Attachment A

PROPOSED 15-DAY MODIFIED REGULATION ORDER

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

Amend sections 1968.2 and 1968.5, title 13**,** California Code of Regulations, to read as follows:

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

* * * *

(c) *Definitions.*

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"*Active off-cycle credit technology*" refers to a technology that generates off-cycle credits in accordance with title 13, CCR section 1961.3(a)(8) or 40 Code of Federal Regulations (CFR) §86.1869-12, as applicable, and that must be activated by the vehicle or driver in order to provide a carbon dioxide (CO_2) reduction benefit. Examples of active off-cycle credit technologies include active aerodynamic features (e.g., grill shutters or ride height that is automatically adjusted by the vehicle control system based on vehicle speed or other conditions), active engine warmup technologies, and driver coaching and/or feedback systems that encourage the driver to alter his/her actions to maximize efficiency. Examples of off-cycle credit technologies that are not ~~active~~ required to be tracked under section (g)(6) include non-active technologies such as solar glazing and solar reflective paint, thermal control technologies specified in title 13, CCR section 1961.3(a)(8)(A)1.a. or 40 CFR §86.1869-12(b)(1)(viii), engine idle stop-start systems, driver-activated technologies where the driver does not have a less efficient selectable option (e.g., high efficiency exterior lights), and technologies related solely to heating, ventilation, and air conditioning for vehicle cabin conditioning.

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"*Charge depleting operation*" means ~~a type of vehicle operation in which the energy storage state of charge may fluctuate but, on average, decreases while the~~

~~vehicle is operated~~ the state of vehicle operation when the current battery state of charge (SOC) is higher than the charge sustaining target SOC value and, while it may fluctuate, the intent of the vehicle control system is to deplete the SOC from a higher level down to the charge sustaining target SOC value. For the purposes of tracking grid energy consumed during charge depleting operation in section (g)(6.4), charge depleting operation shall also include when the vehicle is connected to the grid for charging. For the purposes of defining the transition of the control system from charge depleting operation to charge sustaining operating once the charge sustaining target SOC value has been met, the first occurrence of fueled engine operation once the SOC is less than or equal to the charge sustaining target SOC value shall be used as the transition point.

~~"*Charge increasing operation*" means a type of vehicle operation in which the energy storage state of charge may fluctuate but, on average, increases while the vehicle is operated.~~

"*Charge sustaining operation*" means ~~a type of vehicle operation in which the energy storage state of charge may fluctuate but, on average, is maintained at a certain level while the vehicle is operated~~ the state of vehicle operation when the battery SOC may fluctuate but the intent of the vehicle control system is to maintain, on average, the current SOC. Examples of this state include when a plug-in hybrid electric vehicle is operating as a conventional hybrid vehicle (i.e., if the vehicle has depleted all of the grid energy from the battery and is controlling to the charge sustaining target SOC value) as well as operation in any driver-selectable modes designed to maintain the current SOC (e.g., a 'hold' button intended to save electric drive operation for later in the driving cycle, a 'charge now' button after it has reached its target SOC and the intent of the control system is to maintain, on average, that target SOC, etc.).

"*Charge sustaining target SOC value*" means the nominal target SOC that the control system is designed to maintain, on average, when operating as a conventional hybrid vehicle after depletion of any grid energy in the battery.

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"Diagnostic or emission critical" electronic powertrain control unit refers to the engine and transmission control unit(s). For the 2005 and subsequent model years, it also includes any other on-board electronic powertrain control unit ~~containing software~~ that:

(1) has primary control over any of the monitors required by sections (e)(1~~.0~~) through (e)(14~~.0~~), (e)(16~~.0~~), (f)(1) through (f)(14), and (f)(16), but does not include circuit or out-of-range fault monitors required by sections (e)(7.2.1)(B), (e)(7.2.2)(B), (e)(7.2.2)(D), (e)(7.2.3)(B), (e)(10.2.2)(A), (f)(5.2.1)(A)(ii), (f)(5.2.1)(B)(ii), (f)(5.2.2)(B), (f)(5.2.4)(B), and (f)(11.2.2)(A); or,

(2) ~~excluding~~ except for anti-lock brake system (ABS) control units or stability/traction control units, has primary control over ~~the~~ any rationality fault diagnostic~~s~~ or functional check for more than four input components or more than two ~~of the~~output components required to be monitored by sections (e)(15~~.0~~) and (f)(15)~~.~~; or

(3) for 2019 and subsequent model year vehicles, except for anti-lock brake system (ABS) control units or stability/traction control units, is field reprogrammable and has primary control over any rationality fault diagnostic or functional check for any input or output component required to be monitored by sections (e)(15) and (f)(15).

For purposes of criteria (1) ~~and~~ through (~~2~~3) above, "primary control" over a monitor means the control unit does any of the following: (a) determines if any enable conditions are satisfied; (b) calculates all or part of the diagnostic decision statistic or metric by which pass or fail decisions are made (e.g., the comparison of a component's measured or calculated level of performance to a fault threshold); or (c) makes or processes pass or fail decisions (e.g., debounces diagnostic decision statistics or commands MIL illumination or fault code storage). Further, ~~F~~for purposes of criterion (2)~~(a)~~ above, all glow plugs in an engine shall be considered "one" component in lieu of each glow plug being considered a separate component. For purposes of criteria (1) and (2) above, "input component" and "output component" includes hybrid components required to be monitored in accordance with the requirements under section (e)(15.2.1), (e)(15.2.2), (f)(15.2.1), or (f)(15.2.2).

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"*Driver-selectable charge increasing operation*" means the state of vehicle operation where both: (a) the driver has selected a mode of operation different than the default or normal mode of the vehicle that is intended to increase the battery SOC (e.g., 'charge now' button); and (b) that the current intent of the vehicle control system is to increase the battery SOC from its current level to a higher SOC target value (i.e., the current SOC is lower than the target SOC). This state does not include operation in a driver-selectable mode where the control system has reached the target SOC and is now operating with the intent to maintain, on average, the target SOC. For the purposes of defining the transition of the control system from an intent to increase the SOC to an intent to maintain the SOC once the target has been reached, either the first time the SOC is greater than or equal to the target SOC or the first occurrence of engine off once the SOC is greater than or equal to the target SOC shall be used as the transition point. For continued operation in the driver-selectable mode once the system has transitioned to an intent to maintain the SOC, the operation shall be considered charge sustaining operation unless the actual SOC falls below the target SOC by more than five percent at which time the system will be considered as transitioned back to an intent to increase the SOC (driver-selectable charge increasing operation).

"Driving cycle" is defined as a trip that consists of engine start~~up~~ and engine shutoff and may include~~s~~ the period of engine off time up to the next engine start~~up~~ ~~may be considered part of the driving cycle~~. For monitors that run during engine-off conditions, the period of engine off time following engine shutoff and up to the next engine start shall be considered part of the driving cycle. For vehicles that employ engine shutoff strategies (e.g., engine shutoff at idle), the manufacturer may request Executive Officer approval to use an alternate definition for driving cycle (e.g., key on and key off). Executive Officer approval of the alternate definition shall be based on equivalence to engine start~~up~~ and engine shutoff signaling the beginning and

ending of a single driving event for a conventional vehicle. For applications that are used in both medium-duty and heavy-duty classes, the manufacturer may use the driving cycle definition of title 13, CCR, section 1971.1 in lieu of this definition. Engine restarts following an engine shut-off that has been neither commanded by the vehicle operator nor by the engine control strategy but caused by an event such as an engine stall may be considered a new driving cycle or a continuation of the existing driving cycle.

~~"*Emission standard*," as it applies to OBD compliance and the remedies provided for in the Health and Safety Code for noncompliance, relates to the emission characteristics of a motor vehicle and engine and means:~~

~~(1) a numerical limit on the amount of a given pollutant that a motor vehicle or motor vehicle engine may emit into the atmosphere; or~~

~~(2) a requirement that a motor vehicle or motor vehicle engine be equipped with a certain type of pollution control device or some other design feature related to the control of emissions.~~

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"Emissions neutral default action" refers to any compensating control action or default mode of operation that meets all the following conditions:

(1) it cannot measurably increase emissions during any reasonable in-use driving condition,

(2) it does not cause any OBD II monitoring system to complete monitoring less frequently than required or cause its monitoring to be inaccurate,

(3) the compensating control action or default mode of operation remains activated for the remainder of the driving cycle. If the emissions neutral diagnostic and emissions neutral default action in the worst case take more than ~~10~~ 30 seconds (from engine start or the first effect of the monitored system or component in the driving cycle) to detect the associated malfunction and completely achieve the emissions-neutral state, it must remain activated across driving cycles until: (a) the diagnostic that activated it has run and determined that a malfunction is no longer present or (b) the fault has been cleared with an external diagnostic tool,

(4) the OBD II system monitors and illuminates the MIL for any fault that prevents the compensating control action or default mode of operation from being activated (e.g., communication failure between modules prevents the default action from occurring) when the emissions neutral diagnostic that controls the control action or default mode of operation has detected that a fault is present, and

(5) if the default mode of operation prevents propulsion of the vehicle (e.g., no start condition, stuck in park condition), it is not activated by a ~~non-transmission diagnostic for a component or system that is specifically named in section (e)(15) or (f)(15)~~component with a cost meeting or exceeding that of a "high-price" warranted part as defined by title 13, CCR section 2037(c).

"Emissions neutral diagnostic" refers to a monitoring strategy required pursuant to section (e)(15) or (f)(15) that meets the following conditions: (1) the diagnostic activates an emissions neutral default action (as defined in section (c)) when it

detects a malfunction that would otherwise increase emissions or negatively impact OBD II system performance, and (2) the diagnostic is located within a diagnostic or emission critical electronic powertrain control unit or a control unit meeting the automotive safety integrity level C or D specifications as defined in International Organization for Standardization (ISO) 26262-5 (November 15, 2011), unless the manufacturer demonstrates to the satisfaction of the Executive Officer that the control unit the diagnostic is located within is not likely to be tampered with in-use. An example of an emissions neutral diagnostic is a cruise control system with a default action that disables cruise control when a system malfunction has been detected. Another example of an emissions neutral diagnostic is a monitoring system that overrides disablement of the engine start-stop system based on inputs from the steering angle sensing system when a malfunction in the steering angle sensing system has been detected.

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~~"*Evaporative emission standards*" are a subset of emission standards that refer to the specific motor vehicle fuel evaporative emission standards and test procedures incorporated by reference in title 13, CCR section 1976 to which a vehicle is certified.~~

~~"*Exhaust emission standards*" or "*tailpipe emission standards*" are a subset of emission standards that collectively refer to the specific FTP standards and SET standards to which a vehicle is certified.~~

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"*Grid energy*", for the purposes of tracking grid energy parameters in section (g)(6.4), means all energy into the battery while connected to grid power (e.g., plugged-in) and with the engine off. Grid energy shall not include electrical losses between the grid and the battery (e.g., from on-board charger inefficiency) or energy directly used by the vehicle without first going into the battery (e.g., electricity utilized directly from before or after the on-board charger to power on-vehicle devices for cabin conditioning, charging control, etc.). For the purposes of tracking grid energy consumed during charge depleting operation in section (g)(6.4), energy consumed (i.e., out of the battery) shall be considered non-grid energy until all non-grid energy is depleted. Additionally, on any trip where the vehicle transitions from charge depleting operation to charge sustaining operation once the charge sustaining target SOC value has been met, the values currently assumed for grid and non-grid energy remaining in the battery shall be reset to zero to minimize the accumulation of errors over time.

"*Non-grid energy*", for the purposes of tracking grid energy parameters in section (g)(6.4), means all energy into the battery during charge depleting operation and during driver-selectable charge increasing operation from any source other than grid power (i.e., while not connected to a source of power for charging). Examples of non-grid energy include energy recovered during braking and energy supplied to the battery during engine operation. If an engine running condition exists while connected to a source of grid power for charging, all energy going into the battery during the engine running event shall be considered

non-grid energy. Non-grid energy may not include any energy into the battery during charge sustaining operation.

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"Propulsion system active" is the state where the powertrain (e.g., engine, electric machine) is enabled by the driver (e.g., after ignition on for conventional vehicles, after power button pushed for some hybrid vehicles, or after remote start activation) such that the vehicle is ready to be used (e.g., vehicle is ready to be driven, ready to be shifted from "park" to "drive", heating, ventilation, and air conditioning (HVAC) turned on to condition cabin prior to driving). For purposes of this definition, "the state where the powertrain is enabled" does not include activations that are not driver-initiated (e.g., conditions where portions of the vehicle system wake up to perform OBD II monitoring or off-board charging). This state also does not include remote start activations that ~~do not~~ cannot cause the engine to start (e.g., in a remote activation to condition the cabin, the engine will not start until there is further action by the driver to enable the vehicle for operation regardless of cabin conditioning demand or length of cabin conditioning operation).

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"Safety-only component or system" refers to a component or system that is designed and intended to be used by the vehicle solely to prevent or mitigate personal injury to the vehicle occupant(s), pedestrians, and/or service technicians. Examples include traction control systems, anti-lock braking systems, hybrid high voltage containment systems (e.g., high voltage interlock loop, high voltage isolation detection), and lane departure control systems.

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"Smart device" refers to an electronic powertrain component or system that uses a microprocessor or microcontroller and does not meet the criteria to be classified as a "diagnostic or emission critical electronic powertrain control unit." Devices that provide high level control (i.e., are the primary controllers) of transmissions or battery packs are excluded from this definition. Any component or system externally connected to the smart device shall not be considered part of the smart device unless:

(1) It is a subcomponent integral to the function of the smart device;

(2) It is permanently attached to the smart device with wires or one-time connectors; and

(3) The smart device and subcomponent are designed, manufactured, installed, and serviced (per manufacturer published procedures) as a single component.

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"Warm-up cycle" means a driving cycle with sufficient vehicle operation such that the coolant temperature has risen by at least 40 degrees Fahrenheit or 22.2 degrees Celsius from engine start~~ing~~ and reaches a minimum temperature of at least 160 degrees Fahrenheit or 71.1 degrees Celsius (140 degrees Fahrenheit or 60 degrees Celsius for applications with diesel engines). Alternatively, manufacturers may

define warm-up cycle as a driving cycle with vehicle operation in which the criteria specified in sections (d)(2.5.2)(B)(iii)a. (or f. if applicable), b., and c. are met.

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(d) *General Requirements.*

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(2) *MIL and Fault Code Requirements*.

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(2.2) MIL Illumination and Fault Code Storage Protocol.

