Oregon
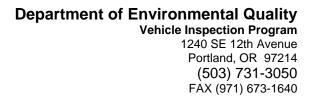
Vehicle Inspection Program

Oregon DEQ Remote OBD Specification Document for Telematic Device Providers

March 5, 2016

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1.   Background

Oregon Adds a Vehicle Emissions Testing Option
In Oregon, motorists refer to the smog test as "Going through DEQ" (Department of Environmental Quality). While DEQ offers several convenient Clean Air Station locations, our average wait time is less than 10 minutes, and we provide weekend and evening hours, we understand it can still be a challenge for our operations to match up with everyone's specific needs. That is why we started allowing for another testing option to evolve in early 2016. Everyone likes choices. Take the evolution of the banking industry where business was conducted only with in-person tellers at first, then ATM machines were introduced and now banking can also be completed using the internet. Similarly, with DEQ, motorists can receive an emissions test with in-person inspectors or self-service machines at our stations and now testing can also be completed using the internet.

The internet option is called DEQ Too™ and involves the motorist voluntarily authorizing On-Board Diagnostics (OBD) data to be remotely transmitted from their vehicle to DEQ. Instead of visiting a Clean Air Station, motorists test their vehicle at locations they are driving to already. While taking care of their other car needs at such places, they can take care of their *DEQ too*. Participating businesses will lend motorists a telematics testing device to plug into their car and two minutes later return it. The car's OBD data will be immediately transmitted to DEQ and then at the motorist's convenience they can use their smart phone or other device to check results. They'll be able to view diagnostic trouble codes if their Check Engine light is on. Or, if all looks good to pass DEQ's emissions test, they can order their DMV (Driver and Motor Vehicle Services Division, a branch of the Oregon Department of Transportation) stickers online which will arrive in the mail in as few as 3 business days.

Telematic devices manufactured into a vehicle's system to provide turn-by-turn navigation, roadside and stolen vehicle assistance, etc., can also transmit OBD data. In addition, auto fleet services, usage-based auto insurance programs, and other applications utilize after-market Telematic devices which can also transmit OBD data. DEQ will accept data transmitted from these types of continuously connected devices as well. While originally intended for other uses, these can be used for *DEQ too*.

The bottom line is that DEQ wants to ensure motorists have multiple testing options and can decide what's best for them in their particular situation at any given time. The DEQ Too option allows motorists to save time and fuel; and even help reduce air pollution.

DEQ Makes the Determination of Test Results
The Department's Environmental Quality Commission authorizes remote, self-service testing via Oregon Administrative Rule 340-256-0358(1). DEQ is the only entity authorized to determine and provide the emissions testing results to vehicle owners.

The 2 Types of Telematic Devices
1)   *Continuously Connected* vehicle telematics device (hereinafter interchangeable with "C-type" device). This device is one that is continuously connected, 24/7 to one vehicle. These C-type devices are either built-in to the vehicle's system during auto manufacturing or plugged-in after-market. By comparison, the other telematics device (S-type) can be shared for use by multiple vehicles.

The C-type device has a primary objective *other than* transmitting OBD data to DEQ. Examples of after-market C-type devices include use by auto fleets to optimize driving routes

and maintenance schedules and by usage-based auto insurance programs to help motorists achieve lower premiums. Key purposes of built-in, C-type devices are roadside assistance, stolen vehicle assistance, turn-by-turn navigation, hands-free calling, etc. Regardless of their primary purpose, these continuously connected devices can also capture OBD data and so they can be used for *DEQ too*.

2) **Shared** telematics device (hereinafter interchangeable with "S-type" device). A S-type is an after-market plug-in device that can be shared for use by multiple vehicles; one vehicle at a time. By comparison, the other telematics device (C-type) is continuously connected to and used by only one vehicle.

The objective of the S-type device is for use with multiple vehicles to transmit a snapshot of each vehicle's OBD data to DEQ. The general public would use S-type devices by borrowing them from participating host locations that exist for a primary purpose other than transmitting OBD data. For example, if a gas station participated as a host, their primary purpose is for motorists to refuel their vehicle. However, by briefly borrowing the device, motorists could take care of their *DEQ too* while they are refueling.

