Attachment B

Proposed 15-Day Modified Regulation Order,
HD OBD Regulations
Title 13, California Code of Regulations, Sections 1971.1 and 1971.5

Proposed Revisions to the On-Board Diagnostic System Requirements and Associated Enforcement Provisions for Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles and Engines, and Heavy-Duty Engines

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 1971.1 and 1971.5, title 13, California Code of Regulation (CCR), to read as follows:

§ 1971.1 On-Board Diagnostic System Requirements--2010 and Subsequent Model-Year Heavy-Duty Engines

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(c) *Definitions*.

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"Calculated load value" refers to the percent of engine capacity being used and is defined in SAE International (SAE) J1979 "E/E Diagnostic Test Modes," (SAE J1979), incorporated by reference (section (h)(1.4)), or SAE J1979-2 "E/E Diagnostic Test Modes – OBDonUDS", incorporated by reference (section (h)(~~1.4.2~~1.13)). For diesel applications, the calculated load value is determined by the ratio of current engine output torque to maximum engine output torque at current engine speed as defined by suspect parameter number (SPN) 92 of SAE J1939-71 "Vehicle Application Layer," incorporated by reference (section (h)(1.7.8)).

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"Chassis odometer" refers to lifetime vehicle distance.

"Cold start emission reduction strategy (CSERS) monitoring conditions~~cold start criteria~~" is defined as a set of criteria that meet all the following conditions in a single driving cycle:

(1) at least 6 hours of engine-off time before the initial combustion engine start for non-hybrid vehicles, or the continuous time the vehicle is not in a state of "propulsion system active" during the period immediately preceding the start of "propulsion system active" is at least 6 hours for hybrid vehicles,

(2) the ambient temperature is greater than or equal to 20 ~~19.4~~ degrees Fahrenheit (or -6.7 ~~7~~ degrees Celsius), and

(3) the engine coolant temperature is less than or equal to 27 degrees Fahrenheit (or 15 degrees Celsius) higher than the ambient temperature.

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"Engine stall" is defined as a drop in the engine speed to zero revolutions-per-minute (rpm) at idle. For vehicles that employ engine shutoff strategies (e.g., hybrid vehicles or vehicles with a start-stop system that shut off the engine at idle), engine states where the engine speed is zero rpm due to the vehicle commanding the engine to shut off are not considered "engine stalls."

"Engine start" is defined as the point when the engine reaches a speed 150 rpm below the normal, warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission). For hybrid vehicles or for engines employing alternate engine start hardware or strategies (e.g., integrated starter and generators), the manufacturer may request Executive Officer approval to use an alternate definition for engine start (e.g., ignition key "on"). Executive Officer approval of the alternate definition shall be based on equivalence to an engine start for a conventional vehicle.

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"Field reprogrammable" means a control unit that is capable of supporting a manufacturer service procedure intended to be executed in a dealership or other vehicle service environment (e.g., by over-the-air reprogramming) that results in the downloading of new software and/or calibration data into the control unit.

(d) *General Requirements.*

Section (d) sets forth the general requirements of the OBD system. Specific performance requirements for components and systems that shall be monitored are set forth in sections (e) through (g) below. The OBD system is required to detect all malfunctions specified in sections (e) through (g). However, except as specified elsewhere, the OBD system is not required to use a unique monitor to detect each malfunction specified.

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(3) Monitoring Conditions.

Section (d)(3) sets forth the general monitoring requirements while sections (e) through (g) sets forth the specific monitoring requirements as well as identifies which of the following general monitoring requirements in section (d)(3) are applicable for each monitored component or system identified in sections (e) through (g).

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(3.2) As specifically provided for in sections (e) through (g), manufacturers shall define monitoring conditions in accordance with the criteria in sections

(d)(3.2.1) through (3.2.3).

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(3.2.2) For all 2013 and subsequent model year engines, manufacturers shall define monitoring conditions that, in addition to meeting the criteria in sections (d)(3.1) (if applicable) and (d)(3.2.1), ensure that the monitor yields an in-use performance ratio (as defined in section (d)(4)) that meets or exceeds the minimum acceptable in-use monitor performance ratio for in-use vehicles. For purposes of this regulation, the following minimum acceptable in-use monitor performance ratio shall apply for monitors specifically required in sections (e) through (g) to meet the monitoring condition requirements of section (d)(3.2):

(A) For 2013 through 2023 model year engines, 0.100 for all monitors.

(B) Except as provided below in section (d)(3.2.2)(C), for 2024 and subsequent model year engines~~,~~:

(i) 0.100 for the diesel catalyst warm-up strategy (section (e)(11.2.2));

(ii) 0.500 for the gasoline cold start emission reduction strategy cold start catalyst heating monitor in section (f)(4.2.3);

(iii) 0.300 for all other monitors.

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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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(B) Except as provided for in sections (d)(4.3.2)(C) through (~~M~~N~~O~~), the denominator for each monitor shall be incremented within 10 seconds if and only if the following criteria are satisfied on a single driving cycle:

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(D) In addition to the requirements of section (d)(4.3.2)(B) or (J) (whichever is applicable), the denominator(s) for the following monitors shall be incremented if and only if the component or strategy is commanded "on" for a cumulative time greater than or equal to 10 seconds:

(i) Secondary Air System (section (f)(5))

(ii) Cold Start Emission Reduction Strategy (sections (e)(11.2.1) or (f)(4.2.2))

(iii) Components or systems that operate only at engine start-up (e.g., glow plugs, intake air heaters) and are subject to monitoring under

"other emission control systems" (section (g)(4)) or comprehensive component output components (section (g)(3))

For purposes of determining this commanded "on" time, the OBD system may not include time during intrusive operation of any of the components or strategies later in the same driving cycle solely for the purposes of monitoring.

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(M) In addition to the requirements of section (d)(4.3.2)(B) above, the denominator for the cold start emission reduction strategy catalyst warm-up strategy monitor (section (e)(11.2.2)) and the feature/component monitors (sections (e)(11.2.3) and (f)(4.2.4)) shall be incremented if and only if the CSERS monitoring conditions ~~cold start criteria~~ (as defined in section (c)) have been met.

(N) In addition to the requirements of section (d)(4.3.2)(B) above, the denominator for the cold start emission reduction strategy cold start catalyst heating monitor (section (f)(4.2.3)) shall be incremented if and only if the CSERS monitoring conditions (as defined in section (c)) have been met and idle operation in park or neutral during the first 30 seconds after engine start is greater than or equal to 10 seconds.

(~~M~~N~~L~~O) For a monitor designed to detect malfunctions specified under more than one section (e.g., one NMHC converting catalyst monitor to detect malfunctions under sections (e)(5.2.2) and (e)(5.2.3)(A)), if each section is subject to different denominator incrementing criteria, the manufacturer shall request Executive Officer approval of the criteria used for incrementing the monitor denominator. Executive Officer approval of the criteria shall be based manufacturer data and/or engineering evaluation demonstrating that the proposed denominator incrementing criteria results in the lowest in-use monitor performance ratio for the monitor.

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(4.5) Disablement of Numerators and Denominators

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(4.5.4) For 2024 and subsequent model year engines, within ten seconds of a malfunction being detected for any component used to determine if any of the criteria in sections (d)(4.3.2)(C) through (I)~~,~~ and (K)~~, and (L)~~ through (N) are satisfied (e.g., engine cold start), the OBD system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is affected. When the malfunction is no longer detected (i.e., the pending code is erased through self-clearing or through a scan tool command), incrementing of the corresponding numerators and denominators shall resume within 10 seconds.

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(7) Implementation Schedule

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(7.7) SAE J1979 and SAE J1979-2 Implementation Schedule: For vehicles using the ISO 15765-4 protocol as required in section (h)(3.1), the manufacturer shall implement SAE J1979 and SAE J1979-2 as follows:

(7.~~2~~7.1) SAE J1979 Implementation: Except as provided below in section (d)(7.~~2~~7.2), the manufacturer shall use SAE J1979 for the standardized functions required in section 1971.1 for 2010 through 2026 model year engines.

(7.~~2~~7.2) SAE J1979-2 Implementation: For 2027 and subsequent model year engines, the manufacturer shall use SAE J1979-2 for the standardized functions required in section 1971.1.

(A) For 2023 through 2026 model year engines, the manufacturer may use SAE J1979-2 in lieu of SAE J1979 for the standardized functions required in section 1971.1.

(B) The manufacturer may not use SAE 1979-2 for the standardized functions required in section 1971.1 on 2022 and earlier model year engines.

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(8) Determination of Requirements for Applicable Engines

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(8.3) For 2024 and subsequent model year hybrid systems in plug-in hybrid electric vehicles, malfunction criteria for each monitor in sections (e) through (g) that are required to indicate a malfunction before emissions exceed an emission threshold based on the applicable standard shall be determined in the driving mode that results in the worst case emissions (i.e., charge depleting or charge sustaining operation) for each monitor.

(8.4) For 2024 and 2025 model year engines certifying to the provisions of title 13, CCR section 1956.8(a)(2)(C)3:

(8.4.1) The manufacturer may implement an OBD system meeting the requirements of section 1971.1 applicable to a 2023 model year engine in lieu of the requirements of section 1971.1 applicable to 2024 and 2025 model year engines, respectively; and

(8.4.2) For engines meeting the 2023 model year OBD requirements as allowed in section (d)(8.4.1) above, wherever the requirements in this regulation require a manufacturer to meet a specific phase-in schedule for the 2024 or 2025 model year, the manufacturer shall exclude the engines from the engine volume count used to determine compliance with the required phase-in schedule (e.g., exclude the 2025 model year engines from the percentage of engines that meet or do not meet the specific requirement

for the 2025 model year and from the manufacturer's total projected sales volume that the phase-in percentage is based on).

