14 OBDG04 TCM Summary Tables

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
Solenoid S1	P0973	Circuit continuity check	Short-cut ground Detect signal of the S1 monitor	"OFF"	DS Active V[1] Time after solenoid output changed S1 driver outputs signal	TRUE >10 msec "ON"	500 msec Continuous	2nd
	P0974		Not connected or short-cut Ubatt Detect signal of the S1 monitor	"ON"	DS Active V[1] Time after solenoid output changed S1 driver outputs signal	TRUE >10 msec "OFF"		
Timing solenoid SLC1	P0966	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0967 for 1 sec and over	500 msec Continuous	2nd
	P0967		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0966 for 1 sec and over	500 msec Continuous	2nd
	P0778		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P0966 P0967 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie "ie" is added to "sum_ie" every 10 msec. "ie" : Difference of "ir" and "ifb". "ir" : Target current "ifb": Feedback current "sum_ie" is cleared as follows: (1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from "ie < 0mA" ("ie >0mA") to "ie >0mA" ("ie < 0mA").	>20000 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P0966 P0967 P0657	sum_ie > 60000mA	
Timing solenoid SLC2	P0970	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0971 for 1 sec and over	500 msec Continuous	2nd
	P0971		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657	500 msec Continuous	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
						P0970 for 1 sec and over		
	P0798		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode DS_Active_V1 No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P0970 P0971 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie "ie" is added to "sum_ie" every 10 msec. "ie" : Difference of "ir" and "ifb". "ir" : Target current "ifb": Feedback current "sum_ie" is cleared as follows: (1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from "ie < 0mA" ("ie >0mA") to "ie >0mA" ("ie < 0mA").	>20000 mA	Battery voltage Feedback current Emergency mode DS_Active_V1 No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P0970 P0971 P0657	sum_ie > 60000mA	
Timing solenoid SLC3	P2720	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2721 for 1 sec and over	500 msec Continuous	2nd
	P2721		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2720 for 1 sec and over	500 msec Continuous	2nd
	P2716		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2720 P2721 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie "ie" is added to "sum_ie" every 10 msec. "ie" : Difference of "ir" and "ifb". "ir" : Target current	>20000 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2720	sum_ie > 60000mA	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			"ifb": Feedback current "sum_ie" is cleared as follows: (1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from "ie < 0mA" ("ie >0mA") to "ie >0mA" ("ie < 0mA").			P2721 P0657		
Timing solenoid SLB1	P2729	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2730 for 1 sec and over	500 msec Continuous	2nd
	P2730		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2729 for 1 sec and over	500 msec Continuous	2nd
	P2727		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2729 P2730 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie "ie" is added to "sum_ie" every 10 msec. "ie" : Difference of "ir" and "ifb". "ir" : Target current "ifb": Feedback current "sum_ie" is cleared as follows: (1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from "ie < 0mA" ("ie >0mA") to "ie >0mA" ("ie < 0mA").	>20000 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2729 P2730 P0657	sum_ie > 60000mA	
Pressure solenoid SLT	P0962	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0963 for 1 sec and over	500 msec Continuous	2nd
	P0963		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0962 for 1 sec and over	500 msec Continuous	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
	P0748		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	 > 50 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P0962 P0963 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie "ie" is added to "sum_ie" every 10 msec. "ie" : Difference of "ir" and "ifb". "ir" : Target current "ifb": Feedback current "sum_ie" is cleared as follows: (1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from "ie < 0mA" ("ie >0mA") to "ie >0mA" ("ie < 0mA").	 >20000 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P0962 P0963 P0657	sum_ie > 60000mA	
Pressure solenoid SLU	P2764	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2763 for 1 sec and over	500 msec Continuous	2nd
	P2763		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2764 for 1 sec and over	500 msec Continuous	2nd
	P2761		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	 > 50 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2764 P2763 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie "ie" is added to "sum_ie" every 10 msec. "ie" : Difference of "ir" and "ifb". "ir" : Target current "ifb": Feedback current "sum_ie" is cleared as follows:	 >20000 mA	Battery voltage Feedback current Emergency mode DS Active V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2764 P2763 P0657	sum_ie > 60000mA	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			(1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from "ie < 0mA" ("ie >0mA") to "ie >0mA" ("ie < 0mA").					
Linear solenoid driver	P0657		Malfunction Linear solenoid driver status	= abnormal	DS_Active_V[1]	TRUE	400 msec Cntinuous	2nd
Transmission Output speed sensor	P0722		No pulse Number of pulses from Transmission Output Speed Sensor Number of pulses from Transmission Input Speed Sensor	 0 16	DS_Active_EG_V[16] Emergency mode Shift position Not during Neutral control T_NConFin[14] msec after Neutral control Not during shifting T_ShiftFin[14] msec after shifting Not during garage control T_GarageFin[14] msec after garage control Not during C1 OFF control T_C1ctrlFin[15] msec after C1 OFF control Not during C2 OFF control T_C3ctrlFin[15] msec after C2 OFF control Not in Engine stall avoidance control outRpmNC No DTC set	TRUE FALSE RANGE_D(defined) >= 300 rpm P0705 P0707 P0708 P0717 P0715 P0748 P0778 P0798 P0962 P0963 P0966 P0967 P0970 P0971 P0973 P0974 P2716 P2720 P2721 P2727 P0657 P0720 P2729	Dependent of Speed	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
						P2730		
	P0720	Circuit continuity check	Electrical Failure (B+ short / GND short / Open) NINM-voltage (AD value)	< 0.206V or > 2.727V (< 45 or > 545)	DS Active V[1]	TRUE	1000 msec Consecutive	2nd
Transmission input speed sensor	P0717		No pulse No of pulses from Transmission Input Speed Sensor No of pulses from Transmission Output Speed Sensor	 0 24	DS_Active_EG_V[16] Emergency mode Shift position CurrentGear Not during Neutral control T_NConFin[14] msec after Neutral control Not during shifting T_ShiftFin[14] msec after shifting Not during garage control T_GarageFin[14] msec after garage control Not during C1 OFF control T_C1ctrlFin[15] msec after C1 OFF control T_C3ctrlFin[15] msec after C2 OFF control Not in Engine stall avoidance control Transmission Output Speed No DTC set	TRUE FALSE RANGE_D(defined) >= 2nd gear >= 300 rpm P0705 P0707 P0708 P0722 P0720 P0748 P0778 P0798 P0962 P0963 P0966 P0967 P0970 P0971 P0973 P0974 P2716 P2720 P2721 P2727 P0657 P0715 P2729 P2730	Dependent of Speed	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
	P0715	Circuit continuity check	Electrical Failure (B+ short / GND short / Open) NOUTM-voltage (AD value)	 < 0.206V or > 2.727V (< 45 or > 545)	DS Active V[1]	TRUE	1000 msec Consecutive	2nd
