

GPS Speedometer

LC-8100/8200

Highly precise measurement
by GPS and IMU

Old Model
(Reference only)

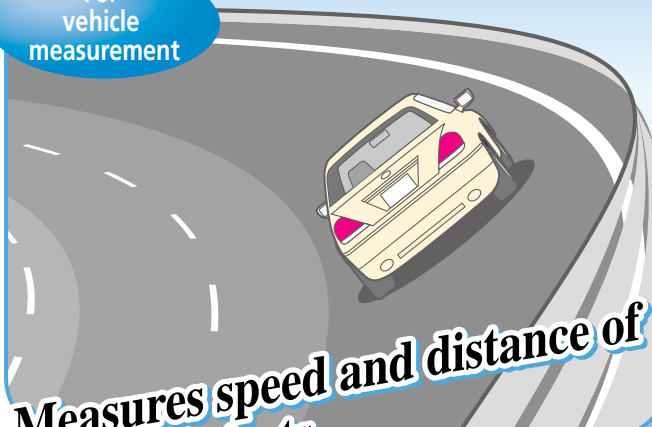


ONOSOKKI

Count on the LC-8000 series for the various measurements of vehicle !

Since 1980's, Ono Sokki's speedometers have been used in a wide variety of applications, including the accurate measurement of speed and distance of moving objects, and recording at vehicle testing field. The shift from the spatial filtering method to the GPS/IMU integration method has made it possible to achieve simple and high precision measurement as well as vehicle behavior measurement.

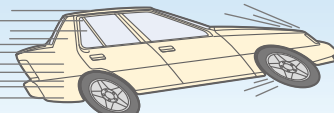
For vehicle measurement




Measures speed and distance of moving objects

For driving tests

100 m :	6.78 s
200 m :	10.12 s
400 m :	15.67 s
1000 m :	29.01 s



TIME : 12.3 s
VO : 60.0 km/h
Dist. : 78.9 m



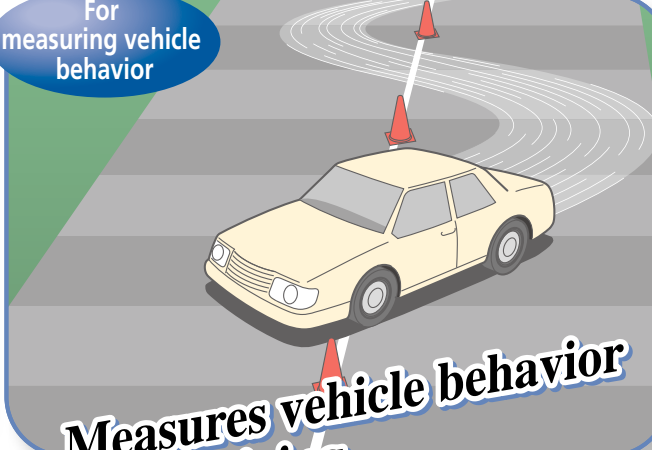
Measures various types of driving tests

For tracking paths



Verifies the vehicle paths

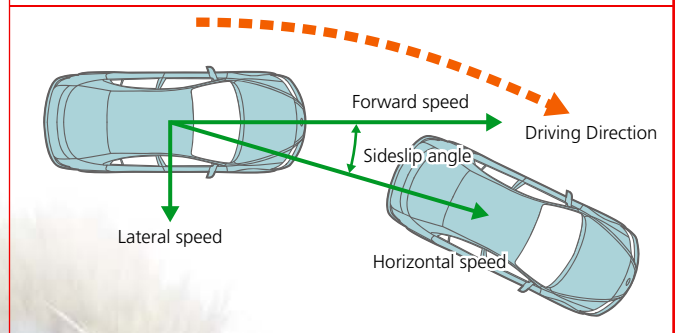
For measuring vehicle behavior



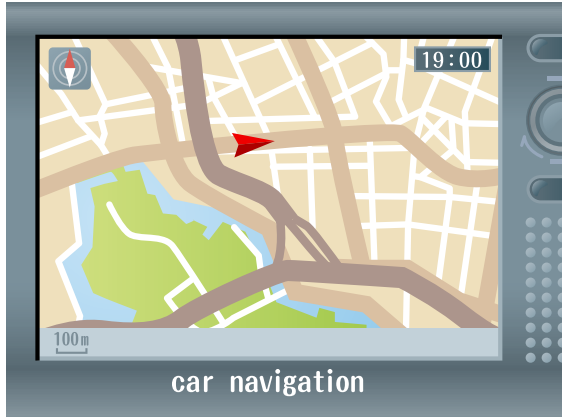
Measures vehicle behavior while driving

New Feature!

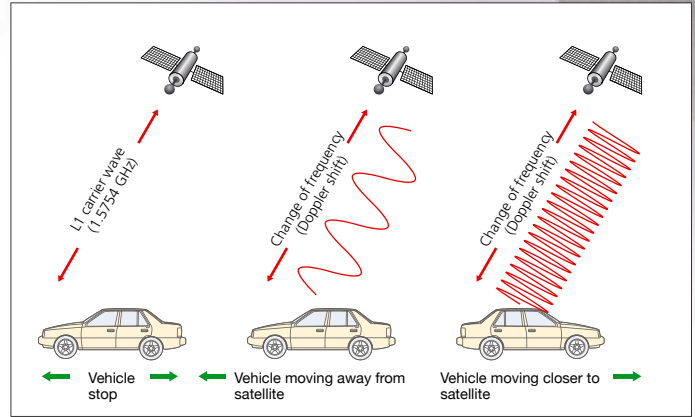
Vector speed measurement is now possible!



