APPENDIX B

PROTOCOL FOR ASSESSMENT OF PROPOSED EMISSION MODIFICATION ("TEST PROTOCOL")

1. Test Vehicles. Defendants shall acquire for testing vehicles that meet the requirements of Paragraphs 1.a, 1.b, 1.c, and Attachment A.

   1.a. Acquisition. Defendants shall acquire Emission Plus Test Vehicles and OBD Demonstration Vehicles (collectively, "Test Vehicles") from individual consumers who advertised their vehicles for sale or from Dealers.

   1.b. Condition of and Changes to Emission Plus Test Vehicles and OBD Demonstration Vehicles.

      1.b.i. Defendants shall ensure all Test Vehicles are free of the defects set forth at 40 C.F.R. Part 86, Subpart S, Appendix II, "As-Received Testing Vehicle Rejection Criteria." If a defect under 40 C.F.R. Part 86, Subpart S, Appendix II, "As-Received Testing Vehicle Rejection Criteria" is discovered, Defendants shall reject the vehicle from use as a Test Vehicle.

      1.b.ii. Nothing in this Test Protocol precludes Defendants from testing or on-road driving of a vehicle to ensure that it is in good working order prior to commencing testing under this Test Protocol.

      1.b.iii. Subject to Paragraph 1.b.i, Defendants may acquire vehicles regardless of current configuration, provided that the vehicle conforms to the requirements of Paragraphs 1.a, 1.b, 1.c, and Attachment A.

      1.b.iv. Defendants shall obtain all records that are related to emission repairs and fluid maintenance for the Test Vehicle from internal systems and databases, including records of warranty repairs and customer-paid repairs, tester logs, and ECU data.

      1.b.v. Prior to selection of a vehicle as a Test Vehicle, Defendants shall make all repairs necessary to ensure proper functioning of the Test Vehicle. Defendants shall not replace a part that is properly functioning, if such part is on the CARB aftermarket approved parts list, or is made by Defendants or their suppliers. Defendants shall provide a written description of the repairs (including part replacements) and the reason for the repairs, in the Emission Modification Proposal Report.

      1.b.vi. After selection of a vehicle as a Test Vehicle, Defendants shall make all repairs necessary to ensure proper functioning of the Test Vehicle, or may choose to use a Secondary Vehicle in lieu of making repairs, as described in Paragraph 1.c.iv.B.2. Unless the Test Vehicle Malfunctions, Defendants shall not replace a part. Defendants shall

provide a written description of the repairs (including part replacements) and the reason for the repairs, and the justification and any relevant data, in the Emission Modification Proposal Report.

1.b.vii. For part replacements performed under Paragraphs 1.b.v or 1.b.vi, Defendants shall use a deteriorated part that has no less than half the Mileage of the vehicle at the time of the repair to replace any of the parts specified in Attachment K, except that: (1) for an Emission Plus Test Vehicle used for testing in the "A" configuration under Paragraph 2.c (A-to-B Testing), a new part shall be used for replacement of any part that will be exchanged during, or will not be used after, the installation of the proposed Emission Modification Configuration; (2) for an Emission Plus Test Vehicle used for testing under Paragraph 2.b (Emission, Special Cycle, and PEMS Testing) or an OBD Demonstration Vehicle, a bench-aged part shall be used for replacement of any part that is bench-aged pursuant to Paragraph 1.e.i; and (3) the requirement to use deteriorated parts shall not apply to parts like seals, gaskets, screws, or clamps (installation materials).

1.b.viii. At any time, Defendants shall conduct any routine maintenance covered by the applicable owner's manual and Mercedes-Benz Service Sheets to ensure proper functioning of a Test Vehicle, provided that Defendants provide a written description of the maintenance and the reason for the maintenance in the Emission Modification Proposal Report.

1.b.ix. Defendants may install a development ECU, known as an ETK, on a Test Vehicle, except that Defendants shall not use an ETK during PVE testing conducted in accordance with the requirements of 13 C.C.R. §§ 1968.2(j)(1) or (j)(2) (2016) as modified by this Test Protocol.

1.b.x. Defendants may make modifications necessary to operate an all-wheel drive vehicle on a two-wheel drive dynamometer for Standard Road Cycle aging and/or stabilization as described under Paragraph 1.e. Prior to commencing any testing pursuant to Paragraph 2 of this Test Protocol, the Test Vehicle shall be returned to the all-wheel drive configuration and remain so configured until testing is completed, and Defendants shall test such Test Vehicle on an all-wheel drive dynamometer.

1.c. Secondary Vehicles.

1.c.i. If any Test Vehicle Malfunctions during testing under this Test Protocol, Defendants shall have at least one Secondary Emission Plus Test Vehicle available for each Emission Modification Category 4–12, and one Secondary OBD Demonstration Vehicle available for OBD Clusters 2 - 5. The Secondary OBD Demonstration Vehicle may be used for driver inducement demonstration under Paragraph 2.d.iii independently of its designation as a Secondary Vehicle (i.e., without necessitating a

Malfunction of the initial OBD Demonstration Vehicle).

1.c.ii. Secondary Vehicles shall also meet the requirements of Paragraph 1.a, 1.b, and Attachment A.

1.c.iii. Nothing in this Test Protocol prohibits Defendants from obtaining additional Secondary Vehicles as needed. Defendants specifically reserve the ability to obtain one additional Emission Plus Test Vehicle for PVE testing for any OBD Cluster where PVE testing is required. Failure to have a Secondary Vehicle available to timely meet the requirements of this Test Protocol shall not constitute force majeure pursuant to Section XI (Force Majeure) of the Consent Decree.

1.c.iv. Upon a Malfunction of a Test Vehicle during aging and stabilization under Paragraph 1.e, or during testing under this Test Protocol, Defendants shall follow the procedure set forth in this Paragraph.

1.c.iv.A. First, stop testing the vehicle and determine the reason for the Malfunction.

1.c.iv.B. Second, Defendants may elect to repair the vehicle consistent with Paragraph 1.b.vi and continue testing, or restart testing using a Secondary Vehicle.

1.c.iv.B.1. If Defendants elect to repair the vehicle, the repairs shall be reported to EPA/CARB in accordance with Paragraphs 4.a.i.I and 4.a.xvi of this Test Protocol.

1.c.iv.B.2. If Defendants elect to switch to a Secondary Vehicle, Defendants shall:

1.c.iv.B.2.a. Conduct each of the following on a single Emission Plus Test Vehicle (1) all emission testing except special cycle testing required under Paragraph 2.b.i, and (2) both the "A" and "B" portions of the testing required under Paragraph 2.c.i (Fuel Economy), Paragraph 2.c.ii (NVH), or Paragraph 2.c.iii (Drivability).

1.c.iv.B.2.b. If retaining any test results generated prior to switching to the Secondary Vehicle, provide an engineering justification explaining why the retained test results are not

impacted by the Malfunction. Defendants may retain test results from an OBD Demonstration Vehicle in lieu of restarting and conducting all OBD demonstration testing required under Paragraph 2.d.i on a Secondary OBD Demonstration Vehicle if and only if the following conditions are met with respect to the OBD Demonstration Vehicle that malfunctioned and the Secondary OBD Demonstration Vehicle: (1) Defendants perform SCR efficiency and EGR low flow monitoring demonstrations on both vehicles, (2) the calibration set is the same on both vehicles, (3) both vehicles are the same Model and MY, and (4) the Mileage on the Secondary OBD Demonstration Vehicle is within 5,000 miles of the OBD Demonstration Vehicle that Malfunctioned at the time Defendants begin testing the Secondary OBD Demonstration Vehicle.

1.c.iv.C. Third, collect all data required (for each Secondary Emission Plus Test Vehicle, for each Emission Plus Test Vehicle, and for each Secondary OBD Demonstration Vehicle, for an OBD Demonstration Vehicle), for each test, and document the Malfunction, including an explanation of the reason for the Malfunction and its impact on the test results, in accordance with the requirements of Paragraphs 4.a.i.J, 4.a.i.M and 4.a.xvii of this Test Protocol.

1.d. Switching to the Proposed Emission Modification Configuration. Upon the completion of the "A" configuration testing set forth in Paragraph 2.c for each Emission Plus Test Vehicle undergoing A-to-B testing, prior to the commencement of testing set forth in Paragraph 2.b (Emission, Special Cycle, and PEMS Testing) for each Emission Plus Test Vehicle undergoing such testing, prior to the commencement of testing set forth in Paragraph 2.d.ii (PVE Testing) or Paragraph 2.d.iii (Demonstration of Driver Inducement Strategies) for each Emission Plus Test Vehicle undergoing such testing, and prior to the commencement of testing set forth in Paragraph 2.d.i (OBD demonstration testing), Paragraph 2.d.ii (PVE Testing) or Paragraph 2.d.iii (Demonstration of

Driver Inducement Strategies) for each OBD Demonstration Vehicle used for demonstrations or testing conducted under Paragraph 2.d, Defendants shall modify the Test Vehicle as follows:

1.d.i. Defendants shall make all hardware changes for that Emission Modification Category specified in Attachment I. Defendants shall not make any further hardware or software changes once the testing of the proposed Emission Modification Configuration specified in Paragraph 2 begins. This does not preclude Defendants from repairing vehicles that experience a Malfunction as described in Paragraph 1.c.iv after the Emission Modification Configuration is installed, carrying out repairs or scheduled maintenance as permitted by Paragraphs 1.b.vi through 1.b.viii, modifying a Test Vehicle in connection with testing conducted under Paragraphs 2.d.ii (PVE Testing) or 2.d.iii (Demonstration of Driver Inducement Strategies), or modifying an OBD Demonstration Vehicle in connection with an OBD demonstration as described in Paragraphs 2.d.i (OBD Demonstration).

1.d.ii. Defendants shall reflash the affected control units of the respective Emission Modification Category as listed in Attachment I, altering their software calibrations to the proposed Emission Modification Configuration for that Emission Modification Category. Each proposed Emission Modification Configuration shall not include any Defeat Devices and shall include only those AECDs contained in the Updated AECD Document for the relevant Emission Modification Category, as those AECDs are described in that document.

1.d.iii. Defendants shall adjust the calibration of the software installed in each Test Vehicle in a manner consistent with the proposed Emission Modification Configuration, to carry over relevant information from the previous control unit or control units as necessary, and to make adjustments to reflect the age of the Test Vehicle based on its accumulated Mileage and bench-aging conducted pursuant to Paragraph 1.e. Defendants shall not make any further software changes once the testing of the proposed Emission Modification Configuration begins, except as allowed under Paragraph 1.d.iv.

1.d.iv. Nothing in this Paragraph 1.d shall prevent Defendants from modifying an OBD Demonstration Vehicle consistent with this Test Protocol in order to conduct an OBD demonstration required under this Test Protocol and return the vehicle to normal operating conditions after the OBD demonstration, as permitted by 13 C.C.R. § 1968.2 (2016) or this Test Protocol. This includes mounting and dismounting threshold parts, adjusting calibration values where it is justified in the OBD Interim Report pursuant to Paragraph 3.a.iv that there is no other method to simulate faults, and restoring the initial values after conducting an OBD demonstration test case.

1.e. Aging and Stabilization. Defendants shall age and stabilize the Test Vehicles as required in Paragraphs 1.e.i, 1.e.ii, and 1.e.iii. The Aftertreatment System for the Emission Plus Test Vehicle used for testing under Paragraphs 2.c.i (A-to-B Fuel Economy Testing), 2.c.ii (A-to-B NVH Testing), or 2.c.iii (A-to-B Drivability Testing) shall not be bench-aged, and shall be installed in the condition and manner that Defendants shall install the proposed Emission Modification Configuration on a customer vehicle, to reflect the customer experience following installation of an Approved Emission Modification. The bench- and whole-vehicle aging requirements of this Test Protocol are detailed in the table below.

Test Type	**Vehicle Type**	**ATS Age for Testing Proposed EMC**	**SRC Whole-Vehicle (Engine) Aging Required**
Paragraph 2.b Emission and Special Cycle Testing, PEMS testing	Emission Plus Test Vehicle	Emission Modification Categories 4–8 and 11–12: ATS bench-aged from new to either: • FUL minus median mileage, but at least 170 regenerations (50,000 miles), or • 400 regenerations FUL equivalent for LEV II. Emission Modification Category 3: ATS bench-aged from new to 500 regenerations FUL equivalent for LEV III.	No
Paragraph 2.c.i Fuel economy A-to-B testing	Emission Plus Test Vehicle	No bench-aging requirement, for any Emission Modification Category.	No
Paragraphs 2.c.ii and 2.c.iii NVH and drivability A-to-B testing	Emission Plus Test Vehicle	No bench-aging requirement, for any Emission Modification Category.	No
Paragraph 2.d.i OBD Demonstration	OBD Demonstration Vehicle	Bench-aged from new to 400 regenerations FUL equivalent for LEV II (OBD Clusters 3–5) or 500 regenerations FUL equivalent for LEV III (OBD Cluster 2)	Yes, to FUL

Test Type	Vehicle Type	ATS Age for Testing Proposed EMC	SRC Whole-Vehicle (Engine) Aging Required
Paragraph 2.d.ii PVE testing	Emission Plus Test Vehicle or OBD Demonstration Vehicle	No bench-aging requirement, for any Emission Modification Category, if using an Emission Plus Test Vehicle. Defendants have the option to bench-age pursuant to Paragraph 2.b., at their discretion, and they may use an OBD Demonstration Vehicle.	No
Paragraph 2.d.iii SCR inducement strategy	Emission Plus Test Vehicle or OBD Demonstration Vehicle	No bench-aging requirement, for any Emission Modification Category, if using an Emission Plus Test Vehicle. Defendants have the option to bench-age pursuant to Paragraph 2.b., at their discretion, and they may use an OBD Demonstration Vehicle.	No

1.e.i. Bench-Aging. Defendants shall bench-age the Aftertreatment System of each Emission Plus Test Vehicle used for Paragraph 2.b testing and each OBD Demonstration Vehicle using the process specified in Paragraph 1.e.i.A, for the total regeneration cycles identified in Paragraph 1.e.i.B and in each Updated AECD Document. All vehicles required to have a bench-aged Aftertreatment System shall receive an Aftertreatment System that has been bench-aged from new to the target aging point.

1.e.i.A. Bench-Aging Process.

1.e.i.A.1. The bench-aging process shall include repeat cycles of high temperature, emulating degradation of the Aftertreatment System as a result of DPF Regeneration Events, conducted according to the following phases and conditions.

1.e.i.A.2. The aging cycle shall consist of repetitions of five different operating points. The approximate aging cycle duration and target engine speed, target temperature upstream of the DPF, and target engine torque at each operating point shall be specified in an appendix to the Updated AECD Document for Emission Modification Categories 3–12, in the form and content specified in an appendix of the Updated AECD Document for Emission Modification Category 9. Normal Mode, Regeneration Mode and Cooling Phase shall occur

at each of the five operating points.

1.e.i.A.3. In the event an aging cycle is aborted before all five operating points are completed, the aging cycle shall start again from Operating Point 1, and Defendants shall provide test sequence data for each aborted aging cycle in the proposed Emission Modification Report.

1.e.i.A.4. The Emission Plus Test Vehicles for Emission Modification Categories 9 and 10 shall be bench-aged as specified in the proposed Emission Modification Proposal Reports and Updated AECD Documents for those respective Emission Modification Categories.

1.e.i.B. Total Regeneration Cycles Required in Bench-Aging Process and Bench-Aging Equivalent Mileage. The total number of regeneration cycles required for FUL equivalency shall be consistent with the table below Paragraph 1.e.

1.e.i.B.1. Any target for bench-aging equivalent mileage below FUL shall be calculated on a linear basis and rounded to the nearest whole number divisible by five.

1.e.i.B.2. For Emission Plus Test Vehicles for Emission Modification Categories 4–8 and 11–12, the minimum bench-aging equivalent mileage shall be the difference between FUL for the relevant Emission Plus Test Vehicle and the applicable median mileage in Table 1, Attachment A, with the exception that a minimum of 170 regenerations (the number of regeneration cycles for 50,000 miles of Bench-Aging Equivalent Mileage) shall be achieved and specified in the Updated AECD Document for each Category.

1.e.i.B.3. For Emission Plus Test Vehicles for Emission Modification Category 3, the minimum bench-aging equivalent mileage shall be the FUL for LEV III and shall be specified in the Updated AECD Document for Emission Modification Category 3.

1.e.ii. Accelerated OBD Demonstration Vehicle Aging. For OBD Clusters 2–5, Defendants shall obtain a high-mileage OBD Demonstration Vehicle as described in Table 2, Attachment A to this Test Protocol. Defendants

shall accumulate the remaining mileage up to FUL using the Standard Road Cycle. In the case of OBD Clusters 3–5, Defendants shall then install in the OBD Demonstration Vehicle an Aftertreatment System bench-aged to FUL in accordance with Paragraph 1.e.i. In the case of OBD Cluster 2, Defendants shall have the option to retain the existing Aftertreatment System on the OBD Demonstration Vehicle as long as the vehicle, including the Aftertreatment System, has at least 110,000 miles, or to age the vehicle and the Aftertreatment System to 110,000 miles or more.

1.e.iii. Stabilization. After bench-aging the Aftertreatment System as required in Paragraph 1.e.i, Defendants shall install the bench-aged Aftertreatment System on the Emission Plus Test Vehicle or OBD Demonstration Vehicle utilized for testing pursuant to Paragraph 2.b or Paragraph 2.d, and operate the vehicle for a stabilization period of at least 1,500 miles of the SRC or on-road driving. The Emission Plus Test Vehicle utilized for A-to-B testing pursuant to Paragraph 2.c shall not be bench-aged; however, Defendants shall operate the vehicle for a stabilization period consisting of up to 500 miles of the SRC or on-road driving after installation of the proposed Emission Modification Configuration. If Defendants elect to use an Emission Plus Test Vehicle for PVE testing pursuant to Paragraph 2.d.ii, Defendants shall operate the vehicle for a stabilization period consistent with the requirements above for a vehicle used for testing pursuant to Paragraph 2.b or a vehicle used for A-to-B testing pursuant to Paragraph 2.c, and Defendants have the option to bench-age the Aftertreatment System prior to the stabilization period.

2. Assessment Testing. For each Emission Modification Category 4–12, Defendants shall test one vehicle per Emission Modification Category (the "Emission Plus Test Vehicle 1") for the emission, special cycle and PEMS tests described in Paragraph 2.b, and one separate vehicle (the "Emission Plus Test Vehicle 2") per Emission Modification Category for A-to-B fuel economy testing described in Paragraph 2.c.i.[1] For each of Emission Modification Categories 4–7, 9–10, and 12, Defendants shall perform A-to-B NVH and drivability testing as described under Paragraphs 2.c.ii and 2.c.iii on either Emission Plus Test Vehicle 2 or an additional Emission Plus Test Vehicle 3. The "A" and "B" portions of any A-to-B test comparison conducted under Paragraph 2.c.i (A-to-B Fuel Economy Testing), 2.c.ii (A-to-B NVH Testing), or 2.c.iii (A-to-B Drivability Testing) shall be performed on the same Emission Plus Test Vehicle. Defendants shall test one OBD Demonstration Vehicle per OBD Cluster as described in Paragraph 2.d, except as modified by Paragraph 2.d.i.G, and Defendants may use an Emission Plus Test Vehicle for PVE testing required under Paragraph 2.d.ii or for

[1] The tests described in Paragraphs 2, 2.b and Paragraph 2.c.i. are summarized in a table in Attachment F. In the event of any discrepancy between Attachment F and the text of Paragraphs 2, 2.b and 2.c.i, the text in the Paragraphs shall be followed.

inducement testing required under Paragraph 2.d.iii.

2.a. Requirements for Assessment Testing.

2.a.i. DPF Regeneration. Defendants shall only manually trigger a DPF Regeneration Event as permitted in Paragraphs 2.a.i.C, 2.c.i, 2.c.ii (and Attachment G), 2.c.iii (and Attachment H) of this Test Protocol. Defendants shall not manually trigger a DPF Regeneration Event in testing conducted under Paragraph 2.b.i (Emission and Special Cycle Testing) or Paragraph 2.b.ii (PEMS Testing). Defendants shall manually trigger a DPF Regeneration before the FTP 72 Prep Cycle used as preconditioning for Test Loop 1 for testing conducted under each of the "A" configuration and the "B" configuration testing under Paragraph 2.c.i (A-to-B Fuel Economy Testing). Defendants shall manually trigger a DPF Regeneration during NVH testing in accordance with the procedures in Paragraph 2.c.ii (and Attachment G), and during drivability testing in accordance with the procedures in Paragraph 2.c.iii (and Attachment H).

2.a.i.A. Imminent DPF Regeneration Event. If a Regeneration Event is imminent prior to the start of a FTP 72 Prep Cycle; Test Loop or any single test pursuant to Paragraph 2.b.i (Emission and Special Cycle Testing) or Paragraph 2.c.i (A-to-B Fuel Economy Testing); or test series or single test pursuant to Paragraph 2.b.ii (PEMS Testing), Defendants shall drive the vehicle on the road or perform multiple back-to-back runs of the FTP 72, HWFET, or US06 to allow the DPF Regeneration Event to complete naturally before Defendants commence a FTP 72 Prep Cycle or a test pursuant to Paragraph 2.b.i (Emission and Special Cycle Testing), Paragraph 2.b.ii (PEMS Testing), or Paragraph 2.c.i (A-to-B Fuel Economy Testing).

2.a.i.B. DPF Regeneration Event Occurrence. If a DPF Regeneration Event occurs, either during a FTP 72 Prep Cycle or test pursuant to Paragraph 2.b (Emission, Special Cycle, and PEMS Testing) or 2.c (A-to-B Testing), Defendants shall complete the FTP 72 Prep Cycle or test to allow the DPF Regeneration Event to complete naturally. If the DPF Regeneration Event does not complete naturally on the FTP 72 Prep Cycle or test, Defendants shall drive the vehicle on the road or perform multiple back-to-back runs of the FTP 72, HWFET, or US06 to allow the DPF Regeneration Event to complete naturally. If a DPF Regeneration Event occurs during a PEMS test pursuant to Paragraph 2.b.ii, Defendants shall either complete the test route or extend the test route to allow the DPF Regeneration Event to complete naturally. Defendants shall invalidate any FTP 72 Prep Cycle or test pursuant to Paragraphs 2.b (Emission, Special Cycle, and PEMS Testing) or 2.c (A-to-B

Testing) in which a DPF Regeneration Event occurs during the test, and the test shall not be counted toward the number of tests Defendants must complete pursuant to Paragraph 2.b (Emission, Special Cycle, and PEMS Testing) or Paragraph 2.c (A-to-B Testing).

2.a.i.C. DPF Regeneration Events During OBD Demonstration. Defendants shall only manually trigger a DPF Regeneration Event during OBD Demonstration as permitted in this Paragraph 2.a.i.C. Defendants are permitted to manually trigger a DPF Regeneration Event during OBD testing under the following circumstances: (1) when a DPF regeneration is necessary for OBD IRAF determination; (2) as part of a test case during OBD demonstration or PVE testing where a DPF regeneration is needed to demonstrate the monitor (for example, demonstration of the DPF monitor); and (3) as part of the workshop procedure to return a vehicle to normal operating condition following an OBD demonstration test case. For (3), a list of these monitors shall be included for EPA/CARB approval in the OBD Interim Report. If a DPF Regeneration Event is imminent prior to the start of an OBD demonstration or PVE test, and a manually triggered DPF regeneration is not authorized as described in this Paragraph 2.a.i.C, Defendants shall drive the vehicle on the road or perform multiple back-to-back runs of the FTP 72, HWFET, or US06 to allow the DPF Regeneration Event to complete naturally before Defendants commence the OBD demonstration or PVE test. If a DPF Regeneration Event that is not part of the OBD demonstration or PVE test takes place during such a demonstration or test, Defendants shall complete the demonstration/test to allow the DPF Regeneration Event to complete naturally. If the DPF Regeneration Event does not complete naturally on the demonstration/test, Defendants shall drive the vehicle on the road or perform multiple back-to-back runs of the FTP 72, HWFET, or US06 to allow the DPF Regeneration Event to complete naturally, and then restart the OBD demonstration or PVE test that was interrupted by the DPF Regeneration Event. Defendants shall invalidate and redo any OBD demonstration or PVE test in which a DPF Regeneration Event that was not part of IRAF determination or the planned test case occurs during the test/demonstration.