Transmission Range Sensor Circuit	P0707	Voltage low	Input POS1 Voltage or Input POS2 Voltage	< 0.127V	Diagnosis Service mode Battery voltage	FALSE 9V < Battery Voltage <= 18 V	200msec Continuous	2nd
	P0708	Voltage high	Input POS1 Voltage or Input POS2 Voltage	> 4.84V	Diagnosis Service mode Battery voltage	FALSE 9V < Battery Voltage <= 18 V	200 msec Continuous	2nd
	P0705	Signal out of range	Input POS1 Voltage + Input POS2 Voltage	< 5V -0.29V or > 5V +0.29V	Diagnosis Service mode Battery voltage No DTC set	FALSE 9 V <= Battery Voltage < 18 V P0707 P0708	200 msec Continuous	2nd
Transmission oil temperature sensor	P0711	Rationality	**Criteria1:** Oil temperature change less than	10 (AD value)	Oil temperature DS Active EG V[16] AD value of oil temperature AD value of oil temperature Emergency mode Shift position Vehicle Speed No DTC set	<= 20deg.C TRUE >= 10 <= 1010 FALSE ≠ (P, R or N) >= 40km/h once P0705 P0707 P0708 P0711 P0712 P0713	10 min	2nd
			Criteria2: Oil temperature	< 20deg.C	DS Active EG V[16] AD value of oil temperature AD value of oil temperature Emergency mode Estimated heating value Engine speed No DTC set	TRUE >= 10 <= 1010 FALSE >= MAP Q NORMAL[16] P0717 P0715 P0711 P0712 P0713	1 time	
	P0712	Circuit continuity check	Short-cut ground AD value of Oil temperature	 < 10 (More than 200deg.C).	DS Active V[1]	TRUE	60 sec	2nd
	P0713	Circuit continuity check	Short-cut Ubat or open circuit AD value of Oil temperature	 > 1010 (less than -55deg.C)	DS Active EG V[16] DriveTime	TRUE > 1 min	12 sec	2nd
Ignition Switch Run/Start Position	P2534	Circuit Low	Ignition voltage	< 9V	DS Active ACC[4] Emergency mode Engine speed No DTC set	TRUE FALSE > 400rpm U0001 U0100	20 sec	2nd
Internal Control Module	P0601	Check Sum Error	Detectin of differences between the result of the		Ignition	OFF->ON	1 time	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
Memory			checksum calculation executed after IG ON and the correct checksum. If there are differences from the correct checksum value stored in the FLASH ROM, a second calculation is made.					
Control Module Programming	P0602	Control Module Programming	Calibration data is not downlord properly.		None		1 time	1st
Non volatile memory	P0603	Read / Write error	To detect calculated checksum in RAM is different from checksum value in EEPROM. TCM has two areas (main and sub) for EEPROM. This failure is detected when both areas are wrong.		Accessory Ignition	OFF->ON (only at T/M computer initialization function) ON	1 time	1st
Random access memory	P0604	Read / Write error	To detect different value between write and read (Step1 and Step2, Step3 and Step4) while TCM checks all RAM from step 1 to step 4 in initialize routine. Step 1. TCU writes 55(hex) data in the ram. Step 2. TCU reads 55(hex) data in the ram. Step 3. TCU writes AA(hex) data in the ram. Step 4. TCU reads AA(hex) data in the ram.		Accessory Ignition	OFF->ON (only at T/M computer initialization function) ON	1 time	1st
CAN Bus Off Counter Overrun	U0001	CAN controller continuity check	Receiving “BUS OFF” state from CAN controller		DS Active ACC[4]	TRUE	8 times	2nd
Lost communication with ECM (Engine)	U0100	Frame missing from ECM	No CAN status frame from ECM detected		Diagnostic Service "Disable Normal Communication" not detected Accessory DS Active CAN[2] No DTC set	 ON >5 sec TRUE U0001	4 sec Continuous	2nd
Gear error, hydraulic fault	P0731	Rationality	Calculation of actual gear ratio for 1st gear is not correct. abs(1 - GRCurrent/ 2nd GearRatio) **or** abs(1 - GRCurrent/ 3rd GearRatio) **or** abs(1 - GRCurrent/ 4th GearRatio)	 < 4% < 4% < 4%	Current Gear Transmission Output Speed EngineTorque_noACC Transmission Input Speed Transmission Input Speed ConditionA[13]	1st > 60rpm >= 60Nm (GEAR_1ST) <=6000rpm (gasoline engine) <=4000rpm (diesel engine) TRUE	2.5sec Continuous	2nd
	P0732	Rationality	Calculation of actual gear ratio for 2nd gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1: abs(1-GRCurrent/GRExpected)	 >20%	Current gear Transmission Output Speed ConditionA[13] No DTC set	2nd >= 60rpm TRUE P0732 (Criteria2)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			Criteria2: abs(1-Gear Ratio Current/ 3rd Gear Ratio) **or** abs(1-Gear Ratio Current/ 4th Gear Ratio) **or** abs(1-Gear Ratio Current/ 6th Gear Ratio)	<4% <4% <4%	Current gear Transmission Output Speed ConditionA[13] InTorque	2nd >= 60rpm TRUE >=30Nm or <=-20Nm	2.5 sec Accumulate	
	P0733	Rationality	Calculation of actual gear ratio for 3rd gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1: abs(1-GRCurrent/GRExpected)	>20%	Current gear Transmission Output Speed ConditionA[13] No DTC set	3rd >= 60rpm TRUE P0733 (Criteria2)		
			Criteria2: abs(1-Gear Ratio Current/ 2nd Gear Ratio) **or** abs(1-Gear Ratio Current/ 4th Gear Ratio) **or** abs(1-Gear Ratio Current/ 5th Gear Ratio)	<4% <4% <4%	Current gear Transmission Output Speed ConditionA[13] InTorque	3rd >= 60rpm TRUE >=30Nm or <=-20Nm	2.5 sec Accumulate	
	P0734	Rationality	Calculation of actual gear ratio for 4th gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1: abs(1-GRCurrent/GRExpected)	>20%	Current gear Transmission Output Speed ConditionA[13] No DTC set	4th >= 60rpm TRUE P0734 (Criteria2)		
			Criteria2: abs(1-Gear Ratio Current/ 2nd Gear Ratio) **or** abs(1-Gear Ratio Current/ 3rd Gear Ratio) **or** abs(1-Gear Ratio Current/ 5th Gear Ratio) **or** abs(1-Gear Ratio Current/ 6th Gear Ratio)	<4% <4% <4% <4%	Current gear Transmission Output Speed ConditionA[13] InTorque	4th >= 60rpm TRUE >=30Nm or <=-20Nm	2.5 sec Accumulate	
	P0735	Rationality	Calculation of actual gear ratio for 5th gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1: abs(1-GRCurrent/GRExpected)	>20%	Current gear Transmission Output Speed ConditionA[13] No DTC set	5th >= 60rpm TRUE P0735 (Criteria2)		
			Criteria2: abs(1-Gear Ratio Current/ 3rd Gear Ratio) **or** abs(1-Gear Ratio Current/ 4th Gear Ratio)	<4% <4%	Current gear Transmission Output Speed ConditionA[13] InTorque	5th >= 60rpm TRUE >=30Nm or <=-20Nm	2.5 sec Accumulate	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			or abs(1-Gear Ratio Current/ 6th Gear Ratio)	<4%				
	P0729	Rationality	Calculation of actual gear ratio for 6th gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1: abs(1-GRCurrent/GRExpected)	> 20%	Current gear Transmission Output Speed ConditionA[13] No DTC set	6th >= 60rpm TRUE P0729 (Criteria2)		
			Criteria2: abs(1-Gear Ratio Current/ 2nd Gear Ratio) **or** abs(1-Gear Ratio Current/ 4th Gear Ratio) **or** abs(1-Gear Ratio Current/ 5th Gear Ratio)	<4% <4% <4%	Current gear Transmission Output Speed ConditionA[13] InTorque	6th >= 60rpm TRUE >=30Nm or <=-20Nm	2.5 sec Accumulate	
Torque Converter Clutch	P0741	Comparison of engine speed and transmission input speed	Converter is slipping with active lock-up on. (Engine Speed - Transmission Input Speed)	> 300rpm	DS Active EG V[16] Fdetect inh[5] Shift position Time after N-D shifting control[10] ends Engine Torque Engine Speed Time after SLU target current (_ir) >= 1000 mA Oil temperature Lock-up Not during garage control T_GarageFin[14] msec after garage control Not during shifting T_ShiftFin[14] msec after shifting No DTC set	TRUE FALSE RANGE_D(defined) 8 sec >= 0 Nm < 4000 rpm Time_SLU_Full[18] sec >= -7deg.C FALSE P2763 P2764 P2761 P0715 P0717 P0720 P0722	12 sec Continuous	2nd
Un-usual shifting	P0869	SLC1 MAX	count fail SLC1MAX usft [17]	>= 5times	DS_Active_EG_V16 Fdetect inh[5] Time after N-D Shifting Control[10] ends Not during garage control T_GarageFin[14] msec after garage control Shift position Not during Neutral control	TRUE FALSE This timer is based on oil temperature. RANGE_D(defined)	1 time	2nd
		SLC2 MAX	count_fail_SLC2MAX_usft [17]	>= 5times				

