OBD SAE Communication Standards Update

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CARB HD OBD-II (CCR 1971.1)

The HD OBD regulations were revised May 28, 2009.

For the most part, changes were made to harmonize with the Light Duty OBD-II regulations (CCR 1968.2) but some unique/new changes were made:

J1962 connector must be mounted to the left of the brake/clutch pedal and may not be covered by a door (may have a dust cover).

Adds PIDs for normalized trigger for PM filter regeneration, PM filter regeneration status, average distance (or engine run time for engines not utilizing vehicle speed information) between PM filter regenerations, EGR temperature, variable geometry turbo control status (e.g., open loop, closed loop), reductant level (e.g., urea tank fill level), alcohol fuel percentage, type of fuel currently being used, NOx adsorber regeneration status, NOx adsorber deSOx status, hybrid battery pack remaining charge, PM sensor output and distance traveled while low/empty SCR reductant driver warning/inducement active.

CARB HD OBD-II (CCR 1971.1)

All 2013 and subsequent model year engines shall have the engine serial number (ESN) available in a standardized format. Only one electronic control unit per vehicle shall report the ESN to generic scan tool.

Adds Mode 09 IUMPR reporting for diesel fuel system monitor, section (e)(1.3.3) (Secondary O2 sensor reporting for gasoline engines was already required in the light duty regs). This will require change to Mode 09 INFOTYPE $0B

Revised Engine Idle Time definition (PID $7F)

Permanent DTC erasure conditions for continuous monitors, section 2.3.1 (C) (ii) b. No failures subsequent to OBD-II drive cycle.

Euro Stage V and VI (EC 715/2007)

- Euro V regulations require that OBD data be provided via OASIS by Sept 2009 (within 6 months of approval).
- Euro V regulations will require support of In-use Performance Monitor data using Service $09 for Sept 2011 (0.1 ratios).
- Euro VI regulations will require the use of CAN communication protocol (ISO 15765-4 dated 10 Jan 2005) by Sept 2014.
- Provide off-board access to reagent consumption information over 2400 km period – average demanded and actual reagent consumption, reagent level
- Require a non-erasable fault PID for NOx exceedence for at least 800 days/30000 km of vehicle operation
- Reactivate vehicle after driver inducement system triggered via scan tool for up to 50 km to validate repair

Euro Heavy Duty Euro V (2005/78/EC)

- HD Euro V regulations allow the use of CAN communication protocol (ISO 15765-4 or SAE J1939).
- HD OBD Stage 2 regulations require a non-erasable fault code for NOx exceedence for at least 400 days/9600 hours engine operation
- Provide off-board access to reagent consumption information – average demanded and actual reagent consumption, reagent level

Changes to SAE/ISO Documents – J1979

- CARB regs, Euro regs and industry continue to driven additional changes to the J1979 document.
- I/M Readiness for fuel monitor
- PID $1C for Korea, India
- Revised Engine Idle Time definition ($7F)
- Revised diesel SCR Inducement PID $88
- Added O2 concentration PID $8C
- Revise Service $09 IPT count to accommodate “older” protocols
- Revised diesel IUMPR data to add fuel monitor
- Added Engine Serial Number (ESN) data to Service $09
- Add scaling IDs $99, $AD and $AE

J1979 Changes – I/M Readiness, PID $1C

PID $01 – fuel monitor readiness bit now reflects non-continuous monitor status for gas and diesel

	Fuel system monitoring ready	5	0 = monitor complete, or not applicable (YES) 1 = monitor not complete (NO)	FUEL_RDY: YES or NO
	Fuel system monitoring shall always indicate complete for spark-ignition and compression ignition engines that have only continuous fuel system monitors. For spark-ignition and compression ignition engines that have one or more non-continuous fuel system monitors (e.g.. cylinder air-fuel imbalance or injection quantity/timing), fuel system monitoring shall indicate complete only after all non-continuous fuel system evaluation(s) are complete.			

PID $1C - revised to reflect Korean and India OBD

Korean OBD	1E		KOBD
India OBD I	1F		IOBD I
India OBD II	20		IOBD II

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J1979 Changes – Dual Throttles

PID $8D - added to accommodate two throttles

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
11	Absolute Throttle Position	A	0 %	100 %	100/255 %	TP: xxx.x %
	Absolute throttle position (not “relative” or “learned” throttle position) shall be displayed as a normalized value, scaled from 0 to 100 %. For example, if a 0 to 5.0 volt sensor is used (uses a 5.0 volt reference voltage), and the closed throttle position is at 1.0 volts, TP shall display (1.0 / 5.0) = 20 % at closed throttle and 50 % at 2.5 volts. Throttle position at idle will usually indicate greater than 0 %, and throttle position at wide open throttle will usually indicate less than 100 %. For systems where the output is proportional to the input voltage, this value is the percent of maximum input reference voltage. For systems where the output is inversely proportional to the input voltage, this value is 100 % minus the percent of maximum input reference voltage. A single throttle plate could have up to three throttle position sensors, A, B and C. A dual throttle plate system could have up to four throttle position sensors, A, B, C and G. NOTE: See PID $45 for a definition of Relative Throttle Position.					

