

# POSPac<sup>™</sup> MMS

FOR MARINE MAPPING APPLICATIONS

## Technical Notes

*Leading the way with increased reliability.*

Industry-leading post-processing software designed to maximize the accuracy potential of your POS MV (Position and Orientation System – Marine Vessels). POSpac MMS for MARINE sets the standard for accurate, reliable and repeatable results even under the most difficult conditions.



# Applanix POSPac™ Mobile Mapping Suite (MMS): Marine Mapping Applications

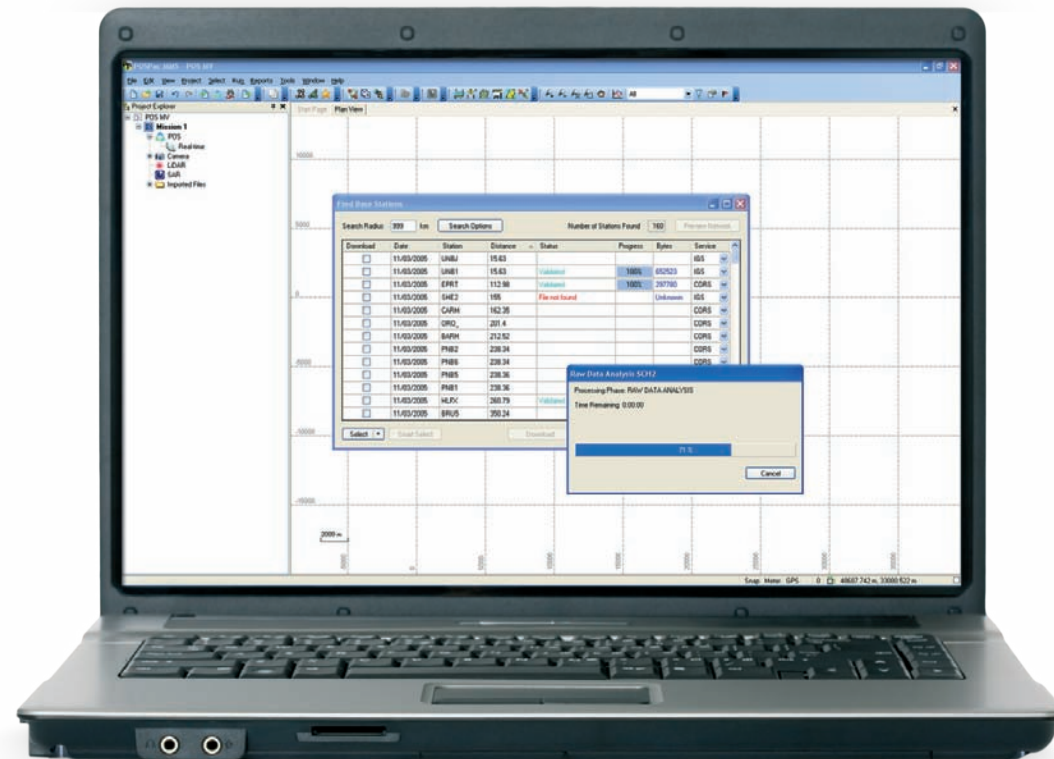
Applanix POSPac MMS for Marine is powerful post-mission software that processes data from your Applanix POS MV GNSS Aided Inertial Navigation System to provide highly accurate Direct Georeferencing of your multibeam sonar or mobile laser scanner.

Optimized for the marine environment, and compatible with a wide variety of hydrographic processing packages, this smart software solution achieves both maximum accuracy and maximum efficiency for Direct Georeferencing. The complete post-processing toolbox delivers a streamlined field-to-office workflow for best results possible. It contains all the tools that you need to:

- Produce highly accurate position and orientation solutions from the GNSS and Inertial data logged by your POS MV system
- Obtain maximum immunity to GNSS outages in difficult environments – under bridges, cranes and other structures
- Achieve stable, reliable, repeatable, and more accurate results
- Import, manage and assess the data from your POS MV system and GNSS reference stations
- Automate data output in a wide variety of industry standard formats or define your own

Featuring the revolutionary new Applanix SmartBase™ module and Applanix IN-Fusion™ technology, POSPac MMS for Marine provides an unequalled level of productivity, accuracy and robustness for the hydrographic surveyor.

