

DIAGNOSTIC TROUBLE CODE DEFINITIONS **EQUIVALENT TO ISO/DIS 15031-6:APRIL 30, 2002** SAE J2012 APR2002

SAE Recommended Practice

Report of the SAE Vehicle E/E System Diagnostics Standards Committee approve dMarch 1992, completely revised January 1994, and revised October 1994, July 1996, and march 1999. Rationale statement available. Completely revised by the SAE Vehicle Electrical and Electronics Diagnostic Systems Standards Committee April 2002.

This document supersedes SAE J2012 MAR1999, and is technically equivalent to ISO/DIS 15031-6: April 30, 2002, except for minor reorganization of Paragraphs 1 and 2.

Foreword—On-Board Diagnostic (OBD) regulations require passenger cars,
and light and medium duty trucks, to report standardized fault codes for malfunc-
tions detected by the OBD system. This document defines the standardized set of
fault codes.
SAE J2012 was originally developed to meet U.S. OBD requirements for 1996
and later model year vahiolog ISO 15021 6 based a GAT MOCO

and later model year vehicles. ISO 15031-6 was based on SAE J1962 and was intended to meet European OBD requirements for 2000 and later model year vehicles. This document is technically equivalent to ISO 15031-6, with new and revised fault codes included.

revised fa	iult codes included. An office of the first
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Appendix A (Normative) Diagnostic Trouble Code Naming Guidelines Discussion

Appendix B (Normative) Powertrain System Diagnostic Trouble Code B.1

- **B.2**
- B.3 P02XX Fuel and Air Metering

Change Requests

P00XX Fuel and Air Metering and Auxiliary Emission Controls P01XX Fuel and Air Metering AND NAMED & COSA MARINA

B.4	P03XX Ignition System or Misfire
B.5	P04XX Auxiliary Emission Controls
B.6	P05XX Vehicle Speed, Idle Control, and Auxiliary Inputs
B.7	PO6XX Computer and Auxiliary Outputs
В.8	DOTYY Transmission
B.9	P08XX Transmission
B.10	P09XX Transmission
B.11	POAXX Hybrid Propulsion
B.12	PORXX Reserved by Dogument
B.13	POCYY Paragrad by Dogument
B.14	DODYY Donowied by Donoming
B.15	DORYY Deserved by Deservent
B.16	POFXX Reserved by Document
B.17	P10XX Manufacturer Controlled Fuel and Air Metering and Auxiliary
€	Emission Controls
B.18	P11XX Manufacturer Controlled Fuel and Air Metering
B.19	P12XX Manufacturer Controlled Fuel and Air Metering
B.20	P13XX Manufacturer Controlled Ignition System or Misfire
B.21	P14XX Manufacturer Controlled Auxiliary Emission Controls
B.22	P15XX Manufacturer Controlled Vehicle Speed, Idle Control, and
6.50	Auxiliary Inputs
B.23	P16XX Manufacturer Controlled Computer and Auxiliary Outputs
B.24	P17XX Manufacturer Controlled Transmission
B.25	P18XX Manufacturer Controlled Transmission

B.29 P22XX Fuel and Air Metering and Auxiliary Emission Controls B.30 P23XX Ignition System or Misfire B.31 P24XX Auxiliary Emission Controls

B.32 P25XX Auxiliary Inputs P26XX Computer and Auxiliary Outputs B.33

B.26

B.27

B.28

B.34 P27XX Transmission B.35 P28XX ISO/SAE Reserved

P2AXX Fuel and Air Metering and Auxiliary Emission Controls B.36 B.37 P30XX Fuel and Air Metering and Auxiliary Emission Controls B.38 P31XX Fuel and Air Metering and Auxiliary Emission Controls

P32XX Fuel and Air Metering and Auxiliary Emission Controls B.39 (S TO: B,40) P33XX Ignition System or Misfire

P19XX Manufacturer Controlled Transmission

P20XX Fuel and Air Metering and Auxiliary Emission Controls

P21XX Fuel and Air Metering and Auxiliary Emission Controls

P34XX Cylinder Deactivation B.41 B.42 P35XX ISO/SAE Reserved P36XX ISO/SAE Reserved B 43

P37XX ISO/SAE Reserved **B.44** B.45 P38XX ISO/SAE Reserved

B.46 P39XX ISO/SAE Reserved

Appendix C(Normative) Network Communication Groupings

C.1U00XX Network Electrical U01XX Network Communication C.2

C.3 U02XX Network Communication

U03XX Network Software C.4

C.5 U04XX Network Data

1.1 Purpose—This SAE Recommended Practice supersedes SAE J2012 MAR1999, and is technically equivalent to ISO/DIS 15031-6: April 30, 2002.

This document is intended to define the standardized Diagnostic Trouble Codes (DTC) that On-Board Diagnostic (OBD) systems in vehicles are required to report when malfunctions are detected.

This document includes:

- a. Diagnostic Trouble Code format
- b. A standardized set of Diagnostic Trouble Codes and descriptions
- 1.2 Differences from ISO Document—There are no technical differences between this document and ISO/DIS 15031-6: April 30, 2002.

2. References

- 2.1 Applicable Publications-The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.
- 2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.
 - SAE J1930-Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms - Equivalent to ISO/TR 15031-2:April 30, 2002
 - SAE J1979-E/E Diagnostic Test Modes Equivalent to ISO/DIS 15031-5:April 30, 2002
- 2.1.2 ISO DOCUMENT—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.
 - ISO/DIS 15031-6: April 30, 2002—Road vehicles—Communication between vehicle and external test equipment for emissions-related diagnostics—Part 6: Diagnostic trouble code definitions
- 2.2 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.
- 2.2.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.
 - SAE J1978—OBD II Scan Tool—Equivalent to ISO/DIS 15031-4:December 14, 2001
- 2.2.2 ISO DOCUMENT—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.
 - ISO 15031-1:2001—Road vehicles—Communication between vehicle and external test equipment for emissions-related diagnostics-Part 1: General information 3.3555555

- 3. Terms and Definitions—This document is not intended to be used for terms and definitions of vehicle component terminology. These may appear in SAE
- 3.1 Circuit/Open-Fixed value or no response from the system where specific high or low detection is not feasible or can be used in conjunction with circuit low and high codes where all three circuit conditions can be detected.
 - NOTE-The term "malfunction" has, in most cases, been deleted from the DTC description.
- 3.2 Range/Performance—Circuit is in the normal operating range, but not correct for current operating conditions, it may be used to indicate stuck or skewed values indicating poor performance of a circuit, component, or system.
- 3.3 Low Input-Circuit voltage, frequency, or other characteristic measured at the control module input terminal or pin that is below the normal operat-
- 3.4 High Input—Circuit voltage, frequency, or other characteristic measured at the control module input terminal or pin that is above the normal operat-
- 3.5 Bank—Specific group of cylinders sharing a common control sensor, bank 1 always contains cylinder number 1, bank 2 is the opposite bank
 - NOTE-If there is only one bank, use bank #1 DTCs and the word bank may be omitted. With a single "bank" system using multiple sensors, use bank #1.

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3.6 Sensor Location—Location of a sensor in relation the engine air flow, starting from the fresh air intake through to the vehicle tailpipe or fuel flow from the fuel tank to the engine in order numbering 1,2,3 and so on

NOTE—See Figures 1 to 4.

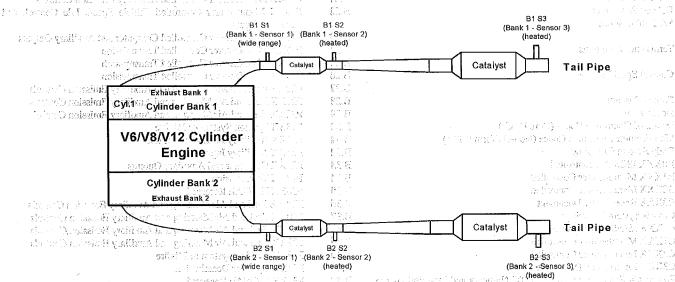
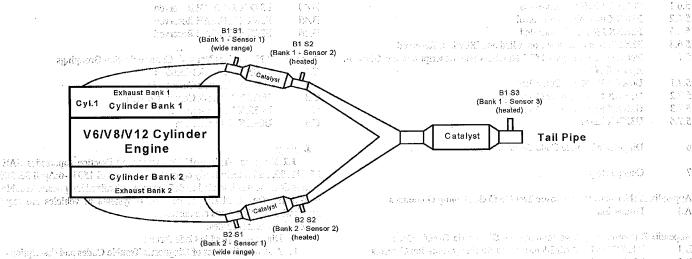


FIGURE 1—V6/V8/V12 CYLINDER ENGINE WITH 2 EXHAUST BANKS AND 4 CATALYSTS EXAMPLE



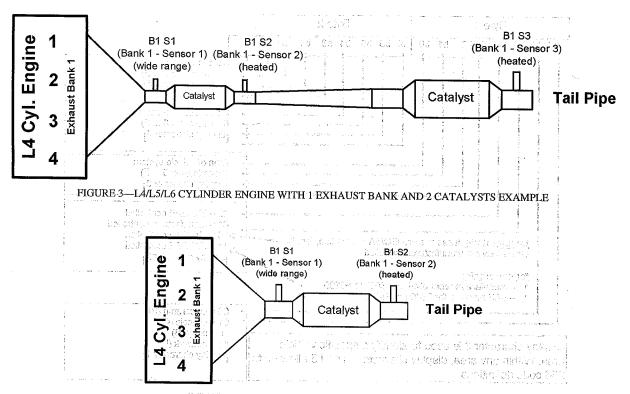


FIGURE 4—L4/L5/L6 CYLINDER ENGINE WITH 1 EXHAUST BANK AND 1 CATALYST EXAMPLE

- 3.7 Left/Right and Front/Rear—Component identified by its position as if it can be viewed from the drivers seating position.
- 3.8 "A" "B"-Where components are indicated by a letter (i.e., A, B, C, etc.) this would be manufacturer defined, starting with component "A".
- 3.9 Intermittent/Erratic—The signal is temporarily discontinuous, the duration of the fault is not sufficient to be considered an open or short, or the rate of change is excessive.

4. General Specifications—The following table specifies systems, code categories, hexadecimal values and particular sections of electrical/electronic systems diagnostic.

TABLE 1-GENERAL CODE SPECIFICATIONS

used persions bulkings od	System	Code categories	Hex value	DTC Prefix
t i NG in District of realis	o os vadia. <mark>Body</mark> sesi žosta	B0xxx - B3xxx		ne milita B ę gyli yr dd
Alt of Mall Koos Bods also	Chassis	C0xxx - C3xxx	4xxx - 7xxx	A Transport New Dec.
		P0xxx - P3xxx	0xxx - 3xxx	Longo Portugacione
. /	OR LID Network	U0xxx - U3xxx	Cxxx - Fxxx	U

The recommended DTCs consist of a three digit numeric code preceded by an alphanumeric designator. The alphanumeric designators are "B0", "B1", "B2", "B3", "C0", "C1", "C2", "C3", "P0", "P1", "P2", "P3", "U0", "U1", "U2", "U3", corresponding to four sets of body, four sets of chassis, four sets of powertrain and four sets of network trouble codes. The code structure itself is partially openended. A portion of the available numeric sequences (portions of "B0", "C0", "P0" and "U0") is reserved for uniform codes assigned by this or future updates. Detailed specifications of the DTC format structure are specified in Section 5. Most circuit, component, or system diagnostic trouble codes are specified by four basic categories: SHE SHALLK LOWER COMMON HO

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OR LONG PLEASE CONSCIUMO A SUAL CAN CONTROL OF STREET CONTROLLING

General circuit /open

- garaged definition of Malaced Comments - Range/Performance problem
- Circuit Low
- Circuit High

Circuit Low is measured with the external circuit, component, or system connected. The signal type (voltage, frequency, etc.) shall be included in the message after Circuit Low or Circuit High.

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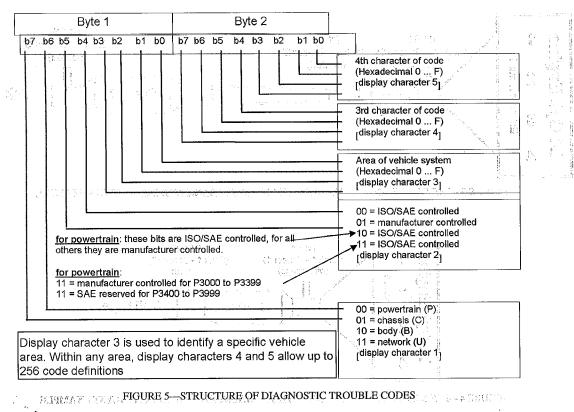
catholic abou

Circuit High is measured with the external circuit, component, or system connected. The signal type (voltage, frequency, etc.) may be included in the message after Circuit Low or Circuit High.

5. Format Structure

5.1 Description—The diagnostic trouble code consists of an alphanumeric designator, B0 -- B3 for body, C0 -- C3 for chassis, P0 -- P3 for powertrain, and U0 -- U3 for network communication, followed by three characters. The assignment of the proper alpha designator should be determined by the area most appropriate for that function. In most cases, the alpha designator will be implied since diagnostic information will be requested from a particular controller. However, this does not imply that all codes supported by a particular controller shall have the same alphanumeric designator. The codes are structured as in the following figure. with made constitution to gradient was to

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EXAMPLE The data bus value \$9234 would be displayed to technicians as the manufacturer controlled body code B1234, see the figure below.

factur	er cor	ntrolled	body c	ode B123	34, see tl	ne figur	e below	· wild								alestro indiffi.
								1. 10 mg	 - 1 en		$\gamma_{ij} = e^{-\frac{1}{4}\left(\frac{\partial}{\partial x_i}x_i x_{ij} - x_{ij}\right)}$	100	573018050		Ar Are	
\$	9				\$2	,			\$3			\$4	Franklika Grandski	150 m		e transitione de la companya de la c
1	1	0	0	1	0	0	1	0	0	0	1 1	0	1122	0	0	140 miles
E	3		1	•	2	•			3			4			14 (1.42)	lau al egye de fo

FIGURE 6—EXAMPLE OF TROUBLE CODE STRUCTURE

Y0.590.73 Codes have been specified to indicate a suspected trouble or problem area and are intended to be used as a directive to the proper service procedure. To minimize service confusion, fault codes should not be used to indicate the absence of problems or the status of parts of the system (e.g., powertrain system O.K., or MIL activated), but should be confined to indicate areas in need of service attention.

Some ranges have been expanded beyond 100 numbers by using the hexadecimal base 16 number system.

5.2 ISO/SAE Controlled Codes (Core DTCs)—ISO/SAE controlled diagnostic trouble codes are those codes where industry uniformity has been achieved. These codes were felt to be common enough across most manufacturers' applications that a common number and fault message could be assigned. All unspecified numbers in each grouping have been reserved for future growth. Although service procedures may differ widely amongst manufacturers, the fault being indicated is common enough to be assigned a particular fault code. Codes in this area are not to be used by manufacturers until they have been approved by ISO/SAE.

5.3 Manufacturer Controlled Codes (Non-Uniform DTCs)—Areas within each alpha designator have been made available for manufacturer-controlled DTCs. These are fault codes that will not generally be used by a majority of the manufacturers due to basic system differences, implementation differences, or diagnostic strategy differences. Each vehicle manufacturer or supplier who designs and specifies diagnostic algorithms, software, and diagnostic trouble codes are strongly encouraged to remain consistent across their product line when assigning codes in the manufacturer controlled area. For powertrain codes, the same groupings should be used as in the ISO /SAE controlled area, i.e., 100's and 200's for fuel and air metering, 300's for ignition system or misfire, etc.

Code groupings for non-powertrain codes will be specified at a later date. While each manufacturer has the ability to define the controlled DTCs to meet their specific controller algorithms, all DTC words shall meet SAE J1930.

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or to firm our groundsheed arm in protection had been factorized that

5.4 Body System Groupings

- 5.4.1 B0XXX ISO/SAE CONTROLLED
- 5.4.2. B1XXX MANUFACTURER CONTROLLED

- 5.4.3 B2XXX MANUFACTURER CONTROLLED
- 5.4.4 B3XXX RESERVED BY DOCUMENT

5.5 Chassis System Groupings

- 5.5.1 COXXX ISO/SAE CONTROLLED
- 5.5.2 C1XXX MANUFACTURER CONTROLLED
- 5.5.3 C2XXX MANUFACTURER CONTROLLED
- 5.5.4 C3XXX RESERVED BY DOCUMENT

5.6 Powertrain System Groupings—DTC Numbers and Cescriptions are Given in Appendix B

- 5.6.1 POXXX ISO/SAE CONTROLLED
- 5.6.2 P1XXX MANUFACTURER CONTROL
- 5.6.3 P2XXX ISO/SAE CONTROLLED
- 5.6.4 P3XXX MANUFACTURER CONTROLLED AND ISO/SAE RESERVED

5.7 Network Groupings-DTC Numbers and Descriptions are given in Appendix C

- 5.7.1 U0XXX ISO/SAE CONTROLLED
- 5.7.2 U1XXX MANUFACTURER CONTROLLED
- 5.7.3 U2XXX MANUFACTURER CONTROLLED
- 5.7.4 U3XXX RESERVED

6. Diagnostic Trouble Code Descriptions—Each specified fault code has been assigned a description to indicate the circuit, component or system area that was determined to be at fault. The descriptions are organized such that different descriptions related to a particular sensor or system are grouped together. In cases where there are various fault descriptions for different types of faults, the group also has a "generic" description as the first code/message of the group. A manufacturer has a choice when implementing diagnostics, based on the specific strategy and complexity of the diagnostic.

Where more specific fault descriptions for a circuit, component, or system exist, the manufacturer should choose the code most applicable to their diagnosable fault. The descriptions are intended to be somewhat general to allow manufacturers to use them as often as possible yet still not conflict with their specific repair procedures. The terms "low" and "high" when used in a description, especially those related to input signals, refer to the voltage, frequency, etc. at the pin of the controller. The specific level of "low" and "high" shall be specified by each manufacturer to best meet their needs.

For example, in diagnosing a 5 V reference Throttle Position Sensor (TP Sensor), if the input signal at the Powertrain Control Module (PCM) is stuck at near 0

W, a manufacturer has the flexibility to select from either of two codes - P0120 (Throttle/Pedal Position Sensor/Switch A Circuit) or P0122 (Throttle/Pedal Position Sensor/Switch A Circuit Low Input), depending on the manufacturer's diagnostic procedures. If the input signal at the PCM is stuck at near 5 V, a manufacturer has the flexibility to select from either of two codes - P0120 (Throttle/Pedal Position Sensor/Switch A Circuit) or P0123 (Throttle/Pedal Position) Sensor/Switch A Circuit High Input), depending on the manufacturer's diagnostic procedures. If the input signal at the PCM is stuck at 1.5 V at idle instead of the expected 1.0 V, the manufacturer has the flexibility to select from either of two codes - P0120 (Throttle/Pedal Position Sensor/Switch A Circuit) or P0121 (Throttle/Pedal Position Sensor/Switch A Circuit Range/Performance Problem), depending on the manufacturer's diagnostic procedures. The root cause of the higher than expected TP Sensor voltage may be either a faulty TP Sensor, corrosion in the TP Sensor connections or an improperly adjusted throttle plate. Identification of the root cause is done using the diagnostic procedures and is not implied by the DTC message, thus allowing the manufacturer the flexibility in assigning DTCs Change requests.

7. Change Requests—Use this form to pass your request.

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COM	REQUEST	FORM FOR NEW SA	E J2012 SAE CON	TROLLED DT	C PAI	etates Air Temp a stare
What is the purpose of the component,	circuit or motor ?	lact V	1.3/00/1/2/01/2005/01/1		987	volvice Speed Service
purpose of the component,	circuit, or system:	Lat. Consider the Call	nie in produce i		#HV	rean 8 brogs of activi
	3	8.5af0	Cago in Complete		CSOH	heated Okyoun Pensor
Example: Exhaust Gas Recirculation.	va i	r in wear and the second of th			errani	and the contract of the contra
What is the purpose of the diagnostic?		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	m (Orace de Labrate) Stasol I		84.CH	१०इ त् है मन्तुर देखिलात
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gerwan]	4g. 4	Christ ,	1767-124		**************************************	V/061 (C. 84.
Example: detect low EGR flow	(Porkumanoa	7 79C1	7 on 3		i W	with the open
Requested Group Number		Choult	aturgen. II. dag muse Carl Lagr	150 scattle	143	Topics Carrier
Requested DTC Number	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	*1 * 1 * **** *** *** *** *** *** *** *			A 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	100.1012 100.00
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SAE Headquarters Actorios National 755 West Big Beaver Road 19 (1907) Suite 1600 JIM Troy, MI 48084 USA /N/4 ATTN: SAE J2012 Powertrain Committee Chairman hairen o al que d minde) flict. 10 P-1-19Q 19. 4.150. $f(z, z; \mathbb{C})$ 0.0.1 's/Sfil gard озвяю en starris.

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A.1 Discussion—The following Table A1 is a guideline used to help in determining DTC descriptions. Appendix B shows applications for recommended industry common trouble codes for the powertrain control system. These include systems that might be integrated into an electronic control module that would be used for controlling engine functions, such as fuel, spark, idle speed, and vehicle

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speed (cruise control) as well as those for transmission control. The fact that a code is recommended as a common industry code does not imply that it is a required code (legislated), an emission related code, nor that it indicates a fault that will cause the malfunction indicator to be illuminated. For which the state of the malfunction indicator is a substantial of the malfunction of the malfunction indicator is a substantial of the malfunction of the malfunction indicator is a substantial of the malfunction of the malfunction indicator is a substantial of the malfunction of the malfunction indicator is a substantial of the malfunction of the malfunction indicator is a substantial of the malfunction of the malfunction indicator is a substantial of the malfunction of the m

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Component/System SAE J1930 ₁₎	Acronym SAEJ1930 ₁₎	Modifier (if used) 1)	Noun Name ₁	Circuit ₁₎	Intermittent (if used) 1)	State (if used) ₁₎	Parameter (if used) ₁₎	Location (if used) ₁₎
Throttle Position	Zerie TP e eri	-1	Sensor	Circuit	Arthur, sizie	Low	Voltage	and the second
Throttle Position	TP ***		Sensor	Circuit		Performance	42.0	1 1 5 12 18 2
Manifold Absolute Pressure	MAP		Sensor	Circuit	1 (2) (1) (1) 12	High	Voltage	7 7 7
Engine Coolant Temperature	ECT		Sensor	Circuit	Table Co (x)	Low	Voltage	
Intake Air Temperature	IAT (15)	. (Sensor	Circuit	The Control Curation	High	Voltage	
Vehicle Speed Sensor	VSS		included in acronym	Circuit		High	Voltage	
Vehicle Speed Sensor	VSS		included in acronym	Circuit	Intermittent	Study, the listing to the	Property of the factors of the facto	The Fault of
Heated Oxygen Sensor	HO2S		included in Acronym Heater	Circuit				
Heated Oxygen Sensor	HO2S		included in Acronym Heater	Circuit		Low	Voltage	Bank (B1) Sensor 1 (S1)
Idle Air Control	IAC		Valve	Circuit		Low	Voltage	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Mass Air Flow	MAF		Sensor	Circuit		High	Frequency	
Mass Air Flow	MAF		Sensor	Circuit		Performance	Visit if	ti tai siis
Knock Sensor	KS	Wrenz, t	included in acronym Module Sensor	Circuit		1 100 1 5 MH 15 A	. III. maj	Bank 1
Knock Sensor	KS	2 (14.1.) 202 (1.1.)	included in acronym Module Sensor	Circuit		Performance		
Crankshaft Position	CKP		Sensor	Circuit				
Evaporative Emissions	EVAP	Canister Purge	Valve	Circuit			ยสอน เลือ	
Engine Speed	RPM		Input	Circuit				
Air Conditioning	A/C	Clutch Status	N/A	Circuit		Low	Voltage	
Heated Oxygen Sensor	HO2S			Circuit		Transition Time Ratio	: .	Bank 1 (B1) Sensor (S1)
Heated Oxygen Sensor	HO2S			Circuit		Insufficient Switching		Bank 1 (B1) 683 7 Sensor 1 (S1)
Distributor Ignition	DI		Low Resolution	Circuit	Intermittent			
Distributor Ignition	DI		High Resolution	Circuit				10.

TABLE A2-DTC NAMING GUIDELINES FOR SIGNALS TO COMPONENTS

Component/System SAE J1930 ₁₎	Acronym SAE J1930 ₁₎	Modifier (if used) 1)	Noun Name1)	Control ₁₎	Circuit ₁₎	Intermittent (if used) ₁)	State (if used) ¹⁾	Parameter (if used) 1)	Location (if used) ₁₎
Malfunction Indicator lamp	MIL		included in acronym	Control	Circuit			:*	
Injector	N/A	`		Control	Circuit		-341		
Fan Control	FC		Relay 1	Control	Circuit			and the second	18 4. 43 (1981)
Fan Control	FC		Relay 2	Control	Circuit	The state of the second	Low		1 2 5 7 7 7 1 2 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2
Exhaust Gas Recirculation	EGR		Solenoid	Control	Circuit		High		
Secondary Air Injection	AIR	-	Solenoid	Control	Circuit		High		
Evaporative Emissions	EVAP	Purge	Solenoid	Control	Circuit				
Air Conditioning	A/C	Clutch	Relay	Control	Circuit				
Idle Air Control	IAC		Valve	Control	Circuit		Low		
Ignition Control	IC		N/A	included in acronym	Circuit		Low	Voltage	
Ignition Control	IC		N/A	included in acronym	Circuit		High	Voltage	
Torque Converter Clutch	TCC		Solenoid	Control	Circuit		Stuck on		

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FROM THE AS A CONTROL TO THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF SYSTEMS

Component/System SAE J1930 ₁₎	Acronym SAE J1930 ₁₎	Modifier ₁₎	System ₁₎	Intermittent ₁₎	State ₁₎	Parameter ₁₎	Location ₁₎
Exhaust Gas Recirculation	EGR		System	A roat of A who is	Date of the Control of the	Section 1 to a Thirty Co.	
Fuel Trim	FT		System	and the second	Lean		Bank 1
Secondary Air Injection	AIR		System			Process Comments	Bank 1

APPENDIX B (NORMATIVE) POWERTRAIN SYSTEM DIAGNOSTIC TROUBLE CODE APPENDIX B (NORMATIVE)

B.1 P00XX Fuel and Air Metering and Auxiliary Emission Controls

TABLE B1—P00XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS

DTC number	DTC naming County des Talest	Location
P0001	Fuel Volume Regulator Control Circuit/Open	Harris A.
P0002	Fuel Volume Regulator Control Circuit Range/Performance	A Part of the Control
P0003	Fuel Volume Regulator Control Circuit Low	
P0004	Fuel Volume Regulator Control Circuit High	
P0005	Fuel Shutoff Valve "A" Control Circuit/Open	The state of the s
P0006	Fuel Shutoff Valve "A" Control Circuit Low	
P0007	Fuel Shutoff Valve "A" Control Circuit High	er er er
P0008	Engine Position System Performance	Bank 1
P0009	Engine Position System Performance	Bank 2
P0010 ^{a)}	"A" Camshaft Position Actuator Circuit	Bank 1
P0011 ^{a)}	"A" Camshaft Position - Timing Over-Advanced or System Performance	Bank 1
P0012 ^{a)}	"A" Camshaft Position - Timing Over-Retarded	Bank 1
P0013 b)	"B" Camshaft Position - Actuator Circuit	Bank 1
P0014 b)	."B" Camshaft Position - Timing Over-Advanced or System Performance	Bank 1
P0015 ^{-b)}	"B" Camshaft Position - Timing Over-Retarded	Bank 1
P0016	Crankshaft Position – Camshaft Position Correlation	Bank 1 Sensor A
P0017	Crankshaft Position – Camshaft Position Correlation	Bank 1 Sensor B
P0018	Crankshaft Position – Camshaft Position Correlation	Bank 2 Sensor A
P0019	Crankshaft Position – Camshaft Position Correlation	Bank 2 Sensor B
P0020 ^{a)}	"A" Camshaft Position Actuator Circuit	Bank 2
P0021 ^{a)}	"A" Camshaft Position - Timing Over-Advanced or System Performance	Bank 2
P0022 ^{a)}	"A" Camshaft Position - Timing Over-Retarded	Bank 2
P0023 b):::::::	"B" Camshaft Position - Actuator Circuit Sender Circuit Sender Circuit	134967 Bank 2 1 1 4
P0024 b)	"B" Camshaft Position - Timing Over-Advanced or System Performance	Bank 2
P0025 b)	"B" Camshaft Position - Timing Over-Retarded	Bank 2
P0026	Intake Valve Control Solenoid Circuit Range/Performance	Bank 1
P0027	Exhaust Valve Control Solenoid Circuit Range/Performance	Bank 1
P0028	Intake Valve Control Solenoid Circuit Range/Performance	Bank 2
P0029	Exhaust Valve Control Solenoid Circuit Range/Performance	Bank 2
P0030	HO2S Heater Control Circuit	Bank 1 Sensor 1
P0031	HO2S Heater Control Circuit Low	Bank 1 Sensor 1
P0032	HO2S Heater Control Circuit High	Bank 1 Sensor 1
P0033	Turbo Charger Bypass Valve Control Circuit	Paragraphic Control of the Control o
P0034	Turbo Charger Bypass Valve Control Circuit Low	Call as
P0035	Turbo Charger Bypass Valve Control Circuit High	
P0036	HO2S Heater Control Circuit	Bank 1 Sensor 2
P0037	HO2S Heater Control Circuit Low	Bank 1 Sensor 2
P0038	HO2S Heater Control Circuit High	Bank 1 Sensor 2
P0039	Turbo/Super Charger Bypass Valve Control Circuit Range/Performance	

DTC number	DTC naming	Location
P0040 O2	2 Sensor Signals Swapped Bank 1 Sensor 1/ Bank 2 Sensor 1	
P0041 O2	2 Sensor Signals Swapped Bank 1 Sensor 2/ Bank 2 Sensor 2	t a second a second
P0042 H	O2S Heater Control Circuit	Bank 1 Sensor 3
P0043 H0	O2S Heater Control Circuit Low	Bank 1 Sensor 3
P0044 H0	O2S Heater Control Circuit High	Bank 1 Sensor 3
	irbo/Super Charger Boost Control Solenoid Circuit/Open	
	urbo/Super Charger Boost Control Solenoid Circuit Range/Performance	111111111111111111111111111111111111111
	urbo/Super Charger Boost Control Solenoid Circuit Low	
	urbo/Super Charger Boost Control Solenoid Circuit High	
	rrbo/Super Charger Turbine Overspeed	
1	O2S Heater Control Circuit	Bank 2 Sensor 1
	O2S Heater Control Circuit Low	Bank 2 Sensor 1
	O2S Heater Control Circuit High O2S Heater Resistance	Bank 2 Sensor 1
; <u> </u>		Bank 1 Sensor 1
	O2S Heater Resistance O2S Heater Resistance	Bank 1 Sensor 2
. 2.1	The Community of the Co	Bank 1 Sensor 3
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Bank 2 Sensor 2
- 1 10 10 10 10 T	O2S Heater Control Circuit Low	Bank 2 Sensor 2
	O2S Heater Control Circuit High	Bank 2 Sensor 2
	O2S Heater Resistance	Bank 2 Sensor 1
	O2S Heater Resistance	Bank 2 Sensor 2
P0061 H	O2S Heater Resistance	Bank 2 Sensor 3
P0062 H	O2S Heater Control Circuit	Bank 2 Sensor 3
P0063 H0	O2S Heater Control Circuit Low	Bank 2 Sensor 3
P0064 H	O2S Heater Control Circuit High	Bank 2 Sensor 3
P0065	r Assisted Injector Control Range/Performance	1.00
P0066 Ai	r Assisted Injector Control Circuit or Circuit Low	A 1 1 44
P0067 Ai	r Assisted Injector Control Circuit High	
P0068 M.	AP/MAF - Throttle Position Correlation	
P0069 M	anifold Absolute Pressure – Barometric Pressure Correlation	
P0070 Ar	mbient Air Temperature Sensor Circuit	
P0071 Ar	mbient Air Temperature Sensor Range/Performance	
P0072 Ar	mbient Air Temperature Sensor Circuit Low	
P0073 Ar	mbient Air Temperature Sensor Circuit High	
P0074 Ar	mblent Air Temperature Sensor Circuit Intermittent	
P0075 In	take Valve Control Solenoid Circuit	Bank 1
	take Valve Control Solenoid Circuit Low	Bank 1
	take Valve Control Solenoid Circuit High	Bank 1
	xhaust Valve Control Solenoid Circuit	Bank 1
	who are Velue Control Sciencial Circuit Loui	Bank 1
	xhaust Valve Control Sciencia Circuit Ligh	
	take Valve Control Solenoid Circuit	Bank 1
*		Bank 2
***************************************	take Valve Control Solenoid Circuit Low	Bank 2
	take Valve Control Solenoid Circuit High	Bank 2
	xhaust Valve Control Solenoid Circuit	Bank 2
1 2 2 2	xhaust Valve Control Solenoid Circuit Low	Bank 2
	xhaust Valve Control Solenoid Circuit High	Bank 2
	uel Rail/System Pressure - Too Low	
P0088 Fu	uel Rail/System Pressure - Too High	
P0089 Fu	uel Pressure Regulator 1 Performance	
P0090 Ft	uel Pressure Regulator 1 Control Circuit	
P0091 Ft	uel Pressure Regulator 1 Control Circuit Low	. 17(11)
P0092 Fu	uel Pressure Regulator 1 Control Circuit High	
P0093 Fu	uel System Leak Detected – Large Leak	
		

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TABLE B1—POOXX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS (continued)

DTC number	DTC naming			Location
P0095	Intake Air Temperature Sensor 2 Circuit	11	NEW 201	\$5,54
P0096	Intake Air Temperature Sensor 2 Circuit Range/Performance	+ 2× 6/7 = 2 ± 2		P I
P0097	Intake Air Temperature Sensor 2 Circuit Low	17. i) d	U. 44.10	N. Tanana
P0098	Intake Air Temperature Sensor 2 Circuit High	6. Trail garage		VM45
P0099	Intake Air Temperature Sensor 2 Circuit Intermittent/Erratic	tocktoro i i such a la fili i s		ALC: Y

[&]quot;A" camshaft shall be either the "intake," "left," or "front" camshaft. Left/Right and Front/Rear are determined as if viewed from the driver's seating position. Bank 1 contains cylinder number one, Bank 2 is the opposite bank.