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(2.2.3) Except as provided for in section (d)(2.6), ~~T~~the OBD II system shall illuminate the MIL and store a pending fault code and confirmed fault code within 10 seconds to inform the vehicle operator whenever the powertrain enters a default or "limp home" mode of operation that can affect emissions or the performance of the OBD II system or in the event of a malfunction of any on-board computer(s) ~~or smart device itself~~ that can affect the performance of the OBD II system.

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(2.4) Erasing a confirmed fault code.

For 2004 through 2018 model year vehicles, ~~T~~the OBD II system may erase a confirmed fault code if the identified malfunction has not been again detected in at least 40 ~~engine~~ warm-up cycles, and the MIL is presently not illuminated for that malfunction. For 2019 and subsequent model year vehicles, the OBD II system shall erase a confirmed fault code: (1) no sooner than the end of the driving cycle in which the identified malfunction has not been again detected in at least 40 consecutive warm-up cycles and the MIL ~~is presently not~~ has not been illuminated for that malfunction for at least 40 consecutive warm-up cycles, and (2) no later than the end of the driving cycle in which no malfunction has been detected in 41 consecutive warm-up cycles and the MIL ~~is presently not~~ has not been illuminated for any malfunction for 40 consecutive warm-up cycles.

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(2.5) Erasing a permanent fault code. The OBD system shall erase a permanent fault code under the following conditions:

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(2.5.2) If all fault information in the on-board computer other than the permanent fault code has been cleared (i.e., through the use of a scan tool or battery disconnect) and the OBD II system is not commanding the MIL on:

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(F) For ~~2019 and subsequent model year vehicles, for~~ the engine cooling system monitors required to detect faults specified under sections (e)(10.2.1)(A) and (B), (e)(10.2.2)(B), (f)(11.2.1)(A) and (B), and (f)(11.2.2)(B) (e.g., thermostat monitor and ECT sensor time to closed-loop monitor), the manufacturer ~~shall~~ may erase the permanent fault code using the criteria under section (d)(2.5.2)(A) in lieu of the criteria under section (d)(2.5.2)(B).

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(2.6) Exceptions to MIL and Fault Code Requirements.

(2.6.1) If the vehicle enters a default mode of operation that can affect emissions or the performance of the OBD II system, a manufacturer may request Executive Officer approval to be exempt from illuminating the MIL and storing a fault code. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and/or engineering evaluation that verify ~~either of the following~~that the default strategy:

(A) ~~The default strategy (1) c~~Causes an overt indication (e.g., vehicle operation limited to idle only) such that the driver is certain to respond and have the problem corrected,

~~(2)~~(B) ~~i~~Is not otherwise caused by a component required to be monitored by the OBD II system under sections (e) through (f), and

~~(3)~~(C) ~~i~~Is not invoked to protect a component required to be monitored by the OBD II system under sections (e) through (f)~~; or~~.

~~(B) The default strategy is an AECD that is properly activated due to the occurrence of conditions that have been approved by the Executive Officer.~~

(2.6.2) The manufacturer is exempt from illuminating the MIL and storing a fault code under section (d)(2.2) for a fault detected by an emissions neutral diagnostic.

(2.6.3) The manufacturer is exempt from illuminating the MIL and storing a fault code under section (d)(2.2) for an AECD when it is properly activated due to the occurrence of conditions that have been approved by the Executive Officer.

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(3) *Monitoring Conditions*.

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

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(3.2) As specifically provided for in sections (e) and (f), manufacturers shall define monitoring conditions in accordance with the criteria in sections (d)(3.2.1) through (3.2.3). The requirements of section (d)(3.2) shall be phased in as follows: 30 percent of all 2005 model year vehicles, 60 percent of all 2006 model year vehicles, and 100 percent of all 2007 and subsequent model year vehicles. Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) with the exception that 100 percent of 2007 and subsequent model year vehicles shall comply with the requirements. Small volume manufacturers shall meet the requirements on 100 percent of 2007 and subsequent model year vehicles but shall not be required to meet the specific phase-in requirements for the 2005 and 2006 model years.

(3.2.1) Manufacturers shall define monitoring conditions that, in addition to meeting the criteria in section (d)(3.1), 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 on in-use vehicles. For purposes of this regulation, except as provided below in section (d)(3.2.1)(D), the minimum acceptable in-use monitor performance ratio is:

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(B) For evaporative system monitors:

(i) 0.260 for monitors designed to detect malfunctions identified in section (e)(4.2.2)(C) (i.e., 0.020 inch leak detection); and

(ii) 0.520 for monitors designed to detect malfunctions identified in sections (e)(4.2.2)(A)~~,~~ ~~and~~ (B)~~, and (D)~~ (i.e., evaporative system purge flow and 0.040 inch leak detection);

(C) 0.336 for catalyst, oxygen sensor, EGR, VVT system, evaporative system high-load purge flow, and all other monitors specifically required in sections (e) and (f) to meet the monitoring condition requirements of section (d)(3.2);

(D) For interim years:

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(viii) through the 2020 model year, for evaporative system monitors specified in section (e)(4.2.2)(D) (i.e., high-load purge flow monitor), 0.100.

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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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(L) For 2015 and subsequent model year plug-in hybrid electric vehicles, ~~in addition to the requirements of sections (d)(4.3.2)(K)(i) through (iii) above,~~ the denominators for the evaporative system monitors (sections (e)(4.2.2)(A) through (C)), ~~denominator(s)~~ the comprehensive component input component temperature sensor rationality fault diagnostics (sections (e)(15) and (f)(15))(e.g., intake air temperature sensor, hybrid component temperature sensor), and the engine cooling system input component rationality monitors (sections (e)(10.2.2)(C) and (D) and (f)(11.2.2)(C) and (D)) and (f)(11)) shall be incremented if and only if:

(i) The requirements of section (d)(4.3.2)(K)(i) through (iv) have been met for the evaporative system purge flow monitor (section (e)(4.2.2)(A)), or the requirements of section (d)(4.3.2)(K)(i) through (iii) have been met for all other monitors specified in section (d)(4.3.2)(L) above;

~~(i)~~(ii) Cumulative propulsion system active time is greater than or equal to 600 seconds while at an ambient temperature of greater than or equal

to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius);

~~(ii)~~(iii) Engine coolant temperature at the start of propulsion system active is greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) but less than or equal to 95 degrees Fahrenheit (or 35 degrees Celsius); and

~~(iii)~~(iv) Continuous time while the vehicle is not in the state of 'propulsion system active' during the period immediately preceding the start of propulsion system active ~~the driving cycle~~ is greater than or equal to 6 hours.

For the comprehensive component input component temperature sensor rationality fault diagnostics and the engine cooling system input component rationality monitors, as an alternative for 2015 through 2018 model year plug-in hybrid electric vehicles, the manufacturer may use the criteria in section (d)(4.3.2)(H) in lieu of the criteria specified in section (d)(4.3.2)(L) above.

For the evaporative system purge flow monitor (section (e)(4.2.2)(A)), as an alternative for 2015 through 2018 model year plug-in hybrid electric vehicles, the manufacturer may choose the increment the denominator if the requirements of section (d)(4.3.2)(K)(i) through (iii) have been met in lieu of the criteria specified in section (d)(4.3.2)(L)(i) above.

(M) ~~In addition to the requirements of section (d)(4.3.2)(B) above, t~~The denominator(s) for the evaporative system high-load purge flow monitor (section (e)(4.2.2)(D)) shall be incremented if and only if:

(i) The requirements of section (d)(4.3.2)(B) have been met (hybrid vehicles shall use section (d)(4.3.2)(K) in lieu of (d)(4.3.2)(B));

~~(i)~~(ii) Cumulative time since engine start is greater than or equal to 600 seconds while at an ~~The~~ ambient temperature of ~~is~~ greater than or equal to 40 degrees Fahrenheit (or 4.4 degrees Celsius) (hybrid vehicles shall use cumulative propulsion system active time in lieu of cumulative time since engine start) ~~during the conditions specified in section (d)(4.3.2)(B)~~; and

~~(ii)~~(iii) High-load purging conditions occur on two or more occasions for greater than two seconds during the driving cycle or for a cumulative time greater than or equal to ten seconds, whichever occurs first.

(iv) For purposes of section (d)(4.3.2)(M)(iii) above, "high-load purging conditions" means an event during which the engine manifold pressure is greater than or equal to 7 kPa above atmospheric pressure.

As an alternative for 2004 through 2018 model year vehicles, the manufacturer may use the criteria in section (d)(4.3.2)(D) or (d)(4.3.2)(L), whichever is applicable, in lieu of the criteria specified above in section (d)(4.3.2)(M).

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(7) Determination of Requirements for Applicable Vehicles.

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(7.2) ~~For vehicles that are equipped with components/systems defined by any of the monitoring requirements in section (e) and components/systems defined by any of the monitoring requirements in section (f) (e.g., vehicles with gasoline lean-burn systems that utilize both gasoline and diesel emission control technologies)~~The requirements of section (d)(7.2) apply to gasoline vehicles equipped with components/systems that are not covered under sections (e)(1) through (14) but are analogous to components/systems covered under sections (f)(1) through (14), and apply to diesel vehicles equipped with components/systems that are not covered under sections (f)(1) through (14) but are analogous to components/systems covered under sections (e)(1) through (14). For these vehicles, the manufacturer shall submit a plan to the Executive Officer for approval of the requirements in section 1968.2 (including the in-use monitor performance requirements in section (d), the monitoring requirements in sections (e) through (f) and the standardization requirements of section (g)), determined by the manufacturer to be applicable to the vehicle. Executive Officer approval shall be based on the appropriateness of the plan with respect to the components and systems on the vehicle (e.g., a spark-ignited gasoline lean-burn vehicle with a NOx adsorber and an SCR system would be monitored in accordance with the misfire monitoring requirements in section (e) for spark-ignited engines and with the NOx adsorber and SCR system monitoring requirements in section (f) for diesel engines typically equipped with the same components).

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

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(4) *Evaporative System Monitoring*

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(4.2) Malfunction Criteria:

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~~(4.2.7)~~(4.2.8) For vehicles subject to the requirements of section (e)(4.2.2)(A) or (e)(4.2.2)(D):

(A) Except as provided for in sections (e)(4.2.8)(A)(i), (e)(4.2.8)(A)(ii), and (e)(4.2.8)(C)(i), ~~F~~for vehicles that utilize more than one purge flow path (e.g., a turbo-charged engine with a low-load ~~pressure~~ purge line and a high-load ~~pressure~~ purge line), the OBD II system shall verify the criteria of section (e)(4.2.2)(A) or (D) (i.e., purge flow to the engine) for ~~both~~ all purge flow paths.

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(ii) For manufacturers subject to the requirements of section (e)(4.2.2)(D) on forced induction engines with separate low-load purge lines and high-load purge lines, if a manufacturer demonstrates that the purge mass flow through the high-load flow path is ~~0 percent of the total purge mass flow to the engine on the Unified cycle and~~ less than 1 percent of the total purge mass flow to the engine on the US06 cycle,

monitoring of purge flow through the high-load purge line is not required.

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(6) *Fuel System Monitoring*

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(6.2) Malfunction Criteria:

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(6.2.4) Except as provided in section (e)(6.2.4)(D) below, t~~T~~he OBD II system shall detect a malfunction whenever the fuel control system fails to enter closed-loop operation (if employed) within an Executive Officer approved ~~manufacturer specified~~ time interval. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(A) For vehicles not included in the phase-in specified in section (e)(6.2.4)(B) below, "closed-loop operation" as specified in section (e)(6.2.4) above shall mean either stoichiometric or non-stoichiometric closed-loop operation, whichever one the manufacturer chooses.

(B) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, "closed-loop operation" as specified in section (e)(6.2.4) above shall mean stoichiometric closed-loop operation.

(C) For engines that employ engine shutoff strategies that do not require the vehicle operator to restart the engine to continue driving (e.g., hybrid vehicle or a vehicle with a start-stop system with engine shutoff at idle) on 2019 and subsequent model year vehicles, the OBD II system shall detect whenever the fuel control system fails to enter closed-loop operation within an Executive Officer-approved time interval after an engine restart. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.

(D) In lieu of detecting the malfunctions specified (e)(6.2.4) above with a fuel-system specific monitor, the OBD II system may monitor the individual parameters or components that are used as inputs for fuel system closed-loop operation if the manufacturer demonstrates that the monitor(s) detect all malfunctions and is equally as effective and timely in detecting faults that prevent achieving closed-loop operation in the time interval approved by the Executive Officer.

~~(6.2.5) Manufacturers may adjust the criteria and/or limit(s) to compensate for changes in altitude, for temporary introduction of large amounts of purge vapor, or for other similar identifiable operating conditions when they occur.~~

~~(6.2.6)~~(~~6.2.5)~~ Notwithstanding the phase-in specified in section (e)(6.2.1)(C), if a vehicle is equipped with separate EGR flow delivery passageways (internal or external) that deliver EGR flow to individual cylinders (e.g., an EGR system with individual delivery pipes to each cylinder), the OBD II

system shall monitor the fuel delivery system for malfunctions specified in section (e)(6.2.1)(C) on all 2011 and subsequent model year vehicles so equipped.

~~(6.2.6) For engines that employ engine shutoff strategies that do not require the vehicle operator to restart the engine to continue driving (e.g., hybrid vehicle or a vehicle with a start-stop system with engine shutoff at idle) on 2019 and subsequent model year vehicles, the OBD II system shall detect whenever the fuel control system fails to enter closed-loop operation within an Executive Officer-approved time interval after an engine restart. Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times.~~

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

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(8.2) Malfunction Criteria:

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(8.2.4) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year gasoline vehicles in which no failure or deterioration of the EGR system that causes an increase in flow could result in a vehicle's emissions exceeding the thresholds specified in section (e)(8.2.2), the OBD II system shall detect a malfunction when either the EGR system has reached its control limits such that it cannot reduce EGR flow to achieve the commanded flow rate or, for non-feedback controlled EGR systems, the EGR system has maximum detectable EGR flow when little or no EGR flow is expected. Manufacturers may request Executive Officer approval to not detect the failure or deterioration if monitoring is not possible because the vehicle has immediately stalled during idle conditions. Executive Officer approval shall be based on data or engineering analysis demonstrating that the failure or deterioration of the EGR system is detected under all other driving conditions. If the failure or deterioration can only be detected under idle conditions, the manufacturer must provide data or engineering analysis demonstrating that the failure or deterioration cannot be detected under other driving conditions.