High accuracy Accurate speed measurement with the Doppler effect of electric waves emitted by a satellite

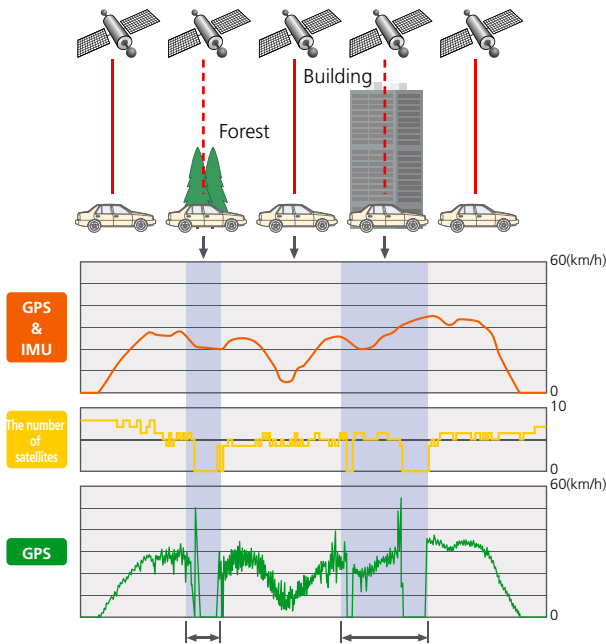


In the latitude/longitude information of the GPS, the speed and the distance are represented by rough data.

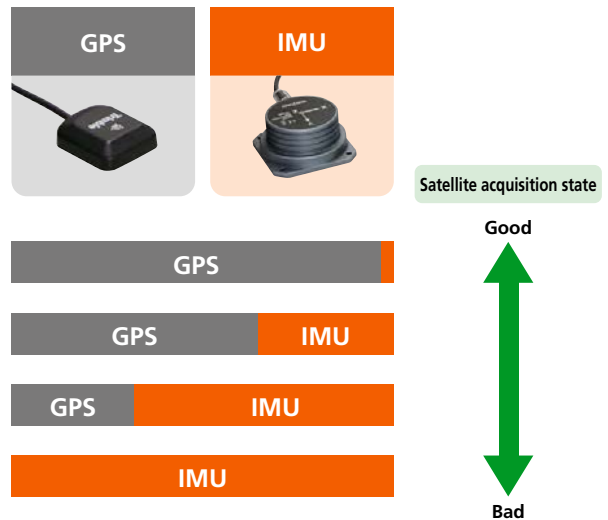


Highly accurate measurement of speed and distance are enabled by Doppler effect of electric waves.
* Recording of latitude/longitude information are also available as standard.

Stable measurement GPS and IMU achieve stable data of speed and distance.



With only the GPS, measurement cannot be performed under the shadows of trees and underneath bridges.



The IMU supports the GPS to achieve stable measurement.

Reliable calibration data Traceability system diagrams, test result reports and calibration certificates are available.

Measurement is performed with the measuring devices which meet standard of NMIJ. We can offer measurement data to be submitted to public institution.

*NMIJ : National Metrology Institute of Japan

Traceability system diagrams

National Metrology Institute of Japan (NMIJ)

↑

GPS Speedometer

Test result reports

XX Year XX month XX day

LC-8000

Temperature 20°C, Humidity 60%

Approver Taro Ono

Person in Charge Jiro Ono

Calibration certificates

To XX Co., Ltd.

I, the undersigned hereby certify that the product identified below has been calibrated based on the traceability system.

