Data Stream of Toyota / Lexus Cars by "Heavy" Scan Tools Display

При поиске неисправности современного автомобиля решающее значение имеет достоверная проверка и анализ диагностических данных силового привода – "Current Powertrain Diagnostic Data" (Live Data, Data Stream). При этом обязательно знание/понимание сути терминов и содержания параметров, считываемых с помощью диагностических сканеров.

Для **Generic Scan Tools** перечень параметров доступных в режиме Mode $01 безусловно большой, но к сожалению во многом недостаточно полный. Действительно можно проверить три группы фактических и расчетных значений параметров системы в текущий (настоящий) момент времени. Объем (количество) информации зависит от типа двигателя, региона продажи, года выпуска и производителя автомобиля и наличия соответствующих систем. Объем мнформации получаемых с помощью этих сканеров позволяет определить/подтвердить проявление (наличие) проблемы, но иногда его не достаточно для проверки всех возможных причин ее появления.

Группа I. В этой группе отображаются, фактические величины аналоговых и цифровых сигналов датчиков и устройств и выводятся эти и другие параметры (PID-**P**arameter **I**dentification **D**ata):

Группа II. Блок данных о состоянии системы, в котором указываются состояние лампы индикатора «Check Engine» («MIL ON/OFF»), количество кодов неисправности («Numbers of DTC»), пробег автомобиля после активации этого индикатора и после включения зажигания; пробег, количество заведений и циклов прогрева двигателя после стирания кодов неисправности, температуру, тип системы самодиагностики и т.д.

Группа III. Статусы («флаги регистров») бортовых мониторов/тестов (Vehicle Readiness Test Status), Возможны варианты состояния (System Readiness Test): «INCMP» или «CMPLT».

Тем не менее, ECM содержит намного более полную информацию. Так называемые «Non-legislated diagnostic messages» определены в SAE J2190/ISO 14229 и относятся к "Manufacturer-Specific" тестам и считыванию Manufacturer-Specific Data (Mode $22*). При этом могут использоваться Obtain packets of PID Data (Rapid Data, Mode $2A и $2C). Практически все автопроизводителя информируют Equipment and Tool Institute (ETI) и объединение производителей диагностического оборудования об этих дополнительных возожностях

Таблица 1. определения параметров, считываемых полноценными диагностическими сканерами.

Параметр, ед. измерения	Диапазон[1]	Описание
INJECTOR, ms	0÷32.64	**Injection Time**. Время открывания форсунок[1].
INJ VOL, ml	0÷2.048	**Injection Volume** (Cylinder 1). Количество впрыскиваемого за 10 раз топлива[2].
INJ TIMING D4, °CA	-210÷480	**Injection Timing**. Опережение момента начала впрыска топлива (открывания форсунок).
INJ TIME D4, ms	0÷32.64	**Injection Time**. Время открывания форсунок.
COOLANT TEMP, °C	-40÷+215	**Engine Coolant Temperature**. Температура ОЖ двигателя (рассчитывается ECM по току через датчик температуры).
INTAKE AIR, °C	-40÷+140	**Ambient (Intake) Air Temperature**. Температура (окружающего) воздуха, поступающего в двигатель.
CALC LOAD (CLV), %	0÷100	**Calculated load value (by ECM).** Расчетное значение[2] нагрузки на двигатель. Определяется в процентах от максимально возможной.
VEHICLE LOAD, %	0÷25,700	**Actual Vehicle Load (**PID$43). Фактическая нагрузка[3] на двигатель.
FUEL SYS 1 (2)	OL / CL / OL DRIVE / OL FAULT / CL FAULT / UNUSED	**Fuel system status Bank 1 (2).** Режим (статус) инжекторной системы: - Open Loop: Has not yet satisfied conditions to go closed loop - Closed Loop: Using heated oxygen Sensor as feedback for fuel control. - Open Loop due to driving conditions (fuel enrichment) - Open Loop due to detected System fault - CL but heated oxygen Sensor, which used for fuel control malfunctioning
#CODES	0÷255	**Number of detected DTCs**. Количество кодов неисправности в памяти ECM.
TC/TE1	OFF / ON	**TC and TE1 terminal of DLC3**. Наличие соединения между соответствующими

[1] Для некоторых параметров этот диапазон может отличаться от указанных значений.

* PID numbers, scaling and units are defined by manufacturer and are specific to their individual systems. Request PID Access->"22 PID (High Byte) PID (Low Byte)". Report->"62 PID(High Byte) PID(Low Byte)".

[2] Идентифицируется как PID $04 (один байт). Refers to an indication of the percent Engine capacity (J1979 "E/E Diagnostic Test Modes or to ISO/DIS 15031-5).

Note. Not all Vehicles used all PIDs

		контактами DLC.
AFM or MAF, g/s	0÷665.35	**Air Flow (Rate) Meter**. Результат пересчета ECM выходного напряжения датчика количества воздуха. PID #10 (два байта). Пересчитывается по формуле: Air Flow, gm/sec=((b1*256)+b2)/100.
INTAKE AIR VOL. , g/s	0÷510	**Intake Air Volume.** Количество воздуха, поступающего в двигатель.
PIM, kPa	0÷224	**Absolute Pressure Inside Intake Manifold**. Абсолютное давление во впускном коллекторе[4].
INTAKE AIR PRES., mmHg	0÷1244	**Intake Air Pressure/vacuum signal.** Аналог PIM.
INI COOL TEMP, °C	-40÷120 (140)	**Initial Engine coolant Temperature.** Начальная («стартовая») температура ОЖ двигателя при его заведении.
INI INTAKE TEMP, °C	-40÷120 (140)	**Initial Intake Air Temperature**. Начальная («стартовая») температура воздуха при заведении двигателя.
AMBI TEMP SENS, °C	-40÷+215	**Ambient Temperature Sensor** Status. Аналог *INTAKE AIR*
FUEL TEMP, °C	-40÷+215	**Fuel Temperature.** Температура топлива.
IGN ADVANCE, ° BTDC	-64÷+63.5	**Ignition Timing Advance** for No.1. Опережение зажигания для 1-го цилиндра
VEHICLE SPD, km/h	0÷255	**Vehicle Speed**. Скорость движения автомобиля[5].
ENGINE SPD, rpm	0÷16,383	**Engine Speed**. Частота вращения двигателя
SECONDARY AIR	ON / OFF	**Second air System Status**. Статус (состояние) системы инжекции дополнительного воздуха.
AIR STATUS	UPSTRM / DNSTRM / ATM/OFF	**Статус**[6] системы инжекции вторичного (Secondary) или дополнительного (Auxiliary) воздуха.
AIR-FUEL RATIO	0÷1.999	**Air-Fuel Ratio**. Состав смеси
EQ_RAT[7]		**Commanded Equivalence Ratio.**
EVAP VAPOR PRES, Pa	-8192 ÷ +8191 (GX470)	**EVAP Vapour Pressure**. (Относительное) давление в системе улавливания паров топлива
EVAP VAPOR PRES, Pa	0÷327.675 (4GR-FSE)	**EVAP Vapour Pressure**. (Относительное) давление в системе улавливания паров топлива
PURGE DENSITY, %	-50÷350	**Learning value of purge density**.
PURGE FLOW, %	0÷102.4	**Purge flow**
EVAP PURGE VSV, %	0÷100	**EVAP (Purge) VSV control Duty**
VAPOR PRESSURE, kPa	−4.125 ÷ 2.125	**Vapour Pressure**. Давление паров в топливном баке[8].
VAPOR PRES PUMP, kPa	33.853 ÷ 125.596	**Vapor Pressure**
VAPOR PRESS CALC, kPa	−5.632 ÷ 715,364	**Vapor Pressure (calculated)**. Давление паров в топливном баке, измеряемое Vapor Pressure Sensor [9].
CAN CTRL VSV (CCV VSV)[3]		**Canister Closed Valve VSV**. «Нормально открытый» клапан[10], расположенный между улавливателем паров (Canister) и впускной системой (кроме LX470).
Tank Bypass VSV	ON / OFF	**Purge Flow Switching Valve VSV.**
KNOCK CRRT VAL, ° CA	-64÷1,984	**Correction learning Value of knocking**
KNOCK FB VAL, ° CA	-64÷1,984	**Feedback Value of knocking**
ACCEL POS #1, %	0÷100	**Absolute Accelerator Pedal Position** (APP) No.1 Абсолютное положение датчика положения педали газа.
ACCEL POS #2, %	0÷100	**Absolute APP** No.2
ACCEL POS #1, V	0÷5.00	**APP Sensor No.1 Voltage.** Выходное напряжение датчика положения педали газа
ACCEL POS #2, V	0÷5.00	**APP Sensor No.2 Voltage.**
ACCEL IDL POS	ON / OFF	Whether or not accelerator pedal position Sensor detecting idle.
ACCEL LEARN VAL, V	0÷5	Acceleration fully closed earned Value
IDLE SIG	ON / OFF	**Idle Switch Signal.** Результат[11] понимания БУ состояния датчика XX. ON=Switch closed (Engine idling), OFF=Switch open (Engine off-idle).
ELECTRICAL LOAD SIG	ON/OFF	Status of the ELS input signal to the ECM. Signal will be ON whenever the tail light or rear window defogger relays are energized (voltage high at ECM).
FC IDL	OFF / ON	**Fuel Cut idle**. Сигнал «отсечки»[12] подачи топлива на принудительном XX. Прекращение подачи топлива при отпущенной педали газа, но еще достаточно большой скорости вращения двигателя. Например, 1,500 rpm for FSE.
FC TAU	OFF / ON	**Fuel cut TAU**. Fuel cut during very light load. The fuel cut being performed under very light Load to prevent the Engine combustion from becoming incomplete. Status of the deceleration enleanment program in the ECM. Signal will be ON whenever deceleration enleanment is commanded as a result of rapid deceleration taking place with the IDL switch contact open.
THRTL LEARN VAL, V	0÷5	**Throttle Valve fully closed** (Learned Value):0.4÷0.8 V
ACCEL SSR #1 AD, V	0÷4.98	**Accelerator fully closed Value** No.1 (AD)

