State of California
Air Resources Board

UPDATED INFORMATIVE DIGEST

TECHNICAL STATUS AND PROPOSED REVISIONS TO ON-BOARD DIAGNOSTIC SYSTEM REQUIREMENTS FOR HEAVY-DUTY ENGINES, PASSENGER CARS, LIGHT-DUTY TRUCKS, MEDIUM-DUTY VEHICLES AND ENGINES

Sections Affected: Amendments to California Code of Regulations, title 13, sections 1968.2, 1968.5, 1971.1, and 1971.5.

Background:

OBD systems serve an important role in helping to ensure that engines and vehicles maintain low emissions throughout their full life. OBD systems monitor virtually all emission controls on gasoline and diesel engines, including catalysts, particulate matter (PM) filters, exhaust gas recirculation systems, oxygen sensors, evaporative systems, fuel systems, and electronic powertrain components, as well as other components and systems that can affect emissions when malfunctioning. The systems also provide specific diagnostic information in a standardized format through a standardized serial data link on-board the vehicles. The use and operation of OBD systems ensure reductions of in-use motor vehicle and motor vehicle engine emissions through improvements in emission system durability and performance.

The Air Resources Board (ARB or Board) originally adopted comprehensive OBD regulations in 1989, requiring all 1996 and newer model year passenger cars, light-duty trucks, and medium-duty vehicles and engines to be equipped with OBD systems (referred to as OBD II). The Board subsequently updated the OBD II requirements in 2002 with the adoption of California Code of Regulations, title 13, section 1968.2, which established OBD II requirements and enforcement requirements for 2004 and subsequent model year vehicles. The Board has modified the OBD II regulation in regular updates since initial adoption to address manufacturers' implementation concerns and, where needed, to strengthen specific monitoring requirements. The Board last adopted comprehensive updates to the OBD II requirements in 2006 to address several concerns and issues regarding the regulation (California Code of Regulations, title 13, §1968.2) and enforcement requirements (§1968.5), while minor updates were made to the OBD II regulations in 2011. In 2005, ARB adopted California Code of Regulations, title 13, section 1971.1, which established comprehensive OBD requirements for 2010 and subsequent model year heavy-duty engines and vehicles (i.e., vehicles with a gross vehicle weight rating greater than 14,000 pounds), referred to as heavy-duty (HD) OBD. The Board subsequently updated the HD OBD regulation in 2009 as well as adopted HD OBD-specific enforcement requirements (California Code of Regulations, title 13, §1971.5). Finally, as part of the 2009 update, the Board aligned the HD OBD with OBD II requirements for medium-duty vehicles.

With this filing, ARB has adopted amendments to California Code of Regulations, title 13, sections 1968.2, 1968.5, 1971.1, and 1971.5. On August 23, 2012, the amendments were approved by the Board with modifications. These modifications, which include changes made in response to comments received during the hearing and the 45-day period prior to it, were made available for public comment in the staff's Notice of Public Availability of Modified Text and Availability of Additional Documents, released January 4, 2013.

Objectives and Benefits:

The purpose of the HD OBD and OBD II regulations is to reduce motor vehicle and motor vehicle engine emissions by establishing emission standards and other requirements for on-board diagnostic systems (OBD systems) that are installed on 2010 and subsequent model-year engines certified for sale in heavy-duty applications in California. The OBD systems, through the use of an on-board computer(s), monitor emission systems in-use for the actual life of the engine, detect malfunctions of the monitored emission systems, illuminate a malfunction indicator light to notify the vehicle operator of detected malfunctions, and store fault codes identifying the detected malfunctions. The use and operation of OBD systems ensure reductions of in-use motor vehicle and motor vehicle engine emissions through improvements in emission system durability and performance.

In adopting the HD OBD and OBD II regulations, the Board directed the staff to continue to follow manufacturers' progress towards meeting the regulations' requirements and to report back should modifications to the requirements be deemed appropriate. Since then, staff has met with stakeholders in teleconferences and face-to-face meetings, including a public workshop in March 2012, where staff and manufacturers identified areas in which modifications to the HD OBD and OBD II regulations, as it applies to medium-duty diesel vehicles, would be beneficial.

