CPT7

Compact dual-antenna enclosure with SPAN GNSS+INS technology from Hexagon | NovAtel delivers 3D position, velocity and attitude



Benefits

- High-performance SPAN GNSS+INS solution
- Small, low-power, all-in-one GNSS+INS enclosure
- Easy integration into space and weight constrained applications
- Commercially exportable system
- Rugged design ideal for challenging environments
- Enhanced connection options including serial, USB, CAN, and Ethernet
- Future-proof for upcoming GNSS signal support

Features

- MEMS gyros and accelerometers
- Small size, rugged, and lightweight
- Dedicated wheel sensor input
- TerraStar Correction Services supported over multi-channel L-Band and IP connections
- SPAN GNSS+INS capability with configurable application profiles
- Spoofing detection, interference detection, and mitigation provided by GNSS Resilience and Integrity Technology (GRIT)
- Supports Precision Time Protocol (PTP) and generalised Precision Time Protocol (gPTP)
- Dual-antenna ALIGN heading
- 16 GB of internal storage
- Four receiver status LEDs

World-leading GNSS+INS technology

SPAN GNSS+INS technology brings together two different but complementary technologies: Global Navigation Satellite System (GNSS) positioning and Inertial Navigation System (INS). The absolute accuracy of GNSS positioning with the stability of inertial measurement unit (IMU) gyro and accelerometer measurements generate a 3D navigation solution that is stable and continuously available. Deeply coupling the GNSS and inertial measurements through SPAN technology enables better bridging through GNSS interruptions and rapid reacquisition of signals.

CPT7 overview

The CPT7 is a compact, single enclosure GNSS+INS receiver powered by world-class OEM7 technology from NovAtel. 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 CPT7 contains a high performing and highly reliable Honeywell HG4930 Micro Electromechanical System (MEMS) IMU to deliver leading-edge SPAN technology from NovAtel 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 CPT7 is a small, lightweight, and low-power solution with multiple communication interfaces for easy integration on multiple platforms.

High-performance IMU and GNSS heading

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

Improve CPT7 accuracy

CPT7 provides 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 the real-time SPAN GNSS+INS solution to provide the system's highest level of accuracy.

SPAN system performance[1]

Signal tracking[2, 3]

GPS	L1 C/A, L1C, L2C, L2P, L5
GLONASS[4]	L1 C/A, L2 C/A, L2P, L3, L5
Galileo[5]	E1, E5 AltBOC, E5a, E5b
BeiDou	B1I, B1C, B2I, B2a, B2b
QZSS	L1 C/A, L1 C/B, L1C, L1S, L2C, L5
NavIC (IRNSS)	L5
SBAS	L1, L5
L-Band	up to 5 channels

Horizontal position accuracy (RMS)

Single point L1/L2	1.2 m
SBAS[6]	60 cm
TerraStar-L[7]	40 cm
TerraStar-C PRO[7]	2.5 cm
RTK	1 cm + 1 ppm

ALIGN heading accuracy

Baseline	Accuracy (RMS)
2 m	0.08 deg
4 m	0.05 deg

Heave performance

Instantaneous	5 cm or 5%
Delayed	3.5 cm or 3.5%
Post-processed (Inertial Explorer)	2.5 cm or 2.5%

Maximum data rate

GNSS measurements	up to 20 Hz
GNSS position	up to 20 Hz
INS solution	up to 200 Hz
IMU raw data rate	100 Hz or 400 Hz

Time to first fix[8]

Cold start	< 34 s (typ)
Hot start	< 20 s (typ)

Signal reacquisition

L1	< 0.5 s (typ)
L2/L5	< 1.0 s (typ)

Time accuracy[9] < 5 ns RMS

Velocity accuracy < 0.03 m/s RMS

Velocity limit[10] 600 m/s

IMU performance[11]

Gyroscope performance

Technology	MEMS
Dynamic range[12]	400 °/s
Bias instability	0.45 °/hr
Angular random walk	0.06 °/√hr

Accelerometer performance

Technology	MEMS
Dynamic range	20 g
Bias instability	0.075 mg
Velocity random walk	0.06 m/s/√hr

