

Microsearch GeoLab 2001 Field Manual

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Understanding Microsearch GeoLab

Getting Started with GeoLab

This section provides an outline of information that will help you learn to use GeoLab. If you are new to GeoLab, it is recommended that you read through this outline in the order the various parts are listed below.

Installing GeoLab

Installing GeoLab is easy. Just run the GeoLabSetup.exe program and follow the instructions.

What is GeoLab?

GeoLab is a powerful, world-leading 32-bit Windows program for processing survey networks. The name GeoLab is derived from the words "Geodetic Laboratory". The primary function of GeoLab is to provide the user with least squares adjustments of networks of survey observations (measurements), final adjusted coordinates, and a detailed evaluation of the quality of the measurements and coordinates. GeoLab supports conventional survey measurements (angles, distances, etc.), as well as GPS coordinate and coordinate difference measurements.

What is a Network Adjustment?

In a network adjustment, the inconsistencies of the observations are statistically removed by assigning residuals to them. For example, if you measure the three angles of a plane triangle, their sum will not normally be 180 degrees because of small errors in the measurements. An adjustment will assign a residual to each angle so that they do add up to 180 degrees, and so that the sum of the squares of the residuals is a minimum (least squares). In other words, the observations are adjusted (by assigning the residuals) so that they are consistent with the geometry of the network.

Doing Sample Adjustments with GeoLab

The easiest way to get started quickly with Microsearch GeoLab is to follow through the descriptions of the included sample files.

GeoLab Features

New Features in GeoLab 2001

We have put a lot of work into improving this new release of GeoLab. A thorough revision of many of the core components of GeoLab has been made, resulting in a more robust and dependable program. All known bugs have been eliminated, and, in addition to the core component revisions, many significant improvements have been made including the following:

- The hardware key is gone! It has been replaced by a very friendly licensing system that is fully Internet friendly!
- Microsearch GeoLab 2001 can now import foreign-format data files directly. Both GPS and conventional (e.g. total station) data file formats are supported, and third-party developers can develop their own plug-in modules that GeoLab will automatically recognize and load at startup. All loaded formats are displayed in the File/Imports menu.
- Network drawing efficiency has been increased dramatically (with immediate scrolling response, for example), and you can now export network drawings to bitmap or Windows metafile formats as well as the usual DXF format.
- The GeoLab Preferences dialog has been significantly expanded. A new option to specify the Windows execution priority for GeoLab has been added, which can improve processing speed significantly.
- GeoLab 2001 now supports network adjustments in local x, y coordinates (XY records).
- GeoLab's Geoid Manager interface has been substantially improved.
- GeoLab's Options dialog has been improved, now providing an "Apply" button so you can see the effects of options changes without closing the dialog, and new options were added to support the new features in GeoLab 2001.
- Station reordering is much more efficient now, and results in more efficient processing of large networks.
- GeoLab's toolbar is now more configurable, as well as more complete.
- Context help is much improved throughout Microsearch GeoLab 2001, and you will appreciate the new Help on the Web feature!
- Text files can now be opened in read-only mode, and text and network windows now have a more complete and useful context menu (right-click popup menus).
- GeoLab 2001 has a new and improved network drawing print-preview feature.
- The output of data in the User-Defined Station Data Lister dialog is more configurable now with the addition of a feature to specify numbers of decimal places in the output.

- An option was added to the Coordinate Observation Extraction dialog to output XYZ records and the corresponding covariance matrix in the CT system.
- And much more. In addition, as with all large software packages, various bugs were eliminated in this new release of GeoLab 2001.
- Microsearch GeoLab 2001 requires Windows 95/98/NT/2000 or later, running on a PC with an Intel Pentium or better processor.

GeoLab Features Summary

GeoLab can do much more than network adjustments. It also performs many related functions including coordinate transformation calculations, map projection computations, and geoid computations.

GeoLab will import data from text files in virtually any file format. This is done through the use and support of third-party "plug-ins" (modules that specify how to transform the source data file into a GeoLab input text file; see File Import Plug-Ins for more information). Any such plug-in module detected by GeoLab when it starts, is automatically loaded and added to the File/Import menu. Therefore, you can import any data that has an associated plug-in.

Your survey network measurements (observations) are entered into GeoLab in the form of specially-formatted "input text files". Because these files are usually named using the file extension "IOB", these files are sometimes called "IOB files". GeoLab provides an intelligent text editor that permits the easy entry and modification of these input files.

The following list summarizes the major capabilities provided by GeoLab:

- Least squares adjustment of vertical, horizontal, three-dimensional, or mixed-dimensional survey networks of any size.
- Pre-analysis (simulation) of any survey network.
- No software limits on the number of stations or observations that can be adjusted.
- Powerful graphics allows you to view your network and plot or print at any reasonable scale.
- Any number of map projection definitions supported in an adjustment or simulation.
- Any number of geoid models can be used in one adjustment or simulation.
- Statistical analyses of survey network adjustments.
- Intelligent text editor for editing input files, data entry, and viewing the output listings.
- Overlay network capability for deformation and control closure analysis.
- Automatic generation of initial station coordinates.
- Automatic map projection "zone jumping".
- Geoid model interpolation, creation, and refinement.
- Coordinate and datum transformations, map projections, and other utility functions.
- Import of survey data in virtually any text file format.

Understanding Input Text Records

A GeoLab input text record is a specially formatted line of text in a text file. Each record provides specific information to GeoLab for network processing. We refer to the structure of these records as the "IOB format".

IOB format input files are stored in ASCII (plain text - no control characters) and may contain option, coordinate, auxiliary parameter, and observation information. A record is one line in this file. Each record has fields of information that appear in fixed format columns. This means that for each field of information in a record, the information to be placed in that field must be in a predefined range of columns. GeoLab text windows will accept records up to 255 characters (columns) long.

Note that when a multiple column field is used for numeric input, the number may be placed anywhere inside that field (i.e. it does not have to be left-justified or right-justified). The numbers must not, however, contain spaces (i.e. 12 0 would be interpreted as 12, not 1200).

Fields that contain alpha-numeric characters are treated differently from numeric fields. Left-justification and right-justification become important. Imbedded and leading blanks are taken to be blank characters by GeoLab. Trailing blanks are always ignored.

Denoting a blank character with the letter b, the following table gives examples of how GeoLab interprets the contents of text fields:

Field Contents (without quotes)	GeoLab Interpretation (b = blank character)
" site1"	b site1
"site1"	site1
"si te1"	si b b b te1

Care must be taken, especially when creating automatic pre-processors for the generation of initial coordinates and observation records, to ensure that the station names referred to in the coordinate list appear exactly as the same station name in the observation records. Most errors involve left-justification or right-justification confusion.

Include Records

A special "include" record may be used in GeoLab text files. The format of the include record is:

```
#include [path]filename
```

where **path** is an optional path, and **filename** is the name of the input text file you wish to include. Note that the # character must be in the first column of the line. The path and filename may be enclosed in quotes (") or angle braces (<>). Note that you should avoid relative paths in the include record because a such a path is relative to the system's current directory, and not relative to the directory of the file containing the include record. You should always use absolute, fully-qualified paths.

Coordinates and Geoids

GeoLab handles input astronomic latitude and longitude coordinates, and geoid deflection components as follows. As the input file(s) are read sequentially, the following assignments are made:

- When an PLH or PLO record is encountered, its ellipsoidal coordinates are assigned to the station if the ellipsoidal coordinates have not already been assigned to that station (see below);
- When an ASTR record is encountered, its astronomic coordinates are assigned to the station if the astronomic coordinates have not already been assigned to that station (see below);
- When a GEOI or GFIL record is encountered, its geoid components are assigned to the station if the geoid components coordinates have not already been assigned to that station (see below).

Note the implications that the following points have for the order of records in your input files:

- As soon as both ellipsoidal coordinates and astronomic coordinates have been assigned to a station, the geoid components are computed from these values (and subsequent GEOI records or GFIL geoids for that station will be ignored);
- As soon as both ellipsoidal coordinates and geoid components have been assigned to a station, the astronomic coordinates are computed from these values (and subsequent ASTR records for that station will be ignored);
- As soon as both astronomic coordinates and geoid components have been assigned to a station, the ellipsoidal coordinates are computed from these values (and subsequent PLO, or PLH records for that station will be ignored).

Special Considerations

Note that GeoLab accepts height of target (HT) and height of instrument (HI) definitions. If these values are not defined, then all observations are expected to be at the monument. Directions, vertical angles, coordinate differences, etc., must be monument-to-monument unless HI and HT are defined. Position (coordinate) observations, distance observations, height observations, etc., must be reduced to the monument before being used by GeoLab unless the HI and HT are specified.

In general, the order that a record appears in the adjustment is not important (see exceptions outlined below). You can mix options, coordinates, angles, etc. in a random jumble and GeoLab will have no problem processing your network. However, it is a good idea to organize your data into some pattern that you are comfortable with so that you don't have difficulty reading the input text file and making corrections to it. For example, if you are adjusting a network of conventional observations, you may want to keep all of your options at the top of the file, followed by control coordinates and each set of observations organized by traverse. GPS data could be organized in a similar fashion except you would place all of your GPS observations together, perhaps in chronological order.

For networks consisting of many observations and/or stations it is a good idea to divide your data into separate IOB-format files and use the main IOB file to include these other files. For example, if you have many traverses in a large network of conventional observations, you might adjust each traverse beforehand so that you can eliminate blunders before adding the traverse to the network. In this case, you could place each traverse in a separate file and process these files one by one. Then you can set up an IOB file to include the separate traverse files so that you can adjust all of the traverses at the same time.

In the case of GPS networks, where it is common to adjust 250 sites or more, it is wise to keep options, coordinates, and GPS baseline observations in separate files for ease of access and editing. Your input data files can also be created by hand-entry using text windows. For many applications, a simple preprocessor may be written to automate the creation of the IOB file. For an example of a complete input file, see the sample data file DEMO.IOB delivered with GeoLab. Until you are familiar with creating input data files, it is a good idea use DEMO.IOB as a guide to the format for different types of observations.

Unless you select the option in GeoLab to generation initial coordinates, each and every station in the adjustment must have an initial coordinate defined for it. The accuracy of these coordinates is not usually critical unless the station is fixed. What is important is that the geometry of the network is properly represented. The initial coordinates should not, when plotted, show stations in the wrong place relative to the other stations in the network. In general you should provide the best coordinates available.

Alternatively, you can provide a minimum set of coordinates (such as control) and ask GeoLab to generate the remaining ones for you. Three examples of this would be:

- A conventional traverse with one or two control points provided. The remaining coordinates could be generated by GeoLab;
- A GPS network with one control point defined. The remaining coordinates would be computed automatically by GeoLab if the coordinate generation option was turned on;
- A GPS network with several GPS stations connected by conventional traversing. In this case you would adjust the GPS network first to ensure that there were no blunders. You could then add the conventional observations and readjust the network. If coordinate generation was turned on it would not be necessary to worry about coming up with initial coordinate values for the points in the traverse.

Station coordinates can be fixed or constrained in the vertical and/or horizontal dimensions. When coordinates of a station are fixed (for example, by using the "111" fix code in a PLO record), they are effectively given a zero standard deviation and will not move at all in the adjustment.

To constrain a coordinate, you can also enter the coordinate as a weighted observation. This has the effect of adding degrees of freedom to the adjustment because residuals are computed for the control point and its weighted coordinate will be adjusted. The weighting that you use will determine how much the constrained coordinate can move in the adjustment.

When you fix coordinates, the variance factor will tend to be higher than if you constrain them, because in the latter case you are letting some of the residual go into the coordinates. Be careful when assigning very small standard deviations to observations; the ratio of standard deviations on one set of observations to standard deviations on another set of observations should not exceed about 1:1000.

When you are performing one-dimensional (leveling) or two-dimensional adjustments, you do not have to fix the other coordinates of a station for which you include no observation information. This will be done automatically by GeoLab. For example, if you input only height and height difference observations, GeoLab will automatically fix the latitude and longitude of all stations.

Coordinate and coordinate difference observations must be input in groups of records. Examples of this can be found in the DEMO.IOB file delivered with GeoLab. You can also create a coordinate observation template using the Edit/Insert/Coordinate Obs menu command. This template can then be edited with the GeoLab Record Editor.

Groups of coordinate difference records are organized as follows: The first coordinate difference record may contain the observed X, Y, Z or ellipsoidal coordinate values for that station, zeros, or any numbers. All records following the first one must contain coordinate values. The coordinate differences used by GeoLab are computed as (record n - record 1) where record n is any record following the first coordinate difference record. In other words, coordinate differences are entered in groups of coordinate records (e.g.: XYZ or PLO) and the differences are computed by GeoLab as (record n - record 1) where record n is any record following the first coordinate difference record. In this way you may enter the actual coordinates and let GeoLab compute the differences, or you can enter the coordinate differences directly by placing a zero value for the first coordinate, and the appropriate coordinate differences for the remaining stations in the observation group.

Note that zero values are not permitted in the first coordinate difference record for 2-D coordinate differences only.

Vector coordinate difference records (DXYZ) are entered as Cartesian coordinate vector differences. This is the best way to enter observations such as GPS baseline vectors because in the residuals section of the GeoLab listing (LST file), the observation will be displayed in an easy to read format.

Note that you must be careful if you plan to make up an observation difference group using ellipsoidal coordinates. The ellipsoid defined in the ELIP record should be the same as the reference ellipsoid for the coordinate differences in the observation group.

Each set (bundle) of direction observations must begin with a DSET record. The first direction in a bundle does not have to be 0. All direction observations in a set must have the same from-station. Only HI and HT records may be placed within a set of DIR records (if a valid record of any other type is encountered, the set of directions is terminated). A sigma-record (SIGM) may be identified on the DSET record.

The sigma record identifier is referred to many times in this guide. This identifier is any 3-character string you want to invent. Suppose for example you have distance observations taken with several types of instruments. You may create a sigma record for each instrument by defining a different sigma identifier name. In subsequent observation records containing the same identifier name, the values in the corresponding sigma record will be used. If there is no identifier name, then the sigma information on the observation record is used. If there is a sigma identifier name on the observation record which was not specified on a sigma-record, an error message will be given. Any number of sigma-records may be used, but all of them must have unique 1 to 3 character identifiers.

For distance and azimuth observations, the corresponding sigma-record must be used if you want to assign auxiliary parameters to these observation types.

The standard deviation information on the optional sigma record takes precedence over any standard deviation found on a following observation record specifying that sigma identifier. The only exception to this rule is if the standard deviation resulting from information on the sigma-record is zero.

If the sigma-record information produces a legal standard deviation (greater than 0), the standard deviation field on the observation record may be left blank. If the sigma-record information produces a zero standard deviation, the observation record is checked for a legal standard deviation. If both the sigma-record and the observation record contain zero standard deviations, an error message is generated.

Note that a sigma-record must be specified if centering errors are to be used.

As was stated above, the order of your records in the IOB format files is not important except in certain cases.

Although it is usually not important where in the IOB file you place your initial coordinates, GeoLab's coordinate generation feature interacts with both initial coordinates records and geoid definition records. When you assign a geoid value to a station, the location of the coordinate for that station in the IOB file can be significant. For this reason an explanation of the coordinate generation feature is given in this section.

GeoLab reads your IOB information several times before starting the adjustment. Each pass through the data picks up certain information, such as which stations are connected, and which coordinates (if any) are not defined.

If you have left coordinate generation turned off and are not using geoid definition records, then it is not important where you place your initial coordinates in the IOB file. GeoLab will only try to generate a coordinate for any station that was not defined through the use of a PL, PLO, PLH, NE, NEO, NEH, or XYZ record.

Therefore, if you have all of your coordinates defined somewhere in the IOB format files, GeoLab will not need to generate initial coordinates.

If you use geoid definition records (GEOI records and/or GFIL records) the problem of initial coordinates becomes more complex. This is partly because GeoLab needs to have a coordinate for a station before it can interpolate the geoid separation value at that station.

If a GEOI record defines geoid values for a particular station, then that definition takes precedence over a GFIL record. In other words, values defined with a GEOI record will not be replaced by values interpolated from a GFIL record. The location of the GEOI record relative to the GFIL record or a coordinate definition record for that station is not important.

If a GEOI record exists for a station, then the geoid values defined in that record will be applied to the coordinate if the coordinate is defined in the IOB format file or if the coordinate is generated by GeoLab.

If a station does not have an undulation value defined by a GEOI record, but the undulation value can be interpolated from the geoid file specified in a GFIL record, then GeoLab will get the geoid value from the specified geoid file. If the initial coordinate for the station was already defined in the IOB format file, then the interpolated separation value will be applied to the initial coordinate. Otherwise, it will be applied to the coordinate generated by GeoLab. If you are using the GFIL record and are defining initial coordinates, then the initial coordinates must appear before the GFIL record in the IOB format file.

Histograms are generated by the HIST record and can be generated in different ways. You can ask for histograms at different points in the processing, after your angles for example, then after distances, and finally at the end of the adjustment. To do this you must place HIST records in the appropriate places in the IOB file. You must put all of your measurements in each group before the appropriate HIST record if you want to see the histogram only for that group.

Sample Input Files

EDM Baseline Calibration

The file for this sample is installed in the GeoLab Samples folder (C:\Program Files\Microsearch\GeoLab\Samples by default) with the name edmbaseline.job. This sample file shows how you can perform a calibration of your electronic distance measurement (EDM) with Microsearch GeoLab.

The first few lines in this sample file are used to override the project options for the adjustment.

The first line "LDEC 4" (see the LDEC record) tells GeoLab that you want the output linear decimals set to 4 (which overrides the current project options setting). In other words, any linear value in the output listing (e.g. a distance or a map projection coordinate) will have 4 digits after the decimal point.

The second line "PADJ NO NO NO NO NO YES NO" (see the PADJ record) tells Microsearch GeoLab to print the selected adjusted coordinates. In this case, we are selecting to list only the adjusted AUX parameter values.

Please see the documentation for the PGEO, PSOL, CONV, and VSCA records for information on the other records in these first few lines.

When this file is adjusted with Microsearch GeoLab, the network drawing on the right is produced. Since we have only accurate distance measurements along the line of the calibration baseline, we see that the relative error ellipses (shown in red) are all at right angles to that line. Of course the station error ellipses (shown in blue) are only based on our arbitrary weights assigned to the baseline coordinates, and are therefore relatively meaningless.



The parameters of interest in this adjustment are the constant ("zero correction") and scale auxiliary parameters assigned to the distance measurements using the AUX record "AUX DIS EDM CONS SCAL".

Of course the exact adjusted values and their accuracies are listed in the output listing produced by the adjustment.

To process this traverse in Microsearch GeoLab, perform the following steps:

- Select the File/Open Text File menu item in Microsearch GeoLab.
- Navigate to the Samples folder (in the GeoLab installation folder), and double-click the edmbaseline.iob file.
- Select the Network/Process the Open IOB File menu item.
- When the adjustment is finished the Network Processing Completed dialog is displayed. Ensure the Scale to Fit Window radio button is checked, and click the Draw Network button.

You can revise the network drawing scale using the Editing Drawing Scales dialog (Network/Drawing Scales menu command), and you can change other network drawing options using the other Project Options editor (Network/Options menu command).

GPS Traverse

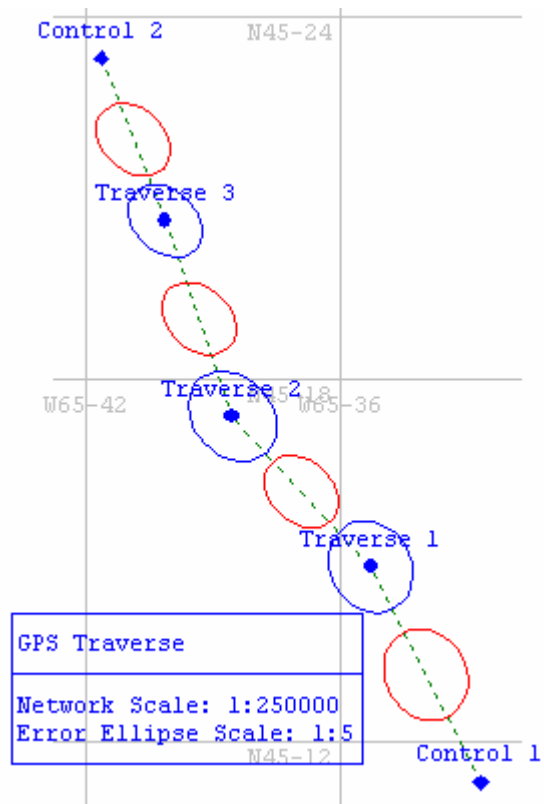
The file for this sample is installed in the GeoLab Samples folder (C:\Program Files\Microsearch\GeoLab\Samples by default) with the name gpstrav.job. This sample file shows how a GPS traverse with Microsearch GeoLab.

The first two PLH records (lines) in this sample file specify the fixed coordinates of the control stations. The traverse will run between these control points. Following these two PLH records are three more PLH records that specify the approximate coordinates for the traverse stations.

The remaining records specify the GPS coordinate differences in 3DD blocks. Each block specifies one GPS vector (X, Y, and Z coordinate differences) and its covariance matrix. These blocks of observations would normally be automatically set up for you when you import them into Microsearch GeoLab (see Importing Foreign Text Files).

When this file is adjusted with Microsearch GeoLab, the network drawing on the right is produced. We see that the error ellipses are fairly uniform because the coordinate difference observations were all assigned relatively the same covariance matrix (relative error ellipses are shown in red, and station error ellipses in blue).

To see the exact adjusted traverse station coordinates and the error ellipse sizes, you should examine the output listing file (gpstrav.lst)



To process this traverse in Microsearch GeoLab, perform the following steps:

- Select the File/Open Text File menu item in Microsearch GeoLab.
- Navigate to the Samples folder (in the GeoLab installation folder), and double-click the gpstrav.iob file.
- Select the Network/Process the Open IOB File menu item.
- When the adjustment is finished the Network Processing Completed dialog is displayed. Ensure the Scale to Fit Window radio button is checked, and click the Draw Network button.

You can revise the network drawing scale using the Editing Drawing Scales dialog (Network/Drawing Scales menu command), and you can change other network drawing options using the other Project Options editor (Network/Options menu command).

Other Sample Files

Other samples are provided in the Samples folder when Microsearch GeoLab is installed. You should experiment with these files also.

In addition to the sample files shipped with Microsearch GeoLab, please keep an eye on the GeoLab web site. Also, if you have questions about the sample files, or about any aspect of Microsearch GeoLab, please email us!

GeoLab Input Record Types

Configuration Records

ADEC: Angle Decimal Places

This record specifies the number of decimal places to use for printing angular observation types (ANGL, AZIM, DIR, GAZI, GVAN, GZAN, VANG, and ZANG). Note that the CDEC record is used for setting the number of decimal places for printing latitudes and longitudes. This option does not affect the number of decimal places used internally by GeoLab for computations. The format of this record is:

Columns	Description
002-005	ADEC
007	Number of decimal places: 1 (default), or 2

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

ANGT: Angular Type

This record specifies the units of angular observations (ANGL, AZIM, DIR, GAZI, GVAN, GZAN, VANG, and ZANG). Note that latitudes and longitudes are always expressed in degrees, minutes, and seconds, and therefore this record does not affect the manner in which these values are expressed. The format of this record is:

Columns	Description
002-005	ANGT
007-009	DMS (degrees, minutes, seconds), or GRD (grads)

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

CDEC: Coordinate Decimal Places

This record specifies the number of decimal places for latitudes and longitudes that are printed in GeoLab text output files. The format of the CDEC record is as follows:

Columns	Description
002-005	CDEC
007	Number of decimal places (4, 5, or 6)

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

CLEV: Confidence Levels

This record is used to specify the confidence levels (in percent) used for statistical computations. The value given for each must be from 10.0 to 99.999. The format of the CLEV record is as follows:

Columns	Description
002-005	CLEV
007-016	Confidence level for residuals and network differences
018-027	Confidence level for 1D confidence regions
029-038	Confidence level for 2D confidence regions
040-049	Confidence level for 3D confidence regions

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

COMP: Computation Type

This record specifies the type of computation that GeoLab should perform on an input text file. The format of the COMP record is as follows:

Columns	Description
002-005	COMP
007-009	ADJ (adjustment, the default) or SIM (simulation)

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

CONF: Confidence Regions

This record specifies which confidence regions (error ellipses, error ellipsoids, and height confidence intervals) GeoLab should produce when processing a network. The format of this record is:

Columns	Description
002-005	CONF
007-009	Compute height confidence intervals (YES/NO)
011-013	Compute 2D horizontal error ellipses (YES/NO)
015-017	Compute 3D error ellipsoids (YES/NO)
019-021	Compute point confidence regions (YES/NO)
023-025	Compute relative confidence regions (NO/ALL/CON/RAD), see table below
027-039	Radius for RAD option in previous field
041-042	Linear unit name

The options for relative confidence regions specify that the following relative confidence regions are to be computed:

Option	Description
NO	None
ALL	Those for all lines in the network (default)
CON	Only those for connected (observed) lines
RAD	Only those for lines shorter than the specified radius (last field)

CONV: Convergence Criterion

This record specifies the criterion for solution convergence (the default value is 0.001). If any parameter correction value is greater than the convergence criterion, and if the maximum number of iterations (MAXI record) has not been reached, another iteration will be performed. Of course this option applies only to adjustments (not simulations). The format of the CONV record is as follows:

Columns	Description
002-005	CONV
007-016	Convergence criterion (must be greater than 0.00001)

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

ELIP: Reference Ellipsoid

This record specifies a reference ellipsoid to be used in GeoLab computations. The format of the ELIP record is as follows:

Columns	Description
002-005	ELIP
007-022	Ellipsoid name
024-036	Major semi-axis
038-050	Minor semi-axis
052-059	X-translation from geocenter
061-068	Y-translation from geocenter
070-077	Z-translation from geocenter
079-080	Linear unit name
082-089	X-rotation (seconds)
091-098	Y-rotation (seconds)
100-107	Z-rotation (seconds)
109-116	Scale change (PPM)

END: End of Data

This record signifies the end of data (logical end of text file). All data (if any) after this record is ignored by GeoLab. The format of the END record is as follows:

Columns	Description
002-005	END

FCOV: Full Covariance Matrix

This record specifies whether to compute the full covariance matrix for an adjustment, or to compute only the part corresponding to the lines in the network connected by observations. Usually only the connected part is required and if this option is set to NO (the default) the adjustment will be performed faster for large networks. The format of the FCOV record is as follows:

Columns	Description
002-005	FCOV
007-009	YES/NO

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

GRP: Observation Group Name

This record specifies a group name (used in printing various information concerning observations) for a set of observations. Group names provide a means for searching in output files for a specific group of observations. All observation after a GRP record, and before the next GRP record, will be assigned the group name on that record. If the group name field (columns 7-70) is blank, a group name is not assigned to the observations following the GRP record. The format of the GRP record is as follows:

Columns	Description
002-005	GRP
007-070	Group name (any text)

HI: Height of Instrument

This record specifies the height of instrument (HI) for a station. HIs and HTs (HT record) are used by GeoLab for reducing observations to the station markers. Once an HI is set for a station, it remains in effect until another HI for that station is encountered. If you wish to reset the HI for a station to zero (i.e. no reduction), you must use the HI record with a value of 0.0 for the HI. Initially (before any HI or HT records are encountered), all HIs and HTs are initialized to zero.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	HI
010	(blank)
011-022	Station name
024-033	Height of instrument
035-036	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	HI
010	* (asterisk)
011-041	Station name
043-052	Height of instrument
054-055	Linear unit name

HIST: Histogram

The HIST record controls which standardized residual histograms are printed. This option has no effect on the performance of the histogram viewer in GeoLab. To produce a histogram you place HIST records in the proper places in your input text file (see further instructions below). The format of the HIST record is as follows:

Columns	Description
002-005	HIST
007-009	NEW, GEN, ALL, or END (see below)
011-074	Histogram title (any text)

The NEW option clears the histogram (if necessary) and starts building a new histogram with observations following the HIST record. The histogram title field is not used for the NEW option. The GEN option generates (prints) a histogram based on the observations after the last NEW record. The title is used by the GEN option to specify the printed title of the generated histogram. The ALL option results in printing the histogram for all observations up to the location of the ALL record. The END option can be used anywhere in your input file, and produces the same result as an ALL option placed after all observation records. The title is used by the ALL option to specify the printed title of the generated histogram. Note that the use of the ALL option is independent of the NEW/GEN pairings and can be used anywhere in your input text file. Also note that a histogram must contain at least 6 observations (residuals) in order to be printed.

HT: Height of Target

This record specifies the height of target (HT) for a station. HIs (HI record) and HTs are used by GeoLab for reducing observations to the station markers. Once an HT is set for a station, it remains in effect until another HT for that station is encountered. If you wish to reset the HT for a station to zero (i.e. no reduction), you must use the HT record with a value of 0.0 for the HT. Initially (before any HI or HT records are encountered), all HIs and HTs are initialized to zero.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

Columns	Description
002-005	HT
010	(blank)
011-022	Station name
024-033	Height of target
035-036	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	HT
010	* (asterisk)
011-041	Station name
043-052	Height of target
054-055	Linear unit name

LDEC: Linear Decimal Places

This record specifies the number of decimal places (default is 3) to print for distances, linear coordinates, etc. The format of the LDEC record is as follows:

Columns	Description
002-005	LDEC
007	Number of decimal places (2, 3, or 4)

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

LUNT: Linear Unit

This record specifies the default linear unit for input text file data. The format of the LUNT record is as follows:

Columns	Description
002-005	LUNT
007-008	Linear unit name
010-025	Number of meters per linear unit

MAXI: Maximum Iterations

This record specifies the maximum number of iterations (zero or more, default value is 5) for GeoLab to make when performing adjustments. The format of the MAXI record is as follows:

Columns	Description
002-005	MAXI
007-016	Maximum number of iterations to allow for adjustment

PADJ: Print Adjusted Values

This record controls the printing of adjusted coordinates. The format of the PADJ record is as follows:

Columns	Description
002-005	PADJ
007-009	Print adjusted NEH coordinates (YES/NO)
011-013	Print adjusted NEO coordinates (YES/NO)
015-017	Print adjusted PLH coordinates (YES/NO)
019-021	Print adjusted PLO coordinates (YES/NO)
023-025	Print adjusted XYZ coordinates (YES/NO)
027-029	Print adjusted AUX parameters (YES/NO)
031-033	Print SFMC records (YES/NO)
035-037	Print XY records (YES/NO)

Note that SFMC records are printed only if the NEO option is YES.

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

PGEO: Print Geoid Values

This record controls the printing of geoid values. The format of the PGEO record is as follows:

Columns	Description
002-005	PGEO
007-009	Print geoid values (YES/NO)

Note that this record overrides the corresponding setting in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

PMIS: Print Misclosures

This record specifies options for printing misclosures. The format of the PMIS record is as follows:

Columns	Description
002-005	PMIS
007-009	Print misclosures (YES/NO)
011-013	Print only first pass misclosures (YES/NO)
015-024	Factor for linear observation types
026-035	Factor for angular observation types

If the second field is NO, misclosures will not be printed. The two factors control which misclosures are printed: only those misclosures greater in absolute value than the factor times the standard deviation of the corresponding observation are printed (if you want all misclosures printed, set the factors to zero).

