Gart-2000® navigation

Manual

Allsat GmbH network + services

Hannover, 10/24/2006

Version: 1.0

Timestamp: 24.10.2006

Welcome!

This reference manual was written to make the start with the software easier; moreover, it shows all the perspectives for usage with different hardware sensors to efficiently solve complex practical tasks. As next the license terms are represented, followed by the table of contents. The first chapter concentrates on the main purpose and some highlights of **Gart-2000® navigation** .The next chapter offers you step by step guide of the installation process, followed with introduction of the graphical user interface. The menu control with all corresponding functions are described in the last chapter.

For future questions or help please write us to:

software@allsat.de

or visit our homepage:

www.allsat.de

License terms

By the lawful purchase of the **Gart-2000® navigation** software and the manuals belonging to it the licensee is entitled to the use of these objects in compliance with the following specified license terms. The licensee agrees to accept the license terms and to keep to them as soon as the software **Gart-2000® navigation** is executed.

§1 Object of the License

The **Allsat GmbH network+services** claim all rights (licenser) to the software **Gart-2000® navigation.** In accordance with these license terms the licenser gives the non-exclusive and the non-applicable right (license) to use this software and the documentation to the licensee.

The licenser has got the right to update or revise the layout and the contents of this software.

Products that are updated or revised are also subject to the provisions of this contract.

§2 Rights of Use, Misuse

The licensee accepts the licenser's rights to the product (patents, copyrights, trademarks, business secrets) unrestrictedly. That also includes the exclusive copyright on all analog and digital documentation. It is allowed to make copies of the product and documentation if this is necessary for backup purposes.

The right to use comprises the execution of the software with only one computer.

It is not allowed to:

- use one license of the software with more than one computer at the same time,

- change the functionality or the design of the software,

- pass the software or the documentation on to third (for example sale, letting, hiring out or free passing on)

Every not-licensed use is a violation of the licenser's patent rights and, therefore, can be prosecuted.

The licensee agrees to arrange all necessary steps to protect the licenser's rights and, especially, to prevent the unauthorized use, multiplication, passing on and publication of the software.

§3 Support

If training is part of the sales-contract, the licensee has got the right to the following support service offered by the licenser (this support service is limited to three month after the delivery):

- Free updates of the software **Gart-2000® navigation** and all documentation

- Hotline advice in case of problems with the use of the software.

- Moreover, the licenser offers software-support contracts.

§4 Liability and Guarantee

The software is tested and - assuming appropriate use - checked. The licenser does not give a guarantee of the respective use of the licensee.

The licensee has to inform the licenser of bugs in the software immediately. Patches or the replacement of the faulty software is guaranteed.

The licensee will only have the right for restitution or reduction of the software price if the patches or the replacement fails within an adequate period of time (at least 4 weeks). The licenser does not give a guarantee of further indirect damages.

All claims to guarantee expire 12 months after the delivery.

The licenser is appreciative for all suggestion for improvement.

§5 Validity

The right of use comes into effect when the licensee pays the license fee to the licenser. The license is given for an indefinite duration.

If the right of use is not exercised any longer by the licensee or if it is revoked the licensee has got the duty to destroy all software and its documentation which he is in possession of or to send them - at his expense - back to the licenser. Moreover, the licensee has got the duty to preserve the licenser's patent rights even if he does not use the software any longer.

§6 Rights of other Companies

Trademarks and company names of foreign companies are used without of the guarantee of free use. The licenser does not guarantee that described programs, circuitry, assembly, processes etc. are free from patent rights of third.

§7 Final provisions

All modifications or completions of these license terms are only effective if they are in written form.

Even if some provisions of these license terms are ineffective, the others still are effective. Ineffective provisions have to be replaced by others that correspond to the general purpose of the license terms.

The law of the Federal Republic of Germany is applied to this license agreement.

Any disputes arising hereunder will be settled before a court of law in Hannover, Germany.

Allsat GmbH network+services,

Hannover, 24. October 2006

Table of contents

1 Product specification and special futures

The **Gart-2000® navigation** software is build as flexible, free extendable platform to control, monitor and analyze complex measurement hardware. Furthermore it provides options for effective integration of multi sensor systems, such as JNS Gyro-4 + JNS IMU, etc. Distinguishing characteristics for that software system are summarized as follows:

- Multi sensor, hardware independent platform
- Extendable module-based architecture for fast implementation of customer requirements
- Effective Real- time and post processing functionalities
- Scalable User Interface
- Simple project administration
- Intuitive message management
- Secure data logging
- Comprehensive viewing options

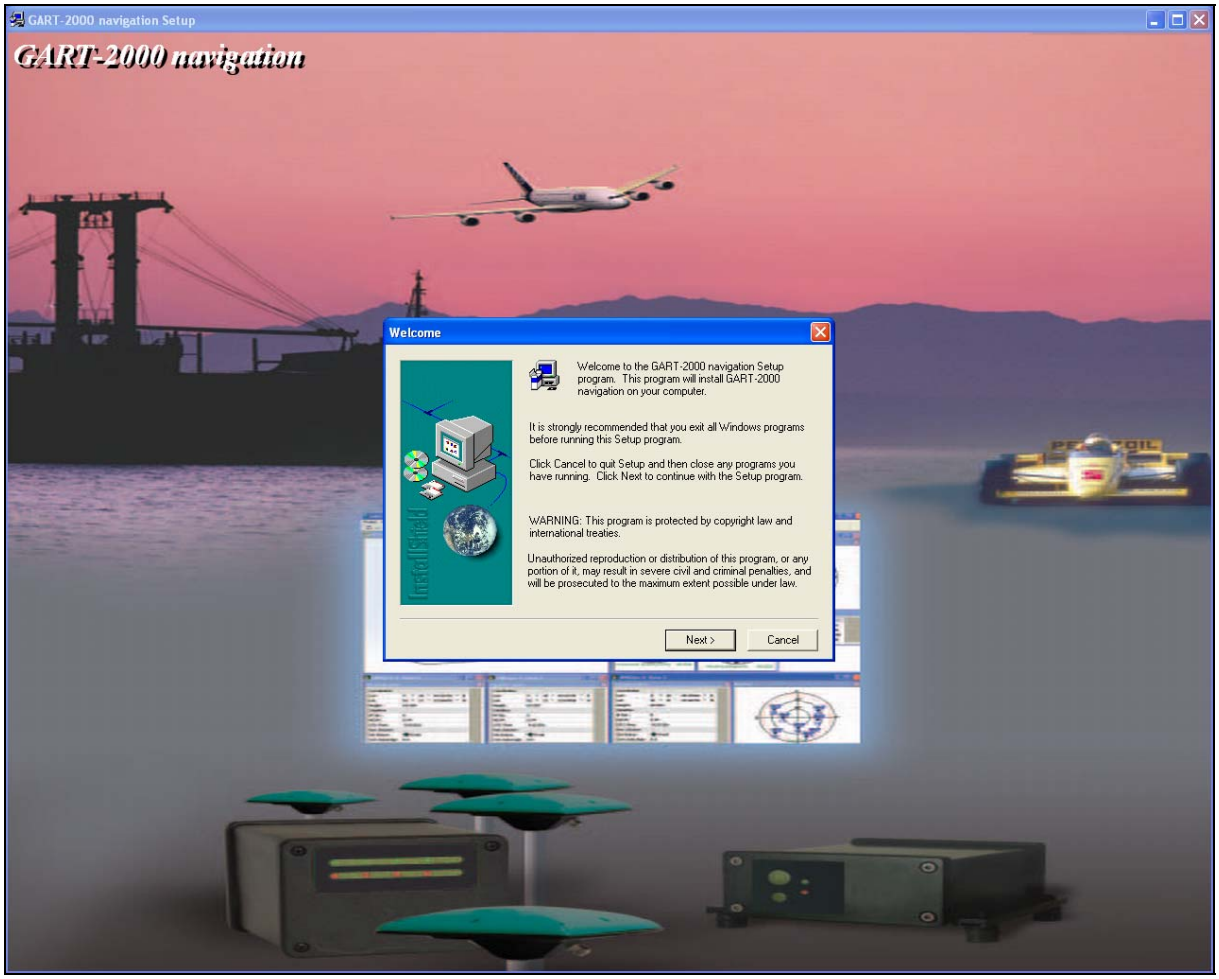
2 Getting started with *Gart-2000® navigation*

2.1 System Requirements

The ***Gart-2000® navigation*** software package runs on Microsoft® Windows® NT/2000/XP. For communication with hardware sensors a serial RS232-port is needed. Furthermore we recommend using an “USB2COM” adapter to emulate several serial ports to communicate with multi sensor hardware-systems.