The 5 Types of Business Participants
DEQ Too relies on an open market approach whereby voluntary participation in a given role is open to any company that meets certain terms and conditions. Each business participant type and role is as follows:
1) **C-Type Device Provider** is the company with which the vehicle owner enters into the original agreement to lease, own and/or activate the telematics device.
2) **S-Type Device Provider** is the company with which the Host, Auto Dealership and/or Fleet enters into an agreement to lease, own and/or activate the telematics device.
3) **Hosts** own or operate a business that has an S-type device that is used on location voluntarily by a motorist or by the host on behalf of the volunteering motorist. The objective is to allow transmission of OBD data to DEQ from the business location. Having the S-type device is in addition to the business' primary product/service. Examples of possible device-borrowing locations include, but are not limited to: gas station, auto service, repair, parts and car washing companies.
4) Companies with a **Fleet** of vehicles voluntarily use the devices to transmit OBD data from the vehicles they own/operate to DEQ and subsequently retrieve results from the DEQ Too website.
5) **Auto Dealerships** voluntarily use the devices to transmit OBD data to DEQ from the vehicles they own/sell and subsequently retrieve results from the DEQ Too website.

When a company enrolls to participate and meets the terms and conditions for one of the above roles, DEQ places them on one of the five list-types as an "Official DEQ Too Business Participant". When a general public vehicle owner voluntarily uses a telematics device to transmit OBD data to DEQ, they do not need to enroll with DEQ Too in advance, but they must agree to certain terms and conditions on the website before results will be shown.

Vehicle Owners will Obtain Results Using the DEQ Too Website
- The vehicle owner will enter their license plate or VIN to display their test results.
- If the vehicle is "Unready", the website will indicate what that means.
- If DEQ has failed the vehicle (Check Engine Light has been commanded "ON"), the website will indicate and provide a link to DEQ's Recognized Auto Repair Shops.

- Once the vehicle has passed the test, the owner will pay DEQ's certification fee via the website.

The remote OBD inspection records shall be sent to Oregon DEQ's Demilitarized Zone (DMZ) Server, designed to collect inspection results received from Remote OBD (used interchangeably with telematics) devices for processing. DMZ server support functions include those needed to manage and validate Remote OBD client systems, manage enrollment of systems, manage and process inspection data for evaluation, and store supporting information for motorists' queries and DEQ Certification requests.

This document describes the communications interface for the secure transmission of standardized Remote OBD inspection and supporting data between the telematics device and/or server and Oregon DEQ's DMZ server.

This document serves to provide telematics device providers an open standard interface and protocol for this data transfer. DEQ's intent is that any data transfer must adhere to this interface and protocol.

Information in this document is organized as follows:

System Overview

Device Connection, Authentication, and Security

Data Transfer Schema

Web Service WSDLs and XML Schema Definitions

Appendices

2. System Overview

DEQ's Remote OBD system is composed of the following components:

1. Telematics Device (acquires and transmits OBD data)

2. Data acquisition server

3. Oregon DEQ's DMZ server

Each is further described below.

2.1 Telematics Device

The telematics device is one of the following technologies as defined in the Background section:

- Continuously Connected vehicle telematics device (C-type)

- Shared telematics device (S-type)

Only vehicles with valid VINs retrieved via an OBD Mode $09 request are eligible for DEQ Certification in this program. Telematic devices must be designed to meet SAE J1962, SAE J1978, SAE J1979, SAE J3005[1], and tested to comply with SAE J1699/2 by each telematics device provider. The devices must be able to properly retrieve, store, and upload all codes

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[1] Section 4.2 of SAE J3005 calls for the device to consume less than an average of 100 microamps (0.1 milliamps) while in sleep state (IGN OFF). This requirement specifically addresses long-term parking with a telematics device continuously connected to a vehicle. Hence, the requirement of this section is waived for the purposes of Oregon's DeqToo program.

listed in SAE J2012. Device providers must be aware of known communication anomalies as described in SAE J1699/4 and take best engineering practices to handle such anomalies such that, at a minimum, no harm is done to the vehicle.

2.2 Data Acquisition Server

The data acquisition server will interface with the telematics device. The acquisition server's purpose is to collect OBD data and electronically transmit it _directly_ to DEQ's DMZ server. In some cases, the telematics device itself (or paired with other transmission-capable technology) may act as the data acquisition server and electronically transmit the OBD data _directly_ to DEQ's DMZ server. Per Section 203(a)(3) of the Federal Clean Air Act, the OBD system data shall not be altered or tampered with during or prior to the electronic transmission.

2.3 DEQ's DMZ Server and VID

DEQ's **Vehicle Inspection Database (**VID) will regularly pull collected inspection results from the DMZ server and apply pass/fail/unready criteria. The vehicle owner will then be able to search for their results on DEQ's website by VIN, license plate, or dealership/fleet name. Once they pay for their certificate on-line, DMV is electronically notified in near-real-time of the passing VIN so DMV tags can be obtained.