Note that this record overrides the corresponding settings in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

PRES: Print Residuals

This record controls which residuals are printed. The format of the PRES record is as follows:

Columns	Description
002-005	PRES
007-009	Print residuals (YES/NO)
011-013	Print only residuals flagged for rejection (YES/NO)

Note that this record overrides the corresponding settings in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

PSOL: Print Solution

This record controls the printing of the adjustment solution. The format of the PSOL record is as follows:

Columns	Description
002-005	PSOL
007-009	Enable solution vector printing (YES/NO)
011-013	Print solution vector for passes after the first (YES/NO)

Note that this record overrides the corresponding settings in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

RTST: Residual Test Type

This record selects the type of statistical critical value to use in testing for residual outliers. You can select from the Normal (NOR), Student's T (STU), or the Tau (TAU) probability density functions. For each of these types, you can select whether non-maximum (NON) or maximum (MAX) critical values are used. Please refer to *Geodesy The Concepts*, Vanicek & Krakiwsky (1982), Chapter 13, for details on the significance of these selections. The format of the RTST record is as follows:

Columns	Description
002-005	RTST
007-009	TAU, NOR, or STU
011-013	MAX or NON

Note that this record overrides the corresponding settings in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

SIGM: Sigma-Record

This record specifies information for the various observation types. Any number of sigma-records can be used. If the sigma-record identifier (columns 7-9) is identical to that of a previously defined sigma-record, the new specification overwrites the old one (you can re-use the identifiers). Note that it is your responsibility to use a defined sigma-record for the appropriate type of observation (see table below).

If the standard deviation computed from sigma-record information is zero, a valid (non-zero) standard deviation (or covariance matrix) must be given in the usual way for the observation (this would be the case when you specify only an auxiliary parameter on the sigma-record). The standard deviation computed from the SIGM record is always added to the standard deviation (or diagonal elements of the covariance matrix) that is given in the usual way.

You can use the SIGM record to define information for all observation types. In the case of 2DC, 2DD, 3DC, and 3DD observation groups, the values are used to modify the diagonal elements only.

The following table shows which values on the sigma-record are used for which observation types (the column headings refer to the abbreviations in parentheses in the SIGM record description below):

Obs.	STD	PPM	AT_C	FR_C	TO_C	AUX
ANGL	Yes	-	Yes	Yes	Yes	-
AZIM	Yes	-	-	Yes	Yes	Yes
GAZI	Yes	-	-	Yes	Yes	Yes
DIST	Yes	Yes	-	Yes	Yes	Yes
EDIS	Yes	Yes	-	Yes	Yes	Yes
DSET	Yes	-	-	Yes	Yes	-
EHDF	Yes	Yes	-	Yes	Yes	-
EHGT	Yes	-	Yes	-	-	-
OHDF	Yes	Yes	-	Yes	Yes	-
OHGT	Yes	-	Yes	-	-	-
VANG	Yes	-	-	Yes	Yes	-
GVAN	Yes	-	-	Yes	Yes	-
ZANG	Yes	-	-	Yes	Yes	-
GZAN	Yes	-	-	Yes	Yes	-
2DC	Yes	Yes	Yes	-	-	Yes
2DD	Yes	Yes	-	Yes	Yes	Yes
3DC	Yes	Yes	Yes	-	-	Yes
3DD	Yes	Yes	-	Yes	Yes	Yes

The SIGM record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	SIGM
007-009	Sigma record identifier (1 to 3 characters)
010	(blank)
011-020	Standard deviation of observation (STD)
022-031	PPM (PPM)
033-042	At-station centering error (AT_C)
044-053	From-station centering error (FR_C)
055-064	To-station centering error (TO_C)
066-077	Auxiliary parameter name (AUX)
079-080	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	SIGM
007-009	Sigma record identifier (1 to 3 characters)
010	* (asterisk)
011-020	Standard deviation of observation (STD)
022-031	PPM (PPM)
033-042	At-station centering error (AT_C)
044-053	From-station centering error (FR_C)
055-064	To-station centering error (TO_C)
066-096	Auxiliary parameter name (AUX)
098-099	Linear unit name

TITL: Title

The title record provides a title that GeoLab will use in printed output. If you do not provide a title using a TITL record, the title defaults to the name of the input text file being processed. The format of the TITL record is as follows:

Columns	Description
002-005	TITL
007-079	Text to be used as a title

VARF: Variance Factor

This record specifies options for the adjustment variance factor. The format of the VARF record is as follows:

Columns	Description
002-005	VARF
007-009	Variance factor known (YES/NO)
011-013	Multiply adjustment covariance matrix by variance factor (YES/NO)
015-017	Multiply residual covariance matrix by variance factor (YES/NO)

Note that this record overrides the corresponding settings in the options file used for the network processing. It is provided for backward compatibility and is not normally used.

VSCA: Variance Factor

This record specifies a factor for scaling input observation variances. All observations following this record (any number of VSCA records may be used) will have their otherwise specified (in the text input file) variances scaled by this factor. The format of the VSCA record is as follows:

Columns	Description
002-005	VSCA
007-022	Factor for observation variances

Coordinates and Auxiliary Parameters

4PAR: 4-Parameter Transformation

This record specifies a set of values for a 4-parameter transformation of 2D coordinate records (PL or NE) and 3D coordinate records (PLH, PLO, NEH, NEO, XYZ). All coordinate records after the 4PAR record, and before another 4PAR record, will be transformed. To disable a 4-parameter transformation, simply use a blank 4PAR record. The format of the 4PAR record is as follows:

Columns	Description
002-005	4PAR
011	Indicator for north (n/N/space) or south (s/S) for origin latitude
012-014	Degrees of origin latitude
016-017	Minutes of origin latitude
019-027	Seconds of origin latitude
029	Indicator for east (e/E/space) or west (w/W) for origin longitude
030-032	Degrees of origin longitude
034-035	Minutes of origin longitude
037-045	Seconds of origin longitude
047-058	North/south translation (linear unit)
060-071	East/west translation (linear unit)
073-084	Rotation angle around zenith (arc-seconds)
086-097	Scale difference (PPM)
099-100	Linear unit name

7PAR: 7-Parameter Transformation

This record specifies a set of values for a 7-parameter transformation of 3D coordinate records (PLH, PLO, NEH, NEO, XYZ). All 3D coordinate records after the 7PAR record, and before another 7PAR record, will be transformed. To disable a 7-parameter transformation, simply use a blank 7PAR record. The format of the 7PAR record is as follows:

Columns	Description
002-005	7PAR
011-022	X translation
024-035	Y translation
037-048	Z translation
050-061	X rotation (arc-seconds)
063-074	Y rotation (arc-seconds)
076-087	Z rotation (arc-seconds)
089-100	Scale difference (PPM)
102-103	Linear unit name

ASTR: Astronomic Coordinates

This record specifies the astronomic latitude and longitude of a station. Only the values that have not already been defined for the station are actually used (the first ASTR record for a station is the one actually used).

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	ASTR
010	(blank)
011-022	Unique station name
024	Indicator for north (n/N/space) or south (s/S) latitude
025-027	Degrees of astronomic latitude
029-030	Minutes of astronomic latitude
032-040	Seconds of astronomic latitude
042	Indicator for east (e/E/space) or west (w/W) longitude
043-045	Degrees of astronomic longitude
047-048	Minutes of astronomic longitude
050-058	Seconds of astronomic longitude
060-065	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	ASTR
010	* (asterisk
011-041	Unique station name
043	Indicator for north (n/N/space) or south (s/S) latitude
044-046	Degrees of astronomic latitude
048-049	Minutes of astronomic latitude
051-059	Seconds of astronomic latitude
061	Indicator for east (e/E/space) or west (w/W) longitude
062-064	Degrees of astronomic longitude
066-067	Minutes of astronomic longitude
069-077	Seconds of astronomic longitude
079-084	Network layer of station

AUX: Auxiliary Parameters

This record declares (creates the existence of) an auxiliary parameter group. Each group of auxiliary parameters can contain from 1 to 7 parameters of the following types:

Type	Description
CONS	Additive constant for distance
SCAL	Scale change (3D)
SCA2	Scale change in the horizontal plane
ORAZ	Rotation around the local vertical (azimuth rotation)
ROTX	Rotation around the CT X-axis
ROTY	Rotation around the CT Y-axis
ROTZ	Rotation around the CT Z-axis
TRAX	Translation along the CT X-axis
TRAY	Translation along the CT Y-axis
TRAZ	Translation along the CT Z-axis
TRAE	Translation in the east/west direction
TRAN	Translation in the north/south direction

Only specific parameter types may be assigned to each observation type as follows (observation types not appearing in the table do not use these auxiliary parameters):

	AZIM	GAZI	DIST	EDIS	2DC	2DD	3DC	3DD
CONS	-	-	Yes	Yes	-	-	-	-
SCAL	-	-	Yes	Yes	Yes	Yes	Yes	Yes
SCA2	-	-	-	-	Yes	Yes	Yes	Yes
ORAZ	Yes	Yes	-	-	Yes	Yes	Yes	Yes
ROTX	Yes	Yes	-	-	Yes	Yes	Yes	Yes
ROTY	Yes	Yes	-	-	Yes	Yes	Yes	Yes
ROTZ	Yes	Yes	-	-	Yes	Yes	Yes	Yes
TRAX	-	-	-	-	Yes	-	Yes	-
TRAY	-	-	-	-	Yes	-	Yes	-
TRAZ	-	-	-	-	Yes	-	Yes	-
TRAE	-	-	-	-	Yes	-	Yes	-
TRAN	-	-	-	-	Yes	-	Yes	-

Note that the first blank parameter type field ends the list of parameter types for the group.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	AUX
007-009	Observation type (AZI, GAZ, DIS, EDI, 3DC, 3DD, 2DC, or 2DD)
010	(blank)
011-022	Unique name of the auxiliary parameter group
024-027	Type for 1st auxiliary parameter in group
029-032	Type for 2nd auxiliary parameter in group (if any)
034-037	Type for 3rd auxiliary parameter in group (if any)
039-042	Type for 4th auxiliary parameter in group (if any)
044-047	Type for 5th auxiliary parameter in group (if any)
049-052	Type for 6th auxiliary parameter in group (if any)
054-057	Type for 7th auxiliary parameter in group (if any)

The long parameter name format is as follows:

Columns	Description
002-005	AUX
007-009	Observation type (AZI, GAZ, DIS, EDI, 3DC, 3DD, 2DC, or 2DD)
010	* (asterisk)
011-041	Unique name of the auxiliary parameter group
043-046	Type for 1st auxiliary parameter in group
048-051	Type for 2nd auxiliary parameter in group (if any)
053-056	Type for 3rd auxiliary parameter in group (if any)
058-061	Type for 4th auxiliary parameter in group (if any)
063-066	Type for 5th auxiliary parameter in group (if any)
068-071	Type for 6th auxiliary parameter in group (if any)
073-076	Type for 7th auxiliary parameter in group (if any)

AUXO: Auxiliary Parameter Observation

This record specifies an auxiliary parameter observation. The observation must refer to a declared auxiliary parameter group and parameter type. The linear unit name must refer to a pre-defined linear unit.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	AUXO
010	(blank)
011-022	Unique name of the auxiliary parameter group
024-027	Parameter type of auxiliary parameter in group (see AUX)
029-038	Auxiliary parameter observation
040-049	Standard deviation of auxiliary parameter observation
051-052	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	AUXO
010	* (asterisk)
011-041	Unique name of the auxiliary parameter group
043-046	Parameter type of auxiliary parameter in group (see AUX)
048-057	Auxiliary parameter observation
059-068	Standard deviation of auxiliary parameter observation
070-071	Linear unit name

GEOI: Geoid Values

This record specifies the geoid undulation and deflections of the vertical for a station. Only the values that have not already been defined for the station are actually used (the first record (GEOI or GFIL) defining geoid data for a station is the one actually used).

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

Columns	Description
002-005	GEOI
010	(blank)
011-022	Station name
024	Sign (-/+ /space) of north/south deflection
025-027	Degrees of north/south deflection
029-030	Minutes of north/south deflection
032-040	Seconds of north/south deflection
042	Sign (-/+ /space) of east/west deflection
043-045	Degrees of east/west deflection
047-048	Minutes of east/west deflection
050-058	Seconds of east/west deflection
060-071	Geoid undulation
073-074	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	GEOI
010	* (asterisk)
011-041	Station name
043	Sign (-/+/space) of north/south deflection
044-046	Degrees of north/south deflection
048-049	Minutes of north/south deflection
051-059	Seconds of north/south deflection
061	Sign (-/+/space) of east/west deflection
062-064	Degrees of east/west deflection
066-067	Minutes of east/west deflection
069-077	Seconds of east/west deflection
079-090	Geoid undulation
092-093	Linear unit name

GFIL: Geoid File

Geoid data files can be used to supply geoid undulations and deflections of the vertical to GeoLab computations. This record allows the specification of the name of the geoid specification file (*.GSP) to use (more than one geoid file can be specified by using additional GFIL records). The named file must be a special GeoLab geoid specification file, which in turn refers to the actual geoid data file. Only the geoid values that have not already been defined for the station are actually used (the first record (GEOI or GFIL) defining geoid data for a station is the one actually used). The format of the GFIL record is as follows:

Columns	Description
002-005	GFIL
007-070	Filename of GeoLab geoid specification file (*.GSP)

NE: Northing & Easting

This record specifies map projection coordinates of a station. It is used to provide initial coordinates or 2DC observations.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	NE
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	(blank)
011-022	Station name
024-039	Northing coordinate
041-056	Easting coordinate
069-075	Map projection name
077-078	Linear unit name
080-085	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	NE
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	* (asterisk)
011-041	Station name
043-058	Northing coordinate
060-075	Easting coordinate
088-094	Map projection name
096-097	Linear unit name
099-104	Network layer of station

The flags for fixing coordinates result in a coordinate being free (not fixed) if it is 0 or blank. Any other character results in fixing the coordinate. The map projection name must match those provided on a defined map projection.

NEH: N, E, & Ellipsoidal Height

This record specifies map projection coordinates and ellipsoidal height of a station. It is used to provide initial coordinates, or to provide 3DC and 3DD observations.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	NEH
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	(blank)
011-022	Station name
024-039	Northing coordinate
041-056	Easting coordinate
058-067	Ellipsoidal height
069-075	Map projection name
077-078	Linear unit name
080-085	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	NEH
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	* (asterisk)
011-041	Station name
043-058	Northing coordinate
060-075	Easting coordinate
077-086	Ellipsoidal height
088-094	Map projection name
096-097	Linear unit name
099-104	Network layer of station

The flags for fixing coordinates result in a coordinate being free (not fixed) if it is 0 or blank. Any other character results in fixing the coordinate. The map projection name must match those provided on a defined map projection.

NEO: N, E, & Orthometric Height

This record specifies map projection coordinates and orthometric height of a station. It is used to provide initial coordinates, or to provide 3DC and 3DD observations.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	NEO
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	(blank)
011-022	Station name
024-039	Northing coordinate
041-056	Easting coordinate
058-067	Orthometric height
069-075	Map projection name
077-078	Linear unit name
080-085	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	NEO
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	* (asterisk)
011-041	Station name
043-058	Northing coordinate
060-075	Easting coordinate
077-086	Orthometric height
088-094	Map projection name
096-097	Linear unit name
099-104	Network layer of station

The flags for fixing coordinates result in a coordinate being free (not fixed) if it is 0 or blank. Any other character results in fixing the coordinate. The map projection name must match those provided on a defined map projection.

PL: Latitude & Longitude

This record specifies the ellipsoidal latitude and longitude of a station. It can be used to provide initial coordinates, or to provide 2DC observations.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	PL
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	(blank)
011-022	Station name
024	Indicator for north (n/N/space) or south (s/S) latitude
025-027	Degrees of latitude
029-030	Minutes of latitude
032-040	Seconds of latitude
042	Indicator for east (e/E/space) or west (w/W) longitude
043-045	Degrees of longitude
047-048	Minutes of longitude
050-058	Seconds of longitude
076-081	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	PL
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	* (asterisk)
011-041	Station name
043	Indicator for north (n/N/space) or south (s/S) latitude
044-046	Degrees of latitude
048-049	Minutes of latitude
051-059	Seconds of latitude
061	Indicator for east (e/E/space) or west (w/W) longitude
062-064	Degrees of longitude
066-067	Minutes of longitude
069-077	Seconds of longitude
095-100	Network layer of station

The flags for fixing coordinates result in a coordinate being free (not fixed) if it is 0 or blank. Any other character results in fixing the coordinate.

PLH: Latitude, Longitude, & Ellipsoidal Height

This record specifies the ellipsoidal coordinates of a station. It can be used to provide initial coordinates, or to provide 3DC and 3DD observations.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	PLH
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	(blank)
011-022	Station name
024	Indicator for north (n/N/space) or south (s/S) latitude
025-027	Degrees of latitude
029-030	Minutes of latitude
032-040	Seconds of latitude
042	Indicator for east (e/E/space) or west (w/W) longitude
043-045	Degrees of longitude
047-048	Minutes of longitude
050-058	Seconds of longitude
060-071	Ellipsoidal height
073-074	Linear unit name
076-081	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	PLH
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	* (asterisk)
011-041	Station name
043	Indicator for north (n/N/space) or south (s/S) latitude
044-046	Degrees of latitude
048-049	Minutes of latitude
051-059	Seconds of latitude
061	Indicator for east (e/E/space) or west (w/W) longitude
062-064	Degrees of longitude
066-067	Minutes of longitude
069-077	Seconds of longitude
079-090	Ellipsoidal height
092-093	Linear unit name
095-100	Network layer of station

The flags for fixing coordinates result in a coordinate being free (not fixed) if it is 0 or blank. Any other character results in fixing the coordinate.

PLO: Latitude, Longitude, & Orthometric Height

This record specifies the ellipsoidal latitude and longitude, and orthometric height of a station. It is used to provide initial coordinates, or to provide 3DC and 3DD observations.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	PLO
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	(blank)
011-022	Station name
024	Indicator for north (n/N/space) or south (s/S) latitude
025-027	Degrees of latitude
029-030	Minutes of latitude
032-040	Seconds of latitude
042	Indicator for east (e/E/space) or west (w/W) longitude
043-045	Degrees of longitude
047-048	Minutes of longitude
050-058	Seconds of longitude
060-071	Orthometric height
073-074	Linear unit name
076-081	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	PLO
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	* (asterisk)
011-041	Station name
043	Indicator for north (n/N/space) or south (s/S) latitude
044-046	Degrees of latitude
048-049	Minutes of latitude
051-059	Seconds of latitude
061	Indicator for east (e/E/space) or west (w/W) longitude
062-064	Degrees of longitude
066-067	Minutes of longitude
069-077	Seconds of longitude
079-090	Orthometric height
092-093	Linear unit name
095-100	Network layer of station

The flags for fixing coordinates result in a coordinate being free (not fixed) if it is 0 or blank. Any other character results in fixing the coordinate.

UND: Undulation

The UND record specifies a geoid undulation. This record is used by the Geoid Manager for geoid improvement computations. The format of the UND record is as follows:

Columns	Description
002-005	UND
011-022	Undulation
024	Indicator for north (n/N/space) or south (s/S) latitude
025-027	Degrees of latitude
029-030	Minutes of latitude
032-040	Seconds of latitude
042	Indicator for east (e/E/space) or west (w/W) longitude
043-045	Degrees of longitude
047-048	Minutes of longitude
050-058	Seconds of longitude
060-061	Linear unit name
063-078	Reference ellipsoid name

XY: Local XY Coordinates

This record specifies local XY coordinates of a station. It is used to provide initial coordinates or 2DC observations.

Important: Internally, GeoLab treats local x, y coordinates as map projection coordinates relative to the projection selected in the "XY-Record Projection" list in the Edit Project Options dialog.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	XY
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	(blank)
011-022	Station name
024-039	x-coordinate (easting)
041-056	y-coordinate (northing)
077-078	Linear unit name
080-085	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	XY
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	* (asterisk)
011-041	Station name
043-058	x-coordinate (easting)
060-075	y-coordinate (northing)
096-097	Linear unit name
099-104	Network layer of station

XYZ: XYZ Coordinates

This record specifies geocentric Cartesian coordinates of a station. It can be used to provide initial coordinates, or to provide 3DC and 3DD observations.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	XYZ
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	(blank)
011-022	Station name
024-041	X-coordinate
043-060	Y-coordinate
062-079	Z-coordinate
081-082	Linear unit name
084-089	Network layer of station

The long parameter name format is as follows:

Columns	Description
002-005	XYZ
007	Flag for fixing ellipsoidal latitude
008	Flag for fixing ellipsoidal longitude
009	Flag for fixing ellipsoidal height
010	* (asterisk)
011-041	Station name
043-060	X-coordinate
062-079	Y-coordinate
081-098	Z-coordinate
100-101	Linear unit name
103-108	Network layer of station

Conventional Observations

ANGL: Angle Observation

This record specifies a horizontal angle observation. A horizontal angle is measured at the at-station, from the from-station, and clockwise (towards the right) to the to-station.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	ANGL
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	At-station name
024-035	From-station name
037-048	To-station name
050	Sign (-/+/space) of angle observation
051-053	Degrees of angle observation
055-056	Minutes of angle observation
058-064	Seconds of angle observation
066-075	Standard deviation of angle observation (seconds)

The long parameter name format is as follows:

Columns	Description
002-005	ANGL
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	At-station name
043-073	From-station name
075-105	To-station name
107	Sign (-/+/space) of angle observation
108-110	Degrees of angle observation
112-113	Minutes of angle observation
115-121	Seconds of angle observation
123-132	Standard deviation of angle observation (seconds)

AZIM: Azimuth Observation

This record specifies an astronomic azimuth observation. Azimuths are measured at the at-station clockwise from either north (default) or south (see below), to the to-station.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	AZIM
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	Unique station name of from-station
024-035	Unique station name of to-station
050	North (n/N/space) or south (s/S) reference for azimuth observation
051-053	Degrees of azimuth observation
055-056	Minutes of azimuth observation
058-064	Seconds of azimuth observation
066-075	Standard deviation of azimuth observation (seconds)

The long parameter name format is as follows:

Columns	Description
002-005	AZIM
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	Unique station name of from-station
043-073	Unique station name of to-station
075	North (n/N/space) or south (s/S) reference for azimuth observation
076-078	Degrees of azimuth observation
080-081	Minutes of azimuth observation
083-089	Seconds of azimuth observation
091-100	Standard deviation of azimuth observation (seconds)

DIR: Direction Observation

This record specifies a horizontal direction observation. Each set of direction observations must begin with a DSET record. All direction observations in a set must have the same from-station. Only HI and HT records may be placed within a set of DIR records (if a valid record of any other type is encountered, the set of directions is terminated). A sigma-record (SIGM) may be identified on the DSET record.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	DIR
010	(blank)
011-022	From-station name
024-035	To-station name
050	Sign (-/+/space) of direction observation
051-053	Degrees of direction observation
055-056	Minutes of direction observation
058-064	Seconds of direction observation
066-075	Standard deviation of direction observation (seconds)

The long parameter name format is as follows:

Columns	Description
002-005	DIR
010	* (asterisk)
011-041	From-station name
043-073	To-station name
075	Sign (-/+/space) of direction observation
076-078	Degrees of direction observation
080-081	Minutes of direction observation
083-089	Seconds of direction observation
091-100	Standard deviation of direction observation (seconds)

DIST: Distance Observation

This record specifies a spatial distance (marker-to-marker slope distance) observation.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	DIST
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	Station name of from-station
024-035	Station name of to-station
050-064	Distance observation
066-075	Standard deviation of distance observation
077-078	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	DIST
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	Station name of from-station
043-073	Station name of to-station
075-089	Distance observation
091-100	Standard deviation of distance observation
102-103	Linear unit name

DSET: Direction Set Header

This record specifies that a set of direction (DIR) observations follows. If a sigma-record identifier is given, it applies to all directions in the set. The format of the DSET record is as follows:

Columns	Description
002-005	DSET
007-009	Sigma record identifier (see the SIGM record)

EDIS: Ellipsoidal Distance Observation

This record specifies an ellipsoidal distance (measured along the surface of the reference ellipsoid) observation.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	EDIS
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	Station name of from-station
024-035	Station name of to-station
050-064	Distance observation
066-075	Standard deviation of distance observation
077-078	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	EDIS
007-009	Sigma record identifier (see SIGM record)
010	* (asterisk)
011-041	Station name of from-station
043-073	Station name of to-station
075-089	Distance observation
091-100	Standard deviation of distance observation
102-103	Linear unit name

EHDF: Ellipsoidal Height Difference

This record specifies an ellipsoidal height difference observation.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	EHDF
007-009	Sigma record identifier (see SIGM record)
010	(blank)
011-022	Station name of from-station
024-035	Station name of to-station
050-064	Ellipsoidal height difference observation
066-075	Standard deviation
077-091	Distance between stations
093-094	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	EHDF
007-009	Sigma record identifier (see SIGM record)
010	* (asterisk)
011-041	Station name of from-station
043-073	Station name of to-station
075-089	Ellipsoidal height difference observation
091-100	Standard deviation
102-116	Distance between stations
118-119	Linear unit name

EHGT: Ellipsoidal Height

This record specifies an ellipsoidal height observation.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	EHGT
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	Station name of at-station
050-064	Ellipsoidal height observation
066-075	Standard deviation
077-078	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	EHGT
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	Station name of at-station
050-064	Ellipsoidal height observation
066-075	Standard deviation
077-078	Linear unit name

GAZI: Geodetic Azimuth Observation

This record specifies a geodetic azimuth observation. Azimuths are measured at the at-station clockwise from either north (default) or south, to the to-station.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	GAZI
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	Unique station name of from-station
024-035	Unique station name of to-station
050	North (n/N/space) or south (s/S) reference for azimuth observation
051-053	Degrees of azimuth observation
055-056	Minutes of azimuth observation
058-064	Seconds of azimuth observation
066-075	Standard deviation of azimuth observation (seconds)

The long parameter name format is as follows:

Columns	Description
002-005	GAZI
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	Unique station name of from-station
043-073	Unique station name of to-station
075	North (n/N/space) or south (s/S) reference for azimuth observation
076-078	Degrees of azimuth observation
080-081	Minutes of azimuth observation
083-089	Seconds of azimuth observation
091-100	Standard deviation of azimuth observation (seconds)

GVAN: Local Geodetic Vertical Angle Observation

This record specifies a local geodetic vertical angle observation. A vertical angle is measured at the from-station from the horizon up to (positive), or down to (negative), the to-station.

The coefficient of refraction must be from 0.03 to 0.23 (0.13 ± 0.10). If a value less than 0.03 is given, no refraction correction is made. If a value greater than 0.23 is given, it is set to 0.23.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	GVAN
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	From-station name
024-035	To-station name
050	Sign (-/+) of vertical angle observation
051-053	Degrees of vertical angle observation
055-056	Minutes of vertical angle observation
058-064	Seconds of vertical angle observation
066-075	Standard deviation of vertical angle observation
077-086	Coefficient of refraction

The long parameter name format is as follows:

Columns	Description
002-005	GVAN
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	From-station name
043-073	To-station name
075	Sign (-/+) of vertical angle observation
076-078	Degrees of vertical angle observation
080-081	Minutes of vertical angle observation
083-089	Seconds of vertical angle observation
091-100	Standard deviation of vertical angle observation
102-111	Coefficient of refraction

GZAN: Local Geodetic Zenithal Angle Observation

This record specifies a local geodetic zenithal angle observation. A zenithal angle is measured at the from-station from the zenith down to the to-station.

The coefficient of refraction must be from 0.03 to 0.23 (0.13 ± 0.10). If a value less than 0.03 is given, no refraction correction is made. If a value greater than 0.23 is given, it is set to 0.23.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	GZAN
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	From-station name
024-035	To-station name
050	Sign (-/+) of zenithal angle observation
051-053	Degrees of zenithal angle observation
055-056	Minutes of zenithal angle observation
058-064	Seconds of zenithal angle observation
066-075	Standard deviation of zenithal angle observation
077-086	Coefficient of refraction

The long parameter name format is as follows:

Columns	Description
002-005	GZAN
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	From-station name
043-073	To-station name
075	Sign (-/+) of zenithal angle observation
076-078	Degrees of zenithal angle observation
080-081	Minutes of zenithal angle observation
083-089	Seconds of zenithal angle observation
091-100	Standard deviation of zenithal angle observation
102-111	Coefficient of refraction

OHDF: Orthometric Height Difference

This record specifies an orthometric height difference observation.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	OHDF
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	Station name of from-station
024-035	Station name of to-station
050-064	Orthometric height difference observation
066-075	Standard deviation
077-091	Distance between stations
093-094	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	OHDF
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	Station name of from-station
043-073	Station name of to-station
075-089	Orthometric height difference observation
091-100	Standard deviation
102-116	Distance between stations
118-119	Linear unit name

OHGT: Orthometric Height

This record specifies an orthometric height observation.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	OHGT
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	Station name of at-station
050-064	Orthometric height observation
066-075	Standard deviation
077-078	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	OHGT
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	Station name of at-station
050-064	Orthometric height observation
066-075	Standard deviation
077-078	Linear unit name

VANG: Vertical Angle Observation

This record specifies a vertical angle observation. A vertical angle is measured at the from-station from the horizon up to (positive), or down to (negative), the to-station.

The coefficient of refraction must be from 0.03 to 0.23 (0.13 ± 0.10). If a value less than 0.03 is given, no refraction correction is made. If a value greater than 0.23 is given, it is set to 0.23.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	VANG
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	From-station name
024-035	To-station name
050	Sign (-/+ /) of vertical angle observation
051-053	Degrees of vertical angle observation
055-056	Minutes of vertical angle observation
058-064	Seconds of vertical angle observation
066-075	Standard deviation of vertical angle observation
077-086	Coefficient of refraction

The long parameter name format is as follows:

Columns	Description
002-005	VANG
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	From-station name
043-073	To-station name
075	Sign (-/+) of vertical angle observation
076-078	Degrees of vertical angle observation
080-081	Minutes of vertical angle observation
083-089	Seconds of vertical angle observation
091-100	Standard deviation of vertical angle observation
102-111	Coefficient of refraction

ZANG: Zenithal Angle Observation

This record specifies a zenithal angle observation. A zenithal angle is measured at the from-station from the zenith down to the to-station.

