RECOMP II USERS' PROGRAM NO. 1156

PROGRAM TITLE: LINE PLOTTER, FIXED POINT

PROGRAM CLASSIFICATION: Subroutine

AUTHOR: R. Doyle

PURPOSE: To plot as straight a line as possible given the desired number of x and y plotter increments (0.01 inch) as fixed point integers at b = 39.

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Program Title: Line Plotter, Fixed Point

1. Purpose: To plot as straight a line as possible given the desired number of x and y plotter increments (0.01 inch) as fixed point integers at b = 39.

2. Restrictions: The numbers X and Y should be consistent with the available plotting space.

3. Method

3.1 If X and Y are both zero, return is made immediately

3.2 Define

$$P_X = \begin{cases} 02_8 & \text{if } X > 0 \\ 01_8 & \text{if } 0 \angle X \end{cases} \qquad P_y = \begin{cases} 10_8 & \text{if } Y > 0 \\ 04_8 & \text{if } 0 < Y \end{cases}$$

If $|X| < |Y|$ interchange P_x with P_y and X with Y

Further define

$P_d = P_x + P_y + 20_8$ (becomes address in PNC command)

$P_s = P_x + 20_8$ (becomes address in PNC command)

$$M = \frac{|Y|}{|X|}$$

3.3 If $M = 1$, P_d is output $|x|$ times; otherwise M is repeatedly accumulated. Whenever an overflow occurs P_d is output, otherwise P_s is output. This is repeated until a total of $|x|$ outputs have been made.

3.4 For a description of the plotter output commands see Recomp Technical Bulletin No. 24, paragraphs 4.2 and 4.3.

4. Use: Although by no means necessary, it is intended that one ordinarily use the "Floating Point to Plotter Increment Conversion" subroutine to convert floating point data to the form required by this routine.

4.1 Definition of coordinates:

When facing the plotter
+ x is the direction a line is drawn when the drum moves down
- x is the direction a line is drawn when the drum moves up
+ y is the direction a line is drawn when the carriage moves left
- y is the direction a line is drawn when the carriage moves right

4.2 Calling Sequence: With X in A register and Y in R register transfer to origin of the subroutine. X and Y must be fixed point integers at a binary scale of 39. After line has been plotted return will be made to the next location.

```
CLA  Y  )
XAR     }  or any sequence placing X in A and
CLA  X  )  Y in R
TRA  Lo
RETURN
```

4.3 It is not necessary for the pen to be down before calling this routine.

5. Coding Information:

5.1 Locations used:

This routine occupies 50_8 locations (i.e., L_o to $L_o + 47$). It destroys both L and V loops and all registers. All locations are used and none are erasable.

5.2 Constants

$L_o + 12$	02_8	at B = 18
$+ 13$	01_8	"
$+ 14$	10_8	"
$+ 15$	04_8	"
$L_o + 43$	1	at B = 39

5.3 This subroutine is relocatable by the method of AN-076.

6. Remark: Change of Coordinate System

The coordinate system as defined by 4.1 is such that when facing the plotter the x axis is positive upward and the y axis is positive to the left. It is frequently convenient to have the coordinate system defined in such a manner that the y axis is positive upward and the x axis is positive to the right (i.e., a 90 degree clockwise rotation of the standard plotter coordinate system.) This result may be achieved by altering the following locations to read (in command format):

$L_o + 12$	+ 00	00040	0	00	00000
$+ 13$	+ 00	00100	0	00	00000
$+ 14$	+ 00	00020	0	00	00000
$+ 15$	+ 00	00010	0	00	00000

```
0000.0
 + CTL 0000.0  + SAX 7760.0
 + CTV 0010.0  + TRA 7762.0
 + PNC 0020.0  + 70  0000.1
 + ADD 7762.0  + STA 0040.1
 + CLA 7760.0  + TZE 7776.0
 + FST 7776.0  + TPL 7767.0
 + CLA 7773.0  + TRA 7767.1
 + CLA 7772.0  + XAR 0000.0

0010.0
 + CTL 0020.0  + TPL 7760.0
 + CLA 7775.0  + TRA 7760.1
 + CLA 0002.0  - CLA 0000.0
 + CLA 0001.0  - CLA 0000.0
 + CLA 0010.0  - CLA 0000.0
 + CLA 0004.0  - CLA 0000.0
 + XAR 0000.0  + TZE 0040.0
 + XAR 0000.0  + TRA 7765.0

0020.0
 + CLA 7774.0  + FST 7774.0
 + CLA 7776.1  + SUB 7777.1
 + TZE 0044.0  + TPL 7765.0
 + FCA 7776.0  + XAR 0000.0
 + FST 7776.0  + TRA 7766.1
 + FCA 7774.0  + XAR 0000.0
 + FST 7774.0  + CLA 7774.0
 + CTL 0030.0  + TRA 7760.0

0030.0
 + ADD 7766.0  + STO 7766.0
 + ADD 7775.0  + STA 7767.0
 + CLA 7777.1  + DSR 7776.1
 + STO 7760.0  + XAR 0000.0
 + CLA 7776.1  + CTV 0040.0
 + TRA 7770.0  + 70  0000.0
 + PNC 0020.0  + TRA 7767.1
 + PNC 0020.0  + XAR 0000.0
```

```
0040.0
 + SUB 7773.0  + TMI 3205.0
 + XAR 0000.0  + ADD 7760.0
 + TOV 7767.0  + TRA 7766.0
 + CLA 0000.0  - CLA 0000.1
 + CTL 0030.0  + STO 7760.0
 + XAR 0000.0  + ADD 7766.0
 + ADD 7774.0  + STO 7766.0
 + TRA 7764.0  + 70  0000.0
```