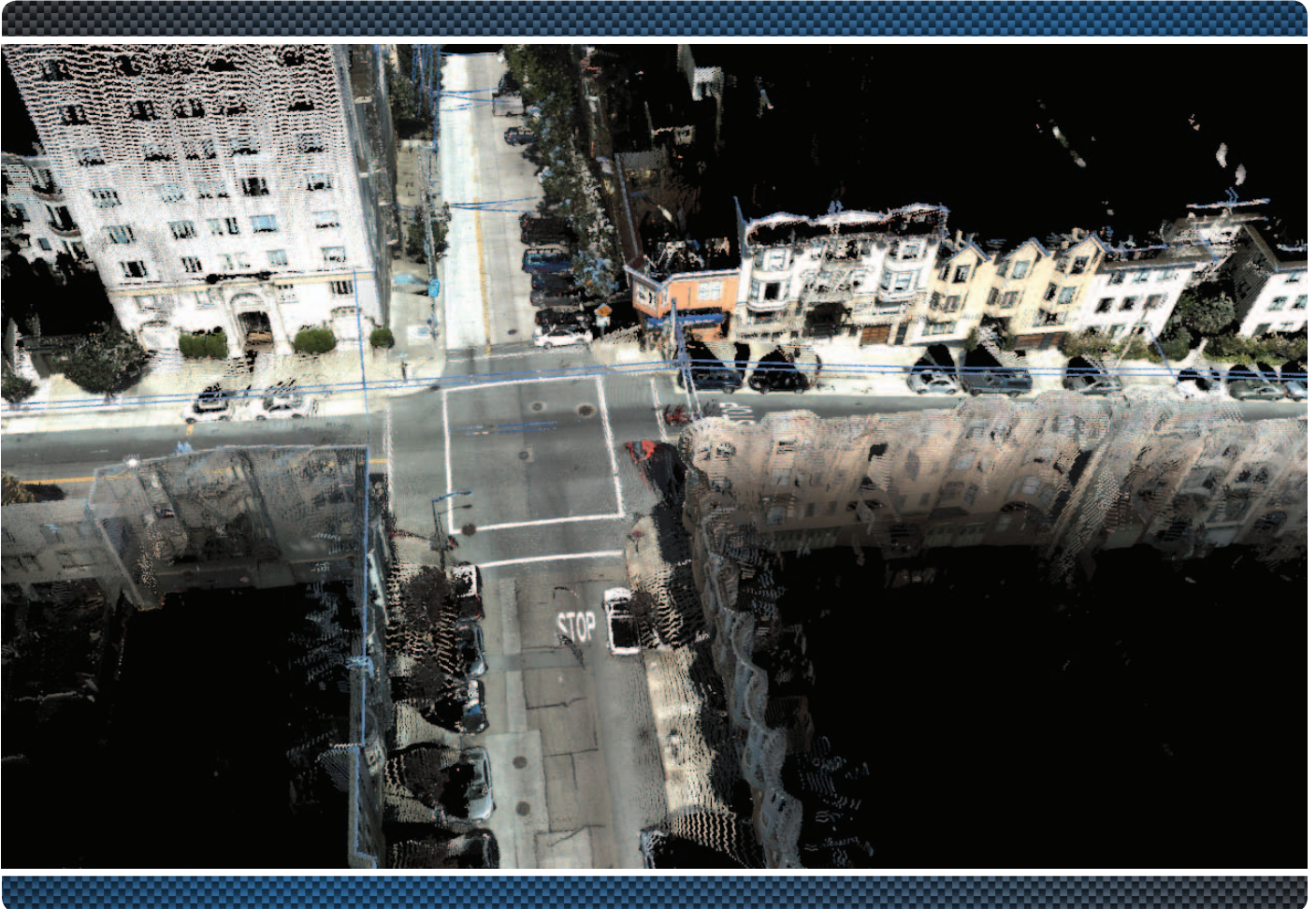


## 3D Mobile Mapping System



- 3D scanning of road and roadside features
- Delivers high density point clouds and 360° spherical imagery
- High accuracy IMU options without export control
- Simple Map, Extract, Deliver Workflow
- Integrated, turn key solution

# IP-S2 Compact+ 3D Mobile Mapping System

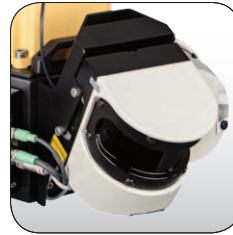
## The IP-S2 Compact+ gives a high density point cloud with colorful image overlay for the ultimate in feature recognition and mapping detail.

Topcon's IP-S2 Compact+ 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 IP-S2 Compact + system effectively measures objects even in changing and bad weather conditions and poor visibility environments such as tunnels and mines. A high resolution, 360° spherical digital camera is included to collect images at fixed distance or time intervals. A compact, lightweight tactical IMU is available with a Ring Laser Gyro or users can choose a non-ITAR high performance commercial grade IMU component with fiber optic gyros.

