RT2000

Inertial and GPS Measurement System

Features

- 2cm Position
- 0.1 km/h Velocity
- 10 mm/s² Acceleration
- Lateral Acceleration
- 0.05° Roll, Pitch
- 0.2° Slip Angle
- 0.02°/s Rates
- Other Measurements
- 100Hz/250Hz Updates
- Real-Time
- Low Latency
- CAN Output Option
- 2 GB Logging
- 5 min Installation
- Compact Size

RT2500 Applications

- Vehicle Testing
- NHTSA ESC
- Lap timing/racing
- Acceleration/Braking

RT2002 Applications

- Vehicle Testing
- ADAS Testing on proving grounds (in combination with RT-Range)
- Steering Robot

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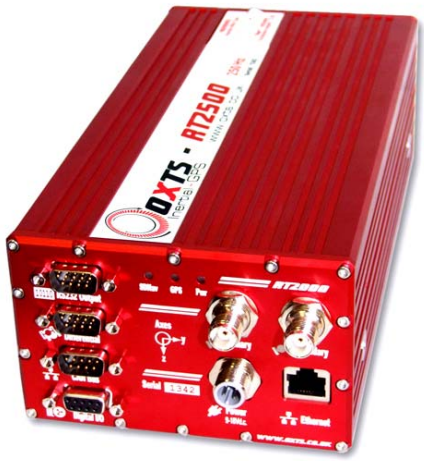
RT2000 Low-Cost Inertial and GPS Navigation Systems



The RT2000 Inertial and GPS Navigation Systems are advanced six-axis inertial navigation systems that blend GPS information to keep the measurements accurate.

The RT2000 products show our commitment to bring customer value to users where a balance between price and performance is necessary.

The RT2000 Inertial and GPS Navigation Systems include three angular rate sensors (gyros), three servo-grade accelerometers, the GPS receiver and all the required processing in one very compact box.

The RT2000 works as a standalone, autonomous unit and requires no user input before it starts operating.

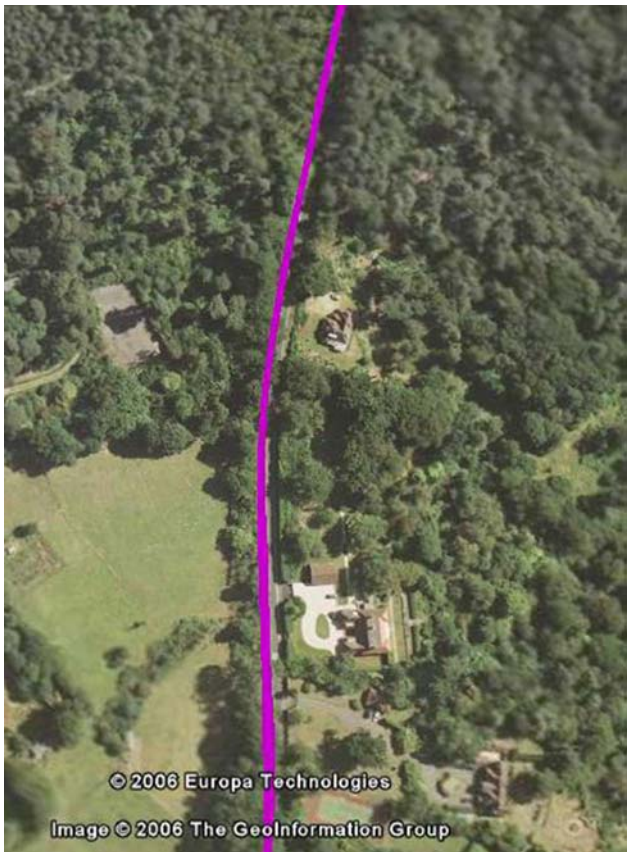
The outputs from the RT2000 Inertial and GPS Navigation Systems are derived from the measurements of the accelerometers and gyros. Using the inertial sensors for the main outputs gives the RT2000 systems a fast update rate and a wide bandwidth. All the outputs are computed in real-time with a very low latency.

The RT2000 Inertial and GPS Navigation Systems output the real-time measurements over RS232, Ethernet and CANbus. Optional outputs can be made over Analogue.

The Analogue option includes 16 individually configurable channels of 16-bit resolution. Galvanic isolation on the analogue outputs ensures there are no ground loops.

The CAN bus output can be combined into a vehicle's CAN bus or captured using any CAN data acquisition system. The real-time nature allows the RT2000 family of products to be used for *hardware in the loop* and controller development. Connection to powerful tools like dSPACE is easy. CAN DBC files are provided.

