

HONEYWELL COMPACT INERTIAL NAVIGATION SYSTEM

The Honeywell compact inertial navigation system (HCINS) for UAVs is a low size, weight and power (SWaP) inertial navigation system that is suitable for all types of UAVs. It enables safe navigation for UAVs during intermittent GNSS disruptions.



Proven – Robust – Accurate

The HCINS is meant to bring avionics heritage into UAS operations, where safety, reliability, and efficiency are the main imperatives. It features GNSS heading, RTK, closed-loop integration with Pixhawk 2.1 and new, unique navigation aiding extensions. Moreover, Honeywell's embedded expertise ensures robustness together with supreme reliability.

The HCINS is designed with both expandability and ease of integration in mind and makes connection with Pixhawk 2.1 or additional aiding sources a seamless experience.

KEY CHARACTERISTICS

Supply Voltage	+4.5 – 5.5VDC (2A)
Power Consumption	3W nominal 5W with LTE connectivity
Weight	115 grams (excluding damping platform) +22 grams (damping platform)
Volume/Size	162cm ³ / 96mm x 60mm x 28mm (excluding damping platform) 100mm x 67 mm x 13mm (damping platform)
Operating Temperature Range	-40 to + 85°C
GNSS Capability	RTK, GNSS Heading (with dual antenna)
GNSS Constellations	GPS L1C/A, L2C; GLONASS L1OF, L2OF; Galileo E1B/C E5b; BeiDou B1I B2I; QZSS L1C/A L1S L2C; SBAS L1C/A
LTE Connectivity	Global Multi-Band LTE-FDD/LTE-TDD/HSPA+
Internal Data Storage	Removable micro SD card up to 32GB
External LED Status Support	Data Logging, Navigation (Init, Nav, Nav GNSS RTK)

PERFORMANCE COMPARISON BY PRODUCT

Parameter	Pixhawk 2.1	HCINS	HCINS RTK
Position Error [m]	2.5	2.5	0.03/0.015
Velocity Error [m/s]	0.11	0.04	0.02
Attitude [deg]	0.2	0.04	0.025
Heading [deg]	2.5	0.28	0.15
Drift* after 10s [m], GNSS outage with no aiding	8.0	0.9	0.35
Drift* after 30s [m], GNSS outage with no aiding	250	5.0	2.6
Drift* after 60s [m], GNSS outage with no aiding	900	22.0	13.0

* Horizontal position drift

KEY HONEYWELL ADVANTAGES

- Tactical-grade redundant inertial sensors
- Position solution with cm-level accuracy (RTK mode)
- Immune to intermittent GNSS outages (<1min)
- Guaranteed functionality with Pixhawk 2.1 Cube (ArduCopter) product line
- Integrated into ArduPilot Mission Planner GUI
- Honeywell Navigation Health Monitor
- GNSS Heading (from 20cm baseline)
- RTK over LTE modem
- Ready for easy-to-integrate robust navigation extensions, e.g. velocity aiding systems
- Regular updates bringing enhanced functionality
- The HCINS is not Export Controlled and does not require a license


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EXTERNAL INTERFACES

Power	PWR connector: connection with power source.
Serial Communication	PX connector: connection with Pixhawk 2.1 Cube (3V3CMOS). EAP connector: connection with External Aiding System (3V3CMOS).
Ethernet Communication	ETH connector: connection with computer (RJ-45). Configurable static IP address.
Cellular LTE	Micro SIM card tray. Cellular connectivity with 2 options available: 1. Built-in LTE antenna (default). 2. External LTE antenna. LTE-FDD B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/B19/B20/B25/B26/B66. LTE-TDD B34/B38/B39/B40/B41. UMTS/HSDPA/HSPA+ B1/B2/B4/B5/B6/B8/B19.
Data Storage	Micro SD card tray (up to 32GB).
LED	LED connector: connection of external status LEDs (Open Collector).
GNSS	Dedicated BAS (Base) and ROV (Rover) SMA connector for antenna.

HCINS COMPARISON WITH PIXHAWK


Pixhawk 2.1



Error: 58m after 30s

- Mission Disruption
- Unsafe Autoland


HCINS Standard GNSS mode



Error: 5m after 30s

- <1min GNSS Outages
- Safer Autoland

HCINS RTK GNSS mode




Error: 2.6m after 30s

- <1min GNSS Outages
- Precise Hover and Safer Autoland (cm Accuracy)

← Error Grows with Time →

Status Box/
Mission Planner

<p>Status</p> <p>Aiding Source : HCINS</p> <p>Navigation State : GPS EAP Aided</p> <p>EAP Status : Active</p> <p>Heading Source : HCINS</p> <p>Heading Time / Acc : 70.8 / 0.01732</p> <p>GPS State : 3D Fix</p> <p>Pos / GPS H Acc : 1.415 / 1.789</p> <p>Vibration x,y,z : 0.22 0.21 0.17</p> <p>Log Active : Yes (41% used)</p> <p>Internet : No</p> <p>Jamming : No</p> <p>Serial No / SW Ver : 040 / 14.9.4_e</p>	<p>Integrity Monitor</p> <p>PX GPS Valid : Yes HCINS Valid : Yes</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Level 1</th> <th style="text-align: left;">Level 2</th> </tr> <tr> <td>Position N Diff : Pass</td> <td>Position H Acc : Pass</td> </tr> <tr> <td>Position E Diff : Pass</td> <td>Position H Diff : Pass</td> </tr> <tr> <td>Velocity N Diff : Pass</td> <td>Altitude Diff : Pass</td> </tr> <tr> <td>Velocity E Diff : Pass</td> <td>Velocity N Diff : Pass</td> </tr> <tr> <td>Velocity D Diff : Pass</td> <td>Velocity E Diff : Pass</td> </tr> <tr> <td></td> <td>Velocity D Diff : Pass</td> </tr> <tr> <td></td> <td>TR Angle Diff : Pass</td> </tr> <tr> <td></td> <td>Heading Diff : Pass</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Active</th> <th>Level 1</th> <th>Level 2</th> <th>Delay</th> </tr> </thead> <tbody> <tr> <td>Switch</td> <td>No</td> <td>HCINS</td> <td>HCINS</td> </tr> <tr> <td></td> <td></td> <td></td> <td>0</td> </tr> </tbody> </table>	Level 1	Level 2	Position N Diff : Pass	Position H Acc : Pass	Position E Diff : Pass	Position H Diff : Pass	Velocity N Diff : Pass	Altitude Diff : Pass	Velocity E Diff : Pass	Velocity N Diff : Pass	Velocity D Diff : Pass	Velocity E Diff : Pass		Velocity D Diff : Pass		TR Angle Diff : Pass		Heading Diff : Pass	Active	Level 1	Level 2	Delay	Switch	No	HCINS	HCINS				0	
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