GRAPHICAL APPLICATIONS AT THE R.M.I. OF BELGIUM

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Graphical output started several years ago at the Belgian Meteorological Office with a Calcomp plotter. In 1980 we introduced Versatec electrostatic plotters for our graphical applications.

As our basic computer system is a Univac 1100/40 we started by using the Univac version of the Versatec software. Quickly this revealed to be too slow and was rather limited in its possibilities.

It was clear that the only reasonable way to obtain an efficient and time saving system was to write a new software.

The results of this rethinking was very surprising. Indeed the number of subroutines was shrinking from 50 to 2 subprograms; the gain in computer time was about 30%; the drawing time was halved. The basic program in our users software is a Fortran subroutine which has 4 arguments

P I N T (X, Y, I, J)

These arguments stand for:

X,Y: in the case of an absolute displacement, they represent the co-ordinates of the next point.

X,Y: in the case of a relative displacement, they represent the numbers of steps in X, Y direction.

I : type of displacement (pen-up, relative or absolute, change of origin, start or end of a drawing).

J : is an integer of the form

$$J1 + J2 * 64 + J3 * 512$$

where J1 specifies the type of line
J2 the thickness
J3 the blackness

All types of characters, even specific meteorological symbols, are plotted by the second subprogram of our users software. This program transmits the information to our basic routine PINT.

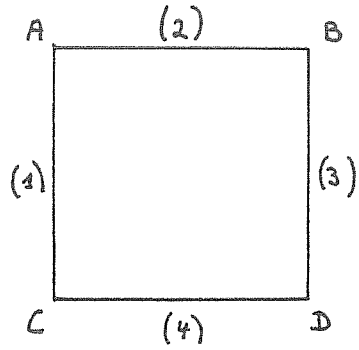
This basic routine can also be used for several pen plotters (Calcomp 960, Benson 112) which are still on site. All our plotters are off-line. Due to the different format of each plotter tape it is clear that the program which transfers the data on tape is plotter-dependent.

Construction of iso-lines on a rectangular grid

The drawing of an iso-line on a rectangular grid is based on the well known meteorological principle that a low is situated at the left-hand side of a stream-line.

Suppose we have a rectangular grid. The values Z(I,J) of a parameter Z are given in the raster points (I,J). We want to draw in this grid an iso-line for the value ZISO of Z.

Using the mentioned principle, the determination of ingoing and outgoing points of ZISO in squares of our grid is done by analysing the sides of each square ABCD.



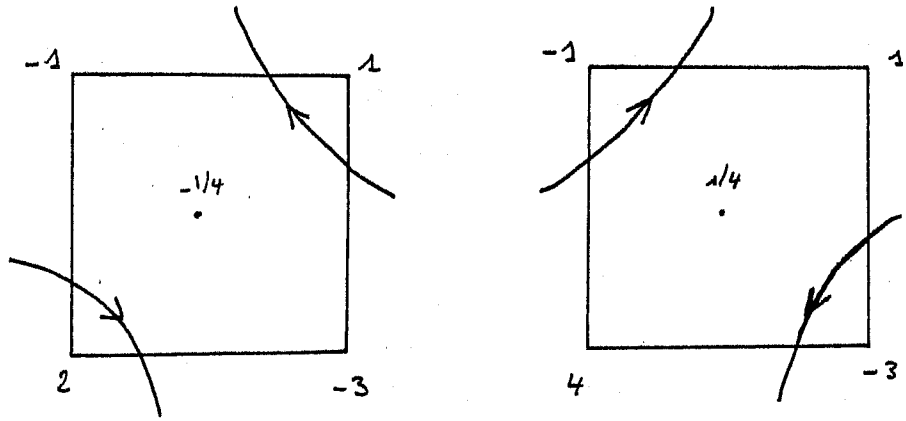
For example we have an ingoing point on AC if

$$Z(A) \leq ZISO < Z(C)$$

We have an outgoing point on AC if

$$Z(C) \leq ZISO < Z(A)$$

The same criteria are applicable to the other sides of the square. If there are 2 ingoing and 2 outgoing points the mean value of the parameter Z in this square will fix the sense of movement on ZISO



The calculation of these ingoing and outgoing points is a two step operation. We start with a linear interpolation as first guess. The final position is fixed by a quadratic interpolation. All the couples of ingoing and outgoing points are stocked in a matrix which defines a segment of the isoline ZISO.

