PART 4

FINAL REGULATION ORDER TEST PROCEDURES
(Part 1065)

Small Off-Road Engines

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FINAL REGULATION ORDER TEST PROCEDURES

Note: This appendix shows the entirety of regulatory amendments to the test procedures titled below, which were approved by the Air Resources Board on December 16, 2011, and refined via subsequent conforming modifications authorized under Resolution 11-41. Incorporated by reference into these test procedures are portions of Title 40 of the Code of Federal Regulations (CFR) Part 1065 – Engine-Testing Procedures, Subparts A through K inclusive, as amended June 28, 2011; and, the internally referenced sections of Title 40 CFR, Parts 60, 80, 86, 90, 1054, and 1068. Sections that have been included in their entirety are set forth with the section number and title. California provisions that replace specific federal language provisions are denoted by the words “DELETE” for the federal language and “REPLACE WITH” or “ADD” for the California language. The notation [* * * * *] or [...] means that the remainder of the CFR text for a specific section is not shown in these procedures but has been incorporated by reference, with only the printed text changed. CFR sections that are not listed are not part of California’s test procedures. If there is any conflict between the provisions of this document and the California Health and Safety Code, Division 26, or Title 13 of the California Code of Regulations (CCR), the Health and Safety Code and Title 13 apply.

This document is all newly adopted text.

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State of California
AIR RESOURCES BOARD

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2013 AND LATER SMALL OFF-ROAD ENGINES

ENGINE-TESTING PROCEDURES (PART 1065)

Adopted: October 25, 2012

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CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2013 AND LATER SMALL OFF-ROAD ENGINES

The following provisions of Part 1065, Title 40, Code of Federal Regulations, as promulgated by the United States Environmental Protection Agency on the date listed, are adopted and incorporated herein by this reference for 2013 model year and later small off-road engines as the California Exhaust Emission Standards and Test Procedures for New 2013 and Later Small Off-Road Engines, except as altered or replaced by the provisions set forth below.

PART 1065 – ENGINE-TESTING PROCEDURES

SOURCE: 76 FR 37977, June 28, 2011, unless otherwise noted.

Subpart A – Applicability and General Provisions

§ 1065.1 Applicability.

* * * * *

(a) DELETE,
REPLACE WITH:
(a) (1) This part applies to 2013 and later model year small off-road engines regulated under Title 13, California Code of Regulations, Chapter 9, Article 1, and subject to the emission standards in § 2403(b)(1) of that Article. These provisions do not apply to engines and equipment that fall within the scope of the preemption of Section 209(e)(1)(A) of the Federal Clean Air Act, as amended, and as defined by regulation of the Environmental Protection Agency.

(2) Every new small off-road engine that is manufactured for sale, sold, offered for sale, introduced or delivered or imported into California for introduction into commerce and that is subject to any of the standards prescribed herein is required to be covered by an Executive Order issued pursuant to Article 1, Chapter 9, Title 13, California Code of Regulations, including these Test Procedures.

* * * * *

(d) DELETE,
REPLACE WITH:
Paragraph (a) of this section identifies the parts of the CFR that define emission standards and other requirements for particular types of engines. In this part, we refer

to each section of the Article 1, Chapter 9, Title 13, California Code of Regulations, and the incorporated CFR part 1054, generically as the ”standard-setting part.”

* * * * *

(g) DELETE,
REPLACE WITH:
For additional information regarding these test procedures, visit our Web site at http://www.arb.ca.gov/msprog/offroad/sore/sore.htm

§ 1065.2 Submitting information to ARB under this part.

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§ 1065.5 Overview of this part 1065 and its relationship to the standard-setting part.

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§ 1065.10 Other procedures.

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§ 1065.12 Approval of alternate procedures.

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§ 1065.15 Overview of procedures for laboratory and field testing.`

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§ 1065.20 Units of measure and overview of calculations.

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§ 1065.25 Recordkeeping.

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Subpart B – Equipment Specifications

§ 1065.101 Overview.

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§ 1065.110 Work inputs and outputs, accessory work, and operator demand.

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§ 1065.120 Fuel properties and fuel temperature and pressure.

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§ 1065.122 Engine cooling and lubrication.

