

# Irish TM Coordinate System

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## The Irish TM (ITM) Coordinate System

ITM is the Irish Transverse Mercator Coordinate System, based on a Transverse Mercator projection and optimised for the entire isle of Ireland, jointly created by the Ordnance Survey of Ireland and the Ordnance Survey of Northern Ireland (OSI & OSNI).

The ITM system was introduced as an improvement/replacement to the older Irish Grid system. The Irish Grid system required raw GPS measurements to be “translated” in order to produce Grid based coordinates (using coordinate transformations and converters), however, this process introduces errors and inaccuracies into the data, even when precise measurements are taken.

The new ITM system was created with the goal to fulfill various requirements such as;

- A fully GPS compatible Coordinate System, allowing Grid coordinates to be calculated from GPS measurements without translation errors.
- Minimal map distortion for the whole of Ireland.
- Backward compatibility – allowing existing surveys and maps to be compared to/referenced to the new Coordinate System.
- Coordinates values different enough to remove the chance of confusion between the systems.

A customised Transverse Mercator projection with a significantly shifted false origin to create different Coordinate values was chosen, with the parameters as shown in the table below:

<i>Coordinate System</i>	<i>Irish Grid</i>	<i>ITM</i>
<i>True Origin</i>	8°00'00" W; 53°30'00" N	8°00'00" W; 53°30'00" N
<i>False Origin</i>	200,000m W; 250,000m S	600,000m W; 750,000m S
<i>Ellipsoid</i>	Airy Modified	GRS80
<i>Scale Factor of C.M</i>	1.000035	0.999820

## ITM Information Links

The following links provide further information/tools regarding Irish Coordinate Systems:

- Ordnance Survey of Ireland (OSI) – <http://www.osi.ie/>
- Ordnance Survey Northern Ireland (OSNI) – <http://www.osni.gov.uk/>
- Grid InQuest; Coordinate Converter tool for Great Britain and Ireland  
<http://www.qgsl.com/?product=gridinquest>

## ITM .v. Irish Grid – onboard the instrument and in LGO

The Irish Grid system is a grid based reference system used in both Northern Ireland in the Republic of Ireland, this Irish Grid has been in use since 1975, but in actual fact the survey work the system is based on goes back over 170 years.

Due to the increase in availability and accuracy of GPS the need for users of the a Coordinate System to be able to switch between GPS measurements and the National Grid system is large than ever before – The old Irish Grid system achieved this through a transformation – initially a seven parameter transformation, the table below shows the parameters of the initial seven parameter transformation

	<i>Shift</i>	<i>Rotation</i>
<i>X – Value</i>	+ 482.530 m	+ 1.042 ”
<i>Y – Value</i>	- 130.596 m	+ 0.214 ”
<i>Z – Value</i>	+ 564.557 m	+ 0.631 ”
<i>Scale Factor</i>	+ 8.150 ppm	

More recently a polynomial transformation was created, this transformation improves the accuracy of the initial seven parameter transformation and as such is used in Quest’s Grid InQuest software (<http://www.qgsi.com/?product=gridinquest>) for converting between WGS84 and Irish Grid.

However, even with the use of an improved polynomial transformation, converting accurate GPS measurements into Irish Grid still allows for a loss of some accuracy and integrity and seeing as the accuracy, integrity and repeatability are key factors of a Coordinate System the newer Transverse Mercator system was created.


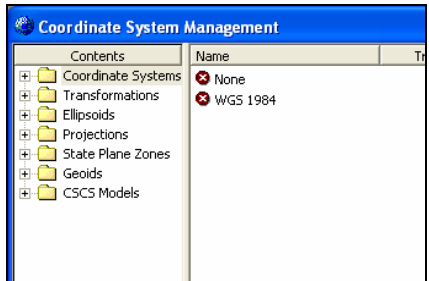
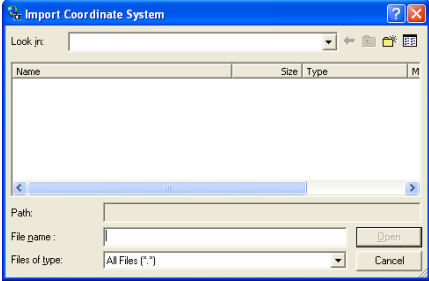
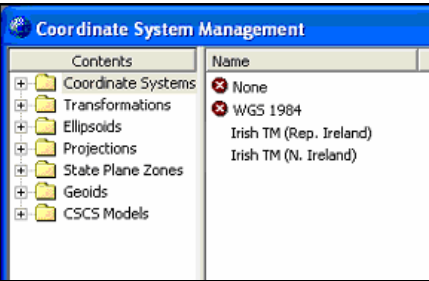
When using the Irish Grid System either onboard a Leica instrument or in the Leica Geo Office software the conversion method is the seven step transformation (using the parameters stated above) – this transformation allows for observed WGS84 coordinates to be transformed to Eastings and Northings, however, in terms of height it is only able to convert from WGS84 Ellipsoidal Heights to Local Ellipsoidal heights, rather than Orthometric Heights tied to a local/National datum, which would be a much more preferred solution.