The drawing of all the segments is based on the well known spline technique.

Fig. 1 Types of lines, thickness and blackness

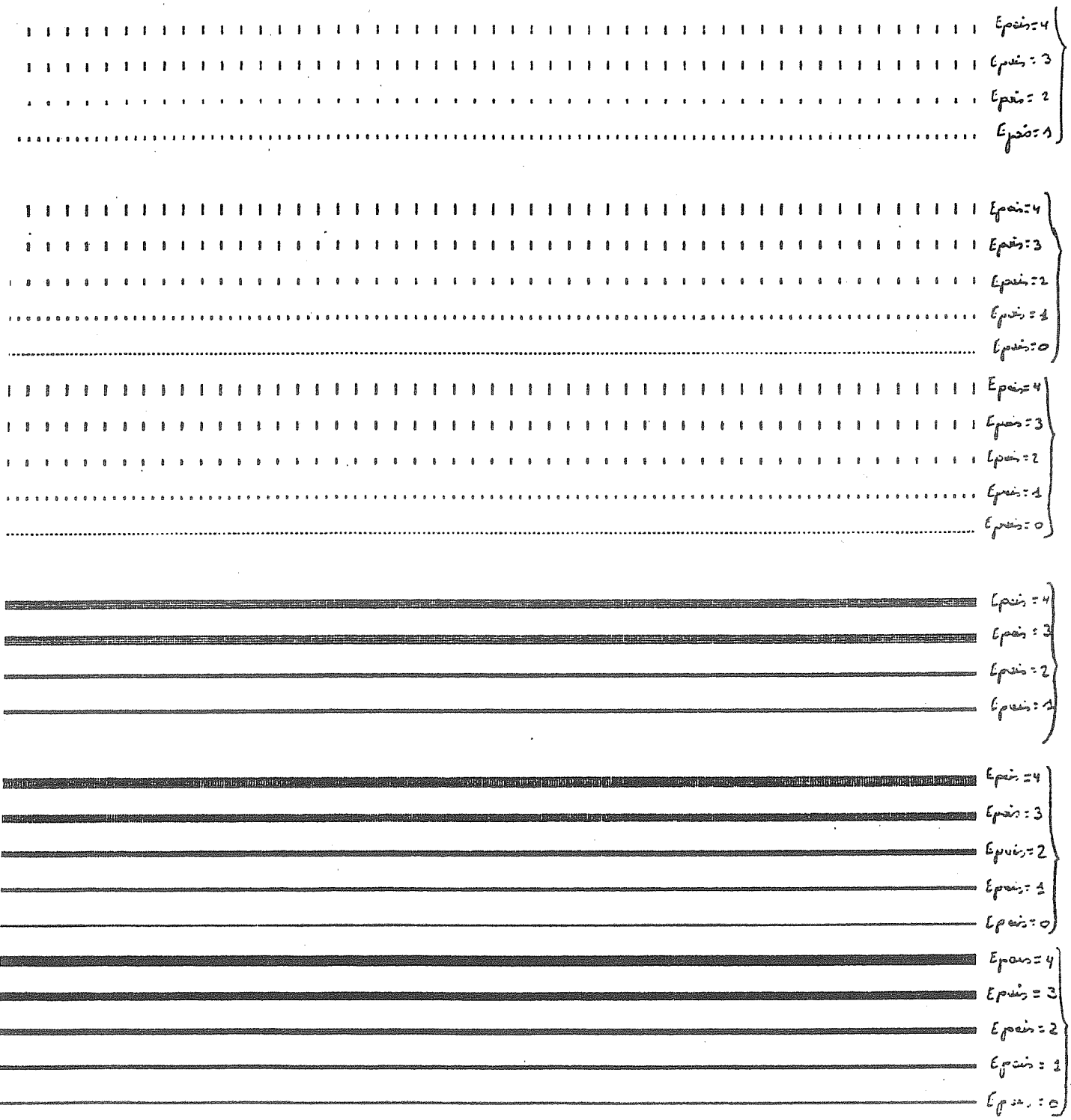


Fig. 1 (continued)

