

6.5 Service \$05 - Request Oxygen Sensor Monitoring Test Results—Service \$05 is not supported for CAN. The functionality of service \$05 is implemented in service \$06.

6.6 Service \$06 - Request On-Board Monitoring Test Results for Specific Monitored Systems

6.6.1 FUNCTIONAL DESCRIPTION—The purpose of this service is to allow access to the results for on-board diagnostic monitoring tests of specific components / systems that are continuously monitored (e.g., mis-fire monitoring) and non-continuously monitored (e.g., catalyst system).

The request message for test values includes an On-Board Diagnostic Monitor ID (see Appendix D) that indicates the information requested. Unit and Scaling information is included in Appendix E.

The vehicle manufacturer is responsible for assigning “Manufacturer Defined Test IDs” for different tests of a monitored system. The latest test values (results) are to be retained, even over multiple ignition OFF cycles, until replaced by more recent test values (results). Test values (results) are requested by On-Board Diagnostic Monitor ID. Test values (results) are always reported with the Minimum and Maximum Test Limits. The Unit and Scaling ID included in the response message defines the scaling and unit to be used by the external test equipment to display the test values (results), Minimum Test Limit, and Maximum Test Limit information.

If an On-Board Diagnostic Monitor has not been completed at least once since Clear/reset emission-related diagnostic information or battery disconnect, then the parameters Test Value (Results), Minimum Test Limit, and Maximum Test Limit shall be set to zero (\$00) values.

Not all On-Board Diagnostic Monitor IDs are applicable or supported by all systems. On-Board Diagnostic Monitor ID \$00 is a bit-encoded value that indicates for each ECU which On-Board Diagnostic Monitor IDs are supported. On-Board Diagnostic Monitor ID \$00 indicates support for On-Board Diagnostic Monitor IDs from \$01 to \$20. On-Board Diagnostic Monitor ID \$20 indicates support for On-Board Diagnostic Monitor IDs \$21 through \$40, etc. This is the same concept for PIDs/TIDs/InfoTypes support in services \$01, \$02, \$06, \$08, and \$09. On-Board Diagnostic Monitor ID \$00 is required for those ECUs that respond to a corresponding service \$06 request message as specified in Appendix A. On-Board Diagnostic Monitor ID \$00 is optional for those ECUs that do not respond to additional service \$06 request messages.

6.6.2 MESSAGE DATA BYTES

6.6.2.1 Request On-Board Monitoring Test Results for Specific Monitored Systems Request Message Definition (Read Supported OBDMIDs)

TABLE 153—REQUEST ON-BOARD MONITORING TEST RESULTS FOR SPECIFIC MONITORED SYSTEMS REQUEST MESSAGE (READ SUPPORTED OBDMIDs)

Data Byte	Parameter Name	Cvt	Hex Value	Mnemonic
#1	Request on-board monitoring test results for specific monitored systems request SID	M	06	SIDRQ
#2	On-Board Diagnostic Monitor ID (OBDMIDs supported: Appendix A)	M	xx	OBDMID
#3	On-Board Diagnostic Monitor ID (OBDMIDs supported: Appendix A)	U	xx	OBDMID
#4	On-Board Diagnostic Monitor ID (OBDMIDs supported: Appendix A)	U	xx	OBDMID
#5	On-Board Diagnostic Monitor ID (OBDMIDs supported: Appendix A)	U	xx	OBDMID
#6	On-Board Diagnostic Monitor ID (OBDMIDs supported: Appendix A)	U	xx	OBDMID
#7	On-Board Diagnostic Monitor ID (OBDMIDs supported: Appendix A)	U	xx	OBDMID

U = User Optional — OBDMID may be included to avoid multiple OBDMID supported request messages

NOTE— To request OBDMIDs supported range from \$C1 - \$FF another request message with OBDMID#1 = \$C0 and OBDMID#2 = \$E0 shall be sent to the vehicle

- 6.6.2.2 *Request On-Board Monitoring Test Results for Specific Monitored Systems Response Message Definition (Report Supported OBDMIDs)*—ECU(s) must respond to all supported ranges if requested. A range is defined as a block of 32 OBDMIDs (e.g., range #1: OBDMID \$01-\$20). The ECU shall not respond to unsupported OBDMID ranges unless subsequent ranges have a supported OBDMID(s).