(a) DELETE,
REPLACE WITH:
The use of auxiliary fans for engine cooling must be indicated in the application for certification. The manufacturer must detail the use of such fans and demonstrate that the supplemental cooling resulting from the use of the fans is representative of in-use engine operation. The records must be maintained by the manufacturer and must be made available to the Executive Officer upon request.

(b) DELETE

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§ 1065.125 Engine intake air.

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§ 1065.127 Exhaust gas recirculation.

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§ 1065.130 Engine exhaust.

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(g) DELETE

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§ 1065.140 Dilution for gaseous and PM constituents.

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§ 1065.145 Gaseous and PM probes, transfer lines, and sampling system components.

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§ 1065.150 Continuous sampling.

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§ 1065.170 Batch sampling for gaseous and PM constituents.

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§ 1065.190 PM-stabilization and weighing environments for gravimetric analysis.

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§ 1065.195 PM-stabilization environment for in-situ analyzers.

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§ 1065.205 Performance specifications for measurement instruments.

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§ 1065.210 Work input and output sensors.

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§ 1065.215 Pressure transducers, temperature sensors, and dewpoint sensors.

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Flow-Related Measurements

§ 1065.220 Fuel flow meter.

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§ 1065.225 Intake-air flow meter.

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§ 1065.230 Raw exhaust flow meter.

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§ 1065.240 Dilution air and diluted exhaust flow meters.

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§ 1065.245 Sample flow meter for batch sampling.

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§ 1065.248 Gas divider.

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CO and CO_2 Measurements

§ 1065.250 Nondispersive infra-red analyzer.

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Hydrocarbon Measurements

§ 1065.260 Flame-ionization detector.

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§ 1065.265 Nonmethane cutter.

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§ 1065.267 Gas chromatograph.

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NO_x and N_2O Measurements

§ 1065.270 Chemiluminescent detector.

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§ 1065.272 Nondispersive ultraviolet analyzer.

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§ 1065.275 N_2O measurement devices.

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O_2 Measurements

§ 1065.280 Paramagnetic and magnetopneumatic O_2 detection analyzers.

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Air-to-Fuel Ratio Measurements

§ 1065.284 Zirconia (ZrO_2) analyzer.

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PM Measurements

§ 1065.290 PM gravimetric balance.

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§ 1065.295 PM inertial balance for field testing analysis.

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Subpart D –Calibrations and Verifications

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§ 1065.303 Summary of required calibration and verifications.

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§ 1065.305 Verifications for accuracy, repeatability, and noise.

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§ 1065.307 Linearity verification.

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§ 1065.308 Continuous gas analyzer system-response and updating-recording verification – for gas analyzers not continuously compensated for other gas species.

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§ 1065.309 Continuous gas analyzer system-response and updating-recording verification – for gas analyzers continuously compensated for other gas species.

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Measurement of Engine Parameters and Ambient Conditions

§ 1065.310 Torque calibration.

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§ 1065.315 Pressure, temperature, and dewpoint calibration.

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Flow-Related Measurements

§ 1065.320 Fuel-flow calibration.

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§ 1065.325 Intake-flow calibration.

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§ 1065.330 Exhaust-flow calibration.

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§ 1065.340 Diluted exhaust flow (CVS) calibration.

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§ 1065.341 CVS and batch sampler verification (propane check).

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§ 1065.342 Sample dryer verification.

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§ 1065.345 Vacuum-side leak verification.

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CO and CO_2 Measurements

§ 1065.350 H_2O interference verification for CO_2 NDIR analyzers.

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§ 1065.355 H_2O and CO_2 interference verification for CO NDIR analyzers.

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Hydrocarbon Measurements

§ 1065.360 FID optimization and verification.

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§ 1065.362 Non-stoichiometric raw exhaust FID O_2 interference verification.

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§ 1065.365 Nonmethane cutter penetration fractions.

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NO_x and N_2O Measurements

§ 1065.370 CLD CO_2 and H_2O quench verification.

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§ 1065.372 NDUV analyzer HC and H_2O interference verification.

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§ 1065.375 Interference verification for N_2O analyzers.

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§ 1065.376 Chiller NO_2 penetration.

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§ 1065.378 NO_2-to-NO converter conversion verification.

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PM Measurements

§ 1065.390 PM balance verifications and weighing process verification.

