

1985/32. DIGPLT preliminary report. Scale change of maps using the digitiser and plotter (Revision 1).

J.W. Hudspeth

#### Abstract

The program DIGPLT enables scale change of maps by tracing the original map on the digitiser and plotting at the altered scale on the plotter.

#### INTRODUCTION

This report is preliminary. The program DIGPLT is operational and has been tested and used for production work. However, the program is very basic and it is planned to offer some additional program options once the users of this program have had a chance to become familiar with its operation and are in a position to recommend additions to suit particular requirements.

#### THE DIGITISER

The digitiser is currently equipped with a twelve-button cursor and a stylus, which is a more appropriate tool for this type of digitisation than the cursor. Along the bottom section of the left hand vertical margin of the digitising tablet are a row of switches and indicator lights. The PROXIMITY light glows when the cursor active device is within approximately 3/8" (9.5 mm) of the tablet surface and in the active area. The digitiser will not acquire data unless the input device (active part of cursor or stylus) is 'in proximity'.

The REMOTE light is not operative as the digitiser has been set to LOCAL for current usage. RESET ORIGIN and RELOCATE ORIGIN may also be ignored, being not currently enabled (the co-ordinate origin is set to the extreme bottom left corner of the active area of the tablet).

The digitiser may acquire co-ordinate data in a variety of ways. When the POINT switch is pressed the adjacent indicator lamp will light and data may then be collected one point at a time. Each time the cursor is 'in proximity' and a cursor button is pressed (or the stylus is pressed slightly but firmly) then that point will be digitised. POINT is recommended for drawing straight lines.

In STREAM mode (engaged by pressing the appropriate side panel button) a constant stream of co-ordinate data is acquired at a rate currently set at 50 co-ordinates per second. It is unlikely that this mode will be required for data acquisition during map digitisation.

SWITCH STREAM mode is a variant of the STREAM mode in which the input device must be actuated (that is, the stylus pressed down or the cursor button held depressed) in proximity for data to be acquired.

INCREMENTAL mode is used in conjunction with STREAM or SWITCH STREAM. In this mode the co-ordinate points are digitised at fixed increments of input device movement across the tablet. The digitiser increment setting is currently 0.05". This is the minimum change of position (net vertical or net horizontal) of the input device required for transmission by the digitiser of a new co-ordinate position.

RUNNING THE PROGRAM

The interactive running of the program is commenced by typing "DIGIT" and entering the scale of the map to be digitised and the scale at which it is to be plotted (in response to the appropriate screen prompts). The next prompt will instruct the user to enter POINT mode and define (with the cursor, by pressing the button with the cursor in position; or with the stylus by pressing) the four corners of the area to be digitised. The program then takes the co-ordinates of the left hand bottom corner and treats this as the origin. If you digitise to the left or below this point, the output X or Y co-ordinates respectively will be correct but negative and the plotter origin will have to be reset to allow plotting on the paper.

USING THE TWELVE-BUTTON CURSOR

When digitising, each co-ordinate pair is tagged with an identifying character. This character is the digit pushed on the cursor button or in STREAM mode (if the cursor button is not pressed) it is a comma. The program examines this tag character and plots to the current point if the tag is the same as the previous character or moves to the current point with the pen up if the tag is different from the previous one.