POSPac MMS FOR MARINE is your key to powerful, consistent, reliable, and accurate data... every time.



## > POSPac MMS for Marine: A Start to Finish Workflow for Direct Georeferencing of Hydrographic Data

### 1. IMPORT AND ANALYZE YOUR DATA

Importing data from your POS MV into POSPac MMS for Marine has been simplified and is now easier than ever. Just drag and drop the logged files into the project space! Alternatively, you can browse to the logged POS file on your computer and click go. POSPac MMS for Marine automatically analyzes the files and imports what it needs. POSPac MMS for Marine will then run an automatic quality check on each and every file and provides immediate feedback to the user regarding any issues that might affect data post-processing quality. For more detailed analysis, the real-time position and orientation and Kalman Filter status are easily plotted.

### 2. DOWNLOAD DATA FROM THE INTERNET

Reference station and precise ephemeris data are imported from the Internet in one easy step. With a single mouse click users can search, preview, and download all reference stations in an optimized multi-base network. User deployed reference station data may also be imported to strengthen the network or enable single base station processing

#### Automated Configuration of Network: Find Base Station command “Smart Select”

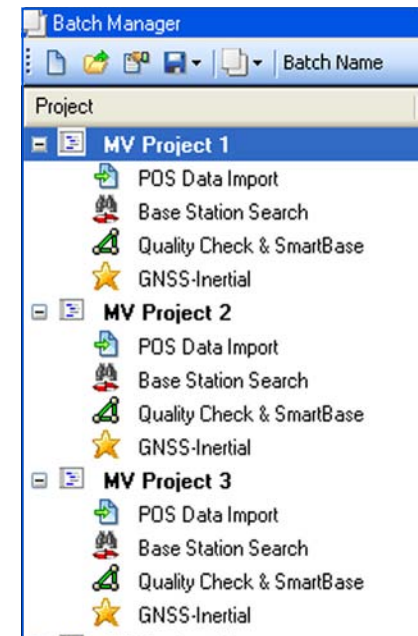
“Smart Select” automatically selects and downloads the best available Applanix SmartBase network of reference receivers and imports them into the project. Not only does Smart Select choose the tightest network fully encompassing the trajectory, it also undertakes a validation of the observation data quality to determine if the stations are suitable for the network. If one station fails this validation, the process automatically continues to search until the best possible network is created. All this with only one click of the mouse!

### 3. PROCESS A GNSS-AIDED INERTIAL SOLUTION

As a hydrographic surveyor, you know that the success of your business relies on producing a high quality product to the accuracy specified by the customer, in the most efficient and robust means possible. Mission execution time and crews are expensive, so you need the re-assurance that your direct georeferencing solution is the right one for the job; re-dos are not an option. Whether you are mapping busy shipping lanes with a sub meter accuracy requirement, or you are conducting engineering-level LiDAR surveys of bridges or other structures where every centimeter counts, you need the right tool for the job.

With its full range of processing options ranging from Precise Point Positioning (PPP) to Differential GPS+GLONASS to the new Applanix SmartBase module and IN-Fusion technology, the GNSS-Aided Inertial Processing Tools supplied in POSPac MMS for Marine provide you everything you need... including peace of mind.

