Appendix B

State of California

California Air Resources Board

Proposed

California Standards for Heavy-Duty Remote On-board Diagnostic Devices

NOTE: This document is incorporated by reference in sections 2195 through 2199, Title 13, California Code of Regulations. It contains the device specifications and certification requirements necessary for the implementation of periodic testing compliance for OBD-equipped heavy-duty vehicles as part of the California's Heavy-duty Inspection and Maintenance Program.

PART I: Definitions.

For the purposes of this document, the following definitions shall apply:

"Authorized representative" means a person who takes responsibility for all the information submitted for remote on-board diagnostic (ROBD) device certification and who signs the device certification application.

"Baud rate" means the rate at which data is transmitted on a vehicle internal communications network.

"Certification" means the process of obtaining an Executive Order with respect to an ROBD device, complying with the device certification requirements specified in Part III of this document.

"Controller Area Network (CAN bus)" is an International Organization for Standardization (ISO) standard (ISO 11898) for vehicle internal communications system (i.e., bus), designed to allow onboard controllers and external devices to communicate with one another.

"Device model" means a grouping of similar ROBD devices made by one manufacturer, vendor, and/or service provider (e.g., CC-ROBD), that are applicable to the same vehicle makes and models, and OBD protocol(s).

"Device serial number" means a device unique serial number that the vendor permanently assigned to a ROBD device.

"DM5" is a standardized diagnostic message in the SAE J1939 onboard diagnostics communication protocol that reports information related to the diagnostics readiness

of vehicle's onboard diagnostics system, as defined by parameter definition 5.7.5 of SAE J1939-73 "Application Layer – Diagnostics", June 2020.

"DM24" is a standardized diagnostic message in the SAE J1939 onboard diagnostics communication protocol that reports detailed information about the data supported by vehicle's OBD system, as defined by parameter definition 5.7.24 of SAE J1939-73 "Application Layer – Diagnostics", June 2020.

"Electronic Control Unit (ECU)," also known as electronic control module, is responsible for controlling one or multiple electrical system(s) in a vehicle.

"End user" means the first person who purchases and uses a new ROBD device.

"Heavy-duty OBD" means the requirements for on-board diagnostic systems in 2013 and subsequent model year heavy-duty engines in title 13, CCR section 1971.1 adopted by CARB.

"Hypertext Transfer Protocol Secure (HTTPS)" is the protocol where encrypted HTTP data is transferred over a secure connection.

"InfoType" means the vehicle-specific vehicle information available via Mode $09, as defined by parameter definition 8.9 of SAE J1979 "E/E Diagnostic Test Modes", February 2017.

"In-use device" means a device currently in the field that is already installed in a vehicle or used by a fleet owner prior to obtaining an Executive Order.

"Mode $06" also known as "Service $06" is the SAE J1979 service that allows access to the results of the on-board diagnostic monitoring tests for specific components and systems, as defined by parameter definition 8.6 of SAE J1979 "E/E Diagnostic Test Modes", February 2017.

"Mode $09" also known as "Service &09" is the SAE J1979 service that provides vehicle-specific information (e.g., Vehicle Identification Number, Engine Serial Number), as defined by parameter definition 8.9 of SAE J1979 "E/E Diagnostic Test Modes", February 2017.

"Monitor ID" identifies an individual diagnostic test for a Mode $06 component/system), as defined by parameter definition 8.6 of SAE J1979 "E/E Diagnostic Test Modes", February 2017.

"OBD data test vehicle" means a vehicle that is used for purposes of testing a potential ROBD device during the certification process.

"OBD protocol group" means the vehicle's OBD communication protocol such as SAE J1939, SAE J1979, and/or SAE J1979-2.

"OBD II" is a standard comprised of a set of specifications and services that specify major characteristics of onboard diagnostic systems (e.g., type of diagnostic connector, electrical signaling protocols, and list of vehicle parameters to be monitored) that is used in light-duty and some heavy-duty engines, as defined by Section 1968.2, Title 13, California Code of Regulations.

"Owner's manual" means a document or collection of documents prepared by the manufacturer of a product for the owners or operators to describe appropriate maintenance, applicable warranties, and other information related to operating or keeping the product. The owner's manual is typically provided to the end user at the time of sale. The owner's manual may be in paper or electronic format.

"POST method" is a HTTPS method that is designed to send loads of data to a server from a specified resource.

"Production date" means the device date of manufacture [MONTH and YEAR].

PART II: Device Requirements.

A. Purpose

1. The purpose of Part II is to establish CARB's requirements for remote OBD devices in order to be used by the OBD-equipped heavy-duty vehicles as a means of demonstrating compliance with the HD I/M program.

B. Reference Documents: The following Society of Automotive Engineers (SAE) and ISO documents are incorporated by reference into this regulation:

1. Section 1968.2, title 13, California Code of Regulations (CCR), "Malfunction and Diagnostic System Requirements--2004 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines", 2021;

2. Section 1971.1, title 13, CCR, "On-Board Diagnostic System Requirements - 2010 and Subsequent Model-Year Heavy-Duty Engines", 2021;

3. ISO 11898-1 "Road vehicles – Controller area network (CAN) – Part 1: Data link layer and physical signaling", 2015;

4. ISO 11898-2 "Road vehicles – Controller area network (CAN) – Part 2: High-speed medium access unit", 2016;

5. ISO 15031-4 "Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 4: External test equipment", 2014;

6. SAE J1699-2 "Test Cases for OBD-II Scan Tools and I/M Test Equipment", 2017;

7. SAE J1962 "Diagnostic Connector", July 2016 (SAE J1962);

8. SAE J1978 "OBD II Scan Tool – Equivalent to ISO/DIS 15031-4, April 2002 (SAE J1978);

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

10. SAE J1979-DA "Digital Annex of E/E Diagnostic Test Modes", May 2019;

11. ISO 15765-4 "Road Vehicles-Diagnostics Communication over Controller Area Network (DoCAN) - Part 4: Requirements for emission-related systems", April 2016 (ISO 15765-4);

