

# SPAN Technology

## QUICK START GUIDE

This guide provides the basic information you need to set up and begin using your SPAN Technology system.



### BOX CONTENTS

In addition to this *Quick Start Guide*, the following is provided in your SPAN package:

- 1 DL-4plus, ProPak-G2plus or ProPak-LBplus receiver and its *Quick Start Guide*
- 1 IMU (if you do not already have one)
- 1 IMU to receiver interface cable
- 2 serial cables (1 straight through and 1 null modem)
- 1 I/O cable
- 1 DB9 to USB cable (ProPak-G2plus and DL-4plus only)
- 1 12 V power cable
- 1 CD containing PC Utilities and product documentation

### ADDITIONAL EQUIPMENT REQUIRED

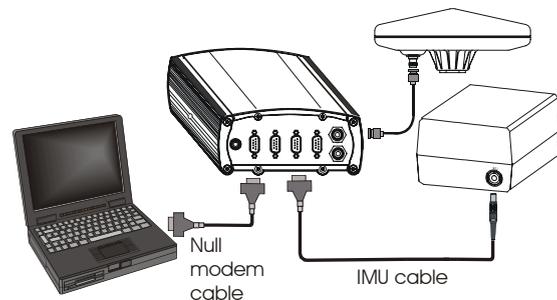
The following additional equipment is needed for a basic setup:

- A Windows-based PC with an RS-232 DB9 or USB port
- A power supply of +12 to +18 VDC (DL-4plus\ProPak-G2plus) or a max. of +15 VDC for the ProPak-LBplus.
- A quality dual frequency GPS antenna such as the GPS-702, or GPS-512 for airborne/high speed applications. For L-Band corrections use the GPS-702L antenna.
- A TNC to appropriate antenna connector RF cable

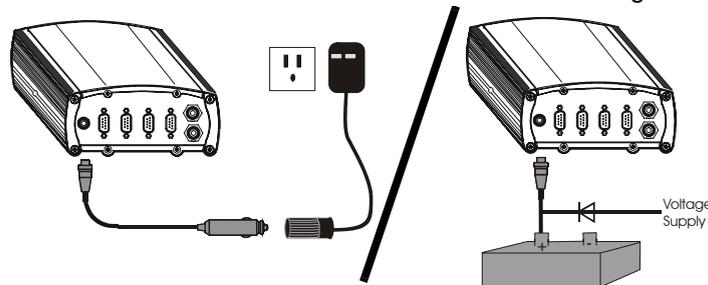
### SPAN HARDWARE SET-UP

Complete the following steps to set up and power your SPAN system where the example graphics show the connections on the back of a DL-4plus or ProPak-G2plus receiver. Refer to your *ProPak-LBplus Quick Start Guide* for graphics of its connectors.

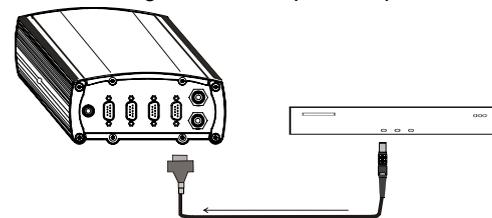
1. Mount the IMU and antenna securely to a vehicle. Ensure they cannot move due to dynamics and that the distance and relative direction between them is fixed. See also *Step 3* in the *SPAN IMU Configuration* section of this guide.
2. Connect the IMU to the receiver using the IMU cable provided. For the Propak-LBplus, the IMU cable plugs into (the COM3 port). For the DL-4 and Propak-G2 receivers, the IMU plugs into the port labelled AUX. See also *Steps 1 and 2* in the *SPAN IMU Configuration* section of this guide.
3. Connect COM1 of the receiver to a computer COM port using a null modem cable.



4. Connect the GPS antenna to the antenna port on the receiver using an appropriate antenna cable.
5. Apply power to the receiver and in the case of the DL-4plus, push its power button to turn it on. It is recommended that a back-up battery is placed between the receiver and its voltage supply to act as a power buffer if installed in a vehicle. When a vehicle engine is started, power can dip to 9.6 VDC or cut-out to ancillary equipment causing the receiver and IMU to lose lock and calibration settings.



