

ATTACHMENT B

PROPOSED 15-DAY MODIFIED REGULATION ORDER

This attachment shows the modifications to the originally proposed regulatory language. The originally proposed regulatory language is shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. The suggested modifications to the proposed regulation are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Text that is both single underlined and double strikeout is text that staff proposed to add during the 45-day public notice period but later retracted as part of this 15-day public notice period. Text that is both double underlined and single strikeout is text that staff proposed to delete during the 45-day notice period but later retracted as part of this 15-day notice period. Various portions of the regulations that are not modified by the proposed amendments are omitted from the text shown and indicated by “ * * * * ”.

Amend sections 1968.2, title 13, California Code of Regulations, to read as follows:

§1968.2. Malfunction and Diagnostic System Requirements--2004 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines

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(c) Definitions.

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“*Active off-cycle credit technology*” refers to a technology that generates off-cycle credits in accordance with title 13, CCR section 1961.3(a)(8) or 40 Code of Federal Regulations (CFR) §86.1869-12 as it existed on August 5, 2015, as applicable, and that must be activated by the vehicle or driver in order to provide a carbon dioxide (CO₂) reduction benefit. Examples of active off-cycle credit technologies include active aerodynamic features (e.g., grill shutters or ride height that is automatically adjusted by the vehicle control system based on vehicle speed or other conditions), active engine warmup technologies, and driver coaching and/or feedback systems that encourage the driver to alter his/her actions to maximize efficiency. Examples of off-cycle credit technologies that are not required to be tracked under section (g)(6) include non-active technologies such as solar glazing and solar reflective paint, thermal control technologies specified in title 13, CCR section 1961.3(a)(8)(A)1.a. or 40 CFR §86.1869-12(b)(1)(viii), as it existed on August 5, 2015, ~~engine idle stop-start systems~~, driver-activated technologies where the driver does not have a less efficient selectable option (e.g., high efficiency exterior lights), and technologies related solely to heating, ventilation, and air conditioning for vehicle cabin conditioning. For 2004 through 2024-2023 model year vehicles, engine idle stop-start systems are not required to be tracked under section (g)(6). For 2022-2024 and subsequent model year vehicles, engine idle stop-start systems are required to be tracked under section (g)(6).

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“Emission Increasing Auxiliary Emission Control Device (EI-AECD)” refers to any approved AECD that: reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation and use; and meets (1) or (2): (1) the need for the AECD is justified in terms of protecting the vehicle against damage or accident, or (2) for 2022-2024 and subsequent model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard, is related to adaptation or learning (e.g., selective catalytic reduction (SCR) system adaptation). For medium-duty vehicles certified to an engine dynamometer tailpipe emission standard, an AECD that is certified as an NTE deficiency shall not be considered an EI-AECD. An AECD that does not sense, measure, or calculate any parameter or command or trigger any action, algorithm, or alternate strategy shall not be considered an EI-AECD. An AECD that is activated solely due to any of the following conditions shall not be considered an EI-AECD: (1) operation of the vehicle above 8000 feet in elevation; (2) ambient temperature; (3) when the engine is warming up and is not reactivated once the engine has warmed up in the same driving cycle; (4) failure detection (storage of a fault code) by the OBD system; (5) execution of an OBD monitor; or (6) execution of an infrequent regeneration event.

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(d) *General Requirements.*

Section (d) sets forth the general requirements of the OBD II system. Specific performance requirements for components and systems that shall be monitored are set forth in sections (e) and (f) below.

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(4) *In-Use Monitor Performance Ratio Definition.*

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(4.3) Denominator Specifications

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(4.3.2) Specifications for incrementing:

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(G) For the following monitors, the denominator(s) shall be incremented by one during a driving cycle in which the following two criteria are met: (1) the requirements of section (d)(4.3.2)(B) have been met on at least one driving cycle since the denominator was last incremented, and (2) the number of cumulative miles of vehicle operation since the denominator was last incremented is greater than or equal to 500 miles. The 500-mile counter shall be reset to zero and begin counting again after the denominator has been incremented and no later than the start of the next ignition cycle.

(i) Diesel NMHC converting catalyst (section (f)(1.2.2)) for 2004 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles certified to a chassis dynamometer tailpipe emission standard and for 2004 through ~~2024~~ 2023 model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

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(vi) PM filter frequent regeneration (section (f)(9.2.2)) for ~~2022-2024~~ and subsequent model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

For the diesel NMHC converting catalyst monitor (section (f)(1.2.2)), as an alternative for 2004 through ~~2021-2023~~ model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard, the manufacturer may use the criteria in section (d)(4.3.2)(I) in lieu of the criteria specified in section (d)(4.3.2)(G) above.