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(9) *Positive Crankcase Ventilation (PCV) System Monitoring*

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(9.2) Malfunction Criteria:

(9.2.1) For the purposes of section (e)(9), "PCV system" is defined as any form of crankcase ventilation system, regardless of whether it utilizes positive pressure. "PCV valve" is defined as any form of valve or orifice used to restrict or control crankcase vapor flow. Further, any additional external PCV system tubing or hoses used to equalize crankcase pressure or to provide a ventilation path between various areas of the engine (e.g.,

between the crankcase and valve cover, between the crankcase and the fresh air intake system on ~~normally~~ naturally aspirated engines with dry sump lubrication systems) are considered part of the PCV system "between the crankcase and the PCV valve" in section (e)(9.2.2) and considered part of the "PCV system" in section (e)(9.2.3), and subject to the malfunction criteria in sections (e)(9.2.2) and (e)(9.2.3) below.

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(9.2.3) For 20 percent of 2023 model year vehicles, 50 percent of 2024 model year vehicles, and 100 percent of 2025 model year vehicles, the following criteria apply for PCV system monitoring:

(A) Except as provided below, the OBD II system shall detect a PCV system malfunction when any hose, tube, or line that transports crankcase vapors contains a ~~leak~~ disconnection or break equal to or greater than the smallest internal cross-sectional area of that hose, tube, or line. For the purposes of section (e)(9.2.3), "hose, tube, or line" includes any fittings that are used for connection such as nipples or barbs that the hoses must be placed over for proper attachment. ~~Additionally, PCV system hoses, tubes, or lines that do not transport crankcase vapors but when disconnected or contains a leak equal to or greater than the smallest internal cross-sectional area of that hose, tube, or line can result in crankcase vapors escaping into the atmosphere (e.g., dedicated fresh air lines) must also detect a PCV system malfunction when the hose, tube, or line contains a leak equal to or greater than the smallest internal cross-sectional area of that hose, tube, or line.~~

(B) Manufacturers are not required to detect disconnections or ~~leaks~~break of any PCV system hose, tube, or line if said disconnection or ~~leak~~break (1) causes the vehicle to stall immediately during idle operation; or (2) is unlikely to occur due to a PCV system design that is integral to the induction system (e.g., machined passages rather than tubing or hoses); ~~or~~ (3) results in a rapid loss of oil or other overt indication of a PCV system malfunction such that the vehicle operator is certain to respond and have the vehicle repaired; or (4) occurs downstream of where the crankcase vapors are delivered to the air intake system.

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(10) *Engine Cooling System Monitoring*

(10.1) Requirement:

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(10.1.4) Vehicles that use an engine and/or engine component temperature sensor or system (e.g. oil temperature sensor, cylinder head temperature sensor) in lieu of or in addition to the cooling system and ECT sensor for an indication of engine operating temperature for emission control purposes (e.g., to modify spark or fuel injection timing or quantity), the following requirements shall apply:

(A) For vehicles that use an engine and/or engine component temperature sensor or ~~a~~ system ~~other than~~ in lieu of the cooling system and ECT

sensor ~~(e.g., oil temperature, cylinder head temperature) for an indication of engine operating temperature for emission control purposes (e.g., to modify spark or fuel injection timing or quantity)~~, the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (e)(10).

(B) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles that use an engine and/or engine component temperature sensor or system in addition to the cooling system and ECT sensor (including systems that use more than one thermostat or flow control device to regulate different temperatures in different cooling circuits and use input from at least two temperature sensors in separate cooling circuits for an indication of engine operating temperatures for emission control purposes), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (e)(10).

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(10.2) Malfunction Criteria:

(10.2.1) Thermostat

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~~(C)~~(D) For monitoring of malfunctions under sections (e)(10.2.1)(A) and (B), ~~W~~with Executive Officer approval, a manufacturer may use alternate malfunction criteria and/or monitoring conditions (see section (e)(10.3)) that are a function of temperature at engine start on vehicles that do not reach the temperatures specified in the malfunction criteria when the thermostat is functioning properly. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data that demonstrate that a properly operating system does not reach the specified temperatures, that the monitor is capable of meeting the specified malfunction criteria at engine start temperatures greater than 50°F, and that the overall effectiveness of the monitor is comparable to a monitor meeting these thermostat monitoring requirements at lower temperatures.

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(10.2.2) ECT Sensor

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(B) Time to Reach Closed-Loop Enable Temperature.

(i) The OBD II system shall detect a malfunction if the ECT sensor does not achieve the stabilized minimum temperature which is needed for the fuel control system to begin closed-loop operation (closed-loop

enable temperature) within an Executive Officer approved time interval after starting the engine.

a. For vehicles not included in the phase-in specified in section (e)(10.2.2)(B)(i)b. below, "closed-loop operation" as specified in section (e)(10.2.2)(B)(i) above shall mean either stoichiometric or non-stoichiometric closed-loop operation, whichever one the manufacturer chooses.

b. For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, "closed-loop operation" as specified in section (e)(10.2.2)(B)(i) above shall mean stoichiometric closed-loop operation across the engine loads observed on the FTP cycle.

(ii) The time interval shall be a function of starting ECT and/or a function of intake air temperature and, except as provided below in section (e)(10.2.2)(B)(iii), may not exceed:

a. two minutes for engine start temperatures at or above 50 degrees Fahrenheit (or 10 degrees Celsius) and five minutes for engine start temperatures at or above 20 degrees Fahrenheit (or -6.7 degrees Celsius) and below 50 degrees Fahrenheit (or 10 degrees Celsius) for Low Emission Vehicle I applications and 2004 and 2005 model year Low Emission Vehicle II applications;

b. two minutes for engine start temperatures up to 15 degrees Fahrenheit (or 8.3 degrees Celsius) below the closed-loop enable temperature and five minutes for engine start temperatures between 15 and 35 degrees Fahrenheit (or between 8.3 and 19.4 degrees Celsius) below the closed-loop enable temperature for all 2006 through 2008 model year Low Emission Vehicle II applications and all 2009 and subsequent model year vehicles.

(iii) Executive Officer approval of the time interval shall be granted upon determining that the data and/or engineering evaluation submitted by the manufacturer supports the specified times and, for monitors meeting section (e)(10.2.2)(B)(i)b. above, demonstrates that closed-loop operation has been achieved across the range of engine loads observed on the FTP cycle. The Executive Officer shall allow longer time intervals upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that the vehicle requires a longer time to warm up under normal conditions.

(iv) The Executive Officer shall exempt manufacturers from the requirement of section (e)(10.2.2)(B) if the manufacturer does not utilize ECT to enable closed loop fuel control.

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(10.3) Monitoring Conditions:

(10.3.1) Thermostat

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~~(C)~~(D) Manufacturers may request Executive Officer approval to suspend or disable thermostat monitoring required under sections (e)(10.2.1)(A) and (B) if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 percent of the warm-up time, ~~hot restart conditions, etc.~~engine block heater operation). With respect to disablement on driving cycles solely due to warm ECT at engine start conditions for thermostat monitoring under section (e)(10.2.1)(A), the manufacturer shall disable the monitor during driving cycles where the ECT at engine start is within 35 degrees Fahrenheit (or 19.4 degrees Celsius) of the thermostat malfunction threshold temperature determined under section (e)(10.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the monitor shall be disabled if the ECT at engine start is above 125 degrees Fahrenheit)~~In general, the Executive Officer shall not approve disablement of the monitor on engine starts where the ECT at engine start is more than 35 degrees Fahrenheit lower than the thermostat malfunction threshold temperature determined under section (e)(10.2.1)(A). The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or engineering analysis that demonstrate the need for the request~~.

(E) Notwithstanding section (e)(10.3.1)(D), manufacturers may request Executive Officer approval to enable thermostat monitoring required under section (e)(10.2.1)(A) during a portion of the driving cycles where the ECT at engine start is warmer than 35 degrees Fahrenheit (or 19.4 degrees Celsius) below the thermostat malfunction threshold temperature determined under section (e)(10.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the manufacturer may request approval to have the monitor enabled for a portion of the ECT at engine start region between 125 and 160 degrees Fahrenheit). The Executive Officer shall approve the request upon determining that the manufacturer has submitted test data and/or engineering evaluation that demonstrate that the monitor is able to robustly detect thermostat malfunctions (e.g., cannot result in false passes or false indications of malfunctions) on driving cycles where it is enabled.

* * * *

(12) Air Conditioning (A/C) System Component Monitoring

(12.1) Requirement: If a vehicle incorporates an engine control strategy that alters off-idle fuel and/or spark control when the A/C system is on, the OBD II system shall monitor all electronic air conditioning system components for malfunctions that cause the system to fail to invoke the alternate control while the A/C system is on or cause the system to invoke the alternate control while the A/C system is off. Additionally, the OBD II system shall monitor for malfunction all electronic air conditioning system components that are used as part of the diagnostic strategy for any other monitored system or component. The requirements of section (e)(12) shall be phased in as follows: 30 percent of all 2006 model year vehicles, 60 percent of all 2007

model year vehicles, and 100 percent of all 2008 and subsequent model year vehicles. As applicable, the A/C system shall also be subject to the comprehensive component monitoring requirements in section (e)(15.2.3)(B).

(12.2) Malfunction Criteria:

(12.2.1) The OBD II system shall detect a malfunction prior to any failure or deterioration of an electronic component of the air conditioning system that would cause any of the criteria in section (e)(12.2.1)(A) through (C) to be met. For sections (e)(12.2.1)(A) and (B), for~~cause a vehicle's emissions to exceed 1.5 times any of the appropriate applicable emission standards or would, through software, effectively disable any other monitored system or component covered by this regulation. For~~ malfunctions that result in the alternate control being erroneously invoked while the A/C system is off, the appropriate emission standards shall be the FTP standards. For malfunctions that result in the alternate control failing to be invoked while the A/C system is on, the appropriate emission standards shall be the SC03 emission standards.

* * * *

(C) For all vehicles, the OBD II system shall detect a malfunction if, through software, the malfunction effectively disables any other monitored system or component covered by this regulation.

* * * *

(15) *Comprehensive Component Monitoring*

(15.1) Requirement:

(15.1.1) Except as provided in sections (e)(15.1.3), (e)(15.1.4), (e)(15.1.5), and (e)(16), the OBD II system shall monitor for malfunction any electronic powertrain component/system not otherwise described in sections (e)(1) through (e)(14) that either provides input to (directly or indirectly) or receives commands from ~~the~~ an on-board computer~~(s)~~ or smart device, and: (1) can affect emissions ~~in excess of the criteria described~~ as determined by the criteria in section (e)(15.1.2) ~~during any reasonable in-use driving condition~~, or (2) is used as part of the diagnostic strategy for any other monitored system or component. Each input to or output from a smart device that meets criterion (1) or (2) above shall be monitored pursuant to section (e)(15). Further detection or pinpointing of faults internal to the smart device is not required. If the control system detects deterioration or malfunction of the component/system and takes direct action to ~~vehicle~~ compensate~~s~~ or adjust~~s~~ for it~~deterioration or malfunction of the component/system~~, manufacturers may not use the criteria under section (e)(15.1.2) and are instead subject to the default action requirements of section (d)(2.2.3) or (e)(15.4.4) as applicable.

* * * *

(15.1.2) For purposes of criteria (1) in section (e)(15.1.1) above, the manufacturer shall determine whether a powertrain input or output component/system can affect emissions when operating without any control system compensation or adjustment for deterioration or malfunction based on the

following: ~~criteria in sections (e)(15.1.2)(A) through (E) below.~~ (1) for 2004 through 2017 model year vehicles, the manufacturer shall use the criteria in section (e)(15.1.2)(G); and (2) for 2018 and subsequent model year vehicles, the manufacturer shall use the criteria in sections (e)(15.1.2) (A) through (F). ~~If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system cannot affect emissions, the Executive Officer shall require the manufacturer to provide emission data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an emission effect. The Executive Officer may request emission data for any reasonable driving condition.~~

* * * *

(B) Manufacturers that have determined that a component or system is not subject to monitoring because a malfunction would not cause emissions to exceed the criteria specified in section (e)(15.1.2)(A) above shall demonstrate for purposes of OBD II system approval that the criteria are satisfied by meeting the requirements in either section (e)(15.1.2)(B)(i) or (e)(15.1.2)(B)(ii) below:

(i) The manufacturer shall conduct an engineering evaluation demonstrating that no malfunction of the component/system could cause an increase in vehicle emissions during any reasonable in-use driving condition, or

~~(i)~~(ii) The manufacturer shall meet the following testing requirements:

a. The manufacturer shall ~~C~~conduct~~ing~~ an FTP test with the component or system malfunctioning, and provide~~ing~~ test data to show that no applicable standard has been exceeded; and

~~(ii)~~b. The manufacturer shall ~~C~~conduct~~ing~~ testing using the component condition causing the largest emission impact during the worst case test cycle or in-use driving condition specified in section (e)(15.1.2)(A)(ii) (as determined by the manufacturer based on sound engineering judgment), and provide~~ing~~ test data to show that the difference between the mean emission values do not exceed 15 percent of any standard.~~, and~~

(iii) The Executive Officer may request one additional test cycle for either section (e)(15.1.2)(B)(i) or (ii) above if the~~re is evidence to suggest~~Executive Officer reasonably believes, based on the component being tested, that the manufacturer's engineering evaluation is insufficient or the cycle chosen by the manufacturer was not the worst case for demonstration of the malfunction.

* * * *

(F) For 2018 and 2019 model year vehicles carried over from 2017 or earlier model year vehicles, a component/system is determined to not affect emissions and the manufacturer is not required to use the criteria in sections (e)(15.1.2)(A) through (E) if the Executive Officer determined that the component/system does not affect emissions on the vehicles in

question in the 2017 or earlier model year in accordance with section (e)(15.1.2)(G).

(G) For 2004 through 2017 model year vehicles, in lieu of the criteria in sections (e)(15.1.2)(A) through (E) above, the manufacturer shall determine whether a powertrain input or output component/system can affect emissions during any reasonable in-use driving condition. If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system cannot affect emissions, the Executive Officer shall require the manufacturer to provide emission data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an emission effect. The Executive Officer may request emission data for any reasonable driving condition. Alternatively, for 2017 model year vehicles, manufacturers may use the criteria in sections (e)(15.1.2)(A) through (E) in lieu of the criteria stated above in section (e)(15.1.2)(G).

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(15.2) Malfunction Criteria:

(15.2.1) Input Components:

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(B) ~~To the extent feasible on~~ Except for input components monitored solely by emissions neutral diagnostics, for all 2005 and subsequent model year vehicles, rationality faults shall be separately detected and store different fault codes than the respective ~~lack of~~ circuit ~~continuity~~ fault and out of range diagnostics. Two-sided rationality diagnostics are not required to set separate fault codes for each side. Additionally:~~,~~

(i) For computer encoded digital inputs: lack of communication from the input to the on-board computer shall be separately detected and store a separate fault code. Separate fault codes are not required for each distinct out-of-range fault.