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§ 1065.395 Inertial PM balance verifications.

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Subpart E – Engine Selection, Preparation, and Maintenance

§ 1065.401 Test engine selection.

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§ 1065.405 Test engine preparation and maintenance.

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§ 1065.410 Maintenance limits for stabilized test engines.

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§ 1065.415 Durability demonstration.

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Subpart F –Performing an Emission Test in the Laboratory

§ 1065.501 Overview.

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§ 1065.510 Engine mapping.

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§ 1065.512 Duty cycle generation.

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§ 1065.514 Cycle-validation criteria for operation over specified duty cycles.

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§ 1065.520 Pre-test verification procedures and pre-test data collection.

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§ 1065.525 Engine starting, restarting, and shutdown, and optional repeating of void discrete modes.

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§ 1065.526 Repeating void modes or test intervals.

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§ 1065.530 Emission test sequence.

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§ 1065.545 Validation of proportional flow control for batch sampling.

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§ 1065.546 Validation of minimum dilution ration for PM batch sampling.

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§ 1065.550 Gas analyzer range validation, drift validation, and drift correction.

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§ 1065.590 PM sampling media (e.g., filters) preconditioning and tare weighing.

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§ 1065.595 PM sample post-conditioning and total weighing.

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Subpart G –Calculations and Data Requirements

§ 1065.601 Overview.

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§ 1065.602 Statistics.

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§ 1065.610 Duty cycle generation.

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§ 1065.630 1980 international gravity formula.

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§ 1065.640 Flow meter calibration calculations.

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§ 1065.642 SSV, CFV, and PDP molar flow rate calculations.

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§ 1065.644 Vacuum-decay leak rate.

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§ 1065.645 Amount of water in an ideal gas.

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§ 1065.650 Emission calculations.

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ADD:
(i) For PM testing, engine manufacturers must use the particulate sampling test procedure specified in this part 1065 or any similar procedure that has been approved by the Executive Officer. For two-stroke engines, engine manufacturers may, in lieu of testing, determine PM emissions through the following equation:

$$PM_{est} = \frac{HC}{\text{Fuel to oil ratio}}$$

Where HC = weighted hydrocarbons in g/kW-hr, and
Fuel to oil ratio = the fuel to oil ratio used in the test engine.

Engine manufacturers may report this estimate as PM_{est}, and indicate that the PM emissions were estimated as per this paragraph.

§ 1065.655 Chemical balances of fuel, intake air, and exhaust.

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§ 1065.659 Removed water correction.

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§ 1065.660 THC, NMHC, and CH_4 determination.

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§ 1065.665 THCE and NMHCE determination.

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§ 1065.667 Dilution air background emission correction.

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§ 1065.670 NO_x intake-air humidity and temperature corrections.

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§ 1065.672 Drift correction.

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§ 1065.675 CLD quench verification calculations.

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§ 1065.690 Buoyancy correction for PM sample media.

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§ 1065.695 Data requirements.

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Subpart H –Engine Fluids, Test Fuels, Analytical Gases and Other Calibration Standards

§ 1065.701 General requirements for test fuels.

(a) DELETE,
REPLACE WITH:

(a) Certification test fuel.

(1) The certification test fuel used for emission testing must be consistent with the fuel specifications as outlined in the California Code of Regulations, title 13, §1960.1, and the "California Exhaust Emission Standards and Test Procedures for 2001 – 2014 Model Passenger Cars, Light Duty Trucks, and Medium-Duty Vehicles", as last amended [insert latest amendment date], and as incorporated by reference herein. The test fuel specification should remain consistent from batch to batch. If a particular engine requires a different octane fuel, test records should indicate the fuel used.

(2) For 2020 and later gasoline-fueled engines: The certification test fuel for emission testing must be consistent with the fuel specifications as outlined in title 13, section 1961.2 and the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," adopted [insert adoption date], and incorporated by reference herein. The test fuel specifications must remain consistent from batch to batch. Optionally, manufacturers may use other renewable fuel blends under this paragraph that have been certified by ARB as yielding test results equivalent, or more stringent than, those resulting from the fuel specified by 13 CCR 1961.2, and which are appropriate for the certification of small off-road engines.