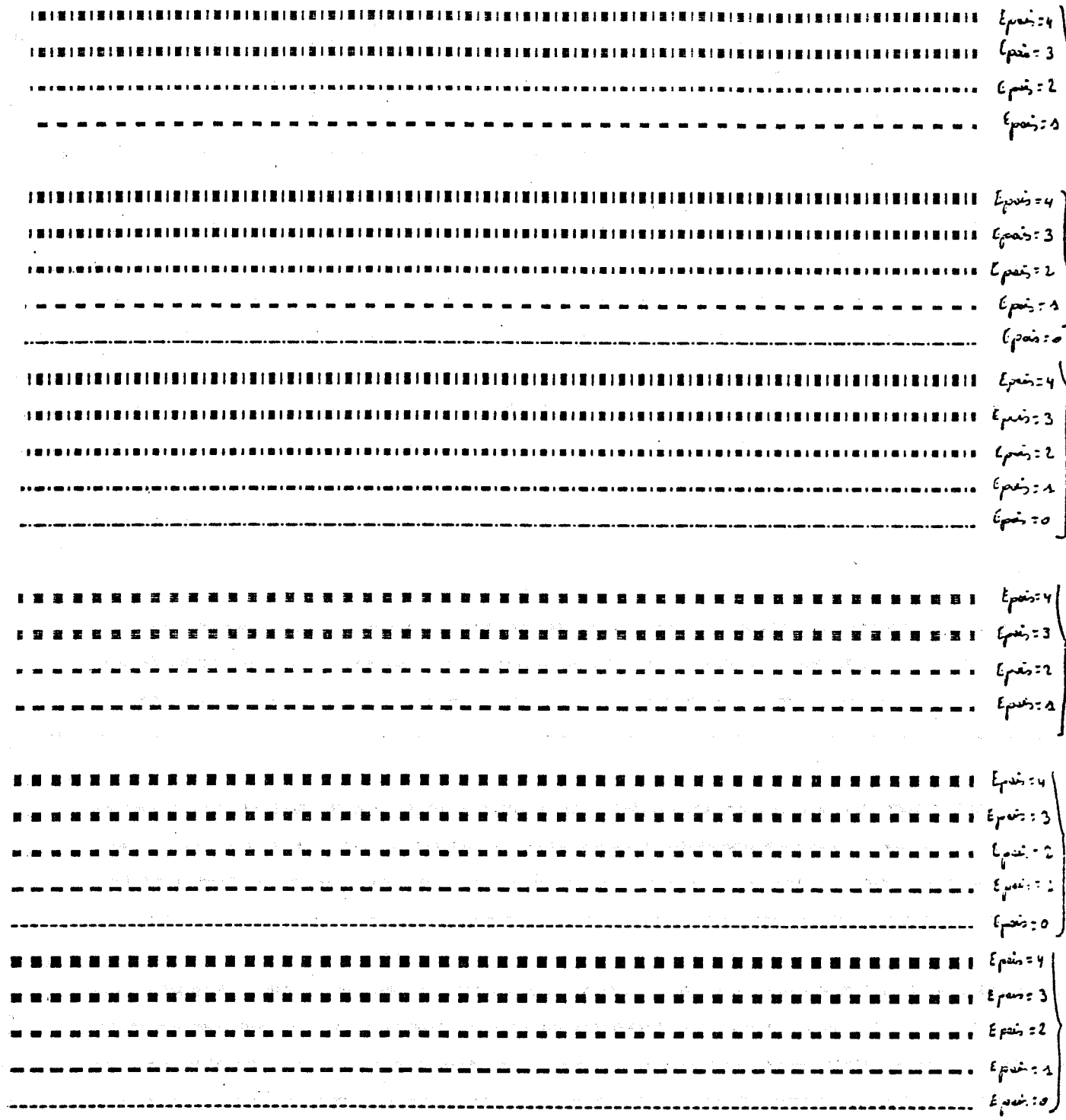


Fig. 2 Types of characters