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
8D	Absolute Throttle Position G	A	0 %	100 %	100/255 %	TP_G: xxx.x %
	Absolute throttle position G, if utilized by the control module, (not “relative” or “learned” throttle position) shall be displayed as a normalized value, scaled from 0 to 100 %. For example, if a 0 to 5.0 volt sensor is used (uses a 5.0 volt reference voltage), and the closed-throttle position is at 1.0 volts, TP_G shall display (1.0 / 5.0) = 20 % at closed throttle and 50 % at 2.5 volts. Throttle position at idle will usually indicate greater than 0 %, and throttle position at wide-open throttle will usually indicate less than 100 %. For systems where the output is proportional to the input voltage, this value is the percent of maximum input reference voltage. For systems where the output is inversely proportional to the input voltage, this value is 100 % minus the percent of maximum input reference voltage. A single throttle plate could have up to three throttle position sensors, A, B and C. A dual throttle plate system could have up to four throttle position sensors, A, B, C and G.					

J1979 Changes – Boost PID $6F

PID $6F - revised to provide additional boost range

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
6F	Turbocharger Compressor Inlet Pressure					
	Support of Turbocharger Compressor Inlet Pressure Sensor Data	A (bit)	Byte 1 of 3			
	Turbocharger Compressor Inlet Pressure Sensor A supported	A, bit 0	0	1	1=Turbocharger Compressor Inlet Pressure Sensor A supported, 1 kPa per bit scaling	
	Turbocharger Compressor Inlet Pressure Sensor B supported	A, bit 1	0	1	1=Turbocharger Compressor Inlet Pressure Sensor B supported, 1 kPa per bit scaling	
	Turbocharger Compressor Inlet Pressure Sensor A supported	A, bit 2	0	1	1=Turbocharger Compressor Inlet Pressure Sensor A supported, 8 kPa per bit scaling	
	Turbocharger Compressor Inlet Pressure Sensor B supported	A, bit 3	0	1	1=Turbocharger Compressor Inlet Pressure Sensor B supported, 8 kPa per bit scaling	
	reserved (bits shall be reported as ‘0’)	A, bits 4 - 7	0	0		
	Turbocharger Compressor Inlet Pressure Sensor A	B	0 kPa (absolute)	255 kPa (absolute)	1 kPa per bit or 8 kPa per bit	TCA_CINP: xxx kPa (xx.x inHg)
	TCA_CINP shall display turbocharger A compressor inlet pressure.					
	Turbocharger Compressor Inlet Pressure Sensor B	C	0 kPa (absolute)	255 kPa (absolute)	1 kPa per bit or 8 kPa per bit	TCB_CINP: xxx kPa (xx.x inHg)
	TCB_CINP shall display turbocharger B compressor inlet pressure.					

J1979 Changes – Idle Time $7F

PID $7F – Idle Time definition changed to match HD regs

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
7F	Engine Run Time					
	Support of Engine Run Time	A (bit)	Byte 1 of 13			
	Total Engine Run Time supported	A, bit 0	0	1	1 = Total Engine Run Time supported	
	Total Idle Run Time supported	A, bit 1	0	1	1 = Total Idle Run Time supported	
	Total Run Time With PTO Active supported	A, bit 2	0	1	1 = Total Run Time With PTO Active supported	
	reserved (bits shall be reported as '0')	A, bits 3 - 7	0	0		
	Total Engine Run Time	B,C,D,E	0 sec	4,294,967,295 sec	1 sec/bit	RUN_TIME: xxxxxxx hrs, xx min
	RUN_TIME shall display the total engine run time. RUN_TIME shall increment while the engine is running. It shall freeze if the engine stalls.					
	Total Idle Run Time	F,G,H,I	0 sec	4,294,967,295 sec	1 sec/bit	IDLE_TIME: xxxxxxx hrs, xx min
	IDLE_TIME shall display the total time the vehicle has been operated at idle. IDLE_TIME shall increment while the accelerator pedal is released by the driver, engine speed is greater than or equal to 50 to 150 rpm below the normal, warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission), PTO not active, and either vehicle speed less than or equal to 1.6 kph (1 mph) or engine speed less than or equal to 200 rpm above normal warmed-up idle. It shall freeze if the engine stalls or the engine is no longer at idle.					
	Total Run Time With PTO Active	J,K,L,M	0 sec	4,294,967,295 sec	1 sec/bit	PTO_TIME: xxxxxxx hrs, xx min
	PTO_TIME shall display the total engine run time with PTO engaged. PTO_TIME shall increment while the engine is running with PTO engaged. It shall freeze if the engine stalls.					
	NOTE: Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Numbers may not be reset to zero under any other circumstances, including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received. If any of the individual counters reach the maximum value, all counters shall be divided by two before any are incremented again to avoid overflow problems.					