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
		SLC3 MAX	count_fail_SLC3MAX_usft [17]	>= 5times	T_NConFin[14] msec after Neutral control Time after neutral control ends wheel spin condition Transmission Output Speed Oil temperature Tmr_inh_GE[14] sec after shift to safe gear No DTC set	This timer is based on oil temperature. FALSE >300rpm >= -20 °C P0715 P0717 P0720 P0722		
		SLB1 MAX	count fail SLB1MAX usft [17]	>= 5times				
Neutral condition	P0965		**Step 1:** abs(Engine Speed - Transmission Input Speed) Transmission Input Speed (at D range)	<300rpm > Transmission Output Speed x (1st gear ratio at RANGE_D) + revNfaildet[19] rpm	DS Active EG V[16] Fdetect_Inh[5] Oil temperature Shift position Not during shifting T ShiftFin[14] msec after shifting Not during garage control(N-D) T_GarageFin[14] msec after garage control	TRUE FALSE >= -7deg.C RANGE_D(defined)	**Step 1:** at D range: 3.3 sec if (0 <= X <= 1500) 1.3 sec if (1501 <= X <= 3000)	2nd
			Step 2: Transmission Input Speed Engine Speed Shift position	<200rpm >600rpm RANGE_D(defined)	Not during Neutral control T_NConFin[14] msec after Neutral control Transmission Output Speed Lockup Current gear QS AirSuction[6] Prohibit Neutral Judgment flag No DTC set	<=500rpm FALSE 1 or 2 or 3 or 4 FALSE FALSE P0717 P0722 P0715 P0720	0.8 sec if (3001 <= X) **Step 2:** 0.3sec	

[1)]DS_Active_V

DS_Active_V = TRUE when start condition for failure detection is fulfilled for 2.0 sec continuously.

DS_Active_V = FALSE when permission condition for failure detection is not fulfilled.

Start Condition for failure detection:

Ignition ON and
10.2V < Battery Voltage <= 18V and
Not in service mode and
Reading EEPROM finish

Permission condition for failure detection:

Ignition ON and
9.0V < Battery Voltage <= 18V and
Not in service mode

[2)] DS_Active_CAN

DS_Active_CAN = TRUE when the start condition for CAN failure detection is fulfilled for 5.0 sec continously.

DS_Active_CAN = FALSE when the permission condition for CAN failure detection is not fulfilled.

Start Condition for failure detection:

Ignition ON and
10.2V < Battery Voltage <= 18V and
Not in service mode and
Reading EEPROM finish

Permission condition for failure detection:

Ignition ON and
9.0V < Battery Voltage <= 18V and
Not in service mode

[3]DS_Active_EG_V

DS_Active_EG_V = TRUE when start condition for failure detection is fulfilled for 2.0 sec continuously.
DS_Active_EG_V = FALSE when permission condition for failure detection is not fulfilled.

Start Condition for failure detection:

Ignition ON and
10.2V < Battery Voltage <= 18V and
Not in service mode and
Reading EEPROM finish and
Egrpm > 400rpm and Egrpm = Q_NORMAL[16]
Bus off, ECU no communication = Q_NORMAL[16]

Permission condition for failure detection:

Ignition ON and
9.0V < Battery Voltage <= 18V and
Not in service mode and
Egrpm > 400rpm and Egrpm = Q_NORMAL[16]
Bus off, ECU no communication = Q_NORMAL[16]

[4] DS_Active_ACC

DS_Active_ACC = TRUE when the start condition for failure detection is fulfilled for 2.0 sec continously.
DS_Active_ACC = FALSE when the permission condition for failure detection is not fulfilled.

Start Condition for failure detection:

Accessory ON **or** Ignition ON and
10.2V < Battery Voltage <= 18V and
Not in service mode and
Reading EEPROM finish

Permission condition for failure detection:

Accessory ON **or** Ignition ON and
9.0V < Battery Voltage <= 18V and
Not in service mode

[5] Fdetech_Inh = TRUE if:

In Emergency mode **or**
Spinning[7] = TRUE **or**
within 10.0 sec after spinning[7] detection end **or**
DTC set: P0973, P0974, P0966, P0967, P0970, P0971, P2720, P2721, P2729, P2730, P0962, P0963, P2763, P0717, P0722, P0705, P0707, P0708, P0562, P0563, U0001, U0100, P0601, P0711, P0712, P0713, P2534, P0604, P0778, P0798, P2716, P0748, P2761, P2727, P0657, P0720, P0715,

Not in Neutral avoidance control
Not in Engine stall avoidance control
Egrpm = Q NORMAL[16]
Egtrq = Q NORMAL[16]

Accel = Q NORMAL[16]

[6]QS_AirSuction : Quick stop detection flag for the prevention of failure misdetection for Air suction, is set if the vehicle brakes hard.

