WORKSHOP MANUAL

TF SERIES

ENGINE DRIVEABILITY AND EMISSIONS

4JA1-TC/4JH1-TC ENGINE WITH BOSCH VP44 SYSTEM

SECTION 6E

ISUZU

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International Service & Parts

Tokyo, Japan

NOTICE

Before using this Workshop Manual to assist you in performing vehicle service and maintenance operations, it is recommended that you carefully read and thoroughly understand the information contained in Section - 0A under the headings "GENERAL REPAIR INSTRUCTIONS" and "HOW TO USE THIS MANUAL".

All material contained in this Manual is based on the latest product information available at the time of publication.
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Applicable Model : TFR/S 54/77

This manual is applicable to 2002 year model and later vehicles.

ENGINE

4JH1 ENGINE DRIVEABILITY AND EMISSIONS

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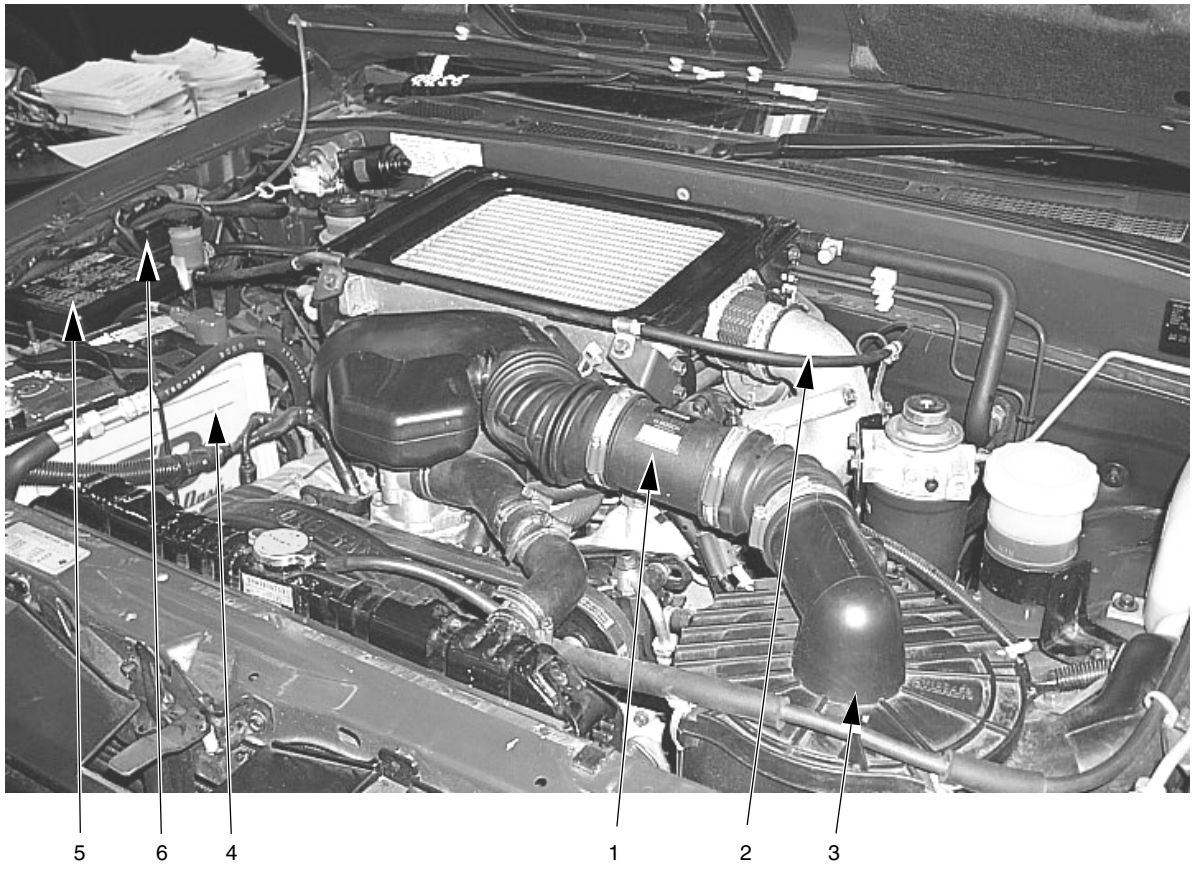
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ABBREVIATION CHARTS

Abbreviations	Appellation
A/C	Air conditioner
A/T	Automatic transmission
ACC	Accessory
BLK	Black
BLU	Blue
BRN	Brown
CAN	Controller Area Network
CEL	Check engine lamp
CKP	Crankshaft position sensor
DLC	Data link connector
DTC	Diagnosis trouble code
DVM	Digital voltage meter
ECM	Engine control module
ECT	Engine coolant temperature
EEPROM	Electrically erasable & programmable read only memory
EGR	Exhaust gas recirculation
EVRV	Electric vacuum regulating valve
GND	Ground
GRY	Gray
IAT	Intake air temperature
IG	Ignition
M/T	Manual transmission
MAB	High pressure solenoid valve cutoff (German abbreviation)
MAF	Mass air flow
MIL	Malfunction indicator lamp
OBD	On-board diagnostic
ORN	Orange
PNK	Pink
RED	Red
PSG	Pump control unit (German abbreviation)
SW	Switch
TCM	Transmission control module
TCV	Timing control valve
TDC	Top dead center
TPS	Throttle position sensor
VIO	Violet
VSS	Vehicle speed sensor
WHT	White
YEL	Yellow

COMPONENT LOCATOR

Engine Component Locator Table



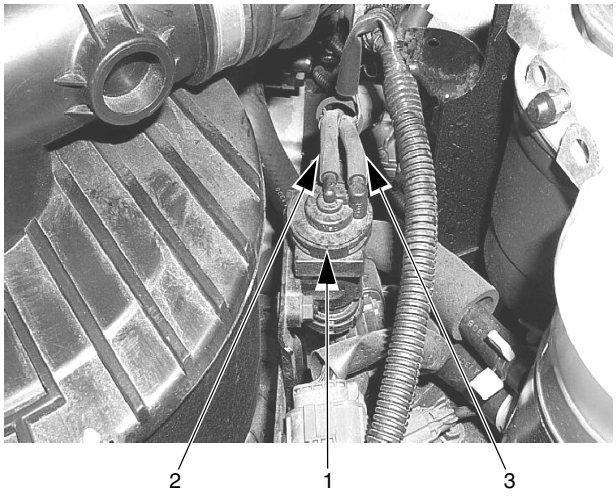
4JA1-TC

(1) Mass Air Flow (MAF) & Intake Air Temperature (IAT) Sensor Assembly
(2) Throttle Cable
(3) Air Cleaner Case
(4) Battery
(5) Relay & Fuse Box
(6) Option Box



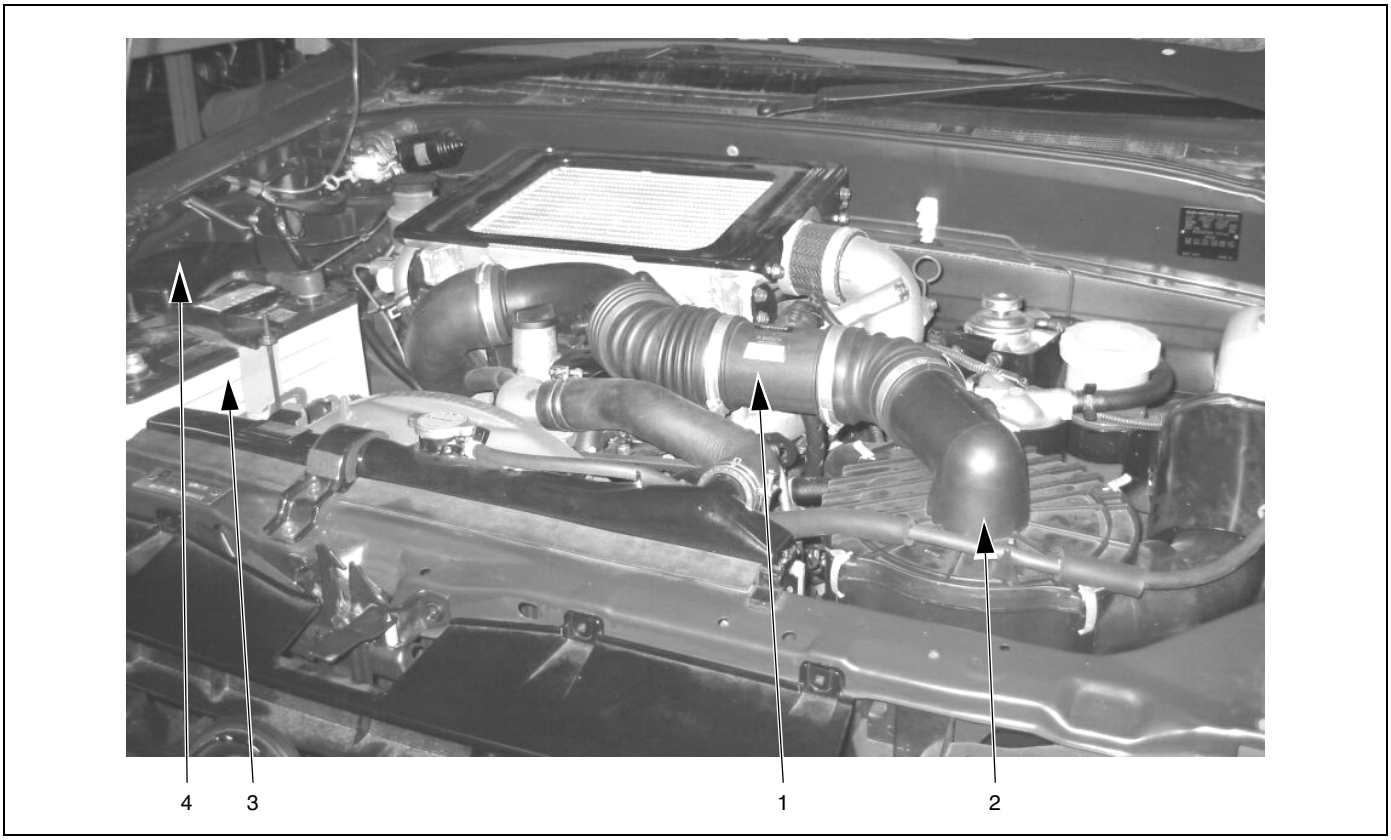
4JA1-TC

(1) Throttle Position Sensor (TPS)



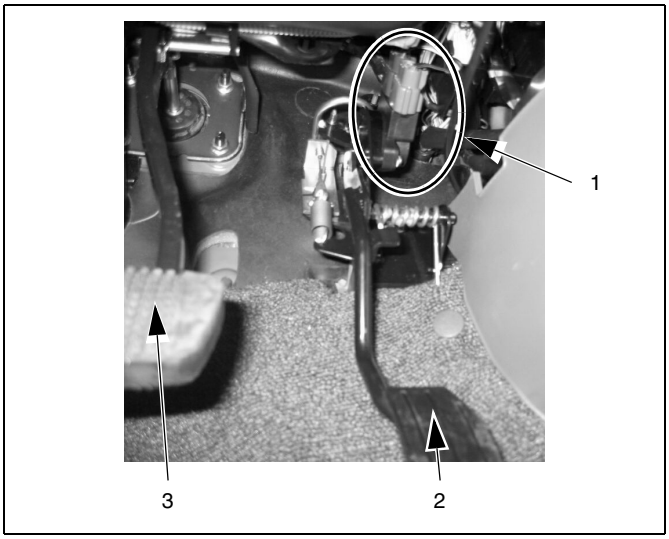
4JA1-TC

(1) Throttle Position Sensor (TPS)
(2) To Vacuum Pump
(3) To EGR Valve



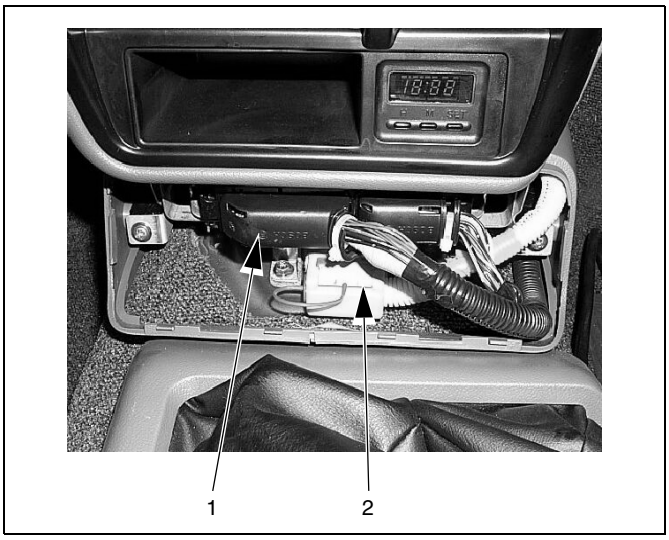
4JH1-TC

(1) Mass Air Flow (MAF) & Intake Air Temperature (IAT) Sensor Assembly
(2) Air Cleaner Case
(3) Battery
(4) Relay & Fuse Box

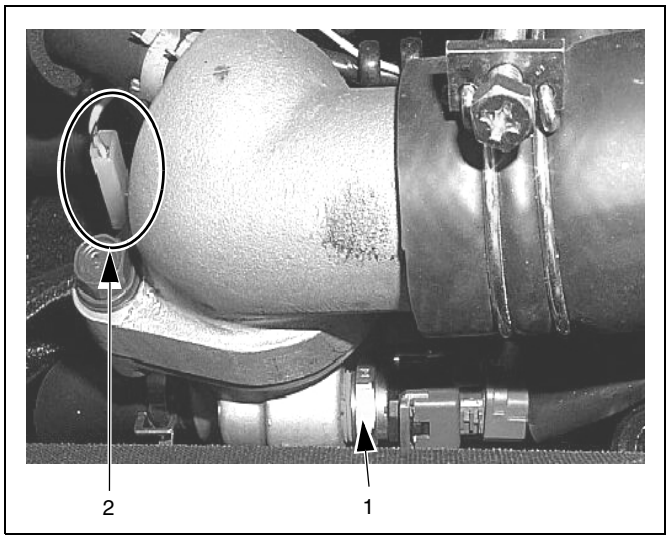


4JH1-TC

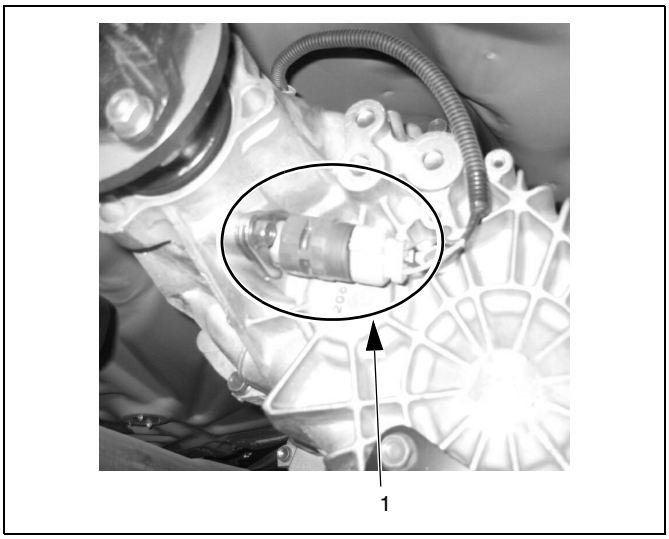
(1) Pedal/Throttle Position Sensor (TPS)
(2) Accelerator Pedal
(3) Brake Pedal



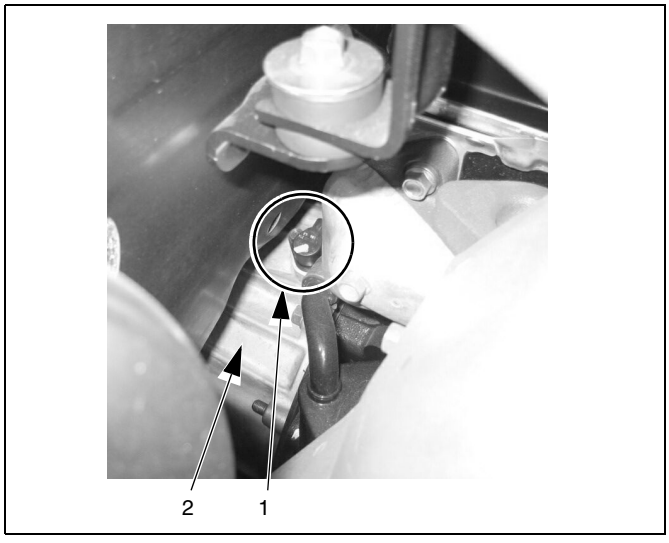
(1) Engine Control Module (ECM)
(2) SRS Control Module



(1) Engine Coolant Temperature (ECT) Sensor
(2) Thermo Unit for Water Temperature Gauge

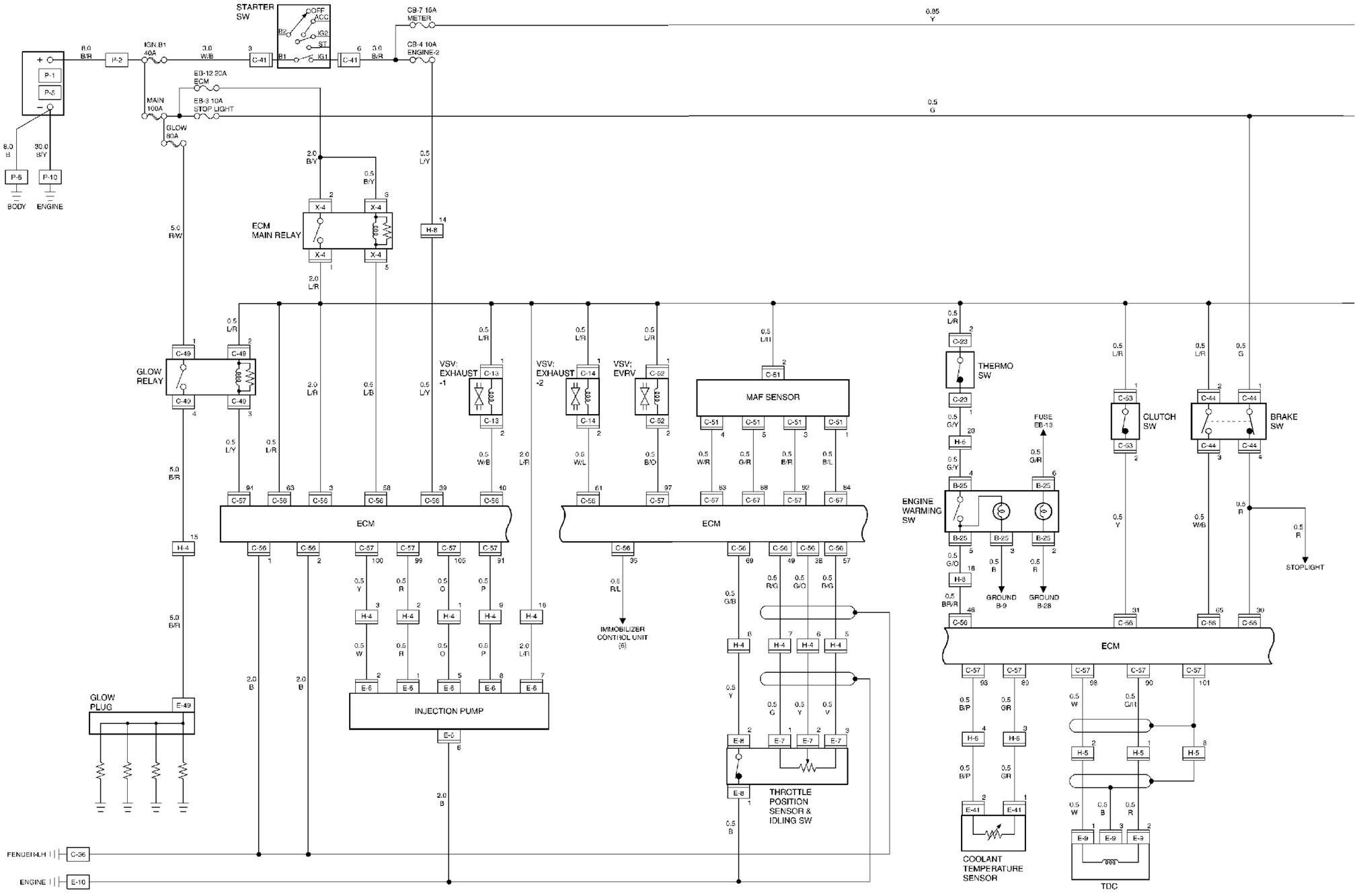


(1) Vehicle Speed Sensor (VSS)

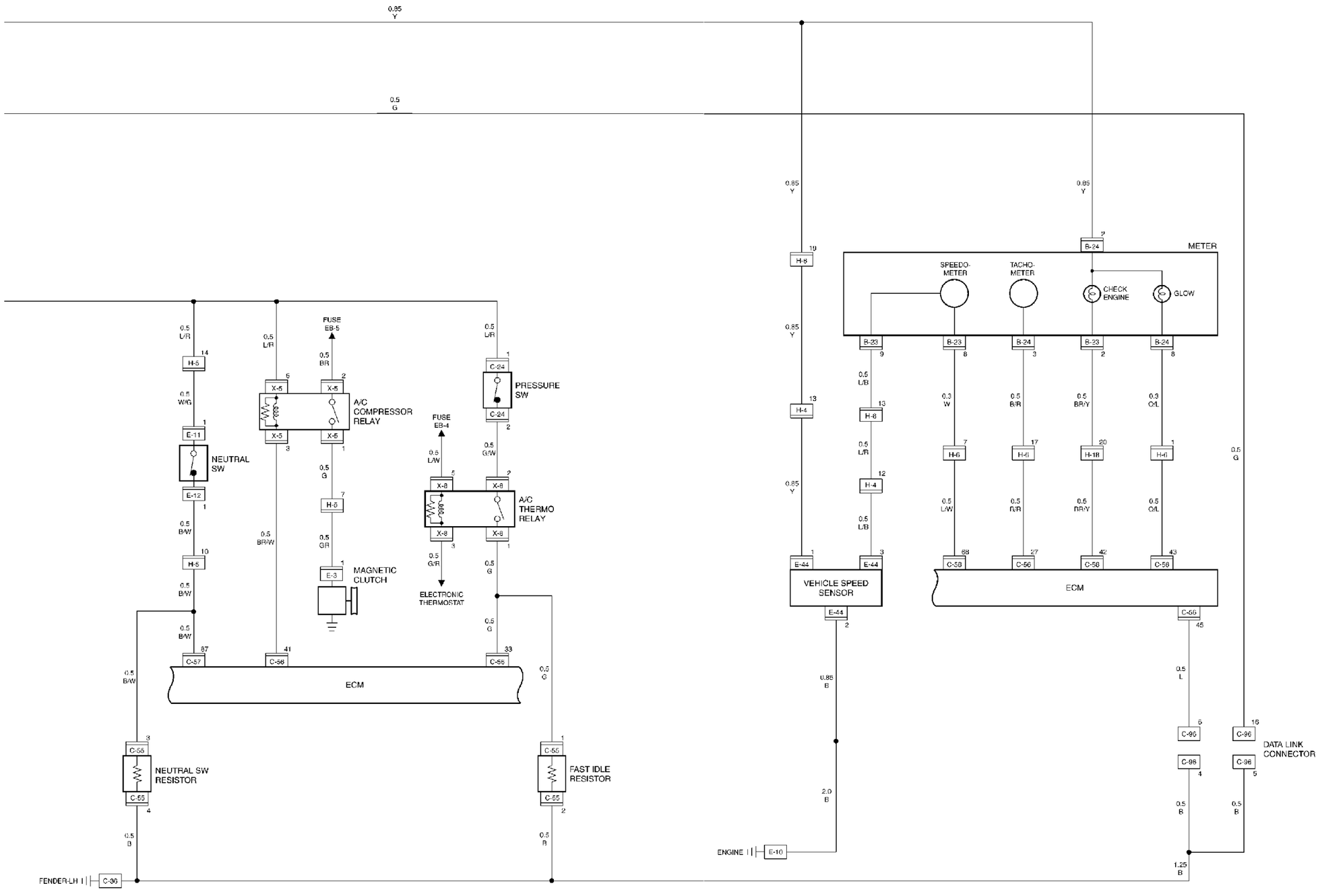


(1) Crankshaft Position (CKP) Sensor
(2) Clutch Housing

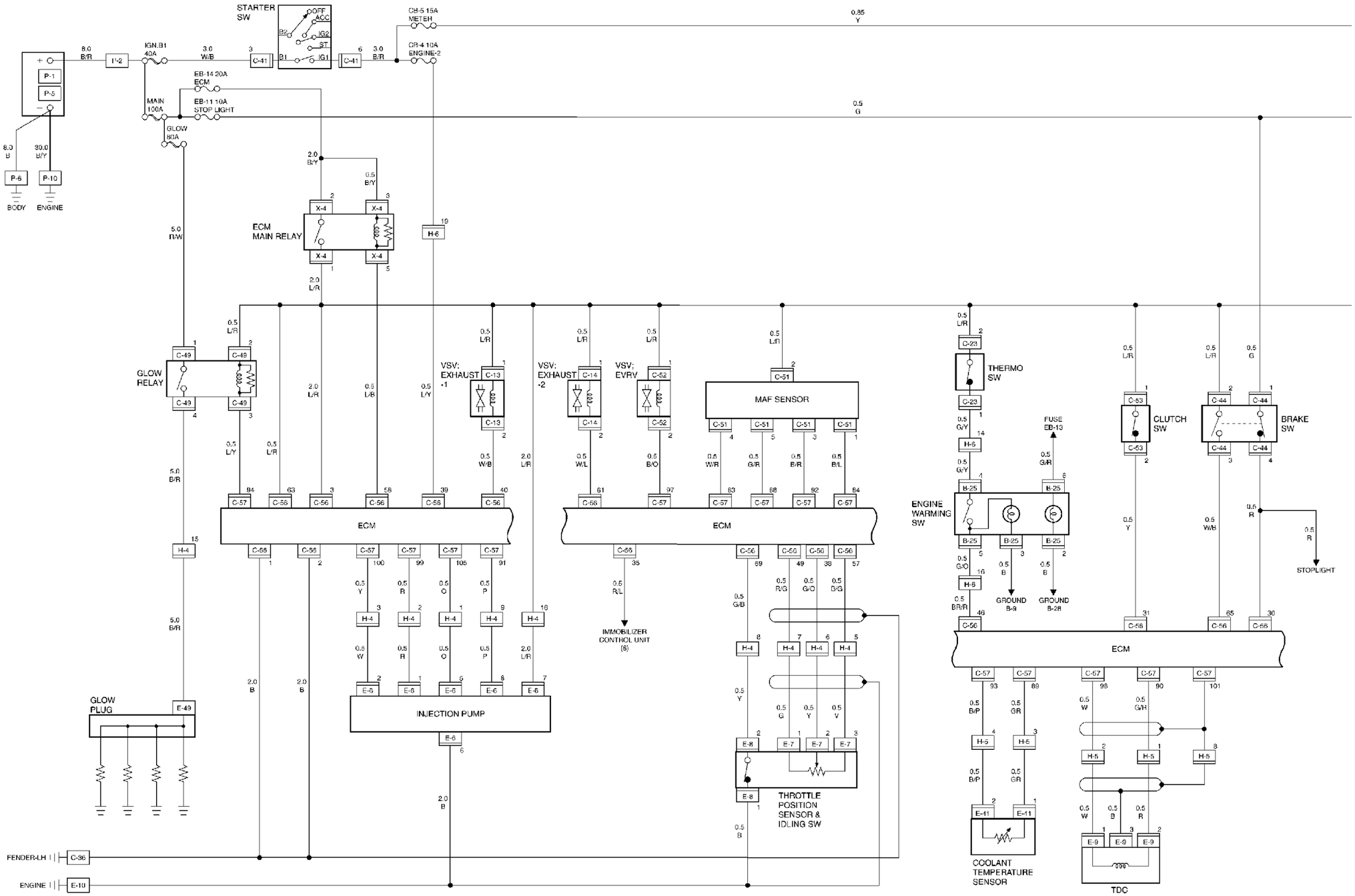
ECM CIRCUIT DIAGRAM (4JA1-TC LHD) (1/2)



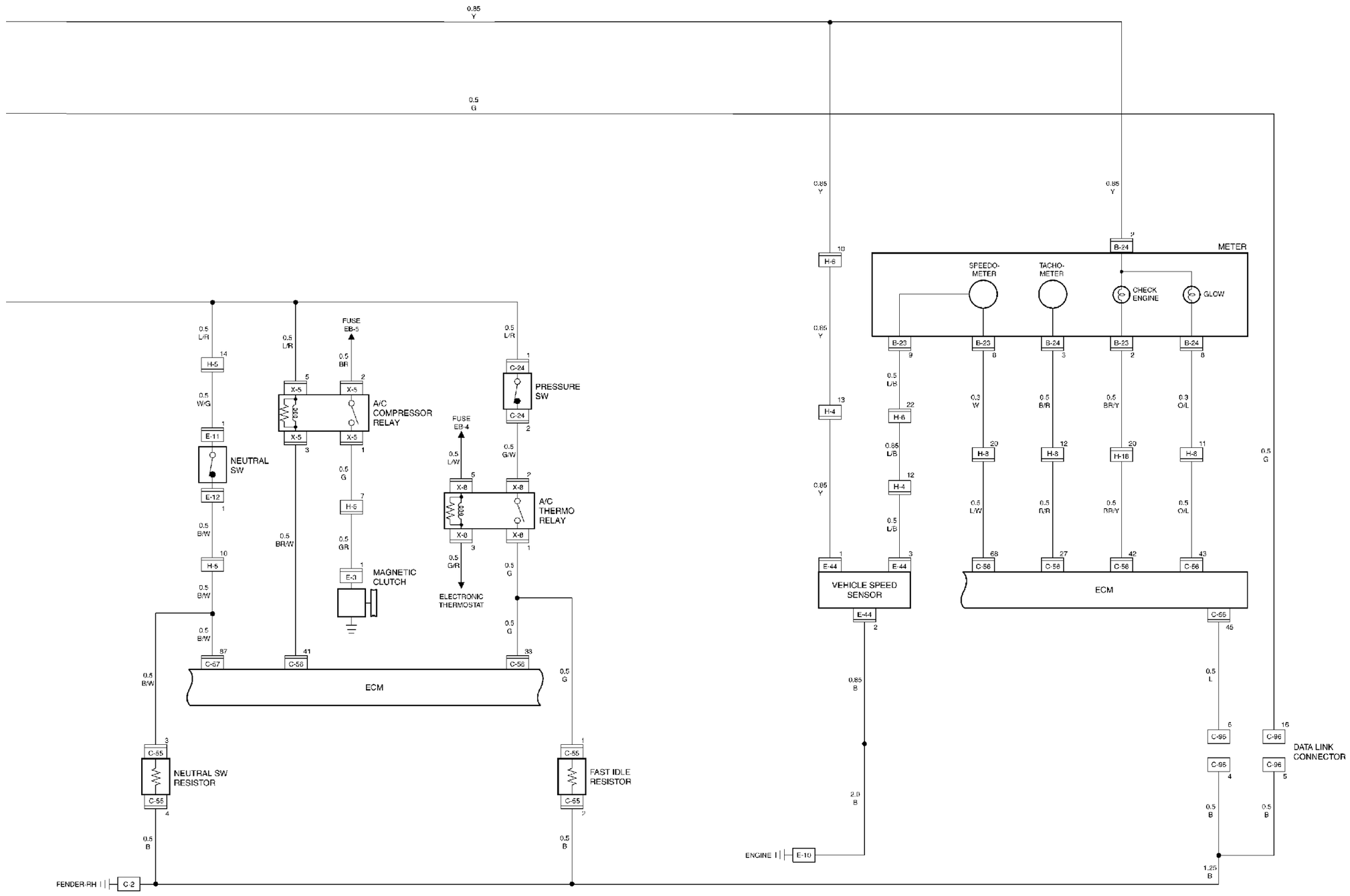
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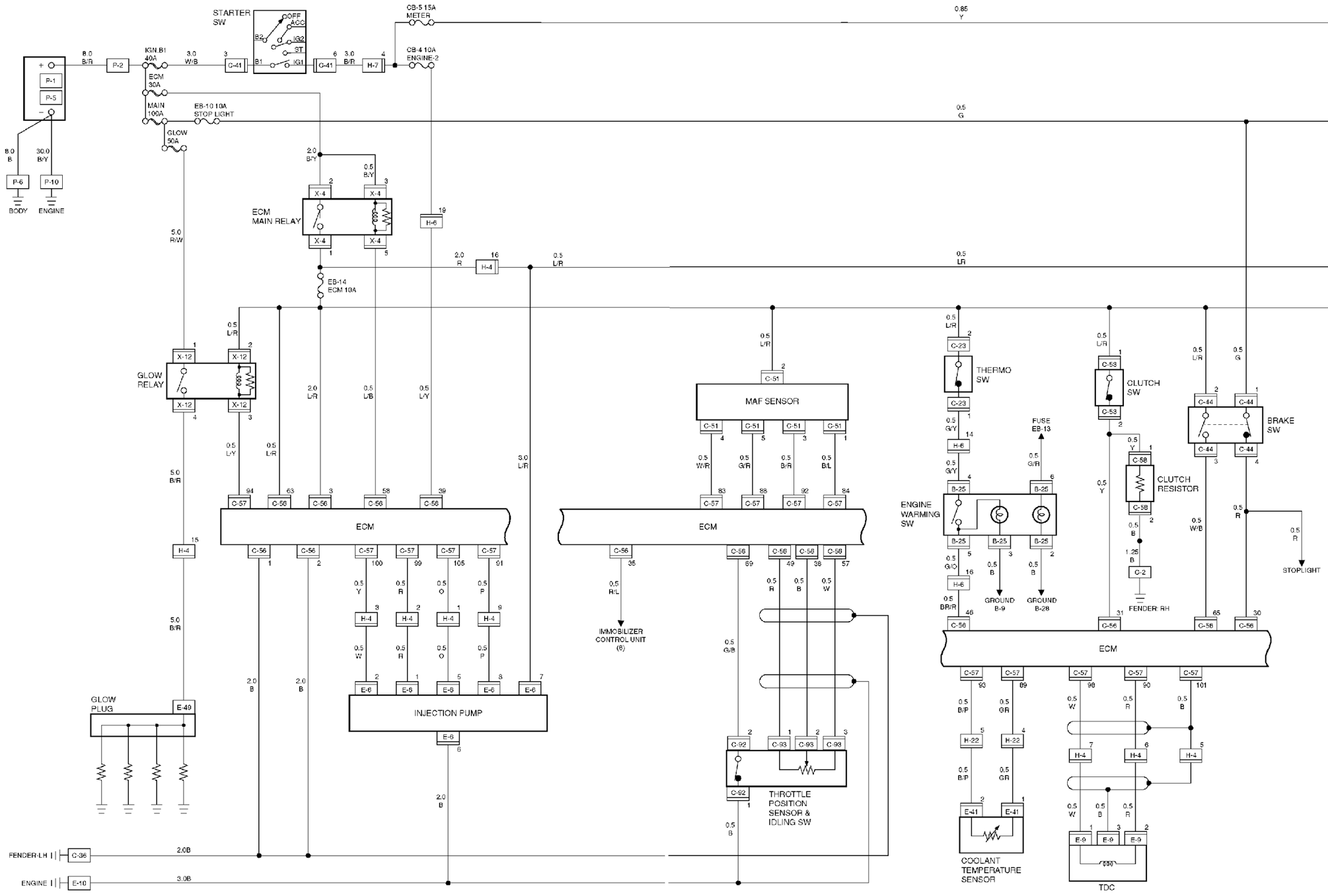
ECM CIRCUIT DIAGRAM (4JA1-TC RHD) (1/2)



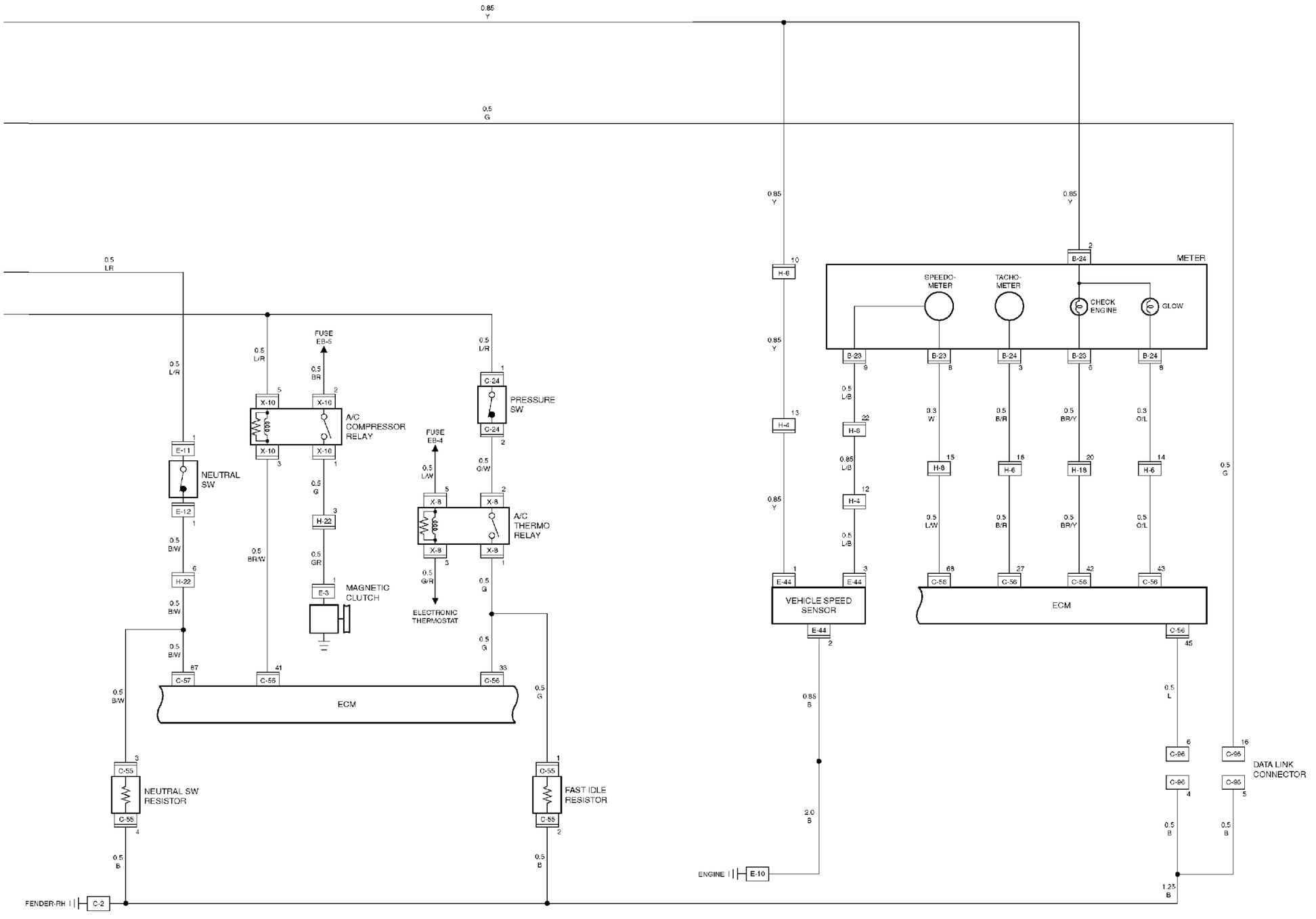
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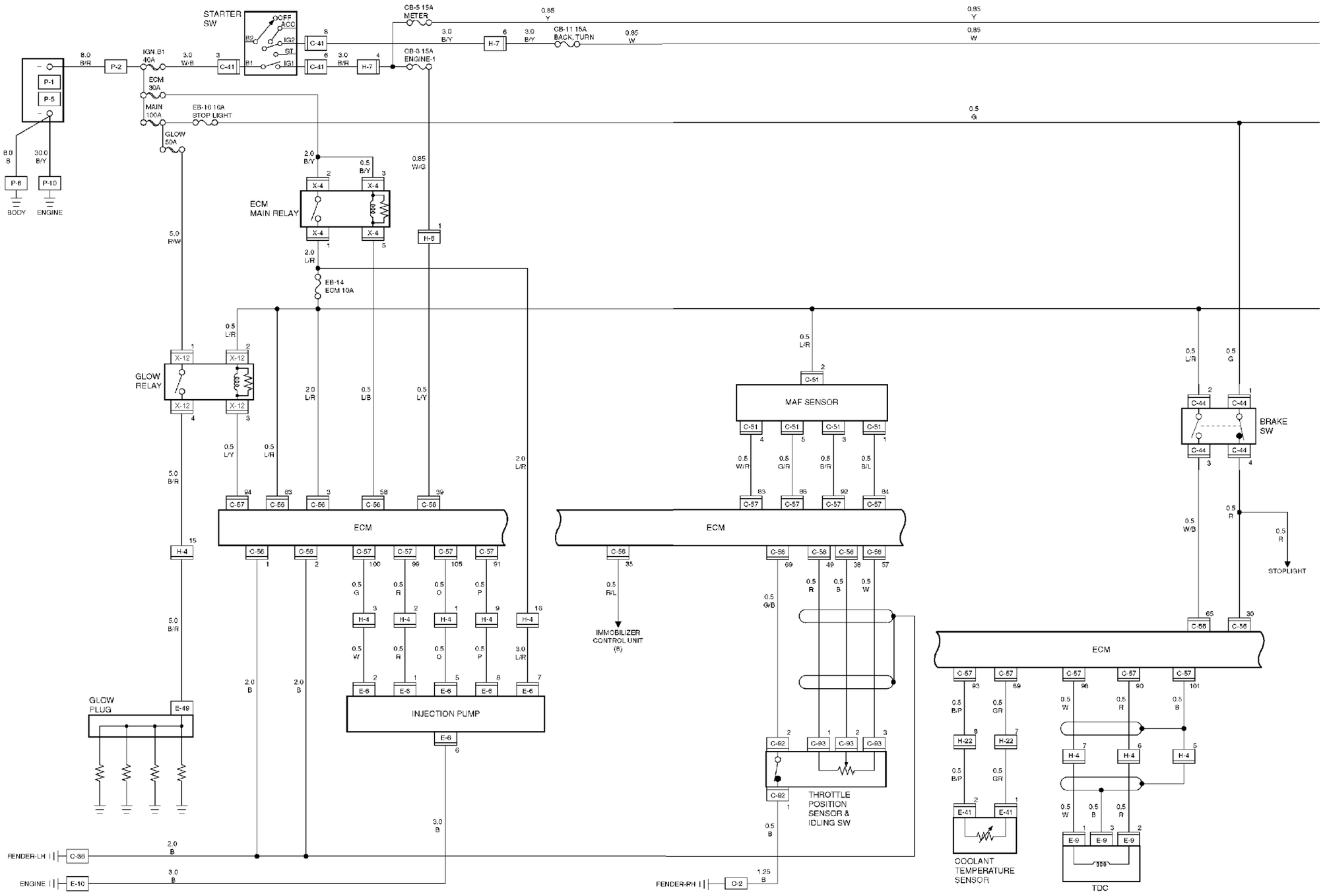
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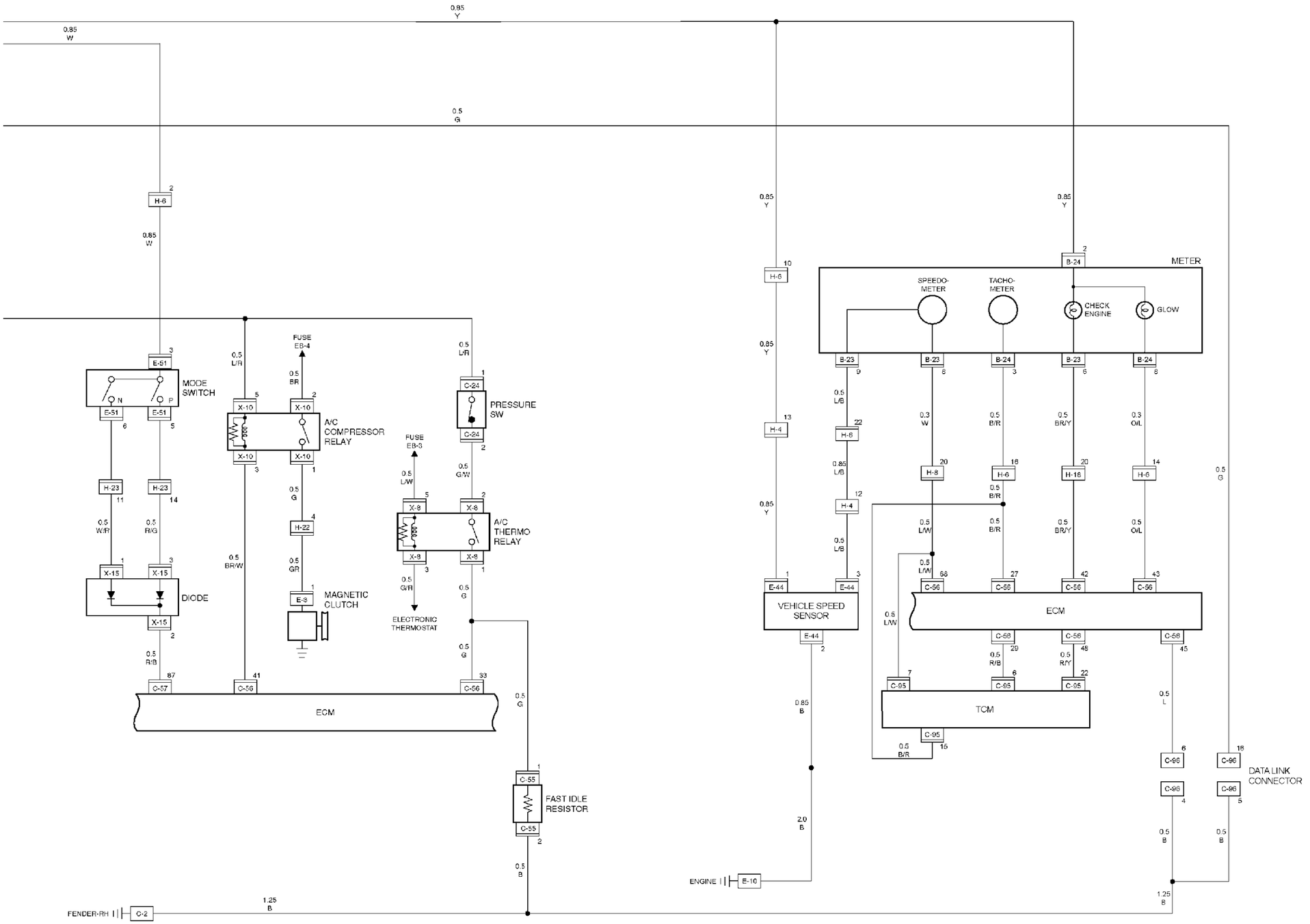
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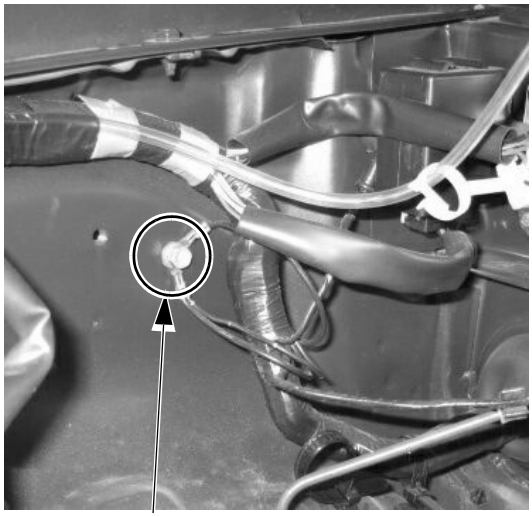
ECM CIRCUIT DIAGRAM (4JH1-TC RHD A/T) (1/2)



ECM CIRCUIT DIAGRAM (4JH1-TC RHD A/T) (2/2)



GROUND LOCATION



C2

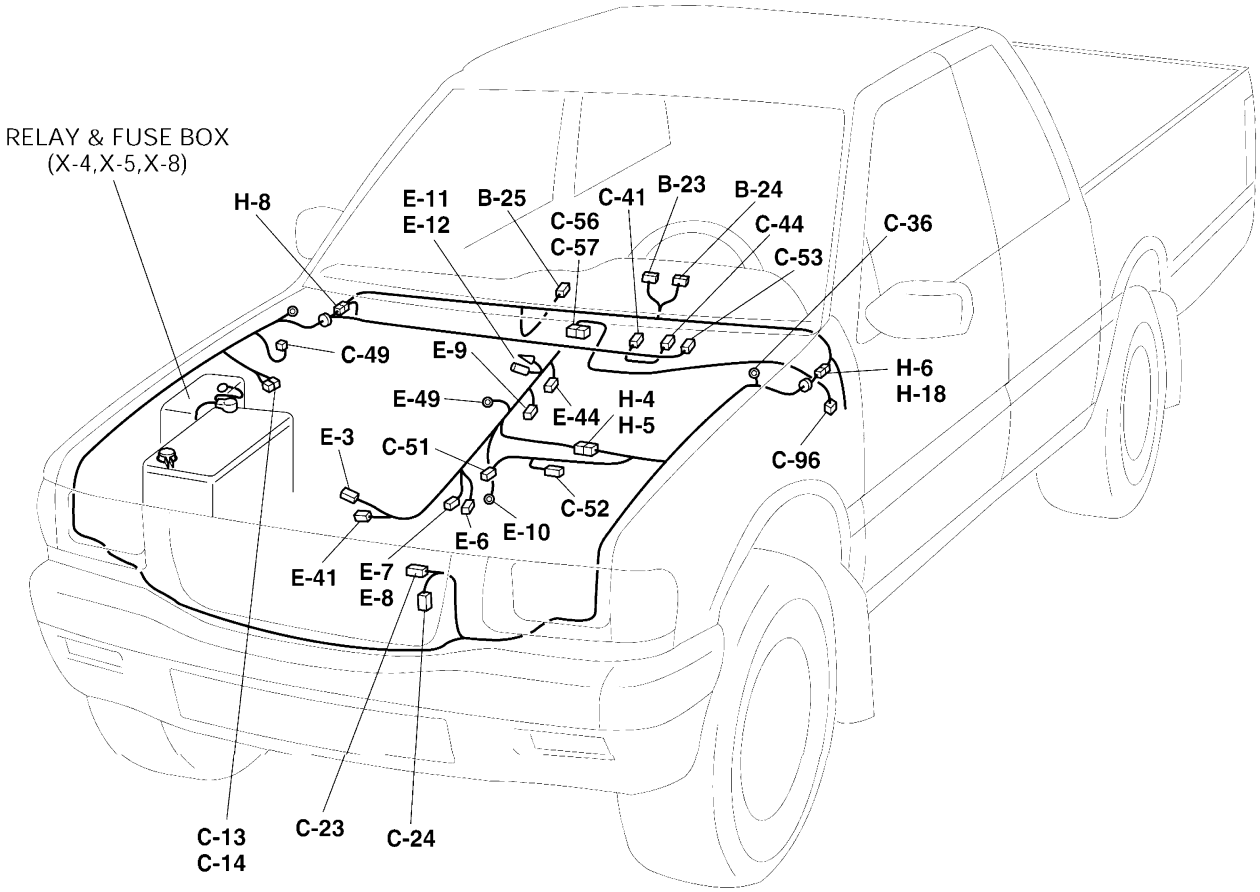


C36

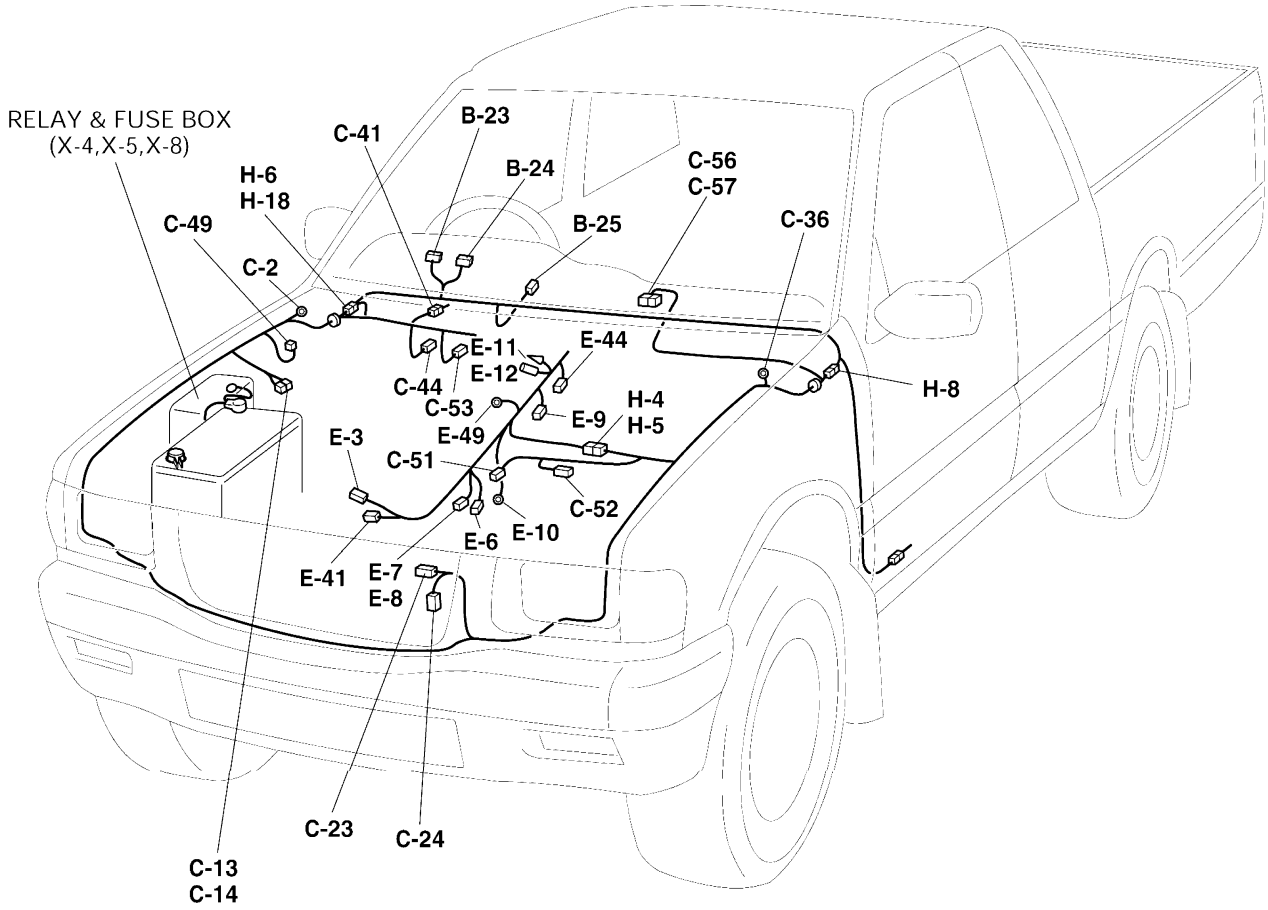


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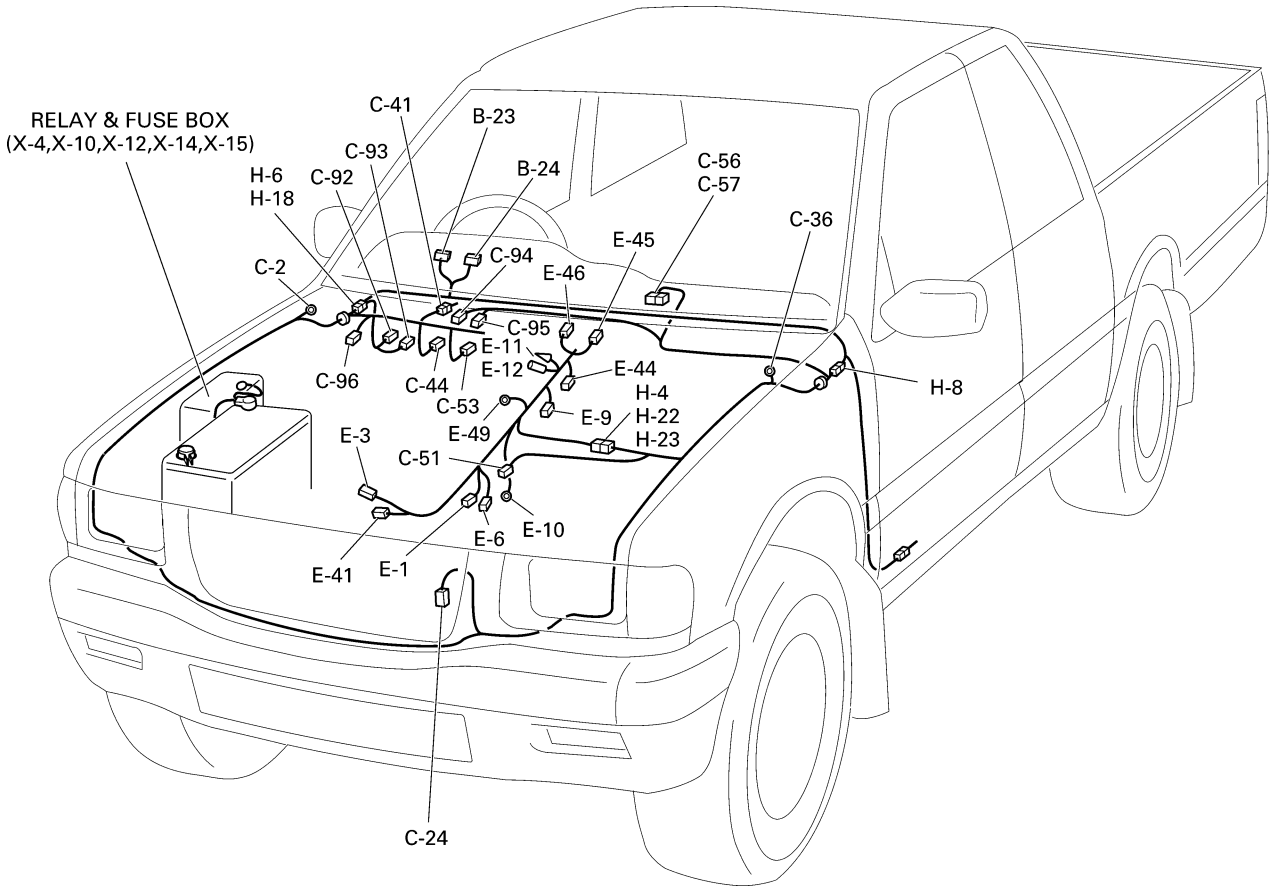
CABLE HARNESS & CONNECTOR LOCATION (4JA1-TC LHD)



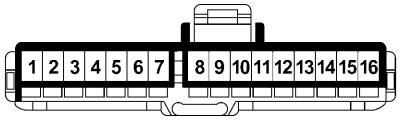
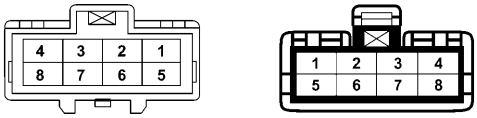
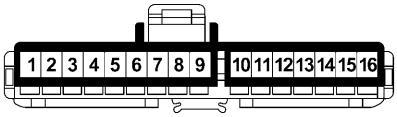
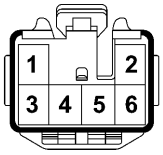
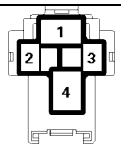
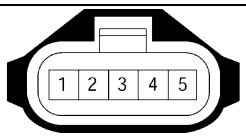
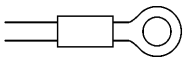
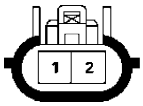
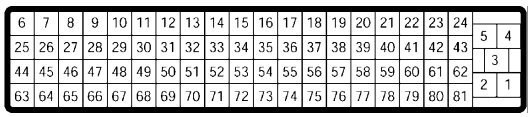
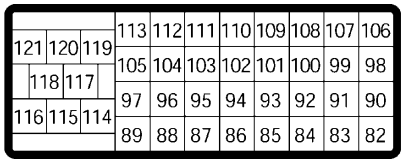
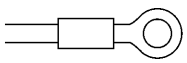
CABLE HARNESS & CONNECTOR LOCATION (4JA1-TC RHD)

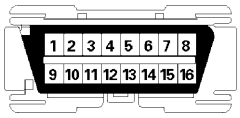
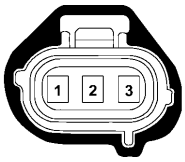
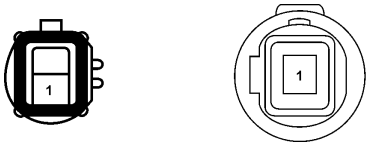
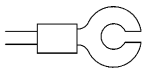
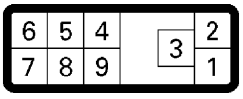
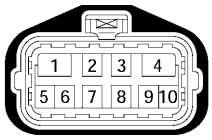
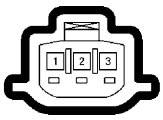
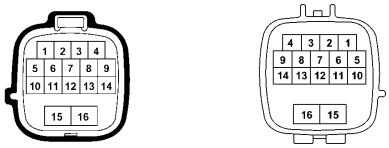
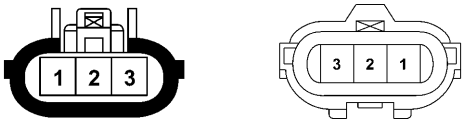
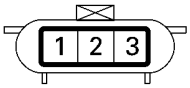
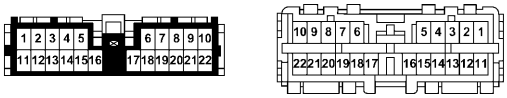
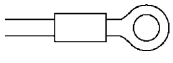
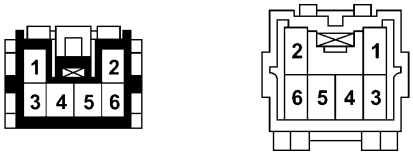


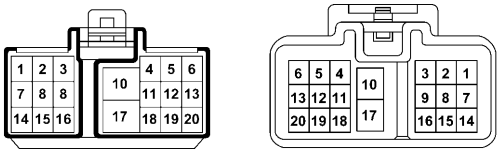
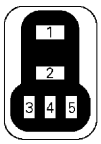
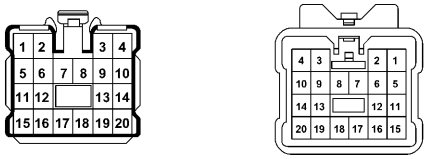
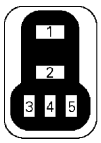
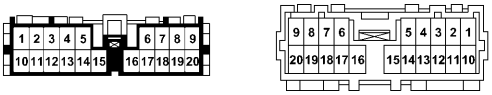
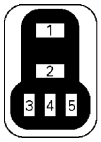
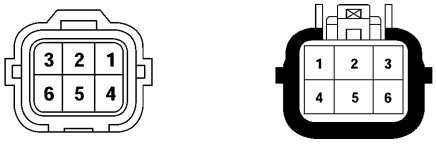
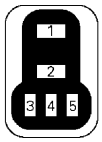
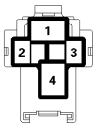
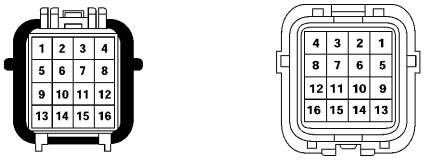
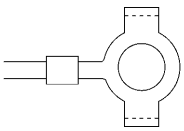
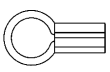
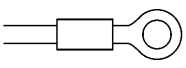
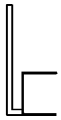
CABLE HARNESS & CONNECTOR LOCATION (4JH1-TC RHD)



CONNECTOR LIST

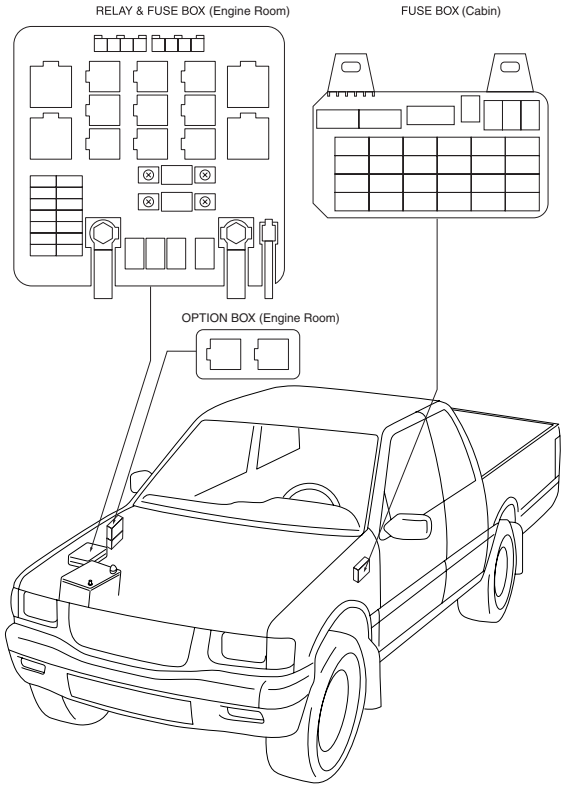
No.	Connector face	No.	Connector face
B-23		C-41	
B-24		C-44	
B-25		C-49	
B-68	 Immobiliser	C-51	
C-2		C-52	 EVRV
C-13		C-53	
C-14		C-55	
C-23		C-56	
C-24		C-57	
C-36		C-58	

No.	Connector face	No.	Connector face
C-92		E-12	
C-93	 TPS 1 main	E-41	
C-96		E-44	
E-3		E-49	
E-6		E-51	
E-7	 TPS 1 main	H-4	
E-8	 Idle SW	H-5	
E-9		H-6	
E-10		H-7 (LHD)	
E-11		H-7 (RHD)	

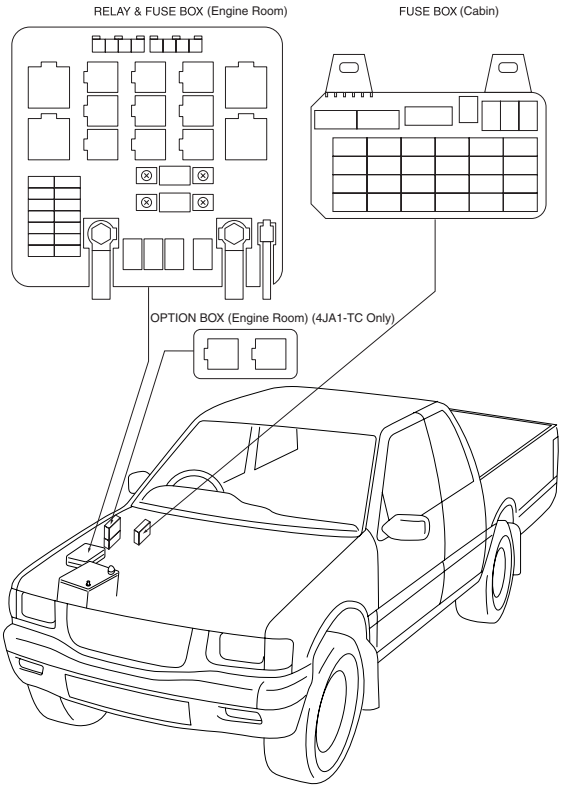
No.	Connector face	No.	Connector face
H-8 (LHD)		X-4 ECM Main	
H-8 (RHD)		X-5 A/C Com-pressor (4JA1)	
H-18		X-8 A/C Thermo	
H-22 (4JH1-MT)		X-10 A/C Com-pressor (4JH1)	
H-22 (4JH1-A/T)		X-12 Glow (4JH1)	
H-23			
P-2			
P-5			
P-6			
P-10			

RELAY AND FUSE

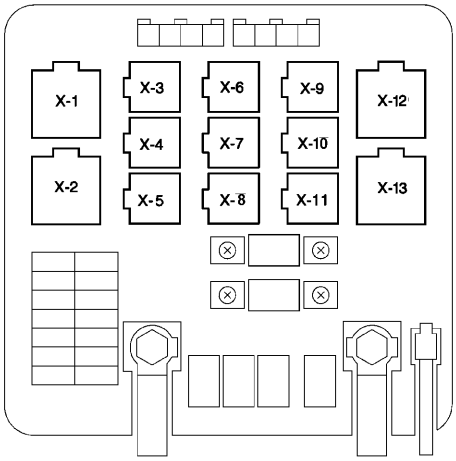
RELAY AND FUSE BOX LOCATION (LHD)

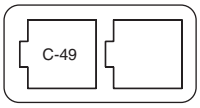


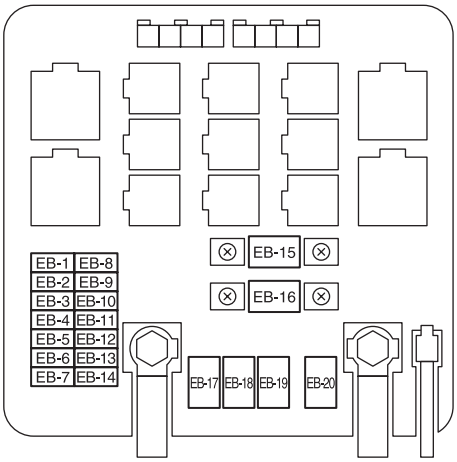
RELAY AND FUSE BOX LOCATION (RHD)



RELAY & FUSE LOCATION







RELAY

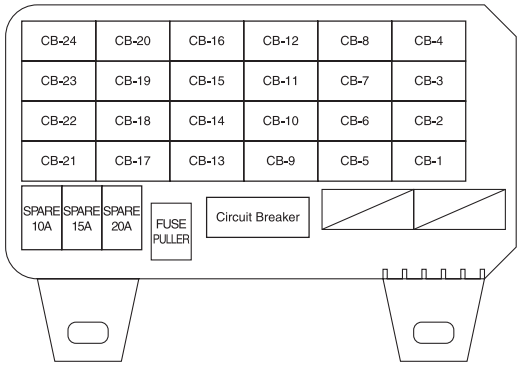
	4JA1-TC	4JH1-TC
X-1	RELAY; HEATER	RELAY; HEATER
X-2	RELAY; ST CUT	RELAY; ST CUT
X-3	RELAY; HONE	RELAY; HONE
X-4	RELAY; ECM MAIN	RELAY; ECM MAIN
X-5	RELAY; A/C COMP.	RELAY; HATCH GATE
X-6	RELAY; TAIL LIGHT	RELAY; TAIL LIGHT
X-7	RELAY; IMMOBILISER	RELAY; IMMOBILISER
X-8	RELAY; A/C THERMO	RELAY; A/C THERMO
X-9	RELAY; HEAD LIGHT	RELAY; HEAD LIGHT
X-10	—	RELAY; A/C COMP.
X-11	RELAY; RR FOG	—
X-12	RELAY; DIMMER	RELAY; GLOW
X-13	RELAY; STARTER	RELAY; STARTER
C-49	RELAY; GLOW	—

FUSE

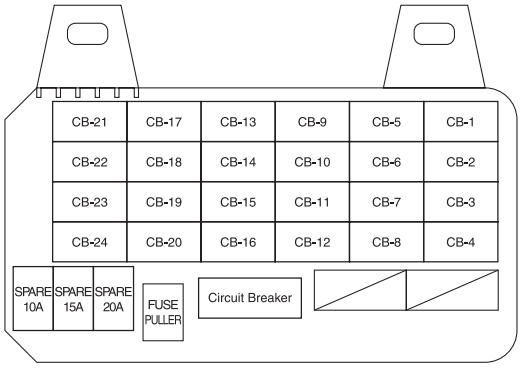
	4JA1-TC	4JH1-TC
EB-1	15A HAZARD	15A HAZARD
EB-2	10A HORN	10A HORN
EB-3	10A STOP LIGHT (LHD)	20A BLOWER
	— (RHD)	
EB-4	20A BLOWER	10A A/C
EB-5	10A A/C	—
EB-6	10A RR FOG LIGHT (LHD)	—
	— (RHD)	
EB-7	10A CHARGE	10A CHARGE
EB-8	10A H/LIGHT-RH (HI) (LHD)	10A H/LIGHT-LH
	10A H/LIGHT-LH (RHD)	
EB-9	10A H/LIGHT-LH (HI) (LHD)	10A H/LIGHT-RH
	10A H/LIGHT-RH (RHD)	
EB-10	10A H/LIGHT-RH (LO) (LHD)	10A STOP LIGHT
	— (RHD)	
EB-11	10A H/LIGHT-LH (LO) (LHD)	10A TAIL LIGHT
	10A STOP LIGHT (RHD)	
EB-12	10A ECM (LHD)	10A TCM
	10A TAIL LIGHT (RHD)	
EB-13	10A TAIL LIGHT RH (LHD)	—
	10A RR FOG LIGHT (RHD)	
EB-14	10A TAIL LIGHT LH (LHD)	10A ECM
	10A ECM (RHD)	
EB-15	30A ECM	30A ECM
EB-16	100A MAIN	100A MAIN
EB-17	40A IGN-B2	40A IGN-B2
EB-18	30A HEAD LIGHT WASHER (LHD)	—
	— (RHD)	
EB-19	50A GLOW	50A GLOW
EB-20	40A IGN-B1	40A IGN-B1

RELAY & FUSE LOCATION

(LHD)



(RHD)

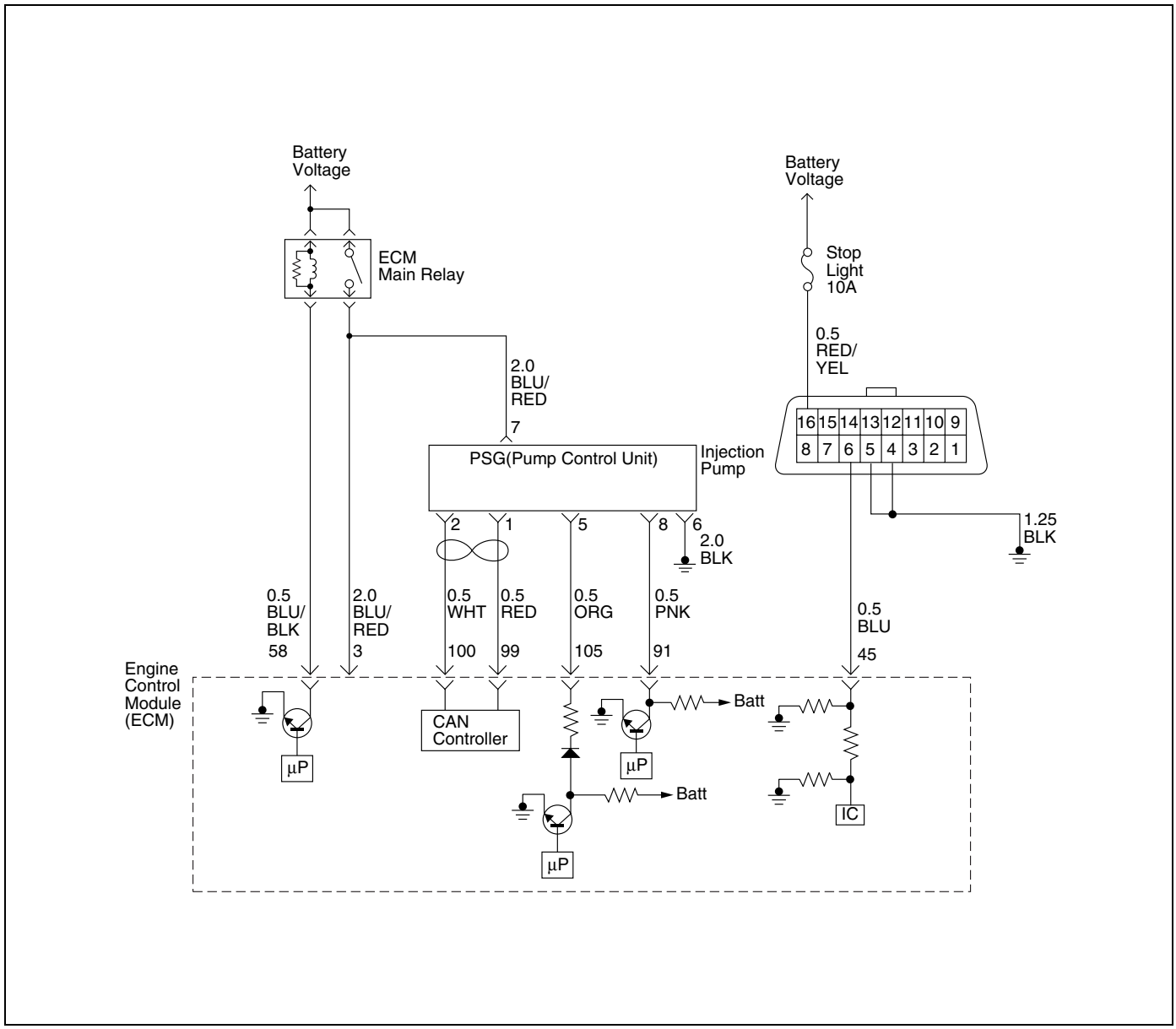


FUSE

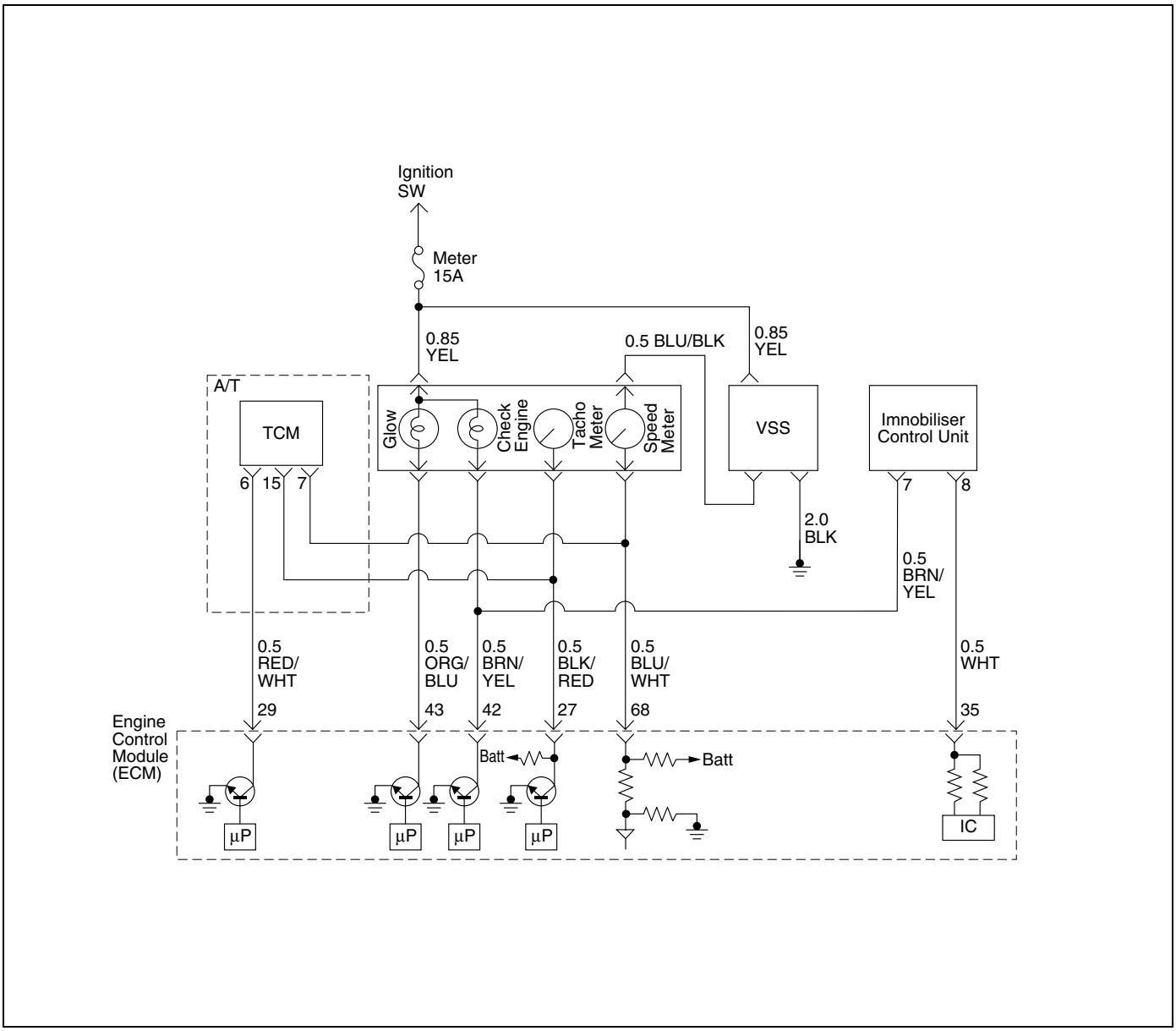
	LHD		RHD	
CB-1	10A	STARTER	10A	STARTER
CB-2	—	—	—	—
CB-3	15A	ENGINE-1	15A	ENGINE-1
CB-4	10A	ENGINE-2	10A	ENGINE-2
CB-5	—	—	15A	METER
CB-6	—	—	20A	FRONT WIPER
CB-7	15A	METER	—	—
CB-8	20A	FRONT WIPER	—	—
CB-9	—	—	—	—
CB-10	—	—	—	—
CB-11	15A	BACK UP, TURN	15A	BACK UP, TURN
CB-12	10A	(SEAT HEATER)	—	—
CB-13	15A	(RR DEFOG.)	15A	(RR DEFOG.)
CB-14	10A	DOME LIGHT	10A	DOME LIGHT
CB-15	20A	(DOOR LOCK)	20A	(DOOR LOCK)
CB-16	—	—	—	—
CB-17	—	—	—	—
CB-18	—	—	—	—
CB-19	15A	AUDIO	15A	AUDIO
CB-20	15A	CIGAR	15A	CIGAR
CB-21	10A	(SRS-2)	20A	(POWER WINDOW)
CB-22	10A	(SRS-1)	20A	(POWER WINDOW)
CB-23	20A	(POWER WINDOW)	10A	(SRS-2)
CB-24	20A	(POWER WINDOW)	10A	(SRS-1)

( )·····IF EQUIPPED

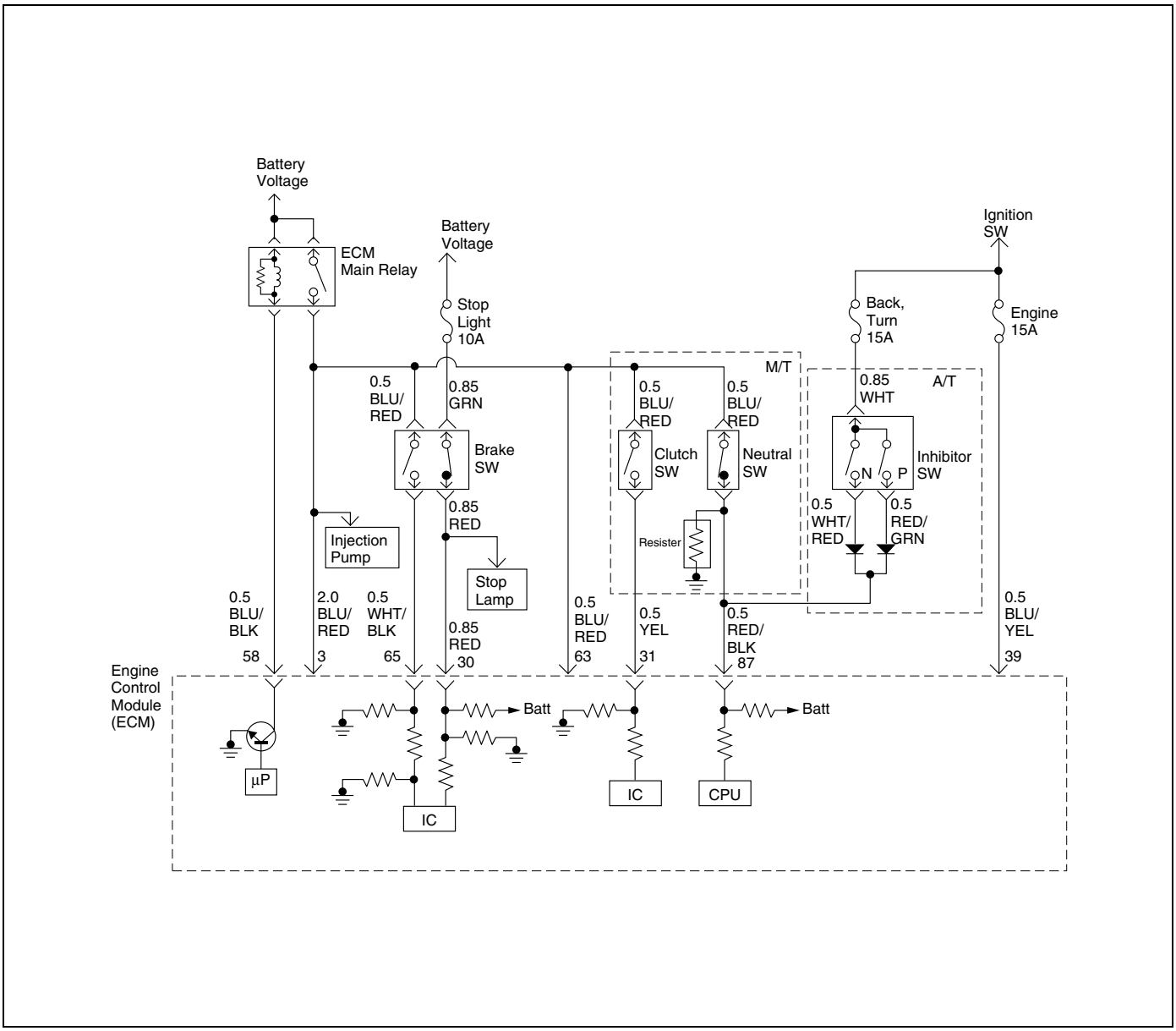
ECM WIRING DIAGRAM (1/7)