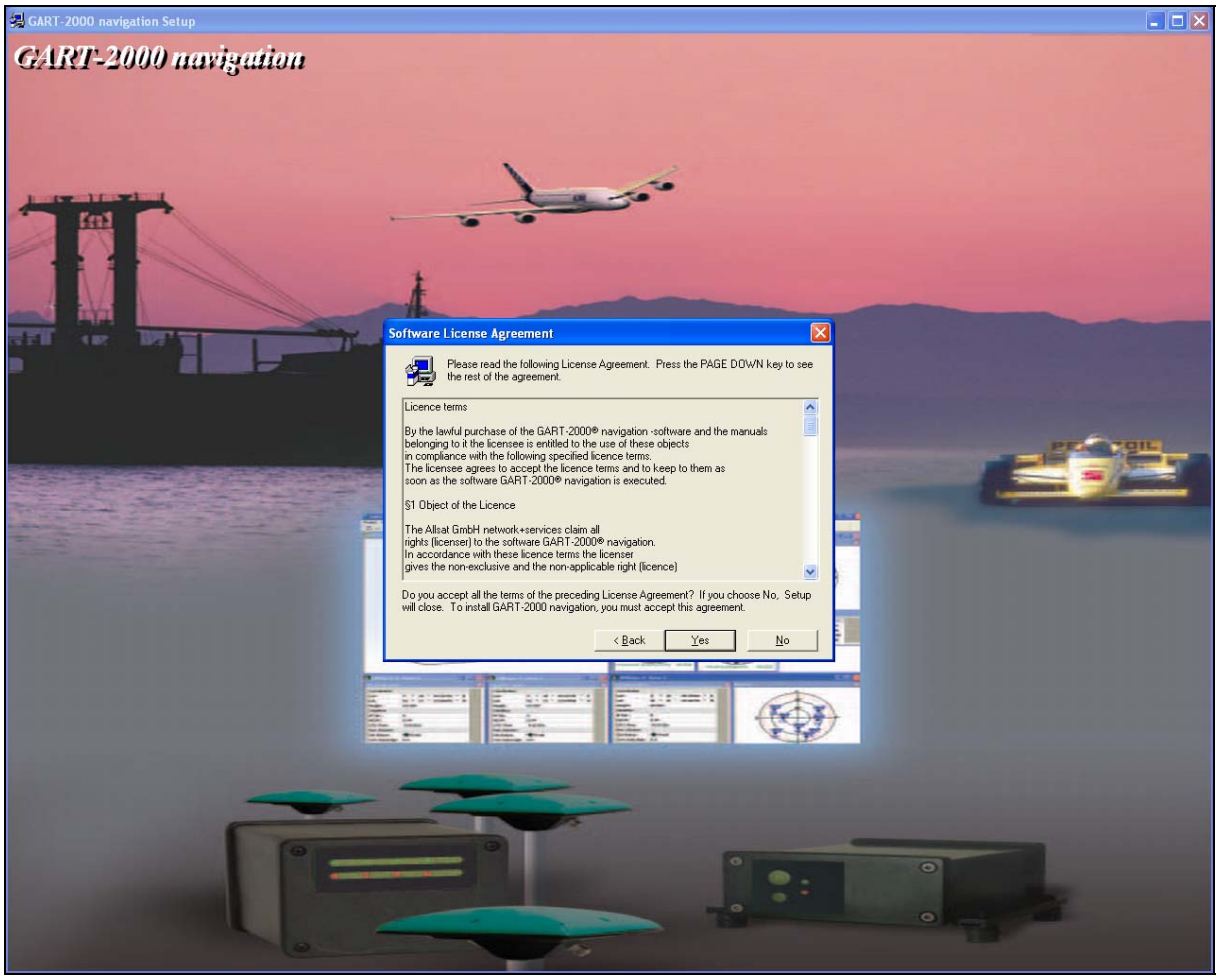
2.2 Installation

The delivered ***Gart-2000® navigation*** installation CD includes the runnable **SETUP.EXE** file. To start the installation routine, execute this file and submit the instructions as follows:



Picture 1.1 Installation – Step 1

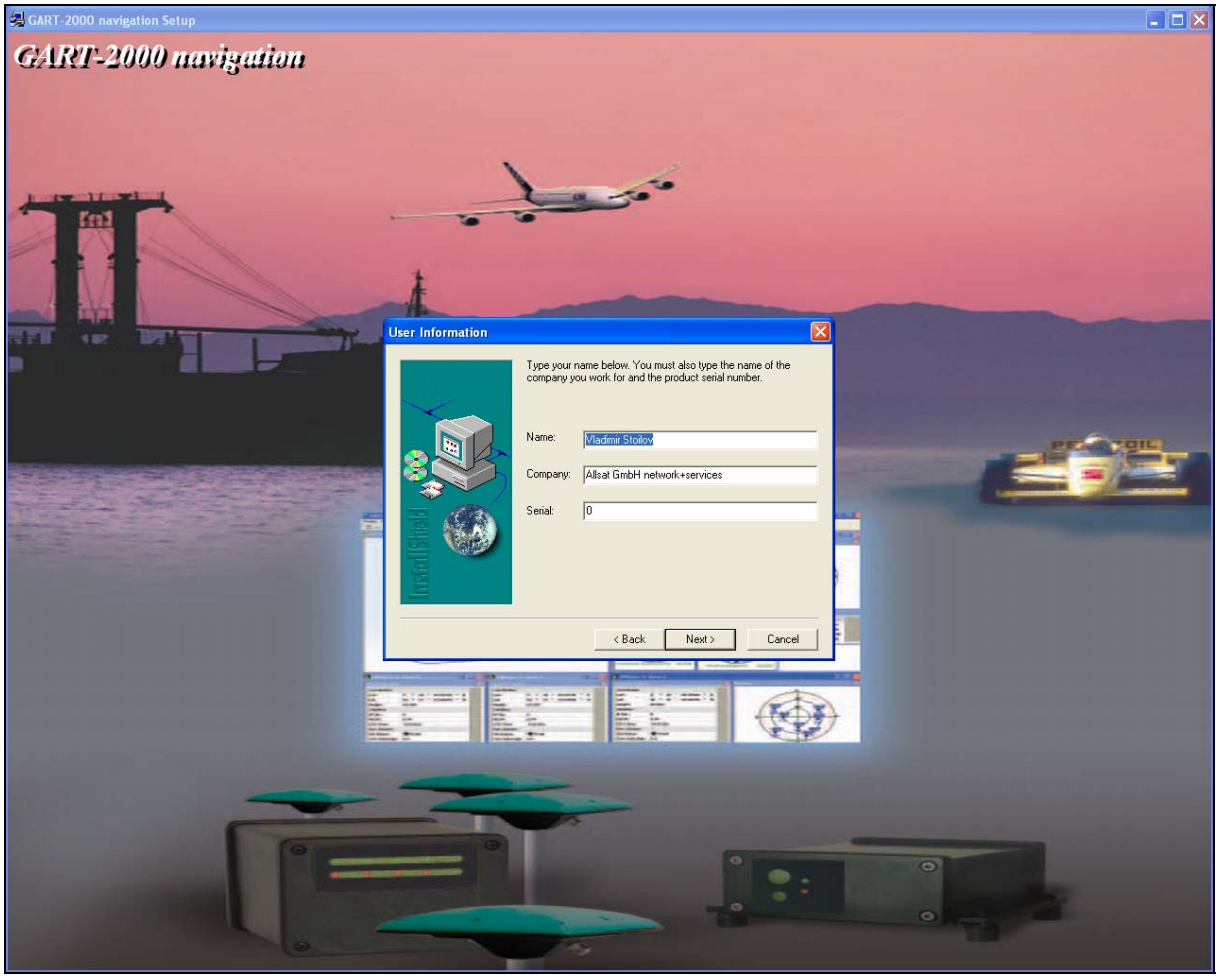
The license agreement from **Gart-2000® navigation** is shown in the next step. After viewing you must commit the license agreement to continue the installation process.