TABLE 154—REQUEST ON-BOARD MONITORING TEST RESULTS FOR SPECIFIC MONITORED SYSTEMS RESPONSE MESSAGE (REPORT SUPPORTED OBDMIDs)

Data Byte	Parameter Name	Cvt	Hex Value	Mnemonic
#1	Request on-board monitoring test results for specific monitored systems response SID	M	46	SIDPR
#2	data record of supported OBDMID = [1st supported OBDMID	M	xx	OBDMIDRE C
#3	Data A: supported OBDMIDs,	M	xx	OBDMID
#4	Data B: supported OBDMIDs,	M	xx	DATA_A
#5	Data C: supported OBDMIDs,	M	xx	DATA_B
#6	Data D: supported OBDMIDs]	M	xx	DATA_C DATA_D
:	:	:	:	:
#n-4	data record of supported OBDMID = [mth supported OBDMID	C1	xx	OBDMIDRE C
#n-3	Data A: supported OBDMIDs,	C2	xx	OBDMID
#n-2	Data B: supported OBDMIDs,	C2	xx	DATA_A
#n-1	Data C: supported OBDMIDs,	C2	xx	DATA_B
#n	Data D: supported OBDMIDs]	C2	xx	DATA_C DATA_D
C1 = Conditional — OBDMID value shall be the same value as included in the request message if supported by the ECU C2 = Conditional — value indicates OBDMIDs supported; range of supported OBDMIDs depends on selected OBDMID value (see C1)				

NOTE— The response message shall only include the OBDMID(s) and Data A - D which are supported by the ECU. If the request message includes (a) OBDMID value(s) which are not supported by the ECU those shall not be included in the response message.

- 6.6.2.3 *Request On-Board Monitoring Test Results for Specific Monitored Systems Request Message Definition (Read OBDMID Test Values)*

TABLE 155—REQUEST ON-BOARD MONITORING TEST RESULTS FOR SPECIFIC MONITORED SYSTEMS REQUEST MESSAGE (READ OBDMID TEST VALUES)

Data Byte	Parameter Name	Cvt	Hex Value	Mnemonic
#1	Request on-board monitoring test results for specific monitored systems request SID	M	06	SIDRQ
#2	On-Board Diagnostic Monitor ID	M	xx	OBDMID

6.6.2.4 Request On-Board Monitoring Test Results for Specific Monitored Systems Response Message Definition (Report OBDMID Test Values)

TABLE 156—REQUEST ON-BOARD MONITORING TEST RESULTS FOR SPECIFIC MONITORED SYSTEMS RESPONSE MESSAGE (REPORT OBDMID TEST VALUES)

Data Byte	Parameter Name	Cvt	Hex Value	Mnemonic
#1	Request on-board monitoring test results for specific monitored systems response SID	M	46	SIDPR
#2	data record of supported OBDMID = [On-Board Diagnostic Monitor ID	M	xx	OBDMIDRE C
#3	Std./Manuf. Defined TID#1	M	xx	OBDMID
#4	Unit And Scaling ID#1	M	xx	S/MDTID
#5	Test Value (High Byte)#1	M	xx	UASID
#6	Test Value (Low Byte)#1	M	xx	TVHI
#7	Min. Test Limit (High Byte)#1	M	xx	TVLO
#8	Min. Test Limit (Low Byte)#1	M	xx	MINTLHI
#9	Max. Test Limit (High Byte)#1	M	xx	MINTLLO
#10	Max. Test Limit (Low Byte)#1]	M	xx	MAXTLHI MAXTLLO
:	:	:	:	:
#n-8	data record of supported OBDMID = [On-Board Diagnostic Monitor ID	C1	xx	OBDMIDRE C
#n-7	Std./Manuf. Defined TID#m	C2	xx	OBDMID
#n-6	Unit And Scaling ID#m	C2	xx	S/MDTID
#n-5	Test Value (High Byte)#m	C2	xx	UASID
#n-4	Test Value (Low Byte)#m	C2	xx	TVHI
#n-3	Min. Test Limit (High Byte)#m	C2	xx	TVLO
#n-2	Min. Test Limit (Low Byte)#m	C2	xx	MINTLHI
#n-1	Max. Test Limit (High Byte)#m	C2	xx	MINTLLO
#n	Max. Test Limit (Low Byte)#m]	C2	xx	MAXTLHI MAXTLLO

C1 = Conditional — parameter is only present if more than one (1) Manufacturer Defined TID is supported by the ECU for the requested Monitor ID.

C2 = Conditional — parameter and value depends on selected Manufacturer Defined TID number and are only included if the Manufacturer Defined TID is supported by the ECU. The value shall be zero (\$00) in case the On-Board Diagnostic Monitor has not been completed at least once since Clear/reset emission-related diagnostic information or battery disconnect.

6.6.3 PARAMETER DEFINITION

6.6.3.1 On-Board Diagnostic Monitor IDs Supported—The On-Board Diagnostic Monitor IDs supported is the same concept as used for PID support in services \$01 and \$02 as specified in Appendix A.

