



**HEXAGON**



## **OEM7500 Evaluation Kit Quick Start Guide**

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# OEM7500 Evaluation Kit Quick Start Guide

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## Proprietary Notice

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## Warnings and Restrictions

Federal Communications Commission (FCC) and Innovation, Science and Economic Development (ISED) Canada Notices:

This development kit is designed to allow:

- (1) Product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product.
- (2) Software developers to write software applications for use with the end product. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference.

This kit generates, uses, and can radiate energy and has been tested for compliance with the limits of digital devices pursuant to Part 15 of the FCC and ICES-003 rules which are designed to provide reasonable protection against radio frequency interference.

## EU Declaration of Conformity

Hereby, NovAtel Inc. declares that the OEM7500 Evaluation Kit is in compliance with Radio Equipment Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: [www.novatel.com/products/compliance](http://www.novatel.com/products/compliance).

# Chapter 1 OEM7500 Evaluation Kit

The OEM7500 Evaluation Kit is a test platform for the evaluation of the OEM7500 GNSS module. The Evaluation Kit provides 2 serial ports, a USB port and a CAN interface.

The OEM7500 Evaluation Kit is integrated with an InvenSense IAM-20680 IMU (default) and a Bosch SMI130 IMU. Optionally, an Epson G320N IMU can be installed. For information about using the Bosch or Epson IMU, refer to the *OEM7500 Evaluation Kit IMU Selection Guide*.



**For evaluation only in laboratory/development environments.** The OEM7500 Evaluation Kit is not intended for consumer use. It is intended solely for preliminary evaluation in laboratory or development environments by technically qualified experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. The OEM7500 Evaluation Kit should not be used as all or part of a finished end product.

## 1.1 OEM7500 User Documentation

For information about the OEM7500, OEM7500 Evaluation Kit, OEM7 logs and commands and OEM7 receiver functionality, consult NovAtel's OEM7 User Documentation portal: [docs.novatel.com/OEM7](https://docs.novatel.com/OEM7)

Contact NovAtel Customer Service to obtain the OEM7500 Evaluation Kit schematics.

## 1.2 Box Contents

- OEM7500 Enclosure Evaluation Assembly (01019998)
- Power Adapter 120/240 VAC to 12 V @ 2.5 A LEMO plug (01018888)
- Cable Assembly USB A to Mini B (60323078)
- AC Input Adapter Clips (21023010)
- 6 ft Null DB9 female/female cable (01017658)
- I/O Cable DB15HD Female Single End (01018651)

## 1.3 Customer Support

For any questions or comments regarding the OEM7500 Evaluation Kit, log a support request with NovAtel Customer Support using one of the following methods:

### Log a Case and Search Knowledge:

Website: [novatel.com/support](https://novatel.com/support)