2.a.ii. FTP 72 Prep Cycle. For each FTP 75 test (at any temperature) conducted under Paragraph 2, Defendants shall conduct a single FTP 72 drive cycle as the Prep Cycle ("FTP 72 Prep Cycle") followed by the "soak" period required under 40 C.F.R. Part 86, Subpart B before commencing with the emission test. Defendants shall collect the data, for each FTP 72 Prep Cycle, required in Paragraphs 4.a.i.B and 4.a.vi of this Test Protocol.

2.a.iii. Testing Mode. For any vehicle with a user-selectable drivability or transmission mode, Defendants may test under this Test Protocol in the predominant mode or any other mode, and EPA/CARB may conduct confirmation testing pursuant to Paragraph 5.b in any mode, regardless of the mode Defendants used for testing.

2.a.iv. Test Data Validity. Testing conducted, or associated data collected, pursuant to this Test Protocol, is invalid only in the following circumstances: a Test Vehicle Malfunctions; a DPF Regeneration Event occurs that was not part of the OBD IRAF determination or as part of a test case during OBD demonstration or PVE testing where a DPF Regeneration Event is needed to demonstrate the monitor; or a problem, other than with the vehicle, prevents the completion of testing in accordance with 40 C.F.R. Part 86 or 1066 as modified by this Test Protocol. All data from a Test Vehicle, including data gathered during one of the circumstances listed in the previous sentence, shall be submitted by Defendants as required under Paragraph 4 of this Test Protocol, and/or retained by Defendants as required by Paragraph 65 of this Consent Decree.

2.a.v. Special Cycles. Special cycles shall be performed in accordance with the procedures in Paragraph 2 and Attachment C. Where the requirements of 40 C.F.R. Part 1066 contradict a requirement of this Paragraph or Attachment C with regard to the special cycles, the provisions in this Test Protocol shall govern. Otherwise, the procedures in 40 C.F.R. Part 1066 shall be followed. Nothing in this Paragraph is intended to require Defendants to comply with procedures set forth in 40 C.F.R. Part 1066 with respect to data validation: specifically, 40 C.F.R. §§ 1066.101(b)(3) & 130. Defendants shall comply with the procedures in 40 C.F.R. Part 86, Subpart B, with respect to data validation.

2.b. Emission, Special Cycle, and PEMS Testing. For Emission Modification Categories 4–12, Defendants shall follow the requirements of Paragraph 2.a and perform the assessment tests set forth below in Paragraphs 2.b.i and 2.b.ii.

2.b.i. Emission and Special Cycle Testing. For each Emission Plus Test Vehicle 1, after switching to the proposed Emission Modification Configuration, Defendants shall conduct the FTP 75, HWFET, US06, and SC03 emission tests a total of three times per test. Defendants shall conduct the FTP 75 emission test an additional one time at an ambient temperature of 20° Fahrenheit. Defendants shall conduct one of each of the special cycles listed in Attachment C. Defendants shall collect the data, for each test, required in Paragraphs 4.a.i.B and 4.a.vi of this Test Protocol. Tests shall be conducted in accordance with 40 C.F.R. Part 86, Subpart B, and 40 C.F.R. Part 1066, except as provided in Paragraph 2.a and Attachment C. Nothing in this Paragraph is intended to require Defendants to comply with procedures set forth in 40 C.F.R. Part 1066

with respect to data validation: specifically, 40 C.F.R. §§ 1066.101(b)(3) & 130.[2]

2.b.ii. PEMS Testing. For each Emission Plus Test Vehicle 1, after switching to the proposed Emission Modification Configuration, Defendants shall conduct PEMS tests over the Combined Freeway and Uphill/Downhill Route and the Urban/Downtown Los Angeles Route, specified in Attachment D. Defendants shall collect the data, for each test, required in Paragraphs 4.a.i.B and 4.a.vii of this Test Protocol.

2.b.ii.A. Multiple PEMS tests on one Emission Plus Test Vehicle may be conducted in the same Day.

2.b.ii.B. The first PEMS test on each Day shall be started after a soak of at least 6 hours. The Emission Plus Test Vehicle may be parked outdoors in Los Angeles for the soak period, or indoors at an ambient temperature of between 68°F and 86°F.

2.b.ii.C. If it is not possible to park the vehicle at the start of the PEMS route for the soak period, the vehicle may be cold-started at another location, provided that the emissions results and PEMS data are collected from engine-on and a map of the route is provided along with the results in the Emission Modification Proposal Report. The portion of the drive from the cold start to the start of the PEMS route will be considered an additional route segment for purposes of Paragraph 4.a.vii.

2.c. A-to-B Testing. Defendants shall follow the requirements of Paragraph 2.a and perform the assessment tests set forth below in Paragraph 2.c.i for Emission Modification Categories 4–12, and perform the assessment tests set forth below in Paragraphs 2.c.ii and 2.c.iii for Emission Modification Categories 4–7, 9–10, and 12. For testing under this Paragraph 2.c, Defendants shall conduct testing before and after installation of the proposed Emission Modification Configuration ("A-to-B" testing). The condition of the Emission Plus Test

[2] If any individual test within a row and identified by a letter in Attachment F is invalidated as described in Paragraph 2.a.iv, Defendants may perform a single test to replace the invalidated test, provided that: (1) Defendants shall perform the test that immediately precedes it as preconditioning for the replacement test, (2) the DPF soot load at the start of the replacement test must be within 1.5 g/l of the soot load at the start of the invalidated test, (3) the ammonia load at the start of the replacement test must be within 10 percent of the total estimated grams of stored the ammonia load at the start of the invalidated test, and (4) the vehicle start temperatures (including engine coolant temperature, engine oil temperature, after-treatment temperatures for DOC, DPF, and SCR) must be within a similar operating range at the start of the invalidated test. Otherwise, Defendants shall repeat all tests prior to the invalidated test specified in the same row and identified by a letter in Attachment F as the invalidated test to obtain a valid replacement test.

Vehicle before switching to the proposed Emission Modification Configuration is the "A" configuration, and the condition after switching to the proposed Emission Modification Configuration is the "B" configuration.

2.c.i. A-to-B Fuel Economy Testing.

2.c.i.A. Defendants shall conduct fuel economy testing before and after installation of the proposed Emission Modification Configuration ("A-to-B" testing). For each Emission Plus Test Vehicle 2, in each of the "A" configuration and "B" configuration, Defendants shall determine the fuel economy of the vehicle by conducting the FTP 75, HWFET, US06, and SC03 emission tests a total of three times per test. Defendants shall repeat the FTP 75 emission test an additional one time in each of the "A" and "B" configurations at an ambient temperature of 20° Fahrenheit. Tests shall be conducted in accordance with 40 C.F.R. Part 86, Subpart B, and 40 C.F.R. Part 1066, except as provided in Paragraph 2.a. Nothing in this Paragraph is intended to require Defendants to comply with procedures set forth in 40 C.F.R. Part 1066 with respect to data validation: specifically, 40 C.F.R. §§ 1066.101(b)(3) & 130.

2.c.i.B. Defendants shall calculate the combined 5 cycle fuel economy for the Emission Plus Test Vehicle 2 consistent with 40 C.F.R. Part 600, and the requirements of Paragraph 4.a.i.C of this Test Protocol.

2.c.ii. A-to-B Noise, Vibration, and Harshness ("NVH") Testing. Defendants shall conduct NVH testing before and after installation of the proposed Emission Modification Configuration ("A-to-B" testing) for a designated Emission Plus Test Vehicle in each of Emission Modification Categories 4–7, 9–10, and 12. The results for NVH testing of Emission Modification Category 7 shall apply to Emission Modification Categories 7 and 8, and the results for NVH testing of Emission Modification Category 10 shall apply to Emission Modification Categories 10 and 11. Defendants shall perform the NVH testing in accordance with the procedures in Attachment G.

2.c.iii. A-to-B Drivability Testing. Defendants shall conduct drivability testing before and after installation of the proposed Emission Modification Configuration ("A-to-B" testing) for a designated Emission Plus Test Vehicle in each of Emission Modification Categories 4–7, 9–10, and 12. The results for drivability testing of Emission Modification Category 7 shall apply to Emission Modification Categories 7 and 8, and the results for drivability testing of Emission Modification Category 10 shall apply to Emission Modification Categories 10 and 11. Defendants shall conduct drivability testing in accordance with the procedures in Attachment H.

2.d. On-Board Diagnostic Demonstration.

2.d.i. OBD Demonstration.

2.d.i.A. Demonstration of Critical OBD Monitors. For an OBD Demonstration Vehicle in each of OBD Clusters 3 and 4, Defendants shall perform the test methods set forth at 13 C.C.R. § 1968.2(h)(5) (2016) and apply the evaluation criteria set forth at 13 C.C.R. § 1968.2(h)(6) (2016), for each of the following critical OBD monitors: (1) NOx SCR catalyst conversion efficiency (P20EE), (2) diesel particulate filter ("DPF") filtering efficiency (P2002), (3) non-methane hydrocarbon ("NMHC") catalyst conversion efficiency (P0420), (4) Exhaust Gas Sensors – NOx sensor downstream amplitude offset (min) (P229F), (5) EGR system (BPU) low flow (P0401), (6) NOx SCR Catalyst – DEF delivery performance with plugged injector fault (P20E8), (7) Exhaust Gas Sensors NOx Sensor (upstream) – response rate (P22FA), (8) Exhaust Gas Sensors NOx Sensor (upstream) – amplitude offset (min) (P2201), (9) Exhaust Gas Sensors NOx Sensor (upstream) – amplitude plausibility (min) (P2201), (10) EGR System – slow response (P240F), (11) EGR System – cooler performance (P2457), (12) for those Emission Modification Categories with Cold Start Only, CSERS (P050E), (13) EGR System – high flow (P240F), (14) Fuel System FMO – rich (P0172), and (15) Fuel System FMO – lean (P0171).

2.d.i.A.1. OBD IRAF. For any OBD demonstration conducted under Paragraph 2.d.i.A, Defendants shall calculate a unique OBD Infrequent Regeneration Adjustment Factor for threshold failure detection as set forth at 13 C.C.R. § 1968.2(d)(6.2) (2016), using a method selected using engineering judgment and approved by EPA/CARB in the process outlined in Paragraph 3. The OBD IRAFs shall be derived for such monitors where, based on engineering judgment, the duration or frequency of DPF regeneration under malfunction conditions will be different after installation of the proposed Emission Modification Configuration as compared to the certified configuration.

2.d.i.B. WAL Demonstration. For an OBD Demonstration Vehicle in each of OBD Clusters 3–5, consistent with 13 C.C.R. § 1968.2(f)(5.2.2)(D) (2016), Defendants shall demonstrate the capability of the OBD system to detect the SCR malfunction that turns on the MIL under the following tests: two tests shall record OBD System data to the point where the SCR malfunction is detected by the worst acceptable limit ("WAL") offset positive and offset negative upstream NOx sensor, two tests shall record OBD System data to the point where the SCR malfunction is detected by the WAL offset positive and offset negative downstream NOx sensor. As an alternative to using a WAL NOx sensor, Defendants may use computer modifications to disable the default emission control strategy and conduct such testing with a best performing unacceptable NOx sensor. Defendants may conduct these demonstrations by driving on-road or on a chassis dynamometer.

2.d.i.C. Full OBD Demonstration for OBD Cluster 5. For an OBD Demonstration Vehicle in OBD Cluster 5, Defendants shall conduct a full OBD demonstration, except that the NMHC catalyst conversion efficiency monitor (P0420) shall be omitted. For this demonstration, Defendants shall derive OBD IRAFs as set forth at 13 C.C.R. § 1968.2(d)(6.2) (2016), except that the OBD IRAFs shall be derived during development, using a method selected using engineering judgment and approved by EPA/CARB in the process outlined in Paragraph 3. The OBD IRAFs shall be derived for monitors where, based on engineering judgment, the duration or frequency of DPF regeneration under malfunction conditions will be different after installation of the proposed Emission Modification Configuration as compared to the previous configuration.

2.d.i.D. OBD Demonstration for OBD Cluster 2. During the MY 2020 OM651 Sprinter full OBD Demonstration, Defendants shall fulfill the requirements of Paragraph 2.d.i.A on the MY 2020 OM651 Sprinter, and shall demonstrate the (1) DPF efficiency monitor, (2) DEF delivery performance monitor, and (3) wrong medium detection monitor, on the MY 2020 OM651 Sprinter, and the OBD Demonstration Vehicle for OBD Cluster 2.

2.d.i.E. Specific Alternative or Modified Monitor Demonstration Proposals. If Defendants seek to use a specific alternative or modified OBD demonstration procedure described in 13

C.C.R. § 1968.2 (2016) that may be used with Executive Officer approval, Defendants shall submit, pursuant to Paragraph 3.a.iii, a proposal describing the specific alternative or modified demonstration procedure in detail for EPA/CARB approval for each OBD Cluster for which Defendants seek to use a specific alternative or modified demonstration procedure.

2.d.i.F. Default Action Monitor Demonstration. For any monitor with a default action demonstrated under this Paragraph 2.d, Defendants may satisfy the demonstration requirement by showing that emissions remain below the applicable OBD threshold with a best performing unacceptable ("BPU") component and the default emission control strategy disabled through computer modifications.

2.d.i.G. Defendants may perform OBD testing under this Paragraph 2.d.i on two OBD Demonstration Vehicles simultaneously if and only if the following conditions are met with respect to both of the OBD Demonstration Vehicles: (1) Defendants perform SCR efficiency and EGR low flow monitoring demonstrations on both vehicles, (2) the calibration set is the same on both vehicles, (3) both vehicles are the same Model and MY, (4) the Mileage on the vehicles is within 5,000 miles of each other at the time Defendants begin testing the vehicles, and (5) and Defendants conduct monitoring as determined by EPA/CARB pursuant to Paragraph 3.c on each OBD Demonstration Vehicle.

2.d.ii. PVE Testing.

2.d.ii.A. J1 Testing OBD Clusters 1, 3–5. For each of OBD Clusters 1 and 3–5, Defendants shall conduct PVE testing on an Emission Plus Test Vehicle or on an OBD Demonstration Vehicle in accordance with 13 C.C.R. § 1968.2(j)(1) (2016).

2.d.ii.B. J2 Testing OBD Clusters 1, 3–5. For each of OBD Clusters 1 and 3–5, Defendants shall conduct PVE § 1968.2(j)(2) testing on an Emission Plus Test Vehicle or on an OBD Demonstration Vehicle in accordance with 13 C.C.R. § 1968.2(j)(2) (2016), modified pursuant to the PVE diagnostic list in Attachment J to this Test Protocol. For OBD Cluster 4, Defendants shall submit an update to the PVE diagnostic list in Attachment J under Paragraph

3.a.v. The updated PVE diagnostic list must meet the criteria in Paragraphs 2.d.ii.B.1 - 2.d.ii.B.3.

2.d.ii.B.1. Dynamic Portion of SAE J1699 test, demonstrating ability to set readiness to complete for all diesel readiness categories.

2.d.ii.B.2. One diagnostic from each control unit and for each monitored emission-related component, as defined in Part 2 of the applicable certification application, to set pending fault, confirmed fault, permanent fault code, and healing of permanent fault code.

2.d.ii.B.3. Any diagnostic that reports to readiness bits used for inspection and maintenance to set pending, confirmed, and permanent fault codes, and healing of permanent fault codes, which will include monitors that undergo software or calibration modification as part of the proposed Emission Modification Configuration.

2.d.iii. Demonstration of driver inducement strategies. In connection with the testing performed under this Paragraph 2.d.iii, Defendants shall report, for OBD Clusters 2–5, all information for SCR Inducement Strategies contained in Appendix M of the MY 2017 Sprinter AECD document, including a Tampering Evaluation matrix (Figure App'x M.8 of the MY 2017 Sprinter AECD document).

2.d.iii.A. DEF Quality Testing. On an Emission Plus Test Vehicle or an OBD Demonstration Vehicle in each of OBD Clusters 2–5, Defendants shall conduct DEF quality testing, using two test cases: (1) the point where Defendants may detect diluted DEF but adapt to remain below the Emission Standards, and (2) the point where poor DEF quality may cause the vehicle to exceed the Emission Standards for that Emission Modification Category required in Attachment I.

2.d.iii.A.1. In both test cases, detection of DEF dilution shall take place one hour after the completion of intermixing time, with the conditions for intermixing time described in the Updated AECD Document for the applicable Emission Modification Category,

and final inducement must occur as described in the Updated AECD Document which shall equal the number of restarts in the original certification application for vehicles in that Emission Modification Category.

2.d.iii.A.2. In case (2), a fault will be detected and the MIL will be illuminated. After the MIL is illuminated, inducement shall begin after a specified amount of driving distance, as described in the Updated AECD Document for the applicable Emission Modification Category.

2.d.iii.A.3. Defendants shall conduct the testing required in this Paragraph 2.d.iii.A by performing an emission standard test. The UDC may not be used to perform the testing required in this Paragraph 2.d.iii.A. The HWFET or FTP 75 may be used. For test case (1) (demonstrating the point where Defendants may detect diluted DEF but adapt to remain below the Emission Standards), if a different test than the FTP 75 is used, Defendants shall perform an FTP 75 immediately after the demonstration test to demonstrate that the OBD Demonstration Vehicle meets the Emission Standards for that Emission Modification Category required in Attachment I.

2.d.iii.A.4. Defendants shall collect the data required in Paragraphs 4.a.i.H, 4.a.xiv and 4.a.xv of this Test Protocol.

2.d.iii.B. Additional Tampering and Inducement Testing. Defendants shall conduct additional tampering and inducement testing on one Emission Plus Test Vehicle or OBD Demonstration Vehicle with a Gen1 DEF dosing system (the Emission Plus Test Vehicle or OBD Demonstration Vehicle for OBD Cluster 5), to demonstrate the performance of the Gen1 DEF dosing system.

2.d.iii.B.1. The tampering-relevant test case shall demonstrate that an approved

inducement begins at or before the detection of zero DEF level.

2.d.iii.B.2. The inducement-relevant test cases shall include faults associated with a (1) disconnected dosing valve, (2) disconnected SCR wiring harness (ECU-DCU communication fault), (3) blocked DEF line or dosing valve, (4) disconnected SCR NOx sensor, and (5) disconnected exhaust temperature sensor.

2.d.iii.B.3. Defendants shall conduct the tampering-relevant and inducement-relevant testing required in this Paragraph 2.d.iii.B on-road.

2.d.iii.B.4. Defendants shall collect the data required in Paragraphs 4.a.i.H, 4.a.xiv and 4.a.xv of this Test Protocol.

2.d.iii.C. Summary Table. The requirements of Paragraphs 2.d.iii.A and 2.d.iii.B are summarized in the following table:

Demonstration	**Dosing System**	**OBD Clusters**	**Test Vehicle**
DEF quality detection	Gen 2	OBD Cluster 2	Sprinter OM651 MY14–16
	Gen 1	OBD Cluster 3	GL350 MY13–16
		OBD Cluster 4	ML320 MY09 ML 350 MY10-–11
		OBD Cluster 5	GLK250 MY13–15
Tampering-relevant test case Approved inducement begins at or before the detection of zero DEF level	Gen 1	OBD Cluster 5	GLK250 MY13–15
Inducement-relevant test cases Faults associated with (1) disconnected dosing valve, (2) disconnected SCR wiring harness (ECU-DCU communication fault), (3) blocked DEF line or dosing valve, (4) disconnected SCR NOx sensor, and (5) disconnected exhaust temperature sensor.	Gen 1	OBD Cluster 5	GLK250 MY13–15

2.e. Emission Modification Category 3 / OBD Cluster 2 Testing.

2.e.i. For Emission Modification Category 3 and OBD Cluster 2 (MY 2014 to MY 2016 OM651 Sprinters), data from MY 2020 OM651 Sprinter vehicles may be used to satisfy requirements of this Test Protocol as follows:

2.e.i.A. Emission, Special Cycle, and PEMS testing required under Paragraph 2.b,

2.e.i.B. OBD demonstration required pursuant to Paragraph 2.d, as modified by EPA/CARB pursuant to Paragraph 3.c,

2.e.i.C. Determination of any OBD IRAFs, and

2.e.i.D. Determination of any DFs.

2.e.ii. If EPA/CARB determine, after review of the OBD Interim Report for Cluster 2 under Paragraph 3.a, that monitors in addition to those specified in Paragraph 2.d.i.D require testing, or additional testing is required under 13 C.C.R. §§ 1968.2(j)(1) (2016) and 1968.2(j)(2) (2016), Defendants shall perform such tests consistent with 13 C.C.R. § 1968.2 (2016) on an OBD Demonstration Vehicle for Cluster 2 and submit the results as required for other OBD Clusters in the Emission Modification Proposal Report.

2.e.iii. If the MY 2020 OM651 Sprinter is not certified and its OBD System is not approved by EPA/CARB, or if EPA/CARB determines that the MY 2020 OM651 Sprinter's OBD System is not similar enough to that of OBD Cluster 2 such that the MY 2020 OM651 Sprinter's OBD System is not representative of that of OBD Cluster 2, Defendants shall conduct for Emission Modification Category 3 and OBD Cluster 2, all testing required for Emission Modification Category 10 and OBD Cluster 5 under this Test Protocol, except (1) with respect to bench-aging, for which Defendants shall follow the requirements applicable to Emission Modification Category 10, (2) Defendants shall not be required to conduct testing pursuant to Paragraph 2.d.iii.B, and (3) for any US06 required under this Appendix B, including those performed pursuant to Attachment C, Defendants shall conduct a modified US06 emissions test in accordance with 13 C.C.R. § 1961.2(a)(7)(C) SFTP NMOG+NOx and CO Exhaust Emission Standards for Medium-Duty Vehicles).

2.f. OBD Noncompliances.

2.f.i.A. Pre-Approved OBD Noncompliances. For Clusters 1 and 5, Defendants shall be permitted the OBD Noncompliances

listed in Attachment L of this Test Protocol. For Clusters 2, 3, and 4, Defendants shall be permitted the following number of Pre-Approved OBD Noncompliances:

OBD Cluster	Emission Modification Category	Engine	OBD Demonstration Vehicle Model, MY	# of Pre-Approved OBD Noncompliances
2	Emission Modification Category 3	OM651	Sprinter, MY14-16	3
3	Emission Modification Categories 4 and 6	OM642	GL350, MY13-16	7
4	Emission Modification Categories 5, 7 and 8	OM642	ML320 MY09 ML350, MY10-11	5

Defendants shall be permitted a total of 11 Pre-Approved OBD Noncompliances and Class 1 Additional OBD Noncompliances subject to the following: If the MY20 OM651 OBD approval is used as a basis for the Emission Modification Proposal Report for OBD Cluster 2, any 13 C.C.R. § 1968.2 OBD Noncompliance identified in the 13 C.C.R. § 1968.2(j)(2) PVE report for the MY20 OM651 Sprinter applicable to OBD Cluster 2 shall be considered a Class 1 OBD Noncompliance for OBD Cluster 2.