B.2 P01XX Fuel and Air Metering

TABLE B2—P01XX FUEL AND AIR METERING

	Air Metering	And the second	18003
1 at 1 at 1 at 1	TABLE B2—P01XX FUEL AND AIR METERING	TVS189D 21	54.74
DTC number		recues 3.	337 -
	DTC naming	Al Make	Location
P0100	Mass or Volume Air Flow Circuit	(16)	1
P0101	Mass or Volume Air Flow Circuit Range/Performance		1
P0102	Mass or Volume Air Flow Circuit Low Input		Al Disk
P0103	Mass or Volume Air Flow Circuit High Input		1 124
P0104	Mass or Volume Air Flow Circuit Intermittent		1 , 1
P0105	Manifold Absolute Pressure/Barometric Pressure Circuit	- E	
P0106	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance		The state of the s
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	1	1 4
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	1.1999	
P0109	Manifold Absolute Pressure/Barometric Pressure Circuit Intermittent 9		2.00
P0110	Intake Air Temperature Sensor 1 Circuit	11.5	3 27 .
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance		
P0112	Intake Air Temperature Sensor 1 Circuit Low	1000	
P0113	Intake Air Temperature Sensor 1 Circuit High	7 . 1 - 1	4.1
P0114	Intake Air/Temperature Sensor 1 Circuit Intermittent	· 1. 50 ·	1
P0115	Engine Coolant Temperature Circuit	a.J.	1 22
P0116	Engine Coolant Temperature Circuit Range/Performance	35.77	1 2 2 2
P0117	Engine Coolant Temperature Circuit Low	70. 3792.1	
P0118	Engine Coolant Temperature Circuit High	1. 14 Th 1	
P0119	Engine Coolant Temperature Circuit Intermittent	3 7 15.5	
P0120	Throttle/Pedal Position Sensor/Switch "A" Circuit	und rust.	237.73
P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	1 2 3 1	3.72
P0122			TYL.
	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	7 De 1 1 1 1 1	
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High		
P0124	Throttle/Pedal Position Sensor/Switch "A" Circuit Intermittent		
P0125	Insurincient Coolant Temperature for Closed Loop Fuel Control		
P0126	Insufficient Coolant Temperature for Stable Operation		
P0127	Intake Air Temperature Too High		
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	104 P v	
P0129	Barometric Pressure Too Low	Histori III.	
P0130	O2 Sensor Circuit	L. Other E	3ank 1 Sensor 1
P0131	O2 Sensor Circuit Low Voltage	Control E	Bank 1 Sensor 1
P0132	O2 Sensor Circuit High Voltage	E	Bank 1 Sensor 1
P0133	O2 Sensor Circuit Slow Response	E	Bank 1 Sensor 1
P0134	O2 Sensor Circuit No Activity Detected	E	Bank 1 Sensor 1
P0135	O2 Sensor Heater Circuit	E	Bank 1 Sensor 1
P0136	O2 Sensor Circuit	E	Bank 1 Sensor 2
P0137	O2 Sensor Circuit Low Voltage	F	Bank 1 Sensor 2
P0138	O2 Sensor Circuit High Voltage	1855 1 E	Bank 1 Sensor 2
P0139	O2 Sensor Circuit Slow Response	. 2113	Bank 1 Sensor 2
P0140	O2 Sensor Circuit No Activity Detected		Bank 1 Sensor 2
P0141	O2 Sensor Heater Circuit	32.5	Bank 1 Sensor 2

b) The "B" camshaft shall be either the "exhaust," "right," or "rear" camshaft. Left/Right and Front/Rear are determined as if viewed from the driver's seating position. Bank 1 contains cylinder number one, Bank 2 is the opposite bank.

(analytics) (and TABLE B2—P01XX FUEL AND AIR METERING (continued)

DTC number	DTC naming	Location
P0142	O2 Sensor Circuit	Bank 1 Sensor 3
P0143	O2 Sensor Circuit Low Voltage page 15 of 1	Bank 1 Sensor 3
P0144	O2 Sensor Circuit High Voltage	Bank 1 Sensor 3
P0145	O2 Sensor Circuit Slow Response	Bank 1 Sensor 3
P0146	O2 Sensor Circuit No Activity Detected	Bank 1 Sensor 3
P0147	O2 Sensor Heater Circuit	Bank 1 Sensor 3
P0148	Fuel Delivery Error	
P0149	Fuel Timing Error: \$1,000 virtues \$100 virtu	nangha siyado natiliku
P0150	O2 Sensor Circuit	Bank 2 Sensor 1
P0151	O2 Sensor Circuit Low Voltage	Bank 2 Sensor 1
P0152	O2 Sensor Circuit High Voltage	Bank 2 Sensor 1
P0153	O2 Sensor Circuit Slow Response	Bank 2 Sensor 1
		Bank 2 Sensor 1
P0154	O2 Sensor Circuit No Activity Detected	
P0155	O2 Sensor Heater Circuit	Bank 2 Sensor 1
P0156	O2 Sensor Circuit	Bank 2 Sensor 2
P0157	O2 Sensor Circuit Low Voltage	Bank 2 Sensor 2
P0158	O2 Sensor Circuit High Voltage	Bank 2 Sensor 2
P0159	U2 Sensor Circuit Slow Response	Bank 2 Sensor 2
P0160	O2 Sensor Circuit No Activity Detected	Bank 2 Sensor 2
P0161	O2 Sensor Heater Circuit	Bank 2 Sensor 2
P0162	Ož Sensor Circuit	Bank 2 Sensor 3
P0163	O2 Sensor Circuit Low Voltage	Bank 2 Sensor 3
P0164	O2 Sensor Circuit High Voltage	Bank 2 Sensor 3
P0165	O2 Sensor Circuit Slow Response	Bank 2 Sensor 3
P0166	O2 Sensor Circuit No Activity Detected	Bank 2 Sensor 3
P0167	O2 Sensor Heater Circuit	Bank 2 Sensor 3
P0168	Fuel Temperature Too High	
P0169	Incorrect Fuel Composition	1
P0170	Fuel Trim	Bank 1
P0171	Suddom Tool one	Bank 1
P0172	System Too Rich	Bank 1
P0173	Fuel Trim	Bank 2
P0174	1	Bank 2
		Bank 2
P0175	System Too Rich	Datik 2
P0176	Fuel Composition Sensor Circuit	
P0177	Fuel Composition Sensor Circuit Range/Performance	· · · · · · · · · · · · · · · · · · ·
P0178	Fuel Composition Sensor Circuit Low	and the second s
P0179	Fuel Composition Sensor Circuit High	<u>e la </u>
P0180	Fuel Temperature Sensor A Circuit	
P0181	Fuel Temperature Sensor A Circuit Range/Performance	· · · · · · · · · · · · · · · · · · ·
P0182	Fuel Temperature Sensor A Circuit Low	311
P0183	Fuel Temperature Sensor A Circuit High	<u> </u>
P0184	Fuel Temperature Sensor A Circuit Intermittent	
P0185	Fuel Temperature Sensor B Circuit	And the second s
P0186	Fuel Temperature Sensor B Circuit Range/Performance	
P0187	Fuel Temperature Sensor B Circuit Low	10 10 10 10 10 10 10 10 10 10 10 10 10 1
P0188	Fuel Temperature Sensor B Circuit High	
P0189	Fuel Temperature Sensor B Circuit Intermittent	
P0190	Fuel Rail Pressure Sensor Circuit	1
1 1 1 1 1 1 1 1	Fuel Rail Pressure Sensor Circuit Range/Performance	
P0191	A11 -	
P0192	Fuel Rail Pressure Sensor Circuit Low	<u> </u>
State Of East		
P0193	Fuel Rail Pressure Sensor Circuit High	<u> </u>
State Of East	Fuel Hall Pressure Sensor Circuit High Fuel Rall Pressure Sensor Circuit Intermittent Engine Oil Temperature Sensor	

TABLE B2-P01XX FUEL AND AIR METERING (continued)

DTC number		DTC naming(mark (A))		Location
P0197	Engine Oil Temperature Sensor Low	MOTI Connection of the Connect	71 100	VF.FG-1
P0198	Engine Oil Temperature Sensor High	europort Pegypte Milloude de la company de la co	1.0	65.57
P0199	Engine Oil Temperature Sensor Intermittent	skJ MilitareneAkka ka ilita ya ka ka		

B.3 P02XX Fuel and Air Metering

(need to supply 1) Whitehalt is a first one of the control of the

DTC number	DTC naming	Kalendria (n. 1977) Martina (n. 1984)	Location
P0200	Injector Circuit/Open	William Street Street	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0201	Injector Circuit/Open – Cylinder 1	The second secon	And the second s
P0202	Iñjector Circuit/Open – Cylinder 2	<u>and the first of the state of </u>	north the state of
P0203	Injector Circuit/Open – Cylinder 3	And the second s	100 T
P0204	Injector Circuit/Open – Cylinder 4		and the second s
P0205	Injector Circuit/Open – Cylinder 5	The standard page of the standard stand	a company of the comp
P0206	Injector Circuit/Open – Cylinder 6	2	- Maria - Mari
P0207	Injector Circuit/Open – Cylinder 7	A STATE OF THE STA	77 - 17 - 17 - 17 - 17 - 17 - 17 - 17 -
P0208	Injector Circuit/Open – Cylinder 8	THE REST OF THE PROPERTY OF TH	
P0209	Injector Circuit/Open – Cylinder 9	American Control of the Control of t	
P0210	Injector Circuit/Open – Cylinder 10	17 4 1/1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	THE BOTH SECTION
P0211	Înjector Circuit/Open – Cylinder 11	more - constant for the second	m many many many many many many many man
P0212	Injector Circuit/Open – Cylinder 12	Service Control of the Control of th	1 (400) 1 (1 (400) 1 (
P0213	Cold Start Injector 1	With a clining of a final control of the control of	No. 1
P0214	Cold Start Injector 2	COMPANION CONTRACTOR	A CONTRACTOR OF THE PROPERTY O
P0215	Engine Shutoff Solenoid	(ACT 100	1997 S. 1 1997 Oct 1
P0216	Injector/Injection Timing Control Circuit	en entenii onin sei	VII. 1 (1.4) +
P0217	Engine Coolant Over Temperature Condition	(6)41 14 145 15 1 43 1	1979 <u>1</u> 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0218	Transmission Fluid Over Temperature Condition	CONTRACTOR	5.000 CATE
P0219	Engine Overspeed Condition	<u> </u>	1.6%
P0220	Throttle/Pedal Position Sensor/Switch "B" Circuit	Springsallace et -	1 m (1 m) 1 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m 1
P0221"	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance	Chelia Principal	1. 10 kg 2
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<u> </u>	1770 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High		<u> </u>
P0224	Throttle/Pedal Position Sensor/Switch "B" Circuit Intermittent	F-101	Angelon III
P0225	Throttle/Pedal Position Sensor/Switch "C" Circuit	Mark State (Section 1997)	and the second s
P0226	Throttle/Pedal Position Sensor/Switch "C" Circuit Range/Performance	Andrew Control of the	[45, 5.1] 154,54 [45, 4] 154,54
P0227	Throttle/Pedal Position Sensor/Switch "C" Circuit Low	Marketine and the second secon	
P0228	Throttle/Pedal Position Sensor/Switch "C" Circuit High	The second secon	Exercised CAPT (
P0229	Throttle/Pedal Position Sensor/Switch "C" Circuit Intermittent	en la constitución de la constit	egas continues c
P0230	Fuel Pump Primary Circuit	<u>. Aga, in the second s</u>	Egrand Silver Silver
P0231	Füel Pümp Secondary Circuit Low	AND THE PROPERTY OF	Carried Control
P0232	Fuel Pump Secondary Circuit High	<u> </u>	<u> </u>
P0233	Fuel Pump Secondary Circuit Intermittent	<u>at op skal belief t</u>	LIGHT A STATE
P0234	Turbo/Super Charger Overboost Condition	<u> </u>	make in the second
P0235	Turbo/Super Charger Boost Sensor "A" Circuit	<u> </u>	<u> </u>
P0236	Turbo/Super Charger Boost Sensor "A" Circuit Range/Performance	200 mars of the Appropriate Control of the Appro	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0237	Turbo/Super Charger Boost Sensor "A" Circuit Low	Matter Control of the	1990 1991 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0238	Turbo/Super Charger Boost Sensor "A" Circuit Low	<u>r. 1808 - 1908 - 1</u>	1 (g. 1) (7) 1 (g. 1) (7)
P0239		<u> </u>	931. (1.1)
P0240	Talbo Caper Orlarger Doost Defision in Circuit	and a second of the second of	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0240	Tulbo/super Charger Boost Sensor B Circuit Range/Penormance	<u> </u>	righter in the Committee of the Committe
	Tulbo/super Charger Boost Sensor B. Circuit Low		age of the second
P0242	Tulbo/super charger Boost Sensor B. Circuit riigii	<u> </u>	Organia de la compania del compania del compania de la compania del compania del compania de la compania del
P0243	Turbo/Super Charger Wastegate Sciencia A		
P0244	Taliborouper orialger wastegate obtended A Hanger Ferformance		
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low		
P0246	Turbo/Super Charger Wastegate Solenoid "A" High		

TABLE B3-P02XX FUEL AND AIR METERING (continued)

DTC number	DTC naming	Location
P0247	Turbo/Super Charger Wastegate Solenoid "B"	e program
P0248	Turbo/Super Charger Wastegate Solenoid "B" Range/Performance	Control West
P0249	Turbo/Super Charger Wastegate Solenoid "B" Low	- 4 Kinto 4
P0250	Turbo/Super Charger Wastegate Solenoid "B" High	
P0251	Injection Pump Fuel Metering Control "A" (Cam/Rotor/injector)	. Profesional and Artis
P0252	Injection Pump Fuel Metering Control "A" Range/Performance (Cam/Rotor/Injector)	
P0253	Injection Pump Fuel Metering Control "A" Low (Cam/Rotor/Injector)	17
P0254	Injection Pump Fuel Metering Control "A" High (Cam/Rotor/Injector)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0255	Injection Pump Fuel Metering Control "A" Intermittent (Cam/Rotor/Injector)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0256	Injection Pump Fuel Metering Control "B" (Cam/Rotor/Injector)	10. 1
P0257	Injection Pump Fuel Metering Control "B" Range/Performance (Cam/Rotor/Injector)	
P0258	Injection Pump Fuel Metering Control "B" Low (Cam/Rotor/Injector)	82.3
P0259		The second secon
	Injection Pump Fuel Metering Control "B" High (Cam/Rotor/Injector)	
P0260	Injection Pump Fuel Metering Control "B" Intermittent (Cam/Rotor/Injector)	
P0261	Cylinder 1 Injector Circuit Low	
P0262	Cylinder 1 Injector Circuit High	
P0263	Cylinder 1 Contribution/Balance	
P0264	Cylinder 2 Injector Circuit Low	
P0265	Cylinder 2 Injector Circuit High	and the second of the second o
P0266	Cylinder 2 Contribution/Balance	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0267	Cylinder 3 Injector Circuit Low	
P0268	Cylinder 3 Injector Circuit High	
P0269	Cylinder 3 Contribution/Balance	
P0270	Cylinder 4 Injector Circuit Low	Company of the same of the company o
P0271	Cylinder 4 Injector Circuit High	
P0272	Cylinder 4 Contribution/Balance	
P0273	Cylinder, 5, Injector, Circuit Low	
P0274	Cylinder 5 Injector Circuit High	
P0275	Cylinder 5 Contribution/Balance	
P0276	Cylinder 6 Injector Circuit Low	18
P0277	Cylinder 6 Injector Circuit High	
P0278	Cylinder 6 Contribution/Balance	
P0279	Cylinder 7 Injector Circuit Low	
P0280	Cylinder 7 Injector Circuit High	
P0281	Cylinder 7 Contribution/Balance	
P0282	Cylinder 8 Injector Circuit Low	
P0283	Cylinder 8 Injector Circuit High	
P0284	Cylinder 8 Contribution/Balance	5.5
P0285	Cylinder 9 Injector Circuit Low Cylinder 9 Injector Circuit High	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0287	Cylinder 9 Contribution/Balance	***
P0288	Cylinder 10 Injector Circuit Low	
P0289	Cylinder 10 Injector Circuit High	
P0290	Cylinder 10 Contribution/Balance	
P0291	Cylinder.11 Injector Circuit Low.	
P0292	Cylinder 11 Injector Circuit High	
P0293	Cylinder 11 Contribution/Balance	
P0294	Cylinder 12 Injector Circuit Low	
P0295	Cylinder 12 Injector Circuit High	
P0296	Cylinder 12 Contribution/Balance	
P0297	Vehicle Overspeed Condition	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
P0298	Engine Qil Over Temperature	American Control of the Control of t
P0299	Turbo/Super Charger Underboost	had to provide the

TABLE B4-P03XX IGNITION SYSTEM OR MISFIRE

	TABLE B4—P03XX IGNITION SYSTEM OR MISFIRE	70 A 1 4 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
DTC number	DTC naming	Location
P0300	Random/Multiple Cylinder Misfire Detected	
P0301	Cylinder 1 Misfire Detected	
P0302	Cylinder 2 Misfire Detected	
P0303	Cylinder 3 Misfire Detected	
P0304	Cylinder 4 Misfire Detected	
P0305	Cylinder 5 Misfire Detected	
P0306	Cylinder 6 Misfire Detected	
P0307	-Cylinder 7 Misfire Detected	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0308	Cylinder 8 Misfire Detected	
P0309	Cylinder 9 Misfire Detected	
P0310	Cylinder 10 Misfire Detected	
P0311	Cylinder 11 Misfire Detected	
P0312	Cylinder 12 Misfire Detected	
P0313	Misfire Detected with Low Fuel	
P0314		
P0314	Single Cylinder Misfire (Cylinder not Specified)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Crankshaft Position System Variation Not Learned	**************************************
P0316	Engine Misfire Detected on Startup (First 1000 Revolutions)	and the second s
P0317	Rough Road Hardware Not Present	
P0318	Rough Road Sensor "A" Signal Circuit	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0319	Rough Road Sensor "B"	
P0320	Ignition/Distributor Engine Speed Input Circuit	
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	
P0323	Ignition/Distributor Engine Speed Input Circuit Intermittent	
P0324	Knock Control System Error	
P0325	Knock Sensor 1-Circuit	Bank 1 or Single Senso
P0326	Knock Sensor 1 Circuit Range/Performance	Bank 1 or Single Senso
P0327	Knock Sensor 1 Circuit Low	Bank 1 or Single Senso
- P0328	Knock Sensor 1 Circuit High	Bank 1 or Single Senso
P0329	Knock Sensor 1-Circuit Input Intermittent	Bank 1 or Single Senso
P0330	Knock Sensor 2 Circuit	
P0331	Knock Sensor 2 Circuit Range/Performance	Dain 2
P0332	Knock Canada Citaribi and	Bank 2
P0333	A property of the second states of the second state	Bank 2
P0334	Knock Sensor 2 Circuit High	Bank 2
1 17 2	Knock Sensor 2 Circuit Input Intermittent	Bank 2
P0335	Crankshaft Position Sensor "A" Circuit	
P0336	Crankshaft-Position Sensor "A" Circuit Range/Performance	
P0337	Crankshaft Position Sensor "A" Circuit Low	
P0338	Crankshaft Position Sensor "A" Circuit High	
P0339	Crankshaft Position Sensor "A" Circuit Intermittent	1 8880 1 3 3 1 2 1
P0340	Camshaft Position Sensor "A" Circuit	Bank 1 or Single Senso
P0341	Camshaft Position Sensor "A" Circuit Range/Performance	Bank 1 or Single Senso
P0342	Camshaft Position Sensor "A" Circuit Low	Bank 1 or Single Sensor
P0343	Camshaft Position Sensor "A" Circuit High	Bank 1 or Single Senso
P0344	Camshaft Position Sensor "A" Circuit Intermittent	Bank 1 or Single Senso
	Camshaft Position Sensor "A" Circuit	Bent 0
P0345	Camshaft Position Sensor "A" Circuit Range/Performance	Ponk 0
P0345 P0346		
P0346	The state of the s	Bank 2
P0346 P0347	Camshaft Position Sensor "A" Circuit Low	Bank 2
P0346 P0347 P0348	Camshaft Position Sensor "A" Circuit Low Camshaft Position Sensor "A" Circuit High	Bank 2 Bank 2
P0346 P0347 P0348 P0349	Camshaft Position Sensor "A" Circuit Low Camshaft Position Sensor "A" Circuit High Camshaft Position Sensor "A" Circuit Intermittent	Bank 2
P0346 P0347 P0348 P0349 P0350	Camshaft Position Sensor "A" Circuit Low Camshaft Position Sensor "A" Circuit High Camshaft Position Sensor "A" Circuit Intermittent Ignition Coll Primary/Secondary Circuit	Bank 2 Bank 2
P0346 P0347 P0348 P0349	Camshaft Position Sensor "A" Circuit Low Camshaft Position Sensor "A" Circuit High Camshaft Position Sensor "A" Circuit Intermittent	Bank 2 Bank 2 Bank 2

DTC number

P0354

P0355

P0356

P0357

P0380

P0381

P0382

P0383-P0384

P0385

P0386

P0387

P0388

P0389

P0390

P0391

P0392

P0393

P0394

Ignition Coil "D" Primary/Secondary Circuit

Ignition Coil "E" Primary/Secondary Circuit

Ignition Coil "F" Primary/Secondary Circuit

Ignition Coil "G" Primary/Secondary Circuit

Glow Plug/Heater Circuit "A"

Glow Plug/Heater Circuit "B"

Reserved by document

Glow Plug/Heater Indicator Circuit

Crankshaft Position Sensor "B" Circuit

Crankshaft Position Sensor "B" Circuit Low

Crankshaft Position Sensor "B" Circuit High

Camshaft Position Sensor "B" Circuit

Camshaft Position Sensor "B" Circuit Low

Camshaft Position Sensor "B" Circuit High

Camshaft Position Sensor "B" Circuit Intermittent

Crankshaft Position Sensor "B" Circuit Intermittent

Crankshaft Position Sensor "B" Circuit Range/Performance

Camshaft Position Sensor "B" Circuit Range/Performance

DTC naming

ETTERA OF FRANCISCO CONTRACTOR VICE CONTRACTOR

Location

Bank 2

Bank 2

Bank 2

Bank 2

B.5 P04XX Auxiliary Emission Controls

windler Buthod

TABLE B5—P04XX AUXILIARY EMISSION CONTROLS

DTC number	1.00	DTC naming	And the second s	Harris San	Location
P0400	Exhaust Gas Recirculation Flow	the state of the state of	Strategy (12) - Coperation	d program	Entraction of
P0401	Exhaust Gas Recirculation Flow Insufficient Detected			- 1	2 54 °F 3 − 3 − 3
P0402	Exhaust Gas Recirculation Flow Excessive Detected		Note that the second of the se	1 - 11	# - · ·
P0403	Exhaust Gas Recirculation Control Circuit		Talanda afilia da la mana di numbera di al-		Σ ₁
P0404	Exhaust Gas Recirculation Control Circuit Range/Performance	rmance	The state of the s		v !
P0405	Exhaust Gas Recirculation Sensor "A" Circuit Low				\$ 1
P0406	Exhaust Gas Recirculation Sensor "A" Circuit High	some make a make an	Maria de Caracteria de Caracte		171 L.A.
P0407	Exhaust Gas Recirculation Sensor "B" Circuit Low		Part of the Company of	1	- 1. 1
P0408	Exhaust Gas Recirculation Sensor "B" Circuit High	manager as a resource of the contract of the c	1. 64.3 (1. CHATH) 1 (1. CHATH)	et et al.	1 0 4 5 1 8 2
P0409	Exhaust Gas Recirculation Sensor "A" Circuit		to the substitute of the	A. C. C.	13.0

TABLE B5—P04XX AUXILIARY EMISSION CONTROLS (continued)

DTC number	DTC naming	Location
P0410	Secondary Air Injection System	1 11 14 Fi Cities
P0411	Secondary Air Injection System Incorrect Flow Detected	
P0412	Secondary Air Injection System Switching Valve "A" Circuit	
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	, mind the contract
P0415	Secondary Air Injection System Switching Valve "B" Circuit	Martin I a
P0416	Secondary Air Injection System Switching Valve "B" Circuit Open	11.4.
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	Table to the second
P0418	Secondary Air Injection System Control "A" Circuit	J. MED 1
P0419	Secondary Air Injection System Control "B" Circuit	to the second se
P0420	Catalyst System Efficiency Below Threshold	Bank 1
P0421	Warm Up Catalyst Efficiency Below Threshold	Bank 1
P0422	Main Catalyst Efficiency Below Threshold	Bank 1
P0423	Heated Catalyst Efficiency Below Threshold	Dank
P0424	Heated Catalyst Temperature Below Threshold	Daile
P0425	Catalyst Temperature Sensor	Dain 1
P0426	Catalyst Temperature Sensor Range/Performance	Dail N
P0427	Catalyst Temperature Sensor Low	Bank 1
P0428	Catalyst Temperature Sensor Low Catalyst Temperature Sensor High	Dank 1
P0429	The state of the s	Dank
P0429	The state of the s	Dank 1
N. 1. 1. W.O.	Catalyst System Efficiency Below Threshold	Bank 2
P0431	Warm Up Catalyst Efficiency Below Threshold	Bank 2
P0432	Main Catalyst Efficiency Below Threshold	Bank 2
P0433	Heated Catalyst Efficiency Below Threshold	Bank 2
P0434	Heated Catalyst Temperature Below Threshold	Bank 2
P0435	Catalyst Temperature Sensor	Bank 2
P0436	Catalyst Temperature Sensor Range/Performance	Bank 2
P0437	Catalyst Temperature Sensor Low	Bank 2
P0438	Catalyst Temperature Sensor High	() Bank 2
P0439	Catalyst Heater Control Circuit	Bank 2
P0440	Evaporative Emission System	រូបនៅក្នុង ខេត្ត ខេត ខេត្ត ខេត្ត ខេត
P0441	Evaporative Emission System Incorrect Purge Flow	e Burny in the second
P0442	Evaporative Emission System Leak Detected (small leak)	
P0443	Evaporative Emission System Purge Control Valve Circuit	E FRANCE
P0444	Evaporative Emission System Purge Control Valve Circuit Open	P(1) (1)
P0445	Evaporative Emission System Purge Control Valve Circuit Shorted	
P0446	Evaporative Emission System Vent Control Circuit	
P0447	Evaporative Emission System Vent Control Circuit Open	
P0448	Evaporative Emission System Vent Control Circuit Shorted	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0449	Evaporative Emission System Vent Valve/Solenoid Circuit	
P0450	Evaporative Emission System Pressure Sensor/Switch	
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	
P0452	Evaporative Emission System Pressure Sensor/Switch Low	
P0453	Evaporative Emission System Pressure Sensor/Switch High	
P0454	Evaporative Emission System Pressure Sensor/Switch Intermittent	
P0455	Evaporative Emission System Leak Detected (large leak)	
P0456	Evaporative Emission System Leak Detected (very small leak)	
P0457	Evaporative Emission System Leak Detected (fuel cap loose/off)	4.1
P0458	Evaporative Emission System Purge Control Valve Circuit Low	
P0459	Evaporative Emission System Purge Control Valve Circuit High	4.44
P0460	Fuel Level Sensor "A" Circuit	
P0461.	Fuel Level Sensor "A" Circuit Range/Performance	la la la la cons
P0462	Fuel Level Sensor "A" Circuit Low	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
P0463	Firely and Consequent Mr. Obrasti High	asset No. 1
	Fuer Level Sensor "A" Circuit High	1.5 ***

TABLE B5—P04XX AUXILIARY EMISSION CONTROLS (continued)

DTC number	DTC naming		. !	Location
P0465	EVAP Purge Flow Sensor Circuit	Tally and the Control of the Control		(2.3)7
P0466	EVAP Purge Flow Sensor Circuit Range/Performance	The Steel of a property with the st		6124731
P0467	EVAP Purge Flow Sensor Circuit Low	tion of the state	1377	
P0468	EVAP Purge Flow Sensor Circuit High	and the second of the transfer of manual terms of	17.4.6	81.04
P0469	EVAP Purge Flow Sensor Circuit Intermittent			1.0
P0470	Exhaust Pressure Sensor	The state of the state of the state of the state of		Taki 1
P0471	Exhaust Pressure Sensor Range/Performance	the property of the control of the c		
P0472	Exhaust Pressure Sensor Low			
P0473	Exhaust Pressure Sensor High	And the second s	4	C 41
P0474	Exhaust Pressure Sensor Intermittent	1		1.744
P0475	Exhaust Pressure Control Valve	Element of the second	40 (40)	(5.54)
P0476	Exhaust Pressure Control Valve Range/Performance	Markey (Exercise Section 2)		<u> </u>
P0477	Exhaust Pressure Control Valve Low	20 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
P0478	Exhaust Pressure Control Valve High	territoria de la composición del composición de la composición del composición de la composición del composición de la composición del composición de la composición del composición del composición del composición del composición		1 77
P0479	Exhaust Pressure Control Valve Intermittent	The state of the s		25. 27th
P0480	Fan 1 Control Circuit	The Company of th		6.1.0
P0481	Fan 2 Control Circuit	and the second of the second o	V	
P0482	Fan 3 Control Circuit	The second secon	100	. 133
P0483	Fan Rationality Check	 Tana Tana Tana Tana Tana Tana Tana Tan		- 1,5454
P0484	Fan Circuit Over Current	and the second of the second o		8i. V#I
P0485	Fan Power/Ground Circuit	en e		Transaction (Contraction)
P0486	Exhaust Gas Recirculation Sensor "B" Circuit	and the second s		
P0487	Exhaust Gas Recirculation Throttle Position Control Circuit	San free Control of Co		477.0
P0488	Exhaust Gas Recirculation Throttle Position Control Range/Performance	The state of the s		· · · · · · · · · · · · · · · · · · ·
P0489	Exhaust Gas Recirculation Control Circuit Low	4 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		A Property
P0490	Exhaust Gas Recirculation Control Circuit High			
P0491	Secondary Air Injection System Insufficient Flow			Bank 1
P0492	Secondary Air Injection System Insufficient Flow		19.	Bank 2
P0493	Fan Overspeed	The second secon		95.00%
P0494	Fan Speed Low	State of the late of the second		
P0495	Fan Speed High			6.1
P0496	Evaporative Emission System High Purge Flow			
P0497	Evaporative Emission System Low Purge Flow			· · · · · · · · · · · · · · · · · · ·
P0498	Evaporative Emission System Vent Valve Control Circuit Low	<u> </u>		
P0499	Evaporative Emission System Vent Valve Control Circuit High			

