

CARB Heavy-Duty Inspection & Maintenance (HD I/M) Program

OBD Data Collection & Submission Specification

Draft

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Definitions, Acronyms, and Abbreviations

Acronym	Description
ACCII	American Standard Code for Information Interchange
CAL ID	Calibration Identifications
CVN	Calibration Verification Number
CAN	Controller Area Network
CC-ROBD	Continuously Connected Remote OBD
ECU	Electronic Control Unit
ELD	Electronic Logging Device
E-VIN	Electronic Vehicle Identification Number
GHG	Greenhouse Gas
GUID	Globally Unique Identifier
GVWR	Gross Vehicle Weight Rating
HD	Heavy-Duty
HD I/M	Heavy-Duty Inspection and Maintenance
HTTPS	Hypertext Transfer Protocol Secure. HTTPS is the protocol where encrypted HTTP data is transferred over a secure connection.
Kbps	Kilobits per second
MID	Monitor ID
MIL	Malfunction Indicator Light
MY	Model Year
NCC-ROBD	Non-Continuously Connected Remote OBD
OBD	Onboard Diagnostics
OBD key event	Specific events that are important to determining the condition of emission related components relevant to an I/M program; OBD key events can be used to verify a vehicle's compliance with the I/M program more frequently while limiting the amount of data that needs to be transmitted to the I/M database to keep the record volume manageable.
ROBD	Remote OBD
ROBD System	Complete remote OBD data collection and submission system, comprised of an ROBD tool (see definition below) and the proprietary database of a certified vendor. Example: The ROBD tool collects and sends the required OBD data to the vendor's database which would then format the data and submit it to the CARB HD I/M database.
ROBD tool	Physical device connected to the vehicle to collect OBD data
OEM	Original Equipment Manufacturer
PGN	Parameter Grouping Number
PID	Parameter ID
POST	POST method is a HTTPS method that is designed to send loads of data to a server from a specified resource.
SPN	Suspect Parameter Number
SSL	Secure Sockets Layer

1. Introduction

The main objective of this document is to communicate specifications for all the systems/tools to be used to collect and submit on-board diagnostics (OBD) data to the California Air Resources Board (CARB) to demonstrate vehicle compliance with California's heavy-duty inspection and maintenance (HD I/M) program. The intended audience of this document is the OBD community who will design and develop hardware, firmware, and software that will be utilized to submit vehicle OBD test data as part of CARB HD I/M program. Such entities may include, but would not be limited to, heavy-duty (HD) engine original equipment manufacturers (OEMs), OBD scan tool manufacturers, and fleet telematics companies who may have an interest in offering a product for use that meets the requirements of the HD I/M program. CARB expects the information provided in this document to be used by the OBD community to meet CARB's specification for collecting and submitting the required OBD data for HD I/M through developing new tools or modifying existing ones (e.g., firmware update, etc.). Such tools would ultimately provide owners of HD vehicles a convenient and reliable method of demonstrating compliance with the HD I/M program.

2. Overview of the role of OBD in the HD I/M program

2.1. Vehicle applicability

The following four categories of non-gasoline combustion on-road heavy-duty vehicles with gross vehicle weight rating (GVWR) greater than 14,000 pounds operating in California would be subject to periodic OBD data submission requirements of the HD I/M program:

- Diesel engines model years (MY) 2013 and newer;
- Diesel hybrid engines (as specified in section 1971.1, title 13, California Code of Regulations [section (c)]) MY 2018 and newer;
- Alternative fuel engines MY 2018 and newer;
- Alternative fuel hybrid MY 2018 and newer;

2.2. Different types of ROBD tools for periodic data submission in HD I/M

- i. Continuously connected remote OBD (CC-ROBD): ROBD tools installed exclusively on one vehicle (either through a dedicated tool developed to meet the HD I/M requirements, or an already-installed telematics/fleet management/ELD tool with modified firmware) that is continuously connected 24/7.
- ii. Non-continuously connected remote OBD (NCC-ROBD): ROBD tools designed for use on multiple vehicles developed to meet the HD I/M requirements by obtaining a snapshot of a vehicle's OBD data and sending to CARB HD I/M database.

