Enclosures PwrPak7D-E1™

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

DUAL ANTENNA INPUT

Multi-frequency, dual antenna input allows the PwrPak7D-E1 to harness the power of NovAtel CORRECT® with RTK and ALIGN functionality. This makes the PwrPak7D-E1 ideal for ground vehicle, marine or aircraft based systems, providing industry leading GNSS multi-constellation heading and position data in static and dynamic environments.

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 PwrPak7D-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 PwrPak7D-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 PwrPak7D-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.

PRECISE THINKING MAKES IT POSSIBLE

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.

FEATURES

+ SPAN enabled enclosure featuring NovAtel's tightly coupled GNSS+INS engine
+ Enhanced connection options including serial, USB, CAN and Ethernet
+ 555 channel, all-constellation, multi-frequency positioning solution
+ Multi-channel L-Band supports TerraStar correction services
+ Multiple communication interfaces for easy integration and installation
+ Built-in Wi-Fi support
+ 16 GB of internal storage
+ ALIGN® heading solution

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

PwrPak7D-E1™

PERFORMANCE[1]

Channel Configuration
555 Channels

Signal Tracking

Primary RF[2]

GPS	L1 C/A, L1C, L2C, L2P, L5
GLONASS[3]	L1 C/A, L2 C/A, L2P, L3, L5
Galileo	E1, E5 AltBOC, E5a, E5b
BeiDou[4]	B1I, B1C, B2I, B2a
QZSS	L1 C/A, L1C, L2C, L5
NavIC (IRNSS)	L5
SBAS	L1, L5
L-Band	up to 5 channels

Secondary RF[2]

GPS	L1 C/A, L1C, L2C, L2P, L5
GLONASS[3]	L1 C/A, L2 C/A, L2P, L3, L5
Galileo	E1, E5 AltBOC, E5a, E5b
BeiDou[4]	B1I, B1C, B2I, B2a
QZSS	L1 C/A, L1C, L2C, L5
NavIC (IRNSS)	L5

Horizontal Position Accuracy (RMS)

Single point L1	1.5 m
Single point L1/L2	1.2 m
SBAS[5]	60 cm
DGPS	40 cm
TerraStar-L[6]	40 cm
TerraStar-C PRO[6]	2.5 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, 8]	<40 s
Hot start[9, 8]	<19 s

Time Accuracy[10] 20 ns RMS

Velocity Limit[11] 515 m/s

IMU PERFORMANCE[12]

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 consumption[13]	1.8 W

2 Antenna LNA Power Outputs

Output voltage	5 VDC ±5%
Maximum current	200 mA

Connectors

2 Antenna	SMA
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 ISO 9022-31-06 (25g)

Shock (non-operating)
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/pwrpak7D-E1

novatel.com

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

China 0086-21-68882300

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SE Asia and Australia 61-400-883-601

PERFORMANCE DURING GNSS OUTAGES[1]

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[15]	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 Model-configurable to track L5/E5a (all / Galileo) through L2 (GPS) or L3/E5b/B2 (GLONASS / Galileo / BeiDou) through L2 (GLONASS). See manual for details.
3 Hardware ready for L3 and L5.
4 Designed for BeiDou Phase 2 and 3, B1 and B2 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 Available in Q2 2019.
9 Typical value. Almanac and recent ephemerides saved and approximate position and time entered.
10 Time accuracy does not include biases due to RF or antenna delay.
11 Export licensing restricts operation to a maximum of 515 metres per second, message output impacted above 500 m/s.
12 Supplied by IMU manufacturer.
13 Typical value. Consult the OEM7 User Documentation for power supply considerations.
14 1 ppm should be added to all position values to account for additional erro 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).

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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

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
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

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

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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SE Asia and Australia 61-400-883-601

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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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