12. SAE J1939 Recommended Practice for a Serial Control and Communications Heavy Duty Vehicle Network – Top Level Document, August 2018;

13. SAE J1939-DA "Digital Annex of Serial Control and Communication Heavy Duty Vehicle Network Data," April 2019;

14. SAE J1939-3 "On Board Diagnostics Implementation Guide", 2015;

15. SAE J1939-13 "Off-Board Diagnostic Connector", October 2016;

16. SAE J1939-21 "Data Link Layer", October 2018(15) SAE J1939-73 "Application Layer—Diagnostics", May 2017;

17. SAE J1939-73 "Application Layer – Diagnostics", June 2020;

18. SAE J1939-81 "Network Management", March 2017;

19. SAE J3005-1 "Permanently or Semi-Permanently Installed Diagnostic Communication Devices", February 2019;

20. SAE J3005-2 "Permanently or Semi-Permanently Installed Diagnostic Communication Devices, Security Guidelines", March 2020;

21. SAE J1979-2 "E/E Diagnostic Test Modes: OBDonUDS", April 2021;

C. General Device Requirements.

1. The ROBD device shall not interfere with the normal operation of the vehicle and/or any manufacturer- or third party-installed device in communication with the vehicle's OBD system.

2. Any ROBD device used for compliance purposes shall be capable of performing the following tasks as further specified in the requirements provided in section D of this Part.

    2.1. Establishing connection with the vehicle and verifying vehicle's support of HD OBD and/or OBD II at the individual ECU level;

    2.2. Collecting the OBD data required to be submitted as part of the HD I/M program specified in this Part; and,

    2.3. Submitting data securely via the standardized data submission format to an electronic reporting database approved by the Executive Officer.

3. The ROBD device shall request data from the onboard ECUs indicating heavy-duty OBD or OBD II support, as specified in subsection D.2 of this Part.

4. The ROBD device shall timestamp each sent request and received response from the CAN bus in the submitted data file, as specified in subsection D.4 of this Part.

5. The ROBD device shall be capable of receiving multiple responses when requesting information (either multiple controllers responding to a request or a controller responding multiple times to a request).

6. The ROBD device shall support at least one OBD protocol, however it may support multiple OBD protocols.

7. The ROBD device shall support at least one heavy-duty engine model, however it may support multiple heavy-duty engine or vehicle models.

8. The ROBD device shall be functional in standard working and vehicle environments and thus be resistant to shock, vibration, and environmental exposure.

9. The ROBD device shall be tamper-resistant to make sure no alteration or erasure can be made on the data collected.

10. The ROBD device shall meet the following label requirements.

    10.1. The device's unique serial number shall be affixed, engraved, or stamped on each certified device in a legible manner. This unique serial number displayed externally on the label shall match the device's electronic unique serial number. New devices produced on or later than [INSERT DATE] must include production date [Month

and Year) and the following statement, "THIS CARB CERTIFIED DEVICE COMPLIES WITH CARB HD I/M PROGRAM."

10.2. The label shall be durable and readable for at least five years from the date of purchase of the device.

10.3. The label shall be attached so no one can remove it without destroying or defacing it.

10.4. The applicant may request of the Executive Officer the use of a modified label, and if approved, shall by allowed to meet the labeling requirements through this modified label.

11. The ROBD device shall be warranted to the ultimate device purchaser for a minimum of one (1) year from the date of delivery that the device is designed and built free of defects in materials and workmanship. If a subsequent purchaser obtains the device prior to the end of the warranty period, the warranty shall extend to the new purchaser through the required one year period.

11.1. The device vendor may deny warranty claims under this Part if the operator caused a problem through improper maintenance or use that voids the warranty.

12. An Owner's manual for the ROBD device shall be provided to the end user that includes, but may not limited to, the following information:

12.1. A description of the device and applicability.

12.2. Instructions on the initial setup, troubleshooting, and proper maintenance.

12.3. A description of the process to update the software of in-use devices.

12.4. A toll-free number that provides a response to purchaser inquiries and technical support to purchasers of the device within 24 hours of receipt of call.

12.5. Other information useful to the purchaser may be included in the manual.

13. The ROBD device vendor shall ensure proper and functioning communication between the device and the CARB electronic reporting system approved by the Executive Officer.

14. Broken devices no longer meeting the requirements of this Appendix shall not be allowed to submit vehicle compliance data.

D. Specific Device Requirements.

This section provides detailed specifications of ROBD devices that meet CARB HD I/M requirements. The specifications apply to both CC-ROBD and NCC-ROBD devices, unless indicated otherwise.

1. Diagnostics Connector.

1.1. The CC-ROBD devices may be installed permanently (hard-wired into the vehicle wire harness) or semi-permanently (plugged into an available OBD port in vehicle).

1.2. The CC-ROBD device shall be compliant with SAE J3005-1, J3005-2, and ISO 15765-4.

1.3. Plug-in ROBD devices (i.e., NCC-ROBD and semi-permanently CC-ROBD device) developed to meet both SAE J1939, SAE J1979, or SAE J1979-2 OBD protocols, whichever applicable, shall be capable of mating to both the connectors defined in SAE J1962/ISO 15031-3 and SAE J1939-13.

1.4. All plug-in ROBD devices shall be capable of connecting to the main standardized OBD ports, as specified in subsection D.1.3 of this Part, as an alternative to any other type of connection that may be used as the primary connection option.

1.5. The SAE J1979, or SAE J1979-2 ROBD device, whichever applicable, shall meet the specified requirements in ISO 15765-4 for CAN where one or more controllers comply with OBD regulations.

1.6. The ROBD device shall meet the same requirements for baud rate, as specified for the standard OBD connector, in section (h)(2) of CARB HD OBD regulation (Section 1971.1, Title 13, CCR).