(ii) For all other inputs: component ~~lack of~~ circuit ~~continuity~~ and out of range faults shall be separately detected and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit, ~~shorted high, shorted low,~~ etc.). Notwithstanding, ~~M~~manufacturers are not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range ~~circuit~~ faults. For sensors that are fixed to a circuit board within a diagnostic or emission critical control unit, as defined in section (c), manufacturers may combine circuit and out-of-range value faults into a single fault code that identifies the malfunctioning sensor.

* * * *

(D) For input components that are directly or indirectly used for any emission control strategies that are not covered under sections (e)(1) through (e)(14) (e.g., exhaust gas temperature sensors used for a control strategy that regulates catalyst inlet temperature within a target window ~~fuel rail~~

~~pressure sensor used for a control strategy that regulates fuel pressure~~), the OBD II system shall detect rationality malfunctions that prevent the component from correctly sensing any condition necessary for the strategy to operate in its intended manner. These malfunctions include faults that inappropriately prevent or delay the activation of the emission control strategy, cause the system to erroneously exit the emission control strategy, or where the control strategy has used up all of the adjustments or authority allowed by the manufacturer and is still unable to achieve the desired condition. The Executive Officer may waive detection of specific malfunctions upon determining that the manufacturer has submitted data and/or an engineering evaluation that demonstrate that reliable detection of the malfunction is technically infeasible or would require additional hardware.

* * * *

(15.2.2) Output Components/Systems:

(A) The OBD II system shall detect a malfunction of an output component/system when proper functional response of the component and system to computer commands does not occur. If a functional check is not feasible, the OBD II system shall detect malfunctions of output components/systems caused by a lack of circuit continuity or circuit fault (e.g., short to ground or high voltage), or communication errors or the lack of communication if the signal to the output component is digital. For output component lack of circuit continuity faults and circuit faults, manufacturers are not required to store different fault codes for each distinct malfunction (e.g., open circuit, shorted low, etc.). Manufacturers are not required to activate an output component/system when it would not normally be active for the purposes of performing a functional ~~monitoring~~ check of the output component~~s~~/system~~s~~ as required in section (e)(15).

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(15.2.3) Hybrid Components

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(B) Hybrid Thermal Management Systems

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(ii) Inverter Thermal Management Systems

a. The individual electronic input and output components that are used for inverter thermal management (i.e., heating or cooling) shall be monitored in accordance with the requirements of sections (e)(15.2.1) and (15.2.2). Electronic components used for inverter thermal management and commanded solely by driver demand are exempt from this monitoring requirement.

* * * *

(H) Monitoring of hybrid components as specified in sections (e)(15.2.3)(A) through (G) above on mild hybrid electric vehicles and strong hybrid electric vehicles is not required if manufacturers can demonstrate:

(i) The component is not used as part of the diagnostic strategy for any other monitored system or component, and

(ii) No malfunction of the component or system can affect emissions as determined by the criteria in section (e)(15.1.2).

(~~H~~I) Monitoring of hybrid components as specified in sections (e)(15.2.3)(A) through (G) above on plug-in hybrid electric vehicles is not required if manufacturers can demonstrate:

* * * *

(ii) In lieu of the criteria in section (e)(15.1.2), except as specified in (e)(15.2.3)(~~H~~I)(iii) and (iv), no malfunction of the component or system could cause:

a. An engine in a vehicle with a fully charged ESS ~~vehicle's engine~~ to start over any of the following test cycles where a properly-functioning fully charged vehicle does not start its engine during a single test cycle: FTP test, HWFET, Unified cycle, and US06 cycle; and

* * * *

(iii) For hybrid thermal management systems, in lieu of the test procedure specified in section (e)(15.2.3)(~~H~~I)(ii) above, manufacturers shall submit a plan for Executive Officer approval for an alternate test cycle/vehicle operating conditions for the purposes of determining whether a malfunction would cause an engine in a vehicle with a fully-charged ESS~~vehicle's engine~~ to start where a properly-functioning fully charged vehicle does not and a 15 percent reduction of all electric range if the component/system is malfunctioning. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that considers all conditions under which the thermal management system may be activated (e.g., high ambient temperatures, ESS charging, high load driving) and demonstrates that the chosen test cycle and operating conditions are representative of in-use conditions where all electric range is likely to be most affected by the malfunctioning component/system.

(iv) If function of the hybrid component or system would not necessarily occur during any of the test cycles specified in section (e)(15.2.3)(~~H~~I)(ii) above (e.g., global positioning system components that control plug-in hybrid operation based on battery state of charge), the manufacturer shall request Executive Officer approval of an added alternate test cycle or vehicle operating conditions for which the determination of vehicle engine starts and increase in integrated net~~-watt hours of~~ energy will be evaluated. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions proposed represent in-use driving conditions under which the component or system will function and where energy

usage is likely to be most affected by the malfunctioning component. The component or system is required to meet the monitoring requirements under section (e)(15) if any condition (e.g., deterioration, failure) of the component or the system could cause the vehicle's engine to start when it otherwise would not, or an increase greater than 15 percent of the integrated net ~~watt-hours of~~ energy used for a mean of three or more tests conducted with a malfunction compared to testing without a malfunction.

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(15.4) MIL Illumination and Fault Code Storage:

(15.4.1) Except as provided in sections (e)(15.4.2) and (15.4.4) below, general requirements for MIL illumination and fault code storage are set forth in section (d)(2). Additional fault code storage requirements are provided in section (e)(15.2.1)(B) for input components, section (e)(15.2.2)(A) for output components/systems, and section (e)(15.2.3)(A)(~~i~~v) for hybrid components.

(15.4.2) Exceptions to general requirements for MIL illumination. For ~~non-Low Emission Vehicle III~~ applications that are not using the criteria of sections (e)(15.1.2)(A) through (E) to determine if a component/system can affect emissions, MIL illumination is not required in conjunction with storing a confirmed fault code for any comprehensive component if both conditions (A) and (B) below are met:

* * * *

(17) *Exceptions to Monitoring Requirements*

(17.1) Except as provided in sections (e)(17.1.1) through (17.1.3) below, upon request of a manufacturer or upon the best engineering judgment of the ARB, the Executive Officer may revise the emission threshold for a malfunction on any diagnostic required in section (e) if the most reliable monitoring method developed requires a higher threshold to prevent ~~significant errors of commission in detecting~~ false indications of a malfunction.

* * * *

(17.1.3) Manufacturers shall use the following malfunction criteria for vehicles certified to the Federal Tier 2 or Tier 3 emission standards:

(A) For vehicles certified to Tier 2 Federal Bin 3 or Bin 4 tailpipe emission standards (as defined in 40 CFR 86.1811-04), manufacturers shall utilize the ULEV II vehicle NMOG and CO malfunction criteria (e.g., 1.5 times the Bin 3 or Bin 4 NMOG and CO standards) and the PC/LDT SULEV II vehicle NOx malfunction criteria (e.g., 2.5 times the Bin 3 or Bin 4 NOx standards).

(B) For vehicles certified to the Tier 3 Federal Bin 85 or Bin 110 tailpipe emission standards (as defined in 40 CFR 86.1811-17), manufacturers shall utilize the following malfunction criteria in accordance with the table below (with the NMOG+NOx and CO multipliers to be used with the applicable standard (e.g., 2.0 times the NMOG+NOx standard)):

	NMOG+NOx Multiplier	CO Multiplier	PM Threshold (mg/mi)[1]
Monitors (except for catalyst)	1.85	1.50	17.50
Catalyst Monitor	2.00	N/A	N/A

1. Applies to 2019 and subsequent model year vehicles

* * * *

(17.8) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the ambient temperature is below 20 degrees Fahrenheit. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that ~~The OBD II system is not required to monitor an electronic powertrain component/system if~~ the following criteria are met when the ambient temperature is above 20 degrees Fahrenheit (or -6.7 degrees Celsius): (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the ambient temperature is determined based on a temperature sensor monitored by the OBD II system (e.g., IAT sensor). ~~The manufacturer shall determine whether a component/system meets these criteria.~~ If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies. The Executive Officer may request emission data for any reasonable driving condition at ambient temperatures above 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(17.9) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the vehicle speed is above 82 miles-per-hour. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that ~~The OBD II system is not required to monitor an electronic powertrain component/system if~~ the following criteria are met when the vehicle speed is below 82 miles-per-hour: (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the vehicle speed is determined based on a sensor monitored by the OBD II system (e.g., vehicle speed sensor). ~~The manufacturer shall determine whether a component/system meets these criteria.~~ If the Executive Officer reasonably

believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies.

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

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

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(1.2) Malfunction Criteria:

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

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(B) For 2015 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard and 2015 and subsequent model year medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard, 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 II system shall detect a malfunction when the catalyst is unable to generate the necessary feedgas constituents for proper SCR system operation. 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 ~~15 percent or more of~~ 25 percent or more for SULEV30 and SULEV20 vehicles, 20 percent or more for ULEV70 and ULEV50 vehicles, and 15 percent or more for all other vehicles, where the percentage is based on the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle; and (2) no malfunction of the catalyst's feedgas generation ability can cause emissions to exceed the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle.

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(2) *Oxides of Nitrogen (NOx) Converting Catalyst Monitoring*

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(2.2) Malfunction Criteria:

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(2.2.2) Conversion Efficiency:

(A) The OBD II system shall detect a NOx catalyst malfunction when the catalyst conversion capability decreases to the point that ~~NOx or NMHC~~ emissions exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

~~a.~~1. 3.0 times the applicable FTP full useful life NMHC or NOx standards for 2004 through 2009 model year vehicles;

~~b.~~2. 2.5 times the applicable FTP full useful life NMHC or NOx standards for 2010 through 2012 model year vehicles; and

~~c.~~3. 1.75 times the applicable FTP full useful life NMHC or NOx standards for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

* * * *

(B) Except as provided below in section (f)(2.2.2)(C), if no failure or deterioration of the catalyst ~~NOx or NMHC~~ conversion capability could result in ~~NOx or NMHC~~ emissions exceeding the applicable malfunction criteria of section (f)(2.2.2), the OBD II system shall detect a malfunction when the catalyst has no detectable amount of ~~NOx or NMHC~~ conversion capability.

* * * *

(2.2.3) Selective Catalytic Reduction (SCR) or Other Active/Intrusive Reductant Injection System Performance:

(A) Reductant Delivery Performance:

(i) For 2007 and subsequent model year vehicles, the OBD II system shall detect a system malfunction prior to any failure or deterioration of the system to properly regulate reductant delivery (e.g., urea injection, separate injector fuel injection, post injection of fuel, air assisted injection/mixing) that would cause a vehicle's ~~NOx or NMHC~~ emissions to exceed the applicable emission levels specified in sections (f)(2.2.2)(A).

(ii) If no failure or deterioration of the reductant delivery system could result in a vehicle's ~~NOx or NMHC~~ emissions exceeding the applicable malfunction criteria specified in section (f)(2.2.3)(A)(i), the OBD II system shall detect a malfunction when the system has reached its control limits such that it is no longer able to deliver the desired quantity of reductant.

* * * *

(3) *Misfire Monitoring*

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(3.3) Monitoring Conditions:

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(3.3.3) For misfires identified in section (f)(3.2.2), the OBD II system shall monitor for misfire as follows:

* * * *

(D) A manufacturer may request Executive Officer approval to disable misfire monitoring or employ an alternate malfunction criterion when misfire cannot be distinguished from other effects. Upon determining that the manufacturer has presented documentation that demonstrates the disablement interval or period of use of an alternate malfunction criterion is limited only to that necessary for avoiding false detection, the Executive Officer shall approve the disablement or use of the alternate malfunction criterion. Such disablements may include but are not limited to events involving:

(i) rough road,
(ii) fuel cut,
(iii) gear changes for manual transmission vehicles,
(iv) traction control or other vehicle stability control activation such as anti-lock braking or other engine torque modifications to enhance vehicle stability,
(v) off-board control or intrusive activation of vehicle components or diagnostics during service or assembly plant testing,
(vi) intrusive diagnostics during portions that can significantly affect engine stability, ~~or~~
(vii) infrequent regeneration events during portions that can significantly affect engine stability~~.~~, or
(viii) conditions where the engine coolant temperature is below 70 degrees Fahrenheit (or 21.1 degrees Celsius) on driving cycles where the engine coolant temperature at engine start is below 20 degrees Fahrenheit (or -6.7 degrees Celsius).

* * * *

(5) *Exhaust Gas Sensor Monitoring*

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(5.3) Monitoring Conditions:

(5.3.1) Exhaust Gas Sensors

(A) Manufacturers shall define the monitoring conditions for malfunctions identified in sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), (5.2.2)(A), and (5.2.2)(D) (e.g., sensor performance faults) in accordance with sections (d)(3.1) and (d)(3.2) (i.e., minimum ratio requirements). Additionally, ~~F~~for all 2010 and subsequent model year vehicles, manufacturers shall track and report the in-use performance of the exhaust gas sensor monitors under sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), (5.2.2)(A)~~, and (5.2.2)(D)~~ in accordance with section (d)(3.2.2). Further, for all 2016 and subsequent model year medium-duty vehicles (except MDPVs certified to a chassis dynamometer tailpipe emission standard) and 2019 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, manufacturers shall track and report the in-use performance of the exhaust gas sensor monitors under section (f)(5.2.2)(D) in accordance with section (d)(3.2.2). ~~f~~For purposes of tracking and reporting as required in section (d)(3.2.2), all monitors

used to detect malfunctions identified in sections (f)(5.2.1)(A)(i), (5.2.1)(B)(i), (5.2.2)(A), and ~~for 2016 and subsequent model year medium-duty vehicles (except MDPVs certified to a chassis dynamometer tailpipe emission standard) and 2019 and subsequent model year passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard, section (f)~~(5.2.2)(D) shall be tracked separately but reported as a single set of values as specified in section (d)(5.2.2).

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(8) *NOx Adsorber Monitoring*

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(8.2) Malfunction Criteria:

(8.2.1) NOx adsorber capability:

(A) The OBD II system shall detect a NOx adsorber system malfunction when the NOx adsorber system capability decreases to the point that would cause a vehicle's ~~NOx or NMHC~~ emissions to exceed:

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

~~a.~~1. 3.0 times the applicable FTP NMHC or NOx standards for 2004 through 2009 model year vehicles;

~~b.~~2. 2.5 times the applicable FTP NMHC or NOx standards for 2010 through 2012 model year vehicles; and

~~c.~~3. 1.75 times the applicable FTP NMHC or NOx standards for 2013 and subsequent model year vehicles.

