

# J1699-3 Communication Compliance Test Update

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# What is J1699-3 ?

- ◆ J1699-3 is a Recommended Practice sponsored by the SAE E/E Diagnostics Committee
- ◆ J1699-3 consists of two parts:
  - The J1699-3 document which describes the test sequence that is run.
  - The J1699-3 software that actually tests the vehicle communication link.

# Why was J1699-3 developed ?

- ◆ The OBD-II regulations require that for the 2005 MY, manufacturers perform production vehicle evaluation testing of the OBD communication link for every unique calibration, within one month of the start of production.
- ◆ The intent is to make sure that I/M test tools can communicate properly with all vehicles.

# Development of J1699-3

- ◆ The J1699-3 software is designed to run on a laptop, using an industry-standard J2534 pass-through communication interface.
- ◆ In theory, any J2534 compatible tool can be used with the J1699-3 software.
- ◆ J1699-3 has software has been used with the following J2534 hardware: CarDAQ2534 (Drew Tech), Python (The Dearborn Group), PassThru+ XS (IME ACTIA), all with the appropriate level of firmware.

# Development of J1699-3

- ◆ The test sequence now includes two major sections – the static test (Sections 5 – 9) and the dynamic test (Sections 10 and 11).
- ◆ The static test can be completed in a relatively short period of time (20 minutes) without having to drive the vehicle very much, or at all.
- ◆ The static test checks all the basic diagnostic messaging functionality of the vehicle.

# Development of J1699-3

- ◆ The dynamic test takes a relatively long period of time to complete, (many days) and requires the vehicle to be driven, and possibly parked overnight, so that all the OBD monitors can run to completion.
- ◆ The dynamic test checks the functionality of the I/M Readiness bits and the In-Use Performance counters.

# Development of J1699-3

- ◆ For the 2005 MY, the J1699-3 software effort was supported by volunteers from the J1699-3 committee. It was evident to all the OEM manufacturers that the software was not progressing at a fast enough rate to support vehicle certification timing.
- ◆ In June 2004, the Alliance requested bids to update the software to document Version 11.5.

# Development of J1699-3

- ◆ In November 2004, the Alliance contracted with EnGenius to update and maintain the J1699-3 software.
- ◆ The J1699-3 committee compiled a “gap” list – differences between the software and the document. The gap list was prioritized and provided to EnGenius.
- ◆ Since that time, the software has been progressing in a timely fashion and is posted to the SourceForge web site, <http://sourceforge.net>



# Development of J1699-3

- ◆ The J1699-3 document (Version 11.7) was balloted, approved and published in August 2004.
- ◆ The J1699-3 document has continued to evolve to Version 12.5 which is targeted towards 2006 MY PVE compliance testing. The primary goal of this evolution was to get the dynamic test working and improve support for testing vehicles with multiple modules.

# Status of J1699-3

- ◆ Software releases are continually made available on SourceForge.
- ◆ Version 12.0.5 or later is recommended for 2006 MY PVE testing. (Version 12.0.10 was released Aug 3, 2005)
- ◆ Manufacturers are encouraged to join the J1699-3 committee and test vehicles using the latest available software.
- ◆ This will help to identify any remaining software bugs as well as help assure the manufacturer passes the production PVE test.

# J1699-3 Required Tests

- ◆ (1.4.1) The testing shall verify that the vehicle can properly establish communications between all emission-related on-board computers and any SAE J1978 scan tool designed to adhere strictly to the communication protocols allowed in section (f)(3);
- ◆ (1.4.2) The testing shall further verify that the vehicle can properly communicate to any SAE J1978 scan tool:

# J1699-3 Required Tests

- ◆ (A) The current readiness status from all on-board computers required to support readiness status in accordance with SAE J1979 and section (f)(4.1) while the engine is running;
- ◆ (B) The MIL command status while the MIL is commanded off and while the MIL is commanded on in accordance with SAE J1979 and section (f)(4.2) while the engine is running and in accordance with SAE J1979 and sections (d)(2.1.2) during the MIL readiness status and, if applicable, (f)(4.1.3) during the MIL readiness status check while the engine is off;

