SPAN® SPAN CPT7

COMPACT DUAL ANTENNA SPAN ENCLOSURE DELIVERS 3D POSITION, VELOCITY AND ATTITUDE

SPAN: WORLD-LEADING GNSS+INS TECHNOLOGY
Synchronous Position, Attitude and Navigation (SPAN) technology brings together two different but complementary technologies: Global Navigation Satellite System (GNSS) positioning and inertial navigation. The absolute accuracy of GNSS positioning and the stability of Inertial Measurement Unit (IMU) gyro and accelerometer measurements are tightly coupled to provide an exceptional 3D navigation solution that is stable and continuously available, even through periods when satellite signals are blocked.

SPAN CPT7 OVERVIEW
The SPAN CPT7 is a compact, single enclosure GNSS+INS receiver, powered by NovAtel’s world class OEM7® technology. Capable of delivering up to centimetre-level accuracy, customers can choose from a variety of positioning modes to ensure they have the optimal level of accuracy for their application.

The SPAN CPT7 contains a high performing and highly reliable Honeywell HG4930P Micro Electromechanical System (MEMS) IMU to deliver leading-edge NovAtel SPAN technology in an integrated, single enclosure solution. It provides tactical grade performance for unmanned vehicles, mobile mapping and other commercial and/or military guidance applications. The SPAN CPT7 is a small, lightweight and low power solution with multiple communication interfaces for easy integration on multiple platforms.

SPAN CPT7 ADVANTAGES
The tight coupling of the GNSS and IMU measurements delivers the most satellite observations and the most accurate, continuous solution possible. Further, SPAN–CPT7 is comprised entirely of commercial components, simplifying export restrictions involved with traditional GNSS+INS systems.

IMPROVE SPAN CPT7 ACCURACY
Take advantage of NovAtel CORRECT® to receive your choice of accuracy and performance, from decimetre to RTK-level positioning. For more demanding applications, Inertial Explorer® post-processing software can be used to post-process SPAN data to provide the system’s highest level of accuracy.

BENEFITS
+ Continuous, stable positioning
+ Easy integration into space and weight constrained applications
+ Future proof for upcoming GNSS signal support
+ Multiple communication interfaces
+ Commercially exportable system (non-ITAR)
+ Small, low power, all-in-one GNSS/INS enclosure

FEATURES
+ MEMS gyros and accelerometers
+ Increased satellite availability with 555 channel capability
+ SPAN Land Vehicle technology
+ Optional SPAN Profiles support
+ Advanced interference mitigation features
+ Dual antenna ALIGN® heading

If you require more information about our SPAN products, visit www.novatel.com/span
### SPAN CPT7

#### SPAN SYSTEM PERFORMANCE

<table>
<thead>
<tr>
<th>Channel Count</th>
<th>555 Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Reacquisition</td>
<td>L1, L2/L5</td>
</tr>
<tr>
<td>Time Accuracy</td>
<td>20 ns RMS</td>
</tr>
<tr>
<td>Velocity Accuracy</td>
<td>&lt; 0.03 m/s RMS</td>
</tr>
<tr>
<td>Velocity Limit</td>
<td>515 m/s</td>
</tr>
</tbody>
</table>

#### IMU PERFORMANCE

- **Gyroscope Performance**: Technology MEMS, Input rate (max) ±200°/s
- **Accelerometer Performance**: Technology MEMS, Range ±20 g
- **IMU Raw Data Rate**: 100 Hz

#### PHYSICAL AND ELECTRICAL

- **Dimensions**: 90 x 60 x 60 mm
- **Weight**: 450 g
- **Power**: Input voltage +9 to +32 VDC, Maximum current 200 mA, Output antenna LNA Power Output 5 V ±5%
- **Input/Output Connectors**: Antennas 2 x SMA, Power and I/O 2 x Fischer
- **Core 16 pin DPBU**: 104 A086 140G/240G

