

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

SPAN SYSTEM COMPONENTS

A SPAN system requires the following primary components:

- A SPAN capable OEM6 receiver (enclosure or receiver card)
- An IMU (see the *IMU Type* column in *Table 2*)
- A quality, dual frequency GNSS antenna such as the GPS-702-GG, ANT-A72GA-TW-N for airborne/high speed applications or GPS-702-GGL for L-Band corrections. See the NovAtel website (www.novatel.com/products/gnss-antennas/) for information on a variety of quality antennas available to meet your form factor and performance needs.
- Cables to connect the components. See Table 1.
- A power supply for the OEM6 receiver.
For the receiver power requirements, refer to the *OEM6 Family Installation and Operation User Manual* available on the NovAtel web site at www.novatel.com/support/firmware-software-and-manuals/.
- A power supply for the IMU.
For the IMU power requirements, refer to the *SPAN Technology for OEM6 User Manual* available on the NovAtel web site at www.novatel.com/support/firmware-software-and-manuals/.



If you want to use the same power supply for the receiver and the IMU, make sure the power supply meets the requirements of both the receiver and the IMU.

SET UP YOUR SPAN HARDWARE

Complete the following steps to set up and power your SPAN system.



This procedure focuses on a SPAN system with a FlexPak6 receiver. For information about SPAN system installation with other OEM6 receivers, see the *SPAN Technology for OEM6 User Manual* found on the NovAtel web site at www.novatel.com/support/firmware-software-and-manuals/.

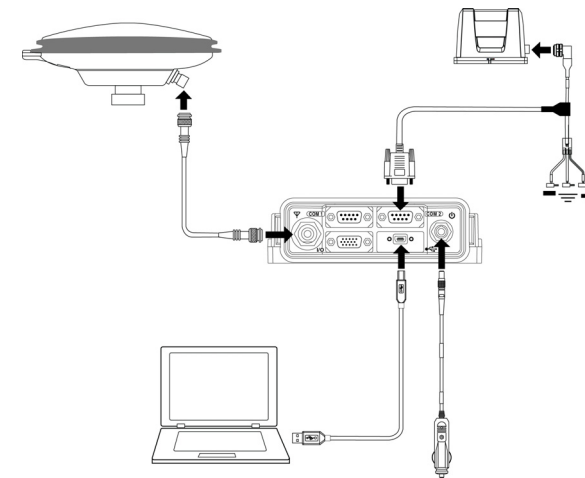
1. Install the NovAtel Connect PC Utilities and USB drivers.



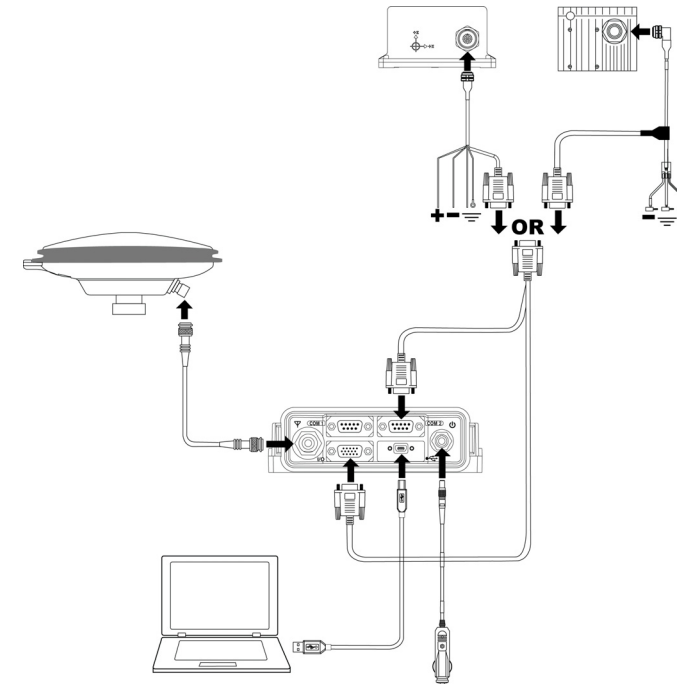
To access and download the most current version of the NovAtel Connect PC Utilities and USB drivers, go to the *Support* page of the NovAtel web site at www.novatel.com/support/firmware-software-and-manuals/.