# J1699-3 Required Tests

- ◆ (C) All data stream parameters required in section (f)(4.2) in accordance with SAE J1979 including the identification of each data stream parameter as supported in SAE J1979 (e.g., Service \$01, PID \$00);
- ◆ (D) The CAL ID, CVN, and VIN (if applicable) in accordance with SAE J1979 and sections (f)(4.6) through (4.8);

# J1699-3 Required Tests

- ◆ (E) An emission-related fault code (both confirmed and pending) in accordance with SAE J1979 (including correctly indicating the number of stored fault codes (e.g., Service \$01, PID \$01, Data A)) and section (f)(4.4); (1.4.3) The testing shall also verify that the vehicle can properly respond to any SAE J1978 scan tool request to clear emission-related fault codes and reset readiness status.
- ◆ Any other test or function CARB wants us to test. Mike McCarthy reviews the J1699-3 documents, manufacturer logfiles, and provides feedback to the committee.

# Reporting J1699-3 Results

- ◆ The J1699-3 software generates a logfile that shows the results of the test sequence.
- ◆ Items indicated as “failures” do not meet the requirements.
- ◆ Items indicated as “warnings” are used for engineering analysis. Depending on the application or model year, a warning may or may not be a failure.
- ◆ A logfile can be presented to CARB for Executive Officer approval.

# Reporting J1699-3 Results

- ◆ For the 2006 MY, it is expected that CARB will require static testing (the short test) for all unique software configurations.
- ◆ It is expected that CARB will require dynamic testing (the long test) only for the OBD DDV vehicles (up to 6 vehicles per manufacturer).
- ◆ It is expected that J1699-3 software Version 12.0.5 or later will be acceptable. (12.0.10 is the latest release.)



# Sample J1699-3 Logfile

0ms Fri Apr 11 13:31:50 2003

0ms \*\*\*\* LOG FILENAME 2003-ford-f350diesel-1.log \*\*\*\*

0ms \*\*\*\* SAE J1699-3 Revision 9 (Buid Date: Feb 25 2003) \*\*\*\*

0ms \*\*\*\* NOTE: Timestamp on left is from the PC \*\*\*\*

0ms \*\*\*\* NOTE: Timestamp with messages is from the J2534 interface \*\*\*\*

0ms Windows NT/2K (08930005)

3325ms Enter your name and/or contact information (optional) (Press Enter): laleman

4707ms How many OBD-II ECUs are on this vehicle (1 to 8)? (Press Enter): 2

5829ms Does the vehicle use compression ignition (i.e. diesel)? (Enter Yes or No): y

8352ms Is this a hybrid vehicle? (Enter Yes or No): n

9614ms Is this an engineering test (i.e. ignore protocol errors)? (Enter Yes or No): n

9614ms ProtocolsSupported = CAN,ISO9141,KWP2000,CAN,ISO15765,J1850VPW,J1850PWM

9614ms Loading CARDAQ32.DLL library

10866ms Would you like to run the optional tests first? (Enter Yes or No): n

10866ms \*\*\*\* Test 1.1 \*\*\*\*

12578ms Turn key OFF for at least thirty (30) seconds (Press Enter):

12578ms Turn key ON with engine OFF.

12578ms Do not crank engine.

