



SURFACE VEHICLE STANDARD

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Truth-in-Labeling Standard for Navigation Map Databases

RATIONALE

This technical report is being stabilized because it covers technology, products, or processes for which technical expertise no longer resides in the owning committee.

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Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

This SAE Standard defines consistent terminology, metrics, and tests for describing the content and quality of navigable map databases. This standard will allow users to determine whether a given map database meets the needs for their application. (A truth-in-labeling standard does NOT specify the physical format of the database or minimum performance standards.)

The focus of this document is to support the navigation applications that automotive manufacturers and suppliers are currently developing for marketplace delivery. While the focus is on in-vehicle navigation applications for motor vehicles, the document will be applicable to other ITS traveler applications using digital maps. The primary audience for this document is systems developers of passenger vehicle navigation products.

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1. Scope—This SAE Standard is a truth-in-labeling standard for map databases.

2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein.

2.1.1 ANSI/ASQC PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI/ASQC Z1.4 1981—ANSI Standard for Quality Testing

2.1.2 NORTH AMERICAN DATUM PUBLICATIONS—Available from U.S. Geological Survey, Box 25046, Building 810, Denver Federal Center, MS 504, Denver, CO 80225-0046.

North American Datum 1927—National Geodetic Survey

North American Datum 1983—National Geodetic Survey

- 2.1.3 **WORLD GEODETIC SYSTEM DOCUMENT**—Available from U.S. Geological Survey, Box 25046, Building 810, Denver Federal Center, MS 504, Denver, CO 08225-0046.

World Geodetic System 1984—An internationally standardized coordinate system

3. **Definitions**

- 3.1 **Motor Vehicle**—In this version of the document, the term motor vehicle is restricted to include only privately owned vehicles designed primarily for use on U.S. roads. It includes cars, light trucks, vans, and sport utility vehicles that are not towing anything that would restrict the use of the vehicle.
- 3.2 **Digital Map Database**—A two-dimensional complex in which geographic and roadway network features are projected onto an ellipsoid. For this document, the database supplier must state the coordinate system used. The supplier must state the original coordinate system used when taking measurements and the method of translating from the original coordinate system to the coordinate system used. For example: "Nodes were measured in NAD 27 and converted to NAD 83 by algorithm A." The algorithm must be provided.

4. **Commercial Disclosure Statement**—All databases offered under this standard will contain the following Commercial Disclosure Statement:

"This map database is intended to support in-vehicle navigation applications. The information contained in the database is not intended to replace or supersede human judgment or reason, and should be considered only as an informational aid in decision making.

This map database is accompanied by a vendor-supplied statement of accuracy, completeness, and currentness of key components of the database in conformance with SAE J1663. This vendor statement was validated and certified by a testing institute of the Society of Automotive Engineers (SAE).

This certification does not guarantee that the map database is accurate in all respects, but simply that the vendor's claims for database accuracy, completeness, and currentness are accurate at a ____ %¹ confidence level as of the date specified under currentness. The user should be aware that changes may have occurred to the street and roadway system, or to other real-world entities covered in the map database, since the map database certification was performed."

5. **Structure of this Document**—The document consists of definitions and detailed descriptions of the map database attributes to be included by the vendor in its statement, followed by metrics and tests for each kind of object or characteristic.

Digital map databases contain information on nodes, links, regions, and points of interest (collectively: "objects"). For each such object and characteristic, the document will include:

- a. Name and Definition
- b. Metrics
- c. Test

- 5.1 **Name and Definition**—Definitions attempt to precisely and unambiguously describe the entity in question. To the extent possible, the names were chosen to evoke the industry's (and the public's) intuitive understanding of the concept.

1. This percentage will be established by the Testing Institute.

5.2 Metrics—A metric is a scale against which an object or characteristic is evaluated. Multiple metrics may apply to an object or characteristic, since:

- a. Different applications may require different metrics
- b. A particular application may require more than one metric (e.g., quality of an individual instance plus percentage of instances in a database which are of this quality)

For each object or characteristic, one or more base metrics are defined.

5.3 Testing Mechanism—A testing mechanism is used to score an object or characteristic against an applicable metric. Tests are designed to be:

- a. Feasible (practical with respect to procedure and cost)
- b. Replicable
- c. Independent of the data sources used to build a database, whenever feasible

6. Coverage—Coverage will be specified for each attribute. Vendors shall state coverage for a particular map database in the U.S. as a collection of county/state pairs, and in Canada as a collection of census division/province pairs. If some additional portion of a county is included in the coverage, the criteria for such inclusion and the geographic description of the included part shall be stated clearly.

6.1 Geopolitical Areas

6.1.1 STATES—States are the major political divisions of the United States. Additionally, there are "state equivalents" such as the District of Columbia and the outlying possessions of Guam and American Samoa, the Commonwealth of Puerto Rico, and the Territory of the U.S. Virgin Islands. Provinces are the major political divisions of Canada.

6.1.2 COUNTIES—Counties are the basic political divisions of the states. Their boundaries are defined by their respective state governments. All states have counties with the exception of Alaska where the Census Bureau created county equivalents called "Census Areas" and "Boroughs." In Louisiana, counties are called "parishes." There are county equivalents called "Independent Cities" which are cities politically independent of any county. Baltimore, MD; St. Louis, MO; and Carson City, NV are independent cities as are 41 cities in Virginia.