3. List of the referenced documents

The referenced documents are listed below. CARB encourages vendors to use the information provided in the listed documents to meet OBD data collection and submission requirements of the CARB HD I/M program.

- [1] Section 1971.1, title 13, California Code of Regulations “On-Board Diagnostic System Requirements - 2010 and Subsequent Model-Year Heavy-Duty Engines”, 2019;
- [2] ISO 15031-4 “Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 4: External test equipment”, 2014;
- [3] SAE J1699-2 “Test Cases for OBD-II Scan Tools and I/M Test Equipment”, 2017;
- [4] SAE J1699-3 “Vehicle OBD II Compliance Test Cases”, 2017;
- [5] SAE J1962 “Diagnostic Connector”, July 2016 (SAE J1962).
- [6] SAE J1978 “OBD II Scan Tool – Equivalent to ISO/DIS 15031-4, April 2002 (SAE J1978).
- [7] SAE J1979 “E/E Diagnostic Test Modes”, February 2017 (SAE J1979).
- [8] SAE J1979-DA “Digital Annex of E/E Diagnostic Test Modes”, May 2019.
- [9] ISO 15765-4 “Road Vehicles-Diagnostics Communication over Controller Area Network (DoCAN) - Part 4: Requirements for emission-related systems”, April 2016 (ISO 15765-4).
- [10] SAE J1939 Recommended Practice for a Serial Control and Communications Heavy Duty Vehicle Network – Top Level Document, August 2013;
- [11] SAE J1939-DA “Digital Annex of Serial Control and Communication Heavy Duty Vehicle Network Data,” April 2019;
- [12] SAE J1939-3 “On Board Diagnostics Implementation Guide”, 2015;
- [13] SAE J1939-13 “Off-Board Diagnostic Connector”, October 2016;
- [14] SAE J1939-21 “Data Link Layer”, March 2016;
- [15] SAE J1939-71 “Vehicle Application Layer”, October 2016;
- [16] SAE J1939-73 “Application Layer—Diagnostics”, May 2017;
- [17] SAE J1939-81 “Network Management”, March 2017;
- [18] SAE J1939-84 “OBD Communications Compliance Test Cases for Heavy Duty Components and Vehicles”, October 2017.
- [19] SAE J3005-1 “Permanently or Semi-Permanently Installed Diagnostic Communication Devices”, 2019;

4. General requirements

- 4.1.1. The ROBD tool shall not interfere with the normal operation of the vehicle.
- 4.1.2. Any ROBD tool used for compliance purposes within the HD I/M program shall be capable of performing the following tasks (specific requirements of each task are provided in in Section 5):
 - i. Establishing connection with the vehicle and verifying vehicle’s support of HD OBD or OBD II at the individual ECU level

- ii. Collecting the OBD data required to be submitted as part of the program
 - iii. Submitting data securely via a standardized data submission format to the CARB HD I/M database
- 4.1.3. The ROBD tool shall request data from the ECUs indicating HD OBD or OBD II support, as specified in section [5.2](#).
 - 4.1.4. The ROBD tool shall timestamp each sent request and received response from the CAN Bus in the submitted data file, as specified in section [5.5](#).
 - 4.1.5. The ROBD tool 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).
 - 4.1.6. The ROBD tool shall not send a code clear command.
 - 4.1.7. The NCC-ROBD tool shall meet the requirements of both SAE J1939 and SAE J1979 OBD protocols¹.
 - 4.1.8. The ROBD tool shall insure that the vehicle's OBD data link Bus is not disturbed and placed in a Bus-passive, Bus-off, or other similar error condition during the protocol detection process.
 - 4.1.9. The ROBD system shall execute all the tasks specified in sections 4 and 5 automatically without any human interaction.

