Geo-referencing OCAD Maps for Orienteering – Using Real World Co-Ordinates

Ocad maps have usually been produced against a background of the Ocad paper co-ordinate grid. It is this grid that enables the Ocad software to calculate and produce a map to a particular scale.
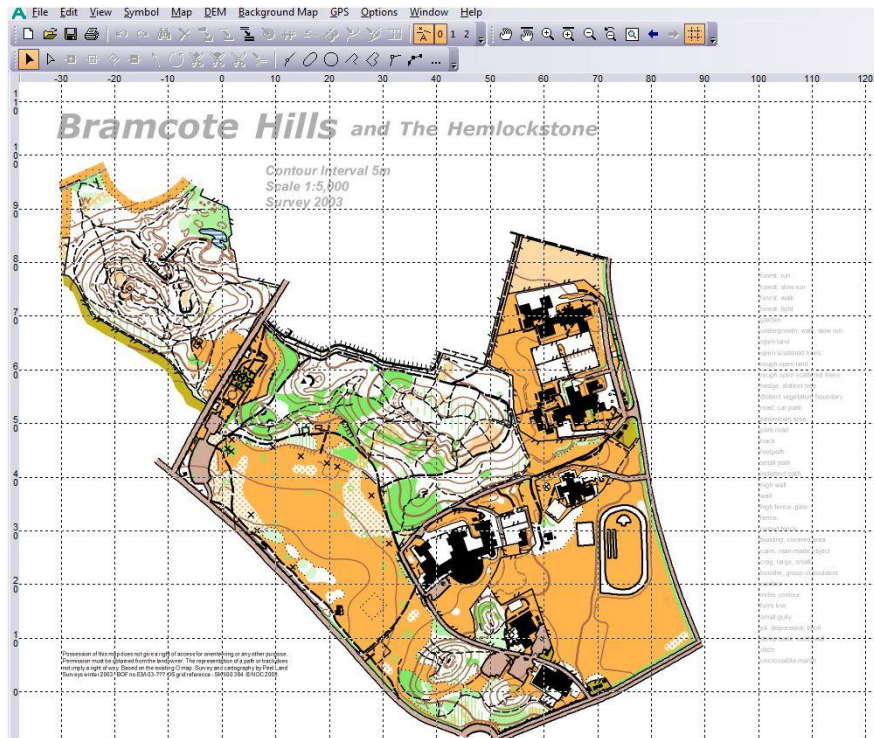
However if this grid is replaced with one that matches the Ordnance Survey grid, then the map can be geo-referenced, that is the map will be aligned with real world co-ordinates. This has a number of important advantages:

- It ensures that the map is at the correct scale;
- The map can be set to the current magnetic north.
- It allows the import of GPS tracks and waypoints, which can improve the accuracy of surveying of point and line features;
- It will allow the import of other geo-referenced material such as:
  - OS DXF files for base information,
  - height information from digital elevation data such as LIDAR to produce contours;
- It will allow controllers and planners to use GPS devices to locate control features;
- Future proofs against other developments, for example the live display of competition data.

This paper explains how to set up a new map and how to change (transform[1]) an existing paper co-ordinate based map to be geo-referenced. It refers to OCAD 9 and 10, not previous versions.

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[1] Transform is to align an Ocad map to the background map or template, as opposed to aligning the background image to the Ocad map.
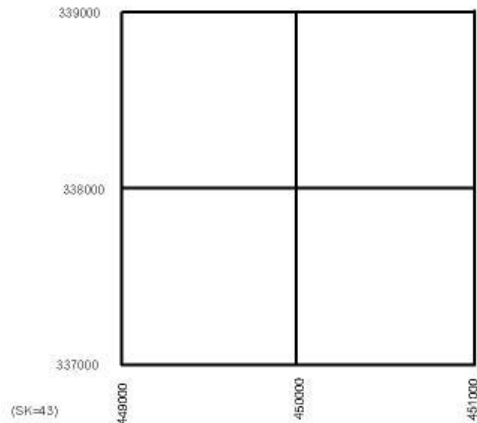
Stage 1: Setting up the Base Map

1. A new base map should be created for both a new map or to transform an existing map.

1.1 A full Ordnance Survey grid reference is required to geo reference the area in Ocad. This is a two x 6 digit reference, for example 450000 (easting, X coordinate), 338000 (northing, Y coordinate).