Picture 1.2 Installation – Step 2

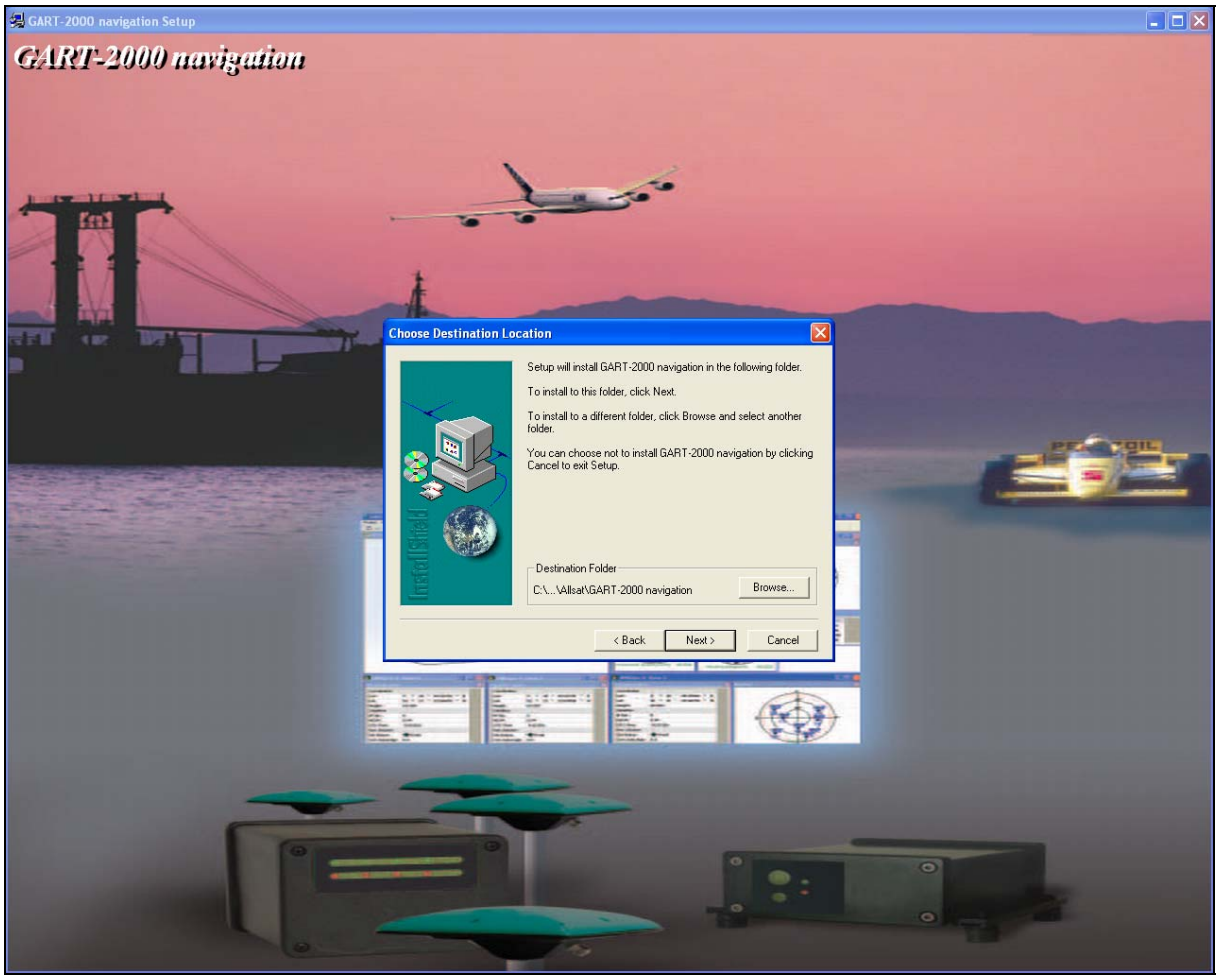
The next dialog requests your name, company and the product serial number. The installer tries to query this information automatically. On errors please correct the input and pres the “Next” button to continue.

Notice: *The edit field for the serial number accepts input of any random numbers. Please type one digit to continue. For more information about licensing please refer to chapter 2.3.4* *Version information and licensing procedure*



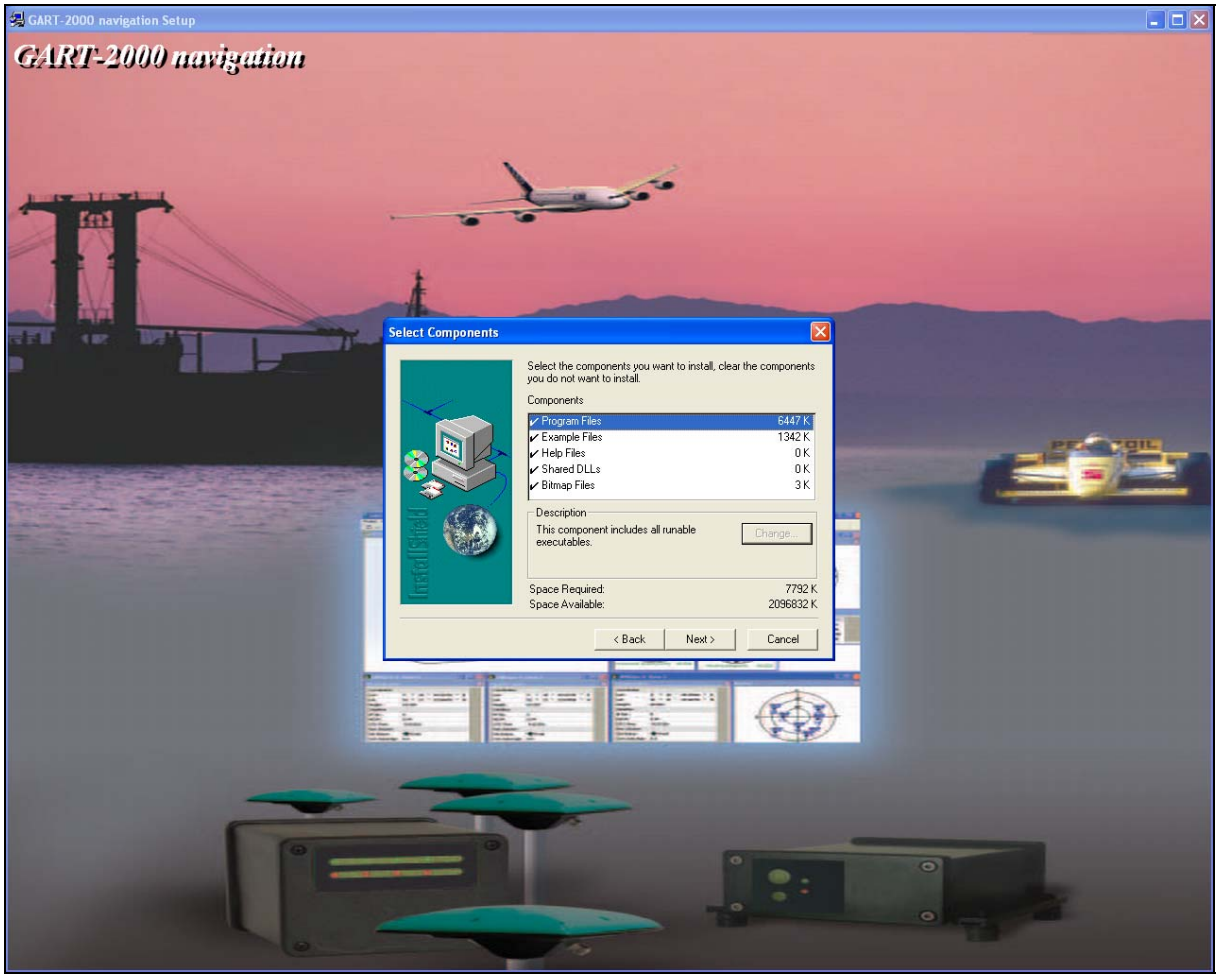
Picture 1.3 Installation – Step 3

Please choose the destination folder or click *"Next"* to install **Gart-2000® navigation** to the default target folder.



