Information Alignment

GuidEx Manager

User guide

GuidEx Project Creation

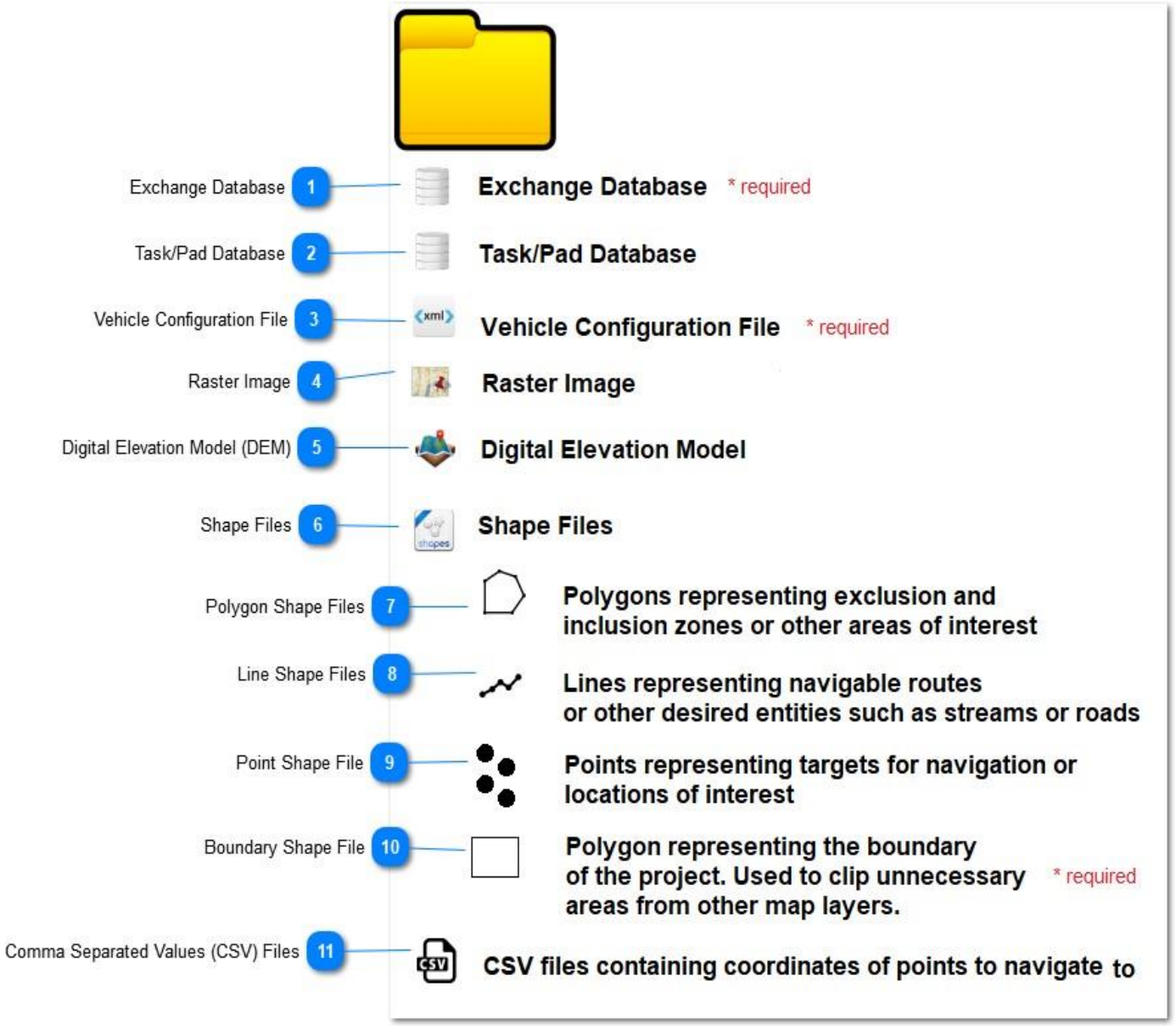
Overview of GuidEx project preparation requirements

Contents

What Is A GuidEx Project

A GuidEx project is made up of a variety of mandatory and optional files that are stored within a project folder. These files are first collected and specified in the exchange database, and then either the entire folder is copied to a USB (zipped or unzipped) and then loaded on the tablet, or a project zip file is uploaded to GuidEx Connect for online distribution. This document provides a step through of an example project, and Appendices that provide additional insight into GNSS Correction sources as well as help with DEMs and sources for DEMs online.

Below is a summary of the files that constitute a project:



1 Exchange Database

This is a required database created by the user with the help of a GuidEx Manager utility described in this document. It is one of the three principal sets of operating parameters for the GuidEx system. This SQLite database specifies the following:

1. Geodetic parameters - this includes the desired local grid coordinate system and an optional geoid model.
2. Map parameters - this includes raster and shape map layers to use and how they are depicted.
3. Digital Elevation Model to use - also known as a DEM, this allows the system to depict the surface in 3D.

2 Task/Pad Database

The Pad/Task Database is another of the three principal sets of operating parameters. This optional SQLite database is created by the user and consists of the following:

1. Coordinates, dimensions, orientation, and characteristics for all pads. This includes sumps and sump orientation relative to the pad.
2. A list of tasks. Each task can be configured individually for various requirements. For example:
    a. Whether a pad is required.
    b. Whether the task requires being within the pad or within a specified distance of the pad.
    c. When and how to prompt the operator during the task.
    d. Whether a pad can be moved and by how much.
3. List of operators, standby reasons, and cancellation reasons for easy call-up in operator dialogs.

3 Vehicle Configuration File

This is a required file created by the user by using a GuidEx Manager utility described in this document. The Configuration XML File is another of the three principal sets of operating parameters. Unlike the exchange database, these are parameters that for the most part can be changed on the tablet. These include the following:

1. Machine name, antenna height and machine geometry (length, width, and placement of GNSS antenna, IMU & position reference point).
2. Inertial Measuring Unit (IMU) orientation, and pitch and roll thresholds.
3. GNSS correction source and precision thresholds.
4. Target navigation parameters.
5. Messaging parameters - NMEA, PPS & Record Trigger.
6. GuidEx Connect cloud setup parameters.
7. Standby behaviour (whether to prompt operator and time between prompts).

4 Raster Image

This file is optional. It will be displayed in the GuidEx application and provides a more realistic experience. Note that GuidEx Manager will use the image to create multiple image tiles for GuidEx to use. Image tiles are used for rendering rather than the original image to improve processing speed. Note that once the tiling process is done, an Images subfolder will be present in the project folder & the original image can be removed from the project folder.

5 Digital Elevation Model (DEM)

This file is optional. It will allow imagery and shape files to be draped over the DEM for a realistic 3D effect. The required format is 'GRD', which is sometimes referred as Surfer Binary Version 7. If you do not have this version, there is a GuidEx Manager utility to convert other formats to it, via View menu DEM Conversions.

6 Shape Files

Polygon, line, and point shape files can be placed in the project folder. For a shape file to be depicted as a map layer, they must be specified as such in the exchange database. There is one exception to this - for polyline shape files to be used as routes. Route line shape files contain one line only (single DBF record) and are placed in the project folder but NOT specified as a map layer.

7 Polygon Shape Files

Polygon shape files can be placed in the project folder but are not utilised unless they are specified as a map layer in the exchange database. When specified as a map layer, they can be set as exclusion zones (I.E: warn on ingress) or inclusion zones (I.E: warn on egress) or they may simply be defined a layer with no such categorization. If they are specified as exclusion or inclusion areas, an additional proximity buffer distance can be specified. A proximity buffer will trigger a warning that a zone is about to be breached. Polygon fill and opacity is customizable.

8 Line Shape Files

Polyline shape files can be placed in the project folder but are not utilised as a map layer unless they are specified as such in the exchange database. Line width and style is customizable. As mentioned earlier, note that there is a special case polyline shape file which the user wants to navigate as a route. This type of shape file must contain only one line (single DBF record) and must NOT be defined in the exchange database, but rather just placed in the project folder.

9 Point Shape File

Point shape files can be placed in the project folder but are not utilised as a map layer unless they are specified as such in the exchange database. If defined as a map layer, point style is customizable. Note that all point shape files in the project folder can be used as targets and navigated to.

10 Boundary Shape File

A single polygon shape file is used both to clip extraneous areas from the other map layers, and use the zoom to extents button in the app. The user creates this as one of the last steps in creating the project. A utility in GuidEx Manager allows the user to quickly make the file with little effort.

11 Comma Separated Values (CSV) Files

CSV files that contain coordinates for points to be navigated to can be placed in the project folder. The format is either 'Station, Easting, Northing' or, Station, Easting, Northing, Height'. If points contain a height value, the point can act as a checkpoint, with a dialog appearing for 10s prior to recording, displaying deltas.

Project File Descriptions

Creating a GuidEx project starts with creating an empty folder and placing files in it that can be utilised in the project. This includes the following files:

Shape Files - Shape files are an industry standard GIS file format. There are many file conversion utilities available to convert DXF files to SHP, etc. See a description of SHP files here:

https://desktop.arcgis.com/en/arcmap/10.3/manage-data/shapefiles/what-is-a-shapefile.htm

Polygon Type - when you configure the project, you will be able to separate each polygon into one of three types:

Exclusion Zones - These are polygon shape files that represent areas the vehicle should avoid.

Inclusion Zones - These are polygon shape files that represent areas the vehicle should remain in.

Render Only - These are polygon shape files that are to be depicted but are neither exclusion nor inclusion areas.

Polyline Type - There are two categories of polyline shape files:

1. Lines that are to be navigated, also called 'route lines' - These polyline shape files must contain only one line, are placed in the project folder, but are NOT specified in the exchange database as a map layer. Note that you will be able to display these lines when not actively navigating them if you want by enabling them in the left drawer Routelines section.

2. Lines that are to be depicted on the map only - These polyline shape files have one or many lines, are placed in the project folder, and are specified in the exchange database as a map layer.

Point Type - All point type shape files placed in the project folder can be used for navigation purposes. Points shape files can also be defined as a map layer if desired. If they are, point styles are customizable.

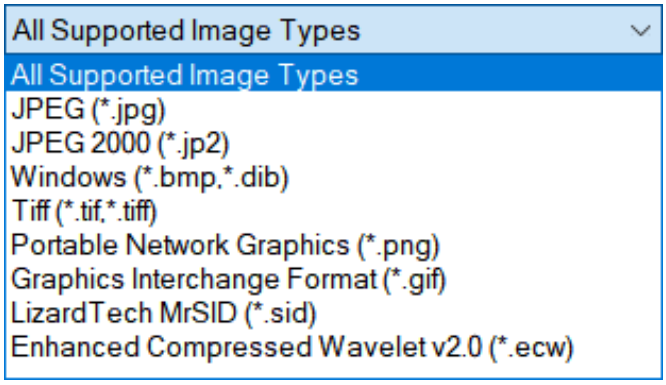
Note: Only '.SHP' and '.DBF' files are utilised. All other files ('PRJ', 'SBN', 'SBX', etc..) can be omitted. In addition, GuidEx Manager creates a 'CBD' file for polygon SHP files - these are also required for GuidEx.

CSV Files - CSV files that contain coordinates for points to be navigated to can be placed in the project folder. The format is either 'Station, Easting, Northing' or, Station, Easting, Northing, Height'. For example:

- Point 1, 500000,2000000,100
- Point 2, 500100,2000100,110
- Point 3, 500200,2000200,120

Imagery

A raster image of the project area is optional. Many different imagery formats can be utilised. An image and its corresponding world registration file in local grid coordinates should be placed in the project folder, however the world registration file is not required for formats that contain the registration in its header (such as JP2).



Note that during project preparation, GuidEx Manager will create an 'Image' subfolder to the project folder and in this folder create multiple image tiles in JPEG format, from the original image. Once this is done, the original image can be removed from the project folder.