Use an OS map to identify the 2 x 6 figure grid reference of the kilometre square near the centre of the area to be mapped/transformed.

The two letter code referencing the 100 x 100 km square (e.g. SK) must be changed to the correct digit (4 and 3). These can be found on an OS paper map.

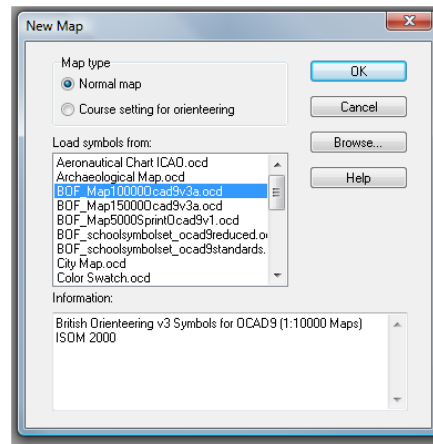It helps to sketch a grid and add the full OS grid references as here.

Tip: For further details on OS grid references see the OS "Using the National Grid" document here. Diagram A shows the 100 kilometre grid square letters; **SK** is the **4**00 **3**00 square.

1.2 Identify and note the difference between magnetic north and OS Grid north by going to the BGS website here and using the Grid Magnetic Angle Calculator. Again the full 6 figure OS reference can be used.

1.3 The Ordnance Survey OpenData StreetView datasets can be used as background maps and are available here. Each download is of a 100 kilometre grid square, for example the whole of SK, and is up to 1.2 Gb in size. Individual 5 kilometre grid square files e.g. SK53NW are in TIF format and can be extracted and imported into the OCAD file as a base map.

1.4 An alternative is to use an image/jpg of the OS 1:25,000 map of the area showing the OS grid lines by scanning a paper OS 1:25,000 map.

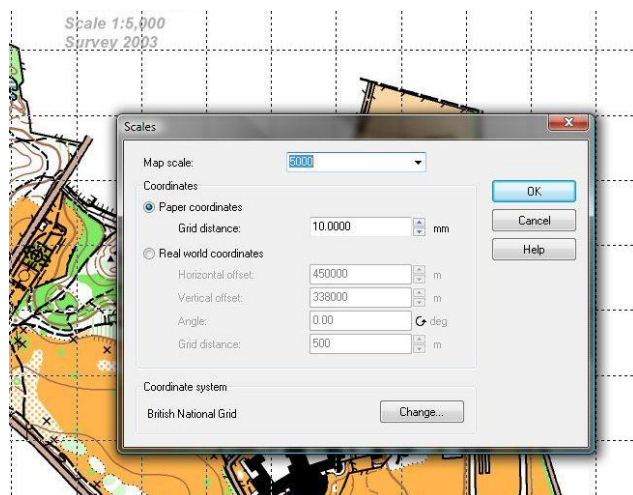1.5 In Ocad open a new file and select the correct BOF symbol set:

File… New…

1.6 Set up Ocad to geo-reference the map:
- Add the map scale
- Add the real world co-ordinates from 1.3 (horizontal offset is the easting, vertical offset is the northing)
- Add the Angle of magnetic north from Grid North
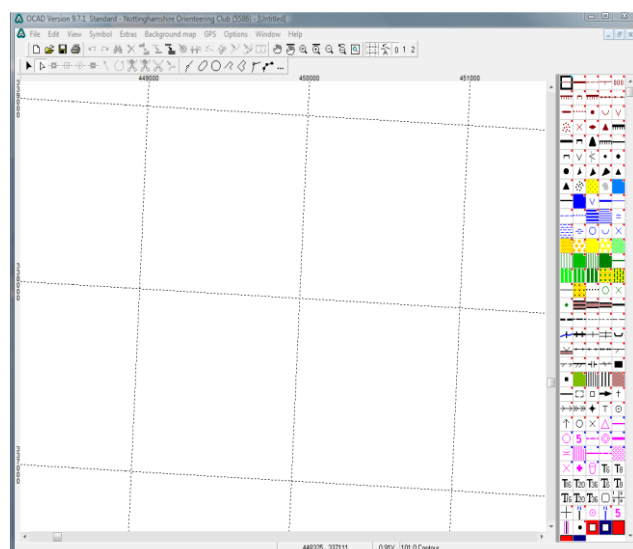- Ensure that the Coordinate system is set to British National Grid

In Ocad 9: Options… Scales…
In Ocad 10: Map… Scale and co-ordinate system…

1.7 Ocad will then display the OS Grid:

Note that the grid is angled to take account of magnetic north. The paper coordinates can be re-selected later if required.