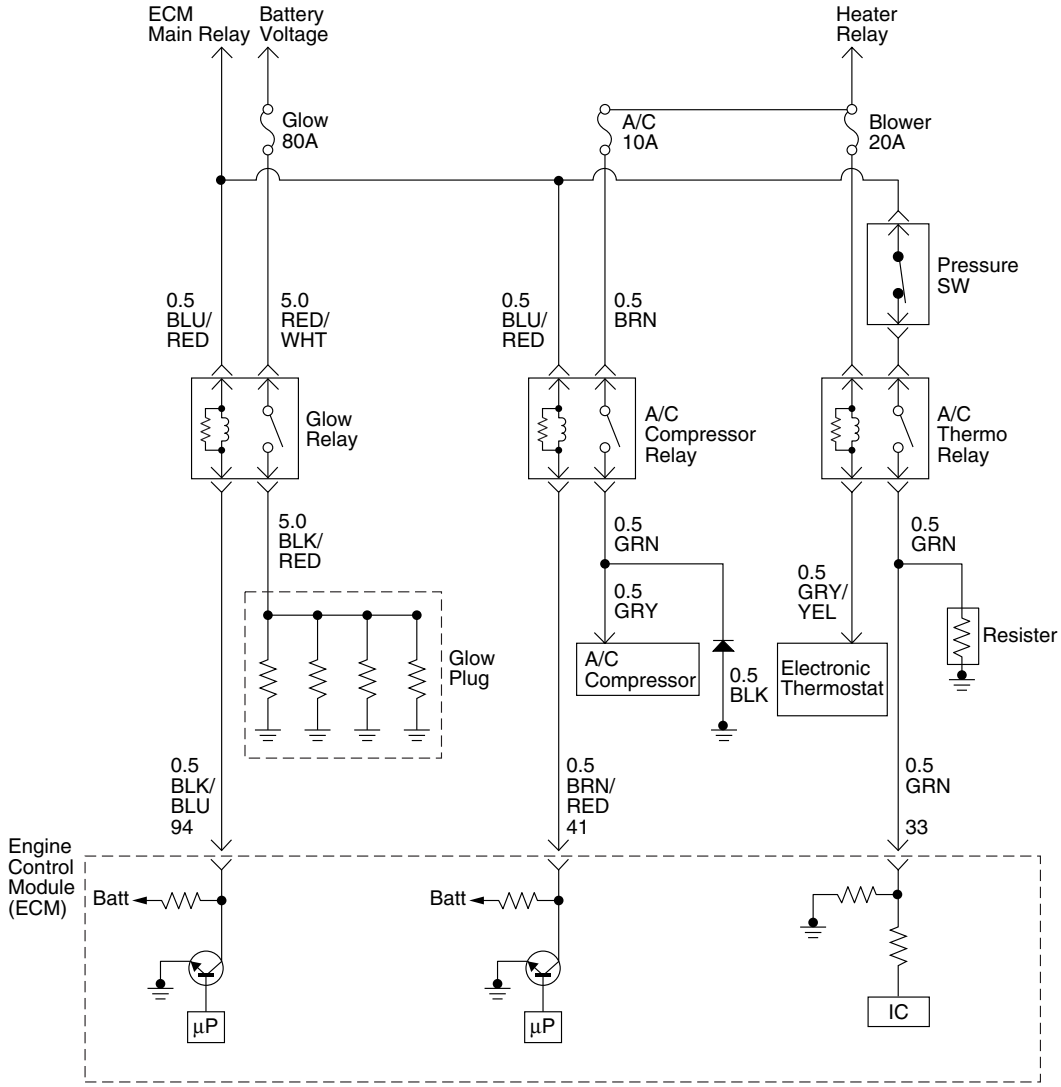
ECM WIRING DIAGRAM (2/7)



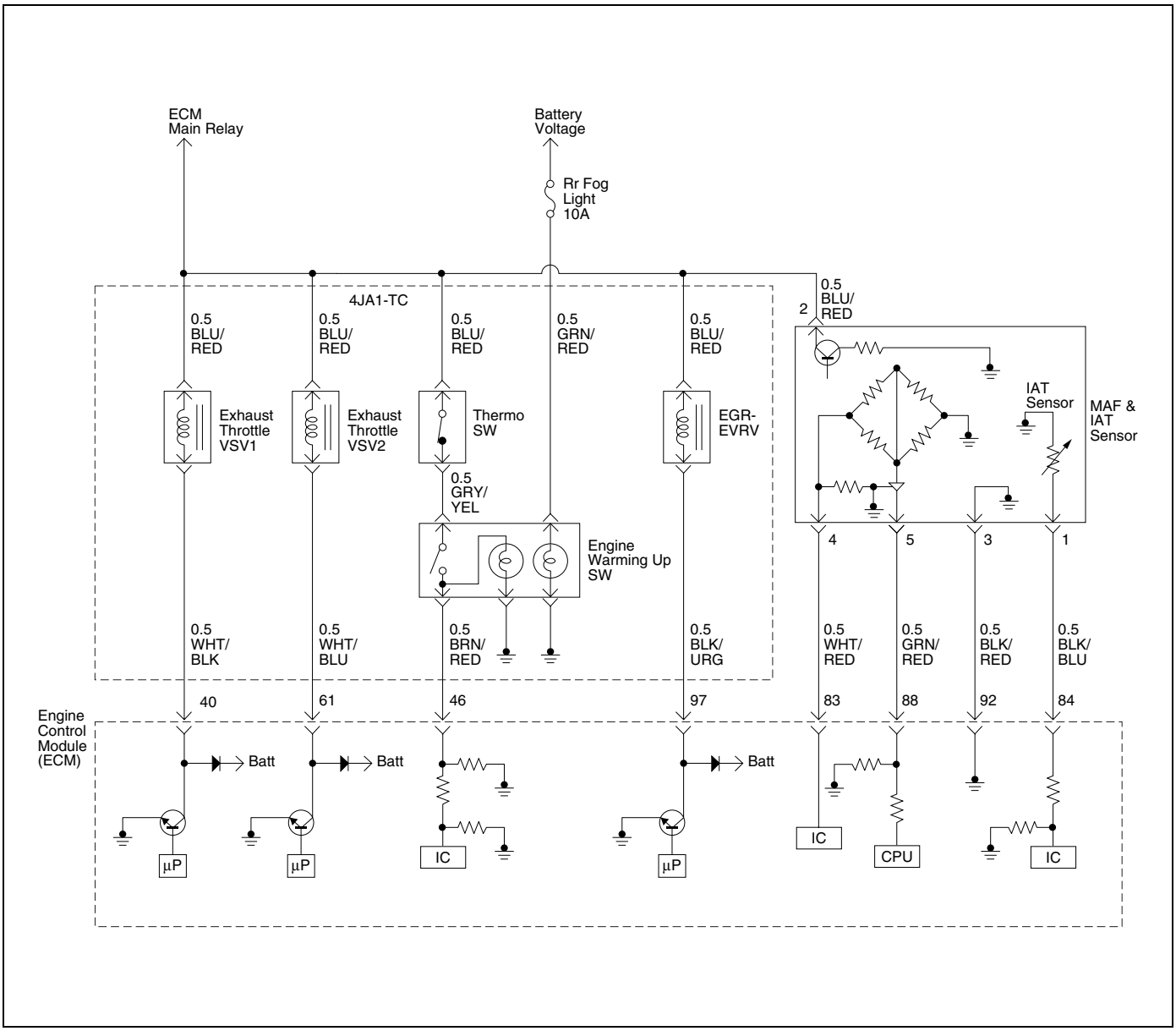
ECM WIRING DIAGRAM (3/7)



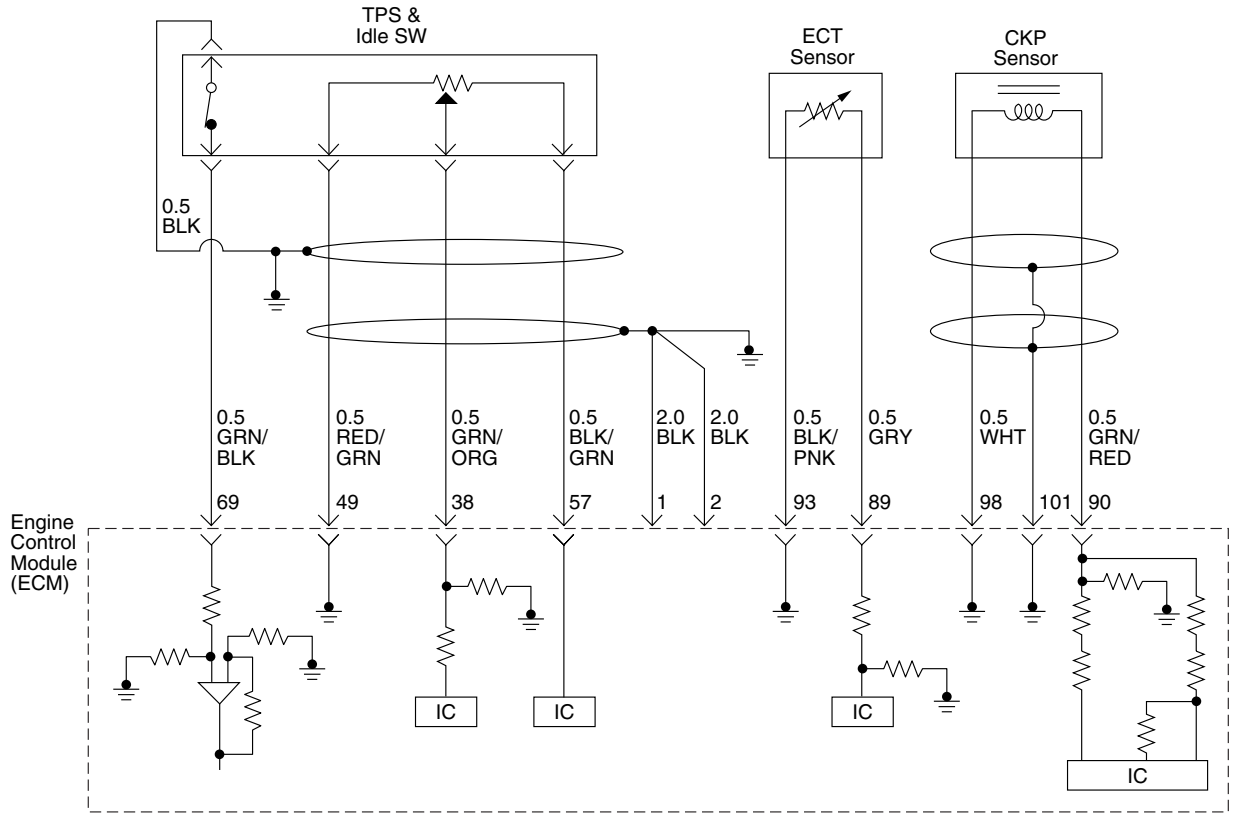
ECM WIRING DIAGRAM (4/7)



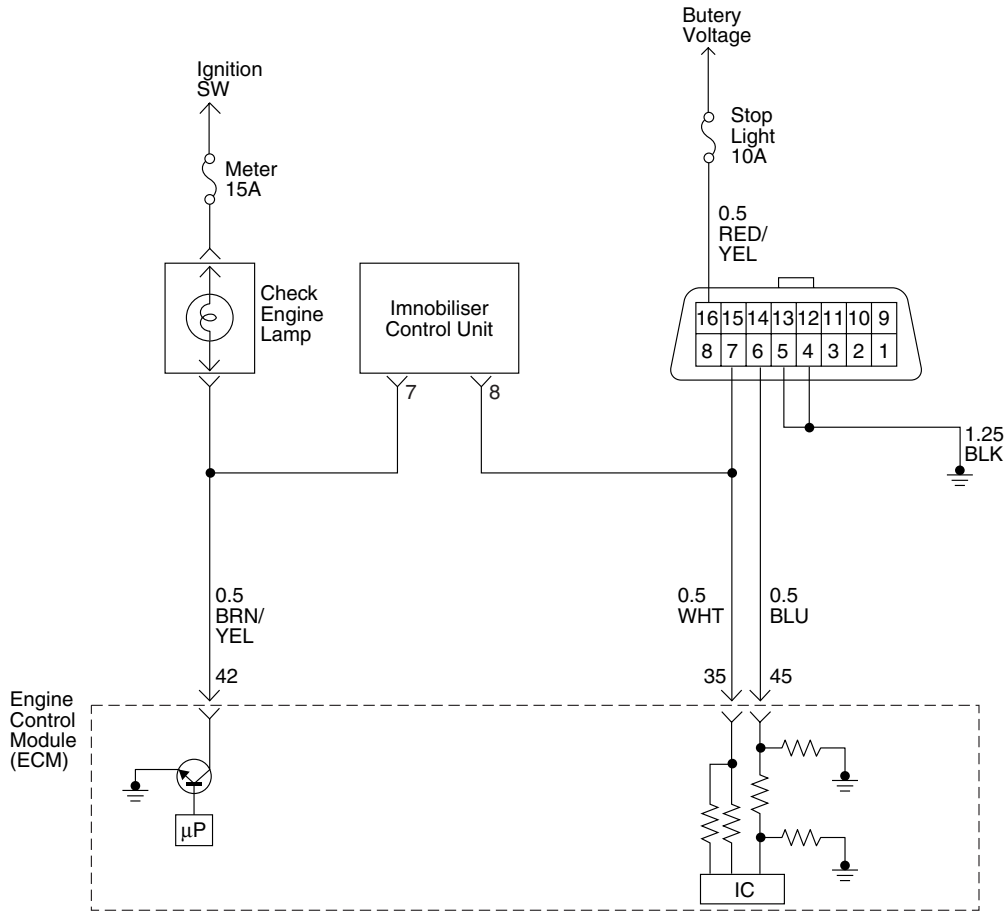
ECM WIRING DIAGRAM (5/7)



ECM WIRING DIAGRAM (6/7)

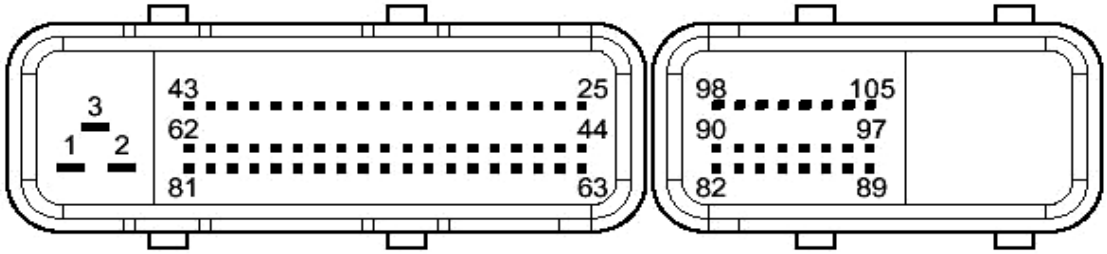


ECM WIRING DIAGRAM (7/7)



ECM CONNECTOR PIN ASSIGNMENT & OUTPUT SIGNAL (4JA1-TC)

View Looking Into ECM Case



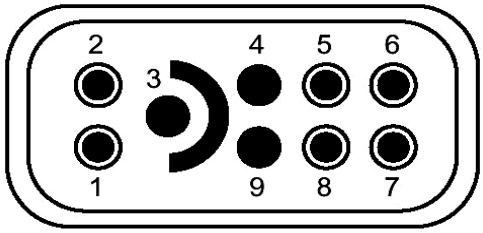
Pin No.	B/Box No.	Pin Function	Wire Color	Signal or Continuity				ECM Connection	Tester Position		
				Key SW Off	Key SW On	Engine Idle	Engine 2000rpm		Range	(+)	(-)
1	1	ECM Ground	BLK	Continuity with ground	-	-	-	Disconnect	Ω	1	GND
2	2	ECM Ground	BLK	Continuity with ground	-	-	-	Disconnect	Ω	2	GND
3	3	Battery Power Supply	BLU/RED	Less than 1V	Battery voltage			Connect	DC V	3	GND
25	25	No Connection	-	-	-	-	-	-	-	-	-
26	26	No Connection	-	-	-	-	-	-	-	-	-
27	27	Engine Speed Output (To Tacho Meter)	BLU/RED	-	-	Approx. 23Hz by wave form or approx. 7.2V	Approx. 68Hz by wave form or approx. 7.5V	Connect	AC V	27	GND
28	28	No Connection	-	-	-	-	-	-	-	-	-
29	29	No Connection	-	-	-	-	-	-	-	-	-
30	30	Brake Switch 1 Signal	RED	Less than 1V	Battery voltage when pedal is stepped on			Connect	DC V	30	GND
31	31	Clutch Switch Signal	YEL	Less than 1V	Battery voltage when pedal is not stepped on			Connect	DC V	31	GND
32	32	No Connection	-	-	-	-	-	-	-	-	-
33	33	A/C Thermo Relay	GRN	Less than 1V	Battery voltage when A/C request switch is turned on			Connect	DC V	33	GND
34	34	No Connection	-	-	-	-	-	-	-	-	-
35	35	Immobiliser Control Unit (ICU B8)	RED/BLU	-	Wave form			-	-	-	-
36	36	No Connection	-	-	-	-	-	-	-	-	-
37	37	No Connection	-	-	-	-	-	-	-	-	-
38	38	Throttle Position Sensor (TPS) Output Signal	GRN/ ORG	Less than 1V	Less than 1V		Approx. 1V	Connect	DC V	38	49
39	39	Key Switch Input Signal Via Engine Fuse	BLU/YEL	Less than 1V	Battery voltage			Connect	DC V	39	GND
40	40	Exhaust Throttle VSV 1	WHT/BLK	Less than 1V	Battery voltage when QWS is not activated			Connect	DC V	40	GND
41	41	A/C Compressor Relay	BRN/RED	Less than 1V	Battery voltage	Battery voltage when A/C compressor is not activated		Connect	DC V	41	GND
42	42	Check Engine Lamp	RED/YEL	Less than 1V	Battery voltage when lamp is turned off			Connect	DC V	42	GND
43	43	Glow Lamp	ORG/BLU	Less than 1V	Battery voltage when lamp is turned off			Connect	DC V	43	GND
44	44	No Connection	-	-	-	-	-	-	-	-	-

Pin No.	B/Box No.	Pin Function	Wire Color	Signal or Continuity				ECM Connection	Tester Position		
				Key SW Off	Key SW On	Engine Idle	Engine 2000rpm		Range	(+)	(-)
45	45	Data Link Connector (No. 6)	BLU	Less than 1V	Battery voltage			Connect	DC V	45	GND
46	46	QWS Switch	BRN/RED	Less than 1V	Battery voltage when thermo switch is closed			Connect	DC V	46	GND
47	47	No Connection	-	-	-	-	-	-	-	-	-
48	48	No Connection	-	-	-	-	-	-	-	-	-
49	49	Throttle Position Sensor (TPS) Ground	RED/GRN	Idle: Approx. 0.4kΩ/ WOT: Approx. 3.8kΩ	-	-	-	Disconnect	Ω	38	49
50	50	No Connection	-	-	-	-	-	-	-	-	-
51	51	No Connection	-	-	-	-	-	-	-	-	-
52	52	No Connection	-	-	-	-	-	-	-	-	-
53	53	No Connection	-	-	-	-	-	-	-	-	-
54	54	No Connection	-	-	-	-	-	-	-	-	-
55	55	No Connection	-	-	-	-	-	-	-	-	-
56	56	No Connection	-	-	-	-	-	-	-	-	-
57	57	Throttle Position Sensor (TPS) Power Supply	BLK/GRN	Less than 1V	Approx. 5V			Connect	DC V	57	49
58	58	ECM Main Relay	BLU/BLK	Battery voltage	Less than 1V			Connect	DC V	58	GND
59	59	No Connection	-	-	-	-	-	-	-	-	-
60	60	No Connection	-	-	-	-	-	-	-	-	-
61	61	No Connection	-	-	-	-	-	-	-	-	-
62	62	No Connection	-	-	-	-	-	-	-	-	-
63	63	ECM Power Supply	BLU/RED	Less than 1V	Battery voltage			Connect	DC V	63	GND
64	64	No Connection	-	-	-	-	-	-	-	-	-
65	65	Brake Switch 2 Signal	WHT/BLK	Less than 1V	Battery voltage when pedal is not stepped on			Connect	DC V	65	GND
66	66	No Connection	-	-	-	-	-	-	-	-	-
67	67	No Connection	-	-	-	-	-	-	-	-	-
68	68	Vehicle Speed Sensor (VSS) Via Speed Meter	BLU/WHT	-	Approx. 15Hz by wave form or approx. 5.8V at vehicle speed 20km/h			Connect	AC V	68	GND
69	69	Idle Switch	GRN/BLK	Less than 1V	Approx. 5V when pedal is stepped on			Connect	DC V	69	GND
70	70	No Connection	-	-	-	-	-	-	-	-	-
71	71	No Connection	-	-	-	-	-	-	-	-	-
72	72	No Connection	-	-	-	-	-	-	-	-	-
73	73	No Connection	-	-	-	-	-	-	-	-	-
74	74	No Connection	-	-	-	-	-	-	-	-	-
75	75	No Connection	-	-	-	-	-	-	-	-	-
76	76	No Connection	-	-	-	-	-	-	-	-	-
77	77	No Connection	-	-	-	-	-	-	-	-	-
78	78	No Connection	-	-	-	-	-	-	-	-	-
79	79	No Connection	-	-	-	-	-	-	-	-	-
80	80	No Connection	-	-	-	-	-	-	-	-	-
81	81	No Connection	-	-	-	-	-	-	-	-	-
82	82	No Connection	-	-	-	-	-	-	-	-	-
83	83	Mass Air Flow (MAF) Sensor Power Supply	WHT/RED	Less than 1V	Approx. 5V			Connect	DC V	83	92

Pin No.	B/Box No.	Pin Function	Wire Color	Signal or Continuity				ECM Connection	Tester Position		
				Key SW Off	Key SW On	Engine Idle	Engine 2000rpm		Range	(+)	(-)
84	84	Intake Air Temperature (IAT) Sensor Signal	BLK/BLU	Less than 1V	Approx. 2.5V at IAT 25°C			Connect	DC V	84	92
85	85	No Connection	-	-	-	-	-	-	-	-	-
86	86	No Connection	-	-	-	-	-	-	-	-	-
87	87	Neutral Switch	BLK/WHT	Less than 1V	Battery voltage at other than neutral			Connect	DC V	87	GND
88	88	Mass Air Flow (MAF) Sensor Signal	GRN/RED	Less than 1V	Approx. 1V	Approx. 2V	Approx. 3V	Connect	DC V	88	92
89	89	Engine Coolant Temperature (ECT) Sensor Signal	GRY	Less than 1V	Approx. 1.3V at ECT 80°C			Connect	DC V	89	93
90	90	TDC Sensor Signal	RED	-	-	Approx. 47Hz by wave form or approx. 0.7V at 700rpm	Approx. 133Hz by wave form or approx. 1.0V	Connect	AC V	90	98
91	91	TDC Sensor Output To Pump Control Unit (PSG) No.8	PNK	-	-	Approx. 47Hz by wave form	Approx. 133Hz by wave form	-	-	-	-
92	92	Mass Air Flow (MAF) Sensor Ground	BLK/RED	Continuity with ground	-	-	-	Connect	Ω	92	GND
93	93	Engine Coolant Temperature (ECT) Sensor Ground	BLK/PNK	Continuity with ground	-	-	-	Connect	Ω	93	GND
94	94	Glow Relay	BLK/BLU	Less than 1V	Battery voltage when glow system is not activated			Connect	DC V	94	GND
95	95	No Connection	-	-	-	-	-	-	-	-	-
96	96	No Connection	-	-	-	-	-	-	-	-	-
97	97	EGR EVRV	BLK/ORG	-		Approx. 140Hz by wave form when EVRV is activated		-	-	-	-
98	98	TDC Sensor Ground	WHT	Continuity with ground	-	-	-	Connect	Ω	98	GND
99	99	CAN (Controller Area Network) to PSG No.1	RED	-	-	-	-	-	-	-	-
100	100	CAN (Controller Area Network) to PSG No.2	WHT	-	-	-	-	-	-	-	-
101	101	TDC Sensor Shield Line	-	Continuity with ground	-	-	-	Connect	Ω	101	GND
102	102	No Connection	-	-	-	-	-	-	-	-	-
103	103	No Connection	-	-	-	-	-	-	-	-	-
104	104	No Connection	-	-	-	-	-	-	-	-	-
105	105	Fuel Cutoff Solenoid Valve (MAB) Output Signal to PSG No.5	ORG	-	Wave form			-	-	-	-

PSG CONNECTOR PIN ASSIGNMENT & OUTPUT SIGNAL (4JA1-TC)

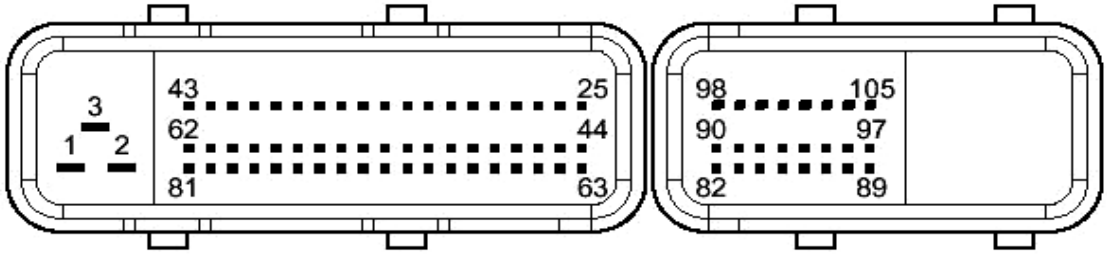
View Looking Into PSG Case



Pin No.	B/Box No.	Pin Function	Wire Color	Signal or Continuity				PSG Connection	Tester Position		
				Key SW Off	Key SW On	Engine Idle	Engine 2000rpm		Range	(+)	(-)
1	99	CAN (Controller Area Network) to ECM No.99	RED	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	1	99
2	100	CAN (Controller Area Network) to ECM No.100	WHT	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	2	100
3	-	No Connection	-	-	-	-	-	-	-	-	-
4	-	No Connection	-	-	-	-	-	-	-	-	-
5	105	Solenoid Valve Shut Off (MAB) Output Signal to ECM No.105	ORG	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	5	105
6	-	Ground	BLK	Continuity with ground	-	-	-	Disconnect	Ω	6	GND
7	3	Battery Power Supply	BLU/RED	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	7	3
8	91	TDC Sensor Output ECM No.91 To Pump Control Unit (PSG)	PNK	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	8	91
9	-	No Connection	-	-	-	-	-	-	-	-	-

ECM CONNECTOR PIN ASSIGNMENT & OUTPUT SIGNAL (4JH1-TC)

View Looking Into ECM Case



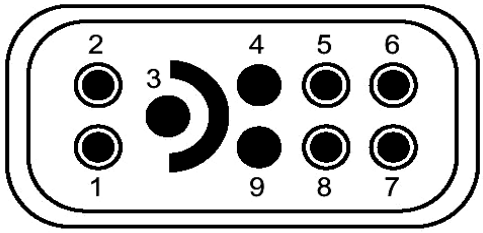
Pin No.	B/Box No.	Pin Function	Wire Color	Signal or Continuity				ECM Connection	Tester Position		
				Key SW Off	Key SW On	Engine Idle	Engine 2000rpm		Range	(+)	(-)
1	1	ECM Ground	BLK	Continuity with ground	-	-	-	Disconnect	Ω	1	GND
2	2	ECM Ground	BLK	Continuity with ground	-	-	-	Disconnect	Ω	2	GND
3	3	Battery Power Supply	BLU/RED	Less than 1V	Battery voltage			Connect	DC V	3	GND
25	25	No Connection	-	-	-	-	-	-	-	-	-
26	26	No Connection	-	-	-	-	-	-	-	-	-
27	27	Engine Speed Output (To Tacho Meter)	BLU/RED	-	-	Approx. 23Hz by wave form or approx. 7.2V	Approx. 68Hz by wave form or approx. 7.5V	Connect	AC V	27	GND
28	28	No Connection	-	-	-	-	-	-	-	-	-
29	29	Throttle Position Signal (AT Only)	BLK/RED	-	Approx. 140Hz by wave form (Idle: Off duty 10% WOT: Off duty 90%)			-	-	-	-
30	30	Brake Switch 1 Signal	RED	Less than 1V	Battery voltage when pedal is stepped on			Connect	DC V	30	GND
31	31	Clutch Switch Signal (MT Only)	YEL	Less than 1V	Battery voltage when pedal is not stepped on			Connect	DC V	31	GND
32	32	No Connection	-	-	-	-	-	-	-	-	-
33	33	A/C Thermo Relay	GRN	Less than 1V	Battery voltage when A/C request switch is turned on			Connect	DC V	33	GND
34	34	No Connection	-	-	-	-	-	-	-	-	-
35	35	Immobiliser Control Unit (ICU B8)	RED/BLU	-	Wave form			-	-	-	-
36	36	No Connection	-	-	-	-	-	-	-	-	-
37	37	No Connection	-	-	-	-	-	-	-	-	-
38	38	Throttle Position Sensor (TPS) Output Signal	GRN/ ORG	Less than 1V	Less than 1V		Approx. 1V	Connect	DC V	38	49
39	39	Key Switch Input Signal Via Engine Fuse	BLU/YEL	Less than 1V	Battery voltage			Connect	DC V	39	GND
40	40	No Connection	WHT/BLK	-	-	-	-	-	-	-	-
41	41	A/C Compressor Relay	BRN/RED	Less than 1V	Battery voltage	Battery voltage when A/C compressor is not activated		Connect	DC V	41	GND
42	42	Check Engine Lamp	RED/YEL	Less than 1V	Battery voltage when lamp is turned off			Connect	DC V	42	GND
43	43	Glow Lamp	ORG/BLU	Less than 1V	Battery voltage when lamp is turned off			Connect	DC V	43	GND
44	44	No Connection	-	-	-	-	-	-	-	-	-

Pin No.	B/Box No.	Pin Function	Wire Color	Signal or Continuity				ECM Connection	Tester Position		
				Key SW Off	Key SW On	Engine Idle	Engine 2000rpm		Range	(+)	(-)
45	45	Data Link Connector (No. 6)	BLU	Less than 1V	Battery voltage			Connect	DC V	45	GND
46	46	No Connection	BRN/RED	-	-	-	-	-	-	-	-
47	47	No Connection	-	-	-	-	-	-	-	-	-
48	48	No Connection	-	-	-	-	-	-	-	-	-
49	49	Throttle Position Sensor (TPS) Ground	RED/GRN	Idle: Approx. 0.4kΩ/ WOT: Approx. 3.8kΩ	-	-	-	Disconnect	Ω	38	49
50	50	No Connection	-	-	-	-	-	-	-	-	-
51	51	No Connection	-	-	-	-	-	-	-	-	-
52	52	No Connection	-	-	-	-	-	-	-	-	-
53	53	No Connection	-	-	-	-	-	-	-	-	-
54	54	No Connection	-	-	-	-	-	-	-	-	-
55	55	No Connection	-	-	-	-	-	-	-	-	-
56	56	No Connection	-	-	-	-	-	-	-	-	-
57	57	Throttle Position Sensor (TPS) Power Supply	BLK/GRN	Less than 1V	Approx. 5V			Connect	DC V	57	49
58	58	ECM Main Relay	BLU/BLK	Battery voltage	Less than 1V			Connect	DC V	58	GND
59	59	No Connection	-	-	-	-	-	-	-	-	-
60	60	No Connection	-	-	-	-	-	-	-	-	-
61	61	No Connection	-	-	-	-	-	-	-	-	-
62	62	No Connection	-	-	-	-	-	-	-	-	-
63	63	ECM Power Supply	BLU/RED	Less than 1V	Battery voltage			Connect	DC V	63	GND
64	64	No Connection	-	-	-	-	-	-	-	-	-
65	65	Brake Switch 2 Signal	WHT/BLK	Less than 1V	Battery voltage when pedal is not stepped on			Connect	DC V	65	GND
66	66	No Connection	-	-	-	-	-	-	-	-	-
67	67	No Connection	-	-	-	-	-	-	-	-	-
68	68	Vehicle Speed Sensor (VSS) Via Speed Meter	BLU/WHT	-	Approx. 15Hz by wave form or approx. 6.4V at vehicle speed 20km/ h			Connect	AC V	68	GND
69	69	Idle Switch	GRN/BLK	Less than 1V	Approx. 5V when pedal is stepped on			Connect	DC V	69	GND
70	70	No Connection	-	-	-	-	-	-	-	-	-
71	71	No Connection	-	-	-	-	-	-	-	-	-
72	72	No Connection	-	-	-	-	-	-	-	-	-
73	73	No Connection	-	-	-	-	-	-	-	-	-
74	74	No Connection	-	-	-	-	-	-	-	-	-
75	75	No Connection	-	-	-	-	-	-	-	-	-
76	76	No Connection	-	-	-	-	-	-	-	-	-
77	77	No Connection	-	-	-	-	-	-	-	-	-
78	78	No Connection	-	-	-	-	-	-	-	-	-
79	79	No Connection	-	-	-	-	-	-	-	-	-
80	80	No Connection	-	-	-	-	-	-	-	-	-
81	81	No Connection	-	-	-	-	-	-	-	-	-
82	82	No Connection	-	-	-	-	-	-	-	-	-
83	83	Mass Air Flow (MAF) Sensor Power Supply	WHT/RED	Less than 1V	Approx. 5V			Connect	DC V	83	92
84	84	Intake Air Temperature (IAT) Sensor Signal	BLK/BLU	Less than 1V	Approx. 2.5V at IAT 25°C			Connect	DC V	84	92

Pin No.	B/Box No.	Pin Function	Wire Color	Signal or Continuity				ECM Connection	Tester Position		
				Key SW Off	Key SW On	Engine Idle	Engine 2000rpm		Range	(+)	(-)
85	85	No Connection	-	-	-	-	-	-	-	-	-
86	86	No Connection	-	-	-	-	-	-	-	-	-
87	87	Neutral Switch	BLK/WHT	Less than 1V	Battery voltage at other than neutral (MT) / Battery voltage in P or N (AT)			Connect	DC V	87	GND
88	88	Mass Air Flow (MAF) Sensor Signal	GRN/RED	Less than 1V	Approx. 1V	Approx. 2V	Approx. 3V	Connect	DC V	88	92
89	89	Engine Coolant Temperature (ECT) Sensor Signal	GRY	Less than 1V	Approx. 1.3V at ECT 80°C			Connect	DC V	89	93
90	90	TDC Sensor Signal	RED	-	-	Approx. 47Hz by wave form or approx. 0.7V at 700rpm	Approx. 133Hz by wave form or approx. 1.0V	Connect	AC V	90	98
91	91	TDC Sensor Output To Pump Control Unit (PSG) No.8	PNK	-	-	Approx. 47Hz by wave form	Approx. 133Hz by wave form	-	-	-	-
92	92	Mass Air Flow (MAF) Sensor Ground	BLK/RED	Continuity with ground	-	-	-	Connect	Ω	92	GND
93	93	Engine Coolant Temperature (ECT) Sensor Ground	BLK/PNK	Continuity with ground	-	-	-	Connect	Ω	93	GND
94	94	Glow Relay	BLK/BLU	Less than 1V	Battery voltage when glow system is not activated			Connect	DC V	94	GND
95	95	No Connection	-	-	-	-	-	-	-	-	-
96	96	No Connection	-	-	-	-	-	-	-	-	-
97	97	EGR EVRV	BLK/ORG	-		Approx. 140Hz by wave form when EVRV is activated		-	-	-	-
98	98	TDC Sensor Ground	WHT	Continuity with ground	-	-	-	Connect	Ω	98	GND
99	99	CAN (Controller Area Network) to PSG No.1	RED	-	-	-	-	-	-	-	-
100	100	CAN (Controller Area Network) to PSG No.2	WHT	-	-	-	-	-	-	-	-
101	101	TDC Sensor Shield Line	-	Continuity with ground	-	-	-	Connect	Ω	101	GND
102	102	No Connection	-	-	-	-	-	-	-	-	-
103	103	No Connection	-	-	-	-	-	-	-	-	-
104	104	No Connection	-	-	-	-	-	-	-	-	-
105	105	Solenoid Valve Shut Off (MAB) Output Signal to PSG No.5	ORG	-	Wave form			-	-	-	-

PSG CONNECTOR PIN ASSIGNMENT & OUTPUT SIGNAL (4JH1-TC)

View Looking Into PSG Case



Pin No.	B/Box No.	Pin Function	Wire Color	Signal or Continuity				PSG Connection	Tester Position		
				Key SW Off	Key SW On	Engine Idle	Engine 2000rpm		Range	(+)	(-)
1	99	CAN (Controller Area Network) to ECM No.99	RED	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	1	99
2	100	CAN (Controller Area Network) to ECM No.100	WHT	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	2	100
3	-	No Connection	-	-	-	-	-	-	-	-	-
4	-	No Connection	-	-	-	-	-	-	-	-	-
5	105	Solenoid Valve Shut Off (MAB) Output Signal to ECM No.105	ORG	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	5	105
6	-	Ground	BLK	Continuity with ground	-	-	-	Disconnect	Ω	6	GND
7	3	Battery Power Supply	BLU/RED	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	7	3
8	91	TDC Sensor Output ECM No.91 To Pump Control Unit (PSG)	PNK	Continuity between ECM & PSG	-	-	-	Disconnect	Ω	8	91
9	-	No Connection	-	-	-	-	-	-	-	-	-

GENERAL DESCRIPTION FOR ECM AND SENSORS

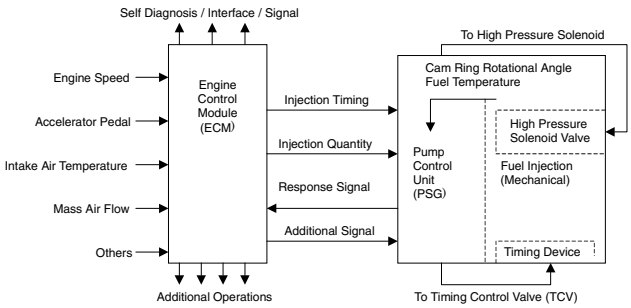
Engine Control Module (ECM)



The engine control module (ECM) is located on the transmission tunnel.
The fuel quantity and injection timing related functions are controlled by the pump control unit (PSG).
The engine control module (ECM) performs the following functions.

- Control of the exhaust gas re-circulation (EGR)
- Control of the quick on start (QOS) glow control system
- Control of the A/C compressor
- Execution of the immobiliser function

Pump Control Unit (PSG) & Data Exchange Between Control Module



The radial plunger distributor type injection pump uses two control modules to execute full control of the engine management system.

- Engine Control Module (ECM)
- Pump Control Unit (PSG) = Pumpen Steuer Great (German)

The pump control unit (PSG) receives signals from the sensors inside the pump to determine the cam ring rotation angle, the pump speed and the fuel temperature .
These values are then compared to the desired values sent by the engine control module (ECM) such as the desired injection timing and the desired fuel injection quantity.
The engine control module (ECM) processes all engine data and data regarding the surrounding environment received from external sensors to perform any engine side adjustments.
Maps for both are encoded in both control units. The control units input circuit process sensor data.
A Microprocessor then determines the operating conditions and calculates set values for optimum running.
The interchange of data between the engine control module (ECM) and the pump control unit (PSG) is perfumed via a CAN-bus system. The abbreviation CAN stands for Controller Area Network. By having two separate control modules, the high pressure solenoid valve. This prevents the discharge of any disturbing signals.

The following signals are exchanged via the CAN-bus:
From ECM to PSG

- Desired injection quantity
- Desired injection timing
- Engine speed

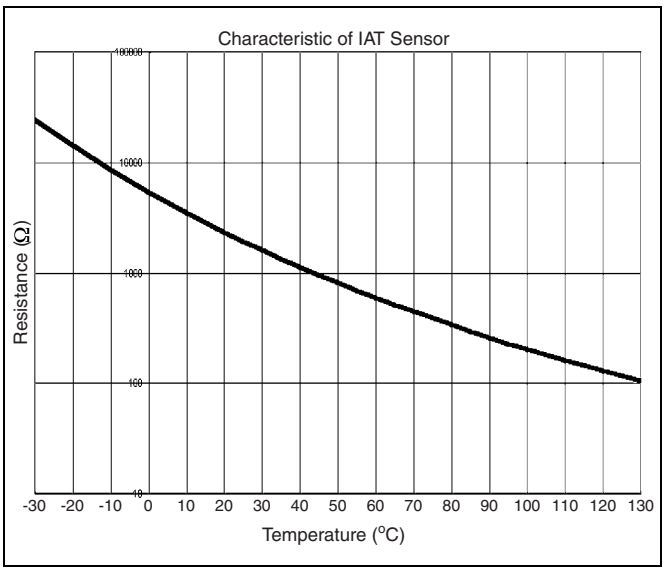
From PSG to ECM

- Fuel temperature
- Pump speed
- Cylinder identifier
- Control pulse (actual injection quantity + actual injection timing)
- PSG status

Mass Air Flow (MAF) Sensor & Intake Air Temperature (IAT) Sensor



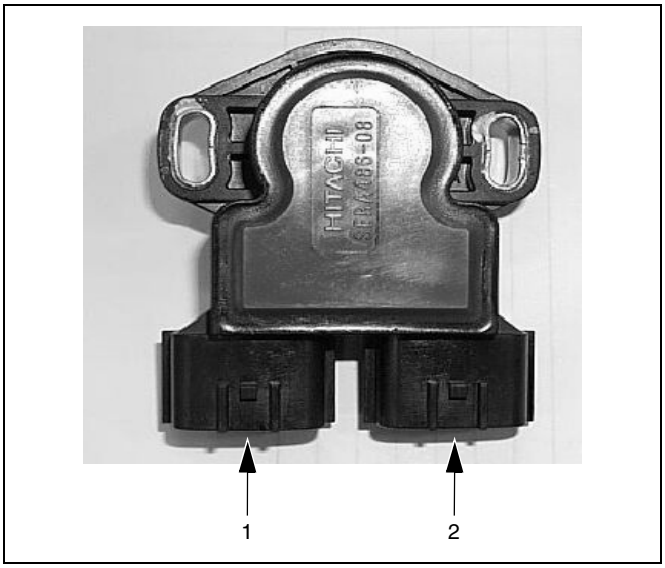
The mass air flow (MAF) sensor is part of the intake air system.
It is fitted between the air cleaner and turbocharger and measure the mass air flowing into the engine.
The mass air flow (MAF) sensor uses a hot film element to determine the amount of air flowing into the engine.
The mass air flow (MAF) sensor assembly consist of a mass air flow (MAF) sensor element and an intake air temperature sensor that are both exposed to the air flow to be measured.
The mass air flow (MAF) sensor element measures the partial air mass through a measurement duct on the sensor housing.
Using calibration, there is an extrapolation to the entire mass air flow to the engine.



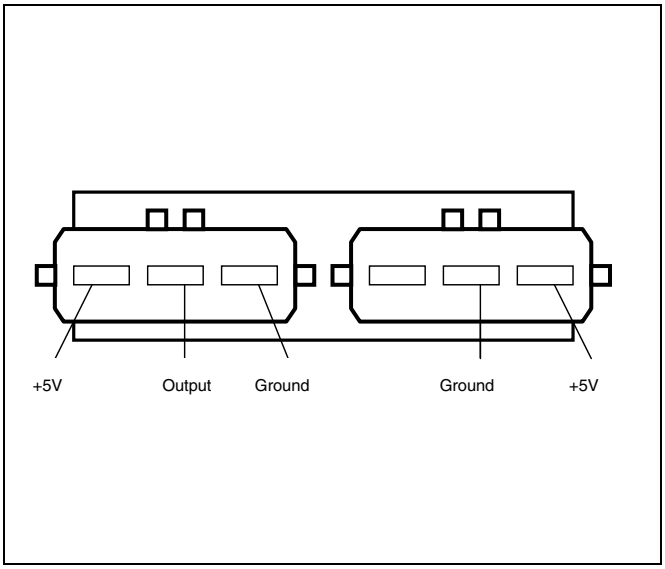
The IAT sensor is a thermistor. A temperature changes the resistance value. And it changes voltage. In other words it measures a temperature value. Low air temperature produces a high resistance.

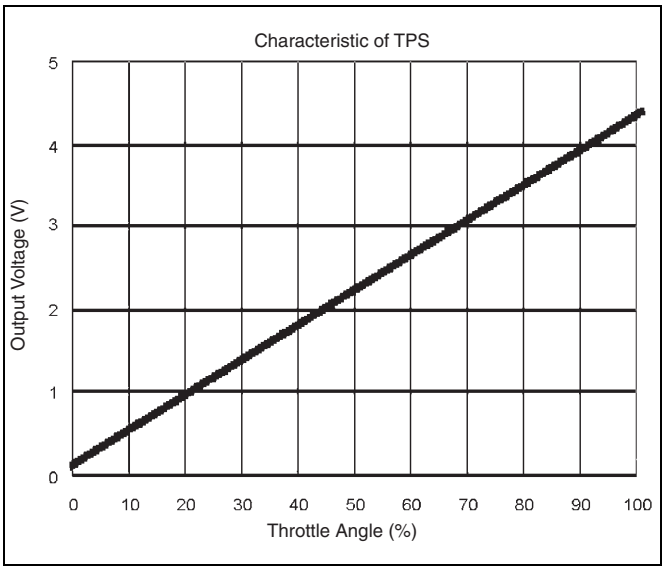
The ECM supplies 5 volts signal to the IAT sensor through resisters in the ECM and measures the voltage. The signal voltage will be high when the air temperature is cold, and it will be low when the air temperature is hot.

Pedal/Throttle Position Sensor (TPS)



(1) Throttle Position Sensor (TPS)
(2) Idle Switch





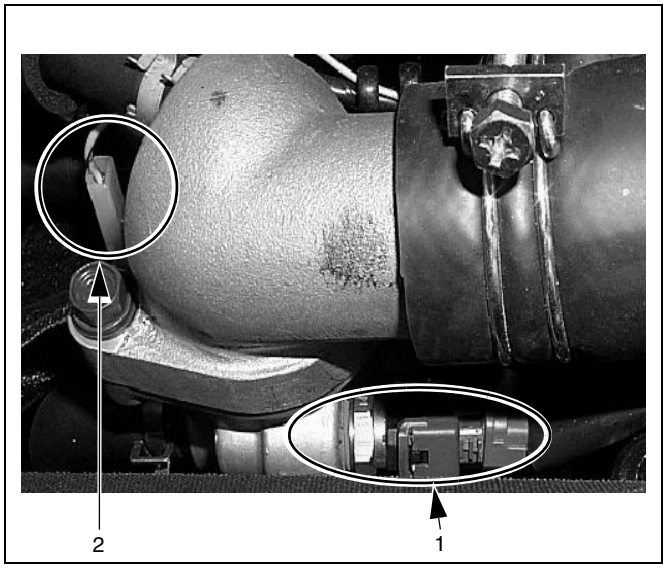
The TPS is a potentiometer connected to throttle shaft on the throttle body. It is installed to the main TPS and idle switch.
The engine control module (ECM) monitors the voltage on the signal line and calculates throttle position. As the throttle valve angle is changed when accelerator pedal moved. The TPS signal also changed at a moved throttle valve. As the throttle valve opens, the output increases so that the output voltage should be high.
The engine control module (ECM) calculates fuel delivery based on throttle valve angle.

Crankshaft Position (CKP) Sensor

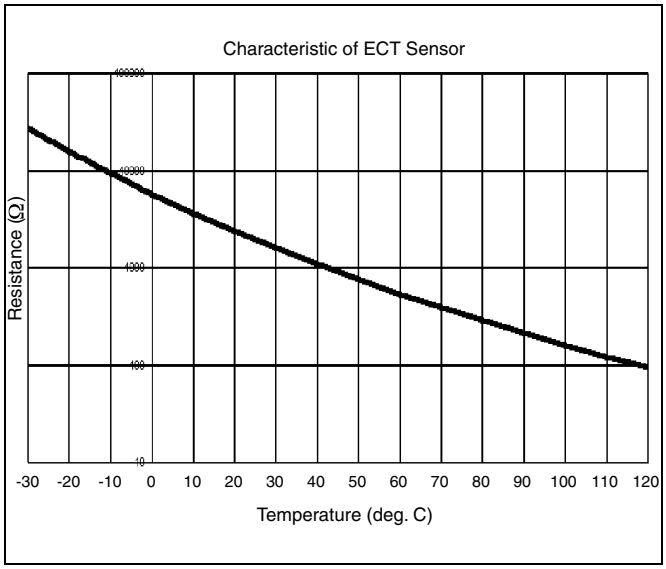


The CKP sensor is located on top of the flywheel housing of the flywheel and fixed with a bolt.
The CKP sensor is of the magnet coil type. The inductive pickup sensors four gaps in the flywheel exciter ring and is used to determine the engine speed and engine cylinder top dead center (TDC).

Engine Coolant Temperature (ECT) Sensor

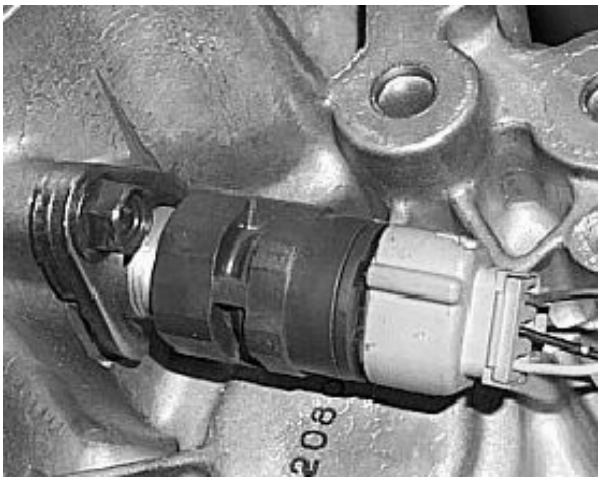


(1) Engine Coolant Temperature (ECT) Sensor
(2) Thermo Unit for Water Temperature Gauge



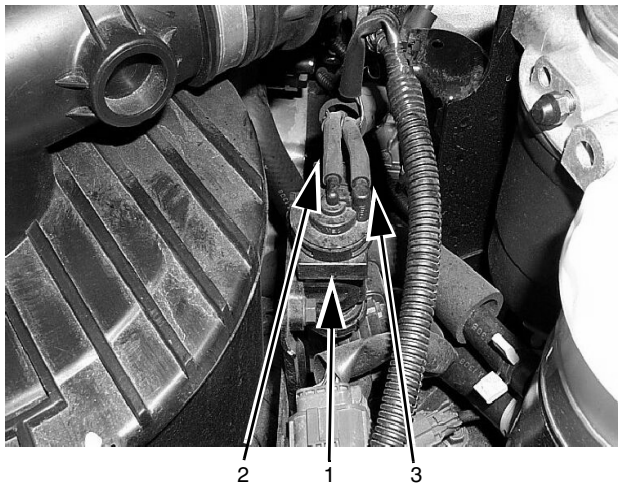
The ECT sensor is a thermistor. A temperature changes the resistance value. And it changes voltage. In other words it measures a temperature value. It is installed on the coolant stream. Low coolant temperature produces a high resistance.
The ECM supplies 5 volts signal to the ECT sensor through resisters in the ECM and measures the voltage. The signal voltage will be high when the engine temperature is cold, and it will be low when the engine temperature is hot.

Vehicle Speed Sensor (VSS)

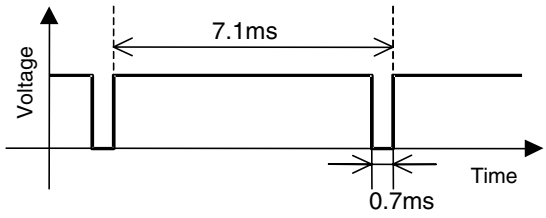


The VSS is a magnet rotated by the transmission output shaft. The VSS uses a hall element. It interacts with the magnetic field treated by the rotating magnet. It outputs pulse signal. The 12 volts operating supply from the meter fuse.
The engine control module (ECM) calculates the vehicle speed by VSS.

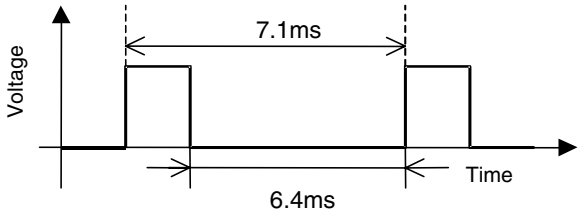
EGR EVRV (4JA1-TC Only)



(1) EGR EVRV
(2) Connecting to Vacuum Pump
(3) Connecting to EGR Valve



Off duty 10% =EGR Pulse Ratio 10%

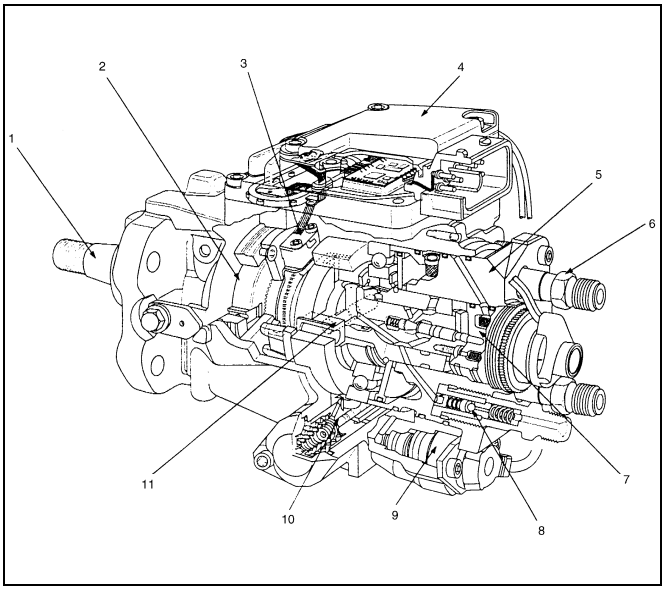


Off duty 70% =EGR Pulse Ratio 70%

The EGR system on this engine is largely responsible for a reduction of the NOx exhaust emission.
The amount of EGR is controlled by EVRV (electrical vacuum regulating valve) via the engine control module (ECM) command signal depends on the engine speed, operating of the accelerator pedal and engine coolant temperature.
The EVRV is shaped to control vacuum applied to the diaphragm chamber of the EGR valve based on duty signal sent from the ECM.

GENERAL DESCRIPTION FOR INJECTION PUMP

Outline



(1) Drive Shaft
(2) Feed Pump
(3) Pump Camshaft Speed Sensor
(4) Pump Control Unit (PSG)
(5) Distributor Head
(6) Constant Pressure Valve (CPV) Holder
(7) High Pressure Solenoid Valve
(8) Constant Pressure Valve (CPV)
(9) Timing Control Valve (TCV)
(10) Timer
(11) Radial Plunger High Pressure Pump

Instead of the previous face cam type, the radial plunger distributor type injection pump utilizes a cam ring to enable fuel injection at high-pressures, marking it suitable for small, high-speed direct injection diesel engines. This pump was developed to provide the most suitable fuel injection quantity and injection timing to satisfy the demand for engine reliability, driveability, low smoke, low noise, high output and clear exhaust emissions.

Characteristic of VP44 Injection System

1. High Pressure Injection

The radial plunger distributor type injection pump is capable of generating pressure of 100 Mpa (approximately 1000 Bar) demanded by small, high speed direct injection diesel engines.

2. High Pressure Atomization of Fuel Injected from the Nozzle

Through high pressure fuel injection, the fuel is atomized at high pressure with a high penetrating force (the fuel droplets penetrate further) and with greater dispersion and distribution (mixing with air is improved) and results in better combustion. This contributes to cleaner emissions.

3. Optimum Fuel Injection

High speed control of fuel injection quantity and fuel injection timing, is performed by the control unit, enabling lower fuel cost and high output.

4. Improved Durability

The components used in the pump are very resistant to high pressure, ensuring improved durability.

5. Improved Engine Matching

As fuel injection is controlled by cylinder selective adaptation, smooth running is improved.

6. Improved Reliability

As a control unit system with both an engine control module (ECM) and a pump control unit (PSG) is used, the control system is extremely reliable.

7. Improved Power Performance

As the control unit controls the optimum fuel injection quantify corresponding to accelerator position, increased torque in low accelerator pedal positions is possible, enabling improved power performance.

8. Decreased Smoke at Acceleration

When the amount of injected fuel is increased, to increase engine power at acceleration, the excess fuel usually generates smoke. The VP44 fuel injection pump, accurately controls fuel injection quantity even in this range to prevent the generation of smoke without adversely affecting acceleration.

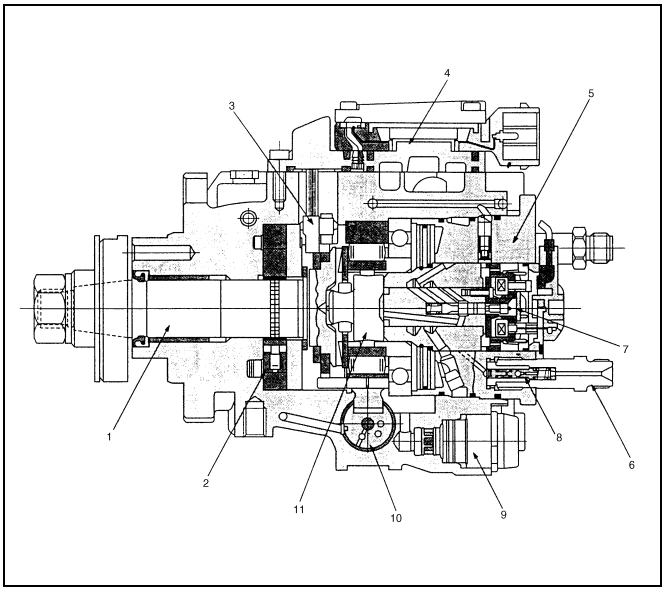
9. Additional Devices are Unnecessary

Such additional devices as the boost compensator and the aneroid compensator are unnecessary, as the control unit compensates, based on signals from each sensor. This results in less “clutter” injection pump.

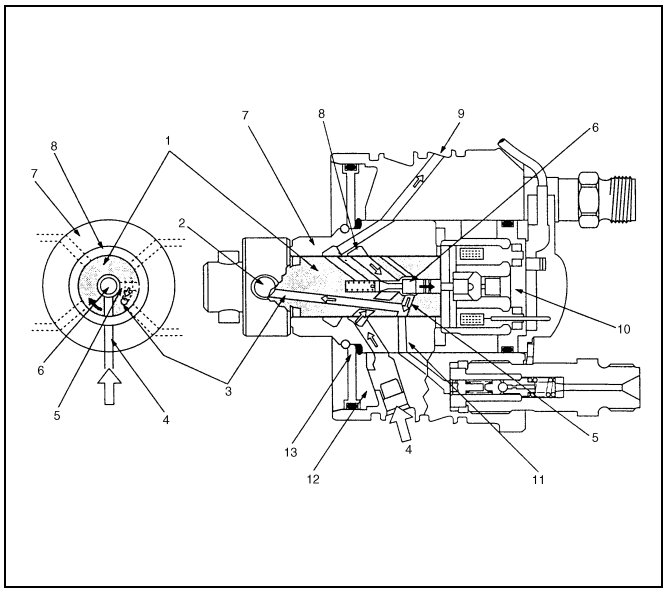
10. Self Diagnosis Function

The system includes a self-diagnosis function, which displays error codes to facilitate the diagnosis of malfunctions.

Cross-section View

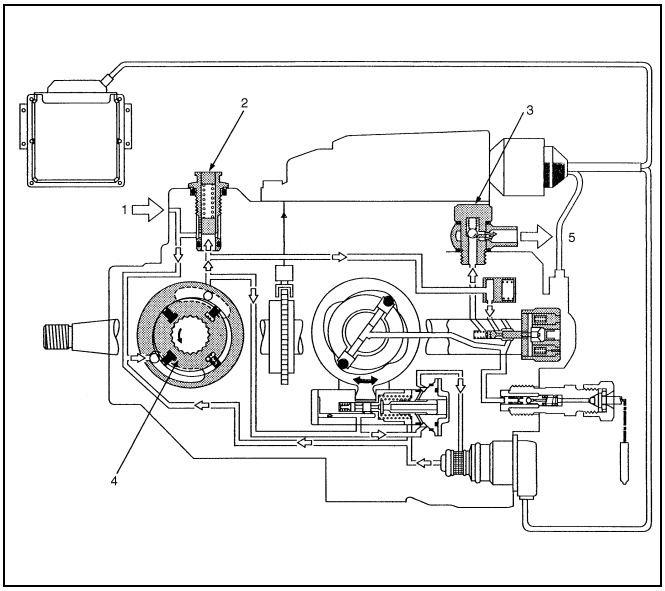


(1) Drive Shaft
(2) Feed Pump
(3) Pump Camshaft Speed Sensor
(4) Pump Control Unit (PSG)
(5) Distributor Head
(6) Constant Pressure Valve (CPV) Holder
(7) High Pressure Solenoid Valve
(8) Constant Pressure Valve (CPV)
(9) Timing Control Valve (TCV)
(10) Timer
(11) Radial Plunger High Pressure Pump



(1) Rotor Shaft
(2) Radial Plunger
(3) High Pressure Passage
(4) Low Pressure Inlet
(5) Distributor Slit
(6) Valve Needle
(7) Barrel
(8) Annular Passage
(9) Fuel Return
(10) High Pressure Solenoid Valve
(11) High Pressure Outlet
(12) Diaphram Chamber
(13) Accumulator Diaphram

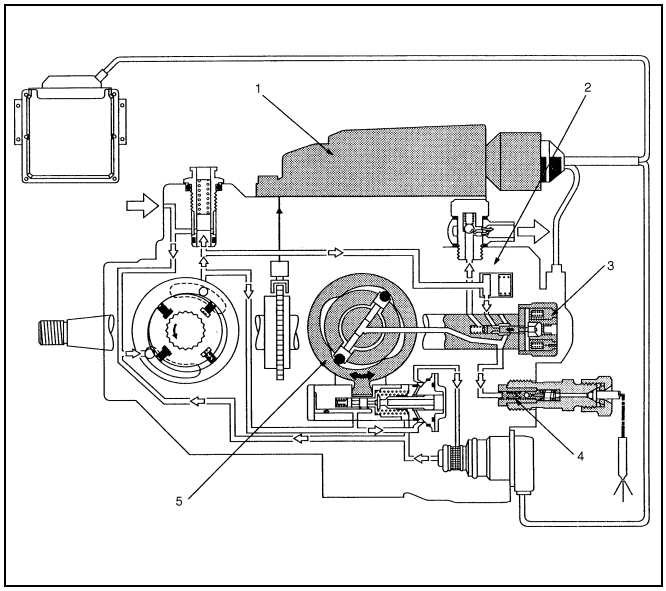
Low Pressure Fuel Circuit



(1) Fuel Suction
(2) Regulating Valve
(3) Overflow Valve
(4) Feed Pump
(5) To Fuel Tank

The low pressure fuel circuit must supply sufficient fuel to the high pressure fuel circuit. The main components are the feed pump, the regulating valve and the overflow valve.

High Pressure Fuel Circuit



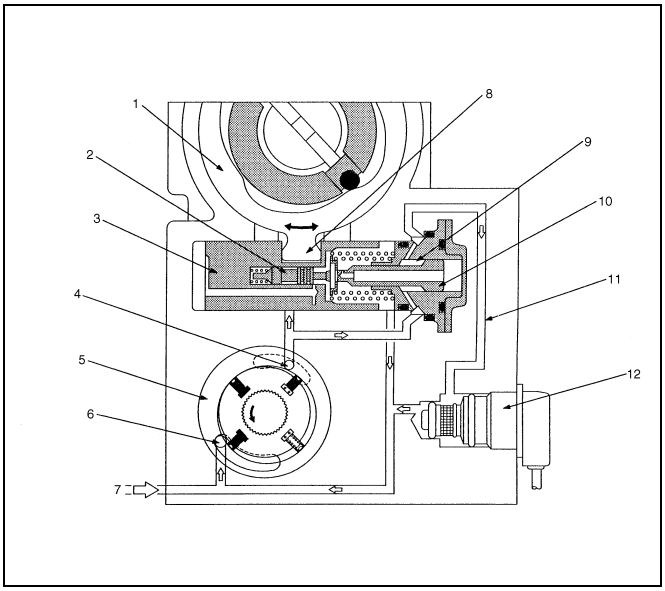
(1) Pump Control Unit (PSG)
(2) Distributor Head
(3) High Pressure Solenoid Valve
(4) Constant Pressure Valve (CPV)
(5) Radial Plunger High Pressure Pump

In addition high pressure generating device, the high pressure circuit also consists of fuel piping, and devices to set the beginning of injection and fuel injection quantity.

The main components are as follows.

- High pressure generation: Radial Plunger High Pressure Pump
- Fuel distribution: Distributor Head
- Beginning of injection timing: Timing Device
- Prevention of secondary injection: Constant Pressure Valve (CPV)

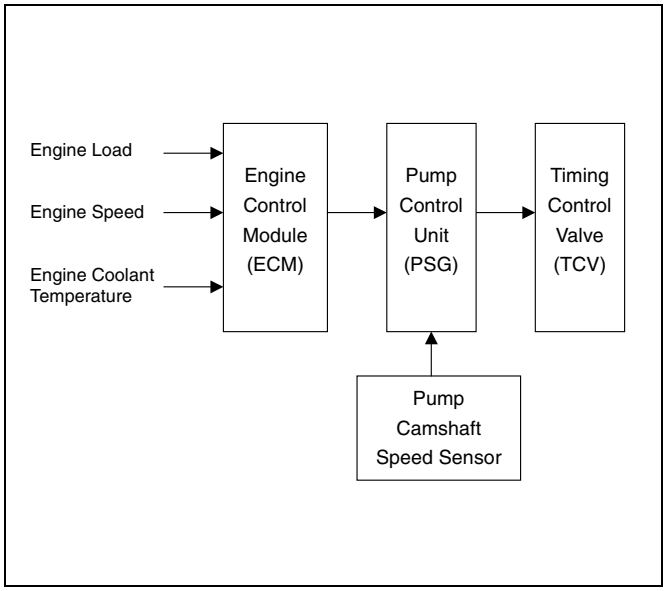
Timing Control



(1) Cam Ring
(2) Servo Valve
(3) Timer Piston
(4) Outlet
(5) Feed Pump
(6) Inlet
(7) Fuel Suction
(8) Ball Pin
(9) Annular Chamber
(10) Hydraulic Stopper
(11) Return Passage
(12) Timing Control Valve (TCV)

The timing device determines the optimum injection timing against variations in engine speed.
The pressure of the fuel fed from the feed pump is adjusted in accordance with speed by the regulating valve. This delivery pressure acts on the hydraulic stopper's annular chamber as control pressure.
The chamber pressure of the annular chamber is controlled by the timing control valve (TCV).
The timing plunger is connected to the cam ring by a ball pin. Axial movement of the timing plunger is transferred to the cam ring in the form of rotational movement. Movement to the right of the timing plunger (to the spring side) advances injection timing.
The main components are timing plunger, the timing control valve (TCV) and pump camshaft speed sensor.

Start of Injection



The engine control module (ECM) contains characteristic maps of the beginning of injection, corresponding to engine operating conditions (engine load, engine speed and engine coolant temperature).
The pump control unit (PSG) is constantly comparing the set beginning of injection timing and the actual beginning of injection timing.
If there is a difference, the timing control valve (TCV) is controlled by the duty ratio. (The actual beginning of injection timing is determined from the pump camshaft speed sensor.)

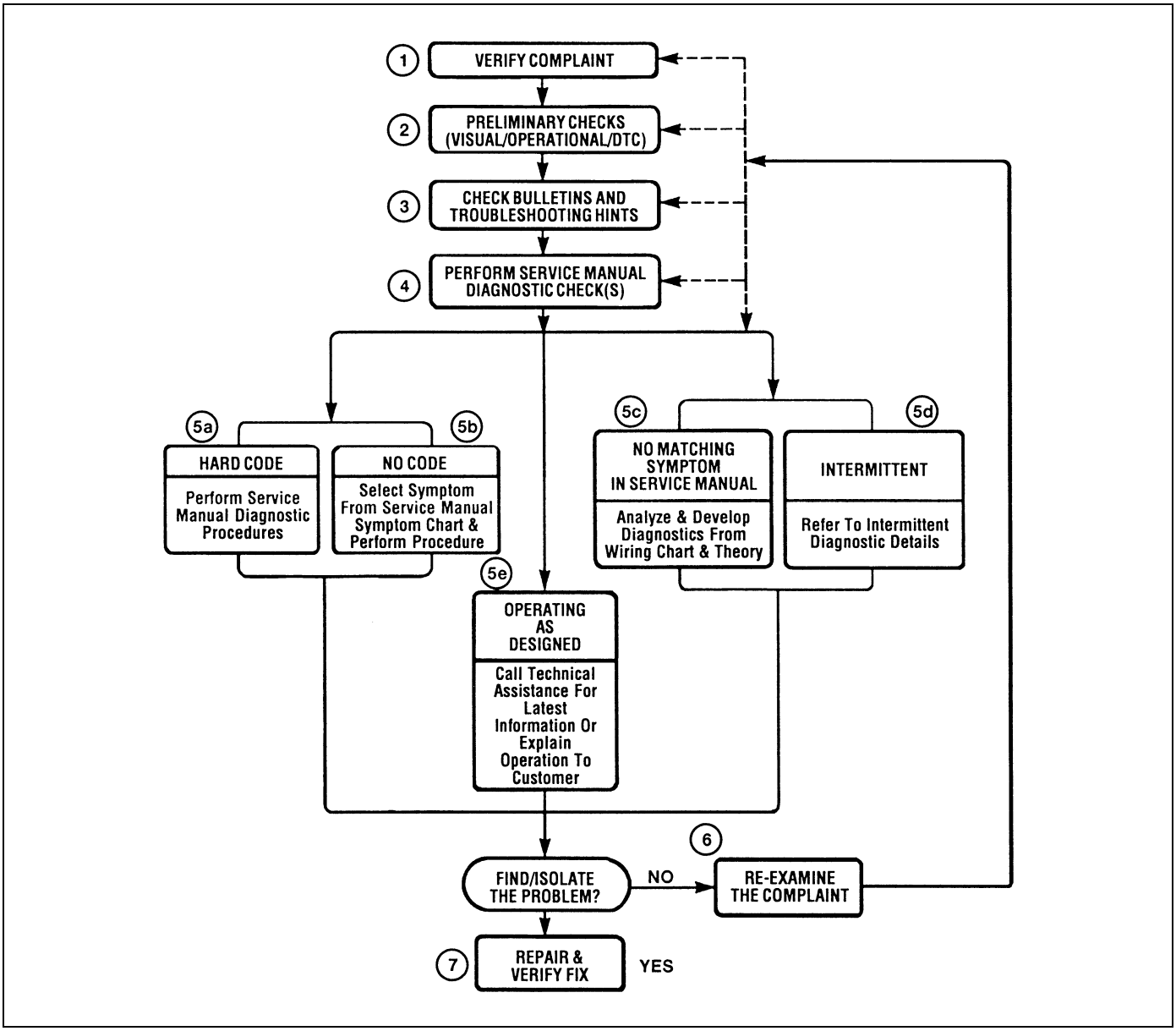
ISUZU Strategy Based Diagnostics

Overview

As a retail service technician, you are part of the ISUZU service team. The team goal is FIX IT RIGHT THE FIRST TIME for the satisfaction of every customer. You are a very important member of the team as you diagnose and repair customer vehicles.

You have maximum efficiency in diagnosis when you have an effective, organized plan for your work. Strategy Based Diagnostics (refer to Figure 1) provides you with guidance as you create and follow a plan of action for each specific diagnostic situation.

STRATEGY BASED DIAGNOSTICS CHART



Diagnostic Thought Process

As you follow a diagnostic plan, every box on the Strategy Based Diagnostics chart requires you to use the diagnostic thought process. This method of thinking optimizes your diagnosis in the following ways:

- Improves your understanding and definition of the customer complaint
- Saves time by avoiding testing and/or replacing good parts
- Allows you to look at the problem from different perspectives
- Guides you to determine what level of understanding about system operation is needed:
  - Owner's manual level
  - Service manual level
  - In-depth (engineering) level
    - Owner's manual level
    - Service manual level
    - In-depth (engineering) level

1. Verify the Complaint

What you should do

To verify the customer complaint, you need to know the correct (normal) operating behavior of the system and verify that the customer complaint is a valid failure of the system.
The following information will help you verify the complaint:

- WHAT the vehicle model/options are
- WHAT aftermarket and dealer-installed accessories exist
- WHAT related system(s) operate properly
- WHEN the problem occurs
- WHERE the problem occurs
- HOW the problem occurs
- HOW LONG the condition has existed (and if the system ever worked correctly)
- HOW OFTEN the problem occurs
- Whether the severity of the problem has increased, decreased or stayed the same

What resources you should use

Whenever possible, you should use the following resources to assist you in verifying the complaint:

- Service manual Theory or Circuit Description sections
- Service manual "System Performance Check"
- Owner manual operational description
- Technician experience
- Identical vehicle for comparison
- Circuit testing tools
- Vehicle road tests
- Complaint check sheet
- Contact with the customer

2. Perform Preliminary Checks

NOTE: An estimated 10 percent of successful vehicle repairs are diagnosed with this step!

What you should do

You perform preliminary checks for several reasons:

- To detect if the cause of the complaint is VISUALLY OBVIOUS
- To identify parts of the system that work correctly
- To accumulate enough data to correctly and accurately search for a ISUZU Service Bulletin on ISUZU Web site.

The initial checks may vary depending on the complexity of the system and may include the following actions:

- Operate the suspect system
- Make a visual inspection of harness routing and accessible/visible power and ground circuits
- Check for blown fuses
- Make a visual inspection for separated connectors
- Make a visual inspection of connectors (includes checking terminals for damage and tightness)
- Check for any DTCs stored by the on-board computers
- Sense unusual noises, smells, vibrations or movements
- Investigate the vehicle service history (call other dealerships, if appropriate)

What resources you should use

Whenever appropriate, you should use the following resources for assistance in performing preliminary checks:

- Tech II or other technical equipment for viewing DTCs
- Service manual information:
  - Component locations
  - Harness routing
  - Wiring schematics
  - Procedures for viewing DTCs
- Dealership service history file
- Vehicle road test
- Identical vehicle or system for comparison

3. Check Bulletins and Troubleshooting Hints

NOTE: As estimated 30 percent of successful vehicle repairs are diagnosed with this step!

What you should do

You should have enough information gained from preliminary checks to accurately search for a bulletin and other related service information. Some service manual sections provide troubleshooting hints that match symptoms with specific complaints.

What resources you should use

You should use the following resources for assistance in checking for bulletins and troubleshooting hints:

- Printed bulletins
- Access ISUZU Bulletin Web site, https://www.einet.isuzu.co.jp//
- Videotapes
- Service manual

4. Perform Service Manual Diagnostic Checks

What you should do

The “System Checks” in most service manual sections and in most cells of section 8A (electrical) provide you with:

- A systematic approach to narrowing down the possible causes of a system fault
- Direction to specific diagnostic procedures in the service manual
- Assistance to identify what systems work correctly

What resources you should use

Whenever possible, you should use the following resources to perform service manual checks:

- Service manual
- Technical equipment (for viewing DTCs and analyzing data)
- Digital multimeter and circuit testing tools
- Other tools as needed

5a and 5b. Perform Service Manual Diagnostic Procedures

NOTE: An estimated 40 percent of successful vehicle repairs are diagnosed with these steps!

What you should do

When directed by service manual diagnostic checks, you must then carefully and accurately perform the steps of diagnostic procedures to locate the fault related to the customer complaint.

What resources you should use

Whenever appropriate, you should use the following resources to perform service manual diagnostic procedures:

- Service manual
- Technical equipment (for analyzing diagnostic data)
- Digital multimeter and circuit testing tools
- Essential and special tools

5c. Technician Self Diagnoses

When there is no DTC stored and no matching symptom for the condition identified in the service manual, you must begin with a thorough understanding of how the system(s) operates. Efficient use of the service manual combined with you experience and a good process of elimination will result in accurate diagnosis of the condition.

What you should do

Step 1: Identify and understand the suspect circuit(s)

Having completed steps 1 through 4 of the Strategy Based Diagnostics chart, you should have enough information to identify the system(s) or sub-system(s) involved. Using the service manual, you should determine and investigate the following circuit characteristics:

- Electrical:
  - How is the circuit powered (power distribution charts and/or fuse block details)?
  - How is the circuit grounded (ground distribution charts)?
  - How is the circuit controlled or sensed (theory of operation):
    - If it is a switched circuit, is it normally open or normally closed?
    - Is the power switched or is the ground switched?
    - Is it a variable resistance circuit (ECT sensor or TP sensor, for example)?
    - Is it a signal generating device (MAF sensor of VSS, for example)?
    - Does it rely on some mechanical/vacuum device to operate?
- Physical:
  - Where are the circuit components (component locators and wire harness routing diagrams):
    - Are there areas where wires could be chafed or pinched (brackets or frames)?
    - Are there areas subjected to extreme

temperatures?
  - Are there areas subjected to vibration or movement (engine, transmission or suspension)?
  - Are there areas exposed to moisture, road salt or other corrosives (battery acid, oil or other fluids)?
  - Are there common mounting areas with other systems/components?
- Have previous repairs been performed to wiring, connectors, components or mounting areas (causing pinched wires between panels and drivetrain or suspension components without causing and immediate problem)?
- Does the vehicle have aftermarket or dealer-installed equipment (radios, telephone, etc.)

Step 2: Isolate the problem

At this point, you should have a good idea of what could cause the present condition, as well as could not cause the condition. Actions to take include the following:

- Divide (and separate, where possible) the system or circuit into smaller sections
- Confine the problem to a smaller area of the vehicle (start with main harness connections while removing panels and trim as necessary in order to eliminate large vehicle sections from further investigation)
- For two or more circuits that do not share a common power or ground, concentrate on areas where harnesses are routed together or connectors are shared (refer to the following hints)

Hints

Though the symptoms may vary, basic electrical failures are generally caused by:

- Loose connections:
  - Open/high resistance in terminals, splices, connectors or grounds
- Incorrect connector/harness routing (usually in new vehicles or after a repair has been made):
  - Open/high resistance in terminals, splices, connectors of grounds
- Corrosion and wire damage:
  - Open/high resistance in terminals, splices, connectors of grounds
- Component failure:
  - Opens/short and high resistance in relays, modules, switches or loads
- Aftermarket equipment affecting normal operation of other systems

You may isolate circuits by:

- Unplugging connectors or removing a fuse to separate one part of the circuit from another part
- Operating shared circuits and eliminating those that function normally from the suspect circuit
- If only one component fails to operate, begin testing at the component
- If a number of components do no operate, begin tests at the area of commonality (such as power sources, ground circuits, switches or major connectors)

What resources you should use

Whenever appropriate, you should use the following resources to assist in the diagnostic process:

- Service manual
- Technical equipment (for data analysis)
- Experience
- Technical Assistance
- Circuit testing tools

5d. Intermittent Diagnosis

By definition, an intermittent problem is one that does not occur continuously and will occur when certain conditions are met. All these conditions, however, may not be obvious or currently known. Generally, intermittents are caused by:

- Faulty electrical connections and wiring
- Malfunctioning components (such as sticking relays, solenoids, etc.)
- EMI/RFI (Electromagnetic/radio frequency interference)
- Aftermarket equipment

Intermittent diagnosis requires careful analysis of suspected systems to help prevent replacing good parts. This may involve using creativity and ingenuity to interpret customer complaints and simulating all external and internal system conditions to duplicate the problem.

What you should do

Step 1: Acquire information

A thorough and comprehensive customer check sheet is critical to intermittent problem diagnosis. You should require this, since it will dictate the diagnostic starting point. The **vehicle service history** file is another source for accumulating information about the complaint.

Step 2: Analyze the intermittent problem

Analyze the customer check sheet and service history file to determine conditions relevant to the suspect system(s).

Using service manual information, you must identify, trace and locate all electrical circuits related to the malfunctioning system(s). If there is more than one system failure, you should identify, trace and locate areas of commonality shared by the suspect circuits.

Step 3: Simulate the symptom and isolate the problem

Simulate the symptom and isolate the system by reproducing all possible conditions suggested in Step 1 while monitoring suspected circuits/components/ systems to isolate the problem symptom. Begin with the most logical circuit/component.
Isolate the circuit by dividing the suspect system into simpler circuits. Next, confine the problem into a smaller area of the system. Begin at the most logical point (or point of easiest access) and thoroughly check the isolated circuit for the fault, using basic circuit tests.

Hints

You can isolate a circuit by:

- Unplugging connectors or removing a fuse to separate one part of the circuit from another
- If only component fails to operate, begin testing the component
- If a number of components do not operate, begin test at areas of commonality (such as power sources, ground circuits, switches, main connectors or major components)
- Substitute a known good part from the parts department or the vehicle system
- Try the suspect part in a known good vehicle

See **Symptom Simulation Tests** on the next page for problem simulation procedures. Refer to service manual sections 6E and 8A for information about intermittent diagnosis. Follow procedures for basic circuit testing in service manual section 8A.

What resources you should use

Whenever appropriate, you should use the following resources to assist in the diagnostic process:

- Service manual
- Bulletins
- Digital multimeter (with a MIN/MAX feature)
- Tech II and Tech II upload function
- Circuit testing tools (including connector kits/ harnesses and jumper wires)
- Experience
- Intermittent problem solving simulation methods
- Customer complaint check sheet

Symptom Simulation Tests

1. Vibration

This method is useful when the customer complaint analysis indicates that the problem occurs when the vehicle/system undergoes some form of vibration.
For connectors and wire harness, slightly shake vertically and horizontally. Inspect the connector joint and body for damage. Also, tapping lightly along a suspected circuit may be helpful.
For parts and sensors, apply slight vibration to the part with a light tap of the finger while monitoring the system for a malfunction.

2. Heat

This method is important when the complaint suggests that the problem occurs in a heated environment. Apply moderate heat to the component with a hair drier or similar tool while monitoring the system for a malfunction.
CAUTION: Care must be take to avoid overheating the component.

3. Water and Moisture

This method may be used when the complaint suggests that the malfunction occurs on a rainy day or under conditions of high humidity. In this case, apply water in a light spray on the vehicle to duplicate the problem.
CAUTION: Care must be take to avoid directly exposing electrical connections to water.

4. Electrical loads

This method involves turning systems ON (such as the blower, lights or rear window defogger) to create a load on the vehicle electrical system at the same time you are monitoring the suspect circuit/component.

5e. Vehicle Operates as Designed

This condition refers to instances where a system operating as designed is perceived to be unsatisfactory or undesirable. In general, this is due to:

- A lack of understanding by the customer
- A conflict between customer expectations and vehicle design intent
- A system performance that is unacceptable to the customer

What you should do

You can verify that a system is operating as designed by:

- Reviewing service manual functional/diagnostic checks
- Examining bulletins and other service information for supplementary information
- Compare system operation to an identical vehicle

If the condition is due to a customer misunderstanding or a conflict between customer expectation and system operation, you should explain the system operation to the customer.
If the complaint is due to a case of unsatisfactory system performance, you should contact Technical Assistance for the latest information.

What resources you should use

Whenever possible, you should use the following resources to facilitate the diagnostic process:

- Vehicle service information (service manual, etc.)
- ISUZU field support
- Experience
- Identical vehicle or system for comparison

6. Re-examine the complaint

When you do not successfully find/isolate the problem after executing a diagnostic path, you should re-examine the complaint.

What you should do

In this case, you will need to backtrack and review information accumulated from step 1 through 4 of Strategy Based Diagnostics. You also should repeat any procedures that require additional attention.
A previous path may be eliminated from consideration only if you are certain that all steps were executed as directed. You must then select another diagnostic path (step 5a, 5b, 5c or 5d). If all possible options have been explored, you may call or seek ISUZU field support.

What resources you should use

Whenever possible, you should use the following resources to facilitate the diagnostic process:

- Service manual
- Accumulated information form a previous diagnostic path
- Service information and publications
- ISUZU field support

7. Repair and Verify Fix

What you should do

After you have located the cause of the problem, you must execute a repair by following recommended service manual procedures.
When the repair is completed, you should verify the fix by performing the system checks under the conditions listed in the customer complaint.
If applicable, you should carry out preventive measures to avoid a repeat complaint.

What resources you should use

Whenever possible, you should use the following resources to facilitate the repair process:

- Electrical repair procedures
- Service manual information and publications

GENERAL SERVICE INFORMATION

Serviceability Issues

Non-OEM Parts

All of the OBD diagnostics have been calibrated to run with OEM parts. Accordingly, if commercially sold sensor or switch is installed, it makes a wrong diagnosis and turns on the check engine lamp.
Aftermarket electronics, such as cellular phones, stereos, and anti-theft devices, may radiate EMI into the control system if they are improperly installed. This may cause a false sensor reading and turn on the check engine lamp.

Poor Vehicle Maintenance

The sensitivity of OBD diagnostics will cause the check engine lamp to turn on if the vehicle is not maintained properly. Restricted oil filters, fuel filters, and crankcase deposits due to lack of oil changes or improper oil viscosity can trigger actual vehicle faults that were not previously monitored prior to OBD. Poor vehicle maintenance can not be classified as a “non-vehicle fault”, but with the sensitivity of OBD diagnostics, vehicle maintenance schedules must be more closely followed.

Related System Faults

Many of the OBD system diagnostics will not run if the ECM detects a fault on a related system or component.

Visual/Physical Engine Compartment Inspection

Perform a careful visual and physical engine compartment inspection when performing any diagnostic procedure or diagnosing the cause of an emission test failure. This can often lead to repairing a problem without further steps. Use the following guidelines when performing a visual/physical inspection:

- Inspect all vacuum hoses for punches, cuts, disconnects, and correct routing.
- Inspect hoses that are difficult to see behind other components.
- Inspect all wires in the engine compartment for proper connections, burned or chafed spots, pinched wires, contact with sharp edges or contact with hot exhaust manifolds or pipes.

Basic Knowledge of Tools Required

NOTE: Lack of basic knowledge of this powertrain when performing diagnostic procedures could result in an incorrect diagnosis or damage to powertrain components. Do not attempt to diagnose a powertrain problem without this basic knowledge.
A basic understanding of hand tools is necessary to effectively use this section of the Service Manual.

ON-BOARD DIAGNOSTIC (OBD)

On-Board Diagnostic (Self Diagnosis System) Tests

A diagnostic test is a series of steps, the result of which is a pass or fail reported to the diagnostic executive. When a diagnostic test reports a pass result, the diagnostic executive records the following data:

- The diagnostic test has been completed since the last ignition cycle.
- The diagnostic test has passed during the current ignition cycle.
- The fault identified by the diagnostic test is not currently active.

When a diagnostic test reports a fail result, the diagnostic executive records the following data:

- The diagnostic test has been completed since the last ignition cycle.
- The fault identified by the diagnostic test is currently active.
- The fault has been active during this ignition cycle.
- The operating conditions at the time of the failure.

The Diagnostic Executive

The Diagnostic Executive is a unique segment of software which is designed to coordinate and prioritize the diagnostic procedures as well as define the protocol for recording and displaying their results. The main responsibilities of the Diagnostic Executive are listed as follows:

- Commanding the check engine lamp on and off
- DTC logging and clearing
- Current status information on each diagnostic

Diagnostic Information

The diagnostic charts and functional checks are designed to locate a faulty circuit or component through a process of logical decisions. The charts are prepared with the requirement that the vehicle functioned correctly at the time of assembly and that there are not multiple faults present.
There is a continuous self-diagnosis on certain control functions. This diagnostic capability is complemented by the diagnostic procedures contained in this manual. The language of communicating the source of the malfunction is a system of diagnostic trouble codes. When a malfunction is detected by the control module, a diagnostic trouble code is set and the check engine lamp is illuminated.

