SPAN-CPT

QUICK START GUIDE

GM-14915124   Rev 1   March 2013

This guide provides the basic information needed to set up and begin using NovAtel® SPAN-CPT™ system. For more detailed information about the installation and operation of your SPAN® system, refer to the *SPAN-CPT User Manual* (OM-20000122) and the SPAN on OEM6® Firmware Reference manual (OM-20000144), available on the NovAtel website at *www.novatel.com/support/firmware-software-and-manuals/*.

BOX CONTENTS

In addition to this quick start guide, the following is provided in your SPAN-CPT package:

• **1** SPAN-CPT (integrated receiver and IMU)

• **1** SPAN-CPT interface cable

• **1** CD containing the NovAtel PC Utilities

ADDITIONAL EQUIPMENT REQUIREMENTS

The following additional equipment is needed for a basic setup:

• A power supply of +9 to +18 VDC

• A quality, dual-frequency GNSS antenna such as the GPS-702-GG, ANT-A72GA-TW-N or GPS-702-GGL. 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.

• An antenna cable with a TNC male connector at the receiver end, such as NovAtel's GPS-C016 model

• A Windows® based computer with a USB or serial port

SET UP YOUR SPAN HARDWARE

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

1. Mount the SPAN-CPT enclosure and antenna securely to a vehicle.
   For the simplest operation, align the Y-axis of the SPAN-CPT with the forward axis (direction of travel) of the vehicle. Ensure the Z-axis is pointing up.

Ensure that the GNSS antenna and enclosure cannot move relative to each other. The distance and relative direction between them must be fixed.
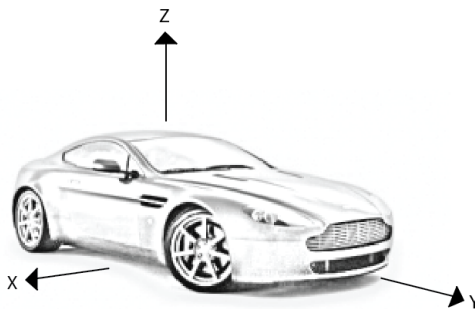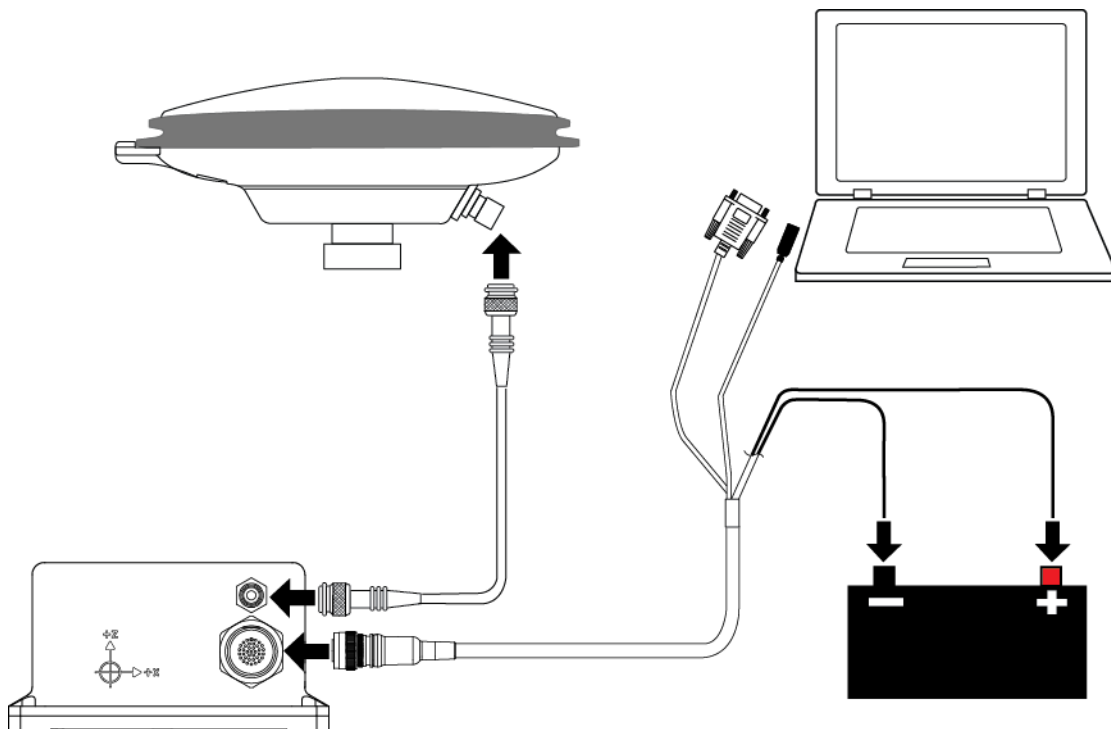

