GENERAL PRECISION, INC. / COMMERCIAL COMPUTER DIVISION

REVISION NOTICE

This publication replaces previous descriptions of "Data Output 9," program J3-12.8. The program designation has been changed to the present reference.

FUNCTION

"Data Output 9" enables the user to print or punch the contents of groups of consecutive memory locations in decimal form, assuming all numbers to be integers. The number of digits to be printed, and the number of decimal places, may be specified for each number. All numbers are printed on a single line and may be separated by spaces.

INPUT

The numbers to be printed are stored in memory at $q = 30$.

CALLING SEQUENCE

Location	Instruction	Address
XXXX	R	$L_o + 30$
XXXX + 1	U	L_o
XXXX + 2	80X N_{t1}	L (1st. number)
XXXX + 3	X N_1	$P_1 D_1$
XXXX + 4	X N_2	$P_2 D_2$
.	.	.
.	.	.
.	.	.
.	.	.
XXXX + 2 + i	X N_i	$P_i D_i$
Next	80X N_{t2} or exit	

CALLING SEQUENCE   (Cont.)

The calling sequence may be classified into groups of the following types
of words

    A.   (Contained in XXXX + 2 above.) This word must be negative, and
        contains the total number of consecutive numbers to be printed,
        N_t (in the order portion), and the location of the first number
        (in the address portion).

    B.   (Contained in XXXX + 3 through XXXX + 2 + i above.) These words
        contain the following

        1.   (N_i).   The number of consecutive numbers requiring the same
                        number of decimal places and same total number of
                        digits. N_i is contained in the order portion.

        2.   (P_i).   The number of decimal places in each number of this
                        group. P_i is contained in the track portion.

        3.   (D_i).   The total number of digits in the field. This in-
                        cludes leading spaces, integral digits, a possible
                        decimal point, fractional digits, and the sign of
                        number. D_i is contained in the sector portion.

Exit to the first "positive" type A calling sequence word as defined
under "CALLING SEQUENCE."

OUTPUT

The decimal equivalent of each number specified is printed. For each
number, leading integral zeros are spaced and the sign (space or minus)
follows the number. BREAK POINT 32 button must be down for use on the
high speed punch. When $P_i = 0$, no decimal point is printed. At least
1 leading space must be included in each D_i.

LIMITS

Numbers to be printed must be within the range $\pm\ 1 \times 10^8$

$$8 \geq P_i \geq 0$$

$$63 \geq D_i \geq 3 \text{ when } P_i = 0 \text{ or}$$

$$63 \geq D_i \geq 4 \text{ when } P_i > 0$$

$$15 \geq N_i \text{ and } N_t \geq 1 \ (N_i \text{ of } 10 \text{ through } 15 \text{ may}$$

be specified by F through W)

Normally $D_i \geq P_i + 3$ (or 2) since D_i includes sign, (a possible decimal point, and at least 1 leading space.

The total of N_i's must equal N_t for each group.

EXAMPLE

Assume 10 numbers in memory stored from 3600 through 3605 and 3630 through 3633. We want to print the first number with 3 decimal places and allow for 2 integral digits. The next 3 numbers are at 3 decimal places, may have 2 integral digits, and 2 leading spaces each for column separation.

The next 2 numbers are to have 2 decimal places, 4 integral digits, and 2 spaces for column separation. We will skip location 3606 through 3629. The last 4 numbers will be printed with no decimal places (or decimal point) and can get as high as 5 digits. We will allow 3 spaces between columns. The calling sequence is

Location	Instruction	Notes
XXXX	R L_o + 30	
XXXX + 1	U L_o	
XXXX + 2	80X63600	N_t = 6; initial location = 3600
XXXX + 3	X10308	(Δ:1 + I: 2 + D: 1 + P: 3 + S:1)
XXXX + 4	X30309	(Δ:2 + I: 2 + D: 1 + P: 3 + S:1)
XXXX + 5	X20210	(Δ:2 + I: 4 + D: 1 + P: 2 + S:1)
XXXX + 6	80X43630	N_t = 4; initial location = 3630
XXXX + 7	X40009	(Δ:3 + I: 5 + D: 0 + P: 0 + S:1)
XXXX + 8	etc.	XXXX + 8 contains a "positive" in-struction.

EXAMPLE   (Cont.)

Note

   Δ = number of leading spaces (must be at least 1).

   I = number of integral digits.

   D = number of digits for decimal point.

   P = number of decimal places.

   S = sign position. Always 1 digit.

Example time

   100 words with D_i = 9 (including exiting, carriage return, and modifying addresses after each 10 words) required 125 seconds on the Flexowriter, and 79 seconds on the high speed punch.

ACCURACY

   Output is exact.

STORAGE

   192 locations (3 tracks) of instructions and constants plus track 63, sectors 00, 01, 03, 04, 06, are required in memory.

PROGRAM STOPS

   L_o + 0130   The number is too large to be printed in this D_i.

   L_o + 0036   Either $\Sigma N_i < N_t$ or $D_i < 3$.

START

MODIFY ADDRESS OF WORD A TO OBTAIN L (WORD B)

IS WORD A < 0 ?
— yes
— no

EXIT TO WORD A

STORE ADDRESS AS LOC. OF FIRST NO. TO PRINT. PRESET N_t

PICK UP WORD B. STORE N_i, TRIM AND STORE $D_i - 3 = Dc$

IS Dc NEGATIVE ?
— no
— yes

ERROR HALT (0036)

IS $P_i = 0$?
— no
— yes

$Dc + 1 \longrightarrow Dc$

$0 \longrightarrow ACC.$

SHIFT P_i TO $q = 29$

STORE AS 2nd P.S.C.

PRINT DEC. POINT AND ELIMINATE LEADING ZERO "SPACING"

SET PRINT EXIT #2

LOOP TO PRINT ALL FRACTIONAL DIGITS

EXIT #2

PRINT THE SIGN OF THE NUMBER

MODIFY ADDRESS OF NUMBER TO PRINT

DECREASE N_i BY ONE. IS IT = 0 ?
— no
— yes

MODIFY ADDRESS OF WORD B (AND A)

DECREASE N_t BY N_i IS IT NEGATIVE ?
— yes
— no

SET PRINT EXIT #1 SET LOOP FOR LEADING ZERO "SP."s

LOCATE AND STORE ADDRESS OF 10^{Dc}

2nd P.S.C. $-1 \longrightarrow$ 1st P.S.C.
— no

IS 2nd P.S.C. = 0 ?
— yes
EXIT #1

LOOP TO PRINT ALL INTEGRAL DIGITS (PRINT LEADING 0's AS "SP.")

ADD 1 AT 30 AND PRINT LEADING "SP."

SCALE |NO.| BY DIVIDING BY 10^{Dc}

$DC - $ 2nd P.S.C. $-1 \longrightarrow$ 1st P.S.C.

SET ADDRESS OF 10^{Dc} TO $L(10^8)$. $Dc = 8$

LOOP TO PRINT (Dc-8) SPACES
— yes

IS Dc $\geq$ 9 ?
— no

PICK UP NO. TO PRINT, HOLD FOR SIGN, AND FIND |NO.|