6.6.3.2 On-Board Diagnostic Monitor ID Description—The On-Board Diagnostic Monitor ID is a one (1) byte parameter and is defined in Appendix A. An On-Board Diagnostic Monitor may have more than one (1) monitor test (Test ID).

NOTE— The On-Board Diagnostic Monitor ID is similar to the Test ID parameter specified in service \$06 in Section 6.6.3.1.

6.6.3.3 Standardized and Manufacturer Defined Test ID Description—The Standardized and Manufacturer Defined Test ID is a one (1) byte parameter. For example, the On-Board Diagnostic Monitor “Oxygen Sensor Monitor Bank 1 - Sensor 1” may have the following Standardized Test ID:

The table below specifies the range of identifiers.

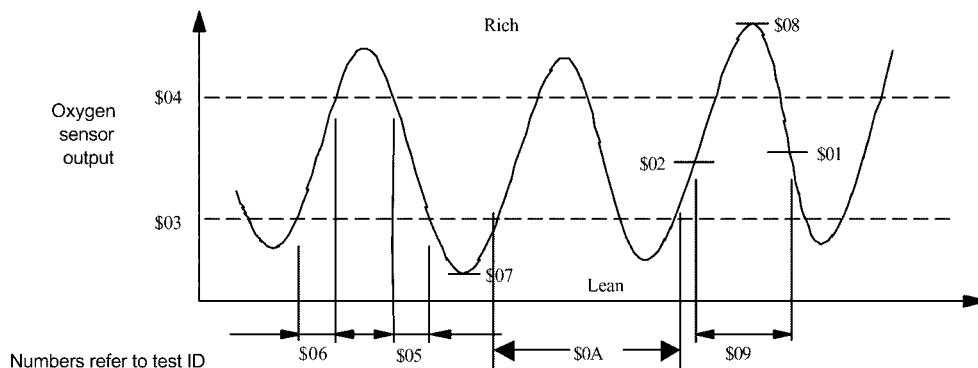
TABLE 157—STANDARDIZED TEST ID DESCRIPTION

Range (Hex)	Description
00	Reserved by document
01	Rich to lean sensor threshold voltage (constant)
02	Lean to rich sensor threshold voltage (constant)
03	Low sensor voltage for switch time calculation (constant)
04	High sensor voltage for switch time calculation (constant)
05	Rich to lean sensor switch time (calculated)
06	Lean to rich sensor switch time (calculated)
07	Minimum sensor voltage for test cycle (calculated)
08	Maximum sensor voltage for test cycle (calculated)
09	Time between sensor transitions (calculated)
0A	Sensor period (calculated)
0B	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles (calculated) Calculation: $0.1 * (\text{current counts}) + 0.9 * (\text{previous average})$ Initial value for (previous average) = 0 This TEST ID shall be reported with OBD Monitor IDs A2 – AD (refer to Appendix D) and the Scaling ID 24 (refer to Appendix E).
0C	Misfire counts for last/current driving cycles (calculated)
0D - 7F	Reserved for future standardisation

TABLE 158—MANUFACTURER DEFINED TEST ID DESCRIPTION

Range (Hex)	Description
80 - FE	Manufacturer Defined Test ID range - this parameter is an identifier for the test performed within the On-Board Diagnostic Monitor.
FF	Reserved by document

Results of latest mandated on-board oxygen sensor monitoring tests, see figure below.

**FIGURE 15—STANDARDIZED TEST ID VALUE EXAMPLE**

6.6.3.4 Unit and Scaling ID Definition—The Unit and Scaling ID is a one (1) byte identifier to reference the scaling and unit to be used by the external test equipment to calculate and display the test values (results), Minimum Test Limit, and the Maximum Test Limit for the Standardized and Manufacturer Defined Test ID requested. All standardized Unit and Scaling IDs are specified in “Appendix E” of this document

6.6.3.5 Test Value (Result) Description—The Test Value represents the test result and is defined in the table below.

TABLE 159—TEST VALUE DESCRIPTION

Parameter name	# of bytes	Description
Test Value	2 (High and Low Byte)	Test Value (Result) - this value shall be calculated and displayed by the external test equipment based on the Unit and Scaling ID included in the response message. The Test Value shall be within the Minimum and Maximum Test Limit to indicate a "Pass" result.

