

**U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
NATIONAL METEOROLOGICAL CENTER**

OFFICE NOTE 16

**PROGRAM NOTES FOR THE ELECTRONIC ASSOCIATES
BINARY TAPE DRIVEN CURVE PLOTTER**

**J. Neilon
Joint Numerical Weather Prediction Unit**

October 1990

**This is an unreviewed manuscript, primarily intended for informal
exchange of information among NMC staff members**

JNWP OFFICE NOTE NO. 17
PROGRAMMING NOTES FOR THE ELECTRONIC ASSOCIATES
BINARY TAPE DRIVEN CURVE PLOTTER

GENERAL FORMAT OF TAPE

Basically, the information contained on the tape consists of sets of x and y coordinates and command words for the plotting board in binary mode. The format of a data word follows (in octal format):

60xxxxooyyyy

where 60 is a required character
xxxx is the x-coordinate of the point
yyyy is the y-coordinate of the point
oo is the operation code.

Every word which contains information for the plotting board must begin with the 60 character. Filler words (any words which do not contain this character) are used to effectively slow the rate of flow of useful information to the plotting board in the free run mode.

Permissible operation codes include:

| | |
|----|--|
| 40 | Read x, y coordinate in the word |
| 20 | Drop pen at the x, y coordinate in this word |
| 10 | Lift pen at the x, y coordinate in this word |
| 04 | Select pen arm (no x, y given with this operation) |
| 02 | Select symbol arm (no x, y given with this operation) |
| 01 | Select symbol given in last two octal digits of this word. |

Some of these commands may be "OR"ed together, e. g. ,

| | |
|----|-----------------------------------|
| 60 | indicates read x, y and drop pen |
| 50 | indicates read x, y and lift pen. |

These are the only combinations allowed.

A machine word of 36 bits is subdivided automatically into groups of six-bit bytes by tape control circuits. Each six-bit group and its associated check bit are recorded on the tape in one vertical column.

Each complete map is one file. Encountering the file mark stops plot and clears all functions.

RESTRICTION: There must be at least three filler words between consecutive data words.

If it is desired to make use of program control of the pen, i. e., dropping and lifting the pen by programmer command, the operation codes for these actions should be combined with the "read x, y" operation code in the appropriate data words.

Operation Codes:

| | | |
|----------|----|----------------------|
| Drop pen | 20 | +40 (read x, y) = 60 |
| Lift pen | 10 | +40 (read x, y) = 50 |

Example: to drop pen at the i^{th} data word give $60x_i x_i x_i x_i 60 y_i y_i y_i y_i$.

RESTRICTION: There must be at least 12 words (including filler words of zeros) between the pen drop and pen lift instruction.

A point may be considered a degenerate line so that to plot a point the format is similar to that of a line:

60xxxx40yyyy 000000000000 000000000000 000000000000 (4-word record)

60xxxx60yyyy (12 filler words) 60xxxx50yyyy (14-word record)

Straight line segments of a line in the x or y direction only may be drawn according to the format for any line as given above or according to the shorter procedure given below.

Provided that the first and last points of a straight line segment in either the x or y direction are not more than 5 inches apart (as measured on the plotting board) give:

$60x_0 x_0 x_0 x_0 40y_0 y_0 y_0 y_0$ 000000000000 000000000000 000000000000 (4-word record)

$60x_0 x_0 x_0 x_0 60y_0 y_0 y_0 y_0$ (12 filler words) $60x_m x_m x_m x_m 50y_m y_m y_m y_m$ (14-word record)

where x_0, y_0 is the first point and x_m, y_m is the last point of the line.

RESTRICTION: If the line is more than 5 inches long the momentum of the arm will cause the pen to overshoot the last point.

If the automatic pen drop feature is used a switch may be set so that it is not necessary to program drop and lift commands. Then only two filler words are required (in the second record above) between the first and last points.