[7] Spinning: If “LateralACC > 7.00m/s^2”, Spinning is TRUE.
LateralACC[m/s^2] = (WheelDiff[m/s] * WheelSpeedABS[m/s]) / WheelWidth[m])
WheelDiff ... “WheelSpeed RR” - “WheelSpeed RL”
WheelWidth... The width of the Wheel.

[8] Wheel spin condition
(1) 300 rpm < outRpm < 3000rpm
(2) Egtorque_noACC > -500Nm
(3) ABS (vehicle front wheels average speed - vehicle rear wheels average speed) > 5.0 km/h
(4) Throttle > 70 %
(5) outRpmSpeed < -50rpm/sec
{(1)and(2)and(3)}or{ (1)and(4)and(5)}continuously detected for 300 msec
After that, Wheel spin condition = TRUE continuously 10000 msec

[9] EngineTorque_noACC
Engine output torque, acceleration inertia torque not included.

[10] Shifting Control
"Shifting Control” is activated when the transmission is in between two gears (undefined gear ratio), until applied pressure has reached to full

[11] "Neutral Control"
Neutral Control is activated if the vehicle is at stand still and in range D with the brake pressed for 2 seconds until the brake is released.

[12] "Garage Shifting"
"Garage Shifting Control” is activated when the range selector changes from N to D or R until appropriate Gear Ratio is detected.

[13] ConditionA = TRUE if:
DS Active EG V[3] = TRUE **and**
Fdetect_Inh[5] = FALSE **and**
Garage shifting control[12](N-D or N-R) = FALSE **and**
T_GarageFin sec [14] after garage shift control[12] end **and**
Neutral control[11] = FALSE **and**
T_NConFin[14] after neutral control[11] end **and**
Shifting control[10] = FALSE **and**
T_ShiftFin[14] after shifting control[10] end **and**
RANGE_D (defined signal) **and**
Oil temperature >= -20 deg.C **and**
QS_AirSuction[6] = FALSE **and**
No DTC set: P0717, P0715, P0722, P0720

[14]

Const Data	< -20 deg.C	>= -20 deg.C< -10 deg.C	>= -10 deg.C< 20 deg.C	>= 20 deg.C
T_GarageFin [msec]	50000	8000	2000	1000
T_NConFin [msec]	50000	8000	2000	1000
T_ShiftFin [msec]	50000	2000	1000	500
Tmr_inh_GE [msec]	50000	2000	1000	500

15)

Const Data	< GE_OT1	>= GE_OT1 < GE_OT2	>= GE_OT2
T_C1ctrlFin [msec]	50000	20000	8000
T_C3ctrlFin [msec]	50000	20000	8000

16) Q_NORMAL

Q_NORMAL menas that no failure is detected

17) count_fail_SLC1MAX_usft, count_fail_SLC2MAX_usft,count_fail_SLC3MAX_usft, count_fail_SLB1MAX_usft

When the following shift conditions are satisfied, increments the counter of count_fail_SLXXMAX_usft.

Condition	A-1*	A-2*	B-1*	B-2*	D*	E*
SLC1MAX_usft	4-5, 4-6, 2-6, 3-5	-	-	-	6-2, 5-3	5-6, 6-5, 6-4, 5-4
SLC2MAX_usft	-	4-3, 4-2, 5-3, 6-2	-	-	2-6, 3-5, 2-1, 1-1EB	1-2, 1-3, 2-3, 2-4, 3-4, 3-2, 3-1, 2-1
SLC3MAX_usft	3-4, 5-6	5-4, 3-2	-	-	2-6, 4-5, 4-6, 4-2 4-3, 6-2	1-2, 1-3, 2-3, 2-4, 4-3, 4-2, 2-1, 2-1EB, 1EB-1, 1-1EB, 4-5, 4-6, 6-5, 6-4
SLB1MAX_usft	2-3, 2-4	6-5, 6-4, 2-1EB	3-4	4-3	3-5, 4-5, 4-6, 5-6, 3-1, 3-2, 4-2, 5-3, 5-4	1-2, 1-3, 3-4, 3-2, 3-1, 1EB-1,1-1EB, 4-5, 4-6, 5-6, 5-4, 4-2

*Refer to Un-usual shifting Condition for the detail of "A-1, A-2, B-1, B-2, D, E"

18)

	OT < 20 deg.C	OT >= 20 deg.C
OilTemp [deg.C]		
Time_SLU_Full [msec]	3000	3000

19)