B.6 P05XX Vehicle Speed, Idle Control, and Auxiliary Inputs

TABLE B6—P05XX VEHICLE SPEED, IDLE CONTROL, AND AUXILIARY INPUTS

DTC number	DTC naming	Location
P0500	Vehicle Speed Sensor "A"	and the second
P0501	Vehicle Speed Sensor "A" Range/Performance	
P0502	Vehicle Speed Sensor "A" Circuit Low Input	
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	1 1 1
P0504	Brake Switch "A"/"B" Correlation	
P0505	Idle Air Control System	
P0506	Idle Air Control System RPM Lower Than Expected	
P0507	Idle Air Control System RPM Higher Than Expected	
P0508	Idle Air Control System Circuit Low	t de la companya de
P0509	Idle Air Control System Circuit High	F 23
P0510	Closed Throttle Position Switch	t i i i kana
P0511	Idle Air Control Circuit	
P0512	Starter Request Circuit	。
P0513	Incorrect mmobilizer Key	in a war in the second of the
P0514	Battery Temperature Sensor Circuit Range/Performance	1 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m

TABLE 86—P05XX VEHICLE SPEED, IDLE CONTROL, AND AUXILIARY INPUTS (continued)

DTC number	DTC naming - 10 / 10 / 1	Location 225
P0515	Battery Temperature Sensor Circuit to the Control of the Control o	action would
P0516	Battery Temperature Sensor Circuit Low Battery Temperature Sensor Circuit Low	Janes Trans
P0517	Battery Temperature Sensor Circuit High	a a dis mon
P0518	Idle Air Control Circuit Intermittent	रक्षा । इसम
P0519	Idle Air Control System Performance	3231 033
P0520	Engine Oil Pressure Sensor/Switch Circuit	Caperial system
P0521	Engine Oil Pressure Sensor/Switch Range/Performance	Charles gray a
P0522	Engine Oil Pressure Sensor/Switch Low Voltage	07.551
P0523	Engine Oil Pressure Sensor/Switch High Voltage	Konstantin Negati
P0524	Engine Oil Pressure Too Low angelor was high replace to the	
P0525	Cruise Control Sanya Control Circuit Pagge/Portermana	
P0526	Fan Speed Sensor Circuit	katoria Viamog
P0527	Fan Speed Sensor Circuit Range/Performance	Contract to the second
P0528	Fan Speed Sensor Circuit No Signal	O god /
P0529	Fan Speed Sensor Circuit Intermittent	And
		Notes that the second s
P0530	A/C Refrigerant Pressure Sensor "A" Circuit	*
P0531	A/C Refrigerant Pressure Sensor "A" Circuit Range/Performance	
P0532	A/C Refrigerant Pressure Sensor "A" Circuit Low	
P0533	A/C Refrigerant Pressure Sensor "A" Circuit High	42 4 4 1
P0534	Air Conditioner Refrigerant Charge Loss	
P0535	A/C Evaporator Temperature Sensor Circuit	0.0
P0536	A/C Evaporator Temperature Sensor Circuit Range/Performance	and the second s
- P0537	A/C Evaporator Temperature Sensor Circuit Low	And the second s
P0538	A/C Evaporator Temperature Sensor Circuit High	200
P0539	A/C Evaporator Temperature Sensor Circuit Intermittent	10.1 T
P0540 ¹⁾	-Intake Ali Heater "A" Circuit	That is a second of the second
P0541 1)	Intake Air Heater "A" Circuit Low	
P0542 ¹⁾	Tintake Air Heater "A" Circuit High	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
and the second of the second	# # # # # # # # # # # # # # # # # # #	2 6
P0543 ¹⁾	Intake Ali Heater "A" Circuit Open	inger i tigeret
P0544	Exhaust Gas Temperature Sensor Circuit	Page 15 Bank 1 Sensor 15
P0545	Exhaust Gas Temperature Sensor Circuit Low Sensor Circuit Low	Bank 1 Sensor 1
P0546	Exhaust Gas Temperature Sensor Circuit High	Bank 1 Sensor 1
P0547	Exhaust Gas Temperature Sensor Circuit	Bank 2 Sensor 1
P0548	Exhaust Gas Temperature Sensor Circuit Low	Bank 2 Sensor 1
P0549	Exhaust Gas Temperature Sensor Circuit High	Bank 2 Sensor 1
P0550	Power Steering Pressure Sensor/Switch Circuit Common Sensor Senso	
P0551	Power Steering Pressure Sensor/Switch Circuit Range/Performance	5.1%
P0552	Power Steering Pressure Sensor/Switch Circuit Low Input	:
P0553	Power Steering Pressure Sensor/Switch Circuit High Input	eva. Later
P0554	Power Steering Pressure Sensor/Switch Circuit Intermittent	
P0555	Brake Booster Pressure Sensor Circuit	en de la companya de La companya de la companya de
P0556	Brake Booster Pressure Sensor Circuit Range/Performance	
P0557	Brake Booster Pressure Sensor Circuit Low Input	
P0558	Brake Booster Pressure Sensor Circuit High Input	en e
P0559	Brake Booster Pressure Sensor Circuit High Input Brake Booster Pressure Sensor Circuit Intermittent	
P0560	System Voltage	A ROSE TO THE RESERVE OF THE RESERVE
P0561	System Voltage Unstable	
P0562	System Voltage Low	(* AVIA
P0563	System Voltage High	
P0564	Cruise Control Multi-Function Input "A" Circuit	F (4.12)
P0565	Cruise Control On Signal	
		of, i w (j)
P0566	Cruise Control Off Signal	and the second second
P0566 P0567	Cruise Control Off Signal Cruise Control Resume Signal	A STAN

DTC number

TABLE B6—P05XX VEHICLE SPEED, IDLE CONTROL, AND AUXILIARY INPUTS (continued)

DTC naming

Location 1

i			
P0569	Cruise Control Coast Signal Production Coast Signal	in many	sodist(m)
P0570	Cruise Control Accelerate Signal		Safetti.
P0571	Brake Switch "A" Circuit	1,1	ν
P0572	Brake Switch "A" Circuit Low	1 50 1	0-899
P0573	Brake Switch "A" Circuit High	1.504	e204
P0574	Cruise Control System - Vehicle Speed Too High	n ingelit	the property
P0575	Cruise Control Input Circuit	6.174	rf (
P0576	Cruise Control Input Circuit Low	5 (87)	25,77,7
P0577	Cruise Control Input Circuit High		891.59
P0578 ²⁾	Cruise Control Multi-Function Input "A" Circuit Stuck		49.191
P0579 ²⁾	Cruise Control Multi-Function Input "A" Circuit Range/Performance		1.191
P0580 ²⁾	Cruise Control Multi-Function Input "A" Circuit Low		4
P0581 ²⁾	Cruise Control Multi-Function Input "A" Circuit High		
P0582	Cruise Control Vacuum Control Circuit/Open		
P0583	Cruise Control Vacuum Control Circuit Low		
P0584	Cruise Control Vacuum Control Circuit High		
P0585	Cruise Control Multi-Function Input "A"/"B" Correlation		
P0586	Cruise Control Vent Control Circuit/Open		
P0587	Cruise Control Vent Control Circuit Low	ь !	
P0588	Cruise Control Vent Control Circuit High		
P0589	Cruise Control Multi-Function Input "B" Circuit		
P0590	Cruise Control Multi-Function Input "B" Circuit Stuck		1.29-11
P0591	Cruise Control Multi-Function Input "B" Circuit Range/Performance		
P0592	Cruise Control Multi-Function Input "B" Circuit Low		
P0593	Cruise Control Multi-Function Input "B" Circuit High		
P0594	Cruise Control Servo Control Circuit/Open		
P0595	Cruise Control Servo Control Circuit Low		
P0596	Crulse Control Servo Control Circuit High		1
P0597	Thermostat Heater Control Circuit/Open		+ 2 · 1
P0598 - D 1 24c	Thermostat Heater Control Circuit Low		
P0599.00 Selec	Thermostat Heater Control Circuit High		73 ·
NOTE 1) For DTCs P054	0 - P0543 also see P2604 - P2609		Abs 13
NOTE 2) For DTCs P057	78 - P0581 also see P0564	i kanata	

B.7 P06XX Computer and Auxiliary Outputs

TABLE B7—P06XX COMPUTER AND AUXILIARY OUTPUTS

DTC number	DTC naming Location	
P0600	Serial Communication Link	
P0601	Internal Control Module Memory Check Sum Error	
P0602	Control Module Programming Error	-
P0603	Internal Control Module Keep Alive Memory (KAM) Error	_
P0604	Internal Control Module Random Access Memory (RAM) Error	
P0605	Internal Control Module Read Only Memory (ROM) Error	
P0606	ECM/PCM Processor	
P0607	Control Module Performance	
P0608	Control Module VSS Output "A"	
P0609	Control Module VSS Output "B"	
P0610	Control Module Vehicle Options Error	
P0611	Fuel Injector Control Module Performance	
P0612	Füel Injector Control Module Relay Control	
P0613	TCM Processor	
P0614	ECM/TCM Incompatible	
P0615	Starter Relay Circuit	
P0616	Starter Relay Circuit Low	14.4

TABLE B7—P06XX COMPUTER AND AUXILIARY OUTPUTS (continued)

DTC number	DTC naming		Location
P0617	Starter Relay Circuit High 1990 (1990)	10 11 1	*5.34
P0618	Alternative Fuel Control Module KAM Error	100	27 C.23
P0619	Alternative Fuel Control Module RAM/ROM Error Fig. 1992 1993		19 (5.5)
P0620	Generator Control Circuit	1 - 1 - 1 - 1	A1., 1.11
P0621	Generator Lamp/L Terminal Circuit	13.	2 .
P0622	Generator Field/F Terminal Circuit	. 1.	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
P0623	Generator Lamp Control Circuit	1 1 1	1.161
P0624	Fuel Cap Lamp Control Circuit	-	583.74
P0625	Generator Field/F Terminal Circuit Low	J 150 .	1 1 1 1 1 1 1 1
P0626	Generator Field/F Terminal Circuit High	. 17, 10-1	2,3,14
P0626 P0627	Fuel Pump "A" Control Circuit /Open	19866	F W. C.
	Turing A Common entertropes	e tilvi i	<u> </u>
P0628	Fuel Fullip A Control Circuit Low	1	FS.393
P0629	Tuest unp // Control estations.	19.7	
P0630	VIII Not registrate of montpasse to	1 12 1 1 1	t in the fact of
P0631	VIN Not Flogrammed of incompatible – Town		to the second
P0632	Outriete Not Togrammed Low On		<u> </u>
P0633	Immobilizer Key Not Programmed – ECM/PCM PCM/ECM/TCM Internal Temperature Too High	 	
P0634	T OWN TOWN THE THE TEMPORATION OF THE TEMPORATION O	at yapıtı	<u> </u>
P0635	Power Steering Control Circuit	1996	
P0636	Power Steering Control Circuit Low		1 2 1
P0637	Power Steering Control Circuit High		1 12.00
P0638	Throttle Actuator Control Range/Performance	11.0	Bank 1
P0639	Throttle Actuator Control Range/Performance		Bank 2
P0640	Intake Air Heater Control Circuit	107 %	<u> </u>
P0641	Sensor Reference Voltage "A" Circuit/Open		\$ - 1
P0642	Sensor Reference Voltage "A" Circuit Low	-0.0	A. Sa
P0643	Sensor Reference Voltage "A" Circuit High	6 1951	1 2 2 2 2 2 2 2 2
P0644	Driver Display Serial Communication Circuit	: 1°0.	The state of the s
P0645	A/C Clutch Relay Control Circuit	- 3 (68)	15 A
P0646	A/C Clutch Relay Control Circuit Low		kingan askrilling ya SV
P0647	A/C Clutch Relay Control Circuit High	i elle Her	28 2 4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
P0648	Immobilizer Lamp Control Circuit	no Material of	
P0649	Speed Control Lamp Control Circuit: 1975 1975 1975 1975 1975 1975 1975 1975	San Cons	
P0650 -	Malfunction Indicator Lamp (MIL) Control Circuit		
P0651	Sensor Reference Voltage "B" Circuit/Open		
P0652	Sensor Reference Voltage "B" Circuit Low		
P0653	Sensor Reference Voltage "B" Circuit High		
P0654	Engine RPM Output Circuit		
P0655	Engine Hot Lamp Output Control Circuit		
P0656	Fuel Level Output Circuit		
P0657	Actuator Supply Voltage "A" Circuit/Open		· v
P0658	Actuator Supply Voltage "A" Circuit Low		4.7
P0659	Actuator Supply Voltage "A" Circuit High		
P0660	Intake Manifold Tuning Valve Control Circuit/Open		Bank 1 ^{a)}
		_	Bank 1 a)
P0661	Intake Manifold Tuning Valve Control Circuit Low		
P0662	Intake Manifold Tuning Valve Control Circuit High	1 19342 1 4	Bank 1 a)
P0663	Intake Manifold Tuning Valve Control Circuit/Open		Bank 2 ^{a)}
P0664	Intake Manifold Tuning Valve Control Circuit Low	. 17 1-17 1	Bank 2 ^{a)}
P0665	Intake Manifold Tuning Valve Control Circuit High	47 ST 184	Bank 2 a)
			* 1
P0666	PCM/FCM/TCM Internal Temperature Sensor Circuit	1	
P0667	POWECW/TOW memai temperature sensor manger enormance	- dine -	
_	LIVERAGE CRACE C'NA Internet Lemperature Seprent Trouit LOW	1	
P0668	PCM/ECM/TCM Internal Temperature Sensor Circuit Low PCM/ECM/TCM Internal Temperature Sensor Circuit High	_	The second secon

TABLE B7—P06XX COMPUTER AND AUXILIARY OUTPUTS (continued)

DTC number	DTC naming		Lo	cation
P0671	Cylinder 1 Glow Plug Circuit	2542 (1974) # New Property (1974)	in and the	Aleca
P0672	Cylinder 2 Glow Plug Circuit	100 H May 100 M 100 M 100 M 100 M	256 A	
P0673	Cylinder 3 Glow Plug Circuit	Restrict and the Little Charles and the	51,195.4	1 14
P0674	Cylinder 4 Glow Plug Circuit	tel ni filianut u		257697.3
P0675	Cylinder 5 Glow Plug Circuit	e navena kaj nava diskome an		1000
P0676	Cylinder 6 Glow Plug Circuit	Ed. 1991 (1992) 4	1 . 1	Y. N. 186
P0677	Cylinder 7 Glow Plug Circuit	W1		2.75.7
P0678	Cylinder 8 Glow Plug Circuit	Herafi e Listen Li		<u>, aris</u>
P0679	Cylinder 9 Glow Plug Circuit	de la propertie		212971
P0680	Cylinder 10 Glow Plug Circuit	in terminal designation (4.7)		16611
P0681	Cylinder 11 Glow Plug Circuit		i	
P0682	Cylinder 12 Glow Plug Circuit	9814 2 84 (1981 - 1911 1983)		
P0683	Glow Plug Control Module to PCM Communication Circuit	different and the second		The st
P0684	Glow Plug Control Module to PCM Communication Circuit Range/Performance			2.41
P0685	ECM/PCM Power Relay Control Circuit /Open	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1,180.7
P0686	ECM/PCM Power Relay Control Circuit Low	the Market and Company	1	
P0687	ECM/PCM Power Relay Control Circuit High	A Charles Service Conference		4.7.4
P0688	ECM/PCM Power Relay Sense Circuit /Open	Thy taking the state of the		474 T.
P0689	ECM/PCM Power Relay Sense Circuit Low	with a state of the		Partie
P0690	ECM/PCM Power Relay Sense Circuit High	A DESCRIPTION OF COURT		50.00
P0691	Fan 1 Control Circuit Low	ASSESSED FOR THE SECOND		<u> </u>
P0692	Fan 1 Control Circuit High	germanaðu rekur þafn ár í rati milja þ	. sall	80608
P0693	Fan 2 Control Circuit Low	gam i Krožina a 1940. od 1941. i	4.1	August 1
P0694	Fan 2 Control Circuit High	to the state of th	in sal	G. 1997
P0695	Fan 3 Control Circuit Low	Language (An Lineau Curvina)		. 4 - 41
P0696 .	Fan 3 Control Circuit High	ext Colorde (7 files de2 colores).		1. 10
P0697	Sensor Reference Voltage "C" Circuit/Open	Zeleski stojana stoja		
P0698	Sensor Reference Voltage "C" Circuit Low	to the standard and the standard	1	A. 11
P0699	Sensor Reference Voltage "C" Circuit High	Salar King na Silar Salar		1 61

a) DTC Application note for Intake Manifold Tuning Valves and Intake Manifold Runner controls:
Active controls are used modify or control airflow within the engine air intake system. These controls may be used to enhance or modify in-cylinder airflow motion (charge motion), modify the airflow dynamics (manifold tuning) within the intake manifold or both.
Devices that control charge motion are commonly called Intake Manifold Runner Control, Swirl Control Valve, and Charge Motion Control Valve. The SAE recommended term for any device that controls charge motion is Intake Manifold Runner Control (MRC).
Devices that control manifold dynamics or manifold tuning are commonly called Intake Manifold Tuning Valve, Long/Short Runner Control and Intake Manifold Communication Control. The SAE recommended term for any device that controls manifold tuning is Intake Manifold Tuning (IMT) Valve.

B.8 P07XX Transmission

TABLE B8—P07XX TRANSMISSION

DTC number	DTC naming	Location
P0700	Transmission Control System (MIL Request)	
P0701	Transmission Control System Range/Performance	
P0702	Transmission Control System Electrical	
P0703	Brake Switch "B" Circuit	
P0704	Clutch Switch Input Circuit Malfunction	
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	er week.
P0706	Transmission Range Sensor Circuit Range/Performance	
P0707 : 55 (21)	Transmission Range Sensor Circuit Low	
P0708	Transmission Range Sensor Circuit High	
P0709	Transmission Range Sensor Circuit Intermittent	
P0710	Transmission Fluid Temperature Sensor "A" Circuit	
P0711	Transmission Fluid Temperature Sensor "A" Circuit Range/Performance	
P0712	-Transmission Fluid Temperature Sensor "A" Circuit Low	
P0713	Transmission Fluid Temperature Sensor "A" Circuit High	
P0714	Transmission Fluid Temperature Sensor "A" Circuit Intermittent	
P0715	Input/Turbine Speed Sensor "A" Circuit	and the second of the second o
P0716 · · · · · · · · · · ·	Input/Turbine Speed Sensor "A" Circuit Range/Performance	

TABLE B8-P07XX TRANSMISSION (continued)

 	DTC naming			Location
P0717	Input/Turbine Speed Sensor "A" Circuit No Signal	. 7a - 2		
P0718	Input/Turbine Speed Sensor "A" Circuit Intermittent		11/11	
P0719	Brake Switch "B" Circuit Low	AND THE WAY TO SEE	and Albert	Same
P0720	Output Speed Sensor Circuit	Fight planting district		100
P0721	Output Speed Sensor Circuit Range/Performance	tia desili kinononia dale della della di discola		81 1
P0722	Output Speed Sensor Circuit No Signal			0.7.7.7
P0723	Output Speed Sensor Circuit Intermittent			6.30
P0724	Brake Switch "B" Circuit High	Paragram (CF being him)	11 1	(F + (-))
P0725	Engine Speed Input Circuit	A STATE OF THE STA	1 11961	ger St.
P0726	Engine Speed Input Circuit Range/Performance	A CONTRACTOR OF THE STATE OF TH	1.442.2	.3.71
P0727	Engine Speed Input Circuit No Signal	And the state of t	.3 E	#1 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0728	Engine Speed Input Circuit Intermittent	and the second s	15017	<u> </u>
P0729	Gear 6 Incorrect Ratio	the state of the s		45 g :
P0730	Incorrect Gear Ratio	Secretary to the second	19	3979 1
P0731	Gear 1 Incorrect Ratio	e de la companya del companya de la companya del companya de la co	2 Nag	Service .
P0732	Gear 2 Incorrect Ratio		312 8	
P0733	Gear 3 Incorrect Ratio	e de la companya del companya de la companya de la companya del companya de la co		VII.VO 4
P0734	Gear 4 Incorrect Ratio	Application (City)	7 1 3 3 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A.W1
P0735	Gear 5 Incorrect Ratio	to has was been as given	Car Value	61/04
P0736	The state of the s	May 1 of the William Bull.	n maske (AUX0.1
* * * * * * * * * * * * * * * * * * * *	Reverse Incorrect Ratio	44 to 1 1970 to 1 44 to 1 1718 to 1 4 1	5 m (4) {	100
P0737		General State of the State of t	10-395	
P0738	TCM Engine Speed Output Circuit Low	Control of the contro	15 (558.1)	Page 1
P0739	TCM Engine Speed Output Circuit High	Setting of the settin	orgen.	6.14
P0740	Torque Converter Clutch Circuit/Open	ertes de la companya	TV-Dedis	39194
P0741	Torque Converter Clutch Circuit Performance or Stuck Off		17 1	36 GT
P0742	Torque Converter Clutch Circuit Stuck On	42. 3 . 3 . 3 . 3 . 3 . 3 . 3 . 3 . 3 . 3	full Heads	100
P0743	Torque Converter Clutch Circuit Electrical	e de la composición del composición de la compos	. 13*44	
P0744	Torque Converter Clutch Circuit Intermittent	A TANGET OF THE SECTION OF THE SECTI		
P0745	Pressure Control Solenoid "A"			
P0746	Pressure Control Solenoid "A" Performance or Stuck Off		4767	
P0747	Pressure Control Solenoid "A" Stuck On			
P0748	Pressure Control Solenoid "A" Electrical	esta de la companya della companya della companya della companya de la companya della companya d		5.000
P0749	Pressure Control Solenoid "A" Intermittent			
P0750	Shift Solenoid "A"		17.43.E	5 10 0201
P0751	Shift Solenoid "A" Performance or Stuck Off	के स्थित विकास के असार क		1000%
P0752	Shift Solenoid "A" Stuck On	The state of the s	torva.	
P0753	Shift Salanaid "A" Electrical		1 10 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P0754	Shift Salanaid "A" Intermittent	The second section of the second section of the second sec	Andrew 1	37.37
P0755	Chitt Colonald IIDII		tara ili	
P0756	Chiff Colonald IIDII Darfarran Cir. J. Cir.	ार्या सम्बद्धाः । । । । । । । । । । । । । । । । । । ।	La Colonia de la	
P0757	Chiff Colonaid IIDII Church On			1.7
P0757	Chit Calanda IIDII 71 - 143 - 1		79.00	
P0759	Shift Solenoid "B" Electrical		· · · · · · · · · · · · · · · · · · ·	
	Shift Solenoid "B" Intermittent			
P0760	Shift Solenoid "C"	GARAGE STREET		at a second
P0761		Step Charles Report 1	51 11 2 12	14 17
P0762		Andrews Andrews and the second of the second		
P0763	Shift Solenoid "C" Electrical			1 154 1
P0764	Shift Solenoid "C" Intermittent		er a le Minaca La California	
P0765	Shift Solenoid "D".	The second secon	1-4-	177.
P0766	Shift Solonoid "D" Performance or Study Off	the second secon		
P0767	Shift Solenoid "D" Stuck On		7 F F 1	
	OLIF O-1	for a company contract	Constant	· · · · · · · · · ·
P0768	Snift Solenoid "D" Electrical	The second secon	4 11 11 11	
P0768 P0769	Shift Solenoid "D" Intermittent		7 7 7 7	

TABLE B8—P07XX TRANSMISSION (continued)

DTC number	DTC naming		Location	
P0772	Shift Solenoid "E" Stuck On		10 press (v mja
P0773	Shift Solenoid "E" Electrical			
P0774	Shift Solenoid "E" Intermittent	And a septimination	1 5 1	V 125
P0775	Pressure Control Solenoid "B"	4. The 1.		1 2 2 2 2
P0776	Pressure Control Solenoid *B" Performance or Stuck off	and the first of the second second second	ar Sgrad	
P0777	Pressure Control Solenoid "B" Stuck On		1, 19-2	s .5
P0778	Pressure Control Solenoid "B" Electrical	AM PARAMETER CONTROL OF THE	Stage 15	
P0779	Pressure Control Solenoid "B" Intermittent	11.	-	
P0780	Shift Error	steems englished		Physical Company
P0781	1-2 Shift			7 40.33
P0782	2-3 Shift	・ 第31 第4 - 2 mm 1	- 1a .	11,1,4
P0783	3-4 Shift	with the distance of the second	44.1	100
P0784	4-5 Shift :	1.794.00		(2.5)
P0785	Shift/Timing Solenoid	√2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 ×		(40°0°)
P0786	Shift/Timing Solenoid Range/Performance	64 T.		P
P0787	Shift/Timing Solenoid Low	Service and the service and th		27.04
P0788	Shift/Timing Solenoid High	glicy information	1 1	55/4/1
P0789	Shift/Timing Solenoid Intermittent	1111 To 1		1-11
P0790	Normal/Performance Switch Circuit	+ 1 ¹ 40 + 1.00	4	
P0791	Intermediate Shaft Speed Sensor "A" Circuit	Single Control		
P0792	Intermediate Shaft Speed Sensor "A" Circuit Range/Performance	Section 2011		*1.14
P0793	Intermediate Shaft Speed Sensor "A" Circuit No Signal	man in the state of the state of the	1 1 2 4 1	Gent Hei
P0794	Intermediate Shaft Speed Sensor "A" Circuit Intermittent			4.77
P0795	-Pressure Control Solenoid "C"	t und the statement		4, 74
P0796	Pressure Control Solenoid "C" Performance or Stuck off			
P0797	Pressure Control Solenoid "C" Stuck On	to the second se	- G. ;	5 V (1)
P0798	Pressure Control Solenoid "C" Electrical	18 19 19 19 19 19 19 19 19 19 19 19 19 19		4. 1
P0799	Pressure Control Solenoid "C" Intermittent	The short of		F V 1

B.9 P08XX Transmission

TABLE B9—P08XX TRANSMISSION

DTC number	DTC naming	Location
P0800	Transfer Case Control System (MIL Request)	
P0801	Reverse Inhibit Control Circuit	
P0802	Transmission Control System MIL Request Circuit/Open	
P0803	1-4 Upshift (Skip Shift) Solenoid Control Circuit	
P0804	1-4 Upshift (Skip Shift) Lamp Control Circuit	
P0805	Clutch Position Sensor Circuit	7) ·
P0806	Clutch Position Sensor Circuit Range/Performance	
P0807	Clutch Position Sensor Circuit Low	
P0808	Clutch Position Sensor Circuit High	
P0809 · · ·	Clutch Position Sensor Circuit Intermittent	
P0810***	Clutch Position Control Error	
P0811	Excessive Clutch Slippage	
P0812	Reverse Input Circuit	
P0813*** ***	Reverse Output Circuit	
P0814	Transmission Range Display Circuit	i de la companion de la compan
P0815	Upshift Switch Circuit	
P0816	Downshift Switch Circuit	e de la companya del companya de la companya del companya de la co
P0817	Starter Disable Circuit	1 10 10 10 10 10 10 10 10 10 10 10 10 10
P0818	Driveline Disconnect Switch Input Circuit	A value of the second
P0819	Up and Down Shift Switch to Transmission Range Correlation	Her is a
P0820	Gear Lever X-Y Position Sensor Circuit	en e
P0821	Gear Lever X Position Circuit	man Ada

TABLE B9-P08XX TRANSMISSION (continued)

DTC naming		Location
Gear Lever Y Position Circuit	-, - 15	V-60-3
Gear Lever X Position Circuit Intermittent		GW 6 E
Gear Lever Y Position Circuit Intermittent		
Gear Lever Push-Pull Switch (Shift Anticipate)	-1	,5 -4
Up and Down Shift Switch Circuit		1974
Up and Down Shift Switch Circuit Low		1. 31
Up and Down Shift Switch Circuit High	in the second	411 m
5-6 Shift		
Clutch Pedal Switch "A" Circuit		en e
	9.35	
· · · · · · · · · · · · · · · · · · ·		i i i
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	+	
		2 v i
	<u> </u>	
Transmission Fluid Pressure Sensor/Switch "B" Circuit		
Transmission Fluid Pressure Sensor/Switch "B" Circuit Range/Performance		
, Transmission Fluid Pressure Sensor/Switch "B" Circuit Low		
Transmission Fluid Pressure Sensor/Switch "B" Circuit High		12
Transmission Fluid Pressure Sensor/Switch "B" Circuit Intermittent		
Park/Neutral Switch Input Circuit		<u> </u>
Park/Neutral Switch Input Circuit Low		* STA
Park/Neutral Switch Input Circuit High		\$13
Drive Switch Input Circuit		i di
Drive Switch Input Circuit Low	1 -	
	. J.P	
		100
	+	
age to the first term of the f		3 13
Gear Shift Module Communication Circuit Low	-	
20 No. 1 No.	. 414.	
	_	
TCM Communication Circuit Low		
TCM Communication Circuit High	1	
Transmission Fluid Pressure	_	
Transmission Fluid Pressure Low		
Transmission Fluid Pressure High		
Transmission Fluid Pressure Sensor/Switch "C" Circuit		***
Transmission Fluid Pressure Sensor/Switch "C" Circuit Range/Performance		·
Transmission Fluid Pressure Sensor/Switch "C" Circuit Low	1	·
Transmission Fluid Pressure Sensor/Switch "C" Circuit High		
Transmission Fluid Pressure Sensor/Switch "C" Circuit Intermittent		
to the contract of the contrac		
	Gear Lever X Position Circuit Intermittent Gear Lever Y Position Circuit Intermittent Gear Lever Y Position Circuit Intermittent Gear Lever Y Position Circuit Intermittent Up and Down Shift Switch Circuit Up and Down Shift Switch Circuit IUp and Down Shift Switch I'v Circuit IUp Circuit Position III Circuit IUp	Gear Lever X Position Circuit Informations Gear Lever Y Position Circuit Informations Gear Lever Y Position Circuit Informations Up and Down Shift Switch Circuit Low Clutch Posit Switch A'r Circuit High Clutch Posit Switch B'r Circuit High Clutch Posit Switch Circuit High Four Wheel Drive (AWD) Switch Circuit Low Four Wheel Drive (AWD) Switch Circuit Low Four Wheel Drive (AWD) Switch Circuit Low Transmission Fluid Pressure Sensor/Switch A'r Circuit Range/Performance Transmission Fluid Pressure Sensor/Switch A'r Circuit Low Transmission Fluid Pressure Sensor/Switch A'r Circuit Low Transmission Fluid Pressure Sensor/Switch A'r Circuit Low Transmission Fluid Pressure Sensor/Switch B'r Circuit High Transmission Fluid Pressure Sensor/Switch B'r Circuit High Transmission Fluid Pressure Sensor/Switch B'r Circuit High Transmission Fluid Pressure Sensor/Switch B

TABLE B9—P08XX TRANSMISSION (continued)

DTC number	DTC nami	DTC naming		: (*)
P0877	Transmission Fluid Pressure Sensor/Switch "D" Circuit Low	Control of the Contro	Thirtie 1750	. 7
P0878	Transmission Fluid Pressure Sensor/Switch "D" Circuit High		Clark Yest	-
P0879	Transmission Fluid Pressure Sensor/Switch "D" Circuit Intermittent	ANT TO AND THE AND	and the	-4
P0880	TCM Power Input Signal	AND AND A SHIPP OF THE SHIPP OF THE		
P0881	TCM Power Input Signal Range/Performance		(3) 65.	
P0882	TCM Power Input Signal Low	+80 + 1 22 × 1 = 1 + 22 ×	r in Will	-
P0883	TCM Power Input Signal High	to Nation Control	1 1.70	a
P0884	TCM Power Input Signal Intermittent			-
P0885	TCM Power Relay Control Circuit/Open	21. Visit 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	Cop.	
P0886	TCM Power Relay Control Circuit Low	1. 经产品的 1. 新山區 1. 养死的	- T	-
P0887	TCM Power Relay Control Circuit High	Test day a con-		-
P0888	TCM Power Relay Sense Circuit	Jenet Con Apacin of		H
P0889	TCM Power Relay Sense Circuit Range/Performance	man englishmen englishmen englishmen englishmen englishmen englishmen englishmen englishmen englishmen english	1	
P0890	TCM Power Relay Sense Circuit Low	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
P0891	TCM Power Relay Sense Circuit High	servicio de la final de la fin	\$1 1 ST	7
P0892	TCM Power Relay Sense Circuit Intermittent	ex respect to August Steeland Commission of the August 1949 Steel		
P0893	Multiple Gears Engaged	en ave Samue grafig fra De	and state of the s	1
P0894	Transmission Component Slipping	in a section of the period of the	1 4 Tal	
P0895	Shift Time Too Short	Straffer and to all earth with the co-	and the state of t	¥.,
P0896	Shift Time Too Long	Tall the Light Sensitive S	an e digitation	
P0897	Transmission Fluid Deteriorated	 1 (generic all regional National) medicinatina i afficialis 	man to the state of	-
P0898	Transmission Control System MIL Request Circuit Low	to the Country of Arthur		-
P0899	Transmission Control System MIL Request Circuit High	The state of the second second second second	- 24 Test	-