14551ms Was the MIL ON for at least fifteen (15) seconds? (Enter Yes or No): y

14551ms \*\*\*\* Test 1.1 PASSED \*\*\*\*

# Sample J1699-3 Logfile

14551ms \*\*\*\* Test 1.2 \*\*\*\*

14551ms Checking for OBD on J1850PWM protocol  
24155ms REQ MSG: J1850PWM 61 6A F1 01 00  
24155ms TX MSG: 235728usec J1850PWM 61 6A F1 01 00  
25216ms Checking for OBD on J1850VPW protocol  
25367ms REQ MSG: J1850VPW 68 6A F1 01 00  
25367ms TX MSG: 236925usec J1850VPW 68 6A F1 01 00  
25677ms Checking for OBD on ISO9141 protocol  
34740ms Checking for OBD on ISO14230 Fast Init protocol  
40118ms REQ MSG: ISO14230 C2 33 F1 01 00  
40118ms TX MSG: 251490usec ISO14230 C2 33 F1 01 00  
40719ms Checking for OBD on ISO14230 protocol  
49792ms Checking for OBD on ISO15765 protocol  
49942ms REQ MSG: ISO15765 00 00 07 DF 01 00  
49942ms TX MSG: 261187usec ISO15765 00 00 07 DF 01 00  
49952ms RX MSG: 261192usec ISO15765 00 00 07 E9 41 00 98 18 00 10  
49972ms RX MSG: 261208usec ISO15765 00 00 07 E8 41 00 98 3B 80 17  
50132ms 2 OBD ECU(s) found  
50132ms OBD on ISO15765 protocol detected  
50152ms Checking for OBD on ISO15765 29 Bit protocol  
50303ms REQ MSG: ISO15765 18 DB 33 F1 01 00  
50303ms TX MSG: 261543usec ISO15765 18 DB 33 F1 01 00  
50583ms Firmware Version: 04.52  
50583ms DLL Version: 04.52  
50583ms API Version: 02.02  
51084ms Battery = 12.490V  
51084ms \*\*\*\* Test 1.2 PASSED \*\*\*\*

# Sample J1699-3 Logfile

58184ms \*\*\*\* Test 1.6 \*\*\*\*

58234ms REQ MSG: ISO15765 00 00 07 DF 01 00

58234ms TX MSG: 269374usec ISO15765 00 00 07 DF 01 00

58254ms RX MSG: 269391usec ISO15765 00 00 07 E8 41 00 98 3B 80 17

58274ms RX MSG: 269405usec ISO15765 00 00 07 E9 41 00 98 18 00 10

58484ms REQ MSG: ISO15765 00 00 07 DF 01 20

58484ms TX MSG: 269621usec ISO15765 00 00 07 DF 01 20

58524ms RX MSG: 269651usec ISO15765 00 00 07 E8 41 20 80 1B A0 01

58725ms REQ MSG: ISO15765 00 00 07 DF 01 40

58725ms TX MSG: 269858usec ISO15765 00 00 07 DF 01 40

58765ms RX MSG: 269888usec ISO15765 00 00 07 E8 41 40 C0 E0 00 00

58975ms REQ MSG: ISO15765 00 00 07 DF 01 01

58975ms TX MSG: 270105usec ISO15765 00 00 07 DF 01 01

58995ms RX MSG: 270117usec ISO15765 00 00 07 E9 41 01 00 44 00 00

59005ms RX MSG: 270126usec ISO15765 00 00 07 E8 41 01 00 15 80 80

59165ms CCM test supported but not complete

59165ms \*\*\*\* Test 1.6 FAILED \*\*\*\*

152900ms REQ MSG: ISO15765 00 00 07 DF 09 06

152900ms TX MSG: 362835usec ISO15765 00 00 07 DF 09 06

152920ms RX MSG: 362849usec ISO15765 00 00 07 E9 7F 09 22

152930ms RX MSG: 362859usec ISO15765 FirstFrame Indication

152940ms RX MSG: 362867usec ISO15765 00 00 07 E8 49 06 02 59 67 82 3A 00 00 00 00

153150ms REQ MSG: ISO15765 00 00 07 DF 09 02

153150ms TX MSG: 363082usec ISO15765 00 00 07 DF 09 02

153170ms RX MSG: 363096usec ISO15765 FirstFrame Indication

153190ms RX MSG: 363112usec ISO15765 00 00 07 E8 49 02 01 B4 B4 B4 B4 B4 B4 B4 B4 B4 B4 B4 B4 B4 B4 B4 B4

153341ms VIN = -----

153341ms Invalid VIN information

153341ms \*\*\*\* Test 1.17 FAILED \*\*\*\*

157386ms Vehicle information data failed. Continue? (Enter Yes or No): y

# What does J1699-3 mean to me ?

- ◆ J1699-3 software checks many items required by the OBD-II regulations as well as adherence to various SAE communication standards like J1979, J1978, J1962, etc.
- ◆ The following slides illustrate some of the things that are checked.