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

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(5) Non-Methane Hydrocarbon (NMHC) Converting Catalyst Monitoring

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(5.2) Malfunction Criteria:

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(5.2.3) Other Aftertreatment Assistance Functions:

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(B) Feedgas generation:

(i) For 2015 through 2024~~and subsequent~~ model year engines, except as provided for in sections (e)(5.2.3)(B)(i)a. through c.~~through (iii)~~ below, for catalysts used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents for proper SCR system operation. For purposes of this monitoring requirement, the manufacturer shall monitor feedgas constituency generation performance of the NMHC catalyst either by itself or in combination with the catalyzed PM filter described under section (e)(8.2.4)(B).

a.~~(i)~~ Catalysts are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyst's feedgas generation ability can cause emissions to increase by 30 percent or more of the applicable NOx standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyst's feedgas generation ability can cause emissions to exceed the applicable NOx standard as measured from an applicable emission test cycle.

b.~~(ii)~~ For purposes of using the monitoring exemption allowance above, the manufacturer shall submit a catalyst deterioration plan to the Executive Officer for review and approval. Executive Officer approval of the plan shall be based on the representativeness of the deterioration method to real world catalyst deterioration replicating a total loss of feedgas constituency generation while still maintaining NMHC conversion capability (e.g., a catalyst loaded only with the production-level specification of palladium).

c.~~(iii)~~ For purposes of using the monitoring exemption allowance above, the manufacturer shall conduct the testing using the NMHC

catalyst either by itself or in combination with the catalyzed PM filter described under section (e)(8.2.4)(B).

(ii) For 2025 and subsequent model year engines, for catalysts used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents to the point when NOx emissions exceed the applicable standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr).

(iii) For OBD systems that have an NMHC catalyst conversion efficiency monitor that fulfills the requirements of section (e)(5.2.2), the manufacturer may use the NMHC catalyst conversion efficiency monitor (i.e., is not required to have a specific feedgas generation performance monitor) to fulfill the feedgas generation performance monitoring requirements of sections (e)(5.2.3)(B)(i) and (e)(5.2.3)(B)(ii).

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(5.2.4) Catalyst System Aging and Monitoring

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(B) For 2025 and subsequent model year engines from engine families selected for monitoring system demonstration in section (i):

(i) In addition to the information described above in section (e)(5.2.4)(A), the catalyst system aging and monitoring plan described above in sections (e)(5.2.4)(A) shall also include the timeline for submitting the information and data described under section (e)(5.2.4)(B)(ii) below. The manufacturer may include several dates in the timeline ~~may include several dates~~ for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD system.

(ii) Information and data to support methods established by the manufacturer to represent real world catalyst deterioration under normal and malfunctioning engine operating conditions in sections (e)(5.2.4)(A) ~~must~~shall be submitted to the Executive Officer and shall ~~at a minimum~~ include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged catalysts, and include the following for a laboratory aged catalyst and ~~a minimum of~~ three field-returned catalysts (data for all field-returned catalysts that are collected for this aging correlation analysis must be submitted to the Executive Officer):

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(iii) The Executive Officer shall approve the catalyst aging method upon finding the data passes each of the following "pass" criteria below. If the manufacturer is not able to locate at least one catalyst to be evaluated under pass criteria 1 through 3 below, the manufacturer may propose to include an additional catalyst described in another pass criterion (e.g., if a catalyst described in pass criterion 2 cannot be located, the manufacturer may use an additional catalyst described in either pass criterion 1 or 3 instead) as representative of the missing catalyst.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (e)(5.2.4)(B)(ii)~~b~~a. that are less than the OBD emission threshold (i.e., parts degraded by less than 2 sigma below the catalyst monitor malfunction threshold) are passing the NMHC catalyst conversion efficiency monitor without MIL illumination. If the engine is certified with an NMHC catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was approved by the Executive Officer will be used in place of the OBD thresholds specified in the regulation.

b. Pass criterion 2: Field-returned parts that have a conversion efficiency averaged over the FTP test representative of the manufacturer's durability demonstration part (i.e., parts degraded within 2 sigma of the catalyst monitor malfunction threshold) meet the following: 1) the NMHC catalyst conversion efficiency monitor illuminates the MIL during the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and emissions are below the emission threshold~~, and meet the FTP emission threshold requirements in section (e)(5.2.4)(B)(ii)b.~~, and 2) the data and analysis show robust detection of NMHC catalyst conversion efficiency malfunctions during conditions meeting the applicable cycle (i.e., the FTP cycle or alternate monitoring conditions approved under section (d)(3.1.3)) and all other monitoring conditions. This testing can be done on road or on a dynamometer. If the engine is certified with an NMHC catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was approved by the Executive Officer will be used in place of the OBD thresholds specified in the regulation.

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(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (e)(5.2.4)(A) and (B) above for an engine if the plan and data have been submitted for a previous model year, the

aging method has not changed from the previous model year, and the calibrations and hardware of the NMHC catalyst monitor, the engine, and the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

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(6) Oxides of Nitrogen (NOx) Converting Catalyst Monitoring

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(6.2) Malfunction Criteria: For purposes of section (e)(6), each catalyst in a series configuration that converts NOx shall be monitored either individually or in combination with others.

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(6.2.3) Catalyst System Aging and Monitoring

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(B) For 2025 and subsequent model year engines from engine families selected for monitoring system demonstration in section (i):

(i) In addition to the information described above in section (e)(6.2.3)(A), the catalyst system aging and monitoring plan described above in section (e)(6.2.3)(A) shall also include the timeline for submitting the information and data described under section (e)(6.2.3)(B)(ii) below. The manufacturer may include several dates in the timeline ~~may include several dates~~ for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD system.

(ii) Information and data to support methods established by the manufacturer to represent real world catalyst deterioration under normal and malfunctioning engine operating conditions in section (f)(6.2.3)(A) must be submitted to the Executive Officer and shall ~~at a minimum~~ include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged catalysts, and include the following for a laboratory aged catalyst and ~~a minimum of~~ three field-returned catalysts (data for all field-returned catalysts that are collected for this aging correlation analysis must be submitted to the Executive Officer):

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(iii) The Executive Officer shall approve the catalyst aging method upon finding the data passes each of the following "pass" criteria below. If the manufacturer is not able to locate at least one catalyst to be evaluated under pass criteria 1 through 3 below, the manufacturer

may propose to include an additional catalyst described in another pass criterion (e.g., if a catalyst described in pass criterion 2 cannot be located, the manufacturer may use an additional catalyst described in either pass criterion 1 or 3 instead) as representative of the missing catalyst.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (e)(6.2.3)(B)(ii)~~b~~a. that are less than the OBD emission threshold (i.e., parts degraded by less than 2 sigma below the catalyst monitor malfunction threshold) are passing the NOx catalyst conversion efficiency monitor without MIL illumination. If the engine is certified with an NOx catalyst monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was approved by the Executive Officer will be used in place of the OBD thresholds specified in the regulation.

* * * *

(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (e)(6.2.3)(A) and (B) above for an engine if the plan and data have been submitted for a previous model year, the aging method has not changed from the previous model year, and the calibrations and hardware of the NOx catalyst monitor, the engine, and the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

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(7) NOx Adsorber Monitoring

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(7.2) Malfunction Criteria:

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(7.2.6) ~~For purposes of determining the NOx adsorber system malfunction criteria in section (e)(7.2.1), the manufacturer shall meet the following requirements:~~Adsorber System Aging and Monitoring

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(B) For 2025 and subsequent model year engines from engine families selected for monitoring system demonstration in section (i):

(i) In addition to the information described above in section (e)(7.2.6)(A), the adsorber system aging and monitoring plan described above in section (e)(7.2.6)(A) shall also include the timeline for submitting the information and data described under section (e)(7.2.6)(B) below. The

manufacturer may include several dates in the timeline ~~may include several dates~~ for data submission for new emission control system designs where the manufacturer has not achieved sufficient in-use aging to demonstrate real world deterioration prior to certification of the OBD system.

(ii) Information and data to support methods established by the manufacturer to represent real world NOx adsorber system deterioration under normal and malfunctioning engine operating conditions in section (e)(7.2.6)(A) ~~must~~shall be submitted to the Executive Officer and ~~shall at a minimum~~ include an analysis of the potential failure modes and effects, highlighting the most likely cause of failure, comparison of laboratory aged versus real world aged adsorbers, and include the following for a laboratory aged adsorber and ~~a minimum of~~ three field-returned NOx adsorbers (data for all field-returned adsorbers that are collected for this aging correlation analysis must be submitted to the Executive Officer):

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(iii) The Executive Officer shall approve the adsorber aging method upon finding the data passes each of the following "pass" criteria below. If the manufacturer is not able to locate at least one adsorber to be evaluated under pass criteria 1 through 3 below, the manufacturer may propose to include an additional adsorber described in another pass criterion (e.g., if an adsorber described in pass criterion 2 cannot be located, the manufacturer may use an additional adsorber described in either pass criterion 1 or 3 instead) as representative of the missing adsorber.

a. Pass criterion 1: High mileage or field-returned parts with FTP emission results from section (e)(7.2.6)(B)(ii)~~b~~a. that are less than the OBD emission threshold (i.e., parts degraded by less than 2 sigma below the adsorber monitor malfunction threshold) are passing the NOx adsorber capability monitor without MIL illumination. If the engine is certified with NOx adsorber monitor deficiency for not detecting a malfunction before emissions exceed the malfunction criteria, the emission levels at which the malfunction was detected when the OBD system was approved by the Executive Officer will be used in place of the OBD thresholds specified in the regulation.