Environmental

Temperature

Operating	-40°C to +71°C
Storage	-40°C to +85°C

Humidity 95% non-condensing

Submersion 2 m for 12 hours (IEC 60529 IP68)

Water MIL-STD-810H, Method 512.6

Dust MIL-STD-810H, Method 510.7

Vibration (operating)

Random	MIL-STD-810H, Method 514.8, Category 24, 7.7 g RMS
Sinusoidal	IEC 60068-2-6

Acceleration (operating) MIL-STD-810H, Method 513.8,Procedure II (G Loading - 15 g)

Bump (operating) IEC 60068-2-27 Ea (25 g)

Shock (operating) MIL-STD-810H, Method 516.8, Procedure 1, 40 g, 11 ms terminal sawtooth

Physical and electrical

Dimensions[13] 90 x 60 x 60 mm

Weight 500 g

Power

Power consumption[14]	9 W (typ)
Input voltage	+9 to +32 VDC

Antenna LNA power output

Output voltage	5 VDC ±5%
Maximum current	200 mA

Input/Output connectors

Antennas	2 x SMA
Power and I/O	2 x Fischer Core 16 pin DPBU 104 A086 140G/240G

Communication ports

1 RS-422	up to 460,800 bps
1 RS-232	up to 460,800 bps
1 USB device	HS
1 Ethernet	10/100 Mbps
1 CAN Bus	1 Mbps
3 Event input	
3 Event output	
1 Wheel sensor input	

Status LEDs

Power, Position, INS, Logging

Compliance

FCC, ISED, CE and Global Type Approvals[15]

Optional accessories

- Power and I/O cable
- Mounting plate

Performance during GNSS outages[16, 17, 18]

Outage duration	Positioning mode	Position accuracy (m) RMS		Velocity accuracy (m/s) RMS		Attitude accuracy (degrees) RMS	
		Horizontal	Vertical	Horizontal	Vertical	Roll/Pitch	Heading
0 s	RTK[19]	0.02	0.03	0.015	0.010	0.010	0.030
	TerraStar-C PRO PPP	0.025	0.05				
	Single point	1.00	0.60				
10 s	RTK[19]	0.12	0.08	0.035	0.020	0.018	0.040
	TerraStar-C PRO PPP	0.12	0.10				
	Single point	1.10	0.65				
60 s	RTK[19]	3.80	0.73	0.165	0.030	0.030	0.055
	TerraStar-C PRO PPP	3.80	0.75				
	Single point	4.80	1.30				
	RTK with Land profile and DMI	2.50	0.55	0.115	0.030	0.030	0.055
0 s	Post-Processed using Inertial Explorer	0.01	0.02	0.015	0.010	0.003	0.010
10 s		0.01	0.02	0.015	0.010	0.003	0.010
60 s		0.11	0.05	0.017	0.010	0.004	0.014

1. *Typical values under ideal, open sky conditions.*
2. *Signal availability based on model configuration. See manual for details.*
3. *The secondary antenna input does not support L-Band or SBAS signals.*
4. *Hardware ready for L5.*
5. *E1bc support only.*
6. *GPS-only.*
7. *Requires subscription to TerraStar correction service.*
8. *Cold start: no almanac or ephemerides and no approximate position or time.*
   Hot start: almanac and recent ephemerides saved and approximate position and time entered.
9. *Time accuracy does not include biases due to RF or antenna delay.*
10. *Export licensing restricts operation to a maximum of 600 m/s, message output impacted above 585 m/s.*
11. *Supplied by IMU manufacturer.*
12. *Full performance to 325 °/s.*
13. *Dimensions do not include mounting feet.*
14. *Typical values using serial port communication without interference mitigation. See manual for power supply considerations.*
15. *Pending.*
16. *Performance may be impacted in conditions with unmitigated vibration or significant temperature variations. May vary from part to part.*
17. *Performance with one antenna, no DMI, and no SPAN profile unless otherwise specified.*
18. *Typical. Based on mixed urban road vehicle dynamics and benign GNSS conditions.*
19. *1 ppm should be added to all position values to account for additional error due to baseline length.*

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