5. Specific requirements

This section provides detailed specifications of ROBD tools/systems that meet CARB HD I/M requirements.

5.1. Diagnostics connector

- 5.1.1. The CC-ROBD tools may be installed permanently (hard-wired into the vehicle wire harness) or semi-permanently (plugged into an available OBD port in vehicle).
- 5.1.2. The CC-ROBD tool shall be compliant with SAE J3005, J3005-1, J3005-2, ISO 15765-4, and ISO 15765-5.
- 5.1.3. The NCC-ROBD tools developed to meet both SAE J1939 and SAE J1979 OBD protocols (as specified in 4.1.8), shall be capable of mating to both the connectors defined in SAE J1962/ISO 15031-3 and to the SAE J1939-13 connector.
 - 5.1.3.1. The J1979 ROBD tool shall meet the specified requirements in ISO 15765-4 for CAN where one or more controllers comply with OBD regulations.
 - 5.1.3.2. The J1979 ROBD tool shall use the standard 16-pin type connector and communicate at 500 kilobits per second (kbps) baud rate.

¹ Upon adoption of the Unified Diagnostic Services (UDS) protocol, ROBD tools will be required to meet the requirements of this protocol as well. CARB will update this document in the future to account for the UDS protocol upon adoption.

- 5.1.3.3. The J1939 ROBD tool shall meet the requirements and guidelines in SAE J1939-3 for the implementation of OBD on heavy duty vehicles.
- 5.1.3.4. The J1939 ROBD tool shall use the standard 9-pin black connector and communicate at 250 kbps baud rate for 2013 – 2015 MY engines.
- 5.1.3.5. The J1939 ROBD tool shall use the standard 9-pin green connector and communicate at 500 kbps baud rate for 2016 MY and newer engines.
- 5.1.4. Plug-in ROBD tools (i.e., NCC-ROBD and semi permanently CC-ROBD tools) shall use colored LED lights as specified below, to be used as visual indicators of communication/data collection/data transmission:
 - 5.1.4.1. Flashing red light (one flash per 3 seconds for a 30-second duration) to indicate failed ROBD tool-vehicle communication (specified in 5.2.3.2) and/or vehicle not supporting the relevant OBD requirement (specified in 5.2.4).
 - 5.1.4.2. Flashing yellow light (one flash per second) to indicate OBD data collection from vehicle is in progress. The light shall extinguish upon completion of data collection.
 - 5.1.4.3. Flashing blue light (one flash per 2 seconds) to indicate data transmission from the ROBD tool is in progress. The light shall extinguish upon completion of data transmission.
 - 5.1.4.4. Solid green light to indicate a successful data transmission. The light shall extinguish after 10 seconds.

5.2. Communication with vehicle

5.2.1. SAE J1939 tool

- 5.2.1.1. The ROBD tool shall meet the standardized communication requirements as illustrated in SAE J1939-84.
- 5.2.1.2. The ROBD tool shall comply with SAE J1939-21 and SAE J1939-71 when connected to a SAE J1939 vehicle.
- 5.2.1.3. The ROBD tool shall meet all the requirements in SAE J1939-3, Section 4.
- 5.2.1.4. The ROBD tool shall act as a client for SAE J1939-73 (Table 1) diagnostics services provided by vehicle network.
- 5.2.1.5. The ROBD tool shall follow the requirements in J1939-3, Section 7 to ensure the proper initialization as a client for diagnostic services on a vehicle using SAE J1939 for OBD communications.
 - 5.2.1.5.1. Address claim: The ROBD tool shall meet address claim and dynamic addressing requirements in SAE J1939-81 to avoid address conflicts in cases where multiple tools communicate on the CAN Bus at the same time.