The coefficient of refraction must be from 0.03 to 0.23 (0.13 ± 0.10). If a value less than 0.03 is given, no refraction correction is made. If a value greater than 0.23 is given, it is set to 0.23.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	ZANG
007-009	Sigma record identifier (see the SIGM record)
010	(blank)
011-022	From-station name
024-035	To-station name
050	Sign (-/+) of zenithal angle observation
051-053	Degrees of zenithal angle observation
055-056	Minutes of zenithal angle observation
058-064	Seconds of zenithal angle observation
066-075	Standard deviation of zenithal angle observation
077-086	Coefficient of refraction

The long parameter name format is as follows:

Columns	Description
002-005	ZANG
007-009	Sigma record identifier (see the SIGM record)
010	* (asterisk)
011-041	From-station name
043-073	To-station name
075	Sign (-/+) of zenithal angle observation
076-078	Degrees of zenithal angle observation
080-081	Minutes of zenithal angle observation
083-089	Seconds of zenithal angle observation
091-100	Standard deviation of zenithal angle observation
102-111	Coefficient of refraction

Coordinate and Coordinate Difference Observations

2DC: 2D Coordinate Header

This record specifies the beginning of a 2D coordinate observation set. The format of the 2DC record is as follows:

Columns	Description
002-005	2DC
007-009	Sigma record identifier (see the SIGM record)

2DD: 2D Coordinate Difference Header

This record specifies the beginning of a 2D coordinate difference observation set. The format of the 2DD record is as follows:

Columns	Description
002-005	2DD
007-009	Sigma record identifier (see the SIGM record)

3DC: 3D Coordinate Header

This record specifies the beginning of a 3D coordinate observation set. The format of the 3DC record is as follows:

Columns	Description
002-005	3DC
007-009	Sigma record identifier (see the SIGM record)

3DD: 3D Coordinate Difference Header

This record specifies the beginning of a 3D coordinate difference observation set.

The format of the 3DD record is as follows:

Columns	Description
002-005	3DD
007-009	Sigma record identifier (see the SIGM record)

If we have the following three sets of coordinate difference observations:

Station 1 to station 2: $d1 = X2 - X1$; $d2 = Y2 - Y1$; $d3 = Z2 - Z1$;
Station 2 to station 3: $d4 = X3 - X2$; $d5 = Y3 - Y2$; $d6 = Z3 - Z2$;
Station 3 to station 1: $d7 = X3 - X1$; $d8 = Y3 - Y1$; $d9 = Z3 - Z1$;

for a total of nine observations (3 sets of dX, dY, and dZ), we would input them in three DXYZ records as follows:

```
3DD
DXYZ12 d1 d2 d3
DXYZ23 d4 d5 d6
DXYZ31 d7 d8 d9
```

If we denote a covariance matrix element as s_{ij} (where s_{11} is the variance of $d1$, and s_{12} is the covariance between $d1$ and $d2$) the upper-triangular portion of the covariance matrix for these observations is as follows (note that the order of the covariance elements depends only on the order in which the observations are given as DXYZ records).

```
s11 s12 s13 s14 s15 s16 s17 s18 s19
s22 s23 s24 s25 s26 s27 s28 s29
s33 s34 s35 s36 s37 s38 s39
s44 s45 s46 s47 s48 s49
s55 s56 s57 s58 s59
s66 s67 s68 s69
s77 s78 s79
s88 s89
s99
```

The ELEM records for this observation would therefore be:

ELEM	s11	s12	s13
ELEM	s14	s15	s16
ELEM	s17	s18	s19
ELEM	s22	s23	s24
ELEM	s25	s26	s27
ELEM	s28	s29	
ELEM	s33	s34	s35
ELEM	s36	s37	s38
ELEM	s39		
ELEM	s44	s45	s46
ELEM	s47	s48	s49
ELEM	s55	s56	s57
ELEM	s58	s59	
ELEM	s66	s67	s68
ELEM	s69		
ELEM	s77	s78	s79
ELEM	s88	s89	
ELEM	s99		

CORR: Correlation Matrix Header

The CORR record is used in coordinate and coordinate difference observation groups (2DC, 2DD, 3DC, and 3DD) for specifying that correlation matrix data follows. The format of the CORR record is as follows:

Columns	Description
002-005	CORR
007-008	Coordinate system of matrix (LG or CT)
010-013	Matrix form (UPPR or DIAG, see below)
015-024	Addition constant for entire matrix
026-035	Scale factor for entire matrix
037-046	Addition constant for diagonal elements
048-057	Scale for diagonal elements
059-068	PPM for diagonal elements
070-079	Addition constant for height/Z
081-090	Scale for height/Z
092-093	Linear unit name

The UPPR matrix form specifies that upper-triangular elements are input, and the DIAG form specifies that only diagonal elements are input. The coordinate system types are:

Type	Description
LG	Local geodetic (North, East, Up)
CT	Conventional Terrestrial (X, Y, Z)

Note that the addition constants and factors are applied to the corresponding covariance matrix (after computing it from the given correlation matrix). All additive values (for entire matrix, for diagonal elements, and PPM) are applied to the matrix first, then the factors are applied. Addition constants are added directly to the covariance matrix (no squaring takes place). The PPM value is used to compute a standard deviation which is then squared before adding it to the diagonal elements of the covariance matrix.

DXYZ: XYZ Coordinate Differences

This record specifies 3D Cartesian coordinate difference observations. It is used in forming groups of 3D coordinate difference observations (3DD).

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	DXYZ
010	(blank)
011-022	Name of from-station
024-035	Name of to-station
037-049	X-coordinate difference
051-063	Y-coordinate difference
065-077	Z-coordinate difference
079-080	Linear unit name

The long parameter name format is as follows:

Columns	Description
002-005	DXYZ
010	* (asterisk)
011-041	Name of from-station
043-073	Name of to-station
075-087	X-coordinate difference
089-101	Y-coordinate difference
103-115	Z-coordinate difference
117-118	Linear unit name

ELEM: Matrix Elements

This record specifies from one to three elements of a matrix (or standard deviations for a correlation matrix). It is used in supplying the matrix data following CORR, COV, or WGT records. The format of the ELEM record is as follows:

Columns	Description
002-005	ELEM
007-029	Matrix element
031-053	Matrix element
055-077	Matrix element
079-080	Linear unit name

The use of ELEM records depends on what type and form of matrix they are used to define. In general, the elements of a matrix are input in the order that they would be read if we were reading a book: from left to right, then from top to bottom. The following paragraphs describe each case.

Diagonal Matrices (DIAG)

Diagonal matrix records only specify the diagonal elements of a matrix from the upper-left to the lower-right of the matrix. For a 5x5 matrix, the ELEM records would be as follows:

```
ELEM M(1, 1) M(2, 2) M(3, 3)
ELEM M(4, 4) M(5, 5)
```

That is, the diagonal elements are simply input in order with three elements on each record (except the last if the size of the matrix is not a multiple of 3).

Upper-Triangular Matrices (UPPR)

The matrix elements input for an upper-triangular matrix are all elements on and above the main diagonal of the matrix. For a 5x5 matrix the upper-triangular elements are as follows:

```
M(1,1) M(1,2) M(1,3) M(1,4) M(1,5)
M(2,2) M(2,3) M(2,4) M(2,5)
M(3,3) M(3,4) M(3,5)
M(4,4) M(4,5)
M(5,5)
```

This matrix would be input as follows:

```
ELEM M(1, 1) M(1, 2) M(1, 3)
ELEM M(1, 4) M(1, 5)
ELEM M( 2, 2) M( 2, 3) M( 2, 4)
ELEM M( 2, 5)
ELEM M( 3, 3) M( 3, 4) M( 3, 5)
ELEM M( 4, 4) M( 4, 5)
ELEM M( 5, 5)
```

Note that when we start inputting a new row (at a diagonal element) we must start with a new record.

Correlation Matrices

Correlation matrices are input as described above. However, in addition to the correlation matrix itself, we also must input the standard deviations immediately after the matrix ELEM records. The standard deviations are input on ELEM records in the same way as diagonal matrix elements are input. For the 5x5 matrix example we would input the five standard deviations as follows:

```
ELEM S(1) S(2) S(3)
ELEM S(4) S(5)
```

GENC: Generate Covariance Matrix Header

This record specifies that the covariance matrix (for 2DC, 2DD, 3DC, and 3DD observation sets) is to be generated. This method of generating the observation covariance matrix should only be used for simulating networks and is not meant to be a replacement for an actual covariance matrix. The format of the GENC record is as follows:

Columns	Description
002-005	GENC
007-008	Coordinate system of covariance matrix (LG or CT)
010-013	Matrix form (UPPR or DIAG)
015-024	Addition constant for entire covariance matrix
026-035	Scale factor for entire covariance matrix
037-046	Addition constant for diagonal of covariance matrix
048-057	Scale factor for diagonal of covariance matrix
059-068	PPM addition for diagonal of covariance matrix
070-079	Addition constant for height/Z
081-090	Scale for height/Z
092-093	Linear unit name

All additive values (for entire matrix, for diagonal elements, and PPM) are applied to the matrix first, then the factors are applied. All addition constants are added directly to the covariance matrix (no squaring takes place). The PPM value is used to compute a standard deviation which is then squared before adding it to the diagonal elements of the covariance matrix.

WGT: Weight Matrix Header

The WGT record is used in coordinate and coordinate difference observation groups (2DC, 2DD, 3DC, and 3DD) for specifying that weight matrix data follows.

The format of the WGT record is as follows:

Columns	Description
002-005	WGT
007-008	Coordinate system of matrix (LG or CT, see below)
010-013	Matrix form (UPPR or DIAG, see below)
015-024	Addition constant for entire matrix
026-035	Scale factor for entire matrix
037-046	Addition constant for diagonal elements
048-057	Scale for diagonal elements
059-068	PPM for diagonal elements
070-079	Addition constant for height/Z
081-090	Scale for height/Z
092-093	Linear unit name

The UPPR matrix form specifies that upper-triangular elements are input, and the DIAG form specifies that only diagonal elements are input. The coordinate system types are:

Type	Description
LG	Local geodetic (North, East, Up)
CT	Conventional Terrestrial (X, Y, Z)

Note that the addition constants and factors are applied to the corresponding covariance matrix (after computing it from the given weight matrix). All additive values (for entire matrix, for diagonal elements, and PPM) are applied to the matrix first, then the factors are applied. Both addition constants are added directly to the covariance matrix (no squaring takes place). The PPM value is used to compute a standard deviation which is then squared before adding it to the diagonal elements of the covariance matrix.

Map Projections

LAMB: Lambert Map Projection

This record specifies a Lambert conformal map projection to be used for transformations between ellipsoidal and mapping coordinates. Any number of LAMB records can be used, each specifying a map projection for a specific area (quadrangle). The area (quadrangle) of validity for a map projection may be specified by preceding the LAMB record with a QUAD record. Note that the XLAM (extended Lambert) record allows the specification of seconds of origin latitude and longitude (in addition to degrees and minutes), whereas the LAMB record only allows the specification of degrees and minutes. The format of the LAMB record is as follows:

Columns	Description
002-005	LAMB
007-013	Map projection name (any text)
015	North (n/N/space) or south (s/S/-) indicator for origin latitude
016-018	Degrees of origin latitude
020-021	Minutes of origin latitude
023	East (e/E/space) or west (w/W/-) indicator for origin longitude
024-026	Degrees of origin longitude
028-029	Minutes of origin longitude
031-042	Northing of origin (false northing)
044-055	Easting of origin (false easting)
057	North (n/N/space) or south (s/S/-) indicator for first standard parallel
058-060	Degrees of first standard parallel
062-063	Minutes of first standard parallel
065	North (n/N/space) or south (s/S/-) indicator for second standard parallel
066-068	Degrees of second standard parallel
070-071	Minutes of second standard parallel
073-074	Linear unit name

Note that it doesn't matter whether you enter the northern-most (or southern-most) standard parallel as the first or second standard parallel.

OMER: Oblique Mercator Map Projection

This record specifies an Oblique Mercator map projection to be used for transformations between ellipsoidal and mapping coordinates. Any number of OMER records can be used, each specifying a map projection for a specific area (quadrangle). The area (quadrangle) of validity for a map projection may be specified by preceding the OMER record with a QUAD record. The format of the OMER record is as follows:

Columns	Description
002-005	OMER
007-013	Map projection name (any text)
015	East (e/E/space) or west (w/W/-) indicator for central meridian
016-018	Degrees of central meridian longitude
020-021	Minutes of central meridian longitude
023-031	Seconds of central meridian longitude
033	North (n/N/space) or south (s/S/-) indicator for origin latitude
034-036	Degrees of origin latitude
038-039	Minutes of origin latitude
041-049	Seconds of origin latitude
051	Sign (-/+ /space) of origin azimuth
052-054	Degrees of origin azimuth
056-057	Minutes of origin azimuth
059-065	Seconds of origin azimuth
067-078	Northing of origin (false northing)
080-091	Easting of origin (false easting)
093-104	Scale at origin
106-107	Linear unit name

QUAD: Quadrangle Definition

This record specifies the coordinates (latitudes and longitudes) of a quadrangle (area between two parallels of latitude and two meridians of longitude). A QUAD record is used to define the area in which a particular map projection is valid. Before a QUAD record is encountered, the valid area for map projections is the entire globe. A QUAD record with all values of zero (0.0 or blank), sets the quadrangle to the entire globe. The format of the QUAD record is as follows:

Columns	Description
002-005	QUAD
011	North (n) or south (s) indicator for from-latitude
012-014	Degrees of from-latitude
016-017	Minutes of from-latitude
019	North (n) or south (s) indicator for to-latitude
020-022	Degrees of to-latitude
024-025	Minutes of to-latitude
027	East (e) or west (w) indicator for from-longitude
028-030	Degrees of from-longitude
032-033	Minutes of from-longitude
035	East (e) or west (w) indicator for to-longitude
036-038	Degrees of to-longitude
040-041	Minutes of to-longitude

SFMC: Scale, Convergence

This record (used only for output text files by GeoLab) contains the point scale factor, elevation factor, and meridian convergence for a station.

This record has two possible formats, a long parameter name format, and a short parameter name format. If column 10 contains an asterisk (*) the long name format is expected, otherwise the short name format is expected.

The short parameter name format is as follows:

Columns	Description
002-005	SFMC
010	(blank)
011-022	Station name
024-037	Point scale factor
039-054	Elevation factor
056-059	Degrees of meridian convergence
061-062	Minutes of meridian convergence
064-072	Seconds of meridian convergence
074-080	Map projection name

The long parameter name format is as follows:

Columns	Description
002-005	SFMC
010	* (asterisk)
011-041	Station name
043-056	Point scale factor
058-073	Elevation factor
075-078	Degrees of meridian convergence
080-081	Minutes of meridian convergence
083-091	Seconds of meridian convergence
093-099	Map projection name

STER: Double Stereographic Map Projection

This record specifies a Double Stereographic map projection to be used for transformations between ellipsoidal and mapping coordinates. Any number of STER records can be used, each specifying a map projection for a specific area (quadrangle). The area (quadrangle) of validity for a map projection may be specified by preceding the STER record with a QUAD record. Note that the XSTR (extended Stereographic) record allows the specification of seconds of origin latitude and longitude (in addition to degrees and minutes), whereas the STER record only allows the specification of degrees and minutes. The format of the STER record is as follows:

Columns	Description
002-005	STER
007-013	Map projection name (any text)
015	North (n) or south (s) indicator for origin latitude
016-018	Degrees of origin latitude
020-021	Minutes of origin latitude
023	East (e) or west (w) indicator for origin longitude
024-026	Degrees of origin longitude
028-029	Minutes of origin longitude
031-042	Northing of origin (false northing)
044-055	Easting of origin (false easting)
057-068	Scale at origin
070-071	Linear unit name

STGR: Stereographic Map Projection

This record specifies a Stereographic map projection to be used for transformations between ellipsoidal and mapping coordinates. Any number of STGR records can be used, each specifying a map projection for a specific area (quadrangle). The area (quadrangle) of validity for a map projection may be specified by preceding the STGR record with a QUAD record. The format of the STGR record is as follows:

Columns	Description
002-005	STGR
007-013	Map projection name (any text)
015	North (n) or south (s) indicator for origin latitude
016-018	Degrees of origin latitude
020-021	Minutes of origin latitude
023-031	Seconds of origin latitude
033	East (e/E/space) or west (w/W/-) indicator for origin longitude
034-036	Degrees of origin longitude
038-039	Minutes of origin longitude
041-049	Seconds of origin longitude
051-062	Northing of origin (false northing)
064-075	Easting of origin (false easting)
077-088	Scale at origin
090-091	Linear unit name

TMER: Transverse Mercator Map Projection

This record specifies a transverse Mercator (including UTM and 3-degree TM) map projection to be used for transformations between ellipsoidal and mapping coordinates. Any number of TMER records can be used, each specifying a map projection for a specific area (quadrangle). The area (quadrangle) of validity for a map projection may be specified by preceding the TMER record with a QUAD record. Note that the XTMR (extended Transverse Mercator) record allows the specification of seconds of origin latitude and longitude (in addition to degrees and minutes), whereas the TMER record only allows the specification of degrees and minutes. The format of the TMER record is as follows:

Columns	Description
002-005	TMER
007-013	Map projection name (any text)
015	East (e/E/space) or west (w/W/-) indicator for central meridian
016-018	Degrees of central meridian longitude
020-021	Minutes of central meridian longitude
023	North (n/N/) or south (s/S/-) indicator for origin latitude
024-026	Degrees of origin latitude
028-029	Minutes of origin latitude
031-042	Northing of origin (false northing)
044-055	Easting of origin (false easting)
057-068	Scale at origin
070-071	Linear unit name

XLAM: Lambert Map Projection (extended)

This record specifies a Lambert conformal map projection to be used for transformations between ellipsoidal and mapping coordinates. Any number of XLAM records can be used, each specifying a map projection for a specific area (quadrangle). The area (quadrangle) of validity for a map projection may be specified by preceding the XLAM record with a QUAD record. The format of the XLAM record is as follows:

Columns	Description
002-005	XLAM
007-013	Map projection name (any text)
015	North (n/N/space) or south (s/S/-) indicator for origin latitude
016-018	Degrees of origin latitude
020-021	Minutes of origin latitude
023-031	Seconds of origin latitude
033	East (e/E/space) or west (w/W/-) indicator for origin longitude
034-036	Degrees of origin longitude
038-039	Minutes of origin longitude
041-049	Seconds of origin longitude
051-062	Northing of origin (false northing)
064-075	Easting of origin (false easting)
077	North (n/N/space) or south (s/S/-) indicator for first standard parallel
078-080	Degrees of first standard parallel
082-083	Minutes of first standard parallel
085-093	Seconds of first standard parallel
095	North (n/N/space) or south (s/S/-) indicator for second standard parallel
096-098	Degrees of second standard parallel
100-101	Minutes of second standard parallel
103-111	Seconds of second standard parallel
113-114	Linear unit name

Note that it doesn't matter whether you enter the northern-most (or southern-most) standard parallel as the first or second standard parallel.

XSTR: Double Stereographic Map Projection (extended)

This record specifies a Double Stereographic map projection to be used for transformations between ellipsoidal and mapping coordinates. Any number of XSTR records can be used, each specifying a map projection for a specific area (quadrangle). The area (quadrangle) of validity for a map projection may be specified by preceding the XSTR record with a QUAD record. The format of the XSTR record is as follows:

Columns	Description
002-005	XSTR
007-013	Map projection name (any text)
015	North (n/N/space) or south (s/S/-) indicator for origin latitude
016-018	Degrees of origin latitude
020-021	Minutes of origin latitude
023-031	Seconds of origin latitude
033	East (e/E/space) or west (w/W/-) indicator for origin longitude
034-036	Degrees of origin longitude
038-039	Minutes of origin longitude
041-049	Seconds of origin longitude
051-062	Northing of origin (false northing)
064-075	Easting of origin (false easting)
077-088	Scale at origin
090-091	Linear unit name

Note that it doesn't matter whether you enter the northern-most (or southern-most) standard parallel as the first or second standard parallel.

XTMR: Transverse Mercator Map Projection (extended)

This record specifies a transverse Mercator (including UTM and 3-degree TM) map projection to be used for transformations between ellipsoidal and mapping coordinates. Any number of XTMR records can be used, each specifying a map projection for a specific area (quadrangle). The area (quadrangle) of validity for a map projection may be specified by preceding the XTMR record with a QUAD record. The format of the XTMR record is as follows:

Columns	Description
002-005	XTMR
007-013	Map projection name (any text)
015	East (e/E/space) or west (w/W/-) indicator for central meridian
016-018	Degrees of central meridian longitude
020-021	Minutes of central meridian longitude
023-031	Seconds of central meridian longitude
033	North (n/N/space) or south (s/S/-) indicator for origin latitude
034-036	Degrees of origin latitude
038-039	Minutes of origin latitude
041-049	Seconds of origin latitude
051-062	Northing of origin (false northing)
064-075	Easting of origin (false easting)
077-088	Scale at origin
090-091	Linear unit name

Note that it doesn't matter whether you enter the northern-most (or southern-most) standard parallel as the first or second standard parallel.

Configuring Microsearch GeoLab

Linear Units

Managing Linear Units

When you select the Tools/Linear Units menu command, the Select/Edit Linear Units dialog box is displayed. This dialog box allows you to select and edit linear units. The dialog box contains the following items:

Control	Description
Name Drop Down List Box	This list shows the names of all currently defined linear units.
Meters Per Unit Edit Box	This edit box shows the current number of meters per unit for the selected unit definition in the Name drop down list box. You may edit this value in this edit box.
New Button	This button presents a dialog (see Entering a New Linear Unit Name) that allows you to enter a name for a new linear unit definition. When you return from that dialog, the new name is selected in the Name drop down list box, and you should edit the number of meters per unit for the new unit in the Meters Per Unit edit box.
Delete Button	This button deletes the currently selected unit definition from the Name drop down list box.
Close Button	This button closes the dialog box, and if the dialog was presented to prompt you to select a linear unit, no linear unit is returned.
Help Button	This button displays this information.

When Microsearch GeoLab is shipped, the following linear units are defined:

Unit	Meters Per Unit
ch (Chains)	20.1168
cm (Centimeters)	0.01
ft (International feet)	0.3048
km (Kilometers)	1000.0
ln (Links)	0.201168
m (Meters)	1.0
mi (International miles)	1609.344
mm (Millimeters)	0.001
nm (Namibian meters)	1.0000135965
na (Nautical miles)	1852.0
uf (US survey feet)	0.3048006096012
um (US survey miles)	1609.347218694

Entering a New Linear Unit Name

The New Linear Unit Name dialog box prompts you to enter a new linear unit name. It contains the following controls:

Control	Description
Linear Unit Name Edit Box	Enter the new linear unit name in this edit box. A linear unit name can be from one to two characters in length.
OK Button	This button closes the dialog and returns the entered name.
Cancel Button	This button closes this dialog without returning the entered name.
Help Button	This button displays this information.

Reference Ellipsoids

Managing Reference Ellipsoids

When you select the Reference Ellipsoids menu command, the Select/Edit Reference Ellipsoids dialog box is presented. This dialog box allows you to select and edit reference ellipsoid definitions. The dialog box contains the following items:

Control	Description
Name Drop Down List Box	This list shows the names of all currently defined reference ellipsoids.
Read-Only Check Box	When this check box is checked, the currently selected ellipsoid (in the Name drop-down list box) cannot be edited.
Linear Unit Down List Box	This list allows you to select the linear unit (from all currently defined linear units) for the linear values in the other edit boxes in this dialog.
Major semi-axis Edit Box	This edit box allows you to enter the major semi-axis of the reference ellipsoid selected in the Name drop down list box.
Minor semi-axis Edit Box	This edit box allows you to enter the minor semi-axis of the reference ellipsoid selected in the Name drop down list box.
X-translation Edit Box	This edit box allows you to enter the x-translation (from the geocenter) of the reference ellipsoid selected in the Name drop down list box.
Y-translation Edit Box	This edit box allows you to enter the y-translation (from the geocenter) of the reference ellipsoid selected in the Name drop down list box.
Z-translation Edit Box	This edit box allows you to enter the z-translation (from the geocenter) of the reference ellipsoid selected in the Name drop down list box.
X-rotation (sec) Edit Box	This edit box allows you to enter the x-rotation (in seconds of arc from the average terrestrial geocentric system) of the reference ellipsoid selected in the Name drop down list box.
Y-rotation (sec) Edit Box	This edit box allows you to enter the y-rotation (in seconds of arc from the average terrestrial geocentric system) of the reference ellipsoid selected in the Name drop down list box.
Z-rotation (sec) Edit Box	This edit box allows you to enter the z-rotation (in seconds of arc from the average terrestrial geocentric system) of the reference ellipsoid selected in the Name drop down list box.
New Button	This button presents a dialog (see Entering a New Reference Ellipsoid Name) that allows you to enter a name for a new reference ellipsoid definition. When you return from that dialog, the new name is selected in the Name drop down list box, and you should edit the defining values for the new ellipsoid.
Delete Button	This button deletes the currently selected reference ellipsoid from the Name drop down list box.
Import Text File Button	This button allows you to import reference ellipsoid definitions from a text file containing GeoLab ELIP text records. All ELIP record definitions found in the file are imported. The main purpose is to move the GEOLAB.REI (used by previous versions of GeoLab) text file ellipsoid definitions into the data file used by this dialog box.

Control	Description
OK Button	This button closes the dialog box, and if the dialog was presented to prompt you to select a reference ellipsoid, the currently selected ellipsoid in the Name drop down list box is returned.
Cancel/Close Button	This button closes this dialog box, and if it was presented to prompt you to select a reference ellipsoid, no ellipsoid is returned.
Help Button	This button displays this information.

Entering a New Reference Ellipsoid Name

The New Reference Ellipsoid Name dialog box prompts you to enter a new reference ellipsoid name. It contains the following controls:

Control	Description
Ellipsoid Name Edit Box	Enter the new reference ellipsoid name in this edit box. A reference ellipsoid name can be from one to sixteen characters in length.
OK Button	This button closes the dialog and returns the entered name.
Cancel Button	This button closes this dialog without returning the entered name.
Help Button	This button displays this information.

Map Projections

Managing Map Projections

When you select the Tools/Map Projections menu command, the Select/Edit Map Projections dialog box is displayed. This dialog box allows you to select and edit map projection definitions. The dialog box contains the following items:

Control	Description						
Projection Name List Box	This list box contains the names of all currently defined map projections. The settings for the projection whose name is selected in this list are displayed in the other lists and edit boxes in this dialog box.						
Read-Only Check Box	When this check box is checked, the currently selected map projection (in the Projection Name list box) cannot be edited.						
Projection Type List Box	This list displays the projection type for the projection whose name is selected in the Projection Name list box. When you are defining a new projection you can use this list to select its projection type.						
Linear Unit List Box	This list displays the linear unit of all linear values that define the projection.						
Origin Latitude Edit Box	This edit box displays, and allows you to edit, the origin latitude for the projection. Note that the latitude is in degrees, minutes, and seconds.						
Origin Longitude Edit Box	This edit box displays, and allows you to edit, the origin longitude for the projection. Note that the longitude is in degrees, minutes, and seconds.						
Origin Northing Edit Box	This edit box displays, and allows you to edit, the origin northing for the projection. Note that the northing is in the linear unit displayed in the Linear Unit list box.						
Origin Easting Edit Box	This edit box displays, and allows you to edit, the origin easting for the projection. Note that the easting is in the linear unit displayed in the Linear Unit list box.						
Origin Scale Edit Box	This edit box displays, and allows you to edit, the origin scale factor for the projection.						
Origin Azimuth Edit Box	For oblique Mercator projections only, this edit box displays, and allows you to edit, the defining azimuth for the projection.						
North Parallel Edit Box	For Lambert projections only, this edit box displays, and allows you to edit, the latitude of the northern standard parallel for the projection.						
South Parallel Edit Box	For Lambert projections only, this edit box displays, and allows you to edit, the latitude of the southern standard parallel for the projection.						
Latitude Limits Group Box	This group box contains two edit boxes that specify the extent in latitude for the projection as follows: <table border="1" data-bbox="548 1696 1386 1816"> <thead> <tr> <th>Edit Box</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Fr (d m s)</td> <td>The latitude of the southern limit for the projection</td> </tr> <tr> <td>To (d m s)</td> <td>The latitude of the northern limit for the projection.</td> </tr> </tbody> </table>	Edit Box	Description	Fr (d m s)	The latitude of the southern limit for the projection	To (d m s)	The latitude of the northern limit for the projection.
Edit Box	Description						
Fr (d m s)	The latitude of the southern limit for the projection						
To (d m s)	The latitude of the northern limit for the projection.						

Control	Description						
Longitude Limits Group Box	<p>This group box contains two edit boxes that specify the extent in longitude for the projection as follows:</p> <table border="1"> <thead> <tr> <th>Edit Box</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Fr (d m s)</td> <td>The longitude of the western limit for the projection</td> </tr> <tr> <td>To (d m s)</td> <td>The longitude of the eastern limit for the projection</td> </tr> </tbody> </table>	Edit Box	Description	Fr (d m s)	The longitude of the western limit for the projection	To (d m s)	The longitude of the eastern limit for the projection
Edit Box	Description						
Fr (d m s)	The longitude of the western limit for the projection						
To (d m s)	The longitude of the eastern limit for the projection						
New Button	This button presents a dialog (see Entering a New Map Projection Name) that allows you to enter a name for a new map projection definition. When you return from that dialog, the new name is selected in the Projection Name list box, and you should edit the defining values for the new projection.						
Delete Button	This button deletes the currently selected map projection from the Projection Name list box.						
Import Text File Button	This button allows you to import map projection definitions from a text file containing GeoLab map projection text records. All map projection definitions found in the file are imported. The main purpose is to move the GEOLAB.MPI (used by previous versions of GeoLab) text file projection definitions into the data file used by this dialog box.						
OK Button	This button closes the dialog box, and if the dialog was presented to prompt you to select a map projection, the currently selected projection in the Projection Name list box is returned.						
Cancel/Close Button	This button closes the dialog box, and if the dialog was presented to prompt you to select a map projection, no projection is returned.						
Help Button	This button displays this information.						

Entering a New Map Projection Name

The New Map Projection Name dialog box prompts you to enter a new map projection name. It contains the following controls:

Control	Description
Map Projection Name Edit Box	Enter the new map projection name in this edit box. A map projection name can be from one to seven characters in length.
OK Button	This button closes the dialog and returns the entered name.
Cancel Button	This button closes this dialog without returning the entered name.
Help Button	This button displays this information.

Project Options

Using the Project Options Dialog

GeoLab project options settings are controlled by special options files (with the extension CFG). The Edit GeoLab Options dialog box provides a systematic interface that allows you to easily edit the various options settings. This dialog box consists of five tabbed pages (Drawing, Adjustment, Statistics, Output Configuration, and Output Composition) as discussed below.