- (H) For the following component monitors, the manufacturer may request Executive Officer approval to use alternate or additional criteria to that set forth in section (d)(4.3.2)(B) above for incrementing the denominator. Executive Officer approval of the proposed criteria shall be based on the equivalence of the proposed criteria in measuring the frequency of monitor operation relative to the amount of vehicle operation in accordance with the criteria in section (d)(4.3.2)(B) above:

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(v) PM filter frequent regeneration (section (f)(9.2.2)) for 2004 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles certified to a chassis dynamometer tailpipe emission standard and 2004 through ~~2021-2023~~ model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

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- (I) For 2013 and subsequent model year vehicles, in addition to the requirements of section (d)(4.3.2)(B) above, the denominator(s) for the following monitors shall be incremented if and only if a regeneration event is commanded for a time greater than or equal to ten seconds:
- (i) Diesel NMHC converting catalyst other aftertreatment assistance functions (sections (f)(1.2.3)(A) and (f)(1.2.3)(C))
 - (ii) PM filter incomplete regeneration (section (f)(9.2.3))
 - (iii) Diesel NMHC converting catalyst (section (f)(1.2.2)) for ~~2022-2024~~ and subsequent model year medium-duty vehicles certified to an engine dynamometer tailpipe emission standard

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- (M) The denominator(s) for the evaporative system high-load purge flow monitor (section (e)(4.2.2)(D)) and the positive crankcase ventilation/crankcase ventilation monitor for lines through which crankcase vapor flows under conditions where the intake manifold pressure is greater than ambient pressure on vehicles with forced induction engines (sections (e)(9.2.3) and (f)(10.2.3)) shall be incremented if and only if:

- (i) The requirements of section (d)(4.3.2)(B) have been met (hybrid vehicles shall use section (d)(4.3.2)(K) in lieu of (d)(4.3.2)(B));
- (ii) Cumulative time since engine start is greater than or equal to 600 seconds while at an ambient temperature of greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) (hybrid vehicles shall use cumulative propulsion system active time in lieu of cumulative time

- since engine start); and
- (iii) High-load purging conditions occur on two or more occasions for greater than two seconds during the driving cycle or for a cumulative time greater than or equal to ten seconds, whichever occurs first.
- (iv) For purposes of section (d)(4.3.2)(M)(iii) above, “high-load purging conditions” means an event during which the engine manifold pressure is greater than or equal to 7 kPa above atmospheric pressure.

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(9) Implementation Schedule.

(9.1) For medium-duty vehicles equipped with diesel engines, for the tracking requirements described in section (g)(6.12), a manufacturer shall meet one of the following two options:

(9.1.1) Option 1: The manufacturer shall meet (A) and may meet (B) below:

(A) For all 2022 and subsequent model year diesel vehicles, the manufacturer shall meet all requirements of section (g)(6.12).

(B) For demonstration testing of 2022 and 2023 model year diesel vehicles under section (h), the manufacturer may test 15 Executive Officer-selected component/system monitors in lieu of testing all the monitors listed under section (h)(4). The Executive Officer shall inform the manufacturer of the monitors to be tested during selection of the demonstration test vehicle under section (h)(2.1).

(9.1.2) Option 2: The manufacturer shall meet both (A) and (B) below:

(A) For 2022 and 2023 model year diesel vehicles, the manufacturer shall meet all the requirements of section (g)(6.12) with the exception of sections (g)(6.12.2)(A) and (B) (i.e., the active 100 hour array and stored 100 hour array requirements); and

(B) For 2024 and subsequent model year diesel vehicles, the manufacturer shall meet all the requirements of section (g)(6.12).

(9.10) Exceptions to General Requirements.

(9.10.1) Whenever the requirements in section (d) of this regulation require a manufacturer to meet a specific phase-in schedule:

(9.10.1.1) The phase-in percentages shall be based on the manufacturer’s projected sales volume for all vehicles subject to the requirements of title 13, CCR section 1968.2 unless specifically stated otherwise in section (d).

(9.10.1.2) Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted for the phase-in of in-use monitor performance ratio monitoring conditions in section (d)(3.2).

(9.10.1.3) Small volume manufacturers may use an alternate phase-in schedule in accordance with section (d)(9.10.1.2) in lieu of the required phase-in schedule or may meet the requirement on all vehicles by the final year of the phase-in in lieu of meeting the specific phase-in requirements for each model year.

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(f) Monitoring Requirements for Diesel/Compression-Ignition Engines.