- ☒ You may also have a user point device such as video equipment. Connect the device to the receiver's I/O port using a cable that is compatible to both the receiver and the device. Refer to your device's documentation for information on its connectors and cables. The arrow along the cable in the figure indicates a MARKIN pulse, refer to *Volume 2* of the *OEM4 User Manual* set, from the user device on the right to the DL4plus I/O port.

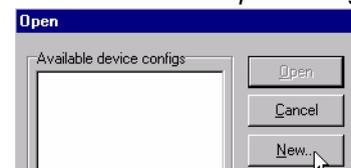


### COMMUNICATING WITH THE SPAN SYSTEM

Once the receiver is connected to the PC, antenna, and power supply, install NovAtel's GPS PC Utilities (GPSolution, DL4Tool and Convert). You can find installation instructions in your receiver's *Quick Start Guide*. (Alternatively, you can use a terminal emulator program such as HyperTerminal to communicate with the receiver. Refer to *Volume 1* of the *OEM4 User Manual* set for details.)

Start GPSolution4 on your PC to enable communication:

1. In the GPSolution menu, select Device | Open.
2. Select the *New...* button in the *Open* dialog box.



3. Enter a name for the new device configuration in the *Name* field of the *New Config* dialog box.
4. Select the *Settings* button.
5. Select the PC serial port the receiver is connected to from the *PC Port* drop-down list, 57600 from the *Baud Rate* list and uncheck the *Use hardware handshaking* checkbox.
6. Select *OK* to save the settings and *OK* again to close the

*New Config* dialog box and return to the *Open* dialog.

7. Select your configuration (*Name*) in the *Open* dialog and click on the *Open* button.
8. Select View | Logging Control from the menu to control the GPSCard's logging to files and serial ports. Refer to GPSolution4's on-line Help for more information.
9. Use the *Console* window to enter commands. See also the *Post-Processing* section of this guide.

- ☒ If you have to power down your receiver, ensure that all windows, other than the Console window, are closed in GPSolution and then use the SAVECONFIG command.

### SPAN IMU CONFIGURATION

You must use COM3 for the ProPaks and AUX for the DL-4 when inputting commands that require a port name. This is true, even if the port is labelled differently.

SPAN Enclosure	Port Label	Port Name for Software <sup>a</sup>
ProPak-G2plus	AUX	COM3
ProPak-LBplus		COM3
DL-4plus	AUX	AUX

- a. This is the name given to the port when described in a command or output in a log

Follow these steps to enable INS as part of the SPAN system:

1. Issue the INTERFACEMODE command to specify the receiver port that is connected to the IMU:

Receiver Type	INTERFACEMODE Command
ProPak-G2plus	interfacemode com3 imu imu off <sup>a</sup>
ProPak-LBplus	interfacemode com3 imu imu off
DL-4plus	interfacemode aux imu imu off

- a. Enter this command even if the port is labelled AUX on the ProPak-G2plus

- Issue the SETIMUTYPE command to specify the type of IMU being used:

IMU Type	SETIMUTYPE Command
AG11 or AG58	setimutype imu_hg1700_ag11
AG17 or AG62	setimutype imu_hg1700_ag17

- Alternatively, select View | INS Window in GPSolution to select the type of IMU and to configure the receiver port, connected to the IMU, to accept IMU data:

INS Configuration and Status		Position (Std Dev)	
INS Status	INS_COARSE_ALIGN_COMPLETE	Latitude	51.11636241° (0.407 m)
IMU Type	IMU_HG1700_AG11	Longitude	-114.03825009° (0.437 m)
IMU Port	COM3	Height	1045.768 m (MSL) (0.627 m)
Velocity (Std Dev)		Attitude (Std Dev)	
North Velocity	-0.001 m/s (0.012 m/s)	Roll	-0.453° (0.053°)
East Velocity	-0.001 m/s (0.012 m/s)	Pitch	0.604° (0.053°)
Up Velocity	0.001 m/s (0.007 m/s)	Azimuth	184.946° (5.149°)

Right-click on the *INS* window and select *Configure INS* to see the *Configure INS* dialog:

Configure INS dialog box showing IMU Type set to IMU\_HG1700\_AG11 and IMU Port set to COM3. Buttons: Enable INS, Disable INS, Cancel.

When you have made your selections in the *IMU Type* and *IMU Port* fields, click on the *Enable INS* button.

