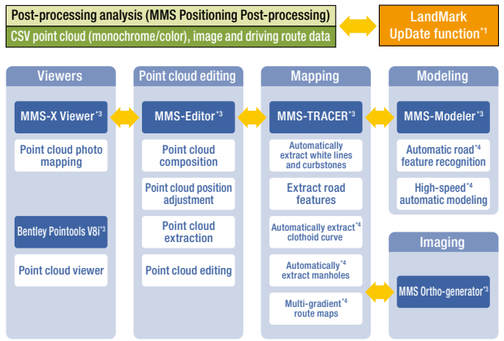
Mitsubishi Electric Mobile Mapping System – High-accuracy GPS Mobile Measuring Equipment

Various Application Software Avaiable



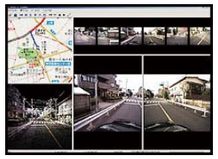
*1 Mitsubishi Electric Corp. *2 Bentley Systems, Inc. *3 Aisan Technology Co., Ltd. *4 under development

PADMS-Solid 3D Mapping Tool (Pasco Corp.)

PADMS-Solid 3D mapping software displays images in 3D by superimposing 3D laser point clouds onto images taken by the cameras. Users can directly edit geographic information system (GIS) data such as shape files and geographic databases, generate cross-sectional views of terrain and features at any position and obtain height data.

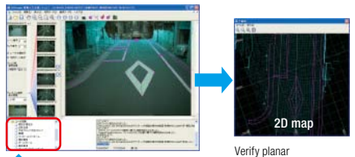
MMS-Viewer (Aisan Technology Co., Ltd.)

MMS-Viewer displays data captured by the MMS and provides a bird's-eye view of the route and color point clouds captured, enabling all longitudinal and cross-sectional data focusing on vehicle position to be viewed on a single screen.



MMS-TRACER (Aisan Technology Co., Ltd.)

Use this software to superimpose laser clouds on camera images and trace road features for converting the data from 3D to 2D maps. Other options such as automatic extraction of white lines and curbstones are offered as well.



Each layer can be set for CAD output when extracting landscape features.

Verify planar representation on screen in real time.

MMS Ortho-generator (Aisan Technology Co., Ltd.)

Use this software to create extremely precise ortho-images by performing a high-speed correction of the route image data and point cloud data captured by the MMS.

MoMoS (Wesco Co., Ltd.)

This software quickly generates triangulated irregular network (TIN) models of point clouds in real time. In a 3D model environment, MoMoS can be used to create movies, extract landscape coordinates, measure range, create cross-sectional maps, determine visual range, measure wear ruts/vertical levelness and create materials for planning and for other purposes. Optional linkage to GIS is also possible.

Main Specifications

Item		MMS-X (640, 440, 320, 220)	MMS-X320R	MMS-K320
Camera	No. mounted	Choice of 2, 3, 4 or 6	3	3
	No. of pixels	5 megapixels		
	Max. capture rate (1 camera)	10 images/sec		
Laser scanner	No. mounted	Choice of 2 or 4 standard lasers	2 standard lasers, 1 long-range/high-density laser (RIEGL VQ250)	2 standard lasers
	Mounting direction (angle setting)	CH1: Front/Down (-25°), CH2: Front/Up (25°), CH3: Rear/Up (45°), CH4: Rear/Down (-45°)	CH1: Front/Down (-25°), CH2: Front/Up (25°)	CH1: Front/Down (-25°), CH2: Front/Up (25°)
	Reflective luminescence	Can be acquired	Can be acquired	Can be acquired
	No. of acquisition points	27,100 points/sec (1 unit)	Standard: 27,100 points/sec (1 unit), Long-range/High-density: 300,000 points/sec	27,100 points/sec (1 unit)
	Range (max.)	65m	Standard: 65m, Long-range/High-density: 200m (500m)	65m
	Viewing angle (1 unit)	180°	Standard: 180°, Long-range/High-density: 360°	180°
Recording capacity	Data log	8 hr (max.)		
	Camera images	90,000 images/unit (max.)		
Absolute accuracy*1, 3		Standard lasers: Within 10cm (rms) at 7m, Long-range/High-density laser: Within 10cm at 80m (rms)*4, 5		
Relative accuracy*2, 3		Standard lasers: Within 1cm (rms), Long-range/High-density laser: Within 10cm (rms)*4, 5		
Self-positioning accuracy*3		Within 6cm (rms)		
Power consumption		12VDC, 900W or less*6	12VDC, 650W or less	12VDC, 450W or less
Compatible vehicles*7		Toyota Vanguard (320, 220) Volkswagen Golf Touran	Toyota Vanguard Volkswagen Golf Touran	Suzuki Wagon R*8 Toyota Corolla Rumion, etc.*9

*1 Absolute accuracy: Extent to which coordinate values captured during mobile measurement match actual coordinate values (Accuracy).
*2 Relative accuracy: Consistency of coordinate values captured during mobile measurement (Precision).
*3 Assuming favorable GPS reception (rms: root mean square).
*4 Driving on a level road at a constant speed of approx. 40km/h.
*5 User must calibrate before each survey.
*6 Power consumption with maximum specifications.
*7 Vehicle to be supplied by the customer.
*8 Mounting on light vehicles requires vehicle reinforcements.
*9 Vehicle reinforcements not required for standard passenger vehicles with mounted load capacity of 60kg or more.