### Log a Case, Search Knowledge and View Your Case History: (login access required)

Web Portal: <https://novatelsupport.force.com/community/login>

### E-mail:

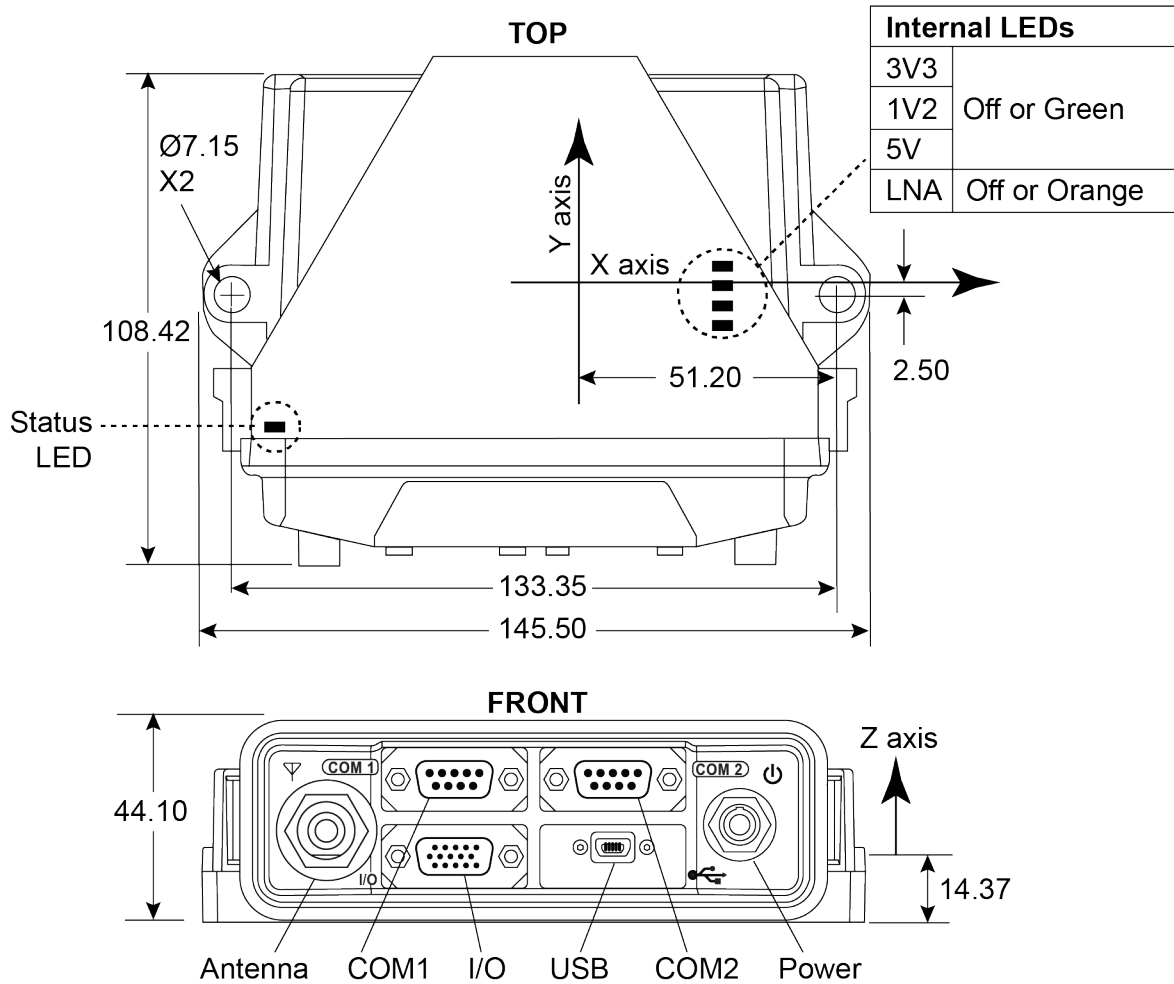
[support.novatel@hexagon.com](mailto:support.novatel@hexagon.com)

### Telephone:

U.S. and Canada: 1-800-NOVATEL (1-800-668-2835)  
International: +1-403-295-4900






## 1.4 Dimensions, LEDs and Connectors

Figure 1: Connectors, LEDs, Dimensions and InvenSense IMU Center of Navigation



### 1.4.1 LEDs and Connectors

Icon	Name	LED Status Description	Connector Description
▽	Antenna	Solid Green – Position valid Flashing Green/Amber – Position valid and pulse per second Solid Red - Board error Flashing Red – Position not valid, pulse per second is free running and not locked to GPS time.	Antenna input connector, 50 $\Omega$ nominal impedance The OEM7500 Evaluation Kit provides +5 VDC ( $\pm 5\%$ , 100 mA max) to a connected antenna/LNA Connector type: TNC female jack

