



IP-S2 HD

High Density 3D Mobile Mapping System



- High Density, Long Range LiDAR sensor for ultimate visual detail
- High Accuracy IMU and DMI Odometry for positional accuracy and reliability
- Geo-referenced, Time-Stamped, Point Clouds and Imagery
- 360 Camera for Spherical Image Capture
- Powered Retractable Mounting System

IP-S2 HD High Density 3D Mobile Mapping System

Topcon's IP-S2 HD Mobile Mapping System overcomes the challenges of mapping 3D features at 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 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 standard IP-S2 HD system includes one sensor head of LiDAR containing 65 lasers oriented to cover roadside features up to 100m away. High resolution digital cameras can be added providing 360 degree spherical images at fixed

distance intervals. All sensor inputs are recorded and time stamped to a common clock driven by the IP-S2 HD.

Geoclean, Topcon's powerful software, will post-process the geo-referenced LiDAR and/or digital imaging data into a viewable 3D image representation which can then be exported to industry standard formats. GNSS data can be post-processed against a reference station for higher accuracy. Optional desktop software includes a viewer enabling the user to review geo-referenced point cloud and camera information, label features and assets, make measurements and export data into GIS programs.

The IP-S2 HD quickly provides high accuracy data and dynamic imaging for any 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, and waterways. Homeland security and disaster management can benefit from the IP-S2 HD's ability to collect high accuracy GIS information simply and quickly. The IP-S2 HD is the perfect solution for the detail required for 3D street-level city mapping and utility asset management.

IP-S2 HD Features

- Geo-referenced spherical imagery produced
- Sensor fusion software provides colorized 3D models of the environment
- Viewer software to identify and label assets and features
- Easily export to industry standard GIS formats
- Accurate vehicle position and attitude
- Factory calibrated, integrated system
- Cost effective, turnkey solution
- High density point cloud for ultimate visual detail
- Extended range for additional data acquisition

IP-S2 HD combines multiple sensors for a high density mapping solution



High Density Laser Scanner

The IP-S2 HD laser scanner captures high resolution, high density 3D point clouds of roadside features regardless of lighting conditions. Included PC software projects sensor data into 3D global coordinates with accurate time-stamps. Geo-referenced panoramas can be produced for visual inspection and detailed analysis such as time-dependent changes in profile, geometry and location.



Positioning Component

The mobile mapping positioning component determines precise vehicle position and attitude on a real-time basis using multiple sensors. An integrated dual frequency GNSS receiver tracks both GPS and GLONASS signals expanding the operation area. An inertial measurement unit (IMU) constantly monitors vehicle motion and attitude, allowing the IP-S2 system to track the vehicle position even

when driving near obstructions or through tunnels where satellite signals can be blocked.



Vehicle Wheel Encoders

Vehicle wheel encoders further enhance positioning accuracy and reliability. Retrofitted to rear wheel axles, the encoder detects rotation of each wheel. Vehicle attitude can be computed even more accurately by comparing difference in rotation speeds between two wheels.



Imaging Component

A 360° digital camera continuously captures spherical video imagery. The combination of imagery with point cloud data significantly enhances the quality of the 3D data and the resulting data analysis. The IP-S2 HD can contain additional imagery sensors for enhanced clarity of the scene.

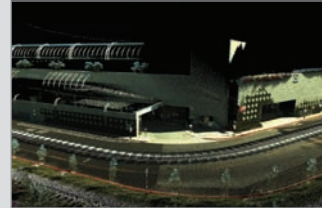
IP-S2 HD Project Workflow

DATA COLLECTION



Drive vehicle through route

POST PROCESSING



Full Color Point Cloud



Vehicle Trajectory

The IP-S2 HD Software Provides User-friendly Data Collection and Processing Solutions

IP-S2 HD Dashboard-Data Collection Software

The IP-S2 HD Dashboard operates on a PC web browser. This software allows the user to easily control and configure the IP-S2 HD Box with all connected sensors. It also controls field data capture, storage and display.