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f).

* * * *

(B) If no failure or deterioration of the NOx adsorber system capability could result in a vehicle's ~~NOx or NMHC~~ emissions exceeding the applicable malfunction criteria specified in section (f)(8.2.1)(A), the OBD II system shall detect a malfunction when the system has no detectable amount of NOx adsorber capability.

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

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(9.2) Malfunction Criteria:

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(9.2.1) Filtering Performance:

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

(i) For passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard:

a. For non-Low Emission Vehicle III applications:

~~a.~~1. 5.0 times the applicable FTP PM standard for 2004 through 2009 model year vehicles;

~~b.~~2. 4.0 times the applicable FTP PM standard for 2010 through 2012 model year vehicles; and

~~c.~~3. 1.75 times the applicable FTP PM standard for 2013 and subsequent model year vehicles.

* * * *

(B) If no failure or deterioration of the PM filtering performance could result in a vehicle's ~~PM~~ emissions exceeding the applicable malfunction criteria specified in section (f)(9.2.1)(A), the OBD II system shall detect a malfunction when no detectable amount of PM filtering occurs.

(9.2.2) Frequent Regeneration:

* * * *

(B) If no failure or deterioration causes an increase in the PM filter regeneration frequency that could result in a vehicle's ~~NMHC, CO, or NOx~~ emissions exceeding the applicable malfunction criteria specified in section (f)(9.2.2)(A), the OBD II system shall detect a malfunction when the PM filter regeneration frequency exceeds the manufacturer's specified design limits for allowable regeneration frequency.

* * * *

(9.2.4) Catalyzed PM Filter:

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

(i) ~~t~~The OBD II system shall monitor the catalyst function of the PM filter and detect a malfunction when the NMHC conversion capability decreases to the point that ~~NMHC~~ emissions exceed:

a. For non-Low Emission Vehicle III applications,

1. 1.75 times the applicable FTP full useful life NMHC standards for passenger cars, light-duty trucks, and MDPVs certified to a chassis dynamometer tailpipe emission standard; or

2. 2.0 times the applicable NMHC standards for medium-duty vehicles (including MDPVs) certified to an engine dynamometer tailpipe emission standard; or

b. For Low Emission Vehicle III applications, any of the applicable NMOG+NOx, CO, or PM emission thresholds set forth in Table 2 in the beginning of section (f) ~~emission levels specified in section (f)(9.2.2)(A)~~.

(ii) If no failure or deterioration of the NMHC conversion capability could result in a vehicle's ~~NMHC~~ emissions exceeding the~~se~~ emission levels specified in section (f)(9.2.4)(A)(i), the OBD II system shall detect a

malfunction when the system has no detectable amount of NMHC conversion capability.

(iii) PM filters are exempt from ~~this~~ the monitoring requirements of sections (f)(9.2.~~2~~4)(A)(i) and (ii) if both of the following criteria are satisfied: (1) no malfunction of the PM filter's NMHC conversion capability can cause emissions to increase by 15 percent or more of the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle; and (2) no malfunction of the PM filter's NMHC conversion capability can cause emissions to exceed the applicable full useful life NMHC, NOx (or NMOG+NOx, if applicable), CO, or PM standard as measured from an applicable emission test cycle.

* * * *

(10) *Crankcase Ventilation (CV) System Monitoring*

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(10.2) Malfunction Criteria:

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(10.2.3) For all 2025 and subsequent model year vehicles, the following criteria apply for CV system monitoring:

(A) Except as provided below, the OBD II system shall detect a CV system malfunction of any hose, tube, or line that transports crankcase vapors when the system contains a ~~leak~~disconnection or break equal to or greater than the smallest internal cross-sectional area of that hose, tube, or line. For the purposes of section (f)(10.2.3), "external hose, tubing, or line" includes any fittings that are used for connection such as nipples or barbs that the hoses must be placed over for proper attachment.

(B) Manufacturers are not required to detect disconnections or ~~leaks~~breaks of any CV system hose, tube, or line if said disconnection or ~~leak~~break (1) causes the vehicle to stall immediately during idle operation; or (2) is unlikely to occur due to a CV system design that is integral to the induction system (e.g., machined passages rather than tubing or hoses); ~~or~~ (3) results in a rapid loss of oil or other overt indication of a CV system malfunction such that the vehicle operator is certain to respond and have the vehicle repaired; or (4) occurs downstream of where the crankcase vapors are delivered to the air intake system.

* * * *

(11) *Engine Cooling System Monitoring*

(11.1) Requirement:

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(11.1.4) Vehicles that use an engine and/or engine component temperature sensor or system (e.g. oil temperature sensor, cylinder head temperature sensor) in lieu of or in addition to the cooling system and ECT sensor for an indication of engine operating temperature for emission control purposes (e.g., to modify fuel injection timing or quantity), the following requirements shall apply:

(A) For vehicles that use a system other than the cooling system and ECT sensor ~~(e.g., oil temperature, cylinder head temperature) for an indication of engine operating temperature for emission control purposes (e.g., to modify spark or fuel injection timing or quantity)~~, the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (f)(11).

(B) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles that use an engine and/or engine component temperature sensor or system in addition to the cooling system and ECT sensor (including systems that use more than one thermostat or flow control device to regulate different temperatures in different cooling circuits and use input from at least two temperature sensors in separate cooling circuits for an indication of engine operating temperatures for emission control purposes), the manufacturer shall submit a monitoring plan to the Executive Officer for approval. The Executive Officer shall approve the request upon determining that the manufacturer has submitted data and an engineering evaluation that demonstrate that the monitoring plan is as reliable and effective as the monitoring required for the engine cooling system under section (f)(11).

* * * *

(11.2) Malfunction Criteria:

(11.2.1) Thermostat

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(D) For monitoring of malfunctions under sections (f)(11.2.1)(A) and (B), with Executive Officer approval, a manufacturer may use alternate malfunction criteria and/or monitoring conditions (see section (f)(11.3)) that are a function of temperature at engine start on vehicles that do not reach the temperatures specified in the malfunction criteria when the thermostat is functioning properly. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data that demonstrate that a properly operating system does not reach the specified temperatures, that the monitor is capable of meeting the specified malfunction criteria at engine start temperatures greater than 50 degrees Fahrenheit (or 10 degrees Celsius), and that the overall effectiveness of the monitor is comparable to a monitor meeting these thermostat monitoring requirements at lower temperatures.

* * * *

(11.3) Monitoring Conditions:

(11.3.1) Thermostat

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(D) Manufacturers may request Executive Officer approval to suspend or disable thermostat monitoring required under sections (f)(11.2.1)(A) and

(B) if the vehicle is subjected to conditions which could lead to false diagnosis (e.g., vehicle operation at idle for more than 50 percent of the warm-up time, ~~hot restart conditions, etc.~~engine block heater operation). With respect to disablement on driving cycles solely due to warm ECT at engine start conditions for thermostat monitoring under section (f)(11.2.1)(A), the manufacturer shall disable the monitor during driving cycles where the ECT at engine start is within 35 degrees Fahrenheit (or 19.4 degrees Celsius) of the thermostat malfunction threshold temperature determined under section (f)(11.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the monitor shall be disabled if the ECT at engine start is above 125 degrees Fahrenheit)~~In general, the Executive Officer shall not approve disablement of the monitor on engine starts where the ECT at engine start is more than 35 degrees Fahrenheit lower than the thermostat malfunction threshold temperature determined under section (f)(11.2.1)(A). The Executive Officer shall approve the request upon determining that the manufacturer has provided data and/or engineering analysis that demonstrate the need for the request~~.

(E) Notwithstanding section (f)(11.3.1)(D), manufacturers may request Executive Officer approval to enable thermostat monitoring required under section (f)(11.2.1)(A) during a portion of the driving cycles where the ECT at engine start is warmer than 35 degrees Fahrenheit (or 19.4 degrees Celsius) below the thermostat malfunction threshold temperature determined under section (f)(11.2.1)(A) (e.g., if the malfunction threshold temperature is 160 degrees Fahrenheit, the manufacturer may request approval to have the monitor enabled for a portion of the ECT at engine start region between 125 and 160 degrees Fahrenheit). The Executive Officer shall approve the request upon determining that the manufacturer has submitted test data and/or engineering evaluation that demonstrate that the monitor is able to robustly detect thermostat malfunctions (e.g., cannot result in false passes or false indications of malfunctions) on driving cycles where it is enabled.

* * * *

(14) ~~[RESERVED]~~*Air Conditioning (A/C) System Component Monitoring*

(14.1) Requirement: On all 2019 and subsequent model year Low Emission Vehicle III applications, if a vehicle incorporates an engine control strategy that is altered when the A/C system is on, the OBD II system shall monitor all electronic air conditioning system components for malfunctions that cause the system to fail to invoke the alternate control while the A/C system is on or cause the system to invoke the alternate control while the A/C system is off. Additionally, the OBD II system shall monitor for malfunction all electronic air conditioning system components that are used as part of the diagnostic strategy for any other monitored system or component. As applicable, the A/C system shall also be subject to the comprehensive component monitoring requirements in section (f)(15.2.3)(B).

* * * *

(15) *Comprehensive Component Monitoring*

(15.1) Requirement:

(15.1.1) Except as provided in sections (f)(15.1.3), (f)(15.1.4), (f)(15.1.5), and (f)(16), the OBD II system shall monitor for malfunction any electronic powertrain component/system not otherwise described in sections (f)(1) through (f)(14) that either provides input to (directly or indirectly) or receives commands from ~~the~~ an on-board computer~~(s)~~ or smart device, and: (1) can affect emissions ~~in excess of the criteria described~~ as determined by the criteria in section (f)(15.1.2) ~~during any reasonable in-use driving condition~~, ~~or~~ (2) is used as part of the diagnostic strategy for any other monitored system or component, or (3) is used as part of an inducement strategy on 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year diesel vehicles. Each input to or output from a smart device that meets criterion (1), (2), or (3) above shall be monitored pursuant to section (f)(15). Further detection or pinpointing of faults internal to the smart device is not required. If the vehicle compensates or adjusts for deterioration or malfunction of the component/system, manufacturers may not use the criteria under section (f)(15.1.2) and are instead subject to the default action requirements of (d)(2.2.3) or (f)(15.4.5) as applicable.

* * * *

(15.1.2) For purposes of criteria (1) in section (f)(15.1.1) above, the manufacturer shall determine whether a powertrain input or output component/system can affect emissions when operating without any control system compensation or adjustment for deterioration or malfunction based on the following: ~~criteria in sections (f)(15.1.2)(A) through (E) below.~~ (1) for 2004 through 2017 model year vehicles, the manufacturer shall use the criteria in section (f)(15.1.2)(G); and (2) for 2018 and subsequent model year vehicles, the manufacturer shall use the criteria in sections (f)(15.1.2) (A) through (F). ~~If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system cannot affect emissions, the Executive Officer shall require the manufacturer to provide emission data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an emission effect. The Executive Officer may request emission data for any reasonable driving condition.~~

* * * *

(B) Manufacturers that have determined that a component or system is not subject to monitoring because a malfunction would not cause emissions to exceed the criteria specified in section (f)(15.1.2)(A) above shall demonstrate for purposes of OBD II system approval that the criteria are satisfied by meeting the requirements in either section (f)(15.1.2)(B)(i) or (f)(15.1.2)(B)(ii) below:

(i) The manufacturer shall conduct an engineering evaluation demonstrating that no malfunction of the component/system could

cause an increase in vehicle emissions greater than 15 percent of the standard on any of the test cycles listed in section (f)(15.1.2)(A) above, or

~~(i)~~(ii) The manufacturer shall meet the following testing requirements:

a. The manufacturer shall ~~C~~conduct~~ing~~ an FTP test with the component or system malfunctioning, and provide~~ing~~ test data to show that no applicable standard has been exceeded, and

~~(ii)~~b. The manufacturer shall ~~C~~conduct~~ing~~ testing using the component condition causing the largest emission impact during the worst case test cycle or in-use driving condition specified in section (f)(15.1.2)(A)(ii) (as determined by the manufacturer based on sound engineering judgment), and provide~~ing~~ test data to show that the difference between the mean emission values do not exceed 15 percent of any standard.~~, and~~

(iii) The Executive Officer may request one additional test cycle for either section (f)(15.1.2)(B)(i) or (ii) above if the~~re is evidence to suggest~~Executive Officer reasonably believes, based on the component being tested, that the engineering evaluation is insufficient or the cycle chosen by the manufacturer was not the worst case for demonstration of the malfunction.

* * * *

(F) For 2018 and 2019 model year vehicles carried over from 2017 or earlier model year vehicles, a component/system is determined to not affect emissions and the manufacturer is not required to use the criteria in sections (f)(15.1.2)(A) through (E) if the Executive Officer determined that the component/system does not affect emissions on the vehicles in question in the 2017 or earlier model year in accordance with section (f)(15.1.2)(G).

(G) For 2004 through 2017 model year vehicles, in lieu of the criteria in sections (f)(15.1.2)(A) through (E) above, the manufacturer shall determine whether a powertrain input or output component/system can affect emissions during any reasonable in-use driving condition. If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system cannot affect emissions, the Executive Officer shall require the manufacturer to provide emission data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an emission effect. The Executive Officer may request emission data for any reasonable driving condition. Alternatively, for 2017 model year vehicles, manufacturers may use the criteria in sections (f)(15.1.2)(A) through (E) in lieu of the criteria stated above in section (f)(15.1.2)(G).

* * * *

(15.2) Malfunction Criteria:

(15.2.1) Input Components:

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(B) ~~To the extent feasible,~~ Except for input components monitored solely by emissions neutral diagnostics, rationality faults shall be separately detected and store different fault codes than the respective ~~lack of~~ circuit ~~continuity~~ fault and out of range diagnostics. Two-sided rationality diagnostics are not required to set separate fault codes for each side. Additionally:~~,~~

(i) For computer encoded digital inputs: lack of communication from the input to the on-board computer shall be separately detected and store a separate fault code. Separate fault codes are not required for each distinct out-of-range fault.

(ii) For all other inputs: component ~~lack of~~ circuit ~~continuity~~ and out of range faults shall be separately detected and store different fault codes for each distinct malfunction (e.g., out-of-range low, out-of-range high, open circuit, ~~shorted high, shorted low,~~ etc.). Notwithstanding, ~~M~~manufacturers are not required to store separate fault codes for lack of circuit continuity faults that cannot be distinguished from other out-of-range ~~circuit~~ faults. For sensors that are fixed to a circuit board within a diagnostic or emission critical control unit, as defined in section (c), manufacturers may combine circuit and out-of-range value faults into a single fault code that identifies the malfunctioning sensor.