[3] A canister closed Valve (CCV) with VSV is located between EVAP canister and air intake System (except LX470).

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ACCEL LRN VAL#1, V	0÷124.512	**Accelerator fully closed learning Value** No.1
ACCEL LRN VAL#2, V	0÷124.512	**Accelerator fully closed learning Value** No.2
THROTTLE POS, %	0÷100	**Throttle position/Absolute Throttle position Sensor**. Относительное положение дроссельной заслонки. Calculated Value based on VTA1 and Recognition Value for Throttle opening Angle on ECM
THROTTL IDL POS	ON / OFF	Whether or not Throttle position Sensor detecting Idle
THRTL REQ POS, V	0÷5.00	**Throttle requirement Position**
THROTTLE POS, #2, %	0÷100	**Throttle Sensor Positioning** #2. Calculated value based on VTA2. Voltage Output of Throttle Position Sensor Calculated as a percentage [4].
THROTTLE POS#1, V	0÷5.00	**Throttle Position** No.1
THROTTLE POS#2, V	0÷5.00	**Throttle pos**. No.2. Read the value with intrusive operation (active test Mode $30). Read the Value with Ignition Switch ON (Do not start Engine).
THRTL COMND VAL, V	0÷4.9804	**Throttle position command Value**. ETCS Service Data
THROTTLE SSR #1, V	0÷4.98	**Throttle Sensor opener Position** No.1. ETCS Service Data
THROTTLE SSR #2, V	0÷4.98	**Throttle Sensor opener Position** No.2. ETCS Service Data
THRTL SSR #1 AD, V	0÷4.98	**Throttle Sensor opener Position** No.1 (AD). ETCS Service Data
THROTTLE MOT, %	ON / OFF	Whether or not Throttle Motor Control permitted: Read Value with Engine Switch ON (IG) (do not Start Engine)
THROTTLE MOT, A	0÷80.0	**Throttle Motor Current**
THROTTLE MOT, %	0÷100	**Throttle Motor**
THROTTLE MOT, A	0÷19.92	**Throttle Motor Current**
THROTL OPN DUTY, %	0÷100	**Throttle Motor opening Duty Ratio**. When accelerator Pedal depressed, Duty Ratio increased; Read the Value with Ignition Switch ON (Do not start Engine).
THROTL CLS DUTY, %	0÷100	**Throttle Motor closed duty ratio**. When accelerator pedal released quickly, Duty Ratio increased; Read the Value with Ignition Switch ON (Do not start Engine).
THRTL MOT (OPN), %	0÷100	**Throttle Motor Duty Ratio (open**). ETCS Service Data
THRTL MOT (CLS), %	0÷100	**Throttle Motor Duty Ratio (close**). ETCS Service Data
Throttle Initial, V	0÷5	**Throttle fully closed learned Value**
THROTTLE TARGT, V	0÷5	**Target position of throttle Valve**
O2 FT B1(2) S2, %	-100÷99.2	**FT B1(2) S2** (UNUSED). Топливная коррекция по напряжению O2-датчиков после катализатора (ов), (не используется).
O2S B1(2) S2, V	0÷1.275	**Heated oxygen Sensor Output Voltage** for Bank 1(2) Sensor 2. Напряжение соответствующего O2-датчика
AFS B1(2) S1, V	0÷7.999	**A/F Sensor output voltage** for Bank 1(2) Sensor 1. Напряжение соответствующего AFR-датчика (параметр, «видимый» ECM)
TOTAL FT #1(2)	−0.5÷ 1.496	**Total fuel trim of Bank** 1(2). Среднее значение[13] топливной коррекции относительно стехиометрического состава смеси. 1.00 – нормальное значение. Значение менее 1.00 – признак уменьшения времени открывания форсуенок (для коррекции обогащенной смеси). При значении более 1.00 ECM увеличивает «подачу топлива» для компенсации обеднения смеси.
SHORT FT #1(2), %	-100÷99.2	**Short−Term Fuel Trim Bank 1(2**). **Short Fuel Trim** (-20÷20). Кратковременный топливный баланс (коррекция[14]) - дополнительная кратковременная коррекция базового состава смеси для поддержания стехиометрического состава смеси. Динамическа («быстрая») адаптация.
LONG FT #1(2), %	-100÷99.2	**Long−term fuel trim Bank 1(2)**. Долговременный топливный баланс[15] (коррекция) характеризует величину изменения базового значения состава топливно-воздушной смеси. Этот параметр – результат постепенной адаптации системы управления к состоянию двигателя в настоящее время. Используется в т.ч. для упрощения (ускорения) реализации кратковременной корреции.
O2FT B1(2) S2	-100÷99.2	**Short−Term Fuel Trim**. Топливная коррекция, согласно O2-датчику Bank 1(2) Sensor 2
AF FT B1(2) S1	0÷1.999	**Short−Term Fuel Trim**. Кратковременная топливная коррекция[16], согласно O2-датчику Bank 1(2) Sensor 1: - значение менее 1.0 (0.000 to 0.999) = бедная смесь (Lean) - стехиометрический состав смеси = 1.0 - значение более 1.0 (1.001 to 1.999) = богатая смесь (Rich)
CAT TEMP B1(2) S1(2),°C	−40÷ 6,513.5	**Catalyst Temperature**. Температура катализатора. PID$3C ÷ $3F.
O2 LR B1(2)S1(2), ms	0÷16,711	**Oxygen Sensor Lean Rich**[17] Bank 1(2) Sensor 1. Время переключения O2S из состояния обедненной смеси к обогащенной. Характеризует состояние датчика (быстродействие).
O2 RL B1(2)S1(2), ms	0÷16,711	**Oxygen Sensor Rich Lean**[18] Bank 1(2) Sensor 1. Время переключения O2S из состояния обогащенной смеси к обедненной.
FAIL #1, FAIL #2	ON / OFF	Whether or not Fail Safe Function executed. ON: ETCS has Failed
STARTER RELAY	ON / OFF	**Starter Relay**. Состояние реле стартера (ON при включении реле[19] стартера).