1.7. The J1939 ROBD device shall meet the requirements and guidelines in SAE J1939-3 for the implementation of OBD on heavy duty vehicles.

2. Communication with the Vehicle.

2.1. SAE J1939 device.

2.1.1. The ROBD device shall comply with SAE J1939-21 and SAE J1939-71 when connected to a SAE J1939 vehicle.

2.1.2. The ROBD device shall meet all the requirements in section 4, SAE J1939-3.

2.1.3. The ROBD device shall act as a client for diagnostics services provided by the vehicle network, including those specified in Table 1, SAE J1939-73.

2.1.4. The ROBD device initialization shall be performed prior to requesting diagnostic services from any ECU.

2.1.4.1. Address claim: The ROBD device shall meet address claim and dynamic addressing requirements in SAE J1939-81.

2.1.4.2. Verifying HD OBD compliance: The ROBD device shall send a global DM5 request as outlined in SAE J1939-3.

2.1.4.3. The ROBD device shall confirm HD OBD compliance (i.e., at least one of the vehicle's onboard ECUs supports CARB's HD OBD requirements) after successful completion of the address claim process and receiving DM5 support response(s) from one or more onboard ECUs.

2.1.5. Identifying the available data: The ROBD device shall send destination-specific requests for DM24 to all HD OBD compliant ECUs identified, as described in subsection D.2.1.4.3 of this Part, and record all the received responses.

2.1.5.1. As described in SAE J1939-71, the ROBD device shall refrain from requesting data that is routinely broadcast on the network.

2.2. SAE J1979 device.

2.2.1. The ROBD device shall be compliant with SAE J1979.

2.2.2. The ROBD device shall communicate with the vehicle OBD system using the signaling standard, and meeting the timing requirements, of ISO 15765-4.

2.2.3. The ROBD device shall meet the standardized communication requirements for scan devices as illustrated in SAE J1699-2.

2.2.4. The ROBD device shall meet the requirements in SAE J1978/ISO 15031-4 and SAE 1699/2 to avoid disturbing the in-vehicle communication.

2.2.5. The ROBD device shall meet the requirements in SAE J3005-1 and J3005-2 for permanently or semi-permanently installed diagnostic communication devices.

2.2.6. The ROBD device shall utilize the initialization sequence of ISO 15765-4 in order to establish communication before sending diagnostic requests.

2.2.7. Identifying the available data: The ROBD device shall record all responses, including CAN source (i.e., specific ECU), to Mode $01 PID $00, $20, $40, etc. requests sent during initialization.

2.2.8. The ROBD device shall conduct an analogous scan for available Monitor IDs (MIDs) in Mode $06 (MID $00, $20, etc.)

2.2.9. The ROBD device shall conduct an analogous scan for available InfoTypes in Mode $09.

2.3. SAE J1979-2 device.

2.3.1. The ROBD device shall be compliant with SAE J1979-2.

2.3.2. The ROBD device shall communicate with the vehicle OBD system using the signaling standard, and meeting the timing requirements, of ISO 15765-4.

2.3.3. The ROBD device shall meet the standardized communication requirements for scan devices as illustrated in SAE J1699-2 or later version, whichever is applicable for vehicles using SAE J1979-2.

2.3.4. The ROBD device shall meet the requirements in SAE J1978/ISO 15031-4 and SAE 1699-2 for vehicles using SAE J1979-2, to avoid disturbing the in-vehicle communication.

2.3.5. The ROBD device shall meet the requirements in SAE J3005-1 and J3005-2 for permanently or semi-permanently installed diagnostic communication devices.

2.3.6. The ROBD device shall utilize the initialization sequence of ISO 15765-4 in order to establish communication before sending diagnostic requests.

2.3.7. Identifying the available data: The ROBD device shall record all responses, including CAN source (i.e., specific ECU), to Service $22 PID $F400, $F420, $F440, etc. requests sent during initialization.

2.3.8. The ROBD device shall conduct an analogous scan for available InfoTypes in Service $22 InfoType $F800, $F820, $F840, etc.

2.4. The ROBD device shall not communicate with the CAN Bus while the device is loading, initializing the operating system, or undergoing firmware or software updates.

2.5. In the case of failed initialization (i.e., vehicle not responding to the ROBD device within the required duration), the ROBD device shall repeat the initialization sequence, up to three times.

2.5.1. The ROBD device shall meet the response time requirements as outlined in SAE J1939-21 and SAE J1979.

2.5.2. After the third failed initialization attempt, the vendor shall notify the vehicle owner of the failed communication between the ROBD device and the vehicle.

2.5.3. The ROBD device shall submit a "Failed Communication" message to the electronic reporting system approved by the Executive Officer, in the format specified in subsection D.6.5 of this Part.

2.6. In the case of a vehicle not supporting the relevant OBD requirement (HD OBD or OBD II) following an initialization sequence, the ROBD device shall repeat the initialization sequence, up to three times.

2.6.1. If all initialization attempts confirm the initial results, the vendor shall notify the vehicle owner, as specified in subsection D.2.5.2 of this Part.

2.6.2. The ROBD device shall submit a "Vehicle not HD OBD/OBD II compliant" message to the CARB electronic reporting system approved by the Executive Officer, in the format specified in subsection D.6.5 of this Part.

3. Collecting the Required OBD Data from the Vehicle.

3.1. The ROBD device shall be capable of collecting all the data, as specified in sections (h)(4) and (h)(5) of the CARB heavy-duty OBD regulation (section 1971.1, title 13, CCR) (see Table 4 in subsection D.6 of this Part for more detail).

3.2. The CC-ROBD device shall collect data, as specified in subsection D.3.1 of this Part, once every 7 days or at the first engine key ON past the 7th day, as separate data logs and store them.

3.2.1. The CC-ROBD device shall transmit at least one and up to the 15 most recent unsubmitted data logs collected when submitting to the CARB HD I/M reporting system.