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(1) *Non-Methane Hydrocarbon (NMHC) Converting Catalyst Monitoring*

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(1.2) Malfunction Criteria:

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(1.2.3) Other Aftertreatment Assistance Functions. Additionally, for 2010 and subsequent model year vehicles, the catalyst(s) shall be monitored for other aftertreatment assistance functions:

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(D) For catalysts located downstream of an SCR system (e.g., to prevent ammonia slip), the OBD II system shall detect a malfunction when the catalyst has no detectable amount of NMHC, CO, NOx, or PM conversion capability. Catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) the catalyst is part of the SCR catalyst and monitored as part of the SCR system; and (2) the catalyst is aged as part of the SCR system for the purposes of determining the SCR system monitor malfunction criteria under section (f)(2.2.2). For catalysts located outside the SCR system, except as provided for in section (f)(1.2.3)(D)(i), ~~C~~catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyst's conversion capability can cause emissions to increase by 15 percent or more of the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyst's conversion capability can cause emissions to exceed the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle.

(i) For 2022 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, monitoring of the catalyst shall not be is not required if there is no measurable emission impact on the criteria pollutants (i.e., NMHC, CO, NOx, and PM) during any reasonable driving condition where in which the catalyst is most likely to affect criteria pollutants (e.g., during conditions most likely to result in ammonia generation or excessive reductant delivery).

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(5) *Exhaust Gas Sensor Monitoring*

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(5.2) Malfunction Criteria:

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(5.2.2) NOx and PM sensors:

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(E) NOx sensor activity faults: For 2022 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer

~~tailpipe emission standard~~, the OBD system shall detect a malfunction of the NOx sensor (e.g., internal sensor temperature not properly achieved/maintained, stabilization criteria not properly achieved/maintained) when the NOx sensor is not actively reporting NOx concentration data (i.e., the NOx sensor is not “active”) under conditions when it is technically feasible for a properly-working NOx sensor to be actively reporting NOx concentration data. The malfunctions include, at a minimum, faults that delay the time it takes for the NOx sensor to become “active” after start (e.g., time after start to satisfy NOx sensor stabilization criteria takes longer than normal) and faults that cause the NOx sensor to not be “active” for longer periods of time than normal (e.g., ratio of sensor “inactive” time to “active” time is higher than normal). If the NOx sensor activity fault is caused by a malfunction of a component other than the NOx sensor (e.g., a component that is used as an input necessary to make the NOx sensor become “active”), the OBD system shall monitor the component and detect a malfunction that prevents the NOx sensor from being “active”.

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(6) *Exhaust Gas Recirculation (EGR) System Monitoring*

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(6.3) Monitoring Conditions:

(6.3.1) For malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) (i.e., EGR low and high flow) manufacturers shall:

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(B) Except as provided in section (f)(6.3.5), ensure that monitoring is conducted continuously for all 2010 and subsequent model year vehicles. Additionally, for all ~~2022~~ 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, manufacturers shall define monitoring conditions for malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) that are continuous and in accordance with section (d)(3.2) (i.e., the minimum ratio requirements), and manufacturers shall track and report the in-use performance of the EGR system monitors under sections (f)(6.2.1) and (f)(6.2.2) in accordance with section (d)(3.2.2). For purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.2).

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(6.3.3) The OBD II system shall monitor continuously for malfunctions identified in section (f)(6.2.4) (i.e., EGR feedback control). Additionally, for all ~~2022~~ 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, manufacturers shall define monitoring conditions for malfunctions identified in section (f)(6.2.4) that are continuous and in accordance with

section (d)(3.2) (i.e., the minimum ratio requirements), and manufacturers shall track and report the in-use performance of the EGR system monitors under section (f)(6.2.4) in accordance with section (d)(3.2.2). For purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in section (f)(6.2.4) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.2).

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(6.4) MIL Illumination and Fault Code Storage:

(6.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(6.4.2) Additionally, for malfunctions identified in sections (f)(6.2.1) and (f)(6.2.2) (i.e., EGR low and high flow) on all ~~2022-2024~~ and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

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(7) *Boost Pressure Control System Monitoring*

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(7.3) Monitoring Conditions:

(7.3.1) Except as provided in section (f)(7.3.4), the OBD II system shall monitor continuously for malfunctions identified in sections (f)(7.2.1), (7.2.2), and (7.2.5) (i.e., over and under boost, feedback control). Additionally, for all ~~2022-2024~~ and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, manufacturers shall define monitoring conditions for malfunctions identified in sections (f)(7.2.1), (7.2.2), and (7.2.5) that are continuous and in accordance with section (d)(3.2) (i.e., the minimum ratio requirements), and manufacturers shall track and report the in-use performance of the boost pressure control system monitors under sections (f)(7.2.1), (7.2.2), and (7.2.5) in accordance with section (d)(3.2.2). For purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(7.2.1), (7.2.2), and (7.2.5) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.2).