Drawing Page

This page contains controls that pertain to GeoLab's drawing (in a network window or on the printer) of survey networks. It contains the following controls:

Control	Description														
Network Drawing Attributes Group Box	This group box contains controls that allow you to choose how GeoLab should draw adjusted survey networks. The controls are as follows:														
	<table border="1"><thead><tr><th>Control</th><th>Description</th></tr></thead><tbody><tr><td>Items List Box</td><td>This list box contains the names of all items that GeoLab draws when drawing a network. Other controls in this group box display the settings for the currently selected item in this list box.</td></tr><tr><td>Line Type List Box</td><td>This list box displays all line types that GeoLab uses to draw lines, and allows you to select the line type for the currently selected item in the Items List Box.</td></tr><tr><td>Color List Box</td><td>This list box displays all colors that GeoLab uses to draw items, and allows you to select the color for the currently selected item in the Items List Box.</td></tr><tr><td>Draw Selected Item Check Box</td><td>This check box controls whether the currently selected item in the Items List Box is drawn. If checked, the item will be drawn; if not checked, the item will not be drawn.</td></tr><tr><td>Draw All Button</td><td>This button turns drawing on for all items in the Items List Box.</td></tr><tr><td>Draw None Button</td><td>This button turns drawing off for all items in the Items List Box.</td></tr></tbody></table>	Control	Description	Items List Box	This list box contains the names of all items that GeoLab draws when drawing a network. Other controls in this group box display the settings for the currently selected item in this list box.	Line Type List Box	This list box displays all line types that GeoLab uses to draw lines, and allows you to select the line type for the currently selected item in the Items List Box.	Color List Box	This list box displays all colors that GeoLab uses to draw items, and allows you to select the color for the currently selected item in the Items List Box.	Draw Selected Item Check Box	This check box controls whether the currently selected item in the Items List Box is drawn. If checked, the item will be drawn; if not checked, the item will not be drawn.	Draw All Button	This button turns drawing on for all items in the Items List Box.	Draw None Button	This button turns drawing off for all items in the Items List Box.
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	Draw All Button	This button turns drawing on for all items in the Items List Box.													
Draw None Button	This button turns drawing off for all items in the Items List Box.														
Show Title Block Check Box	This check box controls whether GeoLab displays the title block in a network drawing. If checked, the title block is displayed; if not checked the title block is not displayed.														

Control	Description	
Draw Connections Group Box	This group box contains radio buttons that control which lines GeoLab will draw between stations in a network drawing. The radio buttons are as follows:	
	Control	Description
	Observed Lines	Draw only lines for which there are observations.
	All Lines	Draw all lines.
Scrolling Group Box	This group box contains drop-down lists that control the amounts that a network window is scrolled by scroll bar operations. Both values are percentages of the window size.	
	Control	Description
	Line Up/Down	The amount to scroll when a line up or line down scroll bar operation is made.
	Page Up/Down	The amount to scroll when a page up or page down scroll bar operation is made.
Grid Spacing (dms) Group Box	The controls in this group box specify default grid spacing values used for drawing the latitude/longitude grid lines in a network window. The two values are as follows:	
	Control	Description
	Latitude	The default grid spacing (in degrees, minutes, and seconds) for latitudes.
	Longitude	The default grid spacing (in degrees, minutes, and seconds) for longitudes.

Adjustment Page

This page contains controls that pertain to processing survey networks with GeoLab. It contains the following controls:

Control	Description						
Computation Type Group Box	This group box contains the following two radio buttons:						
	<table border="1"><thead><tr><th>Control</th><th>Description</th></tr></thead><tbody><tr><td>Adjustment</td><td>GeoLab will perform a network adjustment.</td></tr><tr><td>Simulation</td><td>GeoLab will perform a network simulation (preanalysis).</td></tr></tbody></table>	Control	Description	Adjustment	GeoLab will perform a network adjustment.	Simulation	GeoLab will perform a network simulation (preanalysis).
	Control	Description					
Adjustment	GeoLab will perform a network adjustment.						
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Control	Description																
Computation Options Group Box	<p>This group box contains the following check boxes:</p> <table border="1" data-bbox="550 333 1383 1564"> <thead> <tr> <th data-bbox="550 333 776 373">Check Box</th> <th data-bbox="776 333 1383 373">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="550 373 776 506">Generate Initial Coordinates</td> <td data-bbox="776 373 1383 506">If this box is checked, GeoLab will generate initial coordinates for all network stations. If it is not checked, coordinate generation will not be performed.</td> </tr> <tr> <td data-bbox="550 506 776 667">Optimize Band Width</td> <td data-bbox="776 506 1383 667">If this box is checked, GeoLab will reorder the parameters in the normal equations to arrive at a minimum variable bandwidth (to speed adjustment computations). If it is not checked, no reordering will be performed.</td> </tr> <tr> <td data-bbox="550 667 776 829">Compute Full Inverse</td> <td data-bbox="776 667 1383 829">If this box is checked, GeoLab will compute the entire parameter covariance matrix. If it is not checked, only the portions of the parameter covariance matrix that correspond to stations connected by observations will be computed.</td> </tr> <tr> <td data-bbox="550 829 776 1045">Force Convergence</td> <td data-bbox="776 829 1383 1045">If this box is checked, GeoLab will consider that the adjustment has converged (even if it has not) when the specified maximum number adjustment iterations is reached. If it is not checked, the adjustment computation will be aborted when convergence is not reached in the specified maximum number adjustment iterations.</td> </tr> <tr> <td data-bbox="550 1045 776 1241">Distances Contribute to Heights</td> <td data-bbox="776 1045 1383 1241">If this box is checked, GeoLab will use a 3D observation equation for spatial distance measurements, thereby allowing these measurements to contribute to the determination of network heights. If it is not checked, the usual 2D observation equation will be used.</td> </tr> <tr> <td data-bbox="550 1241 776 1373">Perform Orthometric Corrections</td> <td data-bbox="776 1241 1383 1373">If this box is checked, GeoLab will make orthometric corrections to observed orthometric height differences (OHDF records). If it is not checked, orthometric corrections will not be made.</td> </tr> <tr> <td data-bbox="550 1373 776 1564">Re-Transform Obs After 1st Pass</td> <td data-bbox="776 1373 1383 1564">If this box is checked, GeoLab will re-transform 2D coordinate observations to their 3D counterparts before each adjustment iteration (to remove any inconsistencies caused by inaccurate initial coordinates). If it is not checked, these re-transformations will not be made.</td> </tr> </tbody> </table>	Check Box	Description	Generate Initial Coordinates	If this box is checked, GeoLab will generate initial coordinates for all network stations. If it is not checked, coordinate generation will not be performed.	Optimize Band Width	If this box is checked, GeoLab will reorder the parameters in the normal equations to arrive at a minimum variable bandwidth (to speed adjustment computations). If it is not checked, no reordering will be performed.	Compute Full Inverse	If this box is checked, GeoLab will compute the entire parameter covariance matrix. If it is not checked, only the portions of the parameter covariance matrix that correspond to stations connected by observations will be computed.	Force Convergence	If this box is checked, GeoLab will consider that the adjustment has converged (even if it has not) when the specified maximum number adjustment iterations is reached. If it is not checked, the adjustment computation will be aborted when convergence is not reached in the specified maximum number adjustment iterations.	Distances Contribute to Heights	If this box is checked, GeoLab will use a 3D observation equation for spatial distance measurements, thereby allowing these measurements to contribute to the determination of network heights. If it is not checked, the usual 2D observation equation will be used.	Perform Orthometric Corrections	If this box is checked, GeoLab will make orthometric corrections to observed orthometric height differences (OHDF records). If it is not checked, orthometric corrections will not be made.	Re-Transform Obs After 1st Pass	If this box is checked, GeoLab will re-transform 2D coordinate observations to their 3D counterparts before each adjustment iteration (to remove any inconsistencies caused by inaccurate initial coordinates). If it is not checked, these re-transformations will not be made.
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Convergence Criterion Edit Box	This edit box is used to specify the convergence criterion for adjustments.																
Maximum Matrix RAM Edit Box	This edit box specifies how much system memory GeoLab can use for each matrix. As a rule of thumb, you should not specify more than about one-quarter of system memory for each matrix. The higher the value you set, the more likely that GeoLab will do all computations in system memory, and if all computations are performed in system memory, the time to perform even large adjustments will be greatly reduced.																

Control	Description															
Observation Angle Unit List Box	This list box is used to select the units (either degrees, minutes, seconds, or grads) for angle-type observations.															
Maximum Iterations List Box	This list box is used to select the maximum number of iterations that GeoLab will perform when performing an adjustment.															
Maximum Errors List Box	This list box is used to select the maximum number of errors that GeoLab will allow before aborting an adjustment or simulation.															
Geoid Interpolation Method List Box	<p>This list box is used to select the method for interpolating geoid files between grid intersections. Each geoid interpolation method uses a polynomial for the geoid undulation in latitude and longitude increments of the form:</p> $a_{00} \cdot \Delta\lambda^0 \cdot \Delta\phi^0 + a_{01} \cdot \Delta\lambda^0 \cdot \Delta\phi^1 + a_{02} \cdot \Delta\lambda^0 \cdot \Delta\phi^2 + \dots$ $a_{10} \cdot \Delta\lambda^1 \cdot \Delta\phi^0 + a_{11} \cdot \Delta\lambda^1 \cdot \Delta\phi^1 + a_{12} \cdot \Delta\lambda^1 \cdot \Delta\phi^2 + \dots$ $a_{20} \cdot \Delta\lambda^2 \cdot \Delta\phi^0 + a_{21} \cdot \Delta\lambda^2 \cdot \Delta\phi^1 + a_{22} \cdot \Delta\lambda^2 \cdot \Delta\phi^2 + \dots \text{ etc.}$ <p>The methods currently supported by GeoLab are as follows:</p> <table border="1"> <thead> <tr> <th>Method Name</th> <th>Max. Power</th> <th>Number of Terms</th> </tr> </thead> <tbody> <tr> <td>Bi-Linear</td> <td>1</td> <td>4</td> </tr> <tr> <td>Bi-Quadratic</td> <td>2</td> <td>9</td> </tr> <tr> <td>Bi-Cubic</td> <td>3</td> <td>16</td> </tr> <tr> <td>Bi-Quartic</td> <td>4</td> <td>25</td> </tr> </tbody> </table>	Method Name	Max. Power	Number of Terms	Bi-Linear	1	4	Bi-Quadratic	2	9	Bi-Cubic	3	16	Bi-Quartic	4	25
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Bi-Linear	1	4														
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Adjustment Completion Sound Files Group Box	<p>This group box contains controls for specifying whether to play sounds after GeoLab finishes an adjustment or simulation. You can specify these options separately for both types of completion status (success or failure). Each row of controls in this group box is as follows:</p> <table border="1"> <thead> <tr> <th>Controls</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Checkbox</td> <td>If checked, the sound will be played; if not checked the sound will not be played.</td> </tr> <tr> <td>Edit Box</td> <td>Displays the sound file name.</td> </tr> <tr> <td>Button</td> <td>Allows you to browse for the sound file you wish to have played.</td> </tr> </tbody> </table>	Controls	Description	Checkbox	If checked, the sound will be played; if not checked the sound will not be played.	Edit Box	Displays the sound file name.	Button	Allows you to browse for the sound file you wish to have played.							
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Edit Box	Displays the sound file name.															
Button	Allows you to browse for the sound file you wish to have played.															
Default Linear Unit List Box	This list box allows you to select the default linear unit for network processing.															
Default Ellipsoid List Box	This list box allows you to select the default reference ellipsoid for network processing.															

Statistics Page

This page contains controls that pertain to statistical tests and confidence regions. It contains the following controls:

Control	Description										
Variance Factor Group Box	<p>This group of variables specify how the variance factor is used in performing adjustments with GeoLab. Please refer to Geodesy The Concepts, by Vanicek & Krakiwsky (1982), Chapter 13, for details on the significance of these selections. This group box contains the following check boxes:</p> <table border="1"> <thead> <tr> <th>Check Box</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Known</td> <td>If this box is checked (as it should normally be), GeoLab will perform adjustment statistics assuming the variance factor is known. If it is not checked, the statistics will be performed assuming the variance factor is unknown.</td> </tr> <tr> <td>Scale Covariance Matrix</td> <td>If this box is checked, GeoLab will multiply the parameter covariance matrix by the estimated variance factor. If it is not checked, this scaling will not be done.</td> </tr> <tr> <td>Scale Residual Variances</td> <td>If this box is checked, GeoLab will multiply the residual variances by the estimated variance factor. If it is not checked, this scaling will not be done.</td> </tr> </tbody> </table>	Check Box	Description	Known	If this box is checked (as it should normally be), GeoLab will perform adjustment statistics assuming the variance factor is known. If it is not checked, the statistics will be performed assuming the variance factor is unknown.	Scale Covariance Matrix	If this box is checked, GeoLab will multiply the parameter covariance matrix by the estimated variance factor. If it is not checked, this scaling will not be done.	Scale Residual Variances	If this box is checked, GeoLab will multiply the residual variances by the estimated variance factor. If it is not checked, this scaling will not be done.		
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Compute Confidence Regions Group Box	<p>This group box contains the following check boxes:</p> <table border="1"> <thead> <tr> <th>Check Box</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Point</td> <td>If this box is checked, GeoLab will produce point confidence regions when performing an adjustment or simulation (note that you must have at least one of the Vertical, Horizontal, and 3D check boxes checked for this checkbox to be enabled).</td> </tr> <tr> <td>Vertical</td> <td>If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative vertical confidence regions when performing an adjustment or simulation.</td> </tr> <tr> <td>Horizontal</td> <td>If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative horizontal confidence regions (error ellipses) when performing an adjustment or simulation.</td> </tr> <tr> <td>3D</td> <td>If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative three-dimensional confidence regions when performing an adjustment or simulation.</td> </tr> </tbody> </table>	Check Box	Description	Point	If this box is checked, GeoLab will produce point confidence regions when performing an adjustment or simulation (note that you must have at least one of the Vertical, Horizontal, and 3D check boxes checked for this checkbox to be enabled).	Vertical	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative vertical confidence regions when performing an adjustment or simulation.	Horizontal	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative horizontal confidence regions (error ellipses) when performing an adjustment or simulation.	3D	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative three-dimensional confidence regions when performing an adjustment or simulation.
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Control	Description										
Confidence Levels (10.0 - 99.999 percent) Group Box	<p>This group box is used to select confidence levels used for statistics when GeoLab performs an adjustment or simulation. It contains the following edit boxes:</p> <table border="1" data-bbox="548 394 1385 716"> <thead> <tr> <th data-bbox="548 394 773 434">Edit Box</th> <th data-bbox="773 394 1385 434">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="548 434 773 506">Residuals & Net Diffs</td> <td data-bbox="773 434 1385 506">Level for testing residuals and for testing the significance of network differences.</td> </tr> <tr> <td data-bbox="548 506 773 577">1D Confidence Regions</td> <td data-bbox="773 506 1385 577">Level used for determining the expansion factor for one dimensional regions.</td> </tr> <tr> <td data-bbox="548 577 773 648">2D Confidence Regions</td> <td data-bbox="773 577 1385 648">Level used for determining the expansion factor for two dimensional regions.</td> </tr> <tr> <td data-bbox="548 648 773 716">3D Confidence Regions</td> <td data-bbox="773 648 1385 716">Level used for determining the expansion factor for three dimensional regions.</td> </tr> </tbody> </table>	Edit Box	Description	Residuals & Net Diffs	Level for testing residuals and for testing the significance of network differences.	1D Confidence Regions	Level used for determining the expansion factor for one dimensional regions.	2D Confidence Regions	Level used for determining the expansion factor for two dimensional regions.	3D Confidence Regions	Level used for determining the expansion factor for three dimensional regions.
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3D Confidence Regions	Level used for determining the expansion factor for three dimensional regions.										
Residual Rejection Type List Box	This list box is used to select the type of criterion to be used by GeoLab when determining whether residuals are to be rejected.										
Misclosure Flagging Factors Group Box	<p>This group box contains two edit controls for specifying factors to be used when GeoLab decides whether to flag a misclosure as large enough to be flagged as a potential problem. If the misclosure is larger than the observation standard deviation times the factor, the observation will be flagged) The edit boxes are as follows:</p> <table border="1" data-bbox="548 982 1385 1102"> <thead> <tr> <th data-bbox="548 982 773 1022">Edit Box</th> <th data-bbox="773 982 1385 1022">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="548 1022 773 1062">Linear</td> <td data-bbox="773 1022 1385 1062">The factor for linear-type observations.</td> </tr> <tr> <td data-bbox="548 1062 773 1102">Angular</td> <td data-bbox="773 1062 1385 1102">The factor for angular-type observations.</td> </tr> </tbody> </table>	Edit Box	Description	Linear	The factor for linear-type observations.	Angular	The factor for angular-type observations.				
Edit Box	Description										
Linear	The factor for linear-type observations.										
Angular	The factor for angular-type observations.										

Output Configuration Page

This page contains controls that pertain to the format of the output listing that GeoLab produces when performing an adjustment or simulation. It contains the following controls:

Control	Description														
Page Layout (Lines) Group Box	The controls in this group box specify how GeoLab should format pages in the output listing. Note that all values are in numbers of text lines. The controls are as follows:														
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Automatic (from printer setup)</td> <td>When checked, GeoLab will automatically choose the correct settings for your printer. When not checked, the settings in the Manual Settings group box will be used.</td> </tr> <tr> <td>Page Length</td> <td>The total number of text lines per printed page. This value should correspond to the number of text lines per page that your printer will print with the font selected.</td> </tr> <tr> <td>Top Margin</td> <td>The number of text lines in the top margin.</td> </tr> <tr> <td>Bottom Margin</td> <td>The number of text lines in the bottom margin.</td> </tr> </tbody> </table>	Control	Description	Automatic (from printer setup)	When checked, GeoLab will automatically choose the correct settings for your printer. When not checked, the settings in the Manual Settings group box will be used.	Page Length	The total number of text lines per printed page. This value should correspond to the number of text lines per page that your printer will print with the font selected.	Top Margin	The number of text lines in the top margin.	Bottom Margin	The number of text lines in the bottom margin.				
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Top Margin	The number of text lines in the top margin.														
Bottom Margin	The number of text lines in the bottom margin.														
Output Decimal Places Group Box	The controls in this group box specify the numbers of decimal places that GeoLab will use in writing values to the output listing as follows:														
<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Angular Observations</td> <td>The number of decimal places for writing angular observation types.</td> </tr> <tr> <td>Linear Observations</td> <td>The number of decimal places for writing linear observation types.</td> </tr> <tr> <td>Latitudes/Longitudes</td> <td>The number of decimal places for writing latitudes and longitudes.</td> </tr> <tr> <td>Rotations in Seconds</td> <td>The number of decimal places for displaying 4-parameter and 7-parameter rotation values.</td> </tr> <tr> <td>Scales in PPM</td> <td>The number of decimal places for displaying 4-parameter and 7-parameter scale values.</td> </tr> <tr> <td>Map Projection Scales</td> <td>The number of decimal places for displaying map projection origin scale values.</td> </tr> </tbody> </table>	Control	Description	Angular Observations	The number of decimal places for writing angular observation types.	Linear Observations	The number of decimal places for writing linear observation types.	Latitudes/Longitudes	The number of decimal places for writing latitudes and longitudes.	Rotations in Seconds	The number of decimal places for displaying 4-parameter and 7-parameter rotation values.	Scales in PPM	The number of decimal places for displaying 4-parameter and 7-parameter scale values.	Map Projection Scales	The number of decimal places for displaying map projection origin scale values.	
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Control	Description												
Output Options Group Box	<p>The controls in this group box specify adjustment output options as follows:</p> <table border="1" data-bbox="548 365 1383 1083"> <thead> <tr> <th data-bbox="548 365 776 405">Control</th> <th data-bbox="776 365 1383 405">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="548 405 776 569">Show West Longitudes</td> <td data-bbox="776 405 1383 569">This option controls the display and printing format for longitudes. If not checked, longitudes will always be printed as east-longitudes (0-359), otherwise west-longitudes will be displayed and printed for points in the western hemisphere.</td> </tr> <tr> <td data-bbox="548 569 776 758">Print 3D Residuals as N, E, Up</td> <td data-bbox="776 569 1383 758">If checked, residuals for 3D coordinate and coordinate difference observations will be printed as values in the north, east, and up directions; if not checked, residuals for these observations will be printed as values in the directions of the geocentric Cartesian axes.</td> </tr> <tr> <td data-bbox="548 758 776 890">Print Canadian Order</td> <td data-bbox="776 758 1383 890">If checked, the Canadian order designation (Geodetic Survey of Canada 1973 Specifications) for the least accurate relative error ellipse will be printed.</td> </tr> <tr> <td data-bbox="548 890 776 989">Report Unrecognized Errors</td> <td data-bbox="776 890 1383 989">If checked, GeoLab will write a warning in the output listing when a non-blank unrecognized text record is encountered in the input text file.</td> </tr> <tr> <td data-bbox="548 989 776 1083">Do Chi-Square Test</td> <td data-bbox="776 989 1383 1083">If checked, GeoLab will write a summary of the adjustment's chi-square test on the variance factor to the output listing.</td> </tr> </tbody> </table>	Control	Description	Show West Longitudes	This option controls the display and printing format for longitudes. If not checked, longitudes will always be printed as east-longitudes (0-359), otherwise west-longitudes will be displayed and printed for points in the western hemisphere.	Print 3D Residuals as N, E, Up	If checked, residuals for 3D coordinate and coordinate difference observations will be printed as values in the north, east, and up directions; if not checked, residuals for these observations will be printed as values in the directions of the geocentric Cartesian axes.	Print Canadian Order	If checked, the Canadian order designation (Geodetic Survey of Canada 1973 Specifications) for the least accurate relative error ellipse will be printed.	Report Unrecognized Errors	If checked, GeoLab will write a warning in the output listing when a non-blank unrecognized text record is encountered in the input text file.	Do Chi-Square Test	If checked, GeoLab will write a summary of the adjustment's chi-square test on the variance factor to the output listing.
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Print 3D Residuals as N, E, Up	If checked, residuals for 3D coordinate and coordinate difference observations will be printed as values in the north, east, and up directions; if not checked, residuals for these observations will be printed as values in the directions of the geocentric Cartesian axes.												
Print Canadian Order	If checked, the Canadian order designation (Geodetic Survey of Canada 1973 Specifications) for the least accurate relative error ellipse will be printed.												
Report Unrecognized Errors	If checked, GeoLab will write a warning in the output listing when a non-blank unrecognized text record is encountered in the input text file.												
Do Chi-Square Test	If checked, GeoLab will write a summary of the adjustment's chi-square test on the variance factor to the output listing.												

Output Composition Page

This page contains controls that pertain to the contents of an output listing that GeoLab produces when performing an adjustment or simulation. It contains the following controls:

Control	Description	
Print Input Values Group Box	The controls in this group box select which input information is written to the output listing as follows:	
	Control	Description
	Options Summary	If checked, a summary of the selected options is written to the output listing.
	Station Data	If checked, the input station data is written to the output listing.
Print Adjusted Values Group Box	The controls in this group box select which adjusted information is written to the output listing as follows:	
	Control	Description
	NEO Values	If checked, NEO records containing adjusted values are written.
	NEH Values	If checked, NEH records containing adjusted values are written.
	PLH Values	If checked, PLH records containing adjusted values are written.
	PLO Values	If checked, PLO records containing adjusted values are written.
	XYZ Values	If checked, XYZ records containing adjusted values are written.
	Auxiliary Parameter Values (AUX)	If checked, adjusted auxiliary parameter values are written.
	Scale & Convergence Values (SFMC)	If checked, point scale and meridian convergence values are written if the NEO or NEH Values are checked.
	Grid Distances and Azimuths	If checked, grid distances, grid azimuths, and combined scale factors are written if one or more map projections are used. The Connected Only (by observations) and All Lines radio buttons allow you to select which lines to list this information for.

Control	Description						
Print Adjustment Solution Group Box	The controls in this group box select whether adjustment solutions (adjustment corrections to the parameters) are written during adjustment iterations as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Enable</td> <td>If checked, the solution is written for the first pass of the adjustment; if not checked, no solution is written (even if the following check box is checked)</td> </tr> <tr> <td>All Passes (not only the first pass)</td> <td>If checked, solutions are written for all passes of the adjustment (but only if the previous check box is checked).</td> </tr> </tbody> </table>	Control	Description	Enable	If checked, the solution is written for the first pass of the adjustment; if not checked, no solution is written (even if the following check box is checked)	All Passes (not only the first pass)	If checked, solutions are written for all passes of the adjustment (but only if the previous check box is checked).
	Control	Description					
Enable	If checked, the solution is written for the first pass of the adjustment; if not checked, no solution is written (even if the following check box is checked)						
All Passes (not only the first pass)	If checked, solutions are written for all passes of the adjustment (but only if the previous check box is checked).						
Print Misclosures Group Box	The controls in this group box determine whether adjustment misclosures are written during adjustment iterations as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>First Pass</td> <td>If checked, misclosures are written for the first pass of the adjustment.</td> </tr> <tr> <td>Subsequent Passes</td> <td>If checked, misclosures are written for all passes of the adjustment.</td> </tr> </tbody> </table>	Control	Description	First Pass	If checked, misclosures are written for the first pass of the adjustment.	Subsequent Passes	If checked, misclosures are written for all passes of the adjustment.
	Control	Description					
First Pass	If checked, misclosures are written for the first pass of the adjustment.						
Subsequent Passes	If checked, misclosures are written for all passes of the adjustment.						
Print Residuals Group Box	The controls in this group box determine whether adjustment residuals are written as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Enable</td> <td>If checked, residuals are written.</td> </tr> <tr> <td>Rejects Only</td> <td>If checked (and if Enable is checked), only residuals flagged for rejection are written.</td> </tr> </tbody> </table>	Control	Description	Enable	If checked, residuals are written.	Rejects Only	If checked (and if Enable is checked), only residuals flagged for rejection are written.
	Control	Description					
Enable	If checked, residuals are written.						
Rejects Only	If checked (and if Enable is checked), only residuals flagged for rejection are written.						
Print Geoid Values Group Box	The control in this group box determines whether geoid values are written for each network station as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Enable</td> <td>If checked, geoid values are written.</td> </tr> </tbody> </table>	Control	Description	Enable	If checked, geoid values are written.		
Control	Description						
Enable	If checked, geoid values are written.						
Print Relative Confidence Regions Group Box	The controls in this group box determine whether, and which, relative confidence regions are written as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>If checked, no confidence regions are written.</td> </tr> <tr> <td>Which Group Box</td> <td>If None is not checked, the controls in this check box determine which confidence regions to write as follows: All: All confidence regions; Connected: Only confidence regions for lines that have observations; Within Radius: Only confidence regions for lines not greater in length than the radius specified in Radius (km); Radius (km): The radius for the Within Radius option.</td> </tr> </tbody> </table>	Control	Description	None	If checked, no confidence regions are written.	Which Group Box	If None is not checked, the controls in this check box determine which confidence regions to write as follows: All: All confidence regions; Connected: Only confidence regions for lines that have observations; Within Radius: Only confidence regions for lines not greater in length than the radius specified in Radius (km); Radius (km): The radius for the Within Radius option.
	Control	Description					
None	If checked, no confidence regions are written.						
Which Group Box	If None is not checked, the controls in this check box determine which confidence regions to write as follows: All: All confidence regions; Connected: Only confidence regions for lines that have observations; Within Radius: Only confidence regions for lines not greater in length than the radius specified in Radius (km); Radius (km): The radius for the Within Radius option.						

Options Manager

Managing GeoLab Options Files

When you select the Tools/Options Manager menu command, the GeoLab Options Manager dialog box is displayed. This dialog allows you to manage GeoLab options files. It contains the following controls:

Control	Description
Filename Edit Box	This read-only edit box simply displays the name of options file that you are currently working with.
New Button	This button allows you to create a new options file. The contents of the new file are initialized to the default options file (default.gpj)
Open Button	This button allows you to select an existing options file to set as the current options file.
Save As Button	This button allows you to save the contents of the current options file in a different file.
Copy From Button	This button allows you to select an existing options file from which to copy settings for the current options file.
Edit Options Button	This button displays the Edit GeoLab Options dialog allowing you to edit the options settings in the current options file.
Set to Defaults Button	This button sets all option settings in the currently selected options file to their default values.
Close Button	This button closes this dialog.
Help Button	This button displays this information.

Printer Page Setup

Setting Up Pages for Printing

When you select the File/Page Setup menu command, the GeoLab Page Setup dialog box is presented. This dialog allows you to change the margin and page orientation settings for printing the contents of text and network windows. You can enter margin values from 0 to 2.5 inches (0 to 63.5 millimeters). If you enter a margin value less than the printer is capable of printing, the printer's minimum value is used. This dialog contains the following controls:

Control	Description						
Text Files Group Box	This group box contains controls that you use to set printer margins and page orientation values for text files.						
Network Drawings Group Box	This group box contains controls that you use to set printer margins and page orientation values for network drawings.						
Margin Units Group Box	This group box contains the following controls that specify the linear unit of the margin values: <table border="1"><thead><tr><th>Control</th><th>Description</th></tr></thead><tbody><tr><td>Millimeters Radio Button</td><td>Margin values are in millimeters</td></tr><tr><td>Inches Radio Button</td><td>Margin values are in inches</td></tr></tbody></table> Note that when you select a different unit, the current margin values are automatically displayed in the newly selected unit.	Control	Description	Millimeters Radio Button	Margin values are in millimeters	Inches Radio Button	Margin values are in inches
Control	Description						
Millimeters Radio Button	Margin values are in millimeters						
Inches Radio Button	Margin values are in inches						
OK Button	This button closes the dialog box, and saves any changes you made to the margin and orientation settings.						
Cancel Button	This button closes the dialog box without saving changes you may have made to the margin and orientation settings.						
Help Button	This button displays this information.						

Setting Preferences

Using the GeoLab Preferences Dialog

Selecting the Tools/Preferences menu command displays this dialog that allows you to set GeoLab preferences and contains the pages as described below.

General Tab

This page contains the following controls:

Control	Description
Disable Grid Spacing Dialog Check Box	When this check box is checked, the dialog that reports a grid spacing change won't be displayed (see Understanding the Grid Spacing Dialog).
Force Wide Output Listings Check Box	When this check box is checked, GeoLab's wide output listing format will be used regardless of the maximum parameter name length found in a network. When it is not checked, GeoLab will automatically select the narrow format for output listings if all parameter names are no longer than 12 characters (the wide format is always used if any parameter name is longer than 12 characters).
Enable Adjustment Summary Dialog Checkbox	This checkbox controls whether the Adjustment Summary dialog is presented after successfully completing an adjustment.
Open a New Text Window Check Box	When this check box is checked, GeoLab will open a new text window when starting.
Re-Open Previously Opened Files Check Box	When this check box is checked, GeoLab will re-open any files that were open when you last closed GeoLab. If it is not checked, no previously opened files will be opened the next time you run GeoLab.
Ignore Observation Standard Deviation When SIGM Record is Used	If this checkbox is checked, the observation standard deviation on an observation record will not be used in computing the observation's standard deviation (only the SIGM record's values will be used. If it is not checked, the the observation standard deviation on the observation record will be used, in addition to the values on the SIGM record, to compute the observation's standard deviation.
Remind Me to Check for Web Updates Every N Days	This checkbox and drop-down list allow you to specify if GeoLab should remind you to check for updates on the web, and if so, the number of days to wait before reminding you.
Adjustment Summary Dialog Parameters Group Box	This group box contains controls that determine which items are displayed in the Adjustment Summary dialog. Three types of items are displayed in the Adjustment Summary dialog: standardized residuals, station confidence region major semi-axes, and relative confidence region major semi-axes. For each type, you can set the criterion; no values that are less in absolute value than the criterion value will be displayed. Please see the documentation for the Adjustment Summary dialog for more information.