#### PERFORMANCE DURING GNSS OUTAGES

<table>
<thead>
<tr>
<th>Outage Duration</th>
<th>Positioning Mode</th>
<th>Positioning Accuracy (M) RMS</th>
<th>Velocity Accuracy (M/S) RMS</th>
<th>Attitude Accuracy (DEGREES) RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 s</td>
<td>RTK</td>
<td>0.02</td>
<td>0.015</td>
<td>Vertical 0.010, Pitch 0.010, Heading 0.030</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>1.20</td>
<td>0.015</td>
<td>Vertical 0.010, Pitch 0.010, Heading 0.030</td>
</tr>
<tr>
<td></td>
<td>GPS</td>
<td>0.01</td>
<td>0.01</td>
<td>Vertical 0.005, Pitch 0.005, Heading 0.010</td>
</tr>
<tr>
<td>10 s</td>
<td>RTK</td>
<td>0.12</td>
<td>0.04</td>
<td>Vertical 0.020, Pitch 0.020, Heading 0.040</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>1.30</td>
<td>0.04</td>
<td>Vertical 0.020, Pitch 0.020, Heading 0.040</td>
</tr>
<tr>
<td></td>
<td>GPS</td>
<td>0.01</td>
<td>0.02</td>
<td>Vertical 0.005, Pitch 0.005, Heading 0.010</td>
</tr>
<tr>
<td>60 s</td>
<td>RTK</td>
<td>3.82</td>
<td>0.16</td>
<td>Vertical 0.035, Pitch 0.035, Heading 0.055</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>5.10</td>
<td>0.16</td>
<td>Vertical 0.035, Pitch 0.035, Heading 0.055</td>
</tr>
<tr>
<td></td>
<td>GPS</td>
<td>0.15</td>
<td>0.02</td>
<td>Vertical 0.007, Pitch 0.007, Heading 0.012</td>
</tr>
</tbody>
</table>

1. **Typical SPAN system performance values when using this IMU.** Performance specifications subject to GNSS system characteristics, Signal-in-Space (SIS) operational degradation, ionospheric and tropospheric conditions, satellite geometry, baseline length, multipath effects and the presence of intentional or unintentional interference.
2. **Model-configurable to track L5/E5a (Galileo) through L2 (GPS) or L3/E5b/B2 (GLONASS / Galileo / BeiDou) through L2 (GLONASS).** See manual for details.
3. **Designed for BeiDou Phase 2 and 3, B1and B2 compatibility (where applicable).**
4. **Hardware ready for L3 and L5.**
5. **The secondary antenna input does not support L-band or SBAS signals.**
6. **Booth SPAN CPT7-01, SPAN CPT7-02, SPAN CPT7-03, and SPAN CPT7-04 (all / Galileo).**
7. **Typical value. Almanac and recent ephemerides saved and approximate position and time entered.**
8. **Temperature Operating -40°C to +71°C Storage -40°C to +85°C**
9. **Humidity 95% non-condensing**
10. **Environment Submergence**
11. **IMU Limit: 515 m/s**
12. **Specs available in manual.**
13. **Designated for B2IS Phase 2 and 3, L1+B2 compatibility.**
14. **Hardware ready for L1 and L5.**
15. **Typical values using serial port communication without interference mitigation. Consult the OEM Installation & Operation User Manual for power supply considerations.**
16. **Time accuracy does not include biases due to RF or antenna delay.**
17. **Environmental with 405 mA.**

#### Communication Ports

| RS-422 | 1 |
| RS-232 (230400 bps max) | 1 |
| USB Device | 1 |
| CAN Bus | 1 |
| Event Input | 2 |
| Event Output | 2 |

#### Environmental

- **Temperature**: Operating -40°C to +71°C Storage -40°C to +85°C
- **Humidity**: 95% non-condensing
- **Environment**: Submergence 2 m for 12 hours
- **Water**: MIL-STD-810G (Ch1), Method 512.6
- **Dust**: MIL-STD-810G (Ch1), Method 510.6
- **Vibration (operating)**
  - **Random**: MIL-STD-810G (Ch1), Method 514.7, Category 24, 7.7 g RMS
  - **Sinusoidal**: IEC 60608-2-6
- **Acceleration (operating)**
  - **Random**: MIL-STD-810G (Ch1), Method 514.7, Category 24, 7.7 g RMS
  - **Sinusoidal**: IEC 60608-2-6

#### Firmware Solutions

- **Field upgradeable firmware and software models**
- **Configurable PPS output**
- **SPAN Land Vehicle**
- **ALIGN**
- **TerraStar PPP**
- **NovAtel CORRECT with RTK**
- **RTK ASSIST**
- **API**

#### Optional Accessories

- **Mounting Plate**
- **VEXIS series antennas**
- **ANT series antennas**
- **GrafNav/GrafNet®**
- **Inertial Explorer®**

For the most recent details of this product: [www.novatel.com/products/span-gns-inertial-systems/span-combined-systems/span-cpt7/](http://www.novatel.com/products/span-gns-inertial-systems/span-combined-systems/span-cpt7/)

novatel.com

sales@novatel.com

1-800-NOVATEL (U.S. and Canada) or 403-295-4900

China 0086-21-68882300

Europe 44-1993-848-736

SE Asia and Australia 61-400-883-601

Version 2 Specifications subject to change without notice.

©2018 NovAtel Inc. All rights reserved.

Printed in Canada.