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(7.4) MIL Illumination and Fault Code Storage:

(7.4.1) General requirements for MIL illumination and fault code storage are set forth in section (d)(2).

(7.4.2) Additionally, for malfunctions identified in sections (f)(7.2.1) and (f)(7.2.2) (i.e., over and under boost on all ~~2022-2024~~ and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

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(9) *Particulate Matter (PM) Filter Monitoring*

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(9.2) Malfunction Criteria:

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(9.2.1) Filtering Performance:

(A) The OBD II system shall detect a malfunction prior to a decrease in the filtering capability of the PM filter that would cause a vehicle's emissions to exceed:

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- (ii) For medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:
 - a. 0.09 g/bhp-hr PM as measured from an applicable cycle emission test for 2004 through 2009 model year vehicles;
 - b. 0.07 g/bhp-hr PM as measured from an applicable cycle emission test for 2010 through 2012 model year vehicles; ~~and~~
 - c. 0.03 g/bhp-hr PM as measured from an applicable cycle emission test for 2013 ~~and subsequent~~ through 2024-2023 model year vehicles.; ~~and~~
 - d. the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 0.03 g/bhp-hr PM as measured from an applicable cycle emission test on ~~2022-2024~~ and subsequent model year vehicles.

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(9.2.4) Catalyzed PM Filter:

(A) NMHC conversion: For 2015 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 2015 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard with catalyzed PM filters that convert NMHC emissions:

- (i) The OBD II system shall monitor the catalyst function of the PM filter and detect a malfunction when the NMHC conversion capability decreases to the point that emissions exceed:
 - a. For non-Low Emission Vehicle III applications:
 - 1. 1.75 times the applicable FTP full useful life NMHC standards for passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard; or
 - 2. 2.0 times the applicable NMHC standards for 2015 through ~~2024~~ 2023 model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard; or
 - 3. the applicable NOx standard by more than 0.2 g/bhp-hr (e.g., cause NOx emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr) as measured from an applicable cycle emission test, or 2.0 times the applicable NMHC standards for ~~2022-2024~~ and subsequent model year

medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard; or

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(9.3) Monitoring Conditions:

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(9.3.2) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(9.2.2) through (9.2.6) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements), with the exception that monitoring shall occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required in section (d)(3.1.2). Additionally, for all ~~2022-2024~~ and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, manufacturers shall track and report the in-use performance of the PM filter monitors under sections (f)(9.2.2), (f)(9.2.5), and (f)(9.2.6) in accordance with section (d)(3.2.2). For purposes of tracking and reporting as required in section (d)(3.2.2), all monitors used to detect malfunctions identified in sections (f)(9.2.2), (f)(9.2.5), and (f)(9.2.6) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.2).

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(15) *Comprehensive Component Monitoring*

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(15.2) Malfunction Criteria:

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(15.2.2) Output Components/Systems:

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- (D) Except as provided for below, the wait-to-start lamp circuit shall be monitored for malfunctions that cause the lamp to fail to illuminate when commanded on (e.g., burned out bulb). The manufacturer is exempt from monitoring the wait-to-start lamp if any of the following criteria are met:
- (i) For wait-to-start lamps located on the instrument cluster on an LCD screen, a malfunction that causes the wait-to-start lamp to black out also causes the vehicle speed, engine speed, and fuel level displays to black out; or
 - (ii) The engine is prohibited from cranking until the glow plugs have been activated for a manufacturer-determined amount of time necessary for optimum cold start performance and emission control.

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(g) *Standardization Requirements*

(1) *Reference Documents:*

The following SAE International and International Organization for Standardization (ISO) documents are incorporated by reference into this regulation:

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- (1.4) SAE J1979 "E/E Diagnostic Test Modes", August 2014 (SAE J1979).

(1.4.1) SAE J1979-DA, "Digital Annex of E/E Diagnostic Test Modes", May 2019~~June 2014~~.

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(1.10) SAE J1939 consisting of:

(1.10.1) J1939 "Serial Control and Communications Heavy Duty Vehicle Network – Top Level Document", August 2013;

(A) J1939-DA "Digital Annex of Serial Control and Communication Heavy Duty Vehicle Network Data," April 2019;

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(4) Required Emission Related Functions:

The following standardized functions shall be implemented in accordance with the specifications in SAE J1979 to allow for access to the required information by a scan tool meeting SAE J1978 specifications:

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(4.1) Readiness Status: In accordance with SAE J1979 specifications, the OBD II system shall indicate "complete" or "not complete" since the fault memory was last cleared for each of the installed monitored components and systems identified in sections (e)(1) through (e)(8), (e)(15), (f)(1) through (f)(4), (f)(6), (f)(8), and (f)(15). All 2010 and subsequent model year diesel vehicles shall additionally indicate the appropriate readiness status for monitors identified in sections (f)(5), (f)(7), and (f)(9). All 2010 subsequent model year vehicles equipped with VVT system monitoring and subject to the test results requirements specified in section (g)(4.5.4)(C) shall additionally indicate the appropriate readiness status for VVT system monitors identified in sections (e)(13) and (f)(13).