> (i) The X (pitch), Y (roll) and Z (azimuth) directions are marked on the SPAN-CPT enclosure.

2. Connect the SPAN-CPT interface cable to the multi-purpose I/O connector on the SPAN-CPT.

> (i) For information about using custom cables, refer to the *SPAN-CPT User Manual* available on the NovAtel web site at *www.novatel.com/support/firmware-software-and-manuals/*.

Note: For clarity, additional connectors on the interface cable are not shown.

3. Connect the SPAN-CPT to a computer using the USB connector or COM1 connector on the interface cable.

4. Connect the GNSS antenna to the antenna port on the SPAN-CPT using an appropriate antenna cable.

5. Apply power to the SPAN-CPT.
   It is recommended that you place a back-up battery between the receiver and the voltage supply as a power buffer if installed in a vehicle. When a vehicle engine is started, power can dip or cut-out to ancillary equipment causing the receiver and/or IMU to lose lock and calibration settings.
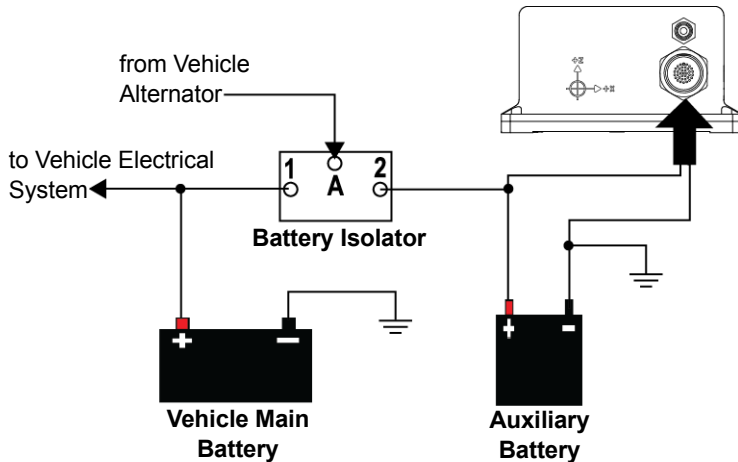
INSTALL THE PC UTILITIES

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

> (i) To access and download the latest 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/.

ESTABLISHING A NEW CONNECTION

The first time you open a serial port to communicate with the receiver, complete the following:

1. Launch NovAtel Connect from the Start menu folder specified during the installation process. The default location is Start | All Programs | NovAtel Connect 1.x.x | NovAtel Connect.