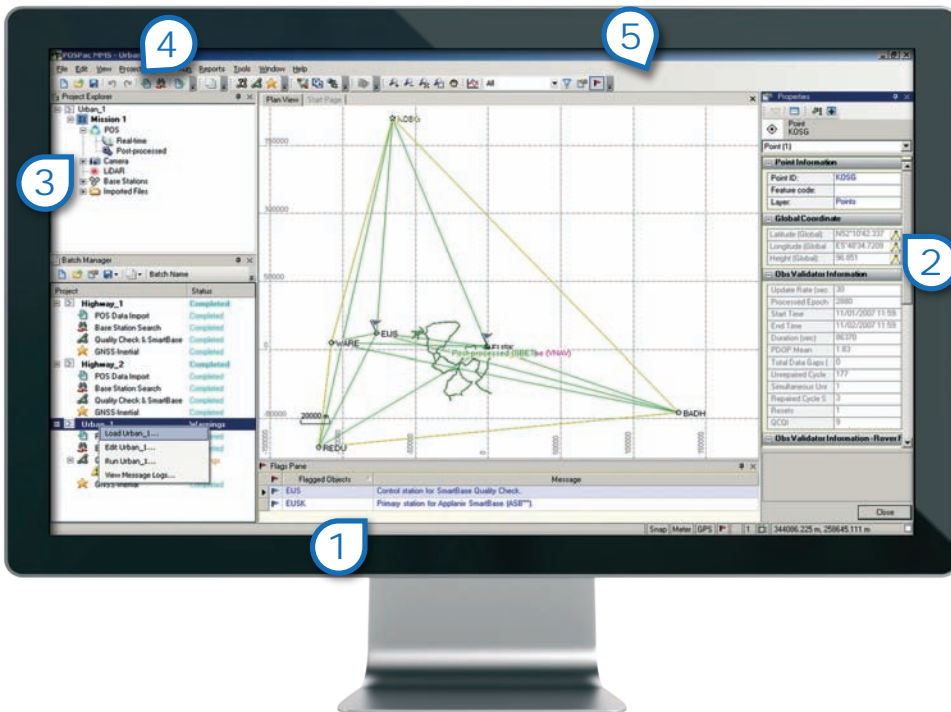
**Steps 1, 2, and 3 are automated allowing for batch processing of multiple missions!**



## > Applanix POSPac MMS GUI:

POSPac MMS for Marine introduces an all-new modern and customizable user interface, letting you work the way you want:

- User definable toolbar buttons and menus - option for adding external tools directly to the toolbar
- Display simultaneous open multiple user views (3D, 2D, and Points Tables)
- All Views are in layers allowing view selections: real-time, post-processed, both, basestations only, etc.
- User defined display style configuration for trajectory by type: real-time vs. post-processed, Position RMS, or by Processing Mode
- Interactive display plots with multiple selection feature for overlaying plots
- Collapsible project explorer menu with quick access to properties of various mission levels: real-time, post-processed, basestations, etc.
- Unified project management/settings for convenience (i.e., single location for setting all project settings)
- Project management and report options
- Background settings in black or white
- Batch Manager provides capability for processing large volumes of data with a minimum of user interaction.



### An Intuitive, Customizable Interface

1. Customize the way you view detail
2. View the details of any object in the Properties Pane
3. Quickly navigate through your data with the Project Explorer
4. Put commands right where you need them for easy access with customizable menus and toolbars
5. Easily and quickly tab between windows

### Post-Processing Advantages

**Improved Accuracy** – Dedicated base stations and a reverse smoothing algorithm can drastically improve position and orientation accuracy.

**Improved Reliability** – Setup errors can be corrected in post-processing. In addition, alternative differential GNSS sources can be found if primary source proves unreliable.

## > Applanix SmartBase™ and IN-Fusion™ Technology Deliver an Unequaled Level of Accuracy and Productivity

The winning combination of our Applanix SmartBase™ software module, and Applanix IN-Fusion™ technology significantly increases the efficiency, accuracy and robustness of your hydrographic surveying operations. GNSS network and inertial post-processing methods have been engineered to work in direct cooperation, reducing and in some cases eliminating the restrictions currently associated with high accuracy GNSS positioning in a Marine-based environment. Reliable centimetric accuracy can be obtained from existing reference station networks, even if the nearest reference station is 70 km or more away! In many scenarios, this eliminates the expense and logistical headaches associated with deploying a dedicated station close to the project area.