J1979 Changes – Reagent System Data $85

TABLE B112 - PID $85 DEFINITION

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
85	NOx Control System					
	Support of NOx Reagent System Data	A (bit)	Byte 1 of 10			
	Average Reagent Consumption Supported	A, bit 0	0	1	1 = Average Reagent Consumption Supported	
	Average Demanded Reagent Consumption Supported	A, bit 1	0	1	1 = Average Demanded Reagent Consumption Supported	
	Reagent Tank Level Supported	A, bit 2	0	1	1 = Reagent Tank Level Supported	
	Minutes run by the engine while NOx warning mode is activated supported	A, bit 3	0	1	1 = Minutes run by the engine while NOx warning mode is activated supported	
	reserved (bits shall be reported as '0')	A, bits 4 - 7	0	0		
	Average Reagent Consumption	B,C	0 L/h	327.675 L/h	0.005 L/h per bit	REAG_RATE: xxx.xx L/h
	REAG_RATE shall indicate average reagent consumption in liters per hour by the engine system either over the previous complete 48 hour period of engine operation or the period needed for a demanded reagent consumption of at least 15 liters, whichever is longer. Note: REAG_RATE shall indicate zero L/h when the engine is not running.					
	Average Demanded Reagent Consumption	D,E	0 L/h	327.675 L/h	0.005 L/h per bit	REAG_DEMD: xxx.xx L/h
	REAG_DEMD shall indicate average demanded reagent consumption in liters per hour by the engine system either over the previous complete 48 hour period of engine operation or the period needed for a demanded reagent consumption of at least 15 liters, whichever is longer. Note: REAG_DEMD shall indicate zero L/h when the engine is not running.					
	Reagent Tank Level	F	0% (no reagent)	100% (max reagent cap.)	100/255 %	REAG_LVL: xxx.x %
	REAG_LVL shall indicate nominal reagent tank liquid fill capacity as a percent of maximum.					
	Total run time by the engine while NOx warning mode is activated	G,H,I,J	0 sec	4,294,967,295 sec	at 1 sec/bit	NWI_TIME: xxxxxxx hrs, xx min

TABLE B112 - PID $85 DEFINITION (CONTINUED)

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
85	NOx Warning Indicator Time - Conditions for "Total run time run by the engine while NOx warning indicator is activated" counter: - reset to $00000000 when warning indicator state changes from deactivated to activated. - accumulate counts in seconds if warning indicator is activated (ON) - do not change value while warning indicator is not activated (OFF) - reset to $00000000 if warning indicator has not been activated for 400 days or 9600 hours of engine operation - do not wrap to $00000000 if value is $FFFFFFFF - counter shall not be erasable by any scan tool command PID $85 is not applicable to spark-ignition engines.					

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J1979 Changes – Reagent System Data $85

PID $85 - revised to accommodate discreet level sensors

<table>
<tr><td>Reagent Tank Level</td><td>F</td><td>0%
(no
reagent)</td><td>100%
(max
reagent
cap.)</td><td>100/255 %</td><td>REAG_LVL: xxx.x %</td></tr>
<tr><td colspan="6">REAG_LVL shall indicate nominal reagent tank liquid fill capacity as a percent of maximum. For systems that have discreet level sensing, e.g. Full (100%, Low (20%) and Empty (0%), REAG_LVL shall indicate the level when at each discreet point and the average level when operating between discreet points. In the example above, REAG_LVL would indicate 100%, 60%, 20%, 10% and 0%.</td></tr>
</table>

J1979 Changes – SCR Inducement PID $88

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
88	SCR inducement system actual state	A(bit)				SCR_INDUCE_SYSTEM:
		0	0	1	1 = reagent level too low	LEVEL_LOW
		1	0	1	1 = incorrect reagent	INCORR_REAG
		2	0	1	1 = deviation of reagent consumption	CONSUMP_DEVIATION
		3	0	1	1 = NOx emissions too high	NOx_LEVEL
	reserved (bits shall be reported as '0')	4-6				
		7	0	1	1 = inducement system active	ACTIVE
	Conditions for "SCR inducement system actual state": indicate if system is currently activated using bit 7 indicate reason for current activation (bit 0 - 3) all bits shall indicate 0 when inducement system is not active					
	SCR inducement system state 10K history (0 – 10,00 km)	B(bit)				SCR_INDUCE_SYSTEM_HIST1:
		0	0	1	1 = reagent level too low	LEVEL_LOW1
		1	0	1	1 = incorrect reagent	INCORR_REAG1
		2	0	1	1 = deviation of reagent consumption	CONSUMP_DEVIATION1
		3	0	1	1 = NOx emissions too high	NOx_LEVEL1
	SCR inducement system state 20K history (10,000 – 20,000 km)	B (bit)				SCR_INDUCE_SYSTEM_HIST2:
		4	0	1	1 = reagent level too low	LEVEL_LOW2
		5	0	1	1 = incorrect reagent	INCORR_REAG2
		6	0	1	1 = deviation of reagent consumption	CONSUMP_DEVIATION2
		7	0	1	1 = NOx emissions too high	NOx_LEVEL2
	Conditions for "SCR inducement system state history": indicate reason for activation (bit 0 - 3) do not reset bit 0 - 3 when reason disappears do not reset upon code clearing (Service$04)					