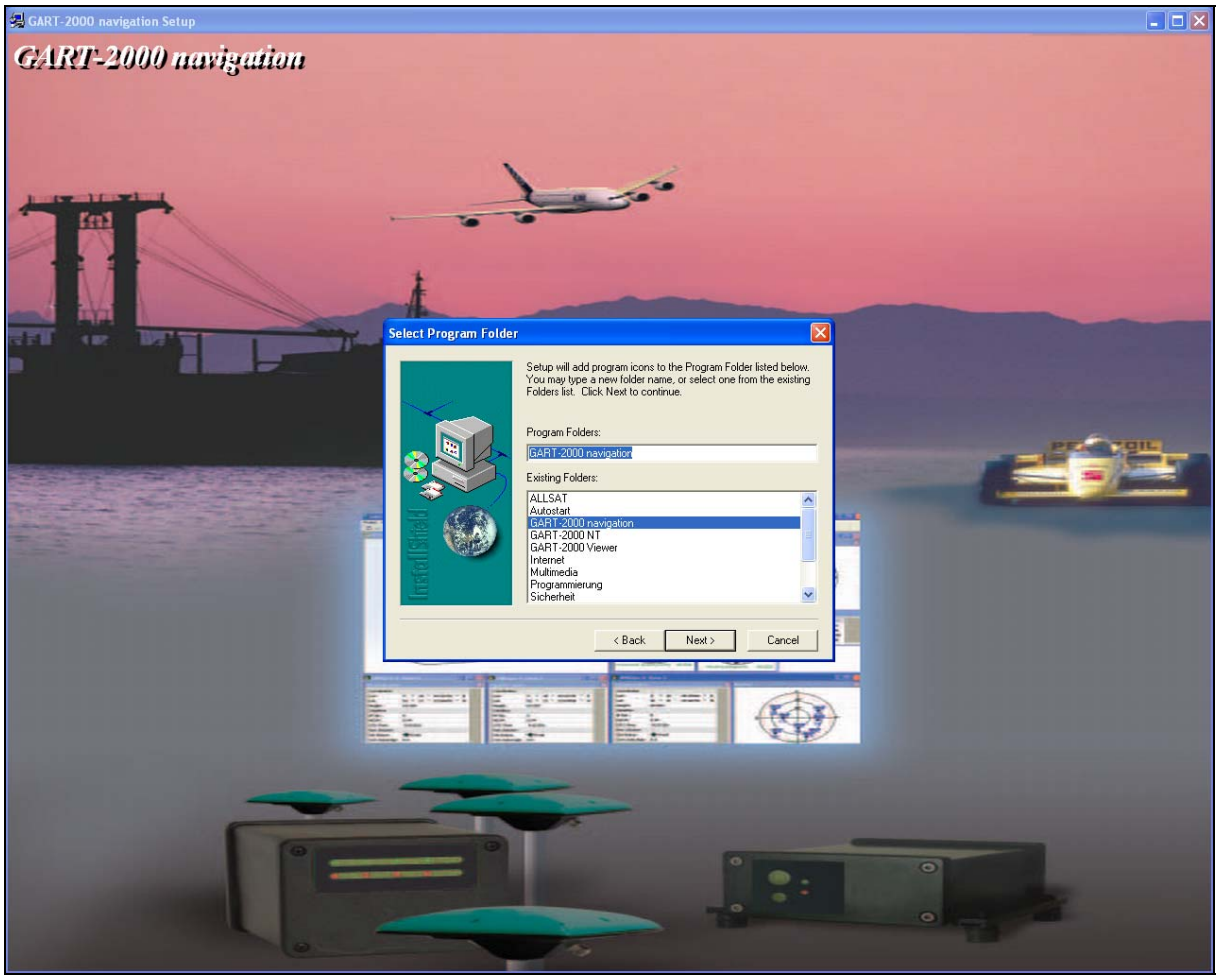
Picture 1.4 Installation – Step 4

The next dialog presents short overview of all installation components in detail with their size in KB included. Please click *"Next"* to continue.



Picture 1.5 Installation – Step 5

Please choose program folder, where shortcuts to program executables etc. are copied or click *"Next"* for default. Afterwards the installer continues coping the program files according to your selections.



Picture 1.6 Installation – Step 6

Progress bar indicators are shown during the copy process. When coping files is done, the installer automatically opens the program group directory with program shortcuts in order to directly start using your new software.

Picture 1.7 Installation – Step 7

2.2.1 Installation repository

Following files and directories are copied/created by the installation routine:

Program main directory, executable , libraries, system-db, etc.:

..\GART-2000 navigation

Demo projects:

..\GART-2000 navigation\Demo_JNSGyro4\GART2000NaviPrj.mdb
..\GART-2000 navigation\Demo_JNSGyro2\GART2000NaviPrj.mdb
..\GART-2000 navigation\Demo_JNSLexon\GART2000NaviPrj.mdb

Script files:

..\GART-2000 navigation\Script\Gyro2
..\GART-2000 navigation\Script\Gyro4
..\GART-2000 navigation\Script\Lexon

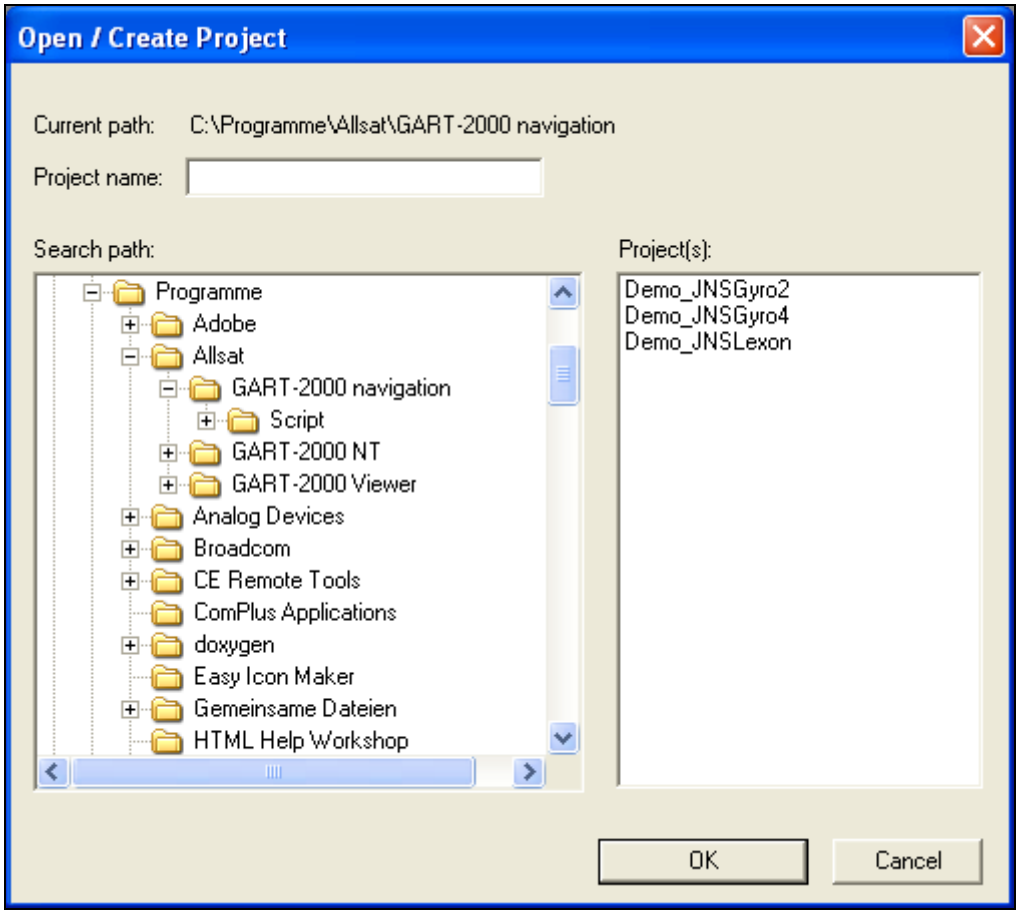
2.3 Graphical User Interface and program structure

Gart-2000® navigation is specially designed to provide simple handling and intuitive workflow. Even complicated application tasks are mapped into user friendly interface, in order to focus to your main goal and avoid dealing with producer-sided details.

Reducing human errors by using complex manufacturer-proprietary interfaces, **Gart-2000® navigation** offers you more safety, to make full advantage of your hardware systems.

2.3.1 Projects

The program starts with *"Open / Create Project"* dialog box, where you can either choose existing one, or create new project:

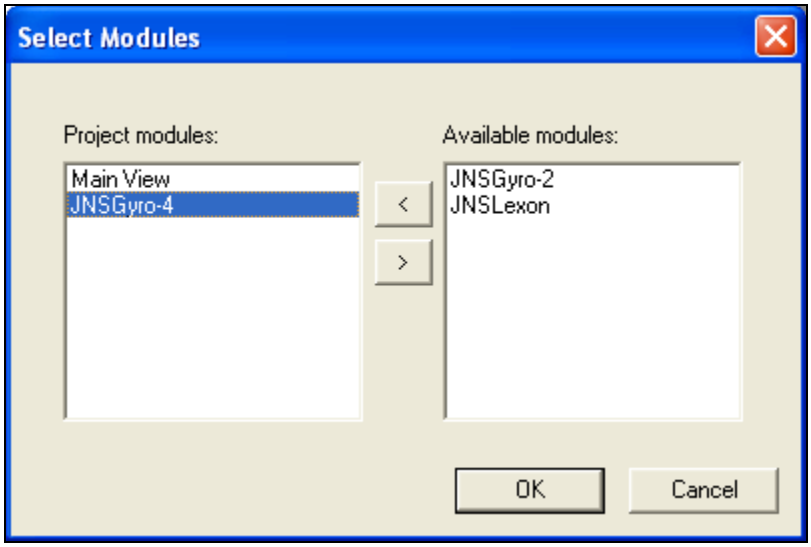


Picture 1.8 Open / Create Project

Each project includes one or more **Gart-2000® navigation** modules and corresponding always to one database file called *"GART2000NaviPrj.mdb"*. Entering a project name will create a new or open existing one. On new, same named project folder is created where all project files e.g. *"GART2000NaviPrj.mdb"* are stored.

2.3.2 Multi document environment

According the expectations of extendable software system, **Gart-2000® navigation** was designed with multi document interface as basic architecture alignment. Consequently it combines several software modules within his main frame, providing more flexibility and scalability dealing with your application.