● Specifications listed are subject to change.

Safety Precautions ●To ensure safe and correct use, please read the instruction manual carefully prior to use.

for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.

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Please visit our website for further details regarding the MMS.

www.MitsubishiElectric.co.jp/pas/mms

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Specifications are subject to change without notice.

MITSUBISHI ELECTRIC
Changes for the Better

for a greener tomorrow

Mobile Mapping System
High-accuracy GPS Mobile Measuring Equipment

No traffic control required

1/500 accuracy w/o GCP correction

Mountable on light vehicles

Registered as a New Technology Information System (NETIS, #KK-090011) with the Ministry of Land, Infrastructure, Transportation and Tourism (Japan)

Consistently Accurate Measurement

Utilizing Mitsubishi Electric's advanced position-estimation technologies developed through vast experience in systems for aviation and space and aviation

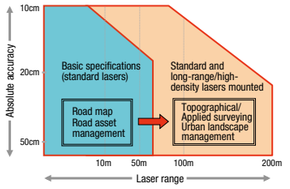
Mitsubishi Electric's Mobile Mapping System (MMS) consists of a vehicle-mounted GPS antenna, laser scanners, cameras and other equipment. This system enables the efficient acquisition of highly accurate 3D positional information such as buildings, road contours and other roadside data while driving. The MMS has diverse applications including government-related public survey projects and infrastructure maintenance and management. Additionally, it can now be mounted on light vehicles, and even easier operation has been realized by reducing space requirements inside the vehicle.

Mitsubishi Mobile Mapping System Features

Highly Accurate Measurement

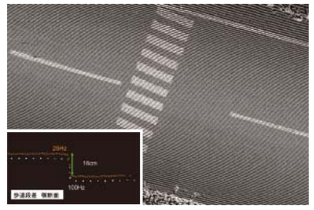
3D positional measurement with absolute accuracy to within 10cm

- A unit consisting of GPS antennas, inertial measurement unit (IMU), cameras and standard lasers is mounted on vehicle. When satellites are visible to the GPS antenna, even without ground control points (GCPs), at a distance of 7m or less, the road surface and roadside features can be measured with an absolute accuracy of 10cm or less and a relative accuracy of 1cm or less.
- Under the same conditions as stated above but equipped with a long-range/high-density laser, the MMS-X320R can survey the area within 80m of the vehicle with an absolute accuracy of 10cm or less.
- Data collection accuracy is maintained even when driving at high speeds.



* Absolute accuracy: Extent to which coordinate values captured during mobile measurement match actual coordinate values (Accuracy)
* Relative accuracy: Consistency of coordinate values captured during mobile measurement (Precision)

- The new standard laser can collect reflective luminance, and also point density can be increased, enabling the cross-sectional profile of the road to be depicted more accurately.
- Compliant with the "Manual for Creating Digital Topographical Map Data Using a Vehicle-based Mobile Measurement System (tentative name)," provided by the Geospatial Information Authority (Japan).



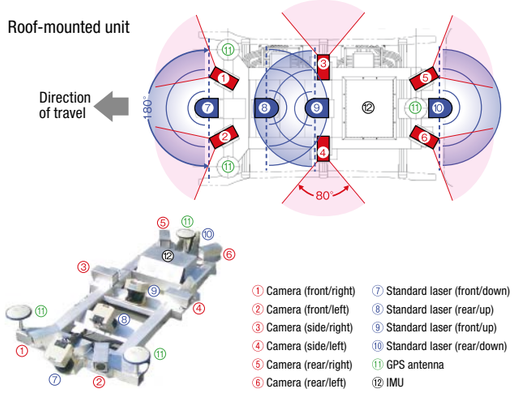
- Spherical (omnidirectional) camera can be connected/mounted.

* Point Grey Research, Inc.

Long-range/High-density Laser Point Clouds

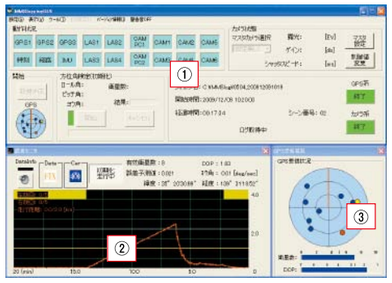
Efficient mapping by superimposing data captured using cameras and lasers

- The MMS-X640 is equipped with six high-definition, 5-megapixel cameras with wide viewing angles (horizontal: 80°, vertical: 64°) and four laser scanners to measure the road surface and roadside features. Color data from camera images can be attached to the laser point clouds captured, coloring them. In addition, special lasers such as RIEGL and Z+F are supported.