Digital Elevation Model (DEM) - A DEM is optional to depict map layers realistically in 3D. The required format is 'GRD', which is sometimes referred as Surfer Binary Version 7. If you do not have this format, there is a GuidEx Manager utility (View menu - DEM Conversions) to convert other formats to it.

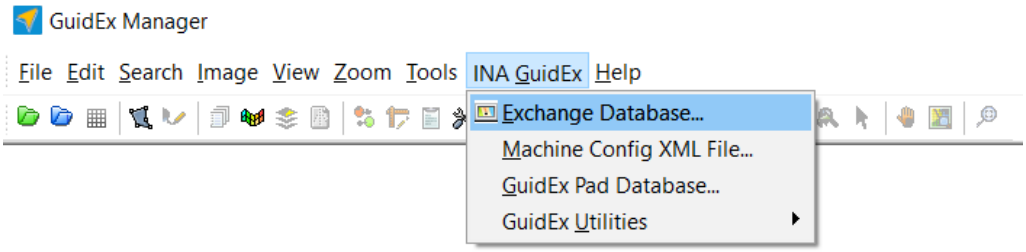
Geoid Model - This optional file is used to convert the GNSS height to a local height. The format required is 'GGF'. Many files are available from Trimble free of charge:

https://www.trimble.com/globalTRLTAB.asp?Nav=Collection-71

Note that when you define a GGF file in a GuidEx exchange DB, a 'Geodesy' sub-folder will be automatically created, and the geoid model copied to that folder.

Other Files - PDF Files - Any PDF file added to the project folder will be available for display in GuidEx by selecting 'User Documents' in the left drawer.

Creating The Exchange Database And Selecting The Coordinate System



This utility is accessed from the “Exchange Database…” menu item in the “INA GuidEx” menu of GuidEx Manager. It allows the user to create and configure a GuidEx exchange database. The exchange database contains information about the coordinate system, how the map layers are configured and several other parameters. Before creating the exchange database, make sure you have created a folder and added all desired files to it.

If you already have an exchange database, use the  button to open it and skip the second button.

If you don't have an exchange database, you use the  button to create a new one. When you select this, it will prompt you for the name of the exchange database. This will be the name of the project on the tablet. The location of the database should be in the project folder you created in step 1.

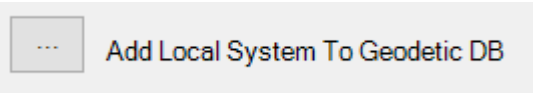
Once you have created an exchange database, you configure the items on the main dialog including map layers, then create a boundary file:

Map and Geodesy Tab

Specifying the Geodetic Parameters

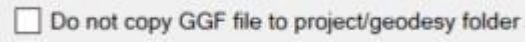
The first things to address are the coordinate system, datum, and U.O.M for the various shape files and images. If you happen to select a coordinate system datum that utilises a shift file, a 'Geodesy' sub-folder will be automatically created in your project folder, and the shift file copied to that sub-folder. GuidEx will use the selected system/datum parameters to transform the GNSS positions to your local system which needs to match all the map files in the project.

NOTE: When a machine is utilising Trimble RTX for GNSS corrections, the projects geodetic parameters will need to be configured to suit. A 2005 epoch RTX shift has been included in GX Manager builds from 2025 onwards. If you are missing this parameter, contact INA to receive an updated sqlite db file to install into your GuidEx Manager data folder.



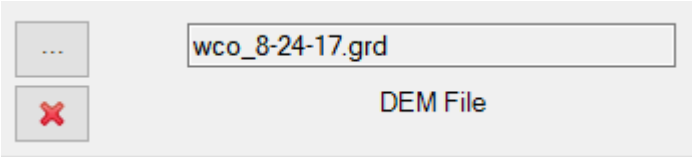
If your coordinate system is a true local system defined by a Trimble 'DC' or 'CAL' file, and it is not included in the lists of predefined systems and datums, press this button, provide a name for the system, and navigate to and select the DC file. The coordinate system will be added to a Group called 'Local_Systems'.

You can select an optional geoid model (.GGF) to use in the GuidEx system if you want to display and record local heights.

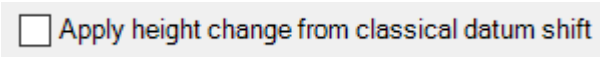


Note that unless this option is checked, when you select a GGF file, a 'Geodesy' sub-folder will be automatically created in your project folder, and the geoid model copied to that sub-folder. You would only check this box, if the tablets already contain a project with the same geoid file present. Geoid files sit in a common folder on the tablet, and do not need to be imported for every project - just once per geoid file. If this scenario applies, checking this box will reduce

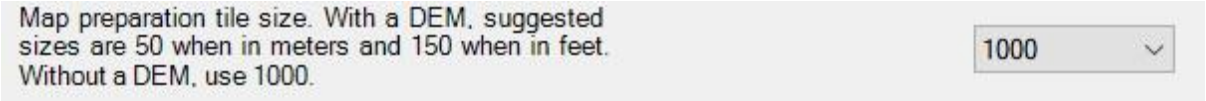
project load times, as geoid files tend to be large in size. In general, it is recommended to be "safe than sorry" and include a geoid in every project.



You can select an optional Digital Elevation Model (DEM) so that in chase mode, images and shape files are displayed draped over the DEM thereby depicting a 3D view. Remember that this model should have been placed in the project folder in step 1, however, a default behaviour of this utility is to copy any file you select to the project folder should it not be there.

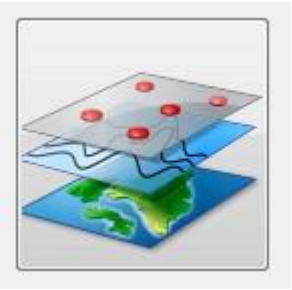


Note - Although rarely used, if your datum shift is classical (3, 7 or 10 parameter), you can elect to apply your height change from the datum shift rather than use the geoid model by checking the checkbox shown.



This value is needed in the process to drape the shape files over the DEM. Using too large a value with undulating terrain can lead to hills and valleys being under sampled. When you have configured map layers and exit this utility, GuidEx Manager will automatically prepare shape file layers by re-creating them to cover the project area and use a tiling system to accomplish that. The size of the tiles are in map units and are dictated by this dropdown. Suggested values are 50 if in meters, 150 if in feet, and a large value of 1000 if the project is a large area with little relief or has no DEM.

Adding and Configuring Map Layers



← Press this button to add and configure map layers.

Map layers can include the following:

Polygon shape files - These can be polygons that you want to use as inclusion or exclusion zones. You can also include polygon shape files that are not to be used as inclusion or exclusion zones, but rather, just displayed. Note that you normally do not add your boundary shape file as a layer should you have one at this point. It has special use for zooming and does not have to be depicted.

Polyline shape files - These can be any polyline file you want to be able to depict on the map. Note that you do NOT include lines you want to actively navigate (aka, 'route lines') which contain single line polylines. Polyline shape files that will serve as route lines are simply placed in the project folder and are depicted on the map automatically when selected as a route.

Point shape files - These can be any point file you want to depict on the map with special point style rendering. Note that all point shape files in the project folder, whether defined as a map layer or not, can be used for point navigation.

Raster images - Note that when you add an image, upon exiting the exchange database utility, GuidEx Manager will create a sub folder called '/ images' and tile the image you selected. GuidEx uses these tiles for rendering and not the original image. This is done to improve render speed.

Map layer items that can be changed include layer position, opacity (0% is invisible while 100% is fully opaque), bitmap for polygon shape file, exclusion/inclusion status for polygon shape file, applies to status, proximity, width of line shape files, and label field for shape files. The various layers and parameters are depicted in a spreadsheet interface:

Saves any changes made to the spreadsheet and exits.

These controls move selected rows up or down.

This deletes the selected row.

Images and shape files can be selected using this button. Multiple files can be selected at one time. If you select multiple files, files are loaded so that from top layer to bottom layer we have the following: points shape files, line shape files, polygon shape files, and finally raster images.

Saves a template file. The template file contains all layer names and settings and can be used to quickly configure another project with similar or identical map layers.

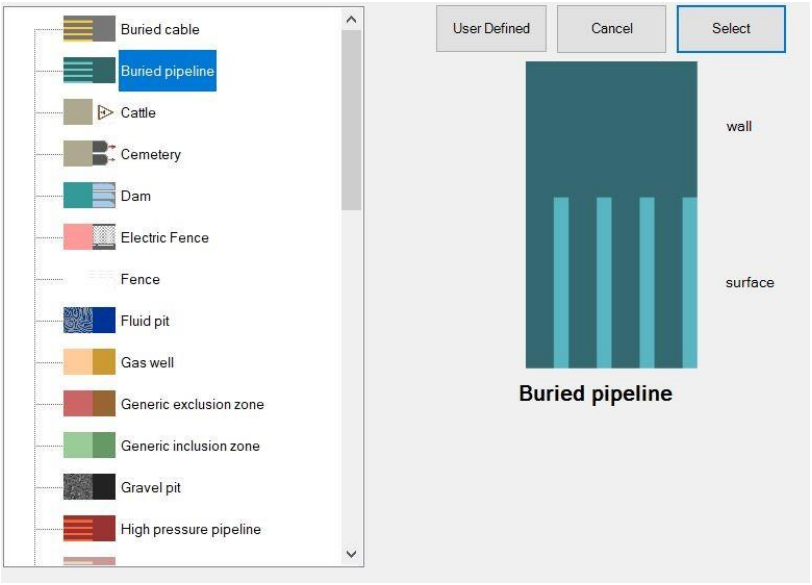
Retrieves a template file and configures layers to what is in the template based on file name match. This can be useful if a new project has many layers and layer attributes (bitmap, opacity, etc.) are the same.

Lists identically configured line and point layers (with regard to bitmap and colour). For example, if there are two point layers that have the same bitmap and same colour, this routine will let you know. Also, at form closing, this routine is run, and the user is informed of any identically configured point and line layers.

Allows user to select a folder containing shape files and provides list of all files in spreadsheet not in folder and vice-versa. This is a tool for making sure you have not forgotten to add a layer or spot a layer that you added that should not be there.

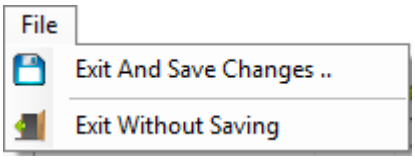
Selecting Bitmaps For Point, Lines and Polygons

To select a bitmap for a polygon layer, press the 'Category' button and select from a list:



Similar dialogs and mechanics are present for selecting point symbols and line symbols.

Note: It is strongly suggested to use the bitmaps for polygon surfaces rather than user defined colours since some colour surfaces can mask other layers.

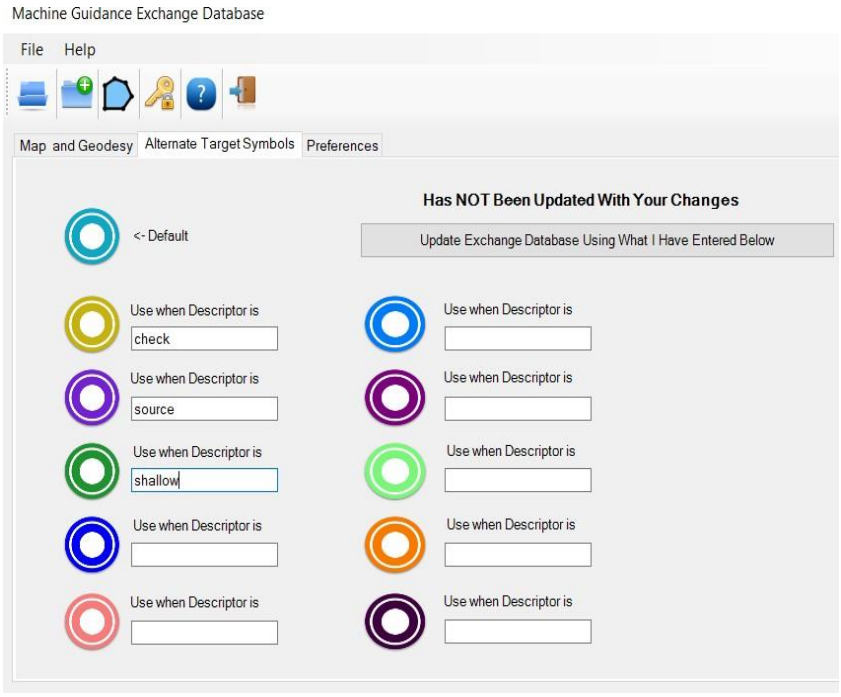


When you are finished with your changes, select 'Exit And Save Changes' in the file menu.