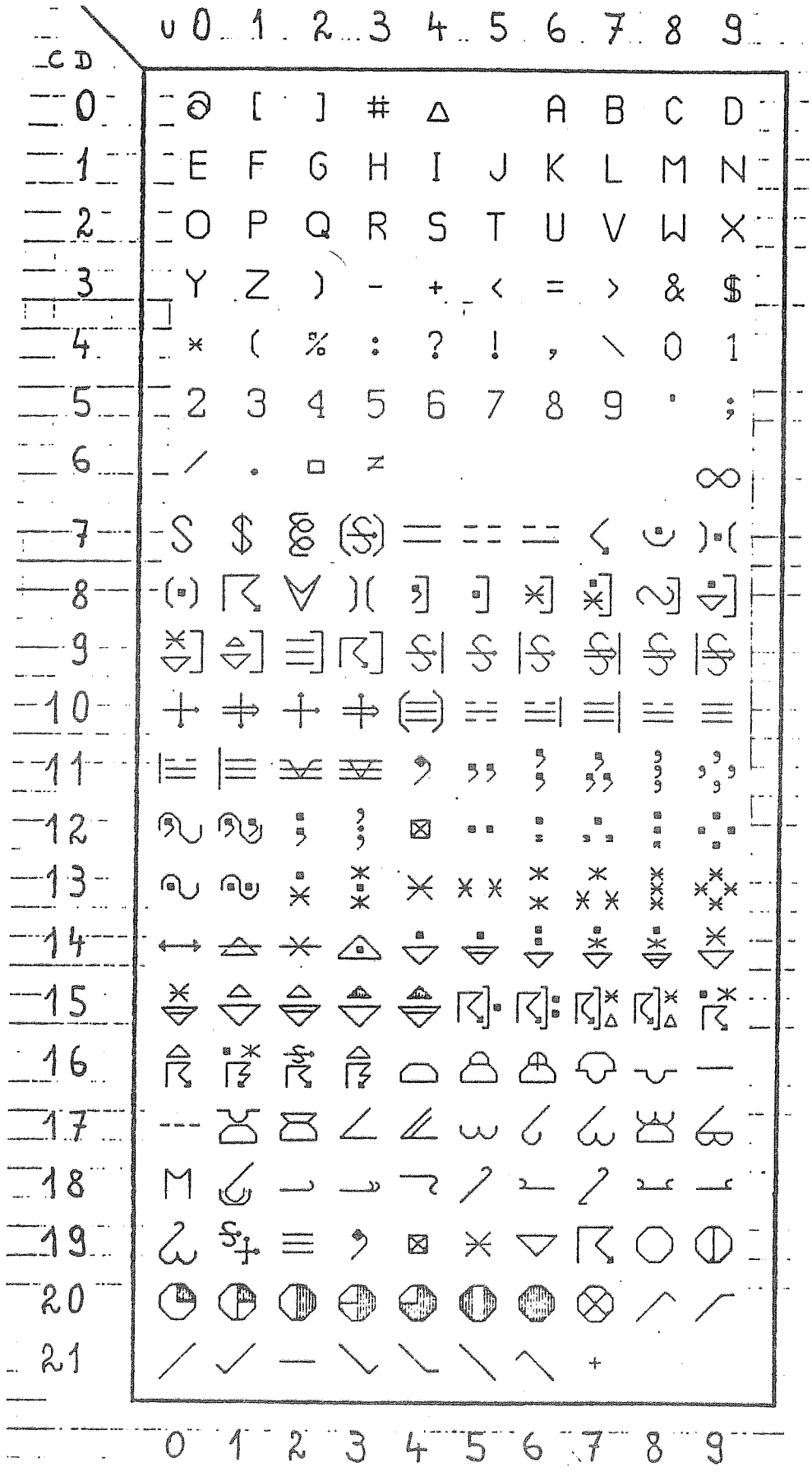
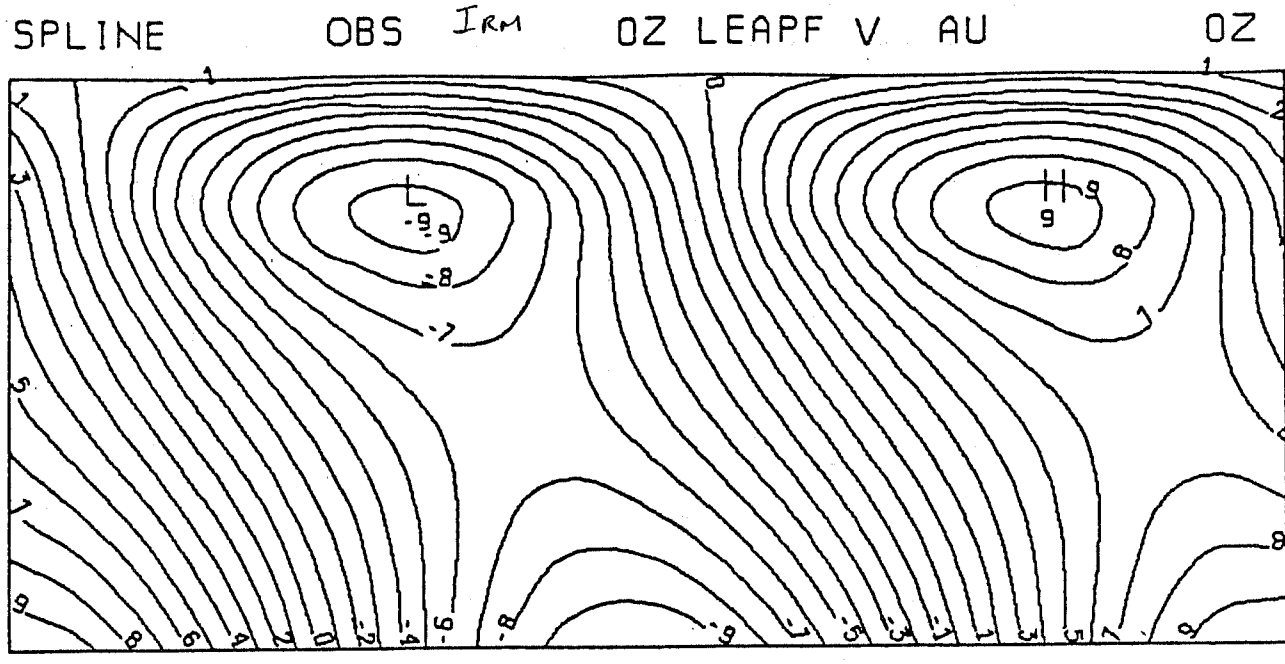