- 5.2.1.5.2. Verifying HD OBD compliance: The ROBD tool shall send a global DM5 request as outlined in SAE J1939-3.
- 5.2.1.5.3. The ROBD tool shall confirm HD OBD compliance after successful completion of the address claim process and receiving DM5 support response(s) from one or more onboard ECUs.
- 5.2.1.6. The ROBD tool initialization shall be performed prior to requesting diagnostic services from any ECU.
- 5.2.1.7. Identifying the available data: The ROBD tool shall send destination-specific requests for DM24 message to all HD OBD compliant ECUs identified as described in 5.2.1.5.3 and record all the received responses.
 - 5.2.1.7.1. As described in SAE J1939-71, the ROBD tool shall refrain from requesting data that is routinely broadcast on the network.
- 5.2.2. SAE J1979 tool
 - 5.2.2.1. The ROBD tool shall be compliant with SAE J1979.
 - 5.2.2.2. The ROBD tool will communicate with the vehicle OBD system using the signaling standard, and meeting the timing requirements, of ISO 15765-4.
 - 5.2.2.3. The ROBD tool shall meet the standardized communication requirements for scan tools as illustrated in SAE J1699-3.
 - 5.2.2.4. The ROBD tool shall meet the requirements in SAE J1978/ISO 15031-4 and SAE 1699/2 to avoid disturbing the in-vehicle communication.
 - 5.2.2.5. The ROBD tool shall meet the requirements in SAE J3005-1 for permanently or semi-permanently installed diagnostic communication devices.
 - 5.2.2.6. The ROBD tool shall utilize the initialization sequence of ISO 15765-4 in order to establish communication before sending diagnostic requests.
 - 5.2.2.7. Identifying the available data: The ROBD tool shall record all responses, including CAN source (i.e. specific ECU), to a Mode \$01 PID \$00, \$20, \$40, etc. requests sent during initialization.
 - 5.2.2.8. The ROBD tool shall conduct an analogous scan for available Monitor IDs (MIDs) in Mode \$06 (MID \$00, \$20, etc.)
 - 5.2.2.9. The ROBD tool shall conduct an analogous scan for available InfoTypes in Mode \$09.

- 5.2.3. In the case of failed initialization (i.e., vehicle not responding to the ROBD tool within the required duration), the ROBD tool shall repeat the initialization sequence, up to three times.
 - 5.2.3.1. The ROBD tool shall meet the response time requirements as outlined in SAE J1939-73 and SAE J1979.
 - 5.2.3.2. After the third failed initialization attempt, the ROBD system shall notify the vehicle driver and owner of the failed communication between the ROBD tool and the vehicle.
 - 5.2.3.2.1. For plug-in ROBD tools, the vendor shall notify the vehicle driver of the failed communication via LED lights on the ROBD tool as specified in 5.1.4.1.
 - 5.2.3.2.2. The CC-ROBD tool vendor may choose different means of communication (text message, e-mail, mail, etc.) to notify the vehicle owner of the failed ROBD tool-vehicle communication.
 - 5.2.3.3. The ROBD system shall submit a “Failed Communication” message to HD I/M database, in the format specified in 6.7.
- 5.2.4. In the case of vehicle not supporting the relevant OBD requirement (HD OBD or OBD II) following an initialization sequence, the ROBD tool shall repeat the initialization sequence up to three times.
 - 5.2.4.1. If all initialization attempts confirm the initial results, the vendor shall notify the vehicle driver (and owner, for CC-ROBD tools) as specified in 5.2.3.2.
 - 5.2.4.2. The ROBD system shall submit a “Vehicle not HD OBD/OBD II compliant” message to the CARB HD I/M database, in the format specified in 6.7.
- 5.3. **Collecting the required OBD data from vehicle**
 - 5.3.1. The ROBD tool shall be capable of collecting all the data required by CARB HD OBD regulation (section 1971.1, title 13, California Code of Regulations) and specified in sections (h)(4) and (h)(5) (see [Table A1](#) in the Appendix for more detail).
 - 5.3.2. The J1939 ROBD tool vendors can refer to Table 1 in SAE J1939-73 and SAE J1939 Digital Annex spreadsheet for more detailed information on requesting the data including the Parameter Grouping Number (PGN) and Suspect Parameter Number (SPN) of the parameters.
 - 5.3.3. The J1979 ROBD tool vendors can refer to Tables A1-A4 in SAE J3005-1 and SAE J1979 Digital Annex spreadsheet for more detailed information on requesting the data including the service modes, PIDs, MIDs, and InfoType data.
 - 5.3.4. In addition to the data required by the HD OBD regulation and specified in this section, the ROBD tool shall provide details of data collection (e.g.,