Product name : GPS Speedometer

Model name : LC-8000

Product number : XXXXXXXXX

LC-8100 GPS Speedometer

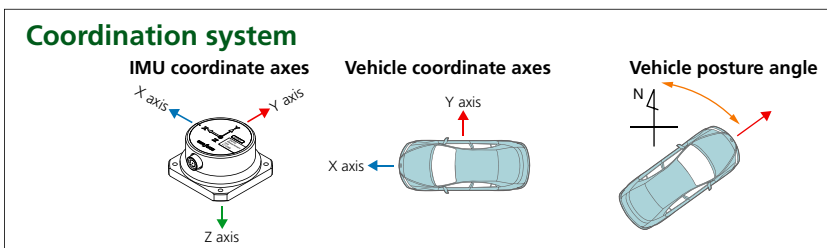
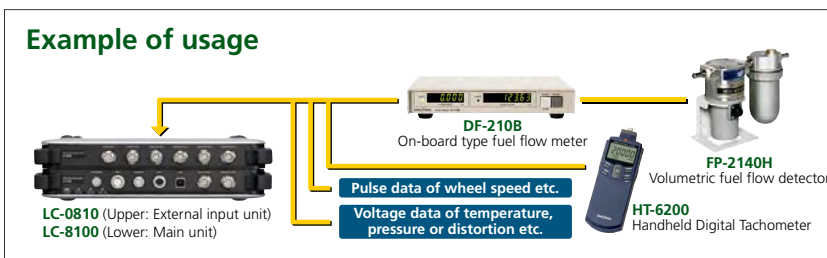
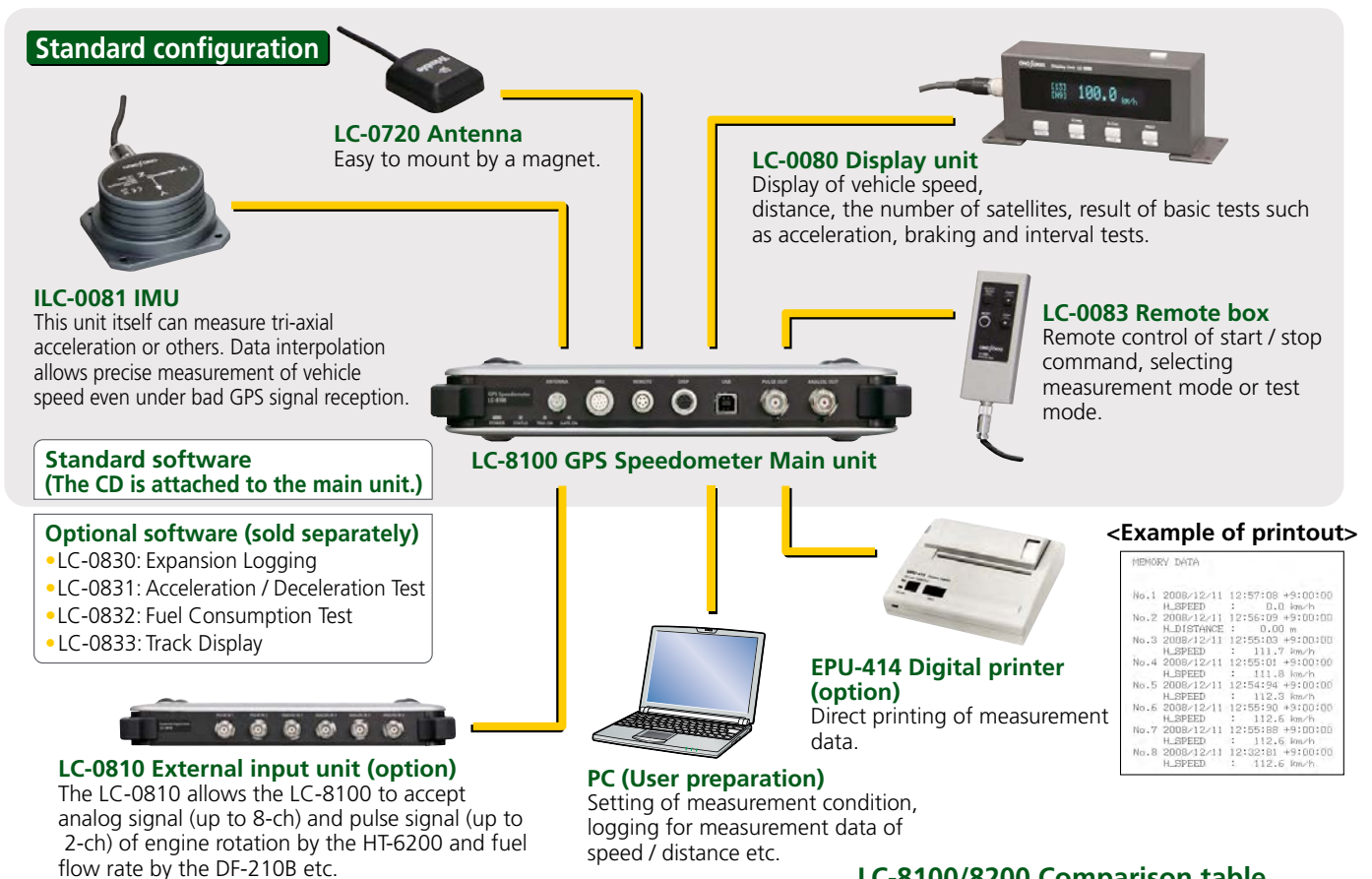
Basic model for various driving tests



Features

- The measurement is not affected by weather or road surface conditions.
- Standard GPS and IMU make stable measurement.
- Can be used for acceleration/braking test with a delay time of 5 ms or less.
- Various optional measurements by hardware; vertical direction, tri-axial acceleration, tri-axial angle etc.
- Various optional vehicle tests by software; expansion logging, acceleration/deceleration test etc.

LC-8100 series system



LC-8100/8200 Comparison table

Main items	Measurement		PC data logging	
	LC-8100	LC-8200	LC-8100	LC-8200
Horizontal speed	○	○	○	○
Horizontal distance	○	○	○	○
Forward speed	×	○*3	×	○*3
Forward distance	×	○*3	×	○*3
Lateral speed	×	○*3	×	○*3
Lateral distance	×	○*3	×	○*3
Vertical speed	△*1	○	△*5	○
Vertical distance	△*1	○	△*5	○
Slope	△*1	○	△*5	○
Number of satellites	○	○	○	○
Driving direction	○	○*4	○	○*4
Latitude	○	○	○	○
Longitude	○	○	○	○
Altitude	○	○	×	○
Sideslip angle	×	○*3	×	○*3
Yaw, pitch, roll angles	△*2	○	△*6	○
XYZ Acceleration (IMU coordinate axes)	△*2	○	△*6	○
XYZ Angular speed (IMU coordinate axes)	△*2	○	△*6	○
XYZ Acceleration (Vehicle coordinate axes)	×	○*3	×	○*3
XYZ Angular speed (Vehicle coordinate axes)	×	○*3	×	○*3
Vehicle posture angle	×	○*3	×	○*3

- : Standard △: Option ×: Not available
 *1: Available by adding the LC-0822 (Vertical direction measurement function).
 *2: Available by adding the LC-0821 (IMU data output function).
 *3: Requires two or more of antennas.
 *4: The direction of north: 0 degree
 *5: Logging is available by adding the LC-0822 (Vertical direction measurement function) and the LC-0830 series (software options).
 *6: Logging is available by adding the LC-0821 (IMU data output function) and the LC-0830 series (software options).