1.8 In Background maps, open the OS StreetView TIFF file(s) from 1.3. By selecting the appropriate georeferencing file provided by the OS download (.TFW) at the same time the background map will be aligned exactly with the OS grid. Scanned images will need to be aligned manually using the blue grid lines on the OS printed map to the grid lines in Ocad. Then SAVE the FILE.

1.9 Above Right shows an enlargement of the aligned background map, the whole area is Bottom Right.

Tip: Look here at the Ocad HowTos, Miscellaneous… for additional support in both Ocad 9 and 10 on geo-referencing.

Stage 2: Next Steps

If a new map of a new area is required then the detail can be built up in Ocad from the various sources available and, of course, ground survey.

If the existing O map is to be re-drawn, which can be preferable if the file has a long history and has poor cartography, then the existing O map can be imported as a background map and aligned to the above base as a template.

If the map is of a reasonable standard then it can be imported into this new Ocad map file as follows:
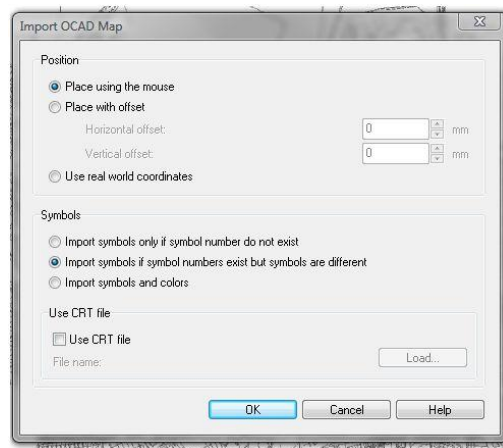
Stage 3: Transforming an existing Ocad Map

2.1 As a first step, it is preferable to import the existing map into the appropriate BOF symbol set. The instructions for doing this and the BOF symbol sets are available from the British Orienteering website Mappers pages.

Tip: This will ensure the symbols are the correct size/specification. Any anomalies in the existing file will be corrected.
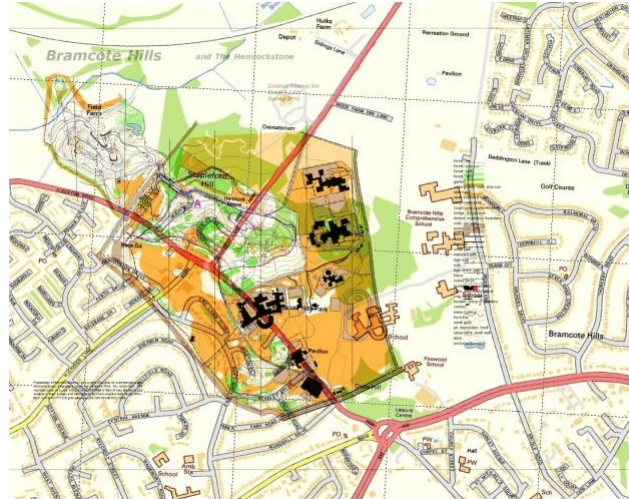
2.2 In Ocad select File… Import… Browse to the map file and select Open. Select position…Place using the mouse (the map will be displayed in the centre of the screen), and Symbols…Import symbols only if symbol number do not exist (any different non-standard symbols will appear at the bottom of the symbol set. Click OK.

Tip: If the map has not been drawn using real world co-ordinates, go to options/scales and set the co-ordinates as in 1.5. This will ensure that the map imports into the approximate correct position.

2.3 The imported map appears above the background map.

In Ocad 9 select Extras…Transform map…
In Ocad 10 select Map… Transform map…Affine transformation.

2.4 To adjust the imported map onto the background map:
a. Mark a point on the map (such as a stream / woodland junction) then
b. Mark the same point on the background map.
For the most accurate adjustment use several points in the corners of the imported map. Up to 12 points can be used for the adjustment.
When enough suitable points have been set press Enter and the map will be rotated and stretched to the best fit.

2.5 Ocad 10 has an additional "rubbersheeting" function. This allows adjustment of a selected section of the map against the geo-referenced background. See the Ocad web site for further information.

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Map Group
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