Statements related to the export of products are based solely on NovAtel’s experience in Canada, are not binding in any way and exportability may be different with respect to the export regulations in effect in another country. The responsibility for re-export of product from a Customer’s facility is solely the responsibility of the Customer.
VEXXIS™ Antennas  GNSS-501

HIGH PERFORMANCE ANTENNA FOR TERRESTRIAL APPLICATIONS

PATENTED TECHNOLOGY
The VEXXIS GNSS–500 series antennas provide outstanding circularly polarized, symmetric radiation patterns with superior multipath rejection performance. This is achieved with a patented multi-point feeding network which provides uniquely low loss and frequency independent amplitude/phase balance. Strictly balancing signals and sequentially feeding the GNSS antenna at multiple points is the key to achieving remarkable performance.

OPTIMIZED FOR TERRESTRIAL APPLICATIONS
The GNSS–501 antenna is designed with a low profile, aerodynamic enclosure, ideal for ground vehicles in applications such as agriculture, machine control and mobile mapping. Magnetic mounts make the antenna easy to install or move between ground vehicle platforms. The combination of intelligent enclosure design along with multi-constellation and L-Band support makes it ideal for any terrestrial application.

RUGGEDIZED FOR CHALLENGING ENVIRONMENTS
The GNSS–501 has been thoroughly tested to withstand even the most challenging environments. It endured over 1000 hours of intense vibration testing to earn its MIL-STD-810G rating. It is also water resistant under heavy rainfall or high pressure spray, ensuring its long survivability under the toughest operating conditions.

FEATURES
+ Supports single-frequency GPS, GLONASS, Galileo and BeiDou signals
+ L-Band signal reception, supporting correction services such as TerraStar
+ Multi-point antenna feed provides stable phase center and enhanced multipath rejection
+ Designed for high quality performance when used with NovAtel’s STEADYLINE® technology
+ Low-profile design ideal for machine control applications

If you require more information about our antennas, visit www.novatel.com/antennas
### PERFORMANCE

**Signal Received**
- GPS L1
- GLONASS L1
- Galileo E1
- BeiDou B1
- L-Band

**Pass Band (typical)**
- Upper passband: 1569.0 ± 43.0 MHz

**Out-of-Band Rejection**
- Band edges ± 50 MHz: 15 dB (typical)
- Band edges ± 100 MHz: 25 dB (typical)

**LNA Gain**
- 29 dB (typical)

**Gain at Zenith (90°)**
- L1/B1/E1/G1: +4.0 dBi minimum
- L-Band: +4.0 dBi minimum

**Gain Roll-Off (from Zenith to Horizon)**
- L1/B1/E1/G1: 12 dB
- L-Band: 12 dB

**Phase Center Stability**
- <5.0 mm

**Noise Figure**
- 2.5 dB (typical)

**VSWR**
- ≤2.0 : 1

**Group Delay Ripple**
- <15 ns

**Nominal Impedance**
- 50 Ω

### PHYSICAL AND ELECTRICAL

**Dimensions**
- 155 mm D × 45 mm H

**Weight**
- 450 g

**Connector**
- TNC female

**Mounting**
- 2 × magnetic mounts
- 2 × M4 screw inserts

**Power**
- Input voltage: +3.3 to +18.0 VDC
- Current: 20 mA (typical)

**ENVIRONMENTAL**

**Temperature**
- Operating: -40°C to +85°C
- Storage: -55°C to +85°C

**Humidity**
- 95% non-condensing

**Salt Fog**
- MIL-STD-810G (CH1), 509.6

**Water/Dust Resistance**
- IP67, IP69K

**Vibration (operating)**
- Random: MIL-STD-810G (CH1), 514.7 (15 g) Annex E, Procedure 1, Category 24

**Shock**
- MIL-STD-810G (CH1), 516.7 (40 g) Procedure 1

**Bump**
- IEC 68-2-27 Ea (25 g)

**Regulatory Compliance**
- FCC, CE

**RoHS**
- EU Directive 2011/65/EU


**novatel.com**
- sales@novatel.com
- 1-800-NOVATEL (U.S. and Canada)
- or 403-295-4900
- China 0086-21-68882300
- Europe 44-1993-848-736
- SE Asia and Australia 61-400-883-601

**Version 3** Specifications subject to change without notice.
©2016 NovAtel Inc. All rights reserved.
NovAtel and STEADYLINE are registered trademarks of NovAtel Inc.
VEXXIS is a trademark of NovAtel Inc.
Printed in Canada.
D20658 September 2016
HIGH PERFORMANCE ANTENNA FOR TERRESTRIAL APPLICATIONS

PATENTED TECHNOLOGY
The VEXXIS GNSS-500 series antennas provide outstanding circularly polarized, symmetric radiation patterns with superior multipath rejection performance. This is achieved with a patented, multi-point feeding network which provides uniquely low loss and frequency independent amplitude/phase balance. Strictly balancing signals and sequentially feeding the GNSS antenna at multiple points is the key to achieving remarkable performance.