2. Mount the IMU and antenna securely to a vehicle.
For the simplest operation, align the Y-axis of the IMU with the forward axis (direction of travel) of the vehicle. Ensure the Z-axis is pointing up. Ensure that the GNSS antenna and IMU cannot move relative to each other. The distance and relative direction between them must be fixed.
3. Connect the IMU to the *COM 2* port on the receiver using the IMU interface cable.
For a system with a FlexPak6 and an IMU-FSAS or IMU-CPT, connect the FlexPak Y Adapter cable to the FlexPak6 ports labelled *COM 2* and *I/O*. Then, connect the IMU to the FlexPak Y Adapter cable using the IMU interface cable.
4. Connect a USB cable from the computer to the USB port on the receiver.
Make sure you have installed the USB drivers. The USB drivers are available on the CD provided with your receiver and from the NovAtel web site.
If you want to connect via a serial connection, connect a null modem serial cable from the computer to the *COM 1* port on the receiver.

UIMU-LN200, UIMU-HG1700 or UIMU-LCI



iIMU-FSAS or IMU-CPT



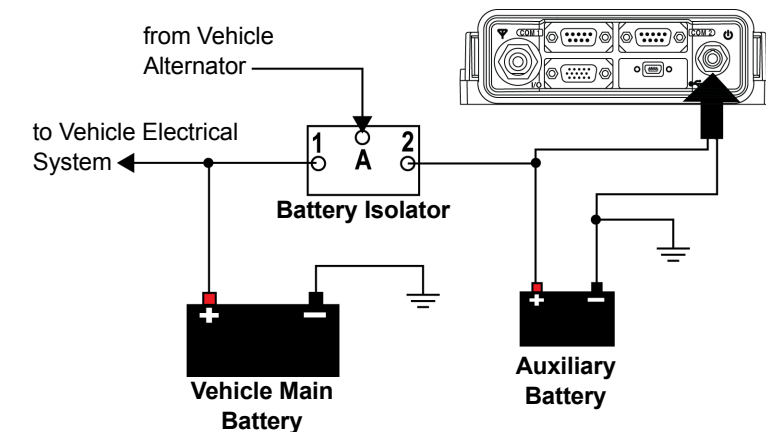
For information about using Ethernet to connect to the receiver, see the *SPAN Technology for OEM6 User Manual* found on the NovAtel web site at www.novatel.com/support/firmware-software-and-manuals/.

5. Connect the GNSS antenna to the antenna port on the receiver using an appropriate antenna cable.
6. Connect the power cable to the power port on the receiver. On a FlexPak6, line up the red mark on the power cable connector with the red mark on the receiver's power port and insert power cable.
7. Connect the receiver and the IMU to the power supply. The power LED lights red when the FlexPak6 is properly powered.




Operation of the SPAN system is not affected by the order in which you power up the IMU and receiver.

It is recommended that you place a back-up battery between the receiver and its voltage supply as a power buffer if installed in a vehicle. When a vehicle engine is started, power can dip to 9.6 V DC or cut-out to ancillary equipment causing the receiver and/or IMU to lose lock and calibration settings.




For an alternative power source:

- Cut the 12 V car adapter from the power cable.
- Tie the exposed wires to a DC power supply.




Be sure to connect the red and orange or green wires to the positive side of the power supply and connect the black and brown or white wires to the negative side of the power supply.




The FlexPak6 requires a power supply that provides 6-36 V DC and is capable of at least 5 W. If you are using the same power supply for the IMU, make sure the voltage range meets the IMU requirements and there is sufficient power for both the receiver and the IMU.

- Install a user supplied 6 A slow blow fuse at the alternate power source to protect the power supply wiring and your warranty.



Since the 12V car adaptor on the supplied adaptor cable incorporates a 6A fuse, a user supplied 6A slow blow fuse in a suitable holder must be used at the alternate power source to protect both the power supply and your warranty. The car adapter is not recommended for use if your power source is greater than 12V.



If you are using custom cables for your installation, rather than the NovAtel cables listed in Table 1, be aware of the following.