3. Device Connection, Authentication, and Security

This section describes the mechanisms for connection, authentication, data transfer, maintaining data integrity, and Vehicle and Test Validity.

3.1 Connecting and Authenticating

Layered secure access to the data transfer services will be controlled by all of the following:

Server Side SSL Certificate, to validate the authenticity of the DMZ server and to establish the HTTPS encryption for privacy. DEQ will obtain and maintain this certificate.

Telematics device provider supplied Client Side SSL Certificate, to validate the authenticity of the client, with an administrative mechanism for loading/validating client certificates. Telematics device providers will be responsible for obtaining and maintaining this certificate.

Digest Access Authentication with an application membership database, to securely identify and authorize each individual telematics device provider. DEQ, in cooperation with prospective telematics device providers, will maintain this membership database. A URL whitelist of approved providers will also be maintained by DEQ's IT department.

Appropriate data transfer services shall be exposed to valid, authenticated device providers on successful login.

3.2 Data Transfer Protocol

The data acquisition server shall transfer messages over HTTPS using SOAP, a protocol for exchanging information structured into XML message format via web services.

3.3 Data Integrity

Logical data integrity shall be maintained and assured through incorporation of payload encryption TCP to ensure reliable transmission of data.

The device initialization procedure shall include a means for establishing a local key on the device that is recognized by DEQ's DMZ server. Interface software shall provide for data encryption that meets DEQ/VIP's security needs. The remote OBD system shall incorporate Data Encryption Standard (DES) or other standard encryption techniques that provide performance equivalent to DES.

3.4   Vehicle and Test Validity

To ensure the vehicle test actually belongs to the indicated VIN, this inspection option will only be available for 2005 and newer models that return OBD VINs as part of a Mode 9 request. Records transmitted without OBD VIN data will not be posted to the DEQ DMZ server.

4.   Data Transfer Schema

The data acquisition server shall communicate with the VID via a data transfer schema that incorporates the following data transfer message:

"Transmit Remote OBD Data Record to DEQ DMZ server".

4.1   Message: Transmit Remote OBD Data Record

The Remote OBD test proceeds as follows:

(Note: this is irrespective of whether a S-type or C-type telematics device is being used)

- Telematics device is connected to DLC on vehicle and either Key On/Engine On or Key On/Engine Off.

- While SAE J1979 stipulates the MIL command not be used during the bulb-check cycle, some manufacturers continue to use this practice. Therefore devices should be programmed to mitigate false failures by checking for a MIL command with no DTC present. A pause followed by another OBD scan usually allows the bulb-check to complete and the MIL command to extinguish. This issue is further exasperated by manufacturers that command the MIL for a fault code that is not accessible to a generic scan tool, but is accessible to a manufacturer scan tool. This means there are cases in which a MIL can be present without a DTC and is a legitimate failure.

- OBD data is acquired and sent to DMZ server.

- OBD test is validated by DEQ's VID.

The following table lists the Field/Data properties that are to be downloaded. Given the wireless nature of the OBD data gathering outlined in this specification, it is important to limit the available Services and PIDs to those listed in the table below. In the unlikely event of a wireless security breach, no Service or PID request outside this list shall be allowed by telematic device providers.

Field/Data Properties:

#	Property Description	Property Name	Length	Type	Layout	Comments
1	Electronic Vehicle Identification Number	VIN	17	A		Must pass standard VIN check algorithm
2	Date of Data Collection[2]	DATE	8	A	YYYYMMDD	Pacific Standard Time
3	Time of Data Collection	TIME	6	A	HHMMSS	Pacific Standard Time
4	Communications Protocol	COMM_PROT	3	A	AAA	See Communication Protocols List
5	MIL Commanded On	MIL	1	A	Y, N	Yes, No
6	OBD Monitor Status - Misfire	MISFIRE_STATUS	1	A	U, R, N	See Monitor Readiness Result List
7	OBD Monitor Status - Fuel System	FUEL_STATUS	1	A	U, R, N	See Monitor Readiness Result List
8	OBD Monitor Status - Comprehensive Component	COMP_STATUS	1	A	U, R, N	See Monitor Readiness Result List
9	OBD Monitor Status - Catalyst	CAT_STATUS	1	A	U, R, N	See list; also note for Compression ignition, monitor label is described as NMHC Catalyst
10	OBD Monitor Status - Catalyst Heater	CATHTR_STATUS	1	A	U, R, N	See list; also note for Compression ignition, monitor label is described as NOx/SCR
11	OBD Monitor Status - Evap	EVAP_STATUS	1	A	U, R, N	See list; also note for Compression ignition, monitor label is described as Reserved
12	OBD Monitor Status - Secondary Air	AIR_STATUS	1	A	U, R, N	See list; also note for Compression ignition, monitor label is described as Boost Pressure
13	OBD Monitor Status - Air Conditioning (Reserved)	AC_STATUS	1	A	U, R, N	Reserved, formerly AC; See list
14	OBD Monitor Status - Oxygen Sensor	O2_STATUS	1	A	U, R, N	See list; also note for Compression ignition, monitor label is described as EGS
15	OBD Monitor Status - Oxygen Sensor Heater	HEATEDO2_STATUS	1	A	U, R, N	See list; also note for Compression ignition, monitor label is described as PM Filter
16	OBD Monitor Status - EGR	EGR_STATUS	1	A	U, R, N	See list; also note for Compression ignition, monitor label is described as EGR/VVT
17	Engine RPM	RPM	4	N	NNNN	At time other data is saved
18	PID Count	PID_COUNT	3	N	NNN	As per ETI flow diagram
19	PCM ID	PCM	4	A		Engine Control Module address; Convert last two bytes to decimal. Example: 07E8 or E8 = 232
20	Diagnostic Trouble Code 1	DTC_1	5	A	AAAAA	
21	Diagnostic Trouble Code 2	DTC_2	5	A	AAAAA	
22	Diagnostic Trouble Code 3	DTC_3	5	A	AAAAA	
23	Diagnostic Trouble Code 4	DTC_4	5	A	AAAAA	
24	Diagnostic Trouble Code 5	DTC_5	5	A	AAAAA	
25	Diagnostic Trouble Code 6	DTC_6	5	A	AAAAA	
26	Diagnostic Trouble Code 7	DTC_7	5	A	AAAAA	
27	Diagnostic Trouble Code 8	DTC_8	5	A	AAAAA	
28	Diagnostic Trouble Code Count	DTC_COUNT	3	N	NNN	
29	Pending Diagnostic Trouble Code 1	PEND_DTC_1	5	A	AAAAA	
30	Pending Diagnostic Trouble Code 2	PEND_DTC_2	5	A	AAAAA	
31	Pending Diagnostic Trouble Code 3	PEND_DTC_3	5	A	AAAAA	
32	Pending Diagnostic Trouble Code 4	PEND_DTC_4	5	A	AAAAA	
33	Pending Diagnostic Trouble Code Count	PEND_DTC_COUNT	3	N	NNN	
34	Permanent Diagnostic Trouble Code 1	PERM_DTC_1	5	A	AAAAA	
35	Permanent Diagnostic Trouble Code 2	PERM_DTC_2	5	A	AAAAA	
36	Permanent Diagnostic Trouble Code 3	PERM_DTC_3	5	A	AAAAA	
37	Permanent Diagnostic Trouble Code 4	PERM_DTC_4	5	A	AAAAA	
37a	Permanent Diagnostic Trouble Code Count	PERM_DTC_COUNT	3	N	NNN	
38	Distance travelled while MIL is activated	DISTANCE_SINCE_MIL	5	N	NNNNN	Kilometers
39	Number of warm-ups since DTC cleared	WARMUPS_SINCE_CC	3	N	NNN	
40	Distance since diagnostic trouble codes cleared	DISTANCE_SINCE_CC	5	N	NNNNN	Kilometers
41	Minutes run by the engine while MIL activated	MIN_SINCE_MIL	5	N	NNNNN	Minutes

[2] Date/Time of Data Collection is distinguished from Payload Date/Time as follows: Date/Time of Data Collection is the date/time of the OBD record event. Payload Date/Time is the date/time the record is transferred to the VID.

