

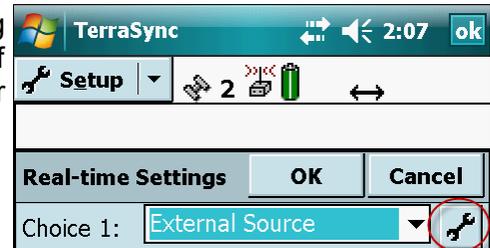
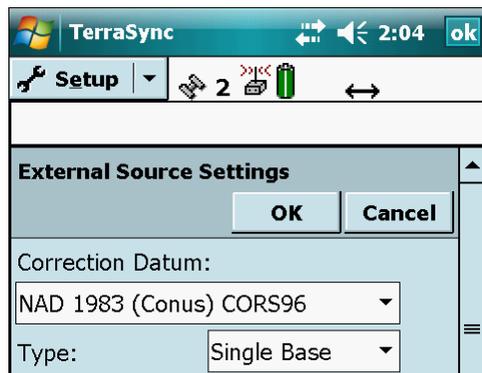
# Non-WGS 84 Datums in Trimble® TerraSync™ and Pathfinder® Office

November 7, 2014

It has long been assumed that GNSS data collected with a Trimble Mapping system is always referenced to the WGS 84 datum. It is absolutely true that the GNSS coordinates calculated by the receiver are always referenced to WGS 84. However, if a differential correction source is used that is referenced to a different datum, then the data collected will assume that datum unless proper steps are taken.

## TerraSync Software - Real-time Differential Correction

In TerraSync 3.20 or greater, real-time settings include specifying the datum of the correction source. These settings are available if a real-time choice is 'External Source,' 'Integrated Beacon,' or 'Integrated SBAS' by pressing the Settings button.



If using Integrated SBAS, no additional settings are needed as the SBAS correction is referenced to WGS 84. However, if a VRS, single base station or Beacon correction source is specified, you must know the datum of the correction source and enter it here.

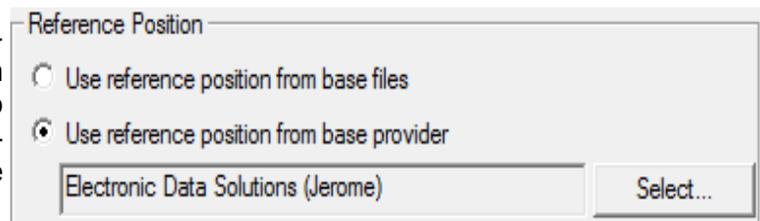
This will ensure that TerraSync makes the appropriate adjustment to the incoming data and move everything back to the WGS 84 datum.

Your other option is to leave this setting alone and know that your data will be recorded in the datum of the real-time correction source. However, Pathfinder Office still assumes all incoming data is in WGS 84, so workarounds will need to be employed to account for that when exporting data from Pathfinder Office.

## GPS Pathfinder Office - Post-processed Differential Correction

The spatial reference of GPS data can be changed from WGS 84 to a realization of NAD 83 during Differential Correction as well as during collection. Follow the instructions below to avoid shifting your data.

During Differential Correction, the user is presented with a choice regarding the base station reference position. Essentially, the choice is to use the reference position contained in Trimble's base station list, or to use the reference position from the base files themselves.



The default choice is to use the reference position contained in Trimble's base station list, which has been compiled from details submitted by base station operators and is presented in terms of ITRF00. This is the option selected, in the Pathfinder Office Differential Correction Wizard (v3.1 and newer).



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All reference positions contained in Trimble's base station list have been converted to ITRF00 (essentially WGS 84 (G1150)). The reliability of the assumption that all of these reference positions are in terms of ITRF00 depends on the coordinate supplied by the base provider, how the reference position was originally created, and whether or not the correct realization could be determined when converting to ITRF00. Particularly with CORS stations, data sheets exist that document clearly which NAD 83 realization the reference position is referenced to, whereas with private base stations, that is not always so easily determined. This could introduce positional errors. For example, if a base station reference position were actually referenced to NAD 83 (1986) but it was assumed that it was referenced to NAD 83 (CORS96) when the reference position contained in Trimble's base station list was converted to ITRF00, there could be a 1-meter horizontal error introduced by what amounts to an 'incorrect' reference position.

The other option, 'Use reference position from base files' or 'Set From Base File...', will use whatever reference position is supplied by the base station operator in whatever datum it has been established.