6.6.3.6 Minimum Test Limit Description—The Minimum Test Limit parameter is defined in the table below.

TABLE 160—MINIMUM TEST LIMIT DESCRIPTION

Parameter name	# of bytes	Description
Minimum Test Limit	2 (High and Low Byte)	The Minimum Test Limit shall be calculated and displayed by the external test equipment based on the Unit and Scaling ID included in the response message. The Unit and Scaling IDs are specified in Appendix E of this document. The Minimum Test Limit shall be the minimum value for the monitor identified by the On-Board Diagnostic Monitor ID. For the Standardized Test IDs which are constant values the Minimum Test Limit shall be the same value as reported for the Test Value. The following conditions apply: — if the Test Value is less than the Minimum Test Value results in a "Fail" condition, — if the Test Value equals the Minimum Test Value results in a "Pass" condition, — if the Test Value is greater than the Minimum Test Value results in a "Pass" condition.

6.6.3.7 Maximum Test Limit description—The Maximum Test Limit parameter is defined in the table below.

TABLE 161—MAXIMUM TEST LIMIT DESCRIPTION

Parameter name	# of bytes	Description
Maximum Test Limit	2 (High and Low Byte)	The Maximum Test Limit shall be calculated and displayed by the external test equipment based on the Unit and Scaling ID included in the response message. The Unit and Scaling IDs are specified in Appendix E of this document. The Maximum Test Limit shall be the maximum value for the monitor identified by the On-Board Diagnostic Monitor ID. For the Standardized Test IDs which are constant values the Maximum Test Limit shall be the same value as reported for the Test Value. The following conditions apply: — if the Test Value is less than the Maximum Test Value results in a "Pass" condition, — if the Test Value equals the Maximum Test Value results in a "Pass" condition, — if the Test Value is greater than the Maximum Test Value results in a "Fail" condition.

6.6.4 MESSAGE EXAMPLE—The example below shows how the “Request on-board monitoring test results for specific monitored systems” service shall be implemented.

6.6.4.1 *Step #1: Request On-Board Monitoring Test Results for Specific Nonitored Systems (Request for Supported OBDMIDs)*—The external test equipment requests all supported OBDMIDs from the vehicle. Refer to the example of service \$01 how to request supported PIDs (same concept is used for supported OBDMIDs).

As a result of the supported OBDMID request the external test equipment creates an internal list of supported OBDMIDs for each ECU: The ECU #1 (ECM) supports OBDMIDs \$01, \$05, \$11, and \$21. The ECU #2 (TCM) does not support any OBDMIDs.

6.6.4.2 *Step #2: Request Current Powertrain Diagnostic Data (Service \$01, PID \$01)*—Prior to requesting OBD Monitor test results the external test equipment shall evaluate if the monitor is complete. The status of the monitor is included in the response message of service \$01, PID \$01 data byte B - D (see Appendix B).

6.6.4.3 *Step #3: Request On-Board Monitoring Test Results for Specific Monitored Systems*—The external test equipment sends a “Request on-board monitoring test results for specific monitored systems” message with one supported OBDMID in the request message to the vehicle. In this example the request message includes the following OBDMID:

— request message: OBDMID \$01 - Oxygen Sensor Monitor Bank 1 - Sensor 1

TABLE 162—REQUEST OXYGEN SENSOR MONITORING TEST RESULTS REQUEST MESSAGE

Message direction:		External test equipment → All ECUs	
Message Type:		Request	
Data Byte	Description (all values are in hexadecimal)	Byte Value (Hex)	Mnemonic
#1	Request on-board monitoring test results for specific monitored systems request SID	06	SIDRQ
#2	OBDMID: 01 - Oxygen Sensor Monitor Bank 1 - Sensor 1	01	OBDMID