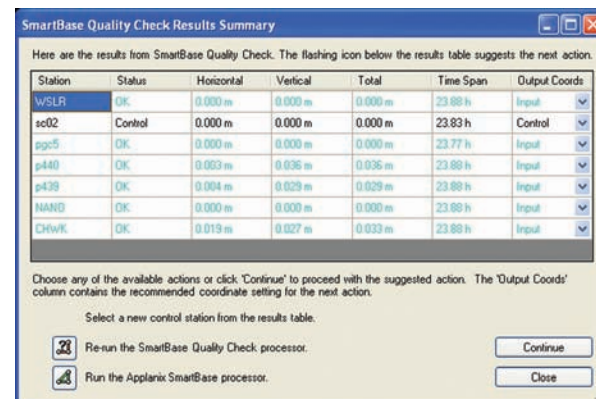
Based on the industry leading Trimble VRS™ technology (adapted for the large areas and sparse networks typical in a mobile mapping project), the Applanix SmartBase™ module uses the data logged from a network of GNSS reference stations to create a model of the atmospheric and other geometric errors across the survey area, and thus generate a set of GNSS observables at a “virtual” location close to the vessel. These and the remote receiver observables are then post-processed along with data from the Inertial Measurement Unit using the Applanix IN-Fusion technology, to simultaneously solve for the GNSS ambiguities and position and orientation of the vessel. The Applanix SmartBase approach ensures that the error due to atmospheric delays is accurately modeled anywhere within the network of receivers, meaning the correct integer ambiguities can be quickly and reliably computed. The tight integration with the inertial data improves accuracy and robustness through cycle slips or even full outages.

SmartBase™ + INFusion™  
= **Accuracy + Productivity**

## > Higher Accuracy, Improved Robustness, Reduced Cost

The combination of the Applanix SmartBase and the Applanix IN-Fusion technologies represents a major shift in operational efficiency for mobile mapping and surveying, and provides important new benefits over standard GNSS Kinematic Ambiguity Resolution (KAR). Reliable centimetric accuracy can be obtained from existing reference station networks without the need to set up a dedicated station close to the project area. This has the benefit of reducing the expenditure associated with high-accuracy surveying, by eliminating the costs associated with setting up a reference station infrastructure, and by reducing the time spent in the office post-processing the results. At the same time the robustness of the solution is increased, ensuring that the data is captured first time, every time. Up to 50 reference stations may be processed at a time, with a minimum of four required for accuracy and robustness.

The Applanix SmartBase and IN-Fusion technology currently includes support for L1 and L2 GPS observables. This will be expanded to include support for additional GNSS observables such as GPS L2C and GLONASS L1 and L2 as they become more readily available.



SmartBase Quality Check Results Summary

Here are the results from SmartBase Quality Check. The flashing icon below the results table suggests the next action.

Station	Status	Horizontal	Vertical	Total	Time Span	Output Coords
WLSLR	OK	0.000 m	0.000 m	0.000 m	23.88 h	Input
sc02	Control	0.000 m	0.000 m	0.000 m	23.83 h	Control
ppc5	OK	0.000 m	0.000 m	0.000 m	23.77 h	Input
pl440	OK	0.053 m	0.036 m	0.036 m	23.88 h	Input
pl438	OK	0.004 m	0.029 m	0.029 m	23.88 h	Input
HWND	OK	0.000 m	0.000 m	0.000 m	23.88 h	Input
CHWK	OK	0.019 m	0.027 m	0.033 m	23.88 h	Input

Choose any of the available actions or click 'Continue' to proceed with the suggested action. The 'Output Coords' column contains the recommended coordinate setting for the next action.

Select a new control station from the results table.

Re-run the SmartBase Quality Check processor.