Check Engine Lamp

The check engine lamp looks the same as the check engine lamp you are already familiar with, the “Check Engine” lamp.
Basically, the check engine lamp is turned on when the

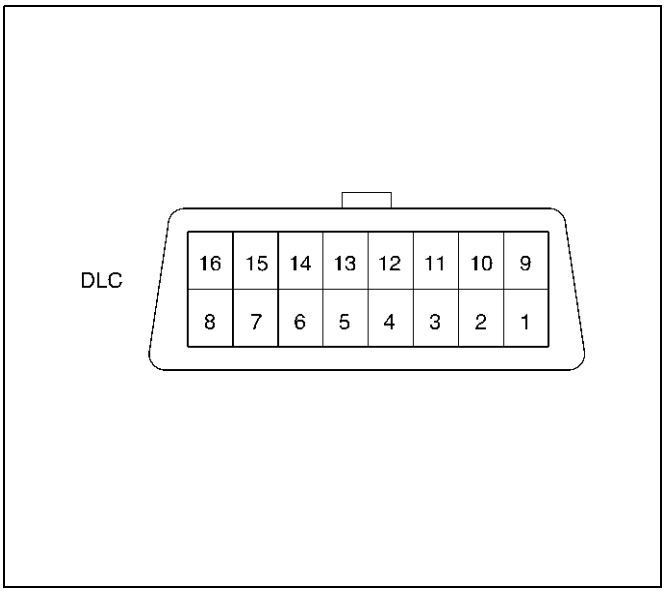
ECM detects a DTC that will impact the vehicle emissions.

- When the check engine lamp remains “ON” while the engine is running, or when a malfunction is suspected due to a driveability or emissions problem, a Powertrain On-Board Diagnostic (OBD) System Check must be performed. The procedures for these checks are given in On-Board Diagnostic (OBD) System Check. These checks will expose faults which may not be detected if other diagnostics are performed first.

Data Link Connector (DLC)

The provision for communication with the contorl module is the Data Link Connector (DLC). It is located behind the lower front instrument panel. The DLC is used to connect to a Tech2. Some common uses of the Tech2 are listed below:

- Identifying stored Diagnostic Trouble Codes (DTCs).
- Clearing DTCs.
- Reading serial data.



Verifying Vehicle Repair

Verification of vehicle repair will be more comprehensive for vehicles with OBD system diagnostic. Following a repair, the technician should perform the following steps:

1. Review and record the Fail Records for the DTC which has been diagnosed.
2. Clear DTC(s).
3. Operate the vehicle within conditions noted in the Fail Records.
4. Monitor the DTC status information for the specific DTC which has been diagnosed until the diagnostic test associated with that DTC runs.

Following these steps is very important in verifying repairs on OBD systems. Failure to follow these steps could result in unnecessary repairs.

Reading Flash Diagnostic Trouble Codes

The provision for communicating with the Engine Control Module (ECM) is the Data Link Connector (DLC). The DLC is located in the front console box. It is used in the assembly plant to receive information in checking that the engine is operating properly before it leaves the plant.

The diagnostic trouble code(s) (DTCs) stored in the ECM’s memory can be read either through a hand-held diagnostic scanner plugged into the DLC or by counting the number of flashes of the check engine lamp when the diagnostic test terminal of the DLC is grounded. The DLC terminal “6” (diagnostic request) is pulled “Low” (grounded) by jumping to DLC terminal “4 or 5”, which is a ground wire.

This will signal the ECM that you want to “flash” DTC(s), if any are present. Once terminals “4 or 5” and “6” have been connected, the ignition switch must be moved to the “ON” position, with the engine not running.

The check engine lamp will indicate a DTC three times if a DTC is present. If more than one DTC has been stored in the ECM’s memory, the DTC(s) will be output from the lowest to the highest, with each DTC being displayed three times.

The DTC display will continue as long as the DLC is shorted.

Reading Diagnostic Trouble Codes Using a Tech 2

The procedure for reading diagnostic trouble code(s) is to used a diagnostic Tech2. When reading DTC(s), follow instructions supplied by Tech2 manufacturer.

For the 1998 model year, Isuzu dealer service departments will continue to use Tech2.

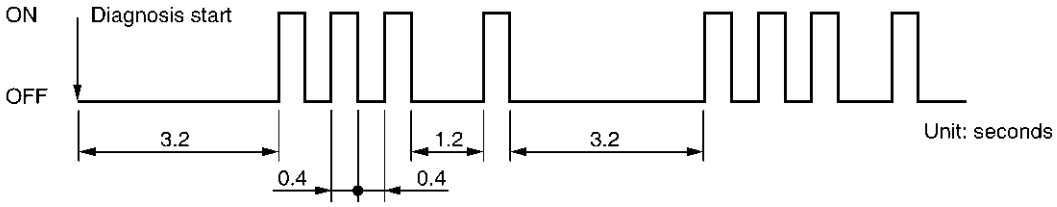
Clearing Diagnostic Trouble Codes

To clear Diagnostic Trouble Codes (DTCs), use the Tech2 “clear DTCs” or “clear information” function. When clearing DTCs follow instructions supplied by the Tech2 manufacturer.

History DTC

History DTC can be candeled after 40 cycle driving with no defect. Or history code can be deleted by Tech 2 “Clear DTCs” function.

Example: DTC 31 is stored



Example: DTC 31 and 43 are stored

[31] • [31] • [31] • [43] • [43] • [43] • [31] • [31] • [31] • [43] • [43] • [43] • [31] • [31] • [31] • [43] • [43] • [43] - - - - -►

◄——— Display will continue ———►

DIAGNOSIS WITH Tech 2

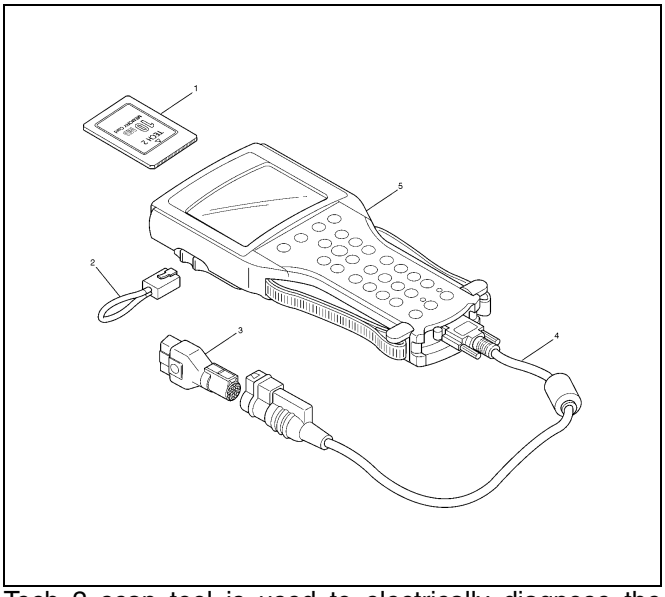
If no codes are set:

- Refer to **F1: Data Display** and identify the electrical faults that are not indicated by trouble code.
- Refer to **"SYMPTOM DIAGNOSIS**".

If codes are set:

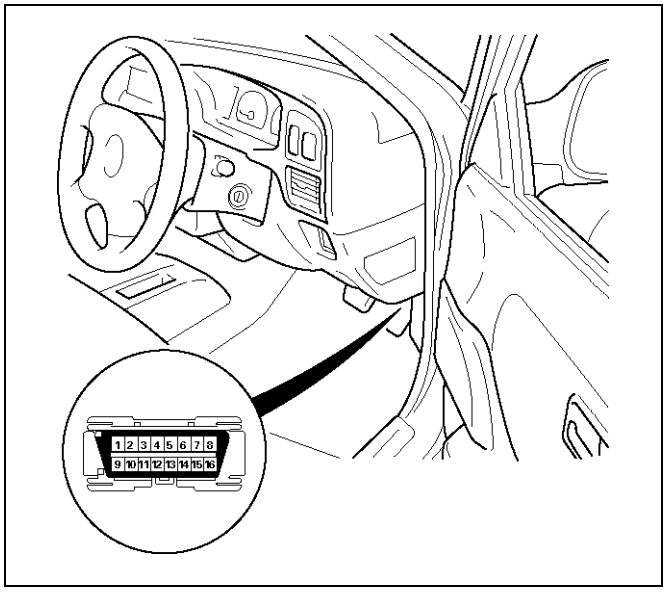
1. Record all trouble codes displayed by Tech 2 and check id the codes are intermittent.
2. Clear the codes.
3. Drive the vehicle for a test to reproduce the faulty status.
4. Check trouble codes again using the Tech 2.
5. If no codes is displayed by test driving, the fault is intermittent. In this case, refer to "DIAGNOSIS AIDS".
6. If a code is present, refer to DTC Chart for diagnosis.
7. Check trouble codes again using the Tech 2.

Tech 2 CONNECTION



Tech 2 scan tool is used to electrically diagnose the automatic transmission system and to check the system. The Tech 2 enhances the diagnosis efficiency though all the troubleshooting can be done without the Tech 2.

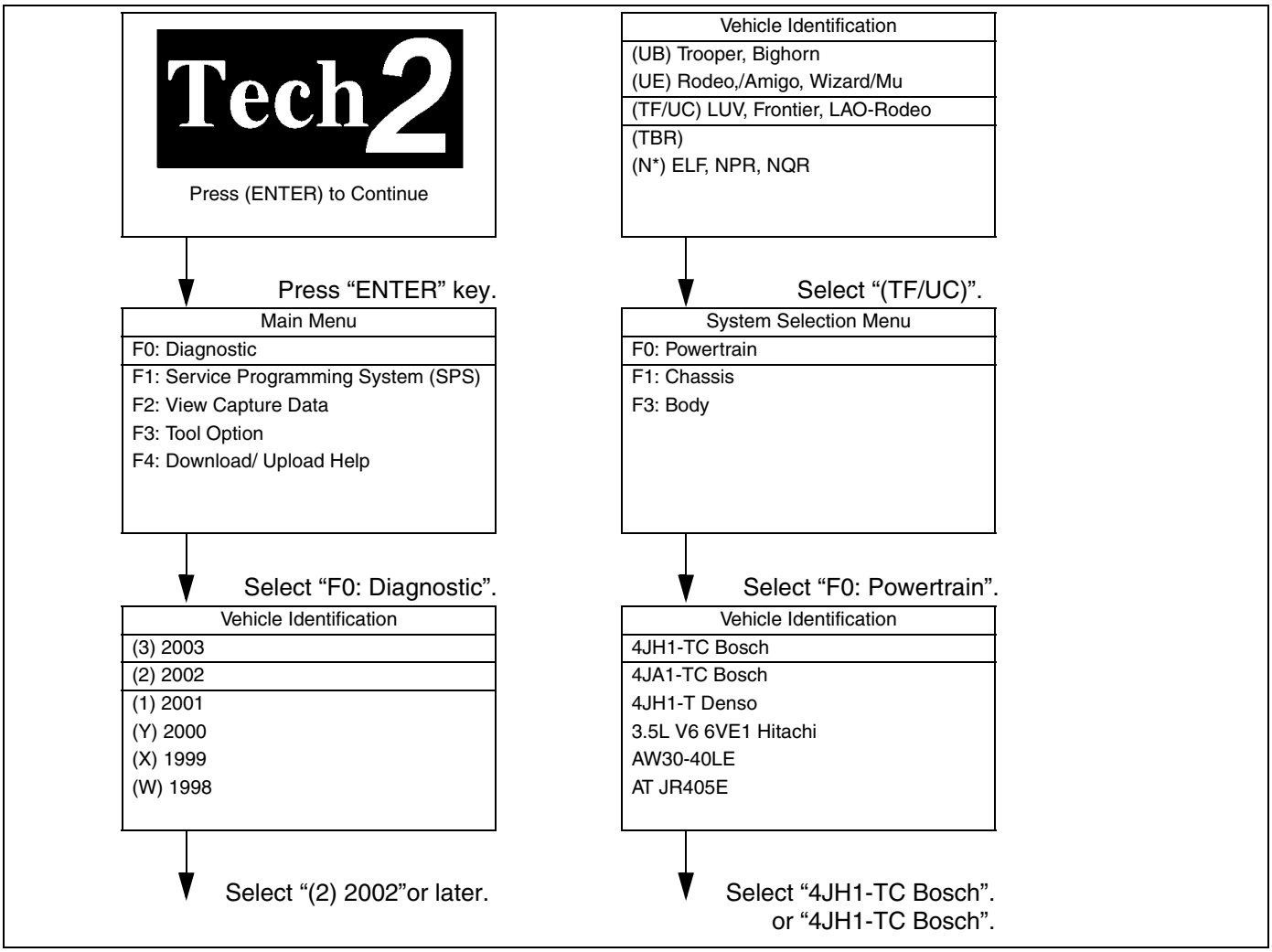
1. Configuration of Tech 2
   - Tech 2 scan tool kit (No. 7000086), Tech 2 scan tool (No. 7000057) and DLC cable (No. 3000095).
   - SAE 16/19 adapter (No. 3000098) (3), RS232 loop back connector (No. 3000112) (2) and PCMCIA card (No. 3000117) (1).
2. Tech 2 Connection
   - Check the key switch is turn OFF.
   - Insert the PCMCIA card (1) into the Tech 2 (5).
   - Connect the SAE 16/19 adapter (3) to the DLC cable (4).
   - Connect the DLC cable (4) to the Tech 2 (5).
   - Connect the SAE 16/19 adapter (3) to the data link connector of the vehicle.



   - Turn the key switch of the vehicle ON and press the "PWR" key of the Tech 2.
   - Check the display of the Tech 2.

NOTE: Be sure to check that the power is not supplied to the Tech 2 when attaching or removing the PCMCIA card.

TECH 2 OPERATING FLOW CART (START UP)



Select “4JA1-TC Bosch” or “4JH1-TC Bosch” in Vehicle Identification menu and the following table is shown in the Tech 2 screen.

F0: Diagnostic Trouble Codes
- F0: Read DTC Infor As Stored By ECU
- F1: Clear DTC Information

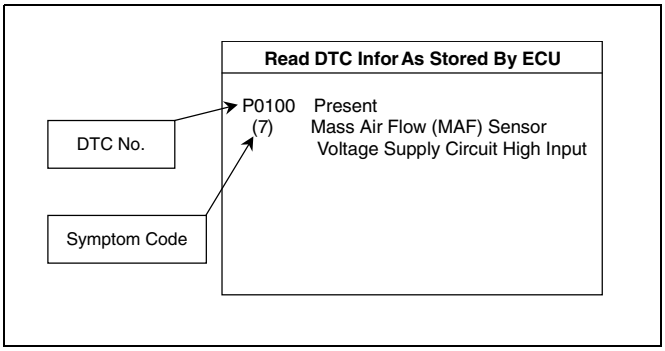
F1: Data Display

F2: Snapshot

F3: Miscellaneous Test
- F0: Lamps
  - F0: Check Light
  - F1: Glow Time Telltale Test
- F1: Relays
  - F0: Glow Time Relay Test
- F2: Engine Speed (RPM) Control

F4: Programming
- F0: Program VIN
- F1: Lock ECU

F0: Diagnostic Trouble Code
The purpose of the “Diagnostic Trouble Codes” mode is to display stored trouble code in the ECM.
When “Clear DTC Information” is selected, a “Clear DTC Information”, warning screen appears.
This screen informs you that by cleaning DTC's “all stored DTC information in the ECM will be erased”.
After clearing codes, confirm system operation by test driving the vehicle.



Symptom Code:
This number or alphabet means identification of the malfunction. Each DTC includes plural symptoms, such as DTC P0100 has four kinds of symptom code (7), (9), (B) and (C). DTC chart (check procedure) is separated depending on the symptom code.

F1: Data Display
The purpose of the “Data Display” mode is to continuously monitor data parameters.
The current actual values of all important sensors and signals in the system are display through F1 mode.
See the “Typical Scan Data” section.

F2: Snapshot
“Snapshot” allows you to focus on making the condition occur, rather than trying to view all of the data in anticipation of the fault.
The snapshot will collect parameter information around a trigger point that you select.

F3: Miscellaneous Test:
The purpose of “Miscellaneous Test” mode is to check for correct operation of electronic system actuators.

F4: Programming (Factory Use Only)
The purpose of “Programming” is to program VIN in the ECM and lock the programmed data.

TYPICAL SCAN DATA & DEFINITIONS 4JA1-TC (ENGINE DATA)

Use the Typical Values Table only after the On-Board Diagnostic System Check has been completed, no DTC(s) were noted, and you have determined that the on-board diagnostics are functioning properly. Tech 2 values from a properly-running engine may be used for comparison with the engine you are diagnosing.
Condition : Vehicle stopping, engine running, air conditioning off & after warm-up (Coolant temperature approximately 80 deg.)

	Tech 2/TIS 2000 Parameter	Units	Idle	1500rpm	2000rpm	Description
1	Engine Speed	rpm	705 - 755	1475 - 1525	1975 - 2025	The engine speed is measured by ECM from the CKP sensor.
2	Vehicle Speed	km/h	0	0	0	This displays vehicle speed. The vehicle speed is measured by ECM from the vehicle speed sensor.
3	Pump Speed	rpm	353 - 375	725 - 775	975 - 1025	This displays injection pump speed. The injection speed is measured by ECM from the pump cam sensor.
4	Accelerator Position Signal	%	0	5 - 7	7 - 9	Throttle position operating angle is measured by the ECM from throttle position output voltage. This should display 0% at idle and 99 - 100% at full throttle.
5	Idle Switch	Active/ Inactive	Active	Active	Inactive	This displays operating status of the idle switch. This should display “Active” when the idle condition.
6	Mass Air Flow Sensor	mg/strk	380 - 430	360 - 390	360 - 390	This displays intake air amount. The mass air flow is measured by ECM from the MAF sensor output voltage.
7	Barometric Pressure	hpa	990 - 1015	990 - 1015	990 - 1015	The barometric pressure is measured by ECM from the sensor in the ECM. This data is changing by altitude.
8	Desired Injection Quantity	mg/stk	8 - 10	8 - 11	8 - 11	This displays commanded value from the ECM. The ECM compensates for fuel rate to basic rate.
9	Injection Quantity	mg/stk	8 - 10	8 - 11	8 - 11	This displays actual fuel quantity. The PSG controls high pressure solenoid valve to meet commanded value from the ECM.
10	Desired Fuel Injection Start	°CA	2 - 3	3 - 4	3 - 4	This displays commanded value from the ECM. The ECM compensates for fuel injection timing by throttle position and various sensor signal.
11	Actual Injection Start	°CA	2 - 3	3 - 4	3 - 4	This displays actual injection timing value controlled by the TCV. The TCV controls duty ratio to meet commanded value from the PSG.
12	Coolant Temperature	°C	80 - 85	80 - 85	80 - 85	The ECT is measured by ECM from ECT sensor output voltage. This data is changing by coolant temperature. When the engine is normally warm upped, this data displays approximately 80 deg.
13	Fuel Temperature	°C	25 - 50	25 - 50	25 - 50	The FT is measured by PSG from FT sensor. This data is changing by fuel temperature.
14	Intake Air Temperature	°C	25 - 50	25 - 50	25 - 50	The IAT is measured by ECM from IAT sensor output voltage. This data is changing by intake air temperature.
15	Ignition Status	On12V/ Off0V	On 12V	On 12V	On 12V	This displays the key switch status indicated by the ECM with key switch signal. This should display “Off 0V” at key OFF and “On12V” at key ON.
16	Brake Switch 1	Active/ Inactive	Inactive	Inactive	Inactive	This displays operating status of the brake switch. This should display “Active” when the brake pedal is stepped on.
17	Brake Switch 2	Active/ Inactive	Inactive	Inactive	Inactive	This displays operating status of the brake switch. This should display “Active” when the brake pedal is stepped on.
18	Clutch Switch	Active/ Inactive	Inactive	Inactive	Inactive	This displays operating status of the clutch switch. This should display “Active” when the clutch pedal is stepped on.
19	Neutral Switch	On/Off	On	On	On	This displays operating status of the neutral switch. This should display “On” when the gear position is neutral.
20	A/C Information Switch	Active 12V/ Inactive 0V	Inactive 0V	Inactive 0V	Inactive 0V	This displays the air conditioner request signal. This should display “Active 12V” when the air conditioner switch is switched on.

	Tech 2/TIS 2000 Parameter	Units	Idle	1500rpm	2000rpm	Description
21	Diagnostic Request	Active 0V/ Inactive 12V	Inactive 12V	Inactive 12V	Inactive 12V	This displays the diagnostic request signal. This should display “Inactive 12V” when the Tech 2 is connected.
22	System Voltage	V	11 - 14	11 - 14	11 - 14	This displays the system voltage measured by the ECM at ignition feed.
23	Main Relay	Active/ Inactive	Active	Active	Active	This displays operating status for the ECM main relay. This should display “On” when the key switch is turned on and while engine is running.
24	Glow Time Relay	Active 0V/ Inactive12V	Inactive 12V	Inactive 12V	Inactive 12V	This displays operating status for the glow relay. This should display “Inactive 12V” when the engine is warm upped.
25	Check Engine Lamp	On/Off	Off	Off	Off	This displays operating status for the Check Engine Lamp. This should display “On” when the Check Engine Lamp is turned on.
26	Glow Time Telltale	On/Off	Off	Off	Off	This displays operating status for the glow indicator lamp. This should display “On” when the glow lamp is turned on.
27	EGR Pulse Ratio	%	70	60 - 70	60 - 70	This displays the duty signal from the ECM to control the EGR flow amount.
28	EGR Command	mg/strk	340 - 360	350 - 370	350 - 370	This displays EGR amount commanded value from the ECM This data is changing with EVRV operation.
29	Intake Manifold Valve	Active/ Inactive	Inactive	Inactive	Inactive	This displays operating status of the intake throttle. This should display “Active” when the intake throttle VSV is operated. (Not Used for TF*)
30	Exhaust Brake Valve 1	Active/ Inactive	Inactive	Inactive	Inactive	This displays operating status of the exhaust throttle. This should display “Active” when the exhaust throttle VSV 1 is operated.
31	Exhaust Brake Valve 2	Active/ Inactive	Inactive	Inactive	Inactive	This displays operating status of the exhaust throttle. This should display “Active” when the exhaust throttle VSV 2 is operated.
32	Desired Engine Idle Speed	rpm	730	730	730	The desired engine idle speed that the ECM commanding. The ECM compensates for various engine loads based on engine coolant temperature.
33	Start of Delivery	°CA	18 - 22	22 - 24	22 - 24	This displays commanded value from the ECM when engine start.
34	A/C Request	Active 0V/ Inactive 12V	Inactive 12V	Inactive 12V	Inactive 12V	This displays operating status of the A/C compressor. This should display “Active 0V” when the compressor relay is operated.
35	Immobiliser	Active/ Inactive	Inactive	Inactive	Inactive	This should display “Inactive” when the immobiliser is normal.
36	Immobiliser Signal	Received/ Not Received	Not Received	Not Received	Not Received	This should display “Not Received” when the immobiliser is not activated.
37	Immobiliser Function Programmed	Yes/No	Yes	Yes	Yes	This should display “Yes” when the immobiliser is programmed.

TYPICAL SCAN DATA & DEFINITIONS 4JH1-TC (ENGINE DATA)

Use the Typical Values Table only after the On-Board Diagnostic System Check has been completed, no DTC(s) were noted, and you have determined that the on-board diagnostics are functioning properly. Tech 2 values from a properly-running engine may be used for comparison with the engine you are diagnosing.
Condition : Vehicle stopping, engine running, air conditioning off & after warm-up (Coolant temperature approximately 80 deg.)

	Tech 2 Parameter	Units	Idle	1500rpm	2000rpm	Description
1	Engine Speed	rpm	675 - 725	1475 - 1525	1975 - 2025	The engine speed is measured by ECM from the CKP sensor.
2	Vehicle Speed	km/h	0	0	0	This displays vehicle speed. The vehicle speed is measured by ECM from the vehicle speed sensor.
3	Pump Speed	rpm	335 - 375	725 - 775	975 - 1025	This displays injection pump speed. The injection speed is measured by ECM from the pump cam sensor.
4	Accelerator Position Signal Value of ( ) shows AT model	%	0 (0)	3-6 (4 - 7)	5-8 (8 - 11)	Throttle position operating angle is measured by the ECM from throttle position output voltage. This should display 0% at idle and 99 - 100% at full throttle.
5	Idle Switch	Active/ Inactive	Active	Active	Inactive	This displays operating status of the idle switch. This should display “Active” when the idle condition.
6	Mass Air Flow Sensor Value of ( ) shows AT model	mg/strk	410-490 (730 - 785)	380-450 (700 - 780)	400-480 (780 - 830)	This displays intake air amount. The mass air flow is measured by ECM from the MAF sensor output voltage.
7	Barometric Pressure	hpa	990 - 1015	990 - 1015	990 - 1015	The barometric pressure is measured by ECM from the sensor in the ECM. This data is changing by altitude.
8	Desired Injection Quantity Value of ( ) shows AT model	mg/stk	5-8 (10 - 16)	5-9 (8 - 12)	6-10 (9 - 13)	This displays commanded value from the ECM. The ECM compensates for fuel rate to basic rate.
9	InjectionQuantity Value of ( ) shows AT model	mg/stk	6-8 (10 - 16)	6-9 (8 - 12)	7-10 (9 - 13)	This displays actual fuel quantity. The PSG controls high pressure solenoid valve to meet commanded value from the ECM.
10	Desired Fuel Injection Start	°CA	1 - 3	2 - 4	3 - 6	This displays commanded value from the ECM. The ECM compensates for fuel injection timing by throttle position and various sensor signal.
11	Actual Injection Start	°CA	1 - 3	2 - 4	3 - 6	This displays actual injection timing value controlled by the TCV. The TCV controls duty ratio to meet commanded value from the PSG.
12	Coolant Temperature	°C	80 - 85	80 - 85	80 - 85	The ECT is measured by ECM from ECT sensor output voltage. This data is changing by coolant temperature. When the engine is normally warm upped, this data displays approximately 80 deg.
13	Fuel Temperature	°C	25 - 50	25 - 50	25 - 50	The FT is measured by PSG from FT sensor. This data is changing by fuel temperature.
14	Intake Air Temperature	°C	25 - 50	25 - 50	25 - 50	The IAT is measured by ECM from IAT sensor output voltage. This data is changing by intake air temperature.
15	Ignition Status	On12V/ Off0V	On 12V	On 12V	On 12V	This displays the key switch status indicated by the ECM with key switch signal. This should display “Off 0V” at key OFF and “On12V” at key ON.
16	Brake Switch 1	Active/ Inactive	Inactive	Inactive	Inactive	This displays operating status of the brake switch 1. This should display “Active” when the brake pedal is stepped on.
17	Brake Switch 2	Active/ Inactive	Inactive	Inactive	Inactive	This displays operating status of the brake switch 2. This should display “Active” when the brake pedal is stepped on.
18	ClutchSwitch Value of ( ) shows AT model	Active/ Inactive	Inactive (-)	Inactive (-)	Inactive (-)	This displays operating status of the clutch switch. This should display “Active” when the clutch pedal is stepped on.
19	Neutral Switch	On/Off	On	On	On	This displays operating status of the neutral switch. This should display “On” when the gear position is neutral.

	Tech 2 Parameter	Units	Idle	1500rpm	2000rpm	Description
20	A/C Information Switch	Active 12V/ Inactive 0V	Inactive 0V	Inactive 0V	Inactive 0V	This displays the air conditioner request signal. This should display “Active 12V” when the air conditioner switch is switched on.
21	Diagnostic Request	Active 0V/ Inactive 12V	Inactive 12V	Inactive 12V	Inactive 12V	This displays the diagnostic request signal. This should display “Inactive 12V” when the Tech 2 is connected.
22	System Voltage	V	10 -14	10 -14	10 -14	This displays the system voltage measured by the ECM at ignition feed.
23	Main Relay	Active/ Inactive	Active	Active	Active	This displays operating status for the ECM main relay. This should display “Inactive” at key OFF and “Active” at key ON.
24	Glow Time Relay	Active 0V/ Inactive12V	Inactive 12V	Inactive 12V	Inactive 12V	This displays operating status for the glow relay. This should display “Inactive 12V” when the engine is warm upped.
25	Check Engine Lamp	On/Off	Off	Off	Off	This displays operating status for the Check Engine Lamp. This should display “On” when the Check Engine Lamp is turned on.
26	Glow Time Telltale	On/Off	Off	Off	Off	This displays operating status for the glow indicator lamp. This should display “On” when the glow lamp is turned on.
27	Desired Engine Idle Speed	rpm	700	700	700	The desired engine idle speed that the ECM commanding. The ECM compensates for various engine loads based on engine coolant temperature.
28	Start of Delivery	°CA	18 - 22	20 - 25	22 - 26	This displays commanded value from the ECM when engine start.
29	A/C Request	Active 0V/ Inactive 12V	Inactive 12V	Inactive 12V	Inactive 12V	This displays operating status of the A/C compressor. This should display “Active 0V” when the compressor relay is operated.
30	Immobiliser	Active/ Inactive	Inactive	Inactive	Inactive	This should display “Inactive” when the immobiliser is normal.
31	Immobiliser Signal	Received/ Not Received	Not Received	Not Received	Not Received	This should display “Not Received” when the immobiliser is not activated.
32	Immobiliser Function Programmed	Yes/No	Yes	Yes	Yes	This should display “Yes” when the immobiliser is programmed.

MISCELLANEOUS TEST

The state of each circuit can be tested by using miscellaneous test menus. Especially when DTC cannot be detected, a faulty circuit can be diagnosed by testing each circuit by means of these menus.
Even DTC has been detected, the circuit tests using these menus could help discriminate between a mechanical trouble and an electrical trouble.
Connect Tech 2 and select “Powertrain”, “4JH1-TC Bosch” & “Miscellaneous Test”.

F0: Lamps
F0: Check Light
When the Tech 2 is operated, “Malfunction Indicator Lamp (Check Engine Lamp)” is turned on or off.
The circuit is normal if the “Malfunction Indicator Lamp (Check Engine Lamp)” in the instrument panel is turned on or off in accordance with this operation.

F1: Glow Time Telltale Test
When the Tech 2 is operated, “Glow Indicator Lamp” is turned on or off.
The circuit is normal if the “Glow Indicator Lamp” in the instrument panel is turned on or off in accordance with this operation.

F1: Relays
F0: Glow Time Relay Test
When the Tech 2 is operated, glow relay signal turns ON or OFF.
The circuit is normal if glow system is activated/ deactivated in accordance with this operation when key switch is turned ON.

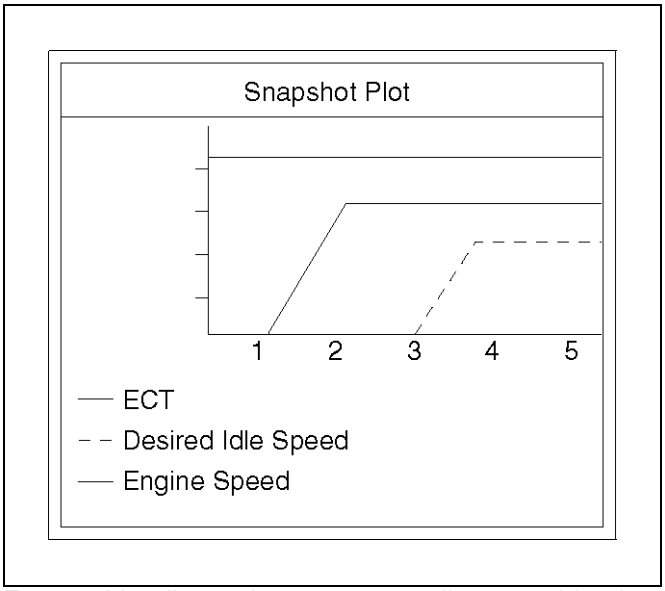
F2: Engine Speed (RPM) Control
When the Tech 2 is operated, “Desired Idle Speed” increases 50rpm-by-50rpm up to 1200rpm.
The circuit is normal if engine speed is changed in accordance with this operation.

Engine Speed (RPM) Control	
Engine Speed	850 RPM
Desired Idle Speed	850 RPM
Injection Quantity	7.5mg/strk

- Press “Increase” key.
  Then, Desired Idle speed increases 50rpm-by-50rpm up to 1200rpm. Engine speed is also changed by this operation.
- Press “Quit” Key.

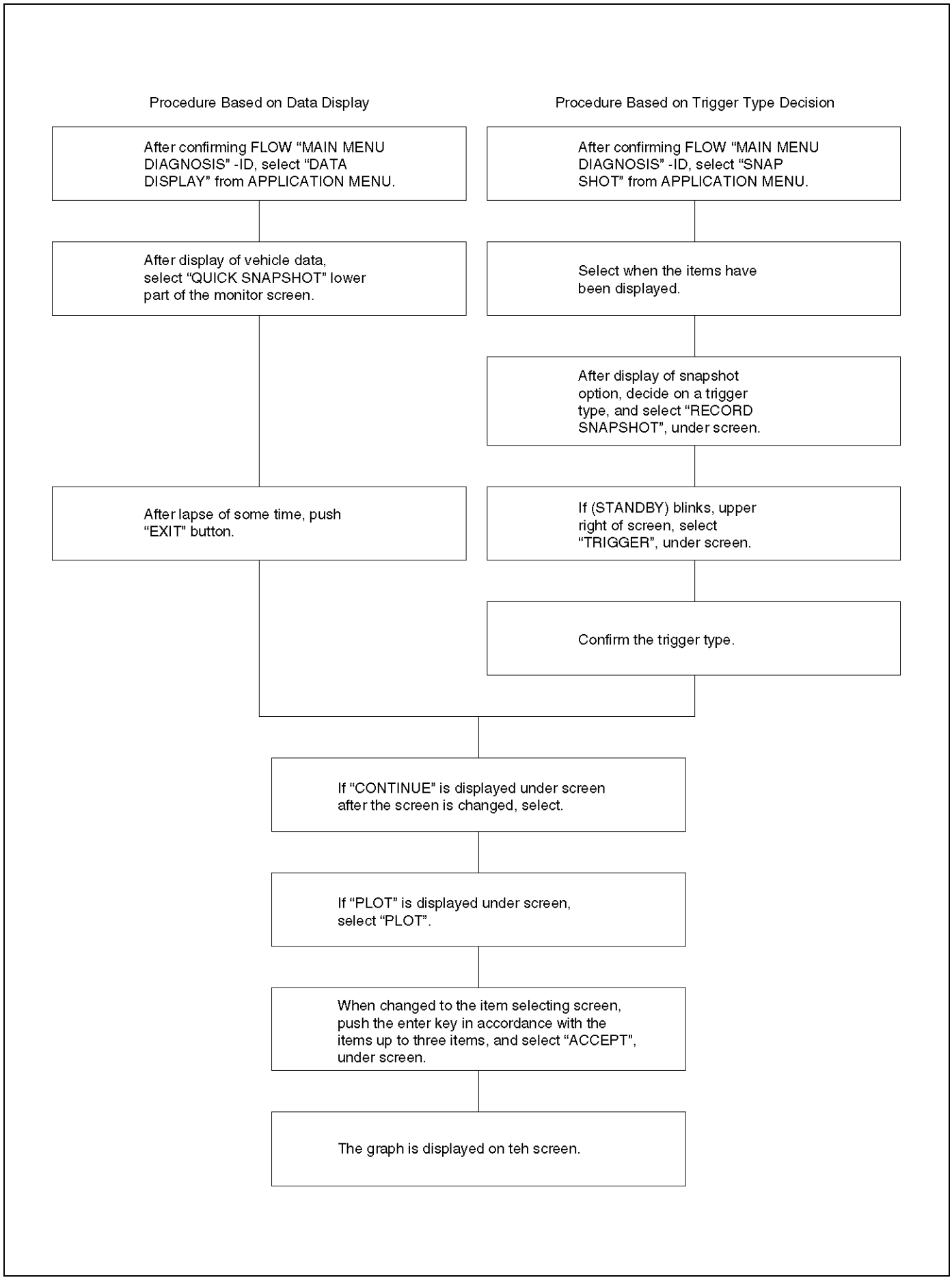
Plotting Snapshot Graph

This test selects several necessary items from the data list to plot graphs and makes data comparison on a long term basis. It is an effective test particularly in emission related evaluations.

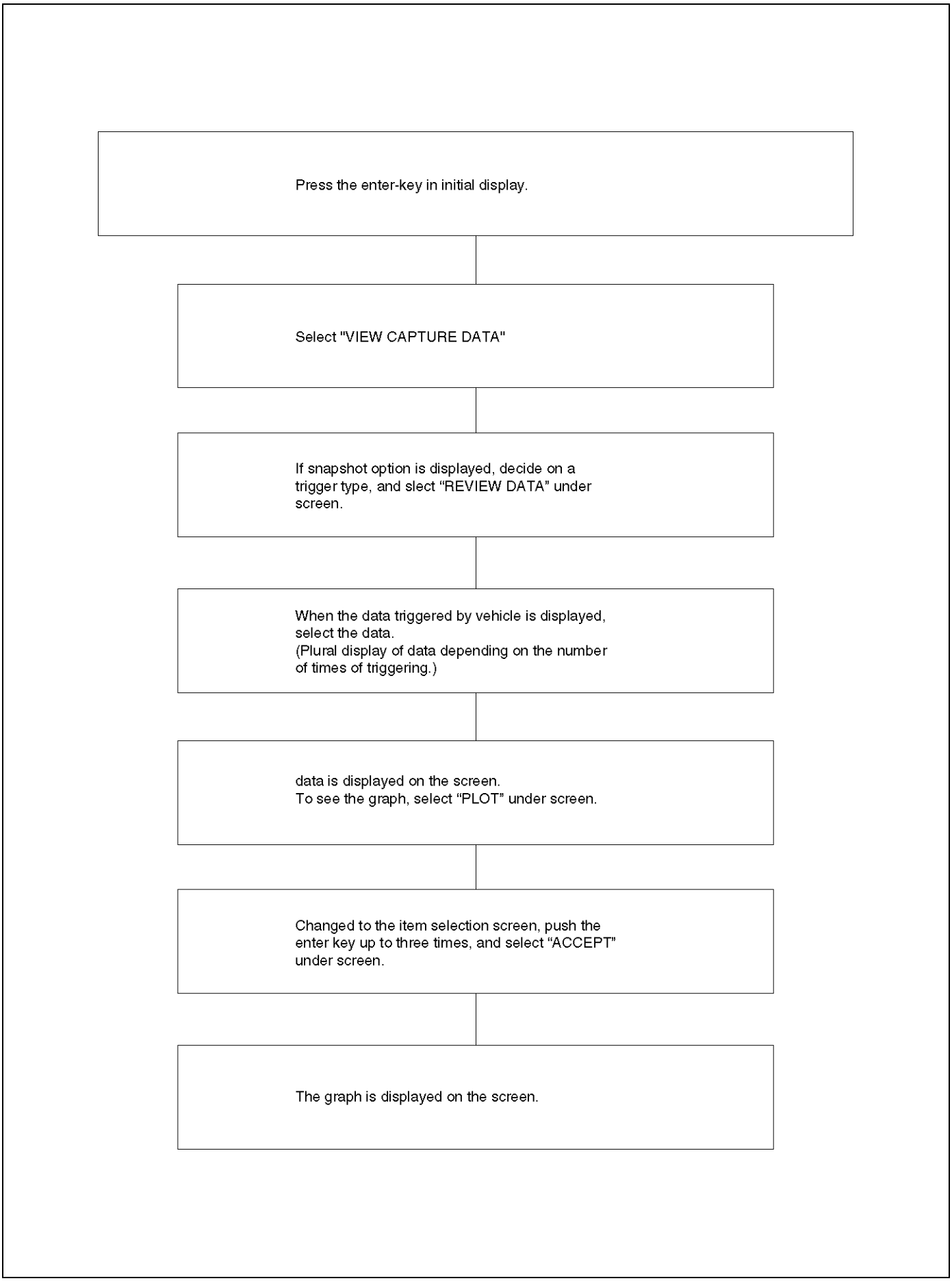


For trouble diagnosis, you can collect graphic data (snap shot) directly from the vehicle.
You can replay the snapshot data as needed. Therefore, accurate diagnosis is possible, even though the vehicle is not available.

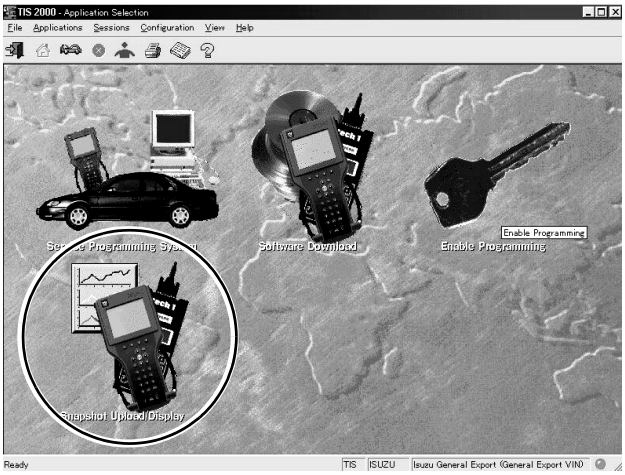
Plotting Graph Flow Chart (Plotting graph after obtaining vehicle information)



Flow Chart for Snapshot Replay (Plotting Graph)



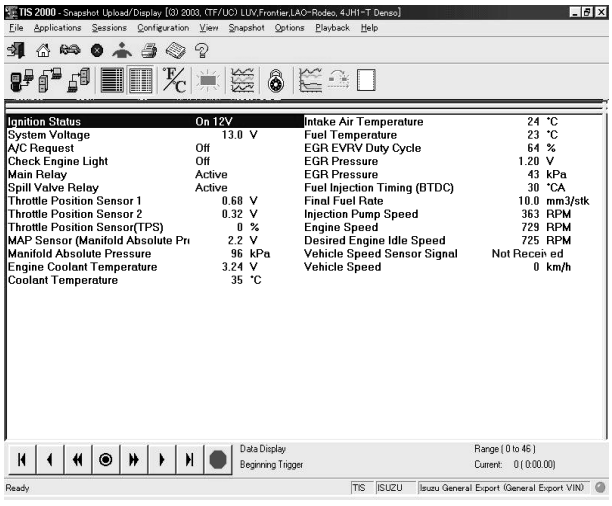
SNAPSHOT DISPLAY WITH TIS2000



Procedures for transferring and displaying Tech2 snapshot data by using TIS2000 [Snapshot Upload] function is described below.
Snapshot data can be displayed with [Snapshot Upload] function included in TIS2000.
By analyzing these data in various methods, trouble conditions can be checked.
Snapshot data is displayed by executing the three steps below shown:

1. Record the snapshot data, in Tech2.

2. Transfer the snapshot data to PC.



After recording the snapshot in Tech2, transfer the data from Tech2 to PC by the below procedures.

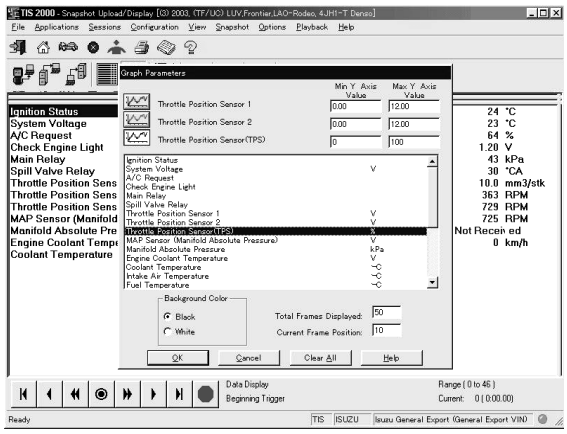
1. Start TIS2000.
2. Select [Snapshot Upload] on the TIS2000 start screen.
3. Select [Upload from trouble diagnosis tool (transfer from diagnosis tester)] or click the corresponding icon of the tool bar.
4. Select Tech2, and transfer the recorded snapshot information.
5. Select the transferred snapshot.
6. After ending transfer of the snapshot, data parameter list is displayed on the screen.

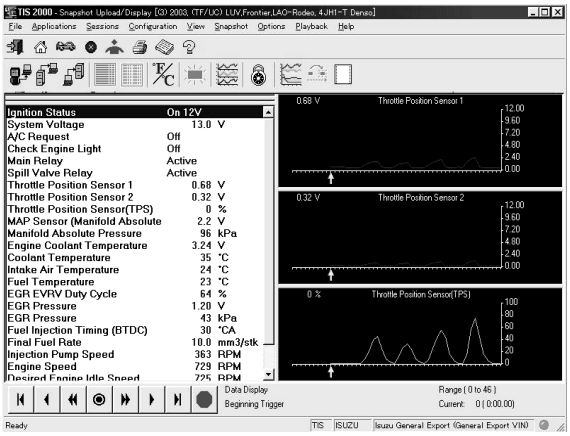
3. Snapshot data is displayed with TIS2000 [Snapshot Upload] function.

Snapshot is stored in the PC hard disk or floppy disk, and can be displayed any time.
Stored snapshot can be displayed by the below procedures.

1. Start TIS2000.
2. Select [Snapshot Upload] on the TIS2000 start screen.
3. Select [Open the existing files] or click the corresponding icon of the tool bar.
4. Select the transferred snapshot.
5. Open the snapshot, to display the data parameter list on the screen.

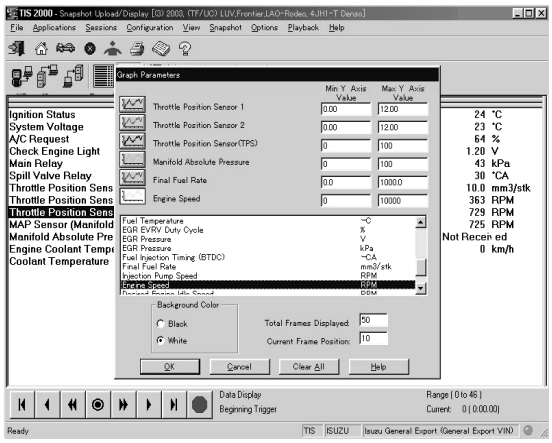
Graph display Values and graphs (Max. 3 graphs):

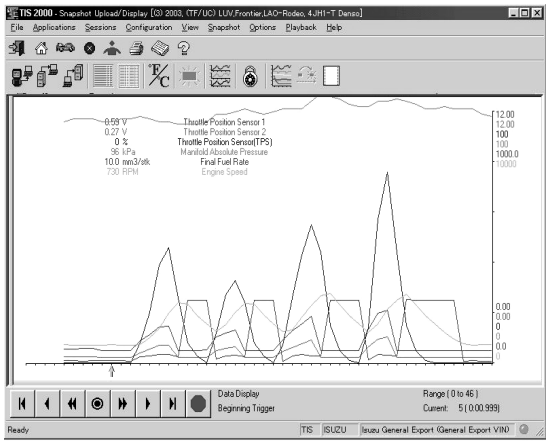




1. Click the icon for graph display. [Graph Parameter] window opens.
2. Click the first graph icon of the window upper part, and select one parameter from the list of the window lower part. Selected parameter is displayed nest to the graph icon. Graph division can be selected in the field on the parameter right side.
3. Repeat the same procedures with the 2nd and 3rd icons.
4. After selecting all parameters to be displayed (Max. 3 parameters), click [OK] button.
5. Parameter selected is displayed in graph form on the right of the data parameter on the screen.
6. Graph display can be moved with the navigation icon.
7. For displaying another parameter by graph, click the parameter of the list, drug the mouse to the display screen while pressing the mouse button and release the mouse button. New parameter is displayed at the position of the previous parameter. For displaying the graph display screen in full size, move the cursor upward on the screen. When the cursor is changed to the magnifying glass form, click the screen. Graph screen is displayed on the whole screen.

Display of graphs on one screen (Max. 6 graphs):





1. Click the 6 graph icon. [Graph Parameter] window opens.
2. Click the graph icon, select the parameter to be displayed from the list and change divisions according to necessity.
3. Repeat the same procedures with the graph icons, from the 2nd to 6th.
4. Click the [OK] button to display.
5. In this case, parameters are displayed only in graph form. All parameters are displayed in one graph.
6. The graph display screen can be moved with the navigation icon.

SERVICE PROGRAMMING SYSTEM (SPS)

The procedure to program the control unit by using the Service Programming System (SPS) software contained in TIS2000 is explained below.

NOTE:

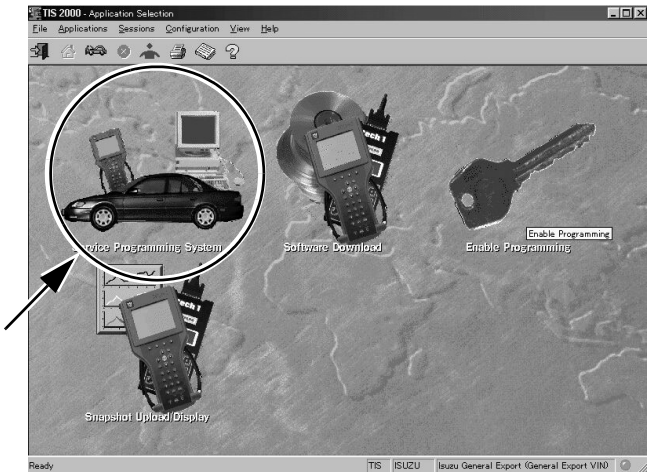
- If the Engine Control Module (ECM) was programmed, the Immobiliser System must be linked to the ECM: Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.

Important: Perform the following checks before attempting to program the control unit:

- The Tech2 PCMCIA card is programmed with The latest software release.
- The latest release of TIS2000 is loaded on the PC.
- The vehicle battery is fully charged.
- The control unit to be programmed is connected to the vehicle.

1. Preparations of TIS 2000

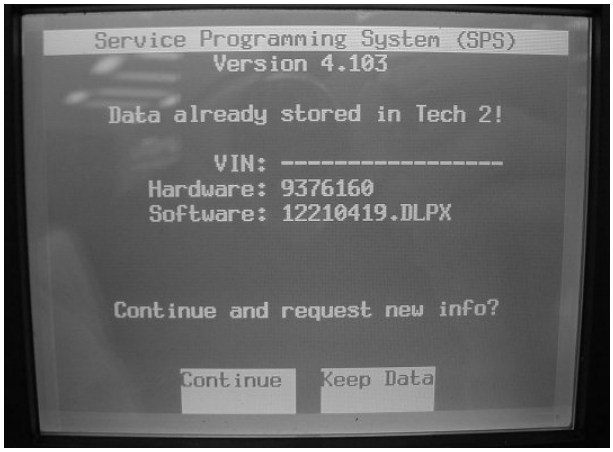
1. Connect Tech 2 to P/C.
2. Check to see if Hardware Key is plugged into Port.
3. Activate TIS 2000 by P/C.
4. On the activating screen of TIS2000, choose “Service Programming System”



5. On the screen of “Diagnostic Tester and Processing Program Selection”, choose the one that will comply with the following.
   - Diagnostic tester in use
   - New programming by the existing module or new programming by the replaced/new module.
   - Fixing position of the control unit.
6. Upon completion of the selection, push the button of “Continue”.

2. Demand of Data

1. Connect Tech-2 to the vehicle. When activated by turning on the power of Tech-2, push the “Enter” switch.
2. Turn on the ignition switch (without starting the engine)
3. In the main menu of Diagnostic Tester, push “F1: Service Programming System (SPS)”.
4. Push “F0: Request Info” of Tech-2.
5. Where vehicle data has been already saved in Tech 2, the existing data come on display. In this instance, as Tech-2 starts asking whether to keep the data or to continue obtaining anew data from the control unit, choose either of them.

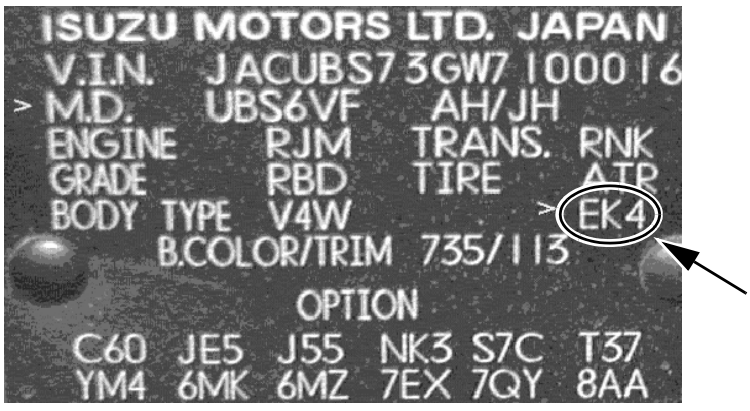


6. If you select “continue”, you have to select “Model Year”, “Vehicle Type”, “Controller Type (Engine)”.
7. After that. then push button and turn Ignition switch tuned on, off, on following Tech-2 display. Tech-2 will read information from controller after this procedure.
8. During obtaining information, Tech-2 is receiving information from the control unit chosen. In replacing the control unit, please be sure to undertake “Obtaining Information” from the new unit. With VIN not being programmed into the new control unit at the time of shipment, “obtaining information” is not complete (because the vehicle model, engine model and model year are specified from VIN). For the procedure get additional information on vehicles, instruction will be provided in dialog form, when TIS2000 is in operation.
9. Following instructions by Tech-2, push the “Exit” switch of Tech-2, turn off the ignition of the vehicle and turn off the power of Tech-2, thereby removing from the vehicle.

3. Data Exchange

1. Connect Tech-2 to P/C, turn on the power and click the “Next” button of P/C.
2. Check VIN of the vehicle and choose “Next”.
3. When a lack of data is asked from among the following menu, enter accordingly.
   Select following Menu
   - Model Year
   - Model
   - Engine type
   - Transmission type
   - Destination code (vehicles for general export)*1
   - Immobiliser

* 1: How to read the destination code
Destination code can be read from ID Plate affixed on vehicles, while on VIN plate the destination code is described at the right-hand edge of Body Type line. In Fig.-3, the destination code can be read as “EK4 (Europe)”.



4. After choosing the data, click the “Next” button.
5. When all the necessary information is entered, the “details” of software within the database that match the entered data will appear for confirmation. Click the “Program” switch and then download the new software onto Tech-2.
6. “Data Transfer” comes on display. The progress of downloading will be displayed on the screen in the

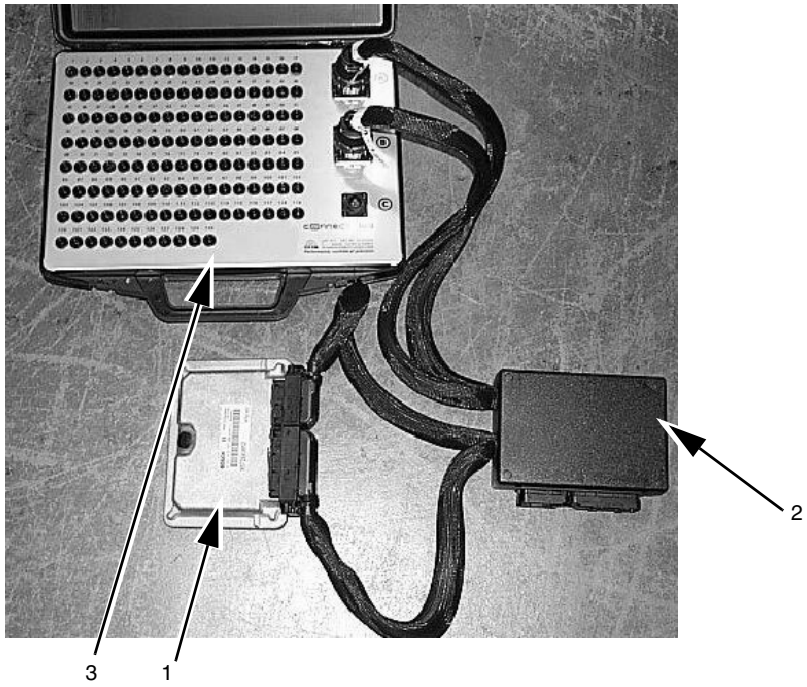
form of bar graph.

7. Upon finishing the data transfer, turn off the power of Tech-2, removing from P/C.

4. Programming of ECM

1. Check to see if batteries are fully charged, while ABS connectors shall be removed from the vehicle.
2. Connect Tech-2 to Vehicle Diagnostic Connectors.
3. Turn on the power of Tech-2 and the title screen comes on display.
4. Turn on the ignition (without allowing the engine to start)
5. On the title screen of Tech-2, push the “Enter” button.
6. Choose “F: Service Programming System” on the main screen and then choose “FI: Programming”.
7. While data is being transferred, “Downloading” will be displayed on the Tech-2 screen.
8. Upon finishing the data transfer, Tech-2 will display “Reprogramming Successful”. Push the “Exit” button to bring program to completion.
9. Following “Procedure 2: Demand of Data”, try over again “Information Obtaining” and check to confirm if the data has been correctly re-loaded.
10. Upon finishing confirmation, turn off the ignition of the vehicle and then turn off the power of Tech-2, removing from the vehicle.

HOW TO USE BREAKER BOX



(1) Engine Control Module (ECM)
(2) Harness Adapter
(3) Breaker Box

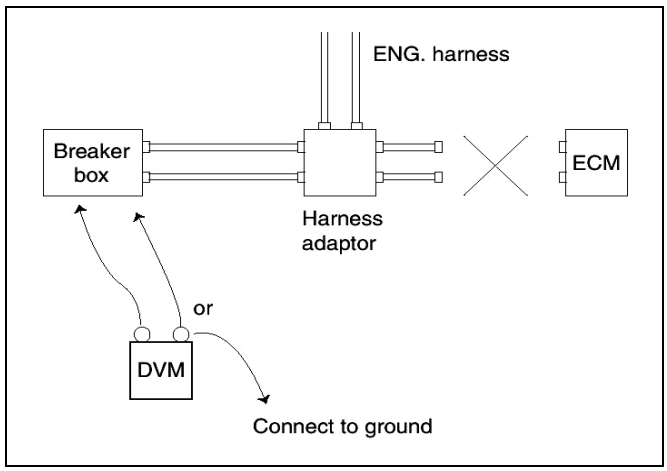
The engine control module (ECM) and other connectors have water proof connector and special terminal. Water proof terminal does not allow to use back prove. In addition, the engine control module (ECM) special terminal can not let regular digital voltage meter prove to access, because terminal shape is very fin pin type.
In order to prevent damage of female terminal and connector itself, the breaker box and adapter is the most suitable special tool.

Breaker Box Connection Type A

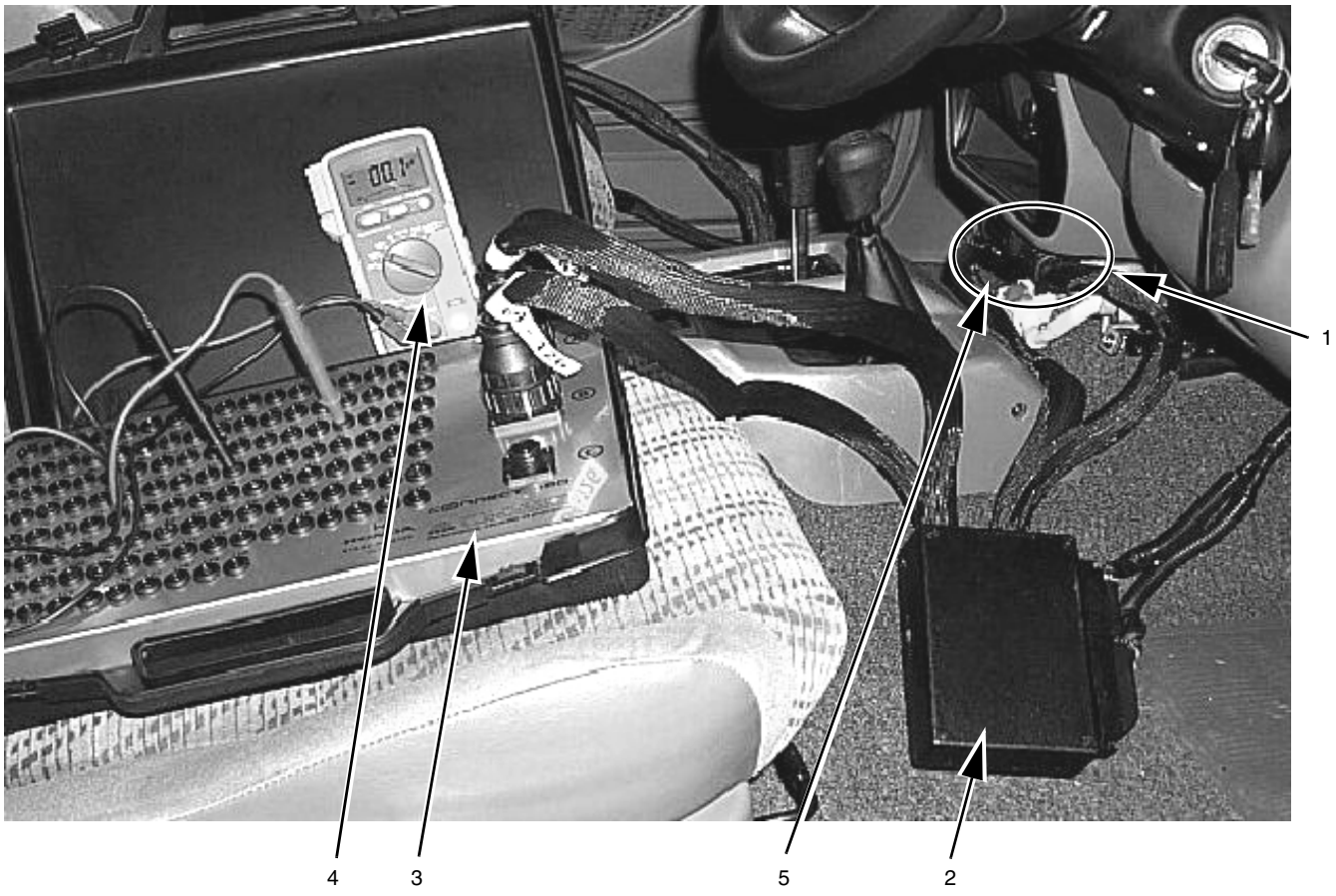


(1) Engine Control Module (ECM)
(2) Harness Adapter
(3) Breaker Box
(4) Digital Voltage Meter
(5) ECM - Harness Adapter Disconnection

Breaker box connection type A, check for “open circuit” and “short to ground circuit”.

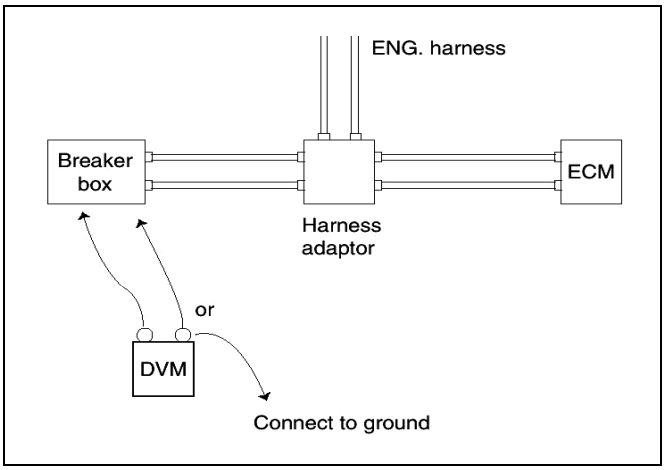


Breaker Box Connection Type B

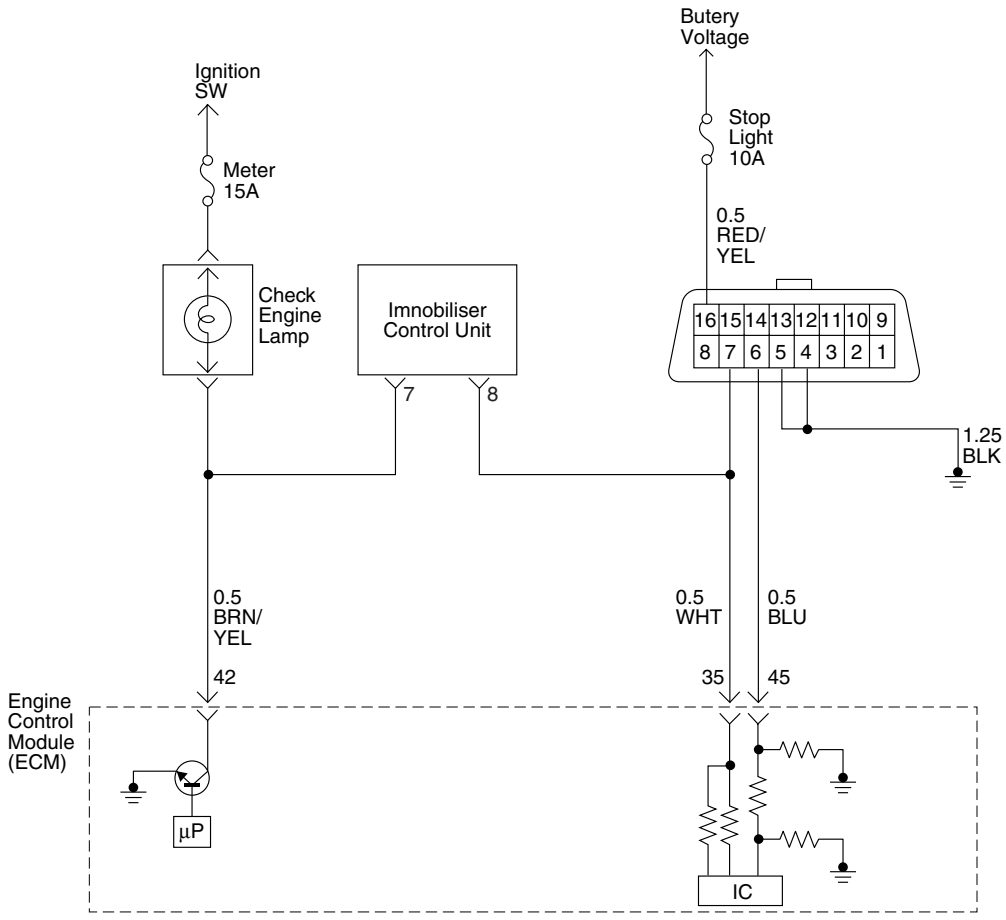


(1) Engine Control Module (ECM)
(2) Harness Adapter
(3) Breaker Box
(4) Digital Voltage Meter
(5) ECM - Harness Adapter Connection

Breaker box connection type B, check for “short to power supply circuit” and “power, signal voltage check” between the engine control module (ECM) and electrical components.



ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK



Circuit Description

The on-board diagnostic system check is the starting point for any driveability complaint diagnosis. Before using this procedure, perform a careful visual/physical check of the ECM and engine grounds for cleanliness and tightness.

The on-board diagnostic system check is an organized approach to identifying a problem created by an electronic engine control system malfunction.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed-through wire insulation or a wire broken inside the insulation. Check for poor connections or a damaged harness. Inspect the ECM harness and connector for improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection, and damaged harness.

Test Description

Number(s) below refer the step number(s) on the Diagnostic Chart:

1. The Check Engine Lamp (MIL) should be ON steady with the ignition “On”, engine “Off”. If not, “No Check Engine Lamp (MIL)” chart should be used to isolate the malfunction.

2. Checks the Class 2 data circuit and ensures that the ECM is able to transmit serial data.

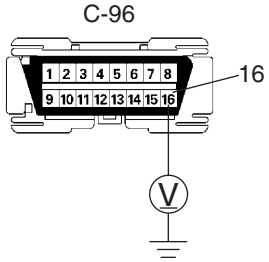
3. This test ensures that the ECM is capable of controlling the Check Engine Lamp (MIL) and the Check Engine Lamp (MIL) driver circuit is not shorted to ground circuit.

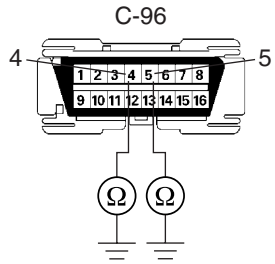
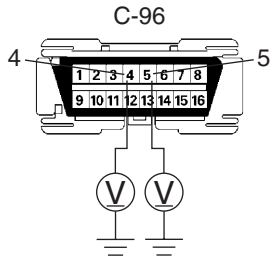
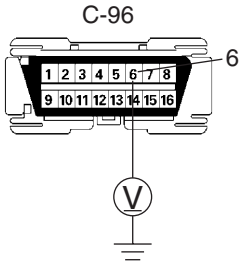
4. If the engine will not start, “Engine Cranks But Will Not Run” chart should be used to diagnose the fault.

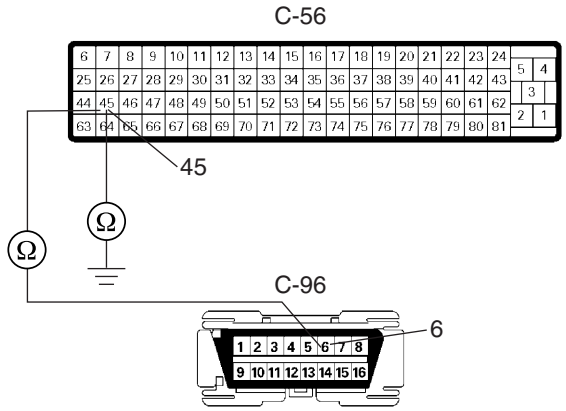
6. The Tech2 parameters which is not within the typical range may help to isolate the area which is causing the problem.

12. This vehicle is equipped with ECM which utilizes an electrically erasable programmable read only memory (EEPROM).

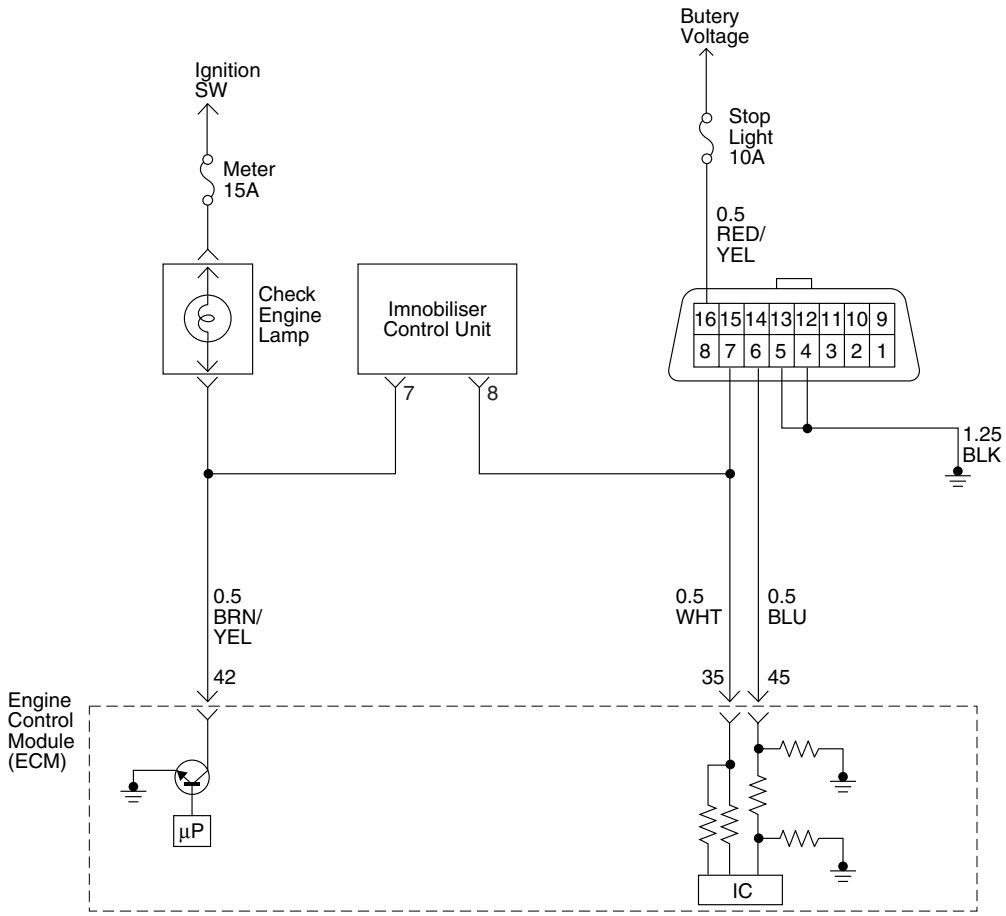
On-Board Diagnostic (OBD) System Check

Step	Action	Value(s)	Yes	No
1	1. Ignition “On”, engine “Off”. 2. Check the “CHECK ENGINE” lamp (MIL). Does the “CHECK ENGINE” lamp turn “On”?	—	Go to *Step 2*	Go to *No CHECK ENGINE Lamp*
2	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Attempt to display “Data Display” with the Tech 2. Does the Tech 2 display engine data?	—	Go to *Step 3*	Go to *Step 7*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select the “Miscellaneous Test” and perform the “Check Light” in “Lamps”. 3. Operate the Tech 2 in accordance with the Tech 2 instructions. Does the “CHECK ENGINE” lamp turn “Off”?	—	Go to *Step 4*	Go to *CHECK ENGINE LAMP On Steady*
4	Attempt to start the engine. Does the engine start and continue to “Run”?	—	Go to *Step 5*	Go to *Engine Cranks But Will Not Run*
5	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select the “Read DTC Infor As Stored By ECU” in “Diagnostic Trouble Code”. 3. Are any DTCs stored?	—	Go to *DTC Chart*	Go to *Step 6*
6	Compare typical scan data values displayed on the Tech 2 “Data Display”. Are the displayed values within the range?	—	Refer to *SYMPTOM DIAGNOSIS*	Refer to *TYPICAL SCAN DATA*
7	Using the DVM and check the data link connector power supply circuit. 1. Ignition “Off”, engine “Off”. 2. Check the circuit for open circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the data link connector ground circuit. 1. Ignition “Off”, engine “Off”. 2. Check the circuit for open circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 9*
9	Using the DVM and check the data link connector ground circuit. 1. Ignition “On”, engine “Off”. 2. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 10*	Repair faulty harness and verify repair
10	Using the DVM and check the data link connector communication circuit. 1. Ignition “On”, engine “Off”. 2. Check the circuit for short to power supply circuit. Was the DVM indicated battery voltage? 	—	Repair faulty harness and verify repair	Go to *Step 11*

Step	Action	Value(s)	Yes	No
11	Using the DVM and check the data link connector communication circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 12*
12	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 13*
13	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

NO CHECK ENGINE LAMP (MIL)



Circuit Description

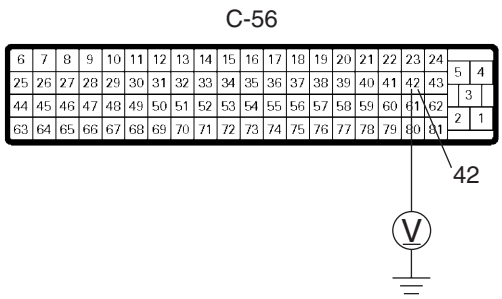
The check engine lamp should be illuminated and steady for about five seconds with the ignition “ON” and the engine stopped. Ignition feed voltage is supplied to the check engine lamp bulb through the meter fuse. The Engine Control Module (ECM) turns the check engine lamp “ON” by grounding the check engine lamp driver circuit.

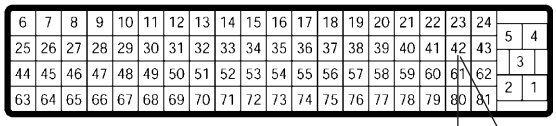
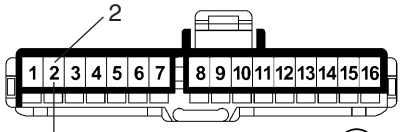
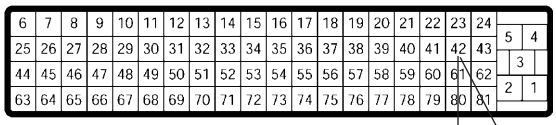
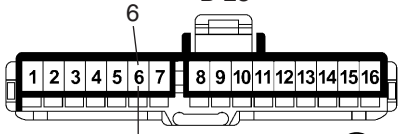
Diagnostic Aids

An intermittent check engine lamp may be cased by a poor connection, rubbed-through wire insulation, or a wire broken inside the insulation. Check for the following items:

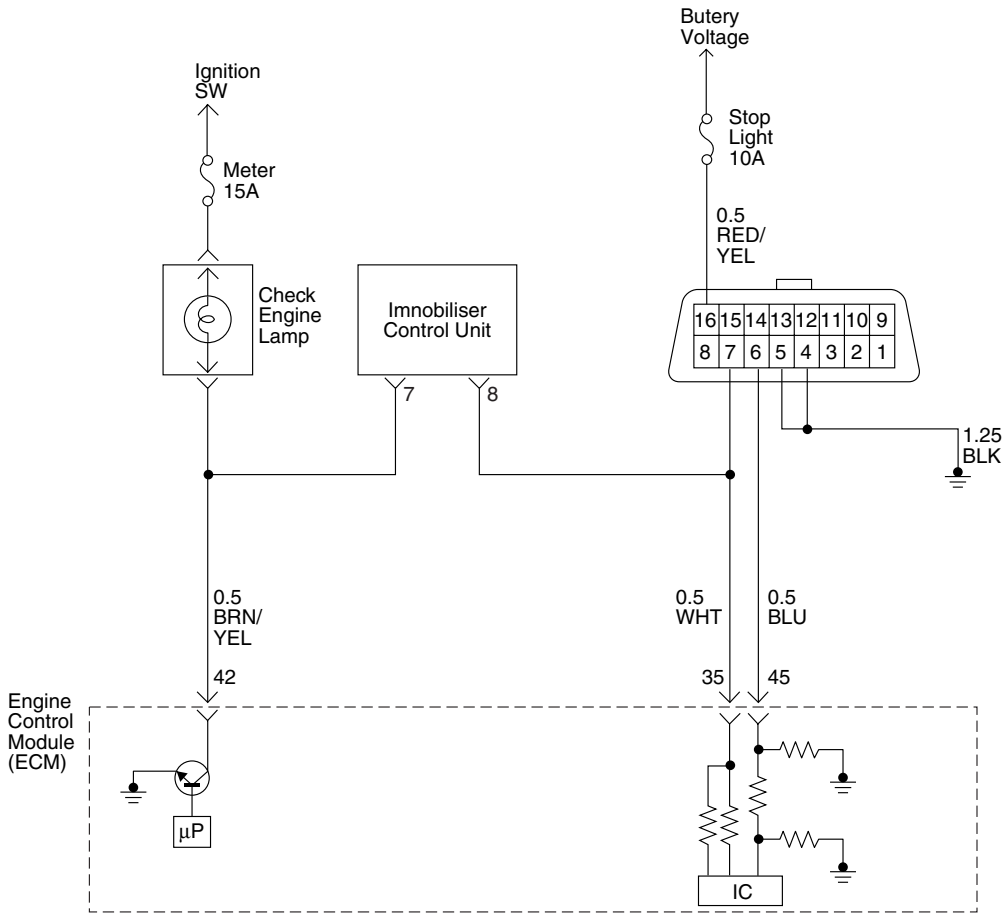
- Inspect the ECM harness and connections for improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection, and damaged harness.
- If the engine runs OK, check for a faulty light bulb, an open in the check engine lamp driver circuit, or an open in the instrument cluster ignition feed.
- If the engine cranks but will not run, check for an open ECM ignition or battery feed, or a poor ECM to engine ground.

No Check Engine Lamp (MIL)

Step	Action	Value(s)	Yes	No
1	Check the meter fuse (15A). If the fuse is burnt out, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 2*
2	Using the DVM and check the “CHECK ENGINE” lamp circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Ignition “On”. 4. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 5*	Go to *Step 3*
3	Check the “CHECK ENGINE” lamp bulb. If the bulb is burnt out, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 4*

Step	Action	Value(s)	Yes	No
4	Using the DVM and check the “CHECK ENGINE” lamp circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the meter connector and ECM connector. 3. Check the circuit for open circuit. Was the problem found? 4JA1-TC C-56  42 B-23 2  4JH1-TC C-56  42 B-23 6 	—	Verify repair	Go to *Step 5*
5	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 6*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

CHECK ENGINE LAMP (MIL) “ON” STEADY



Circuit description

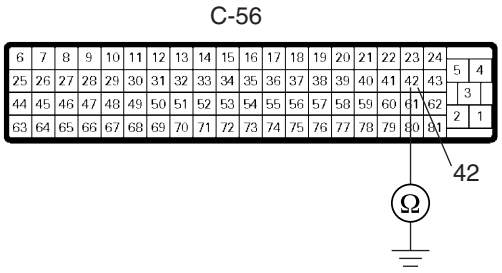
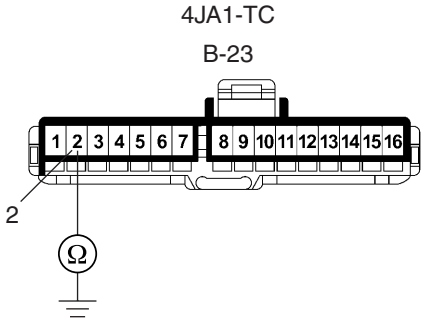
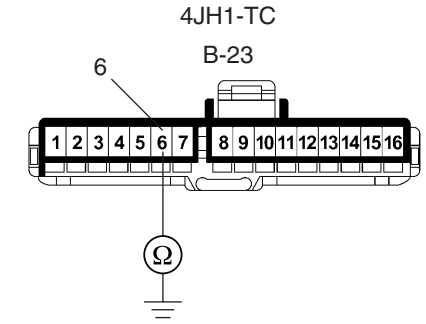
The check engine lamp should always be illuminated and steady for about five seconds with ignition “ON” and the engine stopped. Ignition feed voltage is supplied directly to the check engine lamp indicator. The Engine Control Module (ECM) turns the check engine lamp “ON” by grounding the check engine lamp driver circuit. The check engine lamp should not remain “ON” with the engine running and no DTC(s) set. A steady check engine lamp with the engine running and no DTC(s) suggests a short to ground in the check engine lamp driver circuit.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed-through wire insulation, or a wire broken inside the insulation. Check for the following items:

- Poor connection or damaged harness – Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection, and damaged harness.

