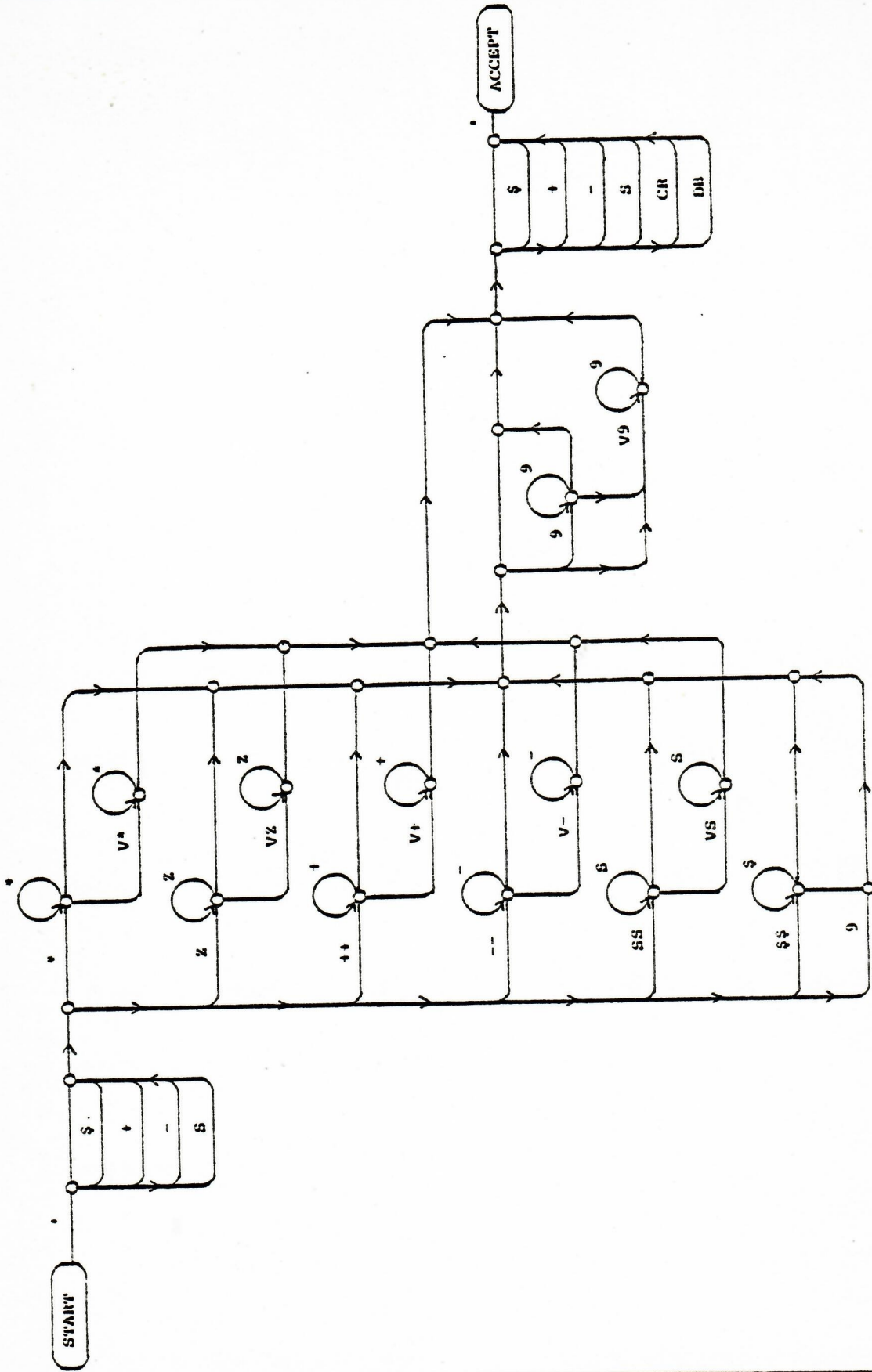


FIGURE D.1 PICTURE SPECIFICATION RECOGNIZER

0.00	BB\$***,***V.99BB	\$*****.00
0.01	BB\$***,***V.99BB	\$*****.01
0.25	BB\$***,***V.99BB	\$*****.25
1.50	BB\$***,***V.99BB	\$*****1.50
12.34	BB\$***,***V.99BB	\$*****12.34
123.45	BB\$***,***V.99BB	\$*****123.45
1234.56	BB\$***,***V.99BB	***1,234.56
12345.67	BB\$***,***V.99BB	**12,345.67
123456.78	BB\$***,***V.99BB	\$123,456.78