OilTemp [deg.C]		OT < 0 deg.C	OT >= 0 deg.C
revNfaildet [rpm]	R range	1200	1000

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
Solenoid S1	P0973	Circuit continuity check	Short-cut ground Detect signal of the S1 monitor	 "OFF"	DS_Active_V[1] Time after solenoid output changed S1 driver outputs signal	TRUE >10 msec "ON"	500 msec Continuous	2nd
	P0974		Not connected or short-cut Ubatt Detect signal of the S1 monitor	 "ON"	DS_Active_V[1] Time after solenoid output changed S1 driver outputs signal	TRUE >10 msec "OFF"		
Timing solenoid SLC1	P0966	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0967 for 1 sec and over	500 msec Continuous	2nd
	P0967		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0966 for 1 sec and over	500 msec Continuous	2nd
	P0778		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	 > 50 mA	Battery voltage Feedback current Emergency mode DS_Active_V[1]	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE	2000 msec Continuous	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
					No DTC set	P0966 P0967 P0657		
			Criteria2:		Battery voltage	> 10.5 V for 500 msec continuously	sum_ie > 60000mA	
			sum_ie	>20000 mA				
					Feedback current	< 1358 mA		
					Emergency mode	FALSE		
			"ie" is added to “sum_ie” every 10 msec.		DS_Active_V[1]	TRUE		
			“ie” : Difference of “ir” and “ifb”.		No DTC set	P0966		
			“ir” : Target current			P0967		
			“ifb”: Feedback current			P0657		
			“sum_ie” is cleared as follows:					
			(1) or (2) or (3)					
			(1): Detection window = FALSE					
			(2): -50 mA <= ie <= 50 mA					
			(3): ie value cahnges from “ie < 0mA“ (“ie >0mA“) to “ie >0mA“ (“ie < 0mA“).					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
Timing solenoid SLC2	P0970	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0971 for 1 sec and over	500 msec Continuous	2nd
	P0971		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0970 for 1 sec and over	500 msec Continuous	2nd
	P0798		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode DS_Active_V1 No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P0970 P0971 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie "ie" is added to “sum_ie” every 10 msec. “ie” : Difference of “ir” and “ifb”. “ir” : Target current	>20000 mA	Battery voltage Feedback current Emergency mode DS_Active_V1 No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P0970	sum_ie > 60000mA	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			"ifb": Feedback current "sum_ie" is cleared as follows: (1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from "ie < 0mA" ("ie >0mA") to "ie >0mA" ("ie < 0mA").			P0971 P0657		
Timing solenoid SLC3	P2720	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V^1 Emergency mode No DTC set	TRUE FALSE P0657 P2721 for 1 sec and over	500 msec Continuous	2nd
	P2721		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V^1 Emergency mode No DTC set	TRUE FALSE P0657 P2720 for 1 sec and over	500 msec Continuous	2nd
	P2716		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode DS_Active_V^1	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE	2000 msec Continuous	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
					No DTC set	P2720 P2721 P0657		
			Criteria2:		Battery voltage	> 10.5 V for 500 msec continuously	sum_ie > 60000mA	
			sum_ie	>20000 mA				
					Feedback current Emergency mode	< 1358 mA FALSE		
			"ie" is added to “sum_ie” every 10 msec.		DS_Active_V[1]	TRUE		
			“ie” : Difference of “ir” and “ifb”. “ir” : Target current		No DTC set	P2720 P2721		
			“ifb”: Feedback current			P0657		
			“sum_ie” is cleared as follows: (1) or (2) or (3)					
			(1): Detection window = FALSE					
			(2): -50 mA <= ie <= 50 mA					
			(3): ie value cahnges from “ie < 0mA“ (“ie >0mA“) to “ie >0mA“ (“ie < 0mA“).					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
Timing solenoid SLB1	P2729	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2730 for 1 sec and over	500 msec Continuous	2nd
	P2730		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2729 for 1 sec and over	500 msec Continuous	2nd
	P2727		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode DS_Active_V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2729 P2730 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie "ie" is added to “sum_ie” every 10 msec. “ie” : Difference of “ir” and “ifb”. “ir” : Target current	>20000 mA	Battery voltage Feedback current Emergency mode DS_Active_V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2729	sum_ie > 60000mA	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			"ifb": Feedback current "sum_ie" is cleared as follows: (1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from "ie < 0mA" ("ie >0mA") to "ie >0mA" ("ie < 0mA").			P2730 P0657		
Pressure solenoid SLT	P0962	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0963 for 1 sec and over	500 msec Continuous	2nd
	P0963		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P0962 for 1 sec and over	500 msec Continuous	2nd
	P0748		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode	> 10.5 V for 500 msec continuously < 1358 mA FALSE	2000 msec Continuous	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
					DS_Active_V[1]	TRUE		
					No DTC set	P0962 P0963 P0657		
			Criteria2:		Battery voltage	> 10.5 V for 500 msec continuously	sum_ie > 60000mA	
			sum_ie	>20000 mA				
					Feedback current	< 1358 mA		
					Emergency mode	FALSE		
			"ie" is added to “sum_ie” every 10 msec.					
					DS_Active_V[1]	TRUE		
			“ie” : Difference of “ir” and “ifb”.					
					No DTC set	P0962		
			“ir” : Target current			P0963		
			“ifb”: Feedback current			P0657		
			“sum_ie” is cleared as follows:					
			(1) or (2) or (3)					
			(1): Detection window = FALSE					
			(2): -50 mA <= ie <= 50 mA					