#	Property Description	Property Name	Length	Type	Layout	Comments
42	Time since diagnostic trouble codes cleared	MIN_SINCE_CC	5	N	NNNNN	Minutes
43	Calibration ID	CAL_ID	16	A		ASCII (requires conversion)
44	Calibration Verification Number	CVN	8	A		Hex (no spaces)
45	OBD Conformance Standard	OBD_CONFORM_STD	3	N	NNN	Decimal value of Mode $01 PID 1C = OBD standards this vehicle conforms to (0-255)
46	OBD Fuel Type	FUEL_TYPE	2	N	NN	Decimal value of Mode $01 PID 51 = Fuel type (0-23)
47	OBD Fuel Ethanol Percentage	FUEL_ALC_PERCENT	3	N	NNN	Mode $01 PID 52 = Ethanol fuel percentage (0-100)
48	OBD Ignition Monitor Type	IGN_MON_TYPE	1	N	N	Mode $01 PID $41 B3 = Spark or compression ignition monitor mapping (0 or 1)
	In addition to the Remote OBD elements listed above, the following information shall also be included in the message:					
H1	Device Initialization Code ID	DEVICE_KEY	5	A		Length intended to match that utilized in DEQ inspection lanes to uniquely identify a station/lane/position SSLLP.
H2	Device Serial Number[3]	LINK_ID	60	A		Begin with abbreviated MFG name, then abbreviated Model name, then number
H3	Device Status	DEVICE_STATUS	12	A		
H4	Device Firmware Number	DEVICE_FIRMWARE	12	A		
H5	Receiver ID	RECEIVER_ID	12	A		Begin with abbreviated MFG name
H6	Receiver Software Version	RECEIVER_VERSION	12	A		
H7	Payload Date[4]	PAYLOAD_DATE	8	A	YYYYMMDD	Pacific Standard Time
H8	Payload Time	PAYLOAD_TIME	6	A	HHMMSS	Pacific Standard Time
H9	Record ID	RECORD_ID	12	A		
H10	QA data flag	QA_DATA_FLAG	1	A	Y, N	Yes, No
H11	Event Code	REMOTEOBD_EVENT	1	A	TBD	TBD, Per program business rules. Encodes the event that triggered the record transfer.

Additional Definitions:

Monitor Readiness Result:

U = Monitor is unsupported

R = Monitor is complete (ready)

N = Monitor is not complete (not ready)

Communication Protocols:

V = SAE J1850 VPW (VPW)

P = SAE J1850 PWM (PWM)

I = ISO 9141-2 (ISO)

Kf = ISO 14230-4 (KeyWord fast initialization)

Ks = ISO 14230-4 (KeyWord slow initialization)

C11 = ISO 15756-4 (CAN - 11 bit)

C29 = ISO 15756-4 (CAN - 29 bit)

The data value format of OBD parameters should be consistent with SAE J1979 unless otherwise specified differently in this document.

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[3] Due to legacy constraints on the DEQ server each link vendor is limited to 1.5 million active device serial numbers.

[4] Date/Time of Data Collection is distinguished from Payload Date/Time as follows: Date/Time of Data Collection is the date/time of the OBD record event. Payload Date/Time is the date/time the record is transferred to the VID.

5. Web Service WSDLs and XML Schema Definitions

5.1 Overview

DEQ desires to allow motorists to receive their DEQ certification through a variety of Remote OBD methods, in addition to their inspector testing and self-service options in the Clean Air Stations. The remote OBD inspection records shall be sent to Oregon DEQ's DMZ Server, designed to collect inspection results received from the remote OBD devices for processing. The DMZ server support functions include those needed to manage and validate remote OBD client systems, manage enrollment of systems, manage and process inspection data for evaluation, and store supporting information for motorists' queries and DEQ Certification requests. This section describes the services supporting the communications interface for the secure transmission of standardized Remote OBD inspection and supporting data between the telematics device or the telematics device provider's server and Oregon DEQ's DMZ server. Specifically, this section provides instructions for utilization of the service endpoint for the UAT/Staging and Production environment.

5.2 Web Service Endpoint URL for UAT/Staging

The Web Service Endpoint URL is **Computer Security Sensitive Information** and will be provided to those telematics device providers approved to participate in Oregon's DeqToo Program.

5.3 Web Service Endpoint URL for Production

This Web Service Endpoint URL is **Computer Security Sensitive Information** and will be provided to those telematics device providers approved to participate in Oregon's DeqToo Program.

5.4 Available Service Operations

Service Operation Name	Parameters	Returns
Loopback		True | False
StoreRemoteOBDDeqTooData	Parameter 1: *ROBDRequestOBDData*	*ROBDResponseResult*

Methods

5.4.1 Loopback

The telematics device provider application can call this method to ensure that the service endpoint is available and responding to requests.

5.4.2 StoreRemoteOBDDeqTooData

The telematics device provider application will invoke this method to send data to Oregon DEQToo server.

Data Types

The table below lists all the elements/values that the vendor can send to Oregon DEQ Too, while invoking the StoreRemoteOBDDeqTooData service call using SOAP. Since not all parameters are supported by all vehicles, the table includes a column labeled "Required". A "No" should not be interpreted as optional if the parameter is supported by the vehicle. If a vehicle supports the parameter or element, then it must be sent.

