

# Trimble Geomatics Office™ and Trimble Survey Controller™

Land Survey

## *Frequently Asked Questions and Answers on Using Ground Coordinate Systems in Trimble Geomatics Office and Trimble Survey Controller*

### Summary

This document answers the most frequently asked questions about using ground coordinate systems with Trimble Geomatics Office™ and the Trimble Survey Controller™.

The table below explains which versions of Trimble Geomatics Office and Trimble Survey Controller support ground coordinate systems.

Trimble Geomatics Office	Trimble Survey Controller 7.7	Trimble Survey Controller 10.0
Version 1.0:	Not supported	Not supported
Version 1.5:	Supported. For more information, refer below to Using Trimble Geomatics Office 1.50 with Trimble Survey Controller 7.70.	Full support. There are no parameter differences between Trimble Geomatics Office 1.50 and Trimble Survey Controller 10.

### **The reported ground coordinates in Trimble Geomatics Office are different from those I calculated in my spreadsheet?**

There are a number of different ways of computing ground coordinates. Trimble Geomatics Office software computes ground coordinates by modifying the underlying projection.

The projection is modified using the standard Grid to Ground formula of:

$$\text{Ground Scale Factor} = \text{Combined Factor} = (\text{Grid Scale Factor}) \times (\text{Elevation Factor})$$

*Note: The Grid scale factor and the elevation factor are fixed by the projection location and the co-ordinate system information.*

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## There are three possible reasons for getting different ground coordinates from Trimble Geomatics Office:

1. A very common difference is that in the calculation of the ground coordinates in the Trimble Geomatics Office system, the false northing and easting values are removed before the combined scale factor is applied to the coordinates. This is because the projection grid scale factor is based on the distance from the projection origin, not the 0,0 position. Therefore the correct method, when computing ground coordinates in a spreadsheet, is to remove the false northing and false easting from the coordinates, apply the scale factor and then re-add the false northing and false easting.
2. Trimble Geomatics Office adjusts the coordinates so that the coordinates of the origin do not change. This is not often done when computed in a spreadsheet and the coordinates for the origin point will shift slightly.
3. Different levels of precision used in the calculations. When the combined scale factor is exported from the office software it may have less decimal places than is used within Trimble Geomatics Office. It is recommended that scale factors be exported to 10 decimal places (use :12.10 after the field name in Trimble Geomatics Office's reporting system)

## I expected the system to create a new projection definition; instead I now have local site settings

Generally, it is good practice to keep information that may be useful. By holding the ground details as a separate part of the coordinate system, you can see at any time how the underlying projection is defined. Modification of the projection would mean that this information was lost. It also means that it is simple to swap between ground coordinates and grid projection (State Plane) coordinates.

## Using Trimble Geomatics Office 1.50 with Trimble Survey Controller 7.7

### 1. Exporting from Trimble Geomatics Office

When Trimble Geomatics Office has to interface with Trimble Survey Controller 7.7, the Trimble Survey Controller converts the projection into an equivalent standard projection, due to the inability of Trimble Survey Controller 7.70 to understand the ground coordinate system as derived by Trimble Geomatics Office.

To export the ground coordinate system parameters from Trimble Geomatics Office, export a DC file to the PC or direct to the Trimble Survey Controller.

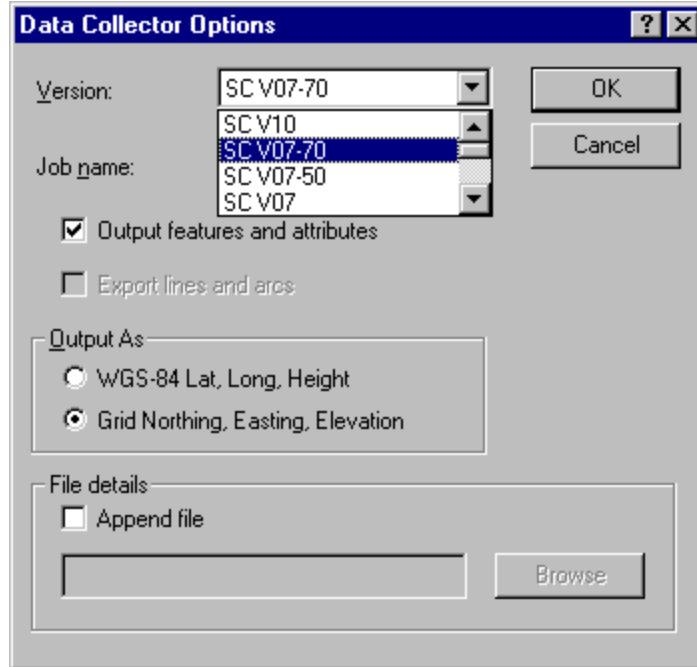
In the **Options** button of the *Export* dialog, ensure that you select SC V07-70:



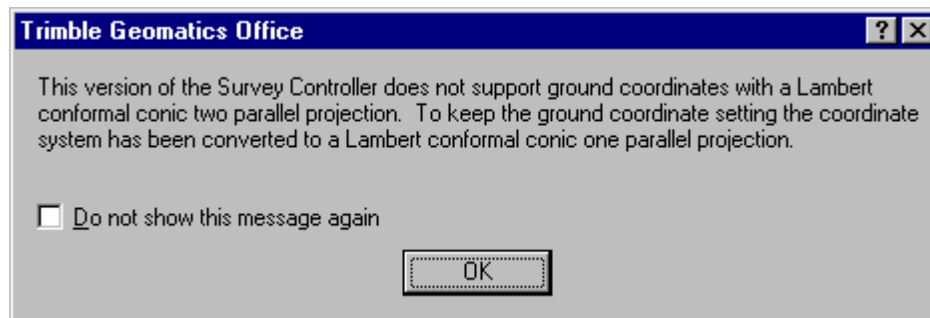
Trimble Navigation Limited  
Engineering and  
Construction Division  
5475 Kellenburger Road  
Dayton, Ohio 45424-1099  
U.S.A.