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			(3): ie value cahnges from “ie < 0mA“ (“ie >0mA“) to “ie >0mA“ (“ie < 0mA“).					
Pressure solenoid SLU	P2764	Circuit continuity check	Short-cut ground or open Feedback current	< 20 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2763 for 1 sec and over	500 msec Continuous	2nd
	P2763		Short-cut Ubatt (B+) Feedback current	>= 1358 mA	DS Active V[1] Emergency mode No DTC set	TRUE FALSE P0657 P2764 for 1 sec and over	500 msec Continuous	2nd
	P2761		Feed Back Current Stuck(Electrical) **Criteria1:** | ie |	> 50 mA	Battery voltage Feedback current Emergency mode DS_Active_V[1] No DTC set	> 10.5 V for 500 msec continuously < 1358 mA FALSE TRUE P2764 P2763 P0657	2000 msec Continuous	2nd
			Criteria2: sum_ie	>20000 mA	Battery voltage Feedback current	> 10.5 V for 500 msec continuously < 1358 mA	sum_ie > 60000mA	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			"ie" is added to “sum_ie” every 10 msec. “ie” : Difference of “ir” and “ifb”. “ir” : Target current “ifb”: Feedback current “sum_ie” is cleared as follows: (1) or (2) or (3) (1): Detection window = FALSE (2): -50 mA <= ie <= 50 mA (3): ie value cahnges from “ie < 0mA“ (“ie >0mA“) to “ie >0mA“ (“ie < 0mA“).		Emergency mode DS_Active_V[1] No DTC set	FALSE TRUE P2764 P2763 P0657		
Linear solenoid driver	P0657		Malfunction Linear solenoid driver status	= abnormal	DS_Active_V[1]	TRUE	400 msec Cntinuous	2nd
Transmission Output speed sensor	P0722		No pulse		DS Active EG V[16] Emergency mode	TRUE FALSE	Dependent of Speed	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
					Shift position	RANGE_D(defined)		
			Number of pulses from Transmission Output Speed Sensor	0				
			Number of pulses from Transmission Input Speed Sensor	16	Not during Neutral control			
					T_NConFin[14] msec after Neutral control			
					Not during shifting			
					T_ShiftFin[14] msec after shifting			
					Not during garage control			
					T_GarageFin[14] msec after garage control			
					Not during C1 OFF control			
					T_C1ctrlFin[15] msec after C1 OFF control			
					Not during C2 OFF control			
					T_C3ctrlFin[15] msec after C2 OFF control			
					Not in Engine stall avoidance control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
					outRpmNC No DTC set	>= 300 rpm P0705 P0707 P0708 P0717 P0715 P0748 P0778 P0798 P0962 P0963 P0966 P0967 P0970 P0971 P0973 P0974 P2716 P2720 P2721 P2727 P0657 P0720 P2729 P2730		
	P0720	Circuit continuity check	Electrical Failure (B+ short / GND short / Open) NINM-voltage (AD value)	 < 0.206V or > 2.727V (< 45 or > 545)	DS Active V[1]	TRUE	1000 msec Consecutive	2nd
Transmission input speed sensor	P0717		No pulse No of pulses from Transmission Input Speed Sensor No of pulses from Transmission Output Speed Sensor	 0 24	DS_Active_EG_V[16] Emergency mode Shift position CurrentGear Not during Neutral control	TRUE FALSE RANGE_D(defined) >= 2nd gear	Dependent of Speed	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
					T_NConFin[14] msec after Neutral control Not during shifting T_ShiftFin[14] msec after shifting Not during garage control T_GarageFin[14] msec after garage control Not during C1 OFF control T_C1ctrlFin[15] msec after C1 OFF control T_C3ctrlFin[15] msec after C2 OFF control Not in Engine stall avoidance control Transmission Output Speed No DTC set	>= 300 rpm P0705 P0707 P0708 P0722 P0720 P0748 P0778 P0798 P0962		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
						P0963 P0966 P0967 P0970 P0971 P0973 P0974 P2716 P2720 P2721 P2727 P0657 P0715 P2729 P2730		
	P0715	Circuit continuity check	Electrical Failure (B+ short / GND short / Open) NOUTM-voltage (AD value)	< 0.206V or > 2.727V (< 45 or > 545)	DS Active V[1]	TRUE	1000 msec Consecutive	2nd
Transmission Range Sensor Circuit	P0707	Voltage low	Input POS1 Voltage or Input POS2 Voltage	< 0.127V	Diagnosis Service mode Battery voltage	FALSE 9V < Battery Voltage <= 18 V	200msec Continuous	2nd
	P0708	Voltage high	Input POS1 Voltage or Input POS2 Voltage	> 4.84V	Diagnosis Service mode Battery voltage	FALSE 9V < Battery Voltage <= 18 V	200 msec Continuous	2nd
	P0705	Signal out of range	Input POS1 Voltage + Input POS2 Voltage	< 5V -0.29V or > 5V +0.29V	Diagnosis Service mode Battery voltage No DTC set	FALSE 9 V <= Battery Voltage < 18 V P0707 P0708	200 msec Continuous	2nd
Transmission oil temperature sensor	P0711	Rationality	**Criteria1:** Oil temperature change less than	10 (AD value)	Oil temperature DS_Active_EG_V[16]	<= 20deg.C TRUE	10 min	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
					AD value of oil temperature	>= 10		
					AD value of oil temperature	<= 1010		
					Emergency mode	FALSE		
					Shift position	≠ (P, R or N)		
					Vehicle Speed	>= 40km/h once		
					No DTC set	P0705 P0707 P0708 P0711 P0712 P0713		
			Criteria2:		DS_Active_EG_V[16]	TRUE	1 time	
			Oil temperature	< 20deg.C	AD value of oil temperature	>= 10		
					AD value of oil temperature	<= 1010		
					Emergency mode	FALSE		
					Estimated heating value	>= MAP		
					Engine speed	Q_NORMAL[16]		
					No DTC set	P0717 P0715 P0711 P0712 P0713		
	P0712	Circuit continuity check	Short-cut ground		DS Active V[1]	TRUE	60 sec	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			AD value of Oil temperature	< 10 (More than 200deg.C).				
	P0713	Circuit continuity check	Short-cut Ubat or open circuit AD value of Oil temperature	> 1010 (less than -55deg.C)	DS Active EG V[16] DriveTime	TRUE > 1 min	12 sec	2nd
Ignition Switch Run/Start Position	P2534	Circuit Low	Ignition voltage	< 9V	DS Active ACC[4] Emergency mode Engine speed No DTC set	TRUE FALSE > 400rpm U0001 U0100	20 sec	2nd
Internal Control Module Memory	P0601	Check Sum Error	Detectin of differences between the result of the checksum calculation executed after IG ON and the correct checksum. If there are differences from the correct checksum value stored in the FLASH ROM, a second calculation is made.		Ignition	OFF->ON	1 time	2nd
Control Module Programming	P0602	Control Module Programming	Calibration data is not downlord properly.		None		1 time	1st
Non volatile memory	P0603	Read / Write error	To detect calculated checksum in RAM is different from checksum value in EEPROM. TCM has two areas (main and sub) for EEPROM. This failure is detected when both areas are wrong.		Accessory Ignition	OFF->ON (only at T/M computer initialization function) ON	1 time	1st
Random access memory	P0604	Read / Write error	To detect different value between write and read (Step1 and Step2, Step3 and Step4) while TCM checks all RAM from step 1 to step 4 in initialize routine. Step 1. TCU writes 55(hex) data in the ram. Step 2. TCU reads 55(hex) data in the ram. Step 3. TCU writes AA(hex) data in the ram. Step 4. TCU reads AA(hex) data in the ram.		Accessory Ignition	OFF->ON (only at T/M computer initialization function) ON	1 time	1st
CAN Bus Off Counter	U0001	CAN controller continuity check	Receiving “BUS OFF” state from CAN controller		DS Active ACC[4]	TRUE	8 times	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
Overrun								
Lost communication with ECM (Engine)	U0100	Frame missing from ECM	No CAN status frame from ECM detected		Diagnostic Service "Disable Normal Communication" not detected		4 sec Continuous	2nd
					Accessory	ON >5 sec		
					DS_Active_CAN[2]	TRUE		
					No DTC set	U0001		
Gear error, hydraulic fault	P0731	Rationality	Calculation of actual gear ratio for 1st gear is not correct.		Current Gear	1st	2.5sec Continuous	2nd
					Transmission Output Speed	> 60rpm		
			abs(1 - GRCurrent/ 2nd GearRatio)	< 4%	EngineTorque_noACC	>= 60Nm (GEAR_1ST)		
			or		Transmission Input Speed	<=6000rpm (gasoline engine)		
			abs(1 - GRCurrent/ 3rd GearRatio)	< 4%	Transmission Input Speed	<=4000rpm (diesel engine)		
			or		ConditionA[13]	TRUE		
			abs(1 - GRCurrent/ 4th GearRatio)	< 4%				
	P0732	Rationality	Calculation of actual gear ratio for 2nd gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1:		Current gear	2nd		
			abs(1-GRCurrent/GRExpected)	>20%	Transmission Output Speed	>= 60rpm		
					ConditionA[13]	TRUE		
					No DTC set	P0732 (Criteria2)		
			Criteria2:				2.5 sec	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			abs(1-Gear Ratio Current/ 3rd Gear Ratio)	<4%	Current gear	2nd	Accumulate	
			or		Transmission Output Speed	>= 60rpm		
			abs(1-Gear Ratio Current/ 4th Gear Ratio)	<4%	ConditionA[13]	TRUE		
			or		InTorque	>=30Nm or <=-20Nm		
			abs(1-Gear Ratio Current/ 6th Gear Ratio)	<4%				
	P0733	Rationality	Calculation of actual gear ratio for 3rd gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1:		Current gear	3rd		
			abs(1-GRCurrent/GRExpected)	>20%	Transmission Output Speed	>= 60rpm		
					ConditionA[13]	TRUE		
					No DTC set	P0733 (Criteria2)		
			Criteria2:		Current gear	3rd	2.5 sec	
			abs(1-Gear Ratio Current/ 2nd Gear Ratio)	<4%	Transmission Output Speed	>= 60rpm	Accumulate	
			or		ConditionA[13]	TRUE		
			abs(1-Gear Ratio Current/ 4th Gear Ratio)	<4%	InTorque	>=30Nm or <=-20Nm		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			or abs(1-Gear Ratio Current/ 5th Gear Ratio)	<4%				
	P0734	Rationality	Calculation of actual gear ratio for 4th gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1: abs(1-GRCurrent/GRExpected)	>20%	Current gear Transmission Output Speed ConditionA[13] No DTC set	4th >= 60rpm TRUE P0734 (Criteria2)		
			Criteria2: abs(1-Gear Ratio Current/ 2nd Gear Ratio) **or** abs(1-Gear Ratio Current/ 3rd Gear Ratio) **or** abs(1-Gear Ratio Current/ 5th Gear Ratio) **or** abs(1-Gear Ratio Current/ 6th Gear Ratio)	<4% <4% <4% <4%	Current gear Transmission Output Speed ConditionA[13] InTorque	4th >= 60rpm TRUE >=30Nm or <=-20Nm	2.5 sec Accumulate	
	P0735	Rationality	Calculation of actual gear ratio for 5th gear is not				12 sec	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			correct. (Criteria1 or Criteria2)				Continuous	
			Criteria1: abs(1-GRCurrent/GRExpected)	>20%	Current gear Transmission Output Speed ConditionA[13] No DTC set	5th >= 60rpm TRUE P0735 (Criteria2)		
			Criteria2: abs(1-Gear Ratio Current/ 3rd Gear Ratio) **or** abs(1-Gear Ratio Current/ 4th Gear Ratio) **or** abs(1-Gear Ratio Current/ 6th Gear Ratio)	<4% <4% <4%	Current gear Transmission Output Speed ConditionA[13] InTorque	5th >= 60rpm TRUE >=30Nm or <=-20Nm	2.5 sec Accumulate	
	P0729	Rationality	Calculation of actual gear ratio for 6th gear is not correct. (Criteria1 or Criteria2)				12 sec Continuous	2nd
			Criteria1: abs(1-GRCurrent/GRExpected)	> 20%	Current gear Transmission Output Speed ConditionA[13] No DTC set	6th >= 60rpm TRUE P0729 (Criteria2)		