J1979 Changes – SCR Inducement PID $88

	SCR inducement system state 30K history (20,000 - 30,000 km)	C(bit)				SCR_INDUCE_SYSTEM_HIST3:
		0	0	1	1 = reagent level too low	LEVEL_LOW3
		1	0	1	1 = incorrect reagent	INCORR_REAG3
		2	0	1	1 = deviation of reagent consumption	CONSUMP_DEVIATION3
		3	0	1	1 = NOx emissions too high	NOx_LEVEL3
	SCR inducement system state 40K history (30,000 – 40,000 km)	C(bit)				SCR_INDUCE_SYSTEM_HIST4:
		4	0	1	1 = reagent level too low	LEVEL_LOW4
		5	0	1	1 = incorrect reagent	INCORR_REAG4
		6	0	1	1 = deviation of reagent consumption	CONSUMP_DEVIATION4
		7	0	1	1 = NOx emissions too high	NOx_LEVEL4
	Conditions for "SCR inducement system state history": indicate reason for activation (bit 0 - 3) do not reset bit 0 - 3 when reason disappears do not reset upon code clearing (Service$04)					

J1979 Changes – SCR Inducement PID $88

	Distance travelled while inducement system active in current 10K block (0 – 10,000 km)	D,E	0 km	65535 km	1 km per count	SCR_IND_DIST_1N: xxxxx km (xxxxx miles)
	Distance travelled in current 10 K block (0 - 10,000 km block)	F,G	0 km	65535 km	1 km per count	SCR_IND_DIST_1D: xxxxx km (xxxxx miles)
	Distance travelled while inducement system active in 20K block (10 – 20,000 km)	H,I	0 km	65535 km	1 km per count	SCR_IND_DIST_2N: xxxxx km (xxxxx miles)
	Distance travelled while inducement system active in 30K block (20 – 30,000 km)	J,K	0 km	65535 km	1 km per count	SCR_IND_DIST_3N: xxxxx km (xxxxx miles)
	Distance travelled while inducement system active in 40K block (30 – 40,000 km)	L,M	0 km	65535 km	1 km per count	SCR_IND_DIST_4N: xxxxx km (xxxxx miles)
	Conditions for inducement system numerator and denominator counters: Initial values for numerators and denominators are zero. Accumulate counts in km After every km, increment the denominator, SCR_IND_DIST_1D If the inducement system is active, increment the numerator, SCR_IND_DIST_1N, if the inducement system is not active, freeze SCR_IND_DIST_1N. Do not reset any bits in the status history If the inducement system is active, set the appropriate bit for the SCR_INDUCE_SYSTEM_HISTORY1 (Note: if the reasons change, multiple bits shall be set). When SCR_IND_DIST_1D reaches 10,000 km, freeze the values for the numerator and history, and copy each set of data (SCR_IND_DIST_xD and SCR_INDUCE_SYSTEM_HISTORYX) into the next older set of data (SCR_IND_DIST_x+1D and SCR_INDUCE_SYSTEM_HISTORYx+1). The denominators for SCR_IND_DIST_2N, SCR_IND_DIST_3N and SCR_IND_DIST_4N would always 10,000 km and do not need to be calculated or displayed. If the data in the oldest block (SCR_IND_DIST_4N and SCR_INDUCE_SYSTEM_HISTORY4) is displaced by new data, it can be discarded. Reset SCR_IND_DIST_1D and SCR_INDUCE_SYSTEM_HISTORY1 and begin accumulating mileage and inducement status again for the current 10,000 block register. do not reset upon code clearing (Service $04) or battery disconnect NOTE: Each number shall be reset to zero only when a non-volatile memory reset occurs (e.g., reprogramming event). Data may not be reset to zero under any other circumstances, including when a scan tool (generic or enhanced) command to clear fault codes or reset KAM is received.					