Additionally, since the adoption of amendments in 2010, stakeholders have argued that OBD system requirements are not emission standards or test procedures and that ARB does not have authority to order manufacturers to recall motor vehicles or engines if ARB were to determine that an installed OBD system was found to be in noncompliance with the HD OBD regulation. To clarify any misunderstanding, ARB staff adopted changes to the OBD regulations to be consistent with the federal definition of emission standard as set forth in *Engine Manufacturers Association v. South Coast Air Quality Management District* (2004) 541 U.S. 246, 253, 124 S.Ct. 1756, 1762 (*EMA)*. For purposes of clarification and consistency, ARB staff also added the terms "exhaust emission standard" and "evaporative emission standard" in the definitions section to provide more specificity, where needed, to preexisting textual references to emission standards.

The changes to the HD OBD regulation include revisions that accelerate the start date for OBD system implementation on alternate-fueled engines from the 2020 model year to the 2018 model year, relax some requirements for OBD systems on heavy-duty hybrid vehicles for the 2013 through 2015 model years, relax the malfunction thresholds

until the 2016 model year for three major emission control systems (particulate matter (PM) filters, oxides of nitrogen (NOx) catalysts, and NOx sensors) on diesel engines based on the current limits of technical feasibility, delay the monitoring requirements for some diesel-related components until 2015 to provide further lead time for emission control strategies to stabilize, and clarify requirements for several monitors and standardization. The amendments to the HD OBD regulation include:

- Clarifying the purposes and objectives of the OBD regulations
- Adding a definition of emission standard as it applies to OBD systems
- Adding definitions for exhaust and evaporative emission standards
- Revisions related to alternate-fueled engines
- Adding definitions and revising the permanent fault code storage and erasure protocol and in-use monitoring performance requirements applicable to hybrid vehicles
- Revising the freeze frame storage and erasure protocol
- Revising the in-use monitoring performance requirements for the PM filter and PM sensor monitors
- Revising the diesel misfire monitoring requirements to no longer require emission threshold-based malfunction criteria and to require expanded monitoring conditions
- Revising the 2013 through 2015 model year malfunction thresholds for the diesel PM filter monitor, the NOx catalyst monitor, and the NOx sensor monitor
- Delaying some monitoring requirements for catalyzed PM filters and diesel non-methane hydrocarbon converting catalysts from the 2013 model year to the 2015 model year
- Revising the cooling system monitoring requirements to clarify when monitor enablement can occur
- Updating the Society of Automotive Engineers (SAE) and International Standards Organization document references
- Revising the standardized communication protocol and diagnostic connector requirements to account for the new 500 kilobits per second baud rate version of SAE J1939
- Revising the readiness status requirements to clarify which monitors are to be included in determining readiness
- Clarifying the calibration verification number requirements
- Deleting the service information requirements
- Revising the certification demonstration testing requirements to clarify how to perform the testing for gasoline air-fuel ratio cylinder imbalance monitoring and exhaust gas sensor monitoring, to clarify the test requirements for diesel misfire monitoring, and to clarify the test requirements for catalyst faults and other faults where default actions are taken
- Adding items required to be submitted as part of the certification application
- Revising the deficiencies section to allow up to two free deficiencies for 2013 through 2015 model year heavy-duty hybrid vehicles and for PM filter and PM sensor monitors

Concurrently, the staff updated the medium-duty vehicle diesel-related requirements in the medium-duty OBD II regulation (§1968.2) to be consistent with the proposed diesel-related amendments to the HD OBD regulation. These changes for medium-duty vehicles include diesel monitoring requirements and diesel-related in-use monitor performance requirements mentioned above. This allows manufacturers of both heavy-duty and medium-duty diesel engines to design to and meet essentially the same requirements.

Further, the staff also adopted amendments to the HD OBD and OBD II enforcement regulations (California Code of Regulations, title 13, §1971.5 and §1968.5, respectively) to align with the proposed diesel-related changes to the HD OBD and OBD II regulations, specifically the selection criteria of engines/vehicles for the test sample group and the mandatory recall provisions for diesel engines.

The HD OBD and OBD II amendments provide engine manufacturers with greater compliance flexibility and clarify the performance requirements that they are expected to meet in designing and developing robust OBD systems. This in turn will encourage manufacturers to design and build more durable engines and emission-related components, all of which will help ensure that forecasted emission reduction benefits from adopted medium- and heavy-duty engine emission control programs are achieved in-use.