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(C) The Executive Officer may waive the requirements for the submittal of the plan and data under sections (e)(7.2.6)(A) and (B) above for an engine if the plan and data have been submitted for a previous model year, the aging method has not changed from the previous model year, and the calibrations and hardware of the NOx adsorber monitor, the engine, and

the emission control system for the current model year have not changed to the extent aging mechanisms are affected from the previous model year.

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(8) Particulate Matter (PM) Filter Monitoring

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(8.2) Malfunction Criteria:

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(8.2.4) Catalyzed PM Filter:

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(B) Feedgas generation:

(i) For 2016 through 2024~~and subsequent~~ model year engines with catalyzed PM filters used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO2 concentration upstream of an SCR system), except as provided below in sections (e)(8.2.4)(B)(i)a. through c. ~~through (iii)~~ below, the OBD system shall detect a malfunction when the system is unable to generate the necessary feedgas constituents for proper SCR system operation. For purposes of this monitoring requirement, the manufacturer shall monitor feedgas generation performance of the catalyzed PM filter either by itself or in combination with the NMHC catalyst described under section (e)(5.2.3)(B).

a.~~(i)~~ Catalyzed PM filters are exempt from this monitoring if both of the following criteria are satisfied: (1) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to increase by 30 percent or more of the applicable NOx standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyzed PM filter's feedgas generation ability can cause emissions to exceed the applicable NOx standard as measured from an applicable emission test cycle.

b.~~(ii)~~ For purposes of using the monitoring exemption allowance above, the manufacturer shall submit a catalyzed PM filter deterioration plan to the Executive Officer for review and approval. Executive Officer approval of the plan shall be based on the representativeness of the deterioration method to real world catalyzed PM filter deterioration replicating a total loss of feedgas generation while still maintaining NMHC conversion capability (e.g., a catalyzed PM filter loaded only with the production-level specification of palladium).

c.~~(iii)~~ For purposes of using the monitoring exemption allowance above, the manufacturer shall conduct the testing using the catalyzed PM filter either by itself or in combination with the NMHC catalyst described under section (e)(5.2.3)(B).

(ii) For 2025 and subsequent model year engines, for catalyzed PM filters used to generate a feedgas constituency to assist SCR systems (e.g., to increase NO_2 concentration upstream of an SCR system), the OBD system shall detect a malfunction when the catalyzed PM filter is unable to generate the necessary feedgas constituents to the point when NOx emissions exceed the applicable standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr).

(iii) For OBD systems that have a catalyzed PM filter NMHC conversion monitor or are exempt from the catalyzed PM filter NMHC conversion monitoring requirements in accordance with section (e)(8.2.4)(A), the manufacturer is not required to meet the feedgas generation performance monitoring requirements of sections (e)(8.2.4)(B)(i) and (e)(8.2.4)(B)(ii).

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(9) Exhaust Gas Sensor Monitoring

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(9.2) Malfunction Criteria:

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(9.2.2) NOx and PM sensors:

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(D) Monitoring capability: To the extent feasible, the OBD system shall detect a malfunction of the sensor when the sensor output voltage, resistance, impedance, current, amplitude, activity, offset, or other characteristics are no longer sufficient for use as an OBD system monitoring device (e.g., for catalyst, EGR, PM filter, SCR, or NOx adsorber monitoring). The dependent monitor (e.g., catalyst, EGR, SCR or NOx adsorber monitor) for which the sensor is used as an OBD system monitoring device must make a robust diagnostic decision (e.g., avoid false passes of a best performing unacceptable catalyst and false fails of a nominal catalyst) with a deteriorated but passing exhaust gas sensor.

(i) For the NOx sensor on 2025 and subsequent model year engines, the manufacturer shall test each applicable failure mode of the NOx sensor (e.g., sensor offset high failure mode, sensor gain low failure mode) with the component/system for the dependent monitor set at the best performing unacceptable level (e.g., with a best performing unacceptable catalyst). For each applicable NOx sensor failure mode,

the manufacturer shall~~, at a minimum,~~ collect one data point with the sensor performance set at the sensor monitor malfunction threshold, at least three data points with the sensor performance set above the sensor malfunction threshold, and at least three data points with the sensor performance set below the sensor malfunction threshold. The spacing between the data points shall be set at two sigma and calculated using the variance of the applicable NOx sensor monitor output (i.e., the variance calculated from the NOx sensor monitor result distribution for the malfunction threshold sensor for the sensor failure mode under consideration). The manufacturer shall also submit test data and/or engineering analysis demonstrating the NOx sensor monitor robustness against false-pass and false-fail decisions. The robustness data/analysis shall include test results from a wide range of sensor monitor enable conditions and may include data/analysis previously collected during development of the sensor monitor. For each applicable NOx sensor failure mode, the manufacturer shall perform tests of all the required data points without sending a scan tool code clear command between each data point test (e.g., for testing of the sensor offset high failure mode, the manufacturer shall perform tests of all seven data points without sending a code clear command in-between each test). The manufacturer shall send a scan tool code clear command between testing of each applicable NOx sensor failure mode (e.g., collect all seven data points for testing of the sensor offset high failure mode, then send a code clear command before testing of the sensor gain high failure mode). The NOx sensor monitor is deemed compliant if, during testing of each applicable sensor failure mode, all the following are met:

* * * *

c. The dependent monitor (e.g., catalyst monitor) makes a fail decision during testing for each data point (except the data point at the sensor monitor malfunction threshold) in the passing region of the sensor monitor,

d. Either the dependent monitor or the sensor monitor makes a fail decision during testing at the data point at the sensor monitor malfunction threshold,

~~d~~e. The MIL illuminates and is commanded on for a malfunction of the NOx sensor at least once during testing of each applicable NOx sensor failure mode, and

~~e~~f. The MIL illuminates and is commanded on for a malfunction of the dependent component (e.g., catalyst) at least once during testing of each applicable NOx sensor failure mode.

~~f~~(ii) Notwithstanding, if the manufacturer data do not satisfy sections (e)(9.2.2)(D)(i)a., b., c., e., or f. ~~through e.~~ above due to a result being

in the 2 percent tail of a normal distribution or do not satisfy section (e)(9.2.2)(D)(i)d., the manufacturer may submit additional data points at the same sensor performance level to support the demonstration of compliance.

(~~ii~~iii) The Executive Officer may waive the requirements for the submittal of the data under section (e)(9.2.2)(D)(i) above for an engine if the data have been submitted for a previous model year and the calibrations of the NOx sensor monitor and dependent monitor for the current engine have not changed from the previous model year.

(~~iii~~iv) The manufacturer may meet the requirements in section (e)(9.2.2)(D)(i) above on 2023 and 2024 model year engines.

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(11) Cold Start Emission Reduction Strategy Monitoring

(11.1) Requirement:

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(11.1.2) For an element~~/~~, feature, or component associated with the cold start emission reduction control strategy under section (e)(11) that is also required to be monitored elsewhere in section (e) or (g) (e.g., fuel injection timing), the manufacturer shall use different diagnostics to distinguish faults detected under section (e)(11) (i.e., faults associated with the cold start strategy) from faults detected under sections other than section (e)(11) (i.e., faults not associated with the cold start strategy).

(11.2) Malfunction Criteria:

(11.2.1) For 2013 and subsequent ~~through 2025~~ model year engines, t~~T~~he OBD system shall, to the extent feasible, detect a malfunction if any of the following occurs:

(~~11.2.1~~A) For engines not included in the phase-in specified in section (e)(11.2.3)(A), a~~A~~ny single commanded element/component does not properly respond to the commanded action while the cold start strategy is active. For purposes of this section, "properly respond" is defined as when the element responds:

(~~A~~i)by a robustly detectable amount by the monitor; and

(~~B~~ii) in the direction of the desired command; and

(~~C~~iii) above and beyond what the element/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher idle engine speed, a fault must be detected if there is no detectable amount of engine speed increase above what the system would achieve without the cold start strategy active);

(~~11.2.2~~B) For engines not included in the phase-in specified in section (e)(11.2.2), a~~A~~ny failure or deterioration of the cold start emission reduction control strategy that would cause an engine's NMHC, NOx, or CO emissions to exceed 2.0 times the applicable standards or the engine's PM emissions to exceed the applicable standard plus 0.02 g/bhp-hr.

* * * *

(11.2.2) Catalyst warm-up strategy (CWS) monitor: For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines, the OBD system shall monitor the CWS while the CSERS monitoring conditions ~~cold start criteria~~ (as defined in section (c)) are met by measuring the inlet temperature and/or energy to the first NOx reducing element (e.g., SCR) and comparing it with a modeled inlet temperature and/or energy to the first NOx reducing element.

* * * *

(11.2.3) Individual components/features:

(A) For ~~2026~~ 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines, the OBD system shall detect a malfunction if any of the following components and features does not properly respond to the commanded action while the CSERS monitoring conditions ~~cold start criteria~~ (as defined in section (c)) are met:

* * * *

(11.2.4) For the phase-in schedules described in sections (e)(11.2.2) and (e)(11.2.3)(A) above, the manufacturer 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) with the exception that 100 percent of 2028 and subsequent model year engines shall comply with the requirements.