3.3. The CC-ROBD device shall collect data only when the vehicle is stationary and in key ON, engine running status.

4. Formatting the Collected OBD Data. The ROBD device shall meet the following data format specification for submitting the collected data.

4.1. File Extension: The file shall be a standard ASCII text file with a ".csv " extension, that is compatible with Notepad, Microsoft Excel/Word 2019 or newer version.

4.2. File Name: The ROBD device software shall generate a 16-character globally unique identifier (GUID) for the file name. All characters shall be ASCII 48-57 and 97-122 and have the text “hdim_” at the beginning of the GUID (examples: “hdim_b8ac348cd69d6d10.csv”, “hdim_81a150dtbd5d56n2.csv”)

4.3. File Structure. The file shall consist of two sections: the data header, and the CAN Bus data in hexadecimal format.

4.3.1. Data Header.

4.3.1.1. The data header shall have two rows: The first row shall contain the data field names for the header data, and the second row shall contain the values for the header data fields.

4.3.1.2. A comma (,) shall separate each data field name or value. Any field value that may contain a comma (,) or a carriage return () must be replaced with a semicolon (;).

4.3.1.3. The data header shall be in ASCII text format and contain the fields listed in Table 1.

Table 1: Contents of the header section of the submission file

Data Field Name	Description of Data	Data Type (length)
VIN	Vehicle identification number located on the tested vehicle in CARB-specified format	String (17)
SAE Protocol	Vehicle's OBD communication protocol (SAE J1939/J1979)	String (10)
Odometer*	Odometer reading of the vehicle at the time the OBD data is downloaded from the vehicle OBD system	Integer (7)
Device Name	The model of the ROBD device	String (50)
Device Serial Number	The serial number of the ROBD device assigned by the device manufacturer	String (50)
Device Firmware Number	The firmware/version number of the software in the ROBD device	String (20)
Firmware Verification Number	A number derived from the ROBD device Firmware that verifies the firmware has not been altered	String (20)
Record ID	A unique value from an ascending numerical sequence assigned by the ROBD device to each submission	Integer (7)
Data Collection Date and Time	The timestamp at the time the ROBD device starts downloading OBD data from the vehicle OBD system. The timestamp is in coordinated universal time (UTC)	Datetime

	and in the format of YYYY-MM-DD HH:MI:SS	

* For vehicles with OBD systems that do not support odometer reading as part of the data monitoring requirements of the HD OBD regulation, Section 1971.1, Title 13, CCR, the ROBD device shall obtain this parameter through other means.

4.3.2. CAN Bus Data.

4.3.2.1. The first row in the CAN Bus data section (the third row from the beginning of the file) shall be the data field names of the OBD data.

4.3.2.2. The CAN Bus data as collected from the vehicle shall start from the fourth row of the submission file.

4.3.2.3. A comma (,) shall separate data field names and values. Any field value that may contain a comma (,) or a carriage return (\r) must be replaced with a semicolon (;).

4.3.2.4. Each message shall have its own individual row.

4.3.2.5. The J1979 ROBD device shall follow the formatting specification in Table 2 for the CAN Bus data section of the submission file (see subsection D.6 of this Part for an example submission file format).

4.3.2.6. The J1939 ROBD device shall follow the formatting specification in Table 3 for the CAN Bus data section of the submission file (see subsection D.6 of this Part for an example submission file format).

Table 2: CAN Bus data formatting requirements for the J1979 ROBD device

Data Field Name	**Description of Data**	**Data Type (length)**
Timestamp	The time that a message is sent from the ROBD device to the vehicle or received from the vehicle. The timestamp is in coordinated universal time (UTC) and has millisecond	Datetime

	precision. The timestamp is in the format of YYYY-MM-DD hh:mm:ss.mmm.	
Message Type	The message type of the data line indicates if the message was sent from the OBD device to the vehicle or received from the vehicle. "REQ" is the request messages sending to the vehicle, and "RSP" is the response messages received from the vehicle.	String (3)
ECU Address	The hexadecimal address of the ECUs that respond to the request. The REQ messages will not have an ECU address. The RSP messages will have the hexadecimal address of the responding ECUs.	String (15)
Message Data	The data portion of the CAN message sent to or received from the vehicle's OBD system. The data shall be ASCII text that represents the hexadecimal values.	String

Table 3: CAN Bus data formatting requirements for the J1939 ROBD tool

Data Field Name	**Description of Data**	**Data Type (length)**
Timestamp	The time that a message is sent from the ROBD device to the vehicle or received from the vehicle. The timestamp is in coordinated universal time (UTC) and has millisecond precision. The timestamp is in the format of YYYY-MM-DD hh:mm:ss.mmm	Datetime
Message Type	The message type of the data line indicates if the message was sent from the ROBD device to the vehicle or received from the vehicle. "REQ" is the request messages sending to the vehicle, and "RSP" is the response messages received from the vehicle.	String (3)
CAN ID	CAN ID	String (15)

Message Data	The data portion of the CAN message sent to or received from the vehicle's OBD system. The data shall be ASCII text that represents the hexadecimal values.	String

5. Transmitting the Collected Data to the CARB Electronic Reporting System Approved by the Executive Officer.

5.1. Connection and Authentication: The ROBD device shall be registered in the electronic reporting system approved by the Executive Officer as a valid testing device in order to receive authentication to submit data to the electronic reporting system approved by the Executive Officer.

5.2. Data Transfer Protocol: The data files shall be submitted to the CARB electronic reporting system approved by the Executive Officer from the ROBD system via HTTPS with the POST method.

5.3. Data Integrity.

5.3.1. Subsequent to formatting the collected data, as specified in subsection D.4 of this Part, the ROBD device shall encrypt the data file.

5.3.2. The data shall not be altered or tampered with during or prior to electronically submitting to the CARB electronic reporting system approved by the Executive Officer.

5.3.3. The data file shall be transmitted securely from the ROBD device to the CARB electronic reporting system approved by the Executive Officer.