LC-8200 GPS Vector Speedometer

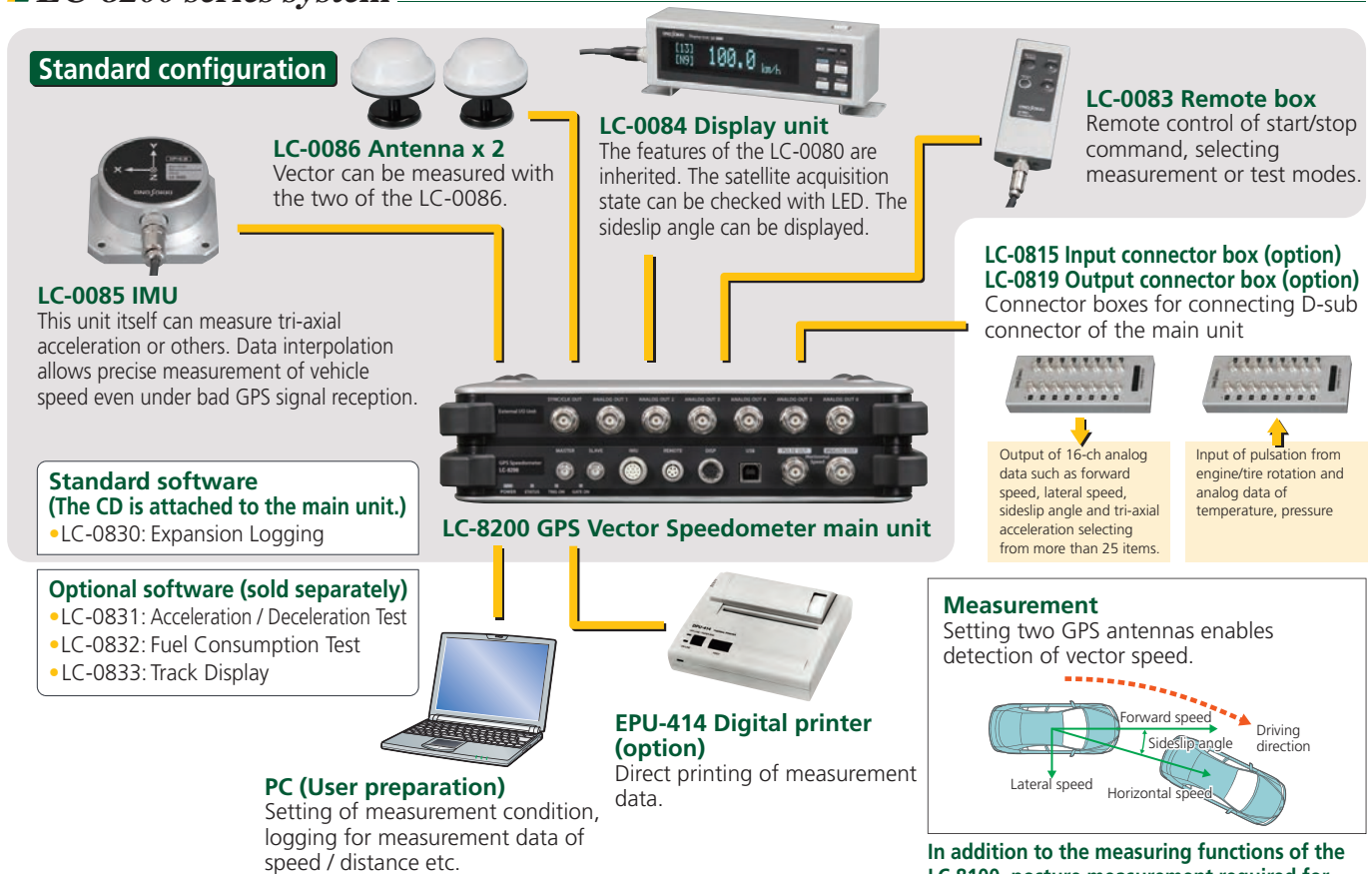
High-end model featuring the measurement of the sideslip angle and 16-ch analog output



Features

- Standard GPS and IMU make stable measurement.
- A single unit allows measurement of over 30 items such as forward speed, lateral speed, sideslip angle and moving distance.
- By selecting from acquired data, 16-channel analog data including tri-axis acceleration and gradient angle can be output.
- If a satellite is lost, it can be recognized with LED and buzzer.
- Input of 8-ch analog and 2-ch pulse are possible.
- With a variety of software options, various vehicle tests (fuel consumption test, acceleration/deceleration test etc.) and drawing of vehicle paths, can be conducted.

LC-8200 series system



Functions of LC-8100/8200

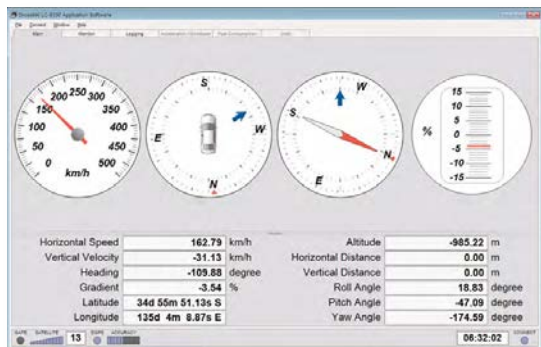
Function	Content	LC-8100	LC-8200
Function of hardware (Main unit)	Interval horizontal direction measurement (time duration, moving distance and speed data in horizontal direction from START to STOP)	○	○
	Displayed data can be stored in the memory of the main body.	○ (8 data)	○ (32 data)
	Basic starting acceleration test (arrival time to the specified distance)	○	○
	Basic braking test (MFDD, initial speed, stop time, stop distance)	○	○
	*1 Interval lateral direction measurement (maximum values of distance and sideslip angle in lateral direction from START to STOP)	—	○
	Synchronous signals can be output to an external device.	—	○
	Function to perform calibration when measuring the forward speed and the lateral speed.	—	○
	Power supply for a sensor with 12-V output function	△ (LC-0810)	○
	Interval vertical direction measurement (time duration, moving distance, speed data in vertical direction from START to STOP)	△ (LC-0822)	○
	External input	Enables signal input of analog 8-ch, pulse 2-ch.	△ (LC-0810)
CAN (Controller Area Network) output function	CAN communication enables output of speed, distance and satellite acquisition state.	△ (LC-0811)	△ (LC-0811)
	Adding the LC-0821 (IMU data output function) enables data output of angle, angular speed, acceleration.	△ (LC-0811)	△ (LC-0811)
IMU data output function *2	Adding the LC-0822 (Vertical direction measurement function) enables data output of relative height, vertical speed.	△ (LC-0811)	△ (LC-0811)
	Measures tri-axial acceleration, angle, angular speed and displays them to a display unit.	△ (LC-0821)	○
Vertical direction measurement function *2	Measures speed, distance and slope angle in vertical direction, and displays them to a display unit.	△ (LC-0822)	○
External analog output	By selecting 16-ch from the measurement items, analog output can be performed.	— *5	○