When plotting straight lines use the POINT mode and straight lines will be drawn between successive points having the same tag. For plotting irregularly or regularly curved lines it is recommended that INCREMENTAL be used in conjunction with either SWITCH STREAM or STREAM and SWITCH STREAM. When using INCREMENTAL and SWITCH STREAM data will be acquired by following the curve with the cursor in proximity and a cursor button held depressed. In order not to plot lines between different line segments the button pressed to digitise the current line should be different from that used to digitise the previous line. In the case of digitising a long line, it may be easier to trace the line without having the cursor button depressed. This may be done by using INCREMENTAL in conjunction with both STREAM and SWITCH STREAM. However, some care must be taken in using the following procedure. Bring the cursor onto the start of the line to be digitised with INCREMENTAL and SWITCH STREAM engaged. With the cursor held stationary, press any cursor button and then engage STREAM (this will automatically disengage SWITCH STREAM). You may now begin to trace the line and digitising will occur without any cursor button being depressed - in fact you should ensure that you do not press any cursor buttons unless you wish to produce a (very likely irregularly) dashed line. If you wish to produce a dashed line this is better done using INCREMENTAL and SWITCH STREAM or better still by plotting software. On reaching the end of the line being digitised, remove the cursor from the tablet along a line perpendicular to the tablet surface (if you remove the cursor in a sideways fashion you may inadvertently collect unwanted data while remaining briefly in proximity). You should now engage SWITCH STREAM (thereby disengaging STREAM) and are now ready to repeat the process on the next line (or else remain in SWITCH STREAM if you wish to now use this mode without STREAM).

When digitising is complete and you wish to exit the program you should engage POINT mode and place the cursor in the far right hand corner of the tablet, outside the active area. Hold a button depressed and move the cursor in the direction of the bottom left hand corner. When the cursor reaches the top right hand corner of the active area the digitiser will beep and the program will terminate. A plot file called PANPLT.TMP will have been created and this may be plotted in the usual manner.

### USING THE STYLUS

Using the stylus is similar to using the cursor. Each co-ordinate pair is tagged with an identifying character. This character is "2" when the stylus is depressed but is "," whenever the stylus is not depressed but reads in PROXIMITY in STREAM mode. As these are the only tags available it is necessary to make use of them in order not to draw a connecting line when moving between unconnected line segments. It is thought that the following method will be the most accurate, reliable and convenient method of digitising unconnected line segments.

Begin by placing the stylus on the start of the line to be digitised while in POINT mode. Holding the stylus steady in position, engage INCREMENTAL followed by STREAM (it is important to engage in this order so that time streamed data are not collected). Release the stylus from the depressed position and trace the desired line with the stylus in PROXIMITY but not depressed. This may take a little practice. It will not matter greatly if the stylus is accidentally depressed during tracing (there will be a corresponding small break in the plotted line) but it is vital that the stylus is not depressed when digitising the last part of the line. On reaching the end of line, hold the stylus steady in position without depressing it and engage POINT. Lift off the stylus, again without depressing it, and transfer it to the start of the next line, where it should be depressed and held while INCREMENTAL and STREAM are engaged. The process is then repeated. The start of each digitised line will be a point followed by a very small gap (0.05 inches at digitised scale at the current setting) followed by the continuous line segment. In a case where this gap will be inconvenient, it may be reduced in size by requesting J. Hudspeth or R. Richardson to alter the gap size for that particular job.

There are alternative ways to keep disconnected lines separated when using the stylus. It is possible to remain in INCREMENTAL plus STREAM mode by pressing down on the stylus at the start of a line segment and collecting data in PROXIMITY with the stylus not pressed by the time the end of the line is reached. It does not matter greatly when the change from depressed to not depressed is made and, as before, there will be a very small gap in the line at the point of changeover. At the end of the line, the stylus should be lifted clear of the tablet in a direction perpendicular to the tablet surface. Deviations from the perpendicular may result in the collection of unwanted data while the stylus remains in PROXIMITY. The stylus should be brought to press on the start of the next line by approaching that point along a direction perpendicular to the digitising tablet. Any deviation of the stylus by more than the set increment (currently 0.05 inches) while in PROXIMITY and before being pressed on the start of the line will result in the unwanted connecting line being drawn between the current line and the preceding one. This will also happen unless you travel at least the increment distance with the stylus depressed at the start of the line and at least the increment distance with the stylus released in PROXIMITY at the end of the line. The alternative method described in this paragraph may also be used in the reverse manner which may be easier for some operators. The start of the line should be approached perpendicularly and at least the incremental distance travelled without the stylus being pressed, and at the end of the line at least the incremental distance should be travelled with the stylus depressed. The stylus should be lifted clear of proximity in a direction perpendicular to the tablet.