2. Select **New Connection** from the Welcome window.
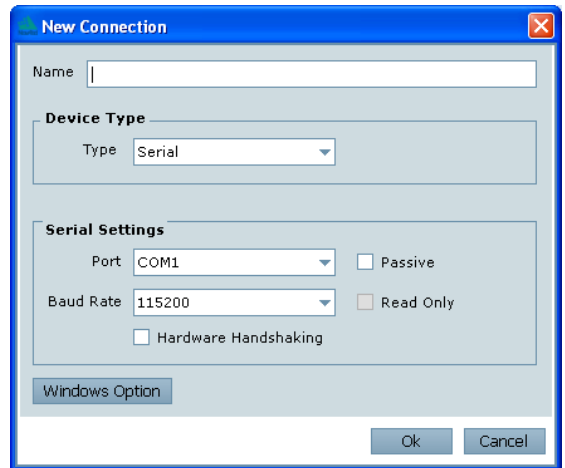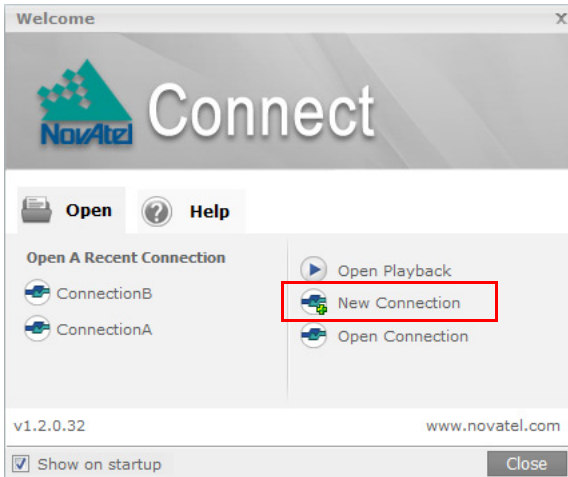
3. Enter a name for the connection.
4. Select **Serial** or **USB** from the **Type** list.
5. Select the computer the SPAN-CPT is connected to from the **Port** drop down list.
6. If this is a serial connection, select **115200** from the **Baud Rate** drop down list.
7. If this is a serial connection, clear the **Hardware Handshaking** check box.
8. Click the **OK** button to save the new connection.
9. Select the SPAN-CPT receiver from the Available Device Connections area of the Open Connection window.
10. Click the **Open** button to open SPAN receiver communications.
    As NovAtel Connect establishes the communication session with the receiver, a progress box is displayed.

> Detailed instructions for using NovAtel Connect are available from within the utility Help, the .chm file bundled with the software or from our web site *http://www.novatel.com/support/firmware-software-and-manuals*.

CONFIGURE THE SPAN SYSTEM

There are two methods to configure the SPAN system:

* *Configure SPAN Manually*
* *Configure SPAN Using NovAtel Connect*

Configure SPAN Manually

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

1. Establish a connection to the SPAN-CPT.

> (i) A GNSS antenna must be connected and tracking satellites for operation.

4

2. Enter the distance from the SPAN-CPT to the GNSS antenna using the SETIMUTOANTOFFSET command. The offset between the antenna phase center and the SPAN-CPT axes must remain constant and be known accurately. The X (pitch), Y (roll) and Z (azimuth) directions are clearly marked on the SPAN-CPT enclosure. The SETIMUTOANTOFFSET parameters are (where the standard deviation fields are optional):

```
x_offset y_offset z_offset [x_stdev] [y_stdev] [z_stdev]
```
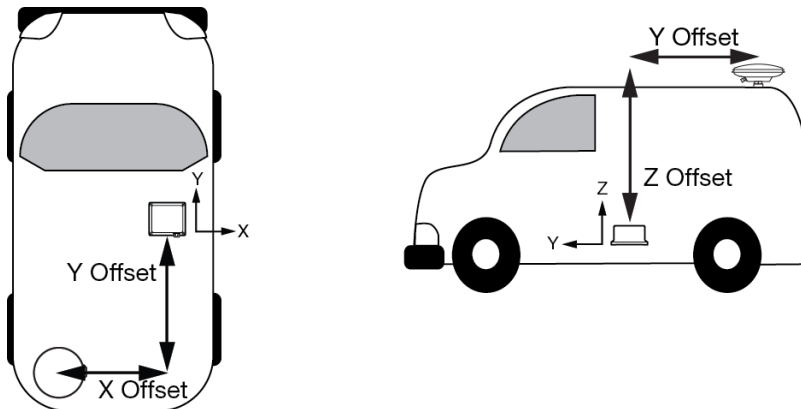

ⓘ This example assumes a default mounting configuration and shows a -X offset, -Y offset and +Z offset.

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.