Check Engine Lamp (MIL) On Steady

Step	Action	Value(s)	Yes	No
1	1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Ignition “On”. Was the “CHECK ENGINE” lamp turned on?	—	Go to Step 2	Go to Step 4
2	Using the DVM and check the “CHECK ENGINE” lamp circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the meter connector and ECM connector. 3. Check the circuit for short to ground circuit. Was the problem found?   	—	Verify repair	Go to Step 3
3	Replace the meter assembly. Is the action complete?	—	Verify repair	—
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to Step 5

Step	Action	Value(s)	Yes	No
5	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

ECM Diagnostic Trouble Codes

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
65	P0100	7	ON	Mass Air Flow (MAF) Sensor Voltage Supply Circuit High Input	MAF sensor power supply voltage is more than 5.2V.	ECM uses mass air flow 1600mg/strk & EGR 10% (4JA1-TC only) condition(s) as substitute.	MAF sensor power supply voltage is below 5.2V.	1. Sensor power supply circuit short to battery voltage circuit. 2. MAF sensor malfunction. 3. ECM malfunction.	83	-	○	○	○
		9	ON	Mass Air Flow (MAF) Sensor Voltage Supply Circuit Low Input	MAF sensor power supply voltage is below 4.6V.		MAF sensor power supply voltage is more than 4.6V.	1. Sensor power supply circuit short to ground circuit. 2. MAF sensor malfunction. 3. ECM malfunction.	83	-	○	○	○
		B	ON	Mass Air Flow (MAF) Sensor Output Circuit Low Input	1. Engine speed is between 600rpm and 5000rpm. 2. MAF sensor output is below -33.7mg/strk.		MAF sensor output is more than -27.4mg/strk.	1. Sensor power supply circuit open circuit. 2. Sensor signal circuit open or short to ground circuit. 3. Sensor heater harness open circuit. 4. Poor connector connection. 5. MAF sensor malfunction. 6. ECM malfunction.	83/88	P0110(1)	○	○	○
		C	ON	Mass Air Flow (MAF) Sensor Output Circuit High Input	1. Engine speed is between 600rpm and 5000rpm. 2. MAF sensor output is more than 1784mg/strk.		MAF sensor output is below 1784mg/strk.	1. Sensor signal circuit short to voltage circuit. 2. Sensor ground circuit open or short to voltage circuit. 3. MAF sensor malfunction. 4. ECM malfunction.	88/ 92	P0110(1)	○	○	○
23	P0110	1	ON	Intake Air Temperature (IAT) Sensor Circuit High Input	IAT sensor output voltage is more than 4.7V.	ECM use 0°C conditions as substitute.	IAT sensor output voltage is below 4.7V.	1. Sensor signal circuit open or short to voltage circuit. 2. Sensor ground circuit open or short to voltage circuit. 3. Poor connector connection 4. IAT sensor malfunction. 5. ECM malfunction.	84/92	P0100(B)/ P0100(C)	○	○	○
		2	ON	Intake Air Temperature (IAT) Sensor Circuit Low Input	IAT sensor output voltage is below 0.3V.		IAT sensor output voltage is more than 0.3V.	1. Sensor signal circuit short to ground circuit. 2. IAT sensor malfunction. 3. ECM malfunction.	84	-	○	○	○
14	P0115	1	ON	Engine Coolant Temperature (ECT) Sensor Circuit High Input	ECT sensor output voltage is more than 4.7V.	1. ECM uses fuel temperature as substitute. 2. ECM uses 60°C condition for injection timing control. 3. ECM uses -15°C condition for glow time control.	ECT sensor output voltage is below 4.7V.	1. Sensor signal circuit open or short to voltage circuit. 2. Sensor ground circuit open or short to voltage circuit. 3. Poor connector connection 4. ECT sensor malfunction. 5. ECM malfunction.	89/93	-	○	○	○
		2	ON	Engine Coolant Temperature (ECT) Sensor Circuit Low Input	ECT sensor output voltage is below 0.3V.		ECT sensor output voltage is more than 0.3V.	1. Sensor signal circuit short to ground circuit. 2. ECT sensor malfunction. 3. ECM malfunction.	89	-	○	○	○

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
15	P0180	B	ON	Fuel Temperature Sensor Circuit Range/Performance	FT sensor output is high temperature (more than 150°C) or low temperature (below -40°C).	The ECM use 75°C conditions as substitute.	FT sensor output is correct temperature range between 150°C and -40°C.	1. ECM malfunction. 2. PSG (pump control unit) malfunction.	-	-	○	○	○
52	P0215	A	ON at next ignition cycle	Fuel Cutoff Solenoid Valve Malfunction	1. Ignition key switch off. 2. Engine speed is below 1500rpm. 3. Vehicle speed is below 1.5km/h. 4. PSG (pump control unit) recognizes MAB (fuel cutoff solenoid valve) signal from the ECM, but the MAB could not operate.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.	No recovery until condition match in the next ignition key cycle.	1. PSG (pump control unit) malfunction. 2. MAB (fuel cutoff solenoid valve) malfunction.	-	-	○	○	○
		B	ON	Fuel Cutoff Solenoid Valve Circuit High Input	ECM does not command MAB (fuel cutoff solenoid valve) signal to the PSG (pump control unit), but PSG detected MAB signal line circuit is high level.	Engine does not start.	No recovery.	1. MAB (fuel cutoff solenoid valve) signal circuit short to voltage circuit. 2. PSG (pump control unit) malfunction.	105	-	○	○	○
		C	ON	Fuel Cutoff Solenoid Valve Always Active	1. Ignition key switch off. 2. Engine speed is below 1500rpm. 3. Vehicle speed is below 1.5km/h. 4. PSG (pump control unit) does not recognize MAB (fuel cutoff solenoid valve) signal from the ECM.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.	No recovery until condition match in the next ignition key cycle.	1. MAB (fuel cutoff solenoid valve) signal circuit open or short to ground circuit. 2. PSG (pump control unit) malfunction.	105	-	○	○	○
		D	ON	Fuel Cutoff Solenoid Valve Malfunction	1. Ignition key switch off. 2. CAN controller does not operate Bus-off.	No fail-safe function.		1. ECM malfunction. 2. PSG (pump control unit) malfunction.	-	-	○	○	○
54	P0216	A	ON	Injection Timing Control Circuit Malfunction (Timer Deviation)	1. Engine speed is more than 700rpm. 2. Fuel injection quantity is more than 4mg/stk. 3. Deviation of actual injection timing and desired injection timing is more than +3°CA or -6°CA for 8 seconds.	Fuel injection quantity is reduced.	Deviation of actual injection timing and desired injection timing is below +3°CA or -6°CA for 8 seconds.	1. Timing control valve malfunction. 2. Timer piston sticking. 3. Pump camshaft speed sensor malfunction.	-	-	○	○	○
		B	ON	Injection Timing Control Circuit Malfunction (Timer Fluctuation)	1. Engine speed is more than 2014rpm. 2. Fluctuation of actual injection timing is more than ±5.2°CA.		1. Engine speed is more than 2014rpm. 2. Fluctuation of actual injection timing is below ±5.2°CA.	1. Insufficient air bleeding of fuel line. 2. Fuel filter clogging. 3. Timing control valve malfunction. 4. Pump camshaft speed sensor malfunction.	-	-	○	○	○

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
53	P0251	6	ON	Injection Pump Malfunction	1. No pump camshaft speed sensor error. 2. High pressure solenoid valve control pulse width does not match with desired fuel injection quantity.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.	No recovery until condition match in the next ignition key cycle.	1. PSG (pump control unit) malfunction. 2. Pump camshaft speed sensor malfunction.	-	-	○	○	○
		7	ON	Injection Pump Malfunction	1. No pump camshaft speed sensor error. 2. No CKP sensor error. 3. Difference of engine speed and doubled pump camshaft speed is more than 720rpm (4JA1-TC) or 690rpm (4JH1-TC).		1. No pump camshaft speed sensor error. 2. No CKP sensor error. 3. Difference of engine speed and doubled pump camshaft speed is below 720rpm (4JA1-TC) or 690rpm (4JH1-TC). No recovery until in the next ignition key cycle.	1. Missing CKP sensor pulses. 2. Electrical interference. 3. Magnetic interference. 4. PSG (pump control unit) malfunction.	91	-	○	○	○
		9	ON	Injection Pump Malfunction	No pump map programmed in the PSG (pump control unit) or PSG malfunction.		No recovery until condition match in the next ignition key cycle.	PSG (pump control unit) malfunction.	-	-	○	○	○
		A	ON	Injection Pump Malfunction	EEPROM or A/D converter malfunction in the PSG (pump control unit).	Fuel injection quantity is reduced.	EEPROM or A/D converter no malfunction in the PSG (pump control unit). No recovery until in the next ignition key cycle.	PSG (pump control unit) malfunction.	-	-	○	○	○
		B	ON	Injection Pump Malfunction	PSG (pump control unit) recognized high pressure solenoid valve drive circuit error.	No fail-safe function.	No recovery until condition match in the next ignition key cycle.	PSG (pump control unit) malfunction.	-	-	○	○	○
		D	ON	Injection Pump Malfunction	PSG (pump control unit) could not measure the high pressure solenoid valve drive voltage.			PSG (pump control unit) malfunction.	-	-	○	○	○
		E	ON	Injection Pump Malfunction	ECM could not accept PSG (pump control unit) message.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.	ECM accepts PSG (pump control unit) message.	1. CAN high circuit open, short to ground or short to voltage circuit. 2. CAN low circuit open, short to ground or short to voltage circuit. 3. ECM malfunction. 4. PSG (pump control unit) malfunction.	99/100	P1650(A)/ P1651(B)	○	○	○

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
43	P0335	B	ON	Crankshaft Position Sensor Circuit Malfunction	1. Engine speed is more than 665rpm. 2. CKP sensor pulse width error.	When pump camshaft speed sensor is OK: ECM uses doubled pump camshaft speed as substitute engine speed. When pump camshaft speed sensor is not OK: 1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.	ECM detects correct CKP pulse width.	During engine run: 1. CKP sensor harness open circuit, short to ground or short to voltage circuit. 2. Poor connector connection. 3. CKP sensor malfunction. 4. Pulse sensing gap incorrect. 5. Pulser malfunction. 6. Electrical interference. 7. Magnetic interference. 8. ECM malfunction.	90/ 98/ 101	P1335 (A)	○	○	○
		D	ON	Crankshaft Position Sensor Circuit Malfunction	1. No pump camshaft speed sensor error. 2. “Crankshaft Position Sensor Circuit Malfunction (Symptom Code B)” is not stored. 3. Engine speed is 0rpm. 4. Doubled pump camshaft speed is more than 50rpm.	When pump camshaft speed sensor is OK: ECM uses doubled pump camshaft speed as substitute engine speed. Other than pump camshaft speed sensor is OK: Fuel injection quantity is reduced.	1. Engine speed is more than 0rpm. 2. Doubled pump camshaft speed is below 100rpm.	During engine crank: 1. CKP sensor harness open circuit, short to ground or short to voltage circuit. 2. Poor connector connection. 3. CKP sensor malfunction. 4. Pulse sensing gap incorrect. 5. Pulser malfunction. 6. Electrical interference. 7. Magnetic interference. 8. ECM malfunction.	90/ 98/ 101	P1135 (A)	○	○	○
		E	ON	Engine Speed Input Circuit Range/Performance	Engine speed is more than 5700rpm.	When intermittent malfunction: 1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk. When preliminary malfunction: ECM uses doubled pump camshaft speed as substitute engine speed.	Engine speed is below 5700rpm.	1. Engine over-running. 2. CKP sensor malfunction. 3. Pulser malfunction. 4. ECM malfunction.	90/ 98/ 101	-	○	○	○
66	P0380	4	ON	Glow Relay Circuit Voltage Low	Glow relay circuit open or short to ground circuit.	No fail-safe function.	Glow relay circuit is correct condition.	1. Glow relay circuit open or short to ground circuit. 2. Glow relay malfunction. 3. ECM malfunction.	94	-	○	○	○
		8	ON	Glow Relay Circuit Voltage High	Glow relay circuit short to voltage circuit.			ECM malfunction.	-	-	○	○	○
67	P0381	4	ON	Glow Plug Indicator Circuit Voltage Low	Glow plug indicator circuit open or short to ground circuit.	No fail-safe function.	Glow plug indicator circuit is correct condition.	1. Glow plug indicator circuit open or short to ground circuit. 2. Glow plug indicator lamp malfunction. 3. ECM malfunction.	43	-	○	○	○
		8	ON	Glow Plug Indicator Circuit Voltage High	Glow plug indicator circuit short to voltage circuit.			ECM malfunction.	-	-	○	○	○

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
32	P0400	3	ON	Exhaust Gas Recirculation Flow Excessive Detected	1. Intake air temperature is between 15°C and 100°C. 2. Engine coolant temperature is between 55°C and 100°C. 3. Barometric pressure is between 850hpa and 1100hpa. 4. Small amount of mass air flow. (Desired mass air flow - mass air flow is more than 150mg/strk)	Fuel injection quantity is reduced.	1. Engine speed is between 1500rpm and 3100rpm. 2. Injection quantity is between 8mg/strk and 32mg/strk. 3. Correct amount of mass air flow.	1. EGR valve is stuck at open position. 2. EGR EVRV malfunction. 3. Air intake is obstructed. 4. Air intake is leaking. 5. MAF sensor malfunction. 6. ECM malfunction.	88/97	-	○	-	-
		4	ON	Exhaust Gas Recirculation Circuit Short to Ground or Open Circuit	EGR EVRV circuit open or short to ground circuit.	Fuel injection quantity is reduced and EGR EVRV 10% conditions as substitute.	EGR EVRV circuit is correct condition.	1. EGR EVRV circuit open or short to ground circuit. 2. EGR EVRV malfunction. 3. ECM malfunction.	97	-	○	-	-
		5	ON	Exhaust Gas Recirculation Flow Insufficient Detected	1. Intake air temperature is between 15°C and 100°C. 2. Engine coolant temperature is between 55°C and 100°C. 3. Barometric pressure is between 850hpa and 1100hpa. 4. Large mount of mass air flow. (Desired mass air flow - mass air flow is below 150 mg/strk)	Fuel injection quantity is reduced.	1. Engine speed is between 1500rpm and 3100rpm. 2. Injection quantity is between 8mg/strk and 32mg/strk. 3. Correct amount of mass air flow.	1. EGR valve is stuck at close position. 2. EGR valve operating vacuum hose is clogged or disconnected. 3. EGR EVRV malfunction. 4. MAF sensor signal circuit short to voltage circuit. 5. MAF sensor malfunction. 6. ECM malfunction.	88/97	-	○	-	-
		8	ON	Exhaust Gas Recirculation Circuit Short to Battery	EGR EVRV circuit short to voltage circuit.	Fuel injection quantity is reduced & EGR EVRV 10% conditions as substitute.	EGR EVRV circuit is correct condition.	1. EGR EVRV circuit short to voltage circuit. 2. EGR EVRV malfunction. 3. ECM malfunction.	97	-	○	-	-
24	P0500	1	ON at next ignition cycle	Vehicle Speed Sensor Circuit High Input	Vehicle speed is more than 200km/h.	ECM uses vehicle speed 5km/h condition as substitute.	Vehicle speed is below 200km/h.	1. VSS signal circuit open, short to ground or short to voltage circuit. 2. VSS malfunction. 3. Speed meter malfunction. 4. ECM malfunction.	68	-	○	○	○
		A	ON at next ignition cycle	Vehicle Speed Sensor Input Signal Frequency Too High	Input signal frequency is too high.	ECM uses vehicle speed 5km/h condition as substitute.	Correct vehicle speed signal frequency.	1. VSS malfunction. 2. Speed meter malfunction. 3. Electrical interference. 4. Magnetic interference. 5. ECM malfunction.	68	-	○	○	○
		B	ON at next ignition cycle	Vehicle Speed Sensor Incorrect Signal	1. Engine speed is more than 3600rpm. 2. Fuel injection quantity is more than 41mg/stk. 3. Vehicle speed is below 1.5km/h.	Fuel injection quantity is reduced.	Vehicle speed is more than 1.5km/h.	1. VSS open circuit, short to ground or short to voltage. 2. Poor connector connection. 3. VSS malfunction. 4. Speed meter malfunction. 5. ECM malfunction.	68	-	○	○	-

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
35	P0560	1	OFF	System Voltage Too High	System voltage is more than 20V.	ECM uses 9V conditions as substitute.	System voltage is below 20V.	1. Charge system malfunction. 2. Battery jump start cable mis-connect. 3. ECM malfunction.	3/39	-	○	○	○
		2	OFF	System Voltage Too Low	System voltage is below 7V.		System voltage is more than 7V.	1. Battery power feed harness open circuit or short to ground circuit. 2. ECM ground harness open or poor connection. 3. Poor connector connection. 4. Battery malfunction. 5. Charge system malfunction. 6. ECM malfunction.	3/39	-	○	○	○
		A	OFF	System Voltage Malfunction (PSG)	System voltage of PSG (pump control unit) is below 4.5V or more than 27V.	PSG uses default voltage as substitute.	System voltage of PSG is between 4.5V and 27V.	1. Battery power feed harness open circuit or short to ground circuit. 2. PSG (pump control unit) ground harness open or poor connection. 3. Poor connector connection. 4. Battery malfunction. 5. Charge system malfunction. 6. Battery jump start cable mis-connect. 7. PSG (pump control unit) mal-function.	-	-	○	○	○
18	P0561	A	OFF	System Voltage Circuit Malfunc-tion	The ECM recognized ignition switch turn off signal during ECM is activated.	ECM stops engine.	No recovery until condition match in the next ignition key cycle.	1. Ignition switch circuit open or short to ground circuit. 2. Poor connector connection. 3. Ignition switch malfunction. 4. ECM malfunction.	39	-	○	○	○
		B	ON	System Voltage Circuit Malfunc-tion	Ignition switch circuit is mal-function.			1. Ignition switch circuit open or short to ground circuit. 2. Poor connector connection. 3. Ignition switch malfunction. 4. ECM malfunction.	39	-	○	○	○
-	P0602		-	ECU Programming Error	ECM memory area error.	Engine control disabled.	Memory are is OK.	ECM is not programmed.	-	-	○	○	○
28	P0606	A	ON	ECU Malfunction	Gate Array communication error.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.	No recovery.	ECM malfunction.	-	-	○	○	○
		B	ON	ECU Malfunction	1. Throttle position is below 1%. 2. Desired injection quantity is more than 0mg/strk. 3. Engine speed is more than 2000rpm.	MAB (fuel cutoff solenoid valve) is operated.	Desired injection quantity is below 0mg/strk.	1. ECM malfunction. 2. PSG (pump control unit) mal-function.	-	-	○	○	○

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
46	P0645	4	ON	A/C Compressor Relay Circuit Voltage Low	A/C compressor relay circuit open or short to ground circuit.	No fail-safe function.	A/C compressor relay circuit is correct condition.	1. A/C compressor relay circuit open or short to ground circuit. 2. Poor connector connection. 3. A/C compressor relay malfunction. 4. ECM malfunction.	41	-	○	○	○
		8	ON	A/C Compressor Relay Circuit Voltage High	A/C compressor relay circuit short to voltage circuit.			ECM malfunction.	-	-	○	○	○
25	P0703	A	ON	Brake Switch Malfunction	1. Throttle position is more than 0%. 2. Engine speed is more than 693rpm (4JA1-TC) or 665rpm (4JH1-TC). 3. Vehicle speed is more than 0km/h. 4. Brake switch 1 signal and brake switch 2 signal are differently inputted to the ECM since the ignition switch was turned on.	No fail-safe function.	Brake switch 1 signal and brake switch 2 signal are correctly inputted to the ECM.	1. Brake switch 1 circuit open, short to ground or short to voltage circuit. 2. Poor connector connection. 3. Brake switch 1 malfunction. 4. ECM malfunction.	30	-	○	○	○
		B	ON	Brake Switch Malfunction	1. Throttle position is more than 0%. 2. Engine speed is more than 693rpm (4JA1-TC) or 665rpm (4JH1-TC). 3. Vehicle speed is more than 0km/h. 4. Brake switch 1 signal and brake switch 2 signal are differently inputted to the ECM.			1. Brake switch 2 circuit open or short to ground circuit. 2. Poor connector connection. 3. Brake switch 2 malfunction. 4. ECM malfunction.	65	-	○	○	○
57	P0704	6	ON	Clutch Switch Input Circuit Malfunction	Clutch signal does not change between vehicle speed 1.5km/h and 80km/h since ignition switch was tuned on.	No fail-safe function.	Clutch signal correctly changes.	1. Clutch switch circuit open, short to ground or short to voltage circuit. 2. Poor connector connection. 3. Clutch switch malfunction. 4. ECM malfunction.	31	-	○	○	-
86	P1105	1	ON	Barometric Pressure Sensor Circuit High Input	Barometric pressure sensor output voltage is more than 4.4V.	ECM uses 1013hpa condition as substitute.	Barometric pressure sensor output voltage is below 4.4V.	ECM malfunction.	-	-	○	○	○
		2	ON	Barometric Pressure Sensor Circuit Low Input	Barometric pressure sensor output voltage is below 1.5V.		Barometric pressure sensor output voltage is more than 1.5V.	ECM malfunction.	-	-	○	○	○

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
21	P1120	1	ON	Pedal/Throttle Position Sensor Circuit High Input	Throttle position sensor output voltage is more than 4.5V.	ECM increases idle speed up to 1400rpm.	Throttle position sensor output voltage is below 4.5V.	1. Sensor power supply circuit short to voltage circuit. 2. Sensor signal circuit short to voltage circuit. 3. Sensor ground circuit open or short to voltage circuit. 4. Poor connector connection. 5. TPS malfunction. 6. ECM malfunction.	38/ 49/ 57	-	○	○	○
		7	ON	Pedal/Throttle Position Sensor Voltage Supply Circuit High Input	Throttle position sensor power supply voltage is more than 5.2V.		Throttle position sensor power supply voltage is below 5.2V.	1. Sensor power supply circuit short to battery voltage circuit. 2. TPS malfunction. 3. ECM malfunction.	57	-	○	○	○
		9	ON	Pedal/Throttle Position Sensor Voltage Supply Circuit Low Input	Throttle position sensor power supply voltage is below 4.6V.		Throttle position sensor power supply voltage is more than 4.6V.	1. Sensor power supply circuit short to ground circuit. 2. TPS malfunction. 3. ECM malfunction.	57	-	○	○	○
		D	ON	Pedal/Throttle Position Sensor Brake Switch Error	1. Engine speed is more than 1700rpm. 2. Throttle position sensor is more than 8.7%. 3. When brake pedal is depressed during accelerator pedal is depressing.		Throttle position is more than 20% or brake pedal is released (switch is inactive).	1. Throttle sticking. 2. TPS incorrect adjusting. 3. TPS malfunction. 4. Brake switch malfunction. 5. ECM malfunction.	30/ 38/ 65	-	○	○	○
		E	ON	Pedal/Throttle Position Sensor Idle Position Switch Error	1. When idle switch is turned off, throttle position sensor was below 0.35%. or 2. When idle switch is tuned on, throttle position sensor was more than 7.8%.		1. When throttle position sensor is 100%, idle switch turns off. 2. When throttle position sensor is 0%, idle switch turns on.	1. TPS malfunction. 2. Idle switch malfunction. 3. ECM malfunction.	38/ 69	-	○	○	○
22	P1173	3	OFF	Fuel Reduction Caused By High Coolant Temperature	Excessive high engine coolant temperature is detected.	No fail-safe function.	Engine coolant temperature is normal range.	1. Engine overheat. 2. ECT sensor malfunction. 3. ECM malfunction.	89	-	○	○	○
		7	OFF	Fuel Reduction Caused By High Fuel Temperature	Fuel temperature is more than 100°C.	PSG (pump control unit) controls fuel injection quantity based on engine speed and fuel temperature.	Fuel temperature is below 100°C.	1. ECM malfunction. 2. PSG (pump control unit) malfunction.	-	-	○	○	○
		A	OFF	Fuel Reduction Caused By Low Fuel Temperature	Excessive low fuel temperature is detected.	No fail-safe function.	Fuel temperature is normal range.	1. ECM malfunction. 2. PSG (pump control unit) malfunction.	-	-	○	○	○

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
43	P1335	A	ON	Engine Speed Output Circuit Malfunction	The PSG (pump control unit) is recognized defective engine speed signal form the ECM.	Fuel injection quantity is reduced.	Correct engine speed signal.	1. CKP sensor harness open circuit, short to ground or short to voltage. 2. CKP sensor output harness open circuit, short to ground or short to voltage. 3. Poor connector connection. 4. CKP sensor malfunction. 5. Pulse sensing gap incorrect. 6. Pulser malfunction. 7. Electrical interference. 8. Magnetic interference. 9. ECM malfunction. 10. PSG (pump control unit) malfunction.	90/91/98/101	P0335(B)/P0335(D)	○	○	○
45	P1345	A	ON	Camshaft Speed Malfunction	The PSG (pump control unit) is recognized incorrect camshaft speed signal.	No fail-safe function.	Correct camshaft speed.	1. Pump camshaft speed sensor malfunction. 2. Pulse sensing gap incorrect. 3. Pulser malfunction. 4. Electrical interference. 5. Magnetic interference. 5. ECM malfunction. 6. PSG (pump control unit) malfunction.	-	-	○	○	○
47	P1520	A	ON	Neutral Switch ON Error	Neutral switch signal is inputted “On” three times consecutively under driving conditions.	No fail-safe function.	Correct neutral switch signal is inputted two times consecutively under driving conditions.	1. Neutral switch circuit short to voltage circuit. 2. Neutral switch malfunction. 3. ECM malfunction.	87	-	○	-	-
		B	ON	Neutral Switch OFF Error	Neutral switch signal is inputted “Off” three times consecutively under driving conditions.			1. Neutral switch circuit open, short to ground circuit. 2. Poor connector connection. 3. Neutral switch malfunction. 4. ECM malfunction.	87	-	○	-	-
71	P1576	4	ON	Exhaust Throttle VSV 1 Circuit Voltage Low	Exhaust throttle VSV 1 circuit open or short to ground circuit.	No fail-safe function.	Exhaust throttle VSV 1 circuit is correct condition.	1. Exhaust throttle VSV 1 circuit open or short to ground circuit. 2. Poor connector connection. 3. Exhaust throttle VSV 1 malfunction. 4. ECM malfunction.	40	-	○	-	-
		8	ON	Exhaust Throttle VSV 1 Circuit Voltage High	Exhaust throttle VSV 1 circuit short to voltage circuit.			ECM malfunction.	-	-	○	-	-
71	P1577	4	ON	Exhaust Throttle VSV 2 Circuit Voltage Low	Exhaust throttle VSV 2 circuit open or short to ground circuit.	No fail-safe function.	Exhaust throttle VSV 2 circuit is correct condition.	1. Exhaust throttle VSV 2 circuit open or short to ground circuit. 2. Poor connector connection. 3. Exhaust throttle VSV 2 malfunction. 4. ECM malfunction.	61	-	○	-	-
		8	ON	Exhaust Throttle VSV 2 Circuit Voltage High	Exhaust throttle VSV 2 circuit short to voltage circuit.			ECM malfunction.	-	-	○	-	-

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
55	P1605	D	ON	EEPROM Defect	Write and read from the EEPROM are failed during initialization of the ECM.	ECM uses default values from the EPROM.	Write and read from the EEPROM are correct during initialization of the ECM.	ECM malfunction.	-	-	○	○	○
		E	ON	EEPROM Defect	EEPROM checksum does not match with the read check sum during initialization of the ECM.		EEPROM checksum match with the read check sum during initialization of the ECM.	ECM malfunction.	-	-	○	○	○
56	P1610	A	-	Security Key and Security Code not Programmed	Immobiliser functions are not programmed in the ECM.	1. Engine does not start. 2. Check engine lamp flash.	No recovery.	ECM malfunction.	-	B****	○	○	○
56	P1611	A	-	Wrong Security Code Entered	Received security code is not correct.	1. Engine does not start. 2. Check engine lamp flash.	No recovery.	1. ECM malfunction. 2. Immobiliser control unit malfunction. 3. Transponder key malfunction.	-	B****	○	○	○
56	P1612	A	-	Immobiliser No or Wrong Signal	Received challenge signal is not correct or not received.	1. Engine does not start. 2. Check engine lamp flash.	No recovery.	1. ECM and immobiliser control unit communication circuit open circuit, short to ground circuit or short to voltage circuit. 2. ECM malfunction. 3. Immobiliser control unit malfunction. 4. Transponder key malfunction.	27/35	B****	○	○	○
56	P1613	A	-	Immobiliser No or Wrong Signal	Received response signal is not correct or not received.	1. Engine does not start. 2. Check engine lamp flash.	No recovery.	1. ECM and immobiliser control unit communication circuit open circuit, short to ground circuit or short to voltage circuit. 2. ECM malfunction. 3. Immobiliser control unit malfunction. 4. Transponder key malfunction.	27/35	B****	○	○	○
56	P1614	A	-	Wrong Transponder Key	Received response signal is not correct from the transponder key.	1. Engine does not start. 2. Check engine lamp flash.	No recovery.	1. ECM malfunction. 2. Immobiliser control unit malfunction. 3. Transponder key malfunction.	-	B****	○	○	○
76	P1625	A	OFF	ECM Main Relay Switched Off Too Early	When ignition switch was turned off, timing of the ECM main relay turning off is too early.	No fail-safe function.	No recovery.	ECM malfunction.	3/58	-	○	○	○
		B	OFF	ECM Main Relay Switched Off Too Late	When ignition switch was turned off, timing of the ECM main relay turning off is too late or does not off.		No recovery.	1. ECM main relay malfunction. 2. ECM malfunction.	3/58	-	○	○	○
51	P1630	A	ON	Fuel Injection Quantity Circuit Malfunction	The PSG (pump control unit) detects high pressure solenoid valve control circuit malfunction due to high current.	Fuel injection quantity is reduced.	The PSG (pump control unit) detects correct high pressure solenoid valve control circuit.	PSG (pump control unit) malfunction.	-	-	○	○	○
		B	ON	Fuel Injection Quantity Circuit Malfunction	The PSG (pump control unit) detects high pressure solenoid valve control circuit malfunction due to continuous current.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.	No recovery.	PSG (pump control unit) malfunction.	-	-	○	○	○

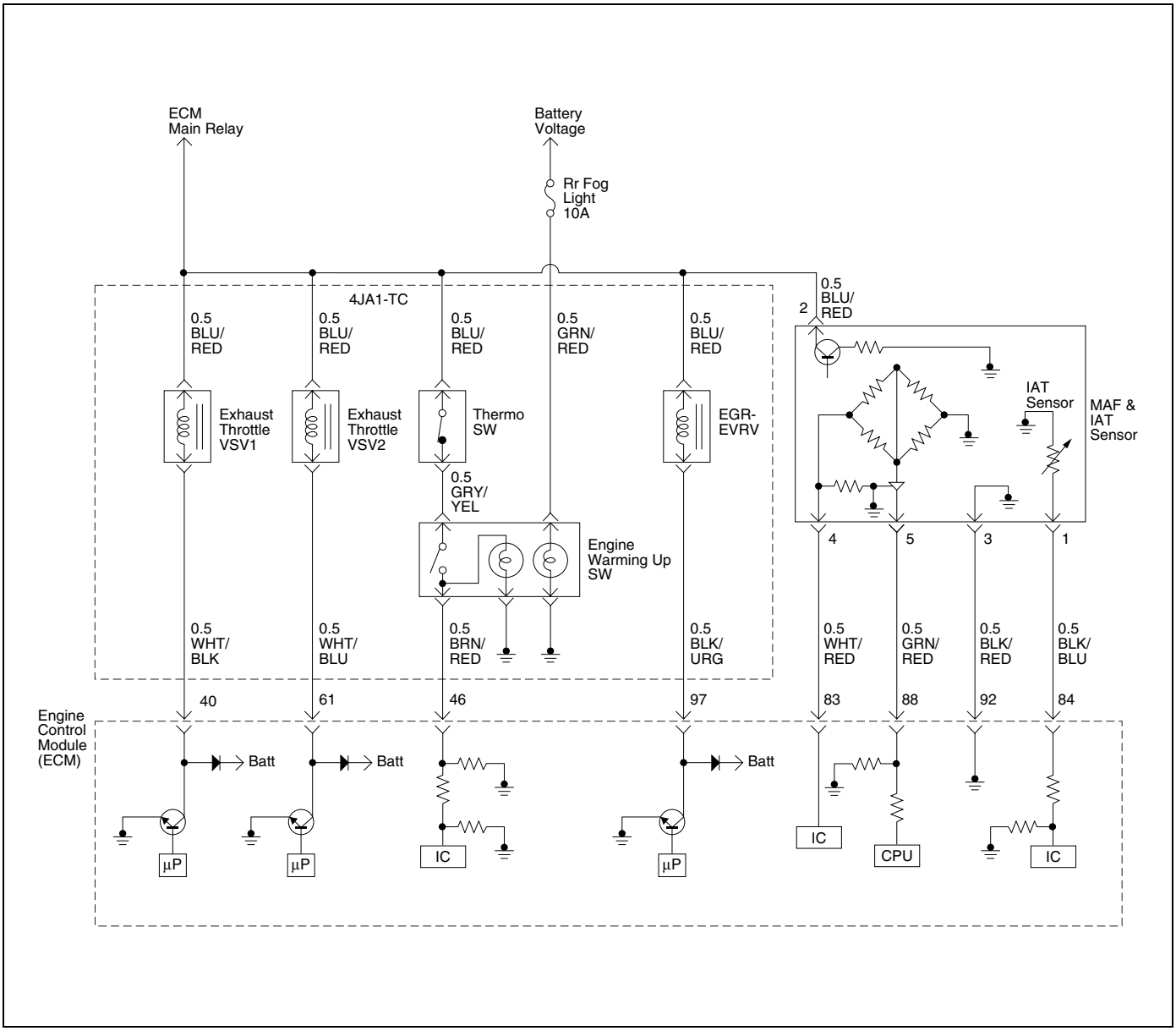
Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)	Recovery Condition	Related Failure Parts	Related ECM Pin No.	Related Multiple DTC	4JA1 -TC (MT)	4JH1 -TC (MT)	4JH1 -TC (AT)
44	P1650	A	ON	CAN Device Offline	CAN controller detects Bus-off or canceling.	MAB (fuel cutoff solenoid valve) is operated.	CAN controller detects correct Bus signal.	1. CAN high circuit open, short to ground or short to voltage circuit. 2. CAN low circuit open, short to ground or short to voltage circuit. 3. Poor connector connection. 4. Electrical interference. 5. ECM malfunction. 6. PSG (pump control unit) malfunction.	99/100	P1651(B)	○	○	○
		B	ON	CAN Device Hang-up	CAN controller does not react under engine running.		CAN controller reacts correctly under engine running.	1. ECM malfunction. 2. PSG (pump control unit) malfunction.	-	-	○	○	○
45	P1651	A	ON	CAN Malfunction (PSG)	The PSG (pump control unit) does not recognize CAN signal from the CAN controller.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.	The PSG (pump control unit) recognizes CAN signal from the CAN controller.	1. ECM malfunction. 2. PSG (pump control unit) malfunction.	-	-	○	○	○
		B	ON	CAN Receives Error	The ECM does not read CAN signal from the PSG (pump control unit).		The ECM reads CAN signal from the PSG (pump control unit).	1. CAN high circuit open, short to ground or short to voltage circuit. 2. CAN low circuit open, short to ground or short to voltage circuit. 3. Poor connector connection. 4. Electrical interference. 5. ECM malfunction. 6. PSG (pump control unit) malfunction.	99/100	P1650(A)	○	○	○
77	P1690	4	OFF	Check Engine Lamp (MIL) Circuit Voltage Low	Check engine lamp circuit open or short to ground circuit.	No fail-safe function.	Check engine lamp circuit is correct condition.	1. Check engine lamp circuit open or short to ground circuit. 2. Check engine lamp malfunction. 3. ECM malfunction.	42	B****	○	○	○
		8	OFF	Check Engine Lamp (MIL) Circuit Voltage High	Check engine lamp circuit short to voltage circuit.			ECM malfunction.	-	-	○	○	○

DIAGNOSTIC TROUBLE CODE (DTC) P0100 (SYMPTOM CODE 7) (FLASH CODE 65) MASS AIR FLOW (MAF) SENSOR VOLTAGE SUPPLY CIRCUIT HIGH INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P0100 (SYMPTOM CODE 9) (FLASH CODE 65) MASS AIR FLOW (MAF) SENSOR VOLTAGE SUPPLY CIRCUIT LOW INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P0100 (SYMPTOM CODE B) (FLASH CODE 65) MASS AIR FLOW (MAF) SENSOR OUTPUT CIRCUIT LOW INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P0100 (SYMPTOM CODE C) (FLASH CODE 65) MASS AIR FLOW (MAF) SENSOR OUTPUT CIRCUIT HIGH INPUT



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
65	P0100	7	ON	Mass Air Flow (MAF) Sensor Voltage Supply Circuit High Input	MAF sensor power supply voltage is more than 5.2V.	ECM uses mass air flow 1600mg/strk & EGR 10% conditions as substitute.
		9	ON	Mass Air Flow (MAF) Sensor Voltage Supply Circuit Low Input	MAF sensor power supply voltage is below 4.6V.	
		B	ON	Mass Air Flow (MAF) Sensor Output Circuit Low Input	1. Engine speed is between 600rpm and 5000rpm. 2. MAF sensor output is below -33.7mg/strk.	
		C	ON	Mass Air Flow (MAF) Sensor Output Circuit High Input	1. Engine speed is between 600rpm and 5000rpm. 2. MAF sensor output is more than 1784mg/strk.	

Circuit Description

The mass air flow (MAF) sensor is part of the intake air system. It is fitted between the air cleaner and turbocharger and measure the mass air flowing into the engine.
The mass air flow (MAF) sensor element measures the partial air mass through a measurement duct on the sensor housing.
The ECM monitors the MAF sensor supply voltage and MAF sensor output voltage. The supply voltage is out of range, DTC P0100 (Symptom Code 7) or P0100 (Symptom Code 9) will be stored. The output voltage excessively high or low, DTC P0100 (Symptom Code B) or P0100 (Symptom Code C) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

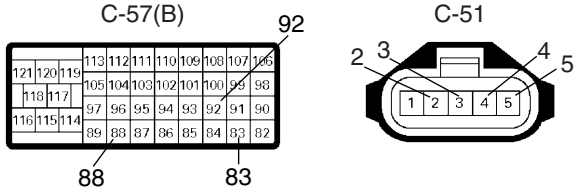
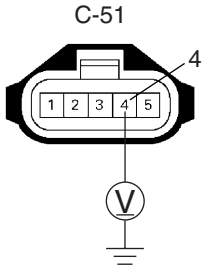
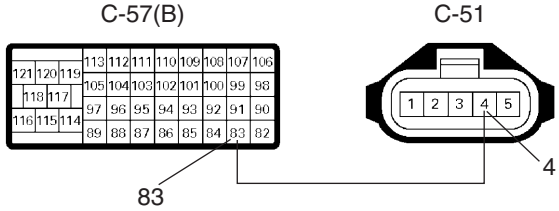
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

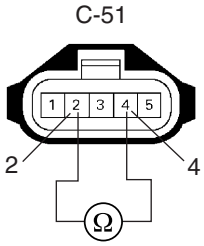
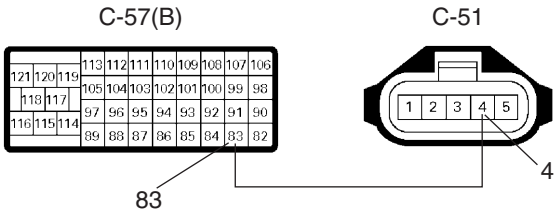
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Mass Air Flow” display on the Tech2 while moving connectors and wiring harness related to the sensor.

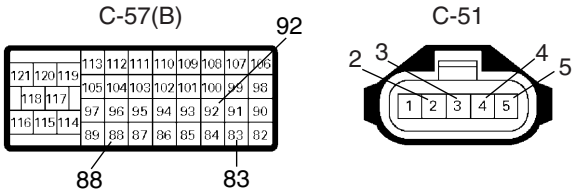
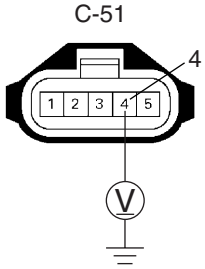
Diagnostic Trouble Code (DTC) P0100 (Symptom Code 7) (Flash Code 65) Mass Air Flow (MAF) Sensor Voltage Supply Circuit High Input

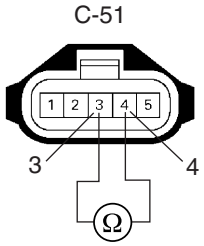
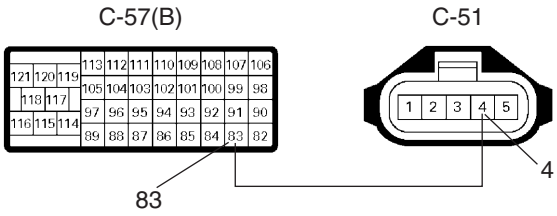
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0100 (Symptom Code 7) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*

Step	Action	Value(s)	Yes	No
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0100 (Symptom Code 7) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the MAF sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the MAF sensor. Was the problem found?	—	Go to Step 11	Go to *Step 6*
6	Using the DVM and check the MAF sensor power supply circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector. 3. Check the circuit for short to battery voltage circuit. Was the DVM indicated specified value? 	Approximately 5.0V	Go to *Step 11*	Less than 1V: Go to *Step 7* More than specified value: Go to *Step 8*
7	Repair the open circuit between the ECM and MAF sensor. Was the problem solved? 	—	Verify repair	Go to *Step 8*

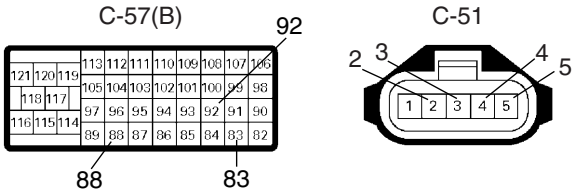
Step	Action	Value(s)	Yes	No
8	Using the DVM and check the MAF sensor power supply circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector and ECM connector. 3. Check the circuit for short to MAF sensor heater circuit. Was the DVM indicated specified value? 	No continuity	Go to *Step 10*	Go to *Step 9*
9	Repair the circuit for short to MAF sensor heater circuit. Is the action complete?	—	Verify repair	—
10	Repair the short to battery voltage circuit between the ECM and MAF sensor. Was the problem solved? 	—	Verify repair	Go to *Step 13*
11	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 12*	Go to *Step 13*
12	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
13	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 14*
14	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

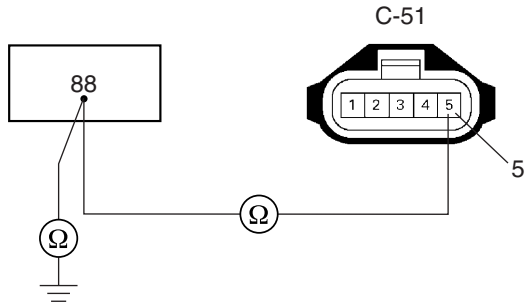
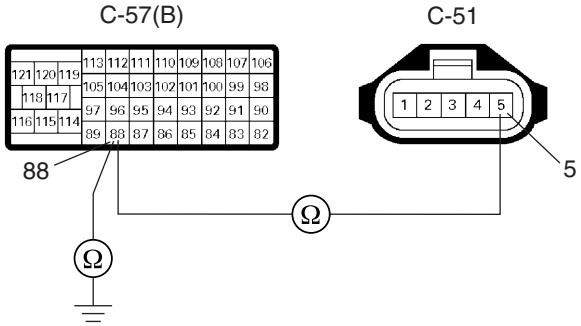
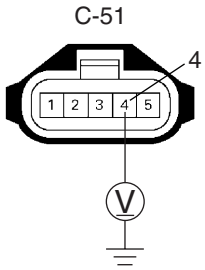
Diagnostic Trouble Code (DTC) P0100 (Symptom Code 9) (Flash Code 65) Mass Air Flow (MAF) Sensor Voltage Supply Circuit Low Input

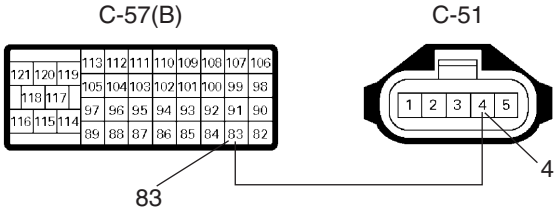
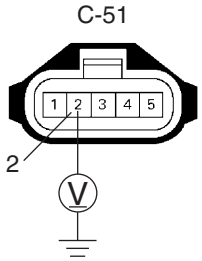
Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic (OBD) System Check" performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select "F0: Read DTC Infor As Stored By ECU" in "F0: Diagnostic Trouble Codes". Is the DTC P0100 (Symptom Code 9) stored as "Present Failure"?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition "On" and engine "Off". 2. Select "F1: Clear DTC Information" in "F0: Diagnostic Trouble Codes" with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the "F0: Read DTC Infor As Stored By ECU" in the "F0: Diagnostic Trouble Codes". Was the DTC P0100 (Symptom Code 9) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the MAF sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the MAF sensor. Was the problem found?	—	Go to Step 10	Go to *Step 6*
6	Using the DVM and check the MAF sensor power supply circuit. 1. Ignition "On", engine "Off". 2. Disconnect the MAF & IAT sensor connector. 3. Check the circuit for short to ground circuit. Was the DVM indicated specified value? 	Approximately 5.0V	Go to *Step 10*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the MAF sensor power supply circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector and ECM connector. 3. Check the circuit for short to MAF sensor ground circuit. Was the DVM indicated specified value? 	No continuity	Go to *Step 9*	Go to *Step 8*
8	Repair the circuit for short to MAF sensor ground. Is the action complete?	—	Verify repair	—
9	Repair the short to ground circuit between the ECM and MAF sensor. Was the problem solved? 	—	Verify repair	Go to *Step 12*
10	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 11*	Go to *Step 12*
11	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
12	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 13*
13	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

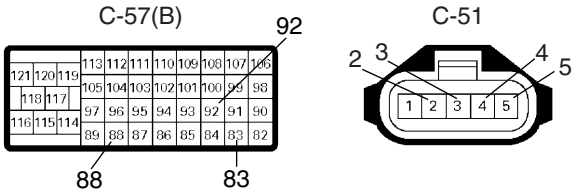
Diagnostic Trouble Code (DTC) P0100 (Symptom Code B) (Flash Code 65) Mass Air Flow (MAF) Sensor Output Circuit Low Input

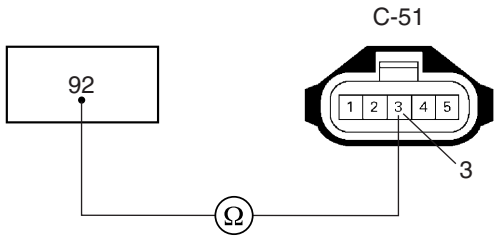
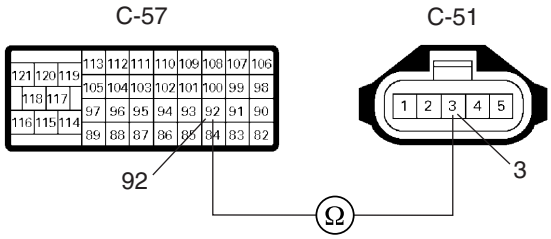
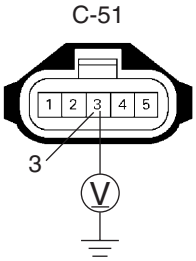
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0100 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0100 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the MAF sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the MAF sensor. Was the problem found?	—	Go to *Step 11*	Go to *Step 6*

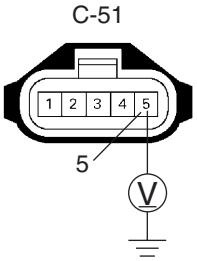
Step	Action	Value(s)	Yes	No
6	Using the DVM and check the MAF sensor signal circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the MAF & IAT sensor connector. 4. Check the circuit for open, short to sensor ground or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector and ECM connector. 3. Check the circuit for open, short to sensor ground or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 7*
7	Using the DVM and check the MAF sensor power supply circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Approximately 5.0V	Go to *Step 9*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	Repair the open circuit between the ECM and MAF sensor. Was the problem solved? 	—	Verify repair	Go to *Step 13*
9	Using the DVM and check the MAF sensor heater circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 11*	Go to *Step 10*
10	Repair the open circuit between the ECM main relay and MAF sensor. Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 12*	Go to *Step 13*
12	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
13	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 14*
14	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0100 (Symptom Code C) (Flash Code 65) Mass Air Flow (MAF) Sensor Output Circuit High Input

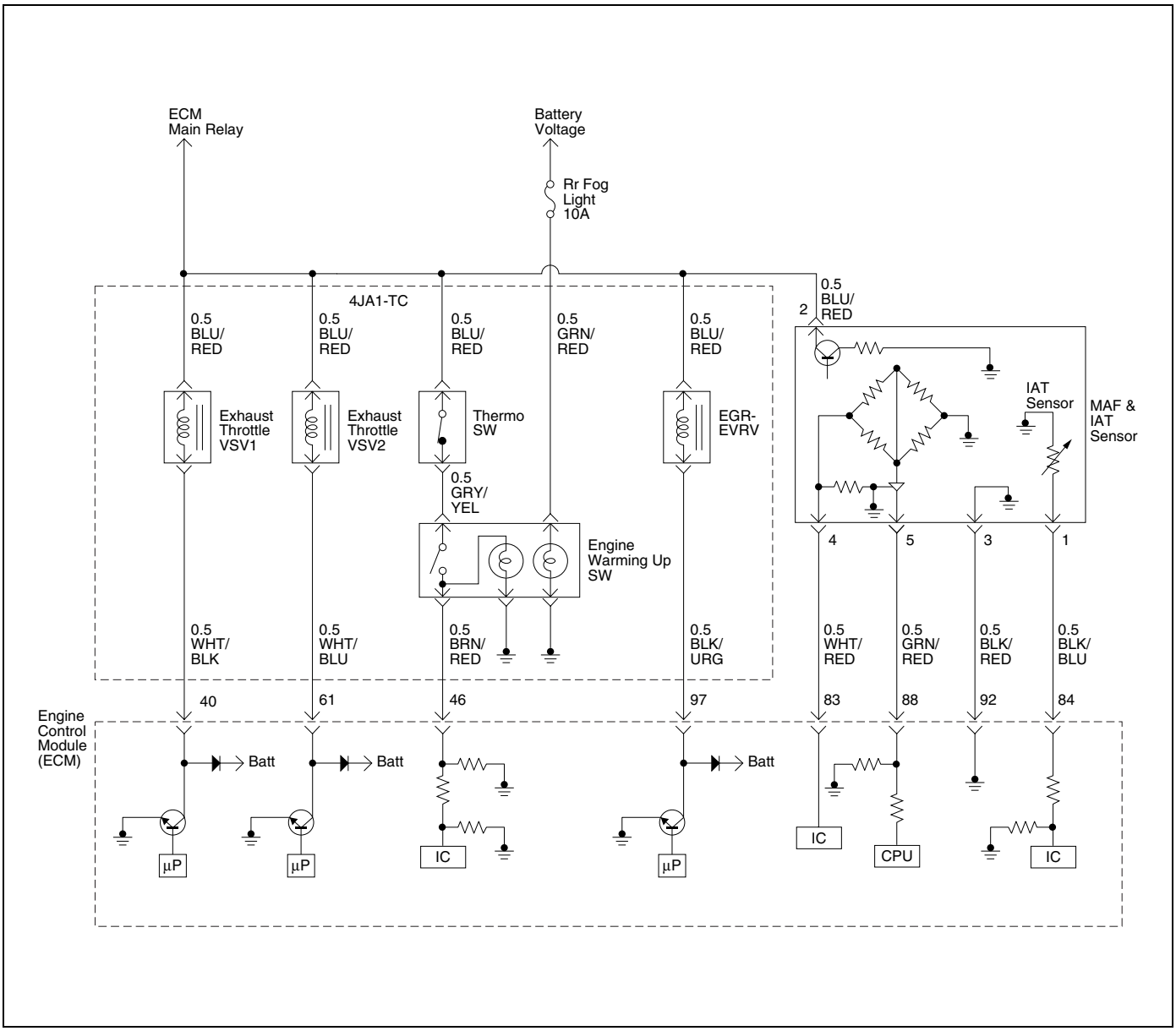
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0100 (Symptom Code C) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0100 (Symptom Code C) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the MAF sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the MAF sensor. Was the problem found?	—	Go to *Step 11*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the MAF sensor ground circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the MAF sensor connector. 4. Check the circuit for open circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the MAF sensor connector and ECM connector. 3. Check the circuit for open circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 7*
7	Using the DVM and check the MAF sensor ground circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the MAF sensor connector . 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 8*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the MAF sensor signal circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the MAF sensor connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 9*	Repair faulty harness and verify repair
9	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 10*	Go to *Step 11*
10	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
11	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 12*
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0110 (SYMPTOM CODE 1) (FLASH CODE 23) INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT HIGH INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P0110 (SYMPTOM CODE 2) (FLASH CODE 23) INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT LOW INPUT



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
23	P0110	1	ON	Intake Air Temperature (IAT) Sensor Circuit High Input	IAT sensor output voltage is more than 4.7V.	ECM use 0°C conditions as substitute.
		2	ON	Intake Air Temperature (IAT) Sensor Circuit Low Input	IAT sensor output voltage is below 0.3V.	

Circuit Description

The IAT sensor is a thermistor. A temperature changes the resistance value. And it changes voltage. In other words it measures a temperature value. Low air temperature produces a high resistance.

The ECM supplies 5 volts signal to the IAT sensor through resisters in the ECM and measures the voltage. The signal voltage will be high when the air temperature is cold, and it will be low when the air temperature is hot. The output voltage excessively high or low, DTC P0110 (Symptom Code 1) or P0110 (Symptom Code 2) will be stored.

Diagnostic Aids

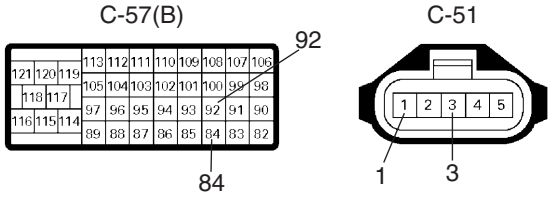
An intermittent may be caused by the following:

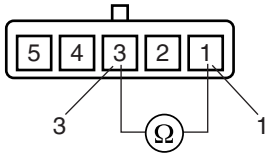
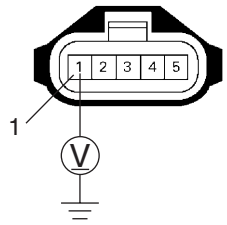
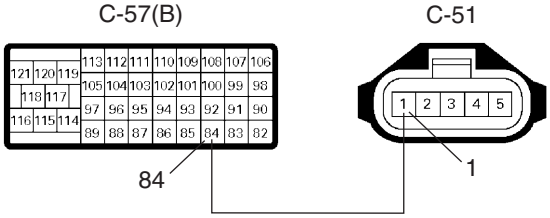
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

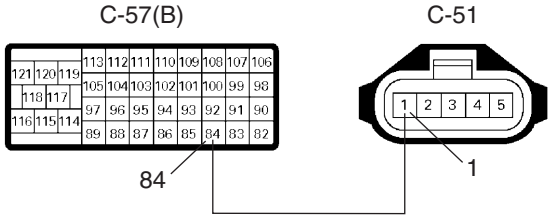
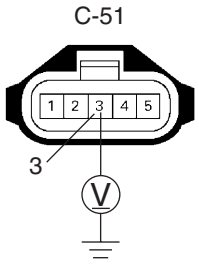
Check for the following conditions:

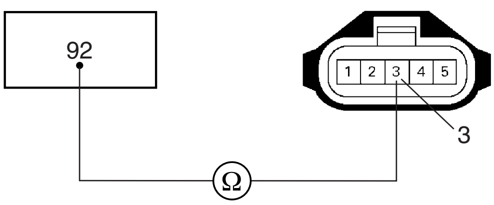
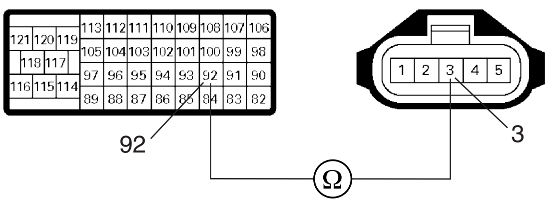
- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Intake Air Temperature” display on the Tech2 while moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P0110 (Symptom Code 1) (Flash Code 23) Intake Air Temperature (IAT) Sensor Circuit High Input

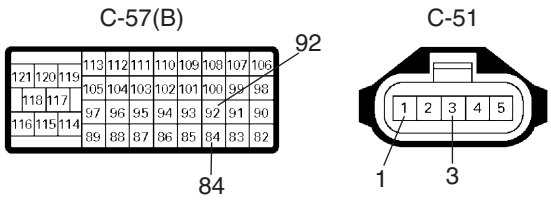
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0110 (Symptom Code 1) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0110 (Symptom Code 1) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the IAT sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the IAT sensor. Was the problem found?	—	Go to *Step 12*	Go to *Step 6*

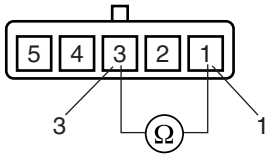
Step	Action	Value(s)	Yes	No
6	Using the DVM and check the IAT sensor. 1. Ignition “Off”, engine “Off”. 2. Disconnect MAF & IAT sensor connector. 3. Measure the resistance of IAT sensor. Does the tester indicate standard resistance as shown in the following table? Temperature (°C) / Resistance (Ω) (Approximately) -20 / 14210 0 / 5402 20 / 2343 40 / 1131 60 / 596 80 / 338 100 / 203 IAT Sensor 	Standard resistance	Go to *Step 7*	Go to *Step 12*
7	Using the DVM and check the IAT sensor signal circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector. 3. Check the circuit for open circuit. Was the DVM indicated specified value? C-51 	Approximately 5.0V	Go to *Step 10*	Less than 1V: Go to *Step 8* More than specified value: Go to *Step 9*
8	Repair the open circuit between the ECM and IAT sensor. Was the problem solved? C-57(B) C-51 	—	Verify repair	Go to *Step 14*

Step	Action	Value(s)	Yes	No
9	Repair the short to voltage circuit between the ECM and IAT sensor. Was the problem solved? 	—	Verify repair	Go to *Step 14*
10	Using the DVM and check the IAT sensor ground circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 11*	Repair faulty harness and verify repair

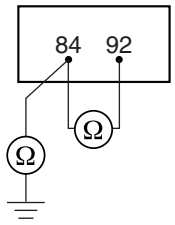
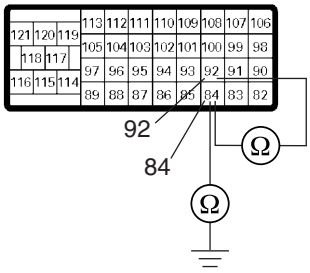
Step	Action	Value(s)	Yes	No
11	Using the DVM and check the IAT sensor ground circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the MAF & IAT sensor connector. 4. Check the circuit for open circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector and ECM connector. 3. Check the circuit for open circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 14*
12	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 14*
13	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
14	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 15*
15	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0110 (Symptom Code 2) (Flash Code 23) Intake Air Temperature (IAT) Sensor Circuit Low Input

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0110 (Symptom Code 2) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0110 (Symptom Code 2) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the IAT sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Remove the MAF & IAT sensor assembly and visually check. Was the problem found?	—	Go to *Step 8*	Go to *Step 6*

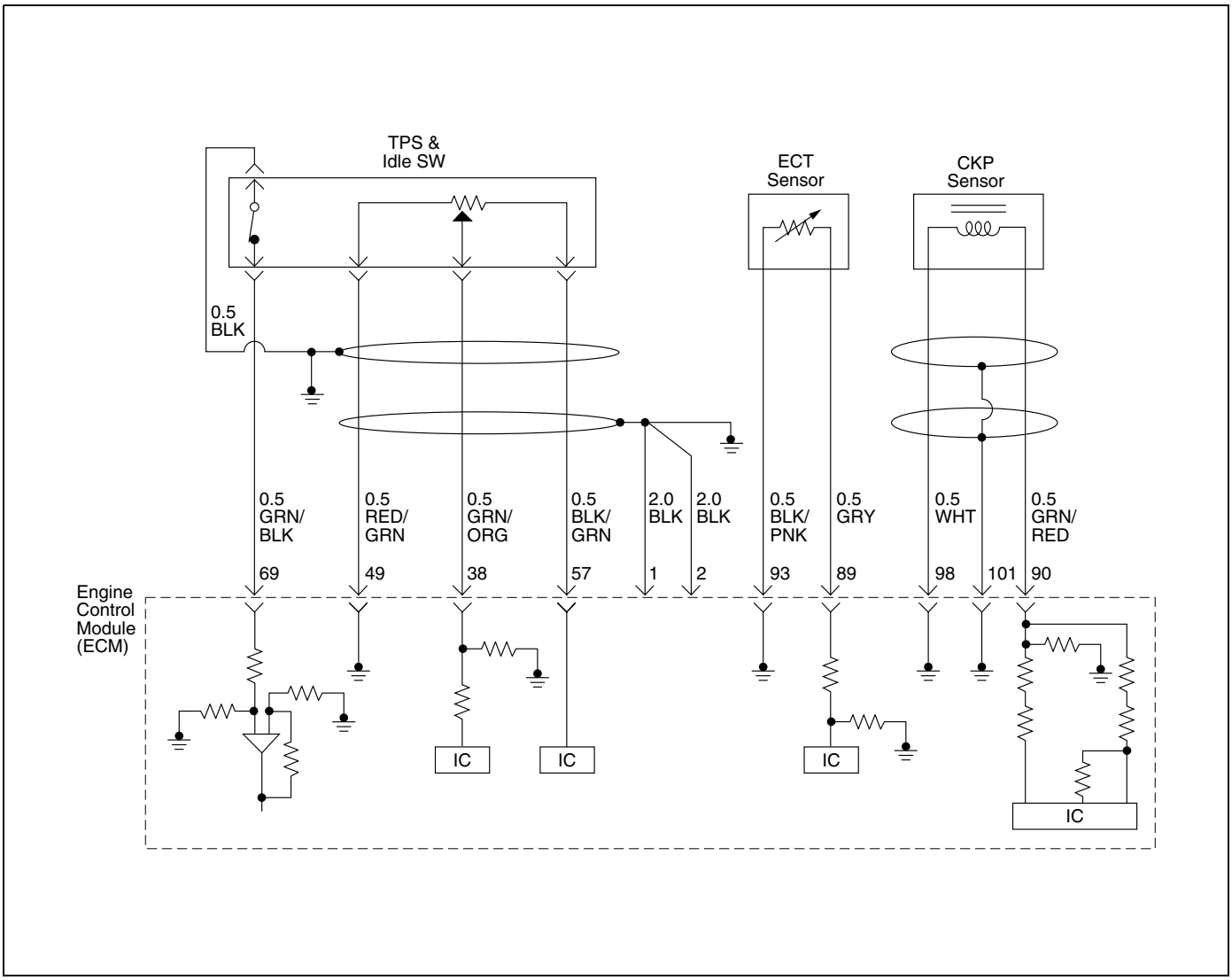
<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr>
<td>6</td>
<td>Using the DVM and check the IAT sensor.
1. Ignition “Off”, engine “Off”.
2. Disconnect MAF & IAT sensor connector.
3. Measure the resistance of IAT sensor.
Does the tester indicate standard resistance as shown in the following table?
<table>
<tr><th>Temperature (°C)</th><th>Resistance (Ω) (Approximately)</th></tr>
<tr><td>-20</td><td>14210</td></tr>
<tr><td>0</td><td>5402</td></tr>
<tr><td>20</td><td>2343</td></tr>
<tr><td>40</td><td>1131</td></tr>
<tr><td>60</td><td>596</td></tr>
<tr><td>80</td><td>338</td></tr>
<tr><td>100</td><td>203</td></tr>
</table>
IAT Sensor


</td>
<td>Standard resistance</td>
<td>Go to Step 7</td>
<td>Go to Step 8</td>
</tr>
</table>

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the IAT sensor signal circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the MAF & IAT sensor connector. 4. Check the circuit for short to sensor ground or ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the MAF & IAT sensor connector and ECM connector. 3. Check the circuit for short to sensor ground or ground circuit. Was the problem found? C-57(B) 	—	Repair faulty harness and verify repair	Go to *Step 10*
8	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 9*	Go to *Step 10*
9	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0115 (SYMPTOM CODE 1) (FLASH CODE 14) ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P0115 (SYMPTOM CODE 2) (FLASH CODE 14) ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
14	P0115	1	ON	Engine Coolant Temperature (ECT) Sensor Circuit High Input	ECT sensor output voltage is more than 4.7V.	1. ECM uses fuel temperature as substitute. 2. ECM uses 60°C condition for injection timing control. 3. ECM uses -15°C condition for glow time control.
		2	ON	Engine Coolant Temperature (ECT) Sensor Circuit Low Input	ECT sensor output voltage is below 0.3V.	

Circuit Description

The ECT sensor is a thermistor. A temperature changes the resistance value. And it changes voltage. In other words it measures a temperature value. It is installed on the coolant stream. Low coolant temperature produces a high resistance.

The ECM supplies 5 volts signal to the ECT sensor through resisters in the ECM and measures the voltage. The signal voltage will be high when the engine

temperature is cold, and it will be low when the engine temperature is hot.
The output voltage excessively high or low, DTC P0115 (Symptom Code 1) or P0115 (Symptom Code 2) will be stored.

Diagnostic Aids

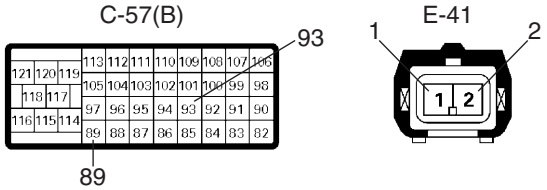
An intermittent may be caused by the following:

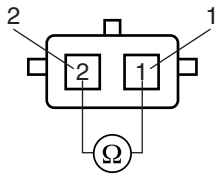
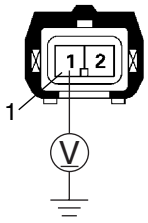
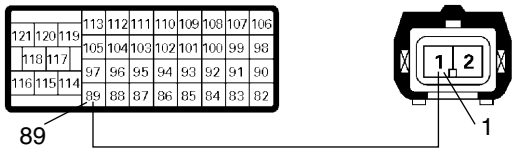
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

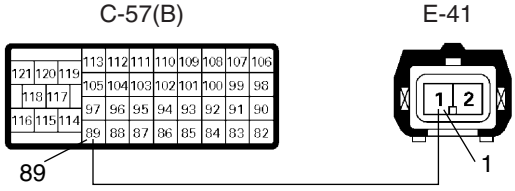
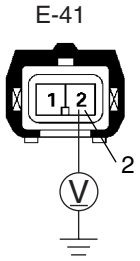
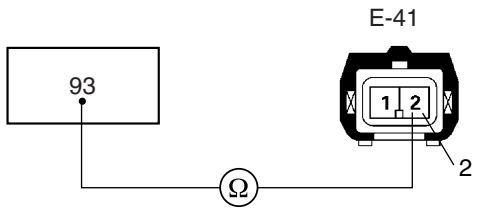
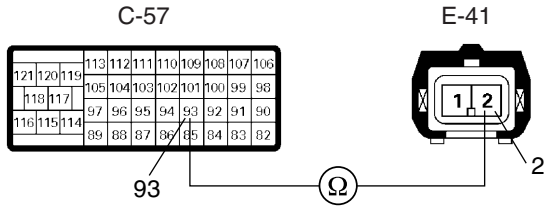
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Coolant Temperature” display on the Tech2 while moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P0115 (Symptom Code 1) (Flash Code 14) Engine Coolant Temperature Sensor Circuit High Input

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0115 (Symptom Code 1) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0115 (Symptom Code 1) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the ECT sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the ECT sensor. Was the problem found?	—	Go to *Step 12*	Go to *Step 6*

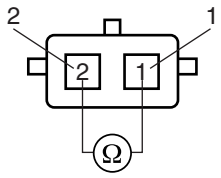
<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>6</td><td>Using the DVM and check the ECT sensor.
1. Ignition “Off”, engine “Off”.
2. Disconnect ECT sensor connector.
3. Measure the resistance of ECT sensor.
Does the tester indicate standard resistance as shown in the following table?
<table><tr><th>Temperature (°C)</th><th>Resistance (Ω) (Approximately)</th></tr><tr><td>-30</td><td>27500</td></tr><tr><td>-20</td><td>16100</td></tr><tr><td>0</td><td>5760</td></tr><tr><td>20</td><td>2370</td></tr><tr><td>40</td><td>1080</td></tr><tr><td>60</td><td>537</td></tr><tr><td>80</td><td>290</td></tr><tr><td>100</td><td>161</td></tr><tr><td>120</td><td>95</td></tr></table>ECT Sensor
  </td><td>Standard resistance</td><td>Go to Step 7</td><td>Go to Step 12</td></tr>
<tr><td>7</td><td>Using the DVM and check the ECT sensor signal circuit.
1. Ignition “On”, engine “Off”.
2. Disconnect the ECT sensor connector.
3. Check the circuit for open circuit.
Was the DVM indicated specified value?
E-41
  </td><td>Approximately 5.0V</td><td>Go to Step 10</td><td>Less than 1V: Go to Step 8
More than specified value: Go to Step 9</td></tr>
<tr><td>8</td><td>Repair the open circuit between the ECM and ECT sensor.
Was the problem solved?
C-57(B) E-41
  </td><td>—</td><td>Verify repair</td><td>Go to Step 14</td></tr>
</table>

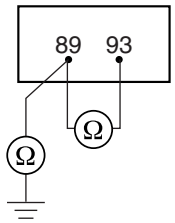
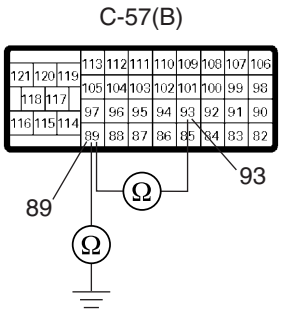
Step	Action	Value(s)	Yes	No
9	Repair the short to voltage circuit between the ECM and ECT sensor. Was the problem solved? 	—	Verify repair	Go to *Step 14*
10	Using the DVM and check the ECT sensor ground circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the ECT sensor connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 11*	Repair faulty harness and verify repair
11	Using the DVM and check the ECT sensor ground circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the ECT sensor connector. 4. Check the circuit for open circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECT sensor connector ECM connector. 3. Check the circuit for open circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 14*

Step	Action	Value(s)	Yes	No
12	Substitute a known good ECT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 14*
13	Replace the ECT sensor. Is the action complete?	—	Verify repair	—
14	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **"SPS (Service Programming System)"**. Was the problem solved?	—	Verify repair	Go to *Step 15*
15	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—

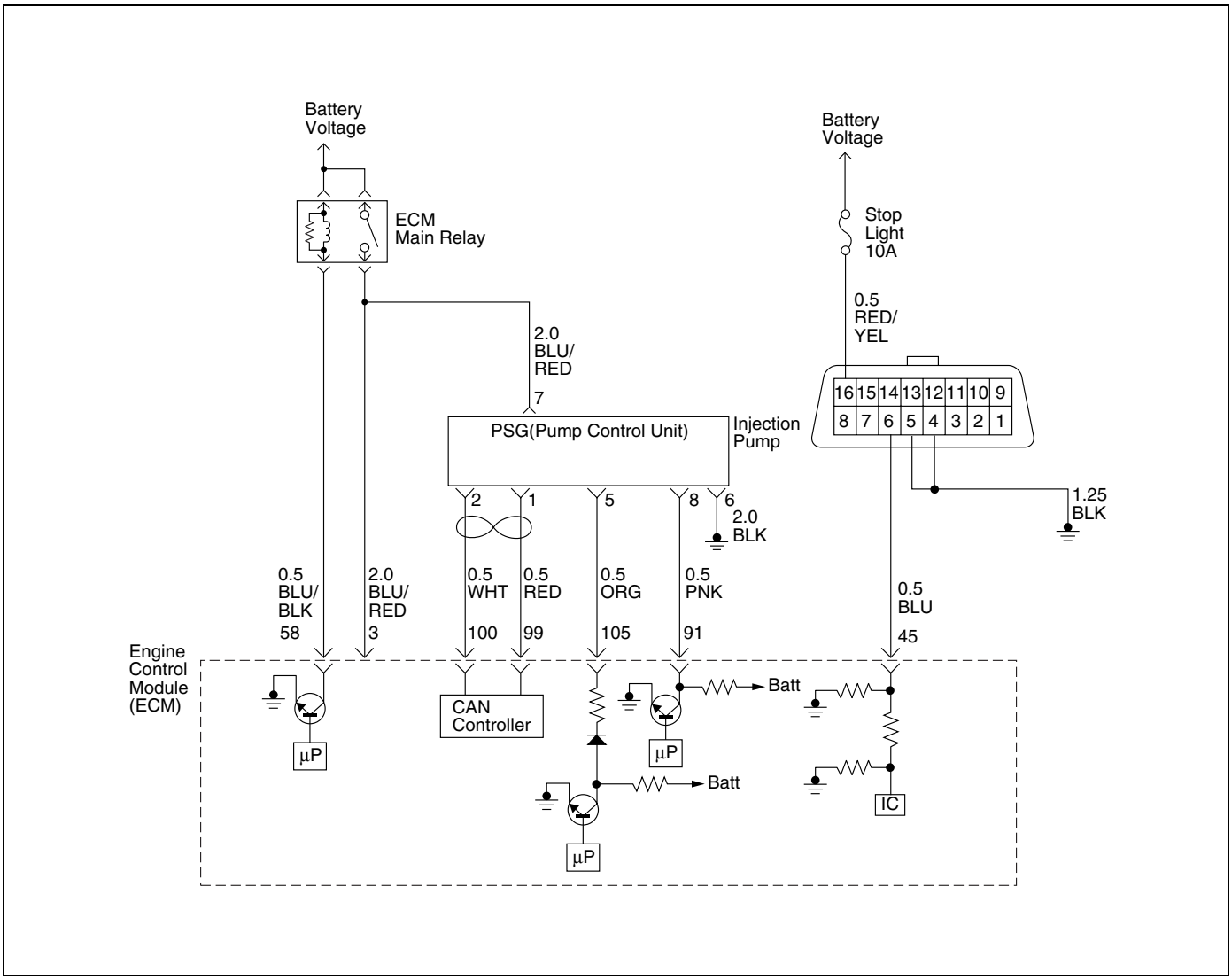
Diagnostic Trouble Code (DTC) P0115 (Symptom Code 2) (Flash Code 14) Engine Coolant Temperature Sensor Circuit Low Input

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0115 (Symptom Code 2) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0115 (Symptom Code 2) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the ECT sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the ECT sensor. Was the problem found?	—	Go to *Step 8*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the ECT sensor. 1. Ignition “Off”, engine “Off”. 2. Disconnect ECT sensor connector. 3. Measure the resistance of ECT sensor. Does the tester indicate standard resistance as shown in the following table? Temperature (°C) / Resistance (Ω) (Approximately) -30 / 27500 -20 / 16100 0 / 5760 20 / 2370 40 / 1080 60 / 537 80 / 290 100 / 161 120 / 95 ECT Sensor  	Standard resistance	Go to *Step 7*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the ECT sensor signal circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the ECT sensor connector. 4. Check the circuit for short to sensor ground or ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECT sensor connector and ECM connector. 3. Check the circuit for short to sensor ground or ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 10*
8	Substitute a known good ECT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 9*	Go to *Step 10*
9	Replace the ECT sensor. Is the action complete?	—	Verify repair	—
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0180 (SYMPTOM CODE B) (FLASH CODE 15) FUEL TEMPERATURE SENSOR CIRCUIT RANGE/ PERFORMANCE



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
15	P0180	B	ON	Fuel Temperature Sensor Circuit Range/Performance	FT sensor output is high temperature (more than 150°C) or low temperature (below -40°C).	The ECM use 75°C conditions as substitute.

Circuit Description

The fuel temperature sensor is assembled inside of the pump control unit (PSG). The signal of fuel temperature is sent via the CAN-bus from the PSG to ECM.
If the fuel temperature is excessively high or low condition, DTC P0180 will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Fuel Temperature” display on the Tech2 while

moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P0180 (Symptom Code B) (Flash Code 15) Fuel Temperature Sensor Circuit Range/Performance

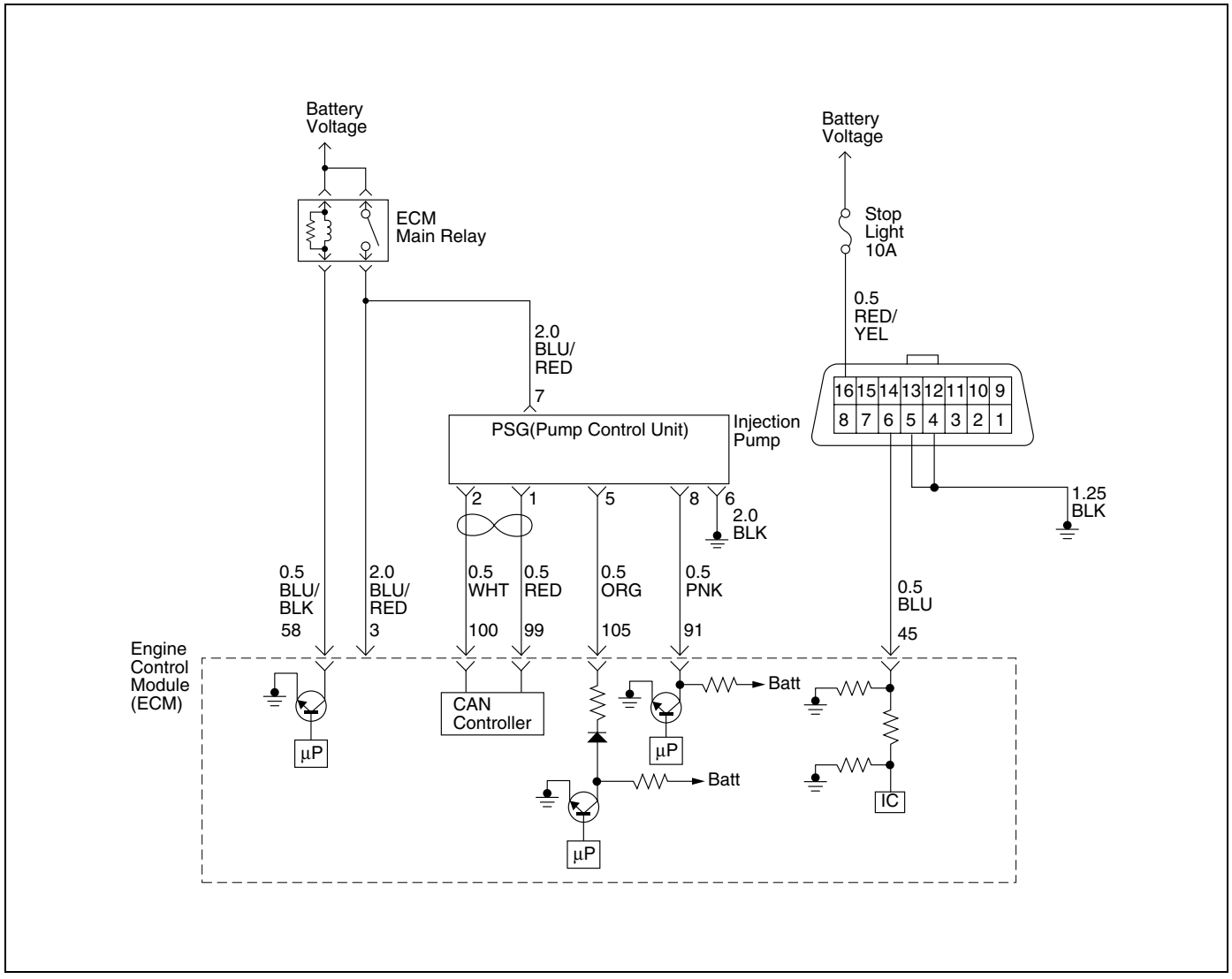
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0180 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0180 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	Go to *Step 7*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
7	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0215 (SYMPTOM CODE A) (FLASH CODE 52) FUEL CUTOFF SOLENOID VALVE MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0215 (SYMPTOM CODE B) (FLASH CODE 52) FUEL CUTOFF SOLENOID VALVE CIRCUIT HIGH INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P0215 (SYMPTOM CODE C) (FLASH CODE 52) FUEL CUTOFF SOLENOID VALVE ALWAYS ACTIVE

DIAGNOSTIC TROUBLE CODE (DTC) P0215 (SYMPTOM CODE D) (FLASH CODE 52) FUEL CUTOFF SOLENOID VALVE MALFUNCTION



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
52	P0215	A	ON at next ignition cycle	Fuel Cutoff Solenoid Valve Malfunction	1. Ignition key switch off. 2. Engine speed is below 1500rpm. 3. Vehicle speed is below 1.5km/h. 4. PSG (pump control unit) recognizes MAB (fuel cutoff solenoid valve) signal from the ECM, but the MAB could not operate.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.
		B	ON	Fuel Cutoff Solenoid Valve Circuit High Input	ECM does not command MAB (fuel cutoff solenoid valve) signal to the PSG (pump control unit), but PSG detected MAB signal line circuit is high level.	Engine does not start.
		C	ON	Fuel Cutoff Solenoid Valve Always Active	1. Ignition key switch off. 2. Engine speed is below 1500rpm. 3. Vehicle speed is below 1.5km/h. 4. PSG (pump control unit) does not recognize MAB (fuel cutoff solenoid valve) signal from the ECM.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.
		D	ON	Fuel Cutoff Solenoid Valve Malfunction	1. Ignition key switch off. 2. CAN controller does not operate Bus-off.	No fail-safe function.

Circuit Description

When the ignition switch is turned “Off”, the fuel solenoid valve (MAB) signal is supplied from the ECM to the PSG. This signal is the command for the PSG to turn “Off” the engine.
If the MAB signal circuit is short to voltage circuit or short to ground circuit, DTC P0215 (Symptom Code B) or P0215 (Symptom Code C) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

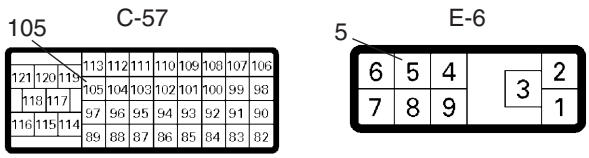
- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.

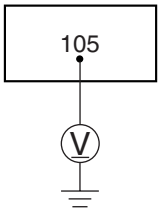
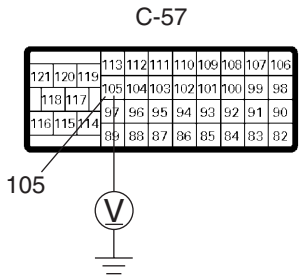
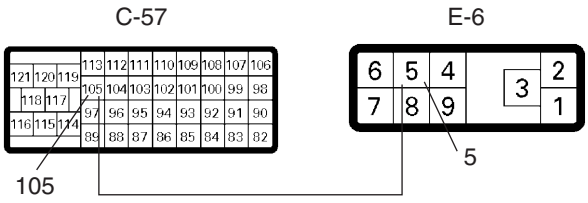
Diagnostic Trouble Code (DTC) P0215 (Symptom Code A) (Flash Code 52) Fuel Cutoff Solenoid Valve Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0215 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*

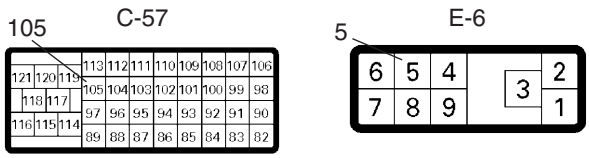
Step	Action	Value(s)	Yes	No
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0215 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

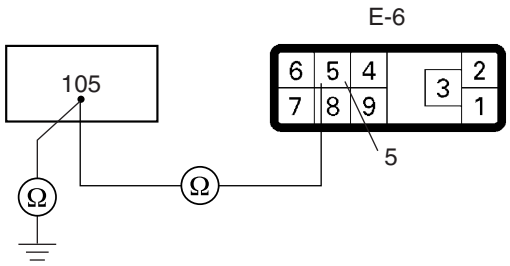
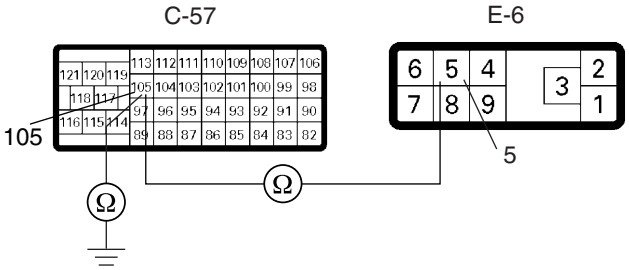
Diagnostic Trouble Code (DTC) P0215 (Symptom Code B) (Flash Code 52) Fuel Cutoff Solenoid Valve Circuit High Input

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0215 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0215 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the ECM or PSG (pump control unit) connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the PSG (pump control unit). Was the problem found?	—	Go to *Step 8*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the MAB (fuel cutoff solenoid valve) circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type B. (ECM connected) Ref. Page 6E-81 3. Check the circuit for short to voltage circuit. Was the DVM indicated specified value?  **Breaker box is not available:** 1. Check the circuit for short to voltage circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 8*	Go to *Step 7*
7	Repair the short to voltage circuit between the ECM and PSG (pump control unit). Was the problem solved? 	—	Verify repair	Go to *Step 8*
8	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0215 (Symptom Code C) (Flash Code 52) Fuel Cutoff Solenoid Valve Always Active

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0215 (Symptom Code C) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0215 (Symptom Code C) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the ECM or PSG (pump control unit) connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the PSG (pump control unit). Was the problem found?	—	Go to *Step 7*	Go to *Step 6*

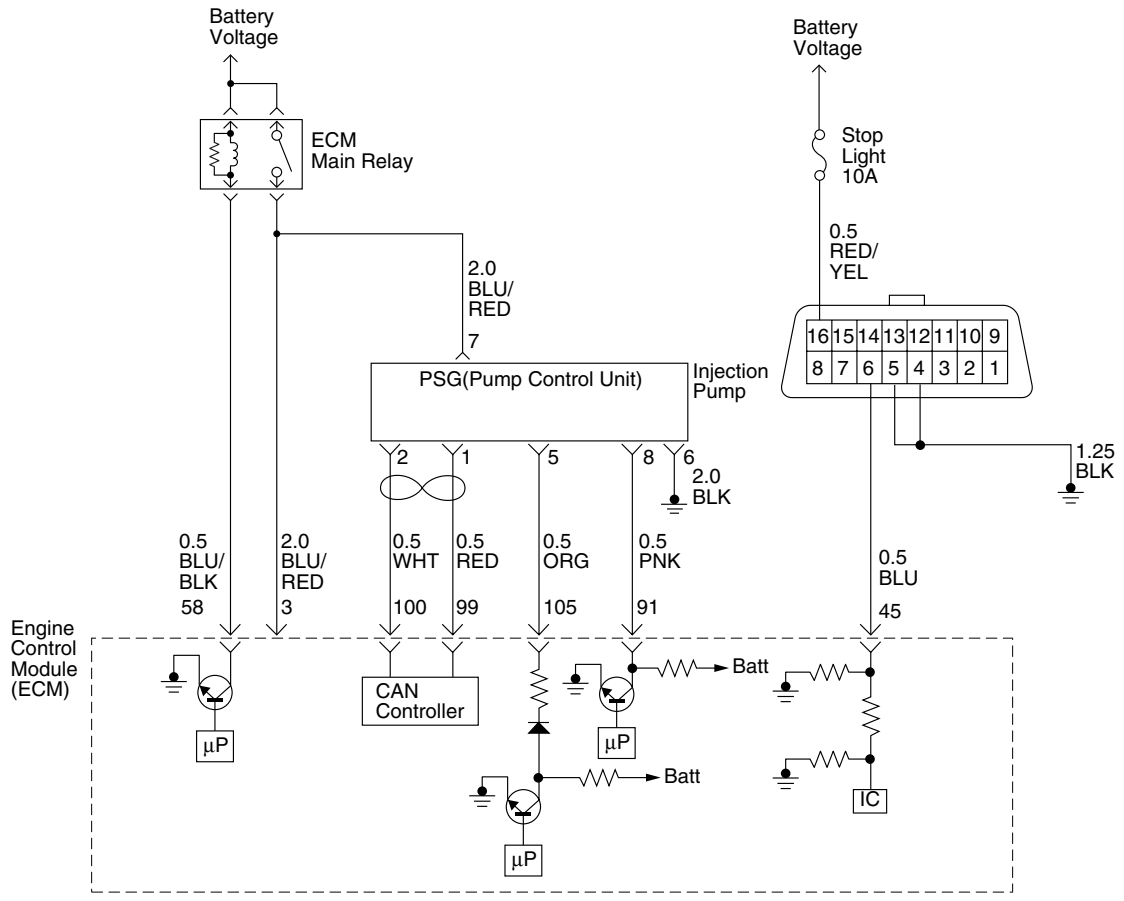
Step	Action	Value(s)	Yes	No
6	Using the DVM and check the MAB (fuel cutoff solenoid valve) circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 7*
7	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0215 (Symptom Code D) (Flash Code 52) Fuel Cutoff Solenoid Valve Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0215 (Symptom Code D) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0215 (Symptom Code D) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	Go to *Step 7*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
7	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0216 (SYMPTOM CODE A) (FLASH CODE 54) INJECTION TIMING CONTROL CIRCUIT MALFUNCTION (TIMER DEVIATION)

DIAGNOSTIC TROUBLE CODE (DTC) P0216 (SYMPTOM CODE B) (FLASH CODE 54) INJECTION TIMING CONTROL CIRCUIT MALFUNCTION (TIMER FLUCTUATION)



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
54	P0216	A	ON	Injection Timing Control Circuit Malfunction (Timer Deviation)	1. Engine speed is more than 700rpm. 2. Fuel injection quantity is more than 4mg/stk. 3. Deviation of actual injection timing and desired injection timing is more than +3°CA or -6°CA for 8 seconds.	Fuel injection quantity is reduced.
		B	ON	Injection Timing Control Circuit Malfunction (Timer Fluctuation)	1. Engine speed is more than 2014rpm. 2. Fluctuation of actual injection timing is more than ±5.2°CA.	

Circuit Description

The ECM is calculates an injection quantity and an injection timing using the various sensors (crankshaft position sensor, camshaft position sensor, engine coolant temperature sensor, etc.). The timing control valve (TCV) operation performs an injection timing decision.
The TCV performs as a variable throttle, using the rapid opening and closing cycle of the valve needle in the TCV.
The TCV is assembled in the injection pump. The signal of desired injection timing and actual injection timing are exchanged via the CAN-bus between the PSG and ECM.
If the timer position is out of tolerance (deviation or fluctuation), DTC P0216 will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.
- Insufficient air bleeding of fuel line.