5.4.3 ROBDRequestOBDData

Element Name	Element Type	Min	Max	Required	Format
CalID	String	0	16	No	*ASCII*
CVN	String	0	8	No	*Hex - no spaces*
DataCollectionDate	String	8	8	Yes	**YYYYMMDD**
DataCollectionTime	String	6	6	Yes	**HHMMSS**
DeviceInfo	ROBDRequestDeviceInformation	-	-	Yes	-
DTCCodes	Array of ROBDRequestDTCCode	-	-	No/Yes[5]	-
DTCCount	Int16	0	3	Yes	*Numeric*
EngineRPM	Int16	0	4	No	*Numeric*
MILCommandedOn	String	1	1	Yes	**Y | N**
OBDMonitors	ROBDRequestMonitors	-	-	Yes	-
OBDParameters	ROBDRequestOBDParametersData	-	-	Yes	-
OBDProtocol	String	0	3	Yes	**V | P | I | Kf | Ks | C11 | C29**
PCMId	String	0	4	No	*Alphanumeric*
PendingDTCCodes	Array of ROBDRequestPendingDTCCode	-	-	No/Yes[4]	-
PendingDTCCount	Int16	0	3	Yes	*Numeric*
PermanentDTCCodes	Array of ROBDRequestPermanentDTCCode	-	-	No/Yes[4]	-
PermanentDTCCount	Int16	0	3	No	*Numeric*
PIDCount	Int16	0	3	No	*Numeric*
VIN	String	17	17	Yes	*Alphanumeric*

5.4.4 ROBDRequestDeviceInformation[4]

Element Name	Element Type	Min	Max	Required	Format
DeviceFirmware	String	0	12	No	*Alphanumeric*
DeviceKey	String	0	5	No	*Alphanumeric*
DeviceSerialNumber	String	1	60	Yes	*Alphanumeric*
EventCode	String	0	1	No	*Alphanumeric*
PayloadDate	String	8	8	Yes	**YYYYMMDD**
PayloadTime	String	6	6	Yes	**HHMMSS**
QADataFlag	String	0	1	Yes	**Y | N**
ReceiverID	String	0	12	No	*Alphanumeric*
ReceiverSoftwareVersion	String	0	12	No	*Alphanumeric*

5.4.5 ROBDRequestDTCCode

Element Name	Element Type	Min	Max	Required	Format
DTCCode	String	0	5	No	*Alphanumeric*

5.4.6 ROBDRequestMonitors

Element Name	Element Type	Min	Max	Required	Format
MonitorMisfire	String	1	1	Yes	**N | R | U**
MonitorFuelSystem	String	1	1	Yes	**N | R | U**
MonitorComprehensive	String	1	1	Yes	**N | R | U**
MonitorCatalyst	String	1	1	Yes	**N | R | U**

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[5] If the associated DTCCount is not '0' then the associated DTCCodes are required.

MonitorCatalystHeater	String	1	1	Yes	**N | R | U**
MonitorEvap	String	1	1	Yes	**N | R | U**
MonitorSecondaryAir	String	1	1	Yes	**N | R | U**
MonitorAirConditioning	String	1	1	Yes	**N | R | U**
MonitorOxygenSensor	String	1	1	Yes	**N | R | U**
MonitorOxygenSensorHeater	String	1	1	Yes	**N | R | U**
MonitorEGR	String	1	1	Yes	**N | R | U**

5.4.7 ROBDRequestOBDParametersData

Element Name	Element Type	Length		Required	Format
		Min	Max		
MileageSinceCodeCleared	String	0	5	No	*Numeric or 'N'*
MileageSinceMIL	String	0	5	No	*Numeric or 'N'*
MinutesSinceCodeCleared	String	0	5	No	*Numeric or 'N'*
MinutesSinceMILOn	String	0	5	No	*Numeric or 'N'*
OBDConformSTD	String	0	3	No	*Numeric or 'N'*
OBDFuelAlcoholPercentage	String	0	3	No	*Numeric or 'N'*
OBDFuelType	String	0	2	No	*Numeric or 'N'*
OBDIgnitionMonitorType	String	0	1	No	*Numeric or 'N'*
WarmupsSinceCodeCleared	String	0	5	No	*Numeric or 'N'*

Note: Unsupported parameter(s) must have their value set to 'N'

5.4.8 ROBDRequestPendingDTCCode

Element Name	Element Type	Length		Required	Format
		Min	Max		
DTCCode	String	0	5	No	*Alphanumeric*

5.4.9 ROBDRequestPermanentDTCCode

Element Name	Element Type	Length		Required	Format
		Min	Max		
DTCCode	String	0	5	No	*Alphanumeric*