Geoclean – Post Processing Software

GNSS Post Processing

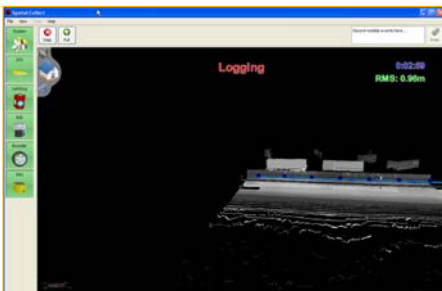
Geoclean determines the vehicle positions by means of continuous kinematic processing using the vehicle mounted GNSS receiver and fixed base station data.

Hybrid Analysis for Vehicle Attitude and Location

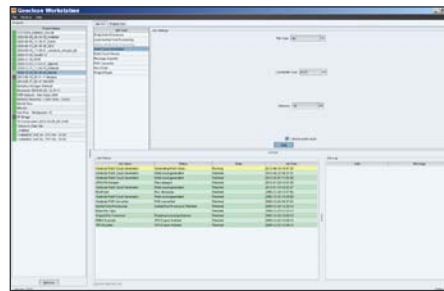
By integrating GNSS data with IMU and wheel encoder data, Geoclean determines a vehicle attitude correlated to accurate geographical locations.

Combining Images and Point Clouds

Geoclean software precisely combines imagery and scanned data to generate insightful full-color point clouds.



IP-S2 HD Dashboard



Geoclean Post-Processing Software

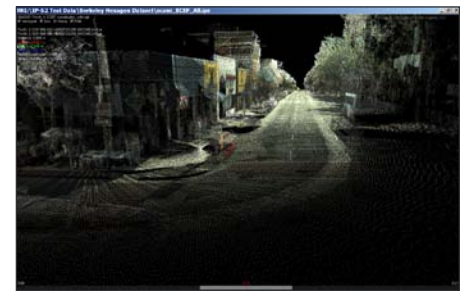


Image and Point Cloud in Geoclean Software

APPLICATIONS



Utilities



GIS Asset Management



Transportation

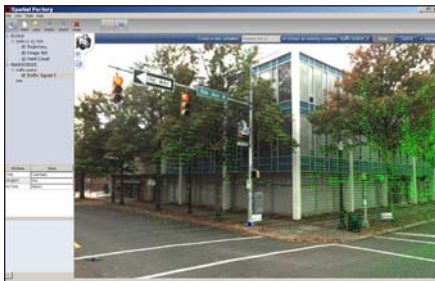
Full-color, high-resolution, high-density point clouds dramatically increase efficiencies in the following areas:

Utilities

Topcon's IP-S2 HD effectively addresses utility infrastructure needs such as mapping electric and telephone grids in both urban and rural areas. In instances where it has been cost prohibitive to collect location and attribute data due to the time consuming, labor intensive nature of traditional data collection techniques, the IP-S2 HD now provides a fast and affordable means to create accurate map data. The amount of ground that can be covered in a day is greatly increased and the number of personnel required to do the job decreases in magnitude. The opportunity for human input error is also greatly decreased. The detail obtained in a high definition point cloud from the IP-S2 HD allow overhead power lines to be captured which may get missed with standard definition mobile mapping systems. As a result, management agencies are able to make accurate and quick maintenance decisions right from the office saving time and costly mistakes.



Point Cloud with Image Overlay



Point Cloud with Image Overlay

GIS Asset Management

Creating a GIS database of assets can be an overwhelming task as the number of items to map can be immense. Topcon's IP-S2 HD can simplify the task by obtaining data on all assets in a particular area as the truck drives through. The high definition point cloud ensures that data on smaller utilities such as water vales is obtained. In addition to location information, asset managers can view descriptive details of the assets using the colorized point cloud image overlay. It is not necessary to predefine the attribute values needed in the GIS database before fieldwork. All information is in the IP-S2 HD database and can be extracted at any time after the field work is complete.