Check for the following conditions:

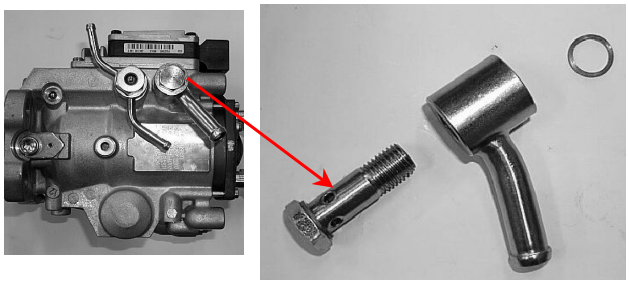
- Insufficient air bleeding of fuel line inside, clogged fuel filter or pinched fuel pipe/hose may cause the DTC store or improper engine performance.
- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Actual Injection Start” display on the Tech2 while moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P0216 (Symptom Code A) (Flash Code 54) Injection Timing Control Circuit Malfunction (Timer Deviation)

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0216 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0216 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0216 (Symptom Code B) (Flash Code 54) Injection Timing Control Circuit Malfunction (Timer Fluctuation)

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0216 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0216 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Perform the air bleeding in the fuel line sufficiently. 1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0216 (Symptom Code B) restored in this ignition cycle?	—	Go to *Step 5*	Verify repair
5	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 6*
6	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 7*

Step	Action	Value(s)	Yes	No
7	Remove the eye bolt with gauze filter from the injection pump and check for the following conditions. • Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was the problem found? 	—	Replace the eye bolt with gauze filter and verify repair	Go to *Step 8*
8	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0251 (SYMPTOM CODE 6) (FLASH CODE 53) INJECTION PUMP MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0251 (SYMPTOM CODE 7) (FLASH CODE 53) INJECTION PUMP MALFUNCTION

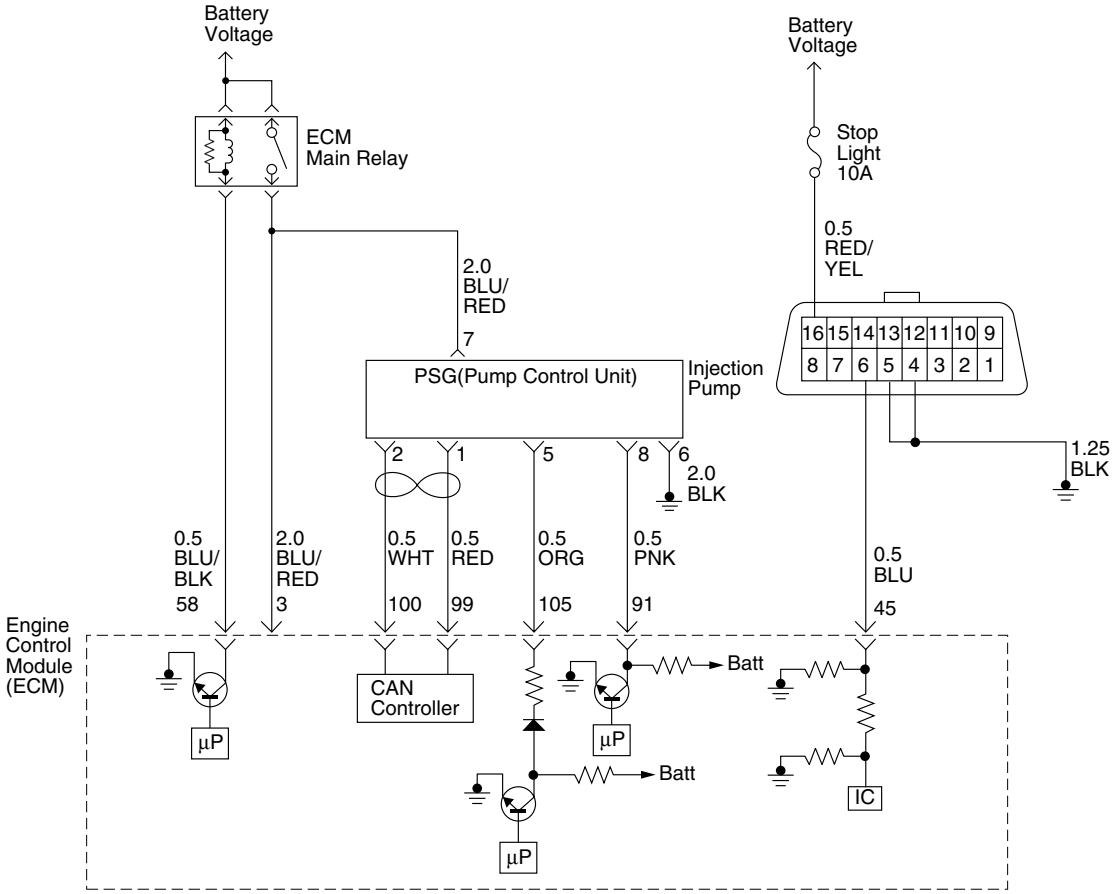
DIAGNOSTIC TROUBLE CODE (DTC) P0251 (SYMPTOM CODE 9) (FLASH CODE 53) INJECTION PUMP MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0251 (SYMPTOM CODE A) (FLASH CODE 53) INJECTION PUMP MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0251 (SYMPTOM CODE B) (FLASH CODE 53) INJECTION PUMP MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0251 (SYMPTOM CODE D) (FLASH CODE 53) INJECTION PUMP MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0251 (SYMPTOM CODE E) (FLASH CODE 53) INJECTION PUMP MALFUNCTION



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
53	P0251	6	ON	Injection Pump Malfunction	1. No pump camshaft speed sensor error. 2. High pressure solenoid valve control pulse width does not match with desired fuel injection quantity.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.
		7	ON	Injection Pump Malfunction	1. No pump camshaft speed sensor error. 2. No CKP sensor error. 3. Difference of engine speed and doubled pump camshaft speed is more than 720rpm (4JA1-TC) or 690rpm (4JH1-TC).	
		9	ON	Injection Pump Malfunction	No pump map programmed in the PSG (pump control unit) or PSG malfunction.	
		A	ON	Injection Pump Malfunction	EEPROM or A/D converter malfunction in the PSG (pump control unit).	Fuel injection quantity is reduced.
		B	ON	Injection Pump Malfunction	PSG (pump control unit) recognized high pressure solenoid valve drive circuit error.	No fail-safe function.
		D	ON	Injection Pump Malfunction	PSG (pump control unit) could not measure the high pressure solenoid valve drive voltage.	
		E	ON	Injection Pump Malfunction	ECM could not accept PSG (pump control unit) message.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.

Circuit Description

The ECM is calculates an injection quantity and an injection timing using the various sensors. And the PSG controls the high pressure solenoid valve depending on programmed pump map data.

The signal of desired injection quantity and actual injection quantify are exchanged via the CAN-bus between the PSG and ECM.

If the relation of engine speed signal and doubled pump camshaft speed signal excessively large, DTC P0251 (Symptom Code 7) will be stored.

If the CAN high or low circuit is defected, DTC P0251 (Symptom Code E) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Injection Quantity” display on the Tech2 while moving connectors and wiring harness related to the sensor.

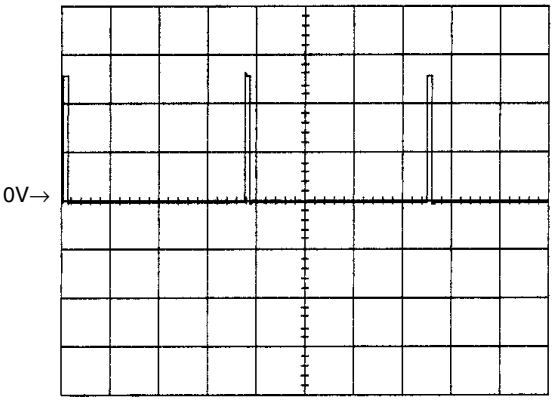
Diagnostic Trouble Code (DTC) P0251 (Symptom Code 6) (Flash Code 53) Injection Pump Malfunction

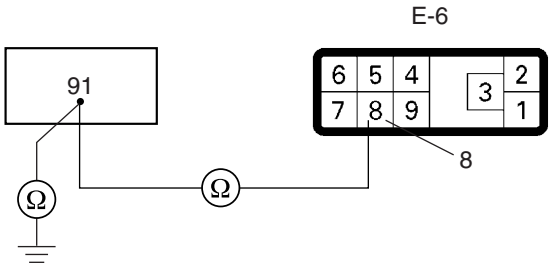
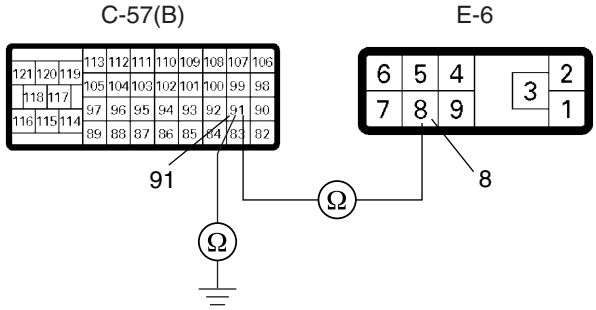
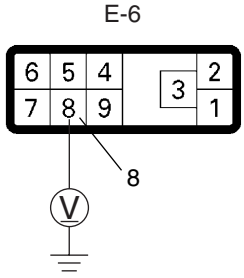
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*

Step	Action	Value(s)	Yes	No
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0251 (Symptom Code 6) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0251 (Symptom Code 6) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0251 (Symptom Code 7) (Flash Code 53) Injection Pump Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0251 (Symptom Code 7) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0251 (Symptom Code 7) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Was the DTC P0335 (Symptom Code B), P0335 (Symptom Code D) or P1335 (Symptom Code A) stored at the same time?	—	Go to DTC *Chart P0335 (Symptom Code B) (Symptom Code D) or P1335 (Symptom Code A)*	Go to *Step 5*
5	Check for poor/faulty connection at the ECM or PSG (pump control unit) connector. If a poor/faulty connection is found, repair the faulty terminal. Was the problem found? C-57(B) 91 121 120 119 113 112 111 110 109 108 107 106 118 117 105 104 103 102 101 100 99 98 116 115 114 97 96 95 94 93 92 91 90 89 88 87 86 85 84 83 82 E-6 6 5 4 3 2 7 8 9 1 8	—	Verify repair	Go to Step 6

Step	Action	Value(s)	Yes	No
6	If a oscilloscope is available, monitor the CKP sensor output signal. Does the oscilloscope indicate correct wave form? CKP Sensor Output Reference Wave Form  Measurement Terminal: 91 (+) 1 (-) Measurement Scale: 5.0V/div 2.0ms/div Measurement Condition: Engine speed at 2000rpm	—	Go to *Step 13*	Not available: Go to *Step 7* Fixed at low: Go to *Step 7* Fixed at High: Go to *Step 8*

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the CKP sensor output circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 8*
8	Using the DVM and check the CKP sensor output circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 9*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
9	Check any accessory parts which may cause electric interference or magnetic interference. Was the problem found?	—	Remove the accessory parts and verify repair	Go to *Step 10*
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **"SPS (Service Programming System)".** Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 12*	Go to *Step 13*
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—
13	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0251 (Symptom Code 9) (Flash Code 53) Injection Pump Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0251 (Symptom Code 9) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0251 (Symptom Code 9) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0251 (Symptom Code A) (Flash Code 53) Injection Pump Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0251 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0251 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0251 (Symptom Code B) (Flash Code 53) Injection Pump Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0251 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0251 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0251 (Symptom Code D) (Flash Code 53) Injection Pump Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0251 (Symptom Code D) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0251 (Symptom Code D) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

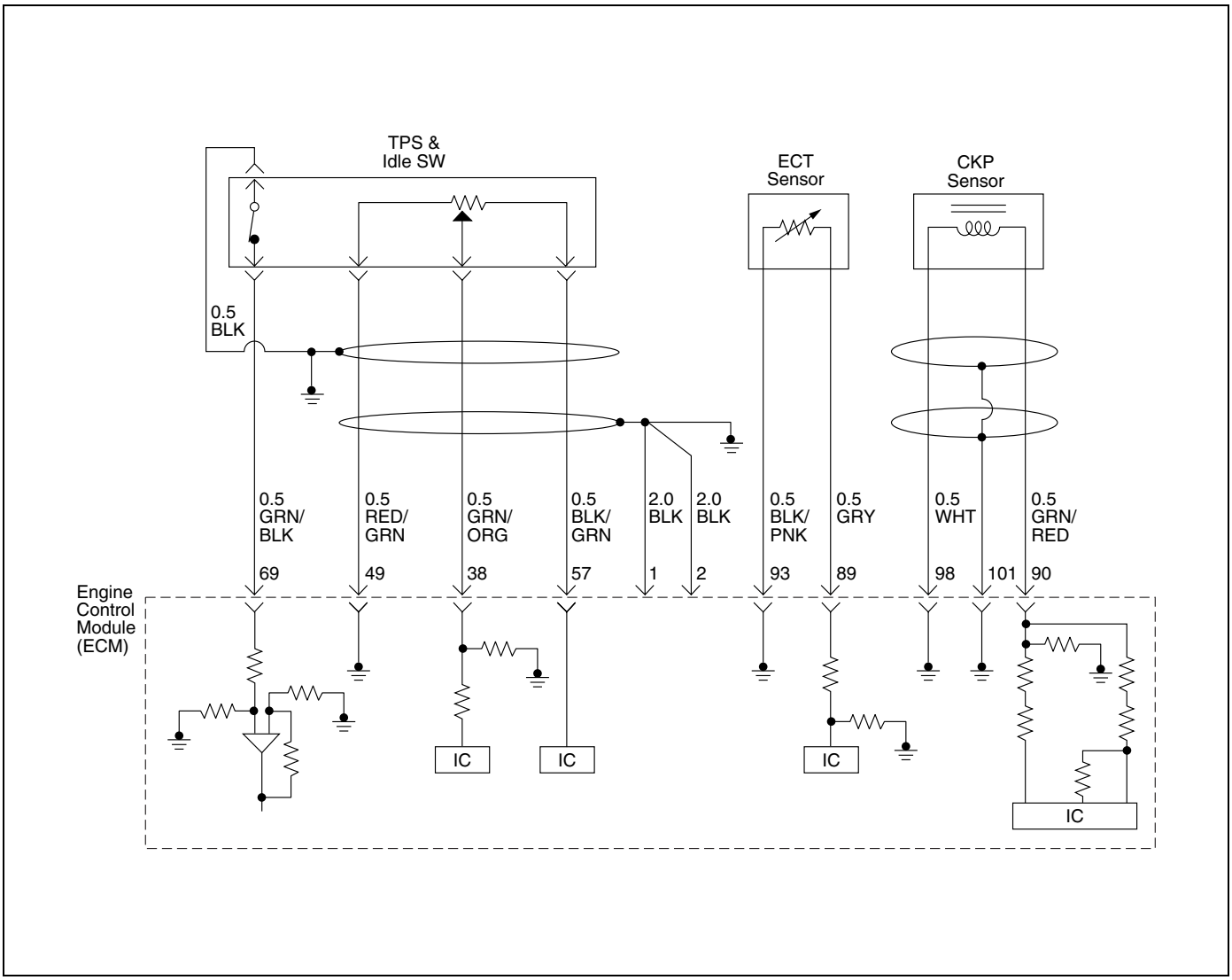
Diagnostic Trouble Code (DTC) P0251 (Symptom Code E) (Flash Code 53) Injection Pump Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0251 (Symptom Code E) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0251 (Symptom Code E) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Was the DTC P1650 (Symptom Code A) or P1651 (Symptom Code B) stored at the same time?	—	Go to *DTC Chart P1650 (Symptom Code A)*	Go to *Step 5*
5	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 6*
6	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 7*	Go to *Step 8*
7	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
8	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0335 (SYMPTOM CODE B) (FLASH CODE 43)CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0335 (SYMPTOM CODE D) (FLASH CODE 43) CRANKSHAFT POSITION SENSOR MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0335 (SYMPTOM CODE E) (FLASH CODE 43) ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
43	P0335	B	ON	Crankshaft Position Sensor Circuit Malfunction	1. Engine speed is more than 665rpm. 2. CKP sensor pulse width error.	When pump camshaft speed sensor is OK: ECM uses doubled pump camshaft speed as substitute engine speed. When pump camshaft speed sensor is not OK: 1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.
		D	ON	Crankshaft Position Sensor Circuit Malfunction	1. No pump camshaft speed sensor error. 2. “Crankshaft Position Sensor Circuit Malfunction (Symptom Code B)” is not stored. 3. Engine speed is 0rpm. 4. Doubled pump camshaft speed is more than 50rpm.	When pump camshaft speed sensor is OK: ECM uses doubled pump camshaft speed as substitute engine speed. Other than pump camshaft speed sensor is OK: Fuel injection quantity is reduced.
		E	ON	Engine Speed Input Circuit Range/Performance	Engine speed is more than 5700rpm.	When intermittent malfunction: 1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk. When preliminary malfunction: ECM uses doubled pump camshaft speed as substitute engine speed.

Circuit Description

The CKP sensor is located on top of the flywheel housing of the flywheel and fixed with a bolt. The CKP sensor is of the magnet coil type. The inductive pickup sensors four gaps in the flywheel exciter ring and is used to determine the engine speed and engine cylinder top dead center.
If the CKP sensor harness or sensor malfunction is detected during engine run, DTC P0335 (Symptom Code B) is stored.
If the CKP sensor harness or sensor malfunction is detected during engine cranking, DTC P0335 (Symptom Code D) is stored.
If the CKP sensor signal frequency is excessively high or engine over-running, DTC P0335 (Symptom Code E) is stored.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

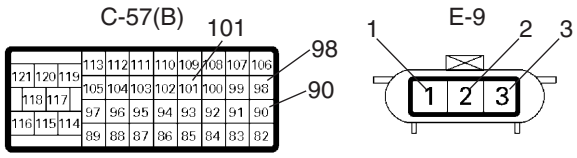
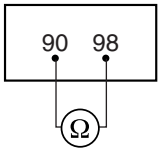
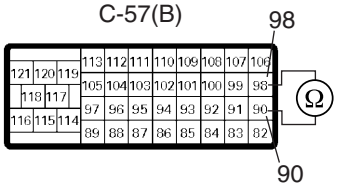
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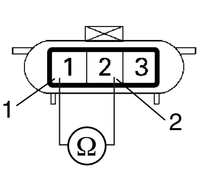
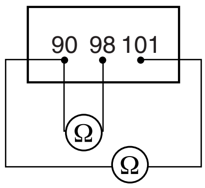
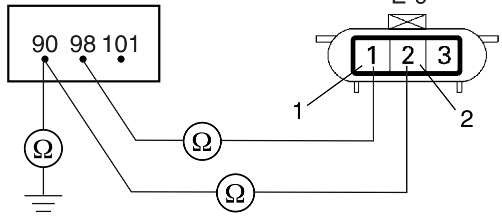
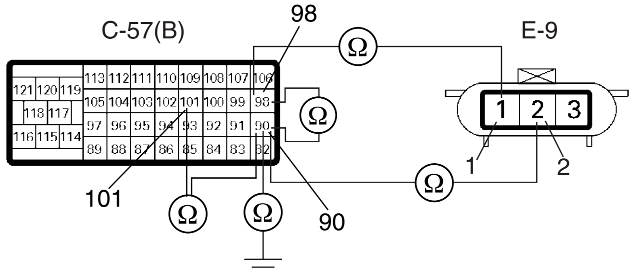
- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Engine Speed” display on the Tech2 while moving connectors and wiring harness related to the sensor.

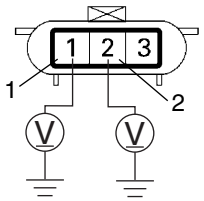
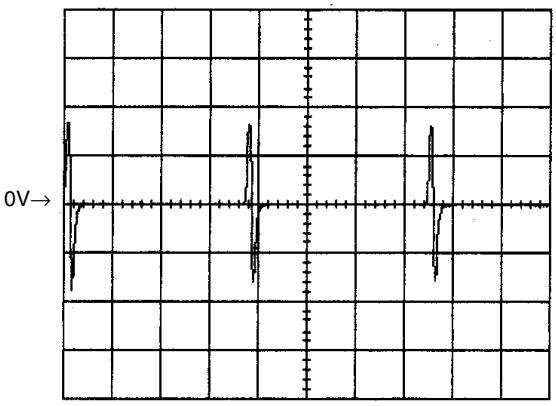
Diagnostic Trouble Code (DTC) P0335 (Symptom Code B) (Flash Code 43) Crankshaft Position Sensor Circuit Malfunction

Diagnostic Trouble Code (DTC) P0335 (Symptom Code D) (Flash Code 43) Crankshaft Position Sensor Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*

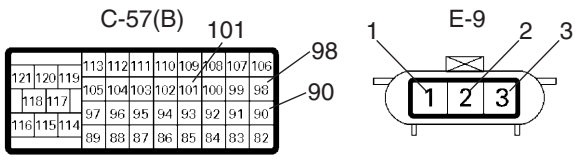
Step	Action	Value(s)	Yes	No
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0335 (Symptom Code B) or P0335 (Symptom Code D) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0335 (Symptom Code B) or P0335 (Symptom Code D) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the CKP sensor or ECM connector. If a poor/faulty connection is found, repair the faulty terminal. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the CKP sensor. If a faulty installation is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 6*
6	Using the DVM and check the CKP sensor circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Check the resistance of the CKP sensor. Was the DVM indicated specified value?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Check the resistance of the CKP sensor. Was the DVM indicated specified value? 	Approximately 0.9kΩ at 20°C	Go to *Step 10*	Go to *Step 7*

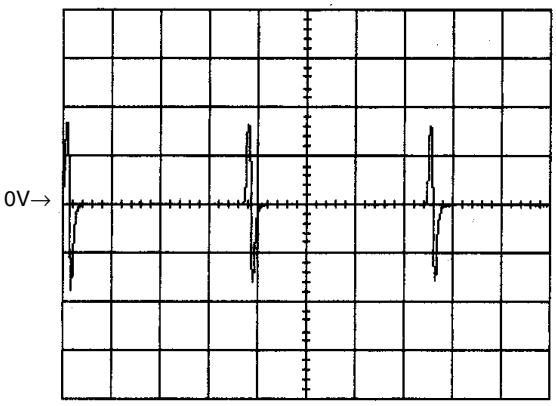
Step	Action	Value(s)	Yes	No
7	Using the DVM and check the CKP sensor circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the CKP sensor connector. 3. Check the resistance of the CKP sensor. Was the DVM indicated specified value? 	Approximately 0.9kΩ at 20°C	Go to *Step 8*	Go to *Step 14*
8	Using the DVM and check the CKP sensor circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the CKP sensor connector. 4. Check the circuit for open, short to sensor wire or short to ground circuit. Was the problem found?   **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Disconnect the CKP sensor connector. 4. Check the circuit for open, short to sensor wire or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 9*

<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>9</td><td>Using the DVM and check the CKP sensor circuit.
1. Ignition “On”, engine “Off”.
2. Disconnect the CKP sensor connector.
3. Check the circuit for short to power supply circuit.
If the DVM indicated out of specified value, repair faulty harness and verify repair.
Is the action complete?
E-9
  </td><td>Less than 1V</td><td>Verify repair</td><td>—</td></tr>
<tr><td>10</td><td>Using the DVM and check the CKP sensor signal.
1. Ignition “On”, engine “On”.
2. Measure the CKP output voltage at the sensor and ECM.
Does the tester indicate standard voltage?
<table><tr><th>Measurement Point</th><th>Voltage (V) (AC Range)</th></tr><tr><td>At CKP sensor terminal 2 & 1</td><td rowspan="2">Approximately 1.0 V at 2000rpm</td></tr><tr><td>At ECM C57 connector 90 & 98</td></tr></table>If a oscilloscope is available, monitor the CKP sensor signal. Does the oscilloscope indicate correct wave form?
CKP Sensor Reference Wave Form
 
Measurement Terminal: 90 (+) 98(-)
Measurement Scale: 20V/div 2.0ms/div
Measurement Condition: Engine speed at 2000rpm</td><td></td><td>Go to Step 13</td><td>Go to Step 11</td></tr>
<tr><td>11</td><td>Remove the CKP sensor from the flywheel housing and visually check.
Check for the following conditions.
• Objects sticking the CKP sensor.
• Objects sticking the CKP sensor pulser.
If a problem is found, repair as necessary.
Was the problem found?</td><td>—</td><td>Verify repair</td><td>Go to Step 12</td></tr>
<tr><td>12</td><td>Check the CKP sensor shield wire for open or short circuit.
Was the problem found?</td><td>—</td><td>Repair faulty harness and verify repair</td><td>Go to Step 13</td></tr>
</table>

Step	Action	Value(s)	Yes	No
13	Check any accessory parts which may cause electric interference or magnetic interference. Was the problem found?	—	Remove the accessory parts and verify repair	Go to *Step 14*
14	Substitute a known good CKP sensor and recheck. Was the problem solved?	—	Go to *Step 15*	Go to *Step 16*
15	Replace the CKP sensor. Was the problem solved?	—	Verify repair	Go to *Step 16*
16	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to Step 17
17	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0335 (Symptom Code E) (Flash Code 43) Engine Speed Input Circuit Range/Performance

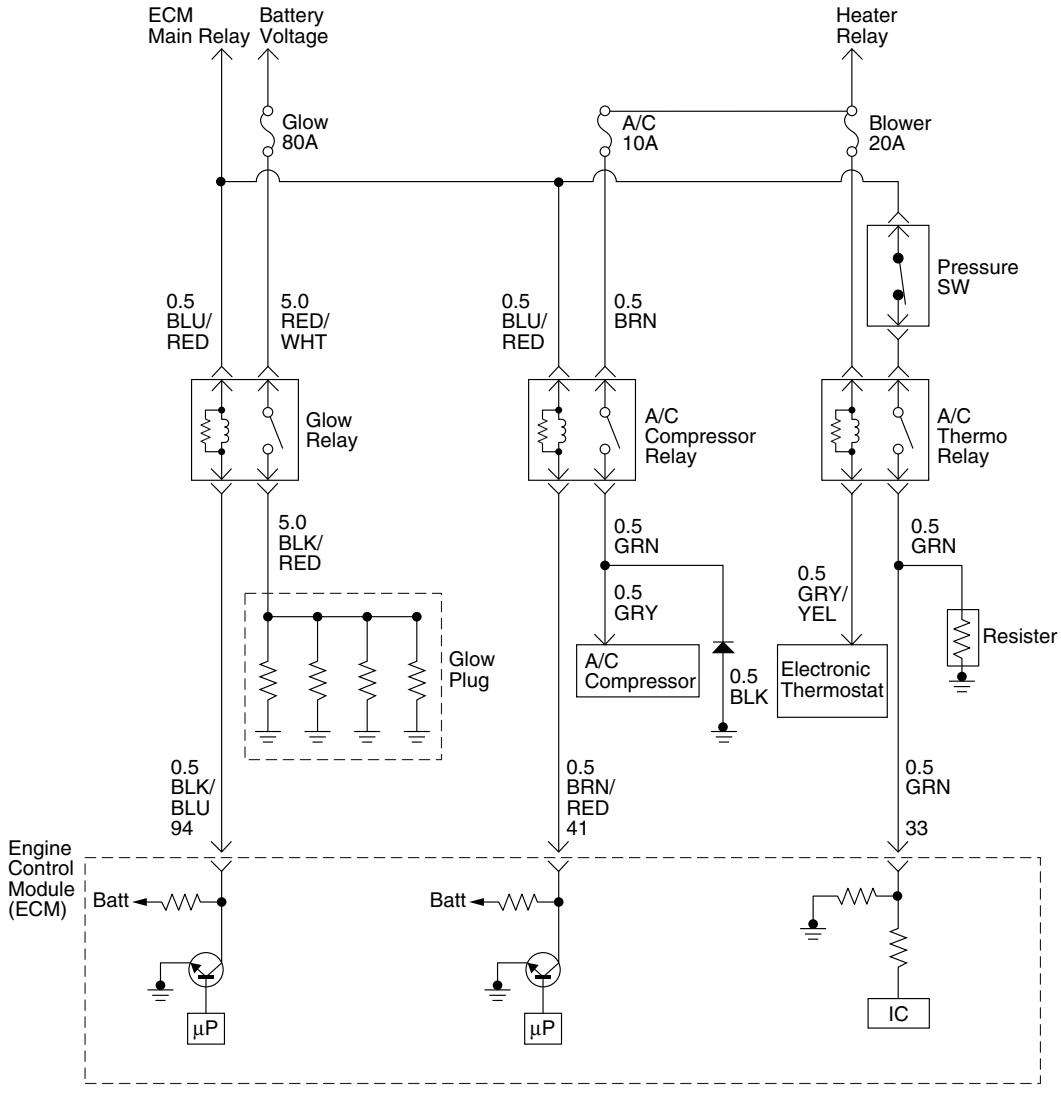
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0335 (Symptom Code E) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0335 (Symptom Code E) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Ask to the customer whether over-speed condition such as miss-gear shifting etc. has been experienced or not.	—	Explain the reason of DTC to the customer	Go to *Step 5*
5	Check for poor/faulty connection at the CKP sensor or ECM connector. If a poor/faulty connection is found, repair the faulty terminal. Was the problem found? 	—	Verify repair	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the CKP sensor signal. 1. Ignition “On”, engine “On”. 2. Measure the CKP output voltage at the sensor and ECM. Does the tester indicate standard voltage? Measurement Point: At CKP sensor terminal 2 & 1; At ECM C57 connector 90 & 98 — Voltage (V) (AC Range): Approximately 1.0 V at 2000rpm If a oscilloscope is available, monitor the CKP sensor signal. Does the oscilloscope indicate correct wave form? CKP Sensor Reference Wave Form  Measurement Terminal: 90 (+) 98(-) Measurement Scale: 20V/div 2.0ms/div Measurement Condition: Engine speed at 2000rpm		Go to *Step 9*	Go to *Step 7*
7	Remove the CKP sensor from the flywheel housing and visually check. Check for the following conditions. • Objects sticking the CKP sensor. • Objects sticking the CKP sensor pulser. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 8*
8	Check the CKP sensor shield wire for open or short circuit. Was the problem found?	—	Repair faulty harness and verify repair	Go to *Step 9*
9	Check any accessory parts which may cause electric interference or magnetic interference. Was the problem found?	—	Remove the accessory parts and verify repair	Go to *Step 10*
10	Substitute a known good CKP sensor and recheck. Was the problem solved?	—	Go to Step 11	Go to *Step 12*
11	Replace the CKP sensor. Was the problem solved?	—	Verify repair	Go to *Step 12*
12	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 13*

Step	Action	Value(s)	Yes	No
13	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0380 (SYMPTOM CODE 4) (FLASH CODE 66) GLOW RELAY CIRCUIT VOLTAGE LOW

DIAGNOSTIC TROUBLE CODE (DTC) P0380 (SYMPTOM CODE 8) (FLASH CODE 66) GLOW RELAY CIRCUIT VOLTAGE HIGH



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
66	P0380	4	ON	Glow Relay Circuit Voltage Low	Glow relay circuit open or short to ground circuit.	No fail-safe function.
		8	ON	Glow Relay Circuit Voltage High	Glow relay circuit short to voltage circuit.	

Circuit Description

The voltage on the coil of the relay glow plug is supplied by the relay engine control module (ECM) main. The ECM switches glow relay to operate glow plug depends on the coolant temperature.

In the after glow phase the lamp is not illuminated but the glow plugs remain active for a certain period depending on engine coolant temperature.

Diagnostic Aids

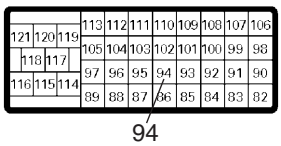
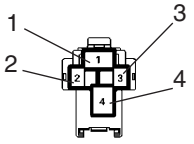
An intermittent may be caused by the following:

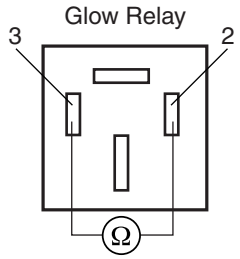
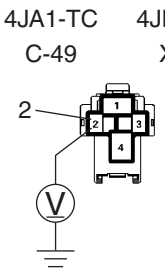
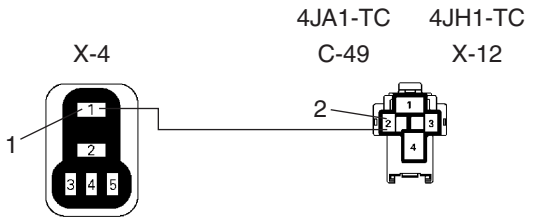
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

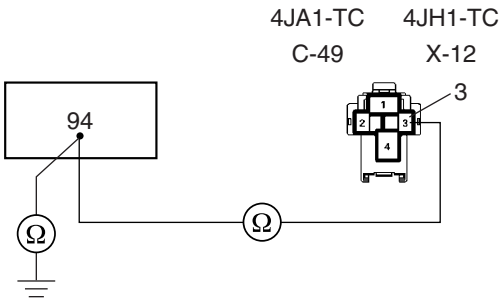
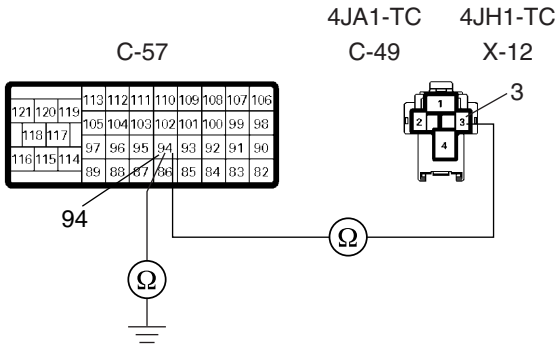
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P0380 display on the Tech2 while moving connectors and wiring harnesses. A change in the display will indicate the location of the fault.

Diagnostic Trouble Code (DTC) P0380 (Symptom Code 4) (Flash Code 66) Glow Relay Circuit Voltage Low

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0380 (Symptom Code 4) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0380 (Symptom Code 4) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the glow relay or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? C-57  94 4JA1-TC C-49 4JH1-TC X-12  	—	Verify repair	Go to *Step 5*

Step	Action	Value(s)	Yes	No
5	Using the DVM and check the glow relay. 1. Ignition “Off”, engine “Off”. 2. Remove the glow relay from the relay box. 3. Check the relay coil. Was the DVM indicated specified value? 	Continuity	Go to *Step 6*	Replace glow relay and verify repair
6	Using the DVM and check the glow relay power supply circuit. 1. Ignition “On”, engine “Off”. 2. Remove the glow relay from the relay box. 3. Check the circuit for open or short to ground circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 8*	Go to *Step 7*
7	Repair the open or short to ground circuit between the ECM main relay and glow relay. Is the action complete? 	—	Verify repair	—

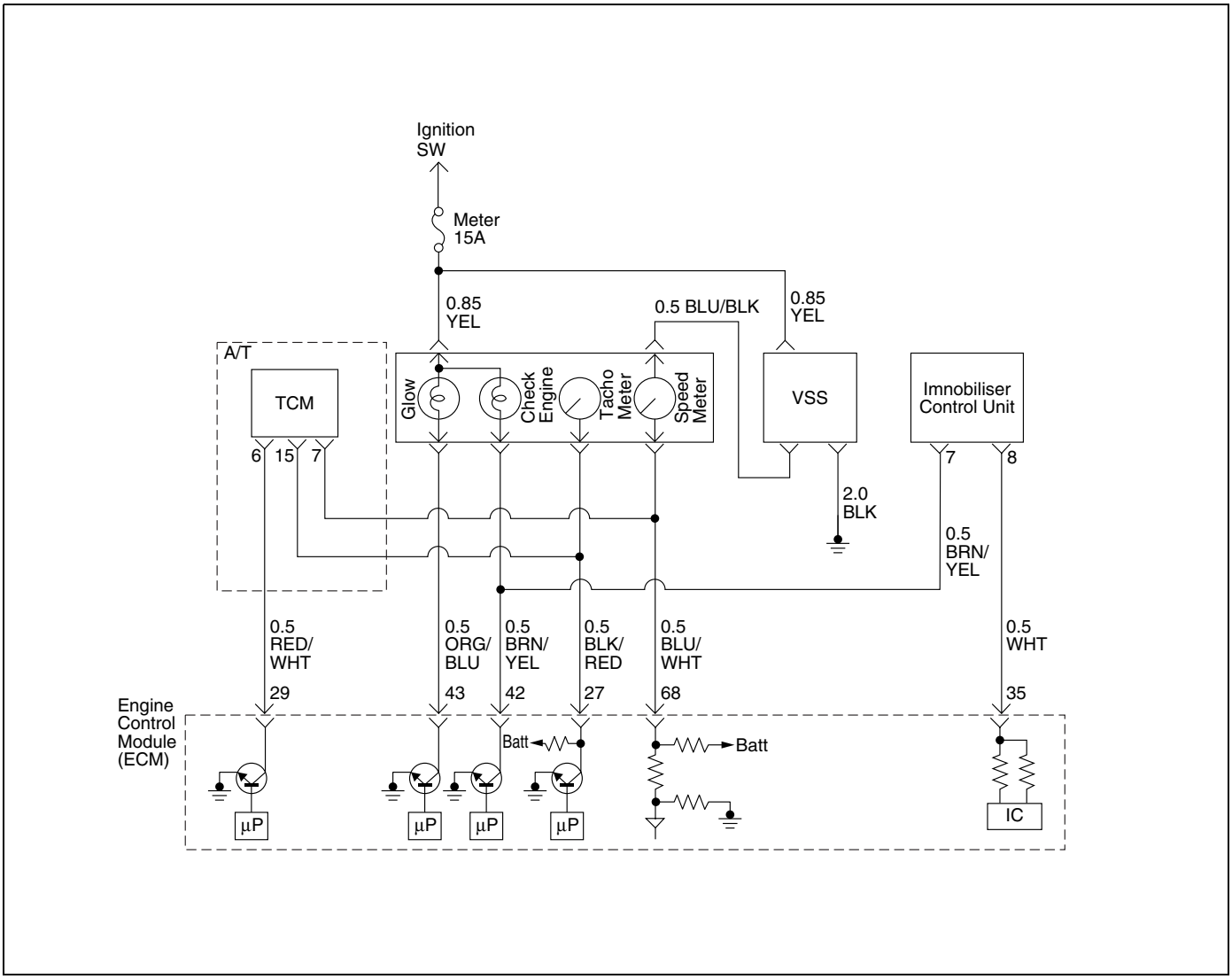
Step	Action	Value(s)	Yes	No
8	Using the DVM and check the glow relay ground circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Remove the glow relay from the relay box. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Remove the glow relay from the relay box. 4. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 9*
9	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 10*
10	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0380 (Symptom Code 8) (Flash Code 66) Glow Relay Circuit Voltage High

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0380 (Symptom Code 8) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0380 (Symptom Code 8) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	—
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0381 (SUB CODE 4) (FLASH CODE 67) GLOW PLUG INDICATOR CIRCUIT VOLTAGE LOW

DIAGNOSTIC TROUBLE CODE (DTC) P0381 (SUB CODE 8) (FLASH CODE 67) GLOW PLUG INDICATOR CIRCUIT VOLTAGE HIGH



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
67	P0381	4	ON	Glow Plug Indicator Circuit Voltage Low	Glow plug indicator circuit open or short to ground circuit.	No fail-safe function.
		8	ON	Glow Plug Indicator Circuit Voltage High	Glow plug indicator circuit short to voltage circuit.	

Circuit Description

The function of the glow time indicator lamp is to inform the driver whether the glow system is activated.
When the lamp turned off, the engine can be started. This does not imply that the glow plugs are no longer activated.
In the after glow phase the lamp is not illuminated but the glow plugs remain active for a certain period depending on engine coolant temperature.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.

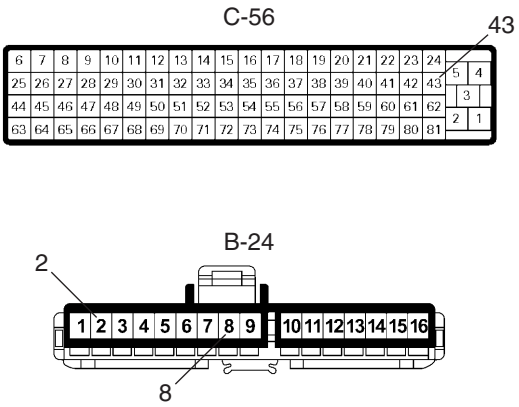
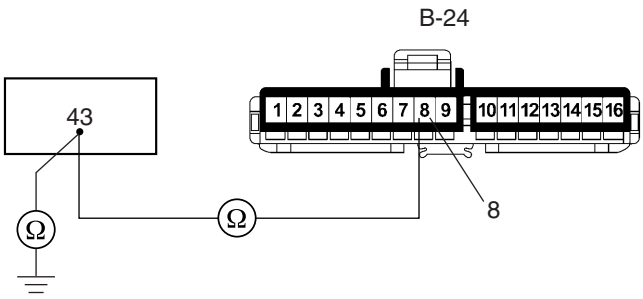
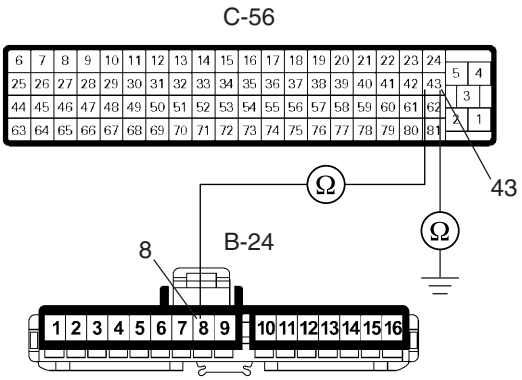
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P0381 display on the Tech2 while moving connectors and wiring harnesses. A change in the display will indicate the location of the fault.

Diagnostic Trouble Code (DTC) P0381 (Symptom Code 4) (Flash Code 67) Glow Plug Indicator Circuit Voltage Low

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0381 (Symptom Code 4) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0381 (Symptom Code 4) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Ignition “On”, engine “Off”. 2. Check the glow plug indicator lamp. Does the lamp turn “On”?	—	Go to *Step 5*	Go to *Step 6*
5	1. Ignition “On”, engine “Off”. 2. Check the glow plug indicator lamp. Does the lamp turn “Off”?	—	Go to *Step 9*	Go to *Step 7*
6	Check the glow plug indicator lamp bulb. If the bulb is burnt out, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 7*

Step	Action	Value(s)	Yes	No
7	Check for poor/faulty connection at the meter connector and ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 8*
8	Using the DVM and check the glow time telltale circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Remove the meter connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Remove the meter connector. 4. Check the circuit for open or short to ground circuit. Was the problem found? 	— —	Repair faulty harness and verify repair	Go to Step 9

Step	Action	Value(s)	Yes	No
9	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to Step 10
10	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0381 (Symptom Code 8) (Flash Code 67) Glow Plug Indicator Circuit Voltage High

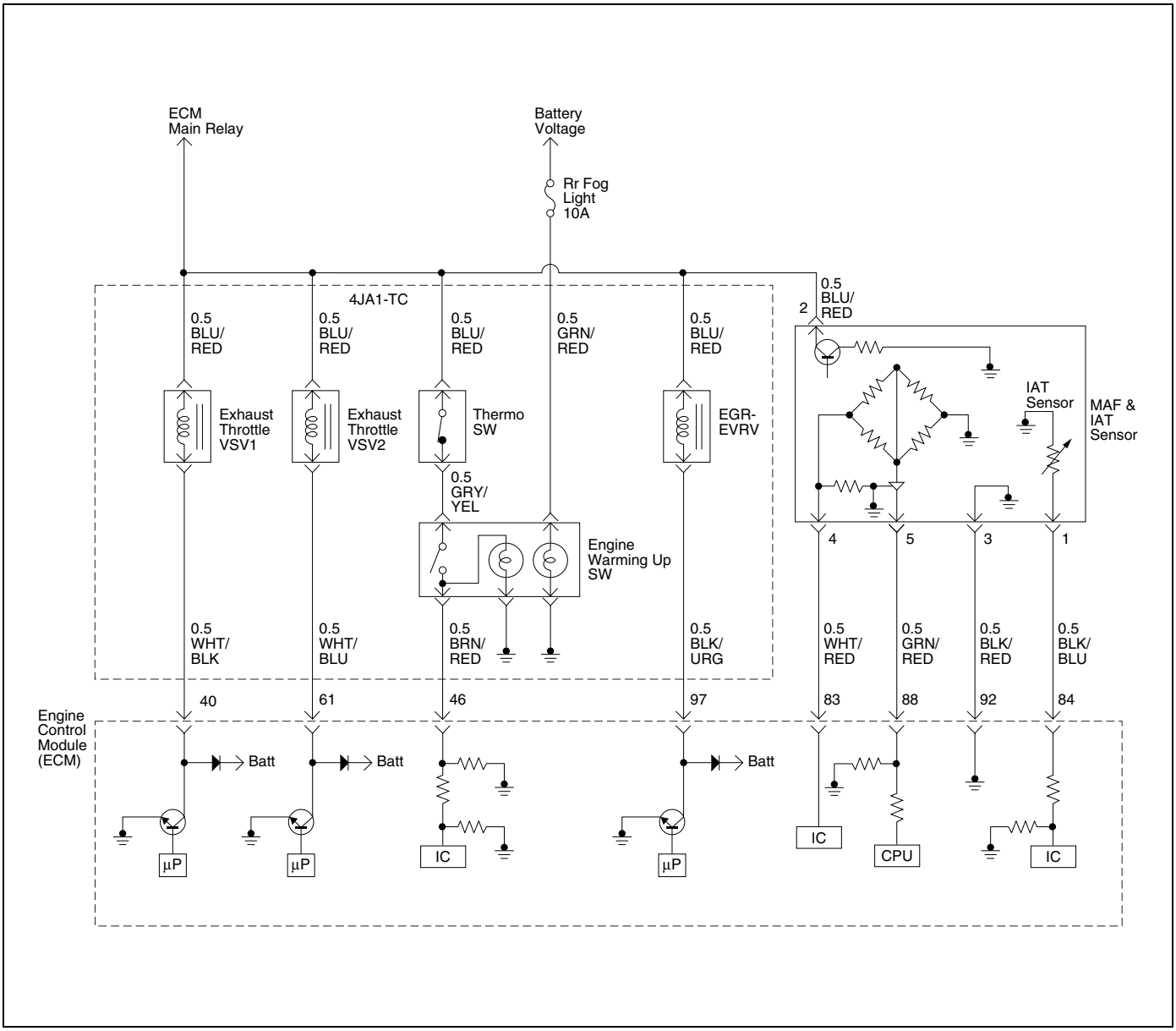
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0381 (Symptom Code 8) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0381 (Symptom Code 8) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	—
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0400 (SYMPTOM CODE 3) (FLASH CODE 32) EXHAUST GAS RECIRCULATION FLOW EXCESSIVE DETECTED

DIAGNOSTIC TROUBLE CODE (DTC) P0400 (SYMPTOM CODE 4) (FLASH CODE 32) EXHAUST GAS RECIRCULATION CIRCUIT SHORT TO GROUND OR OPEN CIRCUIT

DIAGNOSTIC TROUBLE CODE (DTC) P0400 (SYMPTOM CODE 5) (FLASH CODE 32) EXHAUST GAS RECIRCULATION FLOW INSUFFICIENT DETECTED

DIAGNOSTIC TROUBLE CODE (DTC) P0400 (SYMPTOM CODE 8) (FLASH CODE 32) EXHAUST GAS RECIRCULATION CIRCUIT SHORT TO BATTERY



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
32	P0400	3	ON	Exhaust Gas Recirculation Flow Excessive Detected	1. Intake air temperature is between 15°C and 100°C. 2. Engine coolant temperature is between 55°C and 100°C. 3. Barometric pressure is between 850hpa and 1100hpa. 4. Small amount of mass air flow. (Desired mass air flow - mass air flow is more than 150mg/strk)	Fuel injection quantity is reduced.
		4	ON	Exhaust Gas Recirculation Circuit Short to Ground or Open Circuit	EGR EVRV circuit open or short to ground circuit.	Fuel injection quantity is reduced and EGR EVRV 10% conditions as substitute.
		5	ON	Exhaust Gas Recirculation Flow Insufficient Detected	1. Intake air temperature is between 15°C and 100°C. 2. Engine coolant temperature is between 55°C and 100°C. 3. Barometric pressure is between 850hpa and 1100hpa. 4. Large mount of mass air flow. (Desired mass air flow - mass air flow is below 150 mg/strk)	Fuel injection quantity is reduced.
		8	ON	Exhaust Gas Recirculation Circuit Short to Battery	EGR EVRV circuit short to voltage circuit.	Fuel injection quantity is reduced & EGR EVRV 10% conditions as substitute.

Circuit Description

The amount of EGR is controlled by EVRV (electrical vacuum regulating valve) via the engine control module (ECM) command signal depends on the engine speed, operating of the accelerator pedal and engine coolant temperature.
The EVRV is shaped to control vacuum applied to the diaphragm chamber of the EGR valve based on duty signal sent from the ECM.
If the EGR valve is stuck at open position or close position, DTC P0400 (Symptom Code 3) or DTC P0400 (Symptom Code 5) is stored.
If the EGR EVRV circuit is open or short ground circuit, DTC P0400 (Symptom Code 4) is stored.
If the EGR EVRV circuit is short to voltage circuit, DTC P0400 (Symptom Code 8) is stored.

Diagnostic Aids

An intermittent may be caused by the following:

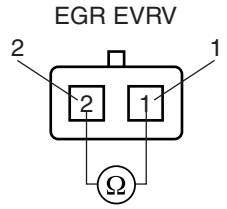
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.
- EGR valve sticking.
- Faulty intake air duct connection.

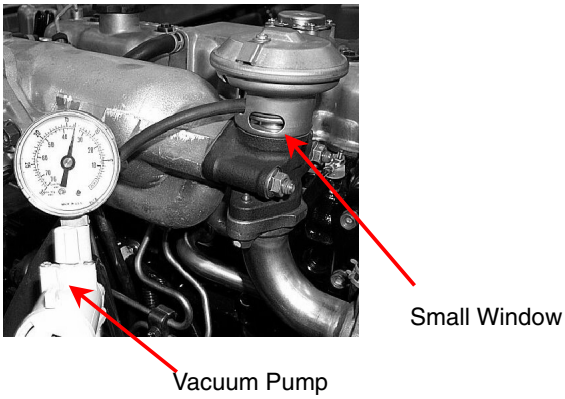
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P0400 display on the Tech2 while moving connectors and wiring harnesses. A change in the display will indicate the location of the fault.

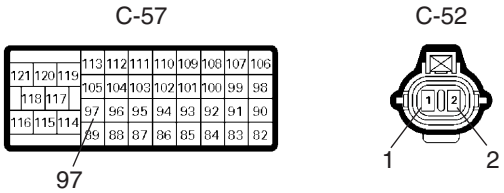
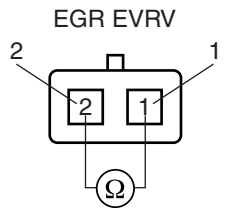
Diagnostic Trouble Code (DTC) P0400 (Symptom Code 3) (Flash Code 32) Exhaust Gas Recirculation Flow Excessive Detected

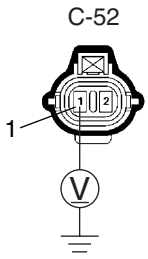
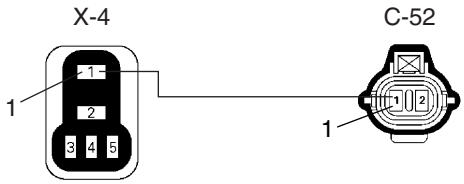
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*

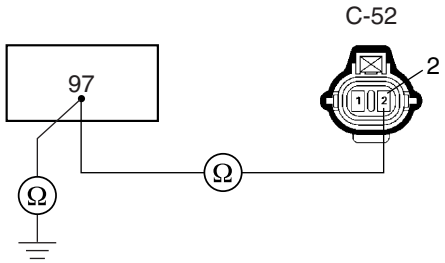
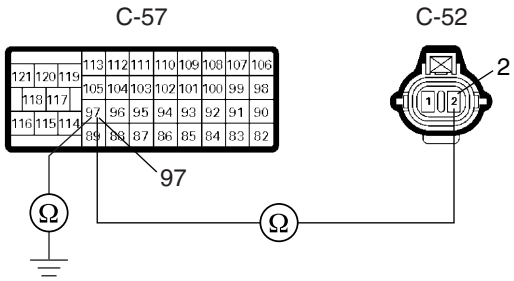
Step	Action	Value(s)	Yes	No
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0400 (Symptom Code 3) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0400 (Symptom Code 3) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking the air cleaner. • Objects blocking the MAF sensor. • Vacuum leaking at intake duct. • Objects blocking the turbocharger. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 5*
5	Remove the MAF & IAT sensor assembly and visually check. Was the problem found?	—	Go to *Step 6*	Go to *Step 8*
6	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 7*	Go to *Step 8*
7	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
8	Using the DVM and check the EGR EVRV. 1. Ignition “Off”, engine “Off”. 2. Disconnect the EGR EVRV connector. 3. Measure the resistance of EGR EVRV solenoid coil. Does the tester indicate standard resistance? 	Approximately 14Ω at 20°C	Go to *Step 11*	Go to *Step 9*
9	Substitute a known good EGR EVRV and recheck. Was the problem solved?	—	Go to *Step 10*	Go to *Step 11*
10	Replace the EGR EVRV. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
11	Using the vacuum pump and check the EGR valve operation for the following condition through the small window. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. If a problem is found, repair as necessary. Was a problem found?  	—	Verify repair or Go to *Step 13*	Go to *Step 12*
12	Inspect the EGR valve. 1. Remove the EGR valve from the engine. 2. Inspect the EGR valve whether pintle valve is stuck or damaged. If excessive carbon deposit is found, clean up the EGR valve and inspect damage of the pintle and seat. Was the problem found?	—	Verify repair or Go to *Step 13*	Go to *Step 14*
13	Replace the EGR valve. Is the action complete?	—	Verify repair	—
14	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 15*
15	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

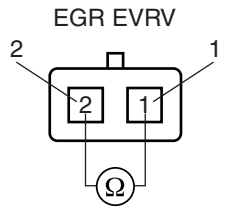
Diagnostic Trouble Code (DTC) P0400 (Symptom Code 4) (Flash Code 32) Exhaust Gas Recirculation Circuit Short to Ground or Open Circuit

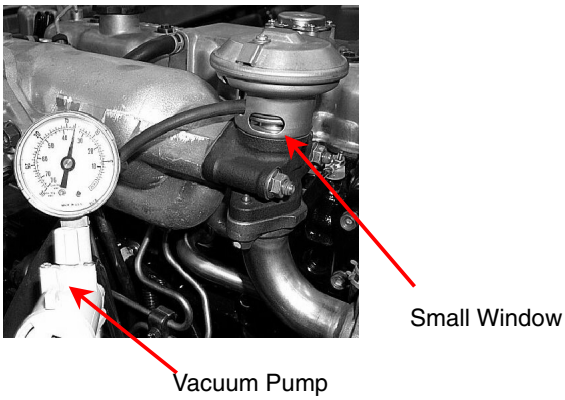
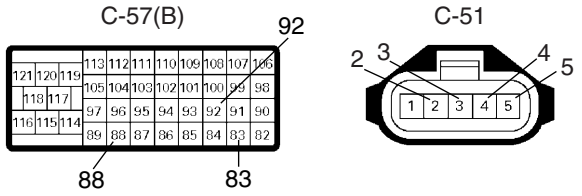
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0400 (Symptom Code 4) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0400 (Symptom Code 4) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to S*tep 4*
4	Check for poor/faulty connection at the EGR EVRV or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Using the DVM and check the EGR EVRV. 1. Ignition “Off”, engine “Off”. 2. Disconnect the EGR EVRV connector. 3. Measure the resistance of EGR EVRV solenoid coil. Does the tester indicate standard resistance? 	Approximately 14Ω at 20°C	Go to *Step 6*	Go to *Step 9*

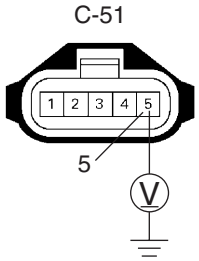
Step	Action	Value(s)	Yes	No
6	Using the DVM and check the EGR EVRV power supply circuit. 1. Ignition “On”, engine “Off”. 2. Remove the EGR EVRV connector. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 8*	Go to *Step 7*
7	Repair the open circuit between the ECM main relay and EGR EVRV. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the EGR EVRV circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Remove the EGR EVRV connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Remove the EGR EVRV connector. 4. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 11*
9	Substitute a known good EGR EVRV and recheck. Was the problem solved?	—	Go to *Step 10*	Go to *Step 11*
10	Replace the EGR EVRV. Is the action complete?	—	Verify repair	—
11	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 12*
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

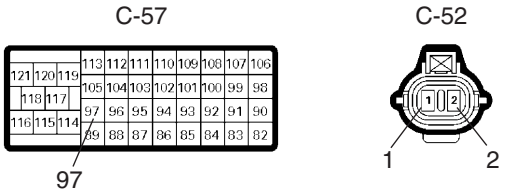
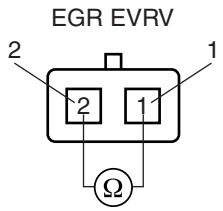
Diagnostic Trouble Code (DTC) P0400 (Symptom Code 5) (Flash Code 32) Exhaust Gas Recirculation Flow Insufficient Detected

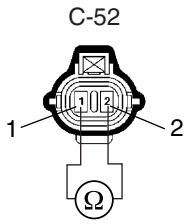
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0400 (Symptom Code 5) stored as “Present Failure”?	—	Go to Step 3	Refer to *Diagnostic Aids* and Go to Step 3
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0400 (Symptom Code 5) stored in this ignition cycle?	—	Go to Step 4	Refer to *Diagnostic Aids* and Go to Step 4
4	Visually check the EGR control vacuum hose. If the hose is clogged or disconnected, repair as necessary. Was the problem found?	—	Verify repair	Go to Step 5
5	Using the DVM and check the EGR EVRV. 1. Ignition “Off”, engine “Off”. 2. Disconnect the EGR EVRV connector. 3. Measure the resistance of EGR EVRV solenoid coil. Does the tester indicate standard resistance? 	Approximately 14Ω at 20°C	Go to Step 8	Go to Step 6
6	Substitute a known good EGR EVRV and recheck. Was the problem solved?	—	Go to Step 7	Go to Step 8
7	Replace the EGR EVRV. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
8	Using the vacuum pump and check the EGR valve operation for the following condition through the small window. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. If a problem is found, repair as necessary. Was a problem found?  	—	Verify repair or Go to Step 10	Go to Step 9
9	Inspect the EGR valve. 1. Remove the EGR valve from the engine. 2. Inspect the EGR valve whether pintle valve is stuck or damaged. If excessive carbon deposit is found, clean up the EGR valve and inspect damage of the pintle and seat. Was the problem found?	—	Verify repair or Go to Step 10	Go to Step 11
10	Replace the EGR valve. Is the action complete?	—	Verify repair	-
11	Check for poor/faulty connection at the MAF sensor or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found?  	—	Verify repair	Go to Step 12
12	Visually check the MAF sensor. Was the problem found?	—	Go to Step 14	Go to Step 13

Step	Action	Value(s)	Yes	No
13	Using the DVM and check the MAF sensor signal circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the MAF sensor connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to Step 16	Repair faulty harness and verify repair
14	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to Step 15	Go to Step 16
15	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
16	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to Step 17
17	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0400 (Symptom Code 8) (Flash Code 32) Exhaust Gas Recirculation Circuit Short to Battery

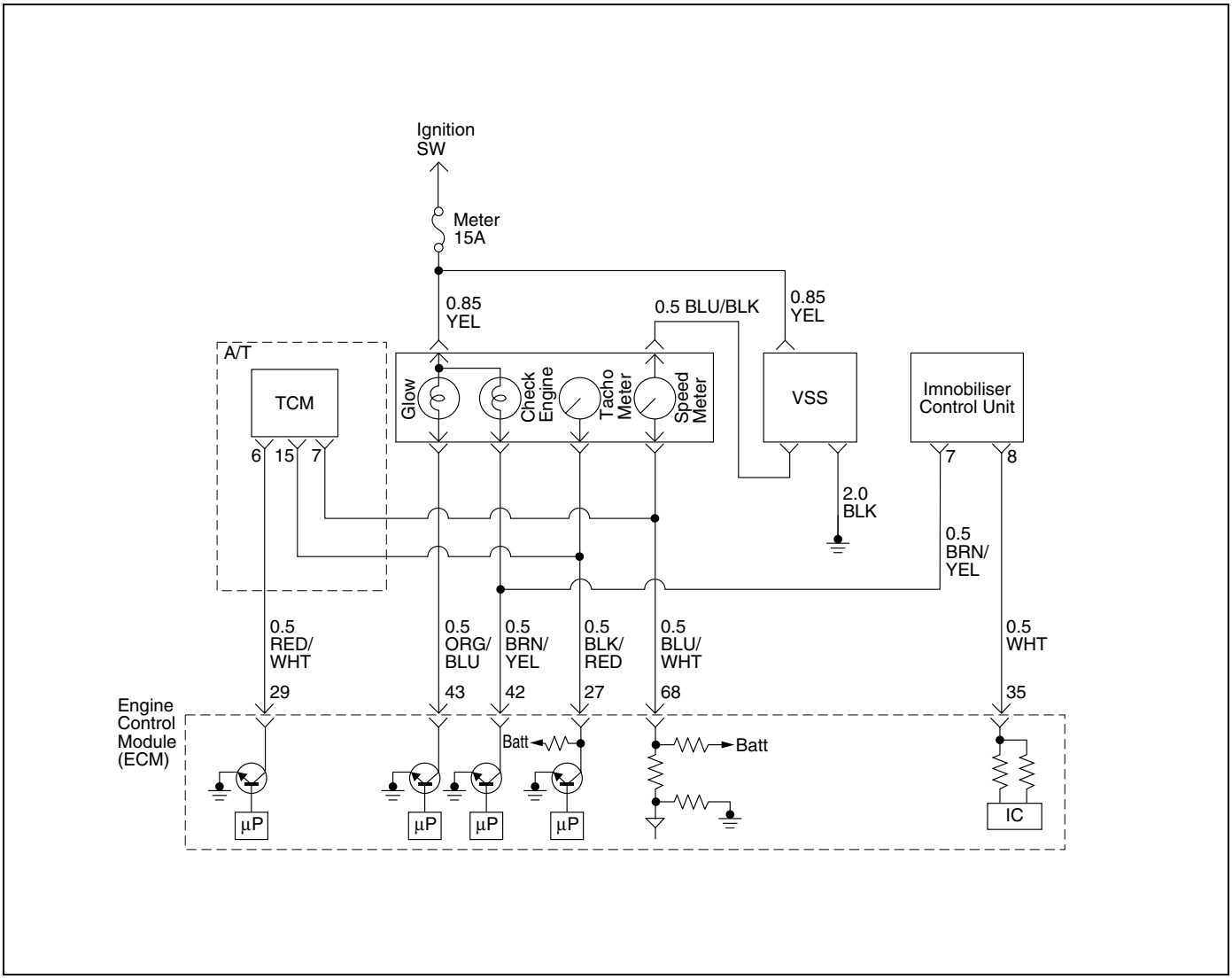
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0400 (Symptom Code 8) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0400 (Symptom Code 8) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Check for poor/faulty connection at the EGR EVRV or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Using the DVM and check the EGR EVRV. 1. Ignition “Off”, engine “Off”. 2. Disconnect the EGR EVRV connector. 3. Measure the resistance of EGR EVRV solenoid coil. Does the tester indicate standard resistance? 	Approximately 14Ω at 20°C	Go to *Step 6*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the EGR EVRV circuit. 1. Ignition “Off”, engine “Off”. 2. Remove the EGR EVRV connector and ECM connector. 3. 3. Check the circuit for short to voltage circuit. Was the DVM indicated specified value? 	No continuity	Go to *Step 10*	Go to *Step 7*
7	Repair the short to voltage circuit. Is the action complete?	—	Verify repair	—
8	Substitute a known good EGR EVRV and recheck. Was the problem solved?	—	Go to *Step 9*	Go to *Step 10*
9	Replace the EGR EVRV. Is the action complete?	—	Verify repair	—
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0500 (SYMPTOM CODE 1) (FLASH CODE 24) VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P0500 (SYMPTOM CODE A) (FLASH CODE 24) VEHICLE SPEED SENSOR INPUT SIGNAL FREQUENCY TOO HIGH

DIAGNOSTIC TROUBLE CODE (DTC) P0500 (SYMPTOM CODE B) (FLASH CODE 24) VEHICLE SPEED SENSOR INCORRECT SIGNAL



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
24	P0500	1	ON at next ignition cycle	Vehicle Speed Sensor Circuit High Input	Vehicle speed is more than 200km/h.	ECM uses vehicle speed 5km/h condition as substitute.
		A	ON at next ignition cycle	Vehicle Speed Sensor Input Signal Frequency Too High	Input signal frequency is too high.	ECM uses vehicle speed 5km/h condition as substitute.
		B	ON at next ignition cycle	Vehicle Speed Sensor Incorrect Signal	1. Engine speed is more than 3600rpm. 2. Fuel injection quantity is more than 41mg/stk. 3. Vehicle speed is below 1.5km/h.	Fuel injection quantity is reduced.

Circuit Description

The VSS is a magnet rotated by the transmission output shaft. The VSS uses a hall element. It interacts with the magnetic field treated by the rotating magnet. It outputs pulse signal. The 12 volts operating supply from the meter fuse.
The engine control module (ECM) calculates the vehicle speed by VSS.

Diagnostic Aids

An intermittent may be caused by the following:

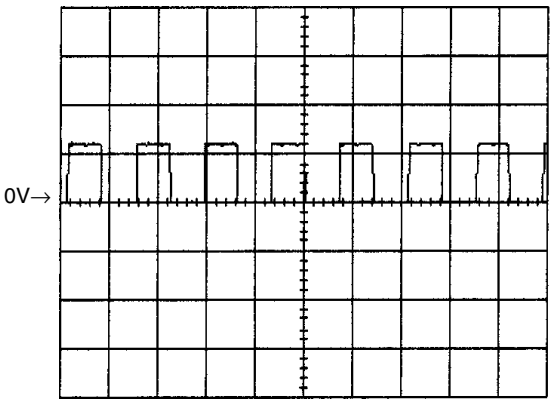
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

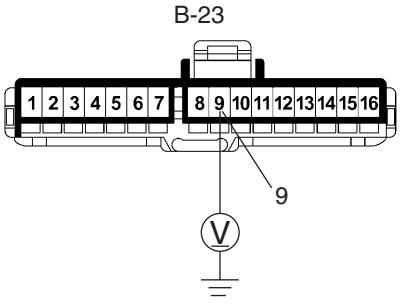
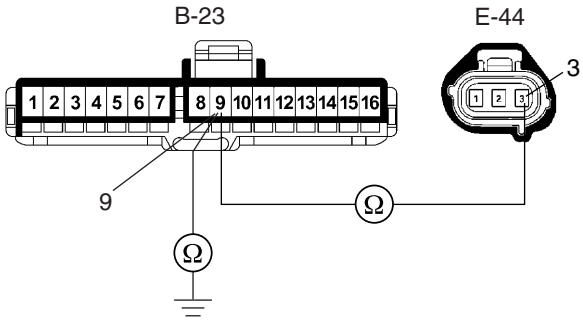
- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P0500 display on the Tech2 while moving connectors and wiring harnesses. A change in the display will indicate the location of the fault.

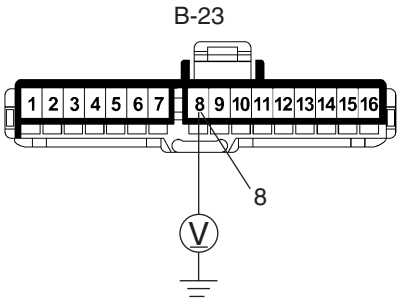
Diagnostic Trouble Code (DTC) P0500 (Symptom Code 1) (Flash Code 24) Vehicle Speed Sensor Circuit High Input

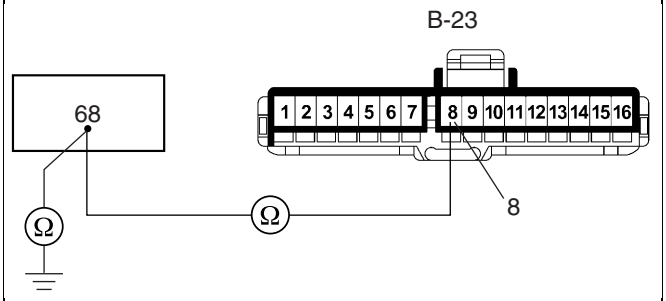
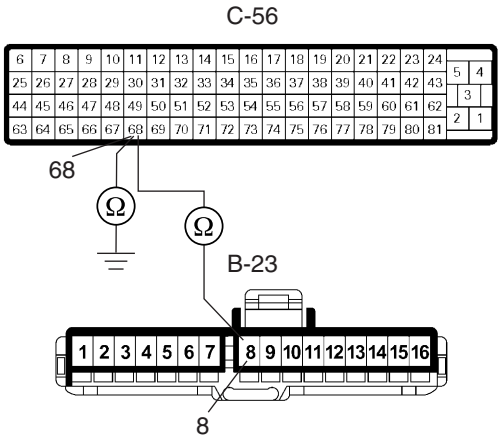
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0500 (Symptom Code 1) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*

<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>1. Using the Tech 2, ignition “On” and engine “Off”.
2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information.
3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”.
Was the DTC P0500 (Symptom Code 1) stored in this ignition cycle?</td><td>—</td><td>Go to Step 4</td><td>Refer to Diagnostic Aids and Go to Step 4</td></tr>
<tr><td>4</td><td>Perform test drive and check the speed meter.
Does the speed meter indicate correct vehicle speed.</td><td>—</td><td>Go to Step 5</td><td>Go to Step 6</td></tr>
<tr><td>5</td><td>Perform test drive and use the Tech 2.
Monitor the “Vehicle Speed” in the data display.
Does the Tech 2 indicate correct vehicle speed as same as the speed meter indication in the instrument panel?</td><td>—</td><td>Go to Step 14</td><td>Go to Step 7</td></tr>
<tr><td>6</td><td>Remove the VSS from the housing case and visually check.
Was the problem found?</td><td>—</td><td>Go to Step 8</td><td>Go to Step 7</td></tr>
<tr><td>7</td><td>Using the DVM and check the VSS signal.
1. Ignition “On”, vehicle “Run (lift up)”.
2. Measure the VSS output voltage at sensor, meter and ECM.
Does the tester indicate specified value?
<table>
<tr><th>Measurement Position</th><th>Voltage (V) (AC Range)</th><th>If No Good</th></tr>
<tr><td>VSS terminal 3 & GND</td><td rowspan="4">Approximately 6.5 V at 20km/h</td><td>Go to Step 8</td></tr>
<tr><td>Meter B23 connector 9 & GND</td><td>Go to Step 9</td></tr>
<tr><td>Meter B23 connector 8 & GND</td><td>Go to Step 11</td></tr>
<tr><td>ECM C56 connector 68 & GND</td><td>Go to Step 12</td></tr>
</table>
If a oscilloscope is available, monitor the VSS signal at each connector connection. Does the oscilloscope indicate correct wave form?
Vehicle Speed Sensor Reference Wave Form
 

Measurement Scale: 10V/div 50ms/div
Measurement Condition: Vehicle Speed 20km/h
Measurement Terminal: At Engine Control Module</td><td></td><td>Refer to Diagnostic Aids and Go to Step 14</td><td>Refer the table</td></tr>
</table>

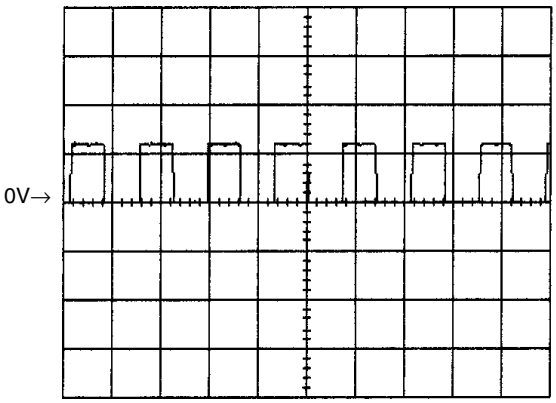
Step	Action	Value(s)	Yes	No
8	Replace the VSS. Is the action complete?	—	Verify repair	
9	Using the DVM and check the VSS signal circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the meter connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 10*	Repair faulty harness and verify repair
10	Using the DVM and check the VSS signal circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the VSS connector and meter connector. 3. Check the circuit for open or short to ground circuit. If a open or short to ground circuit is found, repair the faulty harness and verify repair. Is the action complete? 	—	Verify repair	—
11	Replace the speed meter. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
12	Using the DVM and check the VSS signal circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the meter connector and ECM connector. 3. Ignition “On”. 4. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 13*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
13	Using the DVM and check the VSS signal circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the meter connector. 4. Check the circuit for open or shot to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the meter connector and ECM connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 14*
14	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 15*
15	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0500 (Symptom Code A) (Flash Code 24) Vehicle Speed Sensor Input Signal Frequency Too High

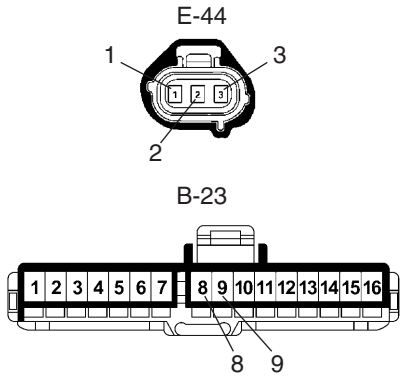
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0500 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0500 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Perform test drive and check the speed meter. Does the speed meter indicate correct vehicle speed.	—	Go to *Step 5*	Go to *Step 6*
5	Perform test drive and use the Tech 2. Monitor the “Vehicle Speed” in the data display. Does the Tech 2 indicate correct vehicle speed as same as the speed meter indication in the instrument panel?	—	Go to *Step 9*	Go to *Step 7*
6	Remove the VSS from the housing case and visually check. Was the problem found?	—	Go to *Step 8*	Go to *Step 7*

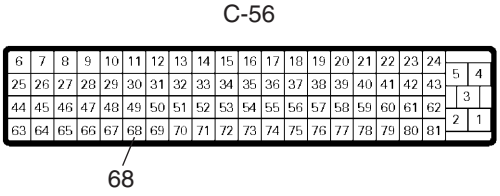
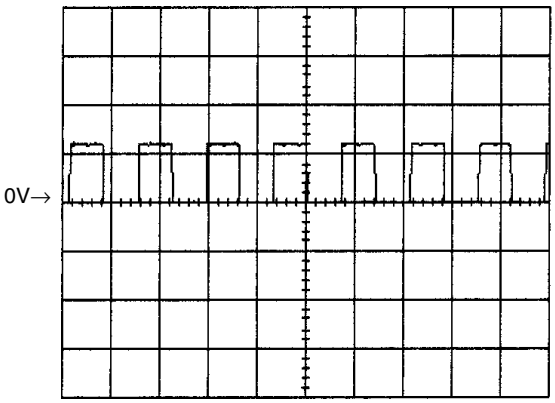
<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Using the DVM and check the VSS signal.
1. Ignition “On”, vehicle “Run (lift up)”.
2. Measure the VSS output voltage at sensor, meter and ECM.
Does the tester indicate specified value?
<table><tr><th>Measurement Position</th><th>Voltage (V) (AC Range)</th><th>If No Good</th></tr><tr><td>VSS terminal 3 & GND</td><td rowspan="4">Approximately 6.5 V at 20km/h</td><td>Go to Step 8</td></tr><tr><td>Meter B23 connector 9 & GND</td><td>Go to Step 9</td></tr><tr><td>Meter B23 connector 8 & GND</td><td>Go to Step 10</td></tr><tr><td>ECM C56 connector 68 & GND</td><td>Go to Step 9</td></tr></table>If a oscilloscope is available, monitor the VSS signal at each connector connection. Does the oscilloscope indicate correct wave form?
Vehicle Speed Sensor Reference Wave Form
 

Measurement Scale: 10V/div 50ms/div
Measurement Condition: Vehicle Speed 20km/h
Measurement Terminal: At Engine Control Module</td><td></td><td>Refer to Diagnostic Aids and Go to Step 9</td><td>Refer the table</td></tr>
<tr><td>8</td><td>Replace the VSS.
Is the action complete?</td><td>—</td><td>Verify repair</td><td></td></tr>
<tr><td>9</td><td>Check any accessory parts which may cause electric interference or magnetic interference.
Was the problem found?</td><td>—</td><td>Remove the accessory parts and verify repair</td><td>Go to Step 11</td></tr>
<tr><td>10</td><td>Replace the speed meter.
Is the action complete?</td><td>—</td><td>Verify repair</td><td>—</td></tr>
<tr><td>11</td><td>Is the ECM programmed with the latest software release?
If not, download the latest software to the ECM using the “SPS (Service Programming System)”.
Was the problem solved?</td><td>—</td><td>Verify repair</td><td>Go to Step 12</td></tr>
</table>

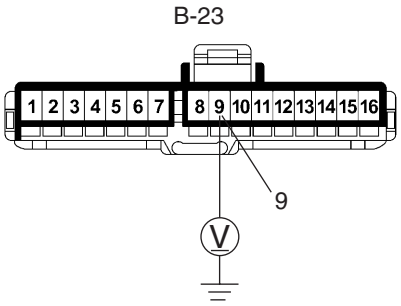
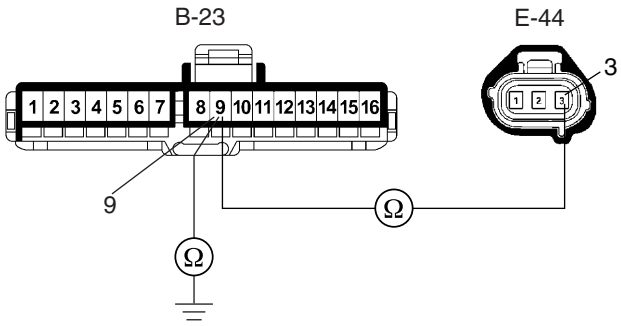
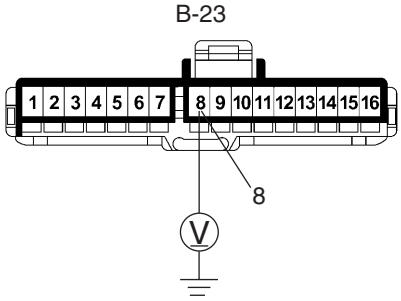
Step	Action	Value(s)	Yes	No
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

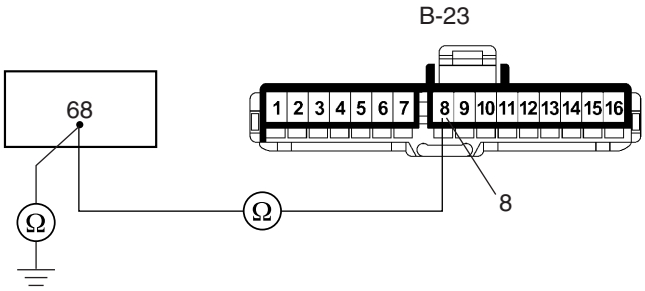
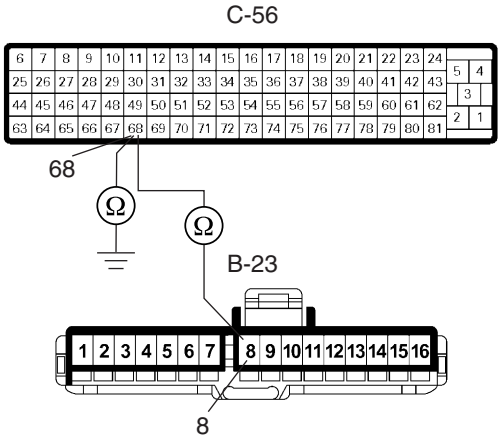
Diagnostic Trouble Code (DTC) P0500 (Symptom Code B) (Flash Code 24) Vehicle Speed Sensor Incorrect Signal

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0500 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0500 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Perform test drive and check the speed meter. Does the speed meter indicate correct vehicle speed.	—	Go to *Step 5*	Go to *Step 6*
5	Perform test drive and use the Tech 2. Monitor the “Vehicle Speed” in the data display. Does the Tech 2 indicate correct vehicle speed as same as the speed meter indication in the instrument panel?	—	Go to *Step 16*	Go to *Step 7*
6	Check for poor/faulty connection at the VSS and meter connectors. If a poor/faulty connection is found, repair the faulty terminal. Was the problem found? 	—	Verify repair	Go to *Step 8*

<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Check for poor/faulty connection at the ECM and other connectors. If a poor/faulty connection is found, repair the faulty terminal.
Was the problem found?
 
</td><td>—</td><td>Verify repair</td><td>Go to Step 9</td></tr>
<tr><td>8</td><td>Remove the VSS from the housing case and visually check.
Was the problem found?</td><td>—</td><td>Go to Step 10</td><td>Go to Step 9</td></tr>
<tr><td>9</td><td>Using the DVM and check the VSS signal.
1. Ignition “On”, vehicle “Run (lift up)”.
2. Measure the VSS output voltage at sensor, meter and ECM.
Does the tester indicate specified value?
<table>
<tr><th>Measurement Position</th><th>Voltage (V) (AC Range)</th><th>If No Good</th></tr>
<tr><td>VSS terminal 3 & GND</td><td rowspan="4">Approximately 6.5 V at 20km/h</td><td>Go to Step 10</td></tr>
<tr><td>Meter B23 connector 9 & GND</td><td>Go to Step 11</td></tr>
<tr><td>Meter B23 connector 8 & GND</td><td>Go to Step 13</td></tr>
<tr><td>ECM C56 connector 68 & GND</td><td>Go to Step 14</td></tr>
</table>
If a oscilloscope is available, monitor the VSS signal at each connector connection. Does the oscilloscope indicate correct wave form?
Vehicle Speed Sensor Reference Wave Form
 

Measurement Scale: 10V/div 50ms/div
Measurement Condition: Vehicle Speed 20km/h
Measurement Terminal: At Engine Control Module</td><td></td><td>Refer to Diagnostic Aids and Go to Step 16</td><td>Refer the table</td></tr>
<tr><td>10</td><td>Replace the VSS.
Is the action complete?</td><td>—</td><td>Verify repair</td><td></td></tr>
</table>

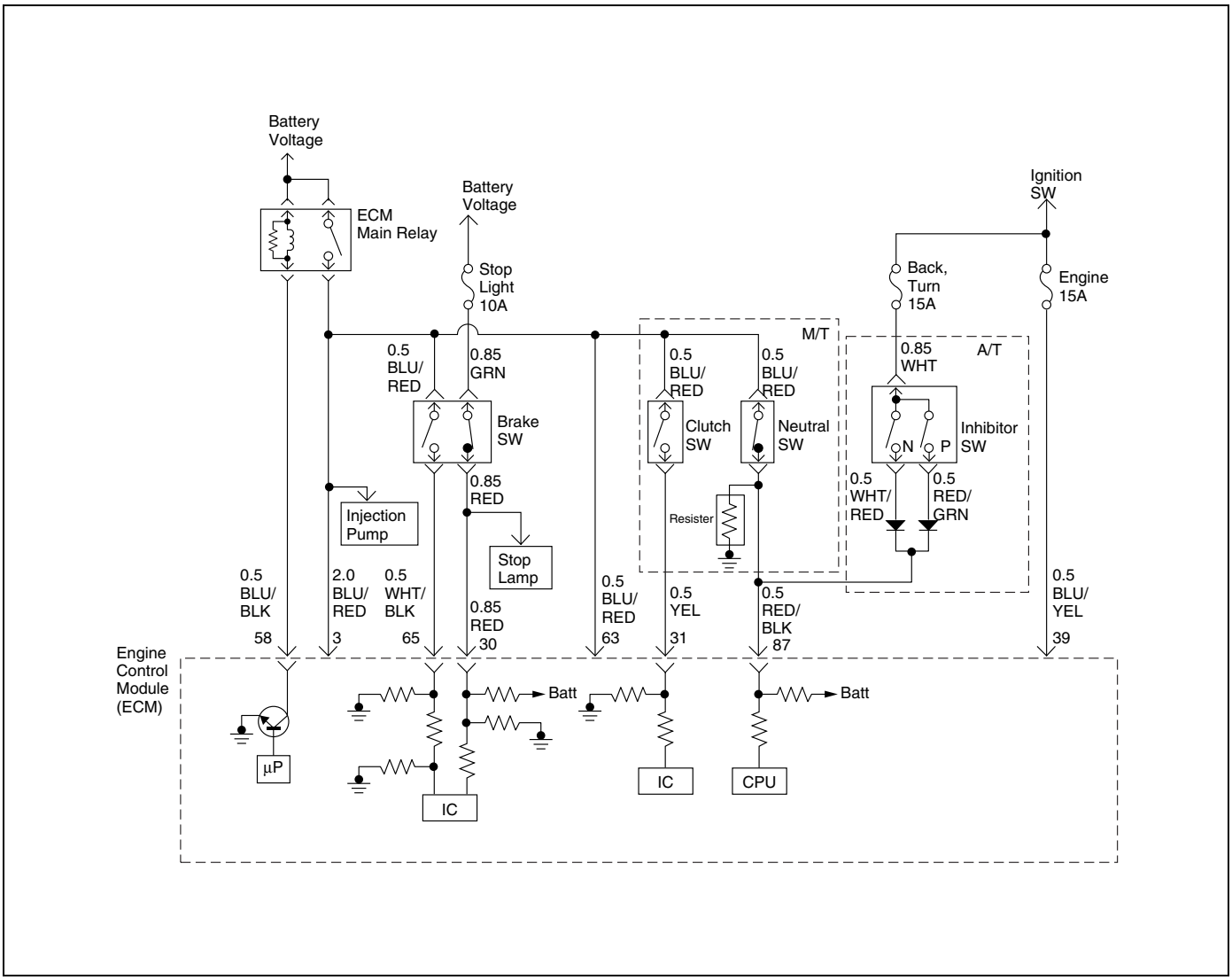
Step	Action	Value(s)	Yes	No
11	Using the DVM and check the VSS signal circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the meter connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 12*	Repair faulty harness and verify repair
12	Using the DVM and check the VSS signal circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the VSS connector and meter connector. 3. Check the circuit for open or short to ground circuit. If a open or short to ground circuit is found, repair the faulty harness and verify repair. Is the action complete? 	—	Verify repair	—
13	Replace the speed meter. Is the action complete?	—	Verify repair	—
14	Using the DVM and check the VSS signal circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the meter connector and ECM connector. 3. Ignition “On”. 4. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 15*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
15	Using the DVM and check the VSS signal circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the meter connector. 4. Check the circuit for open or shot to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the meter connector and ECM connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 16*
16	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 17*
17	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0560 (SYMPTOM CODE 1) (FLASH CODE 35) SYSTEM VOLTAGE TOO HIGH

DIAGNOSTIC TROUBLE CODE (DTC) P0560 (SYMPTOM CODE 2) (FLASH CODE 35) SYSTEM VOLTAGE TOO LOW

DIAGNOSTIC TROUBLE CODE (DTC) P0560 (SYMPTOM CODE A) (FLASH CODE 35) SYSTEM VOLTAGE MALFUNCTION (PSG)



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
35	P0560	1	OFF	System Voltage Too High	System voltage is more than 20V.	ECM uses 9V conditions as substitute.
		2	OFF	System Voltage Too Low	System voltage is below 7V.	
		A	OFF	System Voltage Malfunction (PSG)	System voltage of PSG (pump control unit) is below 4.5V or more than 27V.	PSG uses default voltage as substitute.

Circuit Description

The ECM and PSG monitors the system voltage on the ignition feed terminal to the ECM or PSG. The system voltage to the ECM excessively high or low, DTC P0560 (Symptom Code 1) or P0560 (Symptom Code 2) will be stored. The system voltage to the PSG excessively high

or low, DTC P0560 (Symptom Code A) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

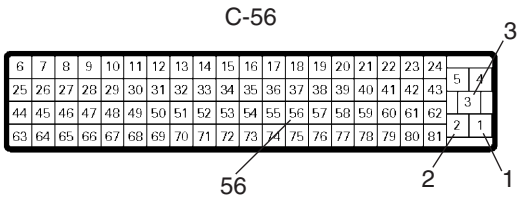
- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “System Voltage” display on the Tech2 while moving connectors and wiring harness related to the sensor.