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(f) *Monitoring Requirements for Gasoline/Spark-Ignited Engines.*

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(4) Cold Start Emission Reduction Strategy Monitoring

(4.1) Requirement:

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(4.1.2) For an element~~/~~, feature, or component associated with the cold start emission reduction control strategy under section (f)(4) that is also required to be monitored elsewhere in section (f) or (g) (e.g., idle control system), the manufacturer shall use different diagnostics to distinguish faults detected under section (f)(4) (i.e., faults associated with the cold

start strategy) from faults detected under sections other than section (f)(4) (i.e., faults not associated with the cold start strategy).

(4.2) Malfunction Criteria:

* * * *

(4.2.2) For 2013 ~~and subsequent~~ ~~through 2025~~ model year engines, the OBD system shall, to the extent feasible, detect a malfunction if any of the following occurs:

(A) For engines not included in the phase-in specified in section (f)(4.2.4)(A), a~~A~~ny single commanded element/component does not properly respond to the commanded action while the cold start strategy is active. For elements/components involving spark timing (e.g., retarded spark timing), the monitor may verify final commanded spark timing in lieu of verifying actual delivered spark timing. For purposes of this section, "properly respond" is defined as when the element/component responds:

(i) by a robustly detectable amount; and

(ii) in the direction of the desired command; and

(iii) above and beyond what the element/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher idle engine speed, a fault must be detected if there is no detectable amount of engine speed increase above what the system would achieve without the cold start strategy active);

(B) For engines not included in the phase-in specified in section (f)(4.2.3), a~~A~~ny failure or deterioration of the cold start emission reduction control strategy that would cause an engine's emissions to be equal to or above 1.5 times the applicable standards. For this requirement, the OBD system shall either monitor the combined effect of the elements/components of the system as a whole (e.g., measuring air flow and modeling overall heat into the exhaust) or the individual elements/components (e.g., increased engine speed, commanded final spark timing) for failures that cause engine emissions to exceed 1.5 times the applicable standards.

(4.2.3) Cold Start Catalyst Heating Monitor: For ~~2026~~ 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines utilizing catalyst heating through combustion inefficiency during idle in park or neutral at cold start, except as provided for in section (f)(4.2.3)(C), the OBD system shall monitor the commanded (or delivered, if feasible) extra cold start exhaust heat energy directed to the catalyst during idle in park or neutral. The monitor shall begin when the engine starts and the conditions of the CSERS monitoring conditions ~~cold start criteria~~ (as defined in section (c)) are met, and shall continue no longer than 30 seconds after engine start. Monitoring is not required if the idle

operation in park or neutral during the first 30 seconds after engine start is less than 10 seconds.

(A) The OBD system shall detect a malfunction of the extra cold start exhaust heat energy delivery to the catalyst when any of the following occurs:

(i) The heat energy delivery fails to achieve at least 20 percent of the additional element commanded by the cold start strategy (e.g., if an additional 20 degrees of spark retard are requested to provide additional heat to the catalyst during nominal cold starts on a properly functioning engine, the monitor must detect a malfunction if the strategy fails to command at least 4 degrees of additional spark retard). The additional element commanded by the cold start strategy shall be determined by comparing the commanded value of the element in a properly functioning engine during ~~an FTP test~~ cold start with the commanded value of the element in a properly functioning fully warmed-up engine. A fully warmed-up engine shall be defined by operating the engine until the engine coolant and/or block temperature achieves the targeted regulated temperature for at least 2 minutes prior to shutting the engine off and then restarting the engine within 60 seconds of shut off.

(ii) The malfunction causes an engine's emissions to be equal to or above 1.5 times any of the applicable emission standards.

* * * *

(C) Engines are exempt from the Cold Start Catalyst Heating monitoring requirements in section (f)(4.2.3)(A) if:

(i) Disabling the CSERS would not cause the engine to exceed the full useful life emission standards through the demonstration of ~~=~~a cold start FTP test cycle with the CSERS fully disabled (i.e., with the system configured to the fully warmed-up values as if the engine was shut off after the engine coolant and/or block temperature achieve the targeted regulated temperature for at least 2 minutes and immediately restarted within 60 seconds), or

(ii) The engine does not use increased air, increased fuel flow, and/or combustion efficiency degradation to accelerate aftertreatment heating to reduce cold start emissions (e.g., catalyst is only electrically-heated).

(D) For purposes of meeting the monitoring exemption criterion in section (f)(4.2.3)(C)(i) on vehicles that utilize both electrically heated catalysts monitored in accordance with section (g)(4) and accelerated catalyst heating based on engine operating conditions, the manufacturer is not required to disable the electrically heated catalyst during the testing but may not increase the electric heating beyond the levels of a properly functioning emission control system.

(4.2.4) Individual Feature/Component Monitoring:

(A) For ~~2026~~ 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines, the OBD system shall detect a malfunction if any of the following components and features does not properly respond to the commanded action while the CSERS monitoring conditions ~~cold start criteria~~ (as defined in section (c)) are met:

(i) Fuel Pressure~~,~~;

(ii) Idle Speed Control;

(iii) Variable Valve Timing/Lift;

(iv) Split/Multiple Injections (missing pulses);

(v) Charge motion control, intake runner, or swirl control valves; or

(vi) Electronic wastegate position

(B) If the setpoint of a component/feature is different between cold start conditions and non-cold start conditions, for purposes of section (f)(4.2.4)(A), "properly respond" is defined as when the feature/component responds:

(i) by a robustly detectable amount; ~~and~~

(ii) in the direction of the desired command; and

(iii) above and beyond what the feature/component would achieve on start-up without the cold start strategy active (e.g., if the cold start strategy commands a higher fuel pressure~~idle engine speed~~, a fault must be detected if there is no detectable amount of fuel pressure~~engine speed~~ increase above what the system would achieve without the cold start strategy active).

(C) For the idle speed control monitor in section (f)(4.2.4)(A)(ii), to meet the requirements in sections (f)(4.2.4)(A) and (B), the OBD system shall detect a malfunction of the idle speed control when any of the following occurs while the CSERS monitoring conditions (as defined in section (c)) are met:

(i) The idle speed control system cannot achieve the target idle speed within 300 rpm below the target speed, or

(ii) The idle speed control system cannot achieve the target idle speed within the smallest engine speed tolerance range required by the OBD system to enable any other monitor (e.g., the Cold Start Catalyst Heating monitor (section (f)(4.2.3)).

(~~C~~D) For features/components where feedback from a sensor is not available to monitor for proper response, the monitor may verify the final commanded action in lieu of verifying actual delivered action.

(4.2.5) For 2023 through 2025 model year engines, the manufacturer may meet the requirements in sections (f)(4.2.3) and (f)(4.2.4) above in lieu of meeting the requirements in section (f)(4.2.2).

(4.2.6) For the phase-in schedules described in sections (f)(4.2.3) and (f)(4.2.4)(A) above, the manufacturer 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) with the exception that 100 percent of 2028 and subsequent model year vehicles shall comply with the requirements.

(4.3) Monitoring Conditions: Manufacturers shall define the monitoring conditions for malfunctions identified in section (f)(4.2) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements).

(4.3.1) For the Cold Start Catalyst Heating monitor (section (f)(4.2.3), manufacturers may request Executive Officer approval to disable monitoring required under section (f)(4.2.3)(A) during certain conditions (e.g., low ambient temperatures) where robust detection of malfunctions is not possible (i.e., to avoid false passes and false indications of malfunctions). The Executive Officer shall approve the request upon determining that the manufacturer has submitted data or an engineering evaluation which demonstrate that a properly operating system cannot be distinguished from a malfunctioning system and that the disablement is limited only to those conditions in which it is technically necessary when using the best available monitoring technologies.

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(g) Monitoring Requirements For All Engines.

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(3) Comprehensive Component Monitoring

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(3.2) Malfunction Criteria:

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(3.2.2) Output Components/Systems:

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(B) The idle control system shall be monitored for proper functional response to computer commands.

(i) For gasoline engines using monitoring strategies based on deviation from target idle speed, a malfunction shall be detected when ~~either~~ any of the following conditions occur:

a. The idle speed control system cannot achieve the target idle speed within 200 revolutions per minute (rpm) above the target speed or

100 rpm below the target speed. The Executive Officer shall allow larger engine speed tolerances upon determining that a manufacturer has submitted data and/or an engineering evaluation which demonstrate that the tolerances can be exceeded without a malfunction being present.

b. The idle speed control system cannot achieve the target idle speed within the smallest engine speed tolerance range required by the OBD system to enable any other monitors.

c. For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year engines without manual transmissions (i.e., any transmission that relies on the vehicle operator to independently control clutch engagement/disengagement and gear selection), an engine stall (as defined in section (c)) occurs ~~(where an "engine stall" refers to a drop in the engine revolutions-per-minute (rpm) to zero rpm)~~ within 20 seconds after engine start at the beginning of a driving cycle ~~when fuel level is 15 percent or more of the nominal capacity of the fuel tank~~.

1. Manufacturers are required to store different fault codes for stalls detected while the CSERS monitoring conditions ~~cold start criteria~~ (defined in section (c)) are met and stalls detected while the CSERS monitoring conditions ~~cold start criteria~~ are not met.

