

Enclosures PwrPak7-E1™



COMPACT OEM7® ENCLOSURE DELIVERS NOVATEL'S LEADING SPAN® GNSS+INS TECHNOLOGY



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 ENABLED MEMS RECEIVER

The PwrPak7-E1 contains an Epson G320N MEMS IMU to deliver world class NovAtel SPAN technology in an integrated, single box solution. This product is commercially exportable and provides an excellent price/performance/size GNSS+INS solution.

FUTURE PROOFED SCALABILITY

Capable of tracking all present and upcoming GNSS constellations and satellite signals, the PwrPak7-E1 is a robust, high precision receiver that is software upgradable in the field to provide the custom performance required for your application demands.

The PwrPak7-E1 has a powerful OEM7 GNSS engine, integrated MEMS IMU, built in Wi-Fi, on board NTRIP client and server support, and 16 GB of internal storage. It also has enhanced connection options including serial, USB, CAN and Ethernet.

PRECISE THINKING MAKES IT POSSIBLE

Developed for efficient and rapid integration, our GNSS products have set the standard in quality and performance for over 20 years. State-of-the-art, lean manufacturing facilities in our North American headquarters produce the industry's most extensive line of OEM receivers, antennas and subsystems. All of our products are backed by a team of highly skilled design and customer support engineers, ready to answer your integration questions.

FEATURES

- + SPAN enabled enclosure featuring NovAtel's tightly coupled GNSS+INS engine
- + 555 channel, all-constellation, multi-frequency positioning solution
- + Multi-channel L-Band supports TerraStar correction services
- + Commercially exportable IMU
- + Multiple communication interfaces for easy integration and installation
- + Built-in Wi-Fi support
- + 16 GB of internal storage
- + Can be paired with an external receiver to support ALIGN® GNSS azimuth aiding for low dynamic applications

If you require more information about our enclosures, visit www.novatel.com/products/gnss-receivers/enclosures/

PwrPak7-E1™



PERFORMANCE¹

Channel Configuration

555 Channels

Signal Tracking

GPS L1 C/A, L1C, L2C, L2P, L5

GLONASS² L1 C/A, L2C, L2P,

L3, L5

Galileo³ E1, E5 AltBOC

E5a, E5b, E6

BeiDou⁴ B1I, B1C, B2I, B2a, B3I

QZSS L1 C/A, L1C, L2C, L5, L6

NavIC (IRNSS) L5

SBAS L1, L5

L-Band up to 5 channels

GNSS Horizontal Position

Accuracy (RMS)

Single point L1 1.5 m

Single point L1/L2 1.2 m

SBAS⁵ 60 cm

DGPS 40 cm

TerraStar-L⁶ 40 cm

TerraStar-C PRO⁶ 4 cm

RTK 1 cm + 1 ppm

Initialization time <10 s

Initialization reliability >99.9%

Maximum Data Rate

GNSS Measurements up to 20 Hz

GNSS Position up to 20 Hz

INS Position/Attitude up to 200 Hz

IMU Raw Data Rate 125 Hz

Time to First Fix

Cold start^{7, 16} <40 s

Hot start^{8, 16} <19 s

Time Accuracy⁹ 20 ns RMS

Velocity Limit¹⁰ 515 m/s

IMU PERFORMANCE¹¹

Gyroscope Performance

Input range ±150 deg/s

Rate bias stability 3.5 deg/hr

Angular random walk

0.1 deg/√hr

Accelerometer Performance

Range ±5 g

Bias stability 0.1 mg

Velocity random walk

0.5 m/s/√hr

COMMUNICATION PORTS

1 RS-232 up to 460,800 bps

2 RS-232/RS-422 selectable

up to 460,800 bps

1 USB 2.0 (device) HS

1 USB 2.0 (host) HS

1 Ethernet 10/100 Mbps

1 CAN Bus 1 Mbps

3 Event inputs

3 Event outputs

1 Pulse Per Second output

1 Quadrature Wheel Sensor

input

PHYSICAL AND ELECTRICAL

Dimensions 147 x 125 x 55 mm

Weight 510 g

Power

Input voltage +9 to +36 VDC

Power consumption¹² 1.8 W

Antenna LNA Power Output

Output voltage 5 VDC ±5%

Maximum current 200 mA

Connectors

Antenna TNC

USB device Micro A/B

USB host Micro A/B

Serial, CAN, Event I/O

DSUB HD26

Ethernet RJ45

Data Logging Push button

Power SAL M12, 5 pin, male

Status LEDs

Power

GNSS

INS

Data Logging

USB

ENVIRONMENTAL

Temperature

Operating -40°C to +75°C

Storage -40°C to +85°C

Humidity 95% non-condensing

Waterproof IEC 60529 IPX7

Dust IEC 60529 IP6X

Vibration (operating)