Fig. 3 Sample output



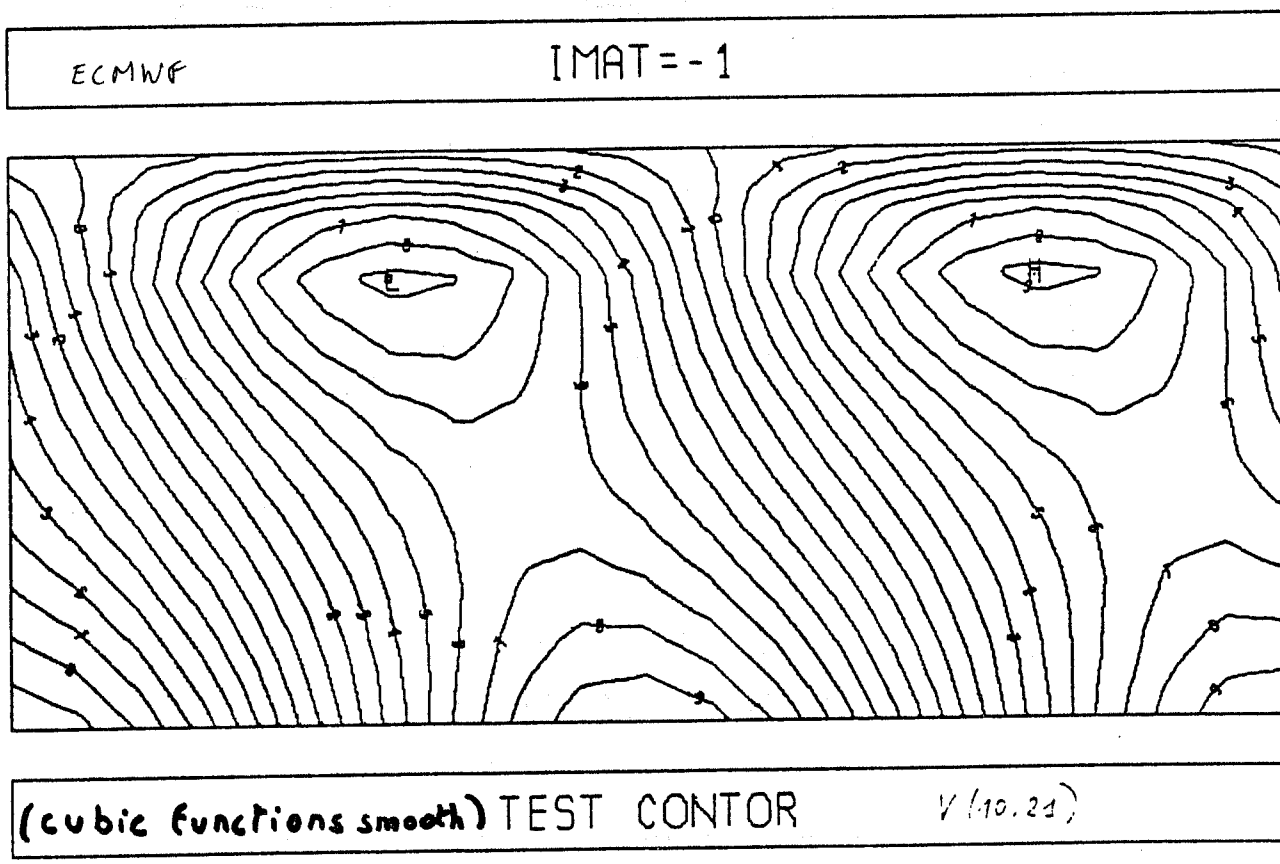


Fig. 3 (continued)