5.4. Once an internet connection is available, the ROBD device shall submit the encrypted data files to the CARB electronic reporting system approved by the Executive Officer.

5.5. Data Storage.

5.5.1. The ROBD device shall have enough internal storage capacity to store, at minimum, 15 encrypted data files that have not been submitted due to unavailable internet connection.

5.5.2. The encrypted collected OBD data shall be retained for at least seven days following a successful submission to the

CARB electronic reporting system approved by the Executive Officer.

6. Data Fields and Submission Examples.

6.1. Table 4 specifies the OBD data required to be collected by a ROBD device.

Table 4: Specifications of the OBD data required to be collected by a ROBD device

Item	Data Type	Corresponding Section in CARB HD OBD Regulation (CCR Title 13, Section 1971.1)	Relevant Diagnostic Message(s)	Relevant Diagnostic Message(s)	Relevant Diagnostic Message(s)	Comments
			J1939	J1979	J1979-2	
1	Readiness status of all OBD monitors listed in sections (e) and (g) of the heavy-duty OBD Regulation	(h)(4.1)	DM5, DM21, DM26	Mode $01 PID $01	Service $22 DID $F501	
2	All data stream parameters	(h)(4.2.2) (h)(4.2.3)	See SAE J1939DA for PGNs and SPNs	Mode $01, see SAE J1979DA for PIDs	Service $22, see SAE J1979DA for $F400 - $F5FF DIDs	
3	Freeze frame data	(h)(4.3)	DM25	Mode $02	Service $19 $04 DTCMREC DTC Snapshot Record Number = $00 (first occurrence)	

					or $F0 (latest occurrence)	
4	Fault codes including active, pending, and permanent	(h)(4.4)	DM1, DM6, DM12, DM23, DM28, DM29	Modes $03, $07, $0A	Service $19 $42 $33 $08 $02, Service $19 $42 $33 $04 $02, Service $19 $55 $33	The J1939 ROBD device shall also be capable of collecting the previously active fault codes
5	Monitoring support status and test results	(h)(4.5)	DM24, DM30	Mode $06	Service $19 $06 DTCMREC $92	
6	Software calibration ID (Cal-ID)	(h)(4.6) (h)(4.7)	DM19	Mode $09 InfoType $04	Service $22 InfoType $F 804	
7	Calibration Verification Number (CVN)	(h)(4.6) (h)(4.7)	DM19	Mode$09 InfoType $06	Service $22 InfoType $F 806	
8	VIN	(h)(4.8)	PGN: 65260 SPN: 237	Mode$09 InfoType $0 2	Service $22 InfoType $F 802	
9	Engine serial number	(h)(4.8)	PGN: 65259 SPN: 588	Mode $09 InfoType $0 D	Service $22 InfoType $F 80D	
10	ECU name	(h)(4.9)	PGN: 60928 SPN:2848	Mode $09 InfoType $0 A	Service $22 InfoType $F 80A	
11	Monitor in-use performance ratio	(h)(5.1)	DM20	Mode $09 InfoType $0 B	Service $19 $06 DTCMREC $91	

12	Engine run time tracking data	(h)(5.2)	See SAE J1939DA for PGNs and SPNs	Mode $01, see SAE J1979DA for PIDs	Service $22, see SAE J1979DA for DIDs	
13	NOx emissions tracking data*	(h)(5.3)	PGNs: 64258 thru 64279	Mode $09 InfoTypes $61 - $76	Service $22 InfoTypes $F861 - $F876	
14	GHG tracking data**	(h)(5.4) thru (h)(5.6)	PGNs: 64252 thru 64257	Mode $09 InfoTypes $41 - $49, $50 - $5B	Service $22 InfoTypes $F841 - $F849, $F850 - $F85B	
15	PM filter regeneration event data	(h)(5.8)	See SAE J1939DA for PGNs and SPNs	Mode $01 PID $8B	Service $22 DID $F48B	
16	Readiness status of each monitor within a readiness group	(h)(4.12) (proposed)	N/A	N/A	Service $19 $56 $33 RGID	Data available for every OBD monitor tied to a readiness group

* For all OBD systems in 2022 and subsequent MY diesel engines required by CARB to support NOx emissions tracking data

** For all OBD systems in 2022 and subsequent MY diesel engines required by CARB to support GHG emissions tracking data

6.2. Submission File Format (J1979 ROBD device using 11-bit protocol) and Example.

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Firmware Verification Number,Record ID, Data Collection Date and Time

1234567890ABCDEFG,J1979,23000, ABC Company,
ABC0000001,1.20.1005,1234567890,23, 2024-06-25 12:23:4567
Timestamp, Message Type, ECU Address, Data Message
2024-06-25 12:23:4570,REQ,,07 DF 01 00
2024-06-25 12:23:4588,RSP,E8,07 E8 41 00 BF BE A8 93
2024-06-25 12:23:4592,RSP,EC,07 EC 41 00 98 18 80 11
2024-06-25 12:23:4623,REQ,,07 DF 01 01
2024-06-25 12:23:4712,RSP,E8,07 E8 41 01 00 07 65 00
2024-06-25 12:23:4800,REQ,,07 DF 01 20
2024-06-25 12:23:4811,RSP,EC,07 EC 41 20 80 01 80 01 2024-06-25
12:23:4823,RSP,E8,07 E8 41 20 A0 07 B1 19