date/time of the data collection and ROBD tool unique hardware and software identifiers, etc.), as specified in section 5.5.

5.4. Checking for OBD key events (specific to CC-ROBD tools)

5.4.1. Within five minutes of every engine start, the CC-ROBD system shall collect the necessary data for a key event check and execute the check to determine if an OBD key event has occurred.

5.4.1.1. The vendor may choose to assign the data collection task to the CC-ROBD tool and execute the key event checks at the database level, or execute both tasks at the tool level.

5.4.2. The CC-ROBD system shall be capable of running both “basic” and “full” OBD key event checks, as defined in 5.4.3 and 5.4.4.

5.4.2.1. The vendor shall activate either the basic or full OBD key event check functionality as per the request from the vehicle owner.

5.4.3. Full OBD key event check: The CC-ROBD system shall be capable of executing all the following checks within five minutes of every engine start and determining if changes (as specified) since the last key event check have occurred:

5.4.3.1. Tool power loss: The CC-ROBD system shall be capable of detecting any loss of power between vehicle and the CC-ROBD tool since the last check.

5.4.3.2. MIL status change (item #4 in Table A1): The CC-ROBD system shall be capable of detecting any change in the MIL status (i.e., MIL has been turned on or off since the last check).

5.4.3.3. Electronic identifiers of the vehicle and its OBD system: The CC-ROBD system shall be capable of detecting any change in the following parameters since the last check:

i. E-VIN (item #8 in Table A1)

ii. Engine serial number and ECU names/IDs (items #9 and #10 in Table A1)

iii. Software CAL IDs and CVNs (items #6 and #7 in Table A1)

5.4.3.4. Readiness (item #1 in Table A1): The CC-ROBD system shall be capable of detecting any change from “Ready” to “Not Ready” in the readiness status of the supported OBD monitors.

5.4.3.5. Entering/exiting California (GPS-based method): The CC-ROBD system shall be capable of identifying if the vehicle has entered or exited California (CA) since the last key event check through CA state geofence parameters.

- 5.4.3.5.1. This is an optional submission feature, and the vendor shall activate it after receiving consent from the vehicle owner.
- 5.4.3.5.2. The CC-ROBD system shall collect the data as specified in sections 5.3 through 5.6 and submit it to the CARB HD I/M database upon identifying the vehicle has entered California in the first key event check subsequent to entry into the state.
- 5.4.3.5.3. Upon exiting California, the CC-ROBD system shall submit a message to the CARB HD I/M database (as specified in 5.5) stating that the vehicle has left CA.
- 5.4.3.5.4. The CC-ROBD system would not be required to collect and submit the complete data specified in 5.3 when the vehicle is outside CA.
- 5.4.4. Basic key event check: The CC-ROBD system shall only execute the mandatory tool power loss check (specified in 5.4.3.1) and the optional CA entry/exit check (specified in 5.4.3.5).
- 5.4.5. Upon identifying an OBD key event, the CC-ROBD system shall collect and submit the required data to the CARB HD I/M database as specified in sections 5.3 through 5.6.
- 5.4.6. The CC-ROBD system shall automatically submit the required OBD data (specified in section 5.3 through 5.6) when ninety days have passed since the last full data submission.
 - 5.4.6.1. Vehicles optioning into the GPS-based key event option (specified in 5.4.3.5) are exempt from the ninety-day submission requirement if they have been operating outside of California for the duration of this timeframe.