2. The manufacturer may use an alternate phase-in schedule as defined in section (c) in lieu of the required phase-in schedule for the engine stall monitor in section (g)(3.2.2)(B)(i)c. if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2028 and subsequent model year engines shall comply with the requirements.

3. Monitoring is not required when the fuel level is equal to or less than 15 percent of the nominal capacity of the fuel tank.

* * * *

(h) *Standardization Requirements.*

(1) Reference Documents:

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

* * * *

(1.4) SAE J1979 "E/E Diagnostic Test Modes", February 2017 (SAE J1979).

(1.4.1) SAE J1979-DA "Digital Annex of E/E Diagnostic Test Modes", ~~May 2019~~ April 2021.

~~(1.4.2) SAE J1979-2, "E/E Diagnostic Test Modes: OBDonUDS", April 2021~~

* * * *

(1.12) ISO 2575 "Road Vehicles – Symbols for Controls, Indicators and Tell-Tales," July 2010 (ISO 2575).

(1.13) SAE J1979-2, "E/E Diagnostic Test Modes: OBDonUDS", April 2021.

* * * *

(3) Communications to a Scan Tool:

All OBD control modules (e.g., engine, auxiliary emission control module) on a single vehicle shall use the same protocol for communication of required emission-related messages from on-board to off-board network communications to a scan tool meeting SAE J1978 specifications or designed to communicate with an SAE J1939 network. Engine manufacturers shall not alter normal operation of the engine emission control system due to the presence of off-board test equipment accessing information required by section (h). The OBD system shall use one of the following standardized protocols:

(3.1) ISO 15765-4. All required emission-related messages using this protocol shall use a 500 kbps baud rate.

* * * *

(3.1.3) For engines using SAE J1979-2, except as provided in sections (h)(3.1.3)(A)~~, (h)(3.1.3)(B), and~~ through (h)(3.1.3)(F) and (h)(4.7.~~4~~5)(~~B~~A), the OBD system may ~~not~~ respond with a negative response code (NRC) in response to a request message from a scan tool in accordance with the specifications of SAE J1979-2.

~~(A) The OBD system may respond with NRC $22, $31, $72, or $78 in response to a Service $14 (i.e., clear/reset emission-related diagnostic information) request message from a scan tool.~~

~~(B) The OBD system may respond with NRC $78 in response to a request message for tracking data specified in sections (h)(5.3) through (h)(5.6) from a scan tool.~~

(A) The OBD system may not respond with NRC $13 in response to a functional or physical request message from a scan tool with an invalid request message format.

(B) The OBD system may not respond with NRC $21 in response to a functional or physical request message from a scan tool for Service $22.

(C) The OBD system may not respond with NRC $72 in response to a functional or physical request message from a scan tool for Service $14 unless the OBD system detects a malfunction and stores a fault code for a malfunction of the on-board computer memory in conjunction with responding with NRC $72.

(D) The OBD system may not respond with NRC $78 in response to a functional or physical request message from a scan tool for Service $19 subfunction $42 or $55 unless the NRC $78 is for data not available and conditions correct, in which case the OBD system may not respond more than once with NRC $78.

(E) If the OBD system responds with NRC $78 in response to a functional or physical request message from a scan tool for Service $14, the OBD system may not respond more than once with NRC $78.

(F) The OBD system may not respond with NRC $78 in response to a functional or physical request message from a scan tool for Service $22 except when tracking data specified in sections (h)(5.3) through (h)(5.6) are requested or the calibration verification number (CVN) is requested in accordance with section (h)(4.7.5)(B).

* * * *

(4) Required Emission Related Functions:

The following standardized functions shall be implemented in accordance with the specifications in SAE J1979, SAE J1979-2, or SAE J1939 to allow for access to the required information by a scan tool meeting SAE J1978 specifications or designed to communicate with an SAE J1939 network:

(4.1) Readiness Status:

(4.1.1) For engines using SAE J1979 or SAE J1939:

* * * *

(I) Subject to Executive Officer approval, if monitoring is disabled for a multiple number of driving cycles due to the continued presence of extreme operating conditions (e.g., cold ambient temperatures, high altitudes), readiness status for the subject monitoring system may be set to indicate "complete" without monitoring having been completed. Executive Officer approval shall be based on the conditions for monitoring system disablement and the number of driving cycles specified without completion of monitoring before readiness is indicated as "complete".

(4.1.2) For engines using SAE J1979-2:

* * * *

(E) If the manufacturer elects to additionally indicate readiness status through the MIL in the key on, engine off position as provided for in section (d)(2.1.3), the readiness status shall be indicated in the following manner:

(i) If the readiness status for all monitored components or systems is "complete", the MIL shall continuously illuminate in the key on, engine off position for at least 15 seconds as required by section (d)(2.1.2).

(ii) If the readiness status for one or more of the monitored components or systems is "not complete", after 15-20 seconds of operation in the key on, engine off position with the MIL illuminated continuously as required by section (d)(2.1.2), the MIL shall blink once per second for 5-10 seconds.

(iii) The data stream value for MIL status (section (h)(4.2)) shall indicate "commanded off" during ~~this~~the sequence in sections (h)(4.1.2)(E)(i) and (ii) unless the MIL has also been "commanded on" for a detected fault.

(F) Subject to Executive Officer approval, if monitoring is disabled for a multiple number of driving cycles due to the continued presence of extreme operating conditions (e.g., cold ambient temperatures, high altitudes), readiness status for the subject monitoring system may be set to indicate "complete" without monitoring having been completed. Executive Officer approval shall be based on the conditions for monitoring system disablement and the number of driving cycles specified without completion of monitoring before readiness is indicated as "complete".

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(4.3) Freeze Frame:

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(4.3.2) For engines using SAE J1979-2:

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(B) "Freeze frame" conditions must include the fault code which caused the data to be stored and all of the signals required in sections (h)(4.2.1)(A) and (4.2.2)(A). Freeze frame conditions shall also include all of the signals required on the engine in sections (h)(4.2.1)(B), (4.2.2)(B), (4.2.2)(E), (4.2.3)(A), (4.2.3)(B), and (4.2.4)(A)~~, and (4.2.4)(B)~~ that are used for diagnostic or control purposes in the specific diagnostic or emission-critical powertrain control unit that stored the fault code.

* * * *

(4.4) Fault Codes:

(4.4.1) For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h):

* * * *

(F) Permanent fault codes:

* * * *

(iv) Permanent fault codes may not be erased when the control module containing the permanent fault code is reprogrammed unless:

a. For engines using SAE J1979, the readiness bits (refer to section (h)(4.1)) for all monitored components and systems in all modules that reported supported readiness for a readiness bit other than the comprehensive components readiness bit are set to "not complete" in conjunction with the reprogramming event.

b. For engines using SAE J1979-2, the readiness bits (refer to section (h)(4.1)) for all monitored components and systems in the module containing the permanent fault code are set to "not complete" in conjunction with the reprogramming event.

* * * *

(4.8) Vehicle and Engine Identification Numbers:

* * * *

(4.8.3) If the VIN or ESN is reprogrammable, in conjunction with reprogramming of the VIN or the ESN~~,~~;

(A) For engines using SAE J1979 or SAE J1939, the OBD system shall erase all emission-related diagnostic information identified in section (h)(4.10.1) in all control modules that reported supported readiness for a readiness bit other than the comprehensive components readiness bit.

(B) For engines using SAE J1979-2, the OBD system shall erase all emission-related diagnostic information identified in section (h)(4.10.1) in the control module that was reprogrammed.

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(5) Tracking Requirements:

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(5.3) NOx Emission Tracking Requirements:

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(5.3.3) Each parameter in each array in section (h)(5.3.2) 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.

* * * *

(F) "Bin 15" stores data only when the engine is operating within the NOx NTE control area and ~~no exclusions apply~~ none of the NTE exclusion criteria are satisfied.

* * * *

(5.9) Cold Start Emission Reduction Strategy Tracking Requirements

(5.9.1) For purposes of section (h)(5.9), the following terms shall be defined as follows:

(A) "Catalyst cold start tracking ~~light-off~~ temperature threshold" is defined as when the SCR catalyst ~~inlet~~ temperature that is directly measured or estimated for purposes of enabling DEF dosing reaches 180 degrees Celsius~~ at which the SCR catalyst NOx conversion efficiency reaches 50 percent~~.

(B) "FTP catalyst cold start tracking ~~light-off~~ time" is defined as the time from engine start until the ~~SCR catalyst inlet temperature reaches the~~ catalyst cold start tracking ~~light-off~~ temperature threshold is achieved on an FTP test. For an engine family with multiple power ratings, manufacturers may request Executive Officer approval for proposing a representative FTP catalyst cold start tracking ~~light-off~~ time for the engine family. The Executive Officer shall approve the request upon determining that, based on manufacturer-submitted data and/or information, the representative ~~light-off~~ time represents the FTP catalyst cold start tracking ~~light-off~~ time on the majority of the power ratings in the field.

(C) "Engine output energy", in units of Joules (J) or Watts (W)*s, is defined by integrating brake engine power output over time, with:

"Brake engine power output" = 2π x (Brake engine torque) x (Engine RPM)/60 in units of W, and

"Brake engine torque" = (engine reference torque) x [(indicated torque) – (friction torque)].