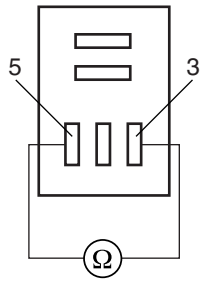
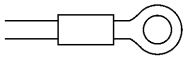
Diagnostic Trouble Code (DTC) P0560 (Symptom Code 1) (Flash Code 35) System Voltage Too High

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0560 (Symptom Code 1) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to S*tep 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0560 (Symptom Code 1) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Was the battery jump start cable incorrectly connecting?	—	Verify procedure	Go to *Step 5*
5	1. Using the Tech 2, ignition “On” and engine “On”. 2. Monitor the “System Voltage” in the data display. 3. Load the electrical system by turning on the headlights, etc.. Does the Tech 2 indicate correct ignition voltage?	10 - 14V	Go to *Step 6*	Check the charging system
6	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 7*

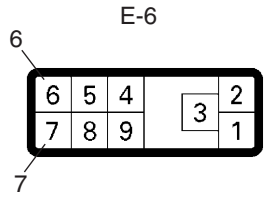
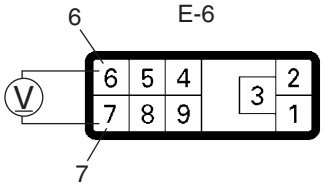
Step	Action	Value(s)	Yes	No
7	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

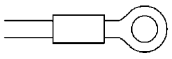
Diagnostic Trouble Code (DTC) P0560 (Symptom Code 2) (Flash Code 35) System Voltage Too Low

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0560 (Symptom Code 2) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0560 (Symptom Code 2) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Using the Tech 2, ignition “On” and engine “On”. 2. Monitor the “System Voltage” in the data display. 3. Load the electrical system by turning on the headlights, etc.. Does the Tech 2 indicate enough ignition voltage?	10 - 14V	Go to *Step 6*	Go to *Step 5*
5	Using the DVM and check the battery voltage at the battery terminal. Does the tester indicate enough battery voltage?	10 - 14V	Go to *Step 6*	Check the charging system, charge or replace the battery
6	Check for poor/faulty connection at the ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 7*

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the ECM main relay. 1. Ignition “Off”, engine “Off”. 2. Remove the ECM main relay from the relay box. 3. Check the relay coil. Was the DVM indicated specified value? ECM Main Relay 	Continuity	Go to *Step 8*	Replace ECM main relay and verify repair
8	Check for poor/faulty connection of the ECM ground at the fender panel. If a poor/faulty connection is found, repair as necessary. Was the problem found? C-36 	—	Verify repair	Go to *Step 9*
9	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 10*
10	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

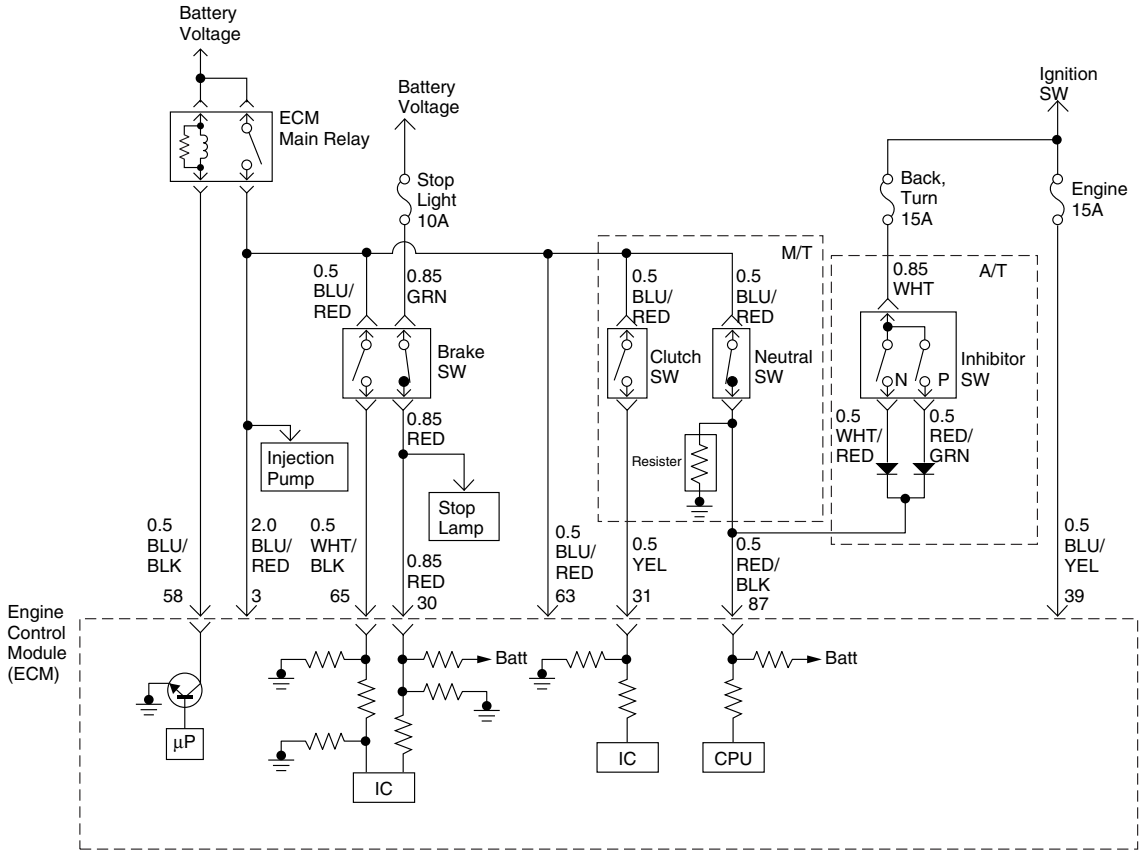
Diagnostic Trouble Code (DTC) P0560 (Symptom Code A) (Flash Code 35) System Voltage Malfunction (PSG)

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0560 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0560 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the PSG (pump control unit) connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Using the DVM and check the PSG (pump control unit) power supply circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the PSG (pump control unit) power supply circuit. Was the DVM indicated specified value? 	10 - 14V	Go to *Step 7*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	Check for poor/faulty connection of the PSG (pump control unit) ground at the cylinder body. If a poor/faulty connection is found, repair as necessary. Was the problem found? E-10 	—	Verify repair	Go to *Step 7*
7	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0561 (SYMPTOM CODE A) (FLASH CODE 18) SYSTEM VOLTAGE CIRCUIT MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0561 (SYMPTOM CODE B) (FLASH CODE 18) SYSTEM VOLTAGE CIRCUIT MALFUNCTION



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
18	P0561	A	OFF	System Voltage Circuit Malfunction	The ECM recognized ignition switch turn off signal during ECM is activated.	ECM stops engine.
		B	ON	System Voltage Circuit Malfunction	Ignition switch circuit is malfunction.	

Circuit Description

The ECM monitors the ignition switch signal on the feed terminal to the ECM. If the ignition switch signal with malfunction, DTC P0561 (Symptom Code A) or DTC P0561 (Symptom Code B) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

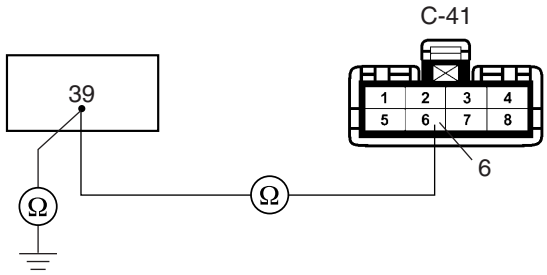
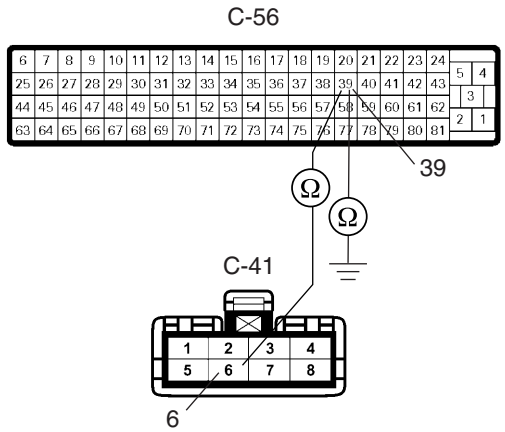
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Ignition Status” display on the Tech2 while moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P0561 (Symptom Code A) (Flash Code 18) System Voltage Circuit Malfunction

Diagnostic Trouble Code (DTC) P0561 (Symptom Code B) (Flash Code 18) System Voltage Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0561 (Symptom Code A) or P0561 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0561 (Symptom Code A) or P0561 (Symptom Code B)stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check the “Engine-2” fuse (10A). If the fuse is burnt out, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 5*

Step	Action	Value(s)	Yes	No
5	Using the DVM and check the ignition power feed circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) 3. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 6*
6	Check the ignition switch. If a poor/faulty connection is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 7*
7	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0602 ECU PROGRAMMING ERROR

Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
-	P0602	-	-	Programming Error	ECM memory area error.	Engine control disabled.

Circuit Description & Diagnostic Aids

The replacement ECM must be programmed by Service Programming System (SPS). Because, the service ECM does not programmed.
When the service ECM is used without SPS, DTC P0602 will appear.

Diagnostic Trouble Code (DTC) P0602 ECU Programming Error

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0602 stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	Download the latest software to the ECM using the “**SPS (Service Programming System)”.** Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0606 (SYMPTOM CODE A) (FLASH CODE 28) ECU MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0606 (SYMPTOM CODE B) (FLASH CODE 28) ECU MALFUNCTION

Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
28	P0606	A	ON	ECM Malfunction (1)	Gate Array communication error.	1. MAB (fuel cutoff solenoid valve cutoff) is operated. 2. Desired injection quantity becomes 0mg/strk.
		B	ON	ECM Malfunction (2)	1. Throttle position is below 1%. 2. Desired injection quantity is more than 0mg/strk. 3. Engine speed is more than 2000rpm.	MAB (fuel cutoff solenoid valve cutoff) is operated.

Circuit Description & Diagnostic Aids

If the ECM inside (IC, circuit, memory, etc,) failed, DTC P0606 (Symptom Code A) or P0606 (Symptom Code B) will be stored.

Diagnostic Trouble Code (DTC) P0606 (Symptom Code A) (Flash Code 28) ECU Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0606 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0606 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*

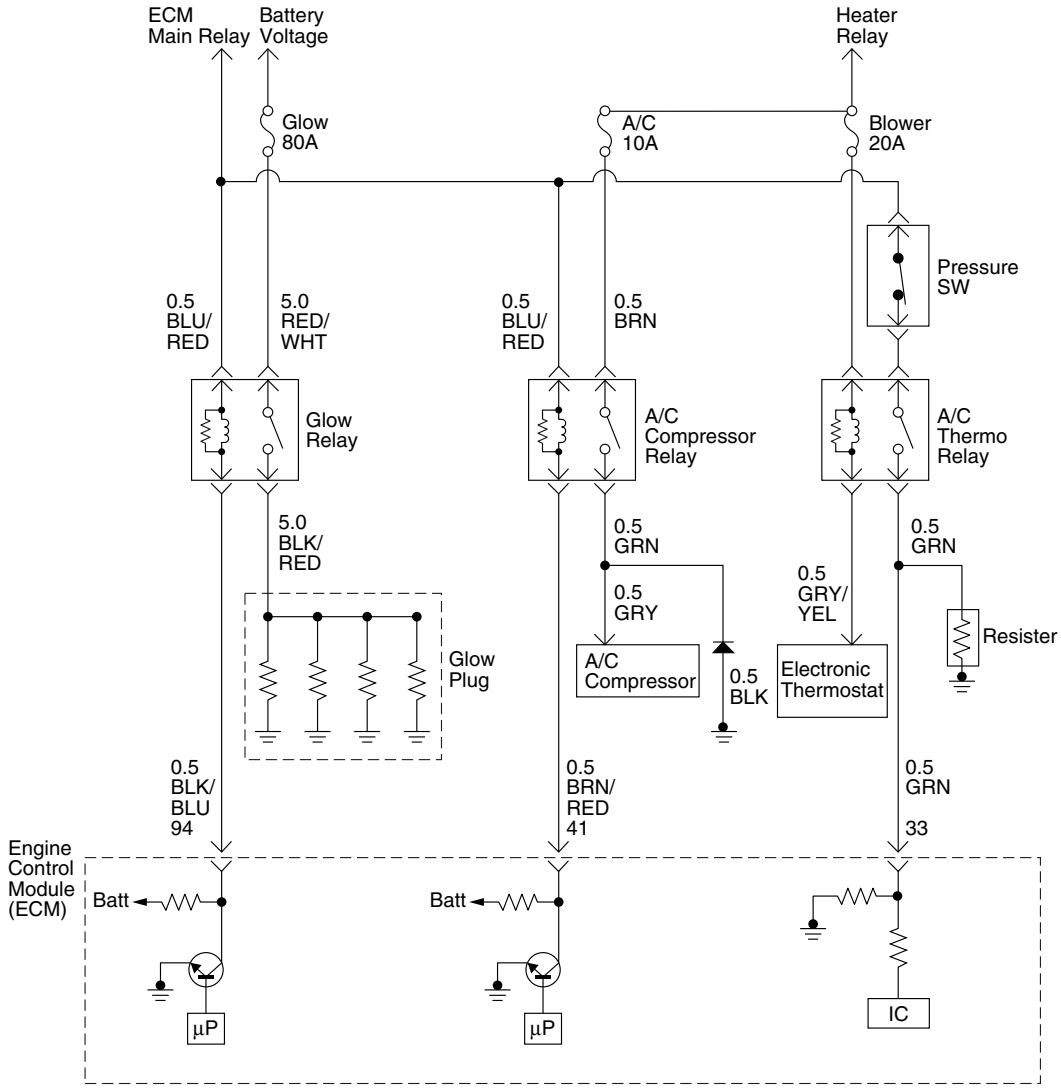
Step	Action	Value(s)	Yes	No
5	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0606 (Symptom Code B) (Flash Code 28) ECU Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0606 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0606 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	Go to *Step 7*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
7	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0645 (SYMPTOM CODE 4) (FLASH CODE 46) A/C COMPRESSOR RELAY CIRCUIT VOLTAGE LOW

DIAGNOSTIC TROUBLE CODE (DTC) P0645 (SYMPTOM CODE 8) (FLASH CODE 46) A/C COMPRESSOR RELAY CIRCUIT VOLTAGE HIGH



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
46	P0645	4	ON	A/C Compressor Relay Circuit Voltage Low	A/C compressor relay circuit open or short to ground circuit.	No fail-safe function.
		8	ON	A/C Compressor Relay Circuit Voltage High	A/C compressor relay circuit short to voltage circuit.	

Circuit Description

The voltage on the coil of the A/C compressor is supplied by the ECM main relay. The ECM switches A/C compressor relay to operate A/C compressor depends on the A/C request signal and certain setting conditions.

Diagnostic Aids

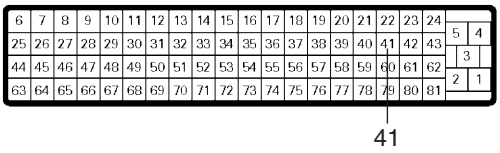
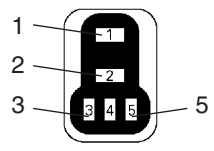
An intermittent may be caused by the following:

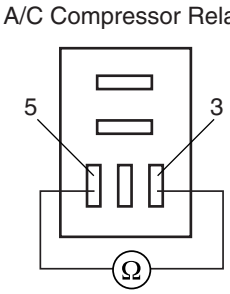
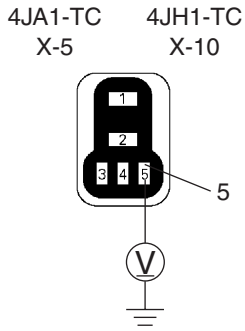
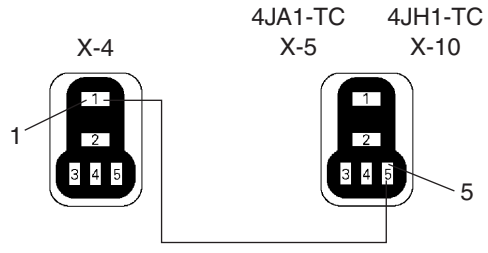
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

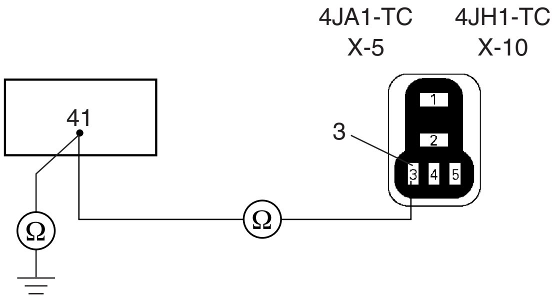
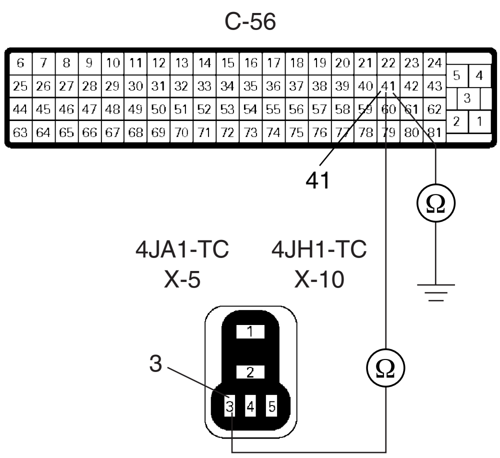
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P0645 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P0645 (Symptom Code 4) (Flash Code 46) A/C Compressor Relay Circuit Voltage Low

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0645 (Symptom Code 4) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0645 (Symptom Code 4) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the A/C compressor relay or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? C-56  41 4JA1-TC X-5 4JH1-TC X-10  	—	Verify repair	Go to *Step 5*

Step	Action	Value(s)	Yes	No
5	Using the DVM and check the A/C compressor relay. 1. Ignition “Off”, engine “Off”. 2. Remove the A/C compressor relay from the relay box. 3. Check the relay coil. Was the DVM indicated specified value? 	Continuity	Go to *Step 6*	Replace A/C compressor relay and verify repair
6	Using the DVM and check the A/C compressor relay power supply circuit. 1. Ignition “On”, engine “Off”. 2. Remove the A/C compressor relay from the relay box. 3. Check the circuit for open or short to ground circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 8*	Go to *Step 7*
7	Repair the open or short to ground circuit between the ECM main relay and A/C compressor relay. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the A/C compressor relay ground circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) 3. Remove the A/C compressor relay from the relay box. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Remove the A/C compressor relay from the relay box. 4. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 9*
9	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 10*

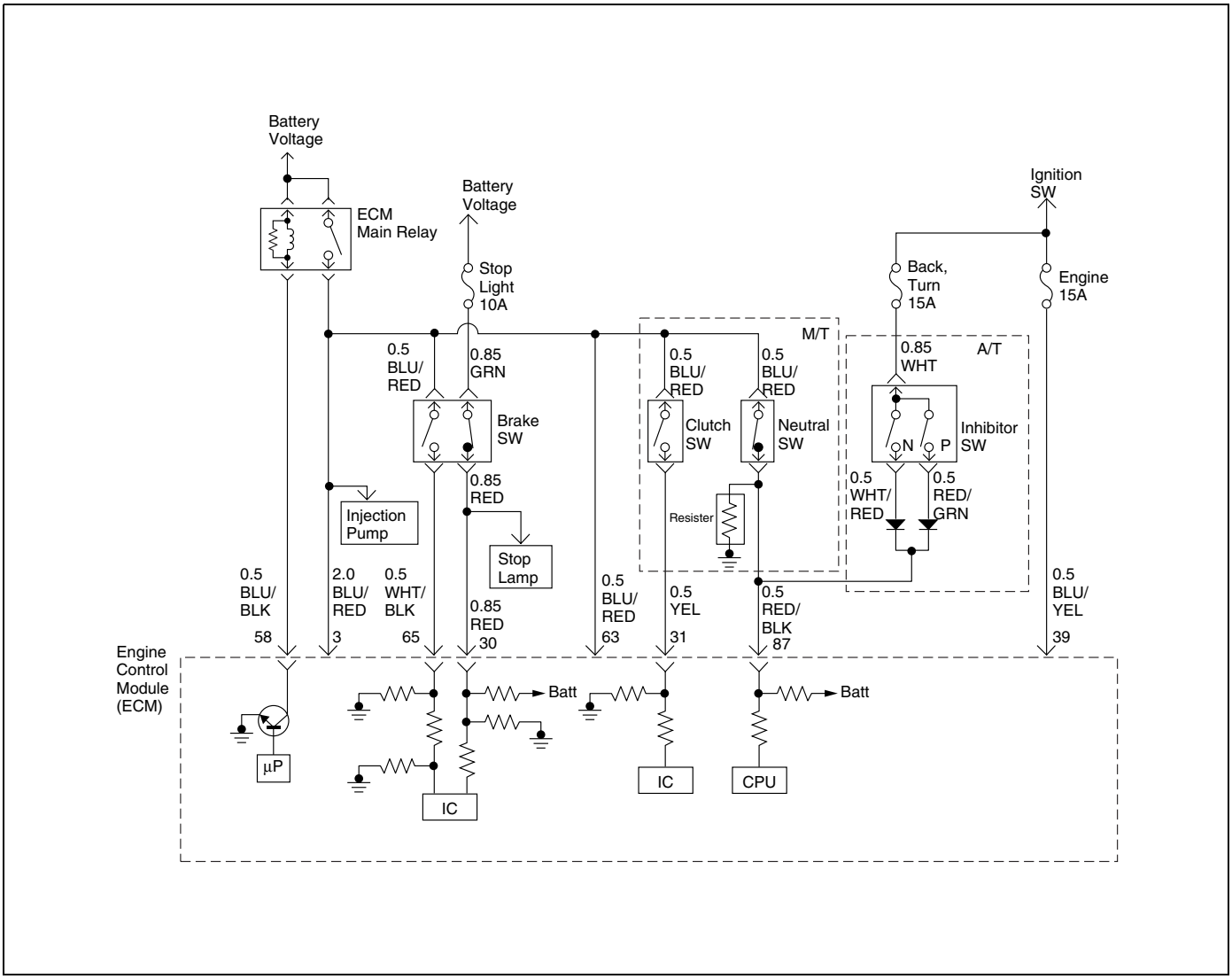
Step	Action	Value(s)	Yes	No
10	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0645 (Symptom Code 8) (Flash Code 46) A/C Compressor Relay Circuit Voltage High

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0645 (Symptom Code 8) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0645 (Symptom Code 8) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	—
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0703 (SYMPTOM CODE A) (FLASH CODE 25) BRAKE SWITCH MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P0703 (SYMPTOM CODE B) (FLASH CODE 25) BRAKE SWITCH MALFUNCTION



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
25	P0703	A	ON	Brake Switch Malfunction	1. Throttle position is more than 0%. 2. Engine speed is more than 693rpm (4JA1-TC) or 665rpm (4JH1-TC). 3. Vehicle speed is more than 0km/h. 4. Brake switch 1 signal and brake switch 2 signal are differently inputted to the ECM since the ignition switch was turned on.	No fail-safe function.
		B	ON	Brake Switch Malfunction	1. Throttle position is more than 0%. 2. Engine speed is more than 693rpm (4JA1-TC) or 665rpm (4JH1-TC). 3. Vehicle speed is more than 0km/h. 4. Brake switch 1 signal and brake switch 2 signal are differently inputted to the ECM.	

Circuit Description

The ECM monitors the brake switch signal on the feed terminal to the ECM. If brake switch 1 or 2 circuit with malfunction, DTC P0703 (Symptom Code A) or P0703 (Symptom Code B) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

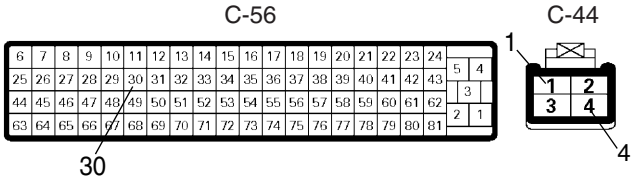
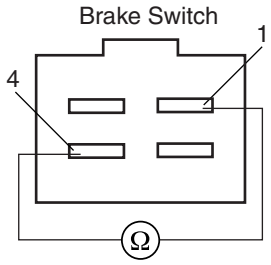
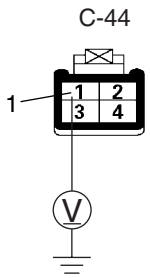
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

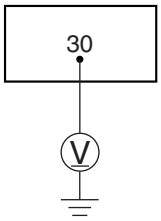
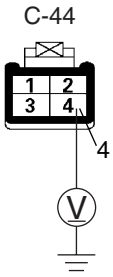
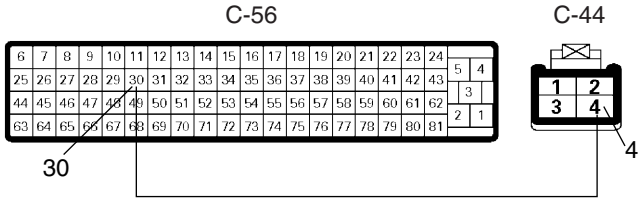
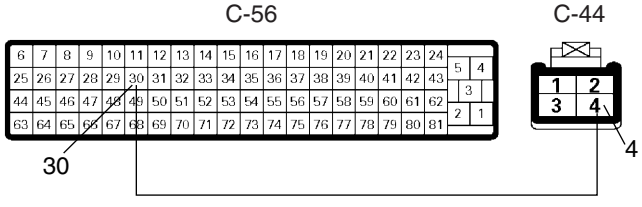
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Brake Switch 1” and “Brake Switch 2” display on the Tech2 while moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P0703 (Symptom Code A) (Flash Code 25) Brake Switch Malfunction

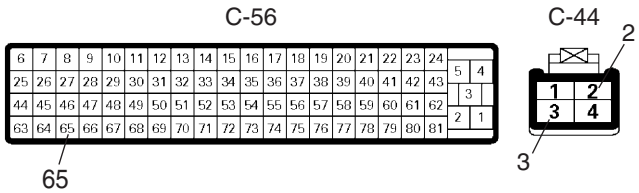
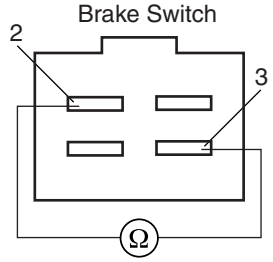
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0703 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*

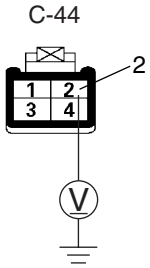
Step	Action	Value(s)	Yes	No
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0703 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check the “Stop Light fuse (10A)”. If the fuse is burnt out, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 5*
5	Check for poor/faulty connection at the brake switch or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 6*
6	Using the DVM and check the brake switch 1. 1. Ignition “Off”, engine “Off”. 2. Remove the brake switch connector at the brake pedal. 3. Check the brake switch 1. Was the DVM indicated specified value? 	Pedal is not stepped on: Continuity Pedal stepped on: No continuity	Go to *Step 7*	Replace pedal switch and verify repair
7	Using the DVM and check the brake switch 1 power supply circuit. 1. Ignition “Off”, engine “Off”. 2. Remove the brake switch connector from the brake switch. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 9*	Go to *Step 8*

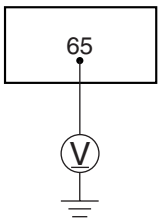
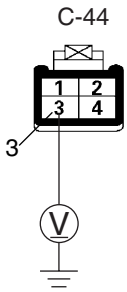
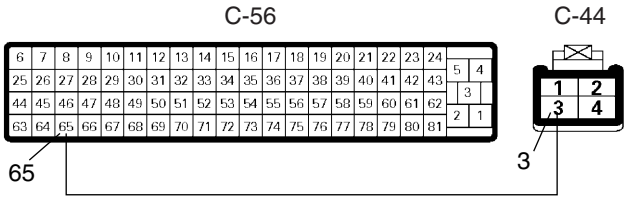
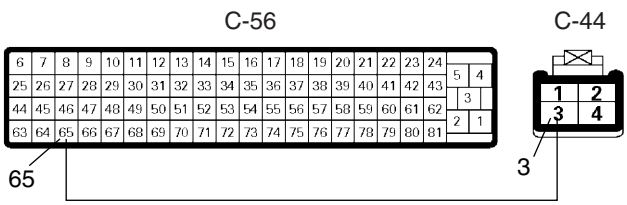
Step	Action	Value(s)	Yes	No
8	Repair the open circuit between the “Stop Light fuse (10A)” and brake switch 1. Is the action complete?	—	Verify repair	—
9	Using the DVM and check the brake switch 1 circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type B. (ECM connected) Ref. Page 6E-81 3. Ignition “On”, engine “Off”. 4. Check the circuit for open or short to voltage circuit. Was the DVM indicated specified value?  **Breaker box is not available:** 1. Ignition “On”, engine “Off”. 2. Back probe the DVM to the brake switch 1 and check the circuit for open or short to voltage circuit. Was the problem found? 	Pedal is not stepped on: Less than 1V Pedal stepped on: Battery voltage	Go to *Step 12*	Fixed at battery voltage: Go to *Step 10* Fixed at less than 1V: Go to *Step 11*
10	Repair the short to voltage circuit between the brake switch 1 connector and ECM. Is the action complete? 	—	Verify repair	—
11	Repair the open circuit between the brake switch 1 connector and ECM. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
12	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the "**SPS (Service Programming System)".** Was the problem solved?	—	Verify repair	Go to *Step 13*
13	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P0703 (Symptom Code B) (Flash Code 25) Brake Switch Malfunction

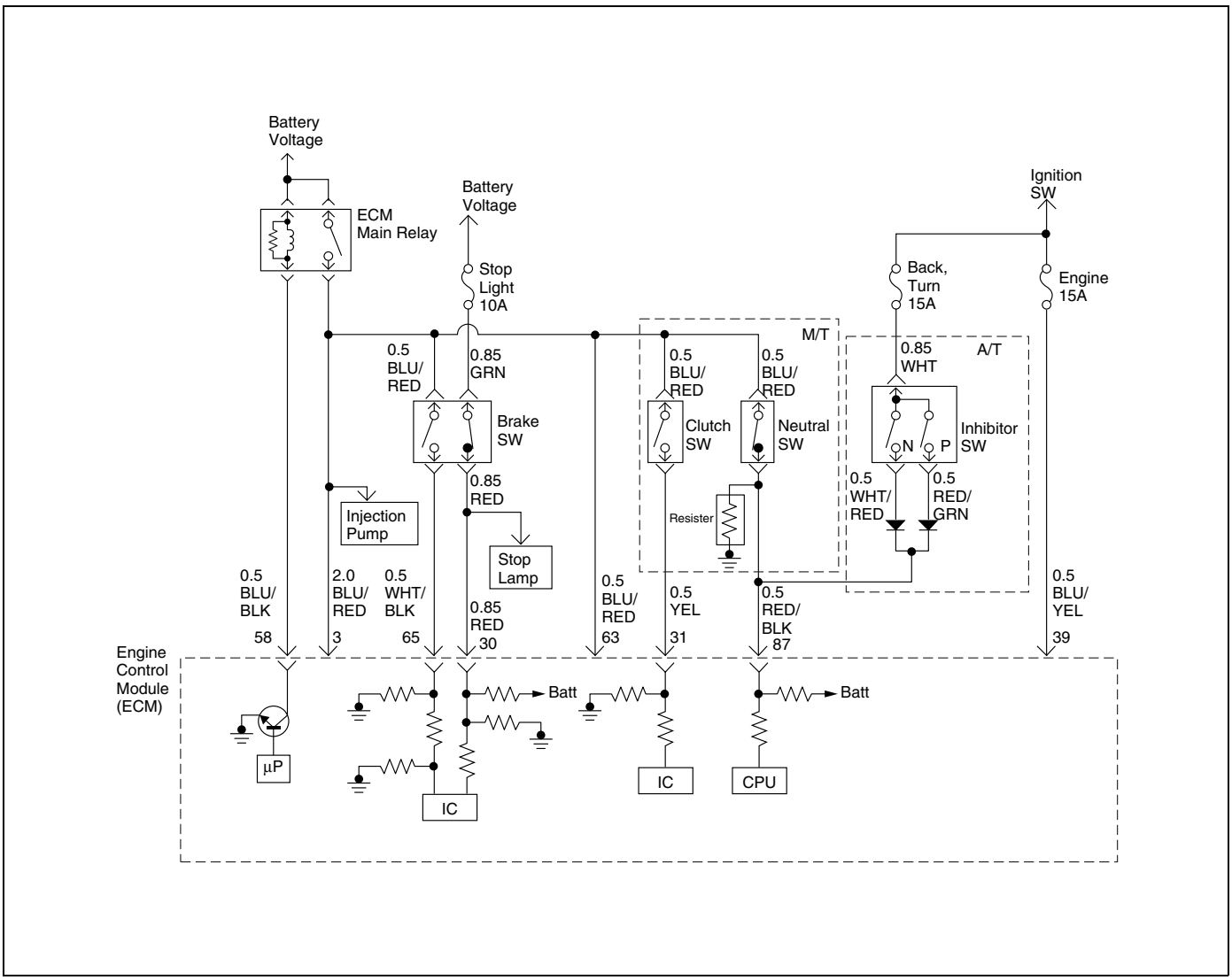
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0703 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0703 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the brake switch or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Using the DVM and check the brake switch 2. 1. Ignition “Off”, engine “Off”. 2. Remove the brake switch connector at the brake pedal. 3. Check the brake switch 2. Was the DVM indicated specified value? 	Pedal is not stepped on: No continuity Pedal stepped on: Continuity	Go to *Step 6*	Replace pedal switch and verify repair

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the brake switch 2 power supply circuit. 1. Ignition “On”, engine “Off”. 2. Remove the brake switch connector from the brake switch. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 8*	Go to *Step 7*
7	Repair the open circuit between the “ECM Main Relay” and brake switch 2. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the brake switch 2 circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type B. (ECM connected) 3. Ignition “On”, engine “Off”. 4. Check the circuit for open or short to voltage circuit. Was the DVM indicated specified value?  **Breaker box is not available:** 1. Ignition “On”, engine “Off”. 2. Back probe the DVM to the brake switch 2 and check the circuit for open or short to voltage circuit. Was the problem found? 	Pedal is not stepped on: Battery voltage Pedal stepped on: Less than 1V	Go to *Step 11*	Fixed at battery voltage: Go to *Step 9* Fixed at less than 1V: Go to *Step 10*
9	Repair the short to voltage circuit between the brake switch 2 connector and ECM. Is the action complete? 	—	Verify repair	—
10	Repair the open circuit between the brake switch 2 connector and ECM. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
11	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 12*
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P0704 (SYMPTOM CODE 6) (FLASH CODE 57) CLUTCH SWITCH CIRCUIT MALFUNCTION



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
57	P0704	6	ON	Clutch Switch Circuit Malfunction	Clutch signal does not change between vehicle speed 1.5km/h and 80km/h since ignition switch was tuned on.	No fail-safe function.

Circuit Description

The ECM monitors the clutch switch signal on the feed terminal to the ECM. If clutch switch circuit with malfunction, DTC P0704 (Symptom Code 6) will be stored.

Diagnostic Aids

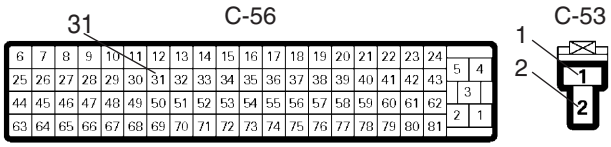
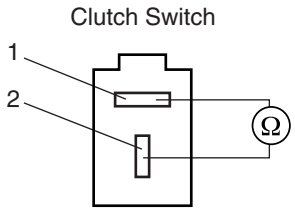
An intermittent may be caused by the following:

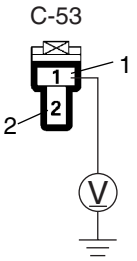
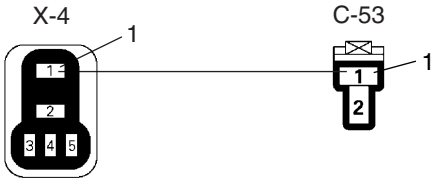
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

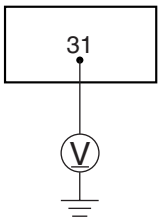
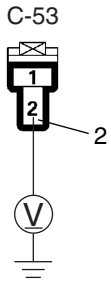
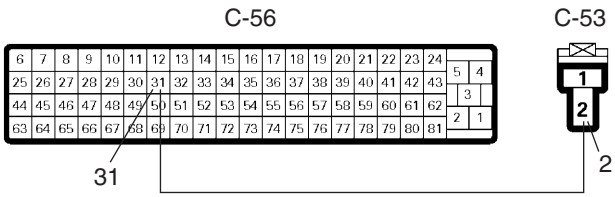
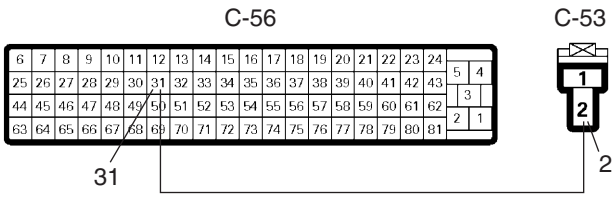
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Clutch Switch” display on the Tech2 while moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P0704 (Symptom Code 6) (Flash Code 57) Clutch Switch Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P0704 (Symptom Code 6) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P0704 (Symptom Code 6) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the clutch switch or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Using the DVM and check the clutch switch. 1. Ignition “Off”, engine “Off”. 2. Remove the clutch switch connector at the clutch pedal. 3. Check the clutch switch. Was the DVM indicated specified value? 	Pedal is not stepped on: Continuity Pedal stepped on: No continuity	Go to *Step 6*	Replace pedal switch and verify repair

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the clutch switch power supply circuit. 1. Ignition “On”, engine “Off”. 2. Remove the clutch switch connector from the clutch switch. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 8*	Go to *Step 7*
7	Repair the open circuit between the “ECM Main Relay” and clutch switch. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the clutch switch circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type B. (ECM connected) Ref. Page 6E-81 3. Ignition “On”, engine “Off”. 4. Check the circuit for open or short to voltage circuit. Was the DVM indicated specified value?  **Breaker box is not available:** 1. Ignition “On”, engine “Off”. 2. Back probe the DVM to the clutch switch and check the circuit for open or short to voltage circuit. Was the problem found? 	Pedal is not stepped on: Battery voltage Pedal stepped on: Less than 1V	Go to *Step 11*	Fixed at battery voltage: Go to *Step 9* Fixed at less than 1V: Go to *Step 10*
9	Repair the short to voltage circuit between the clutch switch connector and ECM. Is the action complete? 	—	Verify repair	—
10	Repair the open circuit between the clutch switch connector and ECM. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
11	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the "**SPS (Service Programming System)".** Was the problem solved?	—	Verify repair	Go to *Step 12*
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1105 (SYMPTOM CODE 1) (FLASH CODE 86) BAROMETRIC PRESSURE SENSOR CIRCUIT HIGH INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P1105 (SYMPTOM CODE 2) (FLASH CODE 86) BAROMETRIC PRESSURE SENSOR CIRCUIT LOW INPUT

Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
86	P1105	1	ON	Barometric Pressure Sensor Circuit High Input	Barometric pressure sensor output voltage is more than 4.4V.	ECM uses 1013hpa condition as substitute.
		2	ON	Barometric Pressure Sensor Circuit Low Input	Barometric pressure sensor output voltage is below 1.5V.	

Circuit Description

The ECM monitors the barometric pressure signal at inside of the ECM. If the sensor with malfunction, DTC P1105 (Symptom Code 1) or P1105 (Symptom Code 2) will be stored.

Diagnostic Aids

If the DTC P1105 is stored, sensor or circuit of ECM inside is failed.

Diagnostic Trouble Code (DTC) P1105 (Symptom Code 1) (Flash Code 86) Barometric Pressure Sensor Circuit High Input

Diagnostic Trouble Code (DTC) P1105 (Symptom Code 2) (Flash Code 86) Barometric Pressure Sensor Circuit Low Input

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1105 (Symptom Code 1) or P1105 (Symptom Code 2) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1105 (Symptom Code 1) or P1105 (Symptom Code 2) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*

Step	Action	Value(s)	Yes	No
5	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

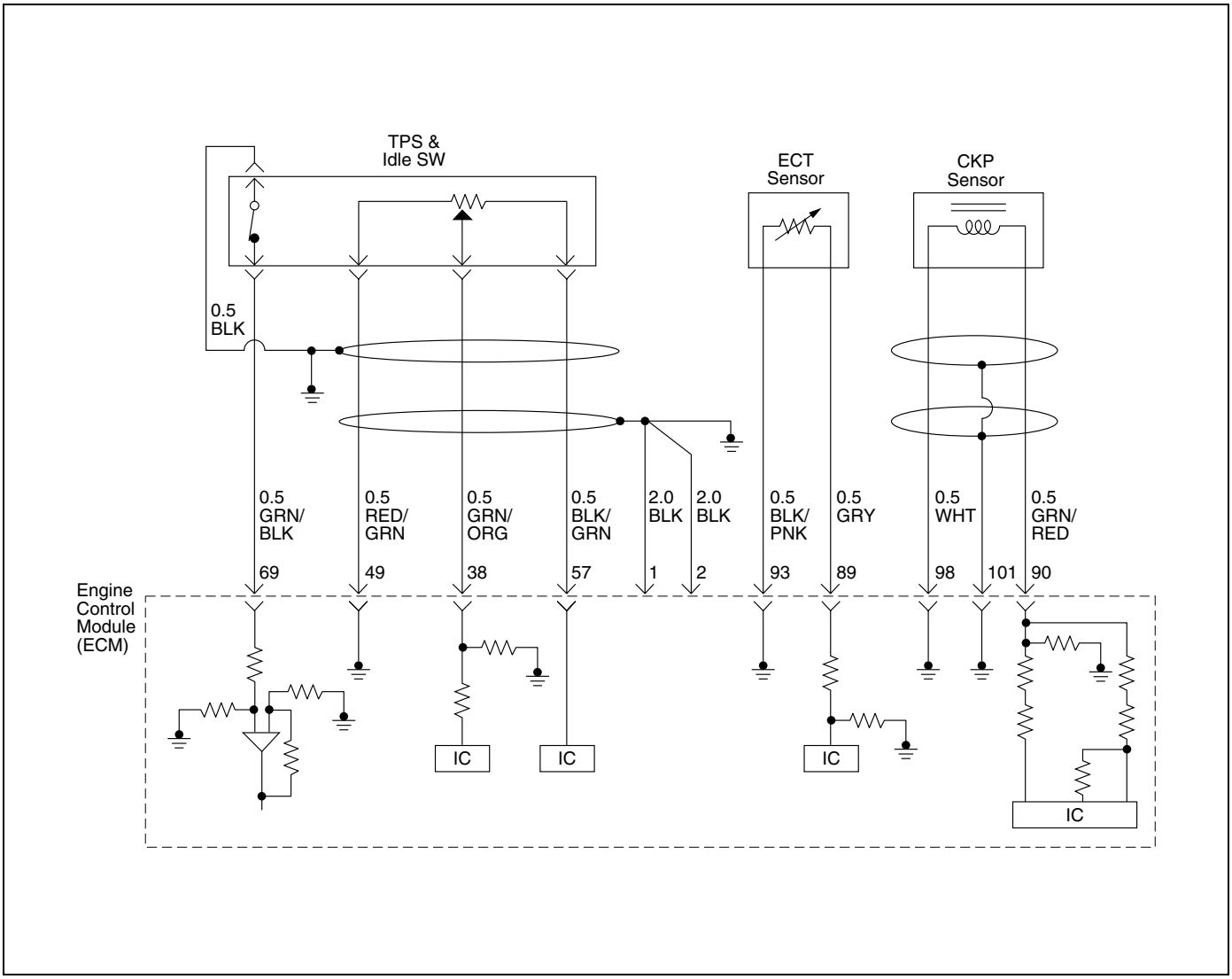
DIAGNOSTIC TROUBLE CODE (DTC) P1120 (SYMPTOM CODE 1) (FLASH CODE 21) PEDAL/THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P1120 (SYMPTOM CODE 7) (FLASH CODE 21) PEDAL/THROTTLE POSITION SENSOR VOLTAGE SUPPLY CIRCUIT HIGH INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P1120 (SYMPTOM CODE 9) (FLASH CODE 21) PEDAL/THROTTLE POSITION SENSOR VOLTAGE SUPPLY CIRCUIT LOW INPUT

DIAGNOSTIC TROUBLE CODE (DTC) P1120 (SYMPTOM CODE D) (FLASH CODE 21) PEDAL/THROTTLE POSITION SENSOR BRAKE SWITCH ERROR

DIAGNOSTIC TROUBLE CODE (DTC) P1120 (SYMPTOM CODE E) (FLASH CODE 21) PEDAL/THROTTLE POSITION SENSOR IDLE POSITION SWITCH ERROR



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
21	P1120	1	ON	Pedal/Throttle Position Sensor Circuit High Input	Throttle position sensor output voltage is more than 4.5V.	ECM increases idle speed up to 1400rpm.
		7	ON	Pedal/Throttle Position Sensor Voltage Supply Circuit High Input	Throttle position sensor power supply voltage is more than 5.2V.	
		9	ON	Pedal/Throttle Position Sensor Voltage Supply Circuit Low Input	Throttle position sensor power supply voltage is below 4.6V.	
		D	ON	Pedal/Throttle Position Sensor Brake Switch Error	1. Engine speed is more than 1700rpm. 2. Throttle position sensor is more than 8.7%. 3. When brake pedal is depressed during accelerator pedal is depressing.	
		E	ON	Pedal/Throttle Position Sensor Idle Position Switch Error	1. When idle switch is turned off, throttle position sensor was below 0.35%. or 2. When idle switch is tuned on, throttle position sensor was more than 7.8%.	

Circuit Description

The TPS is a potentiometer connected to throttle shaft on the throttle body. It is installed to the main TPS and idle switch.

The engine control module (ECM) monitors the voltage on the signal line and calculates throttle position. As the throttle valve angle is changed when accelerator pedal moved. The TPS signal also changed at a moved throttle valve. As the throttle valve opens, the output increases so that the output voltage should be high.

The ECM monitors the TPS supply voltage and TPS output voltage. The supply voltage is out of range, DTC P1120 (Symptom Code 7) or P0100 (Symptom Code 9) will be stored. The output voltage excessively high, DTC P1120 (Symptom Code 1) will be stored.

If the brake pedal is depressed during accelerator pedal is depressing, DTC P1120 (Symptom Code D) will be stored.

If the relation of idle switch and TPS position are incorrect, DTC P1120 (Symptom Code E) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

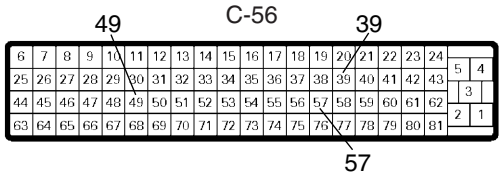
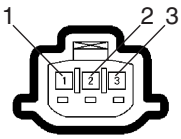
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

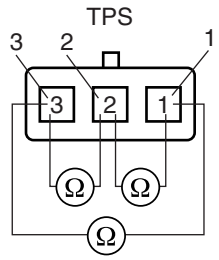
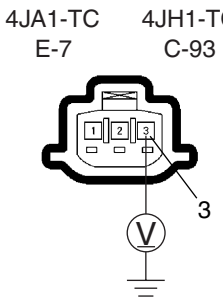
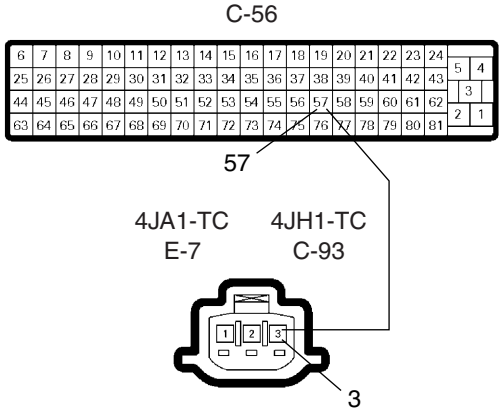
Check for the following conditions:

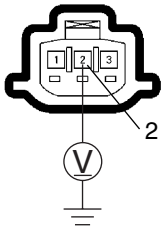
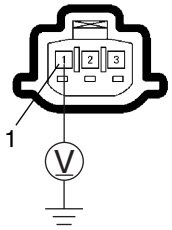
- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Throttle Position”, “Idle Switch”, “Brake Switch 1” and “Brake Switch 2” display on the Tech2 while moving connectors and wiring harness related to the sensor.

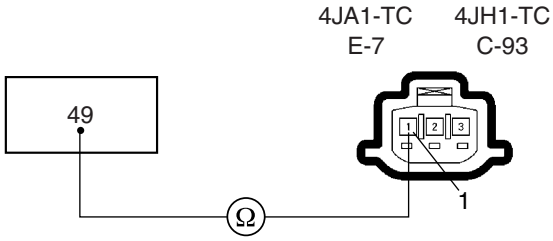
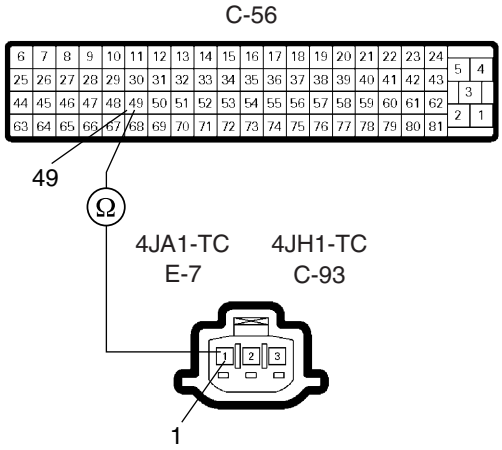
Diagnostic Trouble Code (DTC) P1120 (Symptom Code 1) (Flash Code 21) Pedal/Throttle Position Sensor Circuit High Input

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*

Step	Action	Value(s)	Yes	No
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1120 (Symptom Code 1) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1120 (Symptom Code 1) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the TPS or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found?  4JA1-TC E-7 4JH1-TC C-93 	—	Verify repair	Go to *Step 5*
5	Visually check the TPS. Was the problem found?	—	Go to *Step 12*	Go to *Step 6*

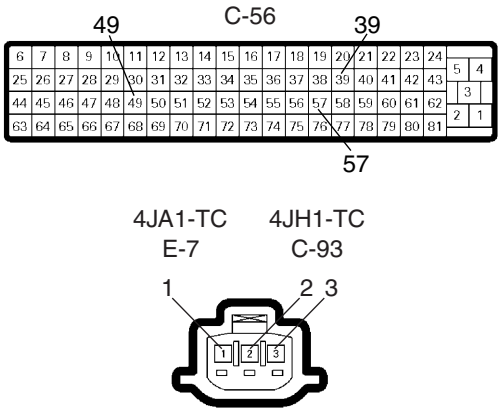
<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>6</td><td>Using the DVM and check the TPS.
1. Ignition “Off”, engine “Off”.
2. Disconnect TPS connector.
3. Measure the resistance of TPS.
Does the tester indicate standard resistance as shown in the following table?
<table><tr><th>Measurement Terminal</th><th>Resistance (Ω)</th></tr><tr><td rowspan="2">1 - 2</td><td>Approximately 0.5kΩ at idle position</td></tr><tr><td>Approximately 4.0kΩ at WOT</td></tr><tr><td rowspan="2">2 - 3</td><td>Approximately 4.3kΩ at idle position</td></tr><tr><td>Approximately 0.8kΩ at WOT</td></tr><tr><td>1 - 3</td><td>Approximately 4.6kΩ at idle position & WOT</td></tr></table>  </td><td>Standard resistance</td><td>Go to Step 7</td><td>Go to Step 12</td></tr>
<tr><td>7</td><td>Using the DVM and check the TPS power supply circuit.
1. Ignition “On”, engine “Off”.
2. Disconnect the TPS connector.
3. Check the circuit for short to voltage circuit.
Was the DVM indicated specified value?
  </td><td>Approximately 5.0V</td><td>Go to Step 9</td><td>Go to Step 8</td></tr>
<tr><td>8</td><td>Repair the short to voltage circuit between the ECM and TPS.
Was the problem solved?
  </td><td>—</td><td>Verify repair</td><td>Go to Step 14</td></tr>
</table>

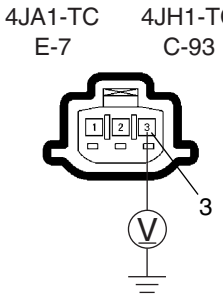
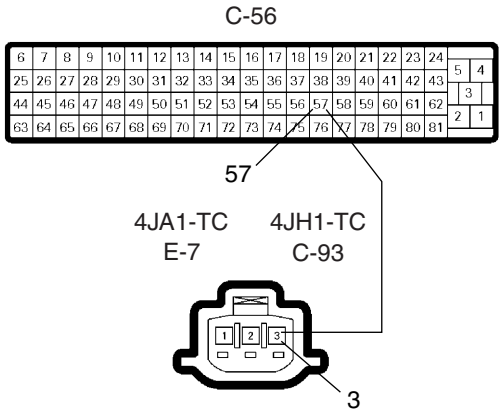
Step	Action	Value(s)	Yes	No
9	Using the DVM and check the TPS signal circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the TPS connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 4JA1-TC E-7 4JH1-TC C-93 	Less than 1V	Go to *Step 10*	Repair faulty harness and verify repair
10	Using the DVM and check the TPS ground circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the TPS connector . 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 4JA1-TC E-7 4JH1-TC C-93 	Less than 1V	Go to *Step 11*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
11	Using the DVM and check the TPS ground circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the TPS connector. 4. Check the circuit for open circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the TPS connector and ECM connector. 3. Check the circuit for open circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 14*
12	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 14*
13	Replace the TPS. Is the action complete?	—	Verify repair	—
14	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 14*

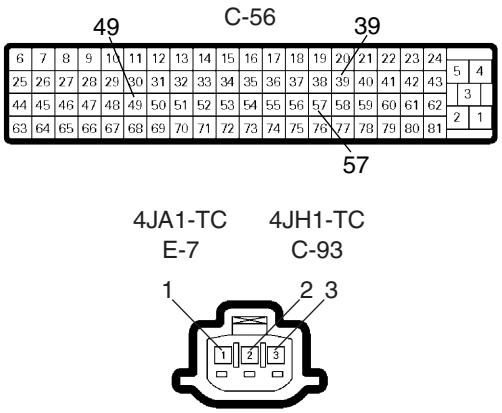
Step	Action	Value(s)	Yes	No
15	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

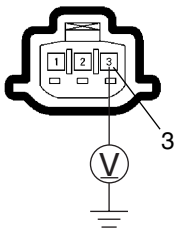
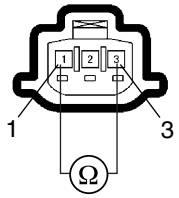
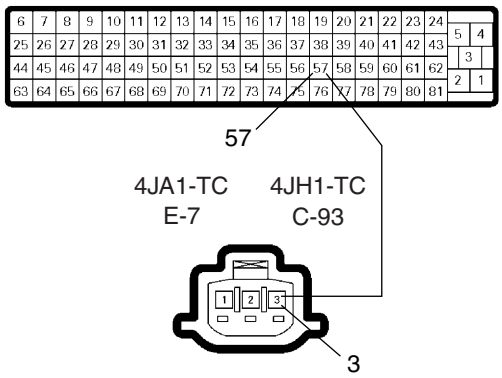
Diagnostic Trouble Code (DTC) P1120 (Symptom Code 7) (Flash Code 21) Pedal/Throttle Position Sensor Voltage Supply Circuit High Input

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1120 (Symptom Code 7) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1120 (Symptom Code 7) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the TPS or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the TPS. Was the problem found?	—	Go to *Step 8*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the TPS power supply circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the TPS connector. 3. Check the circuit for short to ground circuit. Was the DVM indicated specified value? 	Approximately 5.0V	Go to *Step 12*	Go to *Step 7*
7	Repair the short to battery voltage circuit between the ECM and TPS. Was the problem solved? 	—	Verify repair	Go to *Step 8*
8	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 9*	Go to *Step 10*
9	Replace the TPS. Is the action complete?	—	Verify repair	—
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1120 (Symptom Code 9) (Flash Code 21) Pedal/Throttle Position Sensor Voltage Supply Circuit Low Input

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic (OBD) System Check" performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select "F0: Read DTC Infor As Stored By ECU" in "F0: Diagnostic Trouble Codes". Is the DTC P1120 (Symptom Code 9) stored as "Present Failure"?	—	Go to *Step 3*	Refer to Diagnostic Aids and Go to *Step 3*
3	1. Using the Tech 2, ignition "On" and engine "Off". 2. Select "F1: Clear DTC Information" in "F0: Diagnostic Trouble Codes" with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the "F0: Read DTC Infor As Stored By ECU" in the "F0: Diagnostic Trouble Codes". Was the DTC P1120 (Symptom Code 9) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the TPS or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the TPS. Was the problem found?	—	Go to *Step 10*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the TPS power supply circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the TPS connector. 3. Check the circuit for short to battery voltage circuit. Was the DVM indicated specified value? 4JA1-TC E-7 4JH1-TC C-93 	Approximately 5.0V	Go to *Step 10*	Go to *Step 7*
7	Using the DVM and check the TPS power supply circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the TPS connector and ECM connector. 3. Check the circuit for short to TPS ground circuit. Was the DVM indicated specified value? 4JA1-TC E-7 4JH1-TC C-93 	No continuity	Go to *Step 9*	Go to *Step 8*
8	Repair the circuit for short to TPS ground circuit. Is the action complete?	—	Verify repair	—
9	Repair the short to ground circuit between the ECM and TPS. Was the problem solved? C-56 	—	Verify repair	Go to *Step 12*
10	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 11*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
11	Replace the TPS. Is the action complete?	—	Verify repair	—
12	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 13*
13	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1120 (Symptom Code D) (Flash Code 21) Pedal/Throttle Position Sensor Brake Switch Error

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic (OBD) System Check" performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select "F0: Read DTC Infor As Stored By ECU" in "F0: Diagnostic Trouble Codes". Is the DTC P1120 (Symptom Code D) stored as "Present Failure"?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition "On" and engine "Off". 2. Select "F1: Clear DTC Information" in "F0: Diagnostic Trouble Codes" with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the "F0: Read DTC Infor As Stored By ECU" in the "F0: Diagnostic Trouble Codes". Was the DTC P1120 (Symptom Code D) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Visually check the TPS. Check for the following conditions. • Accelerator pedal sticking. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 5*
5	1. Using the Tech 2, ignition "On" and engine "Off". 2. Monitor the "Throttle Position" in the data display. Does the Tech 2 indicate correct "Throttle Position" from 0% to 100% depending on accelerator pedal operation?	—	Go to *Step 7*	Go to *Step 6*
6	1. Using the Tech 2, ignition "On" and engine "Off". 2. Monitor the "Throttle Position" in the data display. 3. Adjust the TPS within 0% to 100%. Was the problem solved?	—	Verify repair	Go to *Step 11*
7	1. Using the Tech 2, ignition "On" and engine "Off". 2. Monitor the "Brake Switch 1" and "Brake Switch 2" in the data display. Does the Tech 2 indicate "Inactive" when the brake pedal was not stepped on?	—	Go to *Step 13*	Go to *Step 8*
8	Adjust the brake switch. Was the problem solved?	—	Verify repair	Go to *Step 9*
9	Substitute a known good brake switch and recheck. Was the problem solved?	—	Go to *Step 10*	Go to *Step 13*
10	Replace the brake switch. Is the action complete?	—	Verify repair	—
11	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 12*	Go to *Step 13*
12	Replace the TPS. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
13	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the "**SPS (Service Programming System)".** Was the problem solved?	—	Verify repair	Go to *Step 14*
14	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1120 (Symptom Code E) (Flash Code 21) Pedal/Throttle Position Sensor Idle Position Switch Error

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1120 (Symptom Code E) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1120 (Symptom Code E) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Visually check the TPS. Was the problem found?	—	Go to *Step 8*	Go to *Step 5*
5	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Throttle Position” in the data display. Does the Tech 2 indicate correct “Throttle Position” from 0% to 100% depending on accelerator pedal operation?	—	Go to *Step 7*	Go to *Step 6*Go to *Step 6*
6	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Throttle Position” in the data display. 3. Adjust the TPS within 0% to 100%. Was the problem solved?	—	Verify repair	Go to *Step 8*
7	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Idle Switch” in the data display. Does the Tech 2 indicate “Inactive” when the accelerator pedal was stepped on?	—	Go to *Step 10*	Go to *Step 8*
8	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 9*	Go to *Step 10*
9	Replace the TPS. Is the action complete?	—	Verify repair	—
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 11*

Step	Action	Value(s)	Yes	No
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1173 (SYMPTOM CODE 3) (FLASH CODE 22) FUEL REDUCTION CAUSED BY HIGH COOLANT TEMPERATURE

DIAGNOSTIC TROUBLE CODE (DTC) P1173 (SYMPTOM CODE 7) (FLASH CODE 22) FUEL REDUCTION CAUSED BY HIGH FUEL TEMPERATURE

DIAGNOSTIC TROUBLE CODE (DTC) P1173 (SYMPTOM CODE A) (FLASH CODE 22) FUEL REDUCTION CAUSED BY LOW TEMPERATURE

Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
22	P1173	3	OFF	Fuel Reduction Caused By High Coolant Temperature	Excessive high engine coolant temperature is detected.	No fail-safe function.
		7	OFF	Fuel Reduction Caused By High Fuel Temperature	Fuel temperature is more than 100°C.	PSG (pump control unit) controls fuel injection quantity based on engine speed and fuel temperature.
		A	OFF	Fuel Reduction Caused By Low Fuel Temperature	Excessive low fuel temperature is detected.	No fail-safe function.

Circuit Description

The engine coolant temperature (ECT) sensor is installed on the coolant stream. High coolant temperature produces a low resistance. The ECM supplies 5 volts signal to the ECT sensor through resisters in the ECM and measures the voltage. The signal voltage will be low when the engine temperature is hot.
The fuel temperature sensor is assembled inside of the pump control unit (PSG). The signal of fuel temperature is sent via the CAN-bus from the PSG to ECM.
If the engine coolant temperature is excessively high condition, DTC P1173 (Symptom Code 3) will be stored.
If the fuel temperature is excessively high or low condition, DTC P1173 (Symptom Code 7) or P1173 (Symptom Code A) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

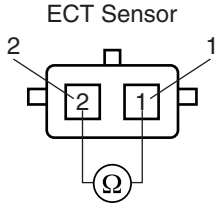
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Coolant Temperature” or “Fuel Temperature” display on the Tech2 while moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P1173 (Symptom Code 3) (Flash Code 22) Fuel Reduction Caused By High Coolant Temperature

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1173 (Symptom Code 3) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*

<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>1. Using the Tech 2, ignition “On” and engine “Off”.
2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information.
3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”.
Was the DTC P1173 (Symptom Code 3) stored in this ignition cycle?</td><td>—</td><td>Go to Step 4</td><td>Refer to Diagnostic Aids and Go to Step 4</td></tr>
<tr><td>4</td><td>Check the engine overheat condition.
Was the problem found?</td><td>—</td><td>Repair the cause of overheat and verify repair</td><td>Go to Step 5</td></tr>
<tr><td>5</td><td>1. Using the Tech 2, ignition “On” and engine “On”.
2. Monitor the “Coolant Temperature” in the data display.
Does the Tech 2 indicate correct “Coolant Temperature” depending on warm up time?</td><td>—</td><td>Go to Step 9</td><td>Go to Step 6</td></tr>
<tr><td>6</td><td>Using the DVM and check the ECT sensor.
1. Ignition “Off”, engine “Off”.
2. Disconnect ECT sensor connector.
3. Measure the resistance of ECT sensor.
Does the tester indicate standard resistance as shown in the following table?
<table><tr><th>Temperature (°C)</th><th>Resistance (Ω) (Approximately)</th></tr><tr><td>-30</td><td>27500</td></tr><tr><td>-20</td><td>16100</td></tr><tr><td>0</td><td>5760</td></tr><tr><td>20</td><td>2370</td></tr><tr><td>40</td><td>1080</td></tr><tr><td>60</td><td>537</td></tr><tr><td>80</td><td>290</td></tr><tr><td>100</td><td>161</td></tr><tr><td>120</td><td>95</td></tr></table>  </td><td>Standard resistance</td><td>Go to Step 9</td><td>Go to Step 7</td></tr>
<tr><td>7</td><td>Substitute a known good ECT sensor assembly and recheck.
Was the problem solved?</td><td>—</td><td>Go to Step 8</td><td>Go to Step 9</td></tr>
<tr><td>8</td><td>Replace the ECT sensor.
Is the action complete?</td><td>—</td><td>Verify repair</td><td>—</td></tr>
<tr><td>9</td><td>Is the ECM programmed with the latest software release?
If not, download the latest software to the ECM using the “SPS (Service Programming System)”.
Was the problem solved?</td><td>—</td><td>Verify repair</td><td>Go to Step 10</td></tr>
</table>

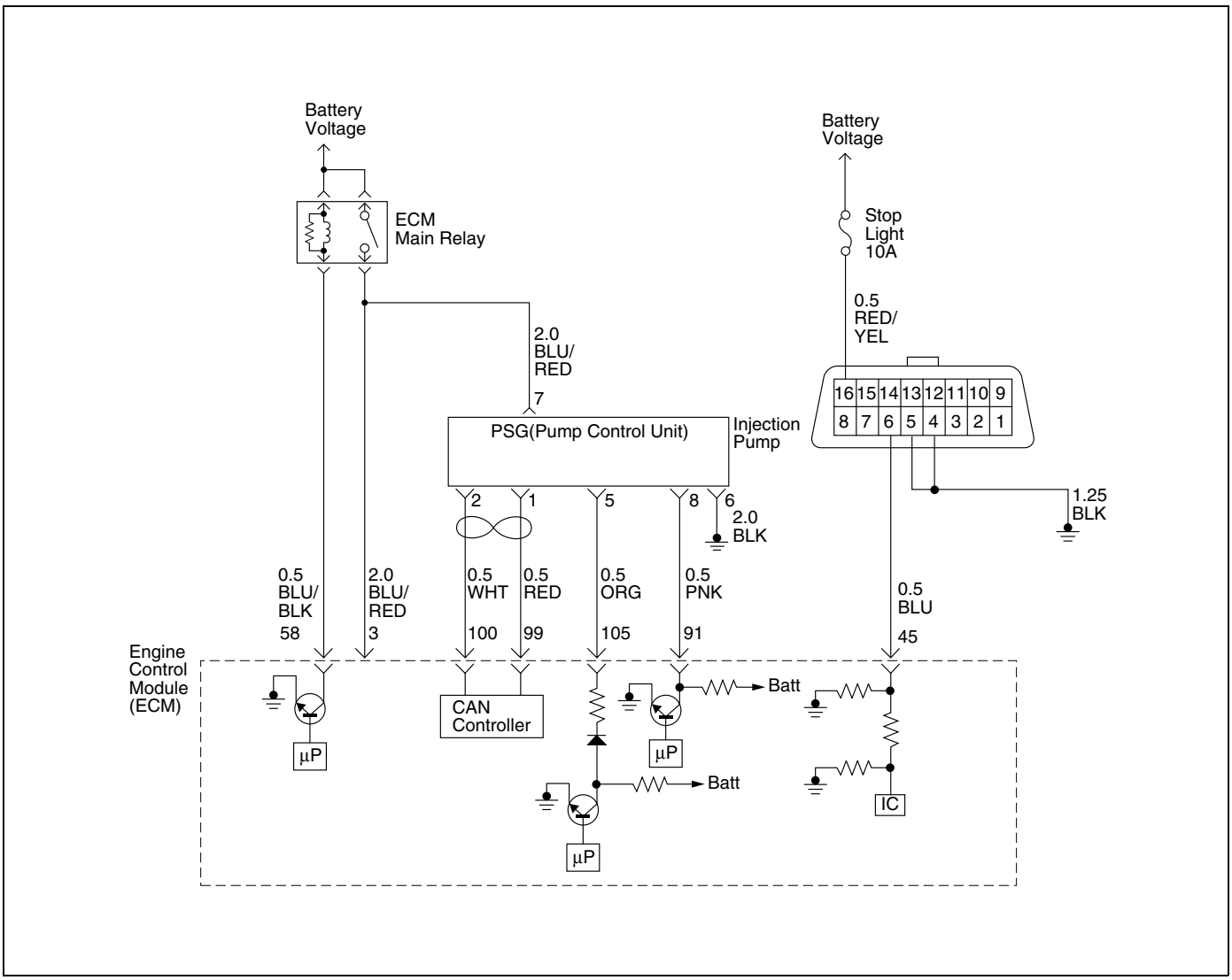
Step	Action	Value(s)	Yes	No
10	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1173 (Symptom Code 7) (Flash Code 22) Fuel Reduction Caused By High Fuel Temperature

Diagnostic Trouble Code (DTC) P1173 (Symptom Code A) (Flash Code 22) Fuel Reduction Caused By Low Temperature

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1173 (Symptom Code 7) or P1173 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1173 (Symptom Code 7) or P1173 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	Go to *Step 7*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
7	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1335 (SYMPTOM CODE A) (FLASH CODE 43) ENGINE SPEED OUTPUT CIRCUIT MALFUNCTION



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
43	P1335	A	ON	Engine Speed Output Circuit Malfunction	The PSG (pump control unit) is recognized defective engine speed signal form the ECM.	Fuel injection quantity is reduced.

Circuit Description

The CKP sensor is located on top of the flywheel housing of the flywheel and fixed with a bolt. The CKP sensor is of the magnet coil type. The inductive pickup sensors four gaps in the flywheel exciter ring and is used to determine the engine speed and engine cylinder top dead center.

The ECM converts sine wave signal to square wave signal. And this signal is provided from the ECM to pump control unit (PSG).

Diagnostic Aids

An intermittent may be caused by the following:

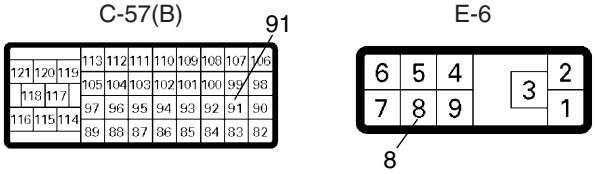
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

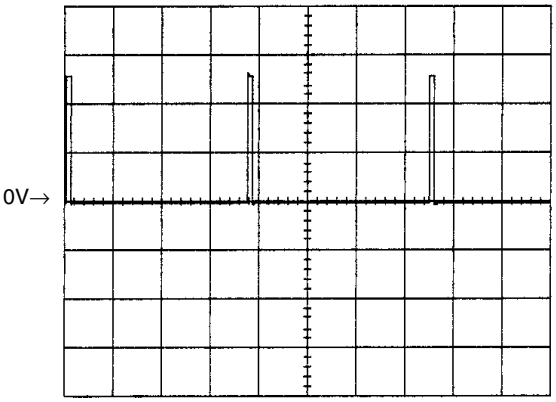
Check for the following conditions:

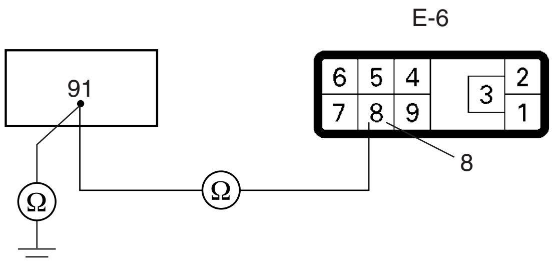
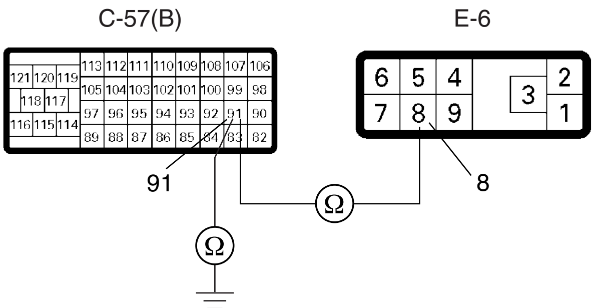
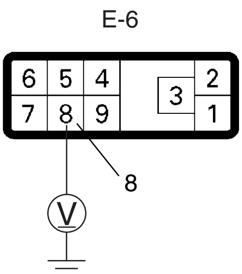
- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.

- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Engine Speed” display on the Tech2 while moving connectors and wiring harness related to the sensor.

Diagnostic Trouble Code (DTC) P1335 (Symptom Code A) (Flash Code 43) Engine Speed Output Circuit Malfunction

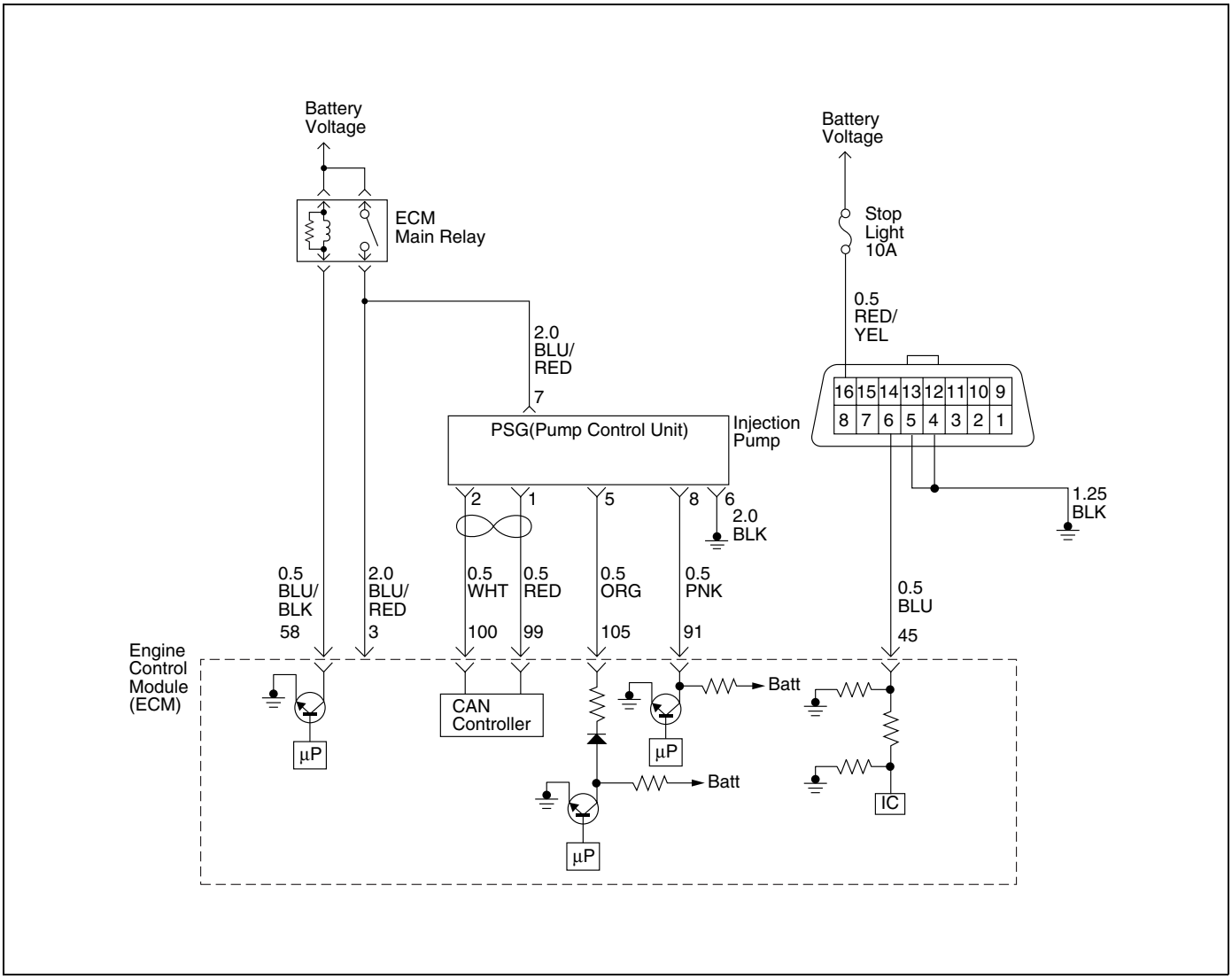
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1335 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1335 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Was the DTC P0335 (Symptom Code B) or P0335 (Symptom Code D) stored at the same time?	—	Go to DTC *Chart P0335 (Symptom Code B) (Symptom Code C)*	Go to *Step 5*
5	Check for poor/faulty connection at the ECM or PSG (pump control unit) connector. If a poor/faulty connection is found, repair the faulty terminal. Was the problem found? 	—	Verify repair	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	If a oscilloscope is available, monitor the CKP sensor output signal. Does the oscilloscope indicate correct wave form? CKP Sensor Output Reference Wave Form  Measurement Terminal: 91 (+) 1 (-) Measurement Scale: 5.0V/div 2.0ms/div Measurement Condition: Engine speed at 2000rpm	—	Go to *Step 13*	Not available: Go to *Step 7* Fixed at low: Go to *Step 7* Fixed at High: Go to *Step 8*

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the CKP sensor output circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  	—	Repair faulty harness and verify repair	Go to *Step 8*
8	Using the DVM and check the CKP sensor output circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated specified value?  	Less than 1V	Go to *Step 9*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
9	Check any accessory parts which may cause electric interference or magnetic interference. Was the problem found?	—	Remove the accessory parts and verify repair	Go to *Step 10*
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 12*	Go to *Step 13*
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
13	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1345 (SYMPTOM CODE A) (FLASH CODE 45) CAMSHAFT SPEED MALFUNCTION



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
45	P1345	A	ON	Camshaft Speed Malfunction	The PSG (pump control unit) is recognized incorrect cam-shaft speed signal.	No fail-safe function.

Circuit Description

The pump camshaft sensor is a magnet with a coil. It uses to combine with the pulser. The pulser is attached main shaft in the pump. It likes a gear shape.
The pump camshaft sensor is attached to the pump control unit (PSG). The signal of pump camshaft speed is sent via the CAN-bus from the PSG to ECM.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

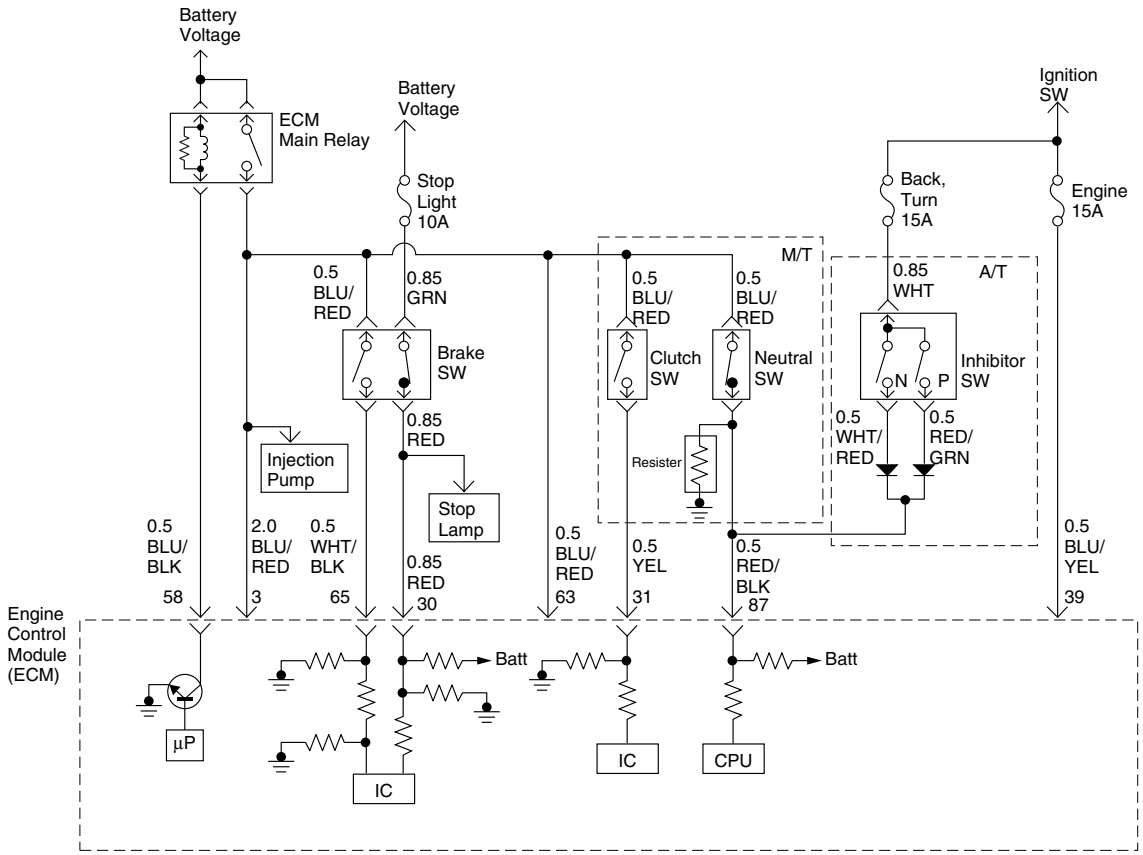
- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Pump Speed” display on the Tech2 while moving connectors and wiring harnesses. A change in the display will indicate the location of the fault.

Diagnostic Trouble Code (DTC) P1345 (Symptom Code A) (Flash Code 45) Camshaft Speed Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1345 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1345 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pump Speed” in the data display. Does the Tech 2 indicate correct “Pump Speed” depending on engine speed?	—	Go to *Step 6*	Go to *Step 5*
5	Check any accessory parts which may cause electric interference or magnetic interference. Was the problem found?	—	Remove the accessory parts and verify repair	Go to *Step 9*
6	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 7*
7	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 8*	Go to *Step 9*
8	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
9	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1520 (SYMPTOM CODE A) (FLASH CODE 47) NEUTRAL SWITCH ON ERROR

DIAGNOSTIC TROUBLE CODE (DTC) P1520 (SYMPTOM CODE B) (FLASH CODE 47) NEUTRAL SWITCH OFF ERROR



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
47	P1520	A	ON	Neutral Switch ON Error	Neutral switch signal is inputted “On” three times consecutively under driving conditions.	No fail-safe function.
		B	ON	Neutral Switch OFF Error	Neutral switch signal is inputted “Off” three times consecutively under driving conditions.	

Circuit Description

The ECM monitors the neutral switch (A/T: N or P position switch in inhibitor switch) signal on the feed terminal to the ECM. If the neutral switch with malfunction, DTC P1520 (Symptom Code A) or P1520 (Symptom Code B) will be stored.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

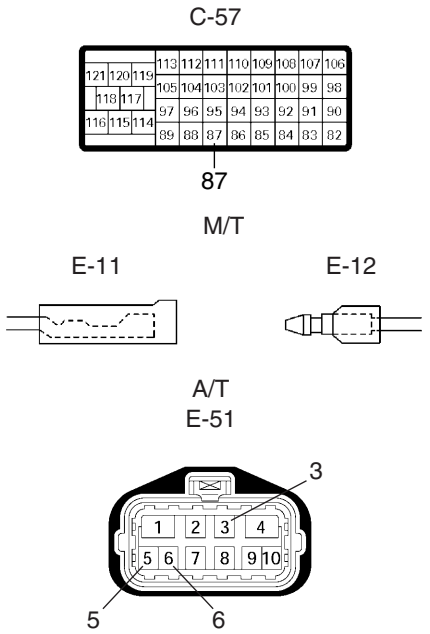
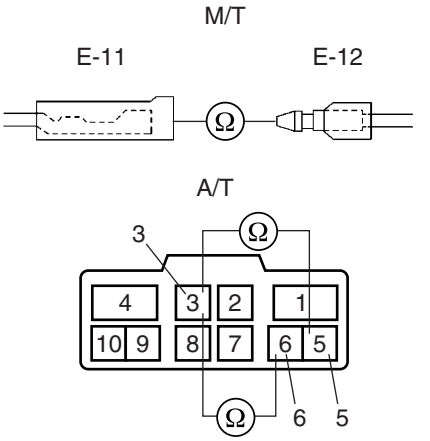
Check for the following conditions:

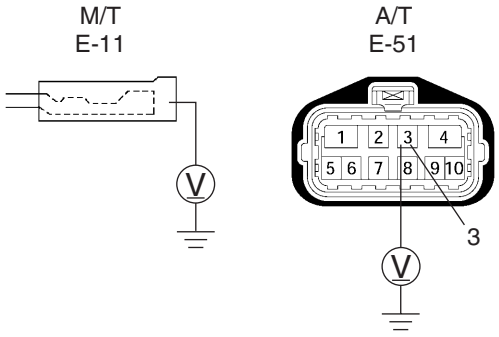
- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Neutral Switch” display on the Tech2 while moving connectors and wiring harness related to the sensor.