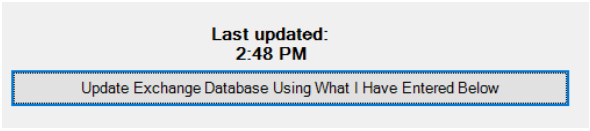
Final note: If any changes are made to the Map configuration, image processing and preparation will occur when exiting the utility to the main GuidEx Manager user interface. Expect to see progress bars on exit representing the progress of this image preparation. This processing includes clipping and simplification of shape files and tiling of images and optimises the images for use in GuidEx.

Alternate Target Symbols Tab

When using GuidEx to target point target (either from CSV or point SHP), if descriptors are available in the target file, they can be leveraged to render points differently on the map via this Alternate Target Symbols feature.



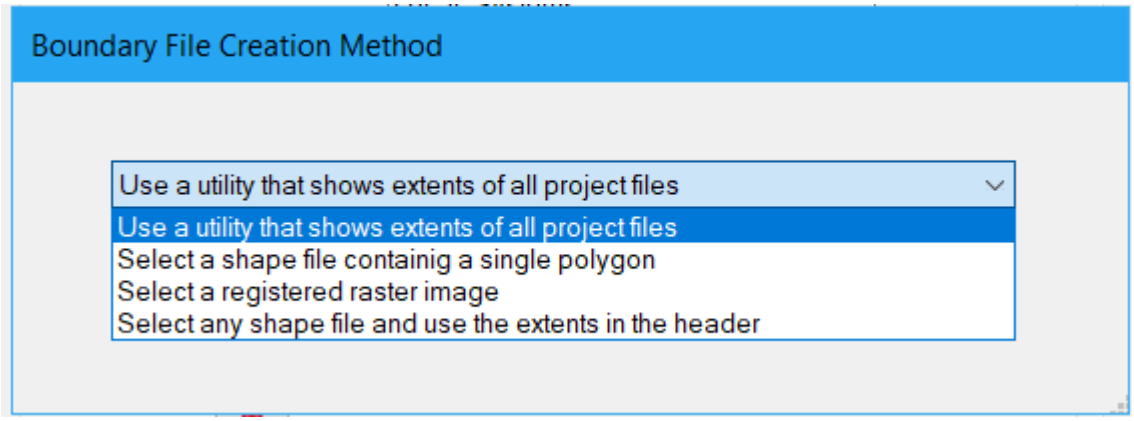
Note: in the image above, you will see in the upper right corner a note "Has NOT Been Updated With Your Changes". Each time you make edits to this page, you must finalise the changes by tapping the "Update Exchange Database Using What I have Entered Below". This will change the text above to read "Last Updated: x time", as below. Ensure you always check the database has been updated on this page before exiting.



Creating A Boundary File

A boundary file is a shape polygon file containing one polygon which encompasses the project area. It is used by GuidEx Manager to clip all other shape files that exist in the project when the exchange database utility is exited. By clipping shape files to include only entities in the project area, rendering is faster and more efficient in GuidEx. It's also used by the GuidEx system to zoom to extents.

On the main dialog, you can press this button to make a boundary file.

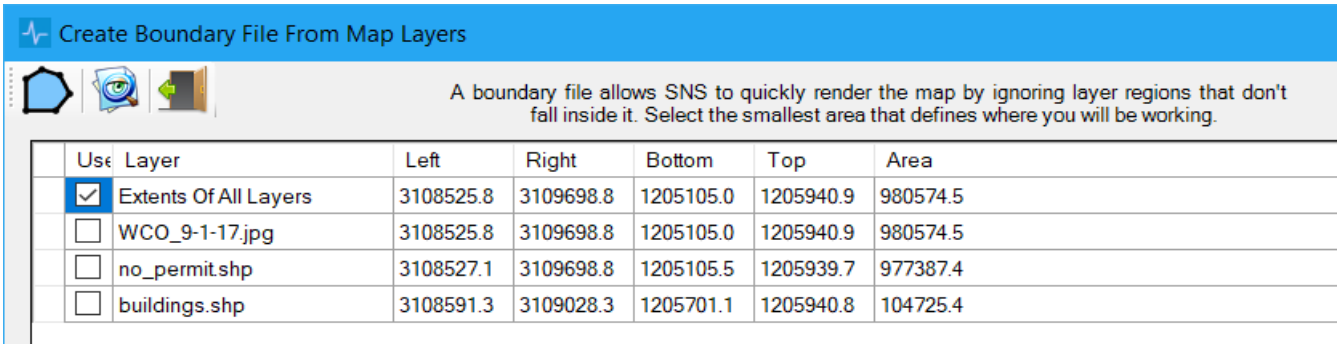


You are presented four ways of creating a boundary file:

1. Select a shape file containing a single polygon - If you have a polygon shape file with one polygon that covers the project area, select this method. Note that you can easily create a single polygon shape file in GuidEx Manager. First import a map layer (image, shape file, DXF file, points) that is in the area of interest. The procedure for creating a polygon is to double click at the first vertex of the polygon, right click and among the popup menu options you see, select, then single click at each subsequent vertex and double click at the last vertex. You will be prompted to save the shape polygon file. Do so in the project folder.

2. Select a registered raster image - Select a registered image and the extents of that image are used to create the boundary file.

3. Select any shape file and use the extents in the header - All shape files contain min and max coordinate values for the objects in the shape file. The method will use those min and max values.



Use	Layer	Left	Right	Bottom	Top	Area
☑	Extents Of All Layers	3108525.8	3109698.8	1205105.0	1205940.9	980574.5
☐	WCO_9-1-17.jpg	3108525.8	3109698.8	1205105.0	1205940.9	980574.5
☐	no_permit.shp	3108527.1	3109698.8	1205105.5	1205939.7	977387.4
☐	buildings.shp	3108591.3	3109028.3	1205701.1	1205940.8	104725.4

4. Use a utility that shows extents of all project files - This particular utility creates boundary files by allowing you to simply select the polygon file you want or by displaying all current map layers and their extents (sorted by descending area size) along with one row that represents the extents of all layers:

On the dialog above, the user checks the row that encompasses the complete project area. It's best to select the smallest area that accomplishes this. Once the row is checked, the  button is pushed, and the file is created. The boundary file is given the name of the exchange database and suffixed with '_boundary'. So, if your exchange database was named 'batman.sqlite', the boundary shape file will be called 'batman_boundary.shp'. It is automatically created in the exchange database folder.

If you want to see how specific extents compares to the 'Extents Of All Layers', check a row and press the  button.

You will see two rectangles. The red one is the 'Extents Of All Layers'. The blue is the relative size and location of the record you checked.

Specifying Lockdown Password(s)

Press this button to specify more or more Lockdown password(s).

UI Lockdown

When the UI is locked down, only a few operating settings are available to the operator. Primarily, you will find the left drawer icon has changed, to only display two icons - Export Log File & View User Documents. Further, when a target file is opened in right drawer, the settings gear icon is disabled. This is intended to prevent operators from handling operation related settings & map layers.

A password is entered and saved here only if you want GuidEx to be able to enter and exit the UI lockdown mode. To enter/exit UI Lockdown mode on the tablet, long tap and hold anywhere on the map, which will display a circular progress - hold until circle is complete, and a password dialog appears. See User Guide highlighting this from the GuidEx app side.

If this is not checked then GuidEx will start in standard mode, and you can enter/exit UI Lockdown via a long tap on the map. If checked, GuidEx will start in locked mode immediately after the project is loaded.

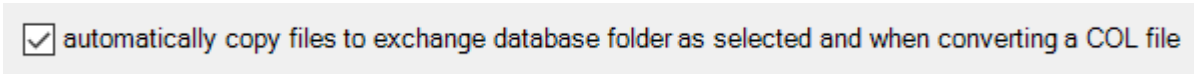
Zone Lock

When a zone lock password is defined and an operator breaches an exclusion or inclusion zone, the warning icon take over the screen (rather than off to the side) and an Enter Password button appears. This feature requires operators to contact a supervisor to discuss the breach before they can continue operating. Note that if a password is defined, this feature can be turned off for individual layers by enabling "Allow Override" option in Map Layers setup dialog.

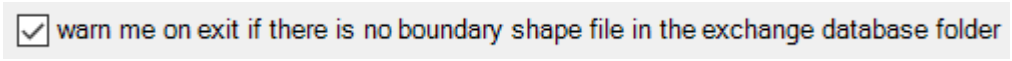
Exiting The Exchange Database Utility

Once you have everything configured including coordinate system selection, map layer assignments and a boundary file, exit the utility. You should see that GuidEx Manager presents a series of progress gauges as it prepares your images. What is happening is that your image(s) are being copied to an 'Images' sub-folder and tiled so that the user's position can quickly be used to find and render the correct part of the image in the display. Also, shape files are being clipped and so everything outside the boundary is removed. Line and polygon shape files are also simplified so as to render with as few vertices as possible. You will note that after this process, there is a backup zip file of your original shape files.

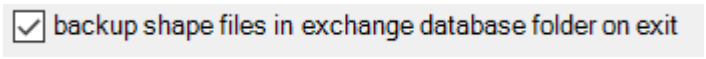
Preference Tab - Options You Should Be Aware Of



Before we go much further, note that there is a preference on the utility (last tab page) that, when checked, will copy any file you specify to the same folder as the exchange database (unless it is already there.)

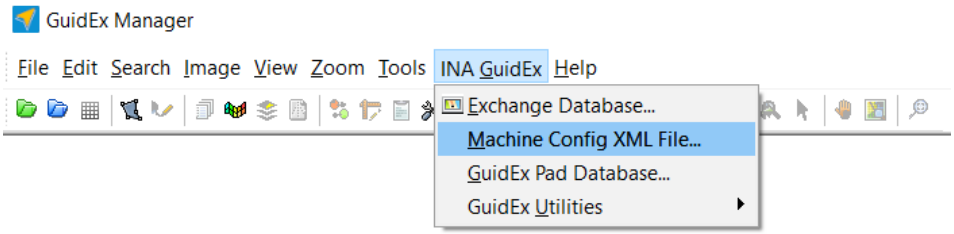


While we are at it, let's look at the other preferences on the Preference tab page. This includes a warning to make a boundary shape file (covered below). The boundary file is used to clip all shape files in use. This creates the most efficient set of files for the system.



Because your original shape files might get altered, this option makes a zip file of those for you.

Creating The GuidEx Config XML File

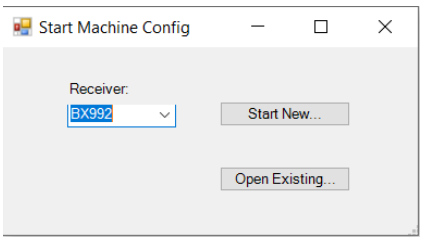


This utility is accessed from the "Machine Config XML File..." menu item in the "INA GuidEx" menu of GuidEx Manager.

In addition to the exchange database and the Task/Pad database, the Configuration XML File is one of three principal sets of operating parameters. These parameters include the following:

1. Machine name, antenna height and machine geometry (length, width, and placement of GNSS antenna, IMU & position reference point)
2. Inertial Measuring Unit (IMU) orientation, and pitch and roll thresholds
3. GNSS correction source and precision thresholds
4. Target navigation parameters.
5. Messaging parameters - NMEA, PPS & Record Trigger
6. GuidEx Connect cloud setup parameters.
7. Standby behaviour (whether to prompt operator and time between prompts)

When launched, you will first be prompted to define which hardware platform you are using this XML file on (current BX992 or legacy NAV900). Here you can either Start a new file or open an existing file to edit.