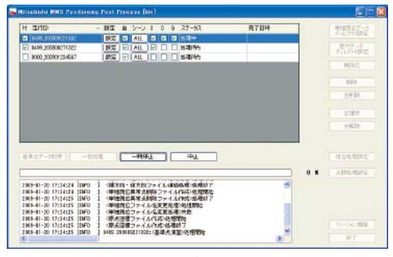
User-friendly Operation

- Precise measurements can be taken even when the vehicle is in a tunnel or driving under an overpass. If satellites are not visible to the GPS antenna, the positions of landscape features (landmarks) measured using traditional surveying methods can be used to correct errors in the coordinate values measured using the MMS.
- In addition to displaying equipment status, GPS reception and route, the estimated error is shown on the monitor in graph form, simplifying survey monitoring and helping to ensure extremely accurate operation and data capture.
- Accuracy remains consistent even when driving long distances by utilizing GPS correction (i.e., flaechen korrektur parameter [FKP] method) for surface correction parameters.
- The reference point auto switching function enables continuous measurement without having to be conscious of electronic reference points.
- Measurement data will be automatically converted into point cloud data by doing some very simple post-processing at your office.



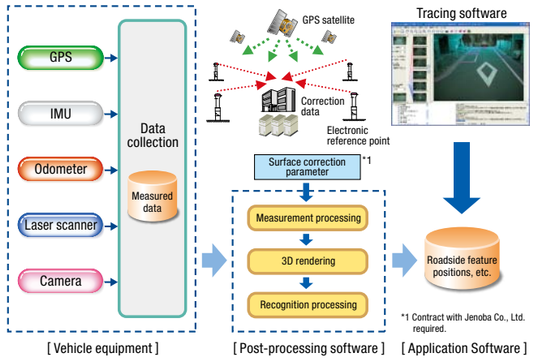
Operations screen configuration
① Main screen
② Error monitor
③ GPS reception status

Operations screen



Easy-to-use post-processing software

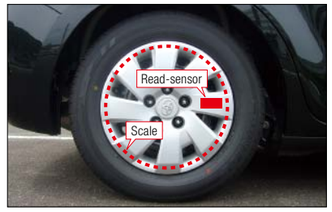
MMS data processing flow



Newly Added Features

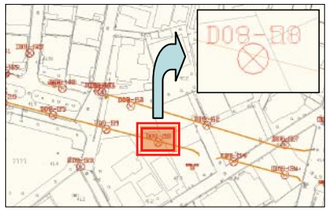
Can be operated at the front passenger's seat by touch panel and wireless keyboard

Equipment downsized: rear seat can be used

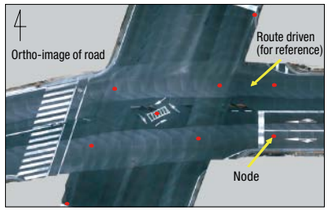


In-wheel odometer adopted: no increase in vehicle width and contact with the curbstone, etc., is avoided

Diverse Applications

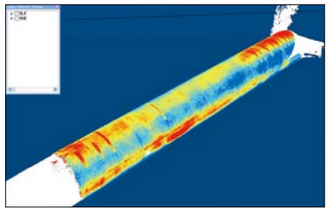


Schematics attached to road ledgers (Toyonaka, Japan)
Used to ensure map precision and accuracy by superimposing data onto the digital maps of Toyonaka City

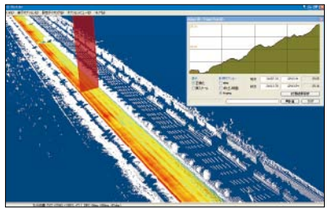


Capture road linearity data
Used to acquire road linearity data near intersections and road network data from the highly accurate ortho-images

Computer graphics processing based on real-size models
Used for creating computer graphics from actual laser point cloud data



Tunnel measurement
Used to examine and inspect tunnels

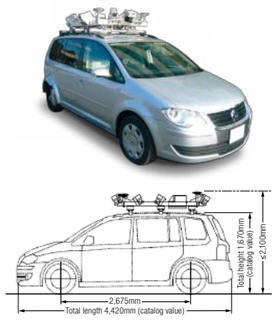


Road surface contours
Used to help ensure more precise and efficient road maintenance by measuring road slope (lateral and vertical), flatness, and size and depth of ruts and other road wear

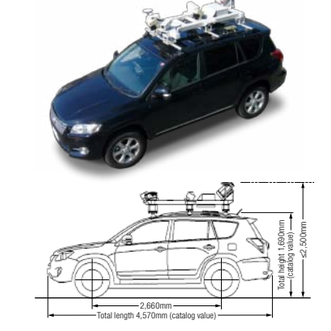
Vehicle motion simulation software
Used in vehicle design and inspections
*Carsim® is a product under the management of Virtual Mechanics Corporation.

MMS Line-up

MMS-X (640, 440, 320, 220)



MMS-X320R



MMS-K320