B.10 P09XX Transmission

TABLE B10—P09XX TRANSMISSION

DTC number	D.	TC naming	Location
P0900	Clutch Actuator Circuit/Open	10 1 40 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	r i i i i i i i i i i i i i i i i i i i
P0901	Clutch Actuator Circuit Range/Performance	300 (ave - 1 - 1 - 1 - 2 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3	
P0902	Clutch Actuator Circuit Low	riphillal built degrae with the sea	wie ei witwi
P0903	Clutch Actuator Circuit High	The state of the s	
P0904	Gate Select Position Circuit	n de la composition de la composition La composition de la	
P0905	Gate Select Position Circuit Range/Performance	The state of the s	
P0906	Gate Select Position Circuit Low		1 T
P0907	Gate Select Position Circuit High	The state of the s	1.69
P0908	Gate Select Position Circuit Intermittent		* * * * * * * * * * * * * * * * * * *
P0909	Gate Select Control Error	 	377 . 4
P0910	Gate Select Actuator Circuit/Open	and the second of the second o	70 (2.1 - 1.
P0911	Gate Select Actuator Circuit Range/Performance	A Company of the second of the	di anni anni anni anni anni anni anni an
P0912	Gate Select Actuator Circuit Low	GF (10 - 11 - 12 - 13 - 13 - 13 - 13 - 13 - 13	
P0913	Gate Select Actuator Circuit High	a taki od service	And the state of the state of
P0914	Gear Shift Position Circuit	e de rouse de la companya del companya del companya de la companya	ya, A Maria d
P0915	Gear Shift Position Circuit Range/Performance	ner famili Dukin ellere	
P0916	Gear Shift Position Circuit Low	White His Committee is a second	Art Art Bredt
P0917	Gear Shift Position Circuit High	7/4/98/2/11 19/d 1 - 147	Part III yank
P0918	Gear Shift Position Circuit Intermittent	de la companya de la	
P0919	Gear Shift Position Control Error	matter with the control of the contr	
P0920	Gear Shift Forward Actuator Circuit/Open	Boll Of A Charles Country of the	
P0921	Gear Shift Forward Actuator Circuit Range/Performance	Control of the Windship Personal Control	
P0922	Gear Shift Forward Actuator Circuit Low	we at particular to the control of t	en e
P0923	Gear Shift Forward Actuator Circuit High	Markey The Live set Set Settle	
P0924	Gear Shift Reverse Actuator Circuit/Open		
P0925	Gear Shift Reverse Actuator Circuit Range/Performance	di Militari di Anglia	F 1 1
P0926	Gear Shift Reverse Actuator Circuit Low	crease for the control of first and control of Applications	

TABLE B10-P09XX TRANSMISSION (continued)

DTC number	DTC naming		Location	
P0927	Gear Shift Reverse Actuator Circuit High	Min er of Alexander		
P0928	Gear Shift Lock Solenoid Control Circuit/Open	um Jahan J	1) 1.	Dali I
P0929	Gear Shift Lock Solenoid Control Circuit Range/Performance	Part Dec 1975. 1839	1. 1. S. 1.	
P0930	Gear Shift Lock Solenoid Control Circuit Low	na Cultur I far i Jobs	Gardina (2)	
P0931	Gear Shift Lock Solenoid Control Circuit High	ascore o statema sa 1.90	8-11 E	Jan 1
P0932	Hydraulic Pressure Sensor Circuit	and the state of the state of the		
P0933	Hydraulic Pressure Sensor Range/Performance	ale in the comment department		2504
P0934	Hydraulic Pressure Sensor Circuit Low Rendered R	ewine the Late		
P0935	Hydraulic Pressure Sensor Circuit High	n si Baran a da d		est i
P0936	Hydraulic Pressure Sensor Circuit Intermittent	and the state of the state of		301
P0937	Hydraulic Oil Temperature Sensor Circuit	many services in the last .		ml
P0938	Hydraulic Oil Temperature Sensor Range/Performance	n ut ka tuan 1 mm angs		: Dar 1
P0939		A STANLAND WALLES OF STANLAND		190 1
P0940		TMT Box (was large) to a way a		2004
P0941		n tradicio de la compansión de la compan		103
P0942				
P0943		e village Delayer et et et et et e et e et e e e e e e		Sales Sales
P0943				1389
P0944 P0945	Hydraulic Pressure Unit Loss of Pressure Hydraulic Pump Relay Circuit/Open	a curtour a carracter (FTI) a entre Color	1 16	
P0946	Hydraulic Pump Relay Circuit Range/Performance	25 05 -		
P0947	Hydraulic Pump Relay Circuit Low			
P0948	Hydraulic Pump Relay Circuit High			<u> </u>
P0949	Auto Shift Manual Adaptive Learning Not Complete			
P0950	Auto Shift Manual Control Circuit	A CONTRACTOR AND		
P0951	Auto Shift Manual Control Circuit Range/Performance	14	· .	
P0952	Auto Shift Manual Control Circuit Low	The second of the second secon		
P0953	Auto Shift Manual Control Circuit High	TO THE WALL TO SERVE THE		
P0954	Auto Shift Manual Control Circuit Intermittent	H 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
P0955	Auto Shift Manual Mode Circuit		1	
P0956	Auto Shift Manual Mode Circuit Range/Performance	Section 1		
P0957	Auto Shift Manual Mode Circuit Low	De tigar		4.5
P0958	Auto Shift Manual Mode Circuit High	1.1		٠.
P0959	Auto Shift Manual Mode Circuit Intermittent			
P0960	Pressure Control Solenoid "A" Control Circuit/Open	the state of the s		" . i.,
P0961	Pressure Control Solenoid "A" Control Circuit Range/Performance			
P0962	Pressure Control Solenoid "A" Control Circuit Low	1		
P0963	Pressure Control Solenoid "A" Control Circuit High			10 10 4 10 10 10 10 10 10 10 10 10 10 10 10 10
P0964	Pressure Control Solenoid "B" Control Circuit/Open	en de la companya de La companya de la co		1 :
P0965	Pressure Control Solenoid "B" Control Circuit Range/Performance			
P0966	Pressure Control Solenoid "B" Control Circuit Hange/Performance			
		7		<u></u>
P0967	Pressure Control Solenoid "B" Control Circuit High			<u> </u>
P0968	Pressure Control Solenoid "C" Control Circuit/Open			
P0969	Pressure Control Solenoid "C" Control Circuit Range/Performance			
P0970	Pressure Control Solenoid "C" Control Circuit Low			
P0971	Pressure Control Solenoid "C" Control Circuit High			•
P0972	Shift Solenoid "A" Control Circuit Range/Performance			
P0973	Shift Solenoid "A" Control Circuit Low			4
P0974	Shift Solenoid "A" Control Circuit High			
P0975	Shift Solenoid "B" Control Circuit Range/Performance	And the second of the second o		
P0976	Shift Solenoid "B" Control Circuit Low		4.70	
P0977	Shift Solenoid "B" Control Circuit High	No. of the second secon		
P0978	Shift Solenoid "C" Control Circuit Range/Performance			
P0979	Shift Solenoid "C" Control Circuit Low	8 E S		<u> </u>
P0980	Shift Solenoid "C" Control Circuit High		<u> </u>	-
	Shift Solenoid "D" Control Circuit Range/Performance			

TABLE B10—P09XX TRANSMISSION (continued)

DTC number	DTC naming	*(\$\dag{\psi})\$		Location
P0982	Shift Solenoid "D" Control Circuit Low	क्षेत्र - संस्कृतक विकास समिति करण स्थाप कर के		1,20,514
P0983	Shift Solenoid "D" Control Circuit High	princi Dilabero di Novo di Monopoliko anciega 80		1221
P0984	Shift Solenoid "E" Control Circuit Range/Performance	curants of lagues visually said to beactors and the		. 1537
P0985	Shift Solenoid "E" Control Circuit Low	un in Property Property (Property Constitution of the Constitution	17 45	41.711
P0986	Shift Solenoid "E" Control Circuit High	rights spain revince 1994 - 1994	. 17 - 1, 11 I	Marine B
P0987	Transmission Fluid Pressure Sensor/Switch "E" Circuit	ten Zilter i el erekti nit	1 12 11	e (,, t)
P0988	Transmission Fluid Pressure Sensor/Switch "E" Circuit Range/Performance	en chapena egit di liber gi nestaci.	a fisa j	1 15 15 L
P0989	Transmission Fluid Pressure Sensor/Switch "E" Circuit Low	winds to dance the late of	2 to 41.	\$70 Cd
P0990	Transmission Fluid Pressure Sensor/Switch "E" Circuit High	ty Louis Constitution to the	1	URWIT
P0991	Transmission Fluid Pressure Sensor/Switch "E" Circuit Intermittent	participation of Managager of Ag		1,134
P0992	Transmission Fluid Pressure Sensor/Switch "F" Circuit	and with the little of the control	1.4	19,371.4
P0993	Transmission Fluid Pressure Sensor/Switch "F" Circuit Range/Performance	ing the control of th	n naje (86259
P0994	Transmission Fluid Pressure Sensor/Switch "F" Circuit Low	ALM CONTROL OF A	1.14	75.44
P0995	Transmission Fluid Pressure Sensor/Switch "F" Circuit High	at Haller Carrier Group Stransfer	an .	9. J. C
P0996	Transmission Fluid Pressure Sensor/Switch "F" Circuit Intermittent	a Christina Capada Christia annoch Maus		10 Car.
P0997	Shift Solenoid "F" Control Circuit Range/Performance	physical sectors		51 17
P0998	Shift Solenoid "F" Control Circuit Low	th. Wile its territy for that is a control		9 1 QF
P0999	Shift Solenoid "F" Control Circuit High	priestrus (Linch State of P	in i	AL 1271

B.11 POAXX Hybrid Propulsion

TABLE B11—POAXX HYBRID PROPULSION

1,58041

DTC number	DTC naming	Source of Red Barrier in the 1/1 (1994) 115	Location
P0A00	Motor Electronics Coolant Temperature Sensor Circuit		
P0A01	Motor Electronics Coolant Temperature Sensor Circuit Range/Performan	nce	A CONTRACTOR OF THE PROPERTY O
P0A02	Motor Electronics Coolant Temperature Sensor Circuit Low		Francisco de la companya del companya de la companya del companya de la companya
P0A03	Motor Electronics Coolant Temperature Sensor Circuit High	The second secon	Brown State
P0A04	Motor Electronics Coolant Temperature Sensor Circuit Intermittent	The second secon	
P0A05	Motor Electronics Coolant Pump Control Circuit/Open	and the second s	**************************************
P0A06	Motor Electronics Coolant Pump Control Circuit Low	Andrew Communication (Communication Communication Communic	
P0A07	Motor Electronics Coolant Pump Control Circuit High	waterial and the second	
P0A08	DC/DC Converter Status Circuit	100 mm	
P0A09	DC/DC Converter Status Circuit Low Input	entre succession de la contraction de la contrac	er e la
P0A10	DC/DC Converter Status Circuit High Input		1864 - 1 A 1864 -
P0A11	DC/DC Converter Enable Circuit/Open		Marie Company
P0A12	DC/DC Converter Enable Circuit Low	The second s Second second se	no.
P0A13	DC/DC Converter Enable Circuit High		
P0A14	Engine Mount Control Circuit/Open	The second secon	
P0A15	Engine Mount Control Circuit Low	The second of th	
P0A16	Engine Mount Control Circuit High	State of the state	
P0A17	Motor Torque Sensor Circuit	en in the West Manager of the security	profit Transfer
P0A18	Motor Torque Sensor Circuit Range/Performance	 The second of the second of the	3
P0A19	Motor Torque Sensor Circuit Low	The state of the s	
P0A20	Motor Torque Sensor Circuit High	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	en e
P0A21	Motor Torque Sensor Circuit Intermittent	A BANK TO THE REPORT OF THE PROPERTY OF THE PR	1
P0A22	Generator Torque Sensor Circuit	n de la companya de l La companya de la co	
P0Ä23	Generator Torque Sensor Circuit Range/Performance	A CONTRACTOR AND	
P0A24	Generator Torque Sensor Circuit Low	en de la composition de la composition La composition de la	
P0A25	Generator Torque Sensor Circuit High	e de la companya del companya de la companya de la companya del companya de la companya del companya de la companya de la companya de la companya de la companya del companya de la companya del companya de la companya de la companya de la companya de la companya del companya de la companya de la companya de la companya de la companya del companya de la companya de la companya del	
P0A26	Generator Torque Sensor Circuit Intermittent	in the control of the	1 270 43
P0A27	Battery Power Off Circuit	Surface (Fig. 1) and the second of the secon	en e
P0A28	Battery Power Off Circuit Low	ann benedictive and the second of the second	
P0A29	Battery Power Off Circuit High		

B.12 POBXX Reserved by Document

B.13 POCXX Reserved by Document

B.14 PODXX Reserved by Document

B.15 POEXX Reserved by Document

B.16 POFXX Reserved by Document

B.17 P10XX Manufacturer Controlled Fuel and Air Metering and Auxiliary

Emission Controls

B.18 P11XX Manufacturer Controlled Fuel and Air Metering

B.19 P12XX Manufacturer Controlled Fuel and Air Metering

B.20 P13XX Manufacturer Controlled Ignition System or Misfire

B.21 P14XX Manufacturer Controlled Auxiliary Emission Controls

B.22 P15XX Manufacturer Controlled Vehicle Speed, Idle Control, and Aux-

iliary Inputs

B.23 P16XX Manufacturer Controlled Computer and Auxiliary Outputs

B.24 P17XX Manufacturer Controlled Transmission

B.25 P18XX Manufacturer Controlled Transmission

B.26 P19XX Manufacturer controlled Transmission

B.27 P20XX Fuel and Air Metering and Auxiliary Emission Controls

TABLE B12—P20XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS

DTC number	DTC naming	
P2000	NOx Trap Efficiency Below Threshold	Bank 1
P2001	NOx Trap Efficiency Below Threshold	Bank 2
P2002	Particulate Trap Efficiency Below Threshold	Bank 1
P2003	Particulate Trap Efficiency Below Threshold	Bank 2
P2004	Intake Manifold Runner Control Stuck Open	Bank 1 a)
P2005	Intake Manifold Runner Control Stuck Open	Bank 2 a)
P2006	Intake Manifold Runner Control Stuck Closed	Bank 1 a)
P2007	Intake Manifold Runner Control Stuck Closed	Bank 2 ^{a)}
P2008	Intake Manifold Runner Control Circuit/Open	Bank 1 ^{a)}
P2009	Intake Manifold Runner Control Circuit Low	Bank 1 ^{a)}
P2010	Intake Manifold Runner Control Circuit High	Bank 1 a)
P2011	Intake Manifold Runner Control Circuit/Open	Bank 2 a)
P2012	Intake Manifold Runner Control Circuit Low	Bank 2 a)
P2013	Intake Manifold Runner Control Circuit High	Bank 2 a)
P2014	Intake Manifold Runner Position Sensor/Switch Circuit	Bank 1 a)
<u> </u>	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance	Bank 1 a)
P2015		Bank 1 a)
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low	Bank 1 a)
P2017	Intake Manifold Runner Position Sensor/Switch Circuit High	Bank 1 a)
P2018	Intake Manifold Runner Position Sensor/Switch Circuit Intermittent	Bank 2 ^{a)}
P2019	Intake Manifold Runner Position Sensor/Switch Circuit	
P2020	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance	Bank 2 a)
P2021	intake Manifold Runner Position Sensor/Switch Circuit Low	Bank 2 a)
P2022	Intake Manifold Runner Position Sensor/Switch Circuit High	Bank 2 a)
P2023	Intake Manifold Runner Position Sensor/Switch Circuit Intermittent	Bank 2 ^{a)}
P2024	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit	No. of the second secon
P2025	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Performance	
P2026	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit Low Voltage	
P2027	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit High Voltage	
P2028	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit Intermittent	
P2029	Fuel Fired Heater Disabled	7.9
P2030	Fuel Fired Heater Performance	
P2031	Exhaust Gas Temperature Sensor Circuit	Bank 1 Sensor 2
P2032	Exhaust Gas Temperature Sensor Circuit Low	Bank 1 Sensor 2
P2033	Exhaust Gas Temperature Sensor Circuit High	Bank 1 Sensor 2
P2034	Exhaust Gas Temperature Sensor Circuit	Bank 2 Sensor 2 Bank 2 Sensor 2
P2035	Exhaust Gas Temperature Serisor Circuit Low	Bank 2 Sensor 2 Bank 2 Sensor 2
P2036	Exhaust Gas Temperature Sensor Circuit High	Dailk 2 Sellsof 2
P2037	Reductant Injection Air Pressure Sensor Circuit	See
P2038	Reductant Injection Air Pressure Sensor Circuit Range/Performance	
P2039	Reductant Injection Air Pressure Sensor Circuit Low Input	
P2040	Reductant Injection Air Pressure Sensor Circuit High Input	
P2041	Reductant Injection Air Pressure Sensor Circuit Intermittent	
P2042	Reductant Temperature Sensor Circuit Reductant Temperature Sensor Circuit Range/Performance	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1

ு அவிகள்ளே ஆண்கள் TABLE B12—P20XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS (continued) அது அது இருக்கு அது இருக்கு அது இருக்கு இது இ

manual manual control of	A STATE OF THE STA	
P2044	Reductant Temperature Sensor Circuit Low Input	
P2045	Reductant Temperature Sensor Circuit High Input	A CONTRACTOR OF THE STATE OF TH
P2046	Reductant Temperature Sensor Circuit Intermittent	* * * * * * * * * * * * * * * * * * *
P2047	Reductant Injector Circuit/Open	Bank 1 Unit 1
P2048	Reductant Injector Circuit Low	Bank 1 Unit 1
P2049	Reductant Injector Circuit High	Bank 1 Unit 1
P2050	Reductant Injector Circuit/Opens, 1981 1987 1988 1988 1988 1988 1988 1988	Bank 2 Unit 1
P2051	Reductant Injector Circuit Low	Bank 2 Unit 1
P2052	Reductant Injector Circuit High	Bank 2 Unit 1
P2053	Reductant Injector Circuit/Open	Bank 1 Unit 2
P2054	Reductant Injector Circuit Low	Bank 1 Unit 2
P2055	Reductant Injector Circuit High	Bank 1 Unit 2
P2056	Reductant Injector Circuit/Open	Bank 2 Unit 2
P2057	Reductant Injector Circuit Low	Bank 2 Unit 2
P2058	Reductant Injector Circuit High	Bank 2 Unit 2
P2059	Reductant Injection Air Pump Control Circuit/Open	5 - 197 - AUCKI
P2060	Reductant Injection Air Pump Control Circuit Low	in the North
P2061	Reductant Injection Air Pump Control Circuit High	* **** *******************************
P2062	Reductant Supply Control Circuit/Open	EXT 571
P2063	Reductant Supply Control Circuit Low	
P2064	Reductant Supply Control Circuit High	<u> </u>
P2065	Fuel Level Sensor "B" Circuit	
P2066	Fuel Level Sensor "B" Performance	2
P2067; 3: 13		
P2068	First Land Concert FDI Claude U.S.	
P2069	Fuel Level Sensor "B" Circuit High	
2 - 9 3 - 7 - 7 -	Fuel Level Sensor "B" Circuit Intermittent	1 1 2000
P2070	Intake Manifold Tuning (IMT) Valve Stuck Open	a)
P2071	Intake Manifold Tuning (IMT) Valve Stuck Closed	a)
P2075	Intake Manifold Tuning (IMT) Valve Position Sensor/Switch Circuit	a)
P2076	Intake Manifold Tuning (IMT) Valve Position Sensor/Switch Circuit Range/Performance	a)
P2077	Intake Manifold Tuning (IMT) Valve Position Sensor/Switch Circuit Low	a)
P2078	Intake Manifold Tuning (IMT) Valve Position Sensor/Switch Circuit High	a)
P2079	Intake Manifold Tuning (IMT) Valve Position Sensor/Switch Circuit Intermittent	-
P2080		; a)
- 14,44,19	Exhaust Gas Temperature Sensor Circuit Range/Performance	Bank 1 Sensor 1
P2081	Exhaust Gas Temperature Sensor Circuit Intermittent	Bank 1 Sensor 1
P2082	Exhaust Gas Temperature Sensor Circuit Range/Performance	Bank 2 Sensor 1
P2083	Exhaust Gas Temperature Sensor Circuit Intermittent	Bank 2 Sensor 1
P2084	Exhaust Gas Temperature Sensor Circuit Range/Performance	Bank 1 Sensor 2
P2085	Exhaust Gas Temperature Sensor Circuit Intermittent	Bank 1 Sensor 2
P2086	Exhaust Gas Temperature Sensor Circuit Range/Performance	Bank 2 Sensor 2
P2087	Exhaust Gas Temperature Sensor Circuit Intermittent	Bank 2 Sensor 2
P2088 ¹⁾	"A" Camshaft Position Actuator Control Circuit Low	Bank 1 b)
P2089 ¹⁾	"A" Camshaft Position Actuator Control Circuit High	Bank 1 b)
P2090 1)	"B" Camshaft Position Actuator Control Circuit Low	Bank 1 c)
P2091 ¹⁾	"B" Camshaft Position Actuator Control Circuit High	Bank 1 c)
P2092 1) 9 5 1 10		
a man Altana	and the state of t	Bank 2 b)
P2093 ¹⁾		Bank 2 b)
P2094.1)	"B" Camshaft Position Actuator Control Circuit Low	Bank 2 ^{c)}
P2095 ¹⁾	"B" Camshaft Position Actuator Control Circuit High	Bank 2 c)
P2096	Post Catalyst Fuel Trim System Too Lean	Bank 1
P2097	Post Catalyst Fuel Trim System Too Rich	Bank 1
	Post Catalyst Fuel Trim System Too Lean	Bank 2

TABLE B12—P20XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS (continued)

Marie Committee	and the second section of the second section is a second section of the second section of the second section of		
DTC number	DTC naming	**	Location
NOTE 1) For DTCs P208	8 - P2095 also see P0010 - P0023	Herological State of State of the State of t	

DTC Application note for Intake Manifold Tuning Valves and Intake Manifold Runner controls:

- Active controls are used modify or control airflow within the engine air intake system. These controls may be used to enhance or modify in-cylinder airflow motion (charge motion), modify the airflow dynamics (manifold tuning) within the intake manifold or both.

 Devices that control charge motion are commonly called Intake Manifold Runner Control, Swirl Control Valve, and Charge Motion Control Valve. The SAE recommended term for any device that control charge motion is pasted. Manifold Runner Control (MARCA)
- that controls charge motion is Intake Manifold Runner Control (IMRC).

 Devices that control manifold dynamics or manifold tuning are commonly called Intake Manifold Tuning Valve, Long/Short Runner Control and Intake Manifold Communication Control. The
- SAE recommended term for any device that controls manifold tuning is intake Manifold Tuning (IMT) Valve.
- b) The "A" camshaft shall be either the "intake," "left," or "front camshaft. Left/Right and Front/Rear are determined as viewed from the driver's seating position. Bank 1 contains cylinder number one, Bank 2 is the opposite bank.
- c) The "B" camshaft shall be either the "exhaust," "right," or "rear" camshaft. Left/Right and Front/Rear are determined as viewed from the driver's seating position. Bank 1 contains cylinder number one, Bank 2 is the opposite bank.

B.28 P21XX Fuel and Air Metering and Auxiliary Emission Controls

TABLE B13—P21XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS

DTC number	DTC naming	Location
P2100 ¹⁾	Throttle Actuator Control Motor Circuit/Open	
P2101 ¹⁾	Throttle Actuator Control Motor Circuit Range/Performance	6 19 14
P2102 ¹⁾	Throttle Actuator Control Motor Circuit Low	General Park
P2103 ¹⁾	Throttle Actuator Control Motor Circuit High	1925 TOST
P2104 ¹⁾	Throttle Actuator Control System - Forced Idle	. grant 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P2105 ¹⁾	Throttle Actuator Control System - Forced Engine Shutdown	
P2105 ¹	Throttle Actuator Control System - Forced Limited Power	
	Throttle Actuator Control Module Processor	The second secon
P2107 ¹⁾	Throttle Actuator Control Module Performance	
P2108 ¹⁾		West of the second
P2109 ¹⁾	Thousand Control Control	
P2110 ¹⁾	Inrottle Actuator Control System - Policed Limited HPWI	
P2111 ¹⁾	Inrottie Actuator Control System - Stuck Open	
P2112 ¹⁾	Throttle Actuator Control System - Stuck Closed	
P2113	Throttle/Pedal Position Sensor "B" Minimum Stop Performance	The second secon
P2114	Throttle/Pedal Position Sensor "C" Minimum Stop Performance	
P2115	Throttle/Pedal Position Sensor "D" Minimum Stop Performance	
P2116	Throttle/Pedal Position Sensor "E" Minimum Stop Performance	7
P2117 ···	Throttle/Pedal Position Sensor "F" Minimum Stop Performance	
P2118 ¹⁾	Throttle Actuator Control Motor Current Range/Performance	
P2119 1)	Throttle Actuator Control Throttle Body Range/Performance	
P2120	Throttle/Pedal Position Sensor/Switch "D" Circuit	
P2121	Throttle/Pedal Position Sensor/Switch "D" Circuit Range/Performance	
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	
P2124	Throttle/Pedal Position Sensor/Switch "D" Circuit Intermittent	
P2125	Throttle/Pedal Position Sensor/Switch "E" Circuit	
P2126	Throttle/Pedal Position Sensor/Switch "E" Circuit Range/Performance	
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	
P2129	Throttle/Pedal Position Sensor/Switch "E" Circuit Intermittent	
P2130	Throttle/Pedal Position Sensor/Switch "F" Circuit	
P2131	Throttle/Pedal Position Sensor/Switch "F" Circuit Range Performance	
P2132	Throttle/Pedal Position Sensor/Switch "F" Circuit Low Input	
P2133	Throttle/Pedal Position Sensor/Switch "F" Circuit High Input	No. 1
P2134	Throttle/Pedal Position Sensor/Switch "F" Circuit Intermittent	
P2135	Throttle/Pedal Position Sensor/Switch "A" / "B" Voltage Correlation	
P2136	Throttle/Pedal Position Sensor/Switch "A" / "C" Voltage Correlation	30 S
P2137	Throttle/Pedal Position Sensor/Switch "B" / "C" Voltage Correlation	
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation	

TABLE B13—P21XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS (continued)

DTC number	DTC naming 125	Location
P2139	Throttle/Pedal Position Sensor/Switch "D" / "F" Voltage Correlation	i sala ing niyata nga a
P2140	Throttle/Pedal Position Sensor/Switch "E" / "F" Voltage Correlation	
P2141 ²⁾	Exhaust Gas Recirculation Throttle Control Circuit Low	
P2142 ²⁾	Exhaust Gas Recirculation Throttle Control Circuit High	
P2143	Exhaust Gas Recirculation Vent Control Circuit/Open	
P2144	Exhaust Gas Recirculation Vent Control Circuit Low	
P2145	Exhaust Gas Recirculation Vent Control Circuit High	 June 10 (1) (1) (1) (2) (2) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4
P2146	Fuel Injector Group "A" Supply Voltage Circuit/Open	
P2147	Fuel Injector Group "A" Supply Voltage Circuit Low	
P2148	Fuel Injector Group "A" Supply Voltage Circuit High	
P2149	Fuel Injector Group "B" Supply Voltage Circuit/Open	CONTRACTOR OF A SECTION OF A SE
P2150	Fuel Injector Group "B" Supply Voltage Circuit Low.	
P2151	Fuel Injector Group "B" Supply Voltage Circuit High	
P2152	Fuel Injector Group "C" Supply Voltage Circuit/Open	
P2153	Fuel Injector Group "C" Supply Voltage Circuit Low	4.34
P2154	Fuel Injector Group "C" Supply Voltage Circuit High	71 (* 1005)
P2155	Fuel Injector Group "D" Supply Voltage Circuit/Open	an a
P2156	Fuel Injector Group "D" Supply Voltage Circuit Low	
P2157	Fuel Injector Group "D" Supply Voltage Circuit High	
P2158	"Vehicle Speed Sensor "B"	77 a.V
P2159	Vehicle Speed Sensor "B" Range/Performance	A parent
P2160	Vehicle Speed Sensor "B" Circuit Low	
P2161	Vehicle Speed Sensor "B" Intermittent/Erratic	
P2162	Vehicle Speed Sensor "A" / "B" Correlation	A Section 1
P2163	Throttle/Pedal Position Sensor "A" Maximum Stop Performance	Park.
P2164 ·	Throttle/Pedal Position Sensor "B" Maximum Stop Performance	on all company
P2165	Throttle/Pedal Position Sensor "C" Maximum Stop Performance	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P2166	Throttle/Pedal Position Sensor "D" Maximum Stop Performance	
P2167	Throttle/Pedal Position Sensor "E" Maximum Stop Performance	
P2168-	Throttle/Pedal Position Sensor "F" Maximum Stop Performance	
P2169	Exhaust Pressure Regulator Vent Solenoid Control Circuit/Open	
P2170	Exhaust Pressure Regulator Vent Solenoid Control Circuit Low	
- P2171	Exhaust Pressure Regulator Vent Solenoid Control Circuit High	<u> </u>
P2172	"Throttle Actuator Control System – Sudden High Airflow Detected	The state of the s
P2173 -	Throttle Actuator Control System – High Airflow Detected	
P2174	Throttle Actuator Control System – Sudden Low Airflow Detected	
P2175	Throttle Actuator Control System – Low Airflow Detected	CA 8
P2176	Throttle Actuator Control System – Idle Position Not Learned	
P2177 a)	System Too Lean Off Idle	Bank 1
P2178 a)	System Too Rich Off Idle	Bank 1
P2179 a)	System Too Lean Off Idle	Bank 2
		N 44 1 25 25 24
P2180 ^{a)}	System Too Rich Off Idle	Bank 2
P2181	Cooling System Performance	
P2182	Engine Coolant Temperature Sensor 2 Circuit	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P2183	Engine Coolant Temperature Sensor 2 Circuit Range/Performance	1.
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	
P2185	Engine Coolant Temperature Sensor 2 Circuit High	
P2186	Engine Coolant Temperature Sensor 2 Circuit Intermittent/Erratic	
	System Too Lean at Idle	Bank 1
P2187	System Too Rich at Idle	Bank 1
P2188		
P2188 P2189	System Too Lean at Idle	Bank 2
P2188		

TABLE B13--P21XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS (continued)

DTC number	DTC naming 11 (1944)		Location
P2193	System Too Lean at Higher Load	A tradition of the constitution	Bank 2
P2194	System Too Rich at Higher Load	n - Dicker of Especial coefficients of the end of the	Bank 2
P2195	O2 Sensor Signal Stuck Lean	n managaran mengantan dan	Bank 1 Sensor 1
P2196	O2 Sensor Signal Stuck Rich	The state of the s	Bank 1 Sensor 1
P2197	O2 Sensor Signal Stuck Lean	Section 1997	Bank 2 Sensor 1
P2198	O2 Sensor Signal Stuck Rich		Bank 2 Sensor 1
P2199	Intake Air Temperature Sensor 1 / 2 Correlation		to the way for
OTE 1) For Throttle	Actuator Control DTCs also see P0638 - P0639	tivikano vikoju ovašnih di inter.	
OTE 2) DTCs P214	- P2142 should be used with P0487 - P0488	representation of the least of stime	50 T 60 00
Use P2177 - P218) for fuel systems with multiple load ranges.	Agricol Control Control	Markey Markey