J1979 Changes – Aftertreatment Status PID $8B

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
8B	Diesel Aftertreatment Status					
	Diesel Aftertreatment Status Supported	A (bit)	Byte 1 of 7			
	Diesel Particulate Filter (DPF) Regen Status Supported	A, bit 0	0	1	1 = DPF regen status data supported	
	Diesel Particulate Filter (DPF) Regen Type Supported	A, bit 1	0	1	1 = DPF regen;type data supported	
	NOx Adsorber Regen Status Supported	A, bit 2	0	1	1 = NOx adsorber regen data supported	
	NOx Adsorber Desulfurization Status Supported	A, bit 3	0	1	1 = NOx adsorber desulfurization data supported	
	Normalized trigger for DPF regen supported	A, bit 4	0	1	1 = Normalized trigger for DPF regen supported	
	Average time between DPF regens supported	A, bit 5	0	1	1 = Average time between DPF regens supported	
	Average distance between DPF regens supported	A, bit 6	0	1	1 = Average distance between DPF regens supported	
	Reserved (bits shall be reported as '0')	A, bit 7	0	0		
	Diesel Aftertreatment Status	B (bit)	Byte 2 of 7			
	Diesel Particulate Filter (DPF) Regen Status	B, bit 0	0	1	1 = DPF Regen in progress; 0 = DPF Regen not in progress	DPF_REGEN: YES or NO
	Diesel Particulate Filter (DPF) Regen Type	B, bit 1	0	1	1 = Active DPF Regen; 0 = Passive DPF Regen	DPF_REGEN: ACTIVE or PASSIVE
	NOx Adsorber Regen Status	B, bit 2	0	1	1 = Desorption (regen) in progress, 0 = Adsorption in progress (no regen)	NOX_ADS_REGEN: YES or NO
	NOx Adsorber Desulfurization Status	B, bit 3	0	1	1 = Desulfurization in progress; 0 = Desulfurization not in progress	NOX_ADS_DESULF: YES or NO
	Reserved (bits shall be reported as '0')	B, bits 4 - 7	0	0		

J1979 Changes – Aftertreatment Status PID $8B

Normalized Trigger for DPF Regen	C	0 %	100 %	100/255 %	DPF_REGEN_PCT: xxx.x %
DPF_REGEN_PCT shall indicate the normalized DPF loading, time, distance, drive cycles or other criteria before the next DPF regen where 0% means the DPF is clean (a regen just occurred) and 100% means the DPF is fully loaded. When there are multiple criteria to trigger a regen, the one that is closest to triggering the regen shall be displayed.					
Average Time Between DPF Regens	D,E	0 min	65535 min	1 min per count	DPF_REGEN_AVGT: xxxx hrs, xx min
DPF_REGEN_AVGT shall indicate the EWMA filtered time between successful, active triggered DPF regens. The weighting factor shall be chosen to produce a representative value after 6 regen cycles (~0.5)					
Average Distance Between DPF Regens	F,G	0 km	65535 km	1 km per count	DPF_REGEN_AVGD: xxxxx km (xxxxx miles)
DPF_REGEN_AVGD shall indicate the EWMA filtered distance between successful, active triggered DPF regens. The weighting factor shall be chosen to produce a representative value after 6 regen cycles (~0.5)					

J1979 Changes – O2 Concentration PID $8C

PID (hex)	Description	Data Byte	Min. Value	Max. Value	Scaling/Bit	External Test Equipment SI (Metric) / English Display
8C	O2 Sensor (Wide Range)					
	Support of O2 Sensor Data	A (bit)	Byte 1 of 9			
	O2 Sensor Concentration Bank 1 Sensor 1 supported	A, bit 0	0	1	1 = O2 Sensor Concentration Bank 1 Sensor 1 supported	
	O2 Sensor Concentration Bank 1 Sensor 2 supported	A, bit 1	0	1	1 = O2 Sensor Concentration Bank 1 Sensor 2 supported	
	O2 Sensor Concentration Bank 2 Sensor 1 supported	A, bit 2	0	1	1 = O2 Sensor Concentration Bank 2 Sensor 1 supported	
	O2 Sensor Concentration Bank 2 Sensor 2 supported	A, bit 3			1 = O2 Sensor Concentration Bank 2 Sensor 2 supported	
	O2 Sensor Lambda Bank 1 Sensor 1 supported	A, bit 4			1 = O2 Sensor Lambda Bank 1 Sensor 1 supported	
	O2 Sensor Lambda Bank 1 Sensor 2 supported	A, bit 5			1 = O2 Sensor Lambda Bank 1 Sensor 2 supported	
	O2 Sensor Lambda Bank 2 Sensor 1 supported	A, bit 6			1 = O2 Sensor Lambda Bank 2 Sensor 1 supported	
	O2 Sensor Lambda Bank 2 Sensor 2 supported	A, bit 7	0	1	1 = O2 Sensor Lambda Bank 2 Sensor 2 supported	
	O2 Sensor Concentration Bank 1 Sensor 1	B,C	0%	100%	0.001526 %/bit	O2S11_PCT xxx.xxxxxx %
	O211 shall display O2 concentration for Bank 1 Sensor 1, if utilised by the control module strategy.					
	O2 Sensor Concentration Bank 1 Sensor 2	D,E	0%	100%	0.001526 %/bit	O2S12_PCT xxx.xxxxxx %
	O212 shall display O2 concentration for Bank 1 Sensor 2, if utilised by the control module strategy.					
	O2 Sensor Concentration Bank 2 Sensor 1	F,G	0%	100%	0.001526 %/bit	O2S21_PCT xxx.xxxxxx %
	O221 shall display O2 concentration for Bank 2 Sensor 1, if utilised by the control module strategy.					
	O2 Sensor Concentration Bank 2 Sensor 2	H,I	0%	100%	0.001526 %/bit	O2S22_PCT xxx.xxxxxx %
	O222 shall display O2 concentration for Bank 2 Sensor 2, if utilised by the control module strategy.					
	O2 Sensor Lambda Bank 1 Sensor 1	J,K	0	7.99	0.000122 lambda//bit	LAMBDA11: x.xxx
	O2S11 shall display O2 Lambda for Bank 1 Sensor 1, if utilised by the control module strategy.					
	O2 Sensor Lambda Bank 1 Sensor 2	L,M	0	7.99	0.000122 lambda//bit	LAMBDA12: x.xxx
	O2S12 shall display O2 Lambda for Bank 1 Sensor 2, if utilised by the control module strategy.					
	O2 Sensor Lambda Bank 2 Sensor 1	N,O	0	7.99	0.000122 lambda//bit	LAMBDA21: x.xxx
	O2S21 shall display O2 Lambda for Bank 2 Sensor 1, if utilised by the control module strategy.					
	O2 Sensor Lambda Bank 2 Sensor 2	P,Q	0	7.99	0.000122 lambda//bit	LAMBDA22: x.xxx
	O2S22 shall display O2 Lambda for Bank 2 Sensor 2, if utilised by the control module strategy.					
	PIDs $8C shall be used for linear or wide-ratio oxygen sensors on compression ignition engines that can be stand-alone sensors or part of the NOx sensor (See PID $83 for NOx PIDs). The O2S outputs can be Lambda (typically 0 to 4 for a compression ignition engine) and/or O2 concentration (typically 0 to 25%) NOTE: Compression ignition engines do not use the O2 sensor location PIDs $13 or $1D to define the oxygen sensor location.					