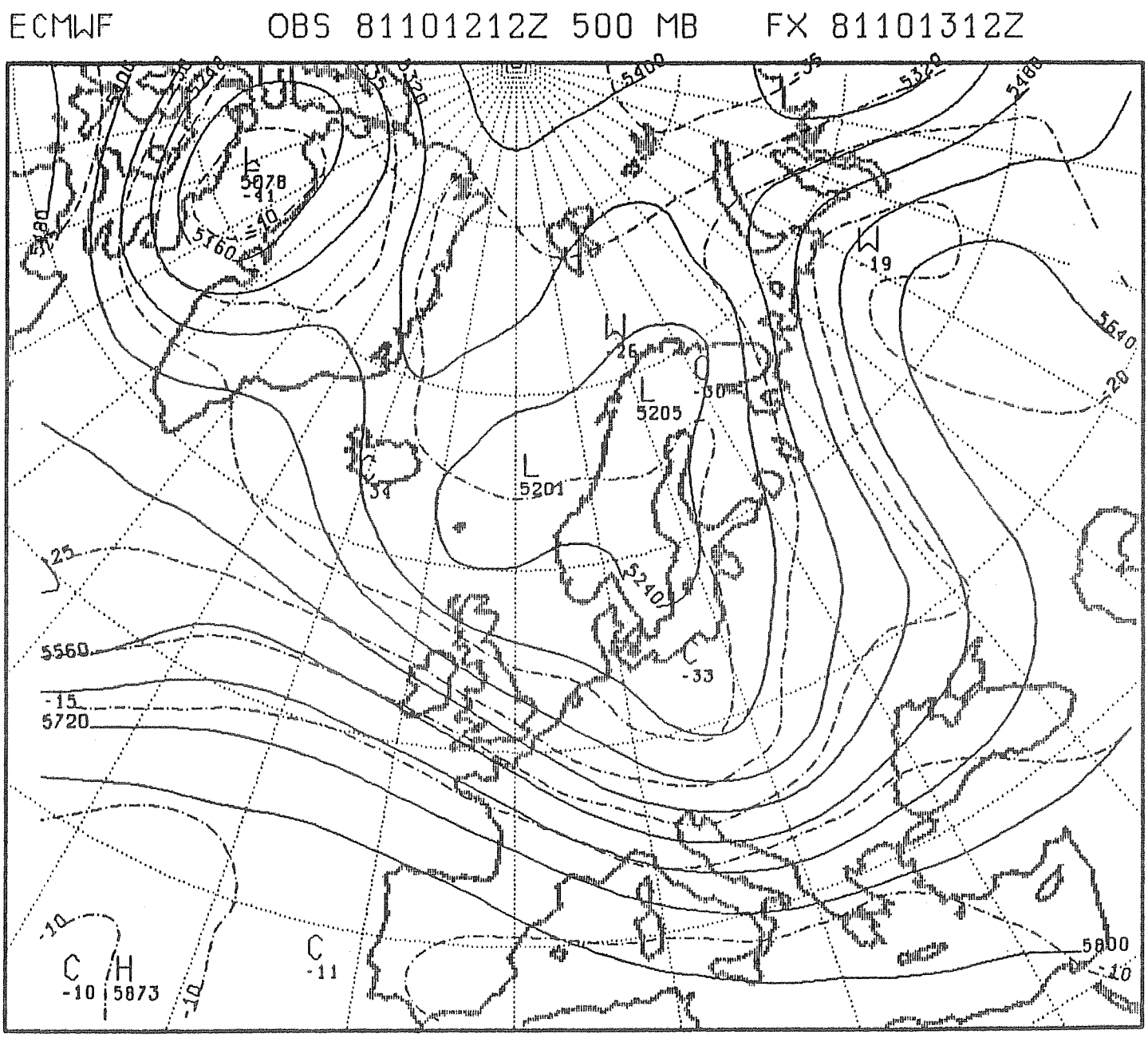