The FlexPak6 provides an output voltage on pin 4 of COM 2 (POUT) that is at the same voltage as the FlexPak6 power source. To ensure that any equipment you connect to COM 2 will not be damaged, refer to the COM 2 pinout in the *SPAN Technology for OEM6 User Manual* found on the NovAtel web site at www.novatel.com/support/firmware-software-and-manuals/.

Do not use the POUT output voltage to power an IMU.

Table 1: SPAN System Cables for FlexPak6

Connection ^a	Cable required
FlexPak6 to UIMU-LN200, UIMU-HG1700 or UIMU-LCI	01018299, Universal IMU Interface Cable
FlexPak6 to IMU-CPT	01018966, IMU-CPT Interface Cable and 01018948, FlexPak Y Adapter Cable
FlexPak6 to iIMU-FSAS	01018299, Universal IMU Interface Cable and 01018948, FlexPak Y Adapter Cable
FlexPak6 to computer	60323078, USB A to mini B cable or 01017658, Null Modem Serial cable
FlexPak6 to antenna	User supplied RF antenna cable
FlexPak6 to power	01017663, 12 V Power cable
FlexPak6 to modem or radio	01018520, Straight Through Serial cable
FlexPak6 to additional outputs (e.g. Ethernet, CAN Bus, PPS)	01018649, I/O Breakout Cable

- These cables are for the FlexPak6. For information about the cables for other OEM6 receivers, see the *OEM6 Family Installation and Operation User Manual*.

CONFIGURE THE SPAN SYSTEM


There are two methods to configure the SPAN system:

- Configure SPAN Manually
- Configure SPAN Using Connect

Configure SPAN Manually

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

- Establish a connection to the OEM6 receiver. Refer to the receiver Quick Start Guide for information about connecting to the receiver and entering commands.
- Issue the *CONNECTIMU* command to specify the type of IMU and the receiver port connected to the IMU (see *Table 2*).



A GNSS antenna must be connected and tracking satellites for operation.

Table 2: CONNECTIMU Commands

IMU Type	CONNECTIMU command
HG1700 AG11	CONNECTIMU COMx ^a IMU_HG1700_AG11
HG1700 AG17	CONNECTIMU COMx ^a IMU_HG1700_AG17
HG1700 AG58	CONNECTIMU COMx ^a IMU_HG1700_AG58
HG1700 AG62	CONNECTIMU COMx ^a IMU_HG1700_AG62
HG1900 CA50	CONNECTIMU COMx ^a IMU_HG1900_CA50
HG1930 CA50	CONNECTIMU COMx ^a IMU_HG1930_CA50
iIMU-FSAS	CONNECTIMU COMx ^b IMU_IMAR_FSAS
IMU-CPT	CONNECTIMU COMx ^b IMU_KVH_COTS
Landmark20	CONNECTIMU COMx ^a IMU_GLADIATOR_LANDMARK20
LCI-1	CONNECTIMU COMx ^a IMU_LITEF_LCI1
LN-200	CONNECTIMU COMx ^a IMU_LN200

- COM2 is the recommended serial port for the IMU, however you can use COM1 or COM2 for these IMUs.
- You must use COM 2 for the iIMU-FSAS and IMU-CPT.

Basic configuration of the SPAN system is now complete. The inertial filter starts once the GNSS solution is solved and the IMU is connected.

- Enter the distance from the IMU to the GNSS antenna using the SETIMUTOANTOFFSET command. The offset between the antenna phase center and the IMU axes must remain constant and be known accurately. The X (pitch), Y (roll) and Z (azimuth) directions are clearly marked on the IMU enclosure. 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 GNSS solution is accurate to a few centimetres. For the integrated INS/GNSS system to have this level of accuracy, the offset must be measured to within a centimetre. Any offset error 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.

