PROGRAM TITLE: POINT PLOTTER, FIXED POINT

PROGRAM CLASSIFICATION: Subroutine

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PURPOSE: To move the pen (in the raised position) as fast as possible given the desired number of x and y plotter increments (0.01 inch) as fixed point integers at b = 39. The motion is along the diagonal as far as possible followed by motion along a co-ordinate axis the remainder of the way.

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

3. **Method**

3.1 This routine utilizes the full word alphanumeric output feature of Recomp. Thus, we define

P_{+X} = word consisting of eight $\underline{+X}$ (02_8) plotter commands

P_{-X} = " " " " $\underline{-X}$ (01_8) " "

P_{+Y} = " " " " $\underline{+Y}$ (10_8) " "

P_{-Y} = " " " " $\underline{-Y}$ (04_8) " "

3.2 If X and Y are both zero return is made immediately.

3.3 Define

$$P_X = \begin{cases} P_{+X} & \text{if } X > 0 \\ P_{-X} & \text{if } X < 0 \end{cases} \qquad P_Y = \begin{cases} P_{+Y} & \text{if } Y > 0 \\ P_{-Y} & \text{if } Y < 0 \end{cases}$$

If $|X| < |Y|$ interchange P_X with P_Y and X with Y

Further define

$$P_d = P_X + P_Y \qquad N_d = |Y|$$

$$P_s = P_X \qquad N_s = |X| - |Y|$$

3.4 Divide N_d by 8 so that $N_d = 8 q + r$ where $0 \le r < 8$. Output P_d using PNC 7760 command q times. If $r \ne 0$ output P_d with PNC 7760 + r command; if r = 0 skip this output. Repeat above using N_s and P_s.

3.5 For a discussion 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.

$$
\begin{array}{ll}
\text{CLA} & \text{Y} \\
\text{XAR} & \\
\text{CLA} & \text{X} \\
\text{TRA} & \text{L}_o \\
\text{RETURN} &
\end{array}
$$
or any sequence placing X in A and Y in R

5.   Coding Information

5.1   Locations used: This routine occupies 60_8 locations (i.e., L_o to $L_o + 57$). It destroys both loops and all registers.

5.2   Constants

$$
\begin{array}{lll}
L_o & + \ 12 & P_{+X} \\
& 13 & P_{-X} \\
& 14 & P_{+Y} \\
& 15 & P_{-Y}
\end{array}
$$
(Alphanumeric words - see 3.1)

$$
\begin{array}{lll}
L_o & + \ 45 & +1 \quad b = 39 \\
& 46 & +7 \quad b = 39
\end{array}
$$

5.3   Erasable Locations

$$
\begin{array}{l}
L_o + 44 \\
 + 46 \\
 + 47
\end{array}
$$

5.4   Unused Location

$$
L_o + 43
$$

5.5   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):

$$L_o + 12 \quad - 20 \; 41020 \; 0 \; 20 \; 41020$$

       13   - 41 02040 0 41 02040
       14   - 10 20410 0 10 20410
       15   - 04 10201 0 04 10201

```
0000.0
  + CTL 0000.0   + CAX 7760.0
  + CTV 0010.0   + TRA 7763.0
  + 70  0000.0   + TRA 0000.1
  + ADD 7762.0   + STO 0057.0
  + 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
  - 10  2041.0   - 10  2041.0
  - FAD 1020.1   - FAD 1020.1
  - ALS 0204.0   - ALS 0204.0
  - DSL 4102.0   - DSL 4102.0
  + XAR 0000.0   + TZE 0057.1
  + XAR 0000.0   + TRA 7765.0

0020.0
  + CLA 7774.0   + FST 7774.0
  + CLA 7776.1   + SUB 7777.1
  + STO 0044.0   + TPL 7765.0
  + FCA 7774.0   + XAR 0000.0
  + FST 7774.0   + TRA 7767.0
  + FCA 7776.0   + XAR 0000.0
  + FST 7776.0   + FCA 7774.0
  + CTL 0030.0   + TRA 7760.0

0030.0
  + ADD 7775.0   + FST 0046.0
  + CLA 7776.1   + CTV 0040.0
  + SUB 7775.0   + TMI 7765.1
  + XAR 0000.0   + CLA 7776.0
  + PNC 7760.0   + XAR 0000.0
  + TRA 7762.0   + ADD 7775.0
  + TZE 7771.0   + ALS 0001.0
  + ADD 7770.0   + STO 7770.0

0040.0
  + CLA 7776.0   + PNC 7760.0
  + CTL 0050.0   + CLA 7774.1
  + XAR 0000.0   + TRA 7761.0
  + CLA 0000.0   - CLA 0000.0
  + CLA 0000.0   - CLA 0000.1
  + CLA 0000.0   - CLA 0004.0
  - 24  5122.1   - 24  5122.1
  - FAD 1020.1   - FAD 1020.1

0050.0
  + XAR 0000.0   + PNC 7760.0
  + CLA 7777.0   + XAR 0000.0
  + SUB 7775.0   + TPL 7760.0
  + ADD 7775.0   + TZE 7767.1
  + ALS 0001.0   + ADD 7766.0
  + STO 7766.0   + 70  0000.0
  + CLA 7777.0   + PNC 7760.0
  + 70  0000.0   + TRA 3003.0
```