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
			Criteria2:		Current gear	6th	2.5 sec	
			abs(1-Gear Ratio Current/ 2nd Gear Ratio)	<4%	Transmission Output Speed	>= 60rpm	Accumulate	
					ConditionA[13]	TRUE		
			or					
			abs(1-Gear Ratio Current/ 4th Gear Ratio)	<4%	InTorque	>=30Nm or <=-20Nm		
			or					
			abs(1-Gear Ratio Current/ 5th Gear Ratio)	<4%				
Torque Converter Clutch	P0741	Comparison of engine speed and transmission input speed	Converter is slipping with active lock-up on. (Engine Speed - Transmission Input Speed)	> 300rpm	DS Active EG V[16] Fdetect_inh[5]	TRUE FALSE	12 sec Continuous	2nd
					Shift position	RANGE_D(defined)		
					Time after N-D shifting control[10] ends	8 sec		
					Engine Torque	>= 0 Nm		
					Engine Speed	< 4000 rpm		
					Time after SLU target current (_ir) >= 1000 mA	Time_SLU_Full[18] sec		
					Oil temperature	>= -7deg.C		
					Lock-up	FALSE		
					Not during garage control			

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
					T_GarageFin[14] msec after garage control Not during shifting T_ShiftFin[14] msec after shifting No DTC set	 P2763 P2764 P2761 P0715 P0717 P0720 P0722		
Un-usual shifting	P0869	SLC1 MAX	count fail SLC1MAX usft [17]	>= 5times	DS_Active_EG_V16 Fdetect inh[5] Time after N-D Shifting Control[10] ends Not during garage control T_GarageFin[14] msec after garage control Shift position Not during Neutral control T_NConFin[14] msec after Neutral control Time after neutral control ends wheel spin condition Transmission Output Speed Oil temperature Tmr_inh_GE[14] sec after shift to safe gear No DTC set	TRUE FALSE This timer is based on oil temperature. RANGE_D(defined) This timer is based on oil temperature. FALSE >300rpm >= -20 °C P0715 P0717 P0720 P0722	1 time	2nd
		SLC2 MAX	count_fail_SLC2MAX_usft [17]	>= 5times				
		SLC3 MAX	count_fail_SLC3MAX_usft [17]	>= 5times				
		SLB1 MAX	count fail SLB1MAX usft [17]	>= 5times				
Neutral condition	P0965		**Step 1:**		DS_Active_EG_V[16]	TRUE	**Step 1:**	2nd

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
				<300rpm		FALSE		
			abs(Engine Speed - Transmission Input Speed) Transmission Input Speed (at D range)	> Transmission Output Speed x (1st gear ratio at RANGE_D) + revNfaildet[19] rpm	Fdetect_Inh[5] Oil temperature Shift position Not during shifting T_ShiftFin[14] msec after shifting Not during garage control(N-D) T_GarageFin[14] msec after garage control	>= -7deg.C RANGE_D(defined)	at D range: 3.3 sec if (0 <= X <= 1500) 1.3 sec if (1501 <= X <= 3000)	
			Step 2: Transmission Input Speed Engine Speed Shift position	<200rpm >600rpm RANGE_D(defined)	Not during Neutral control T_NConFin[14] msec after Neutral control Transmission Output Speed Lockup Current gear QS_AirSuction[6]	<=500rpm FALSE 1 or 2 or 3 or 4 FALSE	0.8 sec if (3001 <= X)	

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Required	MIL Illumin.
							Step 2:	
					Prohibit Neutral Judgment flag No DTC set	FALSE P0717 P0722 P0715 P0720	0.3sec	

[1)]DS_Active_V

DS_Active_V = TRUE when start condition for failure detection is fulfilled for 2.0 sec continuously.

DS_Active_V = FALSE when permission condition for failure detection is not fulfilled.

Start Condition for failure detection:

Ignition ON and
10.2V < Battery Voltage <= 18V and
Not in service mode and
Reading EEPROM finish

Permission condition for failure detection:

Ignition ON and
9.0V < Battery Voltage <= 18V and
Not in service mode

[2)] DS_Active_CAN

DS_Active_CAN = TRUE when the start condition for CAN failure detection is fulfilled for 5.0 sec continously.

DS_Active_CAN = FALSE when the permission condition for CAN failure detection is not fulfilled.