Response Details

5.4.10 ROBDResponseResult

Element Name	Element Type
ErrorCode	Int16
ErrorDescription	String
Success	Boolean

Error Code	Error Description	Success
0	Success	True
1	Retry	False
2	[Refer Reason for Failure](#)	False

5.4.11 Reason for Failure

Duplicate Data
Key Data Missing
Invalid Data Collection Date
Invalid Data Collection Time
Invalid Device Serial Number
Invalid DTC Data
Invalid OBD Parameters Data
Invalid VIN

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5.5   Example: Service Client Code Snippet (C#.NET)

```csharp
class DeqTooTestRecord
 {
    static void Main(string[] args)
    {
        RemoteOBDDeqTooServiceClient serviceClient = new RemoteOBDDeqTooServiceClient();
        ROBDRequestOBDData obdData = new ROBDRequestOBDData()
        {
            CalID = "4L2401A 0006AVAB",
            CVN = "1CD1EF1A",
            DataCollectionDate = "20150615",
            DataCollectionTime = "131456",
            DeviceInfo = new ROBDRequestDeviceInformation()
            {
                DeviceFirmware = "123456",
                DeviceSerialNumber = "123456",
                DeviceKey = "123456"
            },
            DTCCodes = new ROBDRequestDTCCode[]
            {
                new ROBDRequestDTCCode()
                {
                    DTCCode = "P0301"
                },
                new ROBDRequestDTCCode()
                {
                    DTCCode = "P0302"
                }
            },
            DTCCount = 2,
            EngineRPM = 750,
            OBDMonitors = new ROBDRequestMonitors()
            {
                MonitorMisfire = "R",
                MonitorFuelSystem = "R",
                MonitorComprehensive = "R",
                MonitorCatalyst = "R",
                MonitorCatalystHeater = "U",
                MonitorEvap = "R",
                MonitorSecondaryAir = "U",
                MonitorAirConditioning = "U",
                MonitorOxygenSensor = "R",
                MonitorOxygenSensorHeater = "R",
                MonitorEGR = "R"
            },
            OBDParameters = new ROBDRequestOBDParametersData()
            {
                MileageSinceCodeCleared = "6586",
                MileageSinceMIL = "0",
                MinutesSinceCodeCleared = "1234",
                MinutesSinceMILOn = "0",
                OBDConformSTD = "3",
                OBDFuelAlcoholPercentage = "N",
                OBDFuelType = "4",
                OBDIgnitionMonitorType = "1",
                WarmupsSinceCodeCleared = "111"
            },
            OBDProtocol = "C11",
            PCMId = "1",
            PIDCount = 0,
```

```csharp
            VIN = "WA1LMAFE6DD999999"
        };

        ROBDResponseResult serviceResult = serviceClient.StoreRemoteOBDDeqTooData(obdData);
        if (!serviceResult.Success)
        {
            Console.WriteLine(serviceResult.ErrorCode);
            Console.WriteLine(serviceResult.ErrorDescription);
        }
        else
        {
            Console.WriteLine("Data stored successfully.");
        }
        Console.ReadLine();
    }
}
```