6.3. Submission File Format (J1979 ROBD device using 29-bit protocol) and Example.

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Firmware Verification Number,Record ID, Data Collection Date and Time
1234567890ABCDEFG,J1979,23000,ABC Company,
ABC0000001,1.20.1005,1234567890,23,2024-06-25 12:23:4567
Timestamp,Message Type,ECU Address,Data Message
2024-06-25 12:23:4570,REQ,,18 DB 33 F1 01 00
2024-06-25 12:23:4588,RSP,18DAF159,18 DA F1 59 41 00 BF BE A8 93
2024-06-25 12:23:4592,RSP,18DAF15A,18 DA F1 5A 41 00 98 18 80 11
2024-06-25 12:23:4623,REQ,,18 DB 33 F1 01 01
2024-06-25 12:23:4712,RSP,18DAF159,18 DA F1 59 41 01 00 07 65 00
2024-06-25 12:23:4800,REQ,,18 DB 33 F1 01 20
2024-06-25 12:23:4811,RSP,18DAF15A,18 DA F1 5A 41 20 80 01 80 01
2024-06-25 12:23:4823,RSP,18DAF159,18 DA F1 59 41 20 A0 07 B1 19

6.4. Example of a Submission File Format (J1979-2 ROBD device using 11-bit protocol) and Example.

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number, Firmware Verification Number ,Record ID,Data Collection Date and Time
1234567890ABCDEFG,J1979-2,23000,ABC
Company,12345ABCDE,1.20.1005,1234567890,23,2024-06-25 12:23:4567
Timestamp,Message Type,ECU Address,Data Message
2024-06-25 12:23:4570,REQ,,07 DF 22 F4 00 F4 20 F4 40
2024-06-25 12:23:4588,RSP,E8,07 E8 62 F4 00 BF BF A8 91 F4 20 80 00 00 00
2024-06-25 12:23:4592,RSP,EC,07 EC 62 F4 00 80 08 00 00

6.5. Submission File Format (J1979-2 ROBD device using 29-bit protocol) and Example.

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Firmware Verification Number,Record ID,Data Collection Date and Time 1234567890ABCDEFG,J1979-2,23000,ABC Company,12345ABCDE,1.20.1005,1234567890,23,2024-06-25 12:23:4567
Timestamp,Message Type,ECU Address,Data Message
2024-06-25 12:23:4570,REQ,,18 DB 33 F1 22 F4 00 F4 20 F4 40
2024-06-25 12:23:4588,RSP,18DAF159,18 DA F1 59 62 F4 00 BF BF A8 91 F4 20 80 00 00 00
2024-06-25 12:23:4592,RSP,18DAF16A,18 DA F1 6A 62 F4 00 80 08 00 00

6.6. Submission File Format (J1939 ROBD device) and Example.

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number, Firmware Verification Number,Record ID,Data Collection Date and Time
ABCDEFG1234567890,J1939,51000,XYZ Company,
XYZ0000001,1.21.1005,1234567890,123,2024-06-25 12:23:4567
Timestamp,Message Type,CAN ¬ID,Data
2024-06-25 12:23:4567,REQ,18EA2117,EA FE 00
2024-06-25 12:23:4570,RSP,0CF00C03,00 FB 00 00 FF FF FF FF
2024-06-25 12:23:4588,RSP,18FEDF00,7D A0 28 7D 7D FF FF F0
2024-06-25 12:23:4592,REQ,18EA0017,CE FE 00
2024-06-25 12:23:4623,RSP,0CF00203,C0 00 00 FF F7 00 00 03
2024-06-25 12:23:4712,RSP,18FECE00,00 04 13 07 A0 1E 00 04
2024-06-25 12:23:4800,RSP,0CF00300,D1 00 00 FF FF 0F 72 7D
2024-06-25 12:23:4811,RSP,18FEF200,00 00 00 00 73 07 01 FF
2024-06-25 12:23:4823,RSP,18F00E00,FF FF FF FF FF FF FF FF

6.7. Submission File Format (Failed OBD device-vehicle communication or vehicle not HD OBD/OBD II compliant) and Example.

SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Firmware Verification Number,Record ID, Testing Date and Time
J1939,125000,XYZ Company, XYZ0000005,1.21.1005,1234567890,53,
2024-06-25 12:23:4567
"Failed Communication" or "Vehicle Not HD OBD/OBD II Compliant"

NOTE: Authority cited: sections , and , Health and Safety Code.
Reference: sections , and , Health and Safety Code.

Part III: Requirements for Device Vendors.

A. Overview and Applicability

The Executive Officer shall certify devices and provide an Executive Order for the device to the vendor if the vendor meets the requirements specified in this appendix. A vendor submitting a device for certification shall submit the full, complete, and current configuration proposed for sale and consumer use.

B. Certification Application

1. Prior to submitting a certification application, a vendor shall submit a test plan detailing the vendor initial validation testing methodology described in section C.1 of this part. Prior to conducting testing, the vendor shall ensure the test plan is approved by the Executive Officer.

2. A vendor shall complete and submit device certification application forms approved by the Executive Officer and other required information for evaluation of the application. Applications shall be submitted during a one (1) month open collection period per year, as designated by Executive Officer.

    2.1. All information included as part of an application package shall be true, accurate, and include complete statements and information.

    2.2. An authorized representative of the company shall approve and sign the application.

    2.3. The application shall include, but may not be limited to, the following information and shall be approved by the Executive Officer prior to CARB staff performing any verification testing specified in Part III subsection C.2:

        2.3.1. A detailed description of the design of the device and how the device is consistent with and meets the requirements specified in Part II of this document.

        2.3.2. Device manufacturer, if vendor is not the manufacturer of the device.

        2.3.3. Device Model.

        2.3.4. Method used for vendor initial validation testing, e.g. OBD data test vehicles that include model year, make, model, etc.

        2.3.5. Engine(s) OEM, vehicle(s) makes and models that the device can be used on.

2.3.6. Applicable OBD protocol(s) of the device.

2.3.7. Vendor shall identify if they plan to update devices already in use in existing vehicle(s).

2.3.8. Vendor documentation of initial validation testing meeting the requirements specified in Part III subsection C.1.

2.3.9. A detailed proposal for finding applicable fleets/vehicles to test devices in the field to meet the vendor field testing requirements specified in Part III subsection C.3, including expected testing locations and the estimated number of vehicles broken down by fleet, engine OEM, engine model year, vehicle make and model, fuel type, and OBD protocol. After CARB approves the detailed proposal, any changes or deviations from the plan shall be reviewed and approved by CARB.