Function	Content	LC-8100	LC-8200
Function of software (Main unit)	Measurement and display of speed/distance in horizontal direction, driving direction	○	○
	Setting of GPS measurement conditions etc.	○	○
	Display and logging of horizontal speed/distance, driving direction, latitude, longitude and satellite acquisition state.	○	○
Expansion logging software	Recording of all measured data in data sampling of maximum 100 Hz.	△ (LC-0830)	○
	Logging of external input data (by LC-0810)	△ (LC-0830)	○
	Logging of IMU output data (by LC-0821)	△ (LC-0830)	○
	Logging of measurement data in vertical direction (by LC-0822)	△ (LC-0830)	○
Acceleration/deceleration test software *3	Display of elapsed time in acceleration test (0 to 400, 0 to 1000 m)	△ (LC-0831)	△ (LC-0831)
	MFDD calculation in braking test	△ (LC-0831)	△ (LC-0831)
	Display of deceleration speed/elapsed time in ABS test	△ (LC-0831)	△ (LC-0831)
Fuel consumption test software *4	Display of acceleration/braking test data in V-STEP/D-STEP/T-STEP modes	△ (LC-0831)	△ (LC-0831)
	Data output in D-STEP/T-STEP modes at "F-PATTERN" test	△ (LC-0832)	△ (LC-0832)
	Calculation and display of fuel consumption/fuel consumption rate/accumulated fuel consumption	△ (LC-0832)	△ (LC-0832)
Track display software	Enables "F-CONT" test and "F-PATTERN" test by input of the pulse signal from the DF-210B to the LC-0810.	△ (LC-0832)	△ (LC-0832)
	Display of vehicle path, measurement of minimum turning radius measurement	△ (LC-0833)	△ (LC-0833)

*1: Available when two antennas are used.
 *2: External output is possible by CAN output function or Expansion logging function.
 *3: The same function as the power performance test system in the previous models (LC-5200/5200).
 *4: The same function as the fuel consumption performance test system in the previous models (LC-5100/5200).
 *5: Only the speed in horizontal direction is output.

Versatile PC software support data recording and various types of driving tests.

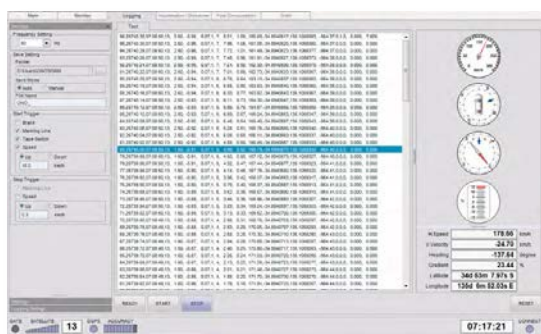
Standard software Software provided as standard with the LC-8100/8200



Easy to read meter display on the main screen

Elapsed Time	26156.59 s	VDOP	-2.47
HDOP	3.50	GPS V Velocity Quality	-0.19 km/h ms
GPS H Speed Quality	-0.09 km/h ms	Horizontal Distance	1.09 m
Vertical Velocity	27.78 km/h	Vertical Distance	2.32 m
North Velocity	-27.67 km/h	East Velocity	39.72 km/h
Lateral Velocity	3.61 km/h	Side Slip Angle	0.07 degree
Lateral Distance	0.00 m	Heading	126.38 degree
Gradient	26.46 %	Roll Angle	21.66 degree
Pitch Angle	54.16 degree	Yaw Angle	-132.82 degree
Latitude	34d 55m 13.65s S	Longitude	135d 6m 46.35s E
Altitude	-922.74 m	X Angular Rate	108.32 deg/s
X Acceleration	-7.084 m/s ²	Y Angular Rate	-72.21 deg/s
Y Acceleration	7.084 m/s ²	Z Angular Rate	-108.32 deg/s
Z Acceleration	-7.084 m/s ²	Analog Input CH1	0
Analog Input CH1	0	Analog Input CH2	0
Analog Input CH3	0	Analog Input CH4	0
Analog Input CH5	0	Analog Input CH6	0
Analog Input CH7	0	Analog Input CH8	0
Pulse Input CH1	0	Pulse Input CH2	0

Screen can be switched with Tab. All measured values can be seen at the screen.



Logging of speed, distance, number of satellites, longitude and latitude on the logging screen.

<Example of logging data>

[Header information]

Model name	LC-8100
Version	1.2.2.1
Application	LOGGING
SAMPLINGS	100
DATE	2011/7/26
TIME	17:01:36

Logging updating cycle: 3
Logging day and hour: 3
Logging time: 3
Information of an external input unit: 3
Measurement item: 3
Unit: 3
Measurement data: 3

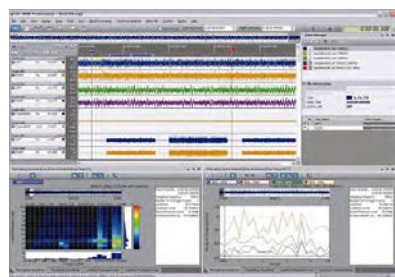
ITEM NAME	Elapsed Time	UTL Time	DGPS	Satellite	N/HDOP	VDOP	GPS H Speed	Altitude	S
1	1042.28	8.3230	1	4	0	11.42	0.09	5	
2	1042.29	8.3230	1	4	0	11.42	0.09	5	
3	1042.3	8.3230	1	4	0	11.42	0.09	5	

[Logging data]

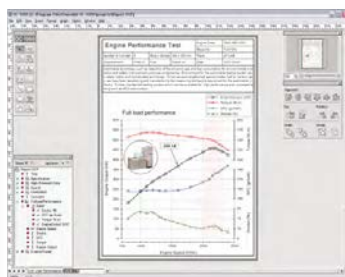
416	15276.66	413.69	1	13	3.5	2.23	-0.04	1	
417	15280.0	413.69	1	13	3.5	2.23	-0.04	1	
418	15280.01	413.59	1	13	3.5	2.23	-0.04	1	
419	15280.02	413.59	1	13	3.5	2.23	-0.04	1	