# OBD serial data links

- ◆ Only one OBD-compliant link can be brought out to the J1962 Data Link Connector. Having different OBD data links is not allowed.
- ◆ Having a non-OBD module respond to an OBD request is not allowed.
- ◆ Every OBD module must respond to Mode \$01, PID \$00

# Standard diagnostic test modes and data

- ◆ Diagnostic test modes are defined by SAE J1979/ISO 15031-5. All test modes are checked for properly formatted responses and proper response timing during the static test.
- ◆ Vehicle responses are checked by inducing a fault in order to light the MIL in one or two trips, then removing the fault for three trips in order to turn the MIL off.
- ◆ I/M Readiness and In-Use Performance data is checked during the dynamic test.

# Mode \$01 – Diagnostic data

- ◆ Mode \$01 provides diagnostic data, commonly called PIDs (Parameter ID)s.
- ◆ A minimum set of PIDs must be supported by each OBD module that supports Mode \$01. At a minimum PIDs \$00, \$01 \$04, \$05, \$0C, \$0D and \$11 must be supported.
- ◆ PIDs that are indicated as being supported must provide valid data.
- ◆ This is a MIL bulb check and MIL PID is checked.

# Mode \$01 – Diagnostic data

- ◆ Multiple PID support is required for CAN.
- ◆ PIDs are checked for proper format and reasonable data values.
- ◆ OBD modules must not drop out of communication if the link is idle (idle test), the link is being pushed at its maximum rate (burst test), PIDs are requested in reverse order (reverse order test), or unsupported data is requested (various tests).



# Mode \$02 – Freeze Frame

- ◆ After a fault is induced into the vehicle, Mode \$02 freeze frame data must be stored at the time a pending or confirmed DTC is stored.
- ◆ At a minimum PIDs \$02 \$04, \$05, \$0C, \$0D and \$11 must be included in freeze frame.
- ◆ PIDs that are indicated as being supported must provide valid data.
- ◆ Multiple PID support is required for CAN.

# Mode \$03 – Retrieve emission-related DTCs

- ◆ Mode \$03 reports confirmed, emission-related DTCs.
- ◆ Confirmed DTCs must be reported after the MIL is illuminated and “history” DTCs must be reported after the fault is corrected.

# Mode \$04 – Clear DTCs and Diagnostic Information

- ◆ Mode \$04 clears/erases DTCs and must reset diagnostic data. Diagnostic data includes freeze frame, I/M readiness, monitor status, certain PIDs, and Mode \$06 data.
- ◆ Mode \$04 is required to function with the engine off.

# Mode \$06 – Retrieve OBD test results and malfunction limits

- ◆ Mode \$06 provides monitoring test values and malfunction limits for various OBD monitors.
- ◆ Mode \$06 data must reset properly after codes are cleared.
- ◆ Misfire data must be supported on CAN systems.

# Mode \$07 – Retrieve pending DTCs

- ◆ Mode \$07 reports pending, emission-related DTCs.
- ◆ A pending DTC must be reported if the last monitoring cycle had a malfunction.
- ◆ The pending DTC must clear after the fault is removed and the malfunction is no longer detected.

# Mode \$09 – Retrieve vehicle information

- ◆ Mode \$09 allows an I/M test technician to obtain vehicle VIN, module calibration (CALID), and Calibration Verification Number (CVN).
- ◆ VIN is required, the vehicle can only report one VIN. (must be 17 chars ASCII, properly padded)
- ◆ CALID is required. (must be ASCII, properly padded)
- ◆ A CVN must be supplied for each CALID (must be hex, properly padded) If a diagnostic/emission critical control module is reprogrammable, it must respond with a CALID and CVN.