5.5. Formatting the collected OBD data

The ROBD system shall meet the following data format specification for submitting the collected data.

- 5.5.1. 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.
- 5.5.2. File name: The ROBD system software shall generate a 16-character GUID for the file name. All characters shall be ASCII 48-57 and 97-122 and have the text "_hdim" appended at the end of the GUID.
Examples:
b8ac348cd69d6d10_hdim.csv
81a150dtbd5d56n2_hdim.csv
- 5.5.3. File structure: The file shall consist of two sections: the data header, and the CAN Bus data in hexadecimal format.

5.5.4. Data header

- 5.5.4.1. 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.
- 5.5.4.2. A comma (,) shall separate each data field name or value.
- 5.5.4.3. 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	String (17)
Protocol	Vehicle's OBD communication protocol (SAE J1939/J1979)	String (5)
Odometer*	Odometer reading of the vehicle at the time the OBD data is downloaded from the vehicle OBD system	Integer (7)
Device Name	The manufacturer (make) of the ROBD tool	String (50)
Device Serial Number	The serial number of the ROBD tool	String (20)
Device Firmware Number	The firmware/version number of the software in the ROBD tool	String (20)
Record ID	A unique value from an ascending numerical sequence assigned by the ROBD tool to each submission	Integer (7)
CA Exit	The value indicates if the vehicle has exited CA. 1=exited CA, 0=inside CA	bit
Event Code	The assigned code of the key event that triggers the OBD data submission	Integer (1)
Data Collection Date and Time	The timestamp at the time the ROBD tool starts downloading OBD data from the vehicle OBD system. The timestamp is in pacific standard time (PST) and in the format of YYYY-MM-DD HH:MI:SS	datetime

* For pre-2024 MY engines that are not required by the HD OBD regulation to provide odometer reading, the ROBD tool shall obtain this parameter through other means.

5.5.5. CAN Bus Data

- 5.5.5.1. 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.
- 5.5.5.2. The CAN Bus data as collected from the vehicle shall start from the fourth row of the submission file.
- 5.5.5.3. A comma (,) shall separate data field names and values.
- 5.5.5.4. Each message shall have its own individual row.
- 5.5.5.5. The J1979 ROBD tool shall follow the formatting specification in Table 2 for the CAN Bus data section of the submission file (see the Appendix for an example submission file format).

Table 2. CAN Bus data formatting requirements for the J1979 ROBD tool

Data Field Name	Description of Data	Data Type (length)
Timestamp	The time that a message is sent from the ROBD tool to the vehicle or received from the vehicle. The timestamp is in pacific standard time (PST) and has millisecond precision. The timestamp is in the format of YYYY-MI-DD HH:MM:SSSS.	Datetime
Message Type	The message type of the data line. It indicates if the message was sent from the OBD tool 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 (2)
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 (50)

- 5.5.5.6. The J1939 ROBD tool shall follow the formatting specification in Table 3 for the CAN Bus data section of the submission file (see the Appendix for an example submission file format).

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 tool to the vehicle or received from the vehicle. The timestamp is in pacific standard time (PST) and has millisecond precision. The timestamp is in the format of YYYY-MI-DD HH:MM:SSSS.	Datetime

Message Type	The message type of the data line. It indicates if the message was sent from the ROBD tool 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 (10)
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 (50)

5.5.6. Upon leaving CA, the CC-ROBD system shall submit a file containing only the header section and the "CA Exit" field set to "1" (see 6.4 for an example).

5.5.7. The NCC-ROBD tools shall report "NA" for the values of "CA Exit" and "Event Code" fields in the header (see 6.5 and 6.6 for examples).

5.6. Transmitting the collected data to the CARB HD I/M database

5.6.1. Connection and authentication:

5.6.1.1. The serial number of the ROBD tool shall be registered in the HD I/M database as a valid testing tool in order to receive authentication to submit data to the HD I/M database.