In Canada, Census Division is the generic term for the basic political divisions of the provinces except for Newfoundland, Manitoba, Saskatchewan, and Alberta, where it applies to equivalent statistical areas created by Statistics Canada. Where the Census Divisions are political entities, their names vary from province to province. They are called counties in Prince Edward Island, Nova Scotia, and parts of Ontario. In the rest of the provinces they may be called regional districts, regional municipalities, and at least 5 other names. The lack of consistency for this type of area may make it difficult, if not impossible to select Census Divisions as a measurement area for many parts of Canada.

7. Currentness—Currentness of any database attribute shall refer to the most recent date on which the database supplier has determined the attribute is accurate to a specified level.

Any database will have a number of currentness dates in month/year format corresponding to various attributes.

The suppliers' Statement of Currentness shall have a format similar to the example in Figure 1:

Database: Named Coverage Area (coverage area as defined by the vendor)

Road geometry meets stated accuracy and completeness as of January, 1993
Turn restrictions meet stated accuracy and completeness as of December, 1992

•
•
•

Highway Names meet stated accuracy and completeness as of October, 1992

FIGURE 1—EXAMPLE OF SUPPLIERS' STATEMENT OF CURRENTNESS FORMAT

8. Applications—This document focuses on attributes needed for motor vehicle navigation applications:

- a. Address Location—Translating a user-oriented place specification (e.g., street address, intersection, vanity address, named place) to a specific object such as a node or link in the database
- b. Route Determination—Calculating a legal driving route between two specified places
- c. Route Guidance—Delivering real-time driving directions to the driver, based on a determined route and vehicle position/speed
- d. Vehicle Positioning—Determining where the vehicle is in relation to map elements (e.g., via Map Matching, GPS)
- e. Display—Visually presenting information from the database to the user

9. Nodes and Junctions

9.1 Definition—A node (0-cell) is a topologically significant point, such as a simple intersection of roadways or other linear features, or an endpoint of such a feature. A junction is a collection of more than one node that represents a logical feature, such as a complex intersection.

Node location is based on position as defined by centerline data.

- a. The centerline of a roadway is the center of the predominant width of the physical pavement (or other surface), ignoring such local aberrations as turn-lane cutouts, shoulders, etc.
- b. For roads with center medians, vendors will state their criteria for representing single or multiple center lines and nodes.
- c. The endpoint of a road is where its centerline ends (either in a "dead end" or by intersecting in a "T" shape with another centerline roadway).

9.2 Types of Nodes and Junctions

9.2.1 ROADWAY NODES AND JUNCTIONS—Result from the intersection of roadways.

- a. An intersection is the meeting point of the centerlines of the intersecting roadways.
 1. A simple intersection is an intersection (without offsets) of two roadways (without center medians), which can be represented by one node (see Figure 2).

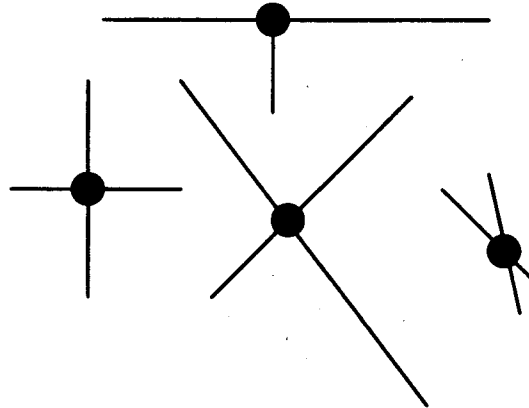


FIGURE 2—SOME SIMPLE INTERSECTIONS

2. A complex intersection is any intersection that is not simple. Some examples of complex intersections are the intersection of roadways involving offsets, central medians or some combination of offsets and central medians which can generate multiple nodes depending on the representation used by the vendor. (See Figure 3.) The vendor shall state its policy for identifying and classifying complex intersections.

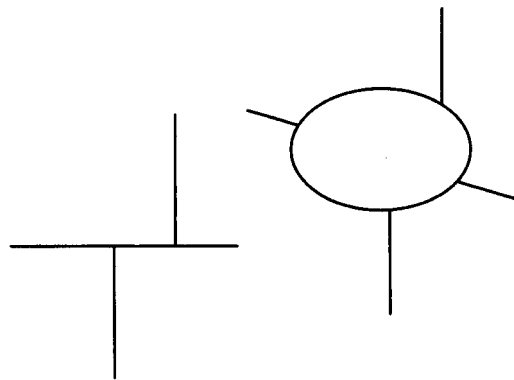


FIGURE 3—SOME COMPLEX INTERSECTIONS

- 9.2.2 ROADWAY ENDPOINT NODE—The endpoint of a roadway centerline.
- 9.2.3 MISCELLANEOUS NODES AND JUNCTIONS—Result from the intersection of roadway and non-roadway features (hydrography, railroads, political boundaries, etc.). Intersections of roads with non-road features such as political units, physical features, and water features will not be tested. Nodes and junctions representing the intersection of roadway and non-roadway features are not critical to the applications for which this document is intended.