2.f.i.B. Limitations on OBD Noncompliances. No OBD noncompliance that would trigger a recall under the version of 13 C.C.R. § 1968.5 applicable to the Model Year at the time of its certification will be approved, except as provided under Paragraphs 12 and 13 of the California First Partial Consent Decree.

2.f.i.C. Applicability of OBD Regulations. Defendants shall comply with the OBD regulations in effect at the time of certification of the particular Model Year of the vehicle, including any requirements regarding testing out, and the OBD regulations in effect at the time of certification shall also be used to determine OBD Noncompliances for vehicles of that Model Year.

3. OBD Interim Report.

3.a. Contents and Submission Timing. Defendants shall provide, for OBD Cluster 2 by January 27, 2020, for OBD Cluster 3 by November 29, 2019, for OBD Cluster 4 by May 11, 2021, for OBD Cluster 5 by August 12, 2019, for review and

approval by EPA/CARB, a report for each of OBD Clusters 2–5 (the "OBD Interim Report") that contains the following:

3.a.i. A list of the OBD monitors for which Defendants will derive a new OBD IRAF as required by Paragraphs 2.d.i.A.1, 2.d.i.C, 2.d.i.D, and 2.e.i.C, an explanation of the methodology Defendants proposes to use to develop each OBD IRAF, and a summary of the underlying engineering judgments made to arrive at this methodology,

3.a.ii. A list of all monitors for which Defendants determined OBD IRAFs were not needed and the reason why OBD IRAFs were not needed for those monitors,

3.a.iii. For each OBD Cluster for which Defendants seek to use a specific alternative or modified OBD demonstration procedure pursuant to Paragraph 2.d.i.E, a proposal describing the procedure for each OBD Cluster, as well as a justification for the need to use an alternative or modified OBD demonstration procedure,

3.a.iv. Where applicable, a justification for adjusting calibration values under Paragraph 1.d.iv by showing that there is no other method to simulate faults during an OBD demonstration test case,

3.a.v. For OBD Clusters 3 and 4, a list of diagnostics Defendants propose to demonstrate for 13 CCR § 1968.2(j)(2) (2016) testing required under Paragraph 2.d.ii.B,

3.a.vi. A list of relevant OBD demonstration test cases where a DPF regeneration is part of the workshop procedure to return a vehicle to normal operating condition following the demonstration,

3.a.vii. For OBD Cluster 2, a comparison between OBD Cluster 2's OBD System and the MY 2020 OM651 OBD System, including a list of monitors for each, and

3.a.viii. Any testing data supporting Defendants' proposal that EPA/CARB may need to evaluate the proposal.

3.a.ix. Certification. Includes a certification, in accordance with Paragraph 48 of the Consent Decree, with respect to all information contained in the OBD Interim Report.

3.b. Consultation. Defendants shall make themselves available, upon request by EPA/CARB, within 10 Days after Defendants submit the OBD Interim Report, to provide any information that EPA/CARB need to evaluate the OBD Interim Report.

3.c. Response. Defendants may consider the OBD Interim Report disapproved unless

otherwise notified in writing by EPA/CARB within 30 Business Days of EPA's/CARB's receipt of the OBD Interim Report. Any approval, approval on specified conditions, approval in part, or disapproval shall follow Paragraphs 5.a.i.A – 5.a.i.D, with the exception that the title of the communication shall reflect that it relates to the OBD Interim Report, and shall also reference the relevant OBD Cluster.

4. Emission Modification Configuration Data Collection and Dissemination

4.a. Testing Data and Final Report. Defendants shall complete all testing required under this Test Protocol and submit it to EPA and CARB in a single submission, as a report (the "Emission Modification Proposal Report") for each Emission Modification Category, by 11:59 pm Eastern Time on the date specified in Attachment I or other date, as modified under Paragraph 87 and agreed to by EPA, CARB, and Defendants. If a test is not required for a specific Emission Modification Category or OBD Cluster under this Test Protocol, the corresponding data collection and dissemination requirement does not apply. Each Emission Modification Proposal Report shall include the following information, with the underlined Paragraph "titles" serving as section and subsection headings for the Report:

4.a.i. Executive Summary. An executive summary that:

4.a.i.A. Emission Standard. (1) States the Emission Standard to be met for that Emission Modification Category pursuant to Attachment I and the vehicle category (e.g., for EPA, HDV1–2, and for CARB, MDV, LDV or LDT 1–4), (2) states the average final emission results determined by application of any Infrequent Regeneration Adjustment Factors but not Deterioration Factors (expect with respect to Paragraph 2.e.i.D DFs) determined at the time of certification for the FTP 75, HWFET, US06 and SC03, and (3) states whether the final average emissions from the Emission Plus Test Vehicle meets that Emission Standard. If Defendants select a Test Vehicle that exceeds FUL during testing under this Test Protocol, Defendants shall not rely upon the exceedance of FUL either to challenge emission data from the vehicle or to apply any discount factor to estimate emissions. Defendants shall not be required to demonstrate compliance beyond FUL, in accordance with 40 C.F.R. § 86.1805-12. Notwithstanding the foregoing sentence, Defendants have the discretion to select Test Vehicles that will exceed their FUL during testing under this Test Protocol. Nothing in this Paragraph changes Defendants' obligation to meet the OBD requirements in Paragraph 2.f.

4.a.i.B. Emission, Special Cycle and PEMS Testing. Provides, for one of each type of emission test and PEMS test conducted under

Paragraph 2.b, the percentage of dosing for each test in feed-forward mode, fill-level mode, and without dosing, and the percentage of overall SCR efficiency and SCR efficiency in feed-forward mode. SCR efficiency shall be calculated based on the NOx sensors and, when the downstream NOx sensor is not available, the exhaust gas analyzers.

4.a.i.C. Fuel Economy Testing. Reports, for each fuel economy test conducted under Paragraph 2.c.i: (1) the individual fuel economy results from each test, (2) the average of the fuel economy test results (i.e., the results from each test, averaged together), consistent with the combined 5 cycle fuel economy test in 40 C.F.R. Part 600, (3) any change in fuel economy between the average of the A and the average of the B tests conducted under Paragraph 2.c.i (in MPG to two decimal places, and as a percentage change), (4) if there are no changes, that there are no changes, and (5) consistent with 40 C.F.R. Part 600.006(b)(1)(iii)(C), that the aforementioned fuel economy test results after the proposed Emission Modification Configuration is installed are in compliance with the applicable Emission Standard. Defendants' reporting of any average changes in fuel economy shall not be deemed an admission that the changes are material.

4.a.i.C.1. The description of changes to fuel economy may be accompanied by a statement explaining that any changes in fuel economy may be different (or nonexistent) for different drivers, depending on multiple factors such as driving behavior and current conditions.

4.a.i.D. NVH and Drivability Testing. Describes, for each NVH and drivability test conducted under Paragraphs 2.c.ii and 2.c.iii, any material changes to NVH and drivability resulting from the proposed Emission Modification Configuration, and if there are no material changes, states that there are no material changes and the basis for this conclusion pursuant to Attachment G for NVH and Attachment H for drivability.

4.a.i.E. OBD Summary Table. For Emission Modification Categories 1 - 5, and 9, includes an OBD Summary Table for the OBD Cluster associated with the Emission Modification Category in one of the following formats, as applicable: 1) if there are changes, a redline of the OBD Summary Table provided for the vehicle's test group at the time of certification, where the redline identifies the changes in the OBD system from the certified configuration due to the proposed Emission Modification Configuration, or, 2) if

there are no material changes, the description of the OBD system from the certified configuration and a statement that there are no material changes and the basis for this conclusion. The OBD Summary Table section of the Report shall also include a written description of any OBD Noncompliances, OBD concerns, or other nonconformities with the applicable version of 13 C.C.R. § 1968.2, or Noncompliance under Paragraphs 12 or 13 of the California Consent Decree. For Emission Modification Categories, 6-8 and 10-12, Defendants shall provide a written description of any OBD Noncompliances, OBD concerns, or other nonconformities with the applicable version of 13 C.C.R. § 1968.2 or Noncompliance under Paragraphs 12 or 13 of the California Consent Decree.

4.a.i.F. OBD IRAF Determination. Lists the OBD monitors for which Defendants derived a new OBD IRAF as required by Paragraph 3.a.i and 3.a.ii, explains the methodology Defendants used to develop each OBD IRAF, and lists all monitors for which Defendants determined OBD IRAFs were not needed and the reason why OBD IRAFs were not needed for those monitors.

4.a.i.G. Vehicle Maintenance. Provides a description of any material changes on aspects of vehicle maintenance which may reasonably be important to vehicle owners, including, but not limited, to oil changes, EGR cleaning, DEF refill, and DPF replacement.

4.a.i.H. Driver Inducement. For driver inducement testing conducted under Paragraph 2.d.iii, reports the level (in percent DEF and percent water) the Emission Control System can adapt to a DEF dilution and stay below the Emission Standard to be met for that Emission Modification Category pursuant to Attachment I and, if available, report the same level from the certification documentation. Defendants shall also specifically describe any material changes in driver inducement strategies from the certified configuration resulting from the proposed Emission Modification Configuration, and if there are no material changes, state that there are no material changes and the basis for this conclusion.

4.a.i.I. Test Vehicle Repairs. Provides a description of any repairs of any Test Vehicle pursuant to Paragraphs 1.b and 1.c.iv.B of this Test Protocol, as well as the following information: curb weight and gross vehicle weight.

4.a.i.J. Test Vehicle Malfunctions. Provides a description of any Malfunction of any Test Vehicle pursuant to Paragraph 1.c of this Test Protocol, and describes the reason for the Malfunction, as

well as the following information: curb weight and gross vehicle weight.

4.a.i.K. Hardware Changes. Lists all hardware changes made in the proposed Emission Modification Configuration, including those changes specified in Attachment I.

4.a.i.L. Carry Over Information. List all information carried over from the previous ECU and adjustments made in the Emission Modification Assessment Report under Paragraph 1.d.iii.

4.a.i.M. Aborted/Invalidated Tests. Lists all tests performed under this Test Protocol that were aborted and/or invalidated for any reason and provides a description of the reason the test was aborted and/or deemed invalid (e.g., equipment problems, DPF Regeneration Event). The data for any aborted or invalidated test shall be provided together with the data from any completed tests, in the relevant "section" of the Emission Modification Proposal Report below.

4.a.i.N. Aborted Aging Cycle. In the event an aging cycle is aborted before all five operating points are completed, pursuant to Paragraph 1.e.i.A.3, Defendants shall provide test sequence data for each aborted aging cycle.

4.a.i.O. Declaration. Includes a declaration from Defendants' corporate official certifying that once the proposed Emission Modification Configuration is applied, the resulting vehicle shall contain no Defeat Devices.

4.a.i.P. Certification. Includes a certification, in accordance with Paragraph 48 of the Consent Decree, with respect to all information contained in the Emission Modification Proposal Report, that explicitly states that the Test Protocol, including the process described in Paragraph 1.e.i.A (Bench-Aging Process) and the bench aging appendix to the Updated AECD Document, was followed, the OBD Interim Report under Paragraph 3.c, was complete and accurate and any conditions specified in EPA/CARB's approval of the OBD Interim Report were followed, and that the laboratory QA/QC reports referenced in Paragraph 4.a.xviii were in effect at the time of testing and were followed.

4.a.ii. AECD Documentation. An Updated AECD Document for the relevant Emission Modification Category that: (1) discloses all AECDs in the proposed Emission Modification Configuration, (2) does not include any Defeat Devices, (3) describes the driver inducement strategies in tabular

form, with the same rows and columns as in "Figure Appendix M.8: BlueTEC Tampering Evaluation Matrix," page M-4, Appendix M, MY 2017 Sprinter AECD document, (4) includes, in a format matching that of Attachment B, at a minimum, the signals listed in the "description" column, and the "signal name" and "minimum data rate" columns populated in the Updated AECD Document and cross-referenced or correlated to the generic "description" column, and (5) an appendix regarding bench aging containing (i) the duration of the aging cycle; (ii) the target engine speed, target temperature upstream of the DPF, and target engine torque at each operating point; (iii) the total number of regeneration cycles required for bench aging the Aftertreatment System to the applicable FUL; (iv) the actual bench aging target used for the Emission Plus Test Vehicle, and if less than FUL, the calculation according to Paragraph 1.e.i.B used to derive the bench aging target.

4.a.ii.A. For any AECD that results in a reduction in the effectiveness of the Emission Control System under conditions which may be reasonably be expected to be encountered in normal vehicle operation and use, the Updated AECD Document shall include a detailed rationale for why the AECD is not a Defeat Device (e.g., how the conditions are substantially included in the Federal emission test procedure; how the AECD is justified in terms of protecting the vehicle against damage or accident; how the AECD does not go beyond the requirements of engine starting; or how the AECD applies only for emergency vehicles).

4.a.ii.B. For any AECD Defendants justify based on substantial inclusion in the Federal emission test procedure, provide data indicating the amount of operation in the Federal emission test procedure and the extent of activation in modulating the emission control system. For the following AECDs, this data shall be provided in a graphical format comparable to that included in the Updated AECD Document for Emission Modification Category 9 for the PM/CO2/NOx Tradeoff Strategy: (1) PM/CO2/NOx Tradeoff Strategy, (2) Aftertreatment System Thermal Management. The requirement in this Paragraph applies only to Updated AECD Documents submitted under this Test Protocol for Emission Modification Categories 4–12.

4.a.iii. AECD Redlines/Tables. Redlines or tables of the Updated AECD Document, as follows:

4.a.iii.A. In the case of Emission Modification Categories 1 and 2, a redline comparing the Updated AECD Document to the MY 2018 Sprinter AECD Document;

4.a.iii.B. In the case of Emission Modification Category 3, a redline comparing the Updated AECD Document to the draft MY 2020 OM651 Sprinter AECD Document;

4.a.iii.C. In the case of Emission Modification Categories 10–12, a redline comparing the Updated AECD Document to the Updated AECD Document for Category 9;

4.a.iii.D. In the case of the first-submitted Updated AECD Document among Emission Modification Categories 4–8, a table comparing the Updated AECD Document for that Category to the Updated AECD Document for Category 9;

4.a.iii.E. In the case of subsequent Updated AECD Documents for Emission Modification Categories 4–8, a redline comparing the Updated AECD Document to the Updated AECD Document submitted for the first Emission Modification Category among Categories 4–8.

4.a.iv. Software Change Summary. A summary of functional software changes to each control unit made in the proposed Emission Modification Configuration.

4.a.v. Software Information. For the ECU, the complete software functional description document in the German language, and the table of contents of the functional description document in the English language, the compiled software files containing data and software code (e.g., .HEX Files), and the complete memory map (e.g., .A2L File) containing a description of map addressing and measure points.

4.a.vi. Emission and Special Cycle Testing. For each emission test conducted under Paragraph 2.b.i: (1) bag data, (2) modal (continuous) data in .CVS and .DAT file formats, (3) ECU data for the parameters identified in the list submitted under Paragraph 4.a.ii in .CSV and .DAT file formats, and (4) a Flat File of each dynamometer test that includes vehicle identification information, the VIN, a test identification number, and average emissions results per phases (bags) and weighted, as listed in Attachment E. Modal data shall be collected using undiluted tailpipe modal measurements.

4.a.vii. PEMS Testing. For each PEMS test conducted under Paragraph 2.b.ii: (1) all raw data generated, including speed, load, and second-by-second emissions data, in a .CSV file format and in the native format of the

PEMS unit, the AVL iFile, (2) average emissions results for NOx and CO2, ambient temperature and other information related to environmental conditions during the test, (3) for Emission Modification Categories 3 – 8 and 10 – 12, average emissions results for THC and CO, ambient temperature and other information related to environmental conditions during the test, (4) the ECU data parameters identified in the list submitted under Paragraph 4.a.ii, and (5) a Flat File of each test that includes vehicle identification information, the VIN, a test identification number, and average emissions results per route segment (parsing), as listed in Attachment E.

4.a.vii.A. Post-processing of PEMS data shall be carried out as follows: (1) drift correction shall be performed in accordance with 40 C.F.R. § 1065.672; (2) wet/dry correction shall be performed in accordance with 40 C.F.R. § 1065.655; and (3) humidity correction shall be performed in accordance with 40 C.F.R. § 1065.670.

4.a.viii. Log Sheets. For all data provided pursuant to Paragraphs 4.a.vi (Emission and Special Cycle Testing), 4.a.vii (PEMS Testing), 4.a.ix (OBD Critical and Full Monitor Demonstration), 4.a.xi (J1 Testing), 4.a.xii (J2 Testing), and 4.a.xiv (DEF Quality Testing), Defendants shall submit a log sheet listing the unique CALID and CVN numbers for the proposed Emission Modification Configuration; for the Emission Plus Test Vehicle or OBD Demonstration Vehicle, the Model Year, Model, and VIN; a test identification number; and the date, time, drive cycle, and Mileage (both for the beginning and for the ending of the test). Such log sheets and data sets shall also include data for any tests that were invalidated for any reason. For EMC 11, the CALID and CVN information will be submitted in an addendum to the Final Report no later than June 15, 2020.

4.a.ix. OBD Critical and Full Monitor Demonstration. For each demonstration of critical and full OBD monitors conducted under Paragraphs 2.d.i.A and 2.d.i.C: (1) a written description of any OBD Noncompliance, concerns, or other nonconformities with the applicable version of 13 C.C.R. § 1968.2, or Noncompliance under Paragraphs 12 or 13 of the California Consent Decree, (2) all test data collected as set forth at 13 C.C.R. § 1968.2(h)(5.3) (2016), including all test data as detailed in 13 C.C.R. § 1968.2(h)(5.3.2) (2016), (3) the ECU data parameters identified in the list submitted under Paragraph 4.a.ii in .CSV and .DAT file formats, (4) a Flat File of each dynamometer test that includes vehicle identification information, the VIN, a test identification number and average emissions results per phases (bags) and weighted, as listed in Attachment E, (5) documentation of the specific hardware used in the testing, (6) specification of demonstration method used (i.e., on-road or dynamometer test cycle) and, if EPA/CARB approved an alternate procedure under Paragraph 3.c, the date of the

approval, (7) all demonstration test results, and (8) any relevant associated data.

4.a.x. WAL Demonstration Testing. For the OBD monitoring capability testing required in Paragraph 2.d.i.B (NOx sensor offset), Defendants shall provide: (1) the ECU data parameters in the list submitted under Paragraph 4.a.ii in .CSV and .DAT file formats, (2) documentation of the specific hardware used in the testing, (3) specification of demonstration method used (i.e., on-road or dynamometer test cycle) and, if EPA/CARB approved an alternate procedure under Paragraph 3.c, the date of the approval, (4) all demonstration test results, and (5) any relevant associated data.

4.a.xi. J1 Testing. For Production Vehicle Evaluation § 1968.2(j)(1) testing conducted under Paragraph 2.d.ii.A: (1) a written report of the problem(s) identified and proposed corrective action (if any) to remedy the problem(s) consistent with 13 C.C.R. § 1968.2(j)(1.5.1) (2016), and (2) a report of the results and the test log file, consistent with 13 C.C.R. § 1968.2(j)(1.5.2) (2016).

4.a.xii. J2 Testing. For Production Vehicle Evaluation § 1968.2(j)(2) testing conducted under Paragraph 2.d.ii.B: (1) a written description of the results of all testing conducted pursuant to section 13 C.C.R. § 1968.2(j)(2) (2016), including the method used to induce a malfunction in each diagnostic, the MIL illumination status, and the confirmed fault code(s) stored, and any OBD Noncompliances, OBD concerns, or other nonconformities with the applicable version of 13 C.C.R. § 1968.2, or Noncompliance under Paragraphs 12 or 13 of the California Consent Decree, and (ii) a list of diagnostics that were previously demonstrated under Paragraph 2.d.i.

4.a.xiii. OBD Calibration Adjustments/Restorations. For all OBD demonstration testing pursuant to this Test Protocol, where applicable, a list of all calibration values adjusted and restored after conducting an OBD demonstration test case under Paragraph 1.d.iv.

4.a.xiv. DEF Quality Testing. For the DEF dilution inducement data specified in Paragraphs 2.d.iii.A and 2.d.iii.B, Defendants shall provide the results in a Flat File for the parameters listed in Attachment E ("DEF Dilution Inducement Strategy Parameters") and any relevant associated data.

4.a.xv. Additional Tampering and Inducement Demonstrations. For the DEF level and tampering inducement demonstrations required in Paragraphs 2.d.iii.A and 2.d.iii.B, Defendants shall provide documentation that includes the following information: (1) the specific hardware used in the inducement demonstrations, (2) the test procedure used for the demonstrations, and (3) the actual inducement test results.

4.a.xvi. Test Vehicle Repairs. Any records related to any repairs of any Test Vehicle or Secondary Vehicle pursuant to Paragraphs 1.b or 1.c.iv of this Test Protocol. Records prior to Defendants' acquisition of the vehicle in accordance with Paragraph 1.a may be drawn from internal Defendants' systems and databases pursuant to Paragraph 1.b.iv.

4.a.xvii. Test Vehicle Malfunctions. Any records related to any Malfunction or exceedance of the Emission Standard of any Test Vehicle or Secondary Vehicle, and to the determination of the reason for the Malfunction pursuant to Paragraph 1.c of this Test Protocol. This excludes malfunctions implanted or exceedance of the Emission Standard as part of an OBD demonstration pursuant to Paragraphs 2.d.i or 2.d.iii, or a malfunction implanted as part of a PVE test under Paragraph 2.d.ii.

4.a.xviii. Laboratory QA/QC Reports. The QA/QC report(s) for any dynamometer laboratory conducting testing pursuant to this Test Protocol that covers the relevant period of dynamometer testing shall be maintained and furnished in accordance with Paragraph 82 of this Consent Decree, and shall constitute part of the administrative record of this case, pursuant to Paragraph 76 of this Consent Decree.

4.a.xix. Emission Modification Category 3 and OBD Cluster 2. For Emission Modification Category 3 and OBD Cluster 2, Defendants may use MY 2020 OM651 Sprinter development vehicles to perform emission testing, IRAF determination, OBD IRAF determination, and OBD demonstration testing (except as provided in described in Paragraphs 2.d.i.D and 2.d.iii). If Defendant does so, EPA and CARB shall review such materials as submitted pursuant to the MY 2020 OM651 Sprinter certification process, and those materials shall not be included in the Emission Modification Proposal Report. Rather, Defendants shall maintain and furnish records regarding these vehicles, including those related to maintenance, repairs, and Malfunctions, in accordance with Paragraph 82 of this Consent Decree. For OBD Cluster 2 testing described in Paragraphs 2.d.i.D, 2.d.iii, 2.e.ii, and 2.e.iii, Defendants shall provide all OBD records required pursuant to those Paragraphs along with any additional OBD records required after EPA/CARB review of the OBD Interim Report in the Emission Modification Proposal Report. If the MY 2020 OM651 Sprinter is not certified and its OBD System is not approved by EPA/CARB, Defendants shall provide for Emission Modification Category 3 and OBD Cluster 2, all records for Emission Modification Category 3 EPTV and the OBD Cluster 2 OBD Demonstration Vehicle that are required for Emission Modification Category 10 and OBD Cluster 5 under this Test Protocol, except that Defendants shall not be required to provide records pursuant to Paragraph 2.d.iii.B. All materials described in this Paragraph, whether submitted or held by Defendants pursuant to the MY 2020 OM651 Sprinter certification process, or submitted as part of the Emission

Modification Proposal Report, shall constitute part of the administrative record of this case, pursuant to Paragraph 76 of this Consent Decree.