Control	Description
Font Button	This button allows you to change the font used for text and network windows. Note that the color of the font selected here applies only to text windows because font colors for the various items in a network window are specified separately in the project options dialog.

Text Windows Tab

This page contains the following controls:

Control	Description
Auto Backup When Saving Text Files Check Box	If checked, a backup file will be created for a text file when you save the text file.
Enable Parameter Names Scan in the Record Editor Check Box	If checked, the Record Editor will scan all open text files for parameter names when it is opened. These parameter names can then be selected from a drop-down list in fields where a pre-defined parameter name is required.
Fill Characters Edit Box	Enter the characters to use for filling selections with the Edit/Fill Text Selection menu command.
Tab Width Drop-down List	Select the tab width to use when interpreting files imported using the Edit/Import menu items. If there are tabs found in the imported text files, they will be expanded by the number of spaces specified by this setting.
Text File Filters Button	Allows editing default text file filters.

Network Windows Tab

This page contains the following controls:

Control	Description
Network Drawing Borders Group Box	The four drop-down lists allow the selection of the percent of the network size to pad the network drawing with.
Maximum RAM for Network Drawings (Kbytes):	This drop-down list allows you to specify a maximum amount of RAM to be used for creating network drawing bitmaps.
Network File Filters Button	Allows editing default network file filters.

Advanced Tab

This page contains the following controls:

Control	Description
Matrix Storage Block Sizes Group	The settings in this group allow you to optimize the speed of GeoLab's matrix calculations by specifying the "block size" to be used for writing the matrix to disk. A matrix is divided up into partitions (blocks) of the sizes you specify with these settings. These settings are especially important if the amount of RAM on your computer is too small to hold the entire matrix in RAM. The Network Adjustment setting is used for the main normal equations matrix, and the Coordinate (Difference) Observations setting is used for 2DC, 2DD, 3DC, and 3DD coordinate and coordinate difference observations.
GeoLab Execution Priority Group Box	Select from the four options of Windows processing priority for GeoLab.

File Filter Settings

Editing File Filter Settings

The editing of file filter settings is done using the Edit File Filters dialog box. This dialog allows the editing of file filters that are displayed in the List Files of Type drop-down list box at the bottom-left of the File Open and File Save As dialogs. The controls in the dialog are as follows:

Control	Description
Filter Names List Box	This list box displays all current filter names (text displayed in the List Files of Type list box in the File Open and File Save As dialogs). To edit the extension for a name, select the name and then edit the extension in the Extension edit box. Note that double clicking a filter name in this list results in performing the Edit Name button function.
Extension Edit Box	This edit box allows you to edit the file extension for the currently selected name in the Filter Names list box. Only the three-character extension should be entered (without a leading period).
Edit Name Button	This button displays the Edit Filter Name dialog in which you can edit the currently selected filter name. Note that if the resulting edited name is the same as an another existing name, the other existing name will be deleted from the list.
New Name Button	This button displays the Edit Filter Name dialog in which you can type a new filter name. When you return from that dialog, the new name will appear in the Filter Names list box and the extension will be initialized to an asterisk. Remember to set the extension to the desired characters after you create a new filter name.
Delete Name Button	This button deletes the currently selected name from the Filter Names list box.
Revert Button	This button allows you to revert to the filters that were defined when you entered this dialog.
Move Up Button	This button allows you exchange the position of the currently selected filter name with the one above it.
Move Down Button	This button allows you exchange the position of the currently selected filter name with the one below it.
OK Button	This button closes this dialog, accepting the changes you have made to the file filters.
Cancel Button	This button closes this dialog, discarding the changes you have made to the file filters.
Help Button	This button displays this information.

Edit Filter Name Dialog Box

This dialog prompts you to enter a new file filter name. It contains the following controls:

Control	Description
Filter Name Edit Box	Enter the new file filter name in this edit box. A file filter name should not be too long, as it is displayed in the Files of Type drop down lists in File Open and File Save As dialogs.
OK Button	This button closes the dialog and returns the entered name.
Cancel Button	This button closes this dialog without returning the entered name.
Help Button	This button displays this information.

Using Text Windows

Text Windows

Working with Text Windows

A text window is used for creating, viewing, and editing GeoLab text files. Two main types of text files are used by GeoLab:

Text File Type	Description
Input Text File	All survey network station definitions, and observations are input to GeoLab in input text files.
Output Text File	GeoLab produces an output text file (output listing) when a network adjustment is performed.

A text window is used to view and edit GeoLab text files. All the standard Windows editing operations are supported by text windows, and GeoLab provides several tools you can use to perform GeoLab-related text editing functions. The most powerful of these tools is the GeoLab Record Editor, which is used for creating and editing GeoLab text input records.

Old GeoLab Formats

Importing Old-Format GeoLab Text Records

When you select the Edit/Import/V1 Input Text File or the Edit/Import/V2 Input Text File menu commands, you are presented with a dialog for selecting the file to import. You must ensure that the file you select is in the correct format. Note that these two menu commands convert the old-format text records as they are imported and the original file is not changed.

Input Text File Converter

If you have many old-format GeoLab text files, you should use the File/Convert Input Text Files menu command to do a batch conversion. The Input Text File Converter dialog box is presented. This dialog allows you to convert one or more older version input text files to the new version 3 format. The main change in version 3 input text files is the expansion of parameter (station and auxiliary parameter) names from 12 to 31 characters. Note that you must convert older version files to the new format before processing or editing (with the GeoLab Record Editor) with GeoLab 3.0. The Input Text File Converter dialog box contains the following controls:

Control	Description
File to Convert List Box	This list box displays the filenames of the input text files that you have selected for conversion. Note that you must select only files that are in the format specified in the Version of Files to Convert group box. You can use the Add Files button to add files to this list box, and the Remove Selected Files button to remove them.
Version of Files to Convert Group Box	This group box allows you to select the format version from which to convert. You can select one of the following conversions (where Vn.n represents the latest GeoLab version): V1.x to Vn.n: Input text files, prior to version 2.x, that used numeric record codes (e.g. 4); V2.x to Vn.n: Input text files, prior to version 3, that introduced 2-4 character input text record codes (e.g. PLH); V3.0-3.3 to Vn.n: Input text files from version 3.0 to version 3.3, that were all in a long name format; Vn.n short names to Vn.n long names: Current version input text files that contain records in short-names format (to long-name record format); Vn.n long names to Vn.n short names: Current version input text files that contain records in long-name format (to short name record format if the parameter names are 12 characters or less in length).
Add Files Button	This button presents a dialog from which you can select the file(s) you wish to convert. The names of the selected files are added to the File to Convert list box.
Remove Selected Files Button	If you have selected one or more file names in the File to Convert list box, this button will remove the selected filenames from the list.
Convert All Button	Once you have selected the files you wish to convert, this button performs the conversion and closes the dialog.
Close Button	This button closes this dialog without performing conversions.
Help Button	This button displays this information.

Record Editor

Using the GeoLab Record Editor

When you select the Edit/Edit GeoLab Text Record menu command, this dialog is displayed, which allows you to easily revise or create GeoLab input text records. It is also accessed simply by pressing the F7 key on the line you wish to edit in a text window.

To see help information on the various records types, see the Input Records index.

When this dialog is opened, GeoLab scans all the current text windows to find the parameter names (for stations and auxiliary parameters) that you have already defined. Then, in fields that require a pre-defined parameter name, a list of all found parameter names is created from which you can select the desired name. If the parameter name you wish to use is not in the list, you may have defined the name in a text input file that is not currently open in a text window. If so, you have to close this dialog, open the text input file that contains the missing parameter names, and then reopen this dialog.

The Record Editor dialog box contains the following items:

Drop Down List Box (at top of the dialog box): This drop down list box allows you to choose the type of record you wish to edit. A list of all GeoLab text input records is presented from which you can choose a record type. When you first enter this dialog, the record type of the current line in the text window is automatically selected.

Other Drop Down List Boxes (in center area of dialog box): Depending of the type of record being edited, a number of drop down list boxes and/or edit boxes will be displayed in the center area of the dialog box. A box will be displayed for each field in the record with a label to its left describing the type of data the field contains. You can use these boxes to edit the contents of new or existing records - the Record Editor places all field contents in the proper columns automatically when you insert the record in the file.

Insert Button: This button inserts a new line in the file based on the current contents of the controls. The and Close button to the right of the Insert button performs the insert operation and then closes the Record Editor.

Replace Button: This button replaces the current line in the file with a line based on the current contents of the controls. The and Close button to the right of the Replace button performs the replace operation and then closes the Record Editor.

Delete Button: This button deletes the current record in the file (while this dialog box is displayed, the current record in the text window is highlighted). The and Close button to the right of the Delete button performs the delete operation and then closes the Record Editor.

Previous Button: This button changes the current line in the file to the line before the current line.

Next Button: This button changes the current line in the file to the line after the current line.

Toggle Comment Button: This button toggles the current line in the file to/from being commented out (* in column one).

Re-Load Names Button: This button forces a re-loading of parameter names from all open text files into the lists used for displaying names that are already defined.

Select Include File: This button is enabled when the #include record type is selected, and allows you to browse for an existing file to place in the record.

Close Button: This button ends your current session with the Record Editor.

Help Button: This button displays this information.

Changing Parameter Names

Changing Network Parameter Names

Many field surveys are performed and recorded without knowing the final official station names of control or new stations. When this is the case, temporary names may be assigned (to GeoLab text records) in the field, with the intention of changing them later once they are known.

The Change Parameter Names dialog box allows you to easily change station and auxiliary parameter names in existing GeoLab input text files (and all include files). This dialog box contains two main group boxes:

Group Box	Description
Input Text File	This group allows you to specify the input text file to change parameter names in.
Alias File	This group allows you to specify the new names for the stations and auxiliary parameters in the specified input text file.

You can also save your name aliases in an alias file. If the new name is the same as the old name, or if there is no line for the name in the alias file, no changes will be made for that name.

The controls in the Input Text File group box are as follows:

Control	Description
File Edit Box	This read-only edit box displays the name of the input text file for which parameter names are to be changed.
Browse Button	This button allows you to select an input text file in which to change parameter names (alias). Note that all include files (if any) will be aliased as well. A dialog box is presented for the selection of the input text file. Once you select the file you wish to change names in, the File edit box displays the file name, and the Current Parameter Names list box is filled with all station and auxiliary parameter names found in the input text file(s). If no names are displayed in the Current Parameter Names list box, no names were found in the specified file(s). Once you have defined aliases (new names) in the Alias File group box, the Convert button at the bottom of the dialog box is enabled.
Current Parameter Names	This list box displays all station and auxiliary parameter names in the specified input text file and all #include files. You can select any number of these names to copy into the Aliases (old-name new-name) list box.
Select All Button	This button selects all station and auxiliary parameter names in the Current Parameter Names list box.
Invert Selection Button	This button will toggle the selection status of each name in the Current Parameter Names list box. If you wish to de-select all names, press the Select All button, and then the Invert Selection button.
Copy Button	This button is enabled when you have at least one name selected in the Current Parameter Names list box. When you click this button, the selected names are copied to the Aliases (old-name new-name) list box. When the names are initially copied, the new name (the one to change to) is the same as the old name and you use the Edit button to change the new name.

The controls in the Alias File group box are as follows:

Control	Description						
File Edit Box	This read-only edit box displays the name of the alias file to be used.						
Browse Button	This button allows you to open an existing alias file. A dialog box will be presented for the selection. Once a file has been selected, the Aliases (old-name new-name) list box is filled with the names found in the file.						
New Button	This button allows you to create a new, empty alias file. A dialog box will be presented to allow you to select a name for the new file.						
Aliases (old-name new-name) List Box	This list box displays all defined aliases. An alias is a fixed-format text line in the form: <table border="1" data-bbox="548 613 1383 737"> <thead> <tr> <th>Columns</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>001-031</td> <td>Old parameter name</td> </tr> <tr> <td>034-064</td> <td>New parameter name</td> </tr> </tbody> </table>	Columns	Description	001-031	Old parameter name	034-064	New parameter name
Columns	Description						
001-031	Old parameter name						
034-064	New parameter name						
Edit Button	This button allows you to edit the new name portion of an alias in the Aliases (old-name new-name) list box. Double-clicking an alias in the list box performs the same function as the Edit button. The Edit button is disabled if no alias is selected. The Edit Parameter Name Alias dialog is presented in which you edit the new name portion of the alias.						
Delete Button	This button removes the selected alias from the Aliases (old-name new-name) list box.						
Switch Button	This button switches the old and new names of the currently selected alias.						
Switch All Button	This button switches the old and new names of all aliases in the Aliases (old-name new-name) list box. To switch them back again, press the Switch All button again.						
Save Button	This button results in the current contents of the Aliases (old-name new-name) list box to be written to the current alias file. If an alias file has not yet been selected, this button results in the same action as the Save As button.						
Save As Button	This button allows you to specify an alias file in which to save the current contents of the Aliases (old-name new-name) list box.						

The controls at the bottom of this dialog are as follows:

Control	Description
Convert Button	<p>This button is enabled once you have selected an input text file and you have specified aliases in the Aliases (old-name new-name) list box. The translation (from old names to new names) of station and auxiliary parameter names is performed when you press this button. The original files are backed-up to files with the following extensions:</p> <p>If the original filename has an extension: the first character of the extension is changed to the tilde (~) character;</p> <p>If the original filename has no extension: the extension is set to "bak".</p> <p>Important: Note that if these backup files already exist, they are overwritten.</p> <p>Once the translation is complete, the new station and auxiliary parameter names in the changed input text file(s) are re-loaded into the Current Parameter Names list box. Note that the #include records in the backup files are not changed to refer to the backup files.</p>
Close Button	This button closes this dialog.
Help Button	This button displays this information.

Moving To Text Lines

Using the Go To Dialog

When you select the Search/Go To Line menu command, the Go To Line dialog box is presented, which prompts you to enter the line number to which you wish to move the insertion point in the current text window. It contains the following controls:

Control	Description
Line Number Edit Box	This edit box allows you to enter the line number to which you wish to move the insertion point. Directly below this edit box, the range of existing line numbers in the current text window is displayed.
OK Button	This button closes the dialog and moves the insertion point to the specified line. If you entered a line number that is out of the range of line numbers in the current text window, the insertion point will be moved to the nearest existing line whose line number is as close as possible to the one you entered.
Cancel Button	This button closes the dialog without moving the insertion point.
Help Button	This button displays this information.

Library Text

Editing Library Text

GeoLab provides functions for creating and editing library text. Library text is a named text scrap that can be used to insert commonly used words or phrases into a text window (also see *Selecting Library Text*). The Edit/Library Text/Edit menu command presents the Edit Text Library dialog box dialog which allows you to set edit the contents of the GeoLab text library. It contains the following controls:

Control	Description
Names List Box	This list box contains the names of all currently defined text library entries.
New Item Button	This button presents the New Text Name dialog that allows you to enter the name of a new text library entry. After returning from this dialog, the name of the new entry will be selected in the Names list box, and you can then enter the text for the entry in the Text edit box.
Delete Item Button	This button deletes the currently selected library entry in the Names list box.
Move Up Button	This button moves the currently selected library entry in the Names list box up one place.
Move Down Button	This button moves the currently selected library entry in the Names list box down one place.
Sort All Button	This button sorts the names of all library entries in the Names list box into ascending alphabetical order.
Text Edit Box	This multiple-line edit box displays the text for the currently selected library entry in the Names list box, and allows you to edit this text.
Close Button	This button closes this dialog box.
Help Button	This button displays this information.

Selecting Library Text

The Library Text/Insert menu command presents the Select Library Text dialog box which allows you to select an entry from the GeoLab text library (see Editing Library Text) for insertion into a text window, and contains the following controls:

Control	Description
Select a Name List Box	This list box displays the names of all currently defined GeoLab text library entries, and allows you to select the entry that you wish to insert into the current text window.
OK Button	This button closes the dialog box, and returns the text of the selected entry.
Cancel Button	This button closes the dialog box, and cancels the insertion of text into the current text window.
Help Button	This button displays this information.
Text Box	This text box (at the bottom of the dialog) displays the text attached to the library entry currently selected in the Select a Name list box.

New Library Text Name

The New Text Name dialog box prompts you to enter a name for a new text item in the text library. It contains the following controls:

Control	Description
Name Edit Box	Enter the new text item name in this edit box.
OK Button	This button closes the dialog and returns the entered name.
Cancel Button	This button closes this dialog without returning the entered name.
Help Button	This button displays this information.

Importing Data

Importing Foreign Text Files

Using the Import Foreign Format File Dialog

The Import Foreign Format File dialog is displayed when you select the File/Import menu item. Note that this menu item is enabled only if GeoLab recognized and loaded one or more import plugin modules at startup. For more information on import plugin modules, see File Import Plug-Ins.

This dialog is used to import foreign-format text files into GeoLab. Using the selected import plugin and selected format name, the foreign-format file is converted to the GeoLab IOB-format, and all successfully imported data is written into a new text window. If errors are encountered (i.e. if the import plugin reports errors when the import is attempted), the list of errors is displayed in the Import Messages Box.

This dialog contains the following controls:

Control	Description
Import Plugins List	This list contains the names of all import plugin modules loaded by GeoLab. The names are simply an abbreviated form of the import plugin DLL file name.
Plugin Information Button	When an import plugin file is selected in the Import Plugins List, this button will be enabled if the supplier of the plugin provided an information file for the plugin. When you click this button, the information, if any, for the plugin is displayed.
Format Names List	This list contains the names of all the formats contained in the selected (in the Import Plugins List) import plugin.
Import Messages Box	This control will display any error messages generated by attempting to import a foreign-format text file when you click the Import Text File button.
Import Text File Button	This button is enabled whenever a format name is selected in the Format Names List. When you click this button, a File Open dialog is displayed allowing you to select the text file you wish to import. If the attempt to import the selected text file fails, any error messages will be displayed in the Import Messages Box. If the import succeeds, the imported GeoLab records (text lines) are loaded into a new text window.
Help Button	Clicking this button displays this information.
Close Button	Clicking this button closes the dialog.

Developing Import Plug-Ins

Overview of Plug-In Development

Microsearch GeoLab supports the use of special DLLs (Windows 32-bit Dynamic Link Libraries) as "plug-ins" for importing formatted text files (into GeoLab input text file format). These DLLs need only be placed in the GeoLab installation folder (where geolab32.exe resides), and GeoLab will automatically load them when it starts up. All successfully loaded import formats will be available to the user from the File/Import menu (see Importing Foreign Text Files for more information). This page discusses the development of import plug-ins.

Plug-In Files and Their Requirements

Each plug-in import module consists of two required files: a *.DLL file and a *.HTM file.

The DLL file must be named using the format MGIFF_xxx.dll, where "xxx" is the unique portion of the file's name. For example, the DLL filename for the Leica SKI import filter is "MGIFF_LeicaSKI.dll" (without the quotes). If a plug-in DLL's filename is not in this format, it will not be loaded. Note that, if the optional GFF_GetPluginName function is not provided by the DLL, the name displayed for the plugin will be the "xxx" portion of the DLL filename.

The HTM file must have the same filename as the DLL except that the extension must be "htm". In the example used, the HTM file would be "MGIFF_LeicaSKI.htm". The HTM file is used to supply information to the user about the formats supported by the DLL. Note that for DLLs that contain more than one format, the HTM file should document all formats.

Format Name Restrictions

Format names (see the GFF_GetPluginName, GFF_GetFirstFormatName, and GFF_GetNextFormatName functions below) must be no more than 50 characters in length. If a retrieved name is longer than 50 characters, it will be truncated. All format names returned must be unique.

Error Report File Format Requirements

When the GFF_TranslateFile function (see below) is called , and if errors are encountered in the specified input text file(s) to be translated, appropriate error message lines should be written to the specified error report file. Each message emitted by the DLL must be one-line comma-delimited messages in the following format:

```
"MessageText" , "LineNumber"
```

where MessageText is the text of the message, and LineNumber is the origin-1 (the first line is line 1) number of the line in the input text file where the error was encountered. For example, if an error occurred on the second line of the input file, the error report line would be formatted like:

```
"Illegal format for a distance value was encountered." , "2"
```

Note that the MessageText portion of the line must always be enclosed in quotes. For some types of errors a line number does not apply. Use -1 for the line number if you do not want the line number reported by GeoLab.

Internal Plug-In Structure

All import plug-ins must export the functions listed below (the GFF_GetPluginName is optional but its use is recommended). An import DLL can contain one or more format definitions, each with a unique name. Note that format names should be unique, descriptive, and less than 50 characters in length.

GFF_GetPluginName

Prototype: `BOOL GFF_GetPluginName(LPSTR name, LONG bufferSize);`

Description: This function is used to retrieve the NULL-terminated name (string) of the plugin. Note that this function is optional, and if it is not present in the DLL, the plugin name will be derived from the DLL filename as described above.

Return Values: If the plugin name is successfully retrieved, this function should return TRUE (non-zero), otherwise it should return FALSE (zero).

GFF_GetFormatCount

Prototype: `LONG GFF_GetFormatCount(VOID);`

Description: This function must return the number of formats contained in the DLL. Any number of formats may be contained in one plug-in DLL.

Return Values: The number of input formats contained in the DLL must be returned. If zero or less is returned, no formats will be loaded.

GFF_GetFirstFormatName

Prototype: `BOOL GFF_GetFirstFormatName(LPSTR name, LONG bufferSize);`

Description: This function must retrieve the NULL-terminated name (string) of the first format contained in the DLL, and copy it into the buffer pointed to by the name parameter. The bufferSize parameter specifies the number of bytes allocated to the name buffer, so that this function can ensure that it doesn't attempt to overwrite the buffer. The name retrieved by this function should not contain any "special" (e.g. '&') or control characters.

Return Values: If the first format name is successfully retrieved, this function should return TRUE (non-zero), otherwise it should return FALSE (zero).

GFF_GetNextFormatName

Prototype: `BOOL GFF_GetNextFormatName(LPSTR name, LONG bufferSize);`

Description: This function must retrieve the NULL-terminated name (string) of the next format contained in the DLL. The DLL is responsible for maintaining a record of which previous format name was retrieved using either this function or the `GFF_GetFirstFormatName` function. The `bufferSize` parameter specifies the number of bytes allocated to the name buffer, so that this function can ensure that it doesn't attempt to overwrite the buffer.

Return Values: If the next format name is successfully retrieved, this function should return `TRUE`. If there are no more next formats to retrieve, it must return `FALSE`.

GFF_TranslateFile

Prototype: `BOOL GFF_TranslateFile(LPCSTR formatname, LPCSTR inputfile, LPCSTR outputfile, LPCSTR errorfile, LONG maxerrors);`

Description: This function must translate the specified input text file (`inputfile`) to the specified GeoLab text file (`outputfile`). The parameters of this function are as follows:

Parameter Description

Parameter	Description
<code>formatname</code>	A pointer to a buffer containing the NULL-terminated name of the format to use for the translation of the input text file (<code>inputfile</code>) to the output GeoLab text file (<code>outputfile</code>). If the format name specified is not one supported by the DLL, <code>FALSE</code> must be returned.
<code>inputfile</code>	A pointer to a buffer containing the NULL-terminated filename of the text file that the user has chosen for translation. This file must be translated (converted) to the GeoLab "IOB" format.
<code>outputfile</code>	A pointer to a buffer containing the NULL-terminated filename of the text file to which the results of the translation must be written (in the GeoLab "IOB" format).
<code>errorfile</code>	A pointer to a buffer containing the NULL-terminated filename of the text file to which any error messages resulting from the DLL's attempt to perform the file translation. See above for the required format of this file. <code>maxerrors</code> : This parameter specifies the maximum number of error messages the DLL should write to the specified error report file (<code>errorfile</code>).

Return Values: If the file translation was successfully performed, this function must return `TRUE`. Otherwise it must return `FALSE`, and write a summary of the reasons for the failure to the file specified by the `errorfile` parameter (in the format specified above).

Using Network Windows

Project Options

Using the Project Options Dialog

GeoLab project options settings are controlled by special options files (with the extension CFG). The Edit GeoLab Options dialog box provides a systematic interface that allows you to easily edit the various options settings. This dialog box consists of five tabbed pages (Drawing, Adjustment, Statistics, Output Configuration, and Output Composition) as discussed below.

Drawing Page

This page contains controls that pertain to GeoLab's drawing (in a network window or on the printer) of survey networks. It contains the following controls:

Control	Description														
Network Drawing Attributes Group Box	This group box contains controls that allow you to choose how GeoLab should draw adjusted survey networks. The controls are as follows: <table border="1" data-bbox="548 1035 1385 1738"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Items List Box</td> <td>This list box contains the names of all items that GeoLab draws when drawing a network. Other controls in this group box display the settings for the currently selected item in this list box.</td> </tr> <tr> <td>Line Type List Box</td> <td>This list box displays all line types that GeoLab uses to draw lines, and allows you to select the line type for the currently selected item in the Items List Box.</td> </tr> <tr> <td>Color List Box</td> <td>This list box displays all colors that GeoLab uses to draw items, and allows you to select the color for the currently selected item in the Items List Box.</td> </tr> <tr> <td>Draw Selected Item Check Box</td> <td>This check box controls whether the currently selected item in the Items List Box is drawn. If checked, the item will be drawn; if not checked, the item will not be drawn.</td> </tr> <tr> <td>Draw All Button</td> <td>This button turns drawing on for all items in the Items List Box.</td> </tr> <tr> <td>Draw None Button</td> <td>This button turns drawing off for all items in the Items List Box.</td> </tr> </tbody> </table>	Control	Description	Items List Box	This list box contains the names of all items that GeoLab draws when drawing a network. Other controls in this group box display the settings for the currently selected item in this list box.	Line Type List Box	This list box displays all line types that GeoLab uses to draw lines, and allows you to select the line type for the currently selected item in the Items List Box.	Color List Box	This list box displays all colors that GeoLab uses to draw items, and allows you to select the color for the currently selected item in the Items List Box.	Draw Selected Item Check Box	This check box controls whether the currently selected item in the Items List Box is drawn. If checked, the item will be drawn; if not checked, the item will not be drawn.	Draw All Button	This button turns drawing on for all items in the Items List Box.	Draw None Button	This button turns drawing off for all items in the Items List Box.
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Draw All Button	This button turns drawing on for all items in the Items List Box.														
Draw None Button	This button turns drawing off for all items in the Items List Box.														
Show Title Block Check Box	This check box controls whether GeoLab displays the title block in a network drawing. If checked, the title block is displayed; if not checked the title block is not displayed.														
Control	Description														

Draw Connections Group Box	<p>This group box contains radio buttons that control which lines GeoLab will draw between stations in a network drawing. The radio buttons are as follows:</p> <table border="1" data-bbox="544 317 1385 443"> <thead> <tr> <th data-bbox="544 317 776 359">Control</th> <th data-bbox="776 317 1385 359">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="544 359 776 401">Observed Lines</td> <td data-bbox="776 359 1385 401">Draw only lines for which there are observations.</td> </tr> <tr> <td data-bbox="544 401 776 443">All Lines</td> <td data-bbox="776 401 1385 443">Draw all lines.</td> </tr> </tbody> </table>	Control	Description	Observed Lines	Draw only lines for which there are observations.	All Lines	Draw all lines.
Control	Description						
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All Lines	Draw all lines.						
Scrolling Group Box	<p>This group box contains drop-down lists that control the amounts that a network window is scrolled by scroll bar operations. Both values are percentages of the window size.</p> <table border="1" data-bbox="544 573 1385 758"> <thead> <tr> <th data-bbox="544 573 776 615">Control</th> <th data-bbox="776 573 1385 615">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="544 615 776 688">Line Up/Down</td> <td data-bbox="776 615 1385 688">The amount to scroll when a line up or line down scroll bar operation is made.</td> </tr> <tr> <td data-bbox="544 688 776 758">Page Up/Down</td> <td data-bbox="776 688 1385 758">The amount to scroll when a page up or page down scroll bar operation is made.</td> </tr> </tbody> </table>	Control	Description	Line Up/Down	The amount to scroll when a line up or line down scroll bar operation is made.	Page Up/Down	The amount to scroll when a page up or page down scroll bar operation is made.
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Line Up/Down	The amount to scroll when a line up or line down scroll bar operation is made.						
Page Up/Down	The amount to scroll when a page up or page down scroll bar operation is made.						
Grid Spacing (dms) Group Box	<p>The controls in this group box specify default grid spacing values used for drawing the latitude/longitude grid lines in a network window. The two values are as follows:</p> <table border="1" data-bbox="544 888 1385 1075"> <thead> <tr> <th data-bbox="544 888 776 930">Control</th> <th data-bbox="776 888 1385 930">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="544 930 776 1003">Latitude</td> <td data-bbox="776 930 1385 1003">The default grid spacing (in degrees, minutes, and seconds) for latitudes.</td> </tr> <tr> <td data-bbox="544 1003 776 1075">Longitude</td> <td data-bbox="776 1003 1385 1075">The default grid spacing (in degrees, minutes, and seconds) for longitudes.</td> </tr> </tbody> </table>	Control	Description	Latitude	The default grid spacing (in degrees, minutes, and seconds) for latitudes.	Longitude	The default grid spacing (in degrees, minutes, and seconds) for longitudes.
Control	Description						
Latitude	The default grid spacing (in degrees, minutes, and seconds) for latitudes.						
Longitude	The default grid spacing (in degrees, minutes, and seconds) for longitudes.						

