

The World's First Computer-Assisted Ordnance Survey Map

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The Ordnance Survey has just published the world's first standard series four colour computer assisted 1:25 000 scale map - SO 29/39 Montgomery which covers parts of the counties of Powys and Salop.

The map was produced, using automated cartographic techniques from maps ten times larger in scale, details of which were already available in digital form in the Ordnance Survey computer databank.

The benefits of this digital derived map over its conventionally produced equivalents are:

- an increased amount of fine detail because only roads and buildings have been generalised
- accuracy for measurement is improved
- the separation of map detail by feature codes assists in multi-colour printing
- there are cost savings over conventional cartographic methods.

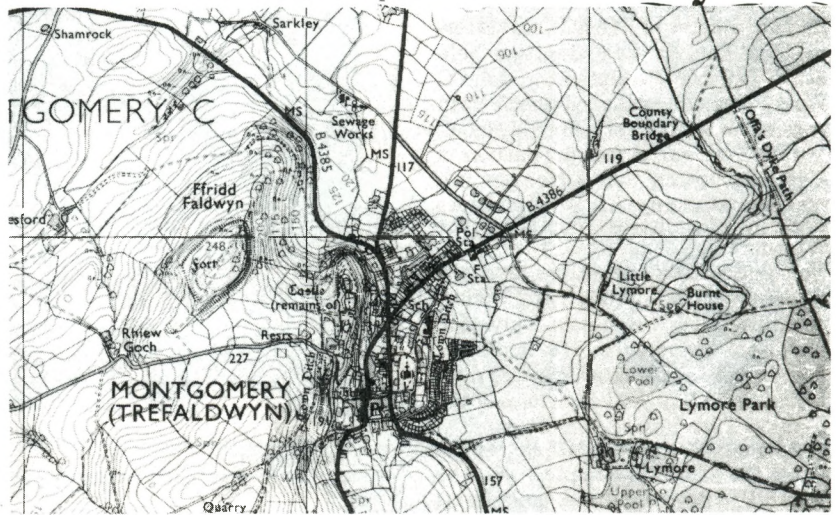
Background to the series

A digital map may be defined as a representation of conventional map detail (line, point and text) in a form suitable for manipulation by computer. The Ordnance Survey defines this map detail by recording strings of co-ordinates on magnetic tape. Once recorded this map information can be quickly re-drawn using an automatic plotter.

The Ordnance Survey has been using automated techniques for the production of some of its large scale maps (1:1 250 and 1:2 500) since 1972. At present 24 Ferranti Freescan digitising tables digitise some 2 500 maps per year with the total available standing at around 10 000.

Experiments were conducted in 1974 and 1975 which culminated in the production of several specimen samples of digital 1:10 000 and 1:25 000 map derived from large scale data. The outcome was a production procedure for 1:10 000 scale maps and a recommendation to produce the whole 20km x 10km 1:25 000 scale map to an agreed specification as soon as sufficient large scale data became available.

It was not until late in 1977 that digital data for 200 1km x 1km 1:2 500 scale maps became available, but in June 1978 a proof was ready.



Specification for this proof was broadly based on the 1:25 000 conventionally produced second series map which was in six colours. Further experimentation continued to look at ways of overcoming the problems created by reducing to four colours.

Experimentation was completed with the final proof in March 1979. The first 1:25 000 standard second series digital derived map was published in June 1979 - sheet SO 29/39.

Method of production

The data, having been digitised for map production at 1:2 500 scale (except for contours which are digitised for 1:10 000 scale maps) was reduced to 1:25 000 scale and plotted directly on to photographic film by one of the two Ferranti master plotters fitted with a light spot projector.

Feature code descriptors allocated to each feature during digitising permitted detail to be selected for subsequent colour printing so that separate positives could be produced. Before the map was finished, manual application of text, vegetation symbols, ornamentation and standard border was necessary.

Generalisation

The conventional map at this scale is generalised. This is reproduced in the digital version to the extent that minor detail has been omitted (a simple matter of suppressing the relevant feature code before plotting), buildings are generalised and roads are cased. The techniques used to achieve the generalised effect are interesting in that a mechanical technique has been adopted.

With the roads, the centre line network is plotted (the centre line being a feature added to the data bank during digitising), using a line gauge the

width of the road infill. This positive, and its negative, are separated by clear film spacers and contact printed.

The small amount of light permitted to creep between the positive and negative images is sufficient to create a parallel road casing at a specified spacing and line gauge.

The building outline was created in the same solid manner but the original positive solid was obtained by drawing the building outline with a larger than necessary line gauge thus merging close buildings and filling the centres of small buildings. The centres of large buildings were filled manually by pen later.

Further developments

No attempt was made to reduce the volume of data by filtering prior to plotting at the smaller scale. This resulted in very long plot times which will be unacceptable if many maps are to be produced using these techniques. Data filter routines and fast high precision plotters will almost certainly have a significant impact on plotting times.

Minor specification changes need to be made. These range from omitting road fences coincident with and close to generated road casings (suppressed by feature code) to omitting partitions within buildings (which may require alterations to digitising procedures).

Whilst it is technically feasible to reduce the data yet further to 1:50 000 scale the problems of computer generalisation that need to be solved in order to reproduce a graphic that looks like a 1:50 000 map make this an unlikely approach until adequate computer generalisation routines are available. In the meantime, work on 1:50 000 map digitising continues separately on an experimental basis.