[4] 0 V->0%, 5 V ->100 %

Note. Not all Vehicles used all PIDs

STARTER SIG	ON / OFF	**Starter Signal**. Сигнал включения стартера STA (ON при вращении[20] стартера).
STARTER CONTROL	ON / OFF	**Starter Switch Status.**
ST1	ON / OFF	**Starter Signal**: ON at Cranking
PS SW	ON / OFF	**Power Steering Signal**: ON at Power steering operation
ACC RELAY	ON / OFF	**ACC Relay.** Состояние реле аксесуаров.
SYS GUARD JUDGE	ON / OFF	**System guard**. ECTS Service Data
OPN MALFUNCTION	ON / OFF	**Open Side Malfunction**. ECTS Service Data
PS Signal	ON / OFF	**Power steering Signal**[21]. ON при первом вращении руля после включения зажигания.
CTP SW	ON / OFF	**Closed Throttle position Switch**[22]**.** Сигнал о полном закрытии дроссельной заслонки (IDL). ON if Throttle fully close
A/C SIG	OFF / ON	**A/C Signal**. ON or OFF Air Conditioning Switch state of dashboard A/C Switch Position. ON/OFF status of the A/C magnetic clutch input to the ECM. Signal will be ON anytime the air conditioning compressor clutch is energized (voltage low at ECM). Signal will cycle OFF whenever compressor cycles off due to low evaporator temperature.
STP SW	ON / OFF	**Closed Throttle Position Switch**
ELECT LOAD SIG	OFF / ON	**Electrical load Signal.** ON if ON: Headlights or Defogger is turned ON
STOP LIGHT SW1	OFF / ON	**Brake light Switch** (Stop Lght Switch[23]). Сигнал о нажатии на педаль тормоза (STP). Используется для управления «fuel cut-off Engine Speed». ON if brake pedal is depressed.
STOP LIGHT SW2	OFF / ON	
+BM	ON / OFF	Whether or not electric Throttle control System power inputted: ON: Idling
+BM VOLTAGE, V	0÷19.92182	**+BM voltage**. ETCS Service Data
BATTER VOLTAGE, V	0÷65.535	**Battery Voltage**
ACTUATOR POWER	ON / OFF	Actuator power supply
ATM PRESSURE , kPa	0÷150	Equivalent to atmospheric Pressure (absolute Pressure)
SECOND AIR VSV	OFF / ON	Secondary air injection System statu (VSV for PAIR System)
ACIS VSV	OFF / ON	VSV for Acoustic Control Induction System (AICS) Status: ON: Open OFF: Closed
ACM	OFF / ON	**VSV for ACM control system status**. Active Test support data.
AIR PMP RPES (A), kPa	0÷320	**Air pump Pressure**
EVAP (PURGE) VSV	OFF / ON	**VSV Status for EVAP control**
FUEL PUMP / SPD	ON / OFF	**Fuel Pump** / Speed Status / ON/H or OFF/M,L
FP TARGET VAL, MPa	0÷32	**Target Fuel Pressure**
FP DISCHARGE, %	0÷100	**Fuel Volume required by the High-Pressure Fuel Pump**
FUEL PUMP D4, %	0÷320	**Fuel Pump Duty**
COMBUSTION D4,	00÷04	**Combustion Status**. 00=FC, 03=Stoich 1, 04=Stoich 2
VVT OCV DUTY B1(2), %	0÷100	**VVT OCV (Bank 1(2) Intake side) operation duty**. Requested duty value for intrusive operation
VVTL AIM ANGL #1(2), %	0÷100	**VVT aim angle (Bank 1(2) Intake side**). VVT duty Signal value during intrusive operation
VVT CHNG ANGL #1(2), °CFR	0÷60	**VVT change angle (Bank 1(2) Intake side)**. Displacement angle during intrusive operation
VVT OCV DUTY B1(2), %	0÷100	**VVT OCV (Bank 1(2) Intake side) operation duty**. Requested duty value for intrusive operation.
VVT EX HOLD B1(2), %	0÷100	**VVT exhaust hold duty ratio learning value (Bank 1(2) Exhaust side)**. Requested duty value for intrusive operation.
VVT EX CHG ANG1(2), °CFR	0÷60	**VVT change angle (Bank 1(2) Exhaust side).** Displacement angle during intrusive operation
VVT EX OCV D B192), %	0÷100	**VVT OCV (Bank 1(2) Exhaust side) operation duty**. Requested duty value for intrusive operation.
AICV VSV		**VSV for Intake Control System (AICS)**
IGNITION	0÷800*	**Ignition Counter** (*0 to 800). Ignition event counter, which is used to determine the percentage of ignition, misfire occurring. This counter resets every 3000 ignition cycles on a 6 cylinder engine, every 2000 ignition cycles on a 4 cylinder engine, and every 4000 ignition cycles on an 8 cylinder engine.
MISFIRE CYL #1-8	0÷255 or 0÷50 %	**Misfire Ratio of the Cylinder**. This item displayed in only Idling. Percentage of time each individual cylinder is detected misfiring during a specified ignition event detection cycle. For example, cylinder #2 is detected misfiring 1500 times during a 3000 event detection cycle. MISFIRE CYL#2 will read 50%.
CYL ALL	0÷255	**All Cylinder Misfire Ratio**
MISFIRE RPM, rpm	0÷6,375	**Engine RPM for first misfire range.** Скорость вращение двигателя при фиксировании БУ misfire
MISFIRE LOAD, g/rev	0÷3.98	**Engine load for first misfire range.** Нагрузка[24] при фиксировании БУ misfire
MISFIRE MARGIN, %	-100÷ 99.22	**Misfire monitoring.** Misfire detecting margin

EVAP VENT VAL	OFF / ON	Key−off EVAP System vent Valve Status
ETCS MAG CLUTCH	ON / OFF	-
EGRT GAS, ºC		**Temperature of exhaust gas.** Температура[25] выхлопных газов на «входе» клапана EGR.
EGR SYSTEM	ON / OFF	**Status of the EGR system**. Состояние[26] системы рециркуляци выхлопных газов. ON при включении системы (When VSV is energized, EGR system is OFF and when VSV is de-energized, EGR system is on).
FUEL PRESS, MPa or kPa	0÷819 or 0÷655350	**Fuel High Pressure** (PID$23). Inside Fuel Delivery Pipe: 8÷13 at Idle
FUEL PRESSSURE	0÷765	**Fuel Pressure.** Значение Engine Fuel Rail Pressure.
COMN RAIL, MPa	0÷255	**Common Rail Pressure**.
		ECD System 1CD-FTV
INJ VOLUME, mm^3	0÷1279.98	Injection Volume
INJ VOL FB #n, mm^3	-10÷10	Injection Volume Correction for Cylinder n: -3.0 to 3.0 at Idling
M-INJ/PILOT OFF, µs	0÷65,535	Pilot-Injection OFF Timing of main Injector: 600 to 1200 µs at Idling
PILOT INJ, µs	0÷65,535	Pilot-Injection
INJ FB VALUE, mm^3	-10÷10	Injection Volume Feedback Learning Value: -4.0 to 4.0 at Idling
DPNR DIFF PRESS, kPa	-5÷100	DPNR Differential Pressure
GENERATOR, %	0÷100	Generator (Alternator) Duty Ratio Status
EX TEMP IN, °C	0÷1000	Actual Exhaust Gas Temperature (on Up-Stream)
EX TEMP OUT, °C	0÷1000	Actual Exhaust Gas Temperature (on Down-Stream)
EX FUEL ADD FBN	0÷2	Exhaust Fuel Addition Correction Value; Vicinity of 1.0
ATM PRESSURE , kPa	0÷150	Actual Atmospheric Pressure
INJ PRS FB VAL,mm^3/s	-500÷500	Injection Pressure Correction Value
ATM LEARN VAL, V	0÷5	Atmospheric Pressure Learning Value
DIFF SEN FB VAL, kPa	-10÷10	Differential Pressure Correction Value
EGR LEARN VALUE, V	0÷5	EGR Valve Learning Value
DPNR REJU (PM)	ON / OFF	Results of DPRN Catalyst Regeneration (PM)
DPNR REJU (S)	ON / OFF	Results of DPRN Catalyst Regeneration (S)
INJ TIMING		-1 to 5 °CA at Idling
Injector Compensation Code	30-digit value	e.g. 10DEE6E9E60C0A2122171C00000029 (1CD-FTV, 2AD-FTV) -Aninjector compensation value and QR(Quick Response) code containing encoded characteristics of the injector are printed on each injector. -The injector compensation value and QR code contain various pieces of information regarding the injector, such as model code, and injection volume correction.
PNP SW (NSW)	ON / OFF	**Park/Neutral Position (PNP) Switch Signal.**
PS OIL PRESSUR SW	OFF / ON	Power Steering Oil Pressure Switch Signal, ON if turning Steering Wheel
PS SIGNAL	ON / OFF	ON if Engine Run
ENGINE STOP SIG	ON / OFF	ON if IGN is ON Engine OFF
IAC DUTY Ratio, % (ISC DUTY CYCLE)	0÷100	**Idle Speed Control (ISC) Valve percentage opening**[27].
FUEL PRES UP VSV	OFF	**VSV for Pressure Switching Valve**. Status of the FPU VSV which controls the vacuum bleed in the manifold vacuum line to the fuel pressure regulator. Signal will be ON whenever the VSV is energized, bleeding atmosphere into the fuel pressure regulator vacuum chamber.
ENG OIL PRES SW	ON / OFF	**Engine Oil Pressure Switch**
SCV VSV	ON / OFF	VSV Status for Intake Air Control Valve
SCV STATUS D4	0 / 1	SCV Status (1 at Idle)
SCV ANGLE D4, º	-17.25÷ 107.75	SCV Angle. Угол поворота
SCV ANG SENS, V	0÷20	SCV Angle Sensor
SCV DUTY RATIO, %	-100÷155	**SCV Duty Ratio.** Скважность импульсов управления SCV
A/C IDLE UP VSV	OFF	VSV (device No.1) for A/C Idle-Up Valve. Status[28] of A/C idle up VSV which controls the A/C idle up air bypass.
PURGE CUT VSV	OFF	VSV между впускным коллектором и Air Inlet Valve (on Canister) - Outline EVAP System
A/C MAG CLUTCH	OFF / ON	**A/C magnetic Clutch Relay Status**. Air Conditioning Switch Status as input to vehicle ECM; based on state of dashboard A/C Switch position. ON=A/C commanded on, OFF=A/C commanded off. Active Test Support Data.
AIR BLEED VSV	OFF / ON	OFF at Idle; OFF at acceleration
INT AIR CTRL (Valve) VSV	ON / OFF	Вакуумный переключатель системы ACIS, который управляет вакуумной диафрагмой привода заслонки изменения геометрии впускного коллектора (ACV - Air Control Valve. Vacuum Switching Valve No.2 . Intake Air Control Valve (IACV) closed (VSV: ON) if Throttle Valve opening angle>30 degr. and Engine Speed>3700 rpm.
EXH GAS CTRL VSV	ON/OFF	**On at Idle; OFF at acceleration and high Engine Speed**. Вакуумный