Once defined, you can still open an existing XML by pressing  . Once file is complete, press  to save it. For a new XML file, complete all sections and press 

The file must have the name 'Config_MyMachine.xml' where 'MyMachine' is the name you entered for the machine.

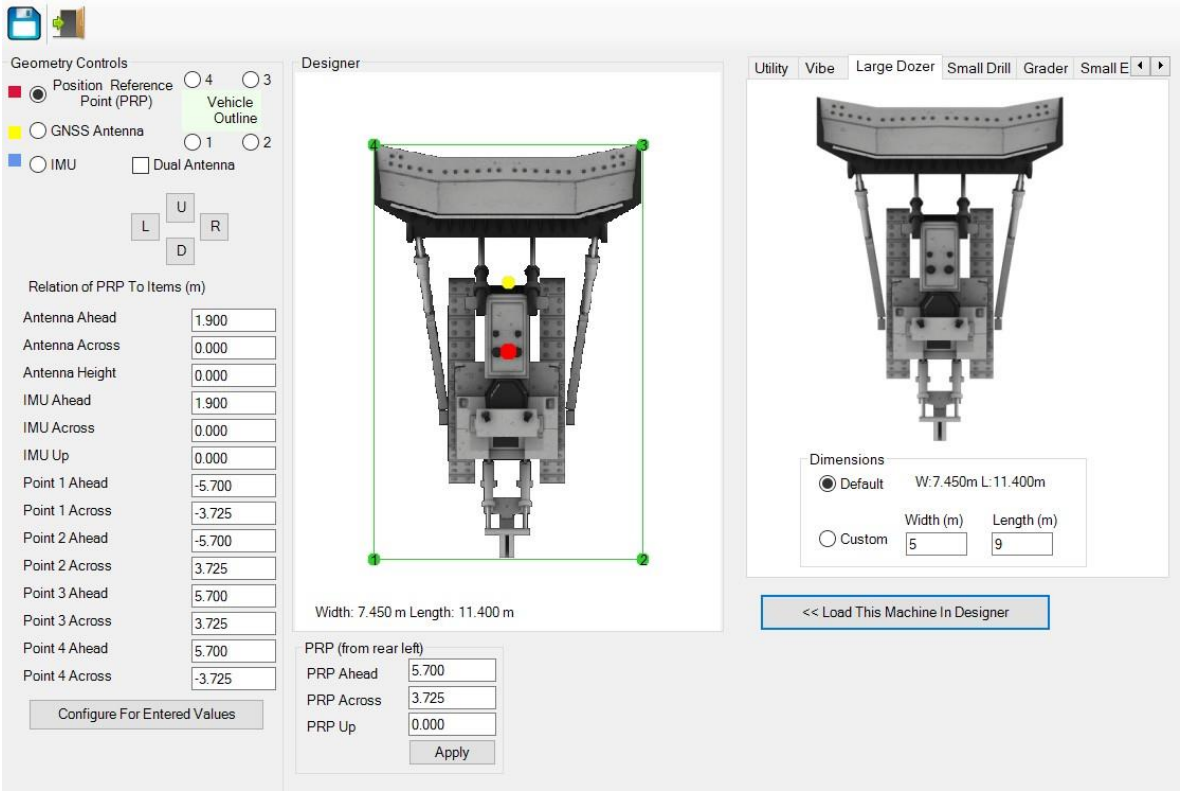
The Configuration File utility has six basic sections, each on its own tab page: Machine, GNSS Correction Source, Target, Messaging, Cloud Setup, Pad DB.

Machine/Geometry

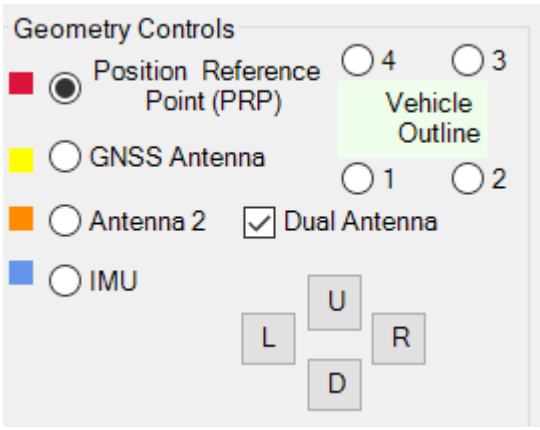
Configuring Machine Parameters

Start by defining your machine geometry. Press the Machine Geometry button and a dialog will display where you can interactively define the machine type, Position Reference Point (PRP), antenna location(s), inertial measuring unit (IMU) location, and four points that roughly describe your vehicle shape.

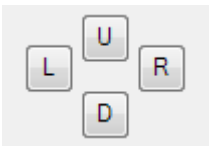
Once the Position Reference dialog is displayed, select a tab page that depicts your machine type. Then press the 'Load This Vehicle In Designer' button at the top of the tab page. This will display the vehicle in the Designer:



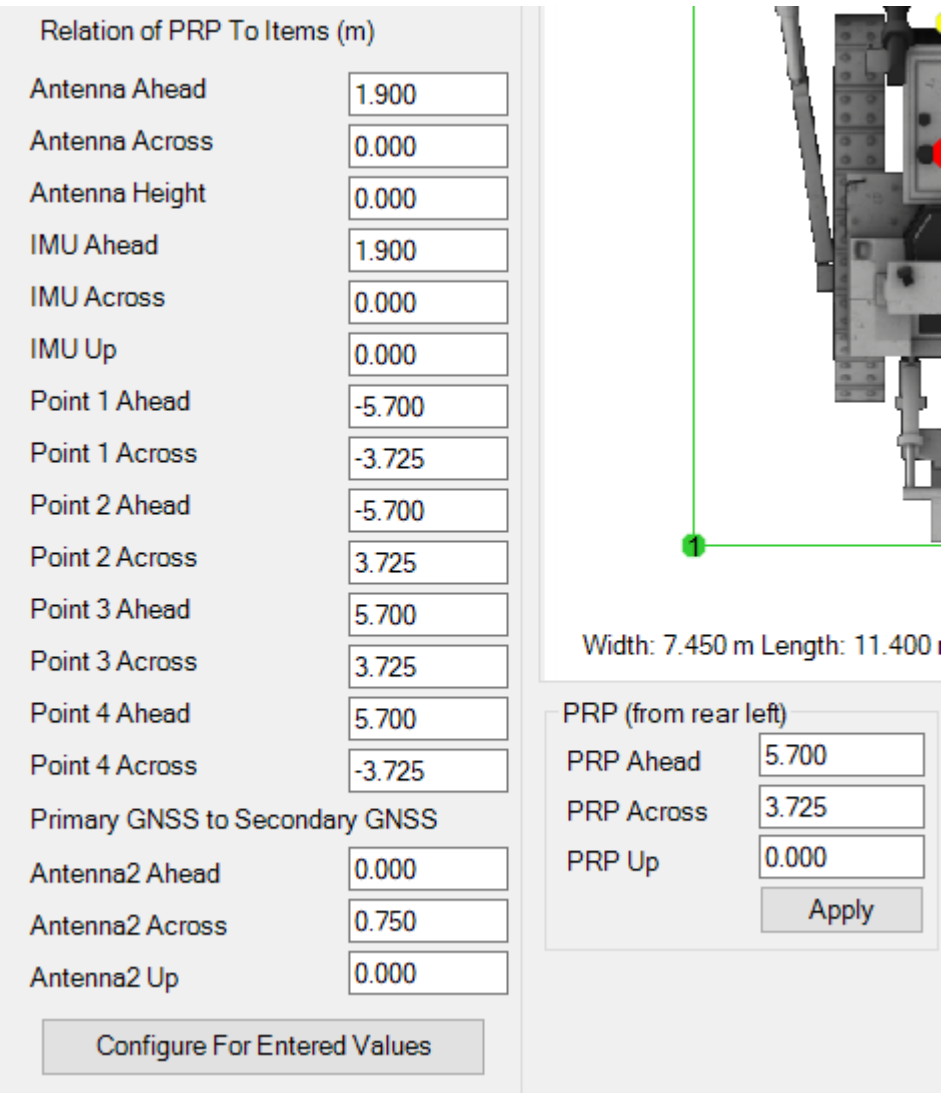
Note that each machine has its own predefined width and height. When a machine is loaded into the Designer, these will appear at the bottom of the Designer vehicle depiction. If your machine does not match these default dimensions, you can override them by entering the actual dimensions in the top toolbar and checking the radio button next to Custom, and then loading the machine in designer.



There will be 4-5 settings to define, depending on if you are running single or dual antenna. The red circle is the Position Reference Point (PRP). This is the position that will be the primary position for navigation and is the recorded point in the GuidEx log file. This position is a virtual lever arm offset, leveraging the IMU heading, pitch, roll to calculate the virtual point The yellow point is the location of the primary GNSS antenna. The blue circle is the IMU position on the machine. The orange circle is the secondary antenna (optional), which displays when the 'Dual Antenna' box is enabled. The four green points are used for the machine footprint to determine the machine position in reference to exclusion/ inclusion zones.



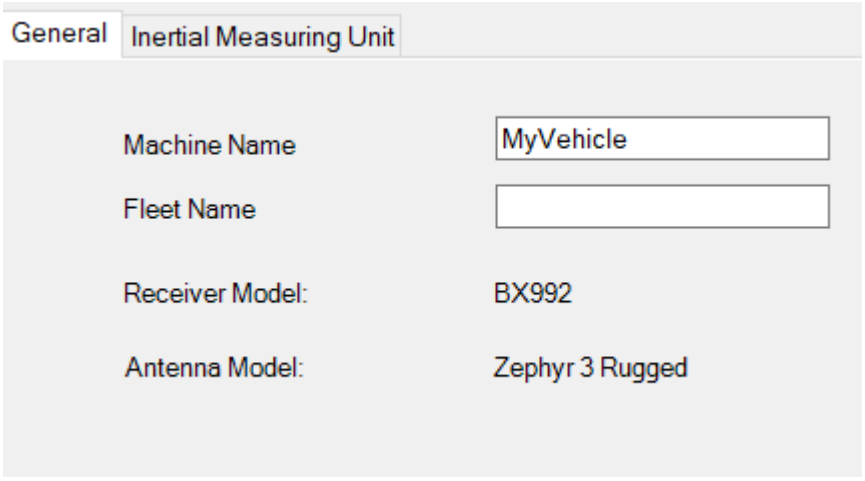
To move the machine footprint points, select the radio button by the point to be moved and press these buttons. U = Up, D = Down, L = Left and R = Right.



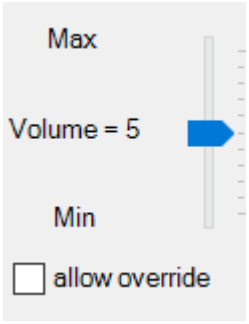
If you want to enter explicit values into the text boxes, do so then press the Configure for Entered Values button. Note that all values are in meters and are the distances ahead or across from the PRP.

Once you have defined the machine geometry, press the  button to return to the main configuration dialog:

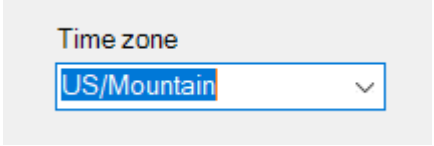
Machine/General Settings



Now give your machine a name. This name is displayed on the tablet logged in the GuidEx log file. Fleet name is optional.