LOGDATA END

OS-2000 series



OC-1300 series



Secondary processing /analysis of logging data

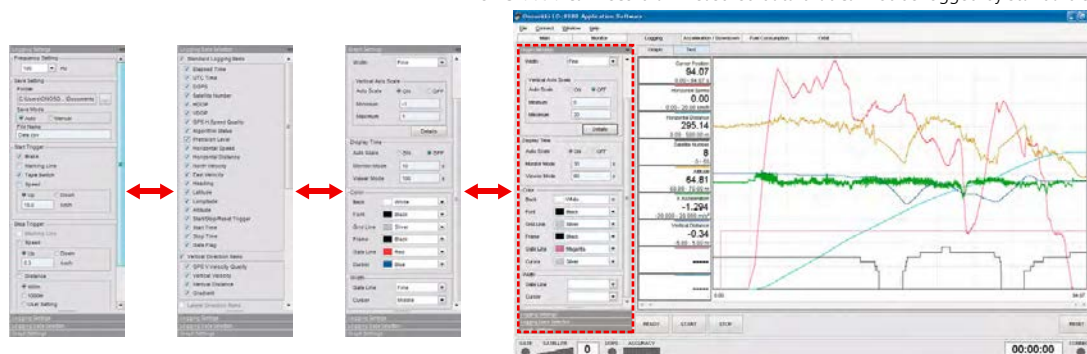
Logging data is output as CSV format. The OS-2000 series and the OC-1300 series (by Ono Sokki) are useful for data processing/analysis. (sold separately)

- Data logging is possible with standard software
- Speed and distance in horizontal direction, driving direction, latitude, longitude, satellite acquisition state

LC-0830 Expansion logging software Can be recorded all data measured by the LC-8000 series.

*Provided as standard with the LC-8200

The LC-0830 can record all measured data that cannot be logged by standard software.

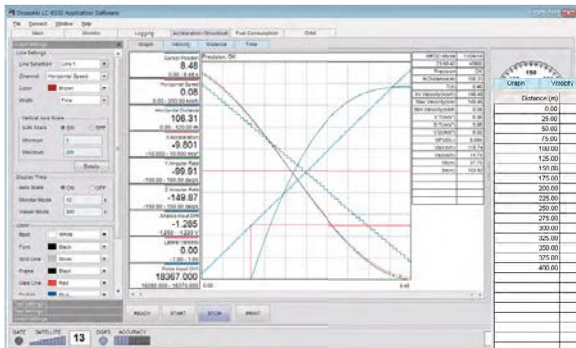


Set up by switching the left plane of the screen. Automatic or manual data saving can be selected. (In automatic save, the date and time is used as the file name.)

LC-0831 Acceleration/deceleration test software

Supports various vehicle tests

- Display of elapsed time in acceleration test (0 to 400 m / 0 to 1000m)
- MFDD calculation in braking test
- Display of deceleration speed/ elapsed time in ABS test
- Measurement of elapsed time in coasting test



Origin	Velocity	Distance	Time	ACC	MFDD
0.00	0.00	0.00	0.00	0.00	0.00
25.00	81.98	5.18	5.18	2.96	103.24
50.00	98.11	6.29	1.11	8.82	198.90
75.00	122.89	7.50	0.81	3.82	6.03
100.00	144.43	7.79	0.89	3.27	
125.00	159.29	8.37	0.59	7.46	
150.00	172.61	8.88	0.54	6.56	
175.00	182.17	9.42	0.51	5.52	
200.00	189.81	9.81	0.63	4.47	
225.00	195.50	10.37	0.48	5.24	
250.00	198.87	10.83	0.46	2.94	
275.00	199.88	11.28	0.45	0.81	
300.00	199.29	11.73	0.45	-0.42	
325.00	196.82	12.19	0.46	-1.85	
350.00	191.76	12.65	0.47	-2.66	
375.00	184.77	13.11	0.46	-4.86	
400.00	175.43	13.63	0.48	-3.58	

MFDD Mode	11/04/14
23:59:42	+0900
Precision	OK
H.Distance(m)	106.31
T(s)	6.48
Ini.Velocity(km/h)	148.48
Max.Velocity(km/h)	148.48
Min.Velocity(km/h)	0.08
V-T(m/s ²)	6.36
D-T(m/s ²)	5.06
V-D(m/s ²)	8.00
MFDD(-)	8.094
Vb(km/h)	118.74
Ve(km/h)	14.74
Sb(m)	37.75
Se(m)	103.92

← Braking distance
← Braking time
← Initial speed of braking

← Average saturated deceleration speed

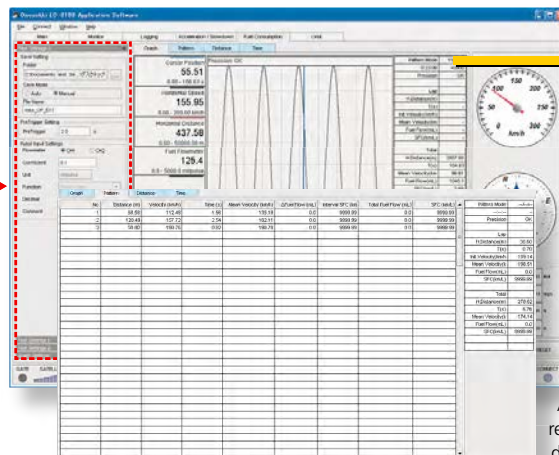
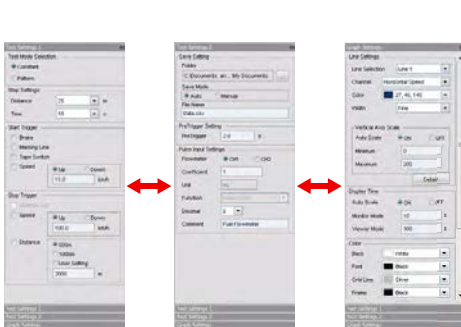
After the test is finished, the test result and the calculation result are displayed in the upper right report.