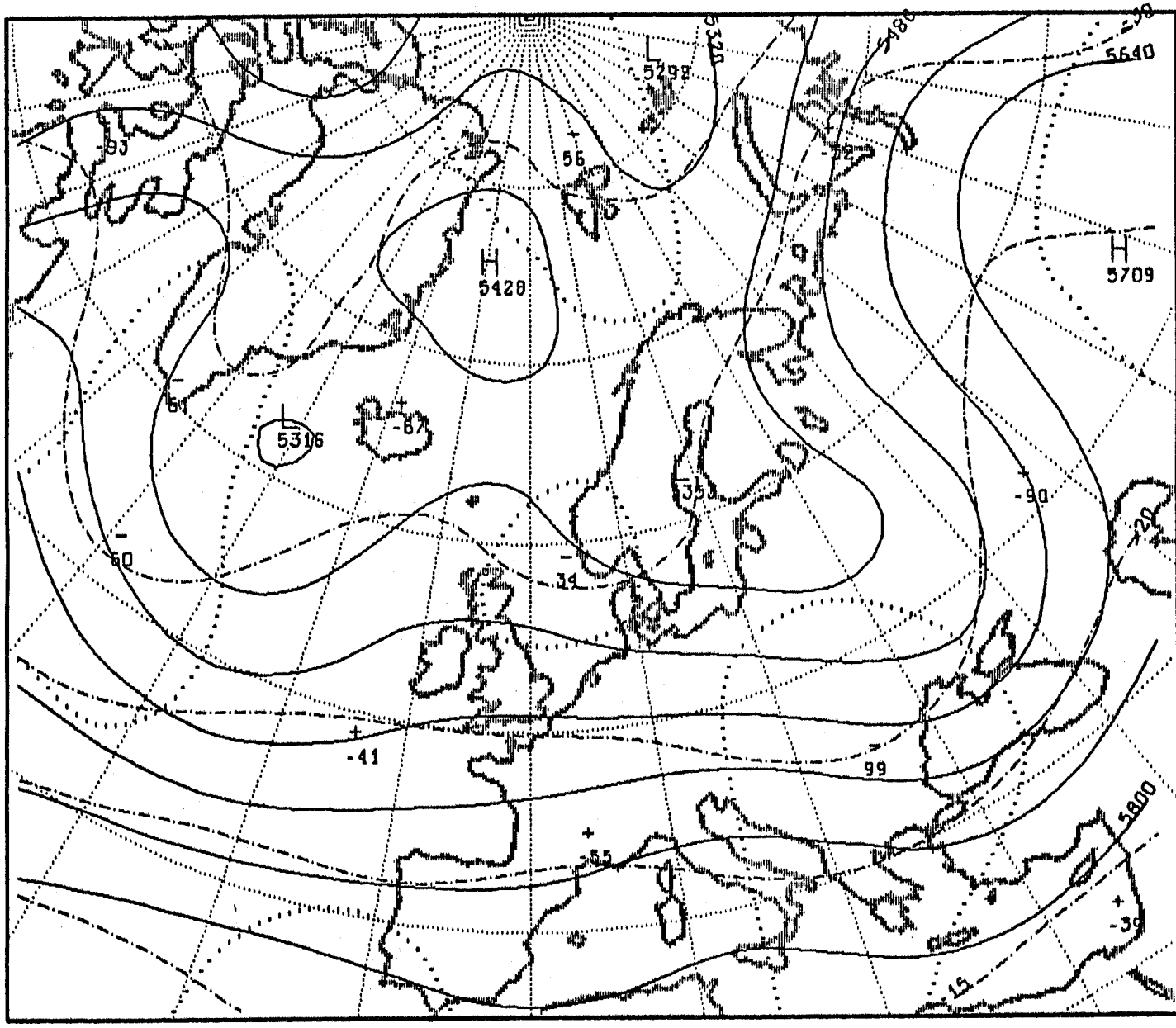