B.29 P22XX Fuel and Air Metering and Auxiliary Emission Controls

TABLE B14—P22XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS

DTC number	DTC naming		Location
P2200	NOx Sensor Circuit	5.51.57	Bank 1
P2201	NOx Sensor Circuit Range/Performance	4 - 1	Bank 1
P2202	NOx Sensor Circuit Low Input	\$ 1.00 m	Bank 1
P2203	NOx Sensor Circuit High Input		Bank 1
P2204	NOx Sensor Circuit Intermittent Input	20.1	Bank 1
P2205	NOx Sensor Heater Control Circuit/Open		Bank 1
P2206	NOx Sensor Heater Control Circuit Low		Bank 1
P2207	NOx Sensor Heater Control Circuit High	1071	Bank 1
P2208	NOx Sensor Heater Sense Circuit	1 1 1 1	Bank 1
P2209	NOx Sensor Heater Sense Circuit Range/Performance	Jr.:	Bank 1
P2210	NOx Sensor Heater Sense Circuit Low Input		Bank 1
P2211	NOx Sensor Heater Sense Circuit High Input		Bank 1
P2212	NOx Sensor Heater Sense Circuit Intermittent		Bank 1
P2213	NOx Sensor Circuit		Bank 2
P2214	NOx Sensor Circuit Range/Performance		Bank 2
P2215	NOx Sensor Circuit Low Input		Bank 2
P2216	NOx Sensor Circuit High Input		Bank 2
P2217	NOx Sensor Circuit Intermittent Input	1	Bank 2
P2218	NOx Sensor Heater Control Circuit/Open		Bank 2
P2219	NOx Sensor Heater Control Circuit Low		Bank 2
P2220	NOx Sensor Heater Control Circuit High		Bank 2
P2221	NOx Sensor Heater Sense Circuit		Bank 2
P2222	NOx Sensor Heater Sense Circuit Range/Performance	1,111	Bank 2
P2223	NOx Sensor Heater Sense Circuit Low	1	Bank 2
P2224	NOx Sensor Heater Sense Circuit High		Bank 2
P2225	NOx Sensor Heater Sense Circuit Intermittent		Bank 2
P2226	Barometric Pressure Circuit		
P2227	Barometric Pressure Circuit Range/Performance	1000 0	
P2228	Barometric Pressure Circuit Low		
P2229	Barometric Pressure Circuit High		
P2230	Barometric Pressure Circuit Intermittent		
P2231 ¹⁾	O2 Sensor Signal Circuit Shorted to Heater Circuit		Bank 1 Sensor 1
P2232 ¹⁾	O2 Sensor Signal Circuit Shorted to Heater Circuit		Bank 1 Sensor 2
P2233 ¹⁾	O2 Sensor Signal Circuit Shorted to Heater Circuit	1	Bank 1 Sensor 3
P2234 ¹⁾	O2 Sensor Signal Circuit Shorted to Heater Circuit		Bank 2 Sensor 1
P2235 ¹⁾	O2 Sensor Signal Circuit Shorted to Heater Circuit		Bank 2 Sensor 2
P2236 ¹⁾	O2 Sensor Signal Circuit Shorted to Heater Circuit	111.5%	Bank 2 Sensor 3
P2237 ²⁾	O2 Sensor Positive Current Control Circuit/Open	PACE IN	Bank 1 Sensor 1
P2238 ²⁾	O2 Sensor Positive Current Control Circuit Low	1100.00	Bank 1 Sensor 1

TABLE B14—P22XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS (continued)

DTC number	DTC naming	Location
P2239 ²⁾	O2 Sensor Positive Current Control Circuit High	Bank 1 Sensor 1
P2240 ²⁾	O2 Sensor Positive Current Control Circuit/Open	Bank 2 Sensor 1
P2241 ²⁾	O2 Sensor Positive Current Control Circuit Low	Bank 2 Sensor 1
P2242 ²⁾	O2 Sensor Positive Current Control Circuit High	Bank 2 Sensor 1
P2243 ²⁾	O2 Sensor Reference Voltage Circuit/Open	Bank 1 Sensor 1
P2244 ²⁾	O2 Sensor Reference Voltage Performance	Bank 1 Sensor 1
P2245 ²⁾	O2 Sensor Reference Voltage Circuit Low	Bank 1 Sensor 1
P2246 ²⁾		Bank 1 Sensor 10,545
P2247 ²⁾	O2 Sensor Reference Voltage Circuit/Open	Bank 2 Sensor 1
P2248 ²⁾	O2 Sensor Reference Voltage Performance	Bank 2 Sensor 1
P2249 ²⁾	O2 Sensor Reference Voltage Circuit Low	Bank 2 Sensor 1
P2250 ²⁾	O2 Sensor Reference Voltage Circuit High	Bank 2 Sensor 1
P2251 ²⁾	O2 Sensor Negative Current Control Circuit/Open	Bank 1 Sensor 1
P2252 ²⁾	O2 Sensor Negative Current Control Circuit Low	Bank 1 Sensor 1
P2253 ²⁾	O2 Sensor Negative Current Control Circuit High	Bank 1 Sensor 1
P2254 ²⁾	O2 Sensor Negative Current Control Circuit/Open	
	The second secon	Bank 2 Sensor 1
P2255 ²⁾	O2 Sensor Negative Current Control Circuit Low	Bank 2 Sensor 1
P2256 ²⁾	O2 Sensor Negative Current Control Circuit High	Bank 2 Sensor 1
P2257	Secondary Air Injection System Control "A" Circuit Low	
P2258	Secondary Air Injection System Control "A" Circuit High	
P2259	Secondary Air Injection System Control "B" Circuit Low	
P2260	Secondary Air Injection System Control "B" Circuit High	
P2261	Turbo/Super Charger Bypass Valve - Mechanical	
P2262	Turbo Boost Pressure Not Detected - Mechanical	<u> </u>
P2263	Turbo/Super Charger Boost System Performance	
P2264	Water in Fuel Sensor Circuit	
P2265	Water in Fuel Sensor Circuit Range/Performance	
P2266	Water in Fuel Sensor Circuit Low	100
P2267	Water in Fuel Sensor Circuit High	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1
P2268	Water in Fuel Sensor Circuit Intermittent	
P2269	Water in Fuel Condition	<u> </u>
P2270	O2 Sensor Signal Stuck Lean	Bank 1 Sensor 2
P2271	O2 Sensor Signal Stuck Rich	Bank 1 Sensor 2
P2272	O2 Sensor Signal Stuck Lean	Bank 2 Sensor 2
P2273	O2 Sensor Signal Stuck Rich	Bank 2 Sensor 2
P2274	O2 Sensor Signal Stuck Lean	Bank 1 Sensor 3
P2275	O2 Serisor Signal Stuck Rich	Bank 1 Sensor 3
P2276	O2 Sensor Signal Stuck Lean	Bank 2 Sensor 3
	O2 Sensor Signal Stuck Rich	Bank 2 Sensor 3
P2278 P2279	O2 Sensor Signals Swapped Bank 1 Sensor 3 / Bank 2 Sensor 3 -Intake Air System Leak	
P2280	Air Flow Restriction / Air Leak Between Air Filter and MAF	<u></u>
P2281	Air Flow Hestriction / Air Leak Between Air Fliter and MAF Air Leak Between MAF and Throttle Body	
P2282	Air Leak Between Throttle Body and Intake Valves	***************************************
P2282 P2283	Air Leak Between Throttle Body and Intake Valves Injector Control Pressure Sensor Circuit	
P2284	Injector Control Pressure Sensor Circuit Injector Control Pressure Sensor Circuit Range/Performance	
P2285	Injector Control Pressure Sensor Circuit Hange/Performance	
P2286 3375.43	Injector Control Pressure Sensor Circuit Low	
P2287		
P2288	Injector Control Pressure Sensor Circuit Intermittent Injector Control Pressure Too High	*** **********************************
	Injector Control Pressure Too High – Engine Off	The state of the s
P2280	Importor Control i roccure 100 i rigit — Engine On	
P2289 P2290	Injector Control Pressure Too Low	

TABLE B14—P22XX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS (continued)

DTC number	DTC naming	Location	a
P2292	Injector Control Pressure Erratic	, i takin, mengaya akendi San	50.T
P2293	Fuel Pressure Regulator 2 Performance		5. 1
P2294	Fuel Pressure Regulator 2 Control Circuit	The state of the s	. 1.51
P2295	Fuel Pressure Regulator 2 Control Circuit Low	and produced by the control of the c	
P2296	Fuel Pressure Regulator 2 Control Circuit High	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
P2297	O2 Sensor Out of Range During Deceleration	Bank 1 Sens	sor 1
P2298	O2 Sensor Out of Range During Deceleration	Bank 2 Sens	sor 1
P2299	Brake Pedal Position / Accelerator Pedal Position Incompatible		55.

NOTE 1) P2231-P2236, This diagnostic is for the sensors (both wide band and switching) that have a PWM controlled heater. If the heater shorts to the signal circuit, the control module can determine this since the signal circuit will be shorted high at the same frequency that the heaters are operating at. NOTE 2) P2237-P2256, These are the diagnostics for the primary circuits of the wide band oxygen sensors.

B.30 P23XX Ignition System or Misfire

P2300 P2301 P2302 P2303 P2304 P2305 P2306 P2307 P2308 P2309	Ignition Coil "A" Primary Control Circuit Low Ignition Coil "A" Primary Control Circuit High Ignition Coil "A" Secondary Circuit Ignition Coil "B" Primary Control Circuit Low Ignition Coil "B" Primary Control Circuit High Ignition Coil "B" Secondary Circuit Ignition Coil "B" Secondary Circuit Ignition Coil "C" Primary Control Circuit Low Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Primary Control Circuit Low	300 CC 30
P2301 P2302 P2303 P2304 P2305 P2306 P2307 P2308 P2309	Ignition Coil "A" Primary Control Circuit High Ignition Coil "A" Secondary Circuit Ignition Coil "B" Primary Control Circuit Low Ignition Coil "B" Primary Control Circuit High Ignition Coil "B" Secondary Circuit Ignition Coil "C" Primary Control Circuit Low Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Primary Control Circuit High	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P2302 P2303 P2304 P2305 P2306 P2307 P2308 P2309	Ignition Coil "A" Secondary Circuit Ignition Coil "B" Primary Control Circuit Low Ignition Coil "B" Primary Control Circuit High Ignition Coil "B" Secondary Circuit Ignition Coil "C" Primary Control Circuit Low Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Secondary Circuit Ignition Coil "C" Secondary Circuit	2025 3 - 172 202 - 172 202
P2303 P2304 P2305 P2306 P2307 P2308 P2309	Ignition Coil "B" Primary Control Circuit Low Ignition Coil "B" Primary Control Circuit High Ignition Coil "B" Secondary Circuit Ignition Coil "C" Primary Control Circuit Low Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Secondary Circuit Ignition Coil "C" Secondary Circuit	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P2304 P2305 P2306 P2307 P2308 P2309	Ignition Coil "B" Primary Control Circuit High Ignition Coil "B" Secondary Circuit Ignition Coil "C" Primary Control Circuit Low Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Secondary Circuit Ignition Coil "C" Secondary Circuit	
P2305 P2306 P2307 P2308 P2309	Ignition Coil "B" Secondary Circuit Ignition Coil "C" Primary Control Circuit Low Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Secondary Circuit	
P2306 P2307 P2308 P2309	Ignition Coil "C" Primary Control Circuit Low Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Secondary Circuit Ignition Coil "C" Secondary Circuit	
P2307 P2308 P2309	Ignition Coil "C" Primary Control Circuit High Ignition Coil "C" Secondary Circuit	1.5
P2308	The same of the sa	
P2309	The same of the sa	
P2310	Ignition Coil "D" Primary Control Circuit High	
P2311	Ignition Coil "D" Secondary Circuit	
P2312	Ignition Coil "E" Primary Control Circuit Low	
P2313	Ignition Coil "E" Primary Control Circuit High	
P2314	Ignition Coil "E" Secondary Circuit	·
P2315	Ignition Coll "F" Primary Control Circuit Low	
P2316	Ignition Coil "F" Primary Control Circuit High	***
P2317	Ignition Coil "F" Secondary Circuit	
P2318	Ignition Coil "G" Primary Control Circuit Low	
P2319	Ignition Coil "G" Primary Control Circuit High	· .
P2320	Ignition Coil "G" Secondary Circuit	
P2321	Ignition Coil "H" Primary Control Circuit Low	
P2322	Ignition Coil "H" Primary Control Circuit High	
P2323	Ignition Coil "H" Secondary Circuit	and the second
P2324	Ignition Coil "I" Primary Control Circuit Low	<u> </u>
P2325	Ignition Coil "I" Primary Control Circuit High	
P2326	Ignition Coil "I" Secondary Circuit	<u> </u>
P2327	Ignition Coil "J" Primary Control Circuit Low	<u> </u>
P2328	Ignition Coil "J" Primary Control Circuit High	
P2329	Ignition Coil "J" Secondary Circuit	
P2330	ignition Coil "K" Primary Control Circuit Low	
P2331	Ignition Coil "K" Primary Control Circuit High	
P2332	Ignition Coll "K" Secondary Circuit	
P2333	Ignition Coil "L" Primary Control Circuit Low	
P2334	Ignition Coil "L" Primary Control Circuit High	
P2335	Ignition Coll "L" Secondary Circuit	<u> </u>
P2336	Cylinder #1 Above Knock Threshold	·
P2337	Cylinder #2 Above Knock Threshold	
P2338	Cylinder #3 Above Knock Threshold	

TABLE B15—P23XX IGNITION SYSTEM OR MISFIRE (continued)

DTC number	:	DTC naming		Location
P2340	Cylinder #5 Above Knock Threshold	STACE OF REPORT	50 101 11	21.11
P2341	Cylinder #6 Above Knock Threshold	ere i delari di in inglitare	n de la la	1.12.13
P2342	Cylinder #7 Above Knock Threshold	s. d. Elbyranti Perrat		2.75
P2343	Cylinder #8 Above Knock Threshold	anti-Dkew/hrvi.afte	1.054	- , 1
P2344	Cylinder #9 Above Knock Threshold	ig Other Dill anathers in sides:	e of the Ed	5
P2345	Cylinder #10 Above Knock Threshold	restricted graphes in the Co	1.2.4.1	********
P2346	Cylinder #11 Above Knock Threshold	osh uku Cipatola nje Svijo O		6,333
P2347	Cylinder #12 Above Knock Threshold	Fig. 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1		4 2 4

B.31 P24XX Auxiliary Emission Controls

TABLE B16—P24XX AUXILIARY EMISSION CONTROLS

DTC number	DTC naming	Location
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	The state of the s
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	
P2405	Evaporative Emission System Leak Detection Pump Sense Circuit Low	The state of the s
P2406	Evaporative Emission System Leak Detection Pump Sense Circuit High	rangi , rana
. P2407	Evaporative Emission System Leak Detection Pump Sense Circuit Intermittent/Erratic	A District
P2408	Fuel Cap Sensor/Switch Circuit	
P2409	Fuel Cap Sensor/Switch Circuit Range/Performance	
P2410	Fuel Cap Sensor/Switch Circuit Low.	
P2411	Fuel Cap Sensor/Switch Circuit High	
P2412	Fuel Cap Sensor/Switch Circuit Intermittent/Erratic	
P2413.	Exhaust Gas Recirculation System Performance	83
P2414	O2 Sensor Exhaust Sample Error	Bank 1 Sensor 1
P2415	O2 Sensor Exhaust Sample Error	Bank 2 Sensor 1
P2416	O2 Sensor Signals Swapped Bank 1 Sensor 2 / Bank 1 Sensor 3	14.
P2417	O2 Sensor Signals Swapped Bank 2 Sensor 2 / Bank 2 Sensor 3	
P2418	Evaporative Emission System Switching Valve Control Circuit /Open	
P2419	Evaporative Emission System Switching Valve Control Circuit Low	
P2420	Evaporative Emission System Switching Valve Control Circuit High	
P2421	Evaporative Emission System Vent Valve Stuck Open	
P2422	Evaporative Emission System Vent Valve Stuck Closed	1.
P2423	HC Adsorption Catalyst Efficiency Below Threshold	Bank 1
P2424	HC Adsorption Catalyst Efficiency Below Threshold	Bank 2
P2425	Exhaust Gas Recirculation Cooling Valve Control Circuit/Open	*
P2426	Exhaust Gas Recirculation Cooling Valve Control Circuit Low	
P2427	Exhaust Gas Recirculation Cooling Valve Control Circuit High	P. C.
P2428	Exhaust Gas Temperature Too High	Bank 1
P2429	Exhaust Gas Temperature Too High	Bank 2
P2430	Secondary Air Injection System Air Flow/Pressure Sensor Circuit.	Bank 1
P2431	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance	Bank 1
P2432	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low	Bank 1
P2433	Secondary Air Injection System Air Flow/Pressure Sensor Circuit High	Bank 1
P2434	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Intermittent/Erratic	Bank 1
P2435	Secondary Air Injection System Air Flow/Pressure Sensor Circuit	Bank 2
P2436	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance	Bank 2
P2437	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low	Bank 2
P2438	Secondary Air Injection System Air Flow/Pressure Sensor Circuit High	Bank 2
P2439	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Intermittent/Erratic	Bank 2
P2440	Secondary Air Injection System Switching Valve Stuck Open	Bank 1
P2441	Secondary Air Injection System Switching Valve Stuck Closed	Bank 1

TABLE B16—P24XX AUXILIARY EMISSION CONTROLS (continued)

DTC number	DTC nat	Location		
P2442	Secondary Air Injection System Switching Valve Stuck Open			Bank 2
P2443	Secondary Air Injection System Switching Valve Stuck Closed	and the fact with the control of the	: :	Bank 2
P2444	Secondary Air Injection System Pump Stuck On	tan Maria yang sebagai	18. S. 17. M	Bank 1
P2445	Secondary Air Injection System Pump Stuck Off	A CONTRACTOR OF THE STATE OF TH	1.750	Bank 1
P2446	Secondary Air Injection System Pump Stuck On			Bank 2
P2447	Secondary Air Injection System Pump Stuck Off		4 14	Bank 2

B.32 P25XX Auxiliary Inputs

TABLE B17—P25XX AUXILIARY INPUTS

		According to the control of the cont		antion
DTC number	DTC naming	The second secon	Lo	cation
P2500	Generator Lamp/L-Terminal Circuit Low			
P2501	Generator Lamp/L-Terminal Circuit High	<u> </u>		<u> </u>
P2502	Charging System Voltage			
P2503	Charging System Voltage Low			
P2504	Charging System Voltage High			
P2505 1)	ECM/PCM Power Input Signal		u zji	3.1
P2506 ¹⁾	ECM/PCM Power Input Signal Range/Performance	. Se Militaria		279 (4)
P2507 ¹⁾	ECM/PCM Power Input Signal Low	and the second second	es de la	i bark
P2508 ¹⁾	ECM/PCM Power Input Signal High			# Du2 "
P2509 ¹⁾	ECM/PCM Power Input Signal Intermittent			450.5
P2510	ECM/PCM Power Relay Sense Circuit Range/Performance	28 T. C. V.		4 4 4 4 4
P2511	ECM/PCM Power Relay Sense Circuit Intermittent	a a ey t		Tail to the
P2512	Event Data Recorder Request Circuit/ Open			
P2513	Event Data Recorder Request Circuit Low			
P2514	Event Data Recorder Request Circuit High			-
P2515	A/C Refrigerant Pressure Sensor "B" Circuit	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
P2516	A/C Refrigerant Pressure Sensor "B" Circuit Range/Performance	1		
P2517	A/C Refrigerant Pressure Sensor "B" Circuit Low			1. 1.
P2518	A/C Refrigerant Pressure Sensor "B" Circuit High			F
P2519	A/C Request "A" Circuit		7. 7	
P2520	A/C Request "A" Circuit Low			6.45%
P2521	A/C Request "A" Circuit High			
P2522	A/C Request "B" Circuit			1.73
P2523	A/C Request "B" Circuit Low	4 2 2		
P2524	A/C Request "B" Circuit High	the state of the s	5	
P2525	Vacuum Reservoir Pressure Sensor Circuit			
P2526	Vacuum Reservoir Pressure Sensor Circuit Range/Performance			
P2527	Vacuum Reservoir Pressure Sensor Circuit Low			
P2528	Vacuum Reservoir Pressure Sensor Circuit High			
P2529	Vacuum Reservoir Pressure Sensor Circuit Intermittent	25.00		
P2530	Ignition Switch Run Position Circuit			
P2531	Ignition Switch Run Position Circuit Low			
P2532	Ignition Switch Run Position Circuit High			
P2533	Ignition Switch Run/Start Position Circuit			
P2534	Ignition Switch Run/Start Position Circuit Low			1.1
P2535	Ignition Switch Run/Start Position Circuit High	and the second of the second o		
P2536	Ignition Switch Accessory Position Circuit	Section Appendix of the Section		
P2537	Ignition Switch Accessory Position Circuit Low			1.5
P2538	Ignition Switch Accessory Position Circuit High	en angele e la		."1
P2539	Low Pressure Fuel System Sensor Circuit	ere er er er er er er er er er		They are
P2540	Low Pressure Fuel System Sensor Circuit Range/Performance			147.67
P2541	Low Pressure Fuel System Sensor Circuit Low			4.5
	Low Pressure Fuel System Sensor Circuit High		1	

TABLE B17—P25XX AUXILIARY INPUTS (continued)

DTC number	DTC naming	Location
P2544	Torque Management Request Input Signal "A"	A No.
P2545	Torque Management Request Input Signal "A" Range/Performance	a ray A ri
P2546	Torque Management Request Input Signal "A" Low	and the second
P2547	Torque Management Request Input Signal "A" High	\$100
P2548	Torque Management Request Input Signal "B"	Const.
P2549	Torque Management Request Input Signal "B" Range/Performance	s male in Market
P2550	Torque Management Request input Signal "B" Low	
P2551	Torque Management Request Input Signal "B" High	A Commission of the Commission
P2552	Throttle/Fuel Inhibit Circuit	
P2553	Throttle/Fuel Inhibit Circuit Range/Performance	(C.)
P2554	Throttle/Fuel Inhibit Circuit Low	
P2555	Throttle/Fuel Inhibit Circuit High	U.S.
P2556	Engine Coolant Level Sensor/Switch Circuit	
P2557	Engine Coolant Level Sensor/Switch Circuit Range/Performance	Frank d
P2558.	Engine Coolant Level Sensor/Switch Circuit Low	F
P2559	Engine Coolant Level Sensor/Switch Circuit High	a - 1 - 2
P2560	Engine Coolant Level Low	
P2561	A/C Control Module Requested MIL Illumination	1. 160.0
P2562	Turbocharger Boost Control Position Sensor Circuit	Sala Series
P2563	Turbocharger Boost Control Position Sensor Circuit Range/Performance	a a service
P2564	Turbocharger Boost Control Position Sensor Circuit Low	
P2565	Turbocharger Boost Control Position Sensor Circuit High	
P2566	Turbocharger Boost Control Position Sensor Circuit Intermittent	
P2567	Direct Ozone Reduction Catalyst Temperature Sensor Circuit	
P2568	Direct Ozone Reduction Catalyst Temperature Sensor Circuit Range/Performance	
P2569	Direct Ozone Reduction Catalyst Temperature Sensor Circuit Low	The state of the s
P2570	Direct Ozone Reduction Catalyst Temperature Sensor Circuit High	***
P2571	Direct Ozone Reduction Catalyst Temperature Sensor Circuit Intermittent/Erratic	
P2572	Direct Ozone Reduction Catalyst Deterioration Sensor Circuit	a section of
P2573	Direct Ozone Reduction Catalyst Deterioration Sensor Circuit Range/Performance	1.00
P2574	Direct Ozone Reduction Catalyst Deterioration Sensor Circuit Low	
P2575	Direct Ozone Reduction Catalyst Deterioration Sensor Circuit High	
P2576	Direct Ozone Reduction Catalyst Deterioration Sensor Circuit Intermittent/Erratic	7 (4.6)
P2577	Direct Ozone Reduction Catalyst Efficiency Below Threshold	

B.33 P26XX Computer and Auxiliary Outputs

TABLE B18—P26XX COMPUTER AND AUXILIARY OUTPUTS

DTC number	DTC naming	Location
P2600	Coolant Pump Control Circuit/Open	
P2601	Coolant Pump Control Circuit Range/Performance	
P2602	Coolant Pump Control Circuit Low	
P2603	Coolant Pump Control Circuit High	
P2604 1)	Intake Air Heater "A" Circuit Range/Performance	
P2605 ¹⁾	Intake Air Heater "A" Circuit/Open	
P2606 ¹⁾	Intake Air Heater "B" Circuit Range/Performance	
P2607 ¹⁾	Intake Air Heater "B" Circuit Low	
P2608 ¹⁾	Intake Air Heater "B" Circuit High	1,14,24
P2609 ¹⁾	Intake Air Heater System Performance	
P2610	ECM/PCM Internal Engine Off Timer Performance	
P2611	A/C Refrigerant Distribution Valve Control Circuit/Open	:
P2612	A/C Refrigerant Distribution Valve Control Circuit Low	
P2613	A/C Refrigerant Distribution Valve Control Circuit High	

TABLE B18—P26XX COMPUTER AND AUXILIARY OUTPUTS (continued)

DTC number	DTC naming 3.47	Location 44
P2614	Camshaft Position Signal Output Circuit/Open	11 N. J. 1
P2615	Camshaft Position Signal Output Circuit Low	v-
P2616	Camshaft Position Signal Output Circuit High	
P2617	Crankshaft Position Signal Output Circuit/Open	
P2618	Crankshaft Position Signal Output Circuit Low	en en grande de la companya de la co
P2619	Crankshaft Position Signal Output Circuit High	in the state of th
P2620	Throttle Position Output Circuit/Open	ា នៅក្នុងមាន ជំនាក់បង្កើញ
P2621	Throttle Position Output Circuit Low and the state of the	the property of the second
P2622	Throttle Position Output Circuit High	
P2623	Injector Control Pressure Regulator Circuit/Open	
P2624	Injector Control Pressure Regulator Circuit Low	
P2625	Injector Control Pressure Regulator Circuit High	
P2626	O2 Sensor Pumping Current Trim Circuit/Open	Bank 1 Sensor 1
P2627	O2 Sensor Pumping Current Trim Circuit Low	Bank 1 Sensor 1
P2628	O2 Sensor Pumping Current Trim Circuit High	Bank 1 Sensor 1
P2629	O2 Sensor Pumping Current Trim Circuit/Open	Bank 2 Sensor 1
P2630	O2 Sensor Pumping Current Trim Circuit Low	Bank 2 Sensor 1
P2631	O2 Sensor Pumping Current Trim Circuit High	Bank 2 Sensor 1
P2632	Fuel Pump "B" Control Circuit /Open	1 32.524
P2633	Fuel Pump "B" Control Circuit Low	
P2634	Fuel Pump "B" Control Circuit High	
P2635	Fuel Pump "A" Low Flow / Performance	
P2636	Fuel Pump "B" Low Flow / Performance	
P2637	Torque Management Feedback Signal "A"	
P2638	Torque Management Feedback Signal "A" Range/Performance	The second second
P2639	Torque Management Feedback Signal "A" Low	
P2640	Torque Management Feedback Signal "A" High	
P2641	Torque Management Feedback Signal "B"	
P2642	Torque Management Feedback Signal "B" Range/Performance	1
P2643	Torque Management Feedback Signal "B" Low	
P2644	Torque Management Feedback Signal "B" High	
P2645 ^{a)}	"A" Rocker Arm Actuator Control Circuit/Open	Bank 1
P2646 ^{a)}	"A" Rocker Arm Actuator System Performance or Stuck Off	Bank 1
P2647 ^{a)}	"A" Rocker Arm Actuator System Stuck On	Bank 1
P2648 ^{a)}	"A" Rocker Arm Actuator Control Circuit Low	Bank 1
P2649 ^{a)}	"A" Rocker Arm Actuator Control Circuit High	Bank 1
P2650 b)	"B" Rocker Arm Actuator Control Circuit/Open	Bank 1
	"B" Rocker Arm Actuator System Performance or Stuck Off	Bank 1
P2651 b)		Bank 1
P2652 b)	B Hower All Actuator Cystem Clock On	
P2653 b)	"B" Rocker Arm Actuator Control Circuit Low	Bank 1
P2654 b)	"B" Rocker Arm Actuator Control Circuit High	Bank 1
P2655 ^{a)}	"A" Rocker Arm Actuator Control Circuit/Open	Bank 2
P2656 ^{a)}	"A" Rocker Arm Actuator System Performance or Stuck Off	Bank 2
P2657 ^{a)}	"A" Rocker Arm Actuator System Stuck On	Bank 2
P2658 ^{a)}	"A" Rocker Arm Actuator Control Circuit Low	Bank 2
	"A" Rocker Arm Actuator Control Circuit High	Bank 2
P2659 a)	A House All March Country Coun	Bank 2
P2660 b)	"B" Hocker Arm Actuator Control Circult/Open	
P2661 b)	"B" Rocker Arm Actuator System Performance or Stuck Off	Bank 2
P2662 b)	"B" Rocker Arm Actuator System Stuck On	Bank 2
P2663 b)	"B" Rocker Arm Actuator Control Circuit Low	Bank 2
1 2000		

TABLE B18—P26XX COMPUTER AND AUXILIARY OUTPUTS (continued)

DTC number	DTC na	ming parasages	L	ocation
P2666	Fuel Shutoff Valve "B" Control Circuit Low	ma kina balawa ahili a maili a kwa Mini ana	30	6.85.111
P2667	Fuel Shutoff Valve "B" Control Circuit High		7+	0 (1997) 11 20 (1997)
P2668	Fuel Mode Indicator Lamp Control Circuit	Sold and the companies of the companies	101	81 N° 1
P2669	Actuator Supply Voltage "B" Circuit /Open	at Wille Tell (Tell tell tell tell te		V. C.
P2670	Actuator Supply Voltage "B" Circuit Low	6.74 (1962) 1.15 (1971) 1.34 (1971)	atri	ne di
P2671	Actuator Supply Voltage "B" Circuit High	rawah ke uhan kecamatan ka		5.5

NOTE 1) For DTCs P2604 - P2609 also see P0540 - P0543

B.34 P27XX Transmission

TABLE B19—P27XX TRANSMISSION DICE DARKER FOR THE CONTRACTOR

DTC number	DTC naming	The street of the state of the	n de la la desarra de la companya d La companya de la companya de	L	ocation
P2700	Transmission Friction Element "A" Apply Time Range/Performance	a de la companya de l		24.27.	Territoria de la compansión de la compan
P2701	Transmission Friction Element "B" Apply Time Range/Performance				11,4011
P2702	Transmission Friction Element "C" Apply Time Range/Performance	a law est a			and the second
P2703	Transmission Friction Element "D" Apply Time Range/Performance			4 11 14 1	20,000
P2704	Transmission Friction Element "E" Apply Time Range/Performance	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		A1 1	500 50
P2705	Transmission Friction Element "F" Apply Time Range/Performance	4	. 1 400 - 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		\$50 PM
P2706	Shift Solenoid "F"	The second secon	170		
P2707	Shift Solenoid "F" Performance or Stuck Off				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P2708	Shift Solenoid "F" Stuck On	* * * * * * * * * * * * * * * * * * *			19974
P2709	Shift Solenoid "F" Electrical	and the second second			200
P2710	Shift Solenoid "F" Intermittent				
P2711	Unexpected Mechanical Gear Disengagement		And the second		and the second
P2712	Hydraulic Power Unit Leakage	A CONTRACTOR OF THE CONTRACTOR	and the second		
P2713	Pressure Control Solenoid "D"		- 10°		* * * * * * * * * * * * * * * * * * *
P2714	Pressure Control Solenoid "D" Performance or Stuck Off				
P2715	Pressure Control Solenoid "D" Stuck On		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		grante,
P2716	Pressure Control Solenoid "D" Electrical	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	190		
P2717	Pressure Control Solenoid "D" Intermittent				
P2718	Pressure Control Solenoid "D" Control Circuit / Open		<u> </u>		
P2719	Pressure Control Solenoid "D" Control Circuit Range/Performance	- 10 % of the 100 hours	A Transport of the Control of the Co		A second
P2720	Pressure Control Solenoid "D" Control Circuit Low	e Faguado A. C. etc.			
P2721	Pressure Control Solenoid "D" Control Circuit High	all of the an	. May Our Line		10.00
P2722	Pressure Control Solenoid "E"	4 14 24 2 Table	The State of the S		7
P2723	Pressure Control Solenoid "E" Performance or Stuck Off	to the stable-containing	Street, Brights	laz, t	1
P2724	Pressure Control Solenoid "E" Stuck On		71 Jan 1992 1995		
P2725	Pressure Control Solenoid "E" Electrical				
P2726	Pressure Control Solenoid "E" Intermittent				
P2727	Pressure Control Solenoid "E" Control Circuit / Open				
P2728	Pressure Control Solenoid "E" Control Circuit Range/Performance				J. 1. 1. 1.
P2729	Pressure Control Solenoid "E" Control Circuit Low	make state of the state of			Takil y
P2730	Pressure Control Solenoid "E" Control Circuit High		197		19894
P2731	Pressure Control Solenoid "F"	1.371.471.47	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		7 50 96
P2732;	Pressure Control Solenoid "F" Performance or Stuck Off	i nikasa	30 0 000		
P2733	Pressure Control Solenoid "F" Stuck On		3		
P2734	Pressure Control Solenoid "F" Electrical		· · · · · · · · · · · · · · · · · · ·		was a second
P2735	Pressure Control Solenoid "F" Intermittent	<u> </u>	<u></u>		
P2736	Pressure Control Solenoid "F" Control Circuit/Open				¥
P2737	Pressure Control Solenoid "F" Control Circuit Range/Performance		Trans.		* (c. 5.1)
P2738	Pressure Control Solenoid "F" Control Circuit Low		N. C.		V 1 (1)
P2739	Pressure Control Solenoid "F" Control Circuit High		The state of the s		1, 4,

a) The "A" rocker arm actuator shall be either the "intake," "left," or "front" rocker arm actuator. Left/Right and Front/Rear are determined as if viewed from the driver's seating position. Bank 1 contains cylinder number one, Bank 2 is the opposite bank. Where only one rocker arm actuator is used for both conditions "A" and "B", use the DTCs for "A".

b) The "B" rocker arm actuator shall be either the "exhaust," "right," or "rear" rocker arm actuator. Left/Right and Front/Rear are determined as if viewed from the driver's seating position. Bank 1 contains cylinder number one, Bank 2 is the opposite bank. Where only one rocker arm actuator is used for both conditions "A" and "B", use the DTCs for "A".