Another method of achieving line segment separation is to alternate between STREAM and SWITCH STREAM while staying in INCREMENTAL. The line is commenced in STREAM and then changed to SWITCH STREAM. In order to register

the change to SWITCH STREAM if the stylus is held depressed in STREAM, it must be lifted from the depressed position momentarily. This method is as reliable as the INCREMENTAL STREAM/POINT method but possibly not as convenient. It is potentially less accurate for the start of the line.

As with the twelve-button cursor, when digitising is complete and you wish to exit the program you should engage POINT mode and place the cursor in the far right hand corner of the tablet, outside the active area. Move the stylus in the direction of the bottom left corner within proximity distance until the PROXIMITY indicator light glows. Depress the stylus whereupon the digitiser will beep and the program will terminate. A plot file called PANPLT.TMP will have been created and this may be plotted in the usual manner.

[19 June 1985]

APPENDIX 1  
Program DIGPLT

```

C * * * * *
COMMON /IO/ LUNG, LUNI
LUNG=5
LUNI=5
IBOLD=11
CALL PLTOUT('PANPLT. TMP')
CALL INITAL(9, 200, 36, 0, 0, 0)
WRITE(5, 50)
50 FORMAT(1X, 'USE POINT MODE', //,
1 ' WHAT IS THE SCALE OF YOUR MAP? 1: ????????)
READ(5, *) SCALIN
WRITE(5, 60)
60 FORMAT(1X, 'WHAT IS REQUIRED NEW SCALE? 1: ????????)
READ(5, *) SCAOUT
FACTOR=SCALIN/SCAOUT
WRITE(5, 70)
YLIMIT=36. 0/FACTOR
WRITE(5, 67) YLIMIT
67 FORMAT(1X, 'DO NOT EXCEED ', F5. 1, ' INCHES VERTICAL LENGTH')
70 FORMAT(1X, 'RECORD FOUR CORNERS IN POINT MODE',
1 'START BOTTOM LEFT CORNER & WORK CLOCKWISE')
CALL DIGTRD(IBTN, LBX, LBY)
WRITE(5, 105) LBX, LBY
105 FORMAT(1X, 'LH BOTTOM', I5, ', ', I5)
CALL DIGTRD(IBTN, IX, IY)
WRITE(5, 115) IX, IY
115 FORMAT(1X, 'LH TOP', I5, ', ', I5)
CALL DIGTRD(IBTN, IX, IY)
WRITE(5, 125) IX, IY
125 FORMAT(1X, 'RH TOP', I5, ', ', I5)
CALL DIGTRD(IBTN, IX, IY)
WRITE(5, 135) IX, IY
135 FORMAT(1X, 'RH BOT', I5, ', ', I5)
IBTN=-20
200 IBOLD=IBTN
CALL DIGTRD(IBTN, IX, IY)
X=FACTOR*(IX-LBX)/1000. 0
Y=FACTOR*(IY-LBY)/1000. 0
IF(IX. GT. 40000. AND. IY. GT. 37000) GO TO 300
IBNEW=IBTN
IF(IBOLD. EQ. IBTN) THEN
CALL PLOT(X, Y, 2)
WRITE(5, 300) X, Y
300 FORMAT(1X, 'PLOTTING TO ', F8. 3, ', ', F8. 3)
ELSE
CALL PLOT(X, Y, 3)
WRITE(5, 310) X, Y
310 FORMAT(1X, 'MOVING TO ', F8. 3, ', ', F8. 3)
ENDIF
GO TO 200
300 CALL RSTR(2)
END

```

NOTE: Subroutine DIGTRD was written by R.G. Richardson and reads one number at a time from the digitiser.