5.6   Example: ROBDRequestOBDData Serialized to XML

```xml
<ROBDRequestOBDData xsd =
"http://schemas.datacontract.org/2004/07/Opus.Data.RemoteOBDDeqTooData">
  <VIN>ABCDEFG1234567890</VIN>
  <DataCollectionDate>20150615</DataCollectionDate>
  <DataCollectionTime>131456</DataCollectionTime>
  <OBDProtocol>I</OBDProtocol>
  <MILCommandedOn>Y</MILCommandedOn>
  <OBDMonitors>
    <MonitorMisfire>R</MonitorMisfire>
    <MonitorFuelSystem>R</MonitorFuelSystem>
    <MonitorComprehensive>R</MonitorComprehensive>
    <MonitorCatalyst>R</MonitorCatalyst>
    <MonitorCatalystHeater>U</MonitorCatalystHeater>
    <MonitorEvap>R</MonitorEvap>
    <MonitorSecondaryAir>U</MonitorSecondaryAir>
    <MonitorAirConditioning>U</MonitorAirConditioning>
    <MonitorOxygenSensor>R</MonitorOxygenSensor>
    <MonitorOxygenSensorHeater>R</MonitorOxygenSensorHeater>
    <MonitorEGR>R</MonitorEGR>
  </OBDMonitors>
  <EngineRPM>750</EngineRPM>
  <PIDCount>10</PIDCount>
  <PCMId>10</PCMId>
  <DTCCodes>
    <DTCCode>
      <DTCCode>P0300</DTCCode>[i]
    </DTCCode>
  </DTCCodes>
  <DTCCount>1</DTCCount>
  <PendingDTCCodes>
    <PendingDTCCode>
      <DTCCode>P0301</DTCCode>
    </PendingDTCCode>
    <PendingDTCCode>
      <DTCCode>P0302</DTCCode>
```

```xml
        </PendingDTCCode>
      </PendingDTCCodes>
      <PendingDTCCount>2</PendingDTCCount>
      <PermanentDTCCodes>
        <PermanentDTCCode>
          <DTCCode>P1005</DTCCode>
        </PermanentDTCCode>
        <PermanentDTCCode>
          <DTCCode>P1006</DTCCode>
        </PermanentDTCCode>
      </PermanentDTCCodes>
      <PermanentDTCCount>2</PermanentDTCCount>
      <OBDParameters>
        <WarmupsSinceCodeCleared>15</WarmupsSinceCodeCleared>
        <MileageSinceCodeCleared>0</MileageSinceCodeCleared>
        <MinutesSinceMILOn>0</MinutesSinceMILOn>
        <OBDConformSTD>0</OBDConformSTD>
        <OBDFuelType>0</OBDFuelType>
        <OBDFuelAlcoholPercentage>0</OBDFuelAlcoholPercentage>
        <OBDIgnitionMonitorType>0</OBDIgnitionMonitorType>
      </OBDParameters>
      <DeviceInfo>
        <DeviceKey>12345</DeviceKey>
        <DeviceSerialNumber>ABC123456789</DeviceSerialNumber>
        <DeviceFirmware>ABC123456789</DeviceFirmware>
        <ReceiverID>RECEIVERID</ReceiverID>
        <ReceiverSoftwareVersion>VNUM</ReceiverSoftwareVersion>
        <PayloadDate>20150116</PayloadDate>
        <PayloadTime>131456</PayloadTime>
        <QADataFlag>Y</QADataFlag>
      </DeviceInfo>
    </ROBDRequestOBDData>
```

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6. Appendices

Appendix A: Table of Abbreviations

Term	Definition
Business Confidential	Confidential business information refers to information whose disclosure may harm the business.
DEQ	Department of Environmental Quality
DLC	Diagnostic Link Connector
DMV	Driver and Motor Vehicle Services Division of the Oregon Department of Transportation
DMZ Server	Demilitarized zone (perimeter network) computer that collects remote OBD test results and holds them for VID to retrieve.
DTC	Diagnostic Trouble Code
HTTPS	Hypertext Transfer Protocol Secure (HTTP over SSL/TLS)
Malfunction Indicator Light (MIL) or Check Engine Light	The MIL is an instrument panel indicator used to notify the vehicle operator of a fault. It is required to illuminate when an emissions failure has occurred.
OBD (On-board diagnostics)	Part of the sophisticated vehicle powertrain management system and is designed to detect powertrain (engine and transmission) problems that might cause vehicle emissions to exceed allowable limits.
OR	Oregon
QA	Quality Assurance
SOAP	Simple Object Access Protocol
SSL	Secure Sockets Layer
TCP	Transmission Control Protocol
TLS	Transport layer Security
UAT	User Acceptance Testing; also known as ATP
VID	Vehicle Inspection Database
VIR	Vehicle Inspection Receipt/Report – Issued at the end of inspection. Provides test results (Pass/Fail), specific emissions issues, if any, etc.
Whitelist	A list or register of entities that are being provided a particular privilege, service, mobility, access or recognition.
XML	Extensible Markup Language

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7.   End Notes

Some languages and utilities such as Java and cURL have trouble with nested XML tags with the same name. This ambiguity can be
resolved by renaming the outer tag in the source XML document prior to unmarshalling. See example below.

```
<DTCCodes>
        <ROBDRequest.DTCCode>
                <DTCCode>P1001</DTCCode>
        </ROBDRequest.DTCCode>
        <ROBDRequest.DTCCode>
                <DTCCode>P1002</DTCCode>
        </ROBDRequest.DTCCode>
</DTCCodes>

 <PendingDTCCodes>
        <ROBDRequest.PendingDTCCode>
                <DTCCode>P1003</DTCCode>
        </ROBDRequest.PendingDTCCode>
</PendingDTCCodes>

<PermanentDTCCodes>
        <ROBDRequest.PermanentDTCCode>
                <DTCCode>P1004</DTCCode>
        </ROBDRequest.PermanentDTCCode>
</PermanentDTCCodes>
```