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(4.1.3) For 2019 and subsequent model year vehicles, for components and systems not listed in section (g)(4.1.1) above, the readiness status for each component/system readiness bit listed below shall immediately indicate "complete" if any of the following conditions occur: (1) all the respective supported monitors listed below for each component/system have fully executed and determined that the component or system is not malfunctioning, or (2) at least one of the monitors listed below for each component/system has determined that the component or system is malfunctioning after the requisite number of decisions necessary for determining the MIL status have been fully executed, regardless of whether or not the other monitors listed have been fully executed:

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(P) Diesel PM Filter:

(i) For 2019 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, and for 2019 through 2023 model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, sections (f)(9.2.1), (f)(9.2.2), (f)(9.2.5), and (f)(9.2.6)

(ii) For 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, sections (f)(9.2.1) and (f)(9.2.5)

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(4.2) Data Stream: The following signals shall be made available on demand through the standardized data link connector in accordance with SAE J1979 specifications. The actual signal value shall always be used instead of a default or limp home value.

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(4.2.2) Additionally, for all 2005 and subsequent model year vehicles using the ISO 15765-4 protocol for the standardized functions required in section (g), the following signals shall be made available:

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(B) For all vehicles so equipped:

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(iv) For all 2022 and subsequent model year medium-duty vehicles equipped with diesel vehicles: NOx mass emission rate - engine out and NOx mass emission rate – tailpipe.

~~(iv)~~ For all ~~2022-2024~~ and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard so equipped: DEF dosing mode (A, B, C, etc.), target ammonia storage level on SCR, modeled actual ammonia storage level on SCR, SCR intake temperature, SCR outlet temperature, ~~NOx mass emission rate – engine out, NOx mass emission rate – tailpipe,~~ stability of NOx sensor reading, EGR mass flow rate, hydrocarbon doser flow rate, hydrocarbon doser injector duty cycle, aftertreatment fuel pressure, charge air cooler outlet temperature, ~~engine operating state,~~ propulsion system active, distance since reflash or control module replacement, commanded/target fresh air flow, crankcase pressure sensor output, crankcase oil separator rotational speed, and evaporative system purge pressure sensor output.

~~(vi)~~ For all ~~2022-2024~~ and subsequent model year medium-duty gasoline vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard so equipped: commanded DEF dosing, DEF dosing rate, and DEF usage for current driving cycle.

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(4.2.3) Additionally, for all 2010 and subsequent model year vehicles with a diesel engine:

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~~(i) For all 2022 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard so equipped, distance since 3 most recent DPF regeneration events and lifetime counter of DPF regeneration events.~~

- (I) For all 2022 and subsequent model year medium-duty vehicles equipped with diesel engines, engine rated power; and
- (J) For all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, engine rated speed.

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(6) *Vehicle Operation Tracking Requirements:*

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- (6.1) For all 2010 and subsequent model year medium-duty vehicles equipped with diesel engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the engine run time while being operated in the following conditions:

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(6.1.7) For ~~2022-2024~~ and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard:

- (i) total run time with no delivery of reductant used to control NOx emissions (e.g., diesel exhaust fluid) due to insufficient exhaust temperature, and
- (ii) total run time with exhaust temperature below 200 degrees Celsius as measured just upstream of the NOx converting catalyst. If an engine has more than one NOx converting catalyst, tracking shall be based on the temperature upstream of the catalyst that is closest to the engine.

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(6.6) Numerical Value Specifications:

(6.6.1) For each counter specified in sections (g)(6.1), and (g)(6.2), and (g)(6.12):

- (A) Each number shall conform to the standardized format specified in SAE J1979.
- (B) Except as provided in section (g)(6.6.1)(B)(i) below, e~~E~~ach number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.
 - (i) For counters specified in section (g)(6.12.1) in arrays described in section (g)(6.12.2)(A), each number shall be reset to zero when any of the following occur:
 - a. A scan tool command to clear fault codes is received;
 - b. An NVRAM reset occurs (e.g., reprogramming event); or
 - c. If the numbers are stored in KAM, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect).
- (C) For counters specified in section (g)(6.12), the OBD II system shall store each number within 600 seconds after the end of a driving cycle.