J1979 Changes – IPT Count

Revised Mode $09 IPT count to accommodate non-CAN protocols

InfoType (Hex)	Vehicle Information Data Byte Description	Scaling	Mnemonic
07	**MessageCount IPT** Number of messages to report In-use Performance Tracking using InfoType $08 for spark ignition engines and InfoType $0B for compression ignition engines. — For ISO 9141-2, ISO 14230-4 and SAE J1850, the message count in the response shall be $08 if sixteen (16) values are required to be reported, $09 if eighteen (18) values are required to be reported, and $0A if twenty (20) values are required to be reported (one message is required to report two values). For ISO 15765-4, support for this parameter is not recommended/required for the ECU and the external test equipment. The response message format is not specified.	1 byte unsigned numeric	MC_IPT

J1979 Changes – Fuel Monitor IPT

Revised INFOTYPE $0B to add fuel monitor

InfoType (Hex)	Description	# of Data Bytes	External Test Equipment SI (Metric) / English Display
0B	**In-use Performance Tracking**: 16 or 18 counters	32 or 36	IPT:
	Scaling: unsigned numeric (most significant byte reported as Data A). This data is used to support regulatory requirements for In-use Performance Tracking for compression ignition engines for 2010 MY and beyond. Manufacturers are required to implement software algorithms that track in-use performance for each of the following components: NMHC catalyst, NOx catalyst monitor, NOx adsober monitor, PM filter monitor, exhaust gas sensor monitor, EGR/ VVT monitor, boost pressure monitor and fuel system monitor for 2013 MY and beyond. The numerator for each component or system shall track the number of times that all conditions necessary for a specific monitor to detect a malfunction have been encountered. The denominator for each component or system shall track the number of times that the vehicle has been operated in the specified conditions. These conditions are specified for each monitored component or system. The ignition counter shall track the number of times that the engine has been started. All data items of the In-use Performance Tracking record shall be reported in the order as listed in this table. Data values, which are not implemented (e.g. bank 2 of the catalyst monitor of a 1-bank system) shall be reported as $0000. If a vehicle utilizes Variable Valve Timing (VVT) in place of EGR, the VVT in-use data shall be reported in place of the EGR in-use data. If a vehicle utilizes both an EGR system and a VVT system, the ECU shall track the in-use performance data for both monitors, but shall report only the data for the system with the lowest numerical ratio.		
	Fuel Monitor Completion Condition Counts	2 bytes	FUELCOMP: xxxxx cnts
	Fuel System Monitor Completion Condition Counts displays the number of times that all conditions necessary to detect a fuel system malfunction have been encountered (numerator).		
	Fuel Monitor Conditions Encountered Counts	2 bytes	FUELCOND: xxxxx cnts
	Fuel System Monitor Conditions Encountered Counts displays the number of times that the vehicle has been operated in the specified fuel system monitoring conditions (denominator).		