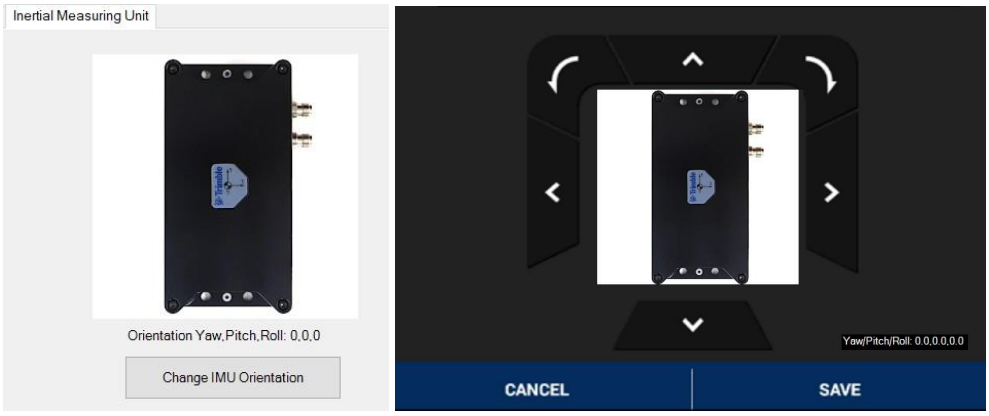


Select a sound volume value and if you want to give the user the option of overriding the volume set, the check the 'allow override' check box. If allow override is unchecked, if the operator attempts to change the volume via the tablet settings, this will be overridden by GuidEx back to the level defined here.

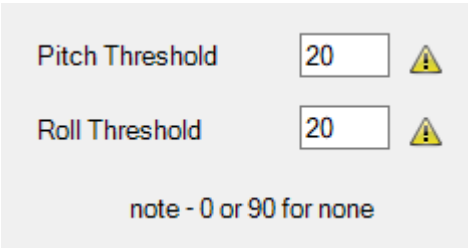


Optionally, you can define a time zone to set the tablets clock to

Machine/Inertial Measuring Unit Settings

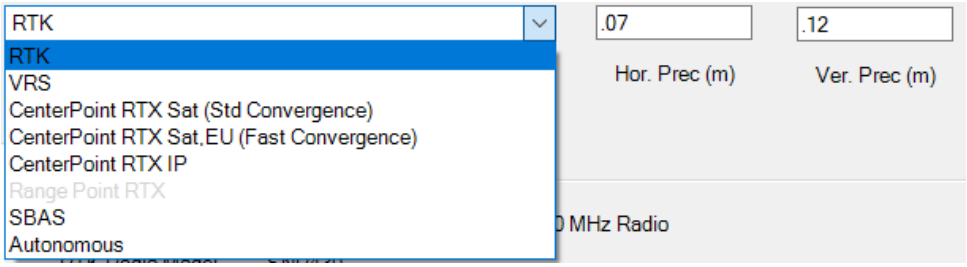


IMU Orientation - Assuming the top of the screen is the front of the machine, select the IMU orientation that best describes your installation. Click "Change IMU Orientation" to rotate the IMU graphically.



Pitch and roll values are in degrees that indicate the maximum angle before alarms sound.

Configuring GNSS Correction Source Parameters



Correction Source and Precision Thresholds

The user should select a correction source. You will have one or several other controls to configure depending on the correction source. Note that every time you select a

different source, the suggested precision thresholds will be selected for you, but you may enter any values you consider appropriate for your operations. Below are the settings that should be addressed for each correction source:

Autonomous - There are no settings associated with Autonomous.

SBAS - The satellite-based augmentation systems (SBAS) with free correction services are: WAAS (Wide Area Augmentation System) in North America

EGNOS (European Geostationary Navigation Overlay Service) in Europe MSAS (Multi-functional Satellite Augmentation System) in Asia Pacific regions Typically, you will set this to 'Automatically Selected From User Position'.

RTX Satellite - These services are optional and requires an unlock. The RangePoint service has an accuracy < 6" (15 cm) while the CenterPoint service is < 1.5" (3.8 cm).

You must select one of five existing regional services or a custom service (in which case frequency and baud rate entries are required).

*Note: RangePoint RTX is only available for use on legacy NAV900 platform, which is why it is disabled in the screenshot above (configuring for BX992 platform).

CenterPoint RTX IP (Modem) - CenterPoint RTX IP is a cellular broadcast subscription service for corrections with < 1.5" (3.8 cm) accuracy. A connected wireless modem receives these signals.

There is a fast restart option only.

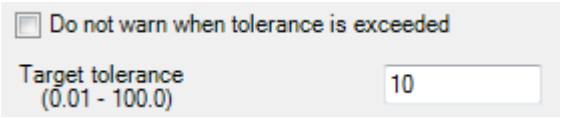
CenterPoint VRS - This service is optional and requires an unlock. CenterPoint VRS is a cellular-broadcast RTK correction service from a ground-based reference station using a modem and requires a connected wireless modem.

Options include username, password, host, port, mount point, xFill (and related frequency options).

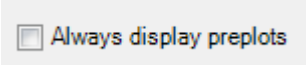
RTK - RTK is a radio-broadcast correction service originating from a ground-based reference station and received by radio signal. The AG-815 is an integrated radio capable of receiving these signals.

Options include whether you are using 450 MHz or 900 MHz radios. If using 450 MHz, then the specific 450 MHz frequency is required along with mode protocol). If using xFill, related frequency options are required.

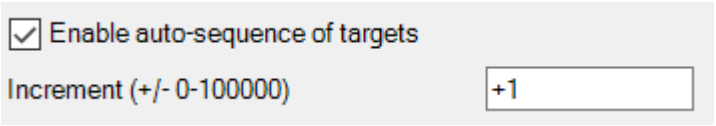
Configuring Target Parameters



This number will draw a circle around the target with the specified radius. Recording is enabled when the vehicle enters this circle, or the vehicle stops. The 'Do not warn when target tolerance is exceeded' checkbox is an off or on option. When off, if the user records the point outside the target tolerance above, the user is warned. If on, this warning is not issued.

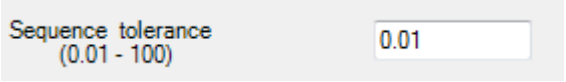


This is an off or on setting. If off, after a point is shot, it disappears from the screen. If on, it remains.

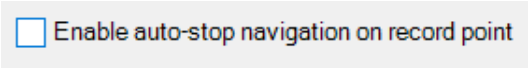


Use this control to change the current point increment and the direction. For example, if your stations are 1,2, 3... and you enter '+1' for the increment, once station 1 has been surveyed, station '2' is automatically targeted. If you enter '+2' then after station 1 has been surveyed, station 3 is targeted and so on. A minus value reverses that logic. For example, if you enter '-2' and you have just surveyed station 5, then the next targeted station is 3. Values can be defined as integers or decimals. Note that '0' and '-0' (without the single quotes) are special values that will simply sequence down the list and up the list respectively, no matter what the station value or text is. If the station has alpha and numeric characters, the alpha characters are ignored. For example:

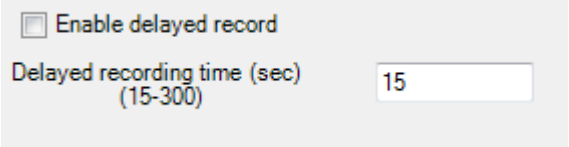
- 1234test uses 1234 for increment calculation.
- test1234 uses 1234 for increment calculation.
- te123st uses 123 for increment calculation.



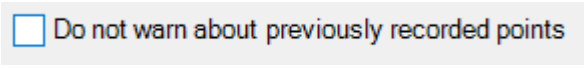
When auto-sequence is disabled, and the machine exceeds the sequence tolerance distance from the currently recorded point (without sequencing to next point), a warning dialog appears asking the user to select the target (I.E: either use previously recorded point or sequence to next point).



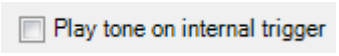
This is an off or on setting. When enabled, navigation is stopped as soon as a point is recorded. You might want to use this if you do not have a viable point sequence, that is, when you record one point, neither adjacent point in the list is the next target. In this way you can manually select the next point to navigate.



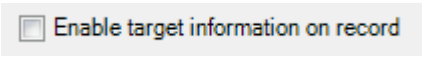
This is an off or on setting. Enabling this setting utilises the value specified. Setting a delay will initiate a countdown of the selected number of seconds before a point is recorded. The log dialog will display the count down and you will be able to force it to record before the countdown is over. This feature is typically used in high multipath environments to allow the GNSS receiver time to model the multipath to obtain an improved position.



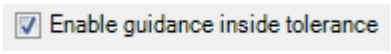
This is an off or on setting. When enabled, the user is not alerted to the fact that a point might have been previously recorded. When disabled, the warning is issued.



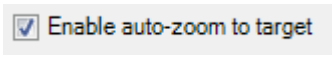
This is an off or on setting. When enabled, a tone is played when an external trigger is received.



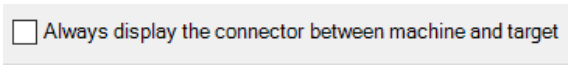
This enables a dialog post point recording to allow the user to enter the comments about the point recorded.



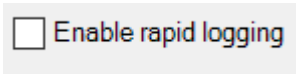
This is an off or on setting. When enabled, values to target centre remain after you have entered the target tolerance. When disabled, the guidance indication simply states you have arrived.



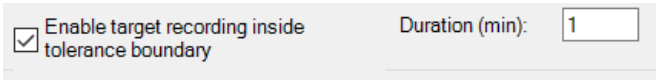
This is an off or on setting. When enabled, GuidEx will automatically zoom in as you approach the target.



This is an off or on setting. When on, a connector line will always be displayed the machine and target. When off, the connector line will only be displayed when auto-zoom is enabled, and the machine is far from the target.

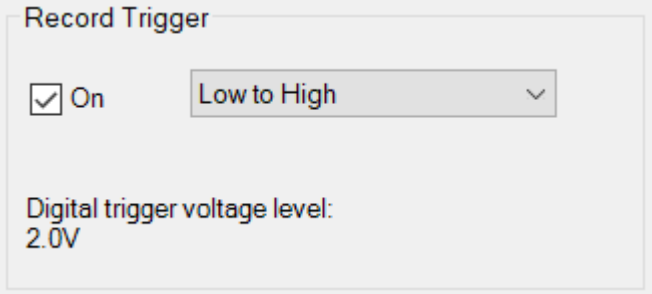


By default, GuidEx records timed positions every ten seconds and 1 meter (meaning, if the new position is at least one meter from the previous log record, and 10 seconds have elapsed). With this rapid logging option checked, timed positions will be logged once per second with the same one-meter distance requirement.

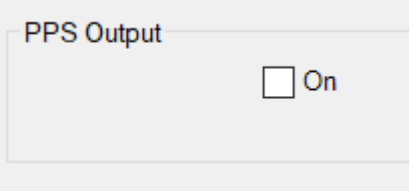


If enabled, when a machine enters the target tolerance boundary of a point, GuidEx will log Event Type 11 records in the duration defined here. This is useful in scenarios with long occupation times on points, where operators may forget to survey a point.

Configuring Messaging Parameters



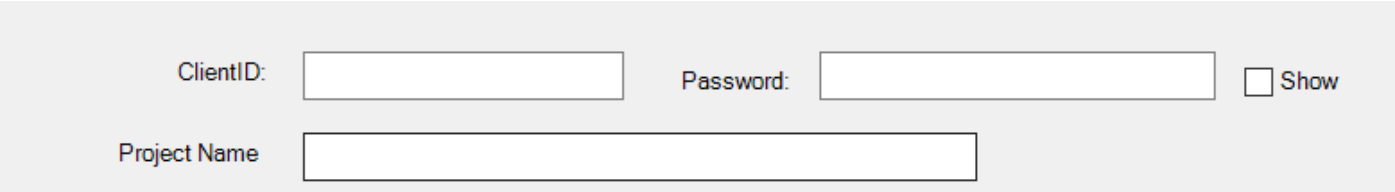
To generate a log record each time a voltage is detected, check the 'On' checkbox and select the polarity and voltage expected.