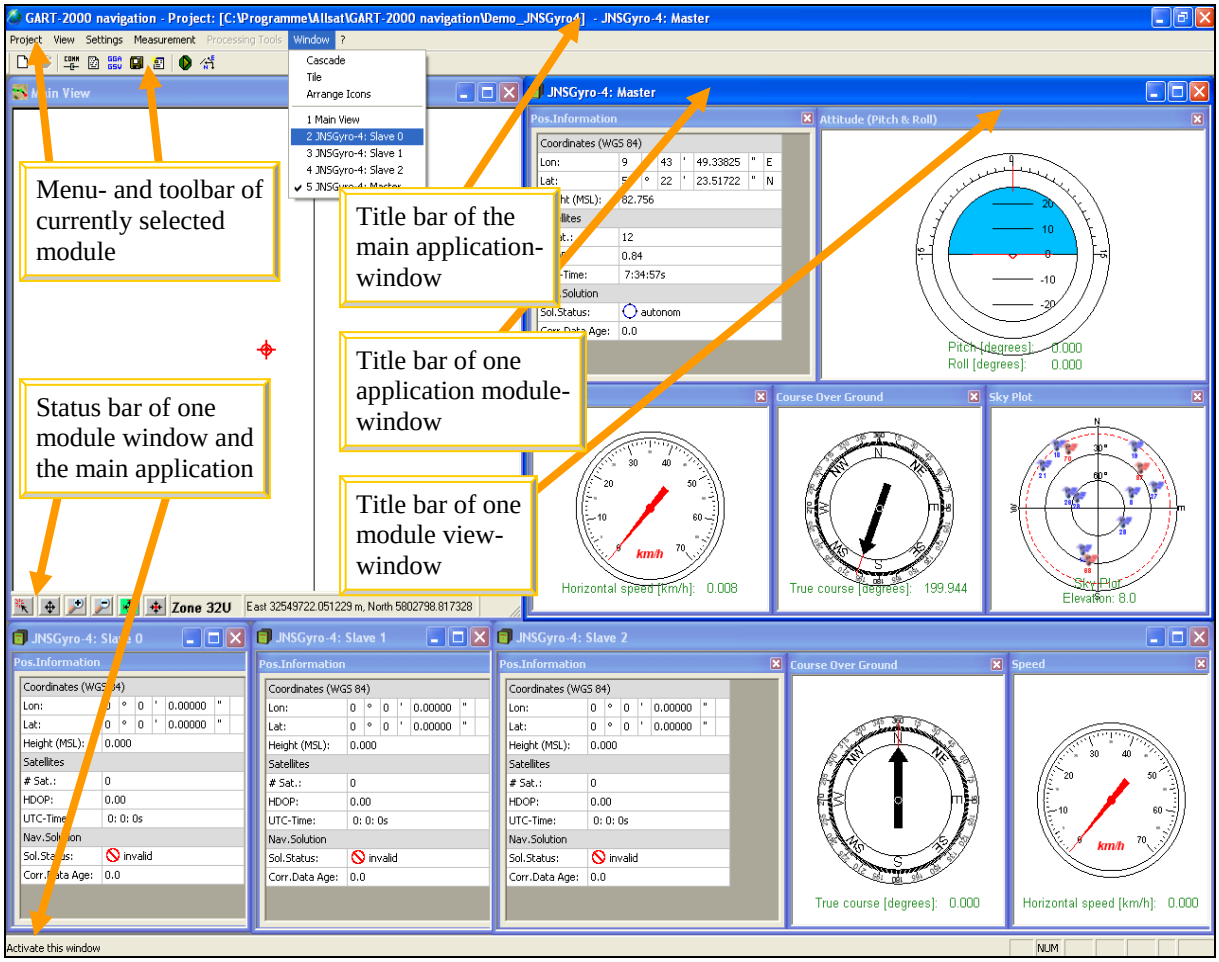


Picture 1.9 Select Modules

For example you can synchronously load and run two or more modules in one program environment such as *"JNS Gyro-4"* with any other measurement sensor. The multi document interface allows also breaking down of specific modules e.g. JNS Gyro-4 to sub-modules with their own control elements and views.

2.3.3 Program Interface

An overview of important control elements of the user interface are showed in the picture below:



Picture 2.0 Global View

The program interface consists of several control and view elements for effective handling, graphical displaying and monitoring issues. All the menu-, tool- and status bars, containing pushbuttons and other operating devices count to the user controls.

Every single control element and his action depends on the module you currently selected. General overview of all loaded modules and sub- modules is available at the main menu *"Window"*. There are several ways to see which module is currently selected. The name is displayed on the program main title bar, its also marked with checkmark on the main menu *"Window"*, finally the highlighted window indicates the active module.

Assuming that two different modules are loaded: *"JNS Gyro-4"* and *"JNS IMU"*, hitting the button *"Initialise"* on the toolbar, will consequently initialise only the currently selected one e.g. *"JNS Gyro-4"*.

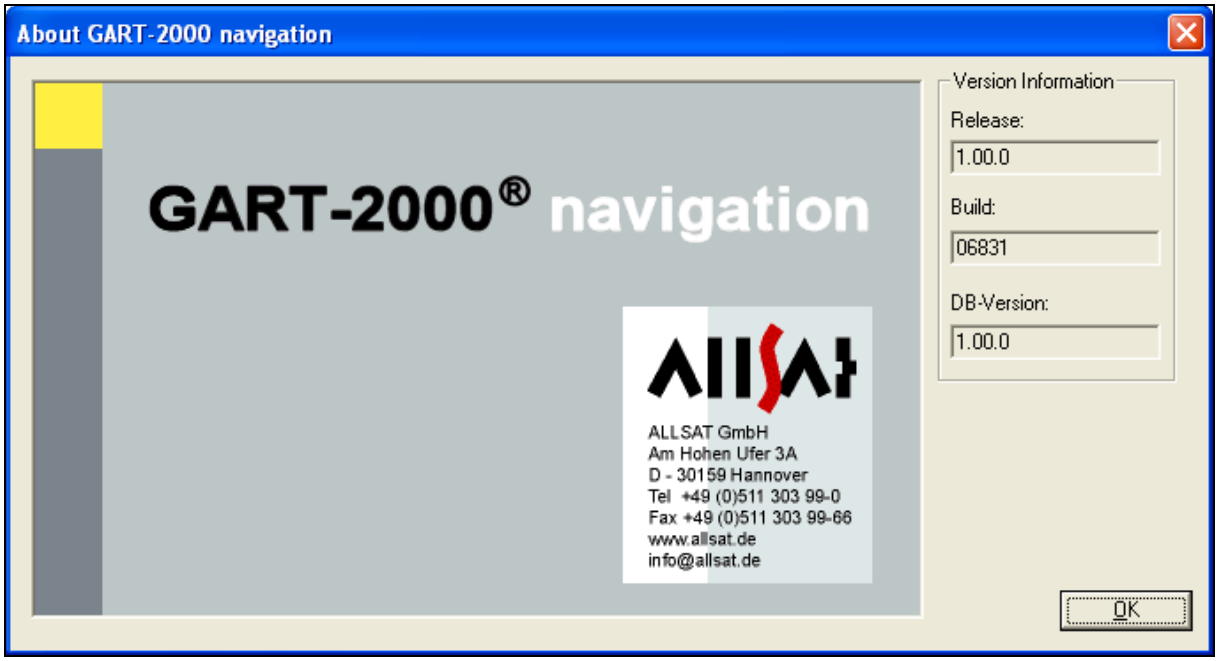
Unlike the user controls all view elements are responsible for displaying relevant information about application events and contents. Each view is placed in separate window with standard options to move, close, minimize or maximize, so you can scale them corresponding to your needs.

Generally the view elements are classified in two categories:

- Main View: This view combines output of several program modules. Spanning various information of different modules it provides options for global comparisons and analyses.
- Module View: Displaying relevant information about e.g. attitude or velocity of every embedded measurement sensor, this type of views correspond to every single module, to provide module- specific visualizations.

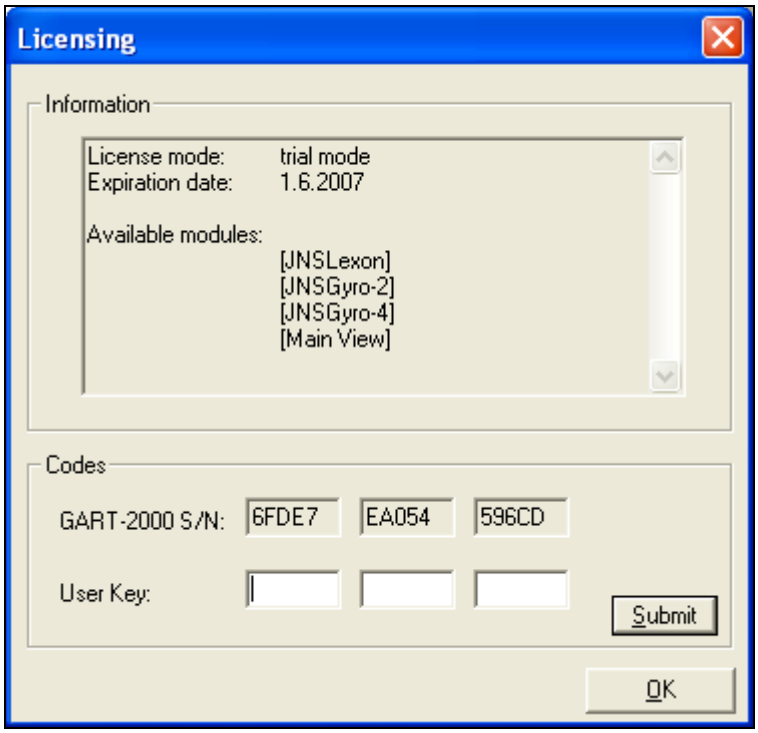
2.3.4 Version information and licensing procedure

Information about build number, release and producer are accessible at following menu: *"?\About",* as shown on the picture bellow:



Picture 2.1 About dialog

The license state and all available modules, as well as activation options are showed at the program menu *"?\License"*:



Picture 2.2 Licensing

The software **Gart-2000® navigation** comes as time-limited demo version. Please contact your distributor to acquire your user key for unlimited license activation. For this purpose the *"GART-2000 S/N"* is needed. You will receive unique user key, that is soft- and hardware bound on your computer and the purchased program-modules.
After entering the 15-digit user key please click *"Submit"* to validate your input and accomplish the activation task. Short confirmation message depending on the result of activation is shown after that. On success the license mode is switched to *"valid"* and the expiration date to *"unlimited"* respectively.