Adjustment Page

This page contains controls that pertain to processing survey networks with GeoLab. It contains the following controls:

Control	Description						
Computation Type Group Box	This group box contains the following two radio buttons:						
	<table border="1"><thead><tr><th>Control</th><th>Description</th></tr></thead><tbody><tr><td>Adjustment</td><td>GeoLab will perform a network adjustment.</td></tr><tr><td>Simulation</td><td>GeoLab will perform a network simulation (preanalysis).</td></tr></tbody></table>	Control	Description	Adjustment	GeoLab will perform a network adjustment.	Simulation	GeoLab will perform a network simulation (preanalysis).
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Control	Description																
Computation Options Group Box	<p>This group box contains the following check boxes:</p> <table border="1" data-bbox="548 331 1383 1562"> <thead> <tr> <th data-bbox="548 331 776 373">Check Box</th> <th data-bbox="776 331 1383 373">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="548 373 776 506">Generate Initial Coordinates</td> <td data-bbox="776 373 1383 506">If this box is checked, GeoLab will generate initial coordinates for all network stations. If it is not checked, coordinate generation will not be performed.</td> </tr> <tr> <td data-bbox="548 506 776 667">Optimize Band Width</td> <td data-bbox="776 506 1383 667">If this box is checked, GeoLab will reorder the parameters in the normal equations to arrive at a minimum variable bandwidth (to speed adjustment computations). If it is not checked, no reordering will be performed.</td> </tr> <tr> <td data-bbox="548 667 776 829">Compute Full Inverse</td> <td data-bbox="776 667 1383 829">If this box is checked, GeoLab will compute the entire parameter covariance matrix. If it is not checked, only the portions of the parameter covariance matrix that correspond to stations connected by observations will be computed.</td> </tr> <tr> <td data-bbox="548 829 776 1045">Force Convergence</td> <td data-bbox="776 829 1383 1045">If this box is checked, GeoLab will consider that the adjustment has converged (even if it has not) when the specified maximum number adjustment iterations is reached. If it is not checked, the adjustment computation will be aborted when convergence is not reached in the specified maximum number adjustment iterations.</td> </tr> <tr> <td data-bbox="548 1045 776 1241">Distances Contribute to Heights</td> <td data-bbox="776 1045 1383 1241">If this box is checked, GeoLab will use a 3D observation equation for spatial distance measurements, thereby allowing these measurements to contribute to the determination of network heights. If it is not checked, the usual 2D observation equation will be used.</td> </tr> <tr> <td data-bbox="548 1241 776 1373">Perform Orthometric Corrections</td> <td data-bbox="776 1241 1383 1373">If this box is checked, GeoLab will make orthometric corrections to observed orthometric height differences (OHDF records). If it is not checked, orthometric corrections will not be made.</td> </tr> <tr> <td data-bbox="548 1373 776 1562">Re-Transform Obs After 1st Pass</td> <td data-bbox="776 1373 1383 1562">If this box is checked, GeoLab will re-transform 2D coordinate observations to their 3D counterparts before each adjustment iteration (to remove any inconsistencies caused by inaccurate initial coordinates). If it is not checked, these re-transformations will not be made.</td> </tr> </tbody> </table>	Check Box	Description	Generate Initial Coordinates	If this box is checked, GeoLab will generate initial coordinates for all network stations. If it is not checked, coordinate generation will not be performed.	Optimize Band Width	If this box is checked, GeoLab will reorder the parameters in the normal equations to arrive at a minimum variable bandwidth (to speed adjustment computations). If it is not checked, no reordering will be performed.	Compute Full Inverse	If this box is checked, GeoLab will compute the entire parameter covariance matrix. If it is not checked, only the portions of the parameter covariance matrix that correspond to stations connected by observations will be computed.	Force Convergence	If this box is checked, GeoLab will consider that the adjustment has converged (even if it has not) when the specified maximum number adjustment iterations is reached. If it is not checked, the adjustment computation will be aborted when convergence is not reached in the specified maximum number adjustment iterations.	Distances Contribute to Heights	If this box is checked, GeoLab will use a 3D observation equation for spatial distance measurements, thereby allowing these measurements to contribute to the determination of network heights. If it is not checked, the usual 2D observation equation will be used.	Perform Orthometric Corrections	If this box is checked, GeoLab will make orthometric corrections to observed orthometric height differences (OHDF records). If it is not checked, orthometric corrections will not be made.	Re-Transform Obs After 1st Pass	If this box is checked, GeoLab will re-transform 2D coordinate observations to their 3D counterparts before each adjustment iteration (to remove any inconsistencies caused by inaccurate initial coordinates). If it is not checked, these re-transformations will not be made.
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Convergence Criterion Edit Box	This edit box is used to specify the convergence criterion for adjustments.																
Maximum Matrix RAM Edit Box	This edit box specifies how much system memory GeoLab can use for each matrix. As a rule of thumb, you should not specify more than about one-quarter of system memory for each matrix. The higher the value you set, the more likely that GeoLab will do all computations in system memory, and if all computations are performed in system memory, the time to perform even large adjustments will be greatly reduced.																

Control	Description															
Observation Angle Unit List Box	This list box is used to select the units (either degrees, minutes, seconds, or grads) for angle-type observations.															
Maximum Iterations List Box	This list box is used to select the maximum number of iterations that GeoLab will perform when performing an adjustment.															
Maximum Errors List Box	This list box is used to select the maximum number of errors that GeoLab will allow before aborting an adjustment or simulation.															
Geoid Interpolation Method List Box	<p>This list box is used to select the method for interpolating geoid files between grid intersections. Each geoid interpolation method uses a polynomial for the geoid undulation in latitude and longitude increments of the form:</p> $a_{00} \cdot \Delta\lambda^0 \cdot \Delta\phi^0 + a_{01} \cdot \Delta\lambda^0 \cdot \Delta\phi^1 + a_{02} \cdot \Delta\lambda^0 \cdot \Delta\phi^2 + \dots$ $a_{10} \cdot \Delta\lambda^1 \cdot \Delta\phi^0 + a_{11} \cdot \Delta\lambda^1 \cdot \Delta\phi^1 + a_{12} \cdot \Delta\lambda^1 \cdot \Delta\phi^2 + \dots$ $a_{20} \cdot \Delta\lambda^2 \cdot \Delta\phi^0 + a_{21} \cdot \Delta\lambda^2 \cdot \Delta\phi^1 + a_{22} \cdot \Delta\lambda^2 \cdot \Delta\phi^2 + \dots \text{ etc.}$ <p>The methods currently supported by GeoLab are as follows:</p> <table border="1"> <thead> <tr> <th>Method Name</th> <th>Max. Power</th> <th>Number of Terms</th> </tr> </thead> <tbody> <tr> <td>Bi-Linear</td> <td>1</td> <td>4</td> </tr> <tr> <td>Bi-Quadratic</td> <td>2</td> <td>9</td> </tr> <tr> <td>Bi-Cubic</td> <td>3</td> <td>16</td> </tr> <tr> <td>Bi-Quartic</td> <td>4</td> <td>25</td> </tr> </tbody> </table>	Method Name	Max. Power	Number of Terms	Bi-Linear	1	4	Bi-Quadratic	2	9	Bi-Cubic	3	16	Bi-Quartic	4	25
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Bi-Linear	1	4														
Bi-Quadratic	2	9														
Bi-Cubic	3	16														
Bi-Quartic	4	25														
Adjustment Completion Sound Files Group Box	<p>This group box contains controls for specifying whether to play sounds after GeoLab finishes an adjustment or simulation. You can specify these options separately for both types of completion status (success or failure). Each row of controls in this group box is as follows:</p> <table border="1"> <thead> <tr> <th>Controls</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Checkbox</td> <td>If checked, the sound will be played; if not checked the sound will not be played.</td> </tr> <tr> <td>Edit Box</td> <td>Displays the sound file name.</td> </tr> <tr> <td>Button</td> <td>Allows you to browse for the sound file you wish to have played.</td> </tr> </tbody> </table>	Controls	Description	Checkbox	If checked, the sound will be played; if not checked the sound will not be played.	Edit Box	Displays the sound file name.	Button	Allows you to browse for the sound file you wish to have played.							
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Checkbox	If checked, the sound will be played; if not checked the sound will not be played.															
Edit Box	Displays the sound file name.															
Button	Allows you to browse for the sound file you wish to have played.															
Default Linear Unit List Box	This list box allows you to select the default linear unit for network processing.															
Default Ellipsoid List Box	This list box allows you to select the default reference ellipsoid for network processing.															

Statistics Page

This page contains controls that pertain to statistical tests and confidence regions. It contains the following controls:

Control	Description										
Variance Factor Group Box	<p>This group of variables specifies how the variance factor is used in performing adjustments with GeoLab. Please refer to Geodesy The Concepts, by Vanicek & Krakiwsky (1982), Chapter 13, for details on the significance of these selections. This group box contains the following check boxes:</p> <table border="1"> <thead> <tr> <th>Check Box</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Known</td> <td>If this box is checked (as it should normally be), GeoLab will perform adjustment statistics assuming the variance factor is known. If it is not checked, the statistics will be performed assuming the variance factor is unknown.</td> </tr> <tr> <td>Scale Covariance Matrix</td> <td>If this box is checked, GeoLab will multiply the parameter covariance matrix by the estimated variance factor. If it is not checked, this scaling will not be done.</td> </tr> <tr> <td>Scale Residual Variances</td> <td>If this box is checked, GeoLab will multiply the residual variances by the estimated variance factor. If it is not checked, this scaling will not be done.</td> </tr> </tbody> </table>	Check Box	Description	Known	If this box is checked (as it should normally be), GeoLab will perform adjustment statistics assuming the variance factor is known. If it is not checked, the statistics will be performed assuming the variance factor is unknown.	Scale Covariance Matrix	If this box is checked, GeoLab will multiply the parameter covariance matrix by the estimated variance factor. If it is not checked, this scaling will not be done.	Scale Residual Variances	If this box is checked, GeoLab will multiply the residual variances by the estimated variance factor. If it is not checked, this scaling will not be done.		
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Compute Confidence Regions Group Box	<p>This group box contains the following check boxes:</p> <table border="1"> <thead> <tr> <th>Check Box</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Point</td> <td>If this box is checked, GeoLab will produce point confidence regions when performing an adjustment or simulation (note that you must have at least one of the Vertical, Horizontal, and 3D check boxes checked for this checkbox to be enabled).</td> </tr> <tr> <td>Vertical</td> <td>If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative vertical confidence regions when performing an adjustment or simulation.</td> </tr> <tr> <td>Horizontal</td> <td>If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative horizontal confidence regions (error ellipses) when performing an adjustment or simulation.</td> </tr> <tr> <td>3D</td> <td>If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative three-dimensional confidence regions when performing an adjustment or simulation.</td> </tr> </tbody> </table>	Check Box	Description	Point	If this box is checked, GeoLab will produce point confidence regions when performing an adjustment or simulation (note that you must have at least one of the Vertical, Horizontal, and 3D check boxes checked for this checkbox to be enabled).	Vertical	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative vertical confidence regions when performing an adjustment or simulation.	Horizontal	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative horizontal confidence regions (error ellipses) when performing an adjustment or simulation.	3D	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative three-dimensional confidence regions when performing an adjustment or simulation.
Check Box	Description										
Point	If this box is checked, GeoLab will produce point confidence regions when performing an adjustment or simulation (note that you must have at least one of the Vertical, Horizontal, and 3D check boxes checked for this checkbox to be enabled).										
Vertical	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative vertical confidence regions when performing an adjustment or simulation.										
Horizontal	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative horizontal confidence regions (error ellipses) when performing an adjustment or simulation.										
3D	If this box is checked, GeoLab will produce point (if the Point checkbox is checked) and relative three-dimensional confidence regions when performing an adjustment or simulation.										

Control	Description										
Confidence Levels (10.0 - 99.999 percent) Group Box	<p>This group box is used to select confidence levels used for statistics when GeoLab performs an adjustment or simulation. It contains the following edit boxes:</p> <table border="1" data-bbox="548 394 1383 722"> <thead> <tr> <th data-bbox="548 394 773 434">Edit Box</th> <th data-bbox="773 394 1383 434">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="548 434 773 506">Residuals & Net Diffs</td> <td data-bbox="773 434 1383 506">Level for testing residuals and for testing the significance of network differences.</td> </tr> <tr> <td data-bbox="548 506 773 577">1D Confidence Regions</td> <td data-bbox="773 506 1383 577">Level used for determining the expansion factor for one dimensional regions.</td> </tr> <tr> <td data-bbox="548 577 773 648">2D Confidence Regions</td> <td data-bbox="773 577 1383 648">Level used for determining the expansion factor for two dimensional regions.</td> </tr> <tr> <td data-bbox="548 648 773 722">3D Confidence Regions</td> <td data-bbox="773 648 1383 722">Level used for determining the expansion factor for three dimensional regions.</td> </tr> </tbody> </table>	Edit Box	Description	Residuals & Net Diffs	Level for testing residuals and for testing the significance of network differences.	1D Confidence Regions	Level used for determining the expansion factor for one dimensional regions.	2D Confidence Regions	Level used for determining the expansion factor for two dimensional regions.	3D Confidence Regions	Level used for determining the expansion factor for three dimensional regions.
Edit Box	Description										
Residuals & Net Diffs	Level for testing residuals and for testing the significance of network differences.										
1D Confidence Regions	Level used for determining the expansion factor for one dimensional regions.										
2D Confidence Regions	Level used for determining the expansion factor for two dimensional regions.										
3D Confidence Regions	Level used for determining the expansion factor for three dimensional regions.										
Residual Rejection Type List Box	This list box is used to select the type of criterion to be used by GeoLab when determining whether residuals are to be rejected.										
Misclosure Flagging Factors Group Box	<p>This group box contains two edit controls for specifying factors to be used when GeoLab decides whether to flag a misclosure as large enough to be flagged as a potential problem. If the misclosure is larger than the observation standard deviation times the factor, the observation will be flagged) The edit boxes are as follows:</p> <table border="1" data-bbox="548 982 1383 1106"> <thead> <tr> <th data-bbox="548 982 773 1022">Edit Box</th> <th data-bbox="773 982 1383 1022">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="548 1022 773 1062">Linear</td> <td data-bbox="773 1022 1383 1062">The factor for linear-type observations.</td> </tr> <tr> <td data-bbox="548 1062 773 1106">Angular</td> <td data-bbox="773 1062 1383 1106">The factor for angular-type observations.</td> </tr> </tbody> </table>	Edit Box	Description	Linear	The factor for linear-type observations.	Angular	The factor for angular-type observations.				
Edit Box	Description										
Linear	The factor for linear-type observations.										
Angular	The factor for angular-type observations.										

Output Configuration Page

This page contains controls that pertain to the format of the output listing that GeoLab produces when performing an adjustment or simulation. It contains the following controls:

Control	Description														
Page Layout (Lines) Group Box	The controls in this group box specify how GeoLab should format pages in the output listing. Note that all values are in numbers of text lines. The controls are as follows:														
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Automatic (from printer setup)</td> <td>When checked, GeoLab will automatically choose the correct settings for your printer. When not checked, the settings in the Manual Settings group box will be used.</td> </tr> <tr> <td>Page Length</td> <td>The total number of text lines per printed page. This value should correspond to the number of text lines per page that your printer will print with the font selected.</td> </tr> <tr> <td>Top Margin</td> <td>The number of text lines in the top margin.</td> </tr> <tr> <td>Bottom Margin</td> <td>The number of text lines in the bottom margin.</td> </tr> </tbody> </table>	Control	Description	Automatic (from printer setup)	When checked, GeoLab will automatically choose the correct settings for your printer. When not checked, the settings in the Manual Settings group box will be used.	Page Length	The total number of text lines per printed page. This value should correspond to the number of text lines per page that your printer will print with the font selected.	Top Margin	The number of text lines in the top margin.	Bottom Margin	The number of text lines in the bottom margin.				
	Control	Description													
	Automatic (from printer setup)	When checked, GeoLab will automatically choose the correct settings for your printer. When not checked, the settings in the Manual Settings group box will be used.													
	Page Length	The total number of text lines per printed page. This value should correspond to the number of text lines per page that your printer will print with the font selected.													
	Top Margin	The number of text lines in the top margin.													
Bottom Margin	The number of text lines in the bottom margin.														
Output Decimal Places Group Box	The controls in this group box specify the numbers of decimal places that GeoLab will use in writing values to the output listing as follows:														
<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Angular Observations</td> <td>The number of decimal places for writing angular observation types.</td> </tr> <tr> <td>Linear Observations</td> <td>The number of decimal places for writing linear observation types.</td> </tr> <tr> <td>Latitudes/Longitudes</td> <td>The number of decimal places for writing latitudes and longitudes.</td> </tr> <tr> <td>Rotations in Seconds</td> <td>The number of decimal places for displaying 4-parameter and 7-parameter rotation values.</td> </tr> <tr> <td>Scales in PPM</td> <td>The number of decimal places for displaying 4-parameter and 7-parameter scale values.</td> </tr> <tr> <td>Map Projection Scales</td> <td>The number of decimal places for displaying map projection origin scale values.</td> </tr> </tbody> </table>	Control	Description	Angular Observations	The number of decimal places for writing angular observation types.	Linear Observations	The number of decimal places for writing linear observation types.	Latitudes/Longitudes	The number of decimal places for writing latitudes and longitudes.	Rotations in Seconds	The number of decimal places for displaying 4-parameter and 7-parameter rotation values.	Scales in PPM	The number of decimal places for displaying 4-parameter and 7-parameter scale values.	Map Projection Scales	The number of decimal places for displaying map projection origin scale values.	
Control	Description														
Angular Observations	The number of decimal places for writing angular observation types.														
Linear Observations	The number of decimal places for writing linear observation types.														
Latitudes/Longitudes	The number of decimal places for writing latitudes and longitudes.														
Rotations in Seconds	The number of decimal places for displaying 4-parameter and 7-parameter rotation values.														
Scales in PPM	The number of decimal places for displaying 4-parameter and 7-parameter scale values.														
Map Projection Scales	The number of decimal places for displaying map projection origin scale values.														

Control	Description												
Output Options Group Box	<p>The controls in this group box specify adjustment output options as follows:</p> <table border="1" data-bbox="548 365 1383 1083"> <thead> <tr> <th data-bbox="548 365 776 405">Control</th> <th data-bbox="776 365 1383 405">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="548 405 776 569">Show West Longitudes</td> <td data-bbox="776 405 1383 569">This option controls the display and printing format for longitudes. If not checked, longitudes will always be printed as east-longitudes (0-359), otherwise west-longitudes will be displayed and printed for points in the western hemisphere.</td> </tr> <tr> <td data-bbox="548 569 776 758">Print 3D Residuals as N, E, Up</td> <td data-bbox="776 569 1383 758">If checked, residuals for 3D coordinate and coordinate difference observations will be printed as values in the north, east, and up directions; if not checked, residuals for these observations will be printed as values in the directions of the geocentric Cartesian axes.</td> </tr> <tr> <td data-bbox="548 758 776 890">Print Canadian Order</td> <td data-bbox="776 758 1383 890">If checked, the Canadian order designation (Geodetic Survey of Canada 1973 Specifications) for the least accurate relative error ellipse will be printed.</td> </tr> <tr> <td data-bbox="548 890 776 989">Report Unrecognized Errors</td> <td data-bbox="776 890 1383 989">If checked, GeoLab will write a warning in the output listing when a non-blank unrecognized text record is encountered in the input text file.</td> </tr> <tr> <td data-bbox="548 989 776 1083">Do Chi-Square Test</td> <td data-bbox="776 989 1383 1083">If checked, GeoLab will write a summary of the adjustment's chi-square test on the variance factor to the output listing.</td> </tr> </tbody> </table>	Control	Description	Show West Longitudes	This option controls the display and printing format for longitudes. If not checked, longitudes will always be printed as east-longitudes (0-359), otherwise west-longitudes will be displayed and printed for points in the western hemisphere.	Print 3D Residuals as N, E, Up	If checked, residuals for 3D coordinate and coordinate difference observations will be printed as values in the north, east, and up directions; if not checked, residuals for these observations will be printed as values in the directions of the geocentric Cartesian axes.	Print Canadian Order	If checked, the Canadian order designation (Geodetic Survey of Canada 1973 Specifications) for the least accurate relative error ellipse will be printed.	Report Unrecognized Errors	If checked, GeoLab will write a warning in the output listing when a non-blank unrecognized text record is encountered in the input text file.	Do Chi-Square Test	If checked, GeoLab will write a summary of the adjustment's chi-square test on the variance factor to the output listing.
Control	Description												
Show West Longitudes	This option controls the display and printing format for longitudes. If not checked, longitudes will always be printed as east-longitudes (0-359), otherwise west-longitudes will be displayed and printed for points in the western hemisphere.												
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Print Canadian Order	If checked, the Canadian order designation (Geodetic Survey of Canada 1973 Specifications) for the least accurate relative error ellipse will be printed.												
Report Unrecognized Errors	If checked, GeoLab will write a warning in the output listing when a non-blank unrecognized text record is encountered in the input text file.												
Do Chi-Square Test	If checked, GeoLab will write a summary of the adjustment's chi-square test on the variance factor to the output listing.												

Output Composition Page

This page contains controls that pertain to the contents of an output listing that GeoLab produces when performing an adjustment or simulation. It contains the following controls:

Control	Description	
Print Input Values Group Box	The controls in this group box select which input information is written to the output listing as follows:	
	Control	Description
	Options Summary	If checked, a summary of the selected options is written to the output listing.
	Station Data	If checked, the input station data is written to the output listing.
Print Adjusted Values Group Box	The controls in this group box select which adjusted information is written to the output listing as follows:	
	Control	Description
	NEO Values	If checked, NEO records containing adjusted values are written.
	NEH Values	If checked, NEH records containing adjusted values are written.
	PLH Values	If checked, PLH records containing adjusted values are written.
	PLO Values	If checked, PLO records containing adjusted values are written.
	XYZ Values	If checked, XYZ records containing adjusted values are written.
	Auxiliary Parameter Values (AUX)	If checked, adjusted auxiliary parameter values are written.
	Scale & Convergence Values (SFMC)	If checked, point scale and meridian convergence values are written if the NEO or NEH Values are checked.
	Grid Distances and Azimuths	If checked, grid distances, grid azimuths, and combined scale factors are written if one or more map projections are used. The Connected Only (by observations) and All Lines radio buttons allow you to select which lines to list this information for.

Control	Description						
Print Adjustment Solution Group Box	The controls in this group box select whether adjustment solutions (adjustment corrections to the parameters) are written during adjustment iterations as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Enable</td> <td>If checked, the solution is written for the first pass of the adjustment; if not checked, no solution is written (even if the following check box is checked)</td> </tr> <tr> <td>All Passes (not only the first pass)</td> <td>If checked, solutions are written for all passes of the adjustment (but only if the previous check box is checked).</td> </tr> </tbody> </table>	Control	Description	Enable	If checked, the solution is written for the first pass of the adjustment; if not checked, no solution is written (even if the following check box is checked)	All Passes (not only the first pass)	If checked, solutions are written for all passes of the adjustment (but only if the previous check box is checked).
	Control	Description					
Enable	If checked, the solution is written for the first pass of the adjustment; if not checked, no solution is written (even if the following check box is checked)						
All Passes (not only the first pass)	If checked, solutions are written for all passes of the adjustment (but only if the previous check box is checked).						
Print Misclosures Group Box	The controls in this group box determine whether adjustment misclosures are written during adjustment iterations as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>First Pass</td> <td>If checked, misclosures are written for the first pass of the adjustment.</td> </tr> <tr> <td>Subsequent Passes</td> <td>If checked, misclosures are written for all passes of the adjustment.</td> </tr> </tbody> </table>	Control	Description	First Pass	If checked, misclosures are written for the first pass of the adjustment.	Subsequent Passes	If checked, misclosures are written for all passes of the adjustment.
	Control	Description					
First Pass	If checked, misclosures are written for the first pass of the adjustment.						
Subsequent Passes	If checked, misclosures are written for all passes of the adjustment.						
Print Residuals Group Box	The controls in this group box determine whether adjustment residuals are written as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Enable</td> <td>If checked, residuals are written.</td> </tr> <tr> <td>Rejects Only</td> <td>If checked (and if Enable is checked), only residuals flagged for rejection are written.</td> </tr> </tbody> </table>	Control	Description	Enable	If checked, residuals are written.	Rejects Only	If checked (and if Enable is checked), only residuals flagged for rejection are written.
	Control	Description					
Enable	If checked, residuals are written.						
Rejects Only	If checked (and if Enable is checked), only residuals flagged for rejection are written.						
Print Geoid Values Group Box	The control in this group box determines whether geoid values are written for each network station as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Enable</td> <td>If checked, geoid values are written.</td> </tr> </tbody> </table>	Control	Description	Enable	If checked, geoid values are written.		
Control	Description						
Enable	If checked, geoid values are written.						
Print Relative Confidence Regions Group Box	The controls in this group box determine whether, and which, relative confidence regions are written as follows:						
	<table border="1"> <thead> <tr> <th>Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>If checked, no confidence regions are written.</td> </tr> <tr> <td>Which Group Box</td> <td>If None is not checked, the controls in this check box determine which confidence regions to write as follows: All: All confidence regions; Connected: Only confidence regions for lines that have observations; Within Radius: Only confidence regions for lines not greater in length than the radius specified in Radius (km); Radius (km): The radius for the Within Radius option.</td> </tr> </tbody> </table>	Control	Description	None	If checked, no confidence regions are written.	Which Group Box	If None is not checked, the controls in this check box determine which confidence regions to write as follows: All: All confidence regions; Connected: Only confidence regions for lines that have observations; Within Radius: Only confidence regions for lines not greater in length than the radius specified in Radius (km); Radius (km): The radius for the Within Radius option.
	Control	Description					
None	If checked, no confidence regions are written.						
Which Group Box	If None is not checked, the controls in this check box determine which confidence regions to write as follows: All: All confidence regions; Connected: Only confidence regions for lines that have observations; Within Radius: Only confidence regions for lines not greater in length than the radius specified in Radius (km); Radius (km): The radius for the Within Radius option.						

Editing Drawing Scales

Using the Edit Drawing Scales Dialog

Drawing scales (for network windows) can be viewed and edited by selecting the Network/Drawing Scales menu command. The Edit Drawing Scales dialog box will be presented, which contains the following controls (note that all drawing scales are expressed in the form 1:nnn. For example, if you wish to enter a scale of 1:50,000, you would enter 50000.0):

Control	Description
Network Edit Box	The overall scale of the network drawing.
Overlays & Residuals Edit Box	The scale for drawing overlay network coordinate differences and observation residuals.
Error Ellipses Edit Box	The scale for drawing error ellipses (2D confidence regions).
Vertical Error Vectors Edit Box	The scale for drawing vertical error vectors (1D confidence regions) for heights and height differences.
Save As Defaults Button	This button allows you to change the default drawing scales that are used for new network windows. The default scales are set to the current values in the four edit boxes.
Set To Defaults Button	This button allows you to set the current values in the four edit boxes to the current default drawing scales.
OK Button	This button closes this dialog and sets the drawing scales to the values entered.
Cancel Button	This button closes this dialog without changing the current network's drawing scales. Any changes you made to the default drawing scales (using the Save As Defaults button) will be saved.
Help Button	This button displays this information.

Title Block Editor

Using the Title Block Editor

When you select the Network/Edit Title Block menu command, the Title Block Editor dialog box is displayed. This dialog allows you to edit the contents of a network window's title block. You can access this dialog in one of two ways:

- By selecting the Network/Edit Title Block menu command;
- By holding the Ctrl button down while clicking on the network window's title block.

The Title Block Editor dialog contains the following controls:

Control	Description										
Title Edit Box	This edit box displays the title (the top-most line of text) of the title block, and allows you to edit it. Initially the title is set to the contents of the TITL record in the input text files for the displayed network, or if the TITL record was blank or not supplied, the filename of the input IOB file. If more than one network is displayed in the current network window, this information is taken from the first network selected using the Network/Select Networks menu command.										
Line n Edit Boxes	These edit boxes allow you to edit the contents of the corresponding lines of the title block (where n can be from 1 to 8).										
Insert Scale Group Box	<p>This group box contains controls that make it easy for you to enter the current network window's drawing scales. The four radio buttons allow you to first select one of the following scales:</p> <table border="1"> <thead> <tr> <th>Scale</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Network</td> <td>The main network scale</td> </tr> <tr> <td>Overlay & Residuals</td> <td>The scale of overlay networks and residuals</td> </tr> <tr> <td>Horizontal Regions</td> <td>The scale of error ellipses</td> </tr> <tr> <td>Vertical Regions</td> <td>The scale of vertical error bars (height confidence intervals)</td> </tr> </tbody> </table> <p>When you select one of the above scales, the read-only edit box below the radio buttons is filled with text describing that scale. You can then click the Insert button to insert this text into the last selected Line n edit box. You should therefore perform the following actions to insert scale information into the title block:</p> <ul style="list-style-type: none"> Click in the Line n edit box into which you wish to insert scale information; Select the type of scale information you wish to insert using the radio buttons in the Insert Scale group box; Click the Insert button. 	Scale	Description	Network	The main network scale	Overlay & Residuals	The scale of overlay networks and residuals	Horizontal Regions	The scale of error ellipses	Vertical Regions	The scale of vertical error bars (height confidence intervals)
Scale	Description										
Network	The main network scale										
Overlay & Residuals	The scale of overlay networks and residuals										
Horizontal Regions	The scale of error ellipses										
Vertical Regions	The scale of vertical error bars (height confidence intervals)										
OK Button	This button closes this dialog, and makes any changes you specified to the title block.										

Control	Description
Cancel Button	This button closes this dialog without making any changes to the title block.
Help Button	This button displays this information.

Viewing Network Histograms

Using the Residual Histogram Viewer Dialog

When you select the View Histogram menu command (in a network window), the Residual Histogram Viewer dialog box is displayed. This dialog displays a histogram of selected observation types for the current network window. It contains the following controls:

Control	Description
Observation Types Group Box	This group box contains check boxes for all GeoLab observation types. The standardized residuals for all selected observation types are displayed in the histogram. If the current network does not have any observations of a certain type, the check box for that type will be disabled.
Select All Button	This button will select all observation types.
Select None Button	This button will deselect all observation types.
Close Button	This button closes the dialog box.
Help Button	This button displays this information.

Viewing Station Information

Using the Station Information Dialog

When you select the Network/Station Info menu command, the Station Information dialog box is displayed. This dialog displays station information for any station in the network displayed in the current network window. It contains the following controls:

Control	Description
Station Drop Down List Box	This list box is used to select the station for which you wish to view station information.
Ellipsoidal Group Box	This group box displays the ellipsoidal latitude, longitude, and height of the selected station.
Cartesian Group Box	This group box displays the Cartesian geocentric coordinates of the selected station.
Geoidal Group Box	This group box displays the deflection of the vertical and undulation of the selected station.
Astronomic Group Box	This group box displays the astronomic latitude, longitude, and orthometric height of the selected station.
Print To File Button	This button copies the current contents of the dialog to a new text window.
Close Button	This button closes the dialog.
Help Button	This button displays this information.

Viewing Station Difference Info

Using the Station Difference Information Dialog

When you select the Network/Station Differences menu command, the Station Difference Information dialog box is displayed. This dialog displays station difference information for any two stations in the network displayed in the current network window. It contains the following controls:

Control	Description
From Station Drop Down List Box	This list box is used to select the from-station of the line for which you wish to view station difference information.
To Station Drop Down List Box	This list box is used to select the to-station of the line for which you wish to view station difference information.
Geodetic Group Box	This group box displays the geodetic (ellipsoidal) azimuth, vertical angle, ellipsoidal height difference, and local geodetic coordinate differences between the currently selected stations.
Astronomic Group Box	This group box displays the astronomic azimuth, vertical angle, orthometric height difference, and local astronomic coordinate differences between the currently selected stations.
Geoidal Group Box	This group box displays the deflection of the vertical and undulation differences between the currently selected stations.
Cartesian Group Box	This group box displays the Cartesian geocentric coordinate differences between the currently selected stations.
Spatial Distance Text	This button displays the spatial distance between the currently selected stations.
Switch Stations Button	This button switches the from and to stations so that you can view the station difference information in the reverse direction for the currently selected stations.
Print To File Button	This button copies the current contents of the dialog to a new text window.
Close Button	This button closes the dialog.
Help Button	This button displays this information.