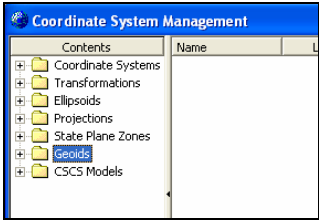
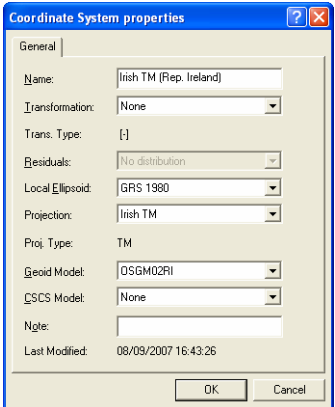
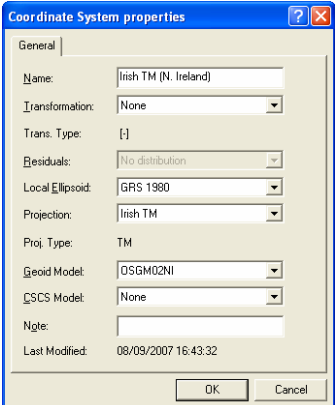
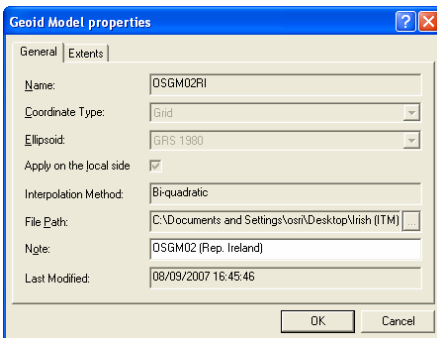
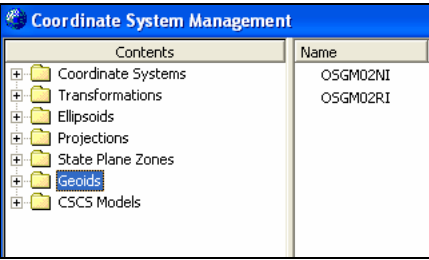
In contrast when used onboard a Leica instrument or in LGO the ITM system not only converts WGS84 coordinates into Eastings and Northings, but also the WGS84 Ellipsoidal Heights to a Orthometric Height, via the use of one of two Geoids. Both Geoids are the OSGM02 model, just with one utilised specifically for Republic of Ireland and the other for Northern Ireland due to the different datums used, Belfast Lough for OSNI and Malin Head for OSI.

Overall, due to the increased accuracy of conversion and the ability to calculate Orthometric Heights it is recommended to use the ITM system onboard and in LGO rather than the older Irish Grid.

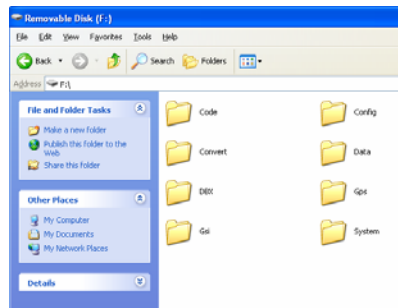


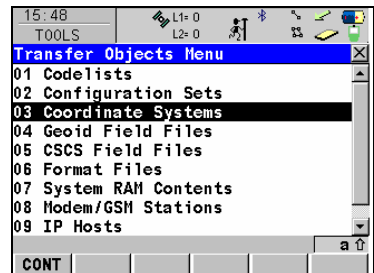
The following pages describe the processes required to load ITM into LGO and onto Leica instruments...