J1979 Changes – Engine Serial Number

Add INFOTYPE $0C and $0D for ESN

TABLE G12 - MESSAGECOUNT VIN DATA BYTE DESCRIPTION

InfoType (Hex)	Vehicle Information Data Byte Description	Scaling	Mnemonic
0C	**MessageCount ESN** Number of messages to report Vehicle Identification Number (ESN) — For ISO 9141-2, ISO 14230-4 and SAE J1850, the message count in the response shall always be $05, and shall be reported for consistency in the use of this service. For ISO 15765-4, support for this parameter is not recommended/required for the ECU and the external test equipment. The response message format is not specified.	1 byte unsigned numeric	MC_ESN

InfoType (Hex)	Description	Scaling	External Test Equipment SI (Metric) / English Display
0D	**Engine Serial Number**	17 ASCII characters	ESN: XXXXXXXXXXXXXXXXX
	For vehicles that provide electronic access to the ESN, it is recommended to report it using this format for ease of use by the external test equipment intended either for vehicle diagnostics or Inspection/Maintenance programs. The length and format of the ESN are not specified, however, ESN shall be reported by always using 17 ASCII characters starting with any fill bytes of $00, followed by the ESN characters. For ISO 9141-2, ISO 14230-4 and SAE J1850, the response consists of the following messages: – Message #1 shall contain up to three filling bytes of $00, followed by any ESN characters; – Message #2 shall contain up to three filling bytes of $00, followed by any ESN characters; – Message #3 shall contain up to three filling bytes of $00, followed by any ESN characters; – Message #4 shall contain up to three filling bytes of $00, followed by any ESN characters; – Message #5 shall contain up to three filling bytes of $00, followed by any ESN characters; For ISO 15765-4, there is only one response message, which contains all 17 ASCII characters starting with any fill bytes of $00, followed by the ESN charaters.		

J1979 Changes – Scaling IDs

Unit and Scaling ID (hex)	Description	Scaling/Bit	Min. Value (hex)	Min. Value (dec.)	Max. Value (hex)	Max. Value (dec.)	External Test Equipment SI (Metric) Display
3D	Current	0.01 mA per bit unsigned	0000	0 mA	FFFF	655.35 mA	xxx.xx mA
			Data Range examples:				Display examples:
	Conversion mA -> A: 1000 mA = 1 A		$0000 $0001 $FFFF	0 mA +0.01 mA + 655.35 mA			0.00 mA 0.01 mA 655.35 mA

Unit and Scaling ID (hex)	Description	Scaling/Bit	Min. Value (hex)	Min. Value (dec.)	Max. Value (hex)	Max. Value (dec.)	External Test Equipment SI (Metric) Display	
99	Pressure	0.1 kPa per bit signed	8000	– 3276.8 kPa	7FFF	3276.7 kPa	xxxx.x kPa (xxx.xx PSI)	
Conversion kPa -> PSI: 1 kPa (10 HPa) = 0.1450377 PSI Additional Conversions: 1 kPa = 4.0146309 inH2O 1 kPa = 101.9716213 mmH2O (millimetre of water) 1 kPa = 7.5006151 mmHg (millimetre of mercury) 1 kPa = 0.010 bar			Data Range examples:				Display examples:	
			$8000	– 3276.8 kPa			– 3276.8 kPa	(-475.26 PSI)
			$FFFF	– 0.1 kPa			– 0.1 kPa	(-0.15 PSI)
			$0000	0 kPa			0.0 kPa	(0.00 PSI)
			$0001	+ 0.1 kPa			0.1 kPa	(0.15 PSI)
			$7FFF	+ 3276.7 kPa			+ 3276.7 kPa	(475.25 PSI)

J1979 Changes – Scaling IDs

Unit and Scaling ID (hex)	Description	Scaling/Bit	Min. Value (hex)	Min. Value (dec.)	Max. Value (hex)	Max. Value (dec.)	External Test Equipment SI (Metric) Display
AD	Mass per stroke	0.01 mg/stroke signed	8000	-327.68 mg/stroke	7FFF	327.67 mg/stroke	xxx.xx mg/stroke
			Data Range examples:				Display examples:
			$8000	-327.68			-327.68 mg/stroke
			$FFFF	- 0.01 mg/stroke			- 0.01 mg/stroke
			$0000	0 mg/stroke			0.00 mg/stroke
			$0001	+ 0.01 mg/stroke			0.01 mg/stroke
			$7FFF	+ 327.67 mg/stroke			327.67 mg/stroke

Unit and Scaling ID (hex)	Description	Scaling/Bit	Min. Value (hex)	Min. Value (dec.)	Max. Value (hex)	Max. Value (dec.)	External Test Equipment SI (Metric) Display
AE	Mass per stroke	0.1 mg/stroke signed	8000	-3276.8 mg/stroke	7FFF	3276.7 mg/stroke	xxxx.x mg/stroke
			Data Range examples:				Display examples:
			$8000	-3276.8 mg/stroke			-3276.8 mg/stroke
			$FFFF	- 0.1 mg/stroke			- 0.1 mg/stroke
			$0000	0 mg/stroke			0.00 mg/stroke
			$0001	+ 0.1 mg/stroke			0.1 mg/stroke
			$7FFF	+ 3276.7 mg/stroke			3276.7 mg/stroke

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Changes to SAE/ISO Documents – J1979

The latest approved document is May 2007. A draft J1979 document has been revised to incorporate these new changes and requirements.

J1979 is planned to be balloted within the next month. In the mean time, the changes have been documented in this presentation to help those manufacturers with 2010 and 2011 MY products.