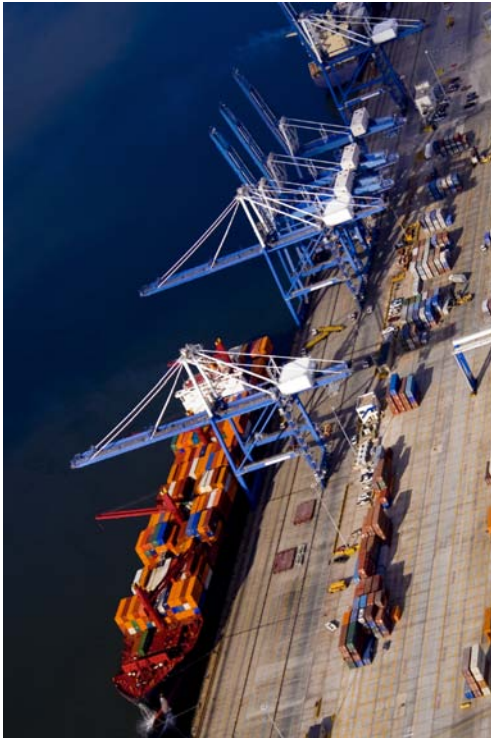
Run the Applanix SmartBase processor.

## > Rigorous Quality Assurance and Control

Included in the Applanix SmartBase module is the ability to perform a quality check on the reference station data. Using rigorous GNSS surveying adjustment algorithms, 18 to 24 hours worth of reference station data are processed to check the quality of both the network coordinates and the raw observations against a control that you specify. Bad reference station data? Bad antenna heights? Bad reference station coordinates? Unlike traditional multiple reference station GNSS processing, each of these errors is detected and then corrected with the quality control step in the Applanix SmartBase module before the remote GNSS data from the vessel is even touched. By the point you start your trajectory processing, you know that your network coordinates, data, and antenna heights are correct, eliminating the uncertainty of having to sort this out during or after the trajectory processing.

## > POSPac MMS FOR MARINE DELIVERS BETTER RESULTS

POSPac MMS increases the accuracy of your survey particularly when operating in locations with problematic GNSS reception, such as where GNSS signals are blocked or affected by multipath.



Even in these difficult environments, you will achieve:

- Maximum immunity to GNSS outages
- Improved positioning and orientation accuracy
- Stable, reliable and repeatable results
- Accurate post-processing with raw GNSS data from as few as one satellite, using the IN-Fusion tightly-coupled configuration
- Support for numerous mapping projections (UTM, Gauss-Kruger, TM, Lambert, Orthographic, US State Plane, etc) allows automatic data output in your format of choice

## > FEATURES

Specifically developed for the challenging marine environment,, POSPac MMS for Marine is the smart software solution for the precise and robust georeferencing and motion compensation of multibeam sonar and LiDAR data used in hydrographic surveying, charting and related marine engineering tasks, POSPac MMS sets the new industry standard for accurate, reliable and repeatable results under the most difficult surveying conditions. Features include:

- **ADVANCED PLANNING:** A powerful, standalone tool with the ability to support various types of satellite data. Visible satellite plots can be generated to help you determine the best times for data collection to ensure field time is productive
- **DATA IMPORT:** Designed to extract the GNSS and IMU observables, as well as the real-time navigation solution from the raw data logged by POS MV
- **APPLANIX SMARTBASE™:** A significant improvement productivity improvement in Real-Time Kinematic (RTK) positioning has been achieved using the concept of a “Virtual Reference Station” (VRS). Here observables from a dedicated network of GNSS reference stations are processed to compute the atmospheric and other errors within the network.
- **GNSS-INERTIAL PROCESSOR:** Imports the output data generated using the extract module to produce a tightly-coupled navigation solution. The GNSS, IMU and GAMS integrated navigation data are post-processed in both forward and reverse directions culminating in a smoothing routine to produce the best results possible.
- **EXPORT:** Transforms the real-time or post-processed data from WGS84 to various user-defined coordinate systems
- **DISPLAY:** Plots and tabulates the output data for easy analysis and QA/QC tasks
- **BATCH:** Schedules the execution of the various modules to provide a turnkey software solution

## > BENEFITS

This complete post-processing toolbox delivers a streamlined field-to-office workflow resulting in the best possible results and many specific advantages to the operators. POSPac MMS for Marine will:

- **Increase Your Scope:** By removing the barriers that have been limiting the efficiencies of high-accuracy mobile mapping, higher accuracy missions can now be performed at a lower cost over larger areas in less time.
- **Increase Your Accuracy:** Applanix Smart Select technology automatically selects, downloads and imports the best available Applanix SmartBase™ network of reference receivers
- **Increase Your Robustness:** The rigorous quality checks and advanced algorithms used in the Applanix POSPac MMS software ensure the first solution is the right solution, minimizing re-work
- **Increase Your Productivity:** The Applanix POSPac MMS software allows you to reduce deployment costs, extend distances and areas for mapping, and reduce re-work and production costs through rigorous quality checks

## > INTEGRATED TOOLS AND NEW TECHNIQUES FROM ONE COMPLETE SOLUTION

POSPac MMS represents an easy step in marine data post-processing with an integrated functionality for today's professionals using Applanix integrated GNSS-Inertial technology. Take advantage of the new powerful tools and techniques designed to provide complete processing solutions from mission startup to project completion.

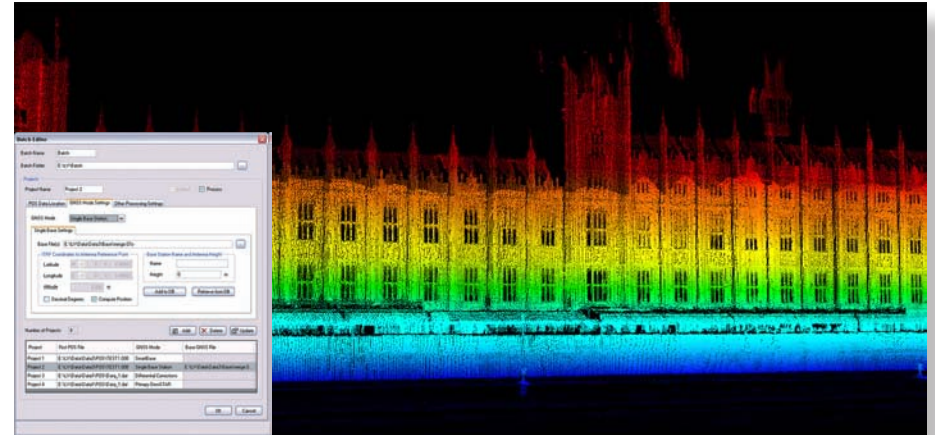
### > SYSTEM REQUIREMENTS

The minimum computer requirements for running POSPac MMS for Marine are:

<b>CPU</b>	Pentium 3 at 800 MHz or equivalent
<b>Memory</b>	512 MB RAM
<b>Operating System</b>	Microsoft Windows® XP Professional (32 and 64 bits) Windows® Vista (32 and 64 bits)
<b>Free Disk Space</b>	400 MB for installation, 1 GB for navigation data
<b>Screen Resolution</b>	1024 X 768 pixels
<b>Regional Options</b>	English (US)
<b>USB Port</b>	2 X USB 1.1 ports for security keys
<b>Internet Access</b>	For downloading Microsoft Framework® during installation and other program operations

The recommended computer requirements for running POSPac MMS for Land are:


<b>CPU</b>	Pentium 4 (32 bits) at 2 GHz or equivalent
<b>Memory</b>	1 GB RAM
<b>Operating System</b>	Microsoft Windows® XP Professional (32 and 64 bits), Windows® Vista (32 and 64 bits)
<b>Free Disk Space</b>	400 MB for installation, 4+ GB for navigation data
<b>Screen Resolution</b>	1280 X 1024 pixels
<b>Regional Options</b>	English (US)
<b>USB Port</b>	2 X USB 2.0 ports for security keys
<b>Internet Access</b>	For downloading Microsoft Framework® during installation and other program operations
<b>User Interface</b>	Several commands in 2D and 3D view modes are more accessible using a 3-button mouse



The LiDAR Point Cloud Generator Module in POSPac MMS is used to combine the raw Lidar range measurements with the navigation data to generate point cloud data as above.



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## AIRBORNE LAND MARINE

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