Configure SPAN Using NovAtel Connect

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

1. Start a NovAtel Connect session and establish a connection to the SPAN-CPT.

2. Select Wizards | SPAN Alignment from the NovAtel Connect toolbar. This wizard takes you through the steps to complete an alignment and configure the receiver port to accept IMU data.
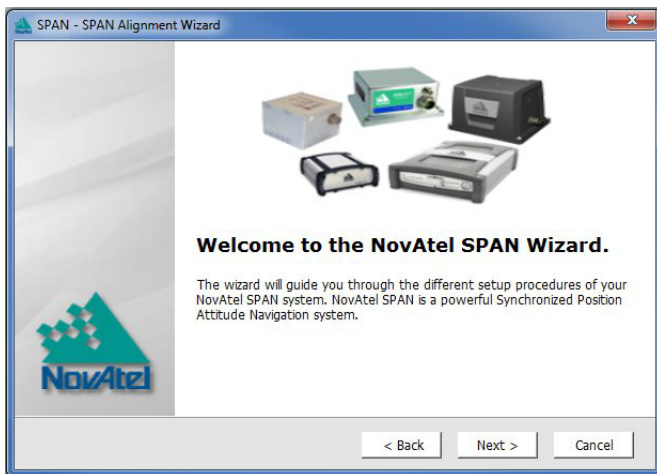

Configuration for Alignment

The default alignment method for a SPAN-CPT is the fast or kinematic alignment. The fast or kinematic alignment is performed by estimating the attitude from the GNSS velocity vector and injecting it into the SPAN filter as the initial system attitude. For this estimate to be made, the vehicle must move faster than 1.15 m/s.

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 NovAtel Connect using the *Logging Control Window*, or sent out the receiver COM port to user-supplied data collection software.
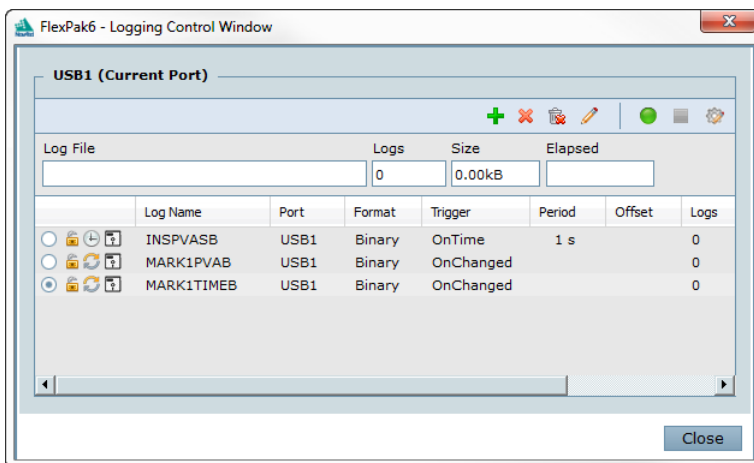
OPERATE THE SPAN SYSTEM

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 NovAtel Connect *INS Window* or in the status field of any of the INS solution logs (for example INSPOS, INSVEL, INSATT and INSPVA).

> (i) INS data is available once there is a good GNSS solution. Therefore, an antenna must be connected for the system to function.

The following status stages may be observed:

Table 1: Inertial Solution Status

Binary	ASCII	Description
0	INS_INACTIVE	IMU logs are present, but the alignment routine has not started; INS is inactive.
1	INS_ALIGNING	INS is in alignment mode.
2	INS_HIGH_VARIANCE	The INS solution is still being computed but the azimuth solution uncertainty has exceed 2 degrees. The solution is still valid but you should monitor the solution uncertainty in the INSCOV log. You may encounter this state during times when the GNSS, used to aid the INS, is absent.
3	INS_SOLUTION_GOOD	The INS filter is in navigation mode and the INS solution is good.
6	INS_SOLUTION_FREE	The INS filter is in navigation mode and the GNSS solution is suspected to be in error. This may be due to multipath or limited satellite visibility. The inertial filter has rejected the GNSS position and is waiting for the solution quality to improve.
7	INS_ALIGNMENT_COMPLETE	The INS filter is in navigation mode, but not enough vehicle dynamics have been experienced for the system to be within specifications.
8	DETERMINING_ORIENTATION	INS is determining the IMU axis aligned with gravity.
9	WAITING_INITIALPOS	The INS filter has determined the IMU orientation and is awaiting an initial position estimate to begin the alignment process.

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)
        1-800-668-2835
        1-403-295-4900 (International)

Fax: 1-403-295-4901