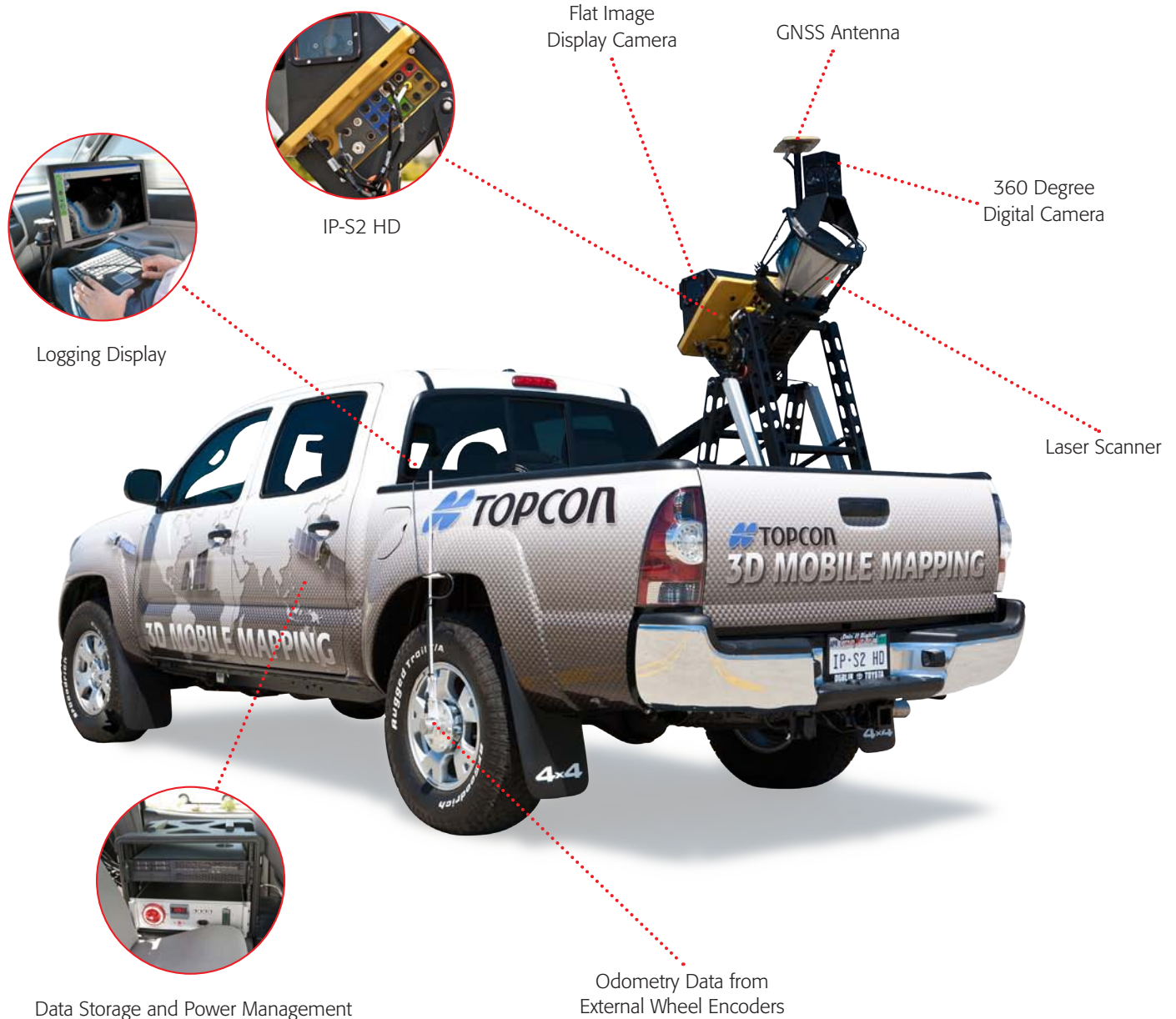
Transportation

Using GPS alone for data collection of transportation facilities such as roads, highways, tunnels and overpasses can often pose problems as GPS signals are blocked by nearby buildings and structures. Topcon's IP-S2 HD becomes a great solution for transportation mapping as the combination of GPS and IMU sensors allows for continued accurate position updates in GPS outage areas. The IP-S2 HD vehicle can also get data under overpasses and in areas where aerial fly-over methods produce no data. The detailed point cloud from the IP-S2 HD allows for data collection of small objects such as individual rail ties for railway applications. A combination of the high definition laser and the speed and accuracy of the IP-S2 HD make the system a perfect fit for transportation mapping applications such as highways, railways and roads.