The precision ADC in the RT2000 systems gives more than 20 bits of resolution. The resolution of the acceleration measurements is 0.12mm/s² (12µg). The ADC oversamples the analogue sensors and uses coning/sculling motion compensation algorithms to avoid aliasing of the signals.

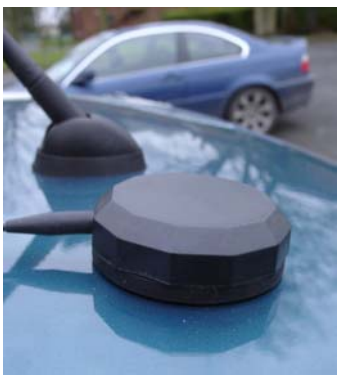


Combining Inertial Sensors and GPS gives smooth trajectories, free from jumps, even in difficult GPS environments.

Parameter	RT2500/ RT2500-250	RT2502/ RT2502-250	RT2002/ RT2002-250	RT2002/ RT2002-250
Positioning	SPS / SBAS	SPS / SBAS	SPS	L1 + GLONASS RTK
Position Accuracy	3.0m CEP SPS 2.0m CEP SBAS	3.0m CEP SPS 2.0m CEP SBAS	1.8m CEP SPS[2]	2cm 1σ RTK[2]
Velocity Accuracy	0.2 km/h RMS	0.2 km/h RMS	0.2 km/h RMS	0.1 km/h RMS
Acceleration – Bias – Linearity – Scale Factor – Range	 10 mm/s² 1σ 0.01% 0.1% 1σ 100 m/s²	 10 mm/s² 1σ 0.01% 0.1% 1σ 100 m/s²	 10 mm/s² 1σ 0.01% 0.1% 1σ 100 m/s²	 10 mm/s² 1σ 0.01% 0.1% 1σ 100 m/s²
Roll/Pitch	0.15° 1σ	0.15° 1σ	0.1° 1σ	0.05° 1σ
Heading	0.3° 1σ[1]	0.2° 1σ	0.2° 1σ[1]	0.1° 1σ[1]
Angular Rate – In-run Bias – ARW – Range[1]	 2 deg/hr 0.2 deg/√hr 100°/s	 2 deg/hr 0.2 deg/√hr 100°/s	 2 deg/hr 0.2 deg/√hr 100°/s	 2 deg/hr 0.2 deg/√hr 100°/s
Track (at 50km/h)	0.25° RMS	0.25° RMS	0.2° RMS	0.1° RMS
Slip Angle (at 50km/h)	0.4° RMS	0.4° RMS	0.3° RMS	0.2° RMS
Lateral Velocity	0.4%	0.4%	0.3%	0.2%
Update Rate	100 Hz / 250 Hz	100 Hz / 250 Hz	100 Hz / 250 Hz	100 Hz / 250 Hz
Calculation Latency	3.9 ms	3.9ms	3.9 ms	3.9 ms

Note 1. On land vehicles using Advanced Slip. Note 2. These specifications are for the same product but in two different modes. The SPS mode, when the product has no differential corrections and the RTK mode when the product has a GPS-Base-20G (or GPS-Base-2G).

Inertial Sensors in the RT2000 product family include servo-grade accelerometers and precision MEMS angular rate sensors. Powerful 40MHz floating point DSP takes care of coning, sculling and aliasing.



Magnetic GPS antenna for vehicle mounting. Other types available.

The internal processing includes the strapdown algorithms (using a WGS-84 earth model), Kalman filtering and in-flight alignment algorithms. The internal Pentium-class processor runs QNX real-time operating system to ensure that the outputs are always delivered on time.

The Kalman filter monitors the performance of the system and updates the measurements using GPS. By using the measurements from GPS, the RT2000 systems are able to maintain highly accurate measurements and to correct inertial sensor errors.

The RT2000 Inertial and GPS Systems come with acquisition software that collects the data on a PC or on Pocket PC devices. The software can be used to save tests in files, display real-time results and monitor the performance.

The internal logging enables the RT2000 range of products to work stand-alone. Post-mission, data can be output in ASCII text format and loaded in to the software of your choice.

Simple configuration software allows the user to change the mounting angle; displace the measurement point to a virtual location; change the differential GPS options and many more.

To obtain the best position accuracy, the RT2500 systems are able to use SBAS corrections such as WAAS and EGNOS.

For further information please contact Oxford Technical Solutions or your nearest local agent.

Parameter	RT2000
Power	9-18 V d.c. 15W
Dimensions (mm)	234 x 120 x 76
Weight	2.3 kg
Operating Temperature	–10 to 50°C
Vibration	0.1 g²/Hz 5-500 Hz
Shock Survival	100G, 11ms
Internal Storage	2 GB