(D) For each counter specified in sections (g)(6.1) and (g)(6.2), if any of the individual counters reach the maximum value, all counters shall be divided by two before any are incremented again to avoid overflow problems.

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(6.12) NOx Emission Tracking Requirements:

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(6.12.2) The parameters in section (g)(6.12.1) shall be stored in the four data arrays described below. Data in each array shall be updated at a frequency of 1 Hertz.

(A) Active 100 Hour Array.

(i) When the NOx sensors used to determine the NOx mass parameters listed in section (g)(6.12.1) are both all reporting valid NOx concentration data, data for all parameters in section (g)(6.12.1) shall be stored in the Active 100 Hour Array.

(ii) When the total engine run time value (or, for hybrid vehicles, total propulsion system active time) that is stored in Bin 1 (defined in section (g)(6.12.3)(A) below) of the Active 100 Hour Array reaches 100 hours, all stored data shall be transferred to the Stored 100 Hour Array described in section (g)(6.12.2)(B). All data in the Active 100 Hour Array shall be reset to zero and begin incrementing anew.

(B) Stored 100 Hour Array.

(i) The Stored 100 Hour Array is a static repository for data stored by the Active 100 Hour Array. Stored 100 Hour Array data are overwritten with the data stored in the Active 100 Hour Array only when the total engine run time (or, for hybrid vehicles, total propulsion system active time) stored in Bin 1 (defined in section (g)(6.12.3)(A) below) of the Active 100 Hour Array reaches 100 hours.

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(C) Lifetime Array.

(i) When the NOx sensors used to determine the NOx mass parameters listed in section (g)(6.12.1) are both all reporting valid NOx concentration data, data for all parameters in section (g)(6.12.1) shall be stored in the Lifetime Array.

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(6.12.3) Each parameter in each array in section (g)(6.12.2) shall be stored in a series of bins that are defined as indicated below. References to "rated power" mean the engine's rated net brake power.

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(H) "Bin 17" stores the total value of the parameter in a given array only when the pause conditions of section (g)(6.12.5)(A) are met.

(H) Storage of data in Bins 1 through 14 occurs independently of data storage in Bins 15 and 16, and is not interrupted or otherwise affected by activity related to Bins 15 and 16.

(6.12.4) The engine-out and tailpipe NOx mass parameters that are calculated by the OBD system to fulfill the requirements in section (g)(6.12) and data

stream requirements in section (g)(4.2) must not have an error of more than +/- 20 percent, or alternatively at the manufacturer's discretion, 0.10 g/bhp-hr when divided by the net brake work of the engine. This requirement applies only to the NOx mass parameters in sections (g)(6.12) and (g)(4.2). Manufacturers shall report the most accurate values that are calculated within the applicable electronic control unit (e.g., the engine control module). The NOx mass values shall furthermore be calculated using the most accurate NOx concentration and exhaust flow rate values that are calculated within the applicable electronic control unit. Manufacturers shall not include a humidity correction factor when calculating NOx mass. Manufacturers shall not include a humidity correction factor when calculating NOx mass. The Executive Officer shall determine compliance with this requirement by comparing data from the OBD system and the test facility that are submitted by the manufacturer as described in section (i)(2.32). Specifically, the Executive Officer shall compare the total tailpipe NOx mass calculated by the OBD system for the test cycle with the total NOx mass measured by the test facility and give consideration to the consistency of the behavior of the two sets of instantaneous NOx mass values over the test cycle. Notwithstanding the compliance determination based on the data submitted as described in section (i)(2.32), manufacturers may not include any calibration/software feature which adversely impacts the accuracy of the calculated NOx mass values relative to the accuracy demonstrated at the time of certification when the engine operates in conditions outside of the certification testing environment.

(6.12.5) Pause conditions for tracking:

- (A) Except for malfunctions described in section (g)(6.12.5)(B) below, the OBD system shall continue tracking all parameters listed in section (g)(6.12.1) if a malfunction has been detected and the MIL is commanded on. Within 10 seconds of the MIL being commanded on, tracked data shall only be stored in Bin 17 as described in section (g)(6.12.3)(H) and storage of data in all other bins (Bins 1-16) shall be paused. When the malfunction is no longer detected and the MIL is no longer commanded on, tracking of all parameters in section (g)(6.12.1) shall resume in Bins 1-16 and shall pause in Bin 17 within 10 seconds.
- (B) The OBD system shall pause tracking of all parameters listed in section (g)(6.12.1) within 10 seconds if any of the conditions in sections (g)(6.12.5)(B)(i) through (iii) below occur. When the condition no longer occurs (e.g., the engine stop lamp is not commanded on), tracking of all parameters in section (g)(6.12.1) shall resume within 10 seconds:
- (i) A malfunction of any component used to determine vehicle speed has been detected and the MIL is commanded on for that malfunction;
 - (ii) A NOx sensor malfunction has been detected and the MIL is commanded on for that malfunction;
 - (iii) The engine stop lamp (if equipped) is commanded on.