TABLE B19—P27XX TRANSMISSION (continued)

DTC number	DTC naming	Location
P2740	Transmission Fluid Temperature Sensor "B" Circuit"	Jan 19 Jan 19
P2741	Transmission Fluid Temperature Sensor "B" Circuit Range Performance	
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low	the state of the s
P2743	Transmission Fluid Temperature Sensor "B" Circuit High	
P2744	Transmission Fluid Temperature Sensor "B" Circuit Intermittent	
P2745	Intermediate Shaft Speed Sensor "B" Circuit	1 40
	Intermediate Shaft Speed Sensor "B" Circuit Range/Performance	
P2746	<u> </u>	
P2747	Intermediate Shaft Speed Sensor "B" Circuit No Signal Intermediate Shaft Speed Sensor "B" Circuit Intermittent	
P2748	intermediate Stiait Speed Sensor B. Circuit intermittent	1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A
P2749	Intermediate Shaft Speed Sensor "C" Circuit	
P2750	Intermediate Shaft Speed Sensor "C" Circuit Range/Performance	
P2751	Intermediate Snart Speed Sensor C. Circuit No Signal	
P2752	Intermediate Shaft Speed Sensor "C" Circuit Intermittent	
P2753	Transmission Fluid Cooler Control Circuit/Open	
P2754	Transmission Fluid Cooler Control Circuit Low	Line and the second
P2755	Transmission Fluid Cooler Control Circuit High	***
P2756	Torque Converter Clutch Pressure Control Solenoid	
P2757	Torque Converter Clutch Pressure Control Solenoid Control Circuit Performance or Stuck Off	
P2758	Torque Converter Clutch Pressure Control Solenoid Control Circuit Stuck On	and the second s
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical	
P2760	Torque Converter Clutch Pressure Control Solenoid Control Circuit Intermittent	10.00
P2761	Torque Converter Clutch Pressure Control Solenoid Control Circuit/Open	The second secon
P2762	Torque Converter Clutch Pressure Control Solenoid Control Circuit Range/Performance	1448 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P2763	Torque Converter Clutch Pressure Control Solenoid Control Circuit High	
P2764	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low	Carry Carry
P2765	Input/Turbine Speed Sensor "B" Circuit	
P2766	Input/Turbine Speed Sensor "B" Circuit Range/Performance	
P2767	Input/Turbine Speed Sensor "B" Circuit No Signal	1.0
P2768	Input/Turbine Speed Sensor "B" Circuit Intermittent	Mary 1 Mary 1
P2769	Torque Converter Clutch Circuit Low	
500 - 51	Torque Converter Clutch Circuit High	
P2770		
P2771	Four Wheel Drive (4WD) Low Switch Circuit	
P2772	Four Wheel Drive (4WD) Low Switch Circuit Range/Performance	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P2773	Four wheel Drive (4WD) Low Switch Circuit Low	* * * * * * * * * * * * * * * * * * *
P2774	Four Wheel Drive (4WD) Low Switch Circuit High	
P2775	Upshift Switch Circuit Range/Performance	
P2776	Upshift Switch Circuit Low	7 p. 10 10 10 10 10 10 10 10 10 10 10 10 10
P2777	Upshift Switch Circuit High	
P2778	Upshift Switch Circuit Intermittent/Erratic	
P2779	Downshift Switch Circuit Range/Performance	
P2780	Downshift Switch Circuit Low	
P2781	Downshift Switch Circuit High	
P2782	Downshift Switch Circuit Intermittent/Erratic	
P2783	Torque Converter Temperature Too High	
P2784	Input/Turbine Speed Sensor "A"/"B" Correlation	
P2785	Clutch Actuator Temperature Too High	
P2786	Gear Shift Actuator Temperature Too High	
P2787	Clutch Temperature Too High	
P2788	Auto Shift Manual Adaptive Learning at Limit	M 1
P2789	Clutch Adaptive Learning at Limit	
P2790	Gate Select Direction Circuit	New York
P2791	Gate Select Direction Circuit Low	F # 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Gate Select Direction Circuit High	
P2792	Gate Select Direction Circuit Gear Shift Direction Circuit	
P2793	1 1-09F NOW 1 PERCHANA ARTHU	

TABLE B19—P27XX TRANSMISSION (continued)

DTC number	DTC naming		Location . 673
P2795	Gear Shift Direction Circuit High	Total value of the section of the se	esta (f. 1.1.19

B.35 P28XX ISO/SAE Reserved B.36 P2AXX Fuel and Air Metering and Auxiliary Emission Controls

TABLE B20—P2AXX FUEL AND AIR METERING AND AUXILIARY EMISSION CONTROLS.

DTC number	1			DTC naming		Location
P2A00		* * * * * * * *	1 1 1 2	O2 Sensor Circuit Range/Performance		Bank 1 Sensor 1
P2A01				O2 Sensor Circuit Range/Performance		Bank 1 Sensor 2
P2A02	-			O2 Sensor Circuit Range/Performance		Bank 1 Sensor 3
P2A03				O2 Sensor Circuit Range/Performance	to the second	Bank 2 Sensor 1
P2A04				O2 Sensor Circuit Range/Performance		Bank 2 Sensor 2
P2A05				O2 Sensor Circuit Range/Performance		Bank 2 Sensor 3

B.37 P30XX Fuel and Air Metering and Auxiliary Emission Controls
 B.38 P31XX Fuel and Air Metering and Auxiliary Cmission Controls
 B.39 P32XX Fuel and Air Metering and Auxiliary Emission Controls

B.40 P33XX Ignition System or Misfire B.41 P34XX Cylinder Deactivation

TABLE B21—P34XX CYLINDER DEACTIVATION

DTC number	1	DTC naming	and the second and the	64 S 88 4 G 8 4	range (right)	Location
P3400	Cylinder Deactivation System	eg grander		199 . 1 11 V, 67		Bank 1
P3401	Cylinder 1 Deactivation/Intake Valve Control Circuit/Open		the state of	The second second		21.04
P3402	Cylinder 1 Deactivation/Intake Valve Control Performance			To a Helius	1000	10.34
P3403	Cylinder 1 Deactivation/Intake Valve Control Circuit Low			1 1 1 1 1	7	, 3 - 1
P3404	Cylinder 1 Deactivation/Intake Valve Control Circuit High	1 411 321	1 4 4			gyssa
P3405	Cylinder 1 Exhaust Valve Control Circuit/Open				54	* ".V., + "
P3406	Cylinder 1 Exhaust Valve Control Performance			4		
P3407	Cylinder 1 Exhaust Valve Control Circuit Low	tier in the second		4 d 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		
P3408	Cylinder 1 Exhaust Valve Control Circuit High	1 12.842.0		1.574	!	
P3409	Cylinder 2 Deactivation/Intake Valve Control Circuit/Open		1 44 4	The second second		7 N 1 N
P3410	Cylinder 2 Deactivation/Intake Valve Control Performance			1	. gr t	* 1
P3411	Cylinder 2 Deactivation/Intake Valve Control Circuit Low			***	The second second	The second secon
P3412	Cylinder 2 Deactivation/Intake Valve Control Circuit High	*	The second secon			
P3413	Cylinder 2 Exhaust Valve Control Circuit/Open	And the second s	Samuela Samuela			
P3414	Cylinder 2 Exhaust Valve Control Performance					4.1.
P3415	Cylinder 2 Exhaust Valve Control Circuit Low	A SECULAR SECU				
P3416	Cylinder 2 Exhaust Valve Control Circuit High				.1"	
P3417	Cylinder 3 Deactivation/Intake Valve Control Circuit/Open				<u></u>	
P3418	Cylinder 3 Deactivation/Intake Valve Control Performance	. The second sec		The second second		
P3419	Cylinder 3 Deactivation/Intake Valve Control Circuit Low				H	
P3420	Cylinder 3 Deactivation/Intake Valve Control Circuit High	e i e i e i e i e				
P3421	Cylinder 3 Exhaust Valve Control Circuit/Open	A Company of the Comp				
P3422	Cylinder 3 Exhaust Valve Control Performance	2 - 1992 1		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	59	
P3423	Cylinder 3 Exhaust Valve Control Circuit Low					
P3424	Cylinder 3 Exhaust Valve Control Circuit High	* 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
P3425	Cylinder 4 Deactivation/Intake Valve Control Circuit/Open		e e e			
P3426	Cylinder 4 Deactivation/Intake Valve Control Performance				* * * * * * * * * * * * * * * * * * * *	an is
P3427	Cylinder 4 Deactivation/Intake Valve Control Circuit Low					
P3428	Cylinder 4 Deactivation/Intake Valve Control Circuit High		-			No. of
P3429	Cylinder 4 Exhaust Valve Control Circuit/Open	and the second of the second o			. 4.	
P3430	Cylinder 4 Exhaust Valve Control Performance					
P3431	Cylinder 4 Exhaust Valve Control Circuit Low				-	
P3432	Cylinder 4 Exhaust Valve Control Circuit High	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
P3433	Cylinder 5 Deactivation/Intake Valve Control Circuit/Open	7 · · · · · · · · · · · · · · · · · · ·				
P3434	Cylinder 5 Deactivation/Intake Valve Control Performance	and the second s	1			

TABLE B21—P34XX CYLINDER DEACTIVATION (continued)

DTC number	DTC naming	Location
P3436	Cylinder 5 Deactivation/Intake Valve Control Circuit High	
P3437	Cylinder 5 Exhaust Valve Control Circuit/Open	
P3438	Cylinder 5 Exhaust Valve Control Performance	;
P3439	Cylinder 5 Exhaust Valve Control Circuit Low	
P3440	Cylinder 5 Exhaust Valve Control Circuit High	
P3441	Cylinder 6 Deactivation/Intake Valve Control Circuit/Open	
P3442	Cylinder 6 Deactivation/Intake Valve Control Performance	
P3443	Cylinder 6 Deactivation/Intake Valve Control Circuit Low	
P3444	Cylinder 6 Deactivation/Intake Valve Control Circuit High	
P3445	Cylinder 6 Exhaust Valve Control Circuit/Open	
P3446	Cylinder 6 Exhaust Valve Control Performance	The Company of the
P3447		
	Cylinder 6 Exhaust Valve Control Circuit Low	
P3448	Cylinder 6 Exhaust Valve Control Circuit High	
P3449	Cylinder 7 Deactivation/Intake Valve Control Circuit/Open	
P3450	Cylinder 7 Deactivation/Intake Valve Control Performance	
P3451	Cylinder 7 Deactivation/Intake Valve Control Circuit Low	<u> </u>
P3452	Cylinder 7 Deactivation/Intake Valve Control Circuit High	N
P3453	Cylinder 7 Exhaust Valve Control Circuit/Open	
P3454	Cylinder 7 Exhaust Valve Control Performance	
P3455	Cylinder 7 Exhaust Valve Control Circuit Low	
P3456	Cylinder 7 Exhaust Valve Control Circuit High	4 1 7.
P3457	Cylinder 8 Deactivation/Intake Valve Control Circuit/Open	
P3458	Cylinder 8 Deactivation/Intake Valve Control Performance	
P3459	Cylinder 8 Deactivation/Intake Valve Control Circuit Low	
P3460	Cylinder 8 Deactivation/Intake Valve Control Circuit High	
P3461	Cylinder 8 Exhaust Valve Control Circuit/Open	
P3462	Cylinder 8 Exhaust Valve Control Performance	Brief
P3463	Cylinder 8 Exhaust Valve Control Circuit Low	No. 19 April
P3464	Cylinder 8 Exhaust Valve Control Circuit High	
P3465	Cylinder 9 Deactivation/Intake Valve Control Circuit/Open	
P3466	Cylinder 9 Deactivation/Intake Valve Control Performance	
P3467	Cylinder 9 Deactivation/Intake Valve Control Circuit Low	1 1 1 1
P3468	Cylinder 9 Deactivation/Intake Valve Control Circuit High	4
P3469	Cylinder 9 Exhaust Valve Control Circuit/Open	
P3469 P3470	Cylinder 9 Exhaust Valve Control Performance	
· · · · · · · · · · · · · · · · · · ·		
P3471	Cylinder 9 Exhaust Valve Control Circuit Low	
P3472	Cylinder 9 Exhaust Valve Control Circuit High	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
P3473	Cylinder 10 Deactivation/Intake Valve Control Circuit/Open	
P3474	Cylinder 10 Deactivation/Intake Valve Control Performance	
P3475	Cylinder:10 Deactivation/Intake Valve Control Circuit Low	
P3476	Cylinder 10 Deactivation/Intake Valve Control Circuit High	
P3477	Cylinder 10 Exhaust Valve Control Circuit/Open	
P3478	Cylinder 10 Exhaust Valve Control Performance	
P3479	Cylinder 10 Exhaust Valve Control Circuit Low	1
P3480	Cylinder 10 Exhaust Valve Control Circuit High	
P3481	Cylinder 11 Deactivation/Intake Valve Control Circuit/Open	
P3482	Cylinder 11 Deactivation/Intake Valve Control Performance	Taken and the second
P3483	Cylinder 11 Deactivation/Intake Valve Control Circuit Low	
P3484	Cylinder 11 Deactivation/Intake Valve Control Circuit High	<u> </u>
P3485	Cylinder 11 Exhaust Valve Control Circuit/Open	
P3486	Cylinder 11 Exhaust Valve Control Performance	e e tota e e e e e e e e e e e e e e e e e e e
P3487	Cylinder 11 Exhaust Valve Control Circuit Low	01 11 25 11
P3488	Cylinder 11 Exhaust Valve Control Circuit High	
P3489	Cylinder 12 Deactivation/Intake Valve Control Circuit/Open	
P3490	Cylinder 12 Deactivation/Intake Valve Control Performance	Page 10 10 10

TABLE B21—P34XX CYLINDER DEACTIVATION (continued)

DTC number	DTC naming		Location	
P3491	Cylinder 12 Deactivation/Intake Valve Control Circuit Low		- 11 P P	
P3492	Cylinder 12 Deactivation/Intake Valve Control Circuit High	Strong Control Control Control Control	Table 1 No. 19	
P3493	Cylinder 12 Exhaust Valve Control Circuit/Open	Approximately 100 and 100	ADA Har	
P3494	Cylinder 12 Exhaust Valve Control Performance	and the second of the second o		
P3495	Cylinder 12 Exhaust Valve Control Circuit Low	Mark gross control Control Andrew		
P3496	Cylinder 12 Exhaust Valve Control Circuit High	a gala in the result place is a compa	A SHAN TO THE STATE OF THE STAT	
P3497	Cylinder Deactivation System	C. Care out the College of the Colle	Bank 2	

B.42 P35XX ISO/SAE Reserved B.43 P36XX ISO/SAE Reserved B.44 P37XX ISO/SAE Reserved B.45 P38XX ISO/SAE Reserved B.46 P39XX ISO/SAE Reserved.

and Brodd Amend Leving & Co. 1991

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APPENDIX C (NORMATIVE) NETWORK COMMUNICATION GROUPINGS

C.1 U00XX Network Electrical

DTC number	DTC naming	Maria Baraga Anga Maraga at Ang	Location
U0001	High Speed CAN Communication Bus		
U0002	High Speed CAN Communication Bus Performance		
U0003	High Speed CAN Communication Bus (+) Open		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
U0004	High Speed CAN Communication Bus (+) Low	₩ # 1	Poly 1
U0005	High Speed CAN Communication Bus (+) High		
U0006	High Speed CAN Communication Bus (-) Open	Harris Company (Market Control	
U0007	High Speed CAN Communication Bus (-) Low	en anti-en in international de la company d	
U0008	High Speed CAN Communication Bus (-) High		and the state of t
U0009	High Speed CAN Communication Bus (-) shorted to Bus (+)		*, "%
U0010	Medium Speed CAN Communication Bus		
U0011	Medium Speed CAN Communication Bus Performance	Extra visit of a second	in the second
U0012	Medium Speed CAN Communication Bus (+) Open	The second of th	14. 14.
U0013	Medium Speed CAN Communication Bus (+) Low	The second secon	
U0014	Medium Speed CAN Communication Bus (+) High		
U0015	Medium Speed CAN Communication Bus (-) Open		
U0016	Medium Speed CAN Communication Bus (-) Low	Here is a second of the second	
U0017 _	Medium Speed CAN Communication Bus (-) High	**************************************	
U0018	Medium Speed CAN Communication Bus (-) shorted to Bus (+)	The state of the s	a ten t
U0019	Low Speed CAN Communication Bus	2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	2 1 12 12 13 14 15 15 15 15 15 15 15 15 15 15 15 15 15
U0020	Low Speed CAN Communication Bus Performance	with the control of t	the stage
U0021	Low Speed CAN Communication Bus (+) Open	K. (1975) - 1975	
U0022	Low Speed CAN Communication Bus (+) Low	NAME OF THE REST OF THE PARTY.	alah Mara
U0023	Low Speed CAN Communication Bus (+) High	William Committee the Committee of the C	San a sa
U0024	Low Speed CAN Communication Bus (-) Open	With a straight and the	
U0025	Low Speed CAN Communication Bus (-) Low		10.
U0026	Low Speed CAN Communication Bus (-) High		e e e e e
U0027	Low Speed CAN Communication Bus (-) shorted to Bus (+)	en e	
U0028	Vehicle Communication Bus A	The state of the s	
U0029	Vehicle Communication Bus A Performance		•
U0030	Vehicle Communication Bus A (+) Open		
U0031	Vehicle Communication Bus A (+) Low		and the second
U0032	Vehicle Communication Bus A (+) High		
U0033	Vehicle Communication Bus A (-) Open		
U0034	Vehicle Communication Bus A (–) Low		

TABLE C1-U00XX NETWORK ELECTRICAL (continued)

DTC number	DTC naming			Location and the first
U0036	Vehicle Communication Bus A (–) shorted to Bus A (+)	group (p. 1741)	gv - tuff	5.157
U0037	Vehicle Communication Bus B	Makereder	, marijā	ya est
U0038	Vehicle Communication Bus B Performance	Seat Millings	M	S Florid
U0039	Vehicle Communication Bus B (+) Open	1000 5 250		1,7,4,4
U0040	Vehicle Communication Bus B (+) Low	1 20 (10 to 1		-1 - 244
U0041	Vehicle Communication Bus B (+) High	Life in	1,54	1000
U0042	Vehicle Communication Bus B (-) Open	1.10	ter 1	. 21
U0043	Vehicle Communication Bus B (-) Low			e, 22
U0044	Vehicle Communication Bus B (-) High	1.00		1 2 2 2 1
	Vehicle Communication Bus B (–) shorted to Bus B (+)			<u>. </u>
U0045	Vehicle Communication Bus C	31 8 B	1965	10 a 15 Aq 11 a 16 Aq
U0046			 	
U0047		1	1	
- U0048	Verificie Confinitionication Bus O (+) Open		1	1 × 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
U0049	Vehicle Communication Bus C (+) Low	tata a	A 15 A 3	1
U0050	Vehicle Communication Bus C (+) High	The state of the s	-	1 2 2
U0051	Vehicle Communication Bus C (–) Open			1
U0052	Vehicle Communication Bus C (-) Low	en e	1	# # # # # # # # # # # # # # # # # # #
U0053	Vehicle Communication Bus C (-) High			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
U0054	Vehicle Communication Bus C (-) shorted to Bus C (+)	<u> </u>	-	
U0055	Vehicle Communication Bus D	편 왕 제 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.	age to see
U0056	Vehicle Communication Bus D Performance			
U0057	Vehicle Communication Bus D (+) Open			
U0058	Vehicle Communication Bus D (+) Low	<u> </u>		
U0059	Vehicle Communication Bus D (+) High			
U0060	Vehicle Communication Bus D (–) Open			
U0061	Vehicle Communication Bus D (-) Low			
U0062	Vehicle Communication Bus D (–) High		1 1 1 1 1	
U0063	Vehicle Communication Bus D (-) shorted to Bus D (+)			
U0064	Vehicle Communication Bus E			
U0065	Vehicle Communication Bus E Performance			
U0066	Vehicle Communication Bus E (+) Open			<u> </u>
U0067	Vehicle Communication Bus E (+) Low			The second second
U0068	Vehicle Communication Bus E (+) High			
U0069	Vehicle Communication Bus E (–) Open	1 41	* # V	
U0070	Vehicle Communication Bus E (–) Low		1 1	
U0071	Vehicle Communication Bus E (-) High	, the second second		
U0072	Vehicle Communication Bus E (-) shorted to Bus E (+)	Programme and	1	
U0073	Control Module Communication Bus Off	. 14 8 65 1 2 5	e di Per	
U0074	Reserved by Document	The state of the state of	1111	
U0075	Reserved by Document	And the second of the	Pal -	\$
U0076	Reserved by Document			
U0076	Reserved by Document Reserved by Document	1 15A S 1 1		The state of the s
<u> </u>	for a 1 and	to the second		
U0078	Reserved by Document	na jedna		
U0079	Reserved by Document		1	1. 198
U0080	Reserved by Document			7.5
U0081	Reserved by Document	a da da da antara		1 1 1 2 2
U0082	Reserved by Document			
U0083	Reserved by Document	131 - 112 - 11	1 2	71 1 1 1 1 1 1 1 1
U0084	Reserved by Document	v		
U0085	Reserved by Document	#11.00 conf	- k	
U0086	Reserved by Document	22 - 1 - 1 - 1 - 1 - 1	56 S	A STATE OF THE STA
U0087	Reserved by Document	and the second		
U0088	Reserved by Document			
U0089	Reserved by Document		7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
U0090	Reserved by Document			The second second

TABLE C1—U00XX NETWORK ELECTRICAL (continued)

DTC number	:	DTC naming		Location
U0091	Reserved by Document	(4) A si-A with the eight of the billion		*** ***
U0092	Reserved by Document	Could Business		
U0093	Reserved by Document	€ FARE SECTION (FREE CONTROL OF CONTROL	- N Mg	(10)
U0094	Reserved by Document	K LUMEN TERRORE	ta e si	
U0095	Reserved by Document	the second of th	1 V:	$C_{+}C_{+}^{N-1}$
U0096	Reserved by Document	etgit (e) sin i lessis i trasse	74 W	12/1/22
U0097	Reserved by Document	may 1 (els le san el frenchis) el el els els els els els els els els e	P0.173	\$17 PM \$1
U0098	Reserved by Document	million to the summer	Jane 7	
U0099	Reserved by Document	in for early on the leading agreement	135.77	

C.2 U01XX Network Communication

TABLE C2—U01XX NETWORK COMMUNICATION

DTC number	DTC naming	The second of th	Location
U0100	Lost Communication With ECM/PCM "A"	(1.3) (1.3	0.00
U0101	Lost Communication with TCM	The second secon	
U0102	Lost Communication with Transfer Case Control Module	A HOLD BOOK SEED OF THE SEED O	Lore .
U0103	Lost Communication With Gear Shift Module	in the second se	tija silita ir ka
U0104	Lost Communication With Cruise Control Module		87.63
U0105	Lost Communication With Fuel Injector Control Module	- 14 244.	
U0106	Lost Communication With Glow Plug Control Module		
Ú0107	Lost Communication With Throttle Actuator Control Module	7. A	
U0108	Lost Communication With Alternative Fuel Control Module		* * * * * * * * * * * * * * * * * * * *
U0109	Lost Communication With Fuel Pump Control Module	the state of the s	
U0110	Lost Communication With Drive Motor Control Module		
U0111	Lost Communication With Battery Energy Control Module "A"		
U0112	Lost Communication With Battery Energy Control Module "B"		
U0113	Lost Communication With Emissions Critical Control Information		
U0114	Lost Communication With Four-Wheel Drive Clutch Control Module	700	
U0115	Lost Communication With ECM/PCM "B"		
U0116	Reserved by Document		An Contract
U0117	Reserved by Document		
U0118	Reserved by Document	1.00	
U0119	Reserved by Document		
U0120	Reserved by Document		
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module		
U0122	Lost Communication With Vehicle Dynamics Control Module	The second secon	
U0123	Lost Communication With Yaw Rate Sensor Module	1971 g. 61 j. 4 v. j.	
U0124	Lost Communication With Lateral Acceleration Sensor Module		
U0125	Lost Communication With Multi-axis Acceleration Sensor Module		
U0126	Lost Communication With Steering Angle Sensor Module		· · · · · · · · · · · · · · · · · · ·
U0127	Lost Communication With Tire Pressure Monitor Module	A STATE OF THE STA	
U0128	Lost Communication With Park Brake Control Module		
U0129	Lost Communication With Brake System Control Module		
U0130	Lost Communication With Steering Effort Control Module	And the second s	
U0131	Lost Communication With Power Steering Control Module		- Andrews - Andr
U0132	Lost Communication With Ride Level Control Module	9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
U0133	Reserved by Document		
U0134	Reserved by Document	2.34	<u> </u>
U0135	Reserved by Document	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
U0136	Reserved by Document	VI	1.1
U0137	Reserved by Document		
U0138	Reserved by Document		
U0139	Reserved by Document		
U0140	Lost Communication With Body Control Module	Fig. 1 (A)	

TABLE C2-U01XX NETWORK COMMUNICATION (continued)

	TABLE C2—U01XX NETWORK COMMUNICATION (continued)					
DTC number	DTC naming	Location				
U0141	Lost Communication With Body Control Module "A"	privopyla i teta				
U0142	Lost Communication With Body Control Module "B"					
U0143	Lost Communication With Body Control Module "C"	15 D. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
U0144	Lost Communication With Body Control Module "D"	ent etel til				
U0145	Lost Communication With Body Control Module "E"					
U0146	Lost Communication With Gateway "A"	1				
U0147	Lost Communication With Gateway "B"					
U0148	Lost Communication With Gateway "C"	1.1				
U0149	Lost Communication With Gateway "D"					
U0150	Lost Communication With Gateway "E"	reference of the second of the				
U0151	Lost Communication With Restraints Control Module	11				
U0152	Lost Communication With Side Restraints Control Module	Left				
U0153	Lost Communication With Side Restraints Control Module	Right				
U0154	Lost Communication With Restraints Occupant Sensing Control Module					
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	distribution				
U0156	Lost Communication With Information Center "A"	water and the second				
U0157	Lost Communication With Information Center "B"					
U0158	Lost Communication With Head Up Display	The second secon				
U0159	Lost Communication With Parking Assist Control Module					
U0160	Lost Communication With Audible Alert Control Module					
U0161	Lost Communication With Compass Module	1611				
U0162	Lost Communication With Navigation Display Module					
U0163	Lost Communication With Navigation Control Module					
U0164	Lost Communication With HVAC Control Module					
U0165	Lost Communication With HVAC Control Module	Rear				
U0166	Lost Communication With Auxiliary Heater Control Module					
U0167	Lost Communication With Advantary Frence Control Module					
U0168	Lost Communication With Vehicle Security Control Module					
U0169	Lost Communication With Sunroof Control Module					
· · · · · · · · · · · · · · · · · · ·						
U0170	Lost Communication With "Restraints System Sensor A"					
U0171	Lost Communication With "Restraints System Sensor B"					
U0172	Lost Communication With "Restraints System Sensor C"	· Land				
U0173	Lost Communication With "Restraints System Sensor D"					
U0174	Lost Communication With "Restraints System Sensor E"					
U0175	Lost Communication With "Restraints System Sensor F"	1.26				
U0176	Lost Communication With "Restraints System Sensor G"					
. U0177	Lost Communication With "Restraints System Sensor H"					
U0178	Lost Communication With "Restraints System Sensor I"					
U0179	Lost Communication With "Restraints System Sensor J"	in the second se				
U0180	Lost Communication With Automatic Lighting Control Module	A Page 1997 Annual Control of the Co				
U0181	Lost Communication With Headlamp Leveling Control Module	_ :1				
U0182	Lost Communication With Lighting Control Module	Front				
U0183	Lost Communication With Lighting Control Module	Rear				
U0184	Lost Communication With Radio					
. U0185	Lost Communication With Antenna Control Module					
U0186	Lost Communication With Audio Amplifier	<u> </u>				
U0187	Lost Communication With Digital Disc Player/Changer Module "A"					
U0188	Lost Communication With Digital Disc Player/Changer Module "B"					
U0189	Lost Communication With Digital Disc Player/Changer Module "C"					
U0190	Lost Communication With Digital Disc Player/Changer Module "D"					
U0191	Lost Communication With Television					
U0192	Lost Communication With Personal Computer	general to the second				
U0193	Lost Communication With "Digital Audio Control Module A"					
U0194	Lost Communication With "Digital Audio Control Module B"					
U0195	Lost Communication With Subscription Entertainment Receiver Module					

TABLE C2—U01XX NETWORK COMMUNICATION (continued)

DTC number	DTC naming 11 (11)		Location :
U0196	Lost Communication With Rear Seat Entertainment Control Module	Marin Mariner Beech Williams (1984) and a	or fu
U0197	Lost Communication With Telephone Control Module	Marketton of Ogles Harver, seamened	rej Beriji
U0198	Lost Communication With Telematic Control Module	FOR ALL MILLS THAT STORE STORE STORE IN THE	85500
U0199	Lost Communication With "Door Control Module A"	Marine grand and the series specification and the	N. N. S.