(3) For 2013 – 2019 model-year gasoline-fueled engines, the manufacturer has the option to use the certification test fuel specified in §1065.701(a)(2).

(4) Alcohol-based fuels. Alcohol-based fuels must be allowed for emission test purposes when the appropriate emission standards with respect to such fuels are a part of these provisions. Such fuels must be as specified in either §1065.701(a)(1) or §1065.701(a)(2), as applicable.

(b) DELETE,
REPLACE WITH:
With Executive Officer approval, the certifying entity may use other test fuels so long as they do not affect the demonstration of compliance.

* * * * *

(f) DELETE,
REPLACE WITH:

(f) Test fuels – service accumulation and aging.

(1) Gasoline.

(i) Gasoline representative of commercial gasoline generally available through retail outlets must be used in service accumulation and aging for gasoline fueled, spark ignition engines. As an alternative, the certification test fuels specified under either §1054.501(b)(2)(ii)(A) or §1054.501(b)(2)(ii)(B), as applicable, may be used for engine service accumulation and aging.

(ii) The octane rating of the gasoline used for service accumulation and aging must be no higher than 4.0 Research Octane Numbers above the minimum recommended by the engine manufacturer when a certification fuel is not used for service accumulation, and must have a minimum sensitivity of 7.5 Octane Numbers. Sensitivity is the Research Octane Number minus the Motor Octane Number.

(iii) The Reid Vapor Pressure of a gasoline used for service accumulation and aging must be characteristic of the engine fuel during the season in which the service accumulation takes place in the outdoors, or must be characteristic of the engine fuel appropriately suited to the ambient conditions of an indoor test cell in which the entire service accumulation takes place.

(2) Alternative fuels.

(i) Liquefied petroleum gas meeting the ASTM D1835 (11/10/1997) or NGPA HD-5 (1970) specifications must be used for service accumulation.

(ii) Natural gas representative of commercial natural gas that is available locally to the manufacturer's test site may be used in service accumulation. The manufacturer must provide the Executive Officer with detail of how the commercial natural gas differs from the certification test fuel specifications.

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§ 1065.703 Distillate diesel fuel.

DELETE

§ 1065.705 Residual and intermediate residual fuel.

DELETE

§ 1065.710 Gasoline.

DELETE

§ 1065.715 Natural gas.

DELETE

§ 1065.720 Liquefied petroleum gas.

DELETE

§ 1065.740 Lubricants.

* * * * *

ADD:
(c) During all engine tests, the engine shall employ a lubricating oil consistent with the engine manufacturer's specifications for that particular engine. These specifications shall be recorded and declared in the certification application.

§ 1065.745 Coolants.

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§ 1065.750 Analytical gases.

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§ 1065.790 Mass standards.

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Subpart I – Testing with Oxygenated Fuels

§ 1065.801 Applicability.

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§ 1065.805 Sampling system.

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§ 1065.845 Response factor determination.

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§ 1065.850 Calculations.

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Subpart J – Field Testing and Portable Emission Measurement Systems

§ 1065.901 Applicability.

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§ 1065.905 General provisions.

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§ 1065.910 PEMS auxiliary equipment for field testing.

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§ 1065.915 PEMS instruments.

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§ 1065.920 PEMS calibrations and verifications.

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§ 1065.925 PEMS preparation for field testing.

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§ 1065.930 Engine starting, restarting, and shutdown.

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§ 1065.935 Emission test sequence for field testing.

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§ 1065.940 Emission calculations.

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Subpart K – Definitions and Other Reference Information

§ 1065.1001 Definitions.

ADD:
The definitions in Section 2401, Chapter 9, Title 13 of the California Code of Regulations, 40 CFR 1054.801, and 1068.30 apply with the following additions:

* * * * *

Act DELETE.

Adjustable parameter DELETE,
REPLACE WITH:
Adjustable parameter means any device, system, or element of design that someone can adjust (including those which are difficult to access) and that, if adjusted, may affect emissions or engine performance during emission testing or normal in-use operation. This includes, but is not limited to, parameters related to injection timing and fueling rate. You may ask us to exclude a parameter that is difficult to access if it cannot be adjusted to affect emissions without significantly degrading engine performance, or if you otherwise show us that it will not be adjusted in a way that affects emissions during in-use operation.