In the case of CORS stations, that would be NAD 83 (CORS96) (2002.00 or 2003.00 epoch), NAD83 (PACP00), or NAD83 (MARP00). Therefore, if this option is selected, GPS data will actually be transformed to the datum of the base station reference position, in this case NAD 83 (CORS96), NAD83 (PACP00), or NAD83 (MARP00). Care would have to be taken that a datum transformation from WGS 84 to NAD 83 (CORS96) was not applied again during Export.

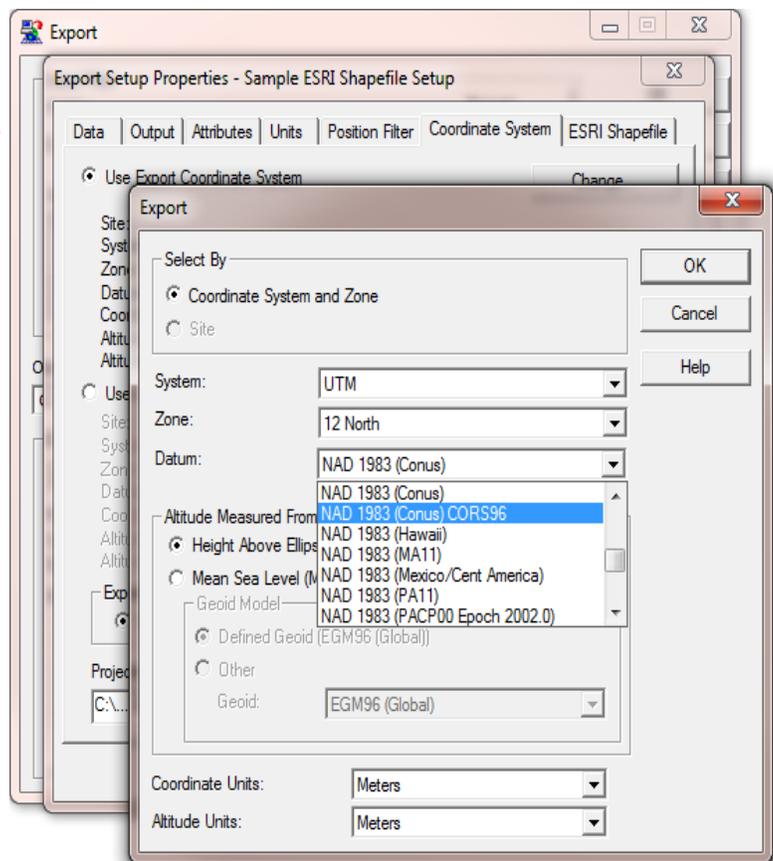
In the case of non-CORS stations, there may be confusion regarding what that spatial reference is. In reality, it could be WGS 84 or any realization of NAD 83. This could cause positional errors, since the input datum may not be known accurately.

### Export:

In Pathfinder Office, the final place where spatial reference can be changed for data collected with TerraSync is during Export. This is specified in Export Setup Properties on the Coordinate System tab.

In Pathfinder Office 3.0 and older, the NAD 1983 datum choices were all "zero" datum transformations, based on the old assumption that WGS 84 (original) = NAD 83 (1986). As these spatial references evolved and the demand for greater accuracy increased, the need for a more accurate transformation to NAD 83 was recognized.

In Pathfinder Office 3.1 or newer, a new datum choice, NAD 1983 (Conus) CORS96, was introduced.



For those who are still using Pathfinder Office 3.0 or earlier, a Support Note, [GPS Pathfinder Office Software or GPS Analyst Extension for ESRI ArcGIS Software: Resolving the NAD 83 Datum Transformation Issue](#), is available specifying how to add this datum transformation into the Coordinate System Database.

*Note: If you were using real-time corrections and chose not to set a datum in your real-time settings, or if you differentially corrected against CORS base stations with the Reference Position option 'Use reference position from base files', your data is likely already referenced to NAD 83 (CORS96). Careful consideration is needed during the export to avoid transforming the data again and introducing a shift. In this case, you may want to use the NAD 1983 (Conus) datum choice (a "zero" datum shift) to avoid applying a datum transformation twice.*

To keep from having datum transformation issues, we recommend the following:

- Keep your data in the same datum. When exporting data to the same project, make sure to use the same datum for exporting
- If you have old data that is a different datum, you can import it into Pathfinder Office and export it again into the correct datum.