TABLE 163—REQUEST OXYGEN SENSOR MONITORING TEST RESULTS RESPONSE MESSAGE

Message direction:		ECU #1 → External test equipment	
Message Type:		Response	
Data Byte	Description (all values are in hexadecimal)	Byte Value (Hex)	Mnemonic
#1	Request on-board monitoring test results for specific monitored systems response SID	46	SIDPRQ
#2	OBDMID: 01 - Oxygen Sensor Monitor Bank 1 - Sensor 1	01	OBDMID
#3	Standardised Test ID: 01 - Rich to lean sensor threshold voltage (constant)	01	STID
#4	Unit And Scaling ID: Voltage	0A	UASID
#5	Test Value High Byte:	06	TESTVAL
#6	Test Value Low Byte: 0.365 V	60	TESTVAL
#7	Minimum Test Limit High Byte:	06	MINLIMIT
#8	Minimum Test Limit Low Byte: 0.365 V	60	MINLIMIT
#9	Maximum Test Limit High Byte:	06	MAXLIMIT
#10	Maximum Test Limit Low Byte: 0.365 V	60	MAXLIMIT
#11	OBDMID: 01 - Oxygen Sensor Monitor Bank 1 - Sensor 1	01	OBDMID
#12	Standardized Test ID: 05 - Rich to lean sensor switch time (calculated)	05	STID
#13	Unit And Scaling ID: Time	10	UASID
#14	Test Value High Byte	00	TESTVAL
#15	Test Value Low Byte: 0.072 s (0 min, 0 s)	48	TESTVAL
#16	Minimum Test Limit High Byte	00	MINLIMIT
#17	Minimum Test Limit Low Byte: 0.000 s (0 min, 0 s)	00	MINLIMIT
#18	Maximum Test Limit High Byte	00	MAXLIMIT
#19	Maximum Test Limit Low Byte: 0.100 s (0 min, 0 s)	64	MAXLIMIT
#20	OBDMID: 01 - Oxygen Sensor Monitor Bank 1 - Sensor 1	01	OBDMID
#21	Manufacturer Defined Test ID: 133 - the name of this Test ID shall be documented in the vehicle Service Information!	85	MDTID
#22	Unit And Scaling ID: Counts	24	UASID
#23	Test Value High Byte	00	TESTVAL
#24	Test Value Low Byte: 150 counts	96	TESTVAL
#25	Minimum Test Limit High Byte	00	MINLIMIT
#26	Minimum Test Limit Low Byte: 75 counts	4B	MINLIMIT
#27	Maximum Test Limit High Byte	FF	MAXLIMIT
#28	Maximum Test Limit Low Byte: 65535 counts	FF	MAXLIMIT

NOTE— ECU#2 does not support any Test IDs and therefore does not send a response message.

6.6.4.4 *Request On-Board Monitoring Test Results for Specific Monitored Systems*—In this example the requested monitor has not been completed once. The request message includes the following OBDMID:

— request message: OBDMID \$21 - Catalyst Monitor Bank 1

TABLE 164—REQUEST CATALYST MONITOR BANK 1 MONITORING TEST RESULTS REQUEST MESSAGE

Message direction:		External test equipment → All ECUs	
Message Type:		Request	
Data Byte	Description (all values are in hexadecimal)	Byte Value (Hex)	Mnemonic
#1	Request on-board monitoring test results for specific monitored systems request SID	06	SIDRQ
#2	OBDMID: 21 - Catalyst Monitor Bank 1	21	OBDMID

TABLE 165—REQUEST CATALYST MONITOR BANK 1 MONITORING TEST RESULTS RESPONSE MESSAGE

Message direction:		ECU #1 → External test equipment	
Message Type:		Response	
Data Byte	Description (all values are in hexadecimal)	Byte Value (Hex)	Mnemonic
#1	Request on-board monitoring test results for specific monitored systems response SID	46	SIDPRQ
#2	OBDMID: 21 - Catalyst Monitor Bank 1	21	OBDMID
#3	Manufacturer Defined Test ID: 135	87	MDTID
#4	Unit And Scaling ID: Percent	2E	UASID
#5	Test Value High Byte: Monitor not completed at least once since erasure	00	TESTVAL
#6	Test Value Low Byte: 0.00 %	00	TESTVAL
#7	Minimum Test Limit High Byte	00	MINLIMIT
#8	Minimum Test Limit Low Byte: 0.00 %	00	MINLIMIT
#9	Maximum Test Limit High Byte	00	MAXLIMIT
#10	Maximum Test Limit Low Byte: 0.00%	00	MAXLIMIT

NOTE— ECU#2 does not support any Test IDs and therefore does not send a response message.

6.7 Service \$07 - Request Emission-Related Diagnostic Trouble Codes Detected During Current or Last Completed Driving Cycle

6.7.1 **FUNCTIONAL DESCRIPTION**—The purpose of this service is to enable the external test equipment to obtain “pending” diagnostic trouble codes detected during current or last completed driving cycle for emission-related components / systems that are tested or continuously monitored during normal driving conditions. Service \$07 is required for all DTCs and is independent of Service \$03. The intended use of this data is to assist the service technician after a vehicle repair, and after clearing diagnostic information, by reporting test results after a single driving cycle. If the test failed during the driving cycle, the DTC associated with that test will be reported. Test results reported by this service do not necessarily indicate a faulty component / system. If test results indicate a failure after additional driving, then the MIL will be illuminated and a DTC will be set and reported with service \$03, indicating a faulty component / system. This service can always be used to request the results of the latest test, independent of the setting of a DTC.

Test results for these components / systems are reported in the same format as the DTCs in Service \$03 - refer to the functional description for service \$03.