Fig. 3 (continued)



500 MB HEIGHT 500 MB TEMP - 500 MB W

1 .4760E+ 4 .8000E+ 2 0.0 4 0.0 .5000E+ 1 0.0 4 .2000E- 4 .2400E- 3 .1000E- 5

Fig. 3 (continued)

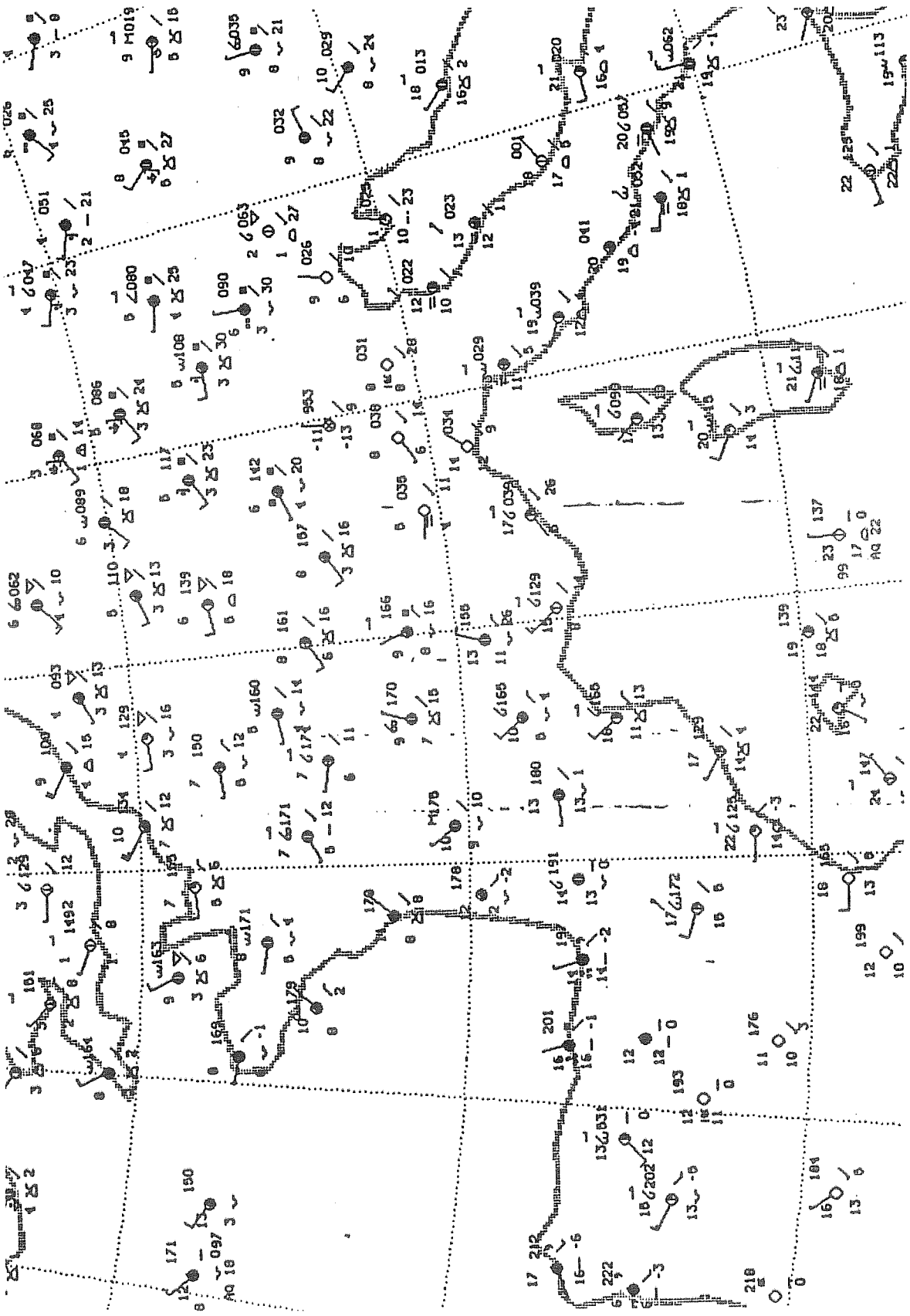


Fig. 3 (continued)