



## ATHENA GS111R UAS AUTOPILOT/ADAHRS/PNT HUB

# RUGGED, HIGH-INTEGRITY UAS AUTOPILOT AND SENSOR SUITE

When it's time to choose the right navigation software and most robust state estimation technology for your unmanned aircraft systems, Collins Aerospace has the solutions you need to stay ahead of the threat. Our Athena® GS111R is an advanced UAS autopilot and air data, attitude and heading reference system (ADAHRS) – as well as a position, navigation and timing hub – packaged in a 0.56-pound unit and qualified to DO-160G and MIL-STD environmental standards.

All internal sensors in each GS111R are calibrated and acceptance-tested for the entire operating temperature range of -40 to +70°C. GS111R state estimation software uses high-integrity algorithms from our commercial avionics products to ensure that flight-critical states, such as pitch, roll, altitude and vertical speed remain accurate—regardless of GNSS status.

Collins UAS autopilot software is flight-proven with millions of flight hours on dozens of operational UAVs. It supports a wide range of fixed wing and vertical takeoff and landing aircraft. The Collins autopilot reapplication process to a new airframe is based on proven analysis and simulation tools, which eliminate the need for risky in-flight gain tuning.

GS111R is designed for a seamless interface with a variety of peripherals, including GNSS receivers, external magnetometer and air data modules, laser and radar altimeters. Future capabilities include precision time keeping and distribution, and integration with emerging aiding sources, such as vision-based navigation, two-way time transfer and ranging via a data link, and low Earth orbit satellite navigation receivers.

### KEY FEATURES & BENEFITS

- Performance specifications verified during harsh environmental conditions, including rapid temperature transients, high levels of vibration, electromagnetic and radio frequency interference
- Trusted GNSS-independent outputs of primary aircraft instruments
- GNSS-aided outputs monitored with GNSS-independent solution
- Real-time kinematics differential GPS with high-confidence containment bounds
- Proven autoflight software, including ship-based precision recovery
- Access port for seamless integration into a hardware-in-the-loop simulation
- Technical support from experienced Collins Aerospace guidance, navigation and control engineers

## Specifications

### INS/GPS PERFORMANCE

Update rate <sup>1</sup>	100 Hz standard
Ground alignment time <sup>1</sup>	1 minute standard
Shipboard alignment time	5 minutes (up to sea state 5)
Angular rate range <sup>1</sup>	±490°/sec standard
Accelerometer range <sup>1</sup>	±20 g standard
Internal airspeed sensor range <sup>1</sup>	120 KIAS (650 KIAS optional)
Internal barometric altimeter range <sup>1</sup>	-1 kft to 50 kft standard
Internal 3-D magnetometer range	±1 Gauss
OAT <sup>2</sup> measurement range	± 60°C (± 1°C accuracy)

### GNSS-INDEPENDENT OUTPUT ACCURACY SPECIFICATIONS<sup>3</sup>

Pitch/roll attitude	0.5° RMS, 2° peak error
Heading (magnetic) <sup>4</sup>	1° RMS
Vertical velocity	0.15 m/sec RMS
Baroinertial altitude <sup>5</sup>	2.5 m RMS
Directional gyro heading drift	2°/hour RMS (typical)

### GNSS-AIDED OUTPUT ACCURACY SPECIFICATIONS<sup>3</sup>

Pitch/Roll attitude	0.1° RMS
Heading (single antenna, dynamic)	0.5° RMS
Heading <sup>6</sup> (dual antenna, 1 m baseline)	0.4° RMS
Vertical velocity <sup>6</sup>	0.15 m/sec RMS
Horizontal velocity <sup>6</sup>	0.1 m/sec RMS
Horizontal position <sup>6</sup> (standalone)	4.0 m CEP 95%
Horizontal position <sup>6</sup> (SBAS)	2.0 m CEP 95%
Vertical position <sup>6</sup> (standalone)	6.0 m VEP 95%
Vertical position <sup>6</sup> (SBAS)	3.0 m VEP 95%
RTK <sup>6,7</sup>	0.01 m + 1 PPM, CEP 50%

### INTERNAL AIR DATA SENSOR ACCURACY SPECIFICATIONS, 3 RMS

Indicated airspeed <sup>8</sup> (kts)	±2.5 @ 40 kts, ±1.5 @ 60 kts, ±1 @ 90 kts
Pressure altitude (ft)	±48 @ sea level, ±63 @ 8 kft, ±76 @ 14 kft, ±93 @ 20 kft, ±131 @ 30 kft, ±317 @ 50 kft

### MECHANICAL AND ELECTRICAL CHARACTERISTICS

Dimensions	9.9 x 7.1 x 3.8 cm (3.9 x 2.8 x 1.5 in)
Weight w/o internal GNSS	236 grams (0.52 lbs)
with internal GNSS	254 grams (0.56 lbs)
Power w/o internal GNSS	4.8 watts maximum
with internal GNSS	5.7 watts maximum
Input voltage	9-36 VDC
Enclosure	Aluminum
GNSS antenna bias voltage	5 VDC

### OPERATIONAL ENVIRONMENTAL QUALIFICATIONS

Operational temperature	-40 to +70 °C
Storage temperature	-54 to +85 °C
Temperature variation	DO-160G Cat B (5°C/min)
RF emissions	DO-160G, Section 21, Cat L
RF susceptibility	DO-160G, Section 20, Cat RR
Induced signal susceptibility	DO-160G, Section 19, Cat ZCX
Audio frequency susceptibility	DO-160G, Section 18, Cat Z
Humidity	DO-160G, Section 6, Cat B
Mechanical shock	20 g, 11 msec, half-sine
Vibration, sine sweep	MIL-STD-810G, 514.4, Cat 7
Vibration, random, propeller a/c	MIL-STD-810G, 514.7, 4.7 g RMS
Vibration, random, jet a/c	MIL-STD-810G, 514.7, 4.5 g RMS

### INTERFACES

Outside air temperature	(1), analog input for OAT probe
PWM inputs	(5), also used as discrete inputs
PWM outputs	(12), also used as discrete outputs
Ethernet	(1), 10/100 Base-T
CAN bus	(1)
USB controller	(1), switchable host/device modes
RS-232	(3)
RS-422/485	(1), without flow control

1. Contact Collins Aerospace for availability of non-standard configurations.

2. Outside Air Temperature

3. Evaluated using fixed wing and helicopter flight trajectories specified in RTCA DO-334

4. Assuming adequately clean magnetic environment and horizontal field strength

5. Baro-stabilized inertial altitude errors in addition to pressure altitude measurement errors

6. Typical performance using aiding from an internal GNSS receiver

7. Depends on atmospheric conditions, multipath environment, GNSS antennas, satellite visibility and geometry. Contact Collins Aerospace for RTK options with high integrity containment bounds.

8. For 120 knots indicated airspeed sensor range

Specifications subject to change without notice.



**COLLINS AEROSPACE**

877-808-7575

crc@collins.com

collinsaerospace.com