PPS messages can be sent from the receiver to a 3rd party device, using the PPS lead on the cable.

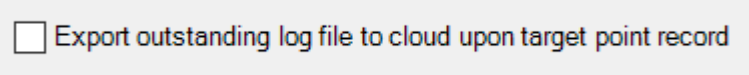
Configuring Cloud Setup Parameters

This section defines configuration parameters used when connecting the tablet via internet connection to the GuidEx Connect platform for file sharing and tracking.

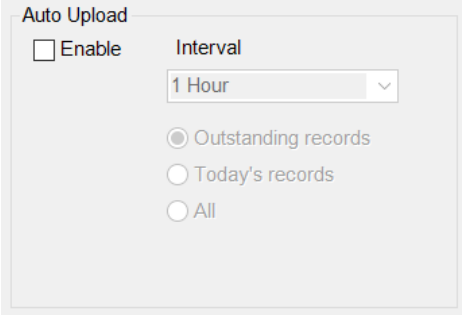


Login parameters and project folder in which the tablet will communicate to. The ClientID and Password (Secret). These are found by logging in to GuidEx Connect, going to the profile icon (upper right corner) and clicking the "Name:" option, which displays account settings. The Project Name should match the Project folder created on the GuidEx Connect platform which the data will be sent to/from.

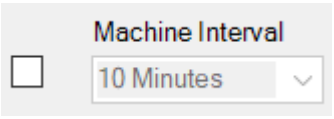
File Sync Interval defines how frequently GuidEx should automatically check for new files (in the Updates folder of GuidEx Connect). Regardless of whether this section is used or not, GuidEx always checks for new files in the Updates folder of GuidEx Connect each time the GuidEx app launches on the tablet.



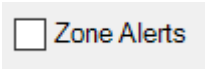
When enabled, each time a machine records a point via the right drawer target list, an outstanding records log file will be uploaded to GuidEx Connect Uploaded folder.



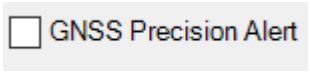
When enabled, the specified log file type is exported to GuidEx Connect in the specified duration. Note that this duration is app runtime.



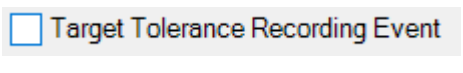
When enabled, the latest machine time event record (type 0) is sent to GuidEx Connect's track machine page based on the duration defined.



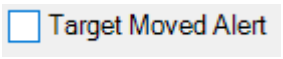
When enabled, exclusion/inclusion zone breach and proximity events are sent to GuidEx Connect's track machine page.



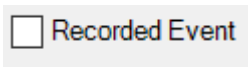
When enabled, GNSS Precision threshold alerts are sent to GuidEx Connect's track machine page.



When enabled, and if the Target Tolerance setting in Target Parameters tab is enabled, when a Target Tolerance recording (type 11) occurs, that point will be sent to GuidEx Connect's track target page.



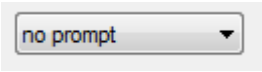
When enabled, if an operator move/offsets a target point (in right drawer), that event will be sent to GuidEx Connect's track target page.



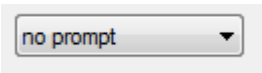
When enabled, each time an operator record's a target point (from right drawer), that event will be sent to GuidEx Connect's track target page.

Configuring Pad DB Parameters

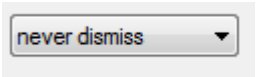
You can set the following prompt times for use with Pad DB workflows:



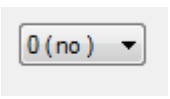
When the machine is in Standby or performing an active task with no pad and inside a pad, a prompt is displayed to choose a pad related task. On dismissal, this prompt is re-issued every number of minutes specified here. You can also set to 'no prompt'.



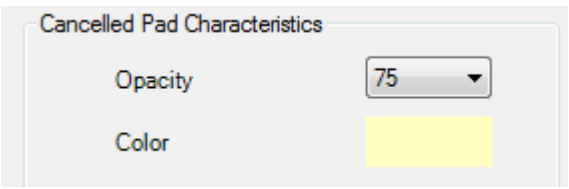
When in Standby and the machine is stationary for the number of minutes specified here, operator is prompted for a standby reason. You can also set to 'no prompt'.



When in Standby and the machine is stationary and the prompt to choose a Standby reason is displayed, this prompt will auto-dismiss after the number of minutes specified here. You can also set to never dismiss.

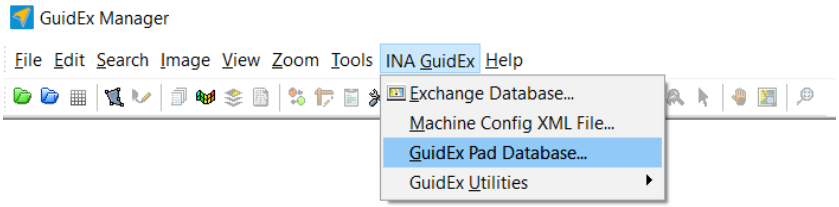


Flash screen when driving in standby. Set to Yes or No.



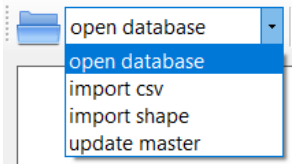
A cancelled pad will have the opacity and colour specified here.

Creating The Pad/Task Database



This utility is accessed from the “GuidEx Pad Database…” menu item in the “INA GuidEx” menu of GuidEx Manager. It allows you to create or modify a GuidEx Pad database. You should familiarize yourself with the database structure before creating one.

Importing Pad Coordinates Or Importing Existing Database



The user may import an existing database, import a CSV file or point shape file to create one, or update a master pad DB from pad DB files exported from machines. If a CSV file is imported, it should have a minimum of three comma delimited items - pad number, easting, northing. Optionally, height, comment, length, width, azimuth fields can also be used, in that order. The CSV structure should be:

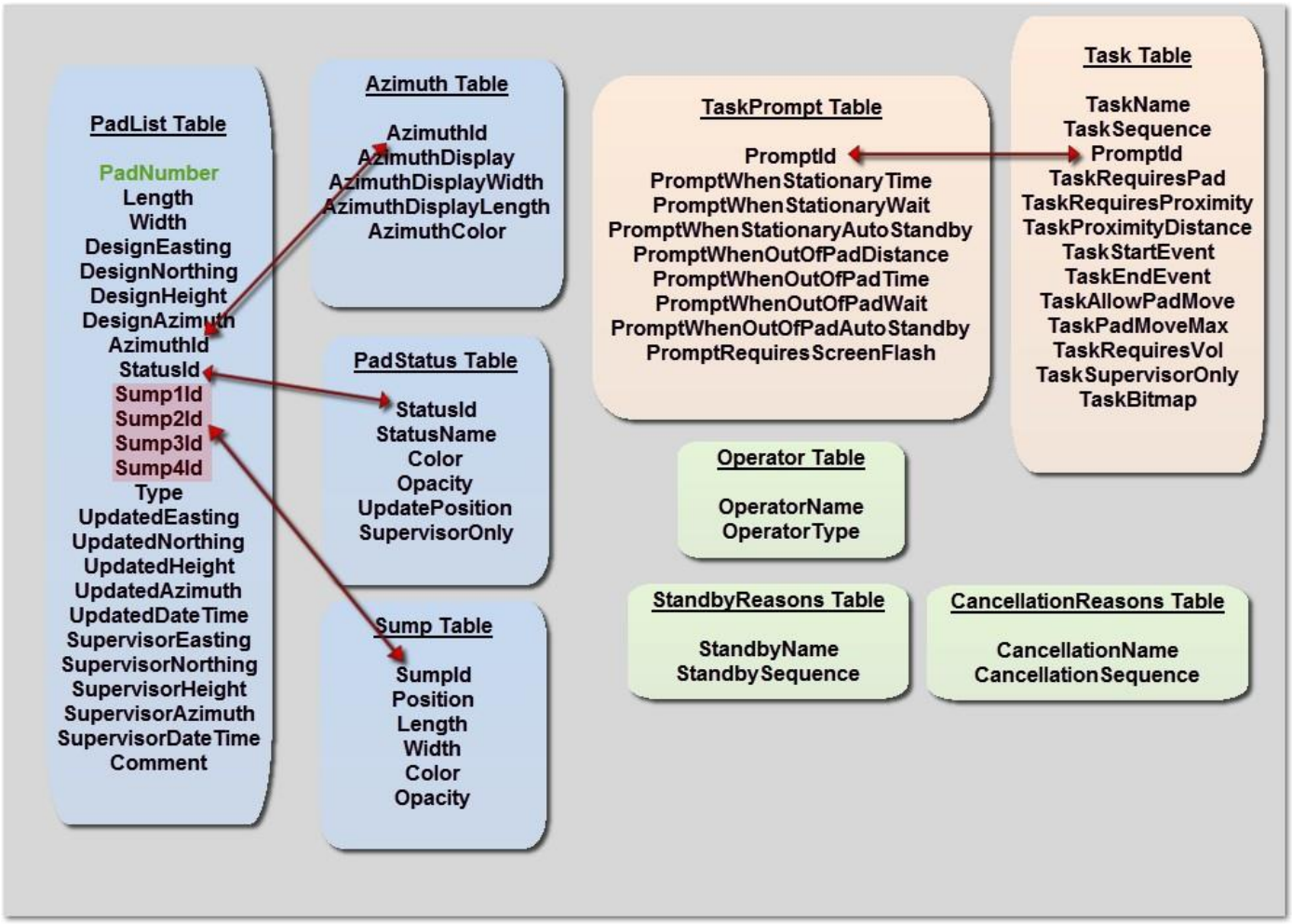
- Pad number
- Easting
- Northing
- Height
- Comment
- Length
- Width
- Azimuth

If importing only some of this data, be sure to include blank fields to maintain this structure for proper import.

When importing a point shape file to create a pad database, the user will be prompted with all 8 potential import fields, each with a drop-down box to define the corresponding DBF field to use. If a field is not to be used, leave blank.

Note that there is no 'save' button. A database is created on initial import and all user interaction with it (described below) updates the database immediately.

Structure Of The Pad/Task Database



PadList Table

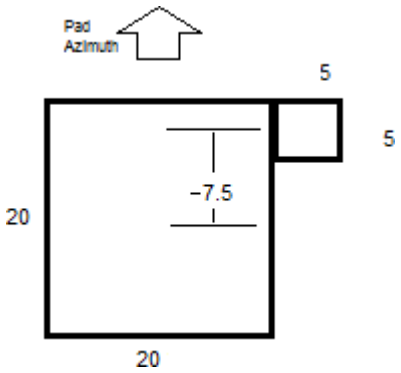
This table contains the locations of all pads, their dimensions and orientation. The PadList table contains the 'PadNumber' field. This is a text field and can be any alphanumeric characters, however each must be unique, that is, there cannot be more than one pad with the same name or number. The 'StatusId' field references the 'StatusId' field in the PadStatus table to determine some of the pad's characteristics such as colour and status name. The 'Sump1Id, Sump2Id, Sump3Id and Sump4Id' fields reference the Sump table 'SumpId' field to determine the sump characteristics. There can be up to 4 sumps and their position with respect to the pad can be specified using the 'Position' field. The 'AzimuthId' field references the 'AzimuthId' field in the Azimuth table which will dictate if and how an azimuth pointer will be displayed. The 'Type' field is 1 or 0 for rectangular or circular, respectively.

PadStatus Table

The PadStatus table allows the user to define various pad characteristics including an assigned name, colour, opacity, and a value which indicates if it can be updated with regards to position, azimuth, and height.