5. EPA and CARB Review and Approval of Emission Modification Proposal Report

5.a. Agency Review of Testing Data. EPA and CARB shall review the Emission Modification Proposal Report to determine whether the proposed Emission Modification presents an approvable Emission Modification Configuration (after approval known as the "Approved Emission Modification" or "AEM"), according to the following criteria and timeline.

5.a.i. Process for Review and Approval. EPA/CARB shall have 45 Days, beginning at 12:01 am Eastern Time on the first Business Day after receipt of the Emission Modification Proposal Report, to approve or disapprove the proposed Emission Modification Configuration based on (1) failure to meet the Emission Standard, Emission Standard First Threshold or Emission Standard Upper Threshold during a test conducted in accordance with Paragraph 2.b.i of this Test Protocol, 40 C.F.R. Part 86, Subpart B, and 40 C.F.R. Part 1066, as applicable, (2) performance consistent with the existence of a Defeat Device, (3) performance consistent with the existence of an undisclosed AECD, (4) failure to meet the OBD requirements in Paragraph 2.d.i, 2.d.ii, 2.e, 2.f, and 3.c of this Test Protocol, or (5) failure to submit a complete Emission Modification Proposal Report. EPA/CARB shall review any proposed Emission Modification Configuration according to this Test Protocol, rather than according to any regulatory processes for reviewing applications for Certificates of Conformity, Executive Orders, or administrative recalls. If EPA/CARB approve a proposed Emission Modification Configuration that meets the Emission Standard First Threshold or Emission Standard Upper Threshold, then where this Consent Decree, Test Protocol and other Appendices and Attachments use the term, "Emission Standard," that term shall be replaced with Emission Standard First Threshold or Emission Standard Upper Threshold, as relevant for the AEM for that Emission Modification Category.

5.a.i.A. Approval. If EPA/CARB approve a proposed Emission Modification Configuration in accordance with the requirements of this Test Protocol, each Agency shall timely notify Defendants by letter titled: "Notice of Approval of Emission Modification Configuration: [corresponding Emission Modification Category, Model(s), MY(s)]," after which Defendants shall then implement the AEM in accordance with Appendix A of the Consent Decree.

5.a.i.B. Approval Upon Specified Conditions. If EPA/CARB approve a proposed Emission Modification Configuration upon specified

conditions, each Agency shall timely notify Defendants by letter titled: "[Notice of Approval of Emission Modification Configuration Upon Conditions]: [corresponding Emission Modification Category, Model(s), MY(s)]," after which Defendants shall take all actions required to implement the modified AEM in accordance with Appendix A of the Consent Decree, subject to Defendants' right to dispute the conditions specified under Section XI (Dispute Resolution).

5.a.i.C. Approval In Part. If EPA/CARB approve part of a proposed Emission Modification Configuration and disapprove the remainder, each Agency shall timely notify Defendants by letter titled: "[Notice of Partial Approval/Partial Disapproval of Emission Modification Configuration]: [corresponding Emission Modification Category, Model(s), MY(s)]," after which Defendants shall take all actions required to implement the AEM in accordance with Appendix A of the Consent Decree that are technically severable from any disapproved portions, subject to Defendants' right to dispute the agencies' decision under Section XI (Dispute Resolution). EPA and CARB shall identify each specific basis for disapproval in writing. Within 45 Days, or such other time as the parties agree to in writing, of receipt of EPA/CARB's written identification of the specific bases for the disapproval, Defendants may submit one revised proposed Emission Modification Configuration that must resolve all of EPA/CARB's bases for disapproval. EPA/CARB shall either approve or disapprove each complete revision within 45 Days of receipt of the revised proposed Emission Modification Configuration. If a resubmitted Submission is disapproved, in whole or in part, EPA/CARB may again require Defendants to correct any deficiencies in accordance with Paragraph 5.a.i.B, 5.a.i.C or Paragraph 5.a.i.D; or EPA/CARB may itself/themselves correct any deficiencies, and Defendants shall implement the Submission as modified by EPA/CARB, subject to Defendants' right to invoke dispute resolution and the right of EPA/CARB to seek stipulated penalties. EPA/CARB shall then issue either a "Final Notice of Disapproval of Remainder of Proposed Emission Modification Configuration: [corresponding Emission Modification Category, Model(s), MY(s)]," that identifies the specific bases for the disapproval, or a "Notice of Approval of Remainder of Emission Modification Configuration: [corresponding Emission Modification Category, Model(s), MY(s)]." If EPA/CARB issue a Final Notice of Disapproval of Remainder, Defendants may invoke dispute resolution under Section XI (Dispute Resolution) of the Consent Decree.

5.a.i.D. Disapproval. If EPA/CARB disapprove in whole a proposed Emission Modification Configuration in accordance with the requirements of this Test Protocol, EPA/CARB shall timely notify Defendants by letter titled: "Notice of Disapproval of Proposed Emission Modification Configuration: [corresponding Emission Modification Category, Model(s), MY(s)]," that identifies each specific basis for disapproval. Within 45 Days, or such other time as the parties agree to in writing, of receipt of EPA/CARB's letter(s), Defendants may submit one revised proposed Emission Modification Configuration that must resolve all of EPA/CARB's bases for disapproval. EPA/CARB shall either approve or disapprove such revision within 45 Days of receipt of the revised proposed Emission Modification Configuration. If a resubmitted Submission is disapproved, in whole or in part, EPA/CARB may again require Defendants to correct any deficiencies in accordance with this Paragraph 5.a.i.D or Paragraph 5.a.i.C; or EPA/CARB may itself/themselves correct any deficiencies, and Defendants shall implement the Submission as modified by EPA/CARB, subject to Defendants' right to invoke dispute resolution and the right of EPA/CARB to seek stipulated penalties. EPA/CARB shall then issue either a "Final Notice of Disapproval of Proposed Emission Modification Configuration: [corresponding Emission Modification Category, Model(s), MY(s)]," that identifies the specific bases for the disapproval, or a "Notice of Approval of Emission Modification Configuration: [corresponding Emission Modification Category, Model(s), MY(s)]." If EPA/CARB issue a Final Notice of Disapproval, Defendants may invoke dispute resolution under Section XI (Dispute Resolution) of the Consent Decree.

5.a.i.E. Failure to Make a Determination. If EPA/CARB, as applicable, fail to make a determination on a proposed Emission Modification Configuration within 45 Days of receipt of the Assessment Report (as of 12:01 am Eastern Time on the 46th Day after receipt of the Assessment Report), Defendants may, at their discretion, consider the proposed Emission Modification Configuration to be disapproved in accordance with Paragraph 5.a.i.D and may invoke dispute resolution under Section XI (Dispute Resolution) of the Consent Decree.

5.b. Confirmation Testing. Prior to approval of the proposed Emission Modification Configuration under Paragraph 5.a above, EPA/CARB reserve the right to conduct emission tests and PEMS tests pursuant to 2.b.i and 2.b.ii, OBD tests pursuant to Paragraphs 2.d and 2.e, and other special tests. EPA/CARB shall request, and Defendants shall provide no earlier than the date of submission of the Emission Modification Proposal Report, no more than one Test Vehicle from each Emission Modification Category and OBD Cluster, with the

exception of Emission Modification Category 9, for which Defendants shall provide both EPA and CARB a Test Vehicle. Along with any such request, if applicable, EPA/CARB shall furnish parameter or other forms EPA/CARB need to conduct testing. The prior sentence shall not preclude EPA/CARB from requesting additional information during confirmation testing. When Defendants provide such a Test Vehicle, the readiness bits on the Test Vehicle shall be set to complete, and Defendants shall promptly submit any parameter or other forms requested by EPA/CARB. Confirmation testing may be the basis for approval or disapproval of a proposed Emission Modification under the criteria of Paragraph 5.a.i, except that approval or disapproval based on special cycle or PEMS tests may only occur under 5.a.i(2) or 5.a.i(3). If requested by EPA and/or CARB, Defendants shall provide EPA and/or CARB with all equipment and software necessary to duplicate the testing required under this Test Protocol.

Attachment A Emission Plus Test Vehicles and OBD Demonstration Vehicles

Table 1. Emission Plus Test Vehicles

Emission Modification Category	Engine	Model, MY	Median Mileage	Minimum Vehicle Mileage at Start of Testing	ATS Mileage After Aging and Stabilization, Per Paragraph 1.e for Emission and PEMS Testing
Emission Modification Category 1	OM642	Sprinter, MY 13	81,900 miles	At least 76,900 miles	120,000 miles
		Sprinter, MY 14	51,400 miles	At least 46,400 miles	120,000 miles
		Sprinter, MY 15	36,300 miles	At least 31,300 miles	120,000 miles
		Sprinter, MY16	25,500 miles	At least 20,500 miles	120,000 miles
Emission Modification Category 2	OM642	N/A; EPTV for Emission Modification Category 1 tested			
Emission Modification Category 3	OM651	Sprinter MY 14	93,600 miles	At least 88,600 miles	150,000 miles
		Sprinter, MY 15	67,800 miles	At least 62,800 miles	150,000 miles
		Sprinter, MY16	42,100 miles	At least 37,100 miles	150,000 miles
Emission Modification Category 4	OM642	GL350, MY 13	81,700 miles	At least 76,700 miles	At least 50,000 and up to 120,000 miles
		GL350, MY 14	68,500 miles	At least 63,500 miles	At least 51,500 and up to 120,000 miles
		GL350, MY 15	55,000 miles	At least 50,000 miles	At least 65,000 and up to 120,000 miles
		GL350, MY 16	40,700 miles	At least 35,700 miles	At least 79,300 and up to 120,000 miles

Emission Modification Category	Engine	Model, MY	Median Mileage	Minimum Vehicle Mileage at Start of Testing	ATS Mileage After Aging and Stabilization, Per Paragraph 1.e for Emission and PEMS Testing
Emission Modification Category 5	OM642	ML320, MY 09	120,400 miles	At least 115,400 miles	At least 50,000 and up to 120,000 miles
		ML350, MY 10	110,900 miles	At least 105,900 miles	At least 50,000 and up to 120,000 miles
		ML350, MY 11	97,600 miles	At least 92,600 miles	At least 50,000 and up to 120,000 miles
Emission Modification Category 6	OM642	S350, MY 12	77,900 miles	At least 72,900 miles	At least 50,000 and up to 120,000 miles
		S350, MY 13	62,400 miles	At least 57,400 miles	At least 57,600 and up to 120,000 miles
Emission Modification Category 7	OM642	E350, MY 13	65,200 miles	At least 60,200 miles	At least 54,800 and up to 120,000 miles
Emission Modification Category 8	OM642	E350, MY 11	91,100 miles	At least 86,100 miles	At least 50,000 and up to 120,000 miles
		E350, MY 12	78,900 miles	At least 73,900 miles	At least 50,000 and up to 120,000 miles
Emission Modification Category 9	OM651	GLK250, MY 13	69,400 miles	At least 64,400 miles	At least 50,600 and up to 120,000 miles
		GLK250, MY 14	60,700 miles	At least 55,700 miles	At least 59,300 and up to 120,000 miles
		GLK250, MY 15	46,800 miles	At least 41,800 miles	At least 73,200 and up to 120,000 miles
Emission Modification Category 10	OM651	GLE300, MY 16	38,700 miles	At least 33,700 miles	150,000 miles
Emission Modification Category 11	OM651	ML250, MY 15	52,000 miles	At least 47,000 miles	At least 68,000 and up to 120,000 miles

Emission Modification Category	Engine	Model, MY	Median Mileage	Minimum Vehicle Mileage at Start of Testing	ATS Mileage After Aging and Stabilization, Per Paragraph 1.e for Emission and PEMS Testing
Emission Modification Category 12	OM651	E250 (4x4), MY 14	60,300 miles	At least 55,300 miles	At least 59,700 and up to 120,000 miles
		E250 (4x4), MY 15	44,500 miles	At least 39,500 miles	At least 75,500 and up to 120,000 miles
		E250 (4x4), MY 16	36,800 miles	At least 31,800 miles	At least 83,200 and up to 120,000 miles

Table 2. OBD Demonstration Vehicles

OBD Cluster	Emission Modification Category	Engine	Model, MY	ATS Mileage After Aging, Per Paragraph 1.e
1	Emission Modification Categories 1 and 2	OM642	N/A; EPTV for Emission Modification Category 1 tested	
2	Emission Modification Category 3	OM651	Sprinter, MY 14-16	150,000 miles
3	Emission Modification Categories 4 and 6	OM642	GL350, MY 13-16	120,000 miles
4	Emission Modification Categories 5, 7 and 8	OM642	ML320, MY09 ML350, MY 10-11	120,000 miles
5	Emission Modification Categories 9, 10, 11, 12	OM651	GLK250, MY 13-15	120,000 miles

Attachment B Sample Signal Data

Description	Signal Name	Minimum Data Rate
Vehicle Speed		
Engine Speed		
Transmission Gear		
Diesel Injection Quantity		
Pilot 1 Injection Proportion		
Pilot 2 Injection Proportion		
Main Injection Proportion		
Close Post Injection Proportion		
Far Post Injection Proportion		
Pilot 1 Injection Timing		
Pilot 2 Injection Timing		
Main Injection Timing		
Close Post Injection Timing in normal mode		
Close Post Injection Timing in RGN/CldStart mode		
Far Post Injection Timing		
Engine Operating States / Mode		
(EGTM, ColdStart, Normal, etc.)		
Estimated Exhaust Mass Flow after turbine		

Description	Signal Name	Minimum Data Rate
Coolant Temperature		
Coolant Temperature		
Ambient Temperature		
Intake Temperature		
Ambient Pressure		
Intake Air Flow (MAF)		
Post CAC Pressure		
Post CAC Temperature		
SCR Dosing Release Conditions		
SCR Dosing State		
SCRFFC Dosing Mode		
SCRFFC Dosing Mode Bits		
SCRFFC Dosing Mode Bit 1 information		
SCRFFC Dosing Mode Bit 7 information		
SCRFFC Dosing Mode Bit 12 information		
SCRFFC Dosing Mode Bit 13 information		
SCRFFC Dosing Mode Bit 14 information		
SCRFFC Bit 12 Temperature Thresholds		
SCRFFC Bit 13 Integrator Value		

Description	Signal Name	Minimum Data Rate
SCR Estimated NO2:NOx Ratio		
SCR Upstream NOx Sensor Concentration		
SCR Downstream NOx Sensor Concentration		
SCR Upstream Temperature		
SCR Downstream Temperature		
DPF Soot Load		
SCR Dosing Modification by OBD		
SCR Feed Forward Dosing Estimate		
SCR Target NH3 Fill Level		
SCR Estimated NH3 Fill Level		
SCR Alternate PreCtl Target Efficiency		
SCR Estimated Conversion Efficiency		
SCR Fill Level Adjustment (Heat Flux Integrator)		
Temporarily added NH3 dosing quantity based on Heat Flux Integral		
SCR Fill Level Adjustment based on Heat Flux Integral		
SCR Dosing Adjustment Applied by Load Governor		

Description	Signal Name	Minimum Data Rate
SCR total dosing amount request		
SCR total dosing amount		
SCR Adaptation State		
NOEA State		
Normalized ATS Performance		
Start of Injection Adjustment by PM/CO2/NOx Tradeoff Strategy		
Start of Injection Adjustment by Engine temperature in normal mode		
Start of Injection Adjustment by Engine temperature in CldStrt mode		
Start of Injection Adjustment for Post CAC temperature in normal mode		
Start of Injection Adjustment for Post CAC temperature in CldStrt mode		
Start of Injection Adjustment for stabilization by engine temperature and time after start		
Commanded EGR		
Adjustment to EGR by PM/CO2/NOx Tradeoff Strategy		

Description	Signal Name	Minimum Data Rate
Adjustment to EGR by Cold/Hot Engine Operation normal mode		
Adjustment to EGR by Cold Engine Operation CldStrt mode		
Adjustment to EGR by Post CAC temperature in Normal Mode		
Adjustment to EGR by Post CAC temperature in CldStrt Mode		
EGR Cooler Bypass Status		
Air path adaption state Idle		
Air path adaption state Load 1		
Air path adaption state Load 2		
Normalized Intake Temperature		
DOC inlet temperature		
DPF inlet temperature		
Enhanced DOC temperature		
Air Mass Setpoint		
Air Mass Setpoint correction by coolant temperature in CldStrt Mode		
Air Mass Setpoint correction by Post CAC temperature in CldStrt Mode		

Description	Signal Name	Minimum Data Rate
Close post correction by coolant temperature in CldStrt Mode		
Close post correction by post CAC temperature in CldStrt Mode		
IGR target taking after taking into consideration high altitude base map interpolation		
IGR target correction for high altitude operation		
IGR target taking after taking into consideration high altitude base map interpolation		
IGR target correction for high altitude operation		
Surge prevention is active/transient		
Surge prevention is active/highly transient		
Actuator Turbocharger HP		
Actuator Turbocharger LP		
Actuator EGR-Valve		
Actuator Throttle-Valve		
Derating engine torque limitation based on oil temperature		
Derating engine torque limitation based on coolant temperature		
EGR setpoint limitation by Lambda Min / Surge Protection		

Description	Signal Name	Minimum Data Rate
EGR Cooler bypass reason		
Base IGR set point normal mode		
Base EGR set point CldStrt mode		
Final IGR/EGR set point before IGR to EGR calculation and limitation		
Base rail pressure set point Normal mode		
Base rail pressure set point CldStrt mode		
Rail Pressure		
Rail pressure set point		
Swirl valve position		
Base Swirl valve set point Normal mode		
Final corrected Swirl valve set point Normal mode		
Base Swirl valve set point CldStrt mode		
Final corrected Swirl valve set point CldStrt mode		
Boost pressure target		
Boost pressure target before limitation		
Base Start of injection timing Normal mode		
Base Start of injection timing CldStrt mode		
Base Pilot 2 injection quantity Normal mode		

Description	Signal Name	Minimum Data Rate
Base Pilot 2 injection quantity CldStrt mode		
Base Pilot 1 injection quantity Normal mode		
Base Pilot 1 injection quantity CldStrt mode		
Engine State		
SCR Temperature average		
Aging DOC factor		
Aging DPF factor		
Aging SCR factor		
DOC aging factor for HC oxidation		
DPF aging factor for HC oxidation		
DPF aging factor for NO2 generation		
SCR catalyst aging factor		
Exhaust gas flow volume scaled		
DPF pressure difference scaled		
DPF pressure difference		
DPF inlet pressure		
Exhaust gas flow volume		
Expected difference pressure		
Status flag DPF regeneration		
Continuous simulated Soot mass		
Distance since last regeneration		

Description	Signal Name	Minimum Data Rate
Fuel consumed since the last DPF change		
DPF backpressure curve without soot (DPF_Mon Parameter A)		
DPF backpressure curve without soot (DPF_Mon Parameter B)		
DPF Surface Temperature		
DPF Simulation active		
EGR delayed activation in overrun for NOx sensor monitor		
Status NOx-Sensor SCR upstream		
Status NOx-Sensor SCR downstream		
NOx-Sensor SCR upstream massflow		
NOx-Sensor SCR upstream Concentration for Dosing Control		
NOx-Sensor SCR downstream massflow		
Estimated NOx Downstream Emission		
Calculated SCR efficiency based on NOx sensors		
Stoichiometric Factor NH3 to NOx		
Maximum possible NH3 Load		

Description	Signal Name	Minimum Data Rate
Maximum possible NH3 Dosing amount limited by hydrolysis		
Inhibit FID for Adaption (OBD failure concerned)		
Load ratio of NH3-Load of SCR Catalyst		
Factor for PM/CO2/NOx Tradeoff Strategy based on SCR Cat Temp and DPF condition value		
Factor for PM/CO2/NOx Tradeoff Strategy based on DOC inlet Temp an DOC aging		
DPF condition Value for PM/CO2/NOx Tradeoff Strategy		
State of Fast Adaption		
Vehicle Odometer start Fast Adaption		
Counter of Fast Adaption		
Status if DiffPreCtlfstAdap is in range		
Inhibit of Fast Adaption		
Target NOx mass flow in Fast Adaption		
Target Conversion Efficiency in Fast Adaption		
SCR Adaption factor		
NOx mass threshold for conditioning before adaption		

Description	Signal Name	Minimum Data Rate
Status change Adaption factor in Adaption State5		
Global release mask for Adaption		
Adaption factor in PreCtl Mode		
Optimal Adaption factor		
Ratio Adaption factor		
Optimal Adaption factor per driving cycle		
Adaption - Max limit funnel		
Adaption - weighting factor		
NOx mass for calculation of optimal Adaption factor		
State release of optimal Adaption factor		
State reset of Fast Adaption		
State reset of optimal Adaption factor		
State mask reset of Fast Adaption		
Output values Fast Adaption		
State Refill signal freeze active		
Release of Adaption		
Request mask of Fast Adaption		
Flag for stop of conditioning by efficiency monitoring		

Description	Signal Name	Minimum Data Rate
Vehicle odometer		
Fault memory information		

Attachment C Special Cycles

Special Cycle A – Cold

Prep and soak for FTP per federal regulations and Test Protocol Paragraph 2.a.ii. Perform an FTP Phase 1 (505 s), immediately followed by six repetitions of FTP Phase 2 (869 s).

There shall be no engine restarts during the test, though there is a 20 second idle between each bag. Sampling: One bag should be sampled for each phase of the test, for a total of seven bags.

Tests shall be run in a 4-wheel drive chassis dynamometer with engine hood closed.

Special Cycle A – Hot

Defendants shall use a vehicle-speed proportional fan for this test.

Perform a US06, followed by another US06. Without an engine restart, perform the FTP Phase 1 (505 s), immediately followed by six repetitions of FTP Phase 2 (869 s).

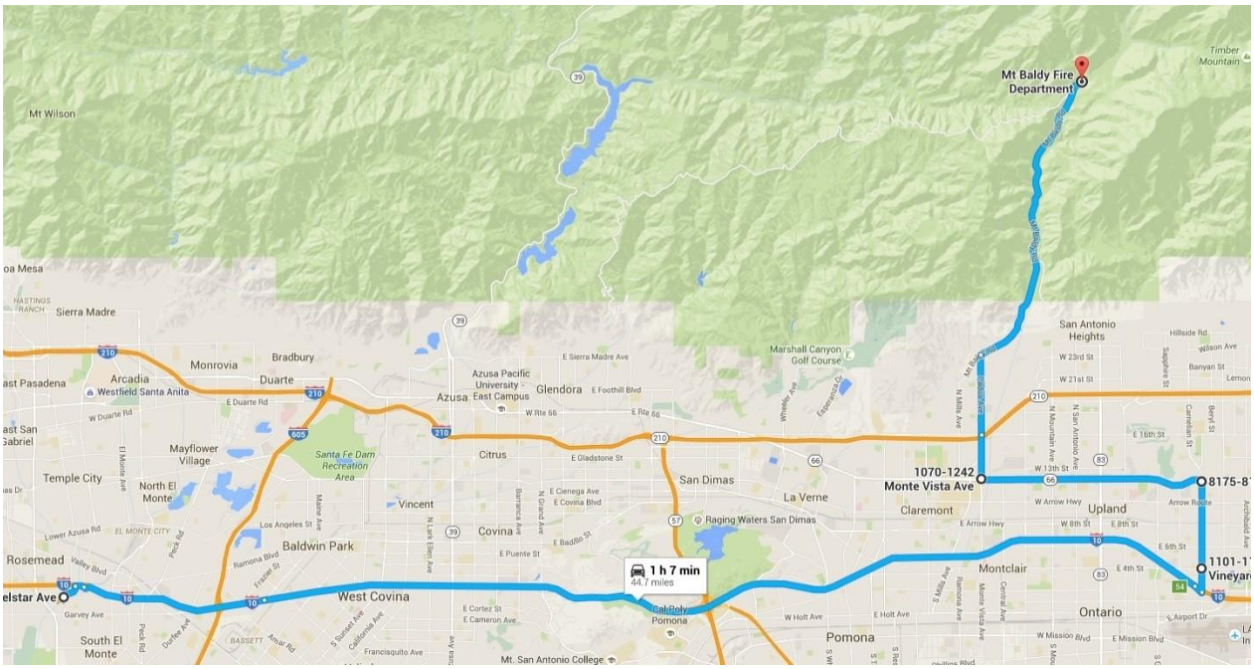
There shall be no engine restarts during the test, though there is a 20 second idle between each bag. Sampling: One bag should be sampled for each phase of the FTP Phase 1 and FTP Phase 2, for a total of seven bags.

