

INTEGRATED POSITIONING SYSTEM



Positioning and data collection solution for land based vehicles

- Dual frequency GNSS tracking
- High Accuracy 6-Axis IMU Integration
- Odometry and tracking from CAN bus
- Advanced auto-calibration for simple set-up
- Supports multiple laser scanners (up to six) for increased data capture

It's time.

Topcon's IP-S2 Mobile Mapping System overcomes the challenges of mapping linear features to a high level of accuracy.

Accurate vehicle positions are obtained using three technologies: a dual frequency GNSS receiver establishes a geospatial position; an Inertial Measurement Unit (IMU) provides vehicle attitude; and connection to the vehicle CAN bus or external wheel encoders obtains odometry information. These three technologies work together to sustain a highly accurate 3D position for the vehicle even in locations where satellite signals can be blocked by obstructions such as buildings, bridges, or tree lines.



The IP-S2 standard system includes three high-resolution LiDAR scanners that cover the vehicle path at ground level and sweep the adjacent areas to a distance of 30 meters.

A high-resolution digital camera can

be added to provide 360 degree spherical images at a rate of 15 frames per second. Other sensors can be integrated to provide total flexibility of system configuration for a wide variety of applications. Sensor inputs are recorded and time stamped at a rate of 15 nanoseconds.

A web-based processing service with desktop PC interface is included as part of the IP-S2 system. Vehicle position and sensor output are integrated seamlessly into one continuous three-dimensional data stream that can be exported as industry-standard formats. GNSS data can be post processed for higher accuracy. The desktop software also includes a viewer enabling the user to review point clouds generated from LiDAR scanners and make linear measurements.

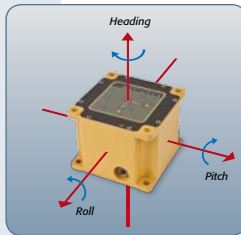
Continued on Page 4

The IP-S2 is a modular system - sensors can be added based on user requirements.



Dual Frequency GNSS Tracking

The IP-S2 incorporates a top of the line, survey grade GNSS receiver capable of processing L1 and L2 GPS and GLONASS signals for the best possible field tracking capability in the industry.



High Accuracy 6-Axis IMU Integration

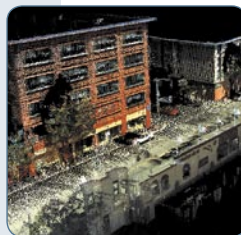
Inertial Measurement Unit (IMU) technology tracks motion in 3D space.

The IMU in the IP-S2 provides high rate acceleration and rotation information. When combined with high accuracy GNSS measurements, the IMU enables the IP-S2 system to calculate positions when driving near an obstruction such as buildings and trees, or through a tunnel or an overpass without compromising accuracy.



Odometry Tracking using Vehicle CAN Bus or Wheel encoders

The IP-S2 is also able to obtain wheel speed information from high accuracy external encoders which can be retrofitted to a vehicle that does not have Antilock brakes or traction control as standard equipment. This is used to estimate the velocity and position of the vehicle based on a previously known location.



Accurate Time-stamping and Geo-referencing of Sensor Data

The system works by processing, logging and time-stamping sensor data to provide real-time, fused feedback. The logged data file may also be post-processed and filtered offline to provide improved position information and geo-registration of sensor data.

Integrated, Calibrated Mounting Solution

Advanced machine learning algorithms greatly ease the calibration of the system by automatically extracting system parameters and tuning the filter for optimal performance.