(D) "Specified FTP engine output energy" is defined as the accumulated engine output energy measured from engine start until the ~~SCR catalyst inlet temperature reaches the~~ catalyst cold start tracking ~~light-off~~ temperature threshold is achieved on an FTP test. For an engine family with multiple power ratings, manufacturers may request Executive Officer approval for proposing a representative specified FTP engine output energy for the engine family. The Executive Officer shall approve the request upon determining that, based on manufacturer-submitted data and/or information, the representative energy represents the specific FTP engine output energy on the majority of the power ratings in the field.

(E) "~~Post-diesel oxidation catalyst (DOC) heat energy~~Pre-SCR heat energy" is defined as the heat energy flow prior to the SCR~~through the DOC~~ over time, with:

"Heat energy flow prior to the SCR~~through the DOC~~" = [heat capacity of exhaust gas (C_p)] x [exhaust mass flow ($m_{exhaust}$)] x (temperature difference between SCR inlet~~DOC outlet~~ and ambient) /1000.

(5.9.2) For 20 percent of 2026, 50 percent of 2027, and 100 percent of 2028 and subsequent model year diesel engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the following parameters. During driving cycles where the CSERS monitoring conditions ~~cold start criteria~~ (as defined in section (c)) are met

at engine start, each parameter shall start ~~accumulating/incrementing~~ tracking from engine start until the conditions described below for each parameter are met:

(A) Heat energy release tracker #1 (kiloJoules (kJ)): ~~accumulate~~ track pre-SCR ~~post- DOC~~ heat energy (in units of kJ) until the FTP catalyst cold start tracking ~~light-off~~ time is achieved.

(B) Heat energy release tracker #2 (kJ): ~~accumulate~~ track pre-SCR ~~post- DOC~~ heat energy until the specified FTP engine output energy is achieved.

(C) Heat energy release tracker #3 (kJ): ~~accumulate~~ track pre-SCR ~~post- DOC~~ heat energy until the ~~on-road~~ catalyst cold start tracking ~~light-off~~ temperature threshold is achieved.

(D) Engine output energy tracker #1 (kJ): ~~accumulate~~track engine output energy until the FTP catalyst cold start tracking ~~light-off~~ time is achieved.

(E) Engine output energy tracker #2 (kJ): ~~accumulate~~track engine output energy until the ~~on-road~~ catalyst cold start tracking ~~light-off~~ temperature threshold is achieved.

(F) EGR mass flow tracker #1 (kilograms (kg)): ~~accumulate~~track EGR mass flow until the FTP catalyst cold start tracking ~~light-off~~ time is achieved.

(G) EGR mass flow tracker #2 (kg): ~~accumulate~~track EGR mass flow until the specified FTP engine output energy is achieved.

(H) EGR mass flow tracker #3 (kg): ~~accumulate~~track EGR mass flow until the ~~on-road~~ catalyst cold start tracking~~light-off~~ temperature threshold is achieved.

(I) Timer #1 e~~E~~ngine energy output accumulated time ~~timer~~ (seconds): ~~increment~~track time until the specified FTP engine output energy is achieved.

(J) Timer #2 c~~C~~atalyst cold start tracking accumulated time ~~Light-Off Timer~~ (seconds): ~~increment~~track time until the catalyst cold start tracking~~light-off~~ temperature threshold is achieved.

* * * *

(5.9.5) Numerical Value Specifications: For each parameter specified in section (h)(5.9.2):

(A) For parameters stored in the data type described in section (h)(5.9.3)(A):

(i) 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).

(ii) The OBD system shall store each number within 10 seconds after all counters in section (h)(5.9.2) have stopped ~~incrementing~~tracking in each driving cycle.

(B) For parameters stored in the data type described in section (h)(5.9.3)(B):

(i) Each 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.

(ii) The OBD system shall store each number within 600 seconds after the end of a driving cycle.

(C) The parameters shall conform to the standardized format specified in SAE J1939, SAE J1979, or SAE J1979-2, whichever is applicable

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(6) Data Reporting Requirements for Over-the-Air Reprogramming:

(6.1) For all 2024 and subsequent model year engines, if any of the data required to be stored and made available pursuant to section (h)(5) would be erased by an over-the-air reprogramming of any control module, the manufacturer shall collect all lifetime data stored in the engine pursuant to this section using the over-air-network prior to their erasure.

(~~6.2~~6.1.1) The manufacturer shall submit a report to the Executive Officer containing the average value and standard deviation of each collected parameter for each affected certified engine family. For engines using SAE J1979 or SAE J1939, the report shall meet the specifications of ~~as specified in,~~ "Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines", dated August 16, 2018, and hereby incorporated by reference. For engines using SAE J1979-2, the report shall meet the specifications of "Data Record Reporting Procedures for Over-the-Air Reprogrammed Vehicles and Engines Using SAE J1979-2", dated ~~June 1, 2021~~December 15, 2021, and hereby incorporated by reference. The manufacturer shall submit the report within 75 calendar days of the availability of the calibration/software update to affected engines. The manufacturer shall submit a separate report for each unique calibration/software update.

* * * *

(j) *Certification Documentation.*

* * * *

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

* * * *

(2.16) A cover letter identifying all concerns and deficiencies applicable to the equivalent previous model year engine, the changes and/or resolution of each concern or deficiency for the current model year engine, a list of modifications to the OBD system that were made as part of a running change or field fix applied to the previous model year (for this engine or another engine), and all other known issues that apply to the current model year engine (e.g., concerns or deficiencies of another engine that also apply to this engine, issues found during production engine/vehicle evaluation testing under section (l) from a previous model year).

* * * *

(l) *Production Engine/Vehicle Evaluation Testing.*

(1) Verification of Standardized Requirements.

* * * *

(1.3) Test Equipment: For the testing required in section (l)(1), manufacturers shall utilize an off-board device to conduct the testing. Prior to conducting testing, manufacturers are required to request and receive Executive Officer approval of the off-board device that the manufacturer will use to perform the testing.

(1.3.1) For vehicles using the ISO 15765-4 protocol for the standardized functions required in section (h), except as provided for in section (l)(1.3.1)(A) below, the Executive Officer shall approve the request upon determining that the manufacturer has submitted data, specifications, and/or engineering analysis that demonstrate that the off-board device meets the minimum requirements to conduct testing according to SAE J1699-3 using ~~the~~ software developed and maintained specifically for ~~the~~ SAE J1699-3 testing ~~committee and available through www.sourceforge.net~~ and SAE J2534-1 compliant hardware configured specifically for SAE J1699-3 testing.

* * * *

(1.3.2) For vehicles using the SAE J1939 protocol for the standardized functions required in section (h), the Executive Officer shall approve the request upon determining that the manufacturer has submitted data, specifications, and/or engineering analysis that demonstrate that the off-board device meets the minimum requirements to conduct testing according to SAE J1939/84 using ~~the~~ software developed and maintained specifically for ~~the~~ SAE J1939/84 testing ~~committee and available through~~

~~www.sourceforge.net~~ and SAE J2534-1 compliant hardware configured for SAE J1939/84 testing.

* * * *

(1.5) Reporting of Results:

(1.5.1) The manufacturer shall submit to the Executive Officer all information described in sections (l)(1.5.1)(A) through (C) in one report for each engine model year. The report shall be one single file for each engine model year and shall include the information for all testing completed in that specific engine model year. The manufacturer shall update the report for each new test within the deadlines described below.~~The manufacturer shall submit to the Executive Officer the following, based on the results of testing~~:

(A) If a variant meets all the requirements of section (l)(1.4), the test results (i.e., the test log file(s)), all information required in section (l)(1.5.1)(C), and a statement specifying that the variant passed all the tests within three months of testing the specific variant, or

(B) If any variant does not meet the requirements of section (l)(1.4), the test log file(s) and all information required in section (l)(1.5.1)(C) ~~a written report~~ to the Executive Officer for approval within one month of testing the specific variant. The written report shall include the problem(s) identified and the manufacturer's proposed corrective action (if any) to remedy the problem(s). Factors to be considered by the Executive Officer in approving the proposed corrective action shall include the severity of the problem(s), the ability of the vehicle to be tested in a California inspection program (e.g., roadside inspection, fleet self-inspection program), the ability of service technicians to access the required diagnostic information, the impact on equipment and tool manufacturers, and the amount of time prior to implementation of the proposed corrective action.

(C) Manufacturers shall include the following information in the report for each test described in sections (l)(1.5.1)(A) and (l)(1.5.1)(B):

(i) Test log filename(s)

(ii) Date the test log file(s) was submitted to CARB

(iii) Date test was conducted

(iv) Manufacturer

(v) Engine Model year

(vi) OBD certification documentation group (if applicable)

(vii) Engine family

(viii) Engine rating

(ix) Fuel type (i.e., gasoline, diesel, or alternate fuel)

(x) Powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle)

(xi) Start of engine production date

(xii) Start of vehicle production date

(xiii) Production vehicle subgroup identifier (i.e., identifier used to indicate either the production vehicle is a unique production vehicle or the production vehicle is part of a production vehicle group in accordance with section (l)(1.2.1))

(xiv) SAE 1699 build revision number or SAE J1939/84 HD OBD scan tool release number

(xv) Number of warnings

(xvi) Number of failures

(xvii) For each warning identified in section (l)(1.5.1)(A) or (B):

a. Warning message

b. Description/explanation of warning

c. SAE J1699 or SAE J1939/84 test number

(xviii) For each failure identified in section (l)(1.5.1)(B):

a. Failure message

b. One of the following failure classifications:

1. Mandatory recall failure (i.e., failures that meet the criteria for mandatory recall under title 13, CCR section 1971.5(d)(3)(A)(vii)),

2. Section 1971.1 standardization failure (i.e., failures due to the OBD system not complying with the standardization requirements of section 1971.1),

3. SAE J1699 or SAE J1939/84 specification failure (i.e., failures incorrectly identified by the SAE J1699 or SAE J1939/84 software),

4. Operator/user error failures, or

5. Other failures (e.g., incorrect failure due to the engine not meeting the requirement based on an alternative phase-in)

c. Description/explanation of failure

d. SAE J1699 or SAE J1939/84 test number

(xix) For each warning and failure identified, any additional notes, including but not limited to corrective actions taken (e.g., running

changes, field fixes, future model year updates) and titles and dates of presentations describing the issues/failures for a test.

