



SURFACE VEHICLE RECOMMENDED PRACTICE	J2976™	MAY2022
	Issued	2016-02
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Superseding J2976 FEB2016		
Speedometer and Odometer Systems for On-Highway Vehicles		

RATIONALE

SAE J2976 has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

This recommended practice is intended to provide industry technical personnel with an overview of vehicle speedometer system accuracy and offset requirements and odometer system accuracy requirements. Speedometer and odometer systems covered by this document are integrated into a vehicle's electrical and electronics system, assembled directly into the vehicle by the OEM, and use rotational data from at least one vehicle wheel that is appropriately converted into longitudinal vehicle speed and distance traveled information. This standard is limited to radial ply tires on new (as manufactured) cars, light trucks, and medium duty trucks. Other methods for measuring vehicle speed and distance traveled may be used provided they meet the performance recommendations herein. Any local market regulatory requirements must be met and shall supersede this document. Service parts are beyond the scope of this recommended practice.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1059	Speedometer Test Procedure
SAE J1226	Electric Speedometer Specification - On Road
SAE J678	Speedometers and Tachometers - Automotive
SAE J862	Factors Affecting Accuracy of Mechanically Driven Automotive Speedometer-Odometers
SAE J966	Test Procedure for Measuring Passenger Car Tire Revolutions Per Mile
SAE J1025	Test Procedures for Measuring Truck Tire Revolutions Per Kilometer/Mile

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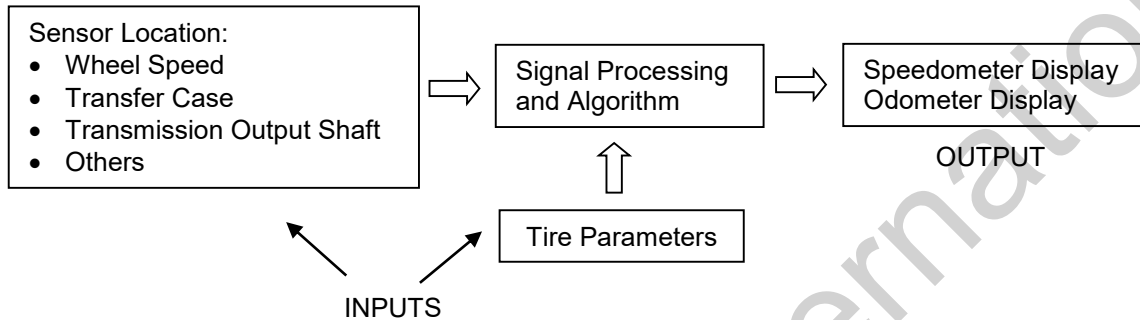
For more information on this standard, visit
https://www.sae.org/standards/content/J2976_202205/

3. VEHICLE SPEEDOMETER AND ODOMETER SYSTEM

3.1 Types of Speedometer and Odometer Systems

Most current speedometer and odometer systems use sensor data based on tire rotation. This parameter is related to distance and time, and is converted into vehicle speed.

3.2 Tire Rotation Sensor Based System – Block Diagram



Passenger car tire parameters shall be measured using the procedure outlined in SAE J966. Truck tire parameters shall be measured using the procedure outlined in SAE J1025.

4. ACCURACY

4.1 Sources of Inaccuracy

Tire revolutions per mile are subject to variations described in SAE J966 and SAE J1025. Inaccuracies due to electronic sensor tolerance and signal processing are negligible compared to tire parameter variation.

4.2 Recommended Tolerance

By using tire and vehicle performance tests described in SAE J966 and SAE J1025, which account for sources of speedometer and odometer system component variability and tolerance stack-up, combined with customer expectations (i.e., potential for complaints due to comparison to 3rd party GPS units), speedometer and odometer systems in a new vehicle can be evaluated in a repeatable and accurate way. This is done as follows. In a new vehicle equipped with new, OEM-specified tires (tire size, rim size, and tire inflation pressure), complete the warm-up procedures described in SAE J966 or SAE J1025, as applicable. After warm-up, verify that tire inflation pressures are consistent with OEM specified values. If they are not, adjust the pressure of each tire as needed and proceed with the appropriate vehicle test. Note that for speedometer and odometer system evaluation, tire pressures specified in SAE J966 and SAE J1025 are superseded by OEM specified values.

The recommended relationship between the speedometer calculated speed (V_C) and the actual vehicle speed (V_A) shall be $0.99V_A \leq V_C \leq 1.04V_A$ at the test points specified in SAE J966 for passenger cars (i.e., 25 mph, 45 mph, and 65 mph) and SAE J1025 for trucks (i.e., 45 mph). Note: V_C is the calculated vehicle speed that is sent to the speedometer display and does not include, for example, speedometer pointer display error introduced by stepper motor position variation. The recommended odometer tolerance shall be within +/- 2.5% of actual distance traveled. These recommendations are valid unless regulatory requirements in a particular market specify otherwise.

5. OTHER CONSIDERATIONS

5.1 Tamper Resistance

Odometer indication and calibration shall be highly tamper resistant such that changes can be performed only by an OEM authorized service technician or by someone that would be defined as a hacker.

5.2 Vehicle maximum speed shall be less than or equal to the maximum speedometer display speed.

5.3 The Odometer should be capable of displaying a numeric value of 999,999 kilometers or miles, depending on the market.

6. SPEEDOMETER / ODOMETER SYSTEM TEST PROCEDURES

Vehicle manufacturers shall determine a nominal system configuration from which the speedometer and odometer system performances can be validated, subject to the tolerances specified herein. Dynamic tire parameters should be measured using an SAE recommended practice.

7. NOTES

7.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY THE SAE ODOMETER AND SPEEDOMETER SYSTEMS STANDARDS COMMITTEE