C.3 U02XX Network Communication

TABLE C3—U02XX NETWORK COMMUNICATION

um professione um 40 mill to Brown

DTC number	DTC naming	Location
U0200	Lost Communication With "Door Control Module B"	activate at the management of the second
U0201	Lost Communication With "Door Control Module C"	7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
U0202	Lost Communication With "Door Control Module D"	1
U0203	Lost Communication With "Door Control Module E"	
U0204	Lost Communication With "Door Control Module F"	
U0205	Lost Communication With "Door Control Module G"	
U0206	Lost Communication With Folding Top Control Module	
U0207	Lost Communication With Moveable Roof Control Module	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
U0208	Lost Communication With "Seat Control Module A"	
U0209	Lost Communication With "Seat Control Module B"	
U0210	Lost Communication With "Seat Control Module C"	
U0211	Lost Communication With "Seat Control Module D"	
U0212	Lost Communication With Steering Column Control Module	1) 1) 1) 1) 1) 1) 1) 1) 1) 1) 1) 1) 1) 1
U0213	Lost Communication With Mirror Control Module	
U0214	Lost Communication With Remote Function Actuation	
U0215	Lost Communication With "Door Switch A"	
U0216	Lost Communication With "Door Switch B"	·
U0217	Lost Communication With "Door Switch C"	
U0218	Lost Communication With "Door Switch D"	
U0219	Lost Communication With "Door Switch E"	
U0220	Lost Communication With "Door Switch F"	
U0221	Lost Communication With "Door Switch G"	
U0222	Lost Communication With "Door Window Motor A"	
U0223	Lost Communication With "Door Window Motor B"	
U0224	Lost Communication With "Door Window Motor C"	<u> </u>
U0225	Lost Communication With "Door Window Motor D"	
U0226	Lost Communication With "Door Window Motor E"	
U0227	Lost Communication With "Door Window Motor F"	
U0228	Lost Communication With "Door Window Motor G"	
U0229	Lost Communication With Heated Steering Wheel Module	
U0230	Lost Communication With Rear Gate Module	<u> </u>
U0231	Lost Communication With Rain Sensing Module	<u> </u>
U0232	Lost Communication With Side Obstacle Detection Control Module	Left
U0233	Lost Communication With Side Obstacle Detection Control Module	Right
U0234	Lost Communication With Convenience Recall Module	
U0235	Lost Communication With Cruise Control Front Distance Range Sensor	

C.4 U03XX Network Software

TABLE C4—U03XX NETWORK SOFTWARE

DTC number		DTC naming	e naky, kit		Location
U0300	Inte	ernal Control Module Software Incompatibility	e state a face	64 1	:
U0301		Software Incompatibility with ECM/PCM	gradi Northey (1997)		The second of
U0302	Software	e Incompatibility with Transmission Control Module		100	a la management
U0303	Software	Incompatibility with Transfer Case Control Module	Letter Hadeler		
U0304	Softwa	are Incompatibility with Gear Shift Control Module	The second second		1
U0305	Softw	ware Incompatibility with Cruise Control Module	The state of the s	2000 T. 50	1 1 1 1 1 1 1 1

TABLE C4--- U03XX NETWORK SOFTWARE (continued)

	DTC number	DTC naming	Location
	U0306	Software Incompatibility with Fuel Injector Control Module	cl. di
	U0307	Software Incompatibility with Glow Plug Control Module	V.2. (c.,
	U0308	Software Incompatibility with Throttle Actuator Control Module	3/46/3
	U0309	Software Incompatibility with Alternative Fuel Control Module	10 mm m 1 mm m 1 mm m m 1 mm m m 1 mm m m 1 mm m m m m m m m m m m m m m m m m m m
	U0310	Software Incompatibility with Fuel Pump Control Module	200
	U0311	Software Incompatibility with Drive Motor Control Module	f sting.
	U0312	Software Incompatibility with Battery Energy Control Module A	
	U0313	Software Incompatibility with Battery Energy Control Module B	
	U0314	Software Incompatibility with Four-Wheel Drive Clutch Control Module	
	U0315	Software Incompatibility with Anti-Lock Brake System Control Module	
	U0316	Software Incompatibility with Vehicle Dynamics Control Module	
	U0317	Software incompatibility with Park Brake Control Module	
Ī	U0318	Software Incompatibility with Brake System Control Module	
Ī	U0319	Software Incompatibility with Steering Effort Control Module	
Ī	U0320	Software Incompatibility with Power Steering Control Module	
	U0321	Software Incompatibility with Ride Level Control Module	
Ī	U0322	Software Incompatibility with Body Control Module	
	U0323	Software Incompatibility with Instrument Panel Control Module	
Ī	U0324	Software Incompatibility with HVAC Control Module	
Ī	U0325	Software Incompatibility with Auxiliary Heater Control Module	· · · · · · · · · · · · · · · · · · ·
	U0326	Software Incompatibility with Vehicle Immobilizer Control Module	······
	U0327	Software Incompatibility with Vehicle Security Control Module	
	U0328	Software Incompatibility with Steering Angle Sensor Module	
Ī	U0329	Software Incompatibility with Steering Column Control Module	
Ī	U0330	Software Incompatibility with Tire Pressure Monitor Module	
Ī	U0331 ·	Software Incompatibility with Body Control Module "A"	

TABLE C5-U04XX Network Data

DTC number	DTC naming	Location
U0400	Invalid Data Received	
U0401	Invalid Data Received From ECM/PCM	
U0402	Invalid Data Received From Transmission Control Module	
U0403	Invalid Data Received From Transfer Case Control Module	
U0404	Invalid Data Received From Gear Shift Control Module	
U0405	Invalid Data Received From Cruise Control Module	
U0406	Invalid Data Received From Fuel Injector Control Module	
U0407	Invalid Data Received From Glow Plug Control Module	
U0408	Invalid Data Received From Throttle Actuator Control Module	
U0409	Invalid Data Received From Alternative Fuel Control Module	
U0410	Invalid Data Received From Fuel Pump Control Module	
U0411	Invalid Data Received From Drive Motor Control Module	
U0412	Invalid Data Received From Battery Energy Control Module A	
U0413	Invalid Data Received From Battery Energy Control Module B	
U0414	Invalid Data Received From Four-Wheel Drive Clutch Control Module	
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	· · · · · · · · · · · · · · · · · · ·
U0416	Invalid Data Received From Vehicle Dynamics Control Module	
U0417	Invalid Data Received From Park Brake Control Module	,
U0418	Invalid Data Received From Brake System Control Module	
U0419	Invalid Data Received From Steering Effort Control Module	
U0420	Invalid Data Received From Power Steering Control Module	
U0421	Invalid Data Received From Ride Level Control Module	
U0422	Invalid Data Received From Body Control Module	
U0423	Invalid Data Received From Instrument Panel Control Module	
U0424	Invalid Data Received From HVAC Control Module	

TABLE C5—U04XX Network Data (continued)

DTC number	DTC naming	Location
U0426	invalid Data Received From Vehicle Immobilizer Control Module	1 199
U0427	Invalid Data Received From Vehicle Security Control Module	
U0428	Invalid Data Received From Steering Angle Sensor Module	
U0429	Invalid Data Received From Steering Column Control Module	
U0430	Invalid Data Received From Tire Pressure Monitor Module	1 1
U0431	Invalid Data Received From Body Control Module "A"	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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FIGURE 1—SIMULATION MODEL DEVELOPMENT UNDER THE MODEL

SPECIFICATION PROCESS STANDARD

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This Process has the benefits of having a common vocabulary and standard interpretation of what is being requested and what will be delivered. Essentially,

this Standard improves the communication between the system integrators and the component manufacturers in the automotive industry and will enable the development of automotive systems that represent high customer value.

This document will focus on developing the *model* requirement guidelines (highlighted oval in Figure 1) and this will allow the development of the SAE Commodity Model Standards.

1.4 Application—This standard provides a guide for the development of model request specifications on a commodity-by-commodity basis. Each request specification describes the fundamentals of commodity behavior and contains a general "request form." This request form in turn contains pre-defined checklist table entries for feature/level options as well as placeholders for free-form text descriptions, graphics and other request-dependent information. A model Requester can then fill out a "blank" form for a given commodity to specify the level of detail and desired functionality that is expected for a generic model of a particular device. a model Requester can also request characterization of an existing generic model to make a model of a specific component or part number.

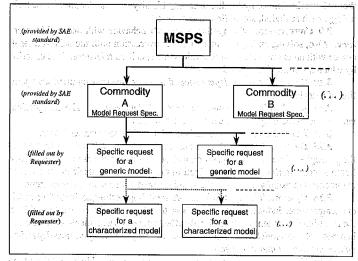


FIGURE 2—HIERARCHY OF COMMODITY MODEL SPECIFICATIONS IN RELATION TO DEFINED STANDARDS

2. References

2.1 Related Publications—The following publications are provided for information purposes only and are not a required part of this specification.

2.1.1 IEEE PUBLICATIONS—Available From ANSI, 25 West 43rd Street, New York, NY 10036-8002 or Web server http://web.ansi.org, or http://standards.ieee.org.

IEEE Std 1076.1-1999—IEEE Standard VHDL Analog and Mixed Signal Extensions

TEBE Std 1076.4-1995—IEBE Standard for VITL Application-Specific Integrated Circuit-ASIC

IEEE Std 1364-1995—IEEE Standard Hardware Description Language Based on Verilog

IEEE Std 1499-1998—IEEE Standard Interface for Hardware Description Models of Electronic Components

IEEE Std 1481-1999—IEEE Standard for Integrated Circuit (IC) Delay and Power Calculation System

2.T.2 RELATED MODELICA INFORMATION—Modelica and the Modelica Association, http://www.modelica.org/documents.shtml.

The object-oriented modeling language Modelica is designed to allow convenient, component-oriented modeling of complex physical systems, e.g., systems containing mechanical, electrical, electronic, hydraulic, thermal, control, electric power or process-oriented subcomponents. The free Modelica language, free modelica libraries and Modelica simulation tools are available, ready-to-use and have been utilized in demanding industrial applications, including hardware-in-the-loop simulations. The development and promotion of Modelica is organized by the non-profit Modelic Association.

3. Definitions

- 3.1 Accuracy—The numerical closeness of fit of *model* behavior in *simulation*, to target data from the real world.
 - 3.2 Algorithm—A formal recipe for solving a specific type of problem.
 - 3.3 Analysis—Extracting behavior from description.

3.4 Argument—A piece of information that can be assigned or "passed" to an *instance* of a *model* prior to *simulation*, an avenue for setting or passing a parameter or a variable.

3.5 Behavioral—Descriptive of a *model* designed around results that represent physical behavior and internal workings of a device. see also *Functional*.

- **3.6 Connection**—A modeling artifact that represents communication of data or signals into or out of other *model* components such as junctions, blocks, or circuit components. For electrical circuit *models*, *instances* of a component are embedded into a design document or *netlist* with their pins or *connection points* linked by *nets*.
- 3.7 Connection Point—An external linkage point on a *model*, usually corresponding to a port, terminal, connector or cavity on the physical device. in most cases, *connection points* must be attached to one or more external components for a valid *simulation*.
- **3.8 Connection Type**—The specific technology or character of a *connection point* on a *model*, defining the allowable *connections* between *models*. The type may determine the physical character of a *connection*, such as electrical, thermal, mechanical or hydraulic, or it may identify a particular *simulation* technology, such as digital, signal *flow* or conserved.
- 3.9 Convergence—Computing a model's behavior with acceptable accuracy. Also, solving an implicit mathematical expression until the achieved result agrees with an extrapolated result within some specified tolerance. The criterion by which a solution is accepted.
- **3.10 Degradation**—A *dependence* of a device *property* on previous operation of a device.
- 3.11 Distribution—A non-time series of data values. The independent variable could be frequency, location, deviation, etc.
 - 3.12 Dependence—A characteristic relationship between variables.
- 3.13 Documentation—The documentation of a model explains to the user the principles of the model's operation and defines its proper use and limitations. Some documentation may be contained in the template file itself in the form of comments, but usually these must be supplemented with a separate document.
- 3.14 Dynamic Thermal Effects—A modeling technique including ambient temperature, induced heating and heat transfer from the device to ambient the resulting device temperature directly affects the electrical, mechanical or other behavior of the model. see also static thermal effects, temperature-dependent effects and mutual thermal effects.
- 3.15 Feature—An aspect of an object's nature captured in a *model*, and the capability to control or acquire that aspect in *simulation*.
- 3.16 Feature Level—Feature Level classifies how an individual feature of a model can be applied.
- 3.17 Fidelity—The degree to which a representation, such as a *model*, captures the nature of the real object being represented.
- 3.18 Flat Model. A model that has no hierarchical structure, and which makes no use of subsidiary models, hence the opposite of macromodel.
- **3.19 Flow**—A channel for data transfer within or among *models* during imulation.
- **3.20 Functional**—Descriptive of a *model* designed to statically or dynamically represent its outputs as functionally dependent on its inputs, without regard for the physical processes involved. See also **Behavioral**.
- 3.21 Generation—Conversion of some other form of energy to thermal energy.
 - 3.22 Heuristic An adaptive framework for solving a class of problems.
- 3.23 Hierarchy—Use of the relationships and *dependencies* amongst the elementary components of a system as a basis for allocating functions and their associated higher levels of abstraction such as *Subsystems*.
- 3.24 High-level—Refers To levels of abstraction in a model that represent reduced functional specificity and detail; opposite of Low-level.
- 3.25 Instance—An *instance* is a single use of a *model* in a design, analogous to a subroutine call. Each *instance* identifies its parent *template*, its own unique identifier, the *interface* links to the design, and *values* for its attributes.
- 3.26 Interface—An element of a *model* which offers transfer of data into and out of the *model* during *simulation*. Compare to Connection Point.
- 3.27 Linear—Model characteristics that produce outputs which are directly proportional to inputs and give additive results from additive inputs. see also Non-linear.
- **3.28 Low-level**—Refers to levels of abstraction in a *model* that represent increased *functional* specificity and detail, opposite of **High-level**.
- **3.29 Macromodel**—A simulation model made up primarily or entirely of subsidiary models, with few or no mathematical or logical expressions at the immediate level of model definition.

- **3.30 Message—A** text string emitted by a *model* during *simulation* to signify the occurrence of some significant event.
- **3.31 Model**—A formal representation of a component or *system* which can be used to compute its expected behavior under specified conditions.
 - **3.32 Model Construction**—A *model* can be built in a variety of ways:
 - a. Write behavioral equations or algorithms in a modeling language.
- b. Write calls to existing models in a modeling language.
- Draw diagrams in modeling software using predefined symbols linked to behavioral descriptions.
- d. Capture certain behavior heuristically from actual parts or from other simulations.
- **3.33 Model Producer**—The component or *system model producer* who, because of their detailed knowledge of the requested component, is best suited to obtain or develop a *simulation model* in response to the model request.
- **3.34 Model Request**—A specification issued by the customer or procuring agent (the *model Requester*) to the component or *system Model Producer* (the *model Producer*). The request details the desired *functional* behavior in a *simulation model*.
- 3.35 Monte Carlo—A statistical characterization technique that employs repetitive time-simulation of a *model* with a pseudo-random sequence of perturbations applied to *parameters* and *variables* so as to represent their statistical variability, followed by statistical representation of the resulting population of results.
- 3.36 Mutual Thermal Effects—A modeling technique including both dynamic thermal effects within the model and external heat transfer between two or more models. See also Temperature-Dependent Effects, Static Thermal Effects and Dynamic Thermal Effects.
 - 3.37 Net (Nets)—A description of how components interconnect.
 - 3.38 Netlist—A formatted representation of the net.
- **3.39 Non-linear**—*Model* characteristics that produce outputs which are not directly proportional to inputs. See also **Linear**.
- **3.40 Parameter**—A quantity which remains constant within a *model* during *simulation*, but may be changed between *simulations* and modes of *model* operation. See also **Variable**.
- **3.41 Precision**—The numerical fineness with which quantities are treated in a *model* or in a simulator.
- **3.42 Procedure**—A computational process that must be called or enabled from another modeling entity to cause it to execute. In certain cases, *variable* inputs and outputs and/or *parameters* may have to be specified as part of the call.
- **3.43 Property**—A quantifiable element within a *model*, whether fixed, assignable or dynamically changing.
 - 3.44 Radiation—Propagation of electromagnetic energy.
- **3.45 Refinement**—The process whereby higher-level or abstract ideas are progressively reexpressed in terms of lower level or concrete ones.
- **3.46 Refinement Level**—Refinement Level broadly classifies how a *model* as a whole can be applied in a *system*.
- **3.47 Requester**—The customer or procuring agent charged with specifying and obtaining a *simulation model* for use by the end user.
- 3.48 Sensitivity—A kind of analysis which shows the dependence of a variable upon a parameter.
- 3.49 Simulation—Computing a model's behavior under specified conditions
- **3.50** Simulation Model—A logical or mathematical description of the *functional* behavior of a particular device or assembly. When used with an appropriate simulator's engine, the *model* emulates the function of the device in the context of its specific application.
- **3.51 State**—One of a finite set of discrete *values* that an element of a *model* sallowed to have.
- **3.52 States**—A set of internal *variables* of a *model* or *model* component that are related by integration or differentiation, wherein the number of *states* is proportional to the order of differentiation.
- 3.53 Static Thermal Effects—A modeling technique including both ambient temperature and modifications to that temperature caused by self-heating of a component. Heat transfer out of the device and the effect of self-heating on the device's functional behavior are neglected. Thus, although the internal temperature is calculated and reported, there is no functional difference between static thermal and temperature-dependent behavior. See also Dynamic Thermal Effects, Temperature-Dependent Effects and Mutual Thermal Effects.
- 3.54 Steady-state—Conditions in a *simulation* which can be effectively extrapolated as being directly proportional to time beyond the end of simulated time.

- 3.55 Stress—A measure of a *property* or *model parameter* exceeding its desired or usual range.
 - 3.56 Subsystem—A system that is a part of a larger system.
- 3.57 System—A group of interdependent components which perform a function.
- 3.58 Temperature-Dependent Effects—A modeling technique wherein certain *model parameters* are represented via user input as being dependent upon ambient temperature. See also Static Thermal Effects, Dynamic Thermal Effects and Mutual Thermal Effects.
- **3.59 Template**—The master copy of a *model* from which *instances* are drawn. The *template* defines the *model*'s name, *interfaces*, attributes and behavior.
 - **3.60 Tolerance**—The allowable range of values of a *parameter* or *variable*.
- **3.61 Validation**—Testing a *model* via *simulation* to confirm compliance to requirements.
- **3.62 Value—**A single quantity associated with a *model property* at some converged stage of a *simulation*.
- **3.63 Variable**—A *model* quantity that is subject to variation with respect to time or internal *states* of the *model*. See also **Parameter**.
- 3.64 Waveform—A time series of data values. The values may be discrete or samples of a continuous waveform. The sequence of data values may represent a periodic function, a continuously-varying signal without any repetitive features or a combination of periodic and non-periodic features.
- 4. EE Commodity Analysis and Modeling Considerations—Automotive EE Commodities are electrical or electronic components of automobiles that are subject to procurement by automobile manufacturers. A structured list of automotive EE commodities is provided in Appendix A as a reference example of the range of electrical and electronic components that are considered to be automotive EE Commodities as of 1998.

The Requester shall specify analysis requirements for the EE Commodity subject to model procurement (and possible eventual commodity procurement). The R analysis requirements implicitly define most of the modeling requirements; however, the Requester may wish to define specific requirements for how modeling is to be accomplished within the context of the modeling and simulation tools specified in the analysis requirements. The following sections address the analysis requirements first, and then build upon that foundation in discussion of the modeling requirements.

4.1 Analysis Requirements—This section provides guidance as to what analyses the *Requester* will provide for in the model. Other chapters of the Specification define requirements for specifying model composition.

As applicable to a particular model, the analysis requirements defined by the *Requester* shall specify the following (each point is discussed in greater detail elsewhere in this document):

- a. The system context and tool environment in which the model is to be used (4.1.1, 4.1.2).
- b. Which commodity the model is to represent (Appendix A).
- c. Which aspects of the commodity are to be represented in the model (Section 5).
- d. Identifiers such as the filename model name and graphical symbol representation (9.1:144).
 - e. The connection points, along with the name, type and unit designation of each (6.2).
 - f. Model *arguments*, their names, unit designations, default *values* and definitions (6.6).
 - g. Existing models that may be used as sub-models within the model (7.2).
 - h. Existing models that serve as useful examples in the development of the model (6.3).
 - i. Properties or behaviors to be characterized within the model (5.2).
 - j. The modeling style or methodology that should be followed (9.1).
 - k. Any empirical data that should be directly incorporated into the model (8.2).
 - 1. Any physical principles that should be incorporated into the model (4.2).
 - m. Any test data or test conditions to be used in validating the model (Section 8).
 - The expected range of inputs and physical environments applied during simulation (6.5).
 - o. The model's response to overstress conditions (7.3.2).
 - p. Expected warning and error messages to be issued by the model (7.3).
 - q. Any special features desired in the model (5.2).

Each component model shall be validated by means of simulations providing deliverable data. These are intended to characterize the model's performance in the context of the actual component's physical environment as well as the model's simulation environment.

- 4.1.1 TYPES OF ANALYSIS—Several different types of analysis may be required for each commodity, at the discretion of the *Requester*. The electrical inputs, model *parameter* variations, and operating environments for each analysis level shall be defined by the *Requester* as part of the Analysis Requirements. The *Requester* shall specify which types of analysis must be performed by the Producer to provide a basis for verification and *validation*. Examples of common analysis types that may be required include the following:
 - a. Continuity and Loads Analysis, wherein the internal circuit paths and resistance of such paths are completely specified, and the *steady-state* currents drawn by the commodity are determined by the *model producer* for the specified input voltage ranges.
 - b. **Nominal Analyses**, wherein the electrical inputs and operating environments of the commodity are within the range of normal usage and the model parameters and inputs are not stochastically represented, the ranges of the electrical inputs and the operating environments shall be defined in the analysis requirements, nominal analyses may include:
 - 1. DC analysis.
 - 2. Transient analyses such as step response.
 - Frequency-domain or Fourier analysis including frequency response in the form of Bode or Nichols analyses, and stability analyses including root loci and eigenvalues.
 - Stress Analysis, wherein the performance of individual components within
 a circuit or system is evaluated for operation outside of accepted electrical,
 thermal or mechanical limits.
 - d. Perturbation or Sensitivity Analyses, wherein the performance results are subjected to statistical or operating-band characterization, while the model parameters, inputs, and operating environments are not subjected to stochastic or deterministic variation from the norm. Modeling of electrical noise and its associated effects may be required.
 - e. Worst-Case Analyses, wherein simulations are accomplished with the model parameters, inputs, and operating environments applied at their upper and lower extremes.
 - f. Failure Modes and Effects Analyses (FMEA), wherein failure modes of the commodity are identified, represented in the model, and simulated to determine the model outputs over a range of parameter values, electrical inputs and operating environments.
 - g. Sneak Circuit Analysis (SCA), wherein an unintentional current path or voltage level caused by a switch-state combination, also referred to as a circuit state (whether under failure or no failure conditions), or an unanticipated interaction between components may cause an undesired function to occur or inhibit a desired function.
- 4.1.2 ANALYSIS METHODOLOGY AND SIMULATION TOOLS—The Requester shall specify which analysis tools the Producer is to use, making sure that they are identical to those used by the Requester for purposes of verification and validation. The range of applications covered by commercially-available modeling and simulation tools is comprehensive, as indicated by the following examples of generic applications and associated languages:
 - a. Analog hardware description language or AHDL (Examples: Saber/Mast, Spice, P-Spice, Simplorer)
 - b. Digital hardware description language such as VHDL or Verilog (Example vendors: Synopsis, Mentor, Verilog)
 - c. Mixed Signal hardware description language or VHDL-AMS (IEEE VHDL1076.1)
 - (Examples: Saber/Mast, Accusim II, Simplorer, hAMSteR)
 - d. Block Diagram or Dataflow programming (Examples: MATRIXx, Simulink, Easy-5, ACSL, Simplorer)
 - Examples: MATRIXX, Simulink, Easy-5, ACSL, Simplo Statecharts or *State* Transition Diagrams
 - (Examples: Statemate; Betterstate, MATRIXx/SystemBuild, Simulink/Stateflow, RDD2000, ObjecTime, Simplorer)
 - Network modeling applied to quantitative flow (cost, power, energy, etc.).
 problems
 - (Examples: Directed Graphs, BondGraphs, MPORT, Opnet)
 - g. Mechanical dynamics modeling environments (Examples: ADAMS, DADS, IDEAS, ANSYs)
 - Mathematical-language behavioral programming (Metalanguage or scripting capability)
 - (Examples: Mathcad, MATRIXx/ Xmath, MATLAB, Maple, Mathematica)
 - Higher-Order-language (HOL) programming in a binary-compilable language
 - (Examples: C, C++, Ada, Fortran, JAVA, LISP, PERL, FORTH)
- **4.2 Modeling Considerations**—The analysis requirements defined by the *Requester*, as above, fully define the form and extent of analyses to be performed.

However, many automotive EE Commodities contain multiple differentiated components, and may require multiple modeling domains to properly model and simulate the desired behaviors. Such commodities generally require special modeling techniques to correctly capture the desired attributes in simulation, as discussed in the following subsections.

- 4.2.1 MODELING OF WHOLLY ELECTRICAL COMMODITIES—Whenever a subject automotive electrical or electronic commodity can be modeled entirely as an electrical circuit, the *Requester* should require the Producer to utilize digital, analog, or mixed-signal circuit modeling and simulation tools to implement the model and perform the required analyses. Wholly Electrical Commodities may consist of simple electrical components (resistors, capacitors, inductors, transistors and diodes), electrical networks composed of such components, and integrated circuits in the form of analog devices, mixed analog/digital devices and digital processing units. Electronic Control Modules (ECMS) are also considered to be Wholly Electrical Commodities, although their complex logical behavior requires some special consideration (4.2.4).
- 4.2.2 MODELING OF MECHATRONIC COMMODITIES—Mechatronic commodities embody some combination of electrical and physical (non-electrical) inputs, outputs, or internal functions, and are generally actuators, sensors, or electrical relays or fuses. Actuators utilize electrical inputs to produce exogenous effects such as mechanical forces and associated motion, fluid (gas or liquid phase) transport, or heat *generation*; examples include solenoids, solenoid or motor-driven valves, electric motors, ignition circuits, spark plugs and heating elements. Sensors convert the physical *states*, environments, or fluid compositions they are exposed to into electrical signals; examples include manifold pressure and temperature sensors, shaft angular position and speed sensors, and oxygen sensors.

Means of representing the mechanical inputs or outputs of mechatronic components must be defined by the *Requester* or specifically assigned to the Producer. This includes specification of parametric loads and load models to be applied to actuator outputs or sensor inputs.

The modeling and simulation environment/tools may have to support concurrent electrical circuit simulation, mechanical dynamics simulation, heat and fluid mass transport (thermodynamics and fluid dynamics) simulation, and arbitrary algorithm simulation. Most of the analysis and simulation tools listed above can represent most of these mixed-mode modeling and simulation requirements to varying degrees of fidelity. In some cases, co-simulation using multiple communicating modeling environments may be required. The Requester shall specify how the required modeling and simulation tools and tool-specific modeling methodologies are to be used in analysis of mechatronic commodities, including any application of co-simulation methods.

4.2.3 MODELING NON-ELECTRICAL ENTITIES IN THE CONTROL LOOP—Every closed-loop control system is composed of actuators, the controlled entity (the "Plant"), sensors, and a control processing element. Therefore, thorough analysis of actuator, sensor, and control processing commodities requires modeling and simulation of a controlled entity to an extent where cause-and-effect relationships between actuators and sensors are captured in the model. Examples of controlled entities include hydraulics and suspension/wheel dynamics associated with antiskid braking systems, and engines subject to control of ignition timing, injector pulsewidth and throttle position.

When controlled entities are relevant to the required analyses for actuator or sensor commodities, the *Requester* shall specify the modeling Level (as outlined in Section 5) as minimum, and consideration shall be given to the controlled entity model to be used. If the *Requester* is procuring a controller, models of controlled entities must represent their input/output gain and phase characteristics with sufficient *accuracy* that variation of the model *parameters* can represent all *instances* of behavior of the controlled entity. The modeling, simulation and analysis Requirements provided by the *Requester* shall clearly define the controlled-entity components to be modeled, as well as the modeling basis and modeling *accuracy* required. It may be adequate to represent non-electrical controlled entities using simple transfer functions.

4.2.4 MODELING OF CONTROL MODULES—Control Modules incorporate analog circuits, digital logic, or both. Examples of control modules include controllers for powertrains, ABS, power steering transfer cases, power steering, lighting, navigation and HVAC. A key property of these devices is they will typically include embedded software.

Modeling and analysis of the analog and digital electrical circuits may require an analog simulator, a digital system simulator that captures the device behavior down to the register transfer level, or a mixed-signal simulator that concurrently represents the analog and digital functionality of the device. Analysis of the logical and algorithmic functionality of the control module may require a gate-array simulator, or software representation of the logical behavior and algorithms in some higher-level simulation language such as VHDL, C, or a graphical block-

diagram or dataflow programming language that represents *state* transitions (control of *flow*) and algorithmic processes directly in the form of executable mathematical entities.

4.2.5 CONTROL SYSTEM MODELING—The *Requestor* shall specify the extent to which modeling and simulation of the complete control system shall be performed by the producer, including the control module simulation and simulations of the control actuators, the controlled entity and the sensors that feed information back to the control module. If closed-loop modeling and simulation is required, the *Requester* shall define the modeling *fidelity* level required for the actuators, sensors, and controlled entity, and either completely define these models or allocate their definition to the Producer.

It is often necessary to implement closed-loop simulations within a single modeling environment, which may require the transfer of models from one modeling environment to another. However, co-simulation standards such as CORBA (Common Object Reference Broker Architecture) are being adopted by several tool vendors, making it unnecessary to convert models from one environment to another if all of the modeling environments used have common co-simulation interfaces.

- 5. Modeling Fidelity Levels—Models can be classified according to sophistication, capability and captured intelligence. This is challenging because of the many dimensions of model fidelity, which may be sequential, parallel, independent, contradictory and/or redundant. Two such dimensions, model refinement and feature control, are each quantified on a scale of 0 to 7.
- **5.1** Levels of Model Refinement—The following level definitions provide a useful shorthand for discussing progressive stages of model *refinement*. Each successive level includes the capabilities of the previous levels. These broad categories range from no model at all, to a model representing all relevant dimensions. Finer distinctions of *refinement level* become difficult to classify in a *linear* progression.

level 0 - "Null" - no model exists -

No representation yet exists in electronic form.

level 1 - "Place" - A placeholder with identifying attributes but no connectivity or behavior -

deeps

This could be a database representation of a component, it may include name, description, part number, cost, etc. Such a representation could be used to generate bills of material, cost reports, size or reliability estimates of a system.

level 2 - "Pins" - A model with named *interfaces* to the external system, but no internal *features* -

A representation including the component's *interface* elements or pinouts. This could take the form of a schematic symbol of the component or a pinout table. Such a representation could be used to build a *system* design, a schematic diagram, to perform placement and routing, or for complexity analysis.

level 3 - "Paths" - a model with identification of internal *states* and connectivity, but no behavior -

This is the first level that allows the most basic forms of simulation, such as sneak circuit analysis. A model at this level contains qualitative information about the component's internal structure, its possible *states* and *flows*, but without quantitative definitions. For example, a relay has ON and OFF *states*, and conduction paths for the contacts, but no electrical resistance or *behavioral* coupling between coil and contacts.

level 4 - "Static" - a model with time-invariant, steady-state internal behavior

A model of this level has primary quantitative *properties*. It is typically useful for dc or *steady-state* ac analysis, but is not sufficient for transient analysis, for example, a motor armature might be treated as a resistor, or a wire could be treated as a resistance.

level 5 - "Dynamic" - a model with time-varying behavior -

A model of this level is suitable for transient analysis, and may include non-linear characteristics. This level captures the principal time-dependent behavior of the component, but may ignore more subtle effects. For example, a motor may have inductance, as well as mechanical effects like inertia and friction, but not cogging or backlash. A wire's resistance could vary with self-heating.

level 6 - "Precision" - a model with significant secondary behavior patterns - A model of this level goes beyond the primary requirements for time-varying behavior. A motor model might have core saturation, cogging, brush arcing, bearing wobble, etc. A wire could react to external thermal loading. A switch could have bounce, arcing, wetting current and aging effects.

level 7 - "Vector" - a model with directional or spatial interfaces -

A model of this level goes beyond one-dimensional lumped connection points to interface with neighboring components. it may use multiple connection points or a distribution function to achieve this. For example, a wire model may have an axial heat flow for each end plus a radial heat flow from the center. A lamp or antenna may have a radiation pattern.

Most models in general use would probably be in the range of levels 4 to 6. Levels 3 and 7 have more specialized applications. Levels 0 through 2 are not suitable for simulation, but support other types of design verification.

The level of refinement needed in a model can depend on the type of analysis to be performed or the application. Consider a solenoid model. In a level 4 context, the dc electrical resistance may be sufficient. In a level 5 context, it would include inductance. In level 6, electromechanical coupling and mechanical effects would be required and their effects reported.

A model could be regarded as having the *fidelity* level of its most central *feature* in the context of interest, but this does not necessarily signify the *fidelity* of individual *features* of the model. For example, a wire model may or may not have self-inductance at level 5, depending whether the intended applications cover a frequency range where inductance is significant. However, the wire model could still be classified as level 5, because it has time-dependent self-heating behavior. Feature-specific level classification is treated in the next section.