Common Coordinate Differences

Analyzing Common Coordinate Differences

You can use GeoLab to perform a statistical analysis on the coordinate differences between common stations in two separate network adjustments. To do this analysis, you must perform the following steps:

Create a new network window using the File/New Network menu command;
Open the networks that you want to analyze using the Network/Select Network(s) menu command;
In the Select Network(s) to Draw dialog, select the networks (adjustments) you wish to analyze (the first network in the list of networks is always considered the main network, and all others are considered overlay networks);
When the networks you wish to analyze are displayed in the network window, use the Network/Network Differences menu command to display the analysis of coordinate differences.

The Analysis of Common Coordinate Differences dialog contains the following controls:

Control	Description										
Network 1 Group Box	This group box displays the first network's name and number of stations. The first network is the first one you selected for the current network window in the Select Network(s) to Draw dialog.										
Network 2 Group Box	This group box displays the second network's name and number of stations. The second network is one of the other, besides the first, networks you selected for the current network window in the Select Network(s) to Draw dialog. If the current network window is displaying more than two networks, you can select the second network from the Filename drop down list box.										
Number of Common Stations Text	This text displays the number of common stations in network 1 and 2										
Station Coordinate Differences Summary Group Box	<p>This group box displays a summary of the coordinate differences between common stations for networks 1 and 2. The minimum, maximum, and RMS differences are given for the following difference types:</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Spatial</td> <td>The length of the 3D vector between the stations</td> </tr> <tr> <td>North/South</td> <td>The coordinate difference in the north/south direction</td> </tr> <tr> <td>East/West</td> <td>The coordinate difference in the east/west direction</td> </tr> <tr> <td>Up/Down</td> <td>The coordinate difference in the vertical direction</td> </tr> </tbody> </table>	Type	Description	Spatial	The length of the 3D vector between the stations	North/South	The coordinate difference in the north/south direction	East/West	The coordinate difference in the east/west direction	Up/Down	The coordinate difference in the vertical direction
Type	Description										
Spatial	The length of the 3D vector between the stations										
North/South	The coordinate difference in the north/south direction										
East/West	The coordinate difference in the east/west direction										
Up/Down	The coordinate difference in the vertical direction										
Statistical Test Group Box	This group box summarizes the statistical test on the sum of squares of the coordinate differences between the two networks.										
Print to File Button	This button writes the contents of this dialog to a new text window.										
Close Button	This button closes this dialog.										
Help Button	This button displays this information.										

Performing Adjustments

Network Processing

Using the Network Processing Setup Dialog

When you select the Network/Process menu command, the GeoLab Network Processing Setup dialog box is presented (also see Using the GeoLab Adjustment Wizard). This dialog allows you to process (perform an adjustment or simulation of) a survey network. It contains the following controls:

Control	Description
IOB File Box	This drop-down list box displays the selected input text file for the network to be processed, as well as a list of previously selected files.
Browse Button	This button displays a dialog box in which you can select an existing input text file for processing. The selected input text file name will be displayed in the IOB File box.
IOB File Mode Group Box	This group box contains two radio buttons that allow you to choose the mode for how the input text file will be handled. If you choose the All Records in IOB File mode, the network will be built and processed by interpreting the specified input text file (IOB file) in the normal manner. If you choose the #Includes Only in IOB File mode, you must use the Construct IOB button to specify the files to be included in the IOB file.
Construct IOB Button	This button displays the Select Include Files dialog, which allows you to select the input text files to be included in the input IOB file.
Options File (*.CFG) Group Box	This group box contains controls that allow you to select and edit the GeoLab options file to be used in processing the survey network. The File box displays the selected options file. The Browse button can be used to select another options file. The Edit button can be used to display the Edit GeoLab Options dialog. The Options Manager button is used to edit and create options files. The Initially select the following options file (*.CFG) group box allows you to specify which options file to automatically select when this dialog is initially displayed. When the Default options file radio button is checked, the GeoLab default options file will be selected. When the Last one selected radio button is checked, the previous options file you selected will be selected. When the One with the same path and name as the IOB file radio button is checked, GeoLab will try to find an options file with the same path and name as the selected IOB file; if none is found, the default options file will be selected.
Process Net Button	This button is used to start processing the selected network.
Close Button	This button closes the dialog box without processing the selected network.
Help Button	This button displays this information.

Selecting Include Files

Using the Select Include Files Dialog

This dialog is displayed when you click the Construct IOB Button in the GeoLab Network Processing Setup dialog box, and allows you to select include files for an input IOB file. It contains the following controls:

Control	Description
Included Files List Box	This list box displays the file names of all files to be included in the IOB file. You can add and delete file names from this list using the Add File and Remove File buttons respectively.
Add File Button	This button allows you to select an existing file to be added to the Included Files list box.
Remove File Button	This button allows you to remove a file from the Included Files list box. Note that it is just the file name that is removed from the list; the file itself is not affected.
File Type To Add Group Box	This group box allows you to select the type of file you wish to add to the Included Files list box. Selecting a file type here simply makes it easier for you to find the files when you use the Add File button, by showing only files of the selected type in the list presented.
OK Button	This button constructs the IOB file so that it contains one <code>#include</code> record for each file you specified in the Included Files list box, and closes the dialog.
Close Button	This button closes this dialog without constructing the IOB file.
Help Button	This button displays this information.

Processing Completed Dialog

Using the Network Processing Completed Dialog

This dialog is presented after the successful completion of network processing to give you the opportunity to decide whether to draw the network in a new network window. It contains the following controls:

Control	Description
Drawing Scales Group Box	This group box contains controls that allow you to specify the scales to use when drawing the adjusted network in a new network window (when you click the Draw Network button). If you select the Scale To Fit Window radio button, the network will be scaled to fit the new window, and the other three scales will be set to the current default values. If you select the Use the Following Scales (1:nnn) radio button, you can set all four scales to use. Note that these four scale settings are saved between adjustment runs so that you can have the network drawn at the same scales used for the previous adjustment. If you change the drawing scales while viewing the network, these four scales will be updated to the new values.
Draw Network Button	This button closes this dialog and draws the processed network in a new network window.
OK Button	This button closes this dialog without drawing the processed network.
Help Button	This button displays this information.

Adjustments Results Summary

Using the Adjustment Results Summary Dialog

If you have the Enable Display of Adjustment Summary Dialog option checked (in the GeoLab Preferences dialog) this dialog is presented after the successful completion of network processing to give you a summary of the adjustment results. Please note that only values that appear in the adjustment output listing are displayed. This dialog contains the following controls:

Control	Description
Station Confidence Regions Group Box	This group box contains controls that display station confidence region major semi-axes that are larger than the criterion set in the GeoLab Preferences dialog. If you double-click an item in the list of major semi-axis values, the corresponding line in the output listing will be scrolled into view. When one of these values is selected, the name of the station with that semi-axis value is displayed in the At edit box.
Relative Confidence Regions Group Box	This group box contains controls that display relative confidence region major semi-axes that are larger than the criterion set in the GeoLab Preferences dialog. If you double-click an item in the list of major semi-axis values, the corresponding line in the output listing will be scrolled into view. When one of these values is selected, the names of the two corresponding stations are displayed in the From and To edit boxes. Also, the line length and PPM values are displayed.
Standardized Residuals Group Box	This group box contains controls that display standardized residuals that are larger than the criterion set in the GeoLab Preferences dialog. If you double-click an item in the list of standardized residuals, the corresponding line in the output listing will be scrolled into view. When one of these values is selected, the names of the corresponding stations are displayed in the At, From, and To edit boxes. Also, the line length and PPM values are displayed if appropriate, and the actual residual and its standard deviation are displayed at the bottom of the group box.
Listing File Edit Box	This edit box displays the filename of the listing file for which the adjustment summary is displayed.
Variance Factor Edit Box	This edit box displays the adjustment variance factor, and a note on the success of the Chi-square test on the variance factor.
Close Button	This button closes this dialog. Note that once you close this dialog, you cannot open it again.
Help Button	This button displays this information.

Grid Spacing Dialog

Understanding the Grid Spacing Dialog Box

When GeoLab finds that too many grid lines would be drawn (in a network window) with the current option settings for latitude and longitude grid spacing the Grid Spacing dialog box is displayed (unless Disable Grid Spacing Dialog option is used; see Setting Preferences). This dialog contains the following controls:

Control	Description
Requested (dms) Group Box	This group box displays the requested (current options settings) grid spacing values in degrees, minutes, and seconds.
Actual (seconds) Group Box	This group box displays the new grid spacing values (in degrees, minutes, and seconds) that GeoLab will set automatically.
Don't show this dialog again Check Box	If this check box is checked, this dialog will not be displayed again. You can enable the display of this dialog again by editing the corresponding option in the drawing options.
OK Button	This button closes the dialog.
Help Button	This button displays this information.

The Adjustment Wizard

Using the GeoLab Adjustment Wizard

Performing network adjustments or simulations with GeoLab is simple when you use the Network/Adjustment Wizard menu command which displays the GeoLab Adjustment Wizard. This wizard makes it easy to perform adjustments by guiding you through a step-by-step process. It consists four pages as described in the following paragraphs.

Adjustment Wizard Page 1

This page contains two controls that allow you to specify a GeoLab input text file for the adjustment or simulation. The Input Text Filename (*.IOB) edit box displays the filename, and the Browse button allows you to select another filename. Note that you must have already prepared your input text file prior to running this wizard.

Adjustment Wizard Page 2

This page contains two controls that allow you to specify a GeoLab options file for the adjustment or simulation. The Options Filename edit box displays the filename, and the Browse button allows you to select another filename. If you want to edit an existing options file or create a new one, you can run the GeoLab Options Manager dialog by clicking the Options Manager button.

Adjustment Wizard Page 3

This page contains controls that specify network drawing options. The Draw network if adjustment is successful check box controls whether the network is drawn in a new network window when the adjustment computation is successfully completed. The Scale network to fit window check box, if checked, overrides the Network scale setting by setting it to a value that allows the entire network to fit within the network window. The Network Drawing Scales (1:nnn) group box contains four edit boxes that allow you to specify network drawing scales. The Set To Defaults button sets the values in these four edit boxes to the current GeoLab defaults.

Adjustment Wizard Page 4

This page, the final page of the wizard, displays the two file settings you selected in the Input Text File and Options File read-only edit boxes. The Computation type group box allows you to select either an adjustment or a simulation. Once you have selected the computation type, clicking the Finish button will result in GeoLab performing the computation you selected.

Managing Network Layers

Using the Network Layers Manager Dialog

When you select the Tools/Network Layers Manager menu command, the Network Layers Manager dialog is presented. This dialog allows you to create and edit special network layers files which contain the specification of a network layer number for each station in the file. A network layers file is accessed by the Load Layer Definitions button in Page 1 of the Canadian Accuracy Standards 1996 Wizard.

The Network Layers Manager dialog contains the following controls:

Control	Description
Network Layers File Group Box	This group box contains controls that allow you to specify and revise the network layers file. The Filename edit box displays the name of the current layers file. The New button creates a new layers file. The Load button loads the contents of an existing layers file. The Save button saves changes to the currently open layers file. The Save As button allows you to save the current layers assignments to another layers file.
Layer List Box	This list box contains the layer numbers that are assigned to stations in the current layers file.
Stations Assigned to that Layer List Box	This list box displays the names of all stations assigned the layer number currently selected in the Layer list box.
Layer to Assign Drop-Down List Box	This list box contains the layer numbers that you can assign to the currently selected station in the Stations Assigned to that Layer list.
Assign this Layer Button	Clicking this button assigns the layer number currently selected in the Layer to Assign list to the currently station in the Stations Assigned to that Layer list.
Add Adjustment Button	This button loads all stations from a specified GeoLab adjustment file into the current layers file. Any stations in the specified adjustment file that are already in the list are assigned the network layer found in the adjustment file.
New Station Button	This button presents the New Station Layer Assignment dialog which allows you to create a new station name entry in the current layers file.
Remove Station Button	This button removes the currently selected station in the Stations Assigned to that Layer list.
Close Button	This button closes this dialog. You will be prompted if changes to the current layers file have not been saved.
Help Button	This button displays this information.

New Station Layer Assignment Dialog

This dialog is presented when you click the New Station button in the Network Layers Manager dialog, and allows you to create a new station name and associated network layer assignment. This dialog contains the following controls:

Control	Description
Name Edit Box	This edit box allows you to enter a new station name.
Layer Edit Box	This edit box allows you to enter a station layer for the station.
OK Button	This button is enabled once you have entered a valid station name and network layer number, and returns the entered data to the Network Layers Manager dialog.
Cancel Button	This button cancels the creation of a new station name and layer assignment.

Listing Adjusted Coordinates

Using the Adjusted Coordinates Lister Dialog

You can produce a listing of adjusted coordinates into a text window by selecting the Network/Adjusted Coordinates List menu command which displays the GeoLab Adjusted Coordinates Lister dialog box. This dialog contains the following controls:

Control	Description
Filename Box	This box displays the filename of the adjusted network for which you wish to generate adjusted coordinates records. You can select an adjusted network using the Browse button.
Browse Button	This button will display a dialog from which you can select an adjusted network.
Output Type Group Box	This group box contains radio button for all the record types from which you can select. Please refer to the documentation of the PL, PLH, PLO, NE, NEH, NEO, and XYZ records for more information.
Linear Decimals Group Box	This group box contains radio buttons for all the linear decimal places settings from which you can select. All linear values (e.g. distances) will be formatted with the specified number of decimal places.
Angular Decimals Group Box	This group box contains radio buttons for all the angular decimal places settings from which you can select. All angular values (e.g. latitudes) will be formatted with the specified number of decimal places.
Write List Button	This button will write the adjusted coordinate records into the current text window according to the current configuration. After the records are written, the dialog will be closed.
Close Button	This button will close the dialog box without writing the adjusted coordinates records.
Help Button	This button displays this information.

User-Defined Station Lists

Using the User-Defined Station Data Lister Dialog

When you select the Network/Station Data Lister menu item, the User-Defined Station Data Lister dialog box is presented. This dialog allows you to design and create text records containing various adjusted station data from a GeoLab adjustment. The output text records are written into a new text window. This dialog contains the following controls:

Control	Description
Source (GeoLab Adjustment) Group Box	This group box contains controls that allow you to specify the GeoLab adjustment file to use as a source for adjusted station data. The Set Source File button presents you with a dialog from which you can select an adjustment. The File edit box is read-only and simply displays the file name you select.
Output Options Group Box	This group box contains the Write Field Names Header check box, which allows you to toggle the writing of a field names header record on and off. If written, the field names header record is the first record written to the output text file. This group box also contains the Edit Decimal Places button, which displays the Edit Decimal Places dialog, allowing you to change the numbers of decimal places used to list the various field data items.
Current Fields List Box	This list box displays all fields currently defined for the output text records. The fields are shown in the order that the corresponding adjusted data will be written to output text records.
Insert Field Button	This button inserts a new field into the Current Fields list box. The new field's name, type, and format are specified by the current settings in the New Field Definition group box. The new field is inserted after the currently selected field in the Current Fields list box.
Replace Field Button	This button replaces the currently selected field in the Current Fields list box. The new field's name, type, and format are specified by the current settings in the New Field Definition group box.
Delete Field Button	This button deletes the currently selected field in the Current Fields list box.
Move Field Up Button	This button moves the currently selected field in the Current Fields list box up one space.
Move Field Down Button	This button moves the currently selected field in the Current Fields list box down one space.
Template File Group Box	This group box contains controls that you can use to save your field definitions in a template file. The New... button creates a new empty field definition with no associated file. The Open button allows you to select an existing template file which is loaded into this dialog. The Save button saves changes to the current template (if it is untitled, you will be prompted to enter a file name). The Save As button allows you to save the current template with another file name.

Control	Description																																						
New Field Definition Group Box	<p>This group box contains controls that allow you to select the name, type, and format for a new field. The Name edit box allows you to enter or modify the name for the field. Note that, once you have selected the desired field type from the Type drop down list box, you can double-click on the Name edit box to set the field name to the name of the field type. The Type drop down list box contains a list of all field types as follows:</p> <table border="1" data-bbox="545 516 1385 1499"> <thead> <tr> <th data-bbox="545 516 824 556">Field Type</th> <th data-bbox="824 516 1385 556">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="545 556 824 596">Station Name</td> <td data-bbox="824 556 1385 596">The station's unique name</td> </tr> <tr> <td data-bbox="545 596 824 667">Northing</td> <td data-bbox="824 596 1385 667">The station's northing (map projection coordinate)</td> </tr> <tr> <td data-bbox="545 667 824 739">Easting</td> <td data-bbox="824 667 1385 739">The station's easting (map projection coordinate)</td> </tr> <tr> <td data-bbox="545 739 824 810">Scale Factor</td> <td data-bbox="824 739 1385 810">The station's point scale factor (map projection)</td> </tr> <tr> <td data-bbox="545 810 824 882">Meridian Convergence</td> <td data-bbox="824 810 1385 882">The station's meridian convergence (map projection)</td> </tr> <tr> <td data-bbox="545 882 824 953">Projection Name</td> <td data-bbox="824 882 1385 953">The name of the map projection used for the above map projection-related information;</td> </tr> <tr> <td data-bbox="545 953 824 993">Latitude</td> <td data-bbox="824 953 1385 993">The station's ellipsoidal latitude</td> </tr> <tr> <td data-bbox="545 993 824 1033">Longitude</td> <td data-bbox="824 993 1385 1033">The station's ellipsoidal longitude</td> </tr> <tr> <td data-bbox="545 1033 824 1073">Orthometric Height</td> <td data-bbox="824 1033 1385 1073">The station's orthometric height (elevation)</td> </tr> <tr> <td data-bbox="545 1073 824 1113">Ellipsoidal Height</td> <td data-bbox="824 1073 1385 1113">The station's ellipsoidal height</td> </tr> <tr> <td data-bbox="545 1113 824 1152">Geoid Undulation</td> <td data-bbox="824 1113 1385 1152">The station's geoidal height</td> </tr> <tr> <td data-bbox="545 1152 824 1192">X-Coordinate</td> <td data-bbox="824 1152 1385 1192">The station's geocentric X-coordinate</td> </tr> <tr> <td data-bbox="545 1192 824 1232">Y-Coordinate</td> <td data-bbox="824 1192 1385 1232">The station's geocentric Y-coordinate</td> </tr> <tr> <td data-bbox="545 1232 824 1272">Z-Coordinate</td> <td data-bbox="824 1232 1385 1272">The station's geocentric Z-coordinate</td> </tr> <tr> <td data-bbox="545 1272 824 1344">N/S Deflection</td> <td data-bbox="824 1272 1385 1344">The station's north/south deflection of the vertical</td> </tr> <tr> <td data-bbox="545 1344 824 1415">E/W Deflection</td> <td data-bbox="824 1344 1385 1415">The station's east/west deflection of the vertical</td> </tr> <tr> <td data-bbox="545 1415 824 1455">Astro Latitude</td> <td data-bbox="824 1415 1385 1455">The station's astronomic latitude</td> </tr> <tr> <td data-bbox="545 1455 824 1495">Astro Longitude</td> <td data-bbox="824 1455 1385 1495">The station's astronomic longitude</td> </tr> </tbody> </table>	Field Type	Description	Station Name	The station's unique name	Northing	The station's northing (map projection coordinate)	Easting	The station's easting (map projection coordinate)	Scale Factor	The station's point scale factor (map projection)	Meridian Convergence	The station's meridian convergence (map projection)	Projection Name	The name of the map projection used for the above map projection-related information;	Latitude	The station's ellipsoidal latitude	Longitude	The station's ellipsoidal longitude	Orthometric Height	The station's orthometric height (elevation)	Ellipsoidal Height	The station's ellipsoidal height	Geoid Undulation	The station's geoidal height	X-Coordinate	The station's geocentric X-coordinate	Y-Coordinate	The station's geocentric Y-coordinate	Z-Coordinate	The station's geocentric Z-coordinate	N/S Deflection	The station's north/south deflection of the vertical	E/W Deflection	The station's east/west deflection of the vertical	Astro Latitude	The station's astronomic latitude	Astro Longitude	The station's astronomic longitude
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Format Group Box	This group box contains six radio buttons used to indicate and select the data format to be used when inserting a field into a text record. For angular data, you can choose from Radians, Degrees, DMS, Degrees and Decimal Minutes, and Seconds. For other field types, the format will be selected automatically.																																						
Field Delimiter Group Box	This group box allows you to select one of four field delimiter characters (field separator character) to be used when forming the text records.																																						

Control	Description
Make Listing Button	This button generates the text records according to the settings in the dialog. The text records are written into a new text window.
Close Button	This button closes this dialog.
Help Button	This button displays this information.

Using the Edit Decimal Places Dialog

In the User-Defined Station Data Lister dialog, when you click the Edit Decimal Places button, this dialog is displayed, allowing you to configure the numbers of decimal places to use for listing the various station data. This dialog contains the following controls:

Control	Description
Linear Types Group	This group contains a drop-down list for all station data linear values from which you can select the desired number of decimal places for each data type.
Angular Types Group	This group contains a drop-down list for all station data angular values from which you can select the desired number of decimal places for each data type.
OK Button	This button closes the dialog and saves any changes you made to the numbers of decimal places.
Cancel Button	This button closes the dialog and ignores any changes you made to the numbers of decimal places.

Extracting Adjusted Observations

Using the GeoLab Coordinate Observations Extraction Dialog

The Network/Extract Observations menu command is used to extract a set of adjusted coordinates and corresponding covariance matrix from an adjusted network. The extracted data is formatted into a set of GeoLab input text records that can be used as observations in another adjustment. The GeoLab Coordinate Observations Extraction dialog box is presented which contains the following controls:

Control	Description										
GeoLab Adjustment File Group Box	This group box displays the file name of the GeoLab adjustment from which the extraction will be made. The Browse button allows you to set or change the adjustment file.										
Selected Stations Group Box	This group box displays a list of stations in the selected adjustment file. You can click on a station name in the list to toggle its selection on and off. The Select All button selects all stations in the list. The Select None button deselects all stations in the list. The Toggle Selections button selects all non-selected stations and deselects all selected stations.										
Output Type (Dimension) Group Box	This group box allows you to choose the type of coordinate observation record to place in the coordinate observation set. You can choose from the following types: <table border="1" data-bbox="548 1060 1383 1413"> <thead> <tr> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1D EHGT Records</td> <td>Ellipsoidal height records</td> </tr> <tr> <td>2D PL Records</td> <td>Latitude (ϕ) and longitude (λ) records with the covariance matrix in the LG system</td> </tr> <tr> <td>3D PLH Records</td> <td>Latitude (ϕ), longitude (λ), and ellipsoidal height (h) records with the covariance matrix in the LG system</td> </tr> <tr> <td>3D XYZ Records</td> <td>CT X, Y, Z coordinates with the covariance matrix in the CT system</td> </tr> </tbody> </table>	Type	Description	1D EHGT Records	Ellipsoidal height records	2D PL Records	Latitude (ϕ) and longitude (λ) records with the covariance matrix in the LG system	3D PLH Records	Latitude (ϕ), longitude (λ), and ellipsoidal height (h) records with the covariance matrix in the LG system	3D XYZ Records	CT X, Y, Z coordinates with the covariance matrix in the CT system
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3D PLH Records	Latitude (ϕ), longitude (λ), and ellipsoidal height (h) records with the covariance matrix in the LG system										
3D XYZ Records	CT X, Y, Z coordinates with the covariance matrix in the CT system										
Use Variance Factor Check Box	This check box controls whether the estimated variance factor of the adjustment is used to scale the extracted covariance matrix. If checked, the covariance matrix is scaled, otherwise the variance factor is not used.										
Save Station Selections Button	This button is enabled when you have at least one station selected in the stations list. The names of all selected stations are written to the specified file so that you can later reload them (using the Load Station Selections button).										
Load Station Selections Button	This button is used to load a previously-saved (with the Save Station Selections button) stations selections file. When the file is loaded, all stations in the stations list are deselected, then any station names found in the file are selected.										

Control	Description
Extract Button	This button closes this dialog and inserts the specified observation set records into a new text window.
Close Button	This button closes this dialog without extracting the observation set records.
Help Button	This button displays this information.

Deleting Adjustment Files

Using the Delete GeoLab Files Dialog

When you process networks with GeoLab, a number of adjustment (or simulation) files are created in which various data are stored. After you are finished with the network adjustment results, you may want to reclaim the disk space that these files are using. To make it easy to clean these files up, the File/Delete GeoLab Files menu command displays the Delete GeoLab Files dialog box which contains the following controls:

Control	Description
Networks List Box	This list box displays all GeoLab adjusted networks found in the current directory. When you select a network in this list, the Files To Delete list box is filled with the names of files belonging to the selected network. You can use the Browse button to change to another directory.
Files To Delete List Box	This list box displays the names of files belonging to the network selected in the Networks list box. Once you have selected the files that you wish to delete (usually all of them), the Delete button can be used to delete them.
Browse Button	This button displays a dialog box in which you can select another directory from which to delete GeoLab network files. The Networks and Files To Delete list boxes will be updated accordingly.
Select All Button	This button will select all files in the Files To Delete list box.
Select None Button	This button will deselect all files in the Files To Delete list box.
Delete Button	This button will result in the deletion of all selected files in the Files To Delete list box. You cannot undo this operation.
Close Button	This button will close the dialog box.
Help Button	This button displays this information.

Managing Station Lists

Using the Station List Manager Dialog

The management of GeoLab station lists is performed using the Station List Manager dialog which is accessed by selecting the Tools/Station List Manager menu command. This dialog allows you to create and edit GeoLab station lists. A station list contains a list of pre-defined stations with the following information for each station:

Information	Description
Station name	The unique station name (up to 31 characters)
Latitude	The station's ellipsoidal latitude (with respect to the specified reference ellipsoid)
Longitude	The station's ellipsoidal longitude (with respect to the specified reference ellipsoid)
Ellipsoidal height	The station's ellipsoidal height (with respect to the specified reference ellipsoid in the specified linear unit)
Geoid undulation	The station's undulation (with respect to the specified reference ellipsoid; in the specified linear unit)
N/S deflection of the vertical	The station's north/south deflection component (with respect to the specified reference ellipsoid)
E/W deflection of the vertical	The station's east/west deflection component (with respect to the specified reference ellipsoid)
Linear unit	The linear unit of the station's ellipsoidal height and undulation.
Reference ellipsoid	The reference ellipsoid for the station's latitude, longitude, height, and geoid components.

This dialog contains the following controls:

Control	Description
Station List File Group Box	This group box contains an edit box that displays the current station list file. The New List button is used to create a new list file, and the Open List button is used to open an existing list file. Both buttons present you with a dialog for selecting the file.
Station List Box	This list box displays (in alphabetical order) the names of all stations in the current station list file.
Add Button	This button presents the Edit Station Data dialog so that you can enter data for a new station to add to the list.
Edit Button	This button presents the Edit Station Data dialog so that you can edit data for the currently selected station in the list. If you edit the station name, the station with the original name is deleted from the list, and the station with the new name is added to the list.
Delete Button	This button deletes the currently selected station from the list. You cannot undo this deletion.

Control	Description								
Load Stations Group Box	<p>The controls in this group box are used to load station data into the current list. You can choose from the following types of files from which to load (radio buttons in the Load From group box):</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Text Input File</td> <td>An existing GeoLab text input file containing GeoLab text records (if you choose an unsaved file that is open in a text window, you will be prompted to save it)</td> </tr> <tr> <td>Adjusted Network</td> <td>An existing set of files produced by a GeoLab adjustment or simulation</td> </tr> <tr> <td>Station List File</td> <td>An existing GeoLab station list file</td> </tr> </tbody> </table>	Type	Description	Text Input File	An existing GeoLab text input file containing GeoLab text records (if you choose an unsaved file that is open in a text window, you will be prompted to save it)	Adjusted Network	An existing set of files produced by a GeoLab adjustment or simulation	Station List File	An existing GeoLab station list file
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Text Input File	An existing GeoLab text input file containing GeoLab text records (if you choose an unsaved file that is open in a text window, you will be prompted to save it)								
Adjusted Network	An existing set of files produced by a GeoLab adjustment or simulation								
Station List File	An existing GeoLab station list file								
Clear List Before Loading Check Box	If this check box is checked, the stations in the current station list will be deleted before those in the specified file are loaded into the list. If it is not checked, the stations in the specified file are added to the current list.								
Load Station Into List Button	This button presents you with a dialog for selecting the file you wish to load from, and loads the stations found into the current station list.								
Close Button	This button closes the dialog.								
Help Button	This button displays this information.								

Editing Station Data

Using the Edit Station Dialog

The Edit Station dialog allows you to edit the data for a station in a GeoLab station data list. It contains the following controls:

Control	Description
Linear Unit Drop Down List Box	This list box displays the linear unit that the station data is displayed in. When you select a different linear unit from this list, the data is converted to that unit.
Reference Ellipsoid Drop Down List Box	This list box displays the reference ellipsoid that the station data is displayed relative to. When you select a different reference ellipsoid from this list, the data is converted to that reference ellipsoid.
Station Name Edit Box	This edit box is used for editing the station name for the station. Station names can be from 1-31 characters in length.
Latitude (dms) Edit Box	This edit box is used for editing the station's latitude. You must enter the latitude in degrees, minutes, and seconds, and you may prefix it with a 'N' (north latitude) or a 'S' (south latitude) character.
Longitude (dms) Edit Box	This edit box is used for editing the station's longitude. You must enter the longitude in degrees, minutes, and seconds, and you may prefix it with a 'E' (east longitude) or a 'W' (west longitude) character.
Ellipsoidal Height Edit Box	This edit box is used for editing the station's ellipsoidal height.
Geoid Undulation Edit Box	This edit box is used for editing the station's geoid undulation.
N/S Deflection (sec) Edit Box	This edit box is used for editing the station's north/south deflection of the vertical component. It must be entered in seconds of arc.
E/W Deflection (sec) Edit Box	This edit box is used for editing the station's east/west deflection of the vertical component. It must be entered in seconds of arc.
Station Level Drop Down List Box	This drop down list allows you to view and select the level for the station. The station level is for future use in the implementation of developing national standards.
OK Button	This button closes this dialog box, and records any changes you made to the station data.
Cancel Button	This button closes this dialog box, and ignores any changes you made to the station data.
Help Button	This button displays this information.

Using GeoLab's Special Tools

Geoid Manager

Using the GeoLab Geoid Manager

The Geoid Manager performs many tasks for creating and using geoid data with GeoLab. Select the Tools/Geoid Manager menu command to display the Geoid Manager dialog. To understand the processes involved with managing and using geoid information with GeoLab, you must keep the following in mind:

A geoid specification file is a file that contains information about the location and contents of a geoid data file;

A geoid data file is the file referred to in a geoid specification file that actually contains the geoid data (geoid undulations over a specified grid).