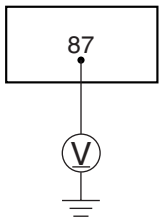
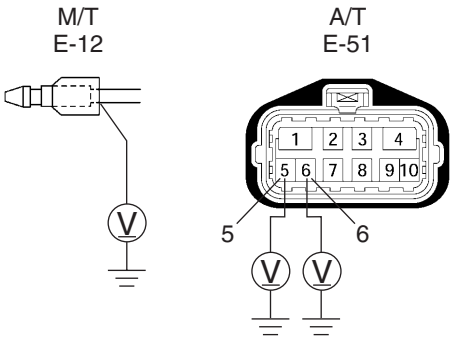
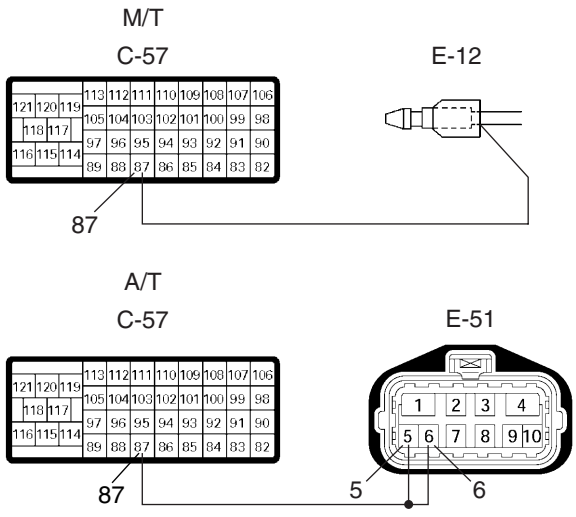
Diagnostic Trouble Code (DTC) P1520 (Symptom Code A) (Flash Code 47) Neutral Switch ON Error

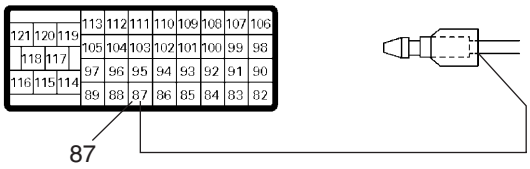
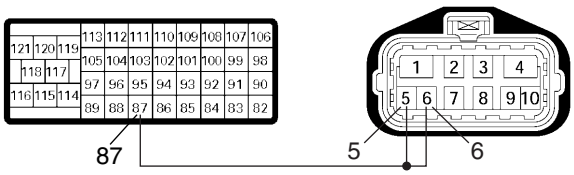
Diagnostic Trouble Code (DTC) P1520 (Symptom Code B) (Flash Code 47) Neutral Switch OFF Error

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1520 (Symptom Code A) or P1520 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1520 (Symptom Code A) or P1520 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*

Step	Action	Value(s)	Yes	No
4	Check for poor/faulty connection at the neutral switch (inhibitor switch) or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Using the DVM and check the neutral switch (inhibitor switch). 1. Ignition “Off”, engine “Off”. 2. Remove the neutral switch connector (inhibitor switch connector) at the transmission. 3. Check the neutral switch (P range N range switch). Was the DVM indicated specified value? 	Neutral (P or N): Continuity Other than neutral (P or N): No continuity	Go to *Step 6*	Replace neutral switch (inhibitor switch) and verify repair

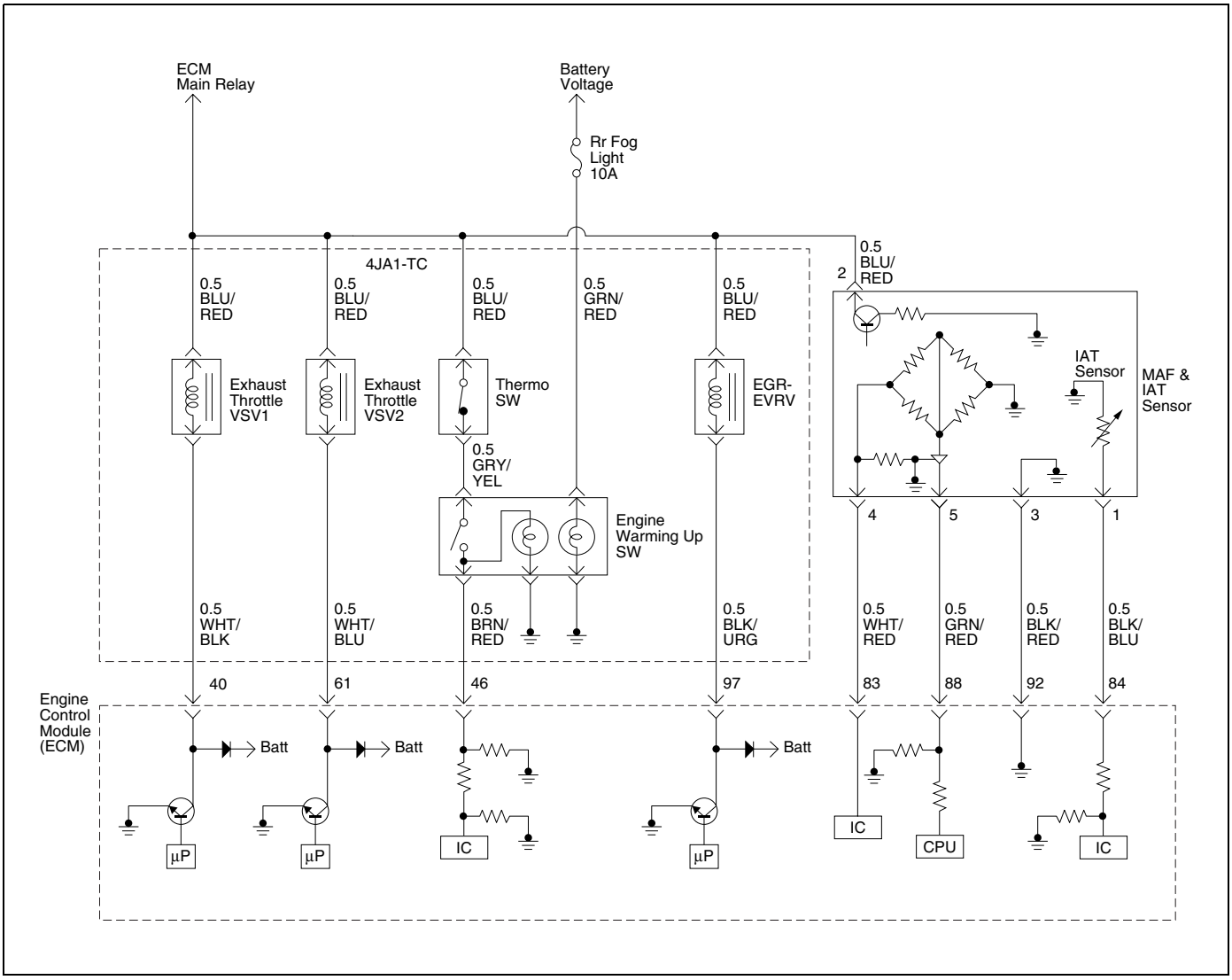
Step	Action	Value(s)	Yes	No
6	Using the DVM and check the neutral switch (inhibitor switch) power supply circuit. 1. Ignition “On”, engine “Off”. 2. Remove the neutral switch (inhibitor switch) connector from the switch. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 8*	Go to *Step 7*
7	Repair the open circuit between the ECM Main Relay and neutral switch (between the “Back, Turn fuse (15A)” and inhibitor switch). Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the neutral switch (inhibitor switch) circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type B. (ECM connected) Ref. Page 6E-81 3. Ignition “On”, engine “Off”. 4. Check the circuit for open or short to voltage circuit. Was the DVM indicated specified value?  **Breaker box is not available:** 1. Ignition “On”, engine “Off”. 2. Back probe the DVM to the neutral switch (inhibitor switch) and check the circuit for open or short to voltage circuit. Was the DVM indicated specified value? 	Neutral (P or N): Battery voltage Other than neutral (P or N): Less than 1V	Go to *Step 11*	Fixed at battery voltage: Go to *Step 9* Fixed at less than 1V: Go to *Step 10*
9	Repair the short to voltage circuit between the neutral switch connector (inhibitor switch connector) and ECM. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
10	Repair the open circuit between the neutral switch connector (inhibitor switch connector) and ECM. Is the action complete? M/T C-57 E-12  A/T C-57 E-51  	—	Verify repair	—
11	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **"SPS (Service Programming System)".** Was the problem solved?	—	Verify repair	Go to *Step 12*
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1576 (SYMPTOM CODE 4) (FLASH CODE 71) EXHAUST THROTTLE VSV 1 CIRCUIT VOLTAGE LOW

DIAGNOSTIC TROUBLE CODE (DTC) P1576 (SYMPTOM CODE 8) (FLASH CODE 71) EXHAUST THROTTLE VSV 1 CIRCUIT VOLTAGE HIGH



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
71	P1576	4	ON	Exhaust Throttle VSV 1 Circuit Voltage Low	Exhaust throttle VSV 1 circuit open or short to ground circuit.	No fail-safe function.
		8	ON	Exhaust Throttle VSV 1 Circuit Voltage High	Exhaust throttle VSV 1 circuit short to voltage circuit.	

Circuit Description

The switch engine warming signals the engine control module (ECM) to activate the quick warm-up system (QWS).
Switch only provides the request and that the ECM decides when to activated when certain conditions are met.

If the exhaust throttle VSV 1 circuit is open or short ground circuit, DTC P1576 (Symptom Code 4) is stored.
If the exhaust throttle VSV 1 circuit is short to voltage circuit, DTC P1576 (Symptom Code 8) is stored.

Diagnostic Aids

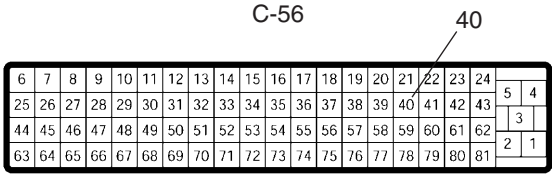
An intermittent may be caused by the following:

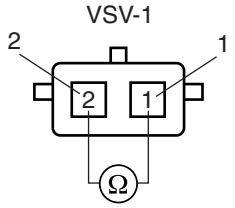
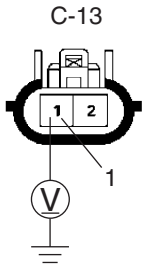
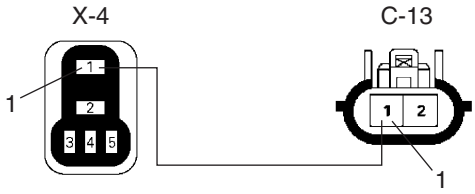
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

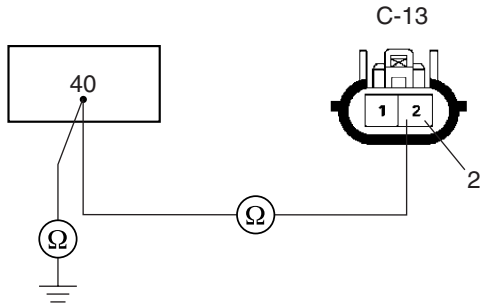
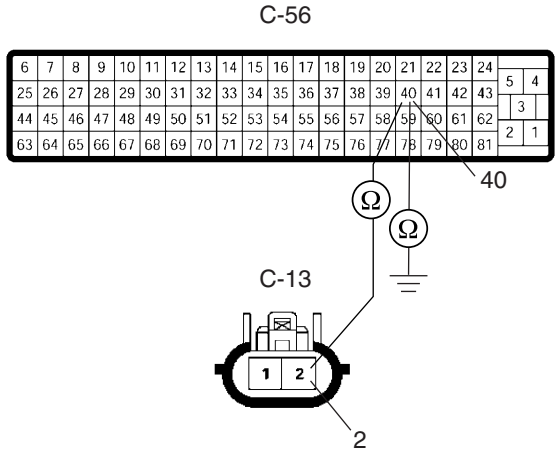
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1576 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P1576 (Symptom Code 4) (Flash Code 71) Exhaust Throttle VSV 1 Circuit Voltage Low

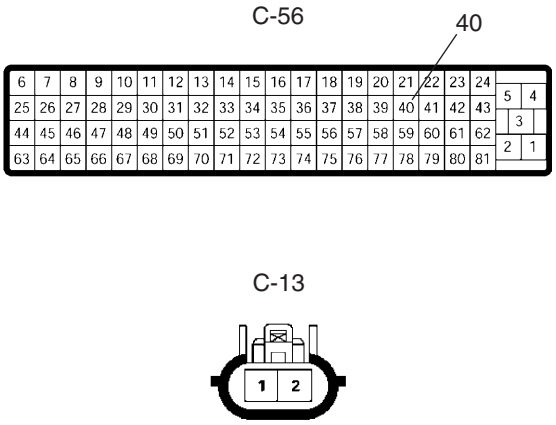
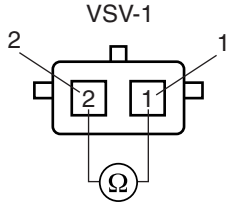
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1576 (Symptom Code 4) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1576 (Symptom Code 4) stored in this ignition cycle?	—	Go to Step 4	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the exhaust throttle VSV 1 or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? C-56  C-13  	—	Verify repair	Go to Step 5

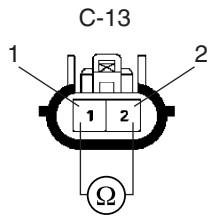
Step	Action	Value(s)	Yes	No
5	Using the DVM and check the exhaust throttle VSV 1. 1. Ignition “Off”, engine “Off”. 2. Disconnect the exhaust throttle VSV 1 connector. 3. Measure the resistance of exhaust throttle VSV 1 solenoid coil. Does the tester indicate standard resistance? 	Approximately 40Ω at 20°C	Go to *Step 6*	Go to *Step 9*
6	Using the DVM and check the exhaust throttle VSV 1 power supply circuit. 1. Ignition “On”, engine “Off”. 2. Remove the exhaust throttle VSV 1 connector. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 8*	Go to *Step 7*
7	Repair the open circuit between the ECM main relay and exhaust throttle VSV 1. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the exhaust throttle VSV 1 circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Remove the exhaust throttle VSV 1 connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Remove the exhaust throttle VSV 1 connector. 4. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 11*
9	Substitute a known good exhaust throttle VSV 1 and recheck. Was the problem solved?	—	Go to Step 10	Go to *Step 11*
10	Replace the exhaust throttle VSV 1. Is the action complete?	—	Verify repair	—
11	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 12*

Step	Action	Value(s)	Yes	No
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

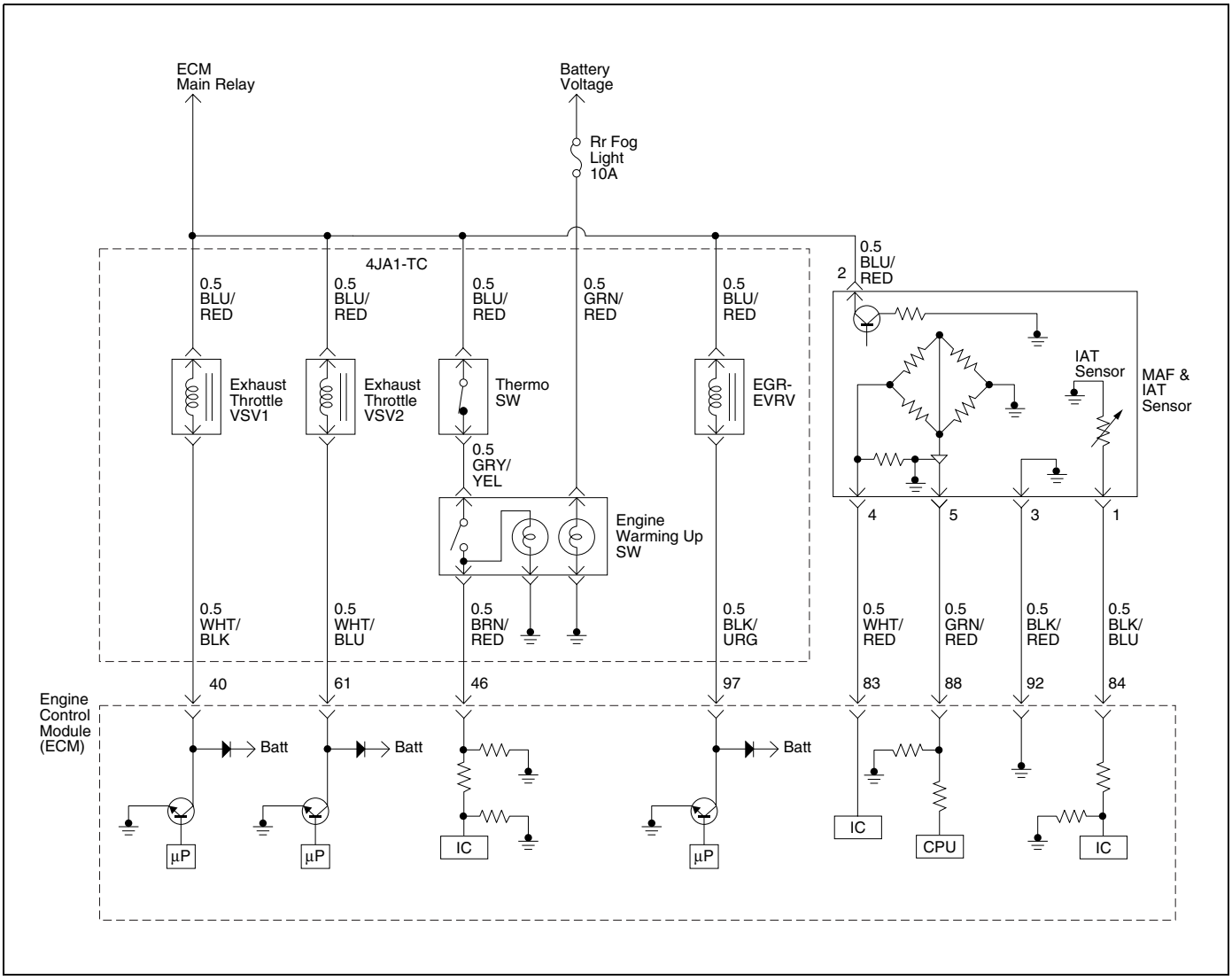
Diagnostic Trouble Code (DTC) P1576 (Symptom Code 8) (Flash Code 71) Exhaust Throttle VSV 1 Circuit Voltage High

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1576 (Symptom Code 8) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1576 (Symptom Code 8) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Check for poor/faulty connection at the exhaust throttle VSV 1 or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Using the DVM and check the exhaust throttle VSV 1. 1. Ignition “Off”, engine “Off”. 2. Disconnect the exhaust throttle VSV 1 connector. 3. Measure the resistance of EGR EVRV solenoid coil. Does the tester indicate standard resistance? 	Approximately 40Ω at 20°C	Go to *Step 6*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the exhaust throttle VSV 1 circuit. 1. Ignition “Off”, engine “Off”. 2. Remove the exhaust throttle VSV 1 connector and ECM connector. 3. Check the circuit for short to voltage circuit. Was the DVM indicated specified value? 	No continuity	Go to *Step 10*	Go to *Step 7*
7	Repair the short to voltage circuit. Is the action complete?	—	Verify repair	—
8	Substitute a known good exhaust throttle VSV 1 and recheck. Was the problem solved?	—	Go to *Step 9*	Go to *Step 10*
9	Replace the exhaust throttle VSV 1. Is the action complete?	—	Verify repair	—
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1577 (SYMPTOM CODE 4) (FLASH CODE 71) EXHAUST THROTTLE VSV 2 CIRCUIT VOLTAGE LOW

DIAGNOSTIC TROUBLE CODE (DTC) P1577 (SYMPTOM CODE 8) (FLASH CODE 71) EXHAUST THROTTLE VSV 2 CIRCUIT VOLTAGE HIGH



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
71	P1577	4	ON	Exhaust Throttle VSV 2 Circuit Voltage Low	Exhaust throttle VSV 2 circuit open or short to ground circuit.	No fail-safe function.
		8	ON	Exhaust Throttle VSV 2 Circuit Voltage High	Exhaust throttle VSV 2 circuit short to voltage circuit.	

Circuit Description

The switch engine warming signals the engine control module (ECM) to activate the quick warm-up system (QWS).
Switch only provides the request and that the ECM decides when to activated when certain conditions are met.

If the exhaust throttle VSV 2 circuit is open or short ground circuit, DTC P1577 (Symptom Code 4) is stored.
If the exhaust throttle VSV 2 circuit is short to voltage circuit, DTC P1577 (Symptom Code 8) is stored.

Diagnostic Aids

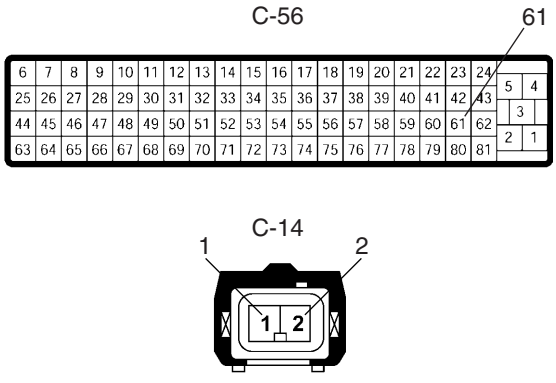
An intermittent may be caused by the following:

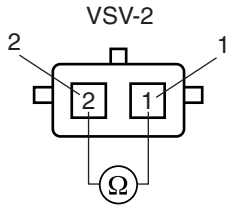
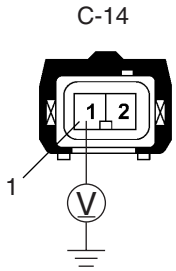
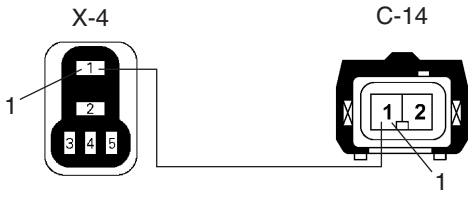
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

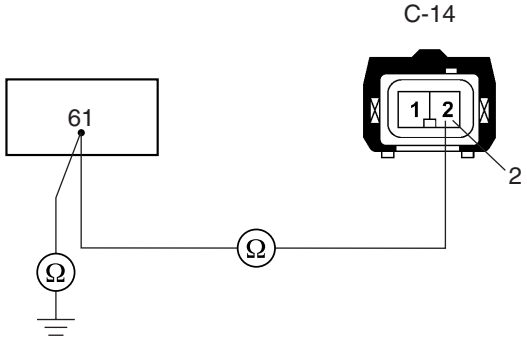
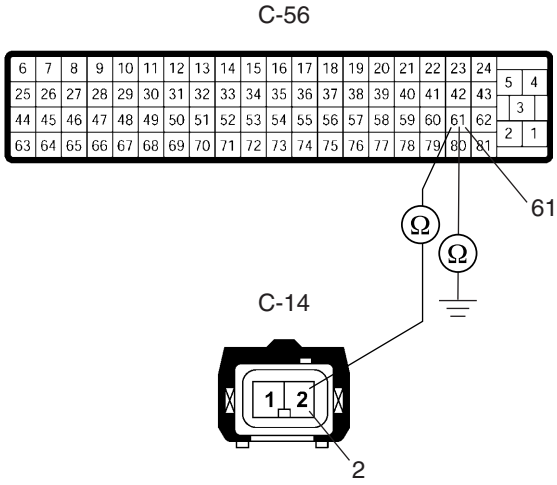
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1577 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P1577 (Symptom Code 4) (Flash Code 71) Exhaust Throttle VSV 2 Circuit Voltage Low

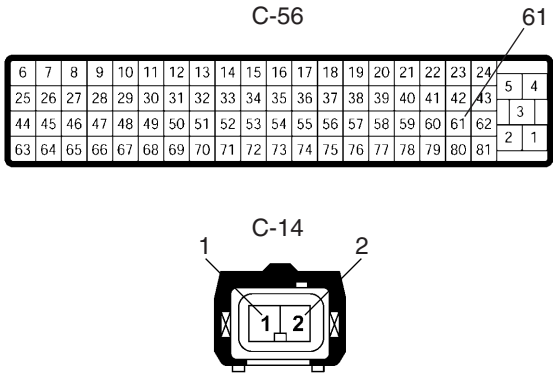
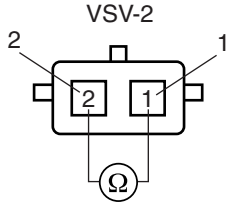
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1577 (Symptom Code 4) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1577 (Symptom Code 4) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the exhaust throttle VSV 2 or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*

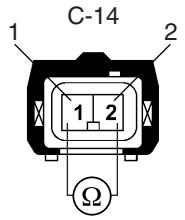
Step	Action	Value(s)	Yes	No
5	Using the DVM and check the exhaust throttle VSV 2. 1. Ignition "Off", engine "Off". 2. Disconnect the exhaust throttle VSV 2 connector. 3. Measure the resistance of exhaust throttle VSV 2 solenoid coil. Does the tester indicate standard resistance? 	Approximately 40Ω at 20°C	Go to *Step 6*	Go to *Step 9*
6	Using the DVM and check the exhaust throttle VSV 2 power supply circuit. 1. Ignition "On", engine "Off". 2. Remove the exhaust throttle VSV 2 connector. 3. Check the circuit for open circuit. Was the DVM indicated specified value? 	Battery voltage	Go to *Step 8*	Go to *Step 7*
7	Repair the open circuit between the ECM main relay and exhaust throttle VSV 2. Is the action complete? 	—	Verify repair	—

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the exhaust throttle VSV 2 circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Remove the exhaust throttle VSV 2 connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Remove the exhaust throttle VSV 2 connector. 4. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 11*
9	Substitute a known good exhaust throttle VSV 2 and recheck. Was the problem solved?	—	Go to *Step 10*	Go to *Step 11*
10	Replace the exhaust throttle VSV 2. Is the action complete?	—	Verify repair	—
11	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 12*

Step	Action	Value(s)	Yes	No
12	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1577 (Symptom Code 8) (Flash Code 71) Exhaust Throttle VSV 2 Circuit Voltage High

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1577 (Symptom Code 8) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to Step 3
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1577 (Symptom Code 8) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Check for poor/faulty connection at the exhaust throttle VSV 2 or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Using the DVM and check the exhaust throttle VSV 2. 1. Ignition “Off”, engine “Off”. 2. Disconnect the exhaust throttle VSV 2 connector. 3. Measure the resistance of EGR EVRV solenoid coil. Does the tester indicate standard resistance? 	Approximately 40Ω at 20°C	Go to *Step 6*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the exhaust throttle VSV 2 circuit. 1. Ignition “Off”, engine “Off”. 2. Remove the exhaust throttle VSV 2 connector and ECM connector. 3. Check the circuit for short to voltage circuit. Was the DVM indicated specified value? 	No continuity	Go to *Step 10*	Go to *Step 7*
7	Repair the short to voltage circuit. Is the action complete?	—	Verify repair	—
8	Substitute a known good exhaust throttle VSV 2 and recheck. Was the problem solved?	—	Go to *Step 9*	Go to *Step 10*
9	Replace the exhaust throttle VSV 2. Is the action complete?	—	Verify repair	—
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”**. Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1605 (SYMPTOM CODE D) (FLASH CODE 55) EEPROM DEFECT

DIAGNOSTIC TROUBLE CODE (DTC) P1605 (SYMPTOM CODE E) (FLASH CODE 55) EEPROM DEFECT

Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
55	P1605	D	ON	EEPROM Defect	Write and read from the EEPROM are failed during initialization of the ECM.	ECM uses default values from the EPROM.
		E	ON	EEPROM Defect	EEPROM checksum does not match with the read check sum during initialization of the ECM.	

Circuit Description & Diagnostic Aids

The ECM used in this vehicle utilizes an electrically erasable & programmable read only memory (EEPROM). The EEPROM contains program information and the calibrations required for engine and diagnostics operation.

If the ECM inside (IC, circuit, memory, etc,) failed, DTC P1605 (Symptom Code C), P1605 (Symptom Code D) or P1605 (Symptom Code E) will be stored.

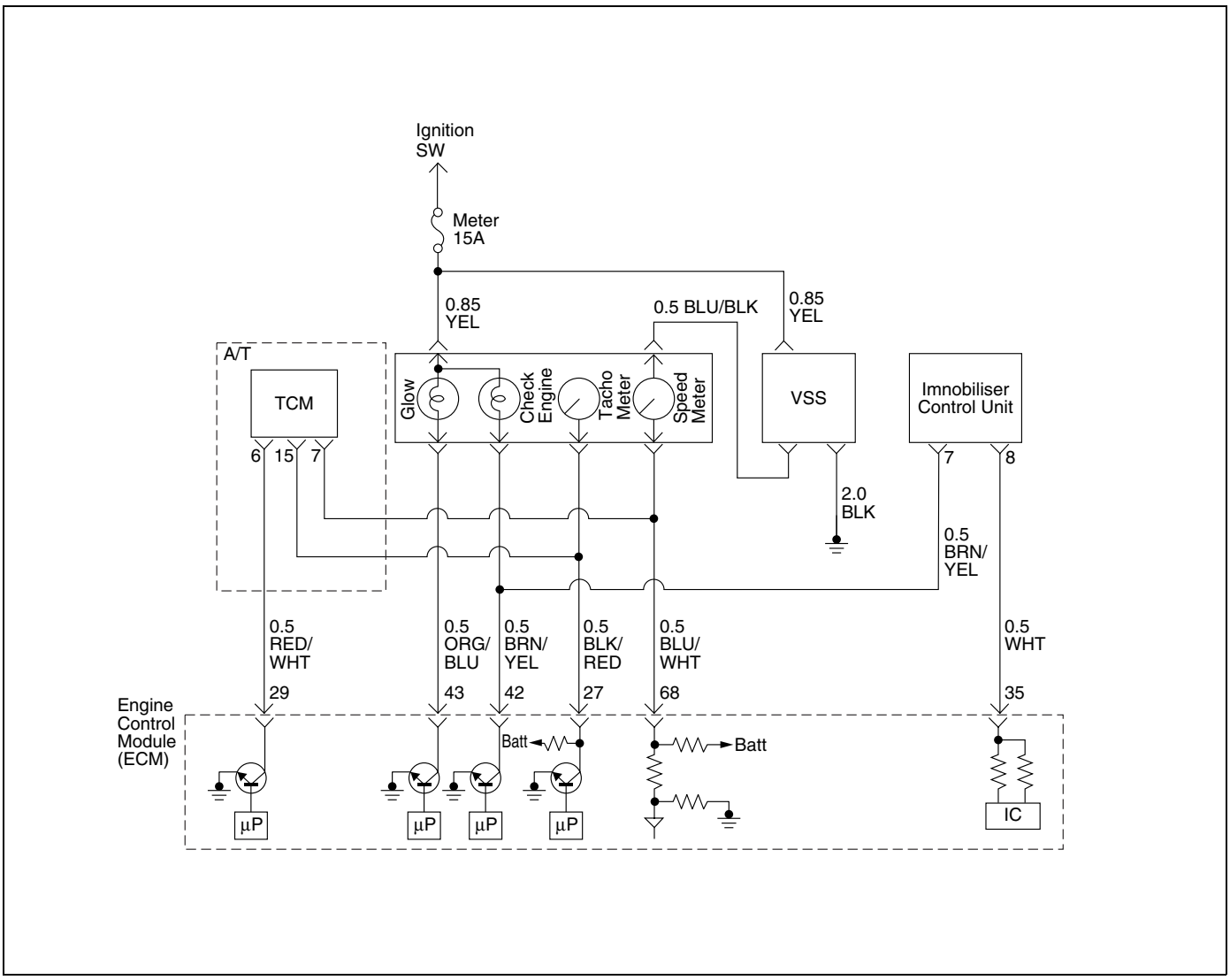
Diagnostic Trouble Code (DTC) P1605 (Symptom Code D) (Flash Code 55) EEPROM Defect

Diagnostic Trouble Code (DTC) P1605 (Symptom Code E) (Flash Code 55) EEPROM Defect

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1605 (Symptom Code D) or P1605 (Symptom Code E) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1605 (Symptom Code D) or P1605 (Symptom Code E) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*

Step	Action	Value(s)	Yes	No
5	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1610 (SYMPTOM CODE A) (FLASH CODE 56) SECURITY KEY AND SECURITY CODE NOT PROGRAMMED



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
56	P1610	A	-	Security Key and Security Code not Programmed	Immobiliser functions are not programmed in the ECM.	1. Engine does not start. 2. Check engine lamp flash.

Circuit Description

The ECM decides whether that is an abnormality in the immobiliser control system. DTC P1610 (Symptom Code A) is recorded when immobiliser function was not programmed in the ECM.

Diagnostic Aids

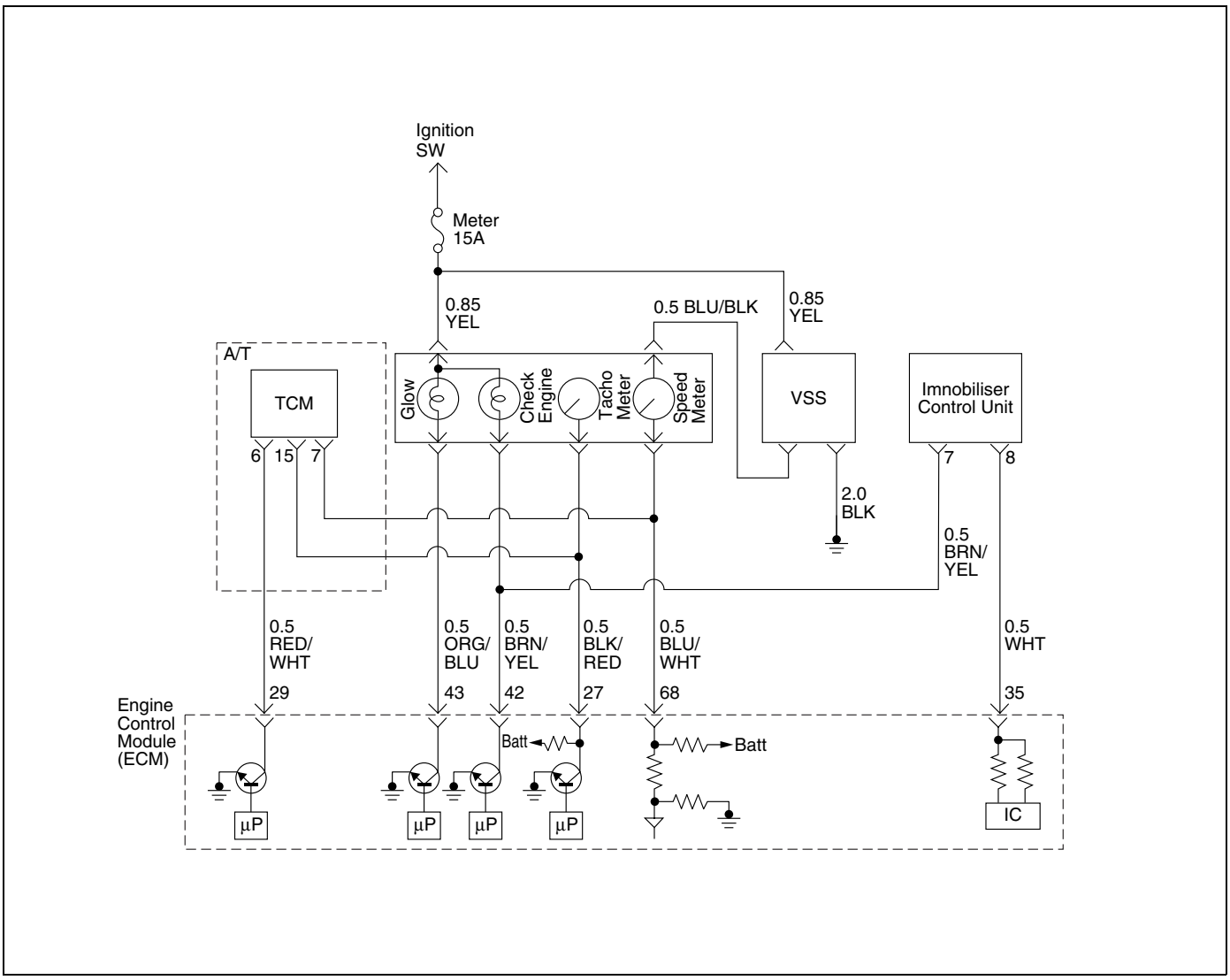
Check for the following conditions:

- Poor connection at ECM and immobiliser control unit-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1610 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P1610 (Symptom Code A) (Flash Code 56) Security Key and Security Code Not Programmed

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1610 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1610 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “Immobiliser” in the system selection menu “Body”. 3. Select “Read DTC Info Ordered By Priority” in the “Diagnostic Trouble Code”. Was the any DTC's B**** stored in this ignition cycle?	—	Refer to “*Immobiliser Workshop Manual” & Go to DTC Chart B****	Go to *Step 5*
5	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 6*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1611 (SYMPTOM CODE A) (FLASH CODE 56) WRONG SECURITY CODE ENTERED



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
56	P1611	A	-	Wrong Security Code Entered	Received security code is not correct.	1. Engine does not start. 2. Check engine lamp flash.

Circuit Description

The ECM decides whether that is an abnormality in the immobiliser control system. DTC P1611 (Symptom Code A) is recorded when received immobiliser security code was not correct.

Diagnostic Aids

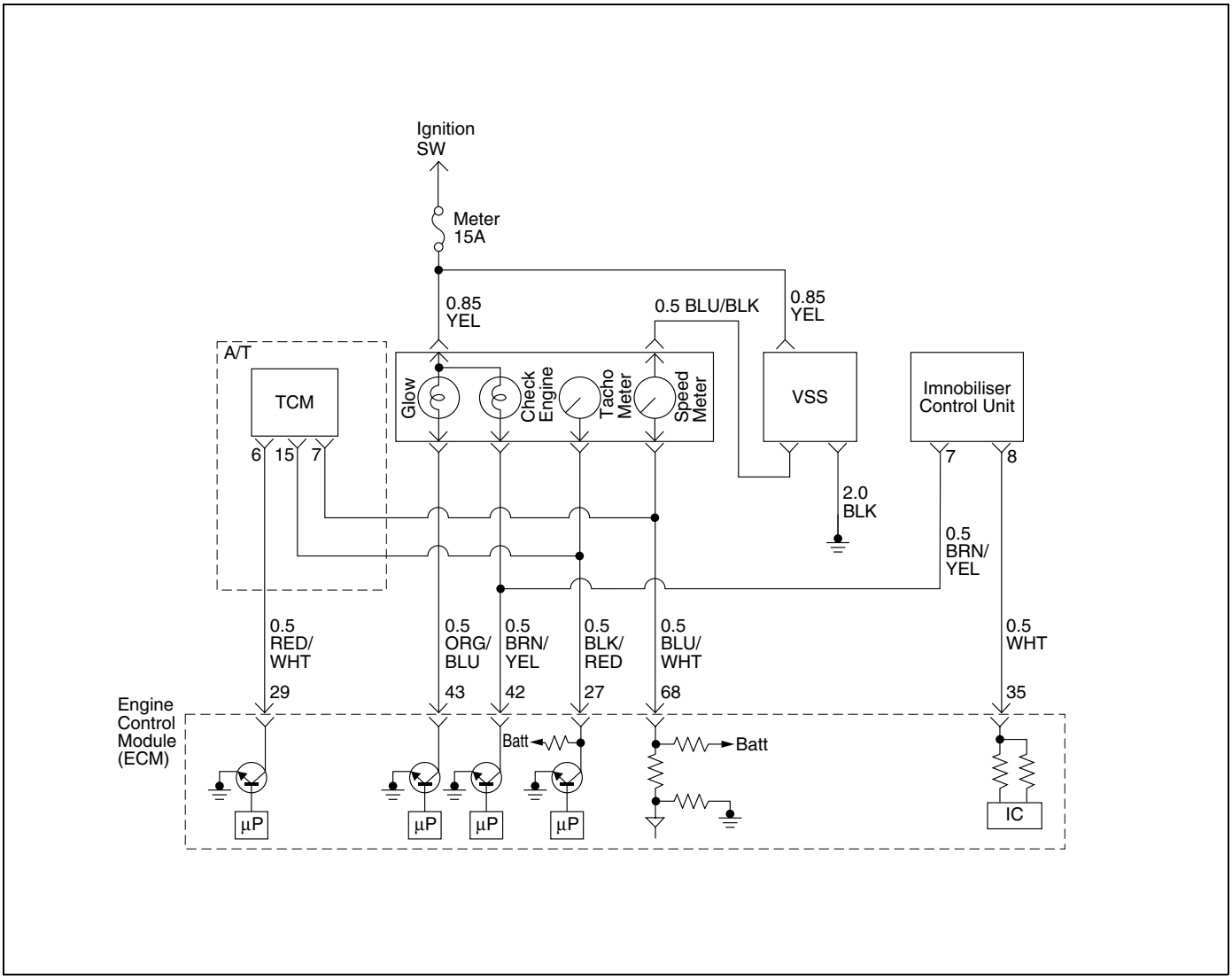
Check for the following conditions:

- Poor connection at ECM and immobiliser control unit-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1611 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P1611 (Symptom Code A) (Flash Code 56) Wrong Security Code Entered

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1611 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1611 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “Immobiliser” in the system selection menu “Body”. 3. Select “Read DTC Info Ordered By Priority” in the “Diagnostic Trouble Code”. Was the any DTC's B**** stored in this ignition cycle?	—	Refer to “*Immobiliser Workshop Manual” & Go to DTC Chart B****	Go to *Step 5*
5	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the **“SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 6*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1612 (SYMPTOM CODE A) (FLASH CODE 56) IMMOBILISER NO OR WRONG SIGNAL



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
56	P1612	A	-	Immobiliser No or Wrong Signal	Received challenge signal is not correct or not received.	1. Engine does not start. 2. Check engine lamp flash.

Circuit Description

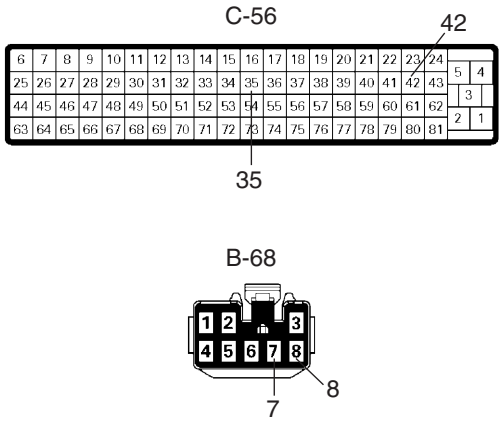
The ECM decides whether that is an abnormality in the immobiliser control system. DTC P1612 (Symptom Code A) is recorded when received immobiliser challenge signal was not correct.

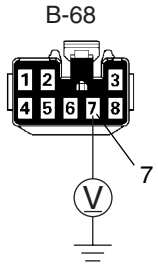
Diagnostic Aids

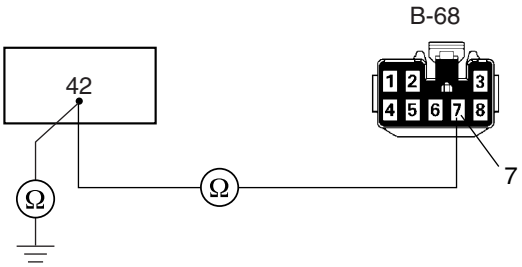
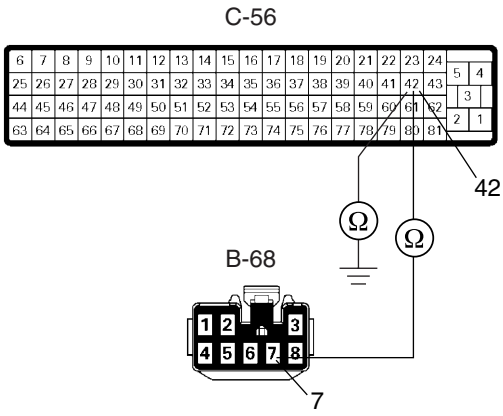
Check for the following conditions:

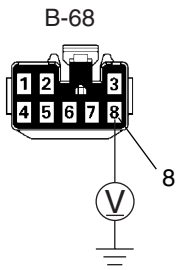
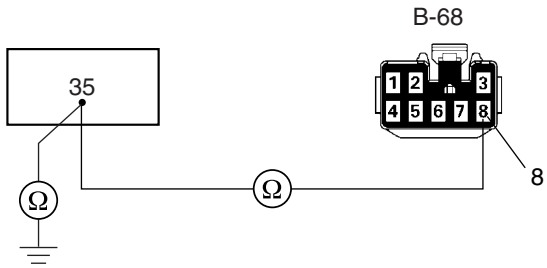
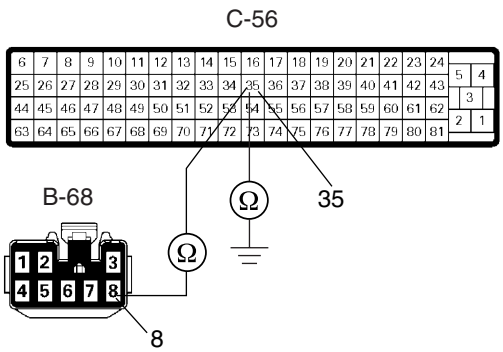
- Poor connection at ECM and immobiliser control unit-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1612 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P1612 (Symptom Code A) (Flash Code 56) Immobiliser No or Wrong Signal

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1612 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1612 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “Immobiliser” in the system selection menu “Body”. 3. Select “Read DTC Info Ordered By Priority” in the “Diagnositic Trouble Code”. Was the any DTC's B**** stored in this ignition cycle?	—	Refer to “*Immobiliser Workshop Manual” & Go to DTC Chart B****	Go to *Step 5*
5	Check for poor/faulty connection at the immobiliser control unit connector or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 6*

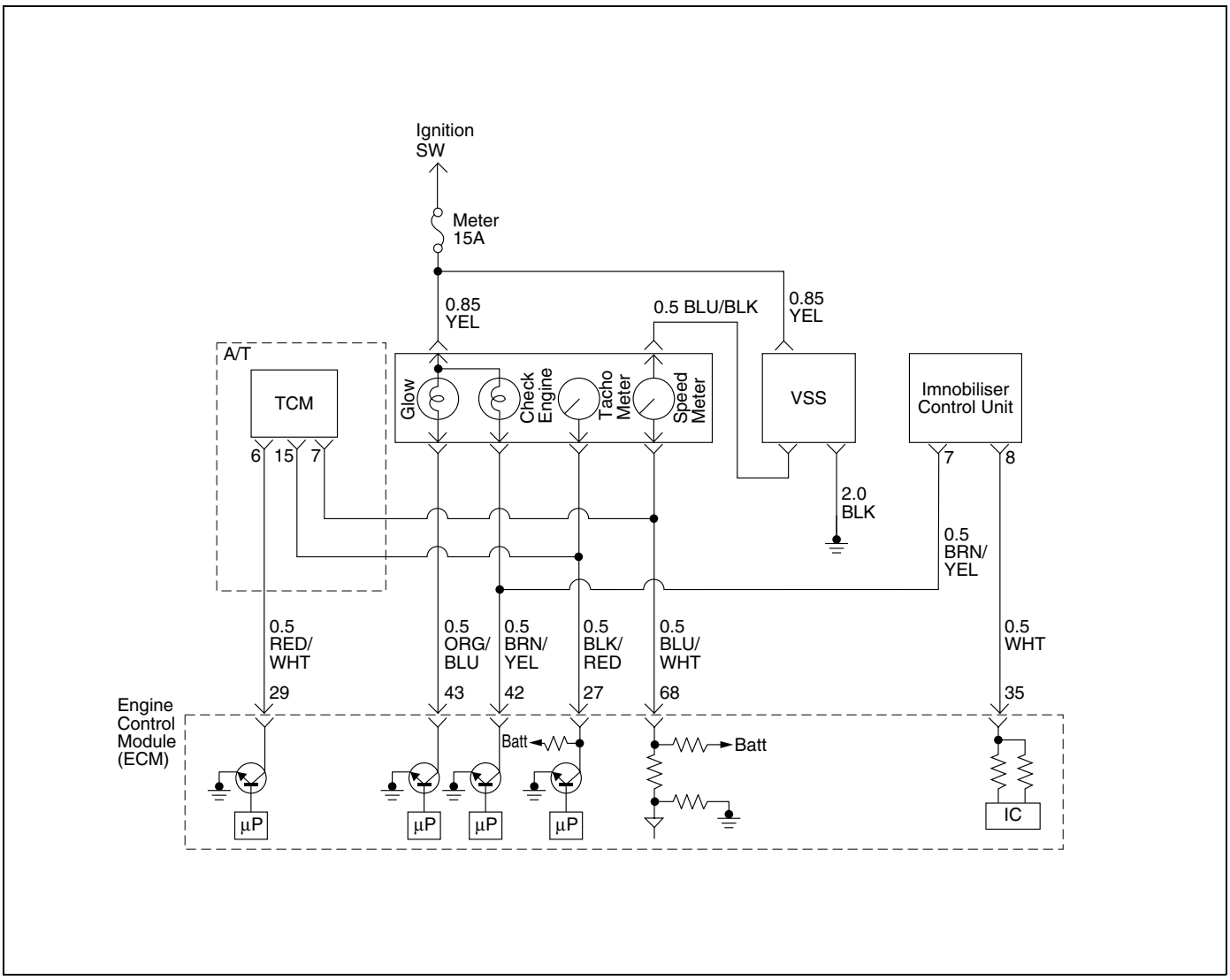
Step	Action	Value(s)	Yes	No
6	Using the DVM and check the “CHECK ENGINE” lamp circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the meter connector and immobiliser control unit connector. 3. Ignition “On”. 4. Check the circuit for short to power supply circuit. Was DVM indicated specified value? 	Less than 1V	Go to *Step 7*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the “CHECK ENGINE” lamp circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the immobiliser control unit connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the the immobiliser control unit connector and ECM connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	— Repair faulty harness and verify repair	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the ECM and immobiliser control unit communication circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the immobiliser control unit connector. 3. Ignition “On”. 4. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 9*	Repair faulty harness and verify repair
9	Using the DVM and check the ECM and immobiliser control unit communication circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the immobiliser control unit connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the the immobiliser control unit connector and ECM connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1613 (SYMPTOM CODE A) (FLASH CODE 56) IMMOBILISER NO OR WRONG SIGNAL



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
56	P1613	A	-	Immobiliser No or Wrong Signal	Received response signal is not correct or not received.	1. Engine does not start. 2. Check engine lamp flash.

Circuit Description

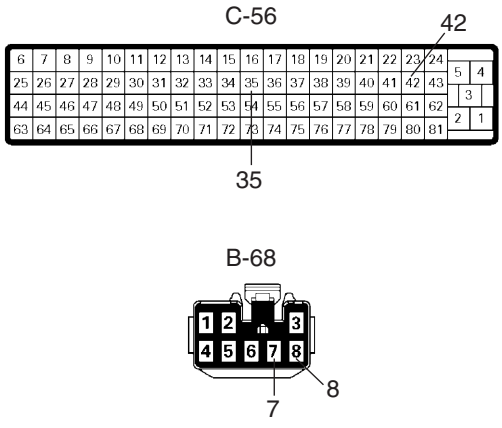
The ECM decides whether that is an abnormality in the immobiliser control system. DTC P1613 (Symptom Code A) is recorded when received immobiliser response signal was not correct.

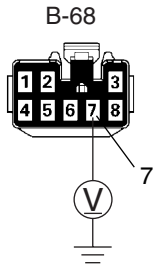
Diagnostic Aids

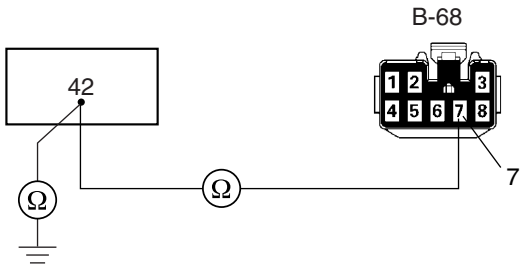
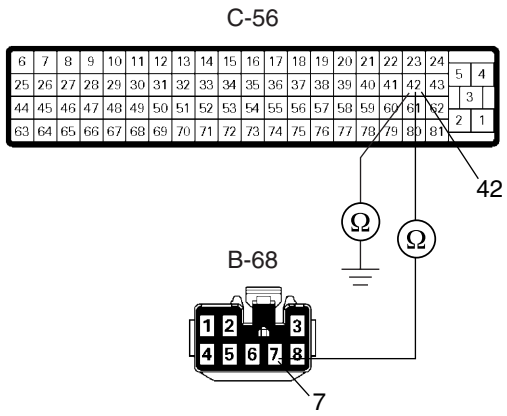
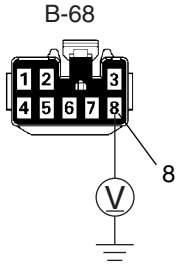
Check for the following conditions:

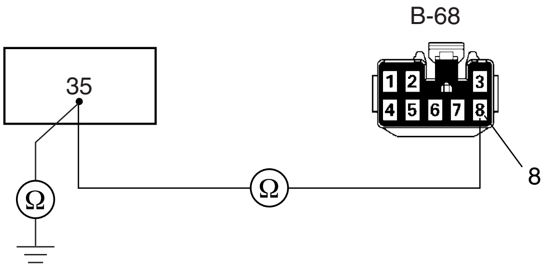
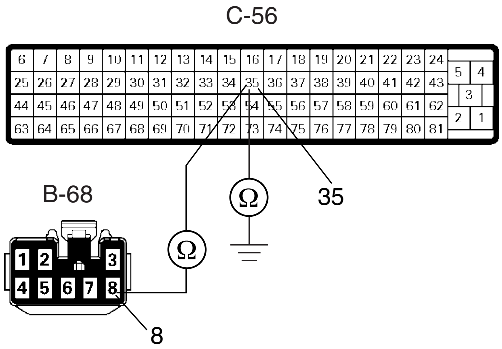
- Poor connection at ECM and immobiliser control unit-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1613 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P1613 (Symptom Code A) (Flash Code 56) Immobiliser No or Wrong Signal

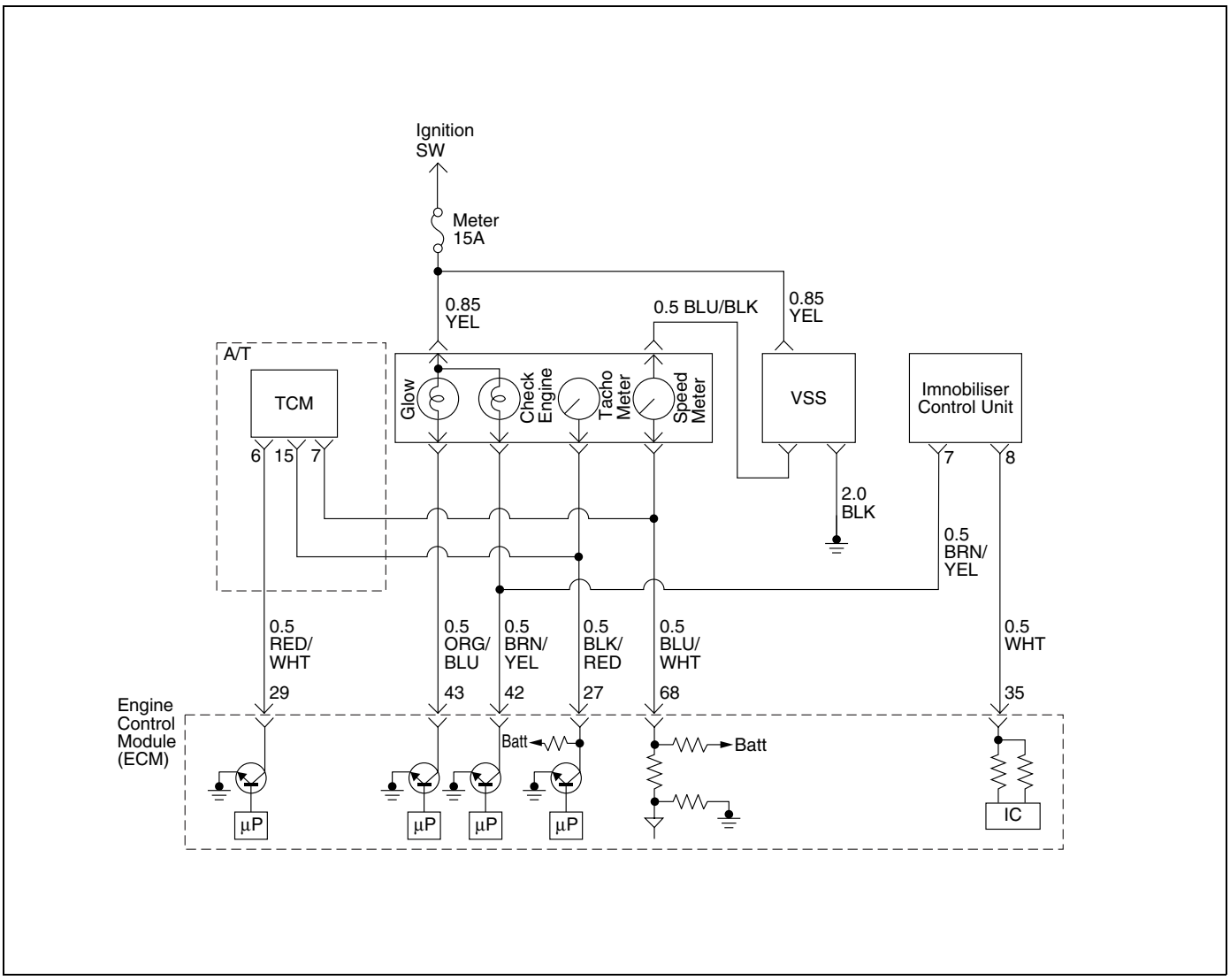
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1613 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1613 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “Immobiliser” in the system selection menu “Body”. 3. Select “Read DTC Info Ordered By Priority” in the “Diagnositic Trouble Code”. Was the any DTC's B**** stored in this ignition cycle?	—	Refer to “*Immobiliser Workshop Manual” & Go to DTC Chart B****	Go to *Step 5*
5	Check for poor/faulty connection at the immobiliser control unit connector or ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	Using the DVM and check the “CHECK ENGINE” lamp circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the meter connector and immobiliser control unit connector. 3. Ignition “On”. 4. Check the circuit for short to power supply circuit. Was DVM indicated specified value? 	Less than 1V	Go to *Step 7*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the “CHECK ENGINE” lamp circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the immobiliser control unit connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the the immobiliser control unit connector and ECM connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 8*
8	Using the DVM and check the ECM and immobiliser control unit communication circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the immobiliser control unit connector. 3. Ignition “On”. 4. Check the circuit for short to power supply circuit. Was the DVM indicated specified value? 	Less than 1V	Go to *Step 9*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
9	Using the DVM and check the ECM and immobiliser control unit communication circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the immobiliser control unit connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the the immobiliser control unit connector and ECM connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 10*
10	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 11*
11	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1614 (SYMPTOM CODE A) (FLASH CODE 56) WRONG TRANSPONDER KEY



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
56	P1614	A	-	Wrong Transponder Key	Received response signal is not correct from the transponder key.	1. Engine does not start. 2. Check engine lamp flash.

Circuit Description

The ECM decides whether that is an abnormality in the immobiliser control system. DTC P1614 (Symptom Code A) is recorded when received immobiliser response signal was not correct from the transponder key.

Diagnostic Aids

Check for the following conditions:

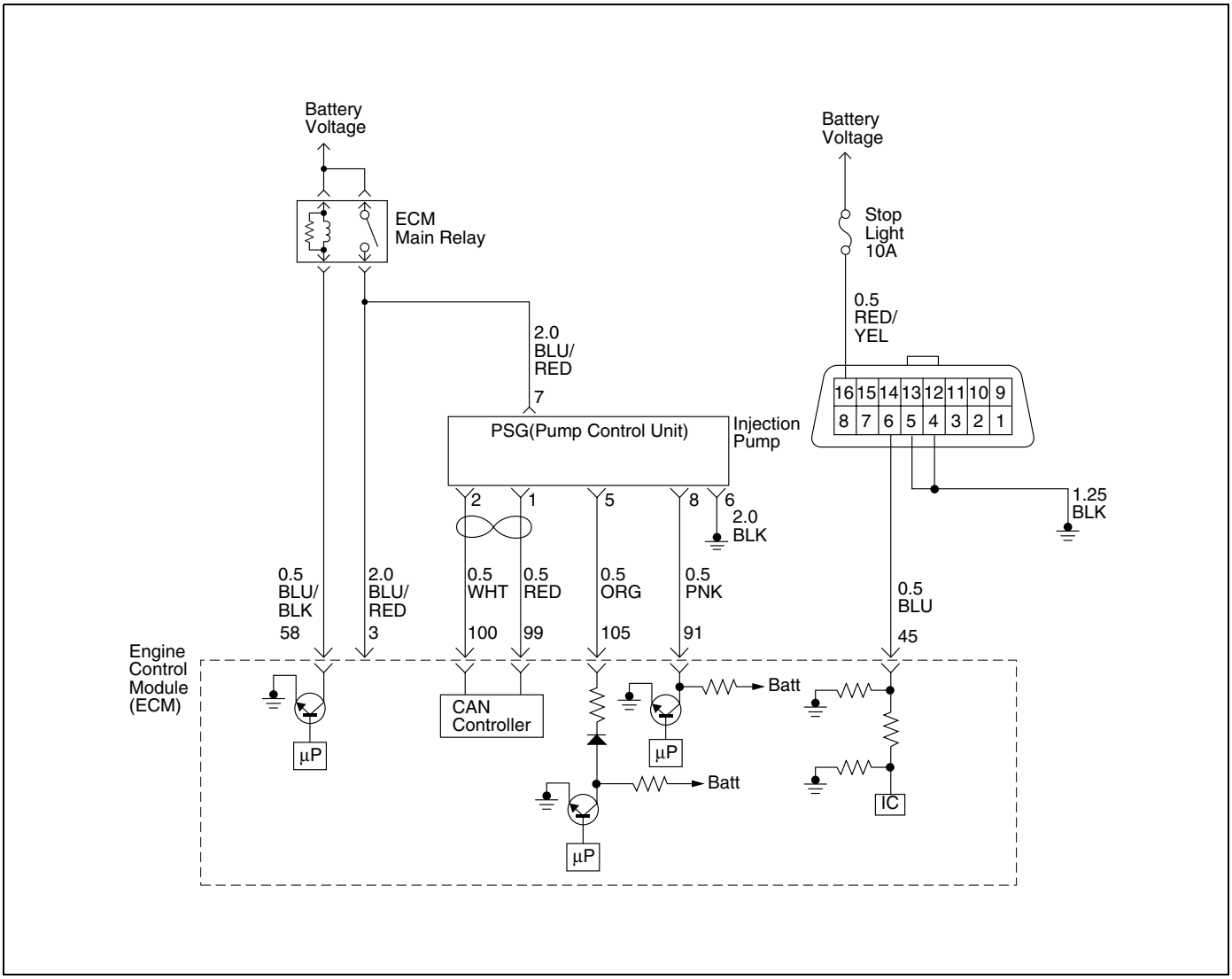
- Poor connection at ECM and immobiliser control unit-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1614 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P1614 (Symptom Code A) (Flash Code 56) Wrong Transponder Key

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1614 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1614 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “Immobiliser” in the system selection menu “Body”. 3. Select “Read DTC Info Ordered By Priority” in the “Diagnostic Trouble Code”. Was the any DTC's B**** stored in this ignition cycle?	—	Refer to “*Immobiliser Workshop Manual” & Go to DTC Chart B****	Go to *Step 5*
5	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 6*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must e programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1625 (SYMPTOM CODE A) (FLASH CODE 76) ECM MAIN RELAY SWITCHED OFF TOO EARLY

DIAGNOSTIC TROUBLE CODE (DTC) P1625 (SYMPTOM CODE B) (FLASH CODE 76) ECM MAIN RELAY SWITCHED OFF TOO LATE



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
76	P1625	A	OFF	ECM Main Relay Switched Off Too Early	When ignition switch was turned off, timing of the ECM main relay turning off is too early.	No fail-safe function.
		B	OFF	ECM Main Relay Switched Off Too Late	When ignition switch was turned off, timing of the ECM main relay turning off is too late or does not off.	

Circuit Description

The ECM switches ECM main relay to operate ECM and other sensors or controller.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.

- Broken wire inside the insulation.

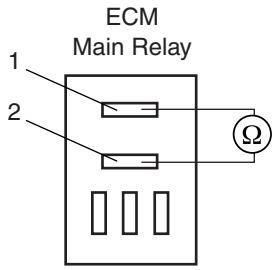
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Main Relay” display on the Tech2 while moving connectors and wiring harnesses. A change in the display will indicate the location of the fault.

Diagnostic Trouble Code (DTC) P1625 (Symptom Code A) (Flash Code 76) ECM Main Relay Switched Off Too Early

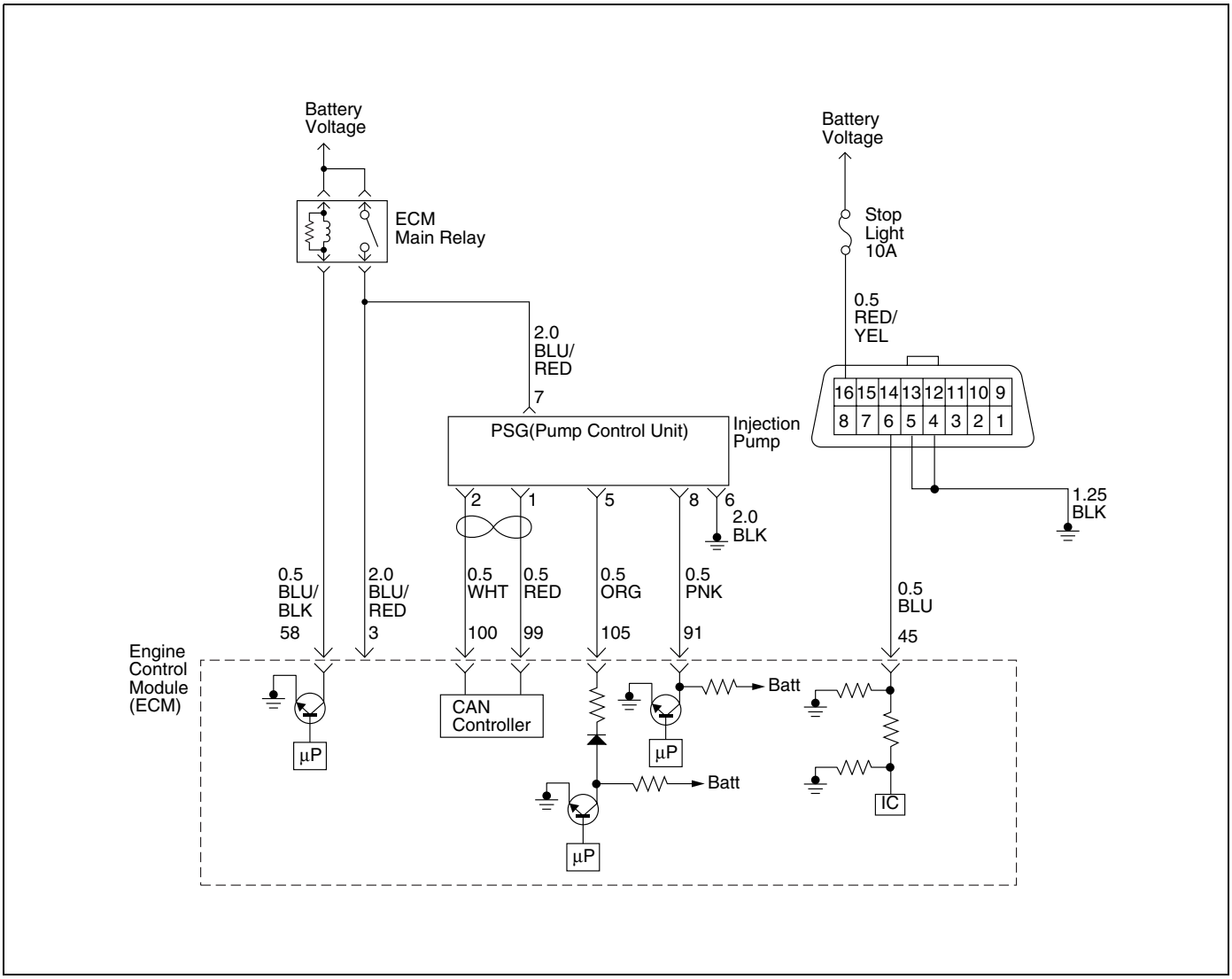
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1625 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1625 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1625 (Symptom Code B) (Flash Code 76) ECM Main Relay Switched Off Too Late

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1625 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1625 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Using the DVM and check the ECM main relay. 1. Ignition “Off”, engine “Off”. 2. Remove the ECM main relay from the relay box. 3. Check the relay switch. Was the DVM indicated specified value? 	No continuitly	Go to *Step 5*	Replace ECM main relay and verify repair
5	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 6*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1630 (SYMPTOM CODE A) (FLASH CODE 51) FUEL INJECTION QUANTITY CIRCUIT MALFUNCTION

DIAGNOSTIC TROUBLE CODE (DTC) P1630 (SYMPTOM CODE B) (FLASH CODE 51) FUEL INJECTION QUANTITY CIRCUIT MALFUNCTION



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
51	P1630	A	ON	Fuel Injection Quantity Circuit Malfunction	The PSG (pump control unit) detects high pressure solenoid valve control circuit malfunction due to high current.	Fuel injection quantity is reduced.
		B	ON	Fuel Injection Quantity Circuit Malfunction	The PSG (pump control unit) detects high pressure solenoid valve control circuit malfunction due to continuous current.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.

Circuit Description

The ECM is calculates an injection quantity and an injection timing using the various sensors. And the PSG controls the high pressure solenoid valve depending on programmed pump map data.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

Check for the following conditions:

- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.

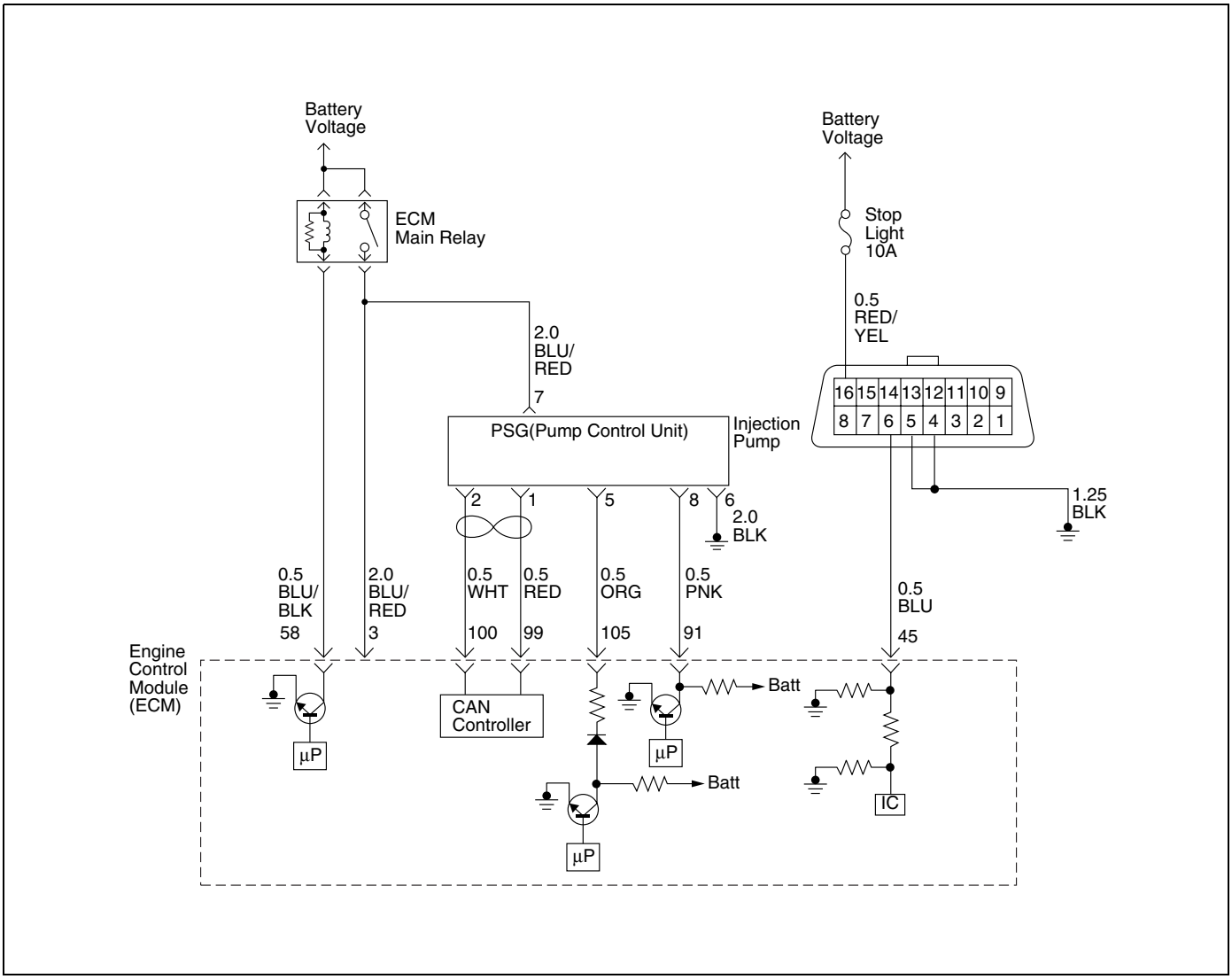
Diagnostic Trouble Code (DTC) P1630 (Symptom Code A) (Flash Code 51) Fuel Injection Quantity Circuit Malfunction

Diagnostic Trouble Code (DTC) P1630 (Symptom Code B) (Flash Code 51) Fuel Injection Quantity Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1630 (Symptom Code A) or P1630 (symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1630 (Symptom Code A) or P1630 (symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1650 (SYMPTOM CODE A) (FLASH CODE 44) CAN DEVICE OFFLINE

DIAGNOSTIC TROUBLE CODE (DTC) P1650 (SYMPTOM CODE B) (FLASH CODE 44) CAN DEVICE HANG-UP



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
44	P1650	A	ON	CAN Device Offline	CAN controller detects Bus-off or canceling.	MAB (fuel cutoff solenoid valve) is operated.
		B	ON	CAN Device Hang-up	CAN controller does not react under engine running.	

Circuit Description

The interchange of data between the engine control module (ECM) and the pump control unit (PSG) is performed via a CAN-bus system. The individual CAN-bus systems are connected via two interfaces and can exchange information and data. This allows control modules that are connected to different CAN-bus systems to communicate.

Diagnostic Aids

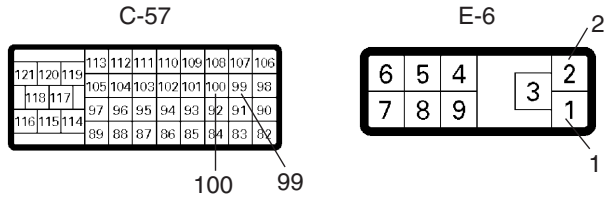
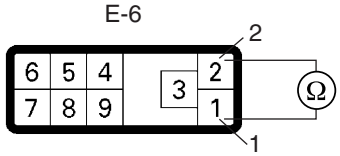
An intermittent may be caused by the following:

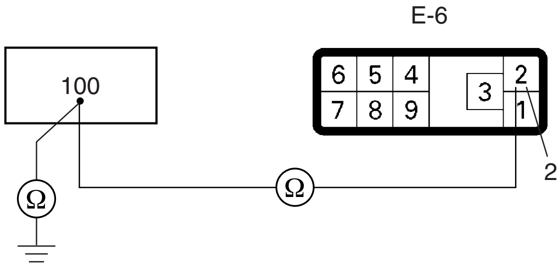
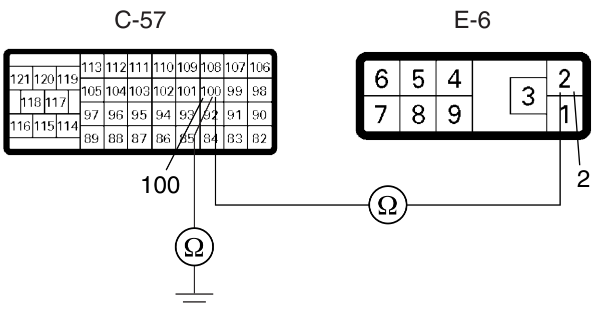
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

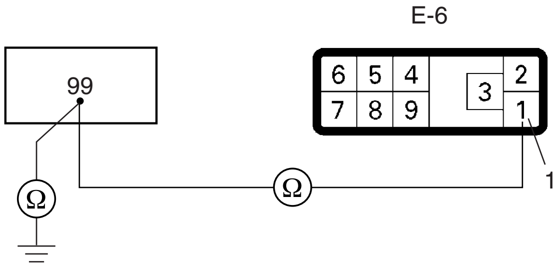
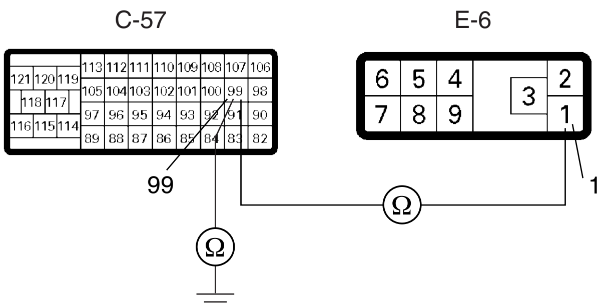
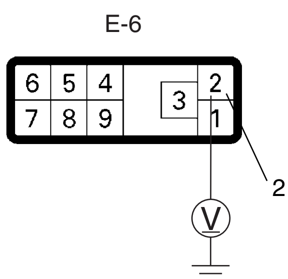
Check for the following conditions:

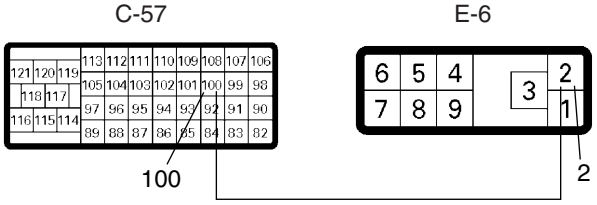
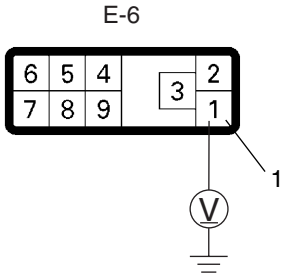
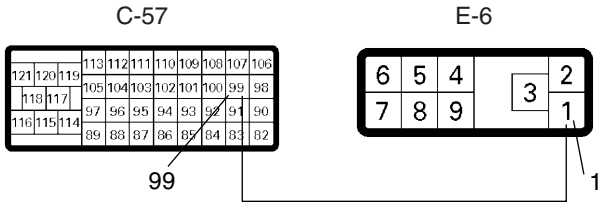
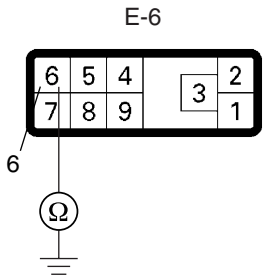
- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1650 display on the Tech2 while moving connectors and wiring harnesses.

Diagnostic Trouble Code (DTC) P1650 (Symptom Code A) (Flash Code 44) CAN Device Offline

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1650 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1650 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Check for poor/faulty connection at the ECM or PSG (pump control unit) connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 5*
5	Visually check the PSG (pump control unit). Was the problem found?	—	Go to *Step 18*	Go to *Step 6*
6	Using the DVM and check the CAN high circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector and PSG (pump control unit) connector. 3. Check the circuit for short to CAN low circuit. Was the DVM indicated specified value? 	No continuity	Go to *Step 7*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
7	Using the DVM and check the CAN high circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the CAN low circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 9*
9	Using the DVM and check the CAN high circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated battery voltage or approximately 5V? 	—	Go to *Step 10*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
10	Repair the short to voltage circuit between the ECM and PSG (pump control unit). Is the action complete? 	—	Verify repair	—
11	Using the DVM and check the CAN low circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated battery voltage or approximately 5V? 	—	Go to *Step 12*	Go to *Step 13*
12	Repair the short to voltage circuit between the ECM and PSG (pump control unit). Is the action complete? 	—	Verify repair	—
13	Using the DVM and check the PSG (pump control unit) ground circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for open circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 14*

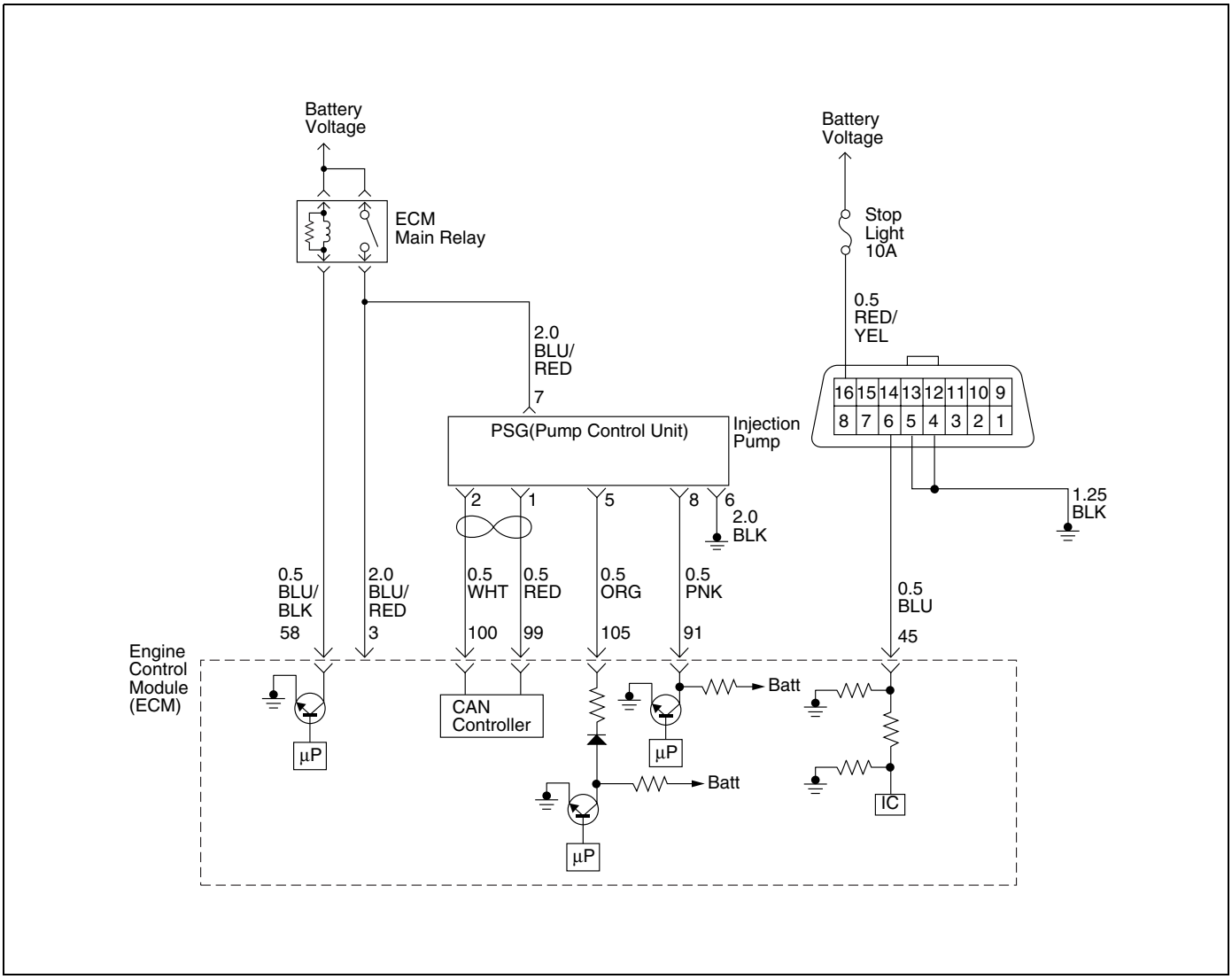
Step	Action	Value(s)	Yes	No
14	Check any accessory parts which may cause electric interference. Was the problem found?	—	Remove the accessory parts and verify repair	Go to *Step 15*
15	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 16*
16	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 17*	Go to *Step 18*
17	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
18	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1650 (Symptom Code B) (Flash Code 44) CAN Device Hang-up

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1650 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1650 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	Go to *Step 7*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
7	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1651 (SYMPTOM CODE A) (FLASH CODE 45) CAN MALFUNCTION (PSG)

DIAGNOSTIC TROUBLE CODE (DTC) P1651 (SYMPTOM CODE B) (FLASH CODE 45) CAN RECEIVES ERROR



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
45	P1651	A	ON	CAN Malfunction (PSG)	The PSG (pump control unit) does not recognize CAN signal from the CAN controller.	1. MAB (fuel cutoff solenoid valve) is operated. 2. Desired injection quantity becomes 0mg/strk.
		B	ON	CAN Receives Error	The ECM does not read CAN signal from the PSG (pump control unit).	

Circuit Description

The interchange of data between the engine control module (ECM) and the pump control unit (PSG) is performed via a CAN-bus system. The individual CAN-bus systems are connected via two interfaces and can exchange information and data. This allows control modules that are connected to different CAN-bus systems to communicate.

Diagnostic Aids

An intermittent may be caused by the following:

- Poor connections.
- Misrouted harness.

- Rubbed through wire insulation.
- Broken wire inside the insulation.

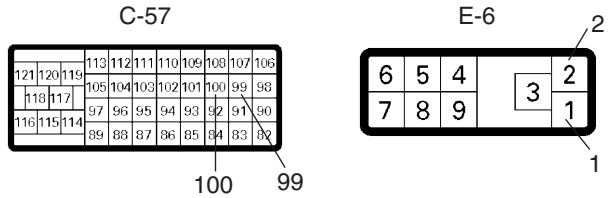
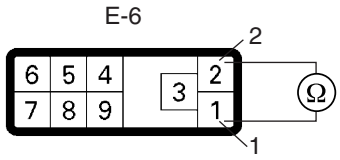
Check for the following conditions:

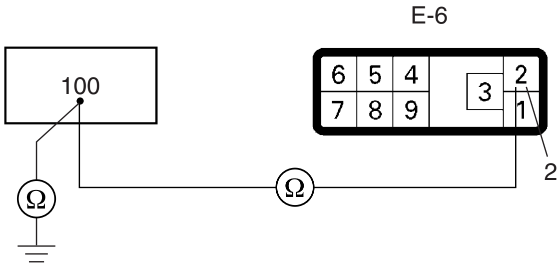
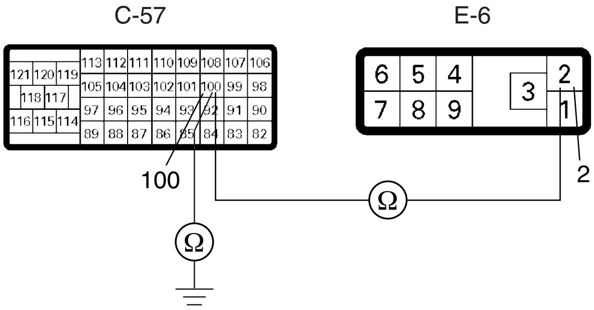
- Poor connection at ECM and PSG-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the DTC P1651 display on the Tech2 while moving connectors and wiring harnesses.