5.2 Levels of Feature Content—Similar level definitions may be used to describe individual model feature content, and thereby imply a level of intelligence contained in the model. There are several channels through which captured model features, including instance arguments, global parameters and connection points are referenced to internal variables. Examples of individual features include such effects as temperature dependency, manufacturing tolerance, aging efects, cycling effects and stress behavior in the model.

level 0 - "none" - feature not included in model -

For example, there may be neither temperature dependence nor manufacturing variation implemented in the model.

level 1 - "Named" *I feature* acknowledged in model, but not implemented For example, the temperature limit of wire insulation may be documented in the model (possibly as a comment), but there is no result from exceeding the limit, neither catastrophic change, nor *stress* ratio, nor warning *message*.

level 2 - "Fixed" - feature can be adjusted only by editing the model or by adjusting a non-related argument -

For example, as applied to the resistance of an element, the model has a fixed value. As applied to tolerance on the resistance, the nominal resistance might be specified by the user, but the model does not have a tolerance "perturbation" argument, nor does it respond to Monte Carlo commands. However, the user could resort to tweaking the nominal resistance argument to see the effect of tolerance.

level 3 - "Index" - feature offers a choice of discrete values or modes - For example, a tolerance feature might offer a choice of "min," "nom" and "max." An aging feature might offer "new," "fiveyears," "tenyears," "end-offlife," etc. A temperature dependent feature might offer "-40C," "25C" and "100C."

level 4 - "Static" - feature accepts any parameter value as set prior to simulation run -

For example, a resistance can be set to any positive real value by argument. A local ambient temperature can be set by argument. With respect to temperature dependence, the resistance would be affected by the local or global ambient temperature. An arbitrary statistical variation could be set prior to simulation, by argument, or by the simulator in Monte Carlo or worst-case analysis. With respect to an aging feature, an arbitrary age could be set prior to simulation and the component's behavior would reflect the predetermined degradation for that age.

level 5 - "Dynamic" feature adapts to internal conditions during simulation - For example, resistance could vary dynamically with self-heating, as would the device temperature. The effects of aging would run their course during the simulation, provided the time scale of the run is appropriately long. Notice that this last example suggests a need for a multi-level strategy to accommodate very short and very long time scales in the case of certain features like aging and cycling.

level 6 - "Mutual" - feature adapts to external influences during simulation - For example, the self-heating of a resistance is affected dynamically by heating or cooling from an external model, such as a heat sink. This would require a "thermal pin" or a co-simulation link. Aging or cycling effects could be accelerated by connecting a ramp generator to an "age pin."

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level 7 - "Directional" - feature adapts to directional external influences during simulation -

For example, a fuse could dissipate heat to both ambient air and through each of its terminals. A light sensor might respond to distance, angle and brightness signals from a light source model.

In general, the *feature level* of one model *feature* is independent of the *feature level* of other *features*. Therefore, each *feature* requires its own level classification. This can range from a *feature* not being included in the model at all, to fully automatic behavior based on information contained in the model.

The example of a simple resistor model can be used to show a variety of features: variation with temperature, manufacturing tolerances, aging, on/off cycles, temperature cycles, self inductance, noise, power rating and derating, thermal response, etc. Model features should be chosen in accordance with the intended applications.

5.3 Forms of Simulation Results—A model request may require results in a variety of forms. The form of result may depend upon the type of simulation performed on the model. The result may be available dynamically during the simulation run, or only at the completion of the simulation.

Common types of simulation results include the following:

- a. "Flag" a true/false, or pass/fail result.
- "Message" an event during simulation generates an informative textual output.
- "Scalar" a single value results from simulation with regard to the property.
- d. "Waveform" a series expressing the change in value of a variable over time or frequency.
- e. "Relation" a non-time series expressing the interaction of two or more variables (temperature, sensitivity, statistical distribution, etc.).
- f. "Link" dynamic transfer of simulation results among two or more simulators.
- 5.4 Diminishing Returns of Fidelity—A simulation model can never capture all aspects of a component's behavior. Even if it could, the computation cost would be prohibitive, as would the development time and cost. Therefore a model is designed to a limited level of fidelity, acceptable for a particular range of applications.

The most detailed model is not always the most applicable for a given objective. "Good" is relative to the needs of the analysis. The higher the level of features, the longer the simulation may take, the more likely convergence difficulties may be encountered during simulation, and the greater the cost and time needed to develop the model.

In fact, a detailed model built from a *hierarchy* of lower level component models may be less accurate than a *flat model* based on simple *behavioral* equations, because of accumulated error in the *hierarchy*.

5.5 Accommodating Different Fidelity Needs in a Model—To specify model requirements, it is first necessary to determine the desired level of model refinement for the intended application. Then, the desired model's features should be specified with associated levels of feature content for each.

There are several ways to maintain versatility in model fidelity:

- a. Use a model having an argument that switches certain features on or off.
- b. Maintain separate models for different kinds of analysis.
- Generate models on demand from a higher-level description or a userinterface tool.
- 6. Model Assumptions—This section defines the macroscopic conditions within which the model will be expected to operate. The conditions include the units of measurement, the connection types, the external conditions that will be applied to the model, the input/output specifications and compatibility issues.
- **6.1 Units of Measurement—**Units of measure shall be defined for all input and output *parameters* of the model, including *messages*; SI units are preferred.
- **6.2 Connection Type Definition**—This section will be used to define the types of *connections* to the model, such as electrical, mechanical, hydraulic, etc., and the names of *connection points* that will be referred to from other models and from within this model. The *Requester* shall specify allowable *connection types* for the producer to use in the deliverable simulation models.

A connection is defined as a point from which information is allowed to flow into or out of the model. These connection points are commonly referred to as "pins." For models where conservation principles are used in the system solution, the pins define the only points at which the conserved quantity (current, fluid flow, etc.) can enter or leave the model. For models where nonconservative quantities are used, pins represent local data flowing into or out of the device, and any variable required for use in another model should be defined as a pin.

ROUTERBOOK (GERTADE LEAVEDONE) OF STOLEN ENTER A TEXT TABLE 1—CONNECTION TYPE EXAMPLES

Connection Type	Name	Description	Units
Electrical	Out	Output pin of the device	Volts, Amps
Thermal	Th	Thermal connection to bulb	° C, Watts
Mechanical - rotational	Shaft	Motor shaft speed & torque	Rad/s, N-m
Data flow	Error	Output error signal	(data dependent)

The component and *system* modeling environments available *feature* a variety of ways to represent communication of electrical signals and data between components. For example, the electrical *connection type* (or "electrical pin") captures the behavior of an electrical *connection*. The connection has the attributes allowing current or signals to *flow* in either of two directions, and the *flow* of current in response to potential difference is represented in accordance with fundamental electrical rules (Kirchoff's Voltage and Current Laws, etc.).

6.2.1 STANDARD SIGN CONVENTION—To ensure compatibility between models, the standard conserved quantity *flow* shall be defined as positive when it *flows* into a *connection point*, negative otherwise. This standard interpretation applies to conserved component models, which require mechanical, thermal, hydraulic, and/or other types of *connections* wherein continuity conditions are enforced on both sides of component *interfaces*.

Non-conserved models will employ simpler dataflow connections wherein components are defined as having distinct data inputs and outputs that flow in one direction between components. No sign convention is required for these connection types, as the value of the unidirectional signal determines its sign.

For quantities where the sign is relevant to a physical interpretation of the model, such as the rotational direction of a motor, the *Requester* shall specify the *connection points* so as to conform to the desired physical interpretation as well as the sign conventions defined above.

- **6.3 Reference**—This section is used to identify any referenceable source of information to be used in defining the model.
- 6.4 Modeling Assumptions—This section should detail any assumptions regarding what model behaviors are to be represented. Behaviors such as thermal effects should be documented as being either considered in detail or simplified. In addition to the positive assumptions about included model behavior, it is important to specify any negative assumptions about which behaviors or technologies are to be neglected.
- **6.5 Environmental And Operating Conditions**—Describe the environmental and operating conditions that will be applied to this model. These shall include all valid regions of operation, such as temperature ranges, voltage ranges, minimum and maximum torque, or pressure.
- **6.6 Input Parameters**—Parameters are those values that are fixed for the duration of a particular simulation run. The Requester shall define the simulation model's input parameters and valid ranges for each. This includes parameters that represent characteristics of the component as well as those implementing control of the model.

TABLE 2-INPUT PARAMETER EXAMPLES

Parameter			Parameter Description
Cable	PVC	None	'Class (insulation, wall)
Gauge TempC	None 27	emile C	List of wire sizes Ambient Temperature
Messages	ON	°C [ON OFF]	Enable or disable messages

6.7 Supplementary Output *Variables*—Specify the desired output *variables* that must be made available from the model. Output *variables* consist of internal model *variables* that are made available as part of the simulation results. It is also possible to specify an optional valid range for each output to be used in *message* creation.

TABLE 3—SUPPLEMENTARY OUTPUT VARIABLE EXAMPLES

Variable	Allowed	l Range L	Jnits	Variable Description
RPM	0 to 4000	Revolution	ons/minute M	lotor speed
Speed	Any	/0 and Share Km/Hou	r V	ehicle Speed
TempC	-40 to 125		. D	evice temperature
The state of the s	11. ACC 1383 677	77 C 1 J 221 7 11 a	Committee and a second	and a few middle of the

7. Model Architecture—This section outlines the general requirements for requesting and developing standard simulation model architectures. Wwhereas the previous section described assumptions about the model's environment and

external interfaces, this section is concerned with internal model characteristics, which dictate how the model responds to its simulated environment. Included are functional requirements for input and output signals, and basic requirements for defining component behavior. in each case, the model and feature level designations will determine the degree of detail required in its behavior.

signals to a model shall be defined as external connections. The model specification should make it clear whether time-invariant connections, such as power supply and ground signals, should be considered as external connections. All time-varying output signals corresponding to an electrical or other transport property output of the model, including logic and dataflow outputs, shall also be defined as external connections.

Any limitations a model may impose on an input signal (such as frequency or magnitude) should be clearly identified. Input or output conditions that would result in damage to the physical device should, at a minimum, generate a warning *message*. Depending on the model requirements, the model may also exhibit appropriate output behavior, device failure effects or other phenomena in response to an excessive internal condition.

Input and output signals can be defined as logic *states*, dataflow inputs, conserved electrical *connections* or conserved non-electrical *connections*. External signal handling in a model will be implemented as a function of model and *feature levels*, as defined in Section 3.

7.2 Model Internal Requirements—The purpose of the model is to use mathematical and/or logical constructs to emulate the *functional* behavior of the component to a degree mandated by the requested model level. Within the constraints imposed by input and output considerations detailed in the previous section, the model may use any capabilities available in the target simulator to implement the required functionality. If possible, model functions should be independent of factors outside the simulation environment, such as computer type, operating system, software language compiler or simulator version. If this is not possible, any external *dependencies* should be clearly defined in the *documentation*, and some means should be provided to allow use of the model outside its native environment, aAs an example, source code should be provided to the *Requester* for any software *procedures* used in a model.

If supported by the simulation tool, the model may reference subsidiary models or *procedures* to implement common behaviors. For example, a network of passive electronic components could be used to implement input impedance, the type and interconnection of subsidiary models need not correspond to structures in the physical device; *behavioral accuracy* is the sole objective. In some cases, the entire model will be made up of subsidiary models or *procedures*, with no mathematical or logical expressions at the topmost level of model definition. These *macromodels* enable the reuse of standard components for model development, and may reflect the physical structure of the device to allow greater insight into the internal operation of the component.

The description and implementation of model internals shall be specified, either explicitly or as an implicit function of model and *feature levels* as defined in Section 5.

7.3 Textual Messages—Certain conditions encountered by a model are of sufficient interest to be brought to the operator's attention. Textual messages may be displayed on the terminal, placed in a message file, presented in a separate window or issued by other means, depending on the capabilities of the simulation environment and the requirements of the Requester.

In general, messages should be issued only once, when the specified condition is first detected. However, the Requester may require that a message be issued periodically or each time the condition is detected. Except in the case of error messages, it should be possible to turn the display of messages on or off by means of a flag or model parameter.

- 7.3.1 INFORMATIONAL MESSAGES—Informational *messages* may be issued when a condition arises which is not critical to the *accuracy* or operation of the model, but nevertheless is of particular interest to the end user. Examples might be a change in operating mode ("airbag squib fired") or a unique operating condition ("ignition switch in START position").
- 7.3.2 OVERSTRESS MESSAGES—When models are subjected to conditions such as voltage, current, heat or power dissipation that cause a monitored *value* to go out of normal operating range, the model may be required to write a *message* to the *system* output describing the overstressed condition.
- 7.3.3 WARNING MESSAGES—Warning *messages* may be required whenever a condition occurs which is critical to the *accuracy* or operation of the model, but not fatal to the simulation run. The model may have warning *messages* similar to the following:
 - a. Model is being operated outside its validated range.
 - b. Model does not support this application.

- c. Model accuracy degraded in this region of operation.
- 7.3.4 ERROR MESSAGES—An error *message* will be issued, and the simulation run shall be aborted, when a condition occurs which compromises the validity of the entire simulation. In developing the model, effort should be devoted to avoiding conditions where a fatal error is possible. For example, model code should be arranged to detect and prevent divide-by-zero errors. At the level of the individual model, error *messages* are usually implemented for unspecified, invalid, or out of range input *parameters*.
- 8. Validation Requirements—This section outlines the validation requirements for the simulation model, assuming that the model corresponds to an existing physical component. The Requester shall require the Producer to perform validation of the subject model and correlate the model's response to empirical data in the model deliverables, as defined in 9.1.
- **8.1 Functional Test Procedures**—This section shall define the test *procedures* to verify that the behaviors specified for the model were in fact implemented as required. These tests normally include qualitative functions such as *functional* testing in various system configurations, *parameter* handling, operating range verification and *messaging* functions.
- 8.2 Characterization Test Procedures—This section shall define the test procedures and equipment used to collect quantitative data for purposes of component characterization. The procedures relate the parameters of the device model to readily obtainable device data. The Requester may require the Provider to perform component characterization tests, and may further specify how the characterization is to be accomplished. The Requester may also specify a representative sample size to verify the statistical validity of the measured device data.
- **8.3 Data Reduction Procedure**—If the component characterization data is processed in any manner more involved than observing the average and spread of directly observable quantities, then the characterization data reduction *procedure* must be detailed in the *documentation*.
- 8.4 Validation Procedure and Data—This section shall determine the accuracy of the model relative to the empirical data acquired from the physical device. The data to be used for validation shall consist of component validation data and simulation test data. Tests and procedures employed to obtain both kinds of data shall be outlined. The relative correlation of simulation test data against component validation data shall be documented. Any physical device data generated by the producer, as well as a description of the test fixtures used, shall also be included.
- **8.5 Validation Criteria**—This section defines what it means for the model to have good correlation with the test data, proving that it is an acceptably accurate model according to the *Requester's* specifications. Correlation criteria apply to the characterized model rather than the base model, since only a specific model can be compared against empirical test results.
- 9. Deliverables—This section outlines the deliverables required of the model producer relative to the simulation model(s) created for the model Requester. The associated files, schematics and block-diagrams of the model(s) as well as the documentation for the model(s) are detailed. A printout of the netlists, templates, schematics, block diagrams, and/or flowcharts shall be provided as appropriate to the model.
- **9.1 Model Deliverables**—The Producer shall be required to deliver models and modeling information to the *requester* in accordance with the following list of deliverable items:
 - a. Model Source code, as defined in 9.1.1 and provided both electronically and as hard copy as agreed upon with the *Requester*. The *Requester* should define the methods to be used to transfer information; either by electronic file transfer (internet/intranet) or physical media (CD-ROM, 3.5" disk, etc.).
 - Copies of schematics, flowcharts and/or block diagrams where applicable.
- 9.1.1 SOURCE CODE—All *netlists*, model-files that correspond to specified modeling and simulation tools, and external routines created to model the component are defined as source code and shall be provided to the *Requester*. Data encryption may be employed at the mutual agreement of *Requester* and producer.
- 9.1.1.1 Header—Source code provided in the form of statement lists, including netlists, ASCII model-files, and external routines, shall contain a header conforming to the Requester's requirements. a representative example is shown in Appendix B. Source code that defines the model in a graphical programming environment shall incorporate the content of the header in a comment block or other commenting feature of the modeling environment.
- 9.1.1.2 Comments—Source code shall contain sufficient comments to be understandable and useable to an experienced analytical engineer. Comments shall include definitions of input and output arguments, definition of units, node connections, and the valid range of operation where appropriate. For deliverable

source code associated with a graphical programming environment, comments shall be incorporated into the comment fields of individual blocks or other documenting *features* of the environment.

9.1.1.3 Programming Languages—Models shall be implemented in the required modeling environment and/or language, as specified by the Requester.

Use of foreign routines or external support code should not be used unless specifically permitted by the Requester.

The range of application domains covered by commercially available modeling and simulation tools is comprehensive, as indicated by the list of generic application domains and associated languages provided in Section 4 of this document.

- 9.1.1.4 Drawing Symbols—Schematic symbols corresponding to the model code shall be supplied as specified by the Requester. the symbol will exhibit connection points and properties appropriate to the model, and shall reference the model code by either naming convention or property value. the symbol graphics shall conform to drafting standards supplied by the Requester, if applicable.
- 9.1.2 SUPPORTING DELIVERABLES—Supplemental tools to be used by the model Producer may be specified by the *requester*. Any supplemental schematic drawings, spreadsheets, flowcharts, command scripts, test files, etc. shall be included in the model deliverables. *Functional* block diagrams, if required, may be prepared and submitted in any "draw" program or formal block-diagram programming environment the model Producer finds to be suitable, but the deliverable graphics file shall be represented in Postscript or other standard graphics language.

Schematics and *functional* block diagrams may also be provided in hardcopy format.

- **9.2 Documentation**—All model *documentation* shall indicate the current level of model release. Model *documentation* shall be supplied per the *Requester's* specifications. At a minimum, the *documentation* should address both model applications (applying the model in a *system* analysis) and model support (continuing model development and support).
- 9.2.1 MODEL APPLICATION DOCUMENTATION—This documentation shall be directed toward analytical engineers applying the model in a *system* analysis.
- 9.2.1.1 Description—This section shall include the functional description of the model. it shall include all the model's equivalent circuits, functional block diagrams, algorithms, parameters and simulation methods, as applicable.
- 9.2.1.2 Netlist or Dataflow Hierarchy—This section shall describe how the circuit models are embedded in the circuit netlist, or otherwise reveal the hierarchical structure of the model.
- 9.2.1.3 Input Parameters—This section shall include a table that will list: name (default), type, units and description of all the model's input parameters.
- 9.2.1.4 Connection Points—This section shall include a table that will list: name, type and description of the model's connections between circuit or functional elements.
- 9.2.1.5 Output Variables—This section shall include a table that will list: name, type, units and description of the model's output variables.
- 9.2.1.6 Usage Notes—This section shall describe how to use the model. A truth table shall be included, if applicable. It shall also describe the model output messages (such as warning and error messages) as applicable.
- 9.2.2 SUPPORT DOCUMENTATION—This documentation shall be directed toward experienced analytical engineers providing model support and continuing development. The support documentation shall describe the development and implementation of the model. This documentation shall explain the concepts used in the development of the model, the methods used to verify its accuracy and how this model can be used in a simulation.
- 9.2.2.1 Model Features—This section shall describe the modeling domain features, as applicable.
- 9.2.2.1.1 Connection Points—The type of *connection points* involved, such as electrical, mechanical or hydraulic *connection points* shall be defined. These *connection points* may be defined as "pin types," meaning that they handle through and across *variables*.
- 9.2.2.1.2 Parameters—Specify whether the model requires any internal *parameters*.
- 9.2.2.2 Template Usage—This section should reference the application documentation which contains the description of the input and output variables.
- 9.2.2.3 Model Limitations—This section shall summarize the operational range, accuracy and underlying assumptions made during model development.
- 9.2.2.4 Model Theory—This section shall describe the model theory in detail. it shall include all the appropriate diagrams along with their functional description. It shall include the transfer function that characterizes the behavior of the model.

- 9.2.2.5 Characterization Test Procedures and Data—This section shall outline the process used in gathering data for the model, it shall describe all test fixtures, instrumentation, required environmental conditions and procedures used to acquire the desired data.
- 9.2.2.5.1 Equipment Used—This section shall list all equipment used in testing the model and physical device.
- 9.2.2.5.2 Data Acquisition Procedure—This section shall describe the test fixtures and equipment arrangements used in acquiring data for the model. The procedures employed in gathering data shall be outlined. Test fixture schematics shall also be included under this section.
- 9.2.2.6 Model Validation Data-Validation data shall be provided in accordance with the requirements set forth in Section 8 of this document.
- 9.2.2.7. Model Datafile-This Section shall include the actual model datafile representing the device in the selected modeling environment, written in ASCII format,
- 9.2.2.8 Appendices—All raw test data used to validate the model shall be contained in an appendix. Additional appendices should be used for additional information, as deemed appropriate.
- 9.3 Support—The Producer shall provide support after delivery of the final model, as required by the model Requester. made q or resolved and unbases which is the properties as we are seen business and

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APPENDIX A Life in the control of th

A.1 Automotive EE Commodities are electrical or electronic components of automobiles that are subject to procurement by automobile manufacturers. A structured list of automotive EE commodities is provided below, wherein the toplevel commodity is defined as a generic component, and specific components are grouped as Sub_Classes under an application Class heading. The listing provided is fairly comprehensive down to Sub_Class I, but only a few instructive examples are provided at Sub_Class II. This list is not claimed to be fully comprehensive, and is only intended to illustrate the extent of automotive ee commodities that may be subject to modeling and simulation.

A,2 Electronic Modules (EE Commodities)

- A.2.1 Body (Class)
 A.2.1.1 AUDIO (SUB_CLASS I)
 A.2.1.2 CLIMATE (SUB_CLASS I)
- A.2.1.3 MEMORY SEAT (SUB_CLASS I)
 A.2.1.4 SECURITY (SUB_CLASS I)
 A.2.1.5 OTHERS... (SUB_CLASS I)
 A.2.2 Chassis (Class)

- A.2.2 Chassis (Cubs Library A.2.2.1 Brakes (Sub Chass I) and the chass I) and I are chass II are chass
- A.2.2.3.1 Speed Sensitive (Sub_Class II) A.2.2.3.2 Power Assist [Electric] (Sub_Class II)
 A.2.3 Lighting (Class)

- A.2.4 Power Train (Class)
 A.2.4.1 ENGINE (SUB_CLASS I)
 A.2.4.2 TRANSMISSION (SUB_CLASS I)
 A.2.4.3 TRANSFER CASE (SUB_CLASS I)

A.2.5 Safety (Class) - transmiss size our set to subdict the find eggs for the

- A.2.5.1 AIR BAG (SUB_CLASS I)
- A.2.5.2 COLLISION AVOIDANCE (SUB_CLASS.I)

- A.2.5.2 COLLESION AVAIDANCE (SUB-CLASS I)

 A.2.5.3 OTHERS... (SUB-CLASS I)

 A.2.6 Switch Modules (Class)

 A.2.7 Communication (Class)

 A.2.7.1 MULTIPLEXERS (SUB-CLASS I)

 A.2.7.2 GATEWAY (SUB-CLASS I)
- A.2.7.3 OTHERS: (SUB_CLASSI) WAS LESSED A CONTROL OF THE CONTROL O

- A.2.8 Miscellaneous Modules (Class)

 A.3 Sensors (EE Commodities)

 A.3.1 Air Flow (Class)

 A.3.1.1 MANIFOLD [MAF] (SUB_CLASS I)
- A.3.1.2 OTHERS... (SUB_CLASS.I)

A.3.2 Temperature (Class)

- A.3.2.1 COOLANT (SUB_CLASS I)
 - A.3.2.1.1 Positive Temperature Coefficient [PTC] Resistors (Sub_Class II)

and the comment of the

- A.3,2.2 Manifold Air [MAT] (Sub_Class I)
- A.3.2.3 Transmission (Sub_Class I)
- A.3.2.4 AMBIENT AIR (SUB_CLASS I)
- A.3.2.4.1 Non-linear Negative Temperature Coefficient [NTC] Thermistors (Sub_Class II) on oth one whose the share room a fell any of the swinging S.S. S.

- A.3.2.5 BATTERY (SUB_CLASS I)

 A.3.2.6 FUBL (SUB_CLASS I)

 A.3.2.7 SUN LOAD (SUB_CLASS I)

 A.3.3 Pressure (Class)

 A.3.3.1 MANIFOLD AIR [MAP] (SUB_CLASS I)

 A.3.3.2 ENGINE OIL (SUB_CLASS I)

 A.3.3.2 AIR CONDITIONER FILLID (SUB_CLASS I) A.3.3.3 AIR CONDITIONER FLUID (SUB_CLASS I)
 - A.3.3.4 SUPERCHARGER BOOST (SUB_CLASS I)

- and the contract of the contract of the property of the contraction of the fundament of the contract of the co A.3.3.5 FUEL RAIL (SUB_CLASS I)
- A.3.3.6 OTHERS... (SUB_CLASS I)

- A.3.4 Load/Strain (Class)
 A.3.4.1 PIEZOELECTRIC (SUB_CLASS I)
 A.3.4.1.1 Knock (Sub_Class II)
 A.3.5 Resistive (Class)
 A.3.6 Displacement (Class)
- A.3.6.1 LINEAR VARIABLE DIFFERENTIAL TRANSFORMER [LVDT] (SUB_CLASS I)

 A.3.6.1.1 Throttle Position (Sub_Class II)

 A.3.6.1.2 Transmission Range (Sub_Class II)

- A.3.7 Rotation (Class)
- A.3.7.2 VARIABLE RELUCTANCE (SUB_CLASS I)
 - A.3.7.2.1, Magnetic (Sub_Class II)
- A.3.7.3 TACHOMETERS [GENERATOR] (SUB_CLASS I)
- A.3.7.4 PAIRED LIGHT EMITTING DIODES AND PHOTO DETECTORS (SUB_CLASS.I) . Describe the second action to the second action of the second field and the s

- A.3.8.1 ACCELEROMETERS (SUB_CLASS I) for the state of a state of the s
- C.A.3.8.2 GYROS (SUB_CLASS I) Configuration of the respection of the principle

A.3.9 Composition (Class)

- A.3.9.1 OXYGEN [EXHAUST] (SUB_CLASS I)
 - A.3,10 Fluid Level (Class)
- A.4 Actuators (EE Commodities)
- A.4.1 Air Conditioning Clutch (Class)

 A.4.2 Squibs/Igniters (Class)

 A.4.2.1 Air BAGS (SUB_CLASS I)
- A.4.3 Motors (Class)
 A.4.3.1 STEPPER (SUB_CLASS I)
- A.4.3.2 DC PERMANENT MAGNET FIELD (SUB_CLASS I) A.4.3.3 DC BRUSHLESS (SUB_CLASS I)
- A.4.3.4 DC SERIES WOUND FIELD (SUB_CLASS I)
- A.4.3.4.1 Starters (Sub_Class II)
- The total A.4.4 Pumps (Class) in the control of the state of the control of the c

- A.4.4.1 FUEL (SUB_CLASS I)

 A.4.5 Solenoids (Class)

 A.4.5.1 STARTER (SUB_CLASS I) A,4.5.2 TRANSMISSION SHIFT (SUB_CLASS I)
- A.5 Interconnects (EE Commodities)
 - A.5.1 Splices (Class)
- Land (A.5.2 Terminals (Class) i puolise, varialisvolik et a la progradi ad
 - A.5.3 Connectors (Class)
- A.5.4 ClockSprings (Class)
 A.5.4 ClockSprings (Class)
 A.5.5 Fiber-Optics (Class)
 A.6 User Electronics (EE Commodities)
 A.6.1 Navigation Systems (Class)
 A.6.2 Cellular Phones (Class)
 A.6.3 Entertainment Systems (Class)
 A.6.3 I RADIO AND ANTENNA (SUB_CLASS I)
 A.6.3.2 SPEAKER (SUB_CLASS I)
 A.6.3.3 TAPE PLAYER (SUB_CLASS I)

- A.6.3.3 TAPE PLAYER (SUB_CLASS I)
 A.6.3.4 COMPACT DISK PLAYER (SUB_CLASS I)
- A.7 Digital Communication Sub-System (EE Commodities)
 - A.7.1 J1850 Class II (Class) A.7.2 CANbus (Class)
- class A.7.3 PCM Driver (Class)

Astonoficasian.

A.7.4 RS232 (Class)

A.7.5 Ethernet (Class)

A.8 Power Generation and Control (EE Commodities)

A.8.1 Alternators (Class)

A.8.2 Battery (Class)

A.8.3 Fuses (Class)

A.8.3.1 THERMAL FUSES (SUB_CLASS I)

A.8.3.2 FUSIBLE LINKS (SUB_CLASS I)

A.8.4 Circuit Breakers (Class)

A.8.4.1 POLYMER POSITIVE TEMPERATURE COEFFICIENT THERMISTORS [PPTC] (SUB_CLASS I)

A.8.4.2 BI-METALLIC (SUB_CLASS I)

A.8.5 Relays (Class)

A.8.6 Switches (Class)

A.8.6.1 BASICS (SUB CLASS I)

A.8.6.1.1 SPST, SPDT, SP3T, ... (Sub_Class II)

A.8.6.1.2 [One or More in a Package] (Sub_Class II)

A.8.6.2 ASSEMBLY (SUB_CLASS I)

A.8.6.2.1 Others... (Sub_Class II)

A.8.7 Voltage Regulators (Class)

A.9 Alarm and Display (EE Commodities)

A.9.1 Indicator Bulbs (Class)

A.9.2 Light Emitting Diodes (Class)

A.9.3 Buzzers (Class)

A.9.3.1 CHIMES (SUB_CLASS I)

A.9.4 Liquid Crystal Displays (Class)

A.9.5 Flasher (Class)

A.9.6 Gauges (Class)

A.9.6.1 AIR CORE GAUGES (SUB_CLASS I)

A.9.6.2 STEPPER MOTOR GAUGES (SUB_CLASS I)

A.9.7 Horn (Class)

A.10 Illumination (EE Commodities)

A.10.1 Single Filament (Class)

A.10.1.1 TURN SIGNAL (SUB_CLASS I)

A.10.1.2 PARKING (SUB_CLASS I)

A.10.1.2 PARKING (SUB_CLASS I)
A.10.1.3 DOME (SUB_CLASS I)

A.10.1.4 MAP LIGHT (SUB_CLASS I)

A.10.1.5 FOG (SUB_CLASS I)

A.10.1.6 HEAD LAMPS (SUB CLASS I)

A.10.1.7 TAIL LAMPS (SUB_CLASS I)

A.10.2 Double Filament (Class)

A.10.2.1 HEAD LAMPS (SUB_CLASS I)

A.10.2.2 TAIL/STOP/TURN SIGNALS (SUB_CLASS I)

A.10.2.3 PARKING/TURN SIGNALS (SUB_CLASS I)

A.10.3 Light Emitting Diodes [LEDS] (Class)

A.10.4 High Intensity Discharge [HID] (Class)
A.10.4.1 HEAD LAMP (SUB_CLASS I)

A.10.4.2 CENTRAL LIGHTING (SUB_CLASS I)

A.10.5 Light Transmission Devices (Class)

A.11 Basic Electronic Components (EE Commodities)

A.11.1 Coils/Inductors (Class)

A.11.2 Diodes (Class)

MAG.

A.11.3 Transistors (Class)

A.11.4 Resistors (Class)

A.11.5 Capacitors (Class)

A.12 Power Distribution (EE Commodities)

A.12.1 Wires and Cables (Class)

A.12.1.1 BARE [SOLID AND STRANDED] (SUB_CLASS I)

A.12.1.1.1 Ground Strap (Sub_Class II)

A.12.1.2 INSULATED (SUB_CLASS I)

A.12.1.2.1 Single (Sub_Class II)

A.12.1.2.2 Twisted Pairs (Sub_Class II)

A.12.1.2.3 Bundled (Sub Class Ii)

A.12.1.2.4 ClockSprings (Sub_Class II)

A.12.1.3 SHIELDED (SUB_CLASS I)

A.12.1.3.1 Coaxial Cables (Sub_Class II)

A.12.2 Grounds (Class)

A.12.3 Electrical Distribution Boxes (Class)

A.12.4 Wiring Harnesses (Class)

A.13 Heaters (EE Commodities)

A.13.1 Glow Plugs (Class)

A.13.2 Heated Element (Class)

A.13.3 Resistive Film (Class)

A.13.3.1 HEATED BACKLIGHT (SUB_CLASS I)

A.13.4 Resistive Wire (Class)

A.13.4.1 HEATED BACKLIGHT (SUB_CLASS I)

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(ELECTIVE POPE) PROFILE APPENDIX B TUCOLO CONTRA PARTE PART (See a control Example Saber modelfile Header Layout

RESPECTATION

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B.1 See Figure B1.

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FIGURE B1a-

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                                                                                                      # be foreign subroutines, external functions, sublevel templates when hierarchy is used, and special units
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