Sump Table

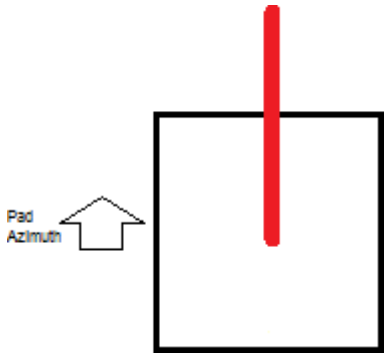
The Sump table contains the Position field which indicates its position on the pad (0=top 1=right 2=bottom 3=left), along with length, width, colour, and opacity.



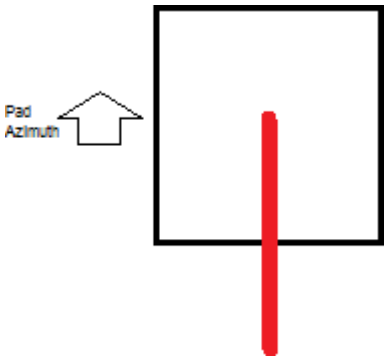
There is a field called OffsetFromCenter which can be used to move the sump along the side of the pad. For example, here we have a pad with dimensions 20x20. We have a sump with dimensions 5x5. Here we have designated this as a sump on the right side of the pad. If we imagine we are standing at pad centre and facing the side of the pad the sump is on, then a negative OffsetFromCenter value will offset to the left and a positive OffsetFromCenter will offset to the right. By entering a -7.5 for OffsetFromCenter, then we end up with what is depicted here.

Azimuth Table

The Azimuth table defines if an azimuth pointer is shown for a pad and the length, colour, orientation, and width of that pointer.



The azimuth is displayed from the centre of the pad. If you have defined a 20x20 pad and an azimuth length of 20, you would expect the azimuth depiction to look something like this.



If you have defined the h orientation to be az+180, the azimuth will be depicted in the opposite direction of the pad azimuth.

CancellationReasons Table

Contains a list of reasons why a pad might be cancelled. The listed sequence can be controlled by specifying the Sequence field.

Operator Table

Contains a list of Operator names and their classification. The classification dictates which actions are permissible. The listed sequence can be controlled by specifying the Sequence field.

StandbyReasons Table

Contains a list of reasons the machine might be standing by for. Also used for storing three times in minutes:

1. When the machine is in Standby and inside a pad, a prompt is displayed to choose a pad related task. On dismissal, this prompt is re-issued every X minutes entered.
2. When in Standby and the machine is stationary for X minutes specified here, user will be prompted for a standby reason.
3. When in Standby and the machine is stationary and the prompt to choose a Standby reason is displayed, this prompt will auto-dismiss after X minutes specified here.

The listed sequence can be controlled by specifying the Sequence field.

Tasks Table

Contains a list of tasks to be performed. A task is defined by a name and has associated parameters such as if it requires a pad and proximity to pad, requires volume, is for supervisor only, and what image to use to represent it in the user interface. The 'PromptId' links to the TaskPrompts table (see below). Specific fields are as follows:

TaskName - This should be a unique name for the task.

TaskSequence - This allows the user to specify in what order tasks are displayed. The lower the number the more to the top the task will be. PromptId - The 'PromptId' links to the TaskPrompts table (see below).

TaskRequiresPad - A yes or no setting that indicates if the task requires specification of a pad.

TaskRequiresProximity - A yes or no setting that indicates whether the task requires a certain proximity to a pad. See next item. TaskProximityDistance - A distance in map units indicating the necessary proximity of the vehicle to the pad when a task requires proximity.

TaskStartEvent - a value that must be 100 or greater which will be written to the log when this task is started. The value must be unique, that is, no other task's start or end event may have the same number.

TaskEndEvent - a value that must be 100 or greater which will be written to the log when this task is ended. The value must be unique, that is, no other task's start or end event may have the same number.

TaskAllowPadMove - a yes or no setting that dictates if a pad can be moved or not.

TaskPadMoveMax - a value in map units that dictates how far pad coordinates can be moved by the operator. TaskRequiresVol - a yes or no setting that dictates if the task requires a prompt for volume information at task end. TaskSupervisorOnly - a yes or no setting that dictates if the task is carried out by a supervisor.

TaskPrompts Table

Primarily contains various times (in minutes) to wait before a prompt occurs. Prompts include 'when stationary' and 'when outside a pad'. Note that these settings are different from the Miscellaneous table setting since they refer to a task. The ones in the Miscellaneous table just refer to standing by. Details follow:

PromptWhenStationaryTime (integer) - When performing a task and you go stationary, you can choose no prompt or the time in minutes machine is stationary before prompted.

PromptWhenStationaryWait (integer) - When performing a task and you go stationary and the stationary prompt has been issued (because you set the 'PromptWhenStationaryTime') field above, this is the number of minutes to wait before stationary prompt is auto-dismissed. You can also elect to never-dismiss.

PromptWhenStationaryAutoStandby (integer) - Your choices here are to immediately go to Standby when auto-dismissing the prompt above, or to stay in current task when auto-dismissing the prompt above.

PromptWhenOutOfPadDistance (double) - The distance in map units beyond and outside the pad boundary for the machine to be considered "Outside the pad". This distance is used with PromptWhenOutOfPadTime field (see below).

PromptWhenOutOfPadTime (integer) - When performing a pad related task and the machine moves outside the pad by the distance PromptWhenOutOfPadDistance AND remains outside for this time in minutes, the prompt "You are outside pad boundary - Are you still

performing Pad work?" will be issued. On dismissing this dialog, it will re-prompt every number of minutes specified here if you remain outside the pad.

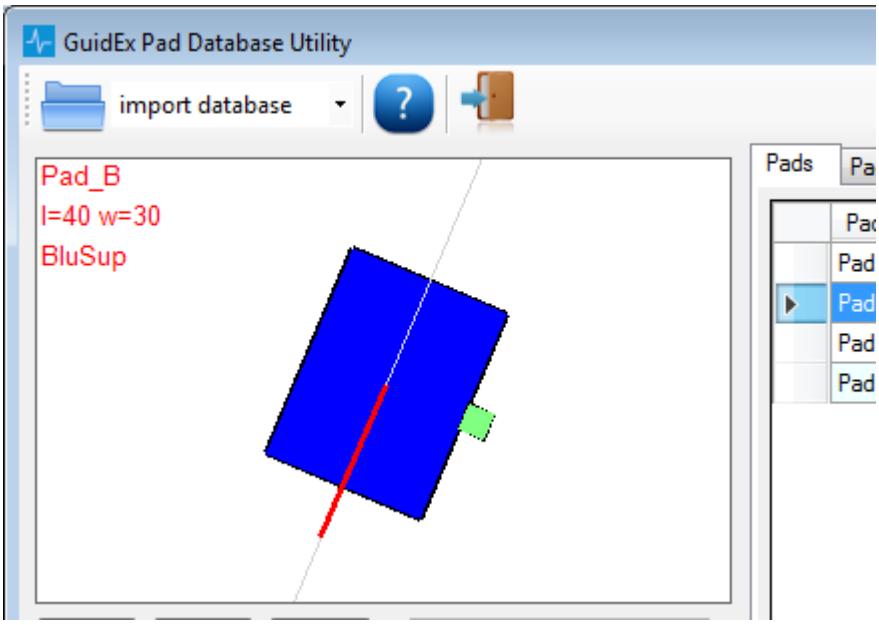
PromptWhenOutOfPadWait (integer) - When performing Pad work and the machine is outside pad boundary, the "You are outside pad boundary, Are you still performing Pad work?" prompt appears. This is the wait time for it to auto-dismiss. You can also elect to never auto-dismiss.

PromptWhenOutOfPadAutoStandby (integer) - You can elect to immediately go to Standby when auto-dismissing or to stay in current task when auto-dismissing.

PromptRequiresScreenFlash (integer) - Indicates whether to flash screen with blue border when prompts are issued.

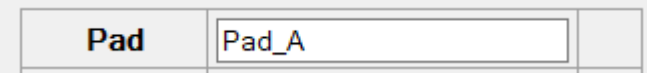
Working With The Pad/Task Database

Working With The PadList Table

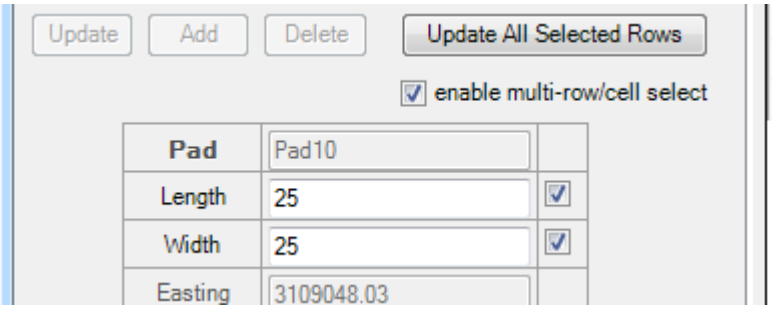


When a database is open, the user can click on a row and the characteristics of that pad and associated sumps are shown at the top left of the dialog. This is how the pad will be rendered on the map.

When you click on a row, the information for that row is automatically inserted in the text boxes and combo dropdowns. This also pertains to clicking on any other spreadsheet that depicts a table's contents.



Delete, Update and Add buttons are used to delete, update, or add the currently specified 'Pad' record (shown here as 'MyPad'). For example, the 'Add' button would add a new record with name, 'Pad_A' and with the settings currently entered. Update would modify the 'Pad_A' record with the settings currently entered. Delete would delete the 'Pad_A record.



You can update multiple rows at the same time. To do this, you would check the checkbox that says: 'enable multi-row/cell select'. This action enables the 'Update All Selected Rows' button as well as checkboxes next to all pad characteristics except pad name and pad coordinates. If the 'enable multi-row/cell select' checkbox is checked, you can select multiple rows in the pad list spreadsheet. Rows don't have to be contiguous. You can use the CTRL and SHIFT keys to select any rows you wish. Once the 'Update All Selected Rows' button is pressed, the fields you checked for all selected rows are changed and the database is updated.

By default, the collar, which is defined by the Easting and Northing value, is located centrally within the pad at the end of the Azimuth line. It is possible to offset the pad design from the actual collar position, either along the Azimuth, to the right/left of the Azimuth, or both.

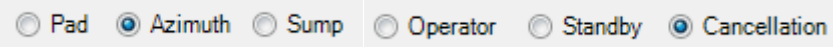
- To adjust the pad design along the Azimuth, enter the desired value into the “Shift on Az” field.
    - Positive values will shift the pad design in the direction of Azimuth.
- To adjust the pad design to either side of the Azimuth, enter the desired value into the “Shift right of Az” field.
    - Positive values will shift the pad design to the right of the Azimuth.
- Click “Update” to save any changes.

Note: The collar position does not change, the pad design moves about the fixed collar position.

Working With TaskPrompts, PadStatus, Azimuth, Sump, Operator, Standby and Cancellation Tables

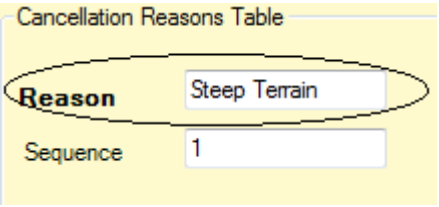
Working with these tables involves working with a similar set of controls:

Which table will be affected is dictated by the radio-button selected:



Update - This will update a record specified by a key field of the table. Here is a list of the key fields for each of these tables:

- *(Table/Key Field)*
  - PadStatus / StatusId
  - Azimuth / AzimuthId
  - Sump / SumpId
  - Operator / OperatorName
  - CancellationReason / CancellationReasonName
  - StandbyReason / StandbyReasonName
  - TaskPrompts / PromptId



This key field is the first field listed in a group of controls. For example, for the CancellationReason table, the key field is the one circled here. If you pressed the Update button, the current record containing 'Steep_Terrain' would be modified.