Start Condition for failure detection:

Ignition ON and
10.2V < Battery Voltage <= 18V and
Not in service mode and
Reading EEPROM finish

Permission condition for failure detection:

Ignition ON and
9.0V < Battery Voltage <= 18V and
Not in service mode

[3)]DS_Active_EG_V

DS_Active_EG_V = TRUE when start condition for failure detection is fulfilled for 2.0 sec continuously.

DS_Active_EG_V = FALSE when permission condition for failure detection is not fulfilled.

Start Condition for failure detection:

Ignition ON and
10.2V < Battery Voltage <= 18V and
Not in service mode and
Reading EEPROM finish and
Egrpm > 400rpm and Egrpm = Q_NORMAL[1b]

Bus off, ECU no communication = Q_NORMAL[16]

Permission condition for failure detection:

Ignition ON and
9.0V < Battery Voltage <= 18V and
Not in service mode and
Egrpm > 400rpm and Egrpm = Q_NORMAL[16]
Bus off, ECU no communication = Q_NORMAL[16]

[4)] DS_Active_ACC

DS_Active_ACC = TRUE when the start condition for failure detection is fulfilled for 2.0 sec continously.
DS_Active_ACC = FALSE when the permission condition for failure detection is not fulfilled.

Start Condition for failure detection:

Accessory ON **or** Ignition ON and
10.2V < Battery Voltage <= 18V and
Not in service mode and
Reading EEPROM finish

Permission condition for failure detection:

Accessory ON **or** Ignition ON and
9.0V < Battery Voltage <= 18V and
Not in service mode

[5)] Fdetech_Inh = TRUE if:

In Emergency mode **or**
Spinning[7)] = TRUE **or**
within 10.0 sec after spinning[7)] detection end **or**
DTC set: P0973, P0974, P0966, P0967, P0970, P0971, P2720, P2721, P2729, P2730, P0962, P0963, P2763, P0717, P0722, P0705, P0707, P0708, P0562, P0563, U0001, U0100, P0601, P0711, P0712, P0713, P2534, P0604, P0778, P0798, P2716, P0748, P2761, P2727, P0657, P0720, P0715,

Not in Neutral avoidance control
Not in Engine stall avoidance control
Egrpm = Q_NORMAL[16]
Egtrq = Q_NORMAL[16]
Accel = Q_NORMAL[16]

[6)]QS_AirSuction : Quick stop detection flag for the prevention of failure misdetection for Air suction, is set if the vehicle brakes hard.

[7)] Spinning : If “LateralACC > 7.00m/s^2”, Spinning is TRUE.

LateralACC[m/s^2] = (WheelDiff[m/s] * WheelSpeedABS[m/s]) / WheelWidth[m])
WheelDiff ... “WheelSpeed RR” - “WheelSpeed RL”
WheelWidth... The width of the Wheel.

[8)] Wheel spin condition

(1) 300 rpm < outRpm < 3000rpm
(2) Egtorque_noACC > -500Nm
(3) ABS (vehicle front wheels average speed - vehicle rear wheels average speed) > 5.0 km/h

(4) Throttle > 70 %
(5) outRpmSpeed < -50rpm/sec
{(1)and(2)and(3)}or{ (1)and(4)and(5)}continuously detected for 300 msec
After that, Wheel spin condition = TRUE continuously 10000 msec

9) EngineTorque_noACC
Engine output torque, acceleration inertia torque not included.

10) Shifting Control
"Shifting Control" is activated when the transmission is in between two gears (undefined gear ratio), until applied pressure has reached to full

11) "Neutral Control"
Neutral Control is activated if the vehicle is at stand still and in range D with the brake pressed for 2 seconds until the brake is released.

12) "Garage Shifting"
"Garage Shifting Control" is activated when the range selector changes from N to D or R until appropriate Gear Ratio is detected.

13) ConditionA = TRUE if:
DS Active EG V[3] = TRUE **and**
Fdetect_Inh[5] = FALSE **and**
Garage shifting control[12](N-D or N-R) = FALSE **and**
T_GarageFin sec [14] after garage shift control[12] end **and**
Neutral control[11] = FALSE **and**
T_NConFin[14] after neutral control[11] end **and**
Shifting control[10] = FALSE **and**
T_ShiftFin[14] after shifting control[10] end **and**
RANGE_D (defined signal) **and**
Oil temperature >= -20 deg.C **and**
QS_AirSuction[6] = FALSE **and**
No DTC set: P0717, P0715, P0722, P0720

14)

Const Data	< -20 deg.C	>= -20 deg.C< -10 deg.C	>= -10 deg.C< 20 deg.C	>= 20 deg.C
T_GarageFin [msec]	50000	8000	2000	1000
T_NConFin [msec]	50000	8000	2000	1000
T_ShiftFin [msec]	50000	2000	1000	500
Tmr_inh_GE [msec]	50000	2000	1000	500

15)

Const Data / oiltemp	< GE_OT1	>= GE_OT1 < GE_OT2	>= GE_OT2
T_C1ctrlFin [msec]	50000	20000	8000
T_C3ctrlFin [msec]	50000	20000	8000

16) Q_NORMAL

Q_NORMAL menas that no failure is detected

17) count_fail_SLC1MAX_usft, count_fail_SLC2MAX_usft,count_fail_SLC3MAX_usft, count_fail_SLB1MAX_usft

When the following shift conditions are satisfied, increments the counter of count_fail_SLXXMAX_usft.

Condition / count	A-1*	A-2*	B-1*	B-2*	D*	E*
SLC1MAX_usft	4-5, 4-6, 2-6, 3-5	-	-	-	6-2, 5-3	5-6, 6-5, 6-4, 5-4
SLC2MAX_usft	-	4-3, 4-2, 5-3, 6-2	-	-	2-6, 3-5, 2-1, 1-1EB	1-2, 1-3, 2-3, 2-4, 3-4, 3-2, 3-1, 2-1
SLC3MAX_usft	3-4, 5-6	5-4, 3-2	-	-	2-6, 4-5, 4-6, 4-2 4-3, 6-2	1-2, 1-3, 2-3, 2-4, 4-3, 4-2, 2-1, 2-1EB, 1EB-1, 1-1EB, 4-5, 4-6, 6-5, 6-4
SLB1MAX_usft	2-3, 2-4	6-5, 6-4, 2-1EB	3-4	4-3	3-5, 4-5, 4-6, 5-6, 3-1, 3-2, 4-2, 5-3, 5-4	1-2, 1-3, 3-4, 3-2, 3-1, 1EB-1,1-1EB, 4-5, 4-6, 5-6, 5-4, 4-2

*Refer to Un-usual shifting Condition for the detail of "A-1, A-2, B-1, B-2, D, E"

18)

OilTemp [deg.C]	OT < 20 deg.C	OT >= 20 deg.C
Time_SLU_Full [msec]	3000	3000

19)

OilTemp [deg.C]		OT < 0 deg.C	OT >= 0 deg.C
revNfaildet [rpm]	R range	1200	1000
	D range	400	400