Notice: *Please store your user key in safe place. If you accidentally enter invalid key, the license mode is switched back to trial mode! Consequently the license engine will shutdown all loaded modules, if the trial period is exceeded. In this case you will need to enter a valid user key, to reactivate your license.*

3 Menu control

This chapter follows the menu structure of **Gart-2000® navigation**. The menu can also be opened with the toolbox button shown above the chapter name:

3.1 Project

3.1.1 Open/Create [1] (Project > Open/Create)

The projects in **Gart-2000® navigation** defined as configuration pool with several settings for various program modules. Before start using the software, a request for open or create a project is prompted. You can perform the same action afterwards using the menu ***"Project > Open/Create"***. Creating new or selecting existing one will close the current project.

3.1.2 Properties*[2] (Project > Properties)

At this menu will give you access to meta information about the current project including e.g. user data, creation date, size, protocol stack about the last project changes.

3.1.3 Recent* (Project > Recent)

This menu entry will offer you list overview about recently opened projects with options to open them directly.

3.1.4 Exit (Project > Exit)

Use ***"Exit"*** to close the application.

[1] The icons represent toolbox button, when available.
[2] All menu entries marked with "*" are in construction and not released yet.

3.2 View

3.2.1 Dockable Window* (View > Dockable Window)

By means of this menu entry you will have access to all available windows with options to open or close them directly.

3.2.2 Toolbar* (View > Toolbar)

This menu entry will provide you options for toolbar management. Furthermore you will be able to personalize your toolbar with shortcuts for any desired menu item.

3.2.3 Statusbar (View > Statusbar)

With this menu you can enable or disable the status bar of the currently selected window in order to gain the corresponding control elements or more view area.

3.3 Settings

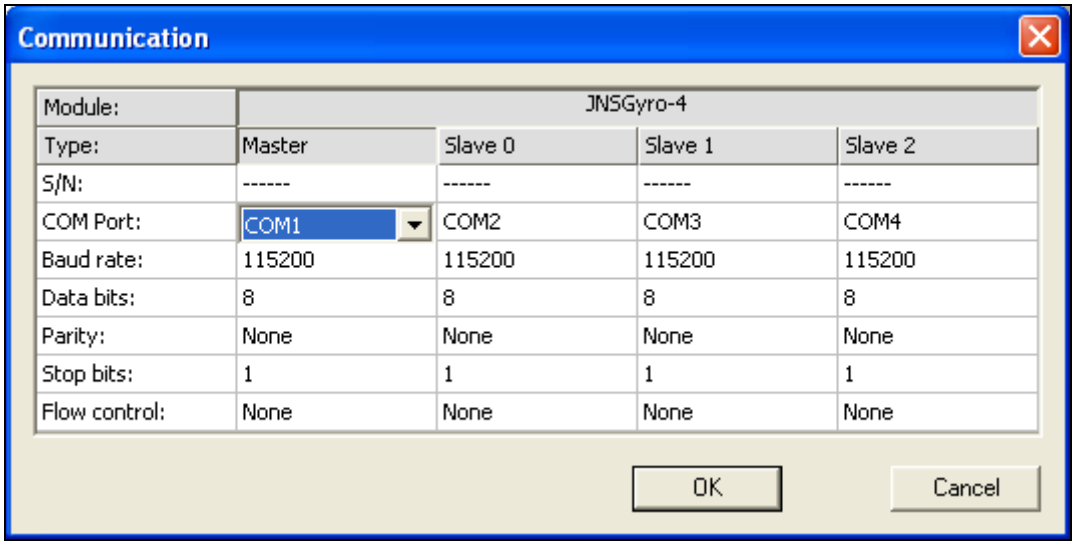
3.3.1 General

Because all the control elements like configuration menus, tool- and status bars, depend on the module, you currently loaded and selected, the contents of the main menu *"Settings"* can vary as well. Anyway the following categories are always available:

- Communication
- Script
- Messages
- Logging
- Main View

3.3.1.1 Design

For better overview and intuitive handling all configuration dialogs in **Gart-2000® navigation** are constructed with grid layout. Mostly every grid is separated into headlines and body fields.
The headlines describe the structure of the selected module including all corresponding sub modules. Thus all configuration values of each and every sub module are represented by the columns and the configuration options for the selected setting e.g. *"Communication"* are placed on the rows of the grid. Following picture demonstrates the layout of one configuration window:

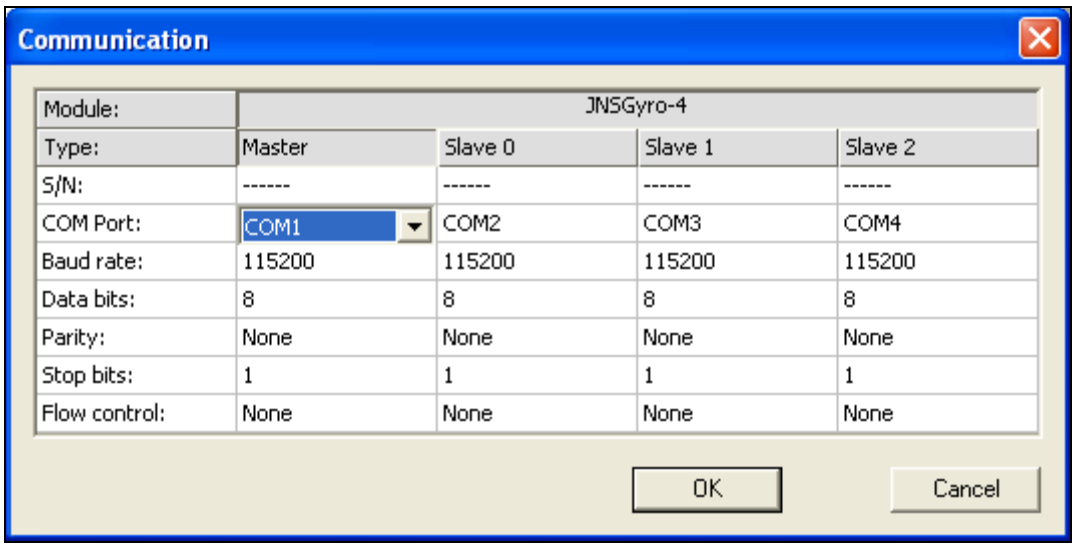


Picture 2.3 Communication Settings (Example for configuration window)

3.3.1.2 Handling

All settings are stored in the project database. Clicking *"Cancel"* will discard the changes you took, while *"OK"* will save them permanently in the project database.

3.3.2 Communication (Settings > Communication)

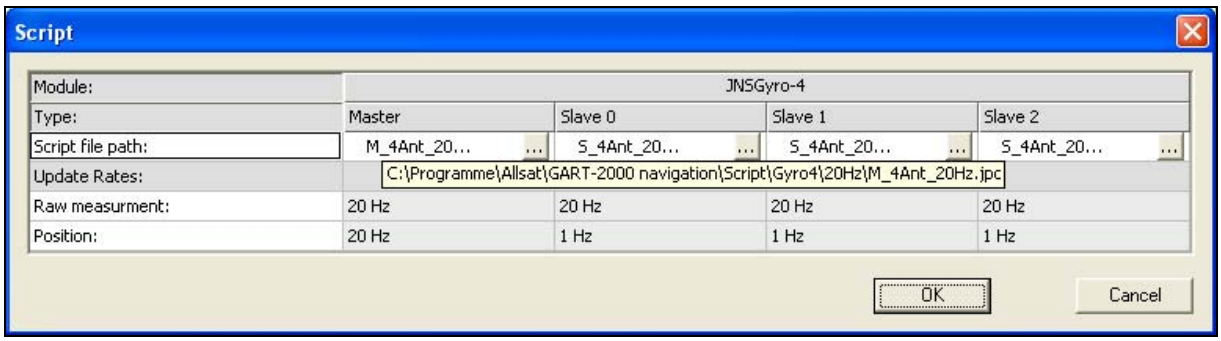


Picture 2.3 Communication Settings

This window allows you to set up the settings for your communication device. In this case you can configure the RS232 devices of your pc. To avoid incorrect input **Gart-2000® navigation** determinates only available RS232 ports.