* * * *

(15.2.2) Output Components/Systems:

(A) The OBD II system shall detect a malfunction of an output component/system when proper functional response of the component and system to computer commands does not occur. If a functional check is not feasible, the OBD II system shall detect malfunctions of output components/systems caused by a lack of circuit continuity or circuit fault (e.g., short to ground or high voltage), or communication errors or the lack of communication if the signal to the output component is digital. For output component lack of circuit continuity faults and circuit faults, manufacturers are not required to store different fault codes for each distinct malfunction (e.g., open circuit, shorted low, etc.). Manufacturers are not required to activate an output component/system when it would not normally be active for the purposes of performing a functional ~~monitoring~~ check of the output component~~s~~/system~~s~~ as required in section (f)(15).

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(15.2.3) Hybrid Components

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(B) ~~ESS~~ Hybrid Thermal Management Systems

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(ii) Inverter Thermal Management Systems

a. The individual electronic input and output components that are used for inverter thermal management (i.e., heating or cooling) shall be monitored in accordance with the requirements of sections

(f)(15.2.1) and (15.2.2). Electronic components used for inverter thermal management and commanded solely by driver demand are exempt from this monitoring requirement.

b. To the extent feasible, the OBD II system shall perform a functional check of the cooling performance and, if applicable, heating performance.

* * * *

(H) Monitoring of hybrid components as specified in sections (f)(15.2.3)(A) through (G) above on mild hybrid electric vehicles and strong hybrid electric vehicles is not required if manufacturers can demonstrate:

(i) The component is not used as part of the diagnostic strategy for any other monitored system or component,

(ii) Is not used as part of an inducement strategy, and

(iii) No malfunction of the component or system can affect emissions as determined by the criteria in section (f)(15.1.2).

(~~H~~I) Monitoring of hybrid components as specified in sections (f)(15.2.3)(A) through (G) above on plug-in hybrid electric vehicles is not required if manufacturers can demonstrate:

* * * *

(ii) In lieu of the criteria in section (~~e~~f)(15.1.2), except as specified in (f)(15.2.3)(~~H~~I)(iii) and (iv),no malfunction of the component or system could cause:

a. An engine in a vehicle with a fully charged ESS ~~vehicle's engine~~ to start over any of the following test cycles where a properly-functioning fully charged vehicle does not start its engine during a single test cycle: FTP test, HWFET, Unified cycle, and US06 cycle; and

* * * *

(iii) For hybrid thermal management systems, in lieu of the test procedure specified in section (f)(15.2.3)(~~H~~I)(ii) above, manufacturers shall submit a plan for Executive Officer approval for an alternate test cycle/vehicle operating conditions for the purposes of determining whether a malfunction would cause an engine in a vehicle with a fully-charged ESS~~vehicle's engine~~ to start where a properly-functioning fully charged vehicle does not and a 15 percent reduction of all electric range if the component/system is malfunctioning. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that considers all conditions under which the thermal management system may be activated (e.g., high ambient temperatures, ESS charging, high load driving) and demonstrates that the chosen test cycle and operating conditions are representative of in-use conditions where all electric range is likely to be most affected by the malfunctioning component/system.

(iv) If function of the hybrid component or system would not necessarily occur during any of the test cycles specified in section (f)(15.2.3)(~~H~~l)(ii) above (e.g., global positioning system components that control plug-in hybrid operation based on battery state of charge), the manufacturer shall request Executive Officer approval of an added alternate test cycle or vehicle operating conditions for which the determination of vehicle engine starts and increase in integrated net ~~watt hours of~~ energy will be evaluated. Executive Officer approval shall be granted upon determining that the manufacturer has submitted data and/or engineering evaluation that demonstrate that the testing conditions proposed represent in-use driving conditions under which the component or system will function and where energy usage is likely to be most affected by the malfunctioning component. The component or system is required to meet the monitoring requirements under section (f)(15) if any condition (e.g., deterioration, failure) of the component or the system could cause the vehicle's engine to start when it otherwise would not, or an increase greater than 15 percent of the integrated net ~~watt hours of~~ energy used for a mean of three or more tests conducted with a malfunction compared to testing without a malfunction.

* * * *

(15.4) MIL Illumination and Fault Code Storage:

(15.4.1) Except as provided in sections (f)(15.4.2), ~~and~~ (f)(15.4.4), and (f)(15.4.5) below, general requirements for MIL illumination and fault code storage are set forth in section (d)(2). Additional fault code storage requirements are provided in sections (f)(15.2.1)(B) for input components and in section (f)(15.2.2)(A) for output components/systems, and section (f)(15.2.3)(A)(~~i~~v) for hybrid components.

(15.4.2) Exceptions to general requirements for MIL illumination. For ~~non-Low Emission Vehicle III~~ applications that are not using the criteria of sections (f)(15.1.2)(A) through (E) to determine if a component/system can affect emissions, MIL illumination is not required in conjunction with storing a confirmed fault code for any comprehensive component if both conditions (A) and (B) below are met:

* * * *

(17) *Exceptions to Monitoring Requirements*

(17.1) Except as provided in sections (f)(17.1.1) through (17.1.4) below, upon request of a manufacturer or upon the best engineering judgment of the ARB, the Executive Officer may revise the emission threshold for a malfunction on any diagnostic required in section (f) for medium-duty vehicles if the most reliable monitoring method developed requires a higher threshold to prevent false indications of a malfunction. Additionally, upon the request of a manufacturer or upon the best engineering judgment of the ARB, the Executive Officer may revise the emission threshold for a malfunction on any diagnostic required in section (f) for passenger cars, light-duty trucks, and

MDPVs certified to a chassis dynamometer tailpipe emission standard if the Executive Officer determined that (1) the most reliable monitoring method developed requires a higher threshold to prevent false indications of a malfunction; (2) a higher threshold is needed under section (e)(17.1) for a corresponding diagnostic in section (e) (e.g., EGR system, misfire, exhaust gas sensor, aftertreatment) for light-duty vehicles; and (3) the threshold for the diagnostic on the diesel vehicle is less than or equal to the threshold required for the corresponding diagnostic on the gasoline vehicle. Additionally, except as specified in section (f)(9.2.1)(A)(iii), for 2007 through 2013 model year light-duty vehicles and 2007 through 2015 model year medium-duty vehicles, the Executive Officer may revise the PM filter malfunction criteria of section (f)(9.2.1) to exclude detection of specific failure modes (e.g., combined failure of partially melted and partially cracked substrates) if the most reliable monitoring method developed requires the exclusion of specific failure modes to prevent false indications of a malfunction.

* * * *

(17.1.2) Manufacturers shall use the following malfunction criteria for vehicles certified to the Federal Tier 2 or Tier 3 emission standards:

(A) For vehicles certified to Tier 2 Federal Bin 3 or Bin 4 tailpipe emission standards (as defined in 40 CFR 86.1811-04), manufacturers shall utilize the ULEV II vehicle NMOG and CO malfunction criteria (e.g., 1.5 times the Bin 3 or Bin 4 NMOG and CO standards) and the PC/LDT SULEV II vehicle NOx malfunction criteria (e.g., 2.5 times the Bin 3 or Bin 4 NOx standards).

(B) For vehicles certified to the Tier 3 Federal Bin 85 or Bin 110 tailpipe emission standards (as defined in 40 CFR 86.1811-17), manufacturers shall utilize the following malfunction criteria in accordance with the table below (with the NMOG+NOx, CO, and PM multipliers to be used with the applicable standard (e.g., 2.0 times the NMOG+NOx standard)):

	NMOG+NOx Multiplier	CO Multiplier	PM Multiplier	PM Threshold (mg/mi)
Monitors [1]	1.85	1.50	2.00	N/A
Aftertreatment Monitors [2]	2.00	1.50[3]	2.00[3]	N/A
PM Filter Filtering Performance Monitor	1.85[3]	1.50[3]	N/A	17.50

1. Applies to (f)(3.2.5), (f)(4)-(f)(7), (f)(9.2.2), (f)(12)-(f)(13)
2. Applies to (f)(1)-(f)(2), (f)(8), and (f)(9.2.4)(A)
3. Applies to 2019 and subsequent model years

* * * *

(17.7) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the ambient temperature is below 20 degrees Fahrenheit. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that ~~The OBD II system is not required to monitor an electronic powertrain component/system if~~ the following criteria are met when the ambient temperature is above 20 degrees Fahrenheit (or -6.7 degrees Celsius): (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the ambient temperature is determined based on a temperature sensor monitored by the OBD II system (e.g., IAT sensor). ~~The manufacturer shall determine whether a component/system meets these criteria.~~ If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies. The Executive Officer may request emission data for any reasonable driving condition at ambient temperatures above 20 degrees Fahrenheit (or -6.7 degrees Celsius).

(17.8) The manufacturer may request to exempt a specific component from all monitoring requirements if all malfunctions of the component affect emissions or the diagnostic strategy for any other monitored component or system only when the vehicle speed is above 82 miles-per-hour. The Executive Officer shall approve the request upon the manufacturer submittal of data or engineering evaluation supporting that ~~The OBD II system is not required to monitor an electronic powertrain component/system if~~ the following criteria are met when the vehicle speed is below 82 miles-per-hour: (1) a malfunction of the component does not affect emissions during any reasonable driving condition, (2) a malfunction of the component does not affect the diagnostic strategy for any other monitored component or system, and (3) the vehicle speed is determined based on a sensor monitored by the OBD II system (e.g., vehicle speed sensor). ~~The manufacturer shall determine whether a component/system meets these criteria.~~ If the Executive Officer reasonably believes that a manufacturer has incorrectly determined that a component/system meets these criteria, the Executive Officer shall require the manufacturer to provide emission and/or other diagnostic data showing that the component/system, when malfunctioning and installed in a suitable test vehicle, does not have an effect on emissions or other diagnostic strategies.

* * * *

(g) *Standardization Requirements*

* * * *

(1) *Reference Documents*:

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

* * * *

(1.2) SAE J1962:

(1.2.1) SAE J1962 "Diagnostic Connector – Equivalent to ISO/DIS 15031-3:December 14, 2001", April 2002 (SAE J1962).

(1.2.2) SAE J1962 "Diagnostic Connector – Equivalent to ISO/DIS 15031-3:December 14, 2001", ~~July 2012~~September 2015 (SAE J1962).

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(1.11) SAE J1699-3 – "Vehicle OBD II Compliance Test Cases", ~~May 2006~~~~May 2012~~July 2015 (SAE J1699-3).

(1.12) SAE J2534-1 – "Recommended Practice for Pass-Thru Vehicle Programming", ~~December 2004~~October 2015 (SAE J2534-1).

* * * *

(2) *Diagnostic Connector*:

~~A standard data link connector conforming to SAE J1962 specifications (except as specified in section (g)(2.3)) shall be incorporated in each vehicle.~~

(2.1) For ~~2004 through 2018 model year~~ vehicles not included in the phase-in specified in section (g)(2.2), a standard data link connector conforming to the "Type A" specifications of SAE J1962 version April 2002 (except as specified in section (g)(2.3)) shall be incorporated in each vehicle.

* * * *

(2.2) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, a standard data link connector conforming to the "Type A" specifications and in the location specified for "Type A" connectors in SAE J1962 version ~~July 2012~~ September 2015 (except as specifications (g)(2.2.1) and (g)(2.3)) shall be incorporated in each vehicle.

(2.2.1) The vehicle connector mounting feature shall withstand a force of 220 N applied to the connector mating area in the direction of the connecting and disconnecting process without mechanical and electrical failure. It shall also withstand a force of 220 Newtons applied in all other axial directions without mechanical failure.

~~(2.2.1)~~(2.2.2) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, the connector may not be covered in any way (e.g., may not be covered by a removable panel, dust cap, lid, flap, door).

(2.2.3) For the required phase-in schedules specified in sections (g)(2.2) and (2.2.2), 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 2021 and subsequent model year vehicles shall comply with the requirements.

* * * *

(4) *Required Emission Related Functions*:

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

(4.1) Readiness Status: In accordance with SAE J1979 specifications, the OBD II system shall indicate "complete" or "not complete" since the fault memory was last cleared for each of the installed monitored components and systems identified in sections (e)(1) through (e)(8), (e)(15), (f)(1) through (f)(4), (f)(6), (f)(8), and (f)(15). All 2010 and subsequent model year diesel vehicles shall additionally indicate the appropriate readiness status for monitors identified in sections (f)(5), (f)(7), and (f)(9). All 2010 subsequent model year vehicles equipped with VVT system monitoring and subject to the test results requirements specified in section (g)(4.5.4)(C) shall additionally indicate the appropriate readiness status for VVT system monitors identified in sections (e)(13) and (f)(13). ~~All components or systems that are monitored continuously shall always indicate "complete". Those components or systems that are not subject to continuous monitoring shall immediately indicate "complete" upon the respective diagnostic(s) being fully executed and determining that the component or system is not malfunctioning. A component or system shall also indicate "complete" if after the requisite number of decisions necessary for determining MIL status have been fully executed, the monitor indicates a malfunction for the component or system. The status for each of the monitored components or systems shall indicate "not complete" whenever fault memory has been cleared or erased by a means other than that allowed in section (d)(2). Normal vehicle shut down (i.e., key off, engine off) may not cause the status to indicate "not complete".~~

(4.1.1) The readiness status for the following component/system readiness bits shall always indicate "complete":

(A) Gasoline Misfire (section (e)(3));

(B) Diesel Misfire (section (f)(3)) for vehicles with a single monitor~~without a separate monitor~~ designed to detect both misfires identified in section (f)(3.2.1) and subject to the monitoring conditions of sections (f)(3.3.1) and (f)(3.3.2) and misfires identified in section (f)(3.2.2) and subject to the monitoring conditions of (f)(3.3.3); and

* * * *

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

(4.2.1) For all vehicles:

(A) ~~c~~Calculated load value, number of stored confirmed fault codes, engine coolant temperature, engine speed, absolute throttle position (if equipped

with a throttle), vehicle speed, OBD requirements to which the engine is certified (e.g., California OBD II, EPA OBD, European OBD, non-OBD), and MIL status (i.e., commanded-on or commanded-off).