Tests shall be run in a 4-wheel drive chassis dynamometer with engine hood closed. For EMC 3, Defendants shall conduct a modified US06 emissions test in accordance with 13 C.C.R. § 1961.2(a)(7)(C) SFTP NMOG+NOx and CO Exhaust Emission Standards for Medium-Duty Vehicles during the US06 portion of this Special Cycle A.

Attachment D PEMS Routes

COMBINED TEST ROUTE
(Freeway and Uphill/Downhill)

OUT-bound



Summary: 44.7 mi (1 hour, 7 min)

Route Parsing

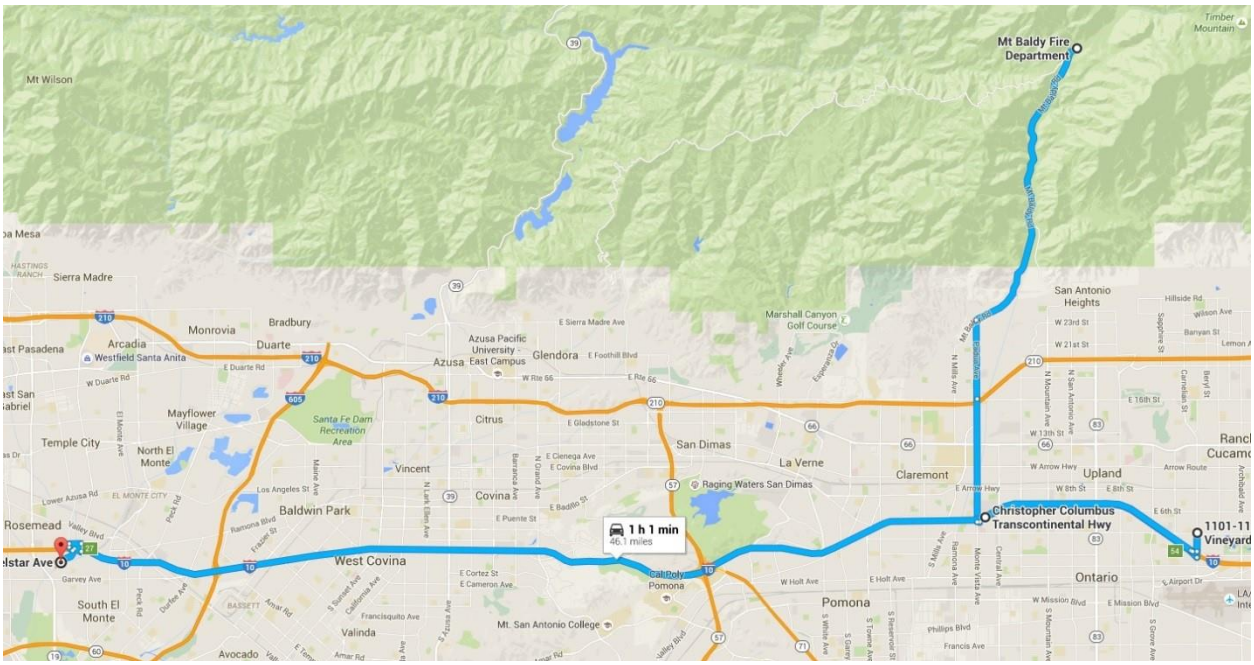
(A0, Drive from engine-on location to start of route)
A1, Freeway, ARB to Ontario intersection of East 4 th and Vineyard Avenue(~27.7 miles)
A2, Uphill, East 4 th and Vineyard Avenue to Mount Baldy, Fire Department) (~17 miles)
B1, Downhill, Mount Baldy, Fire Department to East 4th and Vineyard Avenue(~17.9miles)
B2, Freeway, East 4th and Vineyard Avenue to ARB (~28.5 miles)

Depart 9528 Telstar Ave, El Monte CA 91731

Head east on Telstar Ave toward Fletcher Ave	
0.4 mi	Turn right onto Flair Dr
0.2 mi	Turn right to merge onto I-10 E
26.2 mi	Take exit 54 for Vineyard Ave
	Use the left 2 lanes to turn left onto N Vineyard Ave
	Head north on N Vineyard Ave toward E Harvard Privado
4.2 mi	Use the left 2 lanes to turn left onto E Foothill Blvd
5.1 mi	Turn right onto Monte Vista Ave
2.8 mi	Continue onto Padua Ave
7.2 mi	Turn right onto Mt Baldy Rd
Total Distance 44.7 mi	

COMBINED TEST ROUTE (CONTINUED)

IN-Bound



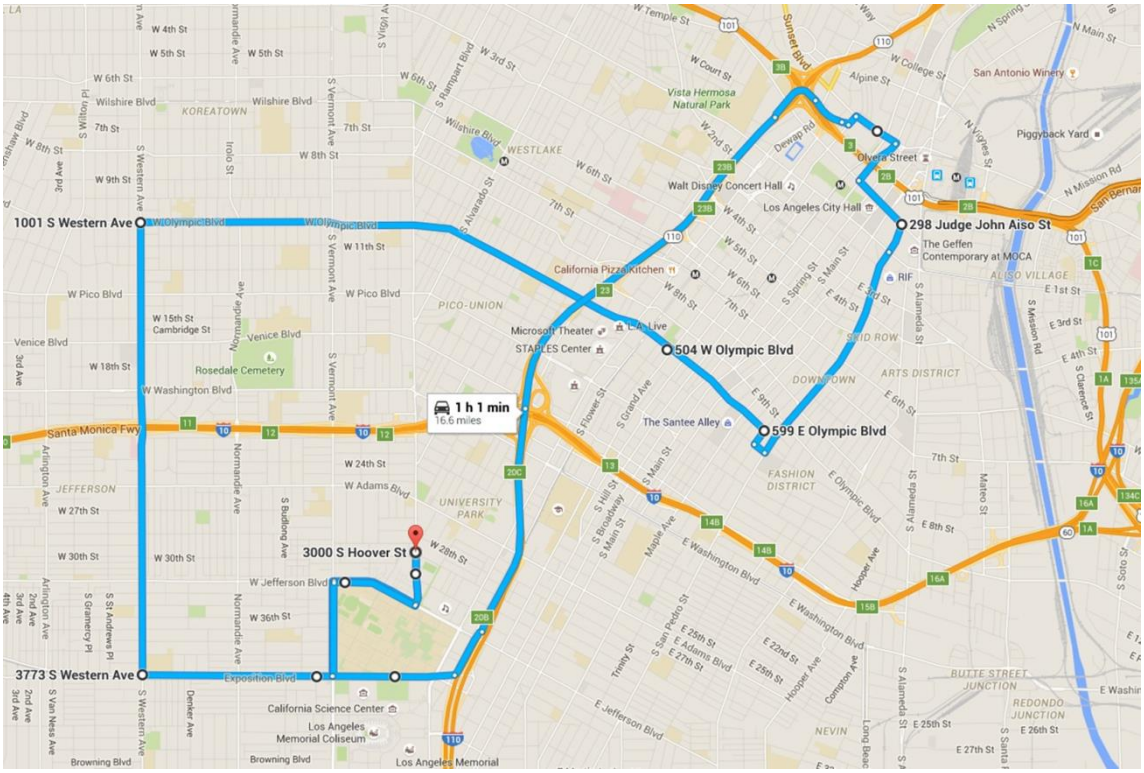
Summary: 46.1 mi (61 min)

Depart 6736 Mount Baldy Road, Mount Baldy, CA 91759
Head west on Mt Baldy Rd toward Central Ave

7.2 mi	Turn left onto Padua Ave
1.8 mi	Continue onto Monte Vista Ave
2.8 mi	Turn left onto Palo Verde St
344 ft	Use the left 2 lanes to turn left to merge onto I-10 E toward San Bernardino Head northeast on I-10 E
5.0 mi	Take exit 54 for Vineyard Ave
0.2 mi	Use the left 2 lanes to turn left onto N Vineyard Ave Destination will be on the left 1101-1119 N Vineyard Ave, Ontario CA 91764
0.5 mi	Get on I-10 W
26.5 mi	Follow I-10 W to Temple City Blvd in Rosemead. Take exit 27 from I-10 W
1.2 mi	Take Loftus Dr to Telstar Ave in El Monte

Total Distance
46.1 mi

URBAN/DOWNTOWN LOS ANGELES ROUTE



Summary: 16.6 miles (61 minutes)

Depart 3000 S Hoover St, Los Angeles, CA 90007
Head south on S Hoover St

0.5mi	Turn RIGHT on W Jefferson Blvd	**0.3mi**	Use the second turn lane from the left to turn **LEFT** onto N. Grand Ave.
0.4mi	Turn **LEFT** on S. Vermont Ave.	**276ft**	Turn **RIGHT** onto the CA-110/I-110 fwy ramp
0.5mi	Turn **RIGHT** on W. Exposition Blvd.	**82ft**	Keep **RIGHT** at the fork and follow the signs for CA-110/I-110
1.0mi	Turn **RIGHT** on S. Western Ave.	**0.2mi**	Keep **LEFT** at the second fork and follow the sign for I-110 South - San Pedro
2.4mi	Turn **RIGHT** onto W. Olympic Blvd.	**0.3mi**	Merge **LEFT** onto the I-110 South - San Pedro
3.6mi	Turn **RIGHT** onto San Julian St.	**1.5mi**	Continue on the CA-110 South/I-110 South towards Exposition Blvd.Take Exit 20 B from I-110 S
446ft	Turn **LEFT** onto E. 11th St.	**1.8mi**	Take the Exposition Blvd. Exit (20B)
361ft	Turn **LEFT** onto S. San Pedro St.	**0.3mi**	Use the right two lanes to slightly turn and continue **STRAIGHT** on W. Exposition Blvd.
1.2mi	Continue **STRAIGHT** as S. San Pedro St. becomes Judge John Aiso St.	**0.6mi**	Turn **RIGHT** onto S. Vermont Ave.

0.2mi	Turn **LEFT** on E. Temple St.
0.3mi	Turn **RIGHT** onto N. Broadway
0.3mi	Turn **LEFT** onto W. Cesar E. Chavez Ave.
0.5mi	Turn **RIGHT** onto W. Jefferson Blvd.
0.4mi	**850 W Jefferson Blvd, Los Angeles, CA 90007**

Attachment E Data Parameters for Flat Files

PEMS Parameters

VEHICLE_ID
VIN
TEST_ID
VEH_DESC
MODEL_YEAR
ENGINE_FAMILY
VEHICLE CATEGORY (1-12)
OBD GROUP (1-5)
BASELINE_FINAL_CONFIGURATION (B/F)
ROUTE
ROUTE_SEGMENT (A0,A1,A2,B1,B2,DT)
START_DATE
START_TIME
START_ODOMETER
GRAMS_PER_MILE_HC
GRAMS_PER_MILE_CO
GRAMS_PER_MILE_NO
GRAMS_PER_MILE_NO2
GRAMS_PER_MILE_CO2
VOL_MPG
DISTANCE
REGEN_EVENT
COMMENTS

Dynamometer Parameters

VEHICLE_ID
VIN
TEST_ID
TEST_TYPE
PHASE_NUMBER/BAG_NUMBER
VEH_DESC
MODEL_YEAR
ENGINE_FAMILY
VEHICLE CATEGORY (1-12)
OBD GROUP (1-5)
BASELINE_FINAL_CONFIGURATION (B/F)
FUEL_TYPE
LOCATION
FACILITY
CELL_TEMP_SET_PT
ALTITUDE_SET_PT
HUM_SET_PT
START_DATE
START_TIME
START_ODOMETER
GRAMS_PER_MILE_THC
GRAMS_PER_MILE_CO
GRAMS_PER_MILE_NOX
GRAMS_PER_MILE_CO2
GRAMS_PER_MILE_NMHC
GRAMS_PER_MILE_CH4
GRAMS_PER_MILE_NMOG+NOX
GRAMS_PER_MILE_N2O
VOL_MPG
DISTANCE
GRAMS_PER_MILE_WT_THC
GRAMS_PER_MILE_WT_CO
GRAMS_PER_MILE_WT_NOX
GRAMS_PER_MILE_WT_CO2
GRAMS_PER_MILE_WT_NMHC
GRAMS_PER_MILE_WT_CH4
GRAMS_PER_MILE_WT_NMOG+NOX
GRAMS_PER_MILE_WT_N2O
WT_VOL_MPG
LAB_QC_STATUS
REGEN_EVENT
COMMENTS

DEF Dilution Inducement Strategy Parameters

VEHICLE_ID
VIN
TEST_ID
TEST_TYPE
PHASE_NUMBER/BAG_NUMBER
VEH_DESC
MODEL_YEAR
ENGINE_FAMILY
VEHICLE CATEGORY (1-12)
OBD GROUP (1-5)
BASELINE_FINAL_CONFIGURATION (B/F)
FUEL_TYPE
LOCATION
FACILITY
CELL_TEMP_SET_PT
ALTITUDE_SET_PT
HUM_SET_PT
START_DATE
START_TIME
START_ODOMETER
GRAMS_PER_MILE_THC
GRAMS_PER_MILE_CO
GRAMS_PER_MILE_NOX
GRAMS_PER_MILE_CO2
GRAMS_PER_MILE_NMHC
GRAMS_PER_MILE_CH4
GRAMS_PER_MILE_NMOG+NOX
GRAMS_PER_MILE_N2O
VOL_MPG
DISTANCE
GRAMS_PER_MILE_WT_THC
GRAMS_PER_MILE_WT_CO
GRAMS_PER_MILE_WT_NOX
GRAMS_PER_MILE_WT_CO2
GRAMS_PER_MILE_WT_NMHC
GRAMS_PER_MILE_WT_CH4
GRAMS_PER_MILE_WT_NMOG+NOX
LAB_QC_STATUS
REGEN_EVENT
DEF DILUTION (%)
INDUCEMENT DETECTION (WITHIN 1 Hour)
FINAL INDUCEMENT START TIME
COMMENTS

Attachment F Testing: Overview

FTP75 – HWFET – US06	A) HWFET for warm-up followed by coast down – HWFET with DPF Regeneration (EPTV2 only) – FTP 72 Prep Cycle as preconditioning
	B) FTP 75 – HWFET, HWFET – US06, US06 – FTP 72 Prep Cycle
	C) FTP 75 – HWFET, HWFET – US06, US06 – FTP 72 Prep Cycle
	D) FTP 75 – HWFET, HWFET – US06, US06

SC03 (on climatic dyno)	A) SC03 – 10 min. soak – SC03
	B) SC03 – 10 min. soak – SC03
	C) SC03 – 10 min. soak – SC03

FTP75 20°F (on climatic dyno)	A) HWFET for warm-up followed by specific coast down for 20 °F
	B) FTP 75 @ 20 °F

Special Cycles [Att. C]	**Cold**	A) FTP72 (preconditioning)
		B) FTP Phase 1 (cold) – 6x FTP Phase 2
	Hot	C) US06 – US06 – FTP Phase 1, 6x FTP Phase 2

PEMS [Att. D]	A) PEMS technical check (function & communication) – max. 30 mi on-road driving, 12-hour soak
	B) Combined Uphill/Downhill and Highway Route (~26mi from LATC (cold) to starting point – 44.7 mile outbound – 46.1 mile inbound)
	C) Urban/Downtown Los Angeles Route (16.6 mile, warm)

Attachment G NVH Protocol

Procedure for A-to-B Noise, Vibration, and Harshness ("NVH") Testing

1. Purpose

This test procedure is designed to enable DMB to conduct an evaluation of noise, vibration, and harshness ("NVH") measurements for informational purposes. Because there is no regulatory standard relating to NVH, this test procedure is not to be used for purposes of vehicle certification or compliance determinations, or for any other purpose. Additionally, because NVH can vary across models, model years, and at different testing intervals, it is expected that performing the same NVH evaluation on different vehicles or on the same vehicle under different circumstances can produce varying results.

2. General Measurement Conditions

All measurements as per Section 3 shall be carried out with an unloaded vehicle. The vehicle is to be filled with the vehicle operator and the measuring equipment. The fuel tank must be full. All measurements as per Section 3 shall be carried out on a test course that is flat, dry, and sufficiently rough to prevent slippage. Gradients of no more than 1.5% are permitted.

The atmospheric air pressure must be between 910 hPa and 1050 hPa, and the ambient temperature must be between 0° C and 30° C. The maximum temperature difference between the individual measurements shall not exceed 5° C. The temperature inside the vehicle cabin shall be between 15 °C and 25 °C. The highest wind speed at 0.7 m above ground must not exceed 3 m/s.

The tire inflation pressure must correspond to the vehicle manufacturer's specifications as documented on the fuel tank cover. The tire tread depth must be greater than the valid minimum profile depth according to the wear indicator, and the tires must be in good condition. The vehicle shall have tires approved by the manufacturer for use on the specific vehicle, including conforming to the size, load index, and speed rating listed in the operator's manual.

A commercially available fuel as specified in the operator's manual for the vehicle in question shall be used. For the baseline testing, the vehicle hardware and software shall correspond to the requirements of Paragraphs 1.a and 1.b of Appendix B (Test Protocol). All vehicle functionalities that consume power (e.g., air conditioning, including fans, and the radio) shall be switched off during the measurement, and the windows and sliding roof must be closed.

2.1 Special Measurement Conditions

- Regeneration Mode is off.
- The DPF should be regenerated through a manually triggered regeneration directly before the measurement. The regeneration will be completed during on-road driving.

- The measurement shall take place with the vehicle warmed up; that is, the vehicle shall have reached stabilized normal operating conditions (for example, with regard to coolant and oil temperatures) before the measurement.
- Measurement equipment: binaural microphone equipment complying with IEC 616732, class 1. The system must be calibrated by an approved laboratory.
- Driver conditions: same driver, same driver seat position (back of the seat must be at the height of the B-pillar), same driver head position (carrying the binaural microphone), same interior loading and setting (same position for all seats and same position for any vehicle contents).
- During the measurements, the driver shall not move his head and must look straight forward.
- The left and right ear positions are to be recorded.
- The drive program shall be the default mode.

3. NVH Testing Procedure

3.1 NVH with Stationary Vehicle

Testing shall be conducted with the engine at idle speed and the transmission in position P.

3.2 NVH While Driving at Constant Speed

Testing shall be conducted at a constant vehicle speed of 25 mph (using cruise control) and the transmission in position D. Measurement time shall not begin until more than 5 seconds have elapsed since the vehicle has reached stable testing conditions. The minimum measurement time is 20 seconds.

The measurements are executed sequentially. No disturbing background-noise is allowed.

4. Realization of Measurement

A distinction is made between the measurements from the stationary (0 mph) and constant driving speed measurements.

The starting and end point of the measurement is the given by the driver with respect to the test track condition and the given vehicle speeds.

For measurements from the stationary state, the vehicle must be in the drive position P and default transmission mode (E) at idle speed. The start-stop system, if present, has to be deactivated.

For measurements with constant speed, the cruise control is set accordingly. The constant speed must be maintained for at least 5 seconds before the driver activates the measurement.

5. Analysis

The results are to be determined from the collected NVH measurement records. Specifically, an acoustic specialist will perform an analysis of each test and determine whether there are any material differences. From the measured period of at least 20 seconds, the acoustic specialist will locate a time interval of about 10 seconds without a noise disturbance from ambient events (e.g., wind, traffic, erratic background noise), and then average the selected interval.

5.1 Plausibility Check of Measurements

DMB retains the discretion to invalidate a measurement if:

- Idle speed is unstable and deviates from a specified value (e.g. raised by on-board electrical system).
- Ambient events influence the NVH measurements (e.g. wind, traffic, erratic background noise).
- The measurement is performed in Regeneration Mode.

5.2 Display of Measurement Results for Comparison

At least 5 measurements will be carried out in the initial (pre-update) condition of the vehicle. The results are to be displayed as a scatter. Two measurements are carried out in the target (updated) condition of the vehicle and the mean value is entered in the scatter.

5.2.1 Evaluation of results

The initial (pre-update) condition and target (updated) condition are to be considered materially the same for purposes of the NVH evaluation if the mean value of the target (updated) state condition is within the scatter of the results for the initial (pre-update) condition, or better.

Attachment H Drivability Protocol

Procedure for A-to-B Drivability Testing

1. Purpose

This test procedure is designed to enable Daimler to conduct an evaluation of the drivability of the tested vehicle using agility measurements for informational purposes. The agility measurements emulate typical driving maneuvers and are described under Section 3. Because there is no regulatory standard relating to drivability, this test procedure is not to be used for purposes of vehicle certification or compliance determinations, or for any other purpose. Additionally, because drivability can vary across models, model years, and at different testing intervals, it is expected that performing the same drivability evaluation on different vehicles or on the same vehicle under different circumstances can produce varying results.

2. General Measurement Conditions

All measurements as per Section 3 shall be carried out with the unloaded vehicle. The vehicle is to be filled with the vehicle operator and the measuring equipment. The fuel tank must be full. All measurements as per Section 3 shall be carried out on a test course, which is flat, dry, and sufficiently rough to prevent slippage. Gradients of no more than 2% are permitted.

The atmospheric air pressure must be between 910 hPa and 1050 hPa, and the ambient temperature must be between 0° C and 30° C. The maximum temperature difference between the measurements in initial state (A) and the update measurements in state (B) shall not exceed 5° C. The highest wind speed at 0.7 m above ground should not exceed 3 m/s.

The tire inflation pressure must correspond to the vehicle manufacturer's specifications as documented on the fuel tank cover, the tire tread depth must be greater than the valid minimum profile depth according to the wear indicator, and the tires must be in good condition. A commercially available fuel in the operator's manual for the vehicle in question shall be used. The cooling and transmission fluid temperatures which occur for normal driving shall be observed. For the baseline testing, the vehicle hardware that is relevant to acceleration and elasticity shall correspond to the series production configuration. All vehicle functionalities that consume power (e.g., air conditioning) shall be switched off during the measurement, and the windows and sliding roof shall be closed.

2.1 Special Measurement Conditions

- Regeneration Mode is off.
- The DPF should be regenerated through a manually triggered regeneration directly before the measurement. The regeneration will be completed during on-

road driving.

- Response times when changing from brake to accelerator must be within defined parameters.
- Before the measurement, the vehicle must be operated with constant speed between 15 and 40 mph for at least 1 minute and after that be at idle speed for 10 s.