		переключатель управления выхлопными газами.
SPEED (NC)		**Counter gear Speed Sensor** (Sensor may also be referred to as NC revolution Sensor)
SOLENOID SLD		**Shift Solenoid DSL** controls hydraulic Pressure acting on lock-up relay Valve, which contains torque converter clutch lock-up. Shift Solenoid DSL is located on transaxle Valve body.
SOLENOID SLT		**Linear Solenoid Valve**[29] **SLT**.
AUTOMATIC TRANSAXLE FLUID TEMPERATURE SENSOR A/T OIL TEMP1, 2 °C	-40÷215	**Automatic Transaxle Fluid Temperature Sensor**[30].
AFM OUTPUT (A/F METER RATIO), V	0÷5	**Air Flow Meter (AFM) output voltage.** Signal sent to the vehicle ECM from the Air Flow Meter; based on the rate of air flow through the AFM.
LEAN SENS B1S2 or LEFT O2S SIGNAL	RICH/LEAN	**Left Oxygen Sensor state flag** based on input to vehicle ECU; based on oxygen content in left exhaust stream, RICH=air fuelRatio above 14.7, LEAN=air fuelRatio below 14.7:1.
RIGHT O2S SIGNAL	RICH/LEAN	**Right Oxygen Sensor state flag** based on input to vehicle ECU; based on oxygen content in right Exhaust Stream, RICH=air fuelRatio above 14.7, LEAN=air fuelRatio below 14.7:1.
VVT1, 2		**VVT Sensor** (VV1 or VV2 Signal) consist of a Signal plate and pickup coil. The VV1 or VV2 Signal plate has 1 tooth on its outer circumference and is mounted on the intake camshafts. When the camshafts rotate, the protrusion on the Signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil. The actual camshaft angle is detected by the VVT Sensor and it provides feedback to the ECM to control the intake Valve Timing in response to during condition.
CHECK MODE	On / OFF (0 or 1)	Режим проверки. При его активации ECM увеличивает чувствительность системы к обнаружению (проявлению) неисправностей при неизменном перечне проверяемых параметров. Этот режим не используется для проверки кодов самодиагностики EVAP системы и «пропусков зажигания» (misfire). 0->Check mode ON and MIL flashes. Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions. Furthermore, the same diagnostic items that are detected in the normal mode can also be detected in the check mode.
SPD TEST	0 or 1	Check mode Result for vehicle Speed Sensor: 0: COMPL, 1: INCOMPL
AS TEST	0 or 1	Check mode Result for secondary Air Injection System:0: COMPL
MISFIRE TEST	0 or 1	Check mode Result for misfire monitor: 0: COMPL, 1: INCOMPL
OXS1(2) TEST	0 or 1	Check mode Result for HO2 Sensor Bank 1(2): 0: COMPL, 1: INCOMPL
A/F SSR TEST B1(2)	0 or 1	Check mode Result for air−fuelRatio Sensor Bank 1(2):0: COMPL
MIL	OFF / ON	**MIL status**. Состояние индикатора неисправности (Malfunction Indicator Lamp / Check Engine Lamp).
MIL ON RUN DIST, km (CHK ENG ON RUN DIST)	0÷65,535	**MIL ON Run Distance** (PID$21). Расстояние[31], которое проехал автомобиль после включения индикатора неисправности.
MIL ON RUN TIME, min	0÷65,535	**Running Time from MIL ON** (PID$4D).Equivalent to running Time after MIL was ON
ENG RUN TIME, sec	0÷65,535	**Engine Run Time** (PID$1F). Время[32] после последнего заведения двигателя.
TIME DTC CLEAR, min	0÷65,535	**Time after DTC cleared** (PID$4E).Cumulative Time after DTCs cleared. Общее время после ститрания кодов неисправности.
DIST DTC CLEAR, km	0÷65,535	**Distance after DTC cleared** (PID$31). Accumulated Distance after DTCs were erased (cleared). Совокупный пробег после ститрания кодов неисправности.
WU CYC DTC CLEAR	0÷255	**Warm-up cycle after DTC cleared** (PID$30). Number of warm−up cycles after DTC cleared. Количество Warm-up циклов после ститрания кодов.
COMP MON	0:NOT AVL / 1: AVAIL	Comprehensive component[33] monitor.
FUEL MON	0:NOT AVL / 1: AVAIL	Fuel System Monitor
MISFIRE MON	0:NOT AVL / 1: AVAIL	Misfire Monitor
O2S (A/FS) MON	0:NOT AVL / 1: AVAIL	O2S (A/F) Monitor
EVAP MON	0:NOT AVL / 1: AVAIL	EVAP Monitor
CAT MON	0:NOT AVL / 1: AVAIL	Catalyst Monitor
AI STATUS	OK or NG	AII operation prohibit
MODEL CODE		**Model code information**. Identifying the model code: GSX3#, UCK30 (2WD), UCK40 (4WD)
ENGINE TYPE		**Identifying the Engine type**, e.g. 2UZFE, 2GRFE
CYLINDER NUMBER	0÷255	**Identifying the cylinder number**

Data Stream of Toyota / Lexus Cars by "Heavy" Scan Tools Display

TRANSMISSION		**Transmission type information**. Identifying the transmission type, e.g. ECT(5AT)
DESTINATION		**Identifying the Destination**, e.g. A (America) Регион продажи.
MODEL YEAR, MY	1900÷2155	**Model Year**. Модельный год[34] выпуска автомобиля.
SYSTEM	GAS /	**Engine system information**. Identifying the Engine System, e.g. GASLIN (gasoline Engine)
OBD CERT (OBD requirements to which vehicle is designed)	OBDII/OBD/ OBD2-OBD/OBDI/ NOOBD/ EOBD/…	PID 1C. Data Byte A(hex): 01=OBD II (California ARB), 02=OBD (Federal EPA), 03=OBD and OBD II, 04=OBD I, 05=Not OBD compliant, 06=EOBD, 07=EOBD and OBD II, 08=EOBD and OBD, 09=EOBD, OBD and OBD II, 0A=JOBD, 0B=JOBD and OBD II, 0C=JOBD and EOBD, 0D=JOBD, EOBD, and OBD II, 0E–FF=reserved