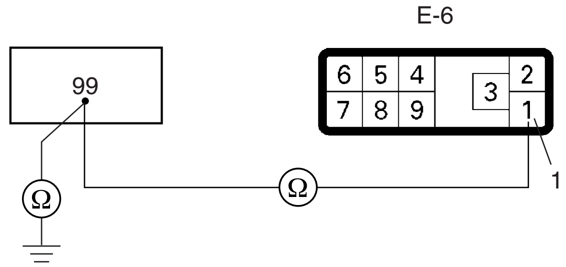
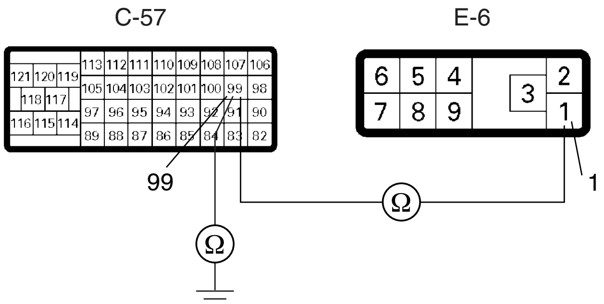
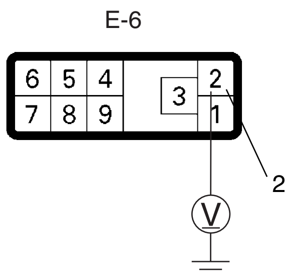
Diagnostic Trouble Code (DTC) P1651 (Symptom Code A) (Flash Code 45) CAN Malfunction (PSG)

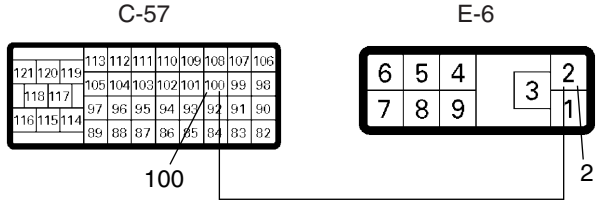
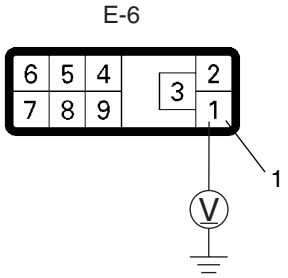
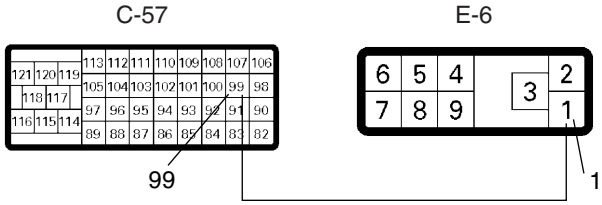
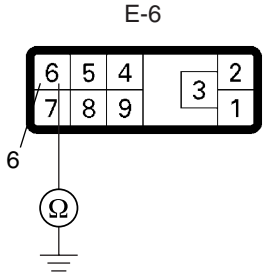
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1651 (Symptom Code A) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1651 (Symptom Code A) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	Go to *Step 7*
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
7	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1651 (Symptom Code B) (Flash Code 45) CAN Receives Error

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1651 (Symptom Code B) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1651 (Symptom Code B) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	Was the DTC P1650 (Symptom Code A) stored at the same time?	—	Go to *DTC Chart P1650 (Symptom Code A)*	Go to *Step 5*
5	Check for poor/faulty connection at the ECM or PSG (pump control unit) connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? 	—	Verify repair	Go to *Step 6*
6	Visually check the PSG (pump control unit). Was the problem found?	—	Go to *Step 19*	Go to *Step 7*
7	Using the DVM and check the CAN high circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector and PSG (pump control unit) connector. 3. Check the circuit for short to CAN low circuit. Was the DVM indicated specified value? 	No continuity	Go to *Step 8*	Repair faulty harness and verify repair

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the CAN high circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 9*

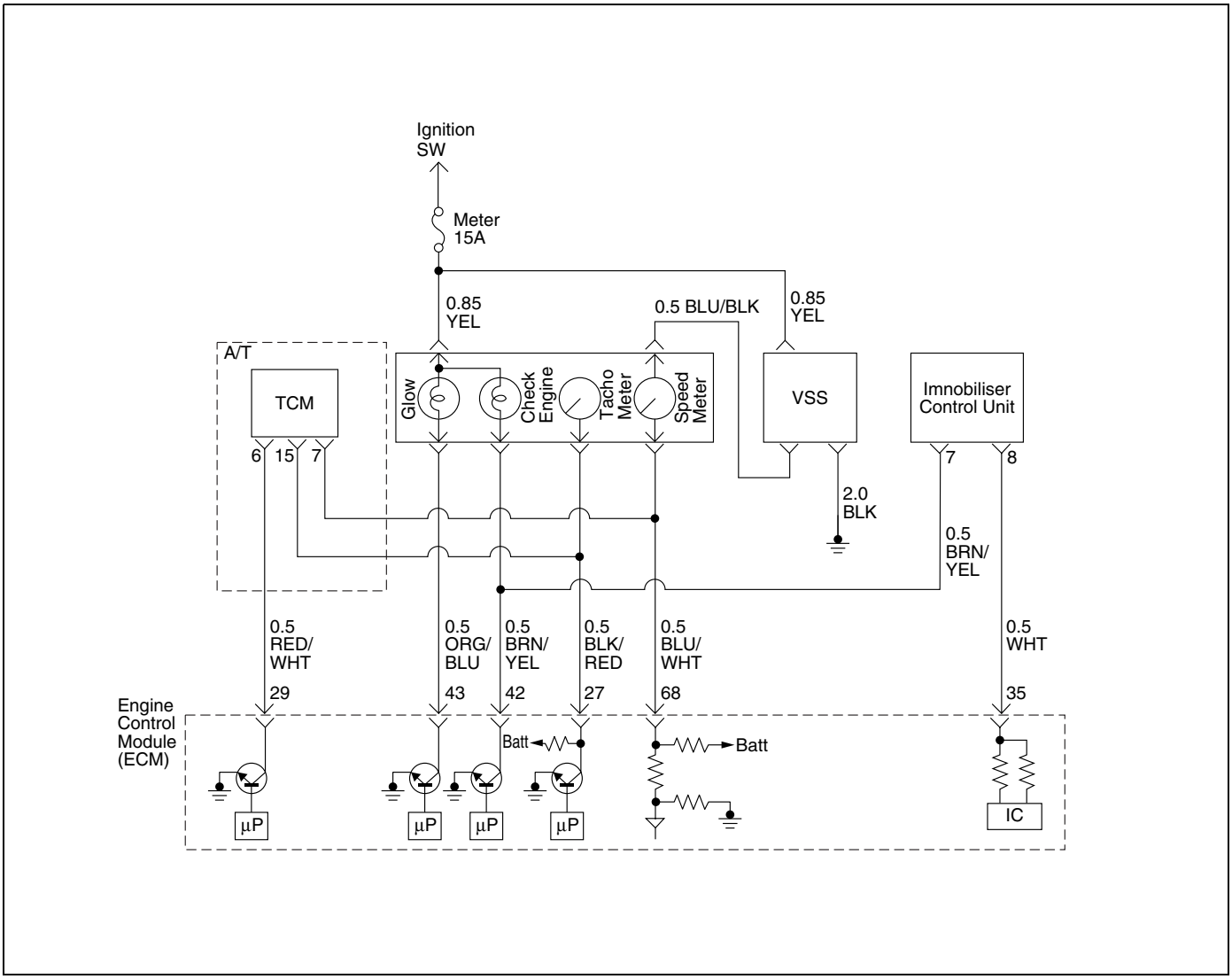
Step	Action	Value(s)	Yes	No
9	Using the DVM and check the CAN low circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Disconnect the PSG (pump control unit) connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for open or short to ground circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 10*
10	Using the DVM and check the CAN high circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated battery voltage or approximately 5V? 	—	Go to Step 11	Go to Step 12

Step	Action	Value(s)	Yes	No
11	Repair the short to voltage circuit between the ECM and PSG (pump control unit). Is the action complete? 	—	Verify repair	—
12	Using the DVM and check the CAN low circuit. 1. Ignition “On”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for short to power supply circuit. Was the DVM indicated battery voltage or approximately 5V? 	—	Go to *Step 13*	Go to *Step 14*
13	Repair the short to voltage circuit between the ECM and PSG (pump control unit). Is the action complete? 	—	Verify repair	—
14	Using the DVM and check the PSG (pump control unit) ground circuit. 1. Ignition “Off”, engine “Off”. 2. Disconnect the PSG (pump control unit) connector. 3. Check the circuit for open circuit. Was the problem found? 	—	Repair faulty harness and verify repair	Go to *Step 15*

Step	Action	Value(s)	Yes	No
15	Check any accessory parts which may cause electric interference. Was the problem found?	—	Remove the accessory parts and verify repair	Go to *Step 16*
16	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 17*
17	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 18*	Go to *Step 19*
18	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
19	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

DIAGNOSTIC TROUBLE CODE (DTC) P1690 (SYMPTOM CODE 4) (FLASH CODE 77) CHECK ENGINE LAMP (MIL) CIRCUIT VOLTAGE LOW

DIAGNOSTIC TROUBLE CODE (DTC) P1690 (SYMPTOM CODE 8) (FLASH CODE 77) CHECK ENGINE LAMP (MIL) CIRCUIT VOLTAGE HIGH



Condition for setting the DTC and action taken when the DTC sets

Flash Code	Code	Symptom Code	MIL	DTC Name	DTC Setting Condition	Fail-Safe (Back Up)
77	P1690	4	OFF	Check Engine Lamp (MIL) Circuit Voltage Low	Check engine lamp circuit open or short to ground circuit.	No fail-safe function.
		8	OFF	Check Engine Lamp (MIL) Circuit Voltage High	Check engine lamp circuit short to ground circuit.	

Circuit Description

The Check Engine Lamp (Malfunction Indicator Lamp =MIL) should always be illuminated and steady with ignition “On”. Ignition feed voltage is supplied to the Check Engine Lamp bulb through the meter fuse. The ECM turns the Check Engine Lamp “On” by grounding the check engine lamp driver circuit for a certain time.

Diagnostic Aids

An intermittent may be caused by the following:

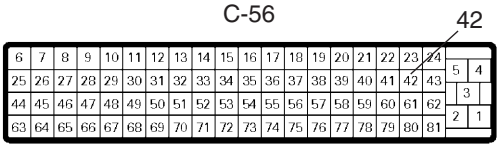
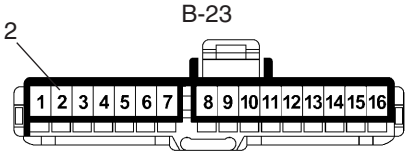
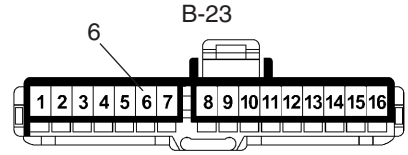
- Poor connections.
- Misrouted harness.
- Rubbed through wire insulation.
- Broken wire inside the insulation.

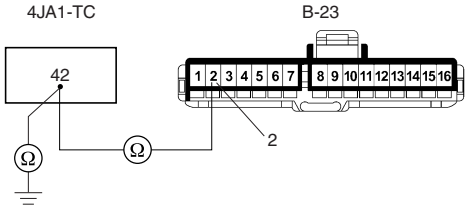
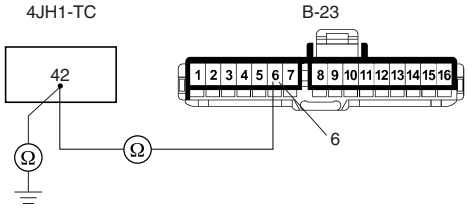
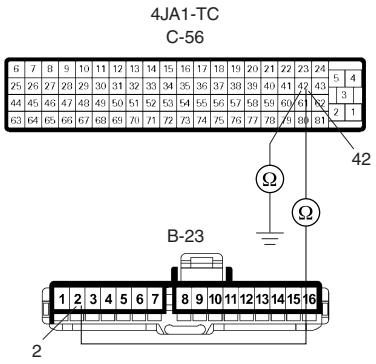
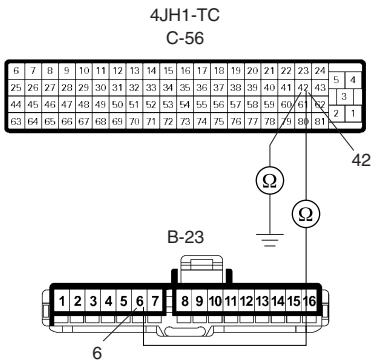
Check for the following conditions:

- Poor connection at ECM-Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
- Damaged harness-Inspect the wiring harness for damage. If the harness appears to be OK, observe the “Check Engine Lamp” display on the Tech2 while moving connectors and wiring harnesses. A change in the display will indicate the location of the fault.

Diagnostic Trouble Code (DTC) P1690 (Symptom Code 4) (Flash Code 77) Check Engine Lamp (MIL) Circuit Voltage Low

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1690 (Symptom Code 4) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1690 (Symptom Code 4) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids* and Go to *Step 4*
4	1. Ignition “On”, engine “Off”. 2. Check the “Check Engine” lamp. Does the lamp turn “On”?	—	Go to *Step 5*	Go to *Step 6*
5	1. Ignition “On”, engine “Off”. 2. Check the “Check Engine” lamp. Does the lamp turn “Off”?	—	Go to *Step 9*	Go to *Step 7*
6	Check the “Check Engine” lamp bulb. If the bulb is burnt out, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 7*

Step	Action	Value(s)	Yes	No
7	Check for poor/faulty connection at the meter connector and ECM connector. If a poor/faulty connection is found, repair as necessary. Was the problem found? C-56  4JA1-TC B-23  4JH1-TC B-23  	—	Verify repair	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	Using the DVM and check the “Check Engine” lamp circuit. **Breaker box is available:** 1. Ignition “Off”, engine “Off”. 2. Install the breaker box as type A. (ECM disconnected) Ref. Page 6E-81 3. Remove the meter connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?   **Breaker box is not available:** 1. Ignition “Off”, engine “Off”. 2. Disconnect the ECM connector. 3. Remove the meter connector. 4. Check the circuit for open or short to ground circuit. Was the problem found?  	—	Repair faulty harness and verify repair	Go to *Step 9*

Step	Action	Value(s)	Yes	No
9	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the "**SPS (Service Programming System)".** Was the problem solved?	—	Verify repair	Go to *Step 10*
10	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—

Diagnostic Trouble Code (DTC) P1690 (Symptom Code 8) (Flash Code 77) Check Engine Lamp (MIL) Circuit Voltage High

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Connect the Tech 2. 2. Review and record the failure information. 3. Select “F0: Read DTC Infor As Stored By ECU” in “F0: Diagnostic Trouble Codes”. Is the DTC P1690 (Symptom Code 8) stored as “Present Failure”?	—	Go to *Step 3*	Refer to *Diagnostic Aids* and Go to *Step 3*
3	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Select “F1: Clear DTC Information” in “F0: Diagnostic Trouble Codes” with the Tech 2 and clear the DTC information. 3. Operate the vehicle and monitor the “F0: Read DTC Infor As Stored By ECU” in the “F0: Diagnostic Trouble Codes”. Was the DTC P1690 (Symptom Code 8) stored in this ignition cycle?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the “**SPS (Service Programming System)”.** Was the problem solved?	—	Verify repair	Go to *Step 5*
5	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 6*	—
6	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—

SYMPTOM DIAGNOSIS

PRELIMINARY CHECKS

Before using this section, perform the “On-Board Diagnostic (OBD) System Check” and verify all of the following items:

- The engine control module (ECM) and check engine lamp (MIL=malfunction indicator lamp are operating correctly.
- There are no Diagnostic Trouble Code(s) stored.
- Tech 2 data is within normal operating range. Refer to Typical Scan Data Values.
- Verify the customer complaint and locate the correct symptom in the table of contents. Perform the procedure included in the symptom chart.

VISUAL/PHYSICAL CHECK

Several of the symptom procedures call for a careful visual/physical check. This can lead to correcting a problem without further checks and can save valuable time. This check should include the following items:

- ECM grounds for cleanliness, tightness and proper location.
- Vacuum hoses for splits, kinks, and proper connection. Check thoroughly for any type of leak or restriction.
- Air intake ducts for collapsed or damaged areas.
- Air leaks at throttle body mounting area, mass air flow (MAF) sensor and intake manifold sealing surfaces.
- Wiring for proper connections, pinches and cuts.

INTERMITTENT

Important: An intermittent problem may or may not turn on the check engine lamp (MIL=malfunction indicator lamp) or store a Diagnostic Trouble Code. Do NOT use the Diagnostic Trouble Code (DTC) charts for intermittent problems.
The fault must be present to locate the problem.
Most intermittent problems are cased by faulty electrical connections or wiring. Perform a careful visual/physical check for the following conditions.

- Poor mating of the connector halves or a terminal not fully seated in the connector (backed out).
- Improperly formed or damaged terminal.
- All connector terminals in the problem circuit should be carefully checked for proper contact tension.
- Poor terminal-to-wire connection. This requires removing the terminal form the connector body to check.
- Check engine lamp (MIL=malfunction indicator lamp) wire to ECM shorted to ground.
- Poor ECM grounds. Refer to the ECM wiring diagrams.

Road test the vehicle with a Digital Multimeter connected to a suspected circuit. An abnormal voltage when the malfunction occurs is a good indication that there is a fault in the circuit being monitored.
Using Tech 2 to help detect intermittent conditions. The Tech 2 have several features that can be used to located an intermittent condition. Use the following features to find intermittent faults:

To check for loss of diagnostic code memory, disconnect the MAF sensor and idle the engine until the check engine lamp (MIL=malfunction indicator lamp) comes on. Diagnostic Trouble Code P0100 should be stored and kept in memory when the ignition is turned OFF.
If not, the ECM is faulty. When this test is completed, make sure that you clear the Diagnostic Trouble Code P0100 from memory.

An intermittent check engine lamp (MIL=malfunction indicator lamp) with no stored Diagnostic Trouble Code may be caused by the following:

- Check engine lamp (MIL=malfunction indicator lamp) wire to ECM short to ground.
- Poor ECM grounds. Refer to the ECM wiring diagrams.

Check for improper installation of electrical options such as light, cellular phones, etc. Check all wires from ECM to the ignition control module for poor connections.
Check for an open diode across the A/C compressor clutch and check for other open diodes (refer to wiring diagrams in Electrical Diagnosis).

If problem has not been found, refer to ECM connector symptom tables.

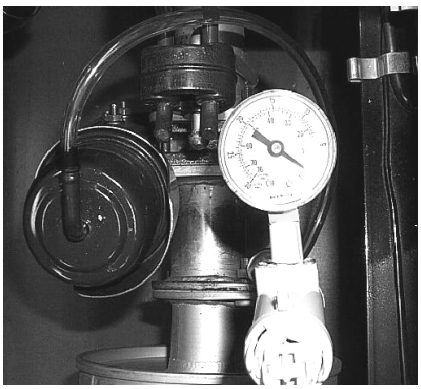
- Check the “Broadcast Code” of the ECM, and compare it with the latest Isuzu service bulletins and/or Isuzu EEPROM reprogramming equipment to determine if an update to the ECM's reprogrammable memory has been released.

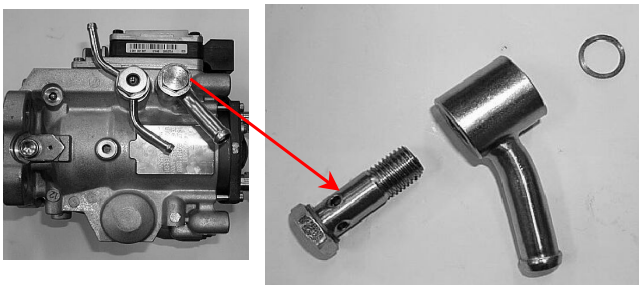
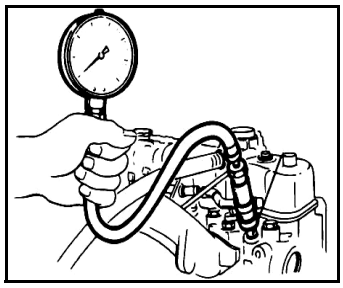
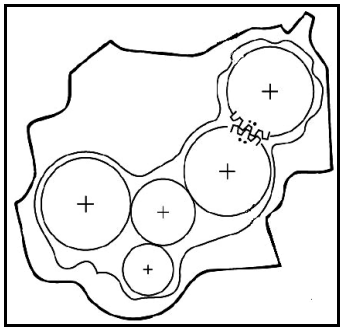
This identifies the contents of the reprogrammable software and calibration contained in the ECM.
If the “Broadcast Code” is not the most current available, it is advisable to reprogram the ECM's EEPROM memory, which may either help identify a hard-to find problem or may fix the problem.
The Service Programming System (SPS) will not allow incorrect software programming or incorrect calibration changes.

ENGINE CRANKS BUT WILL NOT RUN

DEFINITIONS: Engine cranks, but will not run. (The engine never start.)
NOTE: The vehicle with immobiliser system, this system may be activated. Check the immobiliser system diagnosis.

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check*
4	Is the fuel amount enough? 	—	Go to *Step 5*	Add fuel to the tank
5	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to *Step 6*
6	Check the “Engine-1” fuse (15A) and “Engine-2” fuse (10A). If the fuse is burnt out, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 7*
7	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 8*
8	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 9*
9	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Neutral Switch” in the data display. Does the Tech 2 indicate correct “Neutral Switch” status depending on any shift positions? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	Remove the CKP sensor from the flywheel housing and check for the following conditions. • Objects sticking the CKP sensor. • Objects sticking the CKP sensor pulser. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 11*
11	Check the CKP sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 12*
12	Substitute a known good CKP sensor and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 14*
13	Replace the CKP sensor. Is the action complete?	—	Verify repair	—
14	Using the vacuum pump and check the exhaust throttle valve (if equipped) operation for the following condition. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. Was a problem found? 	—	Verify repair	Go to *Step 15*
15	Check the exhaust system for a possible restriction. • Damaged or collapsed pipes or catalytic converter. • Internal muffler failure. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 16*
16	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 17*
17	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 18*

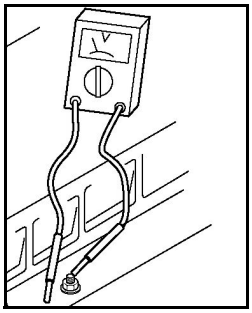
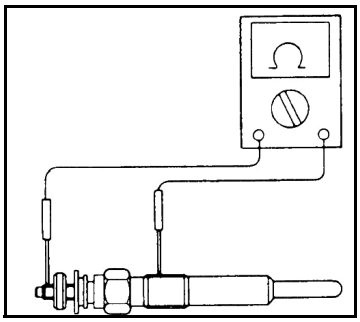
Step	Action	Value(s)	Yes	No
18	Remove the eye bolt with gauze filter from the injection pump and check for the following conditions. • Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was the problem found? 	—	Replace the eye bolt with gauze filter and verify repair	Go to *Step 19*
19	Check the engine compression pressure for each cylinders. If a problem is found, repair as necessary. Was the problem found? 	More than 30 Mpa (31.0 kg/ cm^2)	Verify repair	Go to *Step 20*
20	If the injection pump was replaced, are the timing gears or injection pump correctly installed? 	—	Go to *Step 21*	Repair as necessary

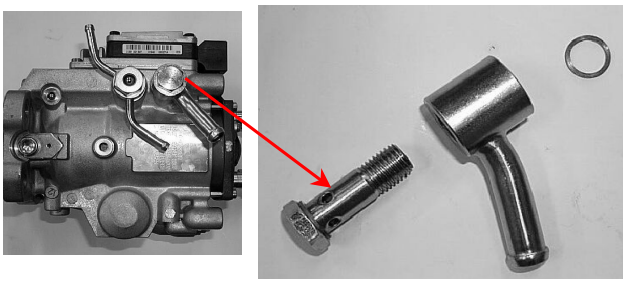
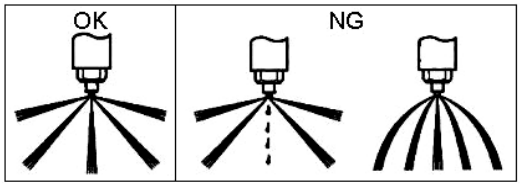
Step	Action	Value(s)	Yes	No
21	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 22*
22	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 23*
23	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 24*	Go to *Step 25*
24	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—
25	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

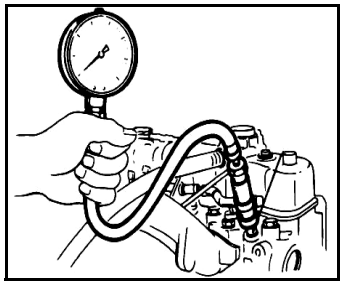
HARD START SYMPTOM

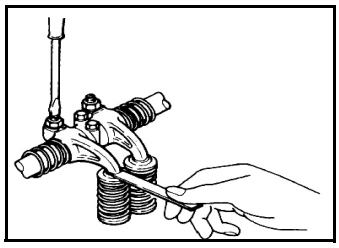
DEFINITIONS: Engine cranks, but does not start for a long time. Does eventually start, or may start and then immediately stall.

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic (OBD) System Check" performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check*
4	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to *Step 6*
5	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 6*
6	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 7*
7	1. Using the Tech 2, display the ECT sensor and IAT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 8*
8	1. Using the Tech 2, display the FT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Go to *Step 20*	Go to *Step 9*
9	1. Using the Tech 2, ignition "On". 2. Monitor the "Glow Time Relay" in the data display. Does the Tech 2 indicate correct "Glow Time Relay" status depending on the time from ignition switch "On"? If a problem is found, repair as necessary. Was the problem found?	—	Go to *Step 20*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	1. Using the Tech 2, ignition “On”. 2. Monitor the “Glow Time Relay” in the data display and then, does the supply voltage correctly supply to the glow plug? 	—	Go to *Step 11*	Repair voltage supply circuit and verify repair
11	Check the glow plugs for continuity. If a problem is found, repair as necessary. Was a problem found? 	—	Verify repair	Go to *Step 12*
12	Check the exhaust system for a possible restriction. • Damaged or collapsed pipes or catalytic converter. • Internal muffler failure. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 13*
13	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 14*
14	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 15*

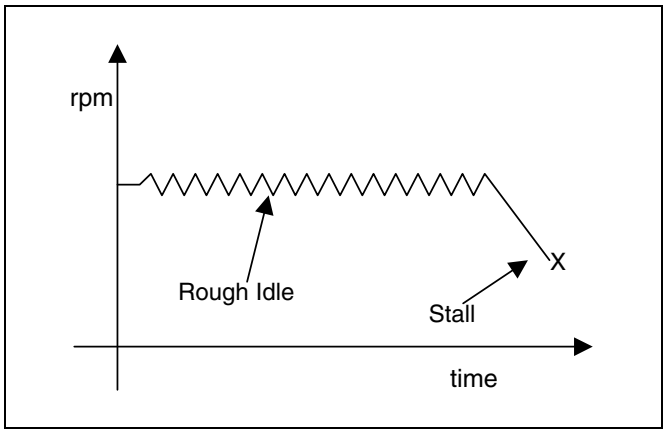
<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>15</td><td>Remove the eye bolt with gauze filter from the injection pump and check for the following conditions.
• Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval.
• Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel.
If a problem is found, repair as necessary.
Was the problem found?
  </td><td>—</td><td>Replace the eye bolt with gauze filter and verify repair</td><td>Go to Step 16</td></tr>
<tr><td>16</td><td>Remove the injection nozzles from the engine and check for the following conditions.
• Improper splay condition.
• Operating pressure is incorrect.
If a problem is found, repair as necessary.
Was the problem found?
 

<table>
<tr><th></th><th>1st Stage</th><th>2nd Stage</th></tr>
<tr><td>4JA1-TC</td><td>19.5 - 20.5 Mpa (199 -209 kg/cm^2)</td><td>34.0 - 35.5 Mpa (347 - 362 kg/cm^2)</td></tr>
<tr><td>4JH1-TC</td><td>20.0 - 21.0 Mpa (204 -214 kg/cm^2)</td><td>34.3 - 35.8 Mpa (350 - 365 kg/cm^2)</td></tr>
</table></td><td>—</td><td>Replace the injection nozzle and verify repair</td><td>Go to Step 17</td></tr>
<tr><td>17</td><td>Check the engine compression pressure for each cylinders.
If a problem is found, repair as necessary.
Was the problem found?
  </td><td>More than 30 Mpa (31.0 kg/ cm^2)</td><td>Verify repair</td><td>Go to Step 18</td></tr>
</table>

Step	Action	Value(s)	Yes	No
18	Check the inlet/exhaust valve clearance for each valves. Are the valve clearances within the specified value? 	0.4mm at cold (In/Ex)	Go to *Step 19*	Adjust and verify repair
19	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 20*
20	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 21*
21	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 22*	Go to *Step 23*
22	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—
23	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

ROUGH, UNSTABLE, OR INCORRECT IDLE, STALLING SYMPTOM

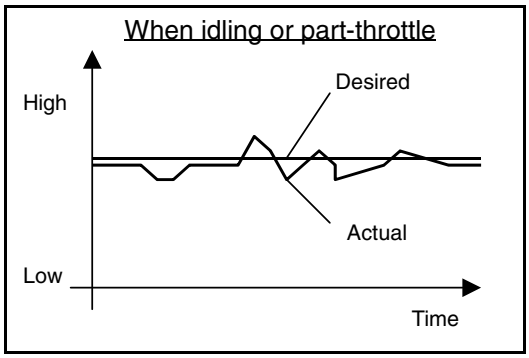
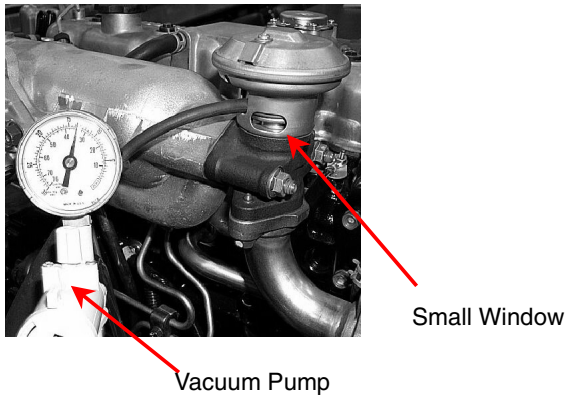
DEFINITIONS: Engine runs unevenly at idle. If severe, the engine or vehicle may shake. Engine idle speed may vary in RPM. Either condition may be severe enough to stall the engine.

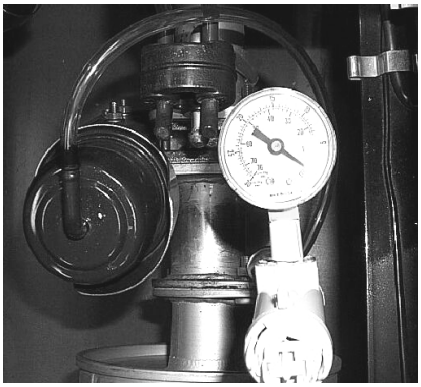


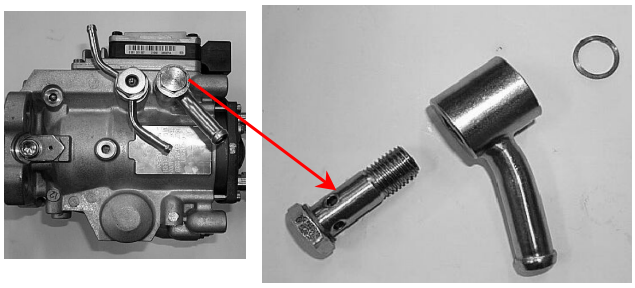
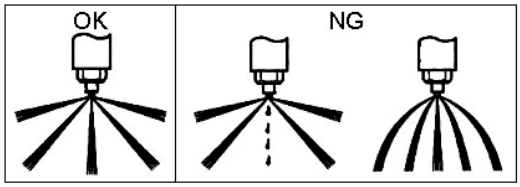
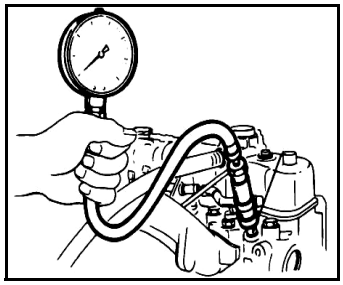
Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check*
4	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to Step 5
5	1. Check for incorrect idle speed. Ensure that the following conditions are present. • Engine fully warm. • Accessories are “OFF”. 2. Using a Tech 2, monitor “Desired Engine Idle Speed” and “Engine Speed”. Is the “Engine Speed” within the specified values?	Desired Engine Idle Speed ± 25 rpm	Go to *Step 7*	Go to *Step 6*
6	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 7*
7	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 8*

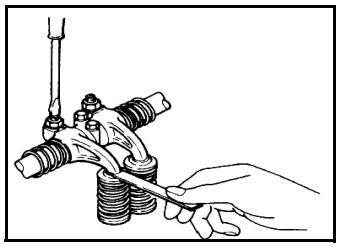
Step	Action	Value(s)	Yes	No
8	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Neutral Switch” in the data display. Does the Tech 2 indicate correct “Neutral Switch” status depending on any shift positions? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 9*
9	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “A/C Information Switch” in the data display. Does the Tech 2 indicate correct “A/C Information Switch” status depending on A/C switch position? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 10*
10	1. Using the Tech 2, display the ECT sensor and IAT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 11*
11	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Mass Air Flow” in the data display. Does the Tech 2 indicate correct “Mass Air Flow” depending on accelerator pedal operation?	—	Go to *Step 16*	Go to *Step 12*
12	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking at the MAF sensor element. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 13*
13	Check the MAF sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 14*
14	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 15*	Go to *Step 36*
15	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
16	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. Does the Tech 2 indicate correct “Pedal/Throttle Position” from 0% to 100% and correct “Idle Switch” status depending on accelerator pedal operation?	—	Go to *Step 21*	Go to *Step 17*

Step	Action	Value(s)	Yes	No
17	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. 3. Adjust the accelerator cable or TPS within 0% to 100%. Was the problem solved?	—	Verify repair	Go to *Step 18*
18	Check the TPS harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 19*
19	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 20*	Go to *Step 36*
20	Replace the TPS. Is the action complete?	—	Verify repair	—
21	Remove the CKP sensor from the flywheel housing and check for the following conditions. • Objects sticking the CKP sensor. • Objects sticking the CKP sensor pulser. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 22*
22	Check the CKP sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 23*
23	Substitute a known good CKP sensor and recheck. Was the problem solved?	—	Go to *Step 24*	Go to *Step 25*
24	Replace the CKP sensor. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
25	1. Using the Tech 2 and ignition “On” and engine “Run”. 2. Monitor the following parameters in the data display. • “Desired Injection Quantity” & “Injection Quantity” • “Desired Injection Start” & “Actual Injection Start” Are the large gap or unstable parameter displayed between “Desired” and “Actual”? 	—	Go to *Step 29*	Go to *Step 26*
26	Using the vacuum pump and check the EGR valve (if equipped) operation for the following condition through the small window. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. If a problem is found, repair as necessary. Was a problem found? 	—	Verify repair	Go to *Step 27*

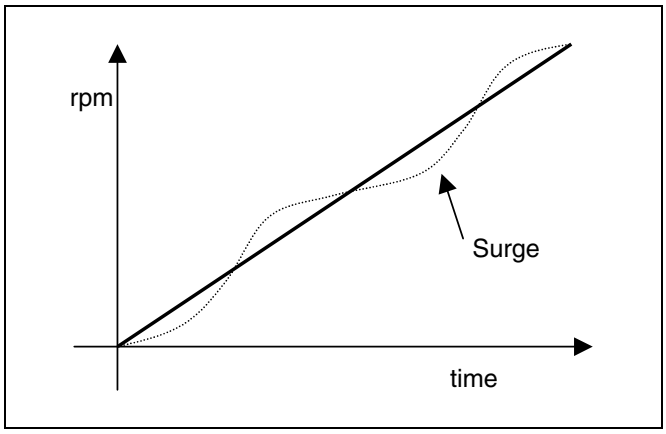
Step	Action	Value(s)	Yes	No
27	Using the vacuum pump and check the exhaust throttle valve (if equipped) operation for the following condition. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. Was a problem found? 	—	Verify repair	Go to *Step 28*
28	Check the exhaust system for a possible restriction. • Damaged or collapsed pipes or catalytic converter. • Internal muffler failure. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 29*
29	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 30*
30	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 31*

<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>31</td><td>Remove the eye bolt with gauze filter from the injection pump and check for the following conditions.
• Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval.
• Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel.
If a problem is found, repair as necessary.
Was the problem found?
  </td><td>—</td><td>Replace the eye bolt with gauze filter and verify repair</td><td>Go to Step 32</td></tr>
<tr><td>32</td><td>Remove the injection nozzles from the engine and check for the following conditions.
• Improper splay condition.
• Operating pressure is incorrect.
If a problem is found, repair as necessary.
Was the problem found?
 
<table><tr><th></th><th>1st Stage</th><th>2nd Stage</th></tr><tr><td>4JA1-TC</td><td>19.5 - 20.5 Mpa (199 -209 kg/cm2)</td><td>34.0 - 35.5 Mpa (347 - 362 kg/cm2)</td></tr><tr><td>4JH1-TC</td><td>20.0 - 21.0 Mpa (204 -214 kg/cm2)</td><td>34.3 - 35.8 Mpa (350 - 365 kg/cm2)</td></tr></table></td><td>—</td><td>Replace the injection nozzle and verify repair</td><td>Go to Step 33</td></tr>
<tr><td>33</td><td>Check the engine compression pressure for each cylinders.
If a problem is found, repair as necessary.
Was the problem found?
  </td><td>More than 30 Mpa (31.0 kg/ cm2)</td><td>Verify repair</td><td>Go to Step 34</td></tr>
</table>

Step	Action	Value(s)	Yes	No
34	Check the inlet/exhaust valve clearance for each valves. Are the valve clearances within the specified value? 	0.4mm at cold (In/Ex)	Go to *Step 35*	Adjust and verify repair
35	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 36*
36	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 37*
37	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 38*	Go to *Step 39*
38	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—
39	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

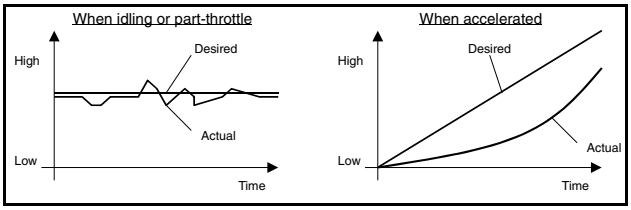
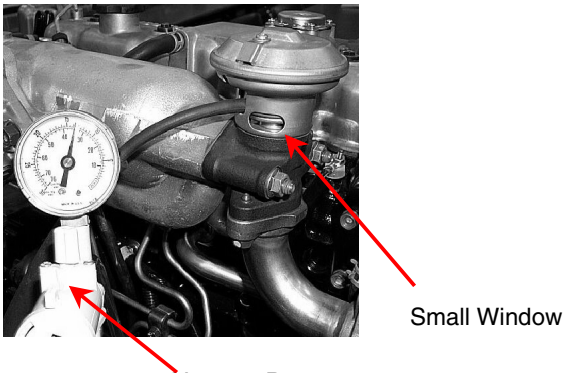
SURGES AND/OR CHUGS SYMPTOM

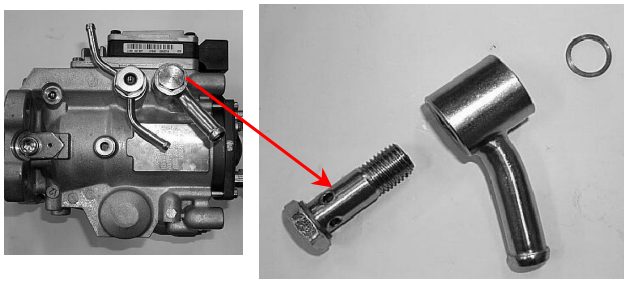
DEFINITIONS: Engine power variation under steady throttle or cruise. Feels like the vehicle speeds up and slows down with no charge in the accelerator pedal.



Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check*
4	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to *Step 5*
5	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 6*
6	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 7*
7	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “A/C Information Switch” in the data display. Does the Tech 2 indicate correct “A/C Information Switch” status depending on A/C switch position? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	1. Using the Tech 2, display the ECT sensor and IAT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 9*
9	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Mass Air Flow” in the data display. Does the Tech 2 indicate correct “Mass Air Flow” depending on accelerator pedal operation?	—	Go to *Step 14*	Go to *Step 10*
10	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking at the MAF sensor element. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 11*
11	Check the MAF sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 12*
12	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 29*
13	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
14	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. Does the Tech 2 indicate correct “Pedal/Throttle Position” from 0% to 100% and correct “Idle Switch” status depending on accelerator pedal operation?	—	Go to *Step 19*	Go to *Step 15*
15	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. 3. Adjust the accelerator cable or TPS within 0% to 100%. Was the problem solved?	—	Verify repair	Go to *Step 16*
16	Check the TPS harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 17*
17	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to Step 18	Go to *Step 29*
18	Replace the TPS. Is the action complete?	—	Verify repair	—

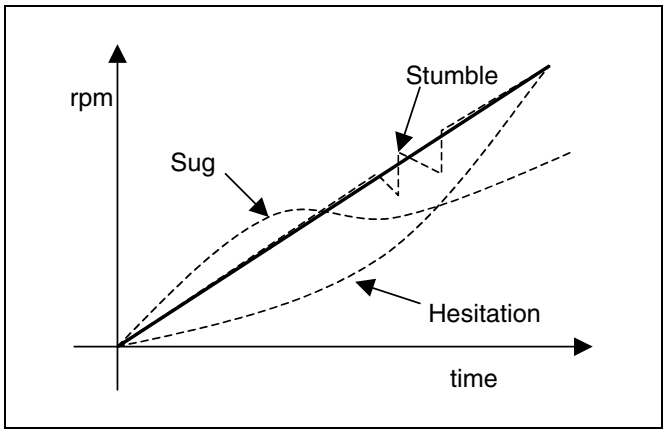
Step	Action	Value(s)	Yes	No
19	Remove the CKP sensor from the flywheel housing and check for the following conditions. • Objects sticking the CKP sensor. • Objects sticking the CKP sensor pulser. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 20*
20	Check the CKP sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 21*
21	Substitute a known good CKP sensor and recheck. Was the problem solved?	—	Go to *Step 22*	Go to *Step 23*
22	Replace the CKP sensor. Is the action complete?	—	Verify repair	—
23	1. Using the Tech 2 and ignition “On” and engine “Run”. 2. Monitor the following parameters in the data display. • “Desired Injection Quantity” & “Injection Quantity” • “Desired Injection Start” & “Actual Injection Start” Are the large gap or unstable parameter displayed between “Desired” and “Actual”? 	—	Go to *Step 25*	Go to *Step 24*
24	Using the vacuum pump and check the EGR valve (if equipped) operation for the following condition through the small window. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. If a problem is found, repair as necessary. Was a problem found? 	—	Verify repair	Go to *Step 25*

Step	Action	Value(s)	Yes	No
25	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 26*
26	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 27*
27	Remove the eye bolt with gauze filter from the injection pump and check for the following conditions. • Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was the problem found? 	—	Replace the eye bolt with gauze filter and verify repair	Go to *Step 28*
28	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 29*
29	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 30*

Step	Action	Value(s)	Yes	No
30	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Go to *Step 31*	Go to *Step 32*
31	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
32	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

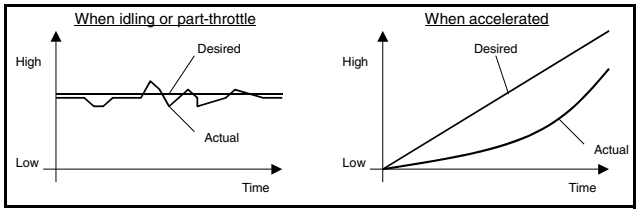
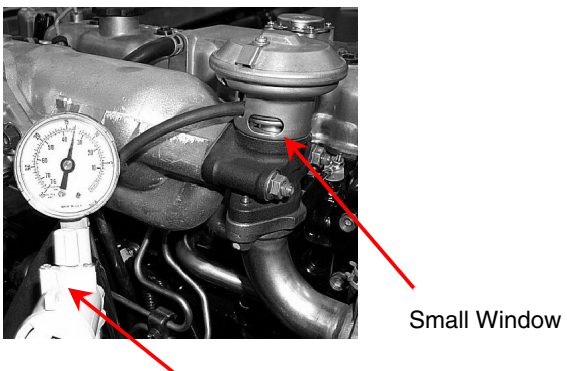
HESITATION, SAG, STUMBLE SYMPTOM

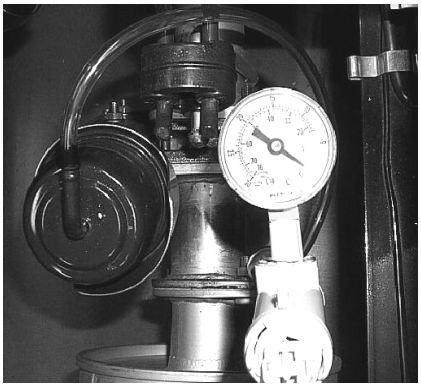
DEFINITIONS: Momentary lack of response as the accelerator is pushed down. Can occur at any vehicle speed. Usually most pronounced when first trying to make the vehicle move, as from a stop sign. May cause the engine to stall if severe enough.

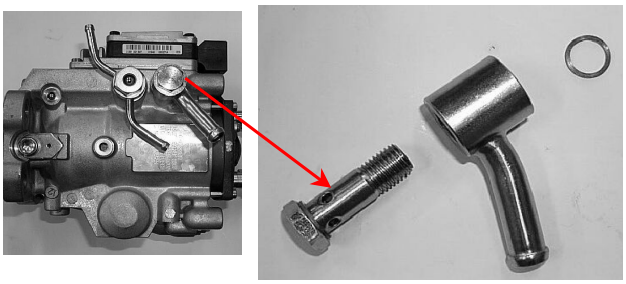


Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic (OBD) System Check" performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to Visual / physical Check
4	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to *Step 5*
5	Check the torque converter clutch (TCC) for proper operation (if A/T model). If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 6*
6	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 7*
7	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	1. Using the Tech 2, display the ECT sensor and IAT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 9*
9	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Mass Air Flow” in the data display. Does the Tech 2 indicate correct “Mass Air Flow” depending on accelerator pedal operation?	—	Go to *Step 14*	Go to *Step 10*
10	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking at the MAF sensor element. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 11*
11	Check the MAF sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 12*
12	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 31*
13	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
14	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. Does the Tech 2 indicate correct “Pedal/Throttle Position” from 0% to 100% and correct “Idle Switch” status depending on accelerator pedal operation?	—	Go to *Step 19*	Go to *Step 15*
15	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. 3. Adjust the accelerator cable or TPS within 0% to 100%. Was the problem solved?	—	Verify repair	Go to *Step 16*
16	Check the TPS harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 17*
17	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 18*	Go to *Step 31*
18	Replace the TPS. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
19	Remove the CKP sensor from the flywheel housing and check for the following conditions. • Objects sticking the CKP sensor. • Objects sticking the CKP sensor pulser. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 20*
20	Check the CKP sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 21*
21	Substitute a known good CKP sensor and recheck. Was the problem solved?	—	Go to *Step 22*	Go to *Step 23*
22	Replace the CKP sensor. Is the action complete?	—	Verify repair	—
23	1. Using the Tech 2 and ignition “On” and engine “Run”. 2. Monitor the following parameters in the data display. • “Desired Injection Quantity” & “Injection Quantity” • “Desired Injection Start” & “Actual Injection Start” Are the large gap or unstable parameter displayed between “Desired” and “Actual”? 	—	Go to *Step 27*	Go to *Step 24*
24	Using the vacuum pump and check the EGR valve (if equipped) operation for the following condition through the small window. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. If a problem is found, repair as necessary. Was a problem found? 	—	Verify repair	Go to *Step 25*

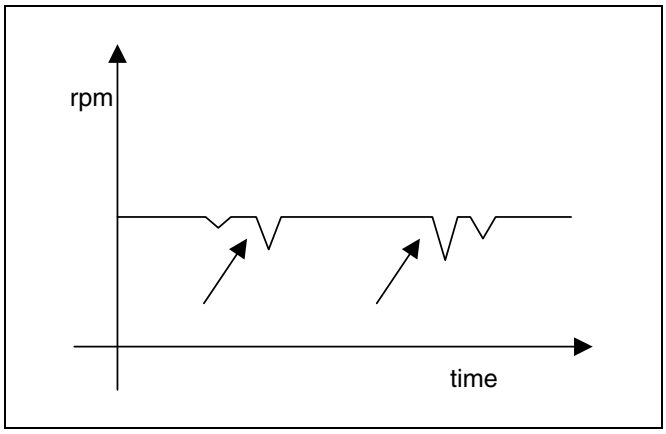
Step	Action	Value(s)	Yes	No
25	Using the vacuum pump and check the exhaust throttle valve (if equipped) operation for the following condition. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. Was a problem found? 	—	Verify repair	Go to *Step 26*
26	Check the exhaust system for a possible restriction. • Damaged or collapsed pipes or catalytic converter. • Internal muffler failure. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 27*
27	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 28*
28	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 29*

Step	Action	Value(s)	Yes	No
29	Remove the eye bolt with gauze filter from the injection pump and check for the following conditions. • Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was the problem found? 	—	Replace the eye bolt with gauze filter and verify repair	Go to *Step 30*
30	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 31*
31	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 32*
32	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 33*	Go to *Step 34*
33	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—

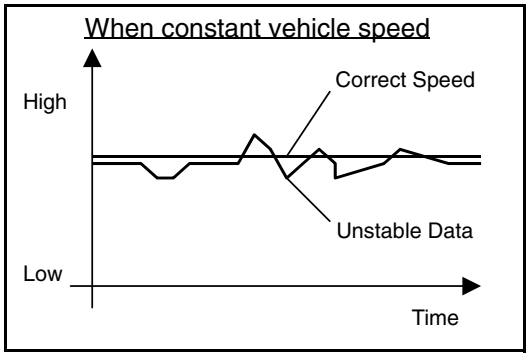
Step	Action	Value(s)	Yes	No
34	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

CUTS OUT, MISSES SYMPTOM

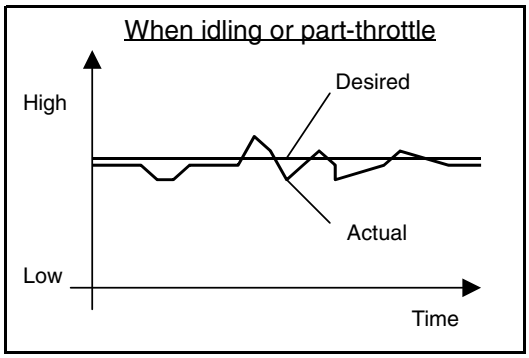
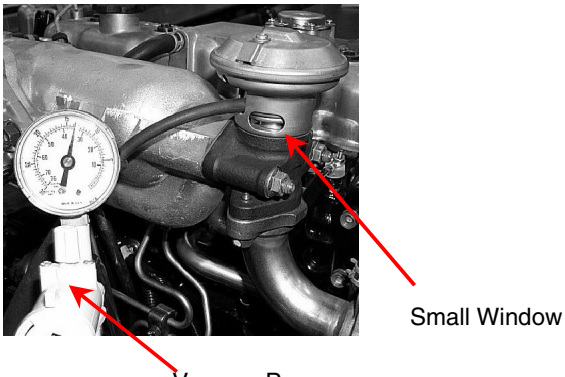
DEFINITIONS: Steady pulsation or jerking that follows engine speed; usually more pronounced as engine load increases.

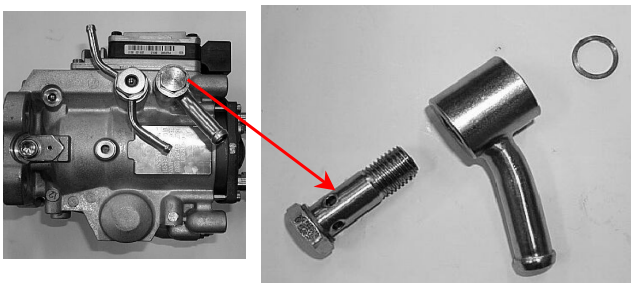


Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check*
4	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to *Step 5*
5	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 6*
6	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 7*

Step	Action	Value(s)	Yes	No
7	1. Using the Tech 2, perform test drive. 2. Monitor the “Vehicle Speed” in the data display. Does the Tech 2 indicate correct “Vehicle Speed” depending on driving speed? 	—	Go to *Step 11*	Go to *Step 8*
8	Check the VSS harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 9*
9	Substitute a known good VSS and recheck. Was the problem solved?	—	Go to *Step 10*	Go to *Step 31*
10	Replace the VSS assembly. Is the action complete?	—	Verify repair	—
11	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Mass Air Flow” in the data display. Does the Tech 2 indicate correct “Mass Air Flow” depending on accelerator pedal operation?	—	Go to *Step 16*	Go to *Step 12*
12	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking at the MAF sensor element. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 13*
13	Check the MAF sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 14*
14	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 15*	Go to *Step 31*
15	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
16	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. Does the Tech 2 indicate correct “Pedal/Throttle Position” from 0% to 100% and correct “Idle Switch” status depending on accelerator pedal operation?	—	Go to *Step 21*	Go to *Step 17*
17	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. 3. Adjust the accelerator cable or TPS within 0% to 100%. Was the problem solved?	—	Verify repair	Go to *Step 18*
18	Check the TPS harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 19*
19	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 20*	Go to *Step 31*
20	Replace the TPS. Is the action complete?	—	Verify repair	—
21	Remove the CKP sensor from the flywheel housing and check for the following conditions. • Objects sticking the CKP sensor. • Objects sticking the CKP sensor pulser. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 22*
22	Check the CKP sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 23*
23	Substitute a known good CKP sensor and recheck. Was the problem solved?	—	Go to *Step 24*	Go to *Step 25*
24	Replace the CKP sensor. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
25	1. Using the Tech 2 and ignition “On” and engine “Run”. 2. Monitor the following parameters in the data display. • “Desired Injection Quantity” & “Injection Quantity” • “Desired Injection Start” & “Actual Injection Start” Are the large gap or unstable parameter displayed between “Desired” and “Actual”? 	—	Go to *Step 29*	Go to *Step 26*
26	Using the vacuum pump and check the EGR valve (if equipped) operation for the following condition through the small window. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. If a problem is found, repair as necessary. Was a problem found? 	—	Verify repair	Go to *Step 27*
27	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 28*
28	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 29*

Step	Action	Value(s)	Yes	No
29	Remove the eye bolt with gauze filter from the injection pump and check for the following conditions. • Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was the problem found? 	—	Replace the eye bolt with gauze filter and verify repair	Go to *Step 30*
30	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 31*
31	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 32*
32	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 33*	Go to *Step 34*
33	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—

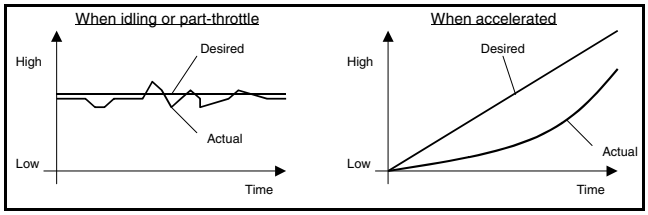
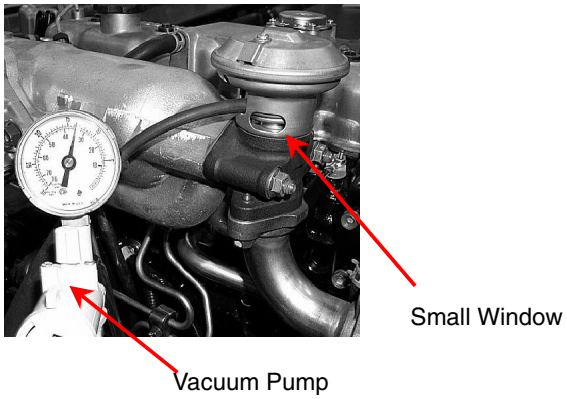
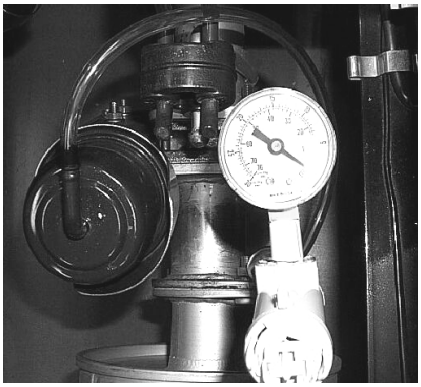
Step	Action	Value(s)	Yes	No
34	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

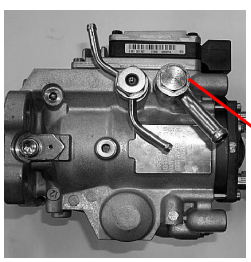
LACK OF POWER, SLUGGISH OR SPONGY SYMPTOM

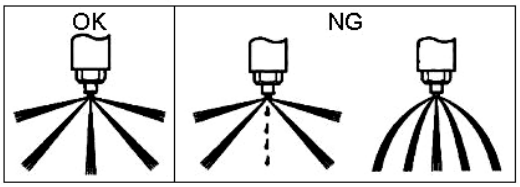
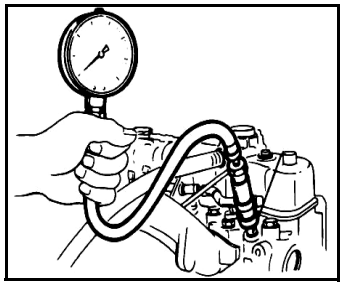
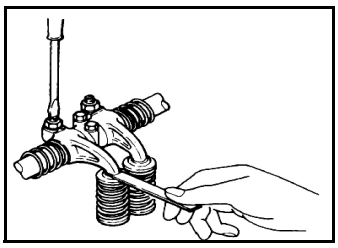
DEFINITIONS: Engine delivers less than expected power. Attempting part-throttle acceleration results in little or no increase in vehicle speed.

Step	Action	Value(s)	Yes	No
1	Was the "On-Board Diagnostic (OBD) System Check" performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check*
4	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to *Step 5*
5	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 6*
6	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 7*
7	1. Using the Tech 2, display the ECT sensor and IAT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 8*
8	1. Using the Tech 2, display the FT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Go to *Step 30*	Go to *Step 9*
9	1. Using the Tech 2, ignition "On" and engine "Run". 2. Monitor the "Mass Air Flow" in the data display. Does the Tech 2 indicate correct "Mass Air Flow" depending on accelerator pedal operation?	—	Go to *Step 14*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking at the MAF sensor element. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 11*
11	Check the MAF sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 12*
12	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 30*
13	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
14	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. Does the Tech 2 indicate correct “Pedal/Throttle Position” from 0% to 100% and correct “Idle Switch” status depending on accelerator pedal operation?	—	Go to *Step 19*	Go to *Step 15*
15	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display. 3. Adjust the accelerator cable or TPS within 0% to 100%. Was the problem solved?	—	Verify repair	Go to *Step 16*
16	Check the TPS harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 17*
17	Substitute a known good TPS and recheck. Was the problem solved?	—	Go to *Step 18*	Go to *Step 30*
18	Replace the TPS. Is the action complete?	—	Verify repair	—

Step	Action	Value(s)	Yes	No
19	1. Using the Tech 2 and ignition “On” and engine “Run”. 2. Monitor the following parameters in the data display. • “Desired Injection Quantity” & “Injection Quantity” • “Desired Injection Start” & “Actual Injection Start” Are the large gap or unstable parameter displayed between “Desired” and “Actual”? 	—	Go to *Step 23*	Go to *Step 20*
20	Using the vacuum pump and check the EGR valve (if equipped) operation for the following condition through the small window. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. If a problem is found, repair as necessary. Was a problem found? 	—	Verify repair	Go to *Step 21*
21	Using the vacuum pump and check the exhaust throttle valve (if equipped) operation for the following condition. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. Was a problem found? 	—	Verify repair	Go to *Step 22*

Step	Action	Value(s)	Yes	No
22	Check the exhaust system for a possible restriction. • Damaged or collapsed pipes or catalytic converter. • Internal muffler failure. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 23*
23	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 24*
24	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 25*
25	Remove the eye bolt with gauze filter from the injection pump and check for the following conditions. • Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was the problem found?  	—	Replace the eye bolt with gauze filter and verify repair	Go to *Step 26*

<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>26</td><td>Remove the injection nozzles from the engine and check for the following conditions.
• Improper splay condition.
• Operating pressure is incorrect.
If a problem is found, repair as necessary.
Was the problem found?
 
<table><tr><th></th><th>1st Stage</th><th>2nd Stage</th></tr><tr><td>4JA1-TC</td><td>19.5 - 20.5 Mpa (199 -209 kg/cm2)</td><td>34.0 - 35.5 Mpa (347 - 362 kg/cm2)</td></tr><tr><td>4JH1-TC</td><td>20.0 - 21.0 Mpa (204 -214 kg/cm2)</td><td>34.3 - 35.8 Mpa (350 - 365 kg/cm2)</td></tr></table></td><td>—</td><td>Replace the injection nozzle and verify repair</td><td>Go to Step 27</td></tr>
<tr><td>27</td><td>Check the engine compression pressure for each cylinders.
If a problem is found, repair as necessary.
Was the problem found?
  </td><td>More than 30 Mpa (31.0 kg/ cm2)</td><td>Verify repair</td><td>Go to Step 28</td></tr>
<tr><td>28</td><td>Check the inlet/exhaust valve clearance for each valves.
Are the valve clearances within the specified value?
  </td><td>0.4mm at cold (In/Ex)</td><td>Go to Step 29</td><td>Adjust and verify repair</td></tr>
<tr><td>29</td><td>1. Review all diagnostic procedures within this table.
2. If all procedures have been completed and no malfunctions have been found, review/inspect the following:
• Visual/physical inspection
• Tech 2 data
• All electrical connections within a suspected circuit and/or system
Was a problem found?</td><td>—</td><td>Verify repair</td><td>Go to Step 30</td></tr>
</table>

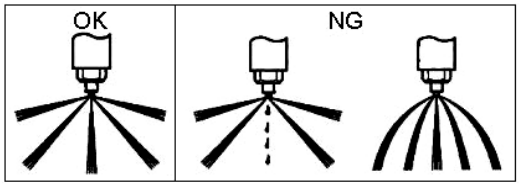
Step	Action	Value(s)	Yes	No
30	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 31*
31	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 32*	Go to *Step 33*
32	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—
33	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

POOR FUEL ECONOMY SYMPTOM

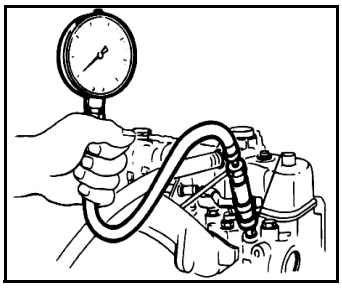
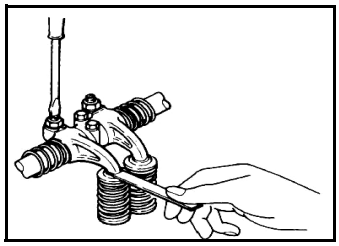
DEFINITIONS: Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, economy is noticeably lower than it was on this vehicle at one time, as previously shown by an actual road test. (Larger than standard tires will cause odometer readings to be incorrect, and that may cause fuel economy to appear poor when it is actually normal.)

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check*.
4	Check owner's driving habits. • Is the A/C “On” full time? • Are tires at the correct pressure? • Are excessively heavy loads being carried? • Is acceleration too much, too often?	—	Go to *Step 5*	Go to *Step 6*
5	Review the items in Step 4 with the customer and advise as necessary. Is the action complete?	—	System OK	—
6	Check for low engine coolant level. Was a problem found?	—	Verify repair	Go to *Step 7*
7	Check for incorrect or faulty engine thermostat. Refer to Engine Cooling. Was a problem found?	—	Verify repair	Go to *Step 8*
8	Check for proper calibration of the speedometer. Does the speed indicated on the speed meter closely match the vehicle speed displayed on the Tech 2?	—	Go to *Step 10*	Go to *Step 9*
9	Diagnose and repair the inaccurate speedometer condition as necessary. Refer to Vehicle Speed Sensor in Electrical Diagnosis.	—	Verify repair	—
10	Check for proper calibration of the fuel gauge. Was a problem found?	—	Verify repair	Go to *Step 11*
11	Check the torque converter clutch (TCC) for proper operation (if A/T model). If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 12*
12	1. Using the Tech 2, ignition “On” and engine “Off”. 2. Monitor the “Neutral Switch” in the data display. Does the Tech 2 indicate correct “Neutral Switch” status depending on any shift positions? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 13*

Step	Action	Value(s)	Yes	No
13	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “A/C Information Switch” in the data display. Does the Tech 2 indicate correct “A/C Information Switch” status depending on A/C switch position? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 14*
14	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 15*
15	1. Using the Tech 2, display the ECT sensor and IAT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 16*
16	1. Using the Tech 2, display the FT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Go to *Step 31*	Go to *Step 17*
17	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Mass Air Flow” in the data display. Does the Tech 2 indicate correct “Mass Air Flow” depending on accelerator pedal operation?	—	Go to *Step 22*	Go to *Step 18*
18	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking at the MAF sensor element. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 19*
19	Check the MAF sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 20*

<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>20</td><td>Substitute a known good MAF & IAT sensor assembly and recheck.
Was the problem solved?</td><td>—</td><td>Go to Step 21</td><td>Go to Step 31</td></tr>
<tr><td>21</td><td>Replace the MAF & IAT sensor assembly.
Is the action complete?</td><td>—</td><td>Verify repair</td><td>—</td></tr>
<tr><td>22</td><td>1. Using the Tech 2, ignition “On” and engine “Off”.
2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display.
Does the Tech 2 indicate correct “Pedal/Throttle Position” from 0% to 100% and correct “Idle Switch” status depending on accelerator pedal operation?</td><td>—</td><td>Go to Step 27</td><td>Go to Step 23</td></tr>
<tr><td>23</td><td>1. Using the Tech 2, ignition “On” and engine “Off”.
2. Monitor the “Pedal/Throttle Position” and “Idle Switch” in the data display.
3. Adjust the accelerator cable or TPS within 0% to 100%.
Was the problem solved?</td><td>—</td><td>Verify repair</td><td>Go to Step 24</td></tr>
<tr><td>24</td><td>Check the TPS harness for the following conditions.
• Check for poor connector connection.
• Check for misrouted harness.
• Check for any accessory parts which may cause electric interference.
If a problem is found, repair as necessary.
Was a problem found?</td><td>—</td><td>Verify repair</td><td>Go to Step 25</td></tr>
<tr><td>25</td><td>Substitute a known good TPS and recheck.
Was the problem solved?</td><td>—</td><td>Go to Step 26</td><td>Go to Step 31</td></tr>
<tr><td>26</td><td>Replace the TPS.
Is the action complete?</td><td>—</td><td>Verify repair</td><td>—</td></tr>
<tr><td>27</td><td>Remove the injection nozzles from the engine and check for the following conditions.
• Improper splay condition.
• Operating pressure is incorrect.
If a problem is found, repair as necessary.
Was the problem found?
 

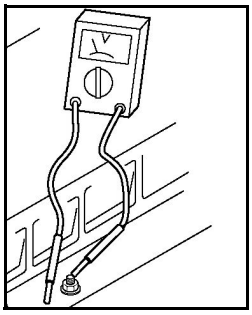
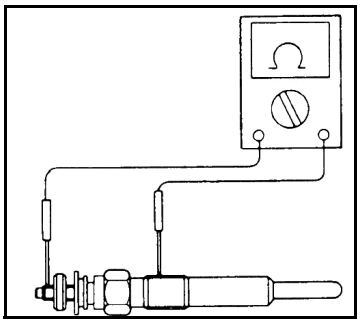
<table>
<tr><th></th><th>1st Stage</th><th>2nd Stage</th></tr>
<tr><td>4JA1-TC</td><td>19.5 - 20.5 Mpa
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(347 - 362 kg/cm^2)</td></tr>
<tr><td>4JH1-TC</td><td>20.0 - 21.0 Mpa
(204 -214 kg/cm^2)</td><td>34.3 - 35.8 Mpa
(350 - 365 kg/cm^2)</td></tr>
</table></td><td>—</td><td>Replace the injection nozzle and verify repair</td><td>Go to Step 28</td></tr>
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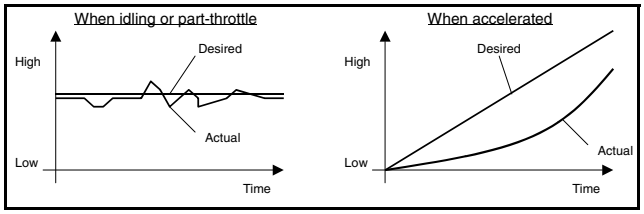
Step	Action	Value(s)	Yes	No
28	Check the engine compression pressure for each cylinders. If a problem is found, repair as necessary. Was the problem found? 	More than 30 Mpa (31.0 kg/ cm^2)	Verify repair	Go to *Step 29*
29	Check the inlet/exhaust valve clearance for each valves. Are the valve clearances within the specified value? 	0.4mm at cold (In/Ex)	Go to *Step 30*	Adjust and verify repair
30	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 31*
31	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 32*
32	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 33*	Go to *Step 34*

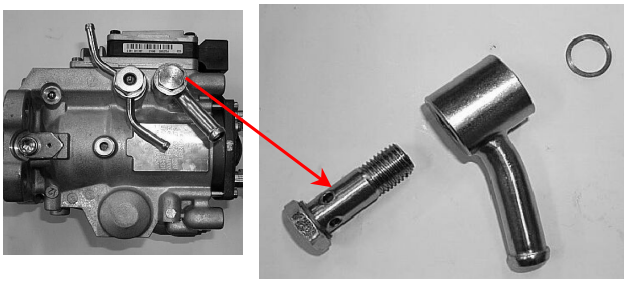
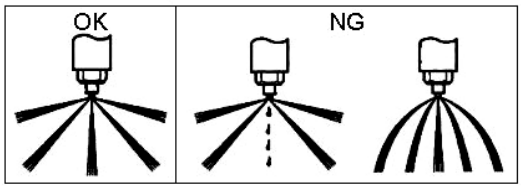
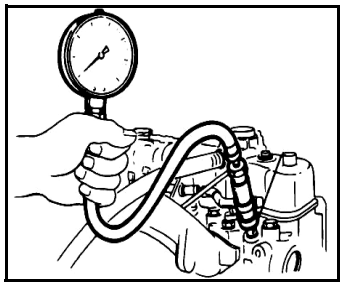
Step	Action	Value(s)	Yes	No
33	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
34	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

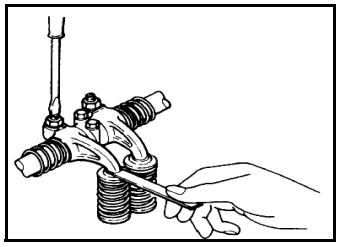
EXCESSIVE WHITE SMOKE

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to *Step 3*
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check.*
4	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to *Step 5*
5	Check the engine coolant consumption to verify that it leaks to combustion chamber or exhaust through the gasket. Was a problem found?	—	Verify repair	Go to *Step 6*
6	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 7*
7	1. Using the Tech 2, display the ECT sensor and IAT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 8*
8	1. Using the Tech 2, display the FT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Go to *Step 30*	Go to *Step 9*
9	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Mass Air Flow” in the data display. Does the Tech 2 indicate correct “Mass Air Flow” depending on accelerator pedal operation?	—	Go to *Step 14*	Go to *Step 10*
10	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking at the MAF sensor element. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 11*
11	Check the MAF sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 12*

Step	Action	Value(s)	Yes	No
12	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 30*
13	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
14	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Glow Time Relay” in the data display. Does the Tech 2 indicate correct “Glow Time Relay” status depending on the time from engine “Run”? If a problem is found, repair as necessary. Was the problem found?	—	Go to *Step 30*	Go to *Step 15*
15	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Glow Time Relay” in the data display and then, does the supply voltage correctly supply to the glow plug? 	—	Go to *Step 16*	Repair voltage supply circuit and verify repair
16	Check the glow plugs for continuity. If a problem is found, repair as necessary. Was a problem found? 	—	Verify repair	Go to *Step 17*
17	Remove the CKP sensor from the flywheel housing and check for the following conditions. • Objects sticking the CKP sensor. • Objects sticking the CKP sensor pulser. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 18*
18	Check the CKP sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 19*

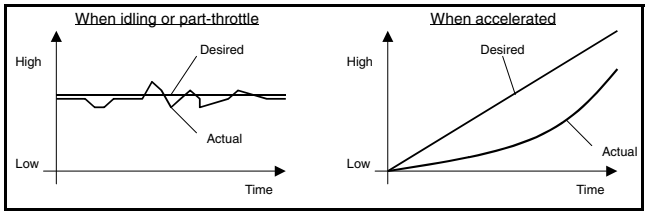
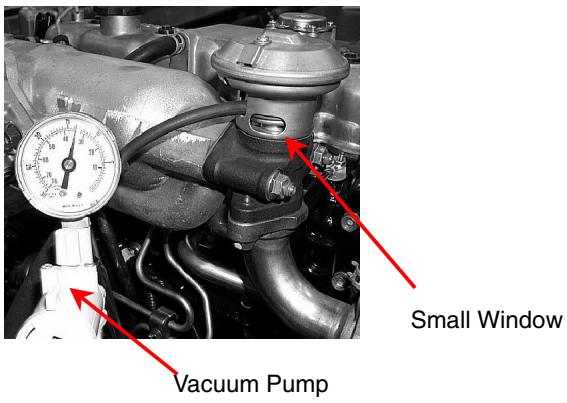
Step	Action	Value(s)	Yes	No
19	Substitute a known good CKP sensor and recheck. Was the problem solved?	—	Go to *Step 20*	Go to *Step 21*
20	Replace the CKP sensor. Is the action complete?	—	Verify repair	—
21	1. Using the Tech 2 and ignition “On” and engine “Run”. 2. Monitor the following parameters in the data display. • “Desired Injection Quantity” & “Injection Quantity” • “Desired Injection Start” & “Actual Injection Start” Are the large gap or unstable parameter displayed between “Desired” and “Actual”? 	—	Go to *Step 23*	Go to *Step 22*
22	Check the exhaust system for a possible restriction. • Damaged or collapsed pipes or catalytic converter. • Internal muffler failure. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 23*
23	Visually/physically inspect for the following conditions. • Restrict fuel supply system. Check for a pinched fuel hose/pipe. • Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 24*
24	Replace the fuel filter. Was the problem solved?	—	Verify repair	Go to *Step 25*

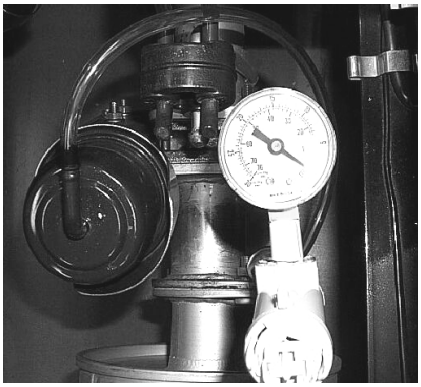
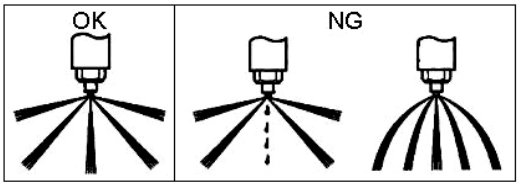
<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>25</td><td>Remove the eye bolt with gauze filter from the injection pump and check for the following conditions.
• Objects blocking at the gauze filter. Check for a condition that causes contaminated fuel, such as the customer is using an aftermarket fuel filter or extended maintenance interval.
• Check for a condition that causes fuel waxing or icing, such as the customer is using an incorrect fuel type in winter season or water mixed with the fuel.
If a problem is found, repair as necessary.
Was the problem found?
  </td><td>—</td><td>Replace the eye bolt with gauze filter and verify repair</td><td>Go to Step 26</td></tr>
<tr><td>26</td><td>Remove the injection nozzles from the engine and check for the following conditions.
• Improper splay condition.
• Operating pressure is incorrect.
If a problem is found, repair as necessary.
Was the problem found?
 
<table><tr><th></th><th>1st Stage</th><th>2nd Stage</th></tr><tr><td>4JA1-TC</td><td>19.5 - 20.5 Mpa (199 -209 kg/cm2)</td><td>34.0 - 35.5 Mpa (347 - 362 kg/cm2)</td></tr><tr><td>4JH1-TC</td><td>20.0 - 21.0 Mpa (204 -214 kg/cm2)</td><td>34.3 - 35.8 Mpa (350 - 365 kg/cm2)</td></tr></table></td><td>—</td><td>Replace the injection nozzle and verify repair</td><td>Go to Step 27</td></tr>
<tr><td>27</td><td>Check the engine compression pressure for each cylinders.
If a problem is found, repair as necessary.
Was the problem found?
  </td><td>More than 30 Mpa (31.0 kg/ cm2)</td><td>Verify repair</td><td>Go to Step 28</td></tr>
</table>

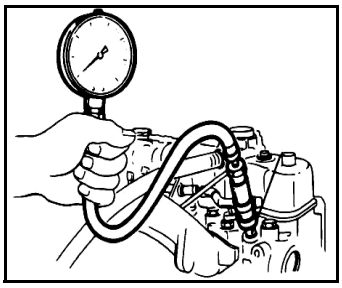
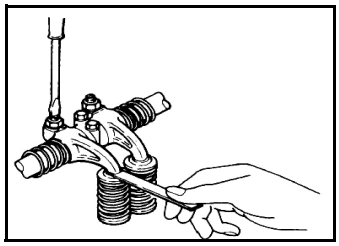
Step	Action	Value(s)	Yes	No
28	Check the inlet/exhaust valve clearance for each valves. Are the valve clearances within the specified value? 	0.4mm at cold (In/Ex)	Go to *Step 29*	Adjust and verify repair
29	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 30*
30	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 31*
31	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 32*	Go to *Step 33*
32	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Verify repair	—
33	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

EXCESSIVE BLACK SMOKE

Step	Action	Value(s)	Yes	No
1	Was the “On-Board Diagnostic (OBD) System Check” performed?	—	Go to *Step 2*	Go to *On Board Diagnostic (OBD) System Check*
2	1. Perform a bulletin search. 2. If a bulletin that addresses the symptom is found, correct the condition as instructed in the bulletin. Was a bulletin found that addresses the symptom?	—	Verify repair	Go to Step 3
3	Was a visually/physical check performed?	—	Go to *Step 4*	Go to *Visual / physical Check.*
4	Is the customer using the incorrect fuel type?	Diesel fuel only	Replace with diesel fuel	Go to *Step 5*
5	Visually/physically inspect for the following conditions. • Restrict air intake system. Check for a restricted air filter element, or foreign objects blocking the air intake system • Check for objects blocking or excessive deposits in the throttle bore and on the throttle plate • Check for a condition that causes a large vacuum leak, such as an incorrectly installed or faulty crankcase ventilation hose. • Restrict air intake system at the turbocharger. Check for objects blocking the turbocharger compressor wheel or turbine shaft sticking. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 6*
6	Check the ECM & PSG grounds to verify that they are clean and tight. Refer to the ECM wiring diagrams. Was a problem found?	—	Verify repair	Go to *Step 7*
7	1. Using the Tech 2, display the ECT sensor and IAT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 8*
8	1. Using the Tech 2, display the FT sensor value. 2. Check the displayed value. Does the Tech 2 indicate correct temperature depending on engine condition? If a problem is found, repair as necessary. Was the problem found?	—	Go to *Step 22*	Go to *Step 9*
9	1. Using the Tech 2, ignition “On” and engine “Run”. 2. Monitor the “Mass Air Flow” in the data display. Does the Tech 2 indicate correct “Mass Air Flow” depending on accelerator pedal operation?	—	Go to *Step 14*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	Remove the MAF & IAT sensor assembly and check for the following conditions. • Objects blocking at the MAF sensor element. If a problem is found, repair as necessary. Was the problem found?	—	Verify repair	Go to *Step 11*
11	Check the MAF sensor harness for the following conditions. • Check for poor connector connection. • Check for misrouted harness. • Check for any accessory parts which may cause electric interference. If a problem is found, repair as necessary. Was a problem found?	—	Verify repair	Go to *Step 12*
12	Substitute a known good MAF & IAT sensor assembly and recheck. Was the problem solved?	—	Go to *Step 13*	Go to *Step 22*
13	Replace the MAF & IAT sensor assembly. Is the action complete?	—	Verify repair	—
14	1. Using the Tech 2 and ignition “On” and engine “Run”. 2. Monitor the following parameters in the data display. • “Desired Injection Quantity” & “Injection Quantity” • “Desired Injection Start” & “Actual Injection Start” Are the large gap or unstable parameter displayed between “Desired” and “Actual”? 	—	Go to *Step 21*	Go to *Step 15*
15	Using the vacuum pump and check the EGR valve (if equipped) operation for the following condition through the small window. • Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit. If a problem is found, repair as necessary. Was a problem found? 	—	Verify repair	Go to *Step 16*

<table>
<tr><th>Step</th><th>Action</th><th>Value(s)</th><th>Yes</th><th>No</th></tr>
<tr><td>16</td><td>Using the vacuum pump and check the exhaust throttle valve (if equipped) operation for the following condition.
• Restrict shaft movement. Check for objects sticking the shaft, broken diaphragm or excessive carbon deposit.
Was a problem found?
  </td><td>—</td><td>Verify repair</td><td>Go to Step 17</td></tr>
<tr><td>17</td><td>Check the exhaust system for a possible restriction.
• Damaged or collapsed pipes or catalytic converter.
• Internal muffler failure.
If a problem is found, repair as necessary.
Was a problem found?</td><td>—</td><td>Verify repair</td><td>Go to Step 18</td></tr>
<tr><td>18</td><td>Remove the injection nozzles from the engine and check for the following conditions.
• Improper splay condition.
• Operating pressure is incorrect.
If a problem is found, repair as necessary.
Was the problem found?
 
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</table>

Step	Action	Value(s)	Yes	No
19	Check the engine compression pressure for each cylinders. If a problem is found, repair as necessary. Was the problem found? 	More than 30 Mpa (31.0 kg/ cm^2)	Verify repair	Go to *Step 20*
20	Check the inlet/exhaust valve clearance for each valves. Are the valve clearances within the specified value? 	0.4mm at cold (In/Ex)	Go to *Step 21*	Adjust and verify repair
21	1. Review all diagnostic procedures within this table. 2. If all procedures have been completed and no malfunctions have been found, review/inspect the following: • Visual/physical inspection • Tech 2 data • All electrical connections within a suspected circuit and/or system Was a problem found?	—	Verify repair	Go to *Step 22*
22	Is the ECM programmed with the latest software release? If not, download the latest software to the ECM using the ***"SPS (Service Programming System)"***. Was the problem solved?	—	Verify repair	Go to *Step 23*
23	Substitute a known good ECM and recheck. Was the problem solved? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 "Immobiliser System-ECM replacement" for the ECM/Immobiliser linking procedure.	—	Go to *Step 24*	Go to *Step 25*

Step	Action	Value(s)	Yes	No
24	Replace the ECM. Is the action complete? **IMPORTANT:** The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual. Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.	—	Verify repair	—
25	Replace the injection pump assembly. Is the action complete?	—	Verify repair	—

ON-VEHICLE SERVICE PROCEDURE

ENGINE CONTROL MODULE (ECM)

Location
Upper the transmission tunnel.

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the ECM cover.
3. Disconnect the two connectors from the ECM.
4. Remove four screws from the ECM braket.



Installation Procedure

1. Put on the ECM to the braket and tighten by four screws.
2. Connect the two connectors to the ECM.
3. Refit the ECM cover by four screws.
4. Connect the negative battery cable.

NOTE: The replacement ECM must be programmed. Refer to section of the Service Programming System (SPS) in this manual.
Following ECM programming, the immobiliser system (if equipped) must be linked to the ECM. Refer to section 11 “Immobiliser System-ECM replacement” for the ECM/Immobiliser linking procedure.

CRANKSHAFT POSITION (CKP) SENSOR

Location
Installed to the clutch housing.

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect connector from the CKP sensor.
3. Loosen a bolt and remove the CKP sensor from the clutch housing.



Installation Procedure

1. Install the CKP sensor to the clutch housing.
2. Tighten CKP sensor by a bolt with specified tightening torque.

Tightening Torque

- Bolts: 8.0 - 12.0 N·m (0.8 - 1.2 kgf·m)

3. Connect a CKP sensor connector to the CKP sensor.
4. Connect the negative battery cable.

NOTE: Verify any DTCs (diagnosis Trouble Code) are not stored after replacement.

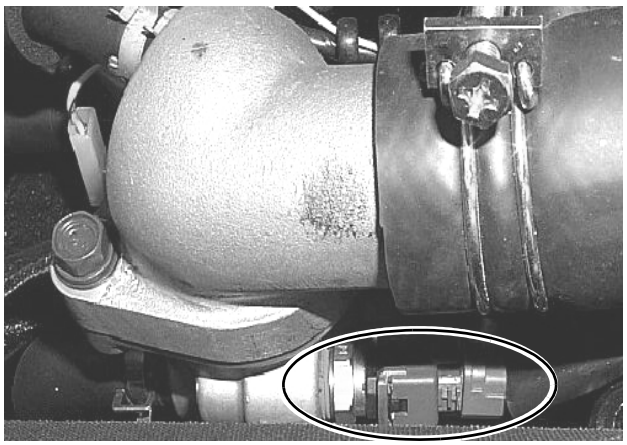
ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Location
Installed to the thermostat housing.

Removal Procedure

1. Disconnect the negative battery cable.
2. Drain enough engine coolant so that the coolant level will be below the ECT sensor.
3. Disconnect connector from the ECT sensor.
4. Loosen and remove the ECT sensor from the thermostat housing.

NOTE: Cool down the engine before above procedures are carried out.



Installation Procedure

1. Apply sealer to threads of screw at the ECT sensor.
2. Tighten the ECT sensor with specified tightening torque.

Tightening Torque

- Bolt: 13N·m (1.3kgf·m)

3. Connect a ECT sensor connector to the ECT sensor.
4. Fill the engine coolant.
5. Connect the negative battery cable.

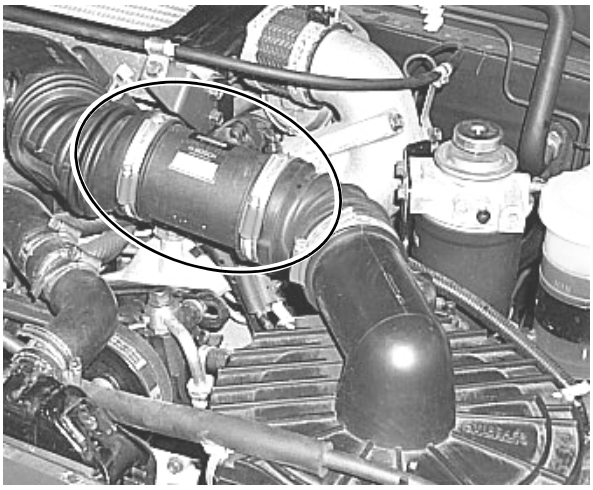
NOTE: Verify any DTCs (diagnosis Trouble Code) are not stored after replacement.
Verify no engine coolant leaking from the sensor threads after replacement.

MASS AIR FLOW (MAF) & INTAKE AIR TEMPERATURE (IAT) SENSOR

Location
Installed to the intake duct housing.

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect a MAF & IAT sensor connector from the MAF & IAT sensor assembly.
3. Loosen the clips and remove the MAF & IAT sensor assembly from the intake duct housing.



Installation Procedure

1. Install the MAF & IAT sensor assembly into intake air duct.
2. Tighten the clips.
3. Connect a MAF & IAT sensor connector to the MAF & IAT sensor assembly.
4. Connect the negative battery cable.

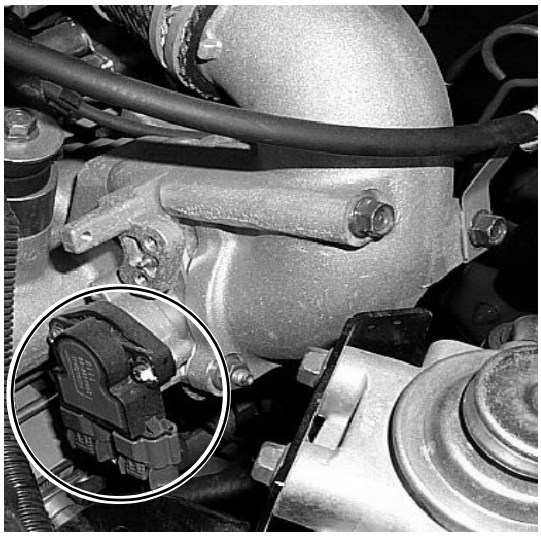
NOTE: Verify any DTCs (diagnosis Trouble Code) are not stored after replacement.

PEDAL/THROTTLE POSITION SENSOR (TPS)

Location
Installed on the throttle body.

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the TPS connector.
3. Loosen two screws and remove TPS from the throttle body.





Installation Procedure

1. Temporary tighten the TPS by two screws.
2. Connect a TPS connectors to the TPS.
3. Connect the Tech2 to the vehicle.
4. Connect the negative battery cable.
5. Select “Data Display” with the Tech2.
6. Check the throttle position data and adjust the TPS position.
7. Tighten two screws.

