

Ellipse AHRS & INS

High Performance, Miniature Inertial Sensors

OEM Integration Manual



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1. Introduction

This documentation aims to merge all information, specifications and recommendations that are specific to Ellipse Devices OEM integration.

This documentation has to be considered as a complement to the Ellipse User Manual which includes most installation and operating guidelines.

OEM devices are more sensitive to their direct environment than box devices. That's why, in addition to the User Manual, OEM integrator is advised to carefully follow the next instructions.

2. OEM Guidelines

2.1. Mechanical mounting

During calibration, SBG Systems takes care to avoid stressing the Ellipse sensor PCB as it could affect sensor performance.

The Ellipse OEM enclosure is significantly lighter than the standard box enclosure. As it is made of plastic, it's possible to bend the enclosure if it is not properly mounted. Care should be taken to avoid such bending by installing the sensor on a flat surface

2.1.1. Device coordinate frame

The following pictures shows how the sensor coordinate frame is oriented with respect to the module:



Figure 2.1: Ellipse L coordinate frame

2.2. Recommended accessories

The following accessories are recommended to connect and mount and connect the Ellipse device on your system.

| Ordering reference | Item | Comments |
|----------------------------|--|---|
| DK-ELI-L | Ellipse development Kit | Includes a USB cable and software development suite. |
| CA-ELI-L-KIT10-0.2M | Ellipse OEM cable kit <ul style="list-style-type: none">• 1 housing• 10 pre-crimped black AWG28 wires) (JAE/Wire Ended)• 0.2m long | |
| ANT-TAL-TW-33-2710-03-3000 | GPS + GLONASS + BEIDOU + GALILEO L1 Antenna with 3M cable, MMCX connector, no magnet | Check ellipse User manual for antenna specifications. This product shares the same specs as ANT-TAL-TW-33-2710-00-3000. |
| - | M2 Screw – 20 mm long | Brass or A4 stainless steel |

2.3. Vibrations considerations

Standard box devices don't include any mechanical anti-vibration system so both boxed and OEM devices have roughly the same requirements.

However, the OEM version is lighter than the boxed device. Most of the time, it's more difficult to efficiently isolate a lightweight part from vibrations than a heavier system.


If it's too hard to isolate the Ellipse sensor alone from vibrations, then it's probably much easier to fix rigidly the IMU to its host system, and then isolate the whole system from vibrations.

Sensors embedded in the Ellipse series are sampled at a very high rate (10kHz), and are able to filter out a lot of vibrations. However, the sensors themselves suffer from an error called VRE (Vibration Rectification Error). This error comes from the sensor intrinsic asymmetry and cannot be compensated for.

It is therefore really important to isolate the sensor from vibrations as much as possible because large vibrations can compromise overall accuracy. Very large vibration levels can lead to the sensor instability due to large sensors errors.

3. OEM Specifications

3.1. Mechanical specifications

All dimensions are in mm. The center of measurement for acceleration, velocity and position is represented on the mechanical outlines by the  symbol. It is referenced to the base plate.

Mechanical Specifications

| | |
|--------|--|
| Size | 33.5 x 34 x 13 mm |
| Weight | A: 15 g / 0.035 lb N: 16 g / 0.035 lb E: 16 g / 0.035 lb |