- (C) The manufacturer may request Executive Officer approval to pause tracking of all parameters listed in section (g)(6.12.1) if a malfunction occurs that is not covered under sections (g)(6.12.5)(B)(i) through (iii) above (e.g., a light is commanded on for vehicles with no engine stop lamps such that the driver is likely to stop the vehicle, the odometer is lost, a malfunction of any component used as a primary input to the exhaust gas flow model occurs). The Executive Officer shall approve the request upon determining based on manufacturer submitted data and/or engineering evaluation that the malfunction will significantly affect the accuracy of the parameter values specified under section (g)(6.12.1).
- (6.12.6) The data specified in section (g)(6.12) reflect vehicle operation in various real world conditions including different driving, environmental, and engine load conditions that may not correspond to regulated test procedures. Engine and vehicle NOx emission levels will vary based on such conditions and as a result, these data may not correspond to the test conditions and/or test procedures associated with California's applicable standards for NOx emissions. Compliance with the applicable standards for NOx emissions for diesel engines and vehicles is determined in accordance with the applicable standards and corresponding test procedures.
- (6.13) For all 2024 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard so equipped, manufacturers shall implement software algorithms to track and report in a standardized format the following parameters:
- (6.13.1) Odometer reading at the beginning and end of the last 3 PM filter regeneration events; and
- (6.13.2) Lifetime counter of PM filter regeneration events.
- (6.13.3) Each number in section (g)(6.13) shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.

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(8) *Data Reporting Requirements for Over-the-Air Reprogramming*

- (8.1) For all ~~2022~~ 2024 and subsequent model year vehicles, if any of the data required to be stored and made available pursuant to sections (g)(5) and (g)(6) would be erased by an over-the-air reprogramming of any control module, the manufacturer shall collect all lifetime data stored in the vehicle pursuant to these sections using the over-air-network prior to their erasure.
- (8.2) The manufacturer shall submit a report to the Executive Officer containing the average value and standard deviation of each collected parameters for each affected certified test group as specified in, "Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines", dated August 16, 2018, and hereby incorporated by reference. The manufacturer shall submit the report within ~~60~~ 75 calendar days of the availability of the

calibration/software update to affected vehicles. The manufacturer shall submit a separate report for each unique calibration/software update.

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(i) *Certification Documentation*

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- (2) The following information shall be submitted as “Part 1” of the certification application. Except as provided below for demonstration data, the Executive Officer will not issue an Executive Order certifying the covered vehicles without the information having been provided. The information must include:

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(2.30) For medium-duty ~~diesel~~ vehicles equipped with diesel engines (including MDPVs) certified to an engine dynamometer tailpipe emission standard, a written description of all parameters and conditions that are technically necessary for each NOx sensor to begin reporting NOx concentration data after engine start and, if technically necessary, all parameters and conditions that cause each NOx sensor to subsequently cease or pause reporting NOx concentration data.

(2.31) For ~~2022-2024~~ and subsequent model year medium-duty diesel vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, data identifying the NOx sensor status (e.g., if the NOx sensor is actively reporting NOx concentration data, not reporting NOx concentration data due to low exhaust temperature, not reporting NOx concentration data due to sensor instability, etc.) for each NOx sensor during the FTP cycle and the SET cycle. The data shall also identify specifically which parameters and conditions documented in the certification application caused the NOx sensor to transition from one status to another (e.g., from not reporting NOx concentration data to actively reporting and from actively reporting to not reporting). The manufacturer shall use an engine with no malfunctions on the system (engine, engine emission controls, aftertreatment).