It can display and record the speed base report, the distance base report, and the time base report using the Tab key.

LC-0832 Fuel consumption test software

Executes fuel measurement using the pulses of the fuel flow meter.

- Supports "F-CONST*1" test and "F-PATTERN*1" test by input of the pulse signal from the DF-210B to the LC-0810. (The same performance tests as the previous model LC-5200 can be performed.)
- Calculation and display of fuel consumption, fuel consumption rate, and accumulated fuel consumption.
- Data output in D-STEP/T-STEP modes*2.



Constant Mode	11/05/09
6:00:34	+0900
Precision	OK
Total	
H.Distance(m)	1000.00
Time(s)	80.44
Ini.Velocity(km/h)	55.32
Mean Velocity(km/h)	59.57
Fuel Flow(mL)	72.5
Fuel Economy(k)	13.73

← Moving distance
← Elapsed time
← Initial speed

← Fuel consumption
← Fuel consumption rate

After the test is finished, the test result and the calculation result are displayed in the upper right report.

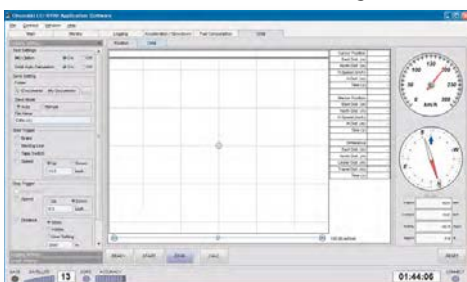
It can display and record the distance base report, the time base report and pattern report using the Tab key.

*1: F-CONST shows the other data series (speed, distance) based on fuel flow.
F-PATTERN is multi-measurement driving mode which measures driving data from START trigger to the next trigger.
*2: D-STEP shows V (velocity) and T (time) series data on the bases of D (distance).
T-STEP shows V (velocity) and D (distance) series data on the bases of T (time).

LC-0833 Track display software

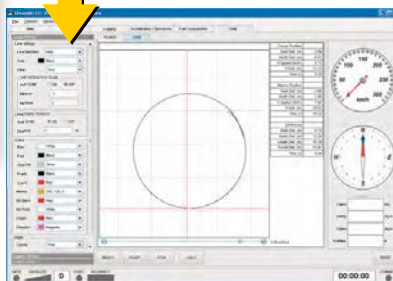
Tracking paths you have driven in direction and moving distance

- Display of vehicle path
- Can be used for measurement of vehicle path in braking test
- Can be used for the minimum turning radius measurement

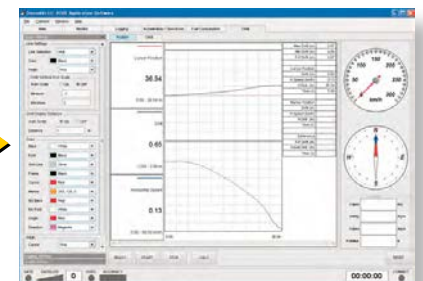


Setting the screen information as the north, the vehicle path is plotted.

The minimum turning radius can be measured easily.



After measurement is finished, vehicle path and speed are displayed separately in the upper and lower of the screen, and the amount of drift can be measured.



Specification

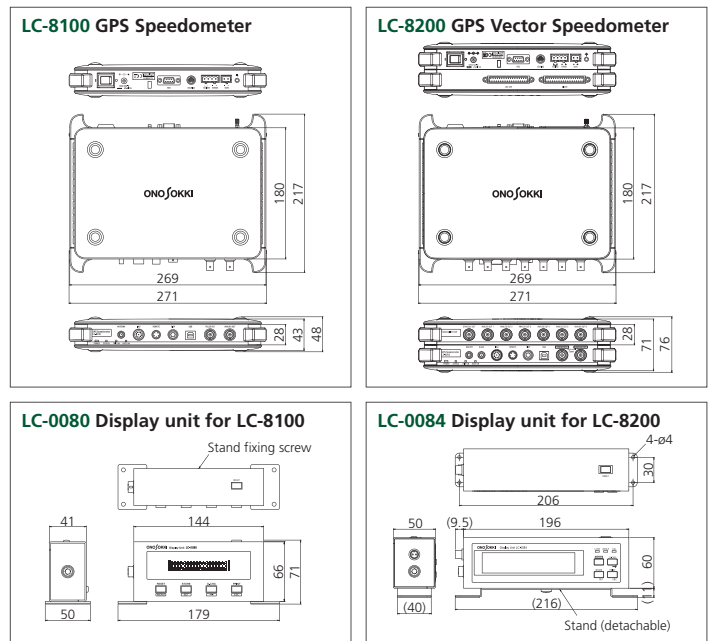
		LC-8100 GPS Speedometer	LC-8200 GPS Vector speedometer
Horizontal speed	Measurement range	0.1 to 500.0 km/h	
	Accuracy	±0.1 km/h*1	
Horizontal distance	Accuracy	±0.05 %*2	
	Measurement range	—	
Forward speed	Measurement range	—500.0 to 500.0 km/h	
	Accuracy	±0.2 km/h*3	
Forward distance	Accuracy	±0.10 %*4	
	Measurement range	—	
Lateral speed	Measurement range	—20.0 to 20.0 m/s	
	Accuracy	±0.08 m/s*5	
Lateral distance	Accuracy	±0.15 %*6	
	Measurement range	—	
Sideslip angle	Measurement range	—25.0 to +25.0°	
	Reference accuracy	0.15° RMS*7	
Yaw angle	Measurement range	—180.0 to +180.0°	
	Reference accuracy	±0.1° RMS*8	
Posture angle	Measurement range	—180.0 to +180.0°	
	Reference accuracy	±0.1° RMS*8	
X,Y,Z acceleration*9	Measurement range	—98.0 to 98.0 m/s ²	
	Linearity	±0.2 % / FS (reference accuracy)	
X,Y,Z angle speed*9	Measurement range	—150.0 to 150.0°/s	
	Accuracy	±0.1 % / FS (reference accuracy)	
Analog (speed) output section	Voltage range	0 to 10 V / 0 to 500 km/h	
	Linearity	±0.2 % / FS	
Pulse (distance) output section	Resolution	1.5, 10 mm/P selectable	
	Level	TTL	
User specified analog output	Item	—	
	Output voltage	—	
External synchronous output	Output level	—	
	Output frequency	—	
Analog input	— (Available by the LC-0810)	—	
	— (Available by the LC-0810)	—	
Power source output	— (Available by the LC-0810)	—	
	— (Available by the LC-0810)	—	
External trigger input/output	Input: start / stop signal (non-voltage contact, voltage contact)	—	
	PC interface	—	
General specification	Power requirement	DC 9 to 32 V / AC 100 to 240 V (use of the AC adapter: option)	
	Power consumption	30 VA or less	
Storage temperature range	Operating temperature range	0 to 50 °C	
	Storage temperature range	—10 to 60 °C	
Accessories	Antenna (LC-0720), Display unit (LC-0080), Remote box (LC-0083), IMU (LC-0081) and each connection cable, DC power cable, USB cable, BNC-BNC cable, CD-ROM of standard software, phoenix connector, IMU bracket	Antenna x 2 (LC-0086), Display unit (LC-0084), Remote box (LC-0083), IMU (LC-0085) and each connection cable, DC power cable, USB cable, CD-ROM, Antenna & IMU bracket, Expansion logging software (LC-0830)	
	Outer dimensions (weight)	—	
Remote box	Model name	LC-0083	
	Function	—	
Display unit	Model name	LC-0080 LC-0084	
	Display method	—	
IMU	Model name	LC-0081 LC-0085	
	Acceleration	—	
Cable	Protection class	—	
	Outer dimensions (weight)	—	
External input unit	Model name	LC-0810 (option)	
	Analog input	—	
CAN output	Model name	LC-0811 (option)	
	Standard	—	
Accessory	Standard	—	
	Data	—	