Plug and Play give the IP-S2 system full flexibility allowing for your choice of sensors



- 1** GNSS Antenna
- 2** 360° Digital Camera
- 3** IMU
- 4** Laser scanners
- 5** Odometry Data from CAN Bus or External Wheel Encoders

Outage Duration	System	Position error (m)		attitude Error (Degrees)		
		2D	H	Roll	Pitch	Heading
0s	IP-S2 (AG58 - 1°/Hr)	0.015	0.025	0.020	0.020	0.040
	IP-S2 (AG60 - 3°/Hr)	0.015	0.025	0.025	0.025	0.050
15s	IP-S2 (AG58 - 1°/Hr)	0.020	0.025	0.020	0.020	0.045
	IP-S2 (AG60 - 3°/Hr)	0.025	0.025	0.025	0.025	0.060
30s	IP-S2 (AG58 - 1°/Hr)	0.040	0.030	0.025	0.025	0.050
	IP-S2 (AG60 - 3°/Hr)	0.055	0.030	0.030	0.030	0.075

Supports Multiple Laser Scanners and Other Sensor Integration

The IP-S2 comes standard with GNSS and IMU measurement capabilities. Add a laser scanner or 360 degree digital camera for additional data, depending on user requirements. With flexible sensor and interface options, powerful automated calibration and high performance filter-

ing the IP-S2 enables applications which demand high precision positioning in diverse and demanding environments.

IP-S2 Features:

- Accurate Vehicle Position
- Precision LiDAR
- 360 (deg) Spherical Imagery



It's time.

The IP-S2 provides fast, high accuracy data and dynamic imaging for any linear mapping project. The vehicle-mounted system can map data at normal travel speeds for roadway surface condition assessments and roadside feature inventories. Safety is increased by removing pedestrians from the travelled lanes. Other applications include pipelines, railways, utility corridors, waterways, security events and disaster management. The IP-S2 is perfect for 3D street-view city mapping and provides essential information for these applications.



The Leader in Positioning Technology...

Topcon Positioning Systems is the worldwide leading developer and manufacturer of precision positioning equipment and offers the widest selection of innovative precision GPS systems, laser, optical surveying, and machine control products.

From open-field construction projects to isolated surveying sites and from rolling farmland to inner city utility projects, Topcon Positioning Systems creates innovative technology solutions that give a decidedly competitive edge to end-users.

Recognized as the innovative trend-setter in its industry, Topcon has focused on developing an array of integrated positioning and automation technologies to meet the constantly changing demands facing GIS, construction, surveying, agriculture, utilities and law enforcement professionals worldwide. We look forward to building solutions that solve your data collection project challenges today and in the future.

Specifications subject to change without notice.
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SPECIFICATIONS

IP-S2	
GNSS COMPONENT	
Channels	40 channels, all-in-view, L1, L1 GPS, L1/L2 GPS, L1/L2 GLONASS, L1/L2 GPS + L1/L2 GLONASS, WAAS
Low signal tracking	Down to 30 dBHz
Cold/warm start	< 60 sec / < 10 sec
Reacquisition	< 1 sec
Vibration	Up to 30 g's of dynamic
Advanced firmware function	Multipath Mitigation, Co-Op Tracking
Real time position & raw data	Up to 20Hz update rate
RTCM SC104 v2.1 and 2.2	Input/Output
NMEA 0183 v2.1, 2.2, 2.3 & 3.0	Output
IMU	
Data rate	100 Hz
Gyro bias/drift rate	1°/hr, 3°/hr, 5°/hr
POWER	
Input supply voltage	9V to 28V
PHYSICAL	
Size/weight	20 cm x 23 cm x 11 cm / 3.6 kg
ENVIRONMENTAL	
Temperature operating storage	-30° to +60°C - 45° to +80°C
I/O PORTS	
CAN Bus	OBDII - MOLEX-9 Pin
Encoder	TTL quadrature input
Ethernet	100 Base-T
USB 2.0	Host input/output
RS-232-422	Up to 2 Mb/s
High-speed digital I/O (x4)	LVDS 400 Mb/s
LASER SCANNER	
Type	Two (2) SICK™ LMS 291-S05, One (1) SICK™ LMS 291-S14
Scanning angle/angular resolution	180°/1° Angular Resolution - LMS 291-S05 90°/0.5° Angular Resolution - LMS 291-S14
Typically measurement accuracy	±45 mm
Typical range	30 m
Date rate	75 Hz via Ethernet



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