# Mode \$09 – Retrieve vehicle information

- ◆ CVN must be calculated every driving cycle (within 30 seconds after reprogramming) and stored in Keep Alive memory so that it can be retrieved with the engine off or engine running, within normal PID response timing.
- ◆ CVN must not be erased by Mode \$04.
- ◆ In-use performance counters are required by 2007 MY for catalyst, O2 sensor, EGR/VVT, secondary air, and evaporative system monitors.

# I/M Readiness and In-Use Performance Data

- ◆ The dynamic test checks for proper implementation of standard diagnostic information used for I/M Readiness and In-Use Performance monitoring. This data, as well as Mode \$01 PID data, is checked on a warmed up engine for properly formatted responses and data integrity during the dynamic test.



# I/M Readiness

- ◆ The dynamic test (Section 10) first clears codes in order to reset all I/M readiness bits and then requires the operator to drive the vehicle in a manner that causes the In-use Performance general denominator to increment. The accuracy of the counter is checked against the vehicle conditions determined using Mode \$01 PID data.




# In-Use Performance counters

- ◆ The dynamic test (Section 11) then requires the operator to drive the vehicle in a manner that causes all the OBD monitors to run to completion (run the OBD drive cycle).
- ◆ The test then verifies that all the I/M Readiness bits get set to "Ready" after the manufacturer OBD drive cycle is complete, Mode \$06 data is not out of limits on a vehicle with no faults, and the In-Use Performance and Ignition Counters increment properly.

# In-use Performance Counters

- ◆ The final portion of the dynamic test verifies that the in-use performance counter data is not reset after DTCs are cleared.

# Dynamic Test Display

F1	F2	F3	F4	F5	F6	F7	F8	Select ECU																														
<b><u>I/M Status</u></b>					<b><u>Rate Based Counter</u></b>																																	
Oxygen Sensor Response					Complete																																	
Oxygen Sensor Heater					Complete																																	
Catalyst Monitor					Incomplete																																	
Catalyst Heater					Not Supported																																	
A/C					Not Supported																																	
Evaporative Emissions					Incomplete																																	
EGR					Not Supported																																	
AIR					Not Supported																																	
Fuel Trim					Complete																																	
Misfire					Complete																																	
Comp / Comp					Complete																																	
<b><u>OBD Drive Cycle</u></b>					<table border="1"> <thead> <tr> <th>OBD Monitoring Conditions</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>Ignition Counter</td> <td>47</td> <td>22</td> </tr> <tr> <td></td> <td><b>N</b></td> <td><b>D</b></td> </tr> <tr> <td>Catalyst B1</td> <td>4</td> <td>22</td> </tr> <tr> <td>Catalyst B2</td> <td>4</td> <td>22</td> </tr> <tr> <td>Oxygen Sensor B1</td> <td>12</td> <td>22</td> </tr> <tr> <td>Oxygen Sensor B2</td> <td>12</td> <td>22</td> </tr> <tr> <td>EGR</td> <td>33</td> <td>22</td> </tr> <tr> <td>AIR</td> <td>0</td> <td>0</td> </tr> <tr> <td>EVAP</td> <td>1</td> <td>5</td> </tr> </tbody> </table>				OBD Monitoring Conditions			Ignition Counter	47	22		<b>N</b>	<b>D</b>	Catalyst B1	4	22	Catalyst B2	4	22	Oxygen Sensor B1	12	22	Oxygen Sensor B2	12	22	EGR	33	22	AIR	0	0	EVAP	1	5
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300 Second >25 MPH Timer																																						
600 Second Total Drive Timer																																						
					<div style="background-color: red; color: white; padding: 10px; display: inline-block; border: 1px solid black;">Start / Stop</div>																																	

# J1699-3 contacts

Chairman – Mark Zachos (mark@dgtech.com)

Recorder – Paul Baltusis (pbaltusi@ford.com)

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# THE END

Thank you for your attention!