		LC-8100 GPS Speedometer	LC-8200 GPS vector speedometer
Antenna	Model name	LC-0720 LC-0086	
	Cable length	—	
Connector box	Input	—	
	Output	—	
Others	Options	—	
	Recommended PC operation environment	—	

- *1: The described value is the accuracy with 30 km/h or more of horizontal speed, and 7 or more of satellite acquisitions. 30 km/h or less of horizontal speed and 7 or more of satellite acquisitions: 0.3 km/h or less. 7 or less of satellite acquisitions without multipath: 0.6 km/h.
- *2: The described value is the accuracy when it is measured at distance of 300 m, horizontal speed of 30 km/h or more, and 7 or more of satellite acquisitions. 300 m of measurement distance, 30 km/h or less of horizontal speed, 7 or more of satellite acquisitions: ±0.3 % 7 or less of satellite acquisitions without multipath: ±0.5 %
- *3: The described value is the accuracy with 7 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 100 km/h. 4 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 100 km/h: ±0.8 km/h
- *4: The described value is the accuracy with 7 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 100 km/h. 4 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 100 km/h: ±0.70 %
- *5: The described value is the accuracy with 7 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 100 km/h. 4 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 100 km/h: ±0.20 m/s
- *6: The described value is the accuracy with 7 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 100 km/h. 4 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 100 km/h: ±0.65 %
- *7: The described value is the accuracy with 7 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 30 km/h or more. 4 or more satellite acquisitions when the distance between antennas is 2 m and the horizontal speed is 30 km/h or more: 0.30° RMS
- *8: The described value is the accuracy with 7 or more satellite acquisitions when the distance between antennas is 2 m. 4 or more satellite acquisitions when the distance between antennas is 2 m: ±0.2° RMS
- *9: LC-8100: Optional function LC-8200: Function provided as standard
- *10: LC-8100: Optional function LC-8200: Function provided as standard

Outer Dimensions

(Unit : mm)



Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries. Other product names and model names are trademarks or registered trademarks of each individual company. The copyrights are reserved by each individual company.

WORLDWIDE ONO SOKKI CO., LTD.

1-16-1 Hakusan, Midori-ku, Yokohama, 226-8507, Japan
 Phone : +81-45-935-3918 Fax : +81-45-930-1808
 E-mail : overseas@onosokki.co.jp

* Outer appearance and specifications are subject to change without prior notice.

URL: <http://www.onosokki.co.jp/English/english.htm>

U.S.A
 Ono Sokki Technology Inc.
 2171 Executive Drive, Suite 400
 Addison, IL. 60101 U.S.A
 Phone : +1-630-627-9700
 Fax : +1-630-627-0004
 E-mail : info@onosokki.net
<http://www.onosokki.net>

P.R.CHINA
 Ono Sokki Beijing Office
 Beijing Jing Guang Center 3510
 Hu Jia Lou, Chao Yang Qu
 Beijing 100020, P.R.China
 Phone : +86-10-6597-3113
 Fax : +86-10-6597-3114
 E-mail : onosokki@bnn.cn

THAILAND
 Ono Sokki (Thailand) Co., Ltd.
 29/67 Moo 5 Tivanon Road, Pakkred,
 Nonthaburi 11120, Thailand
 Phone : +66-2-964-3884
 Fax : +66-2-964-3887
 E-mail : osth_sales@onosokki.co.jp

INDIA
 Ono Sokki India Private Ltd.
 Unit No. 4B, Ground Floor, Tower-A, Spazedge,
 Sector47, Gurgaon-Sohna Expressway, Gurgaon,
 Haryana-122002, INDIA
 Phone : +91-124-421-1807
 Fax : +91-124-421-1809
 E-mail : osid@onosokki.co.in