3. Acceleration and Elasticity

The acceleration of a vehicle is characterized by the acceleration time. This is the shortest time required for a vehicle to change its speed. The specifications according to Sections 2 and 4 shall be observed. The elasticity is described by the required time for acceleration at an initial speed > 0 mph. The acceleration is determined by the following measurements:

Time taken for acceleration of:

- 0–30 mph (48.3 km/h)
- 0–60 mph (96.6 km/h)
- 0–100 mph (160.9 km/h)
- ¼ mile (402m)
- Idle rolling – 60 mph (96.6 km/h)
- 30–50 mph (48.3–80.5 km/h)
- 50–70 mph (80.5–112.7 km/h)

The acceleration time must be measured in both directions of the test course. A measurement is performed in both directions. The measurements in state (A) are performed under different environmental conditions within the ranges specified in Section 2. The measurements in the state (B) are executed sequentially (i.e., each subsequent measurement will be performed after the previous measurement without significant deviations in the environmental conditions).

4. Realization of Measurement

A distinction is made between the measurements from the stationary tests (initial speed of 0 mph) and measurements with an initial speed > 0 mph.

The starting point of the measurement is the time of the accelerator pedal operation. The end point of the measurement is when the target speed is reached (mph).

For measurements from the stationary state (initial speed = 0), the vehicle is in the drive position D and the default transmission mode (E) at idle speed. The start-stop system, if present, has to be deactivated. The brake pedal is actuated in this case (hold function not active). The acceleration is started by a rapid change (< 0.5 s) from the brake pedal to the accelerator pedal. The acceleration has to be done with maximum pedal position (no kick down). The accelerator pedal change from 0% to 100% must take place within 300 ms.

For elasticity measurements (initial speed > 0), there are two categories which have to be

performed: constant speed and idle rolling. In the first category, the initial condition is a constant speed which is implemented by means of cruise control with the respective start speed. The constant speed must be maintained for at least 5 s before the acceleration to maximum pedal position (no kick down). The accelerator pedal change from 0% to 100% must take place within 300 ms.

The measurement with the initial speed idle rolling is defined as follows. The vehicle is in the drive position D and default transmission mode (E) at a standstill (v = 0 mph). The brake pedal is released, whereby the vehicle starts rolling in gear range 1 at idle speed. After 5 s, the speed should have reached a steady condition. The maximum pedal position is accelerated from this condition. The accelerator pedal change from 0% to 100% must take place within 300 ms. If the vehicle does not start to roll on its own, the rolling has to be provoked by a minimal gas surge.

In all cases, the measurement shall be performed until the target speed is reached.

4.1 Measurement from Stationary State

The following measurements are carried out from a standstill:

- 0–30 mph (48.3 km/h)
- 0–60 mph (96.6 km/h)
- 0–100 mph (160.9 km/h)
- ¼ mile (402m)

4.2 Measurement with Initial Speed > 0 mph

The following measurements have to be performed with an initial speed > 0 mph:

- Idle rolling – 60 mph (96.6 km/h)
- 30–50 mph (48.3–80.5 km/h)
- 50–70 mph (80.5–112.7 km/h)

The measurement with the initial speed "idle rolling" is defined as follows. The vehicle is in the drive position D and default transmission mode (E) at a standstill (v = 0 mph). The brake pedal is released, whereby the vehicle starts rolling in gear range 1 at idle speed. After 5 s, the speed should have reached a steady condition. The maximum pedal position is accelerated from this condition. The accelerator pedal change from 0% to 100% must take place within 300 ms. If the vehicle does not start to roll on its own, the rolling has to be provoked by a minimal gas surge.

5. Analysis

The results are to be determined from time measurement records. The drivability evaluation will be based on the accelerator pedal value and the vehicle speed (display head unit) value. In addition, the following parameters (with sampling rate ≤ 20 ms) are to be measured for the plausibility check:

- Brake pressure (system)
- Brake pressure (driver)
- Wheel speeds
- Gear signal
- Fuel mass
- Engine speed
- Engine oil temperature
- Coolant temperature
- Regeneration mode
- Kick down signal
- Ambient temperature

The parameters can be measured directly from the engine control unit or via the CAN by calibration tools. Starting time is when the pedal value is greater than zero, and the end point is the time of the required speed for the first time.

The times determined are to be rounded to 0.1 s. For the measurement "¼ mile (402m)," the distance traveled is to be determined via the integration of the speed signal.

5.1 Plausibility Check of Measurements

Daimler retains the discretion to invalidate a measurement if:

- General measurement conditions in Section 2 were violated.
- The measurement was not performed until the target speed was reached.
- Response time when changing from brake to accelerator is longer than 0.5 s.
- Before the measurement, the vehicle was operated with constant speed between 15 and 40 mph for less than 1 minute and after that less than 10 s in idle speed.
- The accelerator pedal change from 0% to 100% lasts longer than 300 ms.
- The constant speed was maintained for less than 5 s before acceleration to the maximum pedal position.
- The acceleration was done with kick down.
- The stationary measurement was performed with a speed greater than 0 mph.
- Transmission mode was not E.
- Start-Stop system was active.
- Spinning wheels are detected.
- Idle speed is unstable and deviates from a specified value (e.g., raised by on-board electrical system).
- Braking torque system is greater than zero at the time of the accelerator pedal actuation.
- The measurement is performed in Regeneration Mode.

5.2 Display of Measurement Results for Comparison

At least 5 valid measurements are to be carried out in the initial (pre-update) condition (A) of the

vehicle. The results are to be displayed as a scatter. At least 2 valid measurements are to be carried out in the target (updated) condition (B) of the vehicle and the mean value is entered in the scatter.

5.2.1 Evaluation of results

The initial (pre-update) condition and target (updated) condition are to be considered materially the same for purposes of the drivability evaluation if the mean value of the target (updated) state condition is within the scatter of the results for the initial (pre-update) condition, or better.

Attachment I

Emission Modification Configuration Components

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
GL320	2009	9MBXT03.0U2B	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF	5	August 30, 2021	4
ML320 R320	2009	9MBXT03.0U2A	Federal Tier 2 Bin 5 LDT3 (ALVW 3751-5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF	5	August 30, 2021	4
GL350	2010	AMBXT03.0U2B	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF	5	August 30, 2021	4
ML350 R350	2010	AMBXT03.0U2A	Federal Tier 2 Bin 5 LDT3 (ALVW 3751-5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF	5	August 30, 2021	4

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
Sprinter 6-cyl. (OM642), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2010	AMBXT03.0HD1	Federal HDV 40 C.F.R. § 1816-08 (8500-10000 GVWR) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) ECU Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	2	Prior to signature	1
Sprinter 6-cyl. (OM642), 5T (Freightliner 3500, Sprinter 3500 CDI)	2010	AMBXT03.0HD2	Federal HDV 40 C.F.R. § 1816-08 (10001-14000 GVWR) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) ECU Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	2	Prior to signature	1
E350	2011	BMBXV03.0U2B	Federal Tier 2 Bin 5 LDV CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug	8	October 4, 2021	4

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
GL350 4MATIC	2011	BMBXT03.0U2B	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF	5	August 30, 2021	4
ML350 4MATIC R350 4MATIC	2011	BMBXT03.0U2A	Federal Tier 2 Bin 5 LDT3 (ALVW 3751-5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF	5	August 30, 2021	4
Sprinter 6-cyl. (OM642), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI	2011	BMBXT03.0HD1	Federal HDV 40 C.F.R. § 1816-08 (8500-10000 GVWR) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) ECU Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	2	Prior to signature	1

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
Sprinter 6-cyl. (OM642), 5T (Freightliner 3500, Sprinter 3500 CDI)	2011	BMBXT03.0HD2	Federal HDV 40 C.F.R. § 1816-08 (10001-14000 GVWR) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) ECU Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	2	Prior to signature	1
E350 BLUETEC	2012	CMBXV03.0U2B	Federal Tier 2 Bin 5 LDV CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug	8	October 4, 2021	4
GL350 BLUETEC 4MATIC R350 BLUETEC 4MATIC	2012	CMBXT03.0U2B	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) ECU Copper SCR Catalyst DOC DPF	5	August 30, 2021	4

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
ML350 4MATIC	2012	CMBXT03.0U2A	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) Copper SCR Catalyst DOC DPF Coolant thermostat if existing part number is A6422001915	4	September 28, 2020	3
S350 4MATIC	2012	CMBXV03.0U2A	Federal Tier 2 Bin 5 LDV CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug Coolant thermostat if existing part number is A6422001915	6	November 8, 2021	3

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
Sprinter 6-cyl. (OM642), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI	2012	CMBXT03.0HD1	Federal HDV 40 C.F.R. § 1816-08 (8500-10000 GVWR) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) ECU Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	2	Prior to signature	1
Sprinter 6-cyl. (OM642), 5T, (Freightliner 3500, Sprinter 3500 CDI)	2012	CMBXT03.0HD2	Federal HDV 40 C.F.R. § 1816-08 (10001-14000 GVWR) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) ECU Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	2	Prior to signature	1
E350	2013	DMBXV03.0U2B	Federal Tier 2 Bin 5 LDV CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug	7	October 4, 2021	4

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
GL350 BLUETEC 4MATIC ML350 BLUETEC 4MATIC	2013	DMBXT03.0U2A	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR Catalyst DOC Coolant thermostat if existing part number is A6422001915	4	September 28, 2020	3
GLK250 4MATIC (OM651)	2013	DMBXT02.2U2A	Federal Tier 2 Bin 5 LDT2 (LVW 3751-5750, GVW<6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR catalyst DOC DPF Conversion of Lambda sensor to plug HCU	9	Prior to signature	5

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
GL350 BLUETEC 4MATIC ML350 BLUETEC 4MATIC	2013	DMBXT03.0U2C	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR Catalyst DOC DPF Coolant thermostat if existing part number is A6422001915	4	September 28, 2020	3
S350 4MATIC	2013	DMBXV03.0U2A	Federal Tier 2 Bin 5 LDV CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug Coolant thermostat if existing part number is A6422001915	6	November 8, 2021	3

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
Sprinter 6-cyl. (OM642), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2013	DMBXT03.0HD1	HDV1 (Federal HD chassis Class 2b GVW 8,501-10000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	1	Prior to signature	1
Sprinter 6-cyl. (OM642), 5T (Freightliner 3500, Sprinter 3500 CDI)	2013	DMBXT03.0HD2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	1	Prior to signature	1
E250 (OM651) E250 4MATIC (OM651)	2014	EMBXJ02.2U2A	Federal Tier 2 Bin 5 LDV CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug	12	November 2, 2020	5

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
GL350 4MATIC ML350 4MATIC	2014	EMBXT03.0U2A	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR Catalyst DOC DPF Coolant thermostat if existing part number is A6422001915	4	September 28, 2020	3
GLK250 (OM651)	2014	EMBXJ02.2U2A	Federal Tier 2 Bin 5 LDV/LDT2 CA LEV-II ULEV	ECU, TCU, DCU	DOC DPF Copper SCR catalyst NOx sensors (TT3) PM sensor Conversion of Lambda sensor to plug	9	Prior to signature	5
Sprinter 4-cyl. (OM651), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2014	EMBXT02.2HD1	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-III ULEV250	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
Sprinter 4-cyl. (OM651), 5T (Freightliner 3500, Sprinter 3500 CDI)	2014	EMBXT02.2HD2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-III ULEV400	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2
Sprinter 6-cyl. (OM642), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2014	EMBXT03.0HD1	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	1	Prior to signature	1
Sprinter 6-cyl. (OM642), 5T (Freightliner 3500, Sprinter 3500 CDI)	2014	EMBXT03.0HD2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) Copper SCR Catalyst Instrument Cluster if existing part number is 9069018200 or 9069018600	1	Prior to signature	1

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
E250 (OM651) E250 4MATIC (OM651)	2015	FMBXJ02.1U2A	Federal Tier 2 Bin 5 LDV CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug	12	November 2, 2020	5
GL350	2015	FMBXT03.0U2A	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR Catalyst DOC DPF Coolant thermostat if existing part number is A6422001915	4	September 28, 2020	3
GLK250 (OM651)	2015	FMBXJ02.1U2A	Federal Tier 2 Bin 5 LDV/LDT2 CA LEV-II ULEV	ECU, TCU, DCU	DOC DPF Copper SCR catalyst NOx sensors (TT3) PM sensor Conversion of Lambda sensor to plug	9	Prior to signature	5

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
ML250 (OM651)	2015	FMBXT02.1U2A	Federal Tier 2 Bin 5 LDT3 (ALVW 3751-5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug	11	Prior to signature	5
Sprinter 4-cyl. (OM651), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2015	FMBXT02.1HD1	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-III ULEV250	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2
Sprinter 4-cyl. (OM651), 5T (Freightliner 3500, Sprinter 3500 CDI)	2015	FMBXT02.1HD2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-III ULEV400	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2
Sprinter 4-cyl. (OM651), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2015	FMBXT02.1HD3	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-III SULEV170	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
Sprinter 4-cyl. (OM651), 5T (Freightliner 3500, Sprinter 3500 CDI)	2015	FMBXT02.1HD4	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-III SULEV230	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2
Sprinter 6-cyl. (OM642), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2015	FMBXT03.0HD1	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) Copper SCR Catalyst	1	Prior to signature	1
Sprinter 6-cyl. (OM642), 5T (Freightliner 3500, Sprinter 3500 CDI)	2015	FMBXT03.0HD2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3) Copper SCR Catalyst	1	Prior to signature	1
Sprinter 6-cyl. (OM642), 3.88T (Freightliner 2500 4x4, Sprinter 2500 CDI 4x4)	2015	FMBXT03.0HD3	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	1	Prior to signature	1
Sprinter 6-cyl. (OM642), 5T (Freightliner 3500 4x4, Sprinter 3500 CDI 4x4)	2015	FMBXT03.0HD4	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	1	Prior to signature	1

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
E250 (OM651) E250 4MATIC (OM651)	2016	GMBXV02.1U2B	Federal Tier 2 Bin 5 LDV CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) Copper SCR Catalyst DOC DPF Conversion of Lambda sensor to plug	12	November 2, 2020	5
GL350 BLUETEC 4MATIC	2016	GMBXT03.0U2A	Federal Tier 2 Bin 5 LDT4 (ALVW >5750, GVW >6000) CA LEV-II ULEV	ECU, TCU, DCU	NOx sensors (TT3) PM sensor Copper SCR Catalyst DOC DPF Coolant thermostat if existing part number is A6422001915	4	September 28, 2020	3
GLE300 d 4MATIC (OM651)	2016	GMBXT02.1U2A	Federal Tier 3 Bin 125 CA LEV-III ULEV125	ECU, TCU, DCU	NOx sensors (TT3) Conversion of Lambda sensor to plug	10	Prior to signature	5

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
Sprinter 4-cyl. (OM651), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2016	GMBXT02.1HD1	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-III ULEV250	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2
Sprinter 4-cyl. (OM651), 5T (Freightliner 3500, Sprinter 3500 CDI)	2016	GMBXT02.1HD2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-III ULEV400	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2
Sprinter 4-cyl. (OM651), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2016	GMBXT02.1HD3	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-III SULEV170	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2
Sprinter 4-cyl. (OM651), 5T (Freightliner 3500, Sprinter 3500 CDI)	2016	GMBXT02.1HD4	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-III SULEV230	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	3	Within 30 Days of approval of the MY2020 4-cyl. Sprinter, but no later than December 21, 2020	2

Model	MY	Test Group	Emission Standard	Control Units Receiving Proposed Software Update	Proposed Hardware Update	Emission Modification Category	Emission Modification Report Submission Date	OBD Cluster
Sprinter 6-cyl. (OM642), 3.88T and 4.53T (Freightliner 2500, Freightliner 3500, Sprinter 2500 CDI, Sprinter 3500 CDI)	2016	GMBXT03.0HD1	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	1	Prior to signature	1
Sprinter 6-cyl. (OM642), 5T (Freightliner 3500, Sprinter 3500 CDI)	2016	GMBXT03.0HD2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	1	Prior to signature	1
Sprinter 6-cyl. (OM642), 3.88T (Freightliner 2500 4x4, Sprinter 2500 CDI 4x4)	2016	GMBXT03.0HD3	HDV1 (Federal HD chassis Class 2b GVW 8501-10000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	1	Prior to signature	1
Sprinter 6-cyl. (OM642), 5T (Freightliner 3500 4x4, Sprinter 3500 CDI 4x4)	2016	GMBXT03.0HD4	HDV2 (Federal HD chassis Class 3 GVW 10001-14000) CA LEV-II ULEV	ECU, TCU, DCU, Instrument Cluster	NOx sensors (TT3)	1	Prior to signature	1

Attachment J

Cluster 1

Group	Component / System	Fault code	Monitoring strategy description
Misfire monitoring	Misfire detection	P0300	Misfire monitoring - multiple cylinder
Misfire monitoring	Misfire detection	P0301	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0302	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0303	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0304	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0305	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0306	Misfire monitoring - cylinder 1 to 6
Fuel system	Fuel rail pressure control	P0087	Fuel rail pressure too low
Fuel system	Fuel rail pressure control	P0087	Fuel rail pressure governor deviation error
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure too high
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure governor deviation error
Fuel system	Lambda observer	P0171	Monitoring of lambda observer correction value
Fuel system	Lambda observer	P0172	Monitoring of lambda observer correction value
Fuel system	Zero fuel calibration	P2292	Back stop - monitoring of ZFC rail pressure enable conditions
Boost pressure system	Charge air cooler	P026A	Comparison of charge air cooler efficiency with a threshold
Boost pressure system	Boost pressure control	P0234	Governor control deviation monitoring - overboost
Boost pressure system	Boost pressure control	P0299	Governor control deviation monitoring - underboost
Diesel particulate filter	DPF	P2002	Particulate filter - differential pressure monitoring
Diesel particulate filter	DPF	P226D	Plausibility check - detection of defective DPF using differential pressure sensor

Group	Component / System	Fault code	Monitoring strategy description
Diesel particulate filter	DPF	P2459	DPF regeneration interval monitoring
Diesel particulate filter	DPF	P24A2	DPF regeneration monitoring
Diesel particulate filter	Exhaust gas temperature control	P244C	Governor control deviation monitoring - measured exhaust gas temperature downstream oxidation catalyst too low
Diesel particulate filter	Exhaust gas temperature control	P244D	Governor control deviation monitoring - measured exhaust gas temperature downstream oxidation catalyst too high
EGR system	EGR control	P0401	EGR governor control deviation monitoring (low flow)
EGR system	EGR control	P0402	EGR governor control deviation monitoring (high flow)
EGR system	EGR control	P240F	EGR slow response monitoring
EGR system	EGR cooler	P2457	Comparison of EGR cooler efficiency with a threshold
Exhaust gas sensors	NOx sensor downstream SCR	P220B	Plausibility check - comparison of NOx sensor downstream SCR supply voltage with ECU supply voltage
Exhaust gas sensors	NOx sensor downstream SCR	P229E	Driver stage check / signal range check - open circuit NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229E	Driver stage check / signal range check - short circuit NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	NOx sensor downstream SCR - feedback diagnosis
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - offset value - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - offset value - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - heater temperature

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	Physical range check - NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2200	Driver stage check / signal range check - open circuit NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2200	Driver stage check / signal range check - short circuit NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2201	NOx sensor upstream SCR - feedback diagnosis
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check- NOx sensor upstream SCR - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	Physical range check - NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR - offset value - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR - offset value - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR- heater temperature
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P220A	Plausibility check - comparison of NOx sensor upstream SCR supply voltage with ECU supply voltage
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	Plausibility check - NOx sensor upstream SCR - dynamic check
Exhaust gas sensors	O2 sensor	P24C2	Monitoring of lambda sensor dew point release

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - comparison of NOx sensor upstream SCR sensor signal and modeled NOx concentration upstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Stuck in Range check - NOx sensor downstream SCR - delta of NOx concentration
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Driver stage check / signal range check - PeelOff NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx-Sensor downstream SCR - gain check during engine afterrun
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx-Sensor downstream SCR - response time check for sensor acknowledge or sensor diagnosis feedback while the gain check during engine afterrun
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Driver stage check / signal range check - PeelOff NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P22F9	NOx sensor upstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from rich to lean
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	NOx sensor upstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for sgnal transition from lean to rich
Exhaust gas sensors	NOx sensor downstream SCR	P22FC	NOx sensor downstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from rich to lean
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	NOx sensor downstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from lean to rich
Oxidation catalyst	Oxidation catalyst	P0420	Oxidation catalyst - exotherm based HC conversion monitoring
SCR catalyst	Exhaust gas temperature control	P249C	Time to closed loop monitor for urea dosing strategy
SCR catalyst	SCR catalyst	P20EE	NOx conversion efficiency monitoring

Group	Component / System	Fault code	Monitoring strategy description
Urea dosing system	Urea dosing adaption	P20F5	Plausibility check - long term urea dosing adaption value - ouf of range high
Vehicle component protection	Vehicle component protection	P2463	Plausibility check - modeled particulate filter load (based on delta p signal) - out of range high
Exhaust gas sensors	O2 sensor	P2243	Signal range check - nernst voltage pin open circuit
Exhaust gas sensors	O2 sensor	P2237	Plausibility check - lambda sensor O2 concentration
Exhaust gas sensors	O2 sensor	P0130	Signal range check - open circuit
Exhaust gas sensors	O2 sensor	P014C	Plausibility check - response rate during rich to lean transition
Exhaust gas sensors	O2 sensor	P2231	Monitoring for crosstalk between lambda sensor heater control signal and O2 sensor signal
Exhaust gas sensors	O2 sensor	P0032	Driver stage check - short circuit to battery
Exhaust gas sensors	O2 sensor	P0031	Driver stage check - short circuit to ground
Exhaust gas sensors	O2 sensor	P0030	Driver stage check - open circuit
Exhaust gas sensors	O2 sensor	P0132	Signal range check - open circuit
Exhaust gas sensors	O2 sensor	P0131	Signal range check - short circuit to ground
Exhaust gas sensors	O2 sensor	P2195	Plausibility check - measured with calculated lambda signal during overrun
Exhaust gas sensors	O2 sensor	P2195	Plausibility check - measured with calculated lambda signal during part load
Exhaust gas sensors	O2 sensor	P2196	Plausibility check - measured with calculated lambda signal during overrun
Exhaust gas sensors	O2 sensor	P2196	Plausibility check - measured with calculated lambda signal during part load
Exhaust gas sensors	O2 sensor	P0135	Physical signal range check - lambda sensor temperature too high
Exhaust gas sensors	O2 sensor	P0135	Physical signal range check - lambda sensor temperature too low
Exhaust gas sensors	O2 sensor	P0132	Driver stage check - short circuit to battery

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	O2 sensor	P0131	Driver stage check - short circuit to ground
Engine position and speed determination	Crankshaft position sensor	P0335	Plausibility check - comparison of crankshaft signal and camshaft signal
Engine position and speed determination	Camshaft position sensor	P0340	Plausibility check - comparison of crankshaft signal and camshaft signal
Air induction system	Variable swirl valve actuator	P2008	Driver stage check - open circuit
Air induction system	Intake air pressure sensor	P012C	Signal range check - short circuit to ground / open circuit
Air induction system	Charge air temperature sensor downstream charge air cooler	P007C	Signal range check - short circuit to ground
Air induction system	Mass air flow sensor (MAF)	P0102	Signal range check - out of range low / open circuit
Pre glow system	Glow plug cylinder 1	P066A	Driver stage check - short circuit to ground glow plug cylinder 1 to 6
Pre glow system	Glow plug cylinder 2	P066C	Driver stage check - short circuit to ground glow plug cylinder 1 to 6
Pre glow system	Glow plug cylinder 3	P066E	Driver stage check - short circuit to ground glow plug cylinder 1 to 6
Pre glow system	Glow plug cylinder 4	P067A	Driver stage check - short circuit to ground glow plug cylinder 1 to 6
Pre glow system	Glow plug cylinder 5	P067C	Driver stage check - short circuit to ground glow plug cylinder 1 to 6
Pre glow system	Glow plug cylinder 6	P067E	Driver stage check - short circuit to ground glow plug cylinder 1 to 6
Pre glow system	Glow system control module	P052F	Signal range check - battery voltage at GPU out of range low
Fuel system	Cylinder 1 injector	P0201	Driver stage check - open circuit
Fuel system	Cylinder 2 injector	P0202	Driver stage check - open circuit
Fuel system	Cylinder 3 injector	P0203	Driver stage check - open circuit
Fuel system	Cylinder 4 injector	P0204	Driver stage check - open circuit
Fuel system	Cylinder 5 injector	P0205	Driver stage check - open circuit
Fuel system	Cylinder 6 injector	P0206	Driver stage check - open circuit
Fuel system	Fuel metering unit	P0251	Driver stage check - open circuit
Fuel system	Fuel rail pressure sensor	P0192	Signal range check - short circuit to ground / open circuit
Fuel system	Fuel temperature sensor	P0183	Signal range check - short circuit to battery / open circuit
EGR system	EGR valve actuator	P0403	Driver stage check - open circuit

