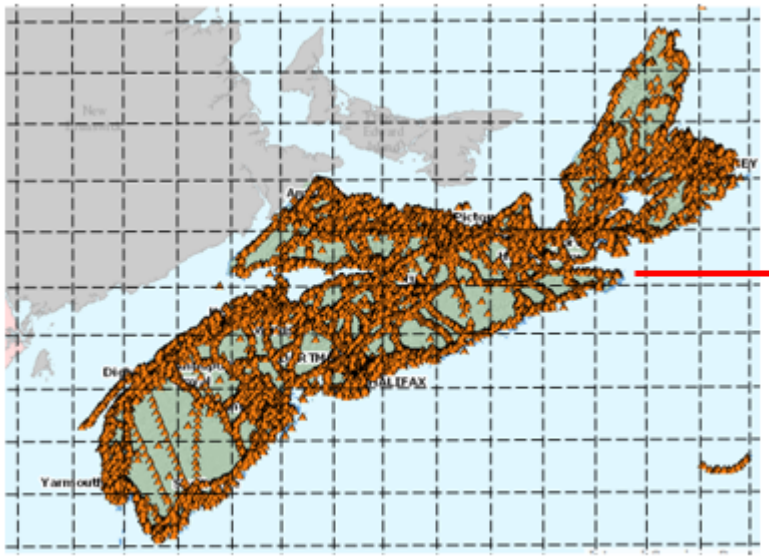
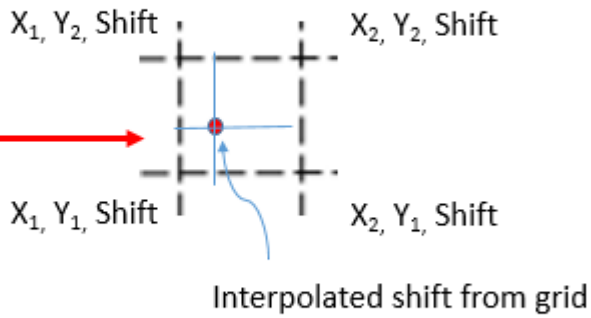
What is a grid shift file?	A grid shift file facilitates the conversion from one coordinate system to another. A grid shift file is often used for defining a transformation over a large area when the distortion in one of the coordinate systems inhibits the use of an exact set of transformation parameters. One of the first grid shift files used in Canada is the National Transformation version 2 (NTv2) which performs coordinate transformations from NAD27 (high distortion) to NAD83. Since NTv2 was developed, other grid shift files have been created using the same format.
How does a grid shift file work?	A grid shift file is built using a sampling of points with coordinate values in the "from" and "to" coordinate systems. A "grid" is developed for which each node has coordinate values and a corresponding "shift" which was derived from the sample points. Depending upon the user's location, the appropriate grid cell is located and an appropriate shift is calculated to move from one coordinate system to the other. In general, the higher the sampling and grid density, the more closely shifts can be defined to map between systems.





What is the benefit of using a grid shift file over a 7 parameter transformation?

A grid shift file is often used for defining a transformation over a large area when the distortion in one of the coordinate systems inhibits the use of an exact set of transformation parameters. The grid shift approach allows the distortion in the less accurate data set to be more closely modelled.

What grid shift files and conversions are available?

	From	To	Accuracy	Source
CVG69710.gsb	Epoch 1997.0	Epoch 2010.0	0.001 m	NRCan
NS778301.gsb	ATS77	NAD83(CSRS) 1997.0	~0.150 m	NS GIS
GS7783.gsb	ATS77	NAD83(Original)	~0.500 m	NS GIS
NTv2.0	NAD27	NAD83(Original)	decimeters to metres	NRCan

How do I use a grid shift file?

Some survey and GIS software packages (e.g., Autodesk AutoCAD Civil 3D, Esri ArcGIS) allow users to import a grid shift file to perform transformations on coordinate sets or data layers. This is useful for transforming plans from an old datum to a new datum (e.g., ATS77 to NAD83(CSRS)2010.0).

In the field, most GNSS controllers for RTK surveys will accept a grid shift file which allow you to convert between coordinate systems on the fly. As described above, this is different than performing a 7 parameter transformation which does not account for local distortions. Most often, manufacturers require you to convert the .gsb file into a proprietary format using a software utility so that it can be recognized by the controller.

Contact your software or hardware supplier for details on integrating grid shift files.

What benefits are there to using a grid shift file?

By using a standardized transformation to transform survey plans forward, there is less dependency on local survey monuments for re-establishing coordinates.

In the field, users benefit from being able to accurately stakeout ATS77 points without localization (site calibration).

Localization will allow for a very good match to historic survey work when the same survey monuments can be used, but as time goes on this is becoming more of a challenge as survey monuments are overgrown or destroyed.

Are there plans for an ATS77 to NAD83(2010.0) grid shift file?	An ATS77 to NAD83(CSRS)2010.0 grid shift file will be produced once the NSHPN network is densified over the spring and summer of 2016. In the meantime, a two-step process is required using the NS778301.gsb and CVG69710.gsb grid shift files above. Data will need to be saved in NAD83(CSRS)1997.0 as an intermediate step, and imported into a new project so that the NAD83(CSRS)1997.0 to NAD83(CSRS)2010.0 transformation can be applied. The difference between NAD83(CSRS)1997.0 and NAD83(CSRS)2010.0 coordinates is approximately 3 cm. In many cases, this error is well within the resolution of the GIS data set being transformed (metre level accuracy) and therefore the NS778301.gsb file can be used as a safe approximation to obtain NAD83(CSRS)2010.0 values. An exception would be boundary layers which may have centimetre level accuracy and therefore a rigorous transformation should be applied. The target accuracy for the new grid shift file is ± 5 cm.
When I check into a NSCM I am seeing a large error. Why isn't the grid shift file working?	If the grid shift file is allowing you to verify ATS77 coordinates with better than ± 15 cm and suddenly you see a large error on Nova Scotia Control Monument, you may have found an unaccounted for distortion in the Nova Scotia Coordinate Control System (NSCCS).
Related Technical Support Documents:	- Technical Support 0007 NAD83(CSRS) - Technical Support 0010 Localization
Useful Links:	NRCan Publication: https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/geomatica.pdf
Additional Illustrations:	