## A guide to installing ITM Coordinate Systems into Leica Geo Office

Step	Instruction	Screenshots
1	Fully install LGO Combined.	 The screenshot shows the Leica Geo Office installation window. It features a globe background and the Leica Geo Office logo. The window title is 'LEICA Geo Office'.
2	Open LGO and enter Management - Coordinate System...  ...Then right click on the right hand side and select to 'Import Coordinate System'.	 The screenshot shows the 'Coordinate System Management' dialog box. It has a 'Contents' pane on the left with a tree view showing 'Coordinate Systems', 'Transformations', 'Ellipsoids', 'Projections', 'State Plane Zones', 'Geoids', and 'CSCS Models'. The 'Name' list on the right contains 'None' and 'WGS 1984'.
3	In the 'Import Coordinate System' dialog box, navigate to the folder containing the Irish TM Coordinate System files...  Then select the TRFSET.DAT file, and click Open	 The screenshot shows the 'Import Coordinate System' dialog box. It has a 'Look in:' dropdown, a file list, a 'Path:' field, a 'File name:' field, and a 'Files of type:' dropdown set to 'All Files (*.*)'. The 'Open' button is visible.
4	Now, in LGO Coordinate System Management two Irish TM Systems will be in the list of Coordinate Systems...  ...Then right click on the either of the ITM Coordinate Systems and select 'properties'.	 The screenshot shows the 'Coordinate System Management' dialog box. The 'Name' list on the right now includes 'None', 'WGS 1984', 'Irish TM (Rep. Ireland)', and 'Irish TM (N. Ireland)'.

Step	Instruction	Screenshots
5	<p>The Coordinate System Properties should match the boxes opposite, make sure that the 'Geoid Model' is as below:</p> <p>Coord System:            Geoid Model:  <i>Rep. Ireland</i>            <i>OSGM02RI</i>  <i>N. Ireland</i>                <i>OSGM02NI</i></p> <p>Once the 'Properties' box matches the screen image (shown right) press Ok to confirm and now the Coordinate System is installed and ready to be used.</p> <p><i>Note: if the Geoid model is not available, press OK to close the box and then in the Coordinate System Management screen select 'Geoids' from the left hand menu...</i></p>  <p><i>...Then right click in the right hand side window and select 'New...' then proceed to step 6.</i></p>	 
6	<p>Enter the Name for the Geoid 'OSGM02 (RI or NI)', select the 'GRS 1980' Ellipsoid, set the Coordinate type to 'Grid' then select the '...' box to the right of 'File Path' and navigate to the folder containing the Irish TM Coordinate System files...</p> <p>Select the OSGM02NI.gem or OSGM02RI.gem file, then 'OK' through the dialog boxes.</p>	
7	<p>The Geoid models will now be present in the 'Geoids' section of Coordinate System Management...</p> <p>...In the Coordinate System Management screen select 'Coordinate Systems' from the left hand menu and repeat Steps 4 and 5.</p>	

## A guide to installing ITM Coordinate Systems into a System 1200

Step	Instruction	Screenshots
1	<p>Make sure that the following Irish TM files are in the correct location on the CF-Card:</p> <p>OSGM02NI.gem      ....\Data\GPS\Geoid\ Trfset.Dat          ....\DBX\</p>	
2	<p>With the CF-Card back in the System 1200, from the 'Main Menu' navigate to 'Tools'(6), to enter the 'Tools Menu'...</p>	
3	<p>From the 'Tools Menu' select (2) 'Transfer Objects', to enter the 'Transfer Objects menu'...</p>	
4	<p>In the 'Transfer Objects Menu' select (03) 'Coordinate Systems' to be taken to the 'Transfer Coord System' screen, where coordinate systems can be uploaded to the instrument...</p>	
5	<p>Set on the 'Transfer Coord Systems' screen:</p> <p>'From : CF Card'</p> <p>'To : System Ram'</p> <p>Then Press F3 - All to load both North and Republic Irish TM Coordinate Systems to the instrument.</p> <p><i>Note: Ok any warning messages and accept to overwrite files if prompted.</i></p> <p>Once this stage is complete the coordinate system will be ready for use.</p>	