Important: A valid geoid specification file always refers to an existing geoid data file. The geoid specification file contains the filename of the geoid data file, so once you have set up a geoid specification file to refer to a specific data file, you should not move the data file.

The Geoid Manager dialog box allows you to load, create, or edit a geoid specification file, and perform other geoid-related functions. It contains the following controls:

Control	Description
New Button	This button allows you to start editing a new geoid file specification.
Open Button	This button allows you to open an existing geoid file specification.
Save Button	This button allows you to save changes you have made to the geoid specification file. If the geoid specification file is untitled, you will be prompted for a filename.
Save As Button	This button allows you to save the contents of the current geoid specification file with another filename.
Description Edit Box	This edit box allows you to enter or edit a description for the geoid specification.

Control	Description										
Geoid data file Group	This group contains a read-only edit box that displays the currently selected geoid data filename for which you are editing the geoid specification file. The two buttons in this group are as follows:										
	<table border="1"> <thead> <tr> <th>Button</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Browse Button</td> <td>This button presents you with a dialog from which you can select the geoid data file to which the current geoid specification file will refer. The selected geoid file must already exist.</td> </tr> <tr> <td>Create Button</td> <td>This button presents the Create Geoid Data File dialog that allows you to create a new geoid data file.</td> </tr> </tbody> </table>	Button	Description	Browse Button	This button presents you with a dialog from which you can select the geoid data file to which the current geoid specification file will refer. The selected geoid file must already exist.	Create Button	This button presents the Create Geoid Data File dialog that allows you to create a new geoid data file.				
	Button	Description									
Browse Button	This button presents you with a dialog from which you can select the geoid data file to which the current geoid specification file will refer. The selected geoid file must already exist.										
Create Button	This button presents the Create Geoid Data File dialog that allows you to create a new geoid data file.										
Linear Unit List Box	This drop-down list box allows you to specify the linear unit for undulations in the geoid data file.										
Ellipsoid List Box	This drop-down list box allows you to specify the reference ellipsoid to which undulations in the geoid file are referred.										
Undulation Type List Box	This drop-down list box allows you to select the type of data (IEEE integer and floating point formats) used in the geoid file for the undulation values. The types are:										
	<table border="1"> <thead> <tr> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>2-Byte Int</td> <td>Two byte signed integer</td> </tr> <tr> <td>4-Byte Int</td> <td>Four byte signed integer</td> </tr> <tr> <td>4-Byte Real</td> <td>Four byte real number</td> </tr> <tr> <td>8-Byte Real</td> <td>Eight byte real number</td> </tr> </tbody> </table>	Type	Description	2-Byte Int	Two byte signed integer	4-Byte Int	Four byte signed integer	4-Byte Real	Four byte real number	8-Byte Real	Eight byte real number
	Type	Description									
	2-Byte Int	Two byte signed integer									
	4-Byte Int	Four byte signed integer									
4-Byte Real	Four byte real number										
8-Byte Real	Eight byte real number										
Data file layout (bytes) Group	This group contains controls used to specify the structure (all values in numbers of bytes) of the binary geoid data file. These controls are as follows:										
	<table border="1"> <thead> <tr> <th>Button</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Header Size Edit Box</td> <td>This edit box allows you to specify the number of bytes in the geoid file that must be skipped over to get to the first geoid undulation record.</td> </tr> <tr> <td>Record Size Edit Box</td> <td>This edit box allows you to specify the length in bytes of each undulation record in the geoid file. For most geoid files the record size is the same as the size of the undulation data type.</td> </tr> <tr> <td>Data Offset Edit Box</td> <td>This edit box allows you to specify the number of bytes in each undulation record that must be skipped to get to the first byte of the undulation. For most geoid files the data offset is zero.</td> </tr> </tbody> </table>	Button	Description	Header Size Edit Box	This edit box allows you to specify the number of bytes in the geoid file that must be skipped over to get to the first geoid undulation record.	Record Size Edit Box	This edit box allows you to specify the length in bytes of each undulation record in the geoid file. For most geoid files the record size is the same as the size of the undulation data type.	Data Offset Edit Box	This edit box allows you to specify the number of bytes in each undulation record that must be skipped to get to the first byte of the undulation. For most geoid files the data offset is zero.		
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Data Offset Edit Box	This edit box allows you to specify the number of bytes in each undulation record that must be skipped to get to the first byte of the undulation. For most geoid files the data offset is zero.										

Control	Description								
Latitude Major Order Check Box	<p>If this check box is checked, the undulations in the geoid data file must be in "latitude major" order, otherwise they must be in "longitude major" order. In terms of reading a book, when both latitude spacing and longitude spacing are positive, latitude major order means that the undulations are read from left to right (west to east) and from bottom to top (south to north) That is, the "sentences" go from left to right and we read them from bottom to top. Longitude major order in this case (both latitude spacing and longitude spacing are positive) would mean that the undulations are read from bottom to top (south to north), and from left to right (west to east). That is, the "sentences" go from bottom to top and we read them from left to right.</p> <p>Note that the first undulation in the geoid file is always the value for the from-latitude and from-longitude.</p> <p>When latitude major order is selected, the longitude is incremented (by the longitude spacing value) across all longitude values, and then the latitude is incremented. If both the latitude spacing and longitude spacing are positive, this would result in starting at the south east corner and proceeding east to west for each latitude until the north west corner is reached.</p> <p>When latitude major order is not selected, the latitude is incremented (by the latitude spacing value) across all latitude values, and then the longitude is incremented. If both the latitude spacing and longitude spacing are positive, this would result in starting at the south east corner and proceeding south to north for each longitude until the north west corner is reached.</p>								
Latitudes (d m s) Group	<p>The edit boxes in this group are used to specify the latitude range and spacing as follows:</p> <table border="1" data-bbox="548 1184 1373 1757"> <thead> <tr> <th data-bbox="548 1184 776 1224">Edit Box</th> <th data-bbox="776 1184 1373 1224">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="548 1224 776 1383">From</td> <td data-bbox="776 1224 1373 1383">This edit box allows you to specify the latitude of the first undulation value in the geoid file. The latitude must be entered in degrees, minutes, and seconds, with an optional leading N or S character indicating north or south latitude respectively.</td> </tr> <tr> <td data-bbox="548 1383 776 1543">To</td> <td data-bbox="776 1383 1373 1543">This edit box allows you to specify the latitude of the last undulation value in the geoid file. The latitude must be entered in degrees, minutes, and seconds, with an optional leading N or S character indicating north or south latitude respectively.</td> </tr> <tr> <td data-bbox="548 1543 776 1757">Spacing</td> <td data-bbox="776 1543 1373 1757">This edit box allows you to specify the latitude grid spacing for the geoid file. The latitude spacing must be entered in degrees, minutes, and seconds, with an optional leading plus or minus character. Note that the sign of the latitude grid spacing must be the same as the sign of the to-latitude minus the from-latitude.</td> </tr> </tbody> </table>	Edit Box	Description	From	This edit box allows you to specify the latitude of the first undulation value in the geoid file. The latitude must be entered in degrees, minutes, and seconds, with an optional leading N or S character indicating north or south latitude respectively.	To	This edit box allows you to specify the latitude of the last undulation value in the geoid file. The latitude must be entered in degrees, minutes, and seconds, with an optional leading N or S character indicating north or south latitude respectively.	Spacing	This edit box allows you to specify the latitude grid spacing for the geoid file. The latitude spacing must be entered in degrees, minutes, and seconds, with an optional leading plus or minus character. Note that the sign of the latitude grid spacing must be the same as the sign of the to-latitude minus the from-latitude.
Edit Box	Description								
From	This edit box allows you to specify the latitude of the first undulation value in the geoid file. The latitude must be entered in degrees, minutes, and seconds, with an optional leading N or S character indicating north or south latitude respectively.								
To	This edit box allows you to specify the latitude of the last undulation value in the geoid file. The latitude must be entered in degrees, minutes, and seconds, with an optional leading N or S character indicating north or south latitude respectively.								
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Control	Description								
Longitudes (d m s) Group	The edit boxes in this group are used to specify the longitude range and spacing as follows:								
	<table border="1"> <thead> <tr> <th>Edit Box</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>From</td> <td>This edit box allows you to specify the longitude of the first undulation value in the geoid file. The longitude must be entered in degrees, minutes, and seconds, with an optional leading E or W character indicating east or west longitude respectively.</td> </tr> <tr> <td>To</td> <td>This edit box allows you to specify the longitude of the last undulation value in the geoid file. The longitude must be entered in degrees, minutes, and seconds, with an optional leading E or W character indicating east or west longitude respectively.</td> </tr> <tr> <td>Spacing</td> <td>This edit box allows you to specify the longitude grid spacing for the geoid file. The longitude spacing must be entered in degrees, minutes, and seconds, with an optional leading plus or minus character. Note that the sign of the longitude grid spacing must be the same as the sign of the to-longitude minus the from-longitude.</td> </tr> </tbody> </table>	Edit Box	Description	From	This edit box allows you to specify the longitude of the first undulation value in the geoid file. The longitude must be entered in degrees, minutes, and seconds, with an optional leading E or W character indicating east or west longitude respectively.	To	This edit box allows you to specify the longitude of the last undulation value in the geoid file. The longitude must be entered in degrees, minutes, and seconds, with an optional leading E or W character indicating east or west longitude respectively.	Spacing	This edit box allows you to specify the longitude grid spacing for the geoid file. The longitude spacing must be entered in degrees, minutes, and seconds, with an optional leading plus or minus character. Note that the sign of the longitude grid spacing must be the same as the sign of the to-longitude minus the from-longitude.
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	From	This edit box allows you to specify the longitude of the first undulation value in the geoid file. The longitude must be entered in degrees, minutes, and seconds, with an optional leading E or W character indicating east or west longitude respectively.							
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Spacing	This edit box allows you to specify the longitude grid spacing for the geoid file. The longitude spacing must be entered in degrees, minutes, and seconds, with an optional leading plus or minus character. Note that the sign of the longitude grid spacing must be the same as the sign of the to-longitude minus the from-longitude.								
Import GFM Button	This button allows you to import an old GFM (*.gfm) file. GFM files were used with previous versions of GeoLab to specify geoid data file formats. The contents of the selected GFM file are used to set the various values in the currently opened (or untitled) geoid specification file.								
Load GeoLab 2.x geoid Button	This button allows you to load an existing GeoLab geoid file. A GeoLab geoid file is a geoid file in a format supported by previous versions of GeoLab. It contains a header that specifies how the geoid data is stored in the remainder of the file. When you load a GeoLab geoid file with this button, you will be prompted to select the file. An attempt will then be made to load the information in the GeoLab geoid file into the current geoid specification file, and the Data File edit box will be set to the name of the GeoLab geoid file you specified (the GeoLab geoid file becomes the geoid data file for the current geoid specification file).								
Refine Geoid Button	This button will be enabled if the current geoid specification file is valid and saved. The Refine Geoid dialog will be displayed, allowing you to revise the associated geoid file.								
View Geoid Button	This button will be enabled if the current geoid specification file is valid. The View Geoid dialog will be displayed, allowing you to view the contents of the associated geoid file.								
Close Button	This button closes this dialog. If the current geoid specification file has not been saved, you will be prompted to save it.								
Help Button	This button displays this information.								

Transforming Coordinates

The GeoLab Coordinate Transformer

GeoLab provides a powerful tool for performing various coordinate transformations. It is accessed by selecting the Tools/Transform Coordinates menu command. This dialog allows you to perform various coordinate transformations and consists of the following five tabbed pages in which you set up the particulars of the transformation you wish to perform:

- Input Page
- Output Page
- 7-Parameters Page
- 4-Parameters Page
- Transformation Page

For an explanation of the details of how GeoLab Coordinate Transformer performs coordinate transformations, please see Understanding Transformations.

Once you have chosen the appropriate settings in each tabbed page, clicking the Transform button at the bottom of the dialog starts the transformation process. Note that if you select the Manual (Sampler) input type the Transform button is disabled. You access the Sampler from the Transform Page.

Note that when you use a text file (containing GeoLab records) as input, you can include GFIL records to specify a geoid file from which to read geoid values when needed in coordinate transformations. Also, if you precede a coordinate record (such as PLO) with a GEOI record, the geoid values for that point will be read from the GEOI record (even if different station names are used in the coordinate and GEOI records). If you precede a coordinate record with a GEOI record, that GEOI record will take precedence over any geoid files specified on GFIL records.

Input Page

This page contains controls that specify the source of input coordinates to transform. It contains the following controls:

Control	Description
Input Type Group Box	This group box contains three radio buttons that allow you to specify the input type. You may select Manual (Sampler), Text File, or GeoLab Adjusted Network. If you select the Manual (Sampler) type, the Sampler button on the Transform Page will be enabled, allowing you to use the GeoLab Transformation Sampler. If you select the Text File type, you will select an Input File that is a text file containing GeoLab records corresponding to the From Type on the Transformation Page (e.g. NEH records if the NEH From Type is selected). If you select the GeoLab Adjusted Network type, you will select an Input File that is a GeoLab adjusted network.
Input File Group Box	This group box contains controls that allow you to select a file containing the coordinates to be transformed (either a Text File or GeoLab Adjusted Network). The edit box displays the file name of the currently selected file, and the Browse... button allows you to select another file. Note that if you select a Text File, the From Type selections (on the Transformation page) will be limited to the types of coordinates found in the text file.
Map Projections List Box	This multiple selection list box displays the names all GeoLab map projections. If the From Type (on the Transformation page) is NE, NEH, or NEO, you must ensure that the map projections to be used are selected in this list. To select a projection simply click on its name in the list. To de-select a map projection, click on it again.
Linear Unit Drop Down List Box	This list box displays the linear unit for the input coordinates. If the Input Type is a Text File, you will be able to select another linear unit from this list.
Ellipsoid Drop Down List Box	This list box displays the reference ellipsoid for the input coordinates. If the Input Type is a Text File, you will be able to select another ellipsoid from this list.

Important: You must select the Input Type before you select the Input File. When you select the Text File type, the radio buttons in the Geoid Interpolation Mode group box will be enabled if one or more GFIL records are found in the input text file. If the Bi-Linear radio button is selected, bi-linear geoid interpolation will be performed; if the Bi-Quadratic radio button is selected, bi-quadratic interpolation will be performed when retrieving geoid values from GFIL-specified geoid files.

Output Page

This page contains controls that specify settings for the output coordinates (results of the transformation). It contains the following controls:

Control	Description
Map Projections List Box	This multiple selection list box displays the names all GeoLab map projections. If the To Type (on the Transformation page) is NE, NEH, or NEO, you must ensure that the map projections to be used are selected in this list. To select a projection simply click on its name in the list. To de-select a map projection, click on it again.
Write Header Information Check Box	If this check box is checked, an information header (commented lines) will be written to the output text file. If it is not checked, the header information will not be written. If you selected the Manual (Sampler) input type, this check box is disabled.
Linear Unit Drop Down List Box	This list box displays the linear unit for the output coordinates. You may select the desired linear unit from this list.
Ellipsoid Drop Down List Box	This list box displays the reference

7-Parameters Page

This page contains controls that specify settings for a geocentric 7-parameter similarity transformation to be applied to the input coordinates. Note that the previous 7-parameter values used are automatically loaded when you re-run the Coordinate Transformer. This page contains the following controls:

Control	Description
X-Translation Edit Box	This edit box allows you to enter or modify the geocentric X-translation.
Y-Translation Edit Box	This edit box allows you to enter or modify the geocentric Y-translation.
Z-Translation Edit Box	This edit box allows you to enter or modify the geocentric Z-translation.
X-Rotation (Secs) Edit Box	This edit box allows you to enter or modify the geocentric X-rotation. This value must be entered in units of arc-seconds.
Y-Rotation (Secs) Edit Box	This edit box allows you to enter or modify the geocentric Y-rotation. This value must be entered in units of arc-seconds.
Z-Rotation (Secs) Edit Box	This edit box allows you to enter or modify the geocentric Z-rotation. This value must be entered in units of arc-seconds.
Scale (PPM) Edit Box	This edit box allows you to enter or modify the scale change. This value must be entered in parts-per-million.
File Edit Box	This read-only edit box displays the currently selected 7-parameter file.
New Button	This button zeros all parameters, and clears the 7-parameter filename.
Load Button	This button allows you to load previously saved 7-parameter values from a file.
Save Button	This button allows you to save the current 7-parameter values to a file that can be later loaded with the Load button.
Save As Button	This button allows you to save the current 7-parameter values to a file; you will be prompted to specify the file to be written.

4-Parameters Page

This page contains controls that specify settings for a topocentric 4-parameter similarity transformation to be applied to the input coordinates. Note that the previous 4-parameter values used are automatically loaded when you re-run the Coordinate Transformer. This page contains the following controls:

Control	Description
Origin Latitude (DMS) Edit Box	This edit box allows you to enter the latitude of the origin for the 4-parameter transformation. This value must be entered in degrees, minutes, and seconds.
Origin Longitude (DMS) Edit Box	This edit box allows you to enter the longitude of the origin for the 4-parameter transformation. This value must be entered in degrees, minutes, and seconds.
N-Translation Edit Box	This edit box allows you to enter or modify the translation in the north/south direction.
E-Translation Edit Box:	This edit box allows you to enter or modify the translation in the east/west direction.
Scale (PPM) Edit Box	This edit box allows you to enter or modify the scale change. This value must be entered in parts-per-million.
File Edit Box	This read-only edit box displays the currently selected 4-parameter file.
New Button	This button zeros all parameters, and clears the 4-parameter filename.
Load Button	This button allows you to load previously saved 4-parameter values from a file.
Save Button	This button allows you to save the current 4-parameter values to a file that can be later loaded with the Load button.
Save As Button	This button allows you to save the current 4-parameter values to a file; you will be prompted to specify the file to be written.

Transformation Page

This page contains controls that specify which coordinate transformation is to be performed. It contains the following controls:

Control	Description
Transformation Switches Group Box	This group box allows you to toggle the 7-parameter and 4-parameter transformations on and off. Note that if the corresponding transformation parameters are not set, these radio buttons will be disabled.
Transformation Order Group Box	This group box allows you to change the order in which the 7-parameter and 4-parameter transformations are performed. You can choose which of the 7-parameter or 4-parameter transformations are done first. If you have not chosen to perform both of these transformations, the settings in this group box will have no effect.
From Type Group Box	This group box contains radio buttons that allow you to select the type of from-coordinates for the transformation to be performed. See the PL, PLH, PLO, NE, NEH, NEO, XYZ, and GEOI records for information on the types.
To Type Group Box	This group box contains radio buttons that allow you to select the type of to-coordinates for the transformation to be performed. The types are the same as in the From Type group box. Note that if you select the GEOI type as the from-type, only the GEOI type can be selected as the to-type.
Sampler Button	This button (enabled only when you select the Manual (Sampler) input type) displays the GeoLab Transformation Sampler dialog.

Transformation Sampler

The GeoLab Transformation Sampler

This dialog allows you to manually enter coordinates for a point, and have them transformed as you type. Note that the read-only and map projection items described below display the corresponding current settings in the GeoLab Transformer dialog.

The From-System group box contains the following controls:

Control	Description
Linear Unit Edit Box	This read-only edit box displays the selected linear unit for the from-coordinates.
Reference Ellipsoid Edit Box	This read-only edit box displays the selected reference ellipsoid for the from-coordinates.
Map Projection List Box	This list box (displayed if the from-coordinates contain map projection coordinates) displays map projections for the from-coordinates. Entered map projection coordinates must be relative to the selected projection in this list.
From-Coordinate Edit Boxes	Up to three edit boxes are displayed below the "Enter From-Coordinates Here" label. The labels to the left of these edit boxes identify the type of coordinates for each box. When you edit the

The To-System group box contains the following controls:

Control	Description
Linear Unit Edit Box	This read-only edit box displays the selected linear unit for the to-coordinates.
Reference Ellipsoid Edit Box	This read-only edit box displays the selected reference ellipsoid for the to-coordinates.
Map Projection List Box	This list box (displayed if the to-coordinates contain map projection coordinates) displays map projections for the to-coordinates. Computed map projection coordinates are relative to the selected projection in this list.
From-Coordinate Edit Boxes	Up to three edit boxes are displayed below the "View/Copy To-Coordinates Here" label. The labels to the left of these edit boxes identify the type of coordinates for each box.
Close Button	This button closes this dialog.
Help Button	This button displays this information.

Understanding Transformations

Understanding Coordinate Transformations

This section explains the process used by the GeoLab Coordinate Transformer when transforming coordinates. Understanding this process is key to understanding the significance of such things as applying 7-parameters to a reference ellipsoid versus specifying a set of 7-parameters to the coordinates.

Any transformation performed by the GeoLab Coordinate Transformer is done in two major steps:

Transform the input coordinates to geocentric Cartesian coordinates;
Transform the resulting geocentric Cartesian coordinates from step one to the desired output coordinate type.

The following abbreviations are used in describing transformations below:

Symbol	Description
E	Easting (map projection x-coordinate)
H	Ellipsoidal height
L	Ellipsoidal longitude
N	Northing (map projection y-coordinate)
O	Orthometric height (elevation)
P	Ellipsoidal latitude
U	Geoid undulation ($U = H - O$)
X	Geocentric Cartesian X-coordinate
Y	Geocentric Cartesian Y-coordinate
Z	Geocentric Cartesian Z-coordinate
n	North-south component of the deflection of the vertical.
e	East-west component of the deflection of the vertical.

It is important to understand the major difference between the two input file types (GeoLab adjustment files and a GeoLab text file). With GeoLab adjustment files, geoid undulations (U) and deflections of the vertical (n, e) are retrieved directly from the adjustment files. With GeoLab text files, geoid undulations (U) and deflections of the vertical (e, n) must be specified by GEOI and GFIL records. If no such records are found in the text file, the geoid values are set to zero.

Step 1: Transforming Input Coordinates to Geocentric Cartesian Coordinates

If the input is from GeoLab adjustment files, the Geocentric Cartesian coordinates are read directly from those files.

If the input is from a GeoLab text file, then the Geocentric Cartesian coordinates are computed as follows:

Input Type	Transformations Performed
NE	Compute PL from NE using specified map projection. Set H to zero, and O to H - U. Compute geocentric XYZ from PLH (PLH is relative to the specified reference ellipsoid for from-coordinates).
NEO	Same as NE, except that O is given and H is set to O + U.
NEH	Same as NE, except that H is given and O is set to H - U.
PL	Set H to zero, and O to H - U. Compute geocentric XYZ from PLH (PLH is relative to the specified reference ellipsoid for from-coordinates).
PLO	Same as PL, except that O is given and H is set to O + U.
PLH	Same as PL, except that H is given and O is set to H - U.
XYZ	Compute PLH (relative to the specified reference ellipsoid for from-coordinates) from the given XYZ.

At this point we know the PLH coordinates (relative to the possibly non-geocentric reference ellipsoid specified for from-coordinates) and the geocentric Cartesian coordinates XYZ. If 4-parameter and/or 7-parameter values are specified, these transformations are now applied to produce the final geocentric XYZ coordinates to start with in Step 2 below (i.e. the specified 4-parameter and/or 7-parameter values are used to transform the near-geocentric XYZ coordinates to geocentric XYZ coordinates).

Step 2: Transforming the Geocentric Cartesian Coordinates to Output Coordinates

Now that we have geocentric Cartesian coordinates XYZ and geoid values (U, e, n), we can compute the to-coordinates. The following transformations are performed (in the given order) to produce the to-coordinates:

If the to-coordinate type is PLO, NEO, or GEOI, we must transform the geoid values (U, e, n) from the from-ellipsoid to the to-ellipsoid.

If the to-coordinate type is PL, PLH, PLO, NE, NEH, or NEO, we must transform XYZ to PLH relative to the to-ellipsoid.

If the to-coordinate type is NE, NEO, or NEH, we must transform PLH (relative to the to-ellipsoid) to NE map projection coordinates relative to the to-map projection.

If the to-coordinate type is NEO or PLO, we set O to $H - U$.

Canadian Standards Wizard

Using the Canadian Accuracy Standards 1996 Wizard

When you select the Network/Canadian Standards 1996 Wizard menu command, the Canadian Accuracy Standards 1996 Wizard is displayed. This wizard will guide you through the steps required to produce listings of the Canadian 1996 Accuracy Standards for an existing GeoLab adjustment. For more information about the standards, see the documents: "Accuracy Standards for Positioning, Version 1.0", September, 1996; and "Proposal to CGRSC for the Implementation of Accuracy Standards", March, 1997; both available from the Geodetic Survey Division, Natural Resources Canada.

The Canadian Accuracy Standards 1996 Wizard consists of four pages (Page 1, Page 2, Page 3, and Page 4) as described below.

Page 1

This page prompts you to select an existing GeoLab adjustment file for which you wish to produce accuracy standards listings, as well as which listings you wish to produce. Once you have selected the adjustment file, the Network Info group box will be filled with some basic information about the network. This page contains the following controls:

Control	Description						
GeoLab Adjustment File Group Box	This group box displays the adjustment filename that you select. Click the Browse button to select a network.						
Network Info Group Box	This group box displays some basic information about the network you select. This information can be useful for configuring the selection of adjacent stations (see Page 3).						
Load Layer Definitions Button	This button allows you to load network layer definitions (see Managing Network Layers) from a network layers file. Any network stations with entries in the specified layers file are assigned the network layer contained in the layers file.						
Produce Listing(s) Group Box	This group box contains controls that allow you to select which standards listings to produce. You can select one or both of:						
	<table border="1"><thead><tr><th>Type</th><th>Description</th></tr></thead><tbody><tr><td>Summary Listing</td><td>A short listing with one line per station (with no details for adjacent stations)</td></tr><tr><td>Detailed Listing</td><td>A longer, more complete listing, with details on all adjacent stations</td></tr></tbody></table>	Type	Description	Summary Listing	A short listing with one line per station (with no details for adjacent stations)	Detailed Listing	A longer, more complete listing, with details on all adjacent stations
	Type	Description					
Summary Listing	A short listing with one line per station (with no details for adjacent stations)						
Detailed Listing	A longer, more complete listing, with details on all adjacent stations						

Page 2

This page provides controls that allow you to configure some statistical options for producing the standards listing(s). It contains the following controls:

Control	Description
Adjustment Variance Factor Group Box	This group box contains controls that specify how to use the adjustment variance factor in producing the standards listing(s). The Variance Factor edit box simply displays the adjustment variance factor from the adjustment you selected. The Variance Factor Known check box initially displays the corresponding setting for the adjustment you selected, and determines the type of statistic to be used for computing the expansion factors for confidence regions. The Scale Covariance Matrix with Variance Factor check box initially displays the corresponding setting for the adjustment you selected, and determines whether the adjustment covariance matrix elements are scaled by the adjustment variance factor when they are used in computing confidence regions.
Statistical Specifications Group Box	This group box contains the Confidence Level (Percent) edit box that allows you to specify the confidence level to be used for computing confidence regions (it is initially set to the corresponding level used in the adjustment you selected). The 1D Expansion Factor and 2D Expansion Factor edit boxes simply display the factors to be used in computing confidence regions (these values are determined automatically from your setting of the Variance Factor Known check box). The Percentile Level (Percent) edit box allows you to specify the percentile level to be used in computing representative values of local accuracies.

Page 3

This page contains controls that allow you to specify how adjacent stations are to be selected. Each set of controls allows you to specify a restriction to how adjacent stations are selected. Note that if you disable all restrictions, all other network stations will be selected as adjacent stations for the station for which accuracy information is being computed. The following controls specify these restrictions:

Control	Description								
Restrict to connected (observed) lines only Check Box	When this box is checked, only stations that are connected by direct observations to the station for which accuracy information is being computed will be allowed to be used as adjacent stations.								
Line Length Restriction Group Box	<p>If the Restrict by check box is checked, adjacent station selection will be restricted according to the type of restriction selected in the drop-down list box. The Min and Max edit boxes allow you to specify the minimum and maximum distances to be used in imposing this restriction. The types of line length restrictions are as follows:</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Actual Line Lengths</td> <td>The actual length of the line must be from Min to Max</td> </tr> <tr> <td>Median Distance Factors</td> <td>The line length must be from Min times the median network line length, to Max times the median network line length</td> </tr> <tr> <td>Average Distance Factors</td> <td>Line length must be from Min times the average network line length, to Max times the average network line length</td> </tr> </tbody> </table>	Type	Description	Actual Line Lengths	The actual length of the line must be from Min to Max	Median Distance Factors	The line length must be from Min times the median network line length, to Max times the median network line length	Average Distance Factors	Line length must be from Min times the average network line length, to Max times the average network line length
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Network Layer Restriction Group Box	<p>If the Restrict by check box is checked, adjacent station selection will be restricted according to the type of restriction selected in the drop-down list box. The Min and Max edit boxes allow you to specify the minimum and maximum network layers to be used in imposing this restriction. The types of network layer restrictions are as follows:</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Absolute Layers</td> <td>A station's network layer must be from Min to Max to be allowed as an adjacent station</td> </tr> <tr> <td>Relative to Station's Layer</td> <td>When the station for which accuracy information is being computed is in network layer L, a station's network layer must be from L + Min to L + Max to be allowed as an adjacent station (Min and Max are relative values in this case and may be negative)</td> </tr> </tbody> </table>	Type	Description	Absolute Layers	A station's network layer must be from Min to Max to be allowed as an adjacent station	Relative to Station's Layer	When the station for which accuracy information is being computed is in network layer L, a station's network layer must be from L + Min to L + Max to be allowed as an adjacent station (Min and Max are relative values in this case and may be negative)		
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Number of Adjacent Points Restriction Group Box	<p>If the Restrict number of adjacent points by check box is checked, adjacent station selection will be restricted as follows: Any stations with less than Min adjacent stations will not be listed; No station will be allowed to have more than Max adjacent stations.</p>								

Control	Description
Generate Adjacent Stations Button	Once you have configured the adjacent stations restrictions, this button will automatically generate lists of adjacent stations for all network stations. When this process is complete, the Adjacent Stations Summary dialog will be displayed so that you can view the selections.

Page 4

This final page provides controls that allow you to confirm or edit the selection of adjacent stations. It contains the following controls:

Control	Description
Adjacent Stations List File Group Box	This group box contains controls that allow you to save the adjacent stations selections to a special adjacent stations list file. The Filename edit box displays the name of the currently active list file. The Save List button can be used to save changes to the currently active list file. The Save List As button allows you to save the current list under a new filename. The Browse button will prompt you with the Replace or Append Adjacent Stations dialog (which allows you to specify how a list is loaded) and then with a dialog in which you can select the list file to load.
Stations List	This list displays the names of all network stations. When you select one of the stations in this list, the Adjacent Stations list will show the adjacent stations selected for that station.
Adjacent Stations List Box	This list box displays all adjacent stations for the currently selected station in the Stations list box.
Revise Adjacent Stations Button	This button presents the Change Adjacent Stations dialog which allows you to manually revise the selection of adjacent stations for the currently selected station in the Stations list.