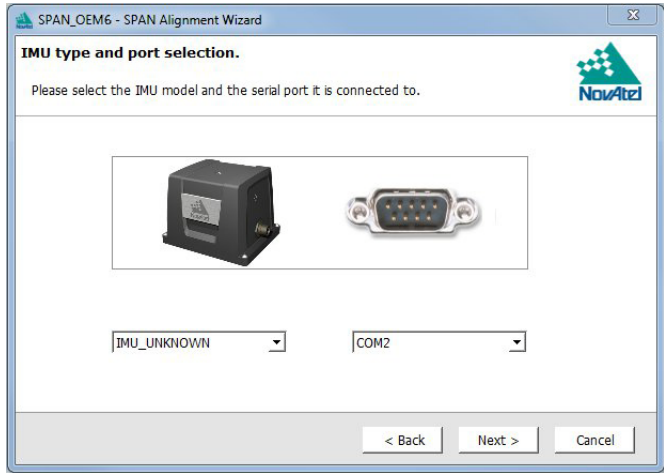
If it is impossible to measure the IMU to GNSS antenna offset precisely, the offset can be estimated by carrying out the Lever Arm Calibration Routine. Refer to the *SPAN Technology for OEM6 User Manual* for details.

Configure SPAN Using Connect

Follow these steps to enable INS as part of the SPAN system using the **NovAtel Connect** software utility:


- Start a **Connect** session and establish a connection to the OEM6 receiver. Refer to the receiver Quick Start Guide for information about connecting to the receiver.

2. Select *Wizards* | *SPAN Alignment* from the **Connect** toolbar. This wizard takes you through the steps to complete a coarse or kinematic alignment, select the type of IMU and configure the receiver port to accept IMU data.



Configuration for Alignment

A coarse alignment routine requires the vehicle to remain stationary for at least 1 minute. If that is not possible, an alternate, kinematic alignment routine is available. The kinematic or moving alignment is performed by estimating the attitude from the GNSS velocity vector and injecting it into the SPAN filter as the initial system attitude.



Static coarse alignment is not available for the IMU-CPT, HG1930 or Landmark 20 IMUs. Use the kinematic alignment instead.

LOG SPAN DATA

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

Data can be collected through **Connect** using the *Logging Control Window*, or sent out the receiver COM port to user-supplied data collection software.


For post-processing applications, collect the data shown in the *Post-Process Data* section of this guide.

For real-time applications, the GNSS/INS solution is available through the logs listed in the *SPAN Technology for OEM6 User Manual* including INSPOS, INSVEL, INSATT and INSPVA. These logs can be collected at rates up to the IMU data rate; however, there are some rate restrictions. Refer to the *Data Collection* section in the *SPAN Operation* chapter of the *SPAN Technology for OEM6 User Manual*.

OPERATE THE SPAN SYSTEM

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

Observe the status of the system in the **Connect 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 there is a good GNSS solution. Therefore, an antenna must be connected for the system to function.

If performing a static alignment, allow the system to be stationary for at least 1 minute after the GNSS solution is computed for its initial system alignment. If performing a kinematic alignment, move the vehicle forward at a speed faster than 1.15 m/s. The following status stages may be observed:

- The status changes from INS_INACTIVE to INS_ALIGNING when the alignment starts.

- The status changes to INS_ALIGNMENT_COMPLETE. when the alignment is complete. After some motion (stops, starts and turns), the attitude solution converges to within specifications, and the status changes to INS_SOLUTION_GOOD.
- The status may occasionally change to INS_SOLUTION_FREE. This status indicates that the inertial solution has detected poor quality GNSS positions from the receiver due to limited satellite visibility or high multipath conditions. The inertial filter may choose to disregard this information and wait for the GNSS quality to improve. The solution is still valid during these times, it is simply a notification that the GNSS/INS solution is more reliable than the GNSS-only solution.

POST-PROCESS DATA

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 onchanged
 - GLOEPHEMERISB onchanged (if using GLONASS)
- From the rover station(s)
 - RANGECMPB ontime 1
 - RAWEPHEMB onchanged
 - GLOEPHEMERISB onchanged (if using GLONASS)
 - RAWIMUSXB onnew
 - IMUTOANTOFFSETSB onchanged
 - VEHICLEBODYROTATIONB onchanged

SPAN system output is compatible with Inertial Explorer post-processing software from the Waypoint Products Group, NovAtel Inc. Visit our website at www.novatel.com for details.

QUESTIONS OR COMMENTS

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

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



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