5.6.1.2. The ROBD system shall supply a Client-Side Secure Sockets Layer (SSL) Certificate. This certificate validates the authenticity of the client with an administrative mechanism for loading/validating client certificates.

5.6.1.3. CARB will obtain and maintain a Server-Side SSL Certificate. This certificate validates the authenticity of the HD I/M database server and to establish the HTTPS encryption for privacy.

5.6.2. Data transfer protocol: The data files shall be submitted to the CARB HD I/M database from the ROBD system via HTTPS with the POST method.

5.6.2.1. The HD I/M program shall provide an URL for data acceptance.

5.6.3. Data integrity:

5.6.3.1. The data shall not be altered or tampered with during or prior to electronically submitting to the CARB HD I/M database.

5.6.3.2. The data file shall be transmitted securely from the ROBD system to the CARB HD I/M database.

5.6.3.3. The data shall be encrypted when sending from the ROBD system to the CARB HD I/M database.

5.6.4. Once an internet connection is available, the ROBD system shall submit the encrypted data files to the CARB HD I/M database. The internet connection can be satellite, cellular network, Wi-Fi, hot spot, etc.

5.6.5. Internal data storage:

- 5.6.5.1. The ROBD tool shall have enough internal storage capacity to store the retrieved data that have not been submitted due to unavailable internet connection.
- 5.6.5.2. The ROBD system shall retain the collected OBD data, either in the internal memory of the ROBD tool or in their proprietary database, for at least seven days following a successful submission to the CARB HD I/M database.

6. Appendix

6.1. Table A1 contains more information about the OBD data requirements of the HD I/M.

Table A1. Additional information about the HD I/M OBD data requirements

Item	Data Type	Corresponding Section in CARB HD OBD Regulation (CCR Title 13, Section 1971.1)	Relevant Diagnostic Message(s) in Each OBD Protocol		Comments
			J1939	J1979	
1	Readiness status of all OBD monitors listed in sections (e) and (g)	(h)(4.1)	DM5, DM21, DM26	Mode \$01 PID \$01	
2	all data stream parameters	(h)(4.2.2) and (h)(4.2.3)	See SAE J1939DA for PGNs and SPNs	Mode \$01, see SAE J1979DA for PIDs	
3	Freeze frame data	(h)(4.3)	DM25	Mode \$02	
4	Fault codes including active, pending, and permanent	(h)(4.4)	DM1, DM6, DM12, DM23, DM28, DM29	Modes \$03, \$07, \$0A	The J1939 ROBD tool 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	
6	Software calibration ID (Cal-ID)	(h)(4.6), (h)(4.7)	DM19	Mode \$09 InfoType \$04	
7	Calibration Verification Number (CVN)			Mode \$09 InfoType \$06	

8	VIN	(h)(4.8)	PGN: 65260 SPN: 237	Mode \$09 InfoType \$02	
9	Engine serial number	(h)(4.8)	PGN: 65269 SPN: 588	Mode \$09 InfoType \$0D	
10	ECU name	(h)(4.9)	PGN: 60928 SPN:2848	Mode \$09 InfoType \$0A	
11	Monitor in-use performance ratio	(h)(5.1)	DM20	Mode \$09 InfoType \$0B	
12	Engine run time tracking data	(h)(5.2)	See SAE J1939DA for PGNs and SPNs	Mode \$01, see SAE J1979DA for PIDs	
13	NOx emissions tracking data	(h)(5.3)	PGNs: 64258 thru 64279	Mode \$09 InfoTypes \$61 - \$76	For all 2022 and subsequent model year diesel engines
14	GHG tracking data	(h)(5.4) - (h)(5.6)	PGNs: 64252 thru 64257	Mode \$09 InfoTypes \$41 - \$49, \$50 - \$5B	For all 2022 and subsequent model year engines
15	PM filter regeneration event data	(h)(5.8)	See SAE J1939DA for PGNs and SPNs	See SAE J1937DA for PGNs and SPNs	