0.00	\$SSSSBSSSV.SS	
0.01	\$SSSSBSSSV.SS	\$ +.01
0.25	\$SSSSBSSSV.SS	\$ +.25
1.50	\$SSSSBSSSV.SS	\$ +1.50
12.34	\$SSSSBSSSV.SS	\$ +12.34
123.45	\$SSSSBSSSV.SS	\$ +123.45
1234.56	\$SSSSBSSSV.SS	\$ +1 234.56
12345.67	\$SSSSBSSSV.SS	\$ +12 345.67
123456.78	\$SSSSBSSSV.SS	\$+123 456.78

0.00	99/99/99	00/00/00
0.01	99/99/99	00/00/00
0.25	99/99/99	00/00/00
1.50	99/99/99	00/00/02
12.34	99/99/99	00/00/12
123.45	99/99/99	00/01/23
1234.56	99/99/99	00/12/35
12345.67	99/99/99	01/23/46
123456.78	99/99/99	12/34/57

0.00	**:**:**	*****
0.01	**:**:**	*****
0.25	**:**:**	*****
1.50	**:**:**	*****2
12.34	**:**:**	*****12
123.45	**:**:**	****1:23
1234.56	**:**:**	***12:35
12345.67	**:**:**	*1:23:46
123456.78	**:**:**	12:34:57

0.00	/++++,+++V++/	
0.01	/++++,+++V++/	/ +01/
0.25	/++++,+++V++/	/ +25/
1.50	/++++,+++V++/	/ +1.50/
12.34	/++++,+++V++/	/ +12.34/
123.45	/++++,+++V++/	/ +123.45/
1234.56	/++++,+++V++/	/ +1,234.56/
12345.67	/++++,+++V++/	/ +12,345.67/
123456.78	/++++,+++V++/	/+123,456.78/

FIGURE D.2 EXAMPLES OF PICTURE EDITED NUMERIC DATA

0.00
-0.01
0.25
-1.50
12.34
-123.45
1234.56
-12345.67
123456.78

S****.V**
S****.V**
S****.V**
S****.V**
S****.V**
S****.V**
S****.V**
S****.V**
S****.V**

-*****01
+*****25
-*****1.50
+*****12.34
-*****123.45
+**1 234.56
-*12 345.67
+123 456.78

0.00
-0.01
0.25
-1.50
12.34
-123.45
1234.56
-12345.67
123456.78

\$\$\$\$\$B\$\$\$V.\$\$
\$\$\$\$\$B\$\$\$V.\$\$
\$\$\$\$\$B\$\$\$V.\$\$
\$\$\$\$\$B\$\$\$V.\$\$
\$\$\$\$\$B\$\$\$V.\$\$
\$\$\$\$\$B\$\$\$V.\$\$
\$\$\$\$\$B\$\$\$V.\$\$
\$\$\$\$\$B\$\$\$V.\$\$
\$\$\$\$\$B\$\$\$V.\$\$

\$ -0.01
\$ +.25
\$ -1.50
\$ +12.34
\$ -123.45
\$ +1 234.56
\$ -12 345.67
\$+123 456.78

0.00
-0.01
0.25
-1.50
12.34
-123.45
1234.56
-12345.67
123456.78

.S
.S
.S
.S
.S
.S
.S
.S
.S

*****-
*****+
*****2-
*****12+
****123-
**1.235+
*12.346-
123.457+

0.00
-0.01
0.25
-1.50
12.34
-123.45
1234.56
-12345.67
123456.78

****,***V**CT
****,***V**CT
****,***V**CT
****,***V**CT
****,***V**CT
****,***V**CT
****,***V**CT
****,***V**CT
****,***V**CT

*****01CR
*****25
*****150CR
*****1234
*****12345CR
***1,23456
**12,34567CR
\$123,45678

0.00
-0.01
0.25
-1.50
12.34
-123.45
1234.56
-12345.67
123456.78

/++++,+++V++/
/++++,+++V++/
/++++,+++V++/
/++++,+++V++/
/++++,+++V++/
/++++,+++V++/
/++++,+++V++/
/++++,+++V++/
/++++,+++V++/

/ 01/
/ +25/
/ 1.50/
/ +12.34/
/ 123.45/
/ +1,234.56/
/ 12,345.67/
/+123,456.78/