OPTIMIZED FOR TERRESTRIAL APPLICATIONS
The GNSS-502 antenna is designed with a low profile, aerodynamic enclosure, ideal for ground vehicles in applications such as agriculture, machine control and mobile mapping. Magnetic mounts make the antenna easy to install or move between ground vehicle platforms. The combination of intelligent enclosure design along with multi-constellation and L-Band support makes it ideal for any terrestrial application.

RUGGEDIZED FOR CHALLENGING ENVIRONMENTS
The GNSS-502 has been thoroughly tested to withstand even the most challenging environments. It endured over 1000 hours of intense vibration testing to earn its MIL-STD-810G rating. It is also water resistant under heavy rainfall or high pressure spray, ensuring its long survivability under the toughest operating conditions.

FEATURES
+ Supports dual-frequency GPS, GLONASS, Galileo, BeiDou and SBAS signal reception
+ L-Band signal reception, supporting correction services such as TerraStar
+ Multi-point antenna feed provides stable phase center and enhanced multipath rejection
+ Designed for high quality performance when used with NovAtel’s STEADYLINE® technology
+ Low-profile design ideal for machine control applications

If you require more information about our antennas, visit www.novatel.com/antennas
## PERFORMANCE

<table>
<thead>
<tr>
<th>Signal Received</th>
<th>L1, L2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS</td>
<td></td>
</tr>
<tr>
<td>GLONASS</td>
<td>L1, L2</td>
</tr>
<tr>
<td>Galileo</td>
<td>E1, E5b</td>
</tr>
<tr>
<td>BeiDou</td>
<td>B1, B2</td>
</tr>
<tr>
<td>L-Band</td>
<td></td>
</tr>
</tbody>
</table>

**Pass Band (typical)**
- Upper passband: 1569.0 ± 43.0 MHz
- Lower passband: 1220.0 ± 31.0 MHz

**Out-of-Band Rejection**
- Band edges ± 50 MHz: 15 dB (typical)
- Band edges ± 100 MHz: 25 dB (typical)

**LNA Gain**
- 29 dB (typical)

**Gain at Zenith (90°)**
- L1/B1/E1/G1: +4.0 dBi minimum
- L2/B2/E5b/G2: +4.0 dBi minimum
- L-Band: +4.0 dBi minimum

**Gain Roll-Off (from Zenith to Horizon)**
- L1/B1/E1/G1: 12 dB
- L2/B2/E5b/G2: 12 dB
- L-Band: 12 dB

**Phase Center Stability**
- <5.0 mm

**Noise Figure**
- 2.5 dB (typical)

**VSWR**
- ≤2.0 : 1

**L1-L2 Differential Propagation Delay**
- 7 ns (maximum)

**Group Delay Ripple**
- <15 ns

**Nominal Impedance**
- 50 Ω

## PHYSICAL AND ELECTRICAL

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>155 mm D × 45 mm H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>450 g</td>
</tr>
<tr>
<td>Connector</td>
<td>TNC female</td>
</tr>
<tr>
<td>Mounting</td>
<td>2 × magnetic mounts</td>
</tr>
<tr>
<td></td>
<td>2 × M4 screw inserts</td>
</tr>
<tr>
<td>Power</td>
<td>Input voltage: +3.3 to +18.0 VDC, Current: 20 mA (typical)</td>
</tr>
</tbody>
</table>

## ENVIRONMENTAL

**Temperature**
- Operating: -40°C to +85°C
- Storage: -55°C to +85°C

**Humidity**
- 95% non-condensing

**Salt Fog**
- MIL-STD-810G (CH1), 509.6

**Water/Dust Resistance**
- IP67, IP69K

**Vibration (operating)**
- Random: MIL-STD-810G (CH1), 514.7 (15 g) Annex E, Procedure 1, Category 24
- Shock: MIL-STD-810G (CH1), 516.7 (40 g) Procedure 1
- Bump: IEC 68-2-27 Ea (25 g)

**Regulatory Compliance**
- FCC, CE
- RoHS: EU Directive 2011/65/EU

---


**novatel.com**
- sales@novatel.com
- 1-800-NOVATEL (U.S. and Canada)
- 403-295-4900
- China 0086-21-68882300
- Europe 44-1993-848-736
- SE Asia and Australia 61-400-883-601

---

Version 3 Specifications subject to change without notice. ©2016 NovAtel Inc. All rights reserved. NovAtel and STEADYLINE are registered trademarks of NovAtel Inc. VEXXIS is a trademark of NovAtel Inc. Printed in Canada. D20659 September 2016