2.3.10. A proposed timeline for completing the field-testing requirements specified in Part III subsection C.3.

2.3.11. Any additional information that may be necessary to help verify that the device meets the requirements of this Part.

3. Vendor shall provide a copy of the warranty statement that will be provided to the end user of the device as specified in Part II subsection C.11.

4. Vendor shall provide a copy of an owner's manual for the installation, operation, and maintenance procedures that will be provided to the end user of the device as specified in Part II subsection C.12.

    4.1. Following approval of the certification package, no changes shall be made to the CARB approved owner's manual without the Executive Officer's prior written approval.

5. Vendor shall provide a sample device label meeting the requirements specified in Part II subsection C.10.

6. Vendor shall provide a Statement of Compliance unconditionally certify that all the devices are designed with tamper-resistant components, built as described in the certification application, and comply with the requirements of this Part.

7. Vendor shall include a statement either in an existing or a separate document to the end user of a certified device to inform that the device is valid for use in the HD I/M program from the date indicated in the Executive Order until the end of the

calendar year, that it must be recertified annually, and may be decertified by CARB at any time if deviations are identified.

8. The vendor shall provide a written document to describe the process and provide a set schedule of performing updates to the hardware, firmware, and/or software.

C. Testing Requirements for Certification

The following certification testing shall be performed to demonstrate that the device meets the program requirements and shall be completed in the following phases:

1. Vendor Initial Validation Testing. Testing shall be completed by the vendor following the required specifications and test conditions described below prior to submitting their application package and shall be consistent with the requirements in Part II.

    1.1. Vendor shall test their device(s) using the specified test conditions below.

        1.1.1. Test at least one vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files from each vehicle that demonstrates that the engine revolutions per minute (RPM) is greater than zero and the vehicle speed is equal to zero.

        1.1.2. Test at least one vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files from each vehicle where the MIL is commanded OFF, there are no pending, active, or permanent trouble codes, and all vehicle supported readiness monitors are in a ready state.

        1.1.3. Test at least one vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files from each vehicle where the MIL is commanded ON, and there is at least one stored active diagnostic trouble code and at least one pending diagnostic trouble code.

        1.1.4. Test at least one vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files from each vehicle where the MIL is commanded ON and there is at least one permanent diagnostic trouble code.

1.1.5. Test at least one vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files from each vehicle where the MIL is commanded OFF, there are no diagnostic trouble codes, and at least one monitor is not ready.

1.1.6. Test at least one vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files from each vehicle showing that the electronic VIN is received from the vehicle and is not a user inputted VIN.

1.1.7. Test at least one hybrid vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files where the MIL is commanded OFF, there are no pending, current, or permanent diagnostic trouble codes, and all vehicle supported readiness monitors are in a ready state.

1.1.8. Test at least one alternative fuel vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files from each vehicle where the MIL is commanded OFF, there are no pending current, or permanent diagnostic trouble codes, and all vehicle supported readiness monitors are in a ready state.

1.1.9. Test at least one vehicle from every OBD protocol group applicable to the device and provide three consecutive ROBD submission files from the different communication baud rates (i.e. 250/500 kilobits per second (kbps)) supported by the protocols.

1.1.10. Specifically for CC-ROBD devices, test at least one vehicle from every OBD protocol group applicable to the device and provide three submission files that contain multiple data logs that were collected and stored every seven days as specified in Part II subsection D.3.2.

1.2. In addition to the ROBD submission files that are submitted with the initial validation testing, the vendor shall include, but may not be limited to, the following additional information in an organized format:

1.2.1. OBD data test vehicle(s): Year, Make, Model, VIN# (or OBD simulator)

1.2.2. The OBD protocol of the vehicle(s)

1.2.3. Engine and engine family of test vehicles

1.2.4. Additional test data or engineering evaluations if CARB staff or the vendor deems it necessary to validate the testing accuracy of the device.

2. CARB Device Verification Testing. The Executive Officer may perform device verification testing or review testing results to ensure the device meets all specifications, to verify if the device successfully communicates with and collects the requested data, and/or to validate the device's ability to meet the required testing specifications.

2.1. Vendor shall submit at least two (2) production ready devices that have valid unique device serial numbers, as well as any equipment that would be packaged with the devices including, but not limited to, extension cables, splitting cables, or installation kits, to the Executive Officer for verification and certification.

2.2. Each device provided shall be in a configuration that is suitable for testing. It shall have all the necessary equipment, instrumentation, and set up information that was used for vendor initial validation testing.

2.3. The Executive Officer shall issue results to the vendor. If the device passes all of CARB's verification testing, the device shall be allowed to advance to the certification requirements specified in Vendor Field Testing.

2.4. If the device fails any portion of CARB's verification testing, the devices may be returned to the vendor. After addressing the device deficiencies, if the vendor testing results show remediation, the vendor may resubmit a new certification package to the Executive Officer.

3. Vendor Field Testing. Testing shall be completed by the vendor using devices in the exact same configuration as those that completed the CARB device verification testing.

3.1. Vendor shall perform real-world testing by collecting data from an applicable heavy-duty vehicle population (non-gasoline with GVWR greater than 14,000 lbs.) within 90 days from the start of field testing.

3.1.1. Vendor shall include a representative sample of vehicle makes, engine families, and fuel types within the tested vehicle population that the device may be used on once certified.

3.1.2. Vendor shall use a minimum of 10 devices with the configuration that completed CARB verification testing.

3.1.3. For NCC-ROBD devices, a minimum of 100 OBD data submissions shall be obtained from a minimum of 100 vehicles per OBD protocol that a device is certifying to.

3.1.4. For CC-ROBD devices, a minimum of 100 data submissions shall be obtained from a minimum of 30 vehicles per OBD protocol that device is certifying to.