(2.32) For 2022 and subsequent model year medium-duty ~~diesel~~ vehicles equipped with diesel engines (including MDPVs) certified to an engine dynamometer tailpipe emission standard, data showing the instantaneous NOx mass emission rate determined using the test facility’s instrumentation and the instantaneous NOx mass emission rate determined by the engine controller that is responsible for NOx tracking (as required in section (g)(6.12)) during ~~one hot start~~ an FTP emissions test using the FTP cycle as described below. The manufacturer shall use an engine with no malfunctions on the system (engine, engine emission controls, aftertreatment). Data from the engine controller must include both engine-out and system-out (i.e., tailpipe) NOx mass emission rates and engine output energy. Data from the test facility must include the engine speed, torque, net brake work, and system-out NOx mass emission rate. The test facility’s NOx mass emission rate data must not include a humidity correction. The FTP test must be immediately preceded by a hot or cold-start FTP cycle (i.e., a preparatory FTP cycle) without cycling the ignition in between the two cycles to warm up the engine

and ensure that all sensors are reporting NOx data throughout the entire FTP test. All data must be provided over the preparatory FTP cycle and the FTP test at a frequency of at least 1 Hertz in a CSV file and summed to show the total NOx mass and total engine output energy over the cycle. The FTP test data (not the preparatory FTP cycle data) must be summed to show the total values determined by the electronic control unit (engine-out NOx mass, system-out NOx mass, and engine output energy) and the total values determined by the test facility (system-out NOx mass and net brake work). The electronic control unit system-out NOx mass and test facility system-out NOx mass emission rate data must be plotted together in a graph versus time over the preparatory FTP cycle and the FTP test. The FTP cycle must be preceded by a warm-up FTP cycle without cycling the ignition to ensure that all sensors are reporting NOx data throughout the entire FTP cycle. A manufacturer may alternatively provide these data with vehicle-based testing using the EPA Urban Dynamometer Driving Schedule for Heavy-Duty Vehicles specified in 40 CFR Part 86, Appendix I as it existed on July 1, 2012. For this option, the requirements and procedures described above for the engine-dynamometer testing option apply (e.g., the UDDS cycle must be preceded by another UDDS cycle without cycling the ignition in between) with the exception that engine speed, torque, and net brake work data from the test facility may be omitted (the net brake work shall be calculated using OBD system parameters).

(2.33) For 2022 and subsequent model year medium-duty vehicles equipped with diesel engines, a list of monitors and respective fault codes for malfunctions listed under sections (g)(6.12.5)(B) and (C).

~~(2.303334)~~ Any other information determined by the Executive Officer to be necessary to demonstrate compliance with the requirements of this regulation.

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(j) *Production Vehicle Evaluation Testing.*

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(2) *Verification of Monitoring Requirements.*

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(2.3) Evaluation requirements:

(2.3.1) Except as provided for emissions neutral diagnostics in section (j)(2.3.1)(A) below, the evaluation shall demonstrate the ability of the OBD II system on the selected production vehicle to detect a malfunction, illuminate the MIL, and store confirmed and permanent fault codes when a malfunction is present, and the monitoring conditions have been satisfied for each individual diagnostic required by title 13, CCR section 1968.2. During testing under section (j)(2), the manufacturer shall also verify the ability of the OBD II system to erase all permanent fault codes stored during testing for each unique pathway within the software that manages the erasing of permanent fault codes under section (j)(2) by the end of testing all diagnostics.

* * * *

(2.3.5) Manufacturers shall submit a proposed test plan for Executive Officer approval prior to evaluation testing being performed. The test plan shall identify the method used to induce a malfunction in each diagnostic, including the permanent fault code storage/erasure test procedure. ~~If~~The Executive Officer shall approve the plan upon determininges that the requirements of section (j)(2) are satisfied, and that the permanent fault code storage/erasure test procedure meets the following:~~the proposed test plan shall be approved.~~

(A) The procedure provides comprehensive testing coverage of at least one of each of the different "types" of monitors (fault codes) in each diagnostic or emission critical electronic control unit (e.g., monitors subject to the minimum ratio requirements of section (d)(3.2), monitors not subject to the minimum ratio requirements of section (d)(3.2), monitors that utilize an alternate MIL statistical MIL illumination and fault code storage protocol).

(B) The procedure provides comprehensive testing coverage of every and the different permanent fault code erasure protocols (e.g., "natural" erasure without a clearing of the fault information in the on-board computer, erasure after a battery disconnect, erasure after a scan tool code clear command, erasure after a reprogramming event).

(C) For diagnostics and permanent fault code erasure protocols covered under section (d)(2.5.2)(B) (e.g., erasure after a battery disconnect, erasure after a scan tool code clear command), the procedure verifies that the permanent fault code is not erased if the diagnostic determines the respective component/system is not malfunctioning but the criteria described under section (d)(2.5.2)(B)(iii) are not met.

(D) The procedure verifies that after a scan tool code clear command, all monitors can fully execute and determine that the respective components or systems are not malfunctioning, and

(E) The last procedure performed on a vehicle during testing under section (j)(2) verifies that any remaining permanent fault code(s) stored as a side effect of the testing is erased without requiring reprogramming of the diagnostic or emission critical electronic control unit (i.e., erased through "natural" erasure).

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