[www.trimble.com](http://www.trimble.com)

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*Note: If your projection is a Lambert 2 Parallel projection, the following message will be displayed:*



This informs you that the coordinate system has been converted to the equivalent Lambert 1 Parallel projection. This is because in a Lambert 2 Parallel projection, the spacing of the two parallels implicitly defines the scale factor in the projection. In the conversion to a ground coordinate system the projection grid scale factor must be changed. As such you must either move the parallels or convert the projection to a single parallel system and adjust the scale factor. Trimble Geomatics Office uses the second method.

You can either view the resultant DC file in the DC Editor or import the DC file into a new Trimble Geomatics Office project so that you can view the details of the ground projection. Or you can open up the Job in the Trimble Survey Controller. Go to the File menu – Review Current Job – you will be able to see:

- Ellipsoid
- Projection
- Datum Transformation

- H. Adjustment
- V. Adjustment

Except for the projection parameters, the parameter information in the Trimble Survey Controller 7.70 corresponds to that in Trimble Geomatics Office 1.50. The ground system parameters of the projection screen in the Trimble Survey Controller 7.70 are computed from Trimble Geomatics Office 1.50 as follows.

For projections that include a scale factor, the existing scale factor is multiplied by the computed (or user entered) ground scale factor at the project location:

***Ground Scale Factor (from TRIMBLE GEOMATICS OFFICE) x Existing Projection Scale Factor = New Scale Factor for the Projection in SC 7.70***

$$1.0001252666 \times 0.9999 = 1.0000252541$$

In order to ensure that the coordinates of the project location remain the same the false northing and false easting values are updated as follows:

***New false northing = Projection false northing - ( $\Delta$ north x ground scale factor -  $\Delta$ North)***

***New false easting = Projection false easting - ( $\Delta$ East x ground scale factor -  $\Delta$ East)***

Or:

***New false northing = Projection false northing - ( $\Delta$ north x (1-ground scale factor))***

***New false easting = Projection false easting - ( $\Delta$ East x (1-ground scale factor))***

If an offset was applied to the coordinates (which is recommended) this offset should be removed for the computation and then reapplied after the new false northing and false easting values have been computed.

The  $\Delta$ North and  $\Delta$ East values are the actual distances in grid coordinates in the underlying coordinate system from the projection origin to the project location. In the worked example below, the grid coordinates of the project location give these in the underlying projection system less the actual origin coordinates:

***$\Delta$ North = The difference in northing from the projection origin to the project location***

***$\Delta$ East = The difference in easting from the projection origin to the project location***

The system is working out how much the ground scale factor will affect these delta values. It is then subtracting the appropriate amounts off the new false origin values to stop the project location from being moved away from the origin. This ensures that the latitude and longitude values for the project location are not changed, and the coordinates for the project origin are not changed.

For example:

$$\Delta\text{North} = 496941.29342 - 0.000 = 496941.29342$$

$$\Delta\text{East} = 950413.97848 - 700000 = 250413.9784$$



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$$\begin{aligned} \text{New false Northing} &= 0.00 - ((496941.29342 \times 1.0001252666) - 496941.29342) \\ &= 62.250 \end{aligned}$$

$$\begin{aligned} \text{New false Easting} &= 700000 - ((250413.9784 \times 1.0001252666) - 250413.9784) \\ &= 699968.631 \end{aligned}$$

## 2. Importing into Trimble Geomatics Office

Trimble Survey Controller 7.7 does not understand the ground coordinate system from Trimble Geomatics Office. Therefore ground coordinate system based data sent to it from the Trimble Geomatics Office system has the projection system converted to a standard projection

Therefore when importing Trimble Survey Controller 7.70 data in a Trimble Geomatics Office ground projection project, the system checks to see if the projection information in the DC file is the same as that of the project. Since the Trimble Survey Controller 7.7 (and earlier) do not support ground coordinates, Trimble Geomatics Office automatically checks to see if the projection information in the DC file is the same as would be created using the current ground coordinate system definition. If it is then the DC file is seamlessly imported. If the projection is different then the standard message indicating that the coordinate system is different is displayed.

### I changed my ground system in the Trimble Geomatics Office system and the coordinates changed

When you change the ground settings within the Trimble Geomatics Office system, this is treated as a change of coordinate system. As such the coordinates are converted to the new system. This is very useful for converting grid projection (State Plane) coordinates to ground, or vice versa. Remember that you can do this conversion when you export a file as well.

### The ground correction is being double applied

There are two issues:

1. Starting with grid coordinates.

There is no problem here as the software (Trimble Survey Controller and Trimble Geomatics Office) is calculating the conversion from grid to ground.

2. Starting with ground coordinates.

The issue here is when you already have ground coordinates and pick a ground coordinate system in the software. The software then applies the corrections necessary to achieve ground coordinates not knowing that you already have ground coordinates, hence the double correction. When importing or keying in ground coordinates, do not pick a ground coordinate system, choose the appropriate state plane coordinate system.



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Construction Division  
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Dayton, Ohio 45424-1099  
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## **I changed my ground system in Trimble Survey Controller and the coordinates did not change**

Trimble Survey Controller does not convert coordinates not derived from measurements (i.e., keyed in or uploaded) when the projection details change. However, the coordinates for measured points (GPS and conventional observations) are updated due to the live database of the Trimble Survey Controller system.

You cannot use the Trimble Survey Controller to convert the coordinates. Use the office software to change coordinates from grid to ground.



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