OBD Data Sream		Parameter Definitions
IGNITION (ADVENCE),	-30÷+90	**Ignition spark advance** angle in addition to base timing (determined by distributor position) referenced to #1 cylinder Top Dead Center. Calculated by comparing the relationship between the NE and G signals.
ISC (Valve) STEP #	0÷125 (215)	Положение клапана управления XX двигателя. **Idle Speed Control (ISC) Valve** step based on output calculated by the vehicle ECU; based on Engine Load, Engine RPM and Throttle Position. Old.Commanded position of the idle air control pintle valve. Value represents valve position relative to the fully closed position. 125 steps indicate valve is fully retracted (maximum by-pass air). Zero steps indicate fully closed or seated valve position. ECM will command step position changes until actual engine speed is within 50 rpm of target idle speed. Therefore, if the valve is mechanically incapable of moving, commanded valve position will continue to change until zero or 125 steps is reached.
ISC DUTY CYCLE, %	0÷100	**Commanded duty ratio** to Rotary Solenoid Idle Air Control Valve. Percentage of time that voltage is high on RSO (open) coil.
ENGINE SPD	0÷10000	**Engine revolutions** per minute calculated by comparing the NE signal with the ECM internal clock.
AIRFLOW (Karman)		**Volume of air** entering the intake manifold (measured with the Karman vortex air flow meter). The Karman sensor generates a variable frequency signal, which increases as intake air volume increases. Signal value is expressed in milliseconds; the time between these frequency pulses. As signal frequency increases, the time between signals decreases. Signal time is calculated by comparing the pulse train generated by the sensor to the clock in the ECM.
AFM SIG. PERIOD, ms	0÷66	**Time period** of Karman-Vortex airflow meter sent as an input to the vehicle ECM from the Karman-Vortex airflow meter; based on the rate of air flow through the KV-AFM.
AIR FLOW (Ratio) (VAF[VS]), V	0÷5	**Volume of air** entering the intake manifold (measured with the Volume Air Flow meter). Airflow meter voltage signal is converted from analog to digital for use by the ECM then changed back to an analog voltage for display on the serial data stream. On OBD equipped vehicles, signal voltage decreases as intake air volume increases.
INTAKE MAN, in. HG (mmHG, Kpa)	0÷1244	**Manifold Absolute Pressure**, displayed as pressure in mmHg (millimeters of mercury), in. Hg, or Kilopascals. Signal value is determined by comparing the PIM voltage signal to corresponding pressures in a lookup table. As load is applied to the engine, manifold pressure increases (approaching atmospheric pressure.)
COOLANT, ºC	-50÷+127	**Temperature of the engine** coolant displayed in degrees Fahrenheit or Celsius.
THROTTLE, º angle	0÷125	Position of the throttle valve displayed in degrees of throttle angle opening. Some OBD applications display this value in steps, skipping several degrees between each position update. Value is determined by comparing VTA voltage to corresponding value in a look-up table. Typical signal range is between 0° at closed throttle, 70° to 80° at wide open throttle.
VEHICLE SPD, mph	0÷125	**Vehicle road speed** displayed in miles or kilometers per hour. Calculated by comparing the pulsed vehicle speed sensor signal with the ECM internal clock.
TARGET A/F (L AND R), V	0÷5	Learned value (adaptive memory) **correction to A/F Ratio feedback** control system (based on left and right main O2 sensors respectively). Displayed as a zero to five volt signal, which changes in 1.25 volt steps. Neutral value (no feedback correction) is displayed as 2.50V. Voltage lower than neutral indicates fuel delivery is being decreased to correct for a rich A/F Ratio. Voltage higher than neutral indicates fuel delivery is being increased to correct for a lean A/F Ratio. Learned value correction is similar to OBD II LONG FT, maximum possible correction is ± 20% of basic injection duration. For example:
LEFT A/F TARGET, V	0÷5	Target (commanded) Air FuelRatio in left-hand Exhaust Manifold as calculated by vehicle ECM.
RIGHT A/F TARGET, V	0÷5	Target (commanded) Air FuelRatio in right-hand Exhaust Manifold as calculated by vehicle ECM.
A/F FB (L & R)	ON / OFF	The same as OBD II FUEL SYS. A/F Ratio feedback loop status (for left and right cylinder banks respectively), displayed as either OFF (open loop) or ON (closed loop.) Open loop indicates that the ECM ignores feedback from the exhaust O2 sensor and relies on other major sensors to determine final injection pulse width (i.e. intake air volume or mass, engine rpm, and coolant temperature.) When in closed loop, Ox SIGNAL values should be constantly variable.

Note. Not all Vehicles used all PIDs

LEFT A/F FB	ON / OFF	**Leftside air-fuel feedback** Signal state as commanded by vehicle ECM; based on Engine load and left O2 Sensor Signal inputs to ECM. ON=feedback enabled, OFF=feedback disabled.
RIGHT A/F FB	ON / OFF	**Right Side air-fuel feedback** Signal state as commanded by vehicle ECM; based on Engine load and right O2 Sensor Signal inputs to ECM. ON=feedback enabled, OFF=feedback disabled.
OX Signal (L & R)	Rich / Lean	Main O2 sensor signal
KNOCK RETARD		ON/OFF **status of knock retard** system operation. Indicates ON whenever detonation is sensed and knock retard is being commanded.
KNOCK SIGNAL	ON / OFF	Knock Sensor Signal correction as commanded by vehicle ECM; based on Engine load and indicates that the ECM advance/retard strategy is controlling ignition Timing. ON=correction enabled, OFF= correction disabled.
STA SIGNAL	ON/OFF	Same as OBD II STARTER SIG. Status of the STA signal at the ECM. Signal will be ON whenever the ignition switch is in the START position (voltage high at ECM).
A/C SIGNAL	ON/OFF	Same as OBD II A/C SIG. Status of the A/C magnetic clutch input to the ECM. Signal will be ON anytime the air conditioning compressor clutch is energized (voltage low at ECM). Signal will cycle OFF whenever compressor cycles off due to low evaporator temperature.
INJECTOR P/W, mSec	0÷33	**Injector Solenoid Pulse Width** (on-Time) based on output calculated by the vehicle ECU; based on Engine load, Engine RPM and Throttle Position. Old.
THROTTLE ANGLE	0÷125	**Angle of Throttle plate** in Throttle body as sent to the vehicle ECM and calculated by the ECM; based on current position of Throttle position Sensor. Old.
NSW SIGNAL		Same as OBD II NEUTRAL SAFETY (PNP) SW. (A/T only) ON/OFF status of the neutral safety switch input to the ECM. Signal will be ON whenever the automatic transmission is in the neutral or park gear positions (voltage low at ECM).
OX (L AND R) SIGNAL		Similar to OBD II 02S Exhaust O2 sensor signal displayed as either RICH or LEAN. High concentration of oxygen in exhaust (lean condition) causes signal display to go LEAN (less than 400 my sensor signal voltage). Low concentration of oxygen in exhaust causes signal to go RICH (greater than 600 my sensor voltage).
LEAN MIX SENSOR ,ma (LEAN CURNT)	0÷72	**Lean mixture Sensor Current** as input to the vehicle ECM; based on air-fuelRatio (O2 content) of exhaust gases.

Безусловный интерес представляют некоторые данные, которые формально не все входят в обязательный перечень Mode $1, но, тем не менее, могут считываться «тяжелыми» сканерами.