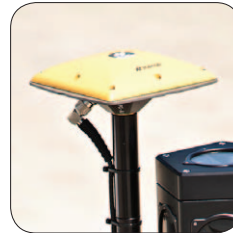
Geoclean is Topcon's powerful post processing software. In a few steps it takes the positioning data, optionally in combination with base station data, and delivers a geo-referenced colorized point cloud panoramic images quickly and easily. The data can then be exported to industry standard data formats such as images, and cloud files for use in well known CAD, GIS and 3D modeling software.

The IP-S2 Compact+ quickly provides high accuracy data and dynamic imaging for any mapping project. The vehicle-mounted system significantly reduces the cost of data collection as it maps data at normal travel speeds. Safety is increased by removing field crews from the travelled lanes.



### Laser Scanner

- Captures high resolution, high density 3D point clouds
- Standard 3 scanner or optional 5 scanner configuration for increased cloud density
- Excellent precision at short range



### Positioning Component

- Constantly determine precise vehicle position and attitude
- Integrated dual frequency GNSS receiver
- Inertial measurement unit options



### Vehicle Wheel Encoders

- Encoders further enhance accuracy and reliability
- Detects rotation of each wheel
- Compares difference in rotation speeds



### Imaging Component

- 360° panoramic images
- >80% of full sphere field of view
- Images captured by distance or time intervals

### IP-S2 Compact+ Setup

This turnkey solution is delivered fully calibrated and ready to deploy.



## IP-S2 COMPACT+ PROJECT WORKFLOW

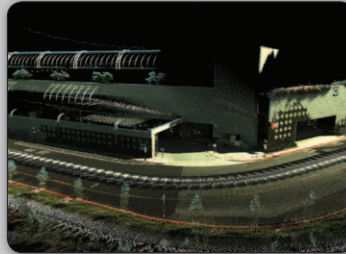
MAP

EXTRACT

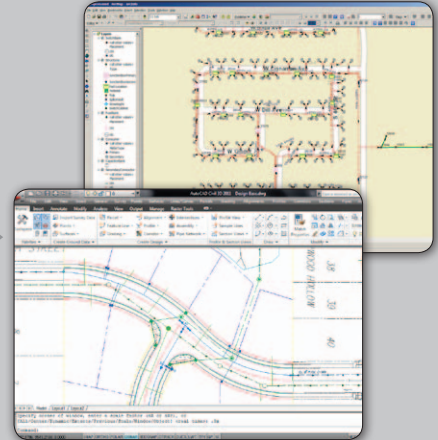
DELIVER



Drive vehicle through route



Pull features from point cloud and make measurements



Export data to GIS or CAD

## The IP-S2 Compact+ Software Provides User-friendly Data Collection and Processing Solutions

### IP-S2 Compact+ Dashboard-Data Collection Software: Spatial Collect

The IP-S2 Compact+ Dashboard operates on a PC web browser. It allows the user to easily control and configure the IP-S2 Compact+ Box. It also controls field data capture, storage and display.

### Geoclean – Post Processing Software

#### GNSS Post Processing

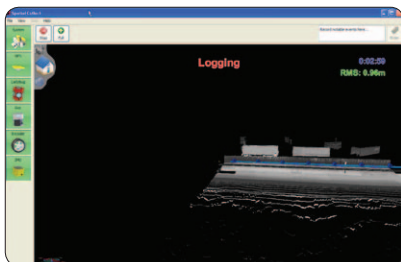
Geoclean determines the vehicle positions by means of continuous kinematic processing using the vehicle mounted GNSS receiver and fixed base station data.

#### Hybrid Analysis for Vehicle Attitude and Location

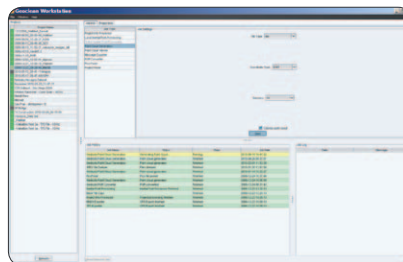
By integrating GNSS data with IMU and wheel encoder data, Geoclean determines a vehicle attitude correlated to accurate geographical locations.

#### Combining Images and Point Clouds

Geoclean software precisely combines imagery and scanned data to generate full-color point clouds. Industry standard formats such as jpeg and .las are easily created for use in CAD and GIS software.



IP-S2 Compact+ Dashboard



Geoclean Post-Processing Software

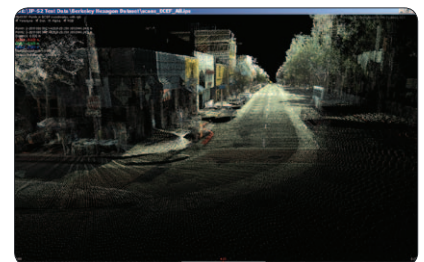


Image and Point Cloud in Geoclean Software

## Applications



*Utilities*



*GIS Asset Management*



*Transportation*

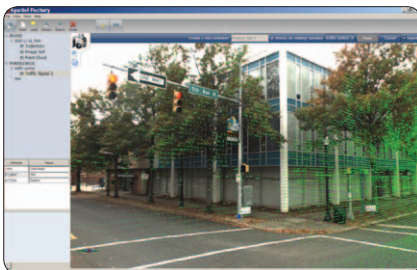
## Full-color, high-resolution, high-density point clouds dramatically increase efficiencies in the following areas:

### Utilities

Topcon's IP-S2 Compact+ effectively addresses utility infrastructure needs such as mapping electric and telephone grids. When traditional data collection techniques are too expensive or time consuming, the IP-S2 Compact+ provides a fast and affordable means to create accurate map data. The number of kilometres covered in a day is greatly increased and the number of personnel required to do the job is significantly reduced. The opportunity for human input error is also greatly decreased. 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 Compact+ simplifies the task by obtaining data on all assets while driving. The precise point cloud ensures that data on smaller utilities such as water valves is obtained. Asset managers can view asset attributes using the colored point cloud image overlay. As IP-S2 Compact+ registers all objects in the environment, a single data set can be used for extracting multiple GIS databases.

### Transportation

Using GNSS alone for data collection of transportation facilities such as roads, highways, tunnels and overpasses often poses problems as GPS signals are blocked by nearby buildings and structures. Topcon's IP-S2 Compact+ uses a combination of GNSS, IMU and wheel sensors to allow for continued accurate position updates in GNSS outage areas. The IP-S2 Compact+ also gets data under overpasses and in areas where aerial fly-over methods produce no data. The detailed point cloud from the IP-S2 Compact+ allows for data collection of small objects such as individual rail ties for railway applications. A combination of the high precision lasers and the speed of the IP-S2 Compact+ make the system a perfect fit for transportation mapping applications such as highways, railways and roads.



*Point Cloud with Image Overlay*

## SYSTEM OVERVIEW



### 3-Scanner or 5-Scanner System Configuration

The IP-S2 Compact + comes standard with 3 laser scanners oriented to optimize visibility of roadside assets for enhanced scanning detail. The standard scanner configuration gives a full 360° Vertical Field of View. The optional 5 scanner configuration increases the cloud density and minimizes scanning shades. The optional IP-S2 Compact+ 5 scanner system collects 150,000 points per second at a range of 40m, with a vertical field of view of 360°.

## SPECIFICATIONS

### GNSS Component

Channels	40 channels, dual constellation, dual frequency GPS+GLONASS L1/L2
Low Signal Tracking	Down to 30 dBHz
Reacquisition	< 1 sec
Real Time Position & Raw Data	Up to 10 Hz update rate

### IMU COMPONENT

(Commercial Grade option, High accuracy IMU)

Gyro type	Fiber Optic Gyro
Gyro Bias stability	1°/hr
Gyro Bias Offset	20°/hr
Gyro ARW	0.0667°/√hr
Accelerometer Bias	7.5 mg (typical)

### IMU COMPONENT

(Tactical Grade option, High accuracy IMU\*)

Gyro type	Ring Laser Gyro
Gyro Bias stability	1°/hr
Gyro Bias Offset	1°/hr
Gyro ARW	0.125°/√hr, Max
Accelerometer Bias	1.0 mg

### Power

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

### Physical and Environmental

Size	1422 x 699 x 1245 mm
Weight	approx 86 lbs (39kg)
Operating Temperature	-10°C to 40°C

### Panoramic Imagery Component

Imaging Sensor Type	Six (6) Sony progressive scan color CCDs (five in horizontal ring, one on top)
Maximum Panorama Resolution	5400 (H) x 2700 (V)
Field of View	>80% of full sphere, 360° Panorama

### LIDAR Components

System Field of View	360° Vertical Field of View, X-configuration when using 5 scanner option
Field of View per scanner	190° max
Scanning Frequency	75 Hz   100 Hz
Operating Range	0.7 m ... 80 m
Laser Class	1, eyesafe (IEC 60825-1 (2007-6))
Angular Resolution	0.5°   0.667°

\* The Tactical Grade IMU is International Traffic in Arms Regulations (ITAR) controlled and requires export approval for customers outside the United States.

## SOFTWARE

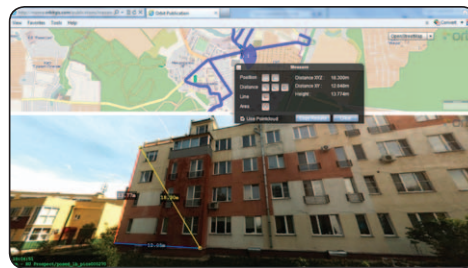
### Complete Your Workflow with Asset Management Software

Simply view and extract locations, attributes, pictures, measurements and more into standard industry formats like shapefiles for GIS applications.



Measure points and distances that you select on screen; heights of underpasses for transport applications or the position of traffic signs for asset management.

Publish data on the web for viewing and taking measurements in a browser or on a mobile device.



Use IP-S2 Compact+ point clouds and photo overlays in combination with ortho imagery and vector data to extract asset directly to a geo database.

3D Visualization to support decision processes for new construction projects, repair and maintenance.



[www.topcon-positioning.eu](http://www.topcon-positioning.eu)

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