Notice: *Although your settings are committed in the project database, the RS232 device is configured not before you initialise the current module.*

3.3.3 Script (Settings > Script)

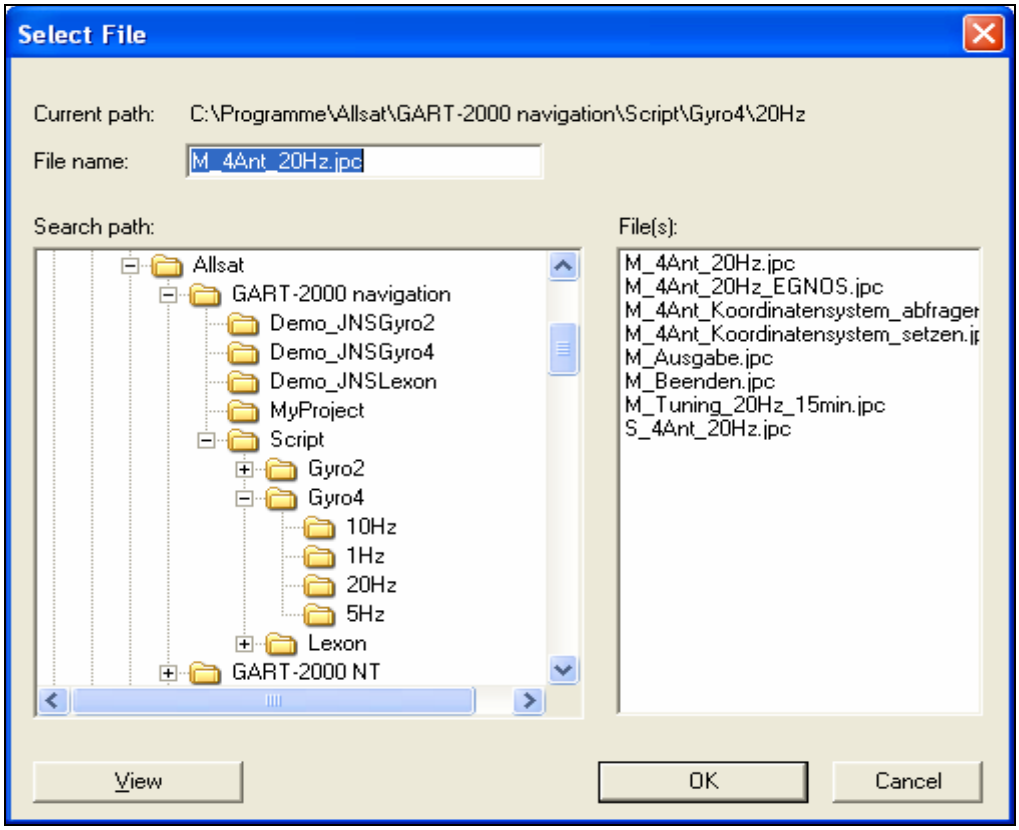


Picture 2.4 Script Settings

Gart-2000® navigation provides you functionalities to send a script file containing commands for the attached sensor. The corresponding configuration window offers you an overview of the currently selected script files for each sub module. Moving the mouse pointer over one of the file-cells will show a tool tip text with the absolute (full) file path. Furthermore the last visited folder is automatically reopened, the next time you browse for a script file.

The second field of settings on this configuration window considers all important file contents, which have decisive meaning for the current application task.

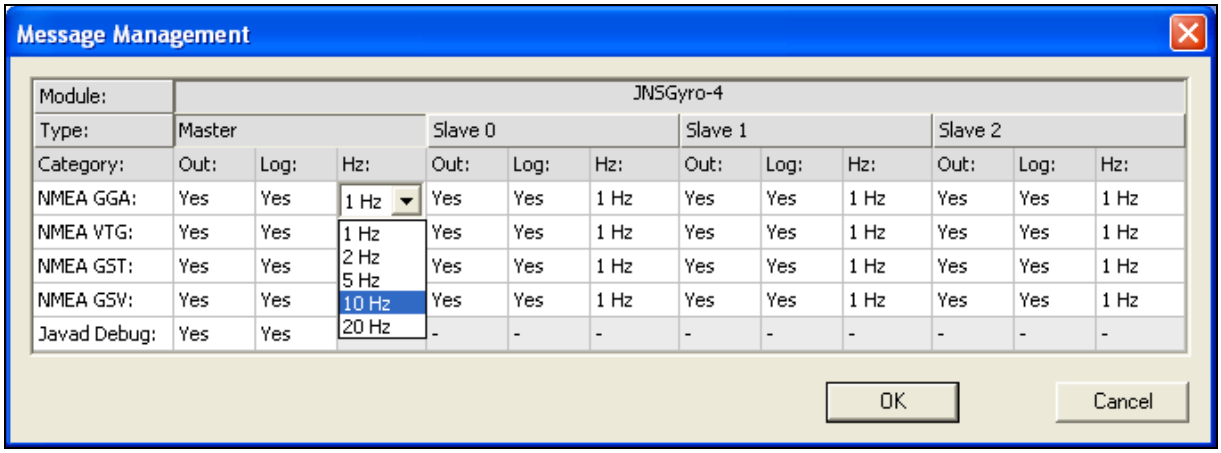
Clicking the button on the file-cells will launch a file browser, to select desired script file, as shown on the picture bellow:



Picture 2.6 Select script file

The current path and selected file are displayed on the top of the window. Using the tree folder for browsing will display the file contents of the current folder. You can select one file and click *"View"* to load it in external editor or commit/undo your selection pressing *"OK"* or *"Cancel"* respectively.

3.3.4 Messages (Settings > Messages)



Picture 2.5 Message Management

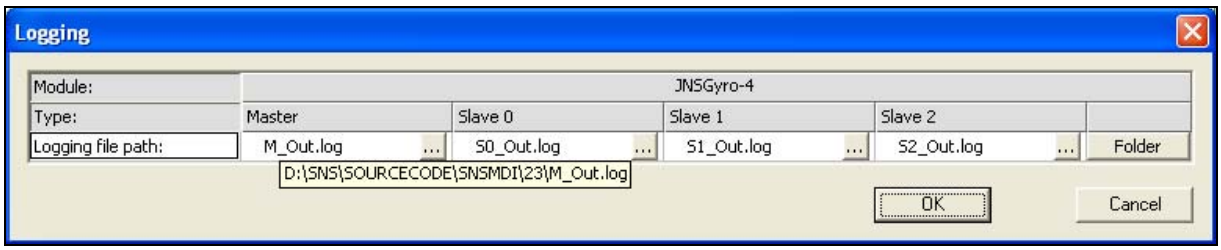
This configuration window provides user friendly access to manage sensor proprietary and standard NMEA messages. All available messages are displayed on the rows and listed on the headline *"Category"* respectively.

Notice: *This configuration grid is free extendable to allow fast implementation of new messages on request. Experience user can manual take influence on the message set using either the script file or internal command terminal of* ***Gart-2000® navigation.***

Operating the *"Yes/No"* switches enables or disables the output of the specific message or sets up the logging stream. The Option *"Hz"* configures the update rate for every message. On default output and logging are turned on and the update rate is set to 1Hz.

On that example the value range for the output rate is linked with the internal position update rate for the *"Master "*- Board of JNSGyro-4. Setting higher rates as the internal configured will produce a sensor error or be discarded. To prevent user errors, **Gart-2000® navigation** cuts down the available update rates corresponding to the internal position update rate, that is configured with the script file respectively (see 3.3.3 Script (Settings > Script)).

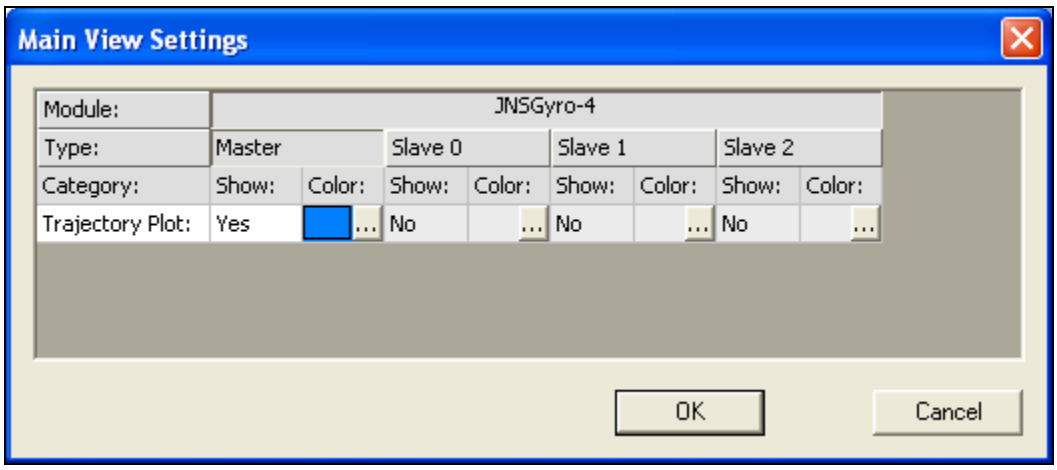
3.3.5 Logging (Settings > Logging)



Picture 2.7 Logging settings

Call this window to configure the logging settings for the current module (in this case JNSGyro-4). The logging files for each and every sub-module are preconfigured on default with standard files stored in the project folder. Pressing the grid cells will launch a browse window, where you can select or create new log file. The button *"Folder"* allows you switching the log folder for all files with just one step.