* * * * *

Aftertreatment DELETE,
REPLACE WITH:
Aftertreatment means relating to a catalytic converter, particulate filter, thermal reactor, or any other system, component, or technology mounted downstream of the exhaust valve (or exhaust port) whose design function is to decrease emissions in the engine exhaust before it is exhausted to the environment. Exhaust-gas recirculation (EGR), turbochargers, and oxygen sensors are not aftertreatment.

* * * * *

Applicable standard DELETE,
REPLACE WITH:
Applicable emission standard or *applicable standard* means an emission standard to which an engine (or equipment) is subject. Additionally, if an engine (or equipment) has been or is being certified to another standard or FEL, *applicable emission standard* means the FEL or other standard to which the engine (or equipment) has been or is being certified.

* * * * *

Brake power DELETE,
REPLACE WITH:
Brake power means the usable power output of the engine, not including power required to fuel, lubricate, or heat the engine, circulate coolant to the engine, or to operate aftertreatment devices.

* * * * *

Calibration DELETE,
REPLACE WITH:
Calibration means the set of specifications and tolerances specific to a particular design, version, or application of a component or assembly capable of functionally describing its operation over its working range.

* * * * *

ADD:
Certificate of Conformity means an Executive Order issued in accordance with the California Health and Safety Code, Division 26, Part 5.

Certification DELETE,
REPLACE WITH:
Certification means, with respect to new small off-road engines, obtaining an executive order for an engine family complying with the small off-road engine emission standards and requirements specified in the California Code of Regulations, Title 13, Chapter 9, Sections 2400-2409.

* * * * *

Designated Compliance Officer DELETE,
REPLACE WITH:
Designated Compliance Officer means the Executive Officer of the Air Resources Board, or a designee of the Executive Officer.

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Discrete-mode DELETE,
REPLACE WITH:
Discrete-mode means relating to the discrete-mode type of steady-state test described in §1054.505.

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Engine DELETE,
REPLACE WITH:
Engine as used in this part, refers to small off-road engine.

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ADD:
EPA means Air Resources Board.

ADD:
Executive Order means an order issued by the Executive Officer of the Air Resources Board or his or her delegate certifying engines for sale in California.

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Fuel type DELETE,
REPLACE WITH:
Fuel type means a general category of fuels such as gasoline or natural gas. There can be multiple grades within a single fuel type, such as low-temperature or all-season gasoline.

Good engineering judgment DELETE.

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Hydrocarbon DELETE,
REPLACE WITH:
Hydrocarbon (HC) means the hydrocarbon group on which the emission standards are based for each fuel type, as described in subpart B of 40 CFR 1054.

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Manufacturer DELETE.

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Nonroad engine DELETE,
REPLACE WITH:
Nonroad engine means a small off-road engine as defined in the California Code of Regulations, Title 13, Chapter 9, Section 2401.

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Ramped-modal DELETE,
REPLACE WITH:
Ramped-modal means ramped-modal type of steady-state test, as described in 40 CFR 1054.

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ADD:
Small volume engine manufacturer means any engine manufacturer whose total production of small off-road engines slated for sale in California are projected at the time of certification of a given model year to be no more than 500 engines.

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Steady-state DELETE,
REPLACE WITH:
Steady-state means relating to emission tests in which engine speed and load are held at a finite set of essentially constant values. Steady-state tests are either discrete-mode tests or ramped-modal tests.

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Test sample DELETE,
REPLACE WITH:
Test sample means the collection of engines selected from the population of an emission family for emission testing. This may include testing for certification, production-line testing, or in-use testing.

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United States DELETE.

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Useful life DELETE,
REPLACE WITH:
Useful life means the period during which the engine and equipment are designed to properly function in terms of power output and intended function, without being remanufactured, specified as a number of hours of operation or calendar years, whichever comes first. It is the period during which an off-road engine must comply with

all applicable emission standards. If an engine has no hour meter, the specified number of hours does not limit the period during which an in-use engine is required to comply with emission standards unless the degree of service accumulation can be verified separately.

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We (us, our) DELETE,
REPLACE WITH:
We (us, our) means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.

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§ 1065.1005 Symbols, abbreviations, acronyms, and units of measure.

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§ 1065.1010 Reference materials.

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