Icon	Name	LED Status Description	Connector Description
	Power	Solid Red - Power on Solid Amber - Measurement Engine ready	Valid input voltage range is +6 to +32 VDC Connector type: 4 pin Lemo
	COM1	Flashing Green - Transmitting data Flashing Red - Receiving data	RS-232 serial communication port (maximum baud rate 460800) Connector type: DB9
	COM2	Flashing Green - Transmitting data Flashing Red - Receiving data	RS-232 serial communication port (maximum baud rate 460800) Connector type: DB9
	I/O	N/A	Input and output port for additional signals: CAN, EVENT_OUT, PPS, ME_RDY, PV Connector type: DB-HD15
	USB	N/A	USB communication port (USB Device) Supports USB 2.0 Full Speed (12 Mbps) Connector type: USB mini-AB
	Status LED	Flashing Green = normal operation Flashing Red/Yellow = error Refer to the OEM7 User Documentation portal ( <a href="https://docs.novatel.com/OEM7">docs.novatel.com/OEM7</a> ) for error status definitions.	N/A

## 1.4.2 OEM7500 Evaluation Kit Ports

Table 1: COM1 and COM2 Ports Pinouts

Pin	Pin Name	Notes
1	NC	No connection
2	RX	RS-232 level input
3	TX	RS-232 level output
4	NC	No connection
5	GND	Signal ground
6	NC	No connection
7	NC	No connection
8	NC	No connection
9	NC	No connection

Table 2: I/O Port Pinouts

Pin	Pin Name	Input/Output	Notes	Cable Color
1	NC			
2	NC			
3	CAN+	Input/Output		N/A
4	NC			
5	GND		Digital ground	White/Grey
6	NC			
7	NC			
8	CAN-	Input/Output		N/A
9	NC			
10	NC			
11	NC			
12	EVENT_OUT	Output	CMOS 3.3 V logic level output Variable frequency output	Black
13	ME_READY	Output	CMOS 3.3 V logic level output Indicates the Measurement Engine is ready when high	Violet
14	PV (Position Valid)	Output	CMOS 3.3 V logic level output Indicates a valid position is available when high	Yellow
15	PPS	Output	CMOS 3.3 V logic level output Pulse per second output	Brown
Shell	Signal Ground		Signal ground	Drain

The I/O lines can be accessed using the DB-HD15 I/O port cable (01018651). The other end of this cable is wire leads.

## 1.5 Mounting

Choose an antenna location with a clear view of the sky so each satellite above the horizon can be tracked without obstruction and mount the OEM7500 Evaluation Kit and antenna securely. Align the Y-axis of the OEM7500 Evaluation Kit with the forward axis (direction of travel) of the vehicle.



When using the InvenSense or Bosch IMU, mount the OEM7500 Evaluation Kit with the front panel facing the back of the vehicle, in the upright position.  
When using the optional Epson IMU, mount the OEM7500 Evaluation Kit with the front panel facing the front of the vehicle, in the upright position.



Once IMU translation has been set, the antenna and OEM7500 Evaluation Kit cannot move relative to each other. The distance and relative direction between them must be fixed.

## 1.6 Communicate with the OEM7500 Evaluation Kit

Communication is established with the OEM7500 Evaluation Kit using a data terminal or computer connected to a serial or USB port on the OEM7500 Evaluation Kit. When connected, enter commands from the terminal, terminal emulation application or Terminal window in NovAtel Application Suite.

NovAtel Application Suite is set of computer based applications that simplify the configuration and monitoring of NovAtel receivers. The configuration windows within NovAtel Application Suite can be used to configure the OEM7500 Evaluation Kit. For information about installing and using NovAtel Application Suite, refer to the online documentation ([docs.novatel.com/Tools](https://docs.novatel.com/Tools)).

## 1.7 SPAN

SPAN functionality provides reliable, continuously available, position, velocity and attitude even through short periods of time when satellite signals are blocked or unavailable.

For detailed SPAN instructions, including commands and logs, go to NovAtel's OEM7 User Documentation portal: [docs.novatel.com/OEM7](https://docs.novatel.com/OEM7).