~~(B) Additionally, for all 2015 and subsequent model year vehicles: type of fuel currently being used.~~

~~(C) Additionally, for 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles: cylinder fuel rate, engine fuel rate, vehicle fuel rate, modeled exhaust flow (mass/time), engine reference torque, engine friction – percent torque, actual engine – percent torque, and odometer reading.~~

~~(4.2.2) For all vehicles so equipped:~~

(~~A~~B) For all vehicles so equipped: ~~f~~fuel control system status (e.g., open loop, closed loop, etc.), fuel trim (short term, long term, secondary), fuel pressure, ignition timing advance, intake air temperature, manifold absolute pressure, air flow rate from mass air flow sensor, secondary air status (upstream, downstream, or atmosphere), oxygen sensor output, air/fuel ratio sensor output.

~~(B) Additionally, for all 2013 and subsequent model year vehicles so equipped:~~

~~(i) EGR temperature, variable geometry turbo control status (e.g., open loop, closed loop), reductant level (e.g., urea tank fill level), alcohol fuel percentage, NOx adsorber regeneration status, NOx adsorber deSOx status, hybrid battery pack remaining charge; and~~

~~(ii) distance traveled while low/empty SCR reductant driver warning/inducement active.~~

~~(C) Additionally, for all 2019 and subsequent model year vehicles so equipped: NOx sensor corrected.~~

(4.2.~~3~~2) Additionally, ~~F~~for all 2005 and subsequent model year vehicles using the ISO 15765-4 protocol for the standardized functions required in section (g), the following signals shall ~~also~~ be made available:

(A) ~~a~~Absolute load, fuel level (if used to enable or disable any other diagnostics), relative throttle position (if equipped with a throttle), barometric pressure (directly measured or estimated), engine control module system voltage, commanded equivalence ratio, catalyst temperature (if directly measured or estimated for purposes of enabling the catalyst monitor(s)), monitor status (i.e., disabled for the rest of this driving cycle, complete this driving cycle, or not complete this driving cycle) since last engine shut-off for each monitor used for readiness status, time elapsed since engine start, distance traveled while MIL activated, distance traveled since fault memory last cleared, and number of warm-up cycles since fault memory last cleared.

(i) For all 2015 and subsequent model year vehicles: type of fuel currently being used.

(ii) For 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles: engine fuel rate, vehicle fuel

rate, modeled exhaust flow (mass/time), engine reference torque, engine friction – percent torque, actual engine – percent torque, odometer reading, and test group or engine family (whichever is applicable).

~~(4.2.4)~~(B) For all ~~2005 and subsequent model year vehicles so equipped and using the ISO 15765-4 protocol for the standardized functions required in section (g)~~vehicles so equipped:

(i) ambient air temperature, evaporative system vapor pressure, commanded purge valve duty cycle/position, commanded EGR valve duty cycle/position, EGR error between actual and commanded, PTO status (active or not active), redundant absolute throttle position (for electronic throttle or other systems that utilize two or more sensors), absolute pedal position, redundant absolute pedal position, and commanded throttle motor position.

(ii) For all 2013 and subsequent model year vehicles so equipped:

a. EGR temperature, variable geometry turbo control status (e.g., open loop, closed loop), reductant level (e.g., urea tank fill level), alcohol fuel percentage, NOx adsorber regeneration status, NOx adsorber deSOx status, hybrid battery pack remaining charge; and

b. distance traveled while low/empty SCR reductant driver warning/inducement active.

(iii) For all 2019 and subsequent model year vehicles so equipped: NOx sensor corrected.

(C) For 2019 and subsequent model year gasoline vehicles so equipped: NOx sensor output.

(D) For 2019 and subsequent model year hybrid vehicles, hybrid/EV charging state, hybrid/EV battery system voltage, and hybrid/EV battery system current.

(E) For vehicles required to meet the requirements of title 13, CCR section 1976(b)(1)(G)6., distance traveled since evap monitoring decision.

(4.2.~~5~~3) Additionally, for all 2010 and subsequent model year vehicles with a diesel engine:

* * * *

(D) For all engines so equipped: absolute throttle position, relative throttle position, fuel injection timing, ~~intake~~ manifold surface temperature, ~~intercooler~~ charge air cooler temperature, ambient air temperature, commanded EGR valve duty cycle/position, actual EGR valve duty cycle/position, EGR error between actual and commanded, PTO status (active or not active), absolute pedal position, redundant absolute pedal position, commanded throttle motor position, fuel rate, boost pressure, commanded/target boost pressure, turbo inlet air temperature, fuel rail pressure, commanded fuel rail pressure, PM filter inlet pressure, PM filter inlet temperature, PM filter outlet pressure, PM filter outlet temperature, PM filter delta pressure, exhaust pressure sensor output, exhaust gas temperature sensor output, injection control pressure, commanded

injection control pressure, turbocharger/turbine speed, variable geometry turbo position, commanded variable geometry turbo position, turbocharger compressor inlet temperature, turbocharger compressor inlet pressure, turbocharger turbine inlet temperature, turbocharger turbine outlet temperature, wastegate valve position, glow plug lamp status, PM sensor output, and NOx sensor output;

(i) ~~Additionally, f~~For all 2019 and subsequent model year vehicles so equipped: diesel exhaust fluid (DEF) sensor output (concentration and temperature), ~~DEF dosing percent duty cycle~~ commanded DEF dosing, DEF usage for the current driving cycle, and DEF dosing rate;

(E) ~~Additionally, f~~For all 2010 and subsequent model year medium-duty vehicles with a diesel engine certified on an engine dynamometer: NOx NTE control area status (i.e., inside control area, outside control area, inside manufacturer-specific NOx NTE carve-out area, or NTE deficiency for NOx active area) and PM NTE control area status (i.e., inside control area, outside control area, inside manufacturer-specific PM NTE carve-out area, or NTE deficiency for PM active area);

(F) For all 2013 and subsequent model year vehicles, normalized trigger for PM filter regeneration, PM filter regeneration status; ~~and~~

(G) For all 2013 and subsequent model year vehicles, average distance (or engine run time for engines not utilizing vehicle speed information) between PM filter regenerations~~.~~; and

(H) For all 2019 and subsequent model year vehicles, cylinder fuel rate.

~~(4.2.6) Additionally, for all 2013 and subsequent model year vehicles so equipped:~~

~~(A) EGR temperature, variable geometry turbo control status (e.g., open loop, closed loop), reductant level (e.g., urea tank fill level), alcohol fuel percentage, NOx adsorber regeneration status, NOx adsorber deSOx status, hybrid battery pack remaining charge; and~~

~~(B) distance traveled while low/empty SCR reductant driver warning/inducement active.~~

~~(4.2.7) Additionally, for all 2015 and subsequent model year vehicles: type of fuel currently being used.~~

~~(4.2.6) Additionally, for 2019 and subsequent model year hybrid vehicles, hybrid/EV charging state, hybrid/EV battery system voltage, and hybrid/EV battery system current.~~

~~(4.2.7) Additionally, for vehicles required to meet the requirements of title 13, CCR section 1976(b)(1)(G)6., distance traveled since evap monitoring decision.~~

(4.2.~~8~~4) For purposes of the calculated load, torque, fuel rate, and modeled exhaust flow parameters in sections (g)(4.2.1)(A), ~~(g)(4.2.1)(C)~~ (g)(4.2.2)(A)(ii), ~~and~~ (g)(4.2.~~5~~3)(A), and (g)(4.2.3)(H), manufacturers shall report the most accurate values that are calculated within the applicable electronic control unit (e.g., the engine control module). ~~"Most accurate values", in this context, shall be of sufficient accuracy, resolution, and~~

~~filtering to be used for the purposes of in-use emission testing with the engine still in a vehicle (e.g., using portable emission measurement equipment).~~

(4.3) Freeze Frame.

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(4.3.2) "Freeze frame" conditions must include the fault code which caused the data to be stored and all of the signals required in section (g)(4.2.1)(A) except number of stored confirmed fault codes, OBD requirements to which the engine is certified, MIL status, and absolute throttle position in accordance with (g)(4.3.3). Freeze frame conditions shall also include all of the signals required on the vehicle in sections ~~(g)(4.2.2) through (g)(4.2.5)(D), (g)(4.2.5)(F), (g)(4.2.6)(A), and (g)(4.2.7)~~ (g)(4.2.1)(B), (g)(4.2.2)(A) through (g)(4.2.2)(A)(i), (g)(4.2.2)(B)(i) through (g)(4.2.2)(B)(ii)a., (g)(4.2.3)(A) through (g)(4.2.~~5~~3)(D) ~~(except (g)(4.2.5)(D)(i))~~, and (g)(4.2.5)(F) that are used for diagnostic or control purposes in the specific diagnostic or emission-critical powertrain control unit that stored the fault code except: oxygen sensor output, air/fuel ratio sensor output, catalyst temperature, evaporative system vapor pressure, glow plug lamp status, PM sensor output, NOx sensor output, monitor status since last engine shut off, distance traveled while MIL activated, distance traveled since fault memory last cleared, and number of warm-up cycles since fault memory last cleared ~~and~~ number of warm-up cycles since fault memory last cleared, DEF sensor output, commanded DEF dosing, DEF usage for the current driving cycle, and DEF dosing rate.

(4.3.3) In lieu of including the absolute throttle position data specified in (g)(4.2.1)(A) in the freeze frame data, diagnostic or emission-critical powertrain control units that do not use the absolute throttle position data may include the relative throttle position data specified in (g)(4.2.~~3~~2)(A) or pedal position data specified in (g)(4.2.~~4~~2)(B).

* * * *

(4.7) Software Calibration Verification Number:

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(4.7.4) When a CVN request message is received by the on-board computer, the stored CVN value shall be made available through the data link connector to a generic scan tool.

(A) Except as provided below in sections (g)(4.7.4)(B) and (C), when a CVN request is received, the on-board computer may not respond with negative response codes (i.e., may not use delayed timing in sending the CVN and may not response with a message indicating the CVN value is not currently available) and may not respond with a default value. Default value is defined as any value or space holder that is not a valid CVN value.

(B) If the CVN request message is received within the first 120 seconds of vehicle operation after a reprogramming event or a non-volatile memory clear or within the first 120 seconds of vehicle operation after a volatile

memory clear or battery disconnect, the on-board computer may respond with a negative response code directing the scan tool to wait or resend the request message after the delay. Such responses and delays shall conform to the specifications for transmitting CVN data contained in SAE J1979.

(C) If a communication malfunction is preventing access to a CVN value for reporting in response to a scan tool request, a default CVN value may be reported in lieu of a valid CVN value provided that:

(i) a pending fault code is stored or a confirmed fault code is stored with the MIL commanded on pinpointing a communication fault for the module that is unable to report a valid CVN, and

(ii) the default CVN value used cannot be mistaken for a valid CVN (e.g., all zeros or all question marks for the default value).

* * * *

(4.10) Erasure of Emission-Related Diagnostic Information:

(4.10.1) For purposes of section (g)(4.10), "emission-related diagnostic information" includes at least all the following:

(A) Readiness status (section (g)(4.1))

(B) Data stream information (section (g)(4.2)) including MIL status, number of stored confirmed fault codes, distance traveled (or engine run time for engines not utilizing vehicle speed information) while MIL activated, number of warm-up cycles since fault memory last cleared, ~~and~~ distance traveled (or engine run time for engines not utilizing vehicle speed information) since fault memory last cleared, and monitor status.

(C) Freeze frame information (section (g)(4.3))

(D) Pending and confirmed fault codes (section (g)(4.4))

(E) Test results (section (g)(4.5))

(4.10.2) For ~~all~~ 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles, the emission-related diagnostic information shall be erased as a result of a command by any scan tool (generic or enhanced) and may be erased if the power to the on-board computer is disconnected. At a minimum, the emission-related diagnostic information shall be erased as a result of a command by a scan tool while in the key on, engine off position. Further, except as provided for in sections (g)(4.4.6)(D), (g)(4.8.2), and (g)(4.10.4), if any of the emission-related diagnostic information is erased as a result of a command by a scan tool, all emission-related diagnostic information shall be erased from all control units that reported supported readiness for a readiness bit other than the comprehensive component readiness bit~~shall be erased~~. For these control units, ~~T~~the OBD II system may not erase a subset of the emission-related diagnostic information in response to a scan tool command (e.g., in such cases, the OBD II system may not erase only one of three stored fault codes or only information from one control unit without erasing information from the other control unit(s)).

(4.10.3) A manufacturer may request Executive Officer approval to be exempt from erase~~e~~ing all emission-related diagnostic information from all control units while in the key on, engine off position ~~during alternate conditions (i.e., conditions other than or in addition to the key on, engine off position)~~ for the purposes of safety or component protection. The manufacturer shall propose alternate conditions (i.e., conditions other than or in addition to the key on, engine off position) to erase the emission-related diagnostic information. The Executive Officer shall approve the alternate conditions upon determining that the manufacturer has demonstrated all of the following:

* * * *

(5) *In-use Performance Ratio Tracking Requirements*:

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(5.2) Numerical Value Specifications:

(5.2.1) For the numerator, denominator, general denominator, and ignition cycle counter:

(A) Each number shall have a minimum value of zero and a maximum value of 65,535 with a resolution of one.

(B) ~~Each number shall meet the following applicable requirements:~~

~~(i) Except as provided in section (g)(5.2.1)(B)(ii) below: The numbers may be stored in keep-alive memory (KAM).~~ Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event, etc.) or, if the numbers are stored in ~~keep-alive memory (~~KAM~~)~~, when KAM is lost due to an interruption in electrical power to the control module (e.g., battery disconnect, etc.). Numbers may not be reset to zero under any other circumstances including when a scan tool command to clear fault codes or reset KAM is received.