VIN-code (Info Type $02), Vehicle Identification Number – уникальный идентификационный номер автомобиля, представляет собой 17-разрядную последовательность букв и цифр. Содержит информацию о месте изготовления, комплектации и другие данные.

```
CALIBRATION ┌XJlt ⁸°# attach.att ┌ф&<G{[Format]
Version=2
[Vehicle]
Number=4
DateOfIssue=2003-08-19
VehicleType=2WD MT
EngineType=1AZ-FE
VehicleName=RAV4
ModelYear=1
ContactType=SIL
KindOfECU=ENG & ECT
NumberOfCalibration=1
[CPU01]
CPUImageName=342053.xx
NewCID=34205300
LocationID=00010013
ECUType=32B 320K
NumberOfTargets=3
01_TargetCalibration=34205000
01_TargetData=444343393B353C4C
02_TargetCalibration=34205100
02_TargetData=444348393B353F4C
03_TargetCalibration=34205200
03_TargetData=44453B343B36493F
┌ ⁸-ьрђЄЄS00F00006C6E6B5F33335F3333200000
E9CF63D44818851S321000001883D4481883D44818
```

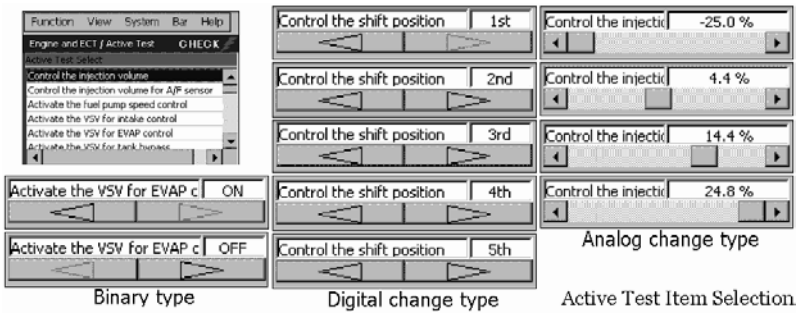
CAL ID (Info Type $04), Calibration Identification (Module) - код «калибровки» программного обеспечения, установленного ECM автомобиля. Несколько напоминает номер версии ПО. Например, ECU $10, CAL ID: 01 73309069; ECU $10, CAL ID: 02 83309012. **CAL ID** is a calibration identification number (similar to a software version number) for the software and calibration installed in a vehicle's ECU. CAL ID indicates the exact emission software/calibration set installed in a vehicle.

CVN[35] (Info Type $06), Calibration Verification Number – «контрольная сумма» калибровок БУ используется для защиты ПО производителя от несанкционированного вмешательства/изменений, внедрения вирусов. Обязательно доступно для считывания в авто, начиная с 2005 MY. При недобросовестном изменении ПО этот параметр будет генерировать «некорректное значение».

Возможность проверки версии CAL, кроме всего прочего, позволяет убедиться в том, что для устранения возникшей проблемы «исследуемый автомобиль» не нуждается в коррекции ПО[5]. Иногда некоторые коды неисправности возникают из-за алгоритмических «ошибок». И только после коррекции «калибровки» (фрагмент содержания ПЗУ) – автомобиль вновь становится полностью исправным.

Active Test.

Performing ACTIVE TEST using the hand−held tester allows the relay, VSV, Actuator and so on to operate without parts removal. Performing the ACTIVE TEST as first step of troubleshooting is one of the methods to Shorten labor Time. During an active test, the



[5] См. статью «The J2534 Reprogramming»

data list can be displayed simultaneously and measurement groups selected from the list box (на рисунке – «возможные варианты»)

"Heavy" Tester Display	Test Details	Diagnostic Note
INJ VOL	Change injection volume between −12 % and 25 %	-All injectors tested at the same Time (at once) -Perform test at less than 3,000 rpm - Injection volume can be changedin 1 % graduations within control range
A/F CONTROL	Change injection volume. Lower by 12.5 % or increase by 25 %	-Perform test at less than 3,000 rpm -A/F CONTROL enables checking and graphing of A/F (Air Fuel Ratio) Sensor and Heated Oxygen (HO2) Sensor voltage outputs -To conduct test, select following menu items: ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press YES and ENTER followed by F4 (MTS3100)
EVAP VSV (ALONE)	Activate EVAP VSV Control ON / OFF	Notmally Closed VSV is Duty-Cycle controlltd by the ECM. It is used to control Engine Vacuum to the EVAP System in order to remove stored hydrocarbons from the charcoal Canister. It/s also used for system leak Detection and may be reffered to as the **PURGEE VSV**.
EVAP (PURGE) VSV	Activate EVAP (Purge) VSV Control	ON or OFF
SCV VSV (e.g. 2AZ-FSE)	Activate the VSV for Intake Air Control Valve	ON or OFF
INTAKE CTRL VSV1	ACIS VSV: ON or OFF	**Intake Air Control Valve VSV Signal.** Status of the ACIS VSV, which controls the vacuum supply to the ACIS, vacuum actuator. Signal will be ON whenever the VSV is energized (voltage low at ECM) and vacuum is being passed to the ACIS actuator.
VVT CTRL B1(2)[36]	Turn on and off OCV (Oil Control Valve): ON or OFF.	-Engine stalls or idles roughly when OCV turned ON -Normal Engine running or idling when OCV off.
VVT LINEAR B1(2)	Control the VVT (bank 1(2) Intake. Side. Between -128 and 127%	This valve added to present OCV control duty: 100%: Maximum advance, -100% : Maximum retard. Engine stalls or idles roughly when VVT actuator operated by 100%. Test is possible while idling.
VVT EX B1(2)	Control the VVT OCV (bank 1 (2) Exhaust Side). -128 to 127%.	This valve added to present OCV control duty: 100%: Maximum retard, -100%: Maximum advance.
VVT B1(2)	Control VVT (Bank1(2)). -128 to 127%.	This Valve addede to present OCV control Duty. 100%=Max. advance; -100%=Max retard. At Engine stall/rough Idle when VVT Act. By 100%
A/C CUT SIG	ON / OFF	Status of A/C cutoff (ACT) signal from ECM to A/C amplifier. Signal is ON (low voltage at ECM) whenever A/C compressor cut is requested as a result of wide open throttle operation.
A/C MAG CLUTCH	ON / OFF	Control the A/C magnet Clutch
FUEL PUMP SP CTL	Fuel Pump Speed Control.	ON (Low Speed) / OFF (High Speed). IGN ON, Engine sopped
FUEL PMP SP CTR	SPD ON / H S OFF / M.L	**Fuel Pump Speed control Stasus**. Режим[37] топливного насоса.
FUEL PUMP / SPD	Activate Fuel Pump (C/OPN Relay)	-
TC/TE1	Turn on and off TC and TE1 connection. ON or OFF	-ON: TC and TE1 connected -OFF: TC and TE1 disconnected
ETCS OPEN SLOW	Throttle Actuator ON: Throttle Valve opens slowly	This test is possible when the following conditions are met: -Ignition Switch ON -Engine does not start -Fully depressing accelerator pedal (APP: 58 degrees or more)
ETCS CLOSE SLOW	Throttle Actuator ON: Throttle Valve closes slowly	Same as above
ETCS OPEN FAST	Throttle Actuator ON: Throttle Valve opens fast	Same as above
ETCS CLOSE FAST	Throttle Actuator ON: Throttle Valve closes fast	Same as above
FUEL CUT #1 (2,3,4…)	Cylinder #1 (2,3,4…) injector fuel cut. ON/OFF	This test is possible during vehicle stopping and Engine idling.
COMP PRESS CHECK	Check the Cylinder Compression Pressure	-
VENT VALVE (ALONE)	Activate vent Valve (built into pump Module). ON/OFF	Activate the VSV for Vent Valve built into pump module
VACUUM PUMP	Activate vacuum pump (built into pump Module)	ON / OFF
FC IDL PROHBT	ON or OFF	Запрещение функции FC IDL
FUEL LEAK TEST	Maintain the Engine Speed at 2,000 rpm, pressurize the common Rail internal Fuel Pressure to 175 MPa	On or OFF. Confirm that here is no Leak in the fuel System when the Common Rail internal fuel Pressure is pressurized high
COOLING FAN	ON or OFF	Control Electric Cooling Fan
INJECTORCUT #1-N	Stop Injection of Injector No.1-N	ON or OFF
TARGET FUEL PRES	Control the target Fuel Pressure	Between -128 and 24.8%. Test possible at Idling
INJ TIMING #1 (N)	Control Injection Timinh #1(N)	Between -16 CA 16 CA Test possible at Idling
ACC CUT	Active ACC Cut Relay, ON or OFF	IGN ON, Engine stopped
STARTER	Starter	ON or OFF
VENT VALVE	Vent VAlve	ON or OFF
SCV DUTY RATIO	Control SCV Duty Ratio. Between -128 and 127%	Perform Test only for 10 seconds
ACM INHIBIT	Control the ACM inhibit. ON / OFF	Test is possible while Engine idling

Note. Not all Vehicles used all PIDs

DPNR REJU (PM)	DPRN Catalyst Regeneration (PM)	Raise temperature of DPNR to more that 600ºC by adding uel intermittenty using the Exhaust fuel addition Injector
DPNR REJU (S)	DPRN Catalyst Regeneration (S)	Raise temperature of DPNR to more that 600ºC by adding uel intermittenty using the Exhaust fuel addition Injector
AICS VSV	ON / OFF	Activate the VSV for Air Intake Control System (AICS)
TANK BYPASS VSV	ON / OFF	Tank Bypass VSV. Purge Flow Switching Valve VSV – normally Open VSV is located on the Charcoal Canister. It allows Vacuum from **EVAP VSV** (or **PURGE VSV**) to Flow through the Canister. When actived by the ECM during internal uel bladder Leak Detection, it switches Airflow from the Canister to the outer tank bladder only.
FAN MOTOR	ON / OFF	Activate the Electric fan motor.