COMPARABLE FEDERAL REGULATIONS

In February 1993, the United States Environmental Protection Agency (U.S. EPA) promulgated final OBD requirements for federally certified light-duty vehicles and trucks. (40 CFR Part 86, §§ 86.094-2, 86.094-17, 86.094-18(a), 86.094-21(h), 86.094-25(d), 86.094-30(f), 86.094-35(l), 86.095-30(f), 86.095-35(l); see 58 Fed.Reg. 9468-9488 (February 19, 1993).) The requirements were later amended to require OBD systems on medium-duty vehicles by the 2008 model year. The final rule with the latest modifications of the requirements was published on February 24, 2009. A central part of the federal regulation is that, for purposes of federal certification of vehicles, U.S. EPA will deem California-certified OBD II systems to comply with the federal regulations.

In Health and Safety Code sections 43013, 43018, and 43101, the Legislature expressly directed ARB to adopt emission standards for new motor vehicles that are necessary and technologically feasible and to endeavor to achieve the maximum degree of emission reduction possible from vehicular and other mobile sources in order to accomplish the attainment of the State standards at the earliest practicable date. ARB initially adopted the OBD II regulations to meet those legislative directives. The OBD II regulation was first adopted in 1990. On October 3, 1996, the U.S. EPA formally granted California's request for a waiver regarding the OBD II regulation, as last

amended in December 1994,[1] recognizing that the OBD II regulation is at least as stringent in protecting public health and welfare as the federal regulation, and that unique circumstances exist in California necessitating the need for the State's own motor vehicle regulations program.

The federal OBD requirements are comparable in concept and purpose with California's OBD II regulation; however, differences exist with respect to the scope and stringency of the requirements of the 2 regulations. More specifically, California's current OBD II regulations are generally more comprehensive and stringent than the comparable federal requirements. Under OBD II requirements, manufacturers must implement monitoring strategies for essentially all emission control systems and emission-related components. Generally, the OBD II regulation requires that components be monitored to indicate malfunctions when component deterioration or failure causes emissions to exceed 1.5 times the applicable tailpipe emission standards of the certified vehicle. The regulation also requires that components be monitored for functional performance even if the failure of such components does not cause emissions to exceed 1.5 times the standard. The federal requirements, in contrast, require monitoring only of the catalyst, engine misfire, evaporative emission control system, and oxygen sensors. Other emission control systems or components, such as exhaust gas recirculation and secondary air systems, need only be monitored if by malfunctioning, vehicle emissions exceed 1.5 times the applicable tailpipe standards. No functional monitoring is required. Historically, virtually every vehicle sold in the U.S. is designed and certified to California's OBD II requirements in lieu of the federal OBD requirements.

ARB initially adopted the HD OBD regulation in 2005. A waiver for the regulation was granted by U.S EPA in 2008.[2] The U.S. EPA has also adopted OBD requirements for vehicles and engines above 14,000 pounds, which is the weight range for California's "heavy-duty" class. The federal regulation, which was published on February 24, 2009, is consistent with ARB's California regulation in almost all important aspects, and while minor differences may exist between these requirements, heavy-duty OBD systems can be designed to comply with both the federal and California programs. In fact, U.S. EPA's regulation directly allows acceptance of systems that have been certified to California's HD OBD regulation and to date, all heavy-duty engine manufacturers have chosen this path for certification.

Finally, in 2004, the United States Supreme Court clarified the definition of emission standard as it applies to motor vehicles and motor vehicle engines, finding that emission standards relate to the emission characteristics of a vehicle or engine and that for compliance purposes require a motor vehicle or motor vehicle engine to emit no more than a certain amount of a given pollutant, be equipped with a certain type of pollution-control device, or have some other design feature related to the control of emissions. (*EMA.* 541 U.S. at 253.) An OBD system, in general, is a design feature related to the

[1] *California State Motor Vehicle Pollution Control Standards; Waiver of Federal Preemption; Decision,* dated October 3, 1996, 61 Fed.Reg. 53371 (October 11, 1996).
[2] *California State Motor Vehicle Pollution Control Standards; Waiver of Federal Preemption; Decision,* dated August 13, 2008 73 Fed.Reg. 52042 (September 8, 2008),

control of emissions and specifically establishes malfunction criteria that set numerical emission limits for pollutants for the purpose of detecting emission control system malfunctions. The amendments are intended to make clear that the definition of emission standard as used in the OBD regulations conform to the federal definition as interpreted.