* * * *

(2) Verification of Monitoring Requirements.

* * * *

(2.3) Evaluation requirements:

* * * *

(2.3.3) The evaluation shall verify that the software used to track the numerator and denominator for purposes of determining in-use monitoring frequency correctly increments as required in section (d)(4), and shall verify that the readiness status correctly sets to "complete" as required in section (h)(4.1). These shall be verified using the "dynamic" testing portion of SAE J1699-3 ~~and available at www.sourceforge.net~~ for SAE J1979 compliant engines or the software described in SAE J3162 for SAE J1939 compliant engines and available at https://github.com/Equipment-and-Tool-Institute/iumpr.

* * * *

(2.4) Reporting of Results:

(2.4.1) Manufacturers shall submit a report of the results of all testing conducted pursuant to section (l)(2) to the Executive Officer for review. This report shall identify the method used to induce a malfunction in each diagnostic, the MIL illumination status, and the fault code(s) stored. The report shall also include all the information described in section (l)(2.4.2)~~a summary of any problems identified during testing (e.g., a monitor that is unable to detect a fault, a monitor that is unable to store a fault code or illuminate the MIL when a fault is detected)~~.

(2.4.2) Manufacturers shall include the following information in the report for each test described in section (l)(2.4.1):

(A) Report of the results filename

(B) Manufacturer

(C) Engine Model year

(D) OBD certification documentation group (if applicable)

(E) Engine family

(F) Engine rating

(G) Fuel type (i.e., gasoline, diesel, or alternate fuel)

(H) Powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle)

(l) Start of engine production date

(J) Start of vehicle production date

(K) Number of diagnostics tested in accordance with section (l)(2.3.1)

(L) Number of diagnostics tested in accordance with section (l)(2.3.2)

(M) Number of problems identified during testing conducted in accordance with sections (l)(2.3.1) and (l)(2.3.2)

(N) For each problem identified:

(i) Fault code (SAE J2012, SAE J1939, or manufacturer-defined)

(ii) Fault code description

(iii) Method used to induce malfunction

(iv) Fail reason (e.g., monitor is unable to detect a fault, monitor is unable to store a fault code or illuminate the MIL when a fault is detected, unable to erase permanent fault codes, OBD system diagnostic is disabled by a malfunction detected by a non-MIL illuminating diagnostic)

(v) Description/explanation of problem

(O) Number of diagnostics exempted from testing in accordance with section (l)(2.3.6)

(P) For each problem identified, any additional notes, including but not limited to corrective actions taken (e.g., running changes, field fixes, future model year updates) and titles and dates of presentations describing the issues/failures for a test.

* * * *

(3) Verification and Reporting of In-use Monitoring Performance.

* * * *

(3.4) Required Data:

(3.4.1) For each group of vehicles using SAE J1979 or SAE J1939:~~,~~

(A) T~~t~~he data must include all of the in-use performance tracking data reported through SAE J1979/J1939 (i.e., all numerators, denominators, the general denominator, and the ignition cycle counter), the engine model year, the engine manufacturer, the engine family, the engine serial number, the engine HP rating (for diesels), the engine torque rating (for diesels), the date the data were collected, the chassis odometer reading, the vehicle/chassis VIN, the monitoring performance group, the ECM software calibration identification number, and the distance traveled and be in the standardized format detailed in Attachments D and E of ARB Mail-Out #MSC 09-22. Additionally, the data shall include the OBD certification documentation group (if applicable), whether or not the

vehicle is an alternate-fueled vehicle, and powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle).

(B) The manufacturer shall ~~also~~ submit a report that includes a summary of any problems identified in the data (e.g., a monitor where the average in-use monitor performance ratio is less than the minimum acceptable ratio under section (d)(3.2.2)).

~~(3.4.1)~~(C) For 2022 and subsequent model year engines on vehicles from which the manufacturer collects and reports in-use monitoring performance data under section (l)(3), the manufacturer shall also collect the data specified in sections (h)(4.1) through (h)(4.9) and (h)(5), as applicable.

(3.4.2) For each group of vehicles using SAE J1979-2:

~~(A) The data must be collected only from vehicles where the general denominator (as defined in section (d)(5.6)) has a value equal to or greater than 300.~~

(~~B~~A) The data ~~must~~shall include all of the in-use performance tracking data reported through SAE J1979-2 (i.e., all numerators, denominators, the general denominator, and the ignition cycle counter), the engine model year, the engine manufacturer, the engine family, the engine serial number, the engine HP rating (for diesels), the engine torque rating (for diesels), the date the data were collected, the chassis odometer reading, the vehicle/chassis VIN, the monitoring performance group, the ECM software calibration identification number, and the distance traveled and be in the standardized format detailed in Attachments D and E of ARB Mail-Out #MSC 09-22. Additionally, the data ~~must~~shall include the OBD certification documentation group (if applicable), whether or not the vehicle is an alternate-fueled vehicle, powertrain type (i.e., conventional, mild hybrid electric, strong hybrid electric, or plug-in hybrid electric vehicle), and the data specified in (d)(5.7), (h)(4.1) through (h)(4.9), and (h)(5).

(~~C~~B) The manufacturer shall submit a report that includes a summary of any problems identified in the data (e.g., a monitor where the average in-use monitor performance ratio is less than the minimum acceptable ratio under section (d)(3.2.2))~~.~~.

(3.4.3) In lieu of the VIN required under sections (l)(3.4.1)(A) and (l)(3.4.2)(A) above, a manufacturer may request Executive Officer approval to include an alternate vehicle identifier. The Executive Officer shall approve the request if the following conditions are met:

(A) The alternate vehicle identifier is unique for each vehicle (i.e., multiple vehicles cannot have the same alternate vehicle identifier),

(B) A specific VIN always has the same alternate vehicle identifier (i.e., a specific VIN cannot have more than one different alternate vehicle identifiers), and

(C) The manufacturer shall provide the VIN for a specific alternate vehicle identifier upon request from the Executive Officer.

* * * *

(n) *How to Submit Required Information.*

(1) Wherever section 1971.1 requires manufacturers to submit information to the Executive Officer, the manufacturer may send the information through the electronic documentation system at this website: https://ww2.arb.ca.gov/certification-document-management-system.

NOTE: Authority cited: Sections 38501, 38510, 39010, 39600, 39601, 39602.5, 43000.5, 43013, 43018, 43100, 43101, 43104, 43105, 43105.5, and 43106, ~~43154, 43211, and 43212,~~ Health and Safety Code. Reference: Sections 38501, 38505, 38510, 39002, 39003, 39010, 39018, 39021.5, 39024, 39024.5, 39027, 39027.3, 39028, 39029, 39031, 39032, 39032.5, 39033, 39035, 39037.05, 39037.5, 39038, 39039, 39040, 39042, 39042.5, 39046, 39047, 39053, 39054, 39058, 39059, 39060, 39515, 39600, 39601, 39602.5, 43000, 43000.5, 43004, 43006, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43105.5, 43106, 43150, 43151, 43152, 43153, 43154, 43155, 43156, 43204, 43211, and 43212, Health and Safety Code.

§ 1971.5. Enforcement of Malfunction and Diagnostic System Requirements for 2010 and Subsequent Model-Year Heavy-Duty Engines.

(a) *General*.

(1) *Applicability*.

(A) These procedures shall be used to assure compliance with the requirements of California Code of Regulations (Cal. Code Regs.), title 13, section 1971.1 for all 2010 and subsequent model year heavy-duty engines equipped with OBD systems that have been certified for sale in California.

(B) Engines manufactured prior to the 2010 model year are covered by the general enforcement and penalty provisions of the Health and Safety Code, and the specific provisions of Cal. Code Regs., title 13, section 1971 and section 2111 through section 2149.

(C) For 2024 and 2025 model year engines certified to the provisions of title 13, CCR section 1956.8(a)(2)(C)3 and with OBD systems meeting the requirements of title 13, CCR section 1971.1 applicable to a 2023 model year engine, a manufacturer shall use the provisions of section 1971.5 applicable to a 2023 model year engine.

* * * *

(b) Testing Procedures for ARB-Conducted Testing.

* * * *

(6) *Finding of Nonconformance after Enforcement Testing*.

After conducting enforcement testing pursuant to section (b)(4) above, the Executive Officer shall make a finding of nonconformance of the OBD system in the identified engine class under the respective tests for the applicable model year(s) as follows:

* * * *

(B) OBD Ratio Testing.

* * * *

(iv) 2028 and subsequent model year engines with monitors certified to a ratio of 0.300 in accordance with Cal. Code Regs., title 13, section 1971.1(d)(3.2.2) shall be considered nonconforming if the data collected from the engines in the test sample group indicate either that the average in-use monitor performance ratio for one or more of the monitors in the test sample group is less than 0.265 or that 66.0 percent or more of the engines in the test sample group have an in-use monitor performance ratio of less than 0.300 for the same monitor.