System Check

Performing a SYSTEM CHECK enables the System, which consists of multiple Actuators, to be operated without removing any parts. In addition, it can show whether or not any DTCs are set, and can detect potential malfunctions in the System. The SYSTEM CHECK can be performed with a tester.

"Heavy" Tester Display	Test Details	Diagnostic Note
EVAP SYS CHECK (AUTO OPERATION)	Perform 5 steps in order to operate EVAP key−off monitor automatically (35ºC or less)	If no DTCs in PENDING CODE after performing this test, System functioning normally. Refer to EVAP Inspection Procedure on Repair Manual
EVAP SYS CHECK (MANUAL OPERATION)	Perform 5 steps in order to operate EVAP key−off monitor manually (35ºC or less)	Used to detect malfunctioning parts. Refer to EVAP Inspection Procedure on Repair Manual
AI INJ CHECK (AUTO OPERATION)	Perform 6 steps in order to operate air injection System automatically	If no DTCs in PENDING CODE after performing this test, System functioning normally
AI INJ CHECK (MANUAL OPERATION)	Perform 8 operations in order to operate air injection System monitor manually	Used to detect malfunctioning parts

Control List		
D-4 SFI (Sequential Multiport Fuel Injection) System	An L-type SFI system directly detects the intake air mass with a hot wire type mass air flow meter.	
ESA (Electronic Spark Advance)	Ignition timing is determined by the ECM based on signals from various sensors. Corrects ignition timing in response to engine knocking.	
	Knocking Judgment Control (KCS)	1 or 2 knock sensors are used to improve knock detection.
	ECT Shifting Torque Control	The torque control correction during gear shifting has been used to minimize the shift shock.
ETCS-i (Electronic Throttle Control System-intelligent)	Based on the signals provided by the sensors, this system applies corrections to the throttle position that has been calculated in accordance with the condition of the engine, in order to achieve an appropriate throttle position.	
	VSC Control	Controls the throttle valve position when the VSC is operating.
	Maximum Speed Control	Controls the engine by closing the throttle valve, thus suppressing the speed of the vehicle when it reaches 230 km/h on a 2WD model and 210 km/h on a 4WD model (or 240 km/h on models other than the U.S.A. and Canada).
	Idle Speed Control(ISC)	Controls the fast idle speed in accordance with the engine coolant temperature, and the idle speed after the engine has been warmed up. It controls the idle speed by regulating the fuel injection volume and the throttle position.
Dual VVT-i Control	Controls the optimal intake and exhaust valve timing in accordance with the conditions of the engine.	
SCV(Swirl Control Valve) Control	Optimally controls the air current in the combustion chamber by closing one of the independent intake ports in accordance with the coolant temperature and engine condition, in order to stabilize the combustion and improve performance.	
ACIS (Acoustic Control Induction System) Control	Varies the intake manifold length to suit the conditions of the engine.	
Fuel Pump Control(For High Pressure Side)	Controls the discharge pressure of the high-pressure fuel pump in accordance with the conditions of the engine.	
Fuel Pump Control	Turns the fuel pump ON/OFF in accordance with the starter signal and the engine speed signal. Stops the operation of the fuel pump in accordance with the signals from the airbag ECU.	
Cold-start Fuel Injector Control	Operates the cold-start fuel injector to improve the startability of a cold engine. (Only U.S.A, Canada)	
Cranking Hold Control	After the starter starts to crank the engine, this control continues to apply current to the starter until the engine starts. Thus, it prevents the failure of the engine to start when the driver inadvertently turns the ignition switch to OFF just before the engine fires.	
Air-Fuel Ratio Sensor Heater Control	Turns the air-fuel ratio sensor heater ON/OFF in accordance with the coolant temperature and the driving conditions.	
Heated Oxygen Sensor Heater Control	Maintains the temperature of the heated oxygen sensor at an appropriate level to increase accuracy of detection of the oxygen concentration in the exhaust gas.	
Evaporative Emission Control	The ECM controls the purge flow of evaporative emissions (HC) in the charcoal canister in accordance with engine conditions.	
Air Conditioning Cut-Off	By controlling the air conditioning compressor ON or OFF in accordance with the engine condition,	

Control	drivability is maintained.
Engine Immobiliser	Vehicle Anti-Theft System. Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid ignition key.
Communicate with multiplex communication system	Communicates with the meter ECU, A/C ECU, etc., on the body side, to input/output necessary signals.
Diagnosis	Enables the accurate and detailed diagnosis of malfunctions through the use of the hand-held tester diagnostic tool to access the SAE-prescribed DTC and data, as well as to perform active tests.
Fail-Safe	When the ECM detects a malfunction, the ECM stops or controls the engine according to the data already stored in the memory.

Function of Main Components Evaporative Emission Control System. Function of Main Components		
Charcoal Canister		Contains activated charcoal to absorb the vapor gas that is created in the fuel tank.
Refueling Valve		Controls the flow rate of the vapor gas from the fuel tank to the charcoal canister when the system is purging or during refueling.
	Restrictor Valve	Prevents the large amount of vacuum during purge operation or system monitoring operation from affecting the pressure in the fuel tank.
Fresh Air Inlet		Fresh air goes into the charcoal canister and the cleaned drain air goes out into the atmosphere.
Pump Module performs the fuel evaporative emission leakage check. This check is done approximately five hours after engine is turned off. So you may hear sound coming from underneath the luggage compartment for several minutes. It does not indicate a malfunction.	Canister Vent Valve	Opens and closes the fresh air line in accordance with the signals from the ECM.
	Vacuum Pump	Applies vacuum pressure in the evaporative emission system in accordance with the signals from the ECM.
	Pressure Sensor	Detects the pressure in the evaporative emission system and sends the signals to the ECM.
EVAP Valve		Opens in accordance with the signals from the ECM when the system is purging, in order to send the vapor gas that was absorbed by the charcoal canister into the intake manifold. During the system monitoring mode, this valve controls the introduction of the vacuum into the fuel tank.
Air Filter		Prevents dust and debris in the fresh air from entering the system.
Service Port		This port is used for connecting a vacuum gauge for inspecting the system.
ECM		Controls the pump module and the EVAP valve in accordance with the signals from various sensors, in order to achieve a purge volume that suits the driving conditions. In addition, the ECM monitors the system for any leakage and outputs a DTC if a malfunction is found.
Actuator		
Main Relay		Supplies main power to the SFI, ESA system, etc.
Circuit Opening Relay		Supplies power to the fuel pump system.
High-Pressure Fuel Pump		Pressurizes fuel.
Fuel Injector		Injects an optimal volume of fuel at an optimal timing.
Cold Start Fuel Injector		Injects an optimal volume of fuel to improve the starting of a cold engine.
Air-Fuel Ratio Sensor Heater		Heats the air-fuel ratio sensor to promote feedback control when the engine is cold.
Heated Oxygen Sensor Heater		Heats the heated oxygen sensor to promote feedback control when the engine is cold.
Igniter		Turns the current to the ignition coil ON/OFF at an optimal timing.
Electr. Controlled Throttle Motor		Controls the position of the throttle valve in accordance with driving conditions.
Intake Camshaft Timing OCV		Controls the intake VVT-i at an optimal valve timing.
Exhaust Camshaft Timing OCV		Controls the exhaust VVT-i at an optimal valve timing.
Rotary Solenoid for ACIS		Opens and closes the ACIS valve in accordance with driving conditions.
Motor for SCV (Swirl Control Valve)		Opens and closes the swirl control valve in accordance with driving conditions.
Evaporative Purging VSV		Regulates the purge volume of the canister.
EDU (Electronic Driver Unit)		Converts the injection request signal from the ECM into a high voltage, high amperage injector actuation signal in order to actuate the high-pressure fuel injector.