**Table 3: SPAN Commands**

Commands	Description
CONNECTIMU	Use to specify the IMU type connected to the receiver and the receiver port used by the IMU
SETINSPROFILE	Use to set specific filter behavior depending on the environment
SETINSTRLANSATION	Use to specify translational offsets between the IMU center of navigation and other devices
SETINSROTATION	Use to specify rotational offsets between the IMU frame and other frames

**Table 4: SPAN Logs**

Logs	Parameter
INSPOS, INSPOSS, INSPOSX	Position
INSVEL, INSVELS, INSVELX, INSSPD, INSSPDS	Velocity
INSATT, INSATTQS, INSATTS, INSATTX	Attitude
INSSTDEV, INSSTDEVS	Solution standard deviation
INSPVA, INSPVAS, INSPVAX	Position, velocity and attitude

'S' at the end of a log indicates the log has a short header, useful for saving logging bandwidth.

'X' at the end of a log indicates the log is an extended log which contains additional information. 'X' logs should be logged at 20 Hz or less.

### 1.7.1 SPAN Setup – InvenSense IAM-20680

To enable SPAN functionality for the InvenSense IAM-20680, issue the following commands:

1. `SETIMUEVENT IN EVENT1`
2. `CONNECTIMU SPI INVENSENSE_IAM20680`
3. `SETINSPROFILE LAND`
4. `SETINSTRLANSATION ANT1 X Y Z [XSD] [YSD] [ZSD]`

The values for X, Y and Z are the distances in metres along the X-axis, Y-axis and Z-axis, in the IMU Body frame, from the IMU center of navigation to the phase center of the primary antenna. The values for XSD, YSD and ZSD are the standard deviation values for the distances.



Large standard deviations can lead to an inaccurate position solution. Therefore, it is highly recommended to measure the translation offsets as accurately as possible and to enter translation offset standard deviations that reflect that accuracy.

#### 5. SETINSROTATION RBV X Y Z [XSD] [YSD] [ZSD]

The values for X, Y and Z are the rotations from the IMU body frame (indicated in *Figure 1: Connectors, LEDs, Dimensions and InvenSense IMU Center of Navigation* on page 4) to the vehicle frame. The order of rotations is Z, X, Y. All rotations are right handed. The values for XSD, YSD and ZSD are the standard deviation values for the rotations.



After completing the SPAN setup, an alignment of the SPAN system must be performed. Refer to System Start-Up and Alignment Techniques in the OEM7 User Documentation portal for details on System Alignment. A coarse alignment cannot be used with the OEM7500 Evaluation Kit IMUs.



For information about using the Bosch or Epson IMU, refer to the *OEM7500 Evaluation Kit IMU Selection Guide*.

## 1.8 Enabling PPP

The OEM7500 Evaluation Kit is equipped with the capability to receive NovAtel's TerraStar-C PRO PPP corrections on the L-Band signal path. To enable PPP positioning using TerraStar corrections, send the following command: **ASSIGNLBANDBEAM AUTO**. The receiver automatically begins scanning for the strongest TerraStar Correction Service satellite signal. Contact your NovAtel Sales representative or NovAtel Customer Support to obtain a subscription for TerraStar corrections.

Use the **TERRASTARINFO** log to obtain details about the TerraStar subscription.

### 1.8.1 Monitoring L-Band Tracking

To monitor tracking status send the following command: **LOG LBANDTRACKSTAT ONTIME 1**. A value of 00c2 in the Status field indicates lock has been obtained to one of the satellites. In the following example, the log indicates the receiver has obtained lock on satellite 98W.

```
#LBANDTRACKSTAT, COM2, 0, 82.5, FINESTEERING, 2054, 406100.000, 02004000, 29e3, 15526;
1,
"98W", 1545865000, 1200, 974c, 00c2, 0, -141.268, 40.765, 3.2063, 7333.552, 139648,
0, 0, 17874944, 34, 0.0000,
```

### 1.8.2 Solution Convergence

The solution is converged when the **BESTPOS** log or **PPPPOS** log reports a solution type of PPP and the X and Y standard deviations are less than 10 cm. It can take a few minutes to achieve full convergence. During this time, the receiver needs to maintain lock with the L-Band satellite. This does not mean it must be static but potential obstructions causing loss of lock will result in the need to restart convergence.