



SURFACE VEHICLE RECOMMENDED PRACTICE

J2012™

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Superseding J2012 DEC2016

(R) Diagnostic Trouble Code Definitions

RATIONALE

The standard is being updated to allow 3 byte Diagnostic Trouble Codes (DTCs) since those protocols (and SAE J2012) will be used also outside the U.S. (e.g., China VI, Japan VI, Korea VI, and Euro VI). Also, the change to 3 byte DTCs provides more room for industry standard DTCs across manufacturer and technology developments.

FOREWORD

On-Board Diagnostic (OBD) regulations require passenger cars, and light and medium duty trucks, to report standardized fault codes for malfunctions detected by the OBD system. This document, with SAE J2012DA, defines the standardized set of fault codes.

SAE J2012 was originally developed to meet U.S. OBD requirements for 1996 and later model year vehicles. ISO 15031-6 was based on SAE J2012 and was intended to meet European OBD requirements for 2000 and later model year vehicles. This document is technically equivalent to ISO 15031-6, with new and revised fault codes included.

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Documents

Standard, visit Sharing Hub

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1. SCOPE

This document is intended to define the standardized Diagnostic Trouble Codes (DTCs) that On-Board Diagnostic (OBD) systems in vehicles are required to report when malfunctions are detected. SAE J2012 may also be used for decoding of enhanced diagnostic DTCs and specifies the ranges reserved for vehicle manufacturer specific usage.

1.1 Purpose

This document supersedes SAE J2012 DEC2016 and is technically equivalent to ISO 15031-6:2015, with the exceptions described in 1.2.

This document includes:

- a. DTC format.
- b. A description of the standardized set of DTCs and descriptions contained in SAE J2012DA. The high byte and middle byte of a DTC may be decoded according to two different lists; DTC Format Identifier 0x00 and 0x04.
- c. A description of the standardized set of DTC subtypes known as Failure Types contained in SAE J2012DA (applies only when 3 byte DTCs are used).
- d. PCB DTC requirements which provide guidance on applying DTCs to printed circuit boards internal to self-reporting ECU components.
- e. Smart Devices provides guidance for applying DTCs to those devices that are not communicating directly to the SAE J1962 DTC.

1.2 Differences from ISO Document

The differences to the ISO document 15031-6:2015 are descriptions of SAE J2012DA, which contain the latest industry standardized DTC and FTB definitions.

1.3 Open Systems Interconnection (OSI) Basic Reference Model

SAE J2012 DTCs are communicated on communication links between a vehicle's OBD systems and test equipment. Applicable communication standards are listed below, and their relationships are illustrated in Table 1.

To achieve this, it is based on the Open Systems Interconnection (OSI) Basic Reference Model in accordance with ISO/IEC 7498-1 and ISO/IEC 10731 which structures communication systems into seven layers. When mapped on this model, the services specified are broken into:

Diagnostic services (layer 7), specified in:

- ISO 15031-5/SAE J1979 (emissions-related OBD)
- SAE J1979-2 (OBDonUDS),
- SAE J1979-3 (ZEVonUDS),
- ISO 27145-3 (WWH-OBD),
- ISO 13400-2 and ISO 13400-3 (DoIP)
- ISO 14229-1 Road Vehicles - Unified Diagnostic Services (UDS)

Presentation layer (layer 6), specified in:

- ISO 15031-2, SAE J1930DA,
- ISO 15031-5, SAE J1979DA,
- ISO 15031-6, SAE J2012DA,
- ISO 27145-2, SAE J2012DA.

Session layer services (layer 5), specified in:

ISO 14229-2 supports ISO 15765-4 DoCAN and ISO 14230-4 DoK-Line protocols and ISO 13400-3 (DoIP),
ISO 14229-2 is not applicable to the SAE J1850 and ISO 9141-2 protocols.

Transport layer services (layer 4), specified in:

DoCAN: ISO 15765-2 Transport protocol and network layer services,
SAE J1850: ISO 15031-5/SAE J1979 Emissions-related diagnostic services,
ISO 9141-2: ISO 15031-5/SAE J1979 Emissions-related diagnostic services,
DoK-Line: ISO 14230-4, ISO 15031-5/SAE J1979 Emissions-related diagnostic services.

Network layer services (layer 3), specified in:

DoCAN: ISO 15765-2 Transport protocol and network layer services,
SAE J1850: ISO 15031-5/SAE J1979 Emissions-related diagnostic services,
ISO 9141-2: ISO 15031-5/SAE J1979 Emissions-related diagnostic services,
DoK-Line: ISO 14230-4, ISO 15031-5/SAE J1979 Emissions-related diagnostic services,
SAE J1979-2 (OBDOnUDS),
SAE J1979-3 (ZEVonUDS),
ISO 13400-2 (DoIP).

Data link layer (layer 2), specified in:

DoCAN: ISO 15765-4, ISO 11898-1, -2,
SAE J1850,
ISO 9141-2,
DoK-Line: ISO 14230-2,
ISO 13400-3 (DoIP).

Physical layer (layer 1), specified in:

DoCAN: ISO 15765-4, ISO 11898-1, -2,
SAE J1850,
ISO 9141-2,
DoK-Line: ISO 14230-1,
ISO 13400-3 (DoIP),

in accordance with Table 1.

Table 1 - Legislated emissions-related OBD/WWH-OBD diagnostic specifications applicable to the OSI layers

Applicability	OSI 7 layers	Emissions-related OBD communication requirements					UDS-based regulated communication requirements			
Seven layers according to ISO/IEC 7498-1 and ISO/IEC 10731	Application (layer 7)	ISO 15031-5, 14229-1/SAE J1979					ISO 27145-3, J1979-2, J1979-3, 14229-1			
	Presentation (layer 6)	ISO 15031-2, -5, -6 SAE J1930DA/SAE J1979DA					ISO 27145-2 SAE J1930DA/SAE J1979DA			
		SAE J2012DA					SAE J2012DA			
	Session (layer 5)	Not Applicable		ISO 14229-2						
	Transport (layer 4)	ISO 15031-5		ISO 14230-4	ISO 15765-2	ISO 15765-4	ISO 15765-2	ISO 15765-4	ISO 13400-2	
	Network (layer 3)									
	Data link (layer 2)	SAE J1850	ISO 9141-2	ISO 14230-2	ISO 11898-1, -2		ISO 15765-2		ISO 11898-1, -2	ISO 13400-3
	Physical (layer 1)			ISO 14230-1						

1.4 SAE Document Reference Concept

ISO 15031-2, ISO 15031-5, and ISO 15031-6 references several SAE documents which contain all terms, data, and DTC definitions.

See Figure 1: SAE digital annex document reference with the following definition of content in ISO 15031-2, ISO 15031-5, and ISO 15031-6:

SAE J1930: The document is concerned with a procedure for naming objects and systems and with the set of words from which names are built. It references SAE J1930DA which contains all standardized naming objects, terms, and abbreviations.

SAE J1979 standards, including SAE J1979-2, SAE J1979-3: These documents are concerned with the definition of emissions-related diagnostic services (diagnostic test modes). It references SAE J1979DA which contains all standardized data items, like PIDs, Test IDs, Monitor IDs, and InfoType IDs.

SAE J2012: The document is concerned with the procedure for defining emissions-related diagnostic trouble codes. It references SAE J2012DA which contains all standardized data items, like DTCs and FTBs.

On-Board Diagnostic (OBD) regulations require passenger cars, and light, medium, and heavy duty trucks, to support a minimum set of diagnostic information to be transmitted to external (off-board) "generic" test equipment.