(v) Engines with monitors certified to a ratio of 0.500 in accordance with Cal. Code Regs., title 13, section 1971.1(d)(3.2.2) shall be considered nonconforming if the data collected from the engines in the test sample

group indicate either that the average in-use monitor performance ratio for one or more of the monitors in the test sample group is less than 0.441 or that 66.0 percent or more of the engines in the test sample group have an in-use monitor performance ratio of less than 0.500 for the same monitor.

* * * *

(c) Manufacturer Self-Testing.

* * * *

(6) *Manufacturer Reporting of Self-Testing Results to the Executive Officer*.

(A) Within 30 days after completing the testing under section (c)(3), the manufacturer shall submit a report of the results of all the testing to the Executive Officer for review. If further testing is required under section (c)(4), an additional report shall be submitted within 30 days of completing the additional testing. The report(s) must include the following:

(i) A description of each test engine and the engine family and engine rating to which the test engine belongs to;

(ii) A description of the test sequence (e.g., the number and types of preconditioning cycles) used for each testing;

(iii) A description of the modified or deteriorated components used for fault simulation with respect to each testing; and

(iv) The test results of all testing done under sections (c)(3) and (c)(4) for each test engine, consisting of:

a. the weighted emission test results and adjusted emission values, if applicable, for all measured pollutants for each test; and

b. the OBD data specified by Cal. Code Regs., title 13, section 1971.1(i)(4.3.2) collected prior to (or immediately after) each engine shut-down during the testing of sections (c)(3) and (c)(4) including the preconditioning cycles.

(v) Report of the results filename

(vi) Manufacturer

(vii) Engine Model year

(viii) Fuel type (i.e., gasoline, diesel, or alternate fuel)

(ix) OBD system calibration used on the test engine (e.g., running change number or field fix number)

(ix) List of deficient emission threshold monitors as defined in section (a)(3)

(x) During testing conducted under section (c)(3), the number of monitors that do not properly illuminate the MIL before emissions exceed any of the applicable levels specified in sections (c)(4)(A)(i) and (ii)

(xi) During additional testing conducted under section (c)(4), the number of monitors that do not properly illuminate the MIL before emissions exceed any of the applicable levels specified in sections (c)(4)(A)(i) and (ii)

(xii) For each failure identified during testing conducted under sections (c)(3) and (c)(4):

a. Fault code (SAE J2012, SAE J1939, or manufacturer-defined)

b. Fault code description

c. Method used to induce malfunction

d. Description/explanation of failure

e. If manufacturer elects to waive the additional testing requirements described under sections (c)(4)(B) and/or (c)(4)(D) for the associated monitor in accordance with section (c)(4)(F)

(xiii) For each failure identified during testing conducted under sections (c)(3) and (c)(4), any additional notes, including but not limited to corrective actions taken (e.g., running changes, field fixes, recalls, future model year updates) and titles and dates of presentations describing the issues/failures for a test.

* * * *

(d) *Remedial Action*.

* * * *

(3) *Ordered Remedial Action-Mandatory Recall*.

(A) Except as provided in sections (d)(3)(B) below, the Executive Officer shall order the recall and repair of all engines in an engine class that have been determined to be equipped with a nonconforming OBD system if enforcement testing conducted pursuant to sections (b) or (c) above or information received from the manufacturer indicates that:

(i) For major monitors required to meet the in-use performance ratio pursuant to Cal. Code Regs., title 13, section 1971.1(d)(3.2) on 2016 and subsequent model year engines:

a. For monitors subject to the nonconformance criteria of sections (b)(6)(B)(ii), ~~and~~ (b)(6)(B)(iv), and (b)(6)(B)(v), the average in-use monitor performance ratio for one or more of the major monitors in the test sample group is less than or equal to 33.0 percent of the applicable required minimum ratio established in Cal. Code Regs., title 13, section 1971.1(d)(3.2.2) (e.g., if the required ratio is 0.100, less than or equal to a ratio of 0.033) or 66.0 percent or more of the vehicles in the test sample group have an in-use monitor performance ratio of less than or equal to 33.0 percent of the applicable required minimum

ratio established in Cal. Code Regs., title 13, section 1971.1(d)(3.2.2) for the same major monitor.

b. For monitors subject to the nonconformance criteria of section (b)(6)(B)(iii), the average in-use monitor performance ratio for one or more of the major monitors in the test sample group is less than or equal to 0.066 or 66.0 percent or more of the vehicles in the test sample group have an in-use monitor performance ratio of less than or equal to 0.066.

* * * *

(6) *Notice to Manufacturer for an Ordered Remedial Action*.

* * * *

(B) For remedial actions other than the assessment of monetary penalties, the notice must:

* * * *

(iv) designate a date at least 45 days from the date of receipt of such notice by which the manufacturer shall submit a plan, pursuant to section (e)(1) below, outlining the remedial action to be undertaken consistent with the Executive Officer's order. Except as provided in section (d)(7)(C) below, all plans shall be submitted to the Chief, Emissions Certification and Compliance Division, ~~9480 Telstar Avenue, Suite 4, El Monte, California 91731 (or the mailing address indicated in the notice)~~CA Air Resources Board, 4001 Iowa Avenue~~P.O. Box 55009~~, Riverside, California 92507~~92517~~, within the time limit specified in the notice. The Executive Officer may grant the manufacturer an extension of time for good cause.

* * * *

(e) *Requirements for Implementing Remedial Actions*.

* * * *

(4) *Label Indicating that Recall Repairs Have Been Performed*.

(A) If the required remedial action involves recall of engine family(ies), OBD group(s), or subgroup(s) thereof, the manufacturer shall require those who perform inspections and/or recall repairs to affix a label to each vehicle that has been inspected and/or repaired.

(B) The label must be placed in a location approved by the Executive Officer and must be fabricated of a material suitable for such location in which it is installed and which is not readily removable.

(C) The label must contain the remedial action campaign number and a code designating the facility at which the remedial action or inspection to determine the need for remedial action was performed.

(D) Manufacturers are exempt from the label requirements of sections (e)(4)(A) through (C) if the following conditions are met

(i) The recall involves only software and/or software calibration repairs or changes and does not involve hardware repairs or changes,

(ii) The manufacturer keeps a record of the VINs of all vehicles that were inspected and/or repaired, and

(iii) Upon request from the Executive Officer, the manufacturer provides information about running changes, field fixes, service campaigns, and recalls for any given VIN from all vehicles affected by the nonconformity.

* * * *

(6) *Record Keeping and Reporting Requirements.*

* * * *

(B) Unless otherwise specified by the Executive Officer, the manufacturer shall report on the progress of the remedial action campaign by submitting reports for eight consecutive quarters commencing with the quarter immediately after the recall campaign begins. The reports shall be submitted no later than 25 days after the close of each calendar quarter to: Chief, Emissions Certification and Compliance Division, ~~9480 Telstar Avenue, Suite 4, El Monte, California 91731 (or the mailing address indicated in the notice in section (d)(6))~~CA Air Resources Board, 4001 Iowa Avenue~~P.O. Box 55009~~, Riverside, California 92507~~92517~~. For each recall campaign, the quarterly report must contain the following:

* * * *

(x) An initial list, using the following data elements and designated positions, indicating all vehicles or engines subject to recall that the manufacturer has not been invoiced for, or a subsequent list indicating all engines subject to the recall that the manufacturer has been invoiced for since the previous report. The list must be supplied in a standardized computer format to be specified by the Executive Officer. The data elements must be written in "ASCII" code without a comma separating each element. For example: XTY32A71234E-9456123408-25-91A. The add flag (see below) should reflect the vehicles or engines for which the manufacturer has not been invoiced and the delete flag should reflect changes since the previous report. The Executive Officer may change the frequency or format of this submittal depending on the needs of enforcement. The Executive Officer may not, however, require a frequency or format for this submittal that is different in any way from the frequency or format determined by the Executive Officer as required for reporting of data in Cal. Code Regs., title 13, section 2119(a)(10) and section 2133(a)(10).

Data Elements	Positions
• File Code (designated by DMV)	1
• License Plate Number	2-8
• Last three VIN positions	9-11
• Recall ID Number	12-17
• Mfg. ID Number (Mfg. Occupational License Number)	18-22
• Recall Start Date (mmddyyyy)	23-30
• Add or Delete Flag (A/D)	31
• Complete VIN ~~if personalized license plate~~ (File Code "L" or "S")	32-48

* * * *

NOTE: Authority cited: Sections 38501, 38510, 39010, 39600, 39601, 39602.5, 43000.5, 43013, 43016, 43018, 43100, 43101, 43104, 43105, 43105.5, 43106, 43154, 43211, and 43212, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 39002, 39003, 39010, 39018, 39021.5, 39024, 39024.5, 39027, 39027.3, 39028, 39029, 39031, 39032, 39032.5, 39033, 39035, 39037.05, 39037.5, 39038, 39039, 39040, 39042, 39042.5, 39046, 39047, 39053, 39054, 39058, 39059, 39060, 39515, 39600, 39601, 39602.5, 43000, 43000.5, 43004, 43006, 43013, 43016, 43018, 43100, 43101, 43102, 43104, 43105, 43105.5, 43106, 43150, 43151, 43152, 43153, 43154, 43155, 43156, 43204, 43211, and 43212, Health and Safety Code.