Random MIL-STD-810 514.6

Category 24, 20g RMS

Sinusoidal IEC 60068-2-6

Acceleration (operating)

MIL-STD 810G, Method 513.6

Procedure II (16 g)

Bump IEC 60068-2-27 (25 g)

Shock (non-operating)¹³

MIL-STD-810G, 516.6,

Procedure 1,

40 g 11 ms terminal sawtooth

Compliance

Industry Canada,

FCC, CE, RoHS, WEEE

INCLUDED ACCESSORIES

- Power cable
- USB cable
- DSUB HD26 to DB9 RS-232 cable

OPTIONAL ACCESSORIES

- Full breakout cable for DSUB HD26 connector
- DSUB HD26 to M12 IMU cable
- RJ45 Ethernet cable
- VEXXIS® GNSS-500 and GNSS-800 series antennas
- ANT series antennas
- GrafNav/GravNet®
- Inertial Explorer®
- NovAtel Connect

For the most recent details of this product:

www.novatel.com/products/gnss-receivers/enclosures/pwrpak7-e1

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61-400-883-601

Version 3 Specifications subject to change without notice.

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PERFORMANCE DURING GNSS OUTAGES¹

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 ¹⁴	0.02	0.03	0.020	0.015	0.020	0.020	0.090
	SP	1.00	0.60	0.020	0.015	0.020	0.020	0.090
	PP ¹⁵	0.01	0.02	0.015	0.010	0.008	0.008	0.038
10 s	RTK ¹⁴	0.25	0.15	0.065	0.025	0.040	0.040	0.130
	SP	1.25	0.70	0.065	0.025	0.040	0.040	0.130
	PP ¹⁶	0.01	0.02	0.015	0.010	0.008	0.008	0.038

¹ Typical values. 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 sources.

² Hardware ready for L3 and L5.

³ E1bc and E6bc support only.

⁴ Designed for BeiDou Phase 2 and 3, B1, B2 and B3 compatibility.

⁵ GPS only.

⁶ Requires a subscription to a TerraStar data service. Subscriptions available from NovAtel.

⁷ Typical value. No almanac or ephemerides and no approximate position or time.

⁸ Typical value. 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 515 metres per second, message output impacted above 500 m/s.

¹¹ Supplied by IMU manufacturer.

¹² Typical value. Consult the OEM7 User Documentation for power supply considerations.

¹³ GNSS only. IMU measurements may not be valid.

¹⁴ 1 ppm should be added to all position values to account for additional error due to baseline length.

¹⁵ Post-processing results using Inertial Explorer software. The survey data used to generate these statistics is ground vehicle data collected with frequent changes in azimuth (i.e., as normally observed in ground vehicle environments).

¹⁶ Available in Q2 2019.

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 makes 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

GNSS-501



PERFORMANCE

Signal Received

GPS	L1
GLONASS	L1
Galileo	E1
BeiDou	B1
L-Band	

Pass Band (typical)

Upper passband	1569.0 ± 43.0 MHz
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Out-of-Band Rejection

Band edges ± 50 MHz	15 dB (typical)
Band edges ± 100 MHz	25 dB (typical)

LNA Gain	29 dB (typical)
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Gain at Zenith (90°)

L1/B1/E1/G1	+4.0 dBic minimum
L-Band	+4.0 dBic minimum

Gain Roll-Off (from Zenith to Horizon)

L1/B1/E1/G1	12 dB
L-Band	12 dB

Phase Center Stability	<5.0 mm
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Noise Figure	2.5 dB (typical)
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VSWR	≤2.0 : 1
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Group Delay Ripple	<15 ns
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Nominal Impedance	50 Ω
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PHYSICAL AND ELECTRICAL

Dimensions	155 mm D × 45 mm H
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Weight	450 g
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Connector	TNC female
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Mounting	2 × magnetic mounts 2 × M4 screw inserts
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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
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Salt Fog	MIL-STD-810G (CH1), 509.6
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Water/Dust Resistance	IP67, IP69K
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Vibration (operating)

Random	MIL-STD-810G (CH1), 514.7 (15 g) Annex E Procedure 1, Category 24
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Shock	MIL-STD-810G (CH1), 516.7 (40 g) Procedure 1
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Bump	IEC 68-2-27 Ea (25 g)
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Regulatory Compliance	FCC, CE
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RoHS	EU Directive 2011/65/EU
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For the most recent details of this product:
www.novatel.com/products/gnss-antennas/vexxis-series-antennas/gnss-500-series-antennas/

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VEXXIS™ Antennas GNSS-502



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

GNSS-502



PERFORMANCE

Signal Received

GPS	L1, L2
GLONASS	L1, L2
Galileo	E1, E5b
BeiDou	B1, B2
L-Band	

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 dBic minimum
L2/B2/E5b/G2	+4.0 dBic minimum
L-Band	+4.0 dBic 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

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

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