Raw IMU data is now available and the INS filter starts.

- Enter the distance from the IMU to the GPS antenna using the SETIMUTOANTOFFSET command. The offset between the antenna phase centre and the IMU axes must remain constant and be known accurately (m). The X (pitch), Y (roll) and Z (azimuth) directions are clearly marked on the IMU.

The SETIMUTOANTOFFSET parameters are (where the standard deviation fields are optional):

x\_offset y\_offset z\_offset [x\_stdev] [y\_stdev] [z\_stdev]

A typical RTK GPS solution is accurate to a few centimeters. For the integrated INS/GPS system to have this level of accuracy, the offset must be measured to within a millimeter. Any bias between the two systems shows up directly in the output position. For example, a 10 cm error in recording this offset will result in at least a 10 cm error in the output.

## SPAN GPS CONFIGURATION

Depending on the accuracy of the solution required, the GPS can be augmented with a number of correction sources including SBAS, L-Band (ProPak-LB only), and RTK (RTCA, RTCM, RTCM V3 and CMR). Refer to your receiver's *Quick Start Guide* or *Volume 1* of the *OEM4 User Manual* set if your receiver model is SBAS- or L-Band-capable. Refer also to *Volume 1* of the *OEM4 User Manual* set for details on RTK setup and operation.

## SPAN DATA LOGGING

Raw GPS, INS and navigation data (position, velocity, attitude) are available from the system as ASCII or binary logs.

Data can be collected through GPSolution using the *Logging Control* window, sent to the compact flash card on the DL-4plus (refer to the *DL-4plus Quick Start Guide*) or sent out the receiver COM port to user-supplied data collection software. See also the *Post-Processing* section of this guide

For post-processing applications, collect the following data:

RAWIMUSA ONNEW  
RANGECMPB ONTIME 1  
RAWEPHEMB ONNEW

For real-time applications, the GPS/INS solution is available through the logs listed in the *SPAN System User Manual* including the INSPOS, INSVEL, INSATT and INSPVA logs. These logs can be collected at rates up to 100 Hz.

## SPAN SYSTEM OPERATION

The system is ready to go once it is powered and the INS and GPS are configured using the previously shown commands.

Observe the status of the system in GPSolution's *INS* window or in the status field of any of the INS solution logs (for example INSPOS, INSVEL, INSATT and INSPVA).

- INS data is available once the system has a good GPS solution therefore an antenna must be connected for the system to function.

Allow the system to be stationary for at least 1 minute after the GPS solution is computed for its initial system alignment. The following status stages may be observed:

- The status changes from INS\_INVALID to INS\_ALIGNING once the coarse alignment starts.
- The status changes to INS\_ALIGNMENT\_COMPLETE. when the coarse alignment is complete. It normally stays in this state until the system senses motion. Then when the attitude solution converges to within specifications, the status changes to INS\_SOLUTION\_GOOD.
- The status may occasionally change to INS\_BAD\_GPS\_AGREEMENT. This status indicates that the inertial solution has detected poor quality GPS positions from the receiver due to limited satellite visibility/high multipath conditions. The inertial filter may choose to disregard this information and wait for the GPS quality to improve. The solution is still valid during these times, it is simply a warning flag that the GPS/INS solution is more reliable than the GPS-only solution.

## POST-PROCESSING

Post-processing requires collection of simultaneous data from the base and rover stations. This includes accurate coordinates of the base station and accurate measurement of the IMU to antenna separation.

Collect the following data for post-processing:

- From the base station
  - RANGECMPB ontime 1
  - RAWEPHEMB onnew
- From the rover station(s)
  - RANGECMPB ontime 1
  - RAWEPHEMB onnew
  - RAWIMUSB onnew

SPAN system output is compatible with post-processing software from Waypoint, a NovAtel Precise Positioning Company. Visit their website at [www.waypnt.com](http://www.waypnt.com) for more details.

## QUESTIONS OR COMMENTS

If you have any questions or comments regarding your SPAN system, please contact NovAtel Customer Service by:

Email: support@novatel.ca  
 Web: www.novatel.com  
 Phone: 1-800-NOVATEL (U.S. & Canada)  
 403-295-4900 (International)  
 Fax: 403-295-4901