3.1.1. Front view

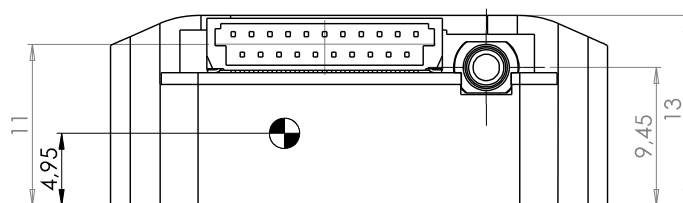


Figure 3.1: Ellipse OEM front view

3.1.2. Top view

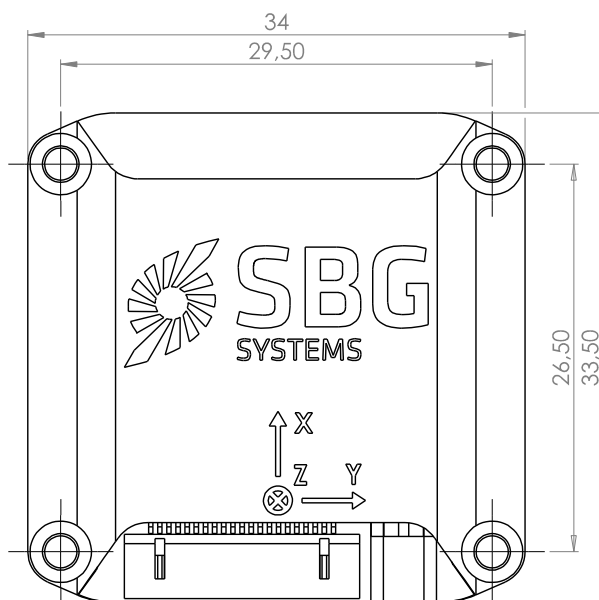


Figure 3.2: Ellipse OEM top view

3.1.3. Bottom view

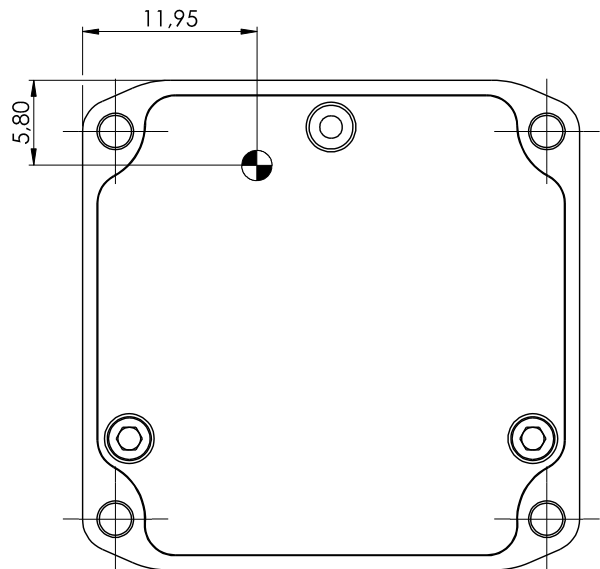


Figure 3.3: Ellipse OEM bottom view

3.2. Electrical specifications

Ellipse L1 and L2 share the same 21 ways board to wire connector, which is a JAE FI-W21P-HFE-E1500. It mates with a FI-W21S plug, which uses FI-C3-A1-15000 contacts.

The connector pin numbering is as follows. Pins 1, 2, 20 and 21 are also marked on the plug.

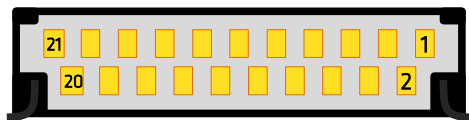


Figure 3.4: FI-W21P-HFE-E1500 pin numbering (front view)

3.2.1. L1 versions (TTL)

The Ellipse L1 versions share most of the boxed versions electrical characteristics. However, due to the TTL interfaces, the following specification apply on serial ports:

| Item | Conditions | Min | Typical | Max | Unit |
|-----------------------|------------|------|---------|-----|------|
| TTL inputs (Rx pins) | | | | | |
| Input range | | -0.3 | 3.3 | 3.6 | V |
| Low level threshold | | TBD | | | V |
| High level threshold | | | | TBD | V |
| TTL outputs (Tx pins) | | | | | |
| Low level output | | | | TBD | V |
| High level output | | TBD | | | V |

3.2.1.1. Connector Pinout

| Pin # | Name | Description |
|-------|-------------------------------|---|
| 1 | GND | Ground return |
| 2 | VIN | Power supply input |
| 3 | VDDL | 3.3 regulated power supply output. May be used for voltage translation if required. |
| 4 | PORT A TTL/RS232 | PORT A type selection. Tie to VDDL to enable RS-232 communication on PORT A. Leave unconnected for TTL communications |
| 5 | PORT E Tx TTL | Port E Tx line |
| 6 | PORT A Tx RS232 | Port A RS-232 Tx – Not used in TTL mode |
| 7 | PORT A Rx RS232 | Port A RS-232 Rx – Not used in TTL mode |
| 8 | PORT E Rx TTL | Port E Rx line |
| 9 | PORT A Tx TTL | PORT A Tx in TTL mode – Not used in RS-232 mode |
| 10 | PORT C TTL TX | Port C Tx line |
| 11 | PORT C TTL RX | Port C Rx line |
| 12 | PORT A RX TTL | PORT A Rx in TTL mode – Not used in RS-232 mode |
| 13 | PORT D TTL Rx | TTL input for miscellaneous applications |
| 14 | SYNC IN A / ODO B | Multi function input. Event or odometer direction input |
| 15 | SYNC IN B / ODO A / PORT B Rx | Multi function input. Event, odometer pulse, or RS-232 Rx for aiding. |
| 16 | SYNC IN C | May be used as clock/event input |
| 17 | SYNC IN D | May be used as clock/event input |
| 18 | SYNC OUT A | Synchronization output signal. |
| 19 | SYNC OUT B | Synchronization output signal. |
| 20 | CAN L | Can Low signal |
| 21 | CAN H | Can High signal |

3.2.2. L2 versions (RS-232 / RS-422 + CAN)

The L2 models share the same electrical specifications as boxed versions B1 and B2. See Ellipse User Manual for more information about L2 electrical specifications.