Group	Component / System	Fault code	Monitoring strategy description
EGR system	Exhaust gas temperature sensor downstream EGR cooler	P040D	Signal range check - short circuit to battery / open circuit
Exhaust gas sensors	Differential pressure sensor	P2455	Signal range check - short circuit to battery
Exhaust gas sensors	Exhaust gas temperature sensor downstream oxidation catalyst	P242C	Signal range check - short circuit to ground
Exhaust gas sensors	Exhaust gas temperature sensor upstream oxidation catalyst	P2033	Signal range check - short circuit to battery / open circuit
Exhaust gas sensors	Exhaust gas temperature sensor upstream SCR	P2470	Signal range check - short circuit to ground
Exhaust gas sensors	Exhaust gas temperature sensor upstream turbocharger turbine	P0545	Signal range check - short circuit to ground
Urea dosing system	Urea supply pump	P208A	Driver stage check - open circuit
Urea dosing system	Urea dosing valve	P2047	Driver stage check - open circuit
Engine cooling system	Engine coolant thermostat	P0128	Plausibility check - comparison of measured ECT with modeled ECT
Engine cooling system	ECT sensor	P0117	Signal range check - short circuit to ground
Boost pressure system	Boost pressure sensor	P0237	Signal range check - short circuit to ground / open circuit
DCU	Reductant tank temperature sensor	P205C	Signal range check - short circuit to ground
TCU		P0562	System Voltage Low
J1699 dynamic		-	-

Cluster 3

Group	Component / System	Fault code	Monitoring strategy description
Misfire monitoring	Misfire detection	P0300	Misfire monitoring - multiple cylinder
Misfire monitoring	Misfire detection	P0301	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0302	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0303	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0304	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0305	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0306	Misfire monitoring - cylinder 1 to 6
Fuel system	Fuel rail pressure control	P0087	Fuel rail pressure too low
Fuel system	Fuel rail pressure control	P0087	Fuel rail pressure governor deviation error
Fuel system	Fuel rail pressure control	P0087	Governor control deviation monitoring
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure too high
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure governor deviation error
Fuel system	Fuel rail pressure control	P00C6	Monitor for fuel rail pressure insufficient for engine start
Fuel system	Lambda observer	P0171	Monitoring of lambda observer correction value
Fuel system	Lambda observer	P0172	Monitoring of lambda observer correction value
Fuel system	Zero fuel calibration	P015E	Back stop - monitoring of ZFC rail pressure enable conditions and Crankshaft adaption completion status
Boost pressure system	Charge air cooler	P026A	Comparison of charge air cooler efficiency with a threshold
Boost pressure system	Boost pressure control	P226C	Boost pressure slow response monitoring
Diesel particulate filter	DPF	P2002	Rationality check - monitoring of the DPF efficiency using particulate sensor
Diesel particulate filter	DPF	P226D	Plausibility check - detection of defective DPF using differential pressure sensor
Diesel particulate	DPF	P2459	DPF regeneration interval monitoring

Group	Component / System	Fault code	Monitoring strategy description
filter			
Diesel particulate filter	DPF	P24A2	DPF regeneration monitoring
Diesel particulate filter	Exhaust gas temperature control	P244C	Governor control deviation monitoring - measured exhaust gas temperature downstream oxidation catalyst too low
Diesel particulate filter	Exhaust gas temperature control	P244D	Governor control deviation monitoring - measured exhaust gas temperature downstream oxidation catalyst too high
EGR system	EGR control	P0401	EGR governor control deviation monitoring (low flow)
EGR system	EGR control	P02EC	EGR governor control deviation monitoring - plausibility check - comparison of measured mass air flow to modeled value
EGR system	EGR control	P0402	Plausibility check - pin pointing - comparison of measured EGR rate ratio between two fuel cut off phases with different demanded EGR valve positions
EGR system	EGR control	P240F	EGR slow response monitoring
EGR system	EGR cooler	P2457	Comparison of EGR cooler efficiency with a threshold
Exhaust gas sensors	NOx sensor downstream SCR	P220B	Plausibility check - comparison of NOx sensor downstream SCR supply voltage with ECU supply voltage
Exhaust gas sensors	NOx sensor downstream SCR	P229E	Driver stage check / signal range check - open circuit NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229E	Driver stage check / signal range check - short circuit NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	NOx sensor downstream SCR - feedback diagnosis
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - offset value - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - offset value - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - heater temperature

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	Physical range check - NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2200	Driver stage check / signal range check - open circuit NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2200	Driver stage check / signal range check - short circuit NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2201	NOx sensor upstream SCR - feedback diagnosis
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check- NOx sensor upstream SCR - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	Physical range check - NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR - offset value - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR - offset value - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR- heater temperature
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P220A	Plausibility check - comparison of NOx sensor upstream SCR supply voltage with ECU supply voltage
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	Plausibility check - NOx sensor upstream SCR - dynamic check
Exhaust gas sensors	NOx sensor upstream SCR	P24C2	Monitoring of NOx sensor upstream SCR dew point release
Exhaust gas sensors	PM sensor	P24AE	Signal range check of PM sensor IDE current - out of range high
Exhaust gas sensors	PM sensor	P24AF	Plausibility check - Comparison of PM sensor control unit supply voltage to ECU supply voltage
Exhaust gas sensors	PM sensor	P24AF	Plausibility check - PM sensor control unit to ECU
Exhaust gas sensors	PM sensor	P24AF	Comparison of IDE-current at high temperature (during sensor regeneration)

Group	Component / System	Fault code	Monitoring strategy description
			with threshold Note: This monitor detects open circuit failures on DIE-pos and IDE-neg and short circuit to ground on IDE-neg
Exhaust gas sensors	PM sensor	P24AF	Signal range check of PM sensor IDE-neg connection - short circuit to battery
Exhaust gas sensors	PM sensor	P24AF	Signal range check of PM sensor IDE-neg connection - short circuit to battery
Exhaust gas sensors	PM sensor	P24AF	Signal range check IDE-pos voltage - out of range low / out of range high
Exhaust gas sensors	PM sensor	P24B4	PM sensor heater monitoring - circuit performance
Exhaust gas sensors	PM sensor	P24B5	PM sensor heater monitoring - short circuit to ground / open circuit
Exhaust gas sensors	PM sensor	P24B6	PM sensor heater monitoring - short circuit to battery
Exhaust gas sensors	PM sensor	P24B7	Rationality check of PM sensor heater resistance Note: This monitor runs once per driving cycle after ignition on
Exhaust gas sensors	PM sensor	P24C6	Signal range check PM sensor temperature sensor - out of range high / out of range low
Exhaust gas sensors	PM sensor	P24C7	Plausibility check - comparison of measured PM sensor temperature to average of exhaust gas temperature sensor values
Exhaust gas sensors	PM sensor	P24C7	Plausibility check - comparison of measured PM sensor temperature to average of exhaust temperature sensor values
Exhaust gas sensors	PM sensor	P24DA	Monitoring of PM sensor protection tube - detection of changes in heater voltage required to maintain constant sensor temperature
Exhaust gas sensors	PM sensor	U02A3	CAN communication monitoring - PM sensor control unit
Exhaust gas sensors	PM sensor	U04A4	Plausibility check of PM sensor sensitivity calibration factor - detection of wrong or manipulated signal
Boost pressure system	Boost pressure control	P0234	Governor control deviation monitoring at part load - overboost
Boost pressure system	Boost pressure control	P0299	Governor control deviation monitoring at part load - underboost
Exhaust gas	NOx sensor	P2201	Plausibility check - comparison of NOx

Group	Component / System	Fault code	Monitoring strategy description
sensors	upstream SCR		sensor upstream SCR sensor signal and modeled NOx concentration upstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Stuck in Range check - NOx sensor downstream SCR - delta of NOx concentration
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	NOx sensor downstream SCR deadcycle detection - comparison of measured lambda from NOx sensor to modeled lambda for signal delay from lean to rich
Exhaust gas sensors	NOx sensor downstream SCR	P22FC	NOx sensor downstream SCR deadcycle detection - comparison of measured lambda from NOx sensor to modeled lambda for signal delay from rich to lean
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	NOx sensor upstream SCR deadcycle detection - comparison of measured lambda from NOx sensor to modeled lambda for sgnal delay from lean to rich
Exhaust gas sensors	NOx sensor upstream SCR	P22F9	NOx sensor upstream SCR deadcycle detection - comparison of measured lambda from NOx sensor to modeled lambda for signal delay from rich to lean
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Driver stage check / plausibility check - peel off NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx-Sensor downstream SCR - gain check during engine afterrun
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - response time check for sensor acknowledge or sensor diagnosis feedback of gain check during engine afterrun
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Driver stage check / signal range check - PeelOff NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P22F9	Removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from rich to lean
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	Removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from lean to rich
Exhaust gas sensors	NOx sensor downstream SCR	P22FC	Removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from

Group	Component / System	Fault code	Monitoring strategy description
			rich to lean
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	Removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from lean to rich
Oxidation catalyst	Oxidation catalyst	P0420	Oxidation catalyst - exotherm based HC conversion monitoring
SCR catalyst	Exhaust gas temperature control	P249C	Time to closed loop monitor for urea dosing strategy
SCR catalyst	Exhaust gas temperature control	P249C	Time to closed loop monitor for urea dosing strategy
SCR catalyst	SCR catalyst	P20EE	NOx conversion efficiency monitoring
Urea dosing system	Urea dosing adaption	P20F5	Plausibility check - long term urea dosing adaption value - ouf of range high
Vehicle component protection	Vehicle component protection	P2463	Plausibility check - modeled particulate filter load (based on delta p signal) - out of range high
Exhaust gas sensors	PM sensor	P24D1	Monitoring of PM sensor regeneration – detection of incomplete PM sensor regeneration
Exhaust gas sensors	O2 sensor	P2243	Signal range check - nernst voltage pin open circuit
Exhaust gas sensors	O2 sensor	P2237	Plausibility check - lambda sensor O2 concentration
Exhaust gas sensors	O2 sensor	P0130	Signal range check - open circuit
Exhaust gas sensors	O2 sensor	P014C	Plausibility check - response rate during rich to lean transition
Exhaust gas sensors	O2 sensor	P2231	Monitoring for crosstalk between lambda sensor heater control signal and O2 sensor signal
Exhaust gas sensors	O2 sensor	P0032	Driver stage check - short circuit to battery
Exhaust gas sensors	O2 sensor	P0031	Driver stage check - short circuit to ground
Exhaust gas sensors	O2 sensor	P0030	Driver stage check - open circuit
Exhaust gas sensors	O2 sensor	P0132	Signal range check - out of range high
Exhaust gas sensors	O2 sensor	P0131	Signal range check - out of range low
Exhaust gas sensors	O2 sensor	P2195	Plausibility check - measured with calculated lambda signal during overrun
Exhaust gas	O2 sensor	P2195	Plausibility check - measured with

Group	Component / System	Fault code	Monitoring strategy description
sensors			calculated lambda signal during part load
Exhaust gas sensors	O2 sensor	P2196	Plausibility check - measured with calculated lambda signal during overrun
Exhaust gas sensors	O2 sensor	P2196	Plausibility check - measured with calculated lambda signal during part load
Exhaust gas sensors	O2 sensor	P0135	Physical signal range check - lambda sensor temperature too high
Exhaust gas sensors	O2 sensor	P0135	Physical signal range check - lambda sensor temperature too low
Exhaust gas sensors	O2 sensor	P0132	Driver stage check - short circuit to battery
Exhaust gas sensors	O2 sensor	P0131	Driver stage check - short circuit to ground
Engine position and speed determination	Crankshaft position sensor	P0335	Plausibility check - comparison of crankshaft signal and camshaft signal
Engine position and speed determination	Camshaft position sensor	P0340	Plausibility check - comparison of crankshaft signal and camshaft signal
Air induction system	Variable swirl valve actuator	P2008	Driver stage check - open circuit
Air induction system	Intake air pressure sensor	P012C	Signal range check - short circuit to ground / open circuit
Air induction system	Charge air temperature sensor downstream charge air cooler	P007C	Signal range check - short circuit to ground
Air induction system	Mass air flow sensor (MAF)	P0102	Signal range check - out of range low / open circuit
Pre glow system	Glow plug cylinder 1	P066A	Driver stage check - short circuit to ground glow plug cylinder 1 to 4 6
Pre glow system	Glow plug cylinder 2	P066C	Driver stage check - short circuit to ground glow plug cylinder 1 to 4 6
Pre glow system	Glow plug cylinder 3	P066E	Driver stage check - short circuit to ground glow plug cylinder 1 to 4 6
Pre glow system	Glow plug cylinder 4	P067A	Driver stage check - short circuit to ground glow plug cylinder 1 to 4 6
Pre glow system	Glow plug cylinder 5	P067C	Driver stage check - short circuit to ground glow plug cylinder 1 to 6
Pre glow system	Glow plug cylinder 6	P067E	Driver stage check - short circuit to ground glow plug cylinder 1 to 6
Pre glow system	Glow system control module	P052F	Signal range check - battery voltage at GPU out of range low
Fuel system	Cylinder 1 injector	P0201	Driver stage check - open circuit

Group	Component / System	Fault code	Monitoring strategy description
Fuel system	Cylinder 2 injector	P0202	Driver stage check - open circuit
Fuel system	Cylinder 3 injector	P0203	Driver stage check - open circuit
Fuel system	Cylinder 4 injector	P0204	Driver stage check - open circuit
Fuel system	Cylinder 5 injector	P0205	Driver stage check - open circuit
Fuel system	Cylinder 6 injector	P0206	Driver stage check - open circuit
Fuel system	Fuel metering unit	P0251	Driver stage check - open circuit
Fuel system	Fuel rail pressure sensor	P0192	Signal range check - short circuit to ground
Fuel system	Fuel temperature sensor	P0183	Signal range check - short circuit to battery / open circuit
EGR system	EGR valve actuator	P0403	Driver stage check - open circuit
EGR system	Exhaust gas temperature sensor downstream EGR cooler	P040D	Signal range check - short circuit to battery / open circuit
Exhaust gas sensors	Differential pressure sensor	P2455	Signal range check - short circuit to battery
Exhaust gas sensors	Exhaust gas temperature sensor downstream oxidation catalyst	P242C	Signal range check - short circuit to ground
Exhaust gas sensors	Exhaust gas temperature sensor upstream oxidation catalyst	P2033	Signal range check - short circuit to battery / open circuit
Exhaust gas sensors	Exhaust gas temperature sensor upstream SCR	P2470	Signal range check - short circuit to ground
Exhaust gas sensors	Exhaust gas temperature sensor upstream turbocharger turbine	P0545	Signal range check - short circuit to ground
Urea dosing system	Urea supply pump	P208A	Driver stage check - open circuit
Urea dosing system	Urea dosing valve	P2047	Driver stage check - open circuit
Engine cooling system	Engine coolant thermostat	P0128	Plausibility check - comparison of measured ECT with modeled ECT
Engine cooling system	ECT sensor	P0117	Signal range check - short circuit to ground
Boost pressure system	Boost pressure sensor	P0237	Signal range check - short circuit to ground / open circuit
Exhaust gas	Exhaust gas	P0472	Signal range check - short circuit to

Group	Component / System	Fault code	Monitoring strategy description
sensors	pressure sensor upstream turbocharger turbine		ground / open circuit
Air induction system	Throttle valve actuator	P2100	Driver stage check - open circuit
Fuel system	Fuel rail pressure control valve	P0090	Driver stage check - open circuit
Air induction system	Charge air temperature sensor downstream charge air cooler	P007C	Signal range check - short circuit to ground
Vehicle speed	Vehicle speed	C0031	Signal range check / plausibility check - wheel speed sensor signals
Vehicle speed	Vehicle speed	C0034	Signal range check / plausibility check - wheel speed sensor signals
Vehicle speed	Vehicle speed	C0037	Signal range check / plausibility check - wheel speed sensor signals
Vehicle speed	Vehicle speed	C003A	Signal range check / plausibility check - wheel speed sensor signals
DCU	Reductant tank temperature sensor	P205C	Signal range check - short circuit to ground
TCU	System Voltage	P0562	range check - low
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Cluster 4

Group	Component / System	Fault code	Monitoring strategy description
Misfire monitoring	Misfire detection	P0300	Misfire monitoring - multiple cylinder
Misfire monitoring	Misfire detection	P0301	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0302	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0303	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0304	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0305	Misfire monitoring - cylinder 1 to 6
Misfire monitoring	Misfire detection	P0306	Misfire monitoring - cylinder 1 to 6
Fuel system	Fuel rail pressure control	P0087	Fuel rail pressure too low
Fuel system	Fuel rail pressure control	P0087	Fuel rail pressure governor deviation error
Fuel system	Fuel rail pressure control	P0087	Governor control deviation monitoring
Fuel system	Fuel rail pressure control	P0087	Governor control deviation monitoring
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure too high
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure - metering unit stuck
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure governor deviation error
Fuel system	Fuel rail pressure control	P00C6	Monitor for fuel rail pressure insufficient for engine start
Fuel system	Fuel rail pressure control	P053F	Fuel rail pressure governor deviation error during CSERS
Fuel system	Fuel rail pressure control	P05XX	Fuel rail pressure governor deviation error during CSERS
Fuel system	Lambda observer	P0171	Monitoring of lambda observer correction value
Fuel system	Lambda observer	P0172	Monitoring of lambda observer correction value
Fuel system	Zero fuel calibration	P2292	Back stop - monitoring of ZFC rail pressure enable conditions
Boost pressure system	Charge air cooler	P026A	Comparison of charge air cooler efficiency with a threshold

Group	Component / System	Fault code	Monitoring strategy description
Boost pressure system	Boost pressure control	P226C	Boost pressure slow response monitoring
Diesel particulate filter	DPF	P2002	Rationality check - monitoring of the DPF efficiency using particulate sensor
Diesel particulate filter	DPF	P226D	Plausibility check - detection of defective DPF using differential pressure sensor
Diesel particulate filter	DPF	P2459	DPF regeneration interval monitoring
Diesel particulate filter	DPF	P24A2	DPF regeneration monitoring
Diesel particulate filter	Exhaust gas temperature control	P244C	Governor control deviation monitoring - measured exhaust gas temperature downstream oxidation catalyst too low
Diesel particulate filter	Exhaust gas temperature control	P244D	Governor control deviation monitoring - measured exhaust gas temperature downstream oxidation catalyst too high
EGR system	EGR control	P0401	EGR governor control deviation monitoring (low flow)
EGR system	EGR control	P02EC	EGR governor control deviation monitoring (high flow)
EGR system	EGR control	P04DD	EGR governor control deviation during cold start (low flow)
EGR system	EGR control	P02EC	EGR governor control deviation during cold start (high flow)
EGR system	EGR control	P240F	EGR slow response monitoring
EGR system	EGR cooler	P2457	Comparison of EGR cooler efficiency with a threshold
Exhaust gas sensors	NOx sensor downstream SCR	P220B	Plausibility check - comparison of NOx sensor downstream SCR supply voltage with ECU supply voltage
Exhaust gas sensors	NOx sensor downstream SCR	P229E	Driver stage check / signal range check - open circuit NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229E	Driver stage check / signal range check - short circuit NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	NOx sensor downstream SCR - feedback diagnosis
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - offset value - out of range high

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - offset value - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - heater temperature
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	Physical range check - NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2200	Driver stage check / signal range check - open circuit NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2200	Driver stage check / signal range check - short circuit NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2201	NOx sensor upstream SCR - feedback diagnosis
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check- NOx sensor upstream SCR - out of range low
Exhaust gas sensors	NOx sensor upstream SCR		
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	Physical range check - NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR - offset value - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR - offset value - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR- heater temperature
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P220A	Plausibility check - comparison of NOx sensor upstream SCR supply voltage with ECU supply voltage
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	Plausibility check - NOx sensor upstream SCR - dynamic check
Exhaust gas sensors	O2 sensor	P24C2	Monitoring of lambda sensor dew point release
Exhaust gas sensors	PM sensor	P24AE	Signal range check of PM sensor IDE current - out of range high

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	PM sensor	P24AF	Plausibility check - Comparison of PM sensor control unit supply voltage to ECU supply voltage
Exhaust gas sensors	PM sensor	P24AF	Plausibility check - PM sensor control unit to ECU
Exhaust gas sensors	PM sensor	P24AF	Comparison of IDE-current at high temperature (during sensor regeneration) with threshold Note: This monitor detects open circuit failures on DIE-pos and IDE-neg and short circuit to ground on IDE-neg
Exhaust gas sensors	PM sensor	P24AF	Signal range check of PM sensor IDE-neg connection - short circuit to battery
Exhaust gas sensors	PM sensor	P24AF	Signal range check of PM sensor IDE-neg connection - short circuit to battery
Exhaust gas sensors	PM sensor	P24AF	Signal range check IDE-pos voltage - out of range low / out of range high
Exhaust gas sensors	PM sensor	P24B5	PM sensor heater monitoring - short circuit to ground / open circuit
Exhaust gas sensors	PM sensor	P24B6	PM sensor heater monitoring - short circuit to battery
Exhaust gas sensors	PM sensor	P24B7	Rationality check of PM sensor heater resistance Note: This monitor runs once per driving cycle after ignition on
Exhaust gas sensors	PM sensor	P24C6	Signal range check PM sensor temperature sensor - out of range high / out of range low
Exhaust gas sensors	PM sensor	P24C7	Plausibility check - comparison of measured PM sensor temperature to average of exhaust gas temperature sensor values
Exhaust gas sensors	PM sensor	P24C7	Plausibility check - comparison of measured PM sensor temperature to average of exhaust temperature sensor values
Exhaust gas sensors	PM sensor	P24DA	Monitoring of PM sensor protection tube - detection of changes in heater voltage required to maintain constant sensor temperature
Exhaust gas sensors	PM sensor	U02A3	CAN communication monitoring - PM sensor control unit
Exhaust gas sensors	PM sensor	U04A4	Plausibility check of PM sensor sensitivity calibration factor - detection of wrong or manipulated signal