Purge Flow Control. When the engine has reached predetermined parameters, stored fuel vapors are purged from the charcoal canister whenever the EVAP valve is opened by the ECM.The ECM will change the duty ratio cycle of the EVAP valve, thus controlling purge flow volume. Purge flow volume is determined by intake manifold pressure and the duty ratio cycle of the EVAP valve. Atmospheric pressure is allowed into the charcoal canister to ensure that purge flow is constantly maintained whenever purge vacuum is applied to the charcoal canister.

ORVR (On-Board Refueling Vapor Recovery). When the internal pressure of the fuel tank increases during refueling, this pressure causes the diaphragm in the refueling valve to lift up, allowing the fuel vapors to enter the charcoal canister. Because the canister vent valve is always open (even when the engine is stopped) when the system is in a mode other than the monitoring mode, the air that has been cleaned through the charcoal canister is discharged outside of the vehicle via the fresh air line. If the vehicle is refueled during the system monitoring mode, the ECM will recognize the refueling by way of the vapor pressure sensor, which detects the sudden pressure increase in the fuel tank, and will open the canister vent valve.

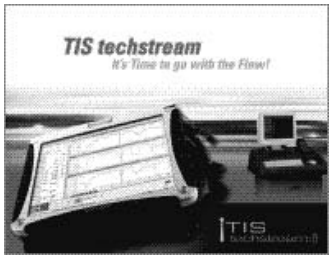
Air-Fuel Ratio Control. The system determines the fuel injection volume based on the engine speed and the intake air volume (which is detected by the airflow meter). After the engine is started, feedback control is effected on the air-fuel ratio based on signals from the air-fuel ratio sensor.

Data Stream of Toyota / Lexus Cars by "Heavy" Scan Tools Display

Diagnostic Trouble Codes | Live Data Meter | Live Data Graphs | **Live Data Grid** | O2 Sensors | Test OnBoard System | OnBoard Test Results

Sensor Name System: Enhanced Powertrain CAN	Value	Units	Minimum	Maximum	Range
Calculated Load	25	%	0	100	24 %
Coolant Temperature	94	C	-40	215	52 %
Short Term Fuel Trim Bank One	0.78	%	-100.00	99.22	50 %
Long Term Fuel Trim Bank One	-0.78	%	-100.00	99.22	49 %
Short Term Fuel Trim Bank Two	0.78	%	-100.00	99.22	50 %
Long Term Fuel Trim Bank Two	0.00	%	-100.00	99.22	50 %
Engine RPM	657	r/min	0	9000	7 %
Ignition Timing Advance for #1	22.5	deg	-64.0	63.5	67 %
Intake Air Temperature	51	C	-40	215	35 %
Air Flow Rate From Mass Air Flow Sensor	2.98	gm/s	0.00	655.35	0 %
Absolute Throttle Position	14	%	0	100	14 %
B1S2 O2 Sensor Output Voltage	0.835	V	0.000	1.275	65 %
B1S2 O2 Sensor Fuel Trim	99.06	%	-100.00	99.22	99 %
B2S2 O2 Sensor Output Voltage	0.800	V	0.000	1.275	62 %
B2S2 O2 Sensor Fuel Trim	99.06	%	-100.00	99.22	99 %
B1S1 Wide Band O2 Sensor Equivalence Ratio	0.994	Lam	0.000	1.999	49 %
B1S1 Wide Band O2 Sensor Voltage	0.887	V	-128.000	127.996	50 %
B3S1 Wide Band O2 Sensor Equivalence Ratio	0.998	Lam	0.000	1.999	49 %
B3S1 Wide Band O2 Sensor Voltage	6.821	V	-128.000	127.996	52 %
Barometric Pressure	100.00	kPaA	0.00	255.00	39 %
B1S1 Wide Band O2 Sensor 2 Equivalence Ratio	0.994	Lam	0.000	1.999	49 %
B1S1 Wide Band O2 Sensor 2 Voltage	5.606	mA	-128.000	127.996	52 %
B3S1 Wide Band O2 Sensor 2 Equivalence Ratio	0.993	Lam	0.000	1.999	49 %
B3S1 Wide Band O2 Sensor 2 Voltage	6.075	mA	-128.000	127.996	52 %
B1S1 Catalyst Temperature	421.20	C	-40.00	6513.50	7 %
B1S2 Catalyst Temperature	421.20	C	-40.00	6513.50	7 %
B2S1 Catalyst Temperature	274.70	C	-40.00	6513.50	4 %
B2S2 Catalyst Temperature	274.70	C	-40.00	6513.50	4 %
Control Module Voltage	13.03	V	0.00	65.54	19 %
Absolute Load Value	13	%	0	25700	0 %
Commanded Equivalence Ratio	0.999	Lam	0.000	1.999	49 %
Relative Throttle Position	0	%	0	100	0 %
Absolute Throttle Position B	45	%	0	100	45 %
Absolute Throttle Position D	16	%	0	100	15 %
Absolute Throttle Position E	32	%	0	100	31 %
Commanded Throttle Actuator Control	14	%	0	100	14 %
Absolute Evaporative System Vapor Pressure	100	%	0	100	100 %
AF Fuel Trim Bank 2 Sensor 1	0.999	mA	0.000	1.999	49 %
AFS Fuel Trim Bank 2 Sensor 1	3.266	V	0.000	7.999	40 %
AF Fuel Trim Bank 1 Sensor 1	1.004	mA	0.000	1.999	50 %
AFS Fuel Trim Bank 1 Sensor 1	3.275	V	0.000	7.999	40 %
Warm-up Cycle After DTC Cleared	2	Count	0	255	0 %
Atmosphere Pressure	100	kPa	0	255	39 %
Catalyst Temperature (Bank 2 Sensor 2)	464.4	F	-40.0	11756.3	4 %
Catalyst Temperature (Bank 1 Sensor 2)	464.4	F	-40.0	11756.3	4 %
Catalyst Temperature (Bank 2 Sensor 1)	725.5	F	-40.0	11756.3	6 %
Catalyst Temperature (Bank 1 Sensor 1)	725.5	F	-40.0	11756.3	6 %
Throttle Sensor Positioning 2	45	%	0	100	45 %
Throttle Sensor Positioning	0	%	0	100	0 %
Air-Fuel Ratio	0.999	Lam	0.000	1.999	49 %
Vehicle Load	13	%	0	25700	0 %
2nd Air Monitor Complete	0	Bit	0	1	0 %
Comprehensive Component Monitor Complete	0	Bit	0	1	100 %
Time After DTC Cleared	59	Min	0	65535	0 %
Running Time From MIL On	0	Min	0	65535	0 %
Throttle Motor	14	%	0	100	14 %
Accelerator Position 2	32	%	0	100	31 %
EGR Learning Status	0	Bit	0	1	0 %
O2 Sensor After HC Adsorber and Catalyst (Bank	0	Bit	0	1	0 %
O2 Sensor After HC Adsorber and Catalyst (Bank	0	Bit	0	1	0 %
Injection Volume (Cylinder 1)	0.088	ml	0.000	2.048	4 %
Injector	2.18	ms	0.00	32.64	6 %
Initial Engine Coolant Temperature	92	C	-40	120	82 %
Initial Exhaust Temperature (IN)	0	C	0	1000	0 %
Initial Exhaust Temperature (OUT)	0	C	0	1000	0 %
Initial Intake Air Temperature	52	C	-40	120	57 %

June 2007
V. P. Leshchenko
Использованы материалы
Engine Control Systems I - Course 852 (00401-TH852 V3)
Engine Control Systems II - Course 874 (00401-TH874)
Advanced Emissions & Driveability Diagnosis - Course 972 (00401-TH972)
Toyota/Lexus Service Repair Manuals
Operator's Manuals Diagnosis Testers Vetronix (3rd Edition)
Description of TIS



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Reference

Toyota Model Name / Code in http://alflash.com.ua/Learn/model.pdf

Toyota / Lexus Acronyms, Glossary and Abbreviation in http://alflash.com.ua/Learn/acr.pdf

Статьи о практике диагностики и ремонта в этой страничке:
"***Story of the Month***" (by al tech page in http://alflash.com.ua/story.htm)

Note. Not all Vehicles used all PIDs