6.2. Example of a submission file format (CC-ROBD J1979 tool)

VIN,Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,
Record ID,CA Exit,Event Code,Data Collection Date and Time
1234567890ABCDEFGH,J1979,23000, ABC
Company,12345ABCDE,1.20.1005,23,0,2, 2024-06-25 12:23:4567
Timestamp, Message Type, ECU Address, Data Message
2024-06-25 12:23:4567,REQ,,686AF1 01 00
2024-06-25 12:23:4570,REQ,,07DF 01 00
2024-06-25 12:23:4588,RSP,10,07E8 41 00 BF BE A8 93
2024-06-25 12:23:4592,RSP,10,07EC 41 00 98 18 80 11
2024-06-25 12:23:4623,REQ,,07DF 01 01
2024-06-25 12:23:4712,RSP,10,07E8 41 01 00 07 65 00
2024-06-25 12:23:4800,REQ,07DF 01 20
2024-06-25 12:23:4811,RSP,10,07EC 41 20 80 01 80 01
2024-06-25 12:23:4823,RSP,10,07E8 41 20 A0 07 B1 19

6.3. Example of a submission file format (CC-ROBD J1939 tool)

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Record ID,CA Exit,Event Code,Data Collection Date and Time
ABCDEFGH1234567890,J1939,51000,XYZ Company,ABCDE12345,1.21.1005,123,0,0,
2024-06-25 12:23:4567

Timestamp,Message Type,CAN ID,Data Message
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

6.4. Example of a submission file format (CC-ROBD tool on a vehicle which has left CA)

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Record ID,CA Exit,Event Code,Data Collection Date and Time
ABCDEFGH1234123412,J1939,125000,XYZ Company,ABCDE12345,1.21.1005,53,1,0,
2024-06-25 12:23:4567

6.5. Example of a submission file format (NCC-ROBD tool-J1939)

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Record ID,CA Exit,Event Code,Data Collection Date and Time
ABCDEFGH7878123412,J1939,85000,XYZ Company,AXCFD55345,1.21.1005,33,NA,NA,
2024-06-25 12:23:4567
Timestamp,Message Type,CAN ID,Data Message
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

6.6. Example of a submission file format (NCC-ROBD tool-J1979)

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Record ID,CA Exit,Event Code,Data Collection Date and Time
ABCDEFGH7878123412,J1979,85000,XYZ Company,AXCFD55345,1.21.1005,33,NA,NA,
2024-06-25 12:23:4567

Timestamp, Message Type, ECU Address, Data Message
2024-06-25 12:23:4567,REQ,,686AF1 01 00
2024-06-25 12:23:4570,REQ,,07DF 01 00
2024-06-25 12:23:4588,RSP,10,07E8 41 00 BF BE A8 93
2024-06-25 12:23:4592,RSP,10,07EC 41 00 98 18 80 11
2024-06-25 12:23:4623,REQ,,07DF 01 01
2024-06-25 12:23:4712,RSP,10,07E8 41 01 00 07 65 00
2024-06-25 12:23:4800,REQ,07DF 01 20
2024-06-25 12:23:4811,RSP,10,07EC 41 20 80 01 80 01
2024-06-25 12:23:4823,RSP,10,07E8 41 20 A0 07 B1 19

6.7. Example of a submission file format (Failed OBD tool-vehicle communication or vehicle not HD OBD/OBD II compliant)

VIN,SAE Protocol,Odometer,Device Name,Device Serial Number,Device Firmware Number,Record ID,CA Exit,Event Code,Data Collection Date and Time
ABCDEFGH1234123412,J1939,125000,XYZ Company,ABCDE12345,1.21.1005,53,0,0,
2024-06-25 12:23:4567
"Failed Communication" or "Vehicle Not HD OBD/OBD II Compliant"