~~(ii) For 2019 and subsequent model year vehicles: The numbers may not be stored in KAM and are required to be stored in NVRAM. 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 command to clear fault codes is received.~~

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(6) ~~*Engine Run Time*~~ *Vehicle Operation Tracking Requirements*:

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(6.3) For ~~all~~ 30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles with gasoline, diesel, or alternate-fueled engines, manufacturers shall implement software algorithms to individually track and report in a standardized format the following:

(6.3.1) Total engine run time

(6.3.2) Total engine idle run time ~~(with "idle" defined in section (g)(6.1.2))~~

(6.3.3) ~~Cumulative~~ Total distance traveled

(6.3.4) ~~Cumulative~~ Total fuel consumed ~~by the vehicle~~

(6.3.5) ~~Cumulative~~ Total positive kinetic energy ~~(with "positive kinetic energy" defined by the equation below when final velocity is greater than initial velocity evaluated on a 1 Hertz basis):~~
~~Positive kinetic energy = (1/distance) * ∑[(final velocity)^2 – (initial velocity)^2)]~~

(6.3.6) ~~Cumulative~~ Total ~~calculated~~ engine output ~~torque~~ energy ~~(with "calculated engine output torque" defined as the net brake torque produced by the engine)~~

(6.3.7) ~~Cumulative~~ Total propulsion system active time

(6.3.8) ~~Cumulative~~ Total idle propulsion system active time ~~(with "idle propulsion system active time" defined as the time when the vehicle is in a state of propulsion system active, accelerator pedal released by driver, and vehicle speed is less than or equal to one mile per hour)~~

(6.3.9) ~~Cumulative~~ Total city propulsion system active time ~~(with "city propulsion system active time" defined as the time when the vehicle is in a state of propulsion system active and the vehicle speed is greater than one mile per hour and less than or equal to 40 miles per hour)~~

(6.4) For ~~all~~ 25 percent of 2019, 50 percent of 2020, and 100 percent of 2021 and subsequent model year plug-in hybrid electric vehicles, manufacturers shall implement software algorithms to individually track and report in a standardized format the following:

(6.4.1) ~~Cumulative~~ Total distance traveled in charge depleting operation with engine off

(6.4.2) ~~Cumulative~~ Total distance traveled in charge depleting operation with engine ~~on~~running

(6.4.3) ~~Cumulative~~ Total distance traveled in driver-selectable charge increasing operation

(6.4.4) ~~Cumulative~~ Total fuel consumed in charge depleting operation

(6.4.5) ~~Cumulative~~ Total fuel consumed in driver-selectable charge increasing operation

(6.4.6) ~~Cumulative~~ Total grid energy consumed in charge depleting operation with engine off ~~(with "grid energy consumed" defined as the amount of energy delivered to the battery from electric vehicle supply equipment)~~

(6.4.7) ~~Cumulative~~ Total grid energy consumed in charge depleting operation with engine ~~on~~running

(6.4.8) Total grid energy into the battery

(6.5) For ~~all~~30 percent of 2019, 60 percent of 2020, and 100 percent of 2021 and subsequent model year vehicles equipped with active off-cycle credit technologies, manufacturers shall submit a plan for Executive Officer approval in accordance with (g)(6.8) to implement software algorithms to individually track and report in a standardized format the following:

(6.5.1) Active Off-Cycle Credit Technology #1;

(6.5.2) Active Off-Cycle Credit Technology #2; and so on up to

(6.5.3) Active Off-Cycle Credit Technology #n.

(6.~~3~~6) Numerical Value Specifications:

(6.3~~6~~.1) For each counter specified in section (g)(6.1) and (g)(6.2):

(A) Each number shall conform to the standardized format specified in SAE J1979.

(B) 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.

(C) If any of the individual counters reach the maximum value, all counters shall be divided by two before any are incremented again to avoid overflow problems.

(6.6.2) For each counter specified in section (g)(6.3) through (g)(6.5):

(A) ~~Each counter shall use the following units:~~

~~(i) Time counters shall use units of seconds.~~

~~(ii) Distance counters shall use units of meters.~~

~~(iii) Fuel consumed counters shall use units of milliliters.~~

~~(iv) Positive kinetic energy counters shall use units of meters per second squared (m/sec^2).~~

~~(v) Torque counters shall use units of Newton-meters.~~

~~(vi) Grid energy consumed counters shall use units of Watt-hours.~~

~~(vii) Active Off-Cycle Credit Technology #n counter 1 shall use units of seconds while Active Off-Cycle Credit Technology #n counter 2 shall use units of seconds for technologies not requiring driver interaction and units of counts for technologies requiring driver interaction.~~

~~(B) Each number shall be a four-byte value with a minimum value of zero, a resolution of one unit per bit (e.g., one second per bit for time counters, one meter per bit for distance counters), and an accuracy of +/- ten units per driving cycle.~~

~~(C)~~ Each number shall be stored twice, one representing the lifetime of the vehicle and the second representing recent operation.

(i) For the lifetime counters, each number shall be reset to zero only when data stored for the in-use performance tracking is reset to zero, as specified in section (g)(5.2.1)(B). ~~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) For the recent operation counters, each number shall be reset to zero when the recent operation counter for cumulative propulsion system active time reaches 50 hours or a scan tool command to clear fault codes is received.

(~~D~~B) If any of the individual lifetime counters reach the maximum value, all lifetime counters shall be divided by two before any are incremented again to avoid overflow problems.

(~~E~~C) The counters shall be made available to a generic scan tool in accordance with the SAE J1979 specifications and may be rescaled when

displayed, if required by the SAE specifications (e.g., seconds to hours, minutes, and seconds).

* * * *

(6.8) Specifications of Active Off-Cycle Credit Technologies: Manufacturers shall submit a plan for Executive Officer approval of tracking of active off-cycle credit technologies. Executive Officer approval of the plan shall be granted upon determination that the manufacturer has developed counters that will accurately track the off-cycle technology usage per the criteria in subsections (g)(6.8.1) or (g)(6.8.2) below. Each active off-cycle credit technology shall be tracked with two separate counters within a single active off-cycle credit technology (e.g., Active Off-Cycle Credit Technology #1 counter 1 and Active Off-Cycle Credit Technology #1 counter 2) as follows:

(6.8.1) For active off-cycle credit technologies where the driver has no direct control over the activation of the technology (e.g., active grill shutters), counter 1 shall increment (time) whenever the technology is active (i.e., in a state intended to reduce CO_2 emissions). For technologies that can have a varying amount of action (e.g., an active ride height system that progressively decreases the ride height based on increasing vehicle speed), counter 1 shall increment (time) when the system is active at a level representing less than 75 percent of the maximum adjustment or authority and counter 2 shall increment (time) when the system is active at a level representing 75 percent or more of its maximum adjustment or authority.

(6.8.2) For active off-cycle credit technologies where the driver must take action to achieve the CO_2 reduction benefits of the technology (e.g., driver coaching or feedback-based systems alerting the driver to take action to avoid unnecessary braking or acceleration), counter 1 shall increment (time) when the technology is enabled and counter 2 shall increment (counts) when system prompts the driver and the driver positively responds to the prompt such that the benefits of the technology are achieved. As an example, a vehicle may have a driver-selectable 'eco' mode that prompts the driver to release the accelerator pedal earlier than normal when the vehicle senses an upcoming braking event is needed, therefore encouraging the driver to coast down instead of maintaining speed and braking later. In such a case, counter 1 would identify the cumulative time the 'eco' mode was selected and counter 2 would count the number of occurrences where the driver was alerted to an upcoming need for braking and the driver positively responded by releasing the accelerator and coasting rather than maintaining speed and then transitioning directly to braking.

(6.9) For data parameters specified in sections (g)(6.3) through (g)(6.5), all data directly collected from vehicles owned by a private individual by either ARB or by a third party contracted directly by ARB shall be:

(6.9.1) Obtained with the voluntary and informed consent of the vehicle operator; and

(6.9.2) Collected and stored in a manner in accordance with required data security and record keeping policies applicable to ARB to protect the data from: (a) unauthorized access; or (b) being used to identify the individual vehicle (i.e., vehicle identification number or license plate number) or registered owner.

(6.10) Nothing in section (g)(6) obligates a vehicle manufacturer to collect the data specified in sections (g)(6.3) through (g)(6.5) from individual vehicles or make the data available to any party other than ARB.

(6.11) The data specified in sections (g)(6.3) through (g)(6.5) reflect vehicle operation in various real world conditions including different driving, environmental, and vehicle weight conditions that may not correspond to regulated test procedures. Vehicle fuel consumption and greenhouse gas (GHG) emission levels will vary based on such conditions and as a result, this data may not correspond to the test conditions and/or test procedures associated with California's GHG emission standards specified in title 13 CCR §1961.3. Compliance with the GHG emission standards applicable to 2017 and subsequent model year passenger cars, light-duty trucks, and medium-duty passenger vehicles is determined in accordance with the standards and test procedures specified in title 13, CCR §1961.3.

* * * *

(7) *Exceptions to Standardization Requirements*.

* * * *

(7.3) Whenever the requirements in section (~~e~~g) of this regulation require a manufacturer to meet a specific phase-in schedule:

* * * *

(7.3.2) Manufacturers may use an alternate phase-in schedule in lieu of the required phase-in schedule if the alternate phase-in schedule provides for equivalent compliance volume as defined in section (c) except as specifically noted elsewhere in section (g).

* * * *

(7.5) Small volume manufacturers may meet the requirement of section (g)(4.2.~~7~~2)(E) on all 2022 and subsequent model year vehicles in lieu of the phase-in schedule described in section (g)(4.2.~~7~~2)(E).

* * * *

(h) *Monitoring System Demonstration Requirements For Certification*

* * * *

(3) *Required Testing for Gasoline/Spark-~~i~~Ignited ~~v~~Vehicles*:
Except as provided below, the manufacturer shall perform single-fault testing based on the applicable FTP test with the following components/systems set at their malfunction criteria limits as determined by the manufacturer for meeting the requirements of section (e):

* * * *

(3.7) Catalyst System: The manufacturer shall perform a test using a catalyst system deteriorated to the applicable emission threshold malfunction criteria (e.g., 1.5 times the standard) in section (e)(1.2) using methods established by

the manufacturer in accordance with sections (e)(1.2.~~6~~7) and (1.2.~~7~~8).

* * * *

(5) *Testing Protocol*:

* * * *

(5.2) Demonstration Test Sequence:

* * * *

(5.2.3) Exhaust emission test: The manufacturer shall operate the test vehicle over the applicable exhaust emission test. Except with Executive Officer approval, ~~T~~the "applicable exhaust emission test" may not include any other test cycle (e.g., any test ~~preconditioning~~ cycle used to precondition the vehicle specifically for demonstrating compliance with the tailpipe emission standards) prior to running the exhaust emission test cycle. The manufacturer may request Executive Officer approval to operate the vehicle on an additional test cycle or other driving conditions prior to implantation of the fault~~, as described in section (h)(5.1.1)~~. Executive Officer approval shall be granted upon determining that a manufacturer has provided data and/or an engineering evaluation that demonstrate that additional test cycle/conditions is necessary to stabilize the emission control system. ~~The test vehicle shall then be operated over the applicable exhaust emission test. If monitoring is designed to run during the Unified Cycle, a second Unified Cycle may be conducted prior to the exhaust emission test.~~

* * * *

(5.3) Test Data Collection:

* * * *

(5.3.2) For 2019 and subsequent model year vehicles, during the test sequence of section (h)(5.2):

(A) The manufacturer shall collect the following data:

(i) Approximate time on the test cycle (in seconds after engine start) when the MIL illuminates (e.g., MIL illuminated at 402 seconds into the cold start FTP cycle);

(ii) All data required by sections (g)(4.1) through (g)(4.9), (g)(5), and (g)(6) which includes readiness status, current data stream values, fault code(s), freeze frame data, test results, CAL ID, CVN, VIN, ECU Name, in-use performance ratios, and vehicle operation tracking data; and

(iii) Emission test data: For all vehicles, the emission test data shall include NMOG, CO, NOx, PM, and CO_2 emission data.

(B) The manufacturer shall collect the data described in section (h)(5.3.2)(A)(ii) ~~through (iii)~~ above immediately prior to each engine shut-down. The engine shutdown shall include the shutdown at the end of each preconditioning cycle in section (h)(5.1), the shutdown at the end of each demonstration test cycle in section (h)(5.2.1) and (h)(5.2.2) (if applicable), and each shutdown during the exhaust emission test in section (h)(5.2.3) (e.g., the end of the FTP cycle (i.e., end of Bag 2) and

the end of the complete FTP test (i.e., end of Bag 3) for passenger vehicles, light-duty trucks, and medium-duty vehicles certified on a chassis dynamometer). If the data cannot be collected immediately prior to engine shut-down, the data shall be collected immediately after engine shut-down. The manufacturer shall collect the emission data specified in section (h)(5.3.2)(A)(iii) during the exhaust emission test in section (h)(5.2.3)

* * * *

(i) *Certification Documentation*

* * * *

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

* * * *

(2.19) A timeline showing the start of normal production and the time the vehicles ~~were~~ will be first introduced into commerce for each test group, and the required deadlines for production vehicle evaluation testing of the standardized requirements (according to section (j)(1.2)), the monitoring requirements (according to section (j)(2.1)), and in-use monitoring performance requirements (according to section (j)(3.1)).

* * * *

(2.26) A list of comprehensive components that are not OBD II monitored due to meeting the criteria under section (e)(15.1.2), (e)(15.2.3)(~~H~~I), (f)(15.1.2), or (f)(15.2.3)(~~H~~I), and the engineering evaluation analysis or associated data for each component, including all emission data, a description of how the worst case configuration was determined, and test cycles used to stabilize the system.

* * * *

(2.29) A list of monitors that run during conditions that are not encountered during the FTP cycle or Unified cycle as allowed under section (d)(3.1.3), and, if applicable, the alternate test cycle during which the monitor runs.

~~(2.17)~~(2.~~29~~30) Any other information determined by the Executive Officer to be necessary to demonstrate compliance with the requirements of this regulation.

§ 1968.5. Enforcement of Malfunction and Diagnostic System Requirements for 2004 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines.

* * * *

(a) *General*

* * * *

(3) *Definitions*.

The definitions applicable to these rules include those set forth in Health and Safety Code section 39010 et seq. and in title 13, CCR sections 1900(b) and 1968.2(c), which are incorporated by reference herein. The following definitions are specifically applicable to section 1968.5 and take precedence over any contrary definitions.

* * * *

"Nonconforming OBD II System" means an OBD II system on a production vehicle that has been determined not to comply with the ~~emission standards as defined in~~ requirements of title 13, CCR section 1968.2~~(c),~~. For purposes of section 1968.5, a motor vehicle class shall be considered nonconforming irrespective of whether vehicles in the motor vehicle class, on average, meet ~~other~~ applicable emission standards (e.g., exhaust emission standards defined in title 13, CCR section 1960.1, evaporative emission standards defined in title 13, CCR section 1976).

* * * *

(b) *Testing Procedures*

* * * *

(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 II system in the identified motor vehicle class if:

* * * *

(B) *OBD II Ratio Testing*.

(i) For monitors specified in sections (b)(6)(B)(i)a. through e. below, the data collected from the vehicles in the test sample 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 0.100 or that 66.0 percent or more of the vehicles in the test sample group have an in-use monitor performance ratio of less than 0.100 for the same monitor:

a. monitors on 2004 through ~~2018~~ ~~2021~~ 2027 model year vehicles certified to a ratio of 0.100 in accordance with title 13, CCR section 1968.2(d)(3.2.1)(D),

* * * *