3.1.4.1. For CC-ROBD devices specific to vehicles for one vehicle make, a minimum of 50 data submissions shall be obtained from a minimum of 10 vehicles.

3.2. Vendor shall electronically submit required testing data through an electronic reporting system approved by the Executive Officer.

3.3. Vendor shall ensure successful communication between the device and the vehicle.

3.4. Vendor shall obtain a successful connectivity rate of 99.9 percent for all data supported by a vehicle's OBD system as listed in Table 4.

3.5. The Executive Officer may adjust the connectivity rate in 0.10 percent increments for the following reasons:

3.5.1. If it is determined through an engineering evaluation that the stringency of the required connectivity rates need to be loosened or tightened

3.5.2. If it is determined that a technical or engineering issue inhibits the ability to meet the required connectivity rates

3.6. Vendor shall ensure that the device is continuously in compliance with the configuration that completed CARB verification testing.

3.7. If the vendor would like to exempt a vehicle(s), a request shall be made to CARB requiring the approval of the Executive Officer before submitting the test results. The request shall contain the technical reasons and supporting data that explains why the vehicle should be exempted from the calculation.

3.8. If vendor cannot complete the field testing at the end of 90 days, vendor shall contact CARB by the 60th day and provide the reason(s) why the field testing may not be completed on time.

3.8.1. The Executive Officer will evaluate whether the vendor shall be allowed to continue with the testing or shall be required to resubmit a new application and restart the certification process. The criteria used to make this determination shall include:

3.8.1.1. Vendor's reasoning as to why the field testing is not able to be completed on time;

3.8.1.2. Whether unavoidable and unexpected issues occurred during the allotted testing period that made meeting the required deadline infeasible;

3.8.1.3. Whether the current testing completed to this point is consistent with the requirements that devices must meet to obtain certification; and/or

3.8.1.4. Additional test data may be requested by the Executive Officer to make this determination.

3.9. If the device fails to meet the requirements during field testing, the vendor shall determine the reason(s) for device failure.

3.9.1. The Executive Officer shall evaluate whether the vendor shall be allowed to retest their device in this phase after addressing the deficiencies or shall be required to resubmit a new application and restart the certification process. The criteria to be used to make this determination shall include:

3.9.1.1. Vendor's provided explanation explaining for the cause(s) of their device failure, with supporting information, and modifications needed to fix the issue(s);

3.9.1.2. Whether unavoidable and unexpected issues occurred during the allotted testing period that made meeting the required deadline infeasible;

3.9.1.3. Whether the technical reasons the device failed and the recommended solution require further laboratory testing to confirm that the issue was remedied;

3.9.1.4. How close the testing device is from being approved for certification; and/or

3.9.1.5. Additional test data may be requested by the Executive Officer to make this determination.

3.9.2. If the device fails a second attempt of field testing, the vendor shall be determined to have failed the certification process. The vendor may resubmit a new certification application after addressing any deficiencies.

D. Post-Certification Requirements.

1. Once the device meets the certification testing requirements, the vendor shall receive an Executive Order and the device may be sold and used for compliance purposes with this regulation. An Executive Order is valid from the indicated effective date until the end of the calendar year for which it is issued. Certification is to be renewed annually for any device for continued use in the program.

2. Vendor shall inform the user that the certified device has been registered and activated in the electronic reporting system approved by the Executive Officer.

    2.1. With CARB approval, the vendor shall provide necessary device updates as provided in the set schedule that was approved by CARB as specified in Part III section B.8. The Executive Officer may waive the set schedule update if a problem is detected with the device that critically impacts the compliance with the certified configuration. Upon CARB's request, the vendor shall provide an approved emergency update.

3. Vendor shall notify user(s) on any changes in the certified device.

4. Vendor shall resubmit a certification application for any changes that modify the device's certified configuration.

E. Reporting and Recordkeeping Requirements.

1. The device vendor shall electronically report certified devices via a method approved by the Executive Officer to the electronic reporting system and keep this information up to date.

2. Organize and maintain the following records:

    2.1. A copy of all applications including, but not limited to the test plan, application forms, test results, labels, owner's manual, warranty statement, and statement of compliance as specified in sections B through D of this Part, any provided information to CARB such as device updates, and any provided information to end users.

    2.2. A list of device unique serial numbers for all devices produced and sold including, but not limited to, purchaser and/or user company name, purchaser and/or user contact information, device model, and production date under each Executive Order.

3. Keep required test data and all other information specified in this Part for three years after CARB issues the Executive Order.

4. Records shall be readily available and stored in the same format as the submitted certification application and on any media, as long as the vendor can promptly send organized, written records in English to the Executive Officer if requested within 30 days.

F. Recertifying Annually.

1. Prior to the conclusion of the certification period, the vendor shall submit a recertification application for a new Executive Order provided the device continues to meet the required specifications.

    1.1. If the Executive Officer determines that the device still meets the required specifications, the device shall be recertified for another one (1) year period.

    1.2. Devices determined not to continually fulfill the required specifications shall not be recertified and shall be removed from use for compliance determination for this Part.

        1.2.1. After addressing the device deficiencies, the device vendor may resubmit a new certification application package to the Executive Officer for approval.

G. Decertifying Devices.

If CARB finds that a certified vendor fails to furnish or install required software updates to the device or continually meet the specifications and requirements as stated in this Part, the Executive Officer shall decertify the device in writing or by electronic mail with a specified effective date of the decertification. After the device is decertified, the device is considered noncompliant and shall no longer be used in the program for compliance determination purposes. The vendor shall notify the user(s) of the change in the device certification status.

H. Other Provisions.

1. Any person who fails to comply with these requirements or fails to submit information, reports, or statements required by this Part shall be subject to citation as specified in section 2198.2 and/or decertification.

2. Any person who knowingly submits any false statement or representation in any application, report, statement, or other document filed, maintained, or used for the purposes of compliance with this chapter shall be subject to citation as specified in section 2198.2 and/or decertification.