Next, the J1979 committee plans to add the requested WWH OBD PIDs and turn the appendices into an excel and on-line database, similar to the work done by the J2012 committee.

Changes to SAE/ISO Documents – J1699-3

J1699-3 software and document were updated based on OBD-II and EOBD regulatory changes. Latest document version 13.15, (S/W version 13.15.00) includes:

- Mandatory PID recall section
- Mode $09 ECU name
- In-Use Performance Tracking for gas and diesel
- Mode $06 checked versus Mode $01 monitor support
- Dynamic freeze frame
- Permanent Codes
- New diesel PIDs

Changes to SAE/ISO Documents – J1699-3

OBD-II regulations call out J1699 specifically for PVE testing:

- J1 requires static testing on all OBD test groups
- J2 requires dynamic testing on 6 PVE vehicles selected by CARB.

Version 13.07.00 or later is recommended for 2009 MY certification testing.

All 2010 MY and 2011 MY content is available in Version 13.15.00 software. There is not enough 2010 MY diesel test data to recommend a 2010 MY version yet.

Version 13.15 document was balloted and approved on July 22, 2009. It will be published shortly.

Changes to SAE/ISO Documents – J1699-3

Next, the J1699-3 Committee plans to make modifications to facilitate testing for EOBD. Changes include:

- Add prompt 6 to choose between OBD-II and EOBD.
- Add ISO15765 250 kbps baud rate to initialization sequence.
- PID 1C - allow for EOBD.
- PID $21 required.
- Euro VIN is different with regard to model year. VIN is not mandatory for EOBD. Allow for user entry of VIN in 10.2.6.
- CALID is mandatory, CVN is not mandatory.
- IUMPR mandatory for Euro V+, 2011.
- ECU name not mandatory.
- need additional drive cycle to turn on MIL for EOBD.
- Add Permanent DTC bypass for EOBD programs.
- Service that are not mandatory must meet ISO 15031-5 requirements if utilized.

Changes to SAE/ISO Documents – J2012

J2012 has added hundreds of new DTCs for gasoline, diesel and hybrid vehicles. New DTCs are added every 3 months.

The J2012 meetings have been combined with J1930 meetings to improve communication.

The latest approved document is Dec 2007. An Excel spreadsheet (J2012DTC_122007) dated June 16, 2008 containing the latest approved DTCs is available for download.

SAE will serve as the DTC registrar for ISO 15031-6.

Changes to SAE/ISO Documents – J2012

The J2012 was asked to review the rate at which DTCs were being used up.

- SAE P-type Codes Possible: 11,160
- SAE P-type Codes Used: 4,134 (number issued over 16 years)
- SAE P-type Codes Remaining: 7,026
- Failure Type Byte (FTB) types available: 137

ISO has requested a new DTC strategy/format for WWH-OBD.

- A two byte DTC with an FTB seems most likely solution if needed.
- A DTC structure change will impact other standards, regulations, tools, technicians and more.
- There are questions and challenges going forward due to the continued use of two formats with no chance of one complete switchover.
- Regulatory support for this change is unknown.

Changes to SAE/ISO Documents – J2012

One possibility is to go to three byte DTC, similar to ISO 14229 (2 byte identifier, 1 byte FTB, 1 byte status)

The Failure Type Byte is designed to describe the specific fault associated with the basic DTC. For example, an FTB of 1C means "circuit voltage out of range", 73 means "actuator stuck closed", etc. When combined with a basic component DTC, it allows one basic DTC to describe many types of failures.

Three byte DTCs are currently used by J2012 for Body and Chassis DTCs. They cannot be used for Powertrain MIL DTCs because J1979 DTC services handle only two byte DTCs and are, therefore, incompatible.

ISO 14229 Service $19 sub-functions could be defined to provide equivalent J1979 functionality. This would commonize DTC retrieval for all J2012 DTCs.

Changes to SAE/ISO Documents – J2012

To retain backward compatibility, a proposal was made to re-use existing base DTC definitions and combine them with an FTB.

Leave specific 2 byte DTCs in place to remain backward compatible but report them with an FTB of $00 (FTB not supported).

Assign new base DTCs in unused J2012 Powertrain ranges.

Revisit FTB definitions to see if they could be made more useful for powertrain, e.g. add location, bank, cylinder number, etc.

Changes to SAE/ISO Documents J1930

J1930 has had extensive updates since the last publication over 5 years ago. (April 2002)

The document now contains J1979 PID acronyms, electronic module names, a glossary, and figures in addition to approved terms and historical reference terms.

Unlike previous versions of the document, the revised document attempts to coordinate all term used in J1979 and J2012 to provide consistency between DTCs, scan tool parameter names and component names.

The online database is up and running for the use of the J1930 committee.

The long term plan is to publish base document and update an excel spreadsheet as needed, similar to J2012.

The ballot of the latest document and appendix was completed and a new document dated October 2008 was published.

ISO 15031-2 will point to the J1930 document.

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THE END

Thank you for your attention!

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