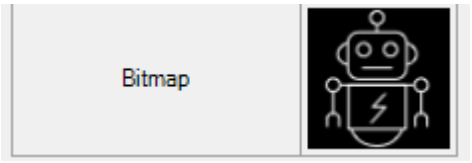
Add - You can add a record to a table by pressing the Add button after entering values for the key field and all relevant parameters. If a record already exists, then you will be prevented from adding it.

Delete - This will delete a record identified by the key field.

Import - Import will prompt for a different database and import all records from it.

Working With The Tasks Table

The Update, Add and Delete buttons work with the 'Task Name' task specified (shown here as 'Dozer'). For example, the 'Add' button would add a new record with name, 'Dozer' and with the settings currently entered. Update would modify the 'Dozer' record with the settings currently entered. Delete would delete the 'Dozer' record.



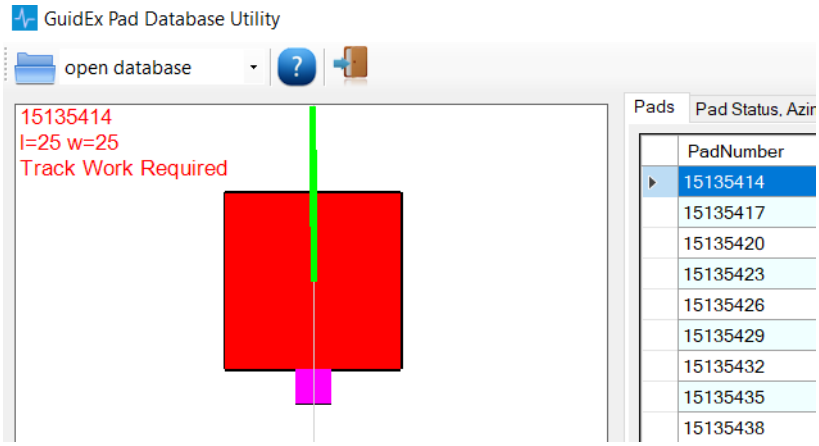
When you retrieve the information for a record, the bitmap in that record is shown.

To select a bitmap, double click on one of the bitmaps at the bottom of the dialog.

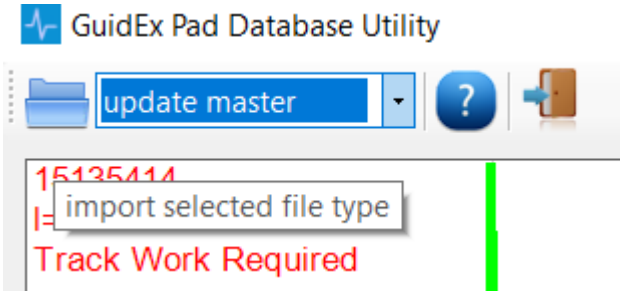
Import will prompt for a different database and import all Tasks from it.

Update Master

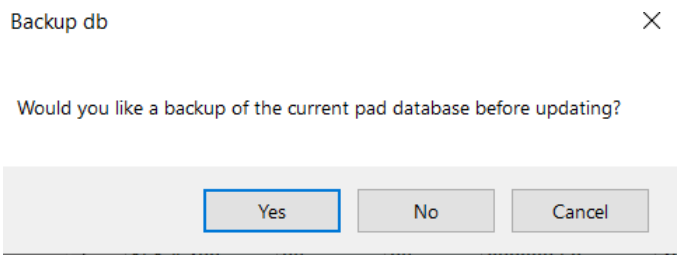
When operators work on a pad database in the field, pad status, position & comment updates are stored in the pad database and exported from the tablet (suffixed with machine name date time), alongside the log file. These daily pad database update files from the machines can then be used to update the "master" pad database. To do so, first open the pad database to be updated in the GuidEx Pad DB utility.



Then, in the drop-down list select update master and click open:



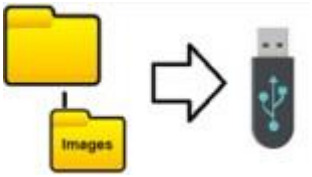
You will first be prompted if you wish to create a backup of the pad opened prior to selecting files to update with:



You can then browse to a folder containing one or more pad databases from machines to update with. There is no limit to the number of pad databases that can be used for updating at one time. This utility will then work to update the master pad database to match the latest pad record in the machine files. This leverages the UpdatedDateTime field and will replace any previous updates with the latest date time record. You can scroll to the UpdatedDateTime field and sort to see these updates. Fields updated include: StatusID, UpdatedEasting, UpdatedNorthing, UpdatedHeight, Updated Azimuth, UpdatedDateTime, SupervisorEasting, SupervisorNorthing, SupervisorHeight, SupervisorAzimuth, SupervisorDateTime, PadHasBeenCancelled, CancelationReason

UpdatedEasting	UpdatedNorthing	UpdatedHeight	UpdatedAzimuth	UpdatedDateTime
				12/16/2020 8:27 PM
				12/16/2020 8:24 PM
624762.51024443668	4824195.051234589	47.971000800840557	165.51382947751961	12/16/2020 8:23 PM
624592.88391426555	4824157.0928100077	47.940890557132661	13.162473771230852	12/16/2020 8:21 PM
				12/16/2020 8:19 PM
				12/16/2020 8:18 PM
				12/16/2020 8:16 PM
				12/16/2020 8:15 PM

Copying The Project To USB



Once you have created your Exchange Database, Configuration XML file and Pad/Task Database, you can copy the entire folder (including images and geodesy sub-folder) to a memory stick.. Prior to doing so, you could make the folder size smaller by removing the shape file backup ZIP file and any original raster image (since the image tiles in the 'Image' folder are what the Machine Guidance system will use). Plug the memory stick into the tablet and follow the procedure for importing a project in the GuidEx application.

NOTE: Ensure the memory stick is formatted to FAT32 for compatibility between Android and Windows operating systems

If you make changes to the exchange database, pad database, or simply add new target files (such as CSV's), then you would create an 'Updates' sub- folder to the main root folder on the memory stick and copy the new data (and exchange database, if mapping layers etc

changed) to this folder. When GuidEx sees an 'Updates' folder, it will always replace the project files with the ones in the folder. It will also add any files that exist in the Updates folder that are not present on the tablet, so this is a good way to quickly import new files to an existing project.

Uploading to GuidEx Connect

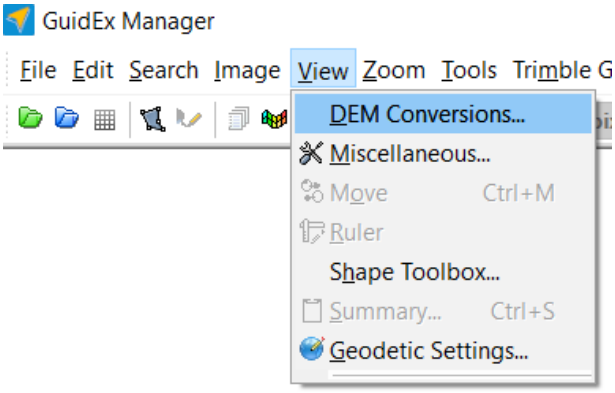
Alternatively, GuidEx Connect can be used to wirelessly transmit project and update files to GuidEx tablets:

1. Login to your GuidEx Connect Account.
2. For new projects, create a new project by clicking “Add Project”, using the same name as your project folder.
3. Once the new folder structure has been created, navigate to “Initial_project_import”
4. Click the “Upload” button to upload your project zip file inside this folder.
5. For updates, navigate to the project folder of the same name, then navigate to:
    a. Common
    b. Updates

Machines that have access to the internet and are synced to your Connect Account will have the ability to sync files.

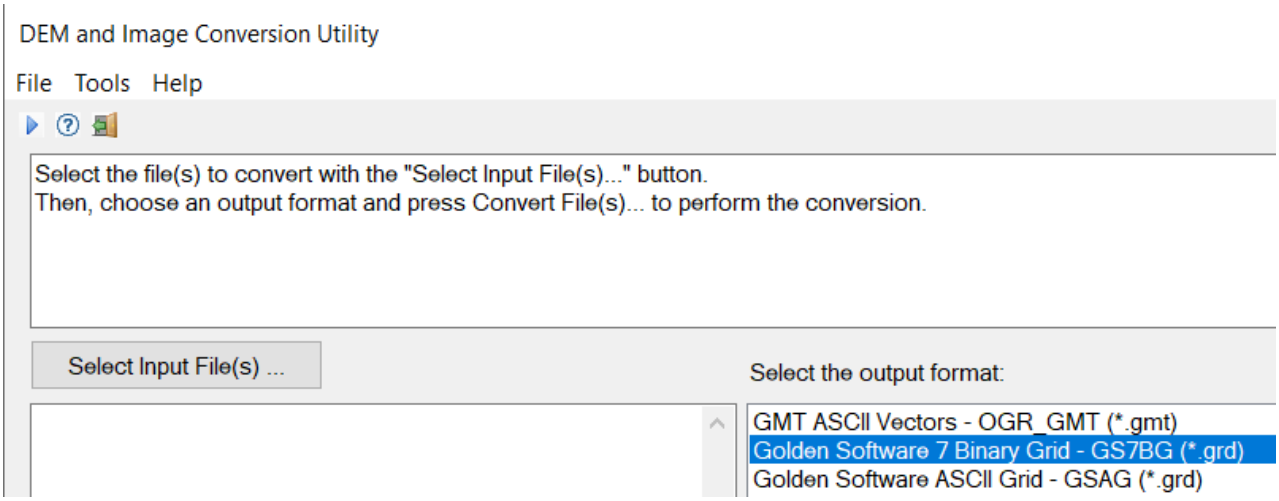
For more information, please read the GuidEx Connect User Guide.

Appendix A - Digital Elevation Model (DEM) Conversions



This utility is accessed from the 'DEM Conversions...' menu item in the View menu of GuidEx Manager. It can convert various file types from one format to another. The formats supported are primarily used for Digital Elevation Models. These conversion capabilities are based on the Geospatial Data Abstraction libraries. Not every combination of input/output formats you might select is valid. For a description of all the formats, visit http://www.gdal.org/formats_list.html.

To use the utility, press the Select Input File(s) button at the top left of the dialog. You can use the CTRL and SHIFT keys in conjunction with the file navigation dialog to select as many files as you want for conversion. However, the files must be of the same type to carry out the conversion successfully.



On the right side of the dialog, select a DEM format to make. Remember that if you want to use the DEM in GuidEx, you need to select the Golden Software 7 Binary Grid - GS7BG (*grd).

On the right-bottom part of the dialog, press the Browse button to select a folder where the converted files will be created.

Once the steps above are made are made, press the 'Convert Files' button. The left textbox will show the progress of the conversion.

Here are some important notes:

SDTS Raster (DDF) - These are USGS SDTS formatted DEM's. SDTS datasets consist of a number of files. Each DEM should have one file with a name like xxxCATD.DDF (where 'xxx' are some alphanumeric characters). This should be selected to open the dataset. If you open any other DDF file, you will encounter an error.

SRTMHGT FILE FORMAT (HGT) - You can convert a DEM from the Shuttle Radar Topography Mission (SRTM) to the GPSeismic/Surfer DEM format. SRTM is an international project spearheaded by the National Imagery and Mapping Agency (NIMA) and the National Aeronautics and Space Administration (NASA). This project supplies 1x1 second or 3x3 second digital elevation models for about 80% of the Earth's land mass. These DEMs are available to download via the internet free of charge. Try http://spatialnews.geocomm.com/features/srtm_jan2002/index2.html for a link to the Nasa FTP site.

USGS OPTIONAL ASCII DEM (AND CDED) - This is the traditional format used by USGS before being replaced by SDTS, and is the format used for CDED DEM data products from Canada such as Canada 3d DEM and GeoBase.

Version	Task	Responsibility	Reason	Date
1	Author	Z. Dredge	First INA branded document version	17/10/2023
2	Author	Z. Dredge	Re-branded	25/11/2024
3	Author	Z. Dredge	Added RTX geodetic parameters information Added USB format requirements (FAT32)	17/06/2025