Point Cloud with Image Overlay

The IP-S2 HD gives a high density point cloud with colorful image overlay for the ultimate in feature recognition and mapping detail.



IP-S2 HD Installation

This turnkey solution is delivered fully calibrated and ready to deploy. A retractable mounting system allows the equipment to fold down for easy storage when the system is not in use.

High Density Laser Scanner

The high density laser scanner included with the IP-S2 HD collects 1.3 million points per second at a range of 100m. The scanner has a 360° horizontal field of view and a 30° vertical field of view to increase data collection coverage and minimize laser shadowing. Coupled with this high definition LiDAR scanner, the IP-S2 HD provides the greatest point cloud density and longest range available in a mobile mapping system today.

IP-S2 HD SPECIFICATIONS

GNSS COMPONENT

Tracking	20 satellites, all-in-view, L1 GPS, L1/L2 GPS, L1/L2 GLONASS, L1/L2 GPS + L1/L2 GLONASS, WAAS, MSAS, EGNOS
Low Signal Tracking	Down to 30 dBHz
Cold Start	< 60 sec
Warm Start	< 10 sec
Reacquisition	< 1 sec
Advanced Firmware Function	Up to 30 g's of dynamic multipath mitigation Co-Op tracking
Real Time Position & Raw Data	Up to 20 Hz update rate
RTCM SC104 v2.1, 2.2, 2.3, 3.0	Input/Output
NMEA 0183 v2.1, 2.2, 2.3 & 3.0	Output

HIGH-ACCURACY IMU

Type	Honeywell HG1700
Data Rate	100MHz
Gyro Bias/Drift Rate	1°/hr, 3°/hr

POWER

Input Supply Voltage	Continuous 12-14 VDC with approximately 50 amp draw.
System power consumption	Approximately 300W.

PHYSICAL

Size	56 x 27.5 x 49 in (1422 x 699 x 1245 mm)
Weight	approx 180 lbs.

ENVIRONMENTAL

Operating Temperature	-10 C to + 40C
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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

VELOCYNE LASER SCANNER

Sensor

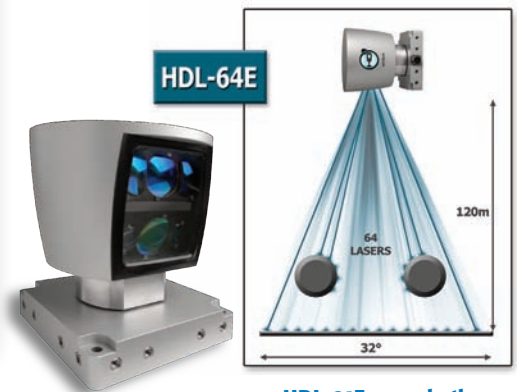
- 64 lasers/detectors
- 360o field of view (azimuth)
- 0.09o angular resolution (azimuth)
- 32o vertical field of view (elevation) --+ 6.7o up to 24.87o down with 64 equally spaced angular subdivisions (approximately 0.5o)
- Approximately 2cm distance accuracy (one sigma)
- 50m range for pavement (~0.10 reflectivity)
- 120m range for cars and foliage (~0.80 reflectivity)
- Approximately 1.333 million points per second
- Operating temperature - 10o to 50oC
- Storage temperature - 10o to 80oC

Laser

- Class 1 – eye safe
- 4 x 16 laser block assemblies
- 905 nm wavelength
- 5 nanosecond pulse
- Adaptive power system for minimizing saturations and blinding

Mechanical

- 15V +/- 1.5V @ 4 amps
- Approximately 29 lbs
- 10" tall cylinder of 8" OD diameter
- 300 RPM spin rate
- Environmental Protection IP67 Output
- 100 MBPS UDP Ethernet packets



Velodyne® HDL-64E S2

HDL-64E scans both sides of features

Your local Authorized Topcon dealer is:



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7400 National Drive • Livermore • CA 94550