3.2.2.1. Connector Pin out

| Pin # | Name | Description |
|-------|------------------------------------|---|
| 1 | GND | Ground return |
| 2 | VIN | Power supply input |
| 3 | NC | Leave unconnected. |
| 4 | PORT A RS232/RS422 | Port A RS-232 or RS-422 selector. Tie to GND to select RS-422 |
| 5 | PORT A RS422 Tx+ / PORT E Tx | Port A RS-422 Tx+ or Port E Tx if Port A is in RS-232 mode. |
| 6 | PORT A RS232 Tx – PORT A RS422 Tx- | Port A RS-422 Tx- or RS-232 Tx line |
| 7 | PORT A RS232 Rx – PORT A RS422 Rx+ | Port A RS-422 Rx+ or RS-232 Rx line |
| 8 | PORT A RS422 Rx- / PORT E Rx | Port A RS-422 Rx- or Port E Rx if Port A is in RS-232 mode. |
| 9 | PORT C RS422 Tx+ | Port C RS-422 Tx+. Not used in RS-232 connection. |
| 10 | PORT C RS232 Tx- PORT C RS422 Tx- | Port C RS-422 Tx- or RS-232 Tx line |
| 11 | PORT C RS232 Rx – PORT C RS422 Rx+ | Port C RS-422 Rx+ or RS-232 Rx line |
| 12 | PORT C RS422 Rx- | Port C RS-422 Rx-. Not used in RS-232 connection. |
| 13 | PORT D Rx | RS-232 input for miscellaneous applications |
| 14 | SYNC IN A / ODO B | Multi function input. Event or odometer direction input |
| 15 | SYNC IN B / ODO A / PORT B Rx | Multi function input. Event, odometer pulse, or RS-232 Rx for aiding. |
| 16 | SYNC IN C | May be used as clock/event input |
| 17 | SYNC IN D | May be used as clock/event input |
| 18 | SYNC OUT A | Synchronization output signal. |
| 19 | SYNC OUT B | Synchronization output signal. |
| 20 | CAN L | Can Low signal |
| 21 | CAN H | Can High signal |

3.2.3. GPS connector (Ellipse N models)

GPS connector in OEM version is a MMCX connector. The active antenna can be directly plugged into this MMCX connector, or can be connected to a SMA to MMCX cable.



Figure 3.5: MMCX connector

3.3. Support

Our goal is to provide the best experience to our customers. If you have any question, comment or problem with the use of your product, we would be glad to help you, so feel free to contact us:

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3.4. Warranty, liability and return procedure

SBG Systems provides a warranty covering this product against any defect in materials or manufacture for a period of two (2) years from the date of shipment. In the event that such a defect becomes obvious during the stipulated warranty period, SBG Systems will undertake, at its sole discretion, either to repair the defective product, bearing the cost of all parts and labor, or to replace it with an identical product.

In order to avail itself of this warranty, Customer must notify SBG Systems of the defect before expiry of the warranty period and take all steps necessary to enable SBG Systems to proceed. Upon reception of required information (Sensor serial number, defect description), SBG Systems will issue an RMA and will provide return instructions. Customer shall be responsible for the packaging and the shipment of the defective product to the repair center notified by SBG Systems, the cost of such shipment being borne by Customer.

This warranty shall not be construed as covering defects, malfunctions or damages caused by improper use or inadequate maintenance of the product. Under no circumstances shall SBG Systems be due to provide repair or replacement under this warranty in order a) to repair damage caused by work done by any person not representing SBG Systems for the installation, repair or maintenance of the product; b) to repair damage caused by improper use or connection to incompatible equipment, and specifically, the opening of the housing of the equipment under warranty shall cause the warranty to be automatically canceled.

This warranty covers the product hereunder and is provided by SBG Systems in place of all and any other warranty whether expressed or implied. SBG Systems does not guarantee the suitability of the product under warranty for sale or any specific use.

SBG Systems' liability is limited to the repair or replacement of defective products, this being the sole remedy open to Customer in the event the warranty becomes applicable. SBG Systems cannot be held liable for indirect, special, subsequent or consequential damage, irrespective of whether SBG Systems has or has not received prior notification of the risk of occurrence of such damage.