3.3.6 Main View (Settings > Main View)



Picture 2.9 Main view settings

The settings for the graphical output screen can be done on this configuration window. Clicking the color button will launch a color picker to select new color for the trajectory rendering. More configuration options for the main view window can be placed there n the future.

3.4 Measurement

The previous chapter 3.3 Settings described the configuration options and how to use them. This chapter describes all the actions available on the main menu *"Measurement >"* based on these settings.

3.4.1 Initialise (Measurement > Initialise)

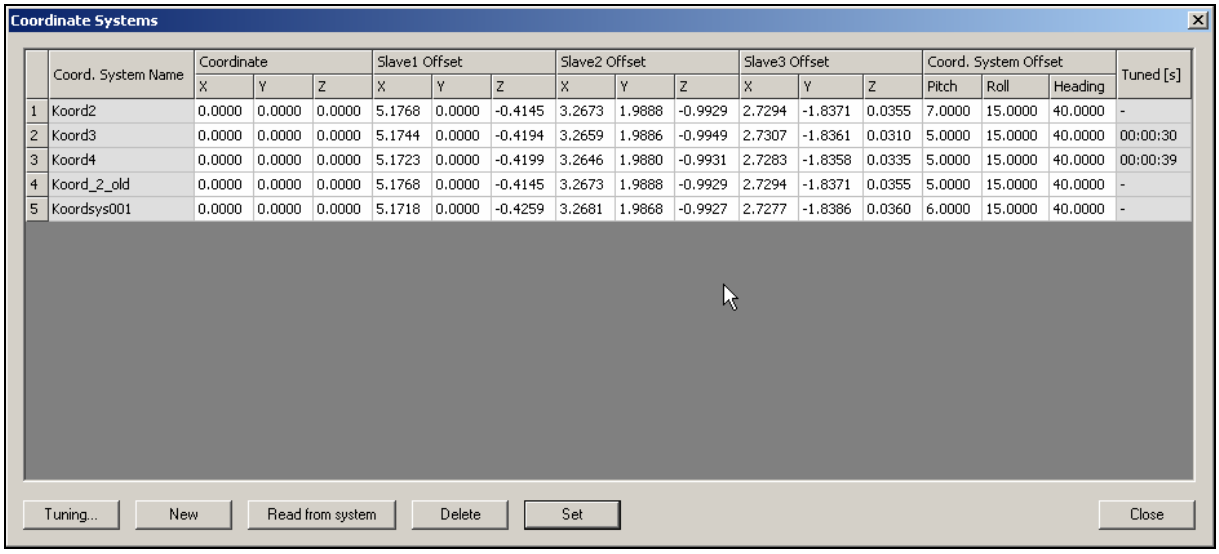
After configuring your system, use the menu entry *"Initialise"* to commit the settings on your hardware system. Clicking this entry or the shortcut button on the toolbar will launch the initialisation process. On the begging **Gart-2000® navigation** tries to establish communication to the attached sensor via the communication settings you took, after that the hardware specific settings are applied on your system.

Notice: *Info messages about the current action and state of initialisation are displayed on the left side of the main status bar (see 2.3.3 Program Interface).*

3.4.2 Reset Hardware* (Measurement > Reset Hardware)

Clicking this menu entry will cause to reset the attached sensor.

3.4.3 Tuning and Coordinate Systems (Measurement > Tuning and Coordinate Systems)

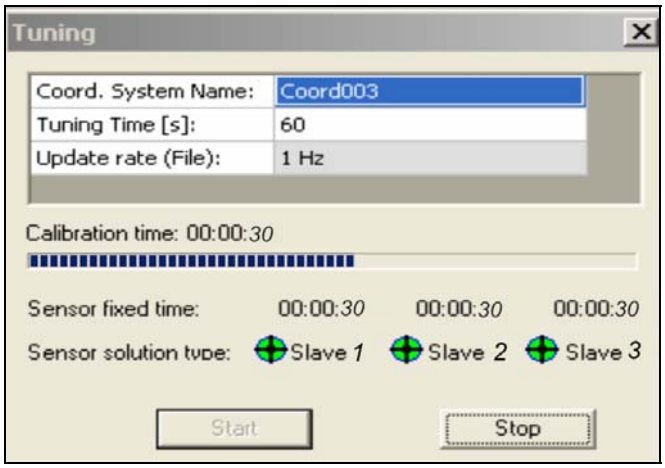


Picture 3.0 Coordinate systems

This configuration window manages the local coordinate systems of multi-antenna measurement sensors like JNS Gyro-4. The coordinate systems are defined by the antenna offsets of the slave boards in relation to the master board-antenna. The attitude angle offsets describe the orientation of the body frame respectively the local horizon and are showed as *"Pitch"*, *"Roll"* and *"Heading"* columns on the settings group *"Coord. System Offset"*. Those settings can take float values in the range of -90.0000..+90.0000 degrees. Using them will effect to the body frame orientation with respect to the local horizon.

Depending on your application task you can easy switch between different systems stored in the project database, or create a new one with an appropriate name.

The button “Tuning” will launch a window, responsible for tuning (calibration) tasks to determinate the base line coordinates. As known, the attitude angles on multi-antenna systems depend on the correct definition of the body reference frame. Thus the base line coordinates in the body frame are requested. For this purpose Gart-2000® navigation offers you user-friendly interface to perform self calibration of the attached sensor as shown on the picture below:

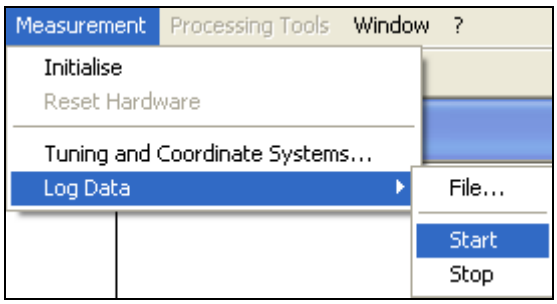


Picture 3.1 Tuning

The name of the resulting coordinate system is required on the first settings-field. The second configuration field *“Tuning time [s]”* serves to set the processing time for the self-calibration. This time period should be sufficient large to eliminate slowly varying errors caused by miltipath effects. Therefore the calibration time should be in the range between ~10 min and 120 min. For control issues the update rate of raw measurements is displayed on the third settings-field. To estimate the number of measurement samples involved in the self-calibration process use following formula:

t × u = N; where <t> the tuning time, <u> the update rate and <N> resulting number of measurement samples.

3.4.4 Log Data (Measurement > Log Data)



Picture 3.2 Log Data

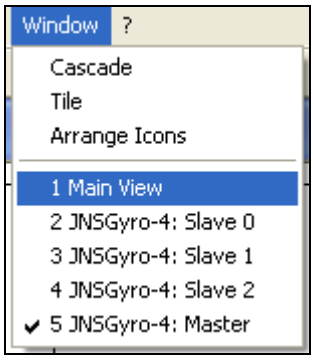
The menu entry *"Log Data"* provides easy way to activate data logging for the attached sensor. To look over the configuration settings for the target log files use "File…". The current state of logging is represented by a check mark placed on the right side of the *"Start"* or *"Stop"* entries respectively. Activating logging will start writing the input messages configured on **Settings > Messages** (see 3.3.3 Messages (Settings > Messages)) into the log file.

*3.5 Processing Tools**

Gart-2000® navigation includes processing tools in order to combine the real time control- and monitoring features with post processing functionality. It will contain following highlights as described in the list below:

- Extensive data model to response the user requirements for flexible data handling and storage.
- Import / Export interfaces for different data formats.
- User friendly access to powerful algorithms for complex calculation tasks e.g. smoothing of measurement data-raw for accuracy optimization.
- Tools to perform comprehensive analysis with application data e.g. relation plot of trajectories from different measurement sensors.
- Visualization utilities

3.6 Window



Picture 3.3 Window

Gart-2000® navigation is constructed with multi document interface, where every module is represented by separate window, menu controls, status- and toolbars. All currently loaded windows are listed on the bottom of this menu. Selecting one will activate the corresponding module e.g. *"Main View"* and all his control elements.

Notice: *The size and position of the loaded module-window are stored in the project database. Therefore the window constellation is saved for each project is saved on program exit. Furthermore preconfigured default window constellation is loaded on every new project.*

3.7 Help

3.7.1 Help (? > Help)

Choosing the menu entry above will run the help documentation.

3.7.2 License (? > License)

(see 2.3.4 Version information and licensing procedure)

3.7.3 About (? > About)

(see 2.3.4 Version information and licensing procedure)