Group	Component / System	Fault code	Monitoring strategy description
Boost pressure system	Boost pressure control	P0234	Negative governor deviation monitoring at part load
Boost pressure system	Boost pressure control	P0299	Positive governor deviation monitoring at part load
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - comparison of NOx sensor upstream SCR sensor signal and modeled NOx concentration upstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Stuck in Range check - NOx sensor downstream SCR - delta of NOx concentration
Boost pressure system	Boost pressure control	P0234	Negative governor deviation monitoring at part load during rapid heat up mode
Boost pressure system	Boost pressure control	P0299	Positive governor deviation monitoring at part load during rapid heat up mode
Boost pressure system	Boost pressure control	P0234	Governor control deviation monitoring - overboost
Boost pressure system	Boost pressure control	P0299	Governor control deviation monitoring - underboost
Fuel system	Fuel rail pressure control	P053F	Fuel rail pressure governor deviation error during CSERS
Exhaust gas sensors	NOx sensor downstream SCR		
Exhaust gas sensors	NOx sensor downstream SCR		
Exhaust gas sensors	NOx sensor upstream SCR		
Exhaust gas sensors	NOx sensor upstream SCR		
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Driver stage check / signal range check - PeelOff NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx-Sensor downstream SCR - gain check during engine afterrun
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx-Sensor downstream SCR - response time check for sensor acknowledge or sensor diagnosis feedback while the gain check during engine afterrun
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Driver stage check / signal range check - PeelOff NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P22F9	NOx sensor upstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled

Group	Component / System	Fault code	Monitoring strategy description
			lambda for signal transition from rich to lean
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	NOx sensor upstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for sgnal transition from lean to rich
Exhaust gas sensors	NOx sensor downstream SCR	P22FC	NOx sensor downstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from rich to lean
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	NOx sensor downstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from lean to rich
Oxidation catalyst	Oxidation catalyst	P0420	Oxidation catalyst - exotherm based HC conversion monitoring
SCR catalyst	Exhaust gas temperature control	P249C	Time to closed loop monitor for urea dosing strategy
SCR catalyst	SCR catalyst	P20EE	NOx conversion efficiency monitoring
Urea dosing system	Urea dosing adaption	P20F5	Plausibility check - long term urea dosing adaption value - ouf of range high
Vehicle component protection	Vehicle component protection	P2463	Plausibility check - modeled particulate filter load (based on delta p signal) - out of range high
Exhaust gas sensors	PM sensor	P24D1	Monitoring of PM sensor regeneration – detection of incomplete PM sensor regeneration
Exhaust gas sensors	O2 sensor	P2243	Signal range check - nernst voltage pin open circuit
Exhaust gas sensors	O2 sensor	P2237	Plausibility check - lambda sensor O2 concentration
Exhaust gas sensors	O2 sensor	P0130	Signal range check - open circuit
Exhaust gas sensors	O2 sensor	P014C	Plausibility check - response rate during rich to lean transition
Exhaust gas sensors	O2 sensor	P2231	Monitoring for crosstalk between lambda sensor heater control signal and O2 sensor signal
Exhaust gas sensors	O2 sensor	P0032	Driver stage check - short circuit to battery

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	O2 sensor	P0031	Driver stage check - short circuit to ground
Exhaust gas sensors	O2 sensor	P0030	Driver stage check - open circuit
Exhaust gas sensors	O2 sensor	P0132	Signal range check - open circuit
Exhaust gas sensors	O2 sensor	P0131	Signal range check - short circuit to ground
Exhaust gas sensors	O2 sensor	P2195	Plausibility check - measured with calculated lambda signal during overrun
Exhaust gas sensors	O2 sensor	P2195	Plausibility check - measured with calculated lambda signal during part load
Exhaust gas sensors	O2 sensor	P2196	Plausibility check - measured with calculated lambda signal during overrun
Exhaust gas sensors	O2 sensor	P2196	Plausibility check - measured with calculated lambda signal during part load
Exhaust gas sensors	O2 sensor	P0135	Physical signal range check - lambda sensor temperature too high
Exhaust gas sensors	O2 sensor	P0135	Physical signal range check - lambda sensor temperature too low
Exhaust gas sensors	O2 sensor	P0132	Driver stage check - short circuit to battery
Exhaust gas sensors	O2 sensor	P0131	Driver stage check - short circuit to ground
Engine position and speed determination	Crankshaft position sensor	P0335	Plausibility check - comparison of crankshaft signal and camshaft signal
Engine position and speed determination	Camshaft position sensor	P0340	Plausibility check - comparison of crankshaft signal and camshaft signal
Air induction system	Variable swirl valve actuator	P2008	Driver stage check - open circuit
Air induction system	Intake air pressure sensor	P012C	Signal range check - short circuit to ground / open circuit
Air induction system	Charge air temperature sensor downstream charge air cooler	P007C	Signal range check - short circuit to ground
Air induction system	Charge air temperature sensor upstream charge air cooler	P0097	Signal range check - short circuit to ground
Air induction system	Mass air flow sensor (MAF)	P0102	Signal range check - out of range low / open circuit

Group	Component / System	Fault code	Monitoring strategy description
Pre glow system	Glow plug cylinder 1	P066A	Driver stage check - short circuit to ground glow plug cylinder 1 to 4
Pre glow system	Glow plug cylinder 2	P066C	Driver stage check - short circuit to ground glow plug cylinder 1 to 4
Pre glow system	Glow plug cylinder 3	P066E	Driver stage check - short circuit to ground glow plug cylinder 1 to 4
Pre glow system	Glow plug cylinder 4	P067A	Driver stage check - short circuit to ground glow plug cylinder 1 to 4
Pre glow system	Glow system control module	P052F	Signal range check - battery voltage at GPU out of range low
Fuel system	Cylinder 1 injector	P0201	Driver stage check - open circuit
Fuel system	Cylinder 2 injector	P0202	Driver stage check - open circuit
Fuel system	Cylinder 3 injector	P0203	Driver stage check - open circuit
Fuel system	Cylinder 4 injector	P0204	Driver stage check - open circuit
Fuel system	Fuel metering unit	P0251	Driver stage check - open circuit
Fuel system	Fuel rail pressure sensor	P0192	Signal range check - short circuit to ground / open circuit
Fuel system	Fuel temperature sensor	P0183	Signal range check - short circuit to battery / open circuit
EGR system	EGR valve actuator	P0403	Driver stage check - open circuit
EGR system	Exhaust gas temperature sensor downstream EGR cooler	P040D	Signal range check - short circuit to battery / open circuit
Exhaust gas sensors	Differential pressure sensor	P2455	Signal range check - short circuit to battery
Exhaust gas sensors	Exhaust gas temperature sensor downstream oxidation catalyst	P242C	Signal range check - short circuit to ground
Exhaust gas sensors	Exhaust gas temperature sensor upstream oxidation catalyst	P2033	Signal range check - short circuit to battery / open circuit
Exhaust gas sensors	Exhaust gas temperature sensor upstream SCR	P2470	Signal range check - short circuit to ground
Exhaust gas sensors	Exhaust gas temperature sensor upstream turbocharger turbine	P0545	Signal range check - short circuit to ground
Urea dosing system	Urea supply pump	P208A	Driver stage check - open circuit

Group	Component / System	Fault code	Monitoring strategy description
Urea dosing system	Urea dosing valve	P2047	Driver stage check - open circuit
Engine cooling system	Engine coolant thermostat	P0128	Plausibility check - comparison of measured ECT with modeled ECT
Engine cooling system	ECT sensor	P0117	Signal range check - short circuit to ground
Boost pressure system	Boost pressure sensor	P0237	Signal range check - short circuit to ground / open circuit
DCU	Reductant tank temperature sensor	P205C	Signal range check - short circuit to ground
TCU		P0562	System Voltage Low
J1699 dynamic		-	-

Cluster 5

Group	Component / System	Fault code	Monitoring strategy description
Misfire monitoring	Misfire detection	P0300	Misfire monitoring - multiple cylinder
Misfire monitoring	Misfire detection	P0301	Misfire monitoring - cylinder 1 to 4
Misfire monitoring	Misfire detection	P0302	Misfire monitoring - cylinder 1 to 4
Misfire monitoring	Misfire detection	P0303	Misfire monitoring - cylinder 1 to 4
Misfire monitoring	Misfire detection	P0304	Misfire monitoring - cylinder 1 to 4
Fuel system	Fuel rail pressure control	P0087	Fuel rail pressure too low
Fuel system	Fuel rail pressure control	P0087	Fuel rail pressure governor deviation error
Fuel system	Fuel rail pressure control	P0087	Governor control deviation monitoring
Fuel system	Fuel rail pressure control	P0087	Governor control deviation monitoring
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure too high
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure - metering unit stuck
Fuel system	Fuel rail pressure control	P0088	Fuel rail pressure governor deviation error
Fuel system	Fuel rail pressure control	P00C6	Monitor for fuel rail pressure insufficient for engine start
Fuel system	Fuel rail pressure control	P053F	Fuel rail pressure governor deviation error during CSERS
Fuel system	Lambda observer	P0171	Monitoring of lambda observer correction value
Fuel system	Lambda observer	P0172	Monitoring of lambda observer correction value
Fuel system	Zero fuel calibration	P2292	Back stop - monitoring of ZFC rail pressure enable conditions
EGR system	Charge air cooler	P026A	Comparison of charge air cooler efficiency with a threshold
Boost pressure system	Boost pressure control	P226C	Boost pressure slow response monitoring
Diesel particulate filter	DPF	P2002	Rationality check - monitoring of the DPF efficiency using particulate sensor
Diesel particulate filter	DPF	P226D	Plausibility check - detection of defective DPF using differential pressure sensor

Group	Component / System	Fault code	Monitoring strategy description
Diesel particulate filter	DPF	P2459	DPF regeneration interval monitoring
Diesel particulate filter	DPF	P24A2	DPF regeneration monitoring
Diesel particulate filter	Exhaust gas temperature control	P244C	Governor control deviation monitoring - measured exhaust gas temperature downstream oxidation catalyst too low
Diesel particulate filter	Exhaust gas temperature control	P244D	Governor control deviation monitoring - measured exhaust gas temperature downstream oxidation catalyst too high
EGR system	EGR control	P02EC	EGR governor control deviation monitoring (low flow)
EGR system	EGR control	P0402	EGR governor control deviation monitoring (high flow)
EGR system	EGR control	P02EC	EGR governor control deviation during cold start (low flow)
EGR system	EGR control	P04DE	EGR governor control deviation during cold start (high flow)
EGR system	EGR control	P240F	EGR slow response monitoring
EGR system	EGR cooler	P2457	Comparison of EGR cooler efficiency with a threshold
Exhaust gas sensors	NOx sensor downstream SCR	P220B	Plausibility check - comparison of NOx sensor downstream SCR supply voltage with ECU supply voltage
Exhaust gas sensors	NOx sensor downstream SCR	P229E	Driver stage check / signal range check - open circuit NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229E	Driver stage check / signal range check - short circuit NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	NOx sensor downstream SCR - feedback diagnosis
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - offset value - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - offset value - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx sensor downstream SCR - heater temperature

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range high
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Physical signal range check - NOx sensor downstream SCR - out of range low
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	Physical range check - NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2200	Driver stage check / signal range check - open circuit NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2200	Driver stage check / signal range check - short circuit NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P2201	NOx sensor upstream SCR - feedback diagnosis
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check- NOx sensor upstream SCR - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR - offset value - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR - offset value - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - NOx sensor upstream SCR- heater temperature
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range high
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Physical signal range check - NOx sensor upstream SCR - out of range low
Exhaust gas sensors	NOx sensor upstream SCR	P220A	Plausibility check - comparison of NOx sensor upstream SCR supply voltage with ECU supply voltage
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	Plausibility check - NOx sensor upstream SCR - dynamic check
Exhaust gas sensors	NOx sensor	P24C2	Monitoring of lambda sensor dew point release
Exhaust gas sensors	PM sensor	P24AE	Signal range check of PM sensor IDE current - out of range high
Exhaust gas sensors	PM sensor	P24AF	Plausibility check - Comparison of PM sensor control unit supply voltage to ECU supply voltage
Exhaust gas sensors	PM sensor	P24AF	Plausibility check - PM sensor control unit to ECU
Exhaust gas sensors	PM sensor	P24AF	Comparison of IDE-current at high temperature (during sensor regeneration) with threshold Note: This monitor detects open circuit failures on DIE-pos and IDE-

Group	Component / System	Fault code	Monitoring strategy description
			neg and short circuit to ground on IDE-neg
Exhaust gas sensors	PM sensor	P24AF	Signal range check of PM sensor IDE-neg connection - short circuit to battery
Exhaust gas sensors	PM sensor	P24AF	Signal range check of PM sensor IDE-neg connection - short circuit to battery
Exhaust gas sensors	PM sensor	P24AF	Signal range check IDE-pos voltage - out of range low / out of range high
Exhaust gas sensors	PM sensor	P24B5	PM sensor heater monitoring - short circuit to ground / open circuit
Exhaust gas sensors	PM sensor	P24B6	PM sensor heater monitoring - short circuit to battery
Exhaust gas sensors	PM sensor	P24B7	Rationality check of PM sensor heater resistance Note: This monitor runs once per driving cycle after ignition on
Exhaust gas sensors	PM sensor	P24C6	Signal range check PM sensor temperature sensor - out of range high / out of range low
Exhaust gas sensors	PM sensor	P24C7	Plausibility check - comparison of measured PM sensor temperature to average of exhaust gas temperature sensor values
Exhaust gas sensors	PM sensor	P24C7	Plausibility check - comparison of measured PM sensor temperature to average of exhaust temperature sensor values
Exhaust gas sensors	PM sensor	P24DA	Monitoring of PM sensor protection tube - detection of changes in heater voltage required to maintain constant sensor temperature
Exhaust gas sensors	PM sensor	U02A3	CAN communication monitoring - PM sensor control unit
Exhaust gas sensors	PM sensor	U04A4	Plausibility check of PM sensor sensitivity calibration factor - detection of wrong or manipulated signal
Boost pressure system	Boost pressure control	P0234	Negative governor deviation monitoring at part load
Boost pressure system	Boost pressure control	P0299	Positive governor deviation monitoring at part load
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Plausibility check - comparison of NOx sensor upstream SCR sensor signal and modeled NOx concentration upstream SCR

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Stuck in Range check - NOx sensor downstream SCR - delta of NOx concentration
Boost pressure system	Boost pressure control	P0234	Negative governor deviation monitoring at part load during rapid heat up mode
Boost pressure system	Boost pressure control	P0299	Positive governor deviation monitoring at part load during rapid heat up mode
Fuel system	Fuel rail pressure control	P053F	Fuel rail pressure governor deviation error during CSERS
Exhaust gas sensors	NOx sensor upstream SCR	P225C	Plausibility check - comparison of measured signal with calculated O2 concentration value during partial load
Exhaust gas sensors	NOx sensor upstream SCR	P225C	Plausibility check - comparison of measured signal with calculated O2 concentration value during fuel cut
Exhaust gas sensors	NOx sensor upstream SCR	P225D	Plausibility check - comparison of measured signal with calculated O2 concentration value during partial load
Exhaust gas sensors	NOx sensor upstream SCR	P225D	Plausibility check - comparison of measured signal with calculated O2 concentration value during fuel cut
Exhaust gas sensors	NOx sensor upstream SCR	P2201	Driver stage check / signal range check - PeelOff NOx sensor upstream SCR
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx-Sensor downstream SCR - gain check during engine afterrun
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Plausibility check - NOx-Sensor downstream SCR - response time check for sensor acknowledge or sensor diagnosis feedback while the gain check during engine afterrun
Exhaust gas sensors	NOx sensor downstream SCR	P229F	Driver stage check / signal range check - PeelOff NOx sensor downstream SCR
Exhaust gas sensors	NOx sensor upstream SCR	P22F9	NOx sensor upstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from rich to lean
Exhaust gas sensors	NOx sensor upstream SCR	P22FA	NOx sensor upstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for sgnal transition from lean to rich

Group	Component / System	Fault code	Monitoring strategy description
Exhaust gas sensors	NOx sensor downstream SCR	P22FC	NOx sensor downstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from rich to lean
Exhaust gas sensors	NOx sensor downstream SCR	P22FD	NOx sensor downstream SCR removal detection - comparison of measured lambda from NOx sensor to modeled lambda for signal transition from lean to rich
Oxidation catalyst	Oxidation catalyst	P0420	Oxidation catalyst - exotherm based HC conversion monitoring
SCR catalyst	Exhaust gas temperature control	P249C	Time to closed loop monitor for urea dosing strategy
SCR catalyst	SCR catalyst	P20EE	NOx conversion efficiency monitoring
Urea dosing system	Urea dosing adaption	P20F5	Plausibility check - long term urea dosing adaption value - ouf of range high
Vehicle component protection	Vehicle component protection	P2463	Plausibility check - modeled particulate filter load (based on delta p signal) - out of range high
Exhaust gas sensors	PM sensor	P24D1	Monitoring of PM sensor regeneration – detection of incomplete PM sensor regeneration
Engine position and speed determination	Crankshaft position sensor	P0335	Plausibility check - comparison of crankshaft signal and camshaft signal
Engine position and speed determination	Camshaft position sensor	P0340	Plausibility check - comparison of crankshaft signal and camshaft signal
Air induction system	Variable swirl valve actuator	P2008	Driver stage check - open circuit
Air induction system	Intake air pressure sensor	P012C	Signal range check - short circuit to ground / open circuit
Air induction system	Charge air temperature sensor downstream charge air cooler	P007C	Signal range check - short circuit to ground
Air induction system	Charge air temperature sensor upstream charge air cooler	P0097	Signal range check - short circuit to ground
Air induction system	Mass air flow sensor (MAF)	P0102	Signal range check - out of range low / open circuit

Group	Component / System	Fault code	Monitoring strategy description
Pre glow system	Glow plug cylinder 1	P066A	Driver stage check - short circuit to ground glow plug cylinder 1 to 4
Pre glow system	Glow plug cylinder 2	P066C	Driver stage check - short circuit to ground glow plug cylinder 1 to 4
Pre glow system	Glow plug cylinder 3	P066E	Driver stage check - short circuit to ground glow plug cylinder 1 to 4
Pre glow system	Glow plug cylinder 4	P067A	Driver stage check - short circuit to ground glow plug cylinder 1 to 4
Pre glow system	Glow system control module	P052F	Signal range check - battery voltage at GPU out of range low
Fuel system	Cylinder 1 injector	P0201	Driver stage check - open circuit
Fuel system	Cylinder 2 injector	P0202	Driver stage check - open circuit
Fuel system	Cylinder 3 injector	P0203	Driver stage check - open circuit
Fuel system	Cylinder 4 injector	P0204	Driver stage check - open circuit
Fuel system	Fuel metering unit	P0251	Driver stage check - open circuit
Fuel system	Fuel rail pressure sensor	P0192	Signal range check - short circuit to ground / open circuit
Fuel system	Fuel temperature sensor	P0183	Signal range check - short circuit to battery / open circuit
EGR system	EGR valve actuator	P0403	Driver stage check - open circuit
EGR system	Exhaust gas temperature sensor downstream EGR cooler	P040D	Signal range check - short circuit to battery / open circuit
Exhaust gas sensors	Differential pressure sensor	P2455	Signal range check - short circuit to battery
Exhaust gas sensors	Exhaust gas temperature sensor downstream oxidation catalyst	P242C	Signal range check - short circuit to ground
Exhaust gas sensors	Exhaust gas temperature sensor upstream oxidation catalyst	P2033	Signal range check - short circuit to battery / open circuit
Exhaust gas sensors	Exhaust gas temperature sensor upstream SCR	P2470	Signal range check - short circuit to ground
Exhaust gas sensors	Exhaust gas temperature sensor upstream turbocharger turbine	P0545	Signal range check - short circuit to ground
Urea dosing system	Urea supply pump	P208A	Driver stage check - open circuit

Group	Component / System	Fault code	Monitoring strategy description
Urea dosing system	Urea dosing valve	P2047	Driver stage check - open circuit
Engine cooling system	Engine coolant thermostat	P0128	Plausibility check - comparison of measured ECT with modeled ECT
Engine cooling system	ECT sensor	P0117	Signal range check - short circuit to ground
Boost pressure system	Boost pressure sensor	P0237	Signal range check - short circuit to ground / open circuit
DCU	Reductant tank temperature sensor	P205C	Signal range check - short circuit to ground
TCU		P0562	System Voltage Low
J1699 dynamic		-	-

Attachment K

Where this list includes a component of a larger assembly, if such a component is subject to replacement under Paragraph 1.b.vii, Defendants may replace the entire assembly.

F-Nr.	Part description
04.33	Fuel injector
05.01	Turbocharger, VNT
08.01	EGR Valve (Exhaust Gas Recirculation Valve)
08.13	EGR cooler (Exhaust Gas Recirculation cooler)
02.09	Glow plug
03.02	Intake Manifold / Boost Air Distribution Line
03.05	Throttle valve step motor
03.23	Crankcase ventilation valve
03.52	Intake-port shutoff
04.32	High pressure pump
05.16	Charge air cooler (CAC)
08.17	Exhaust Gas Recirculation Line Front
20.33	MAP Sensor (Manifold air pressure sensor)
	MAP Sensor compressor
	MAP sensor charge air
36.01	Mass Air Flow Sensor
10.05	Oxidation catalyst
10.12	Sensor (exhaust back pressure)
10.13	Diesel particulate filter
10.29	Sensor (exhaust differential-pressure)
10.41	Catalyst SCR
11.01	Primary O2 sensor
11.07	NOX-sensor after DPF
	NOX-sensor after SCR-catalyst
11.14	Particulate matter sensor
12.26	Injection valve, additive
24.17	Temperature sensor exhaust gas (after DPF)
	Temperature sensor exhaust gas (before DPF)
	Temperature sensor exhaust gas (catalyst)

Attachment L

Pre-Approved OBD Noncompliances, OBD Cluster 1

	Topic
1	Swirl Actuator Monitoring
2	Upstream NOx Sensor Monitoring
3	NOx Converting Catalyst Monitoring
4	Thermostat Monitoring
5	NMHC Catalyst Demonstration Method
6	Catalyzed PM Filter Feedgas Generation Monitoring
7	Comprehensive Component Monitoring
8	Ambient Air Temperature Sensor Monitoring
9	Boost Pressure Control Monitoring
10	Lambda Observer Monitoring
11	In-Use Monitor Performance Engine Oil Sensor Monitoring
12	NOx Sensor Upstream and Downstream Plausibility Check
13	Numerator Incrementation after Fault Detection
14	Urea Dosing Adaption
15	Air Path Adaption
16	NMHC Catalyst Feedgas Generation Monitoring
17	NOx sensor upstream: Numerator Incrementation Issue (DTC P2201)
18	Camshaft position sensor plausibility check healing behavior (P0341)
19	Throttle Valve Actuator - Driver Stage Check – Open Circuit (P2100): Additional Fault Code Entry
20	NOx Sensor Open and Short Circuit
21	Mode $06 Test Results

Pre-Approved OBD Noncompliances, OBD Cluster 5

	Topic
1	NMHC Catalyst Feedgas Monitoring
2	Catalyzed PM Filter Monitoring
3	Comprehensive Component Out-Of-Range Monitoring
4	NMHC Catalyst Conversion Efficiency Monitor
5	NOx Converting Catalyst Conversion Efficiency
6	Fuel System Monitoring (Zero Fuel Calibration)
7	Upstream NOx sensor Numerator Tracking
8	Numerator Incrementation after Fault Detection
9	Red. Delivery Performance Monitoring
10	CSERS false MIL due to engine off timer initialization problem
11	Urea Dosing Adaption
12	Air Path Adaption
13	OBD Diagnosis Ambient Air Temperature
14	Glow Plug Fault Code Handling and Pinpointing
15	NAG2 Transmission Fault Healing
16	Throttle Valve Actuator Additional Fault Code Entry (P2101)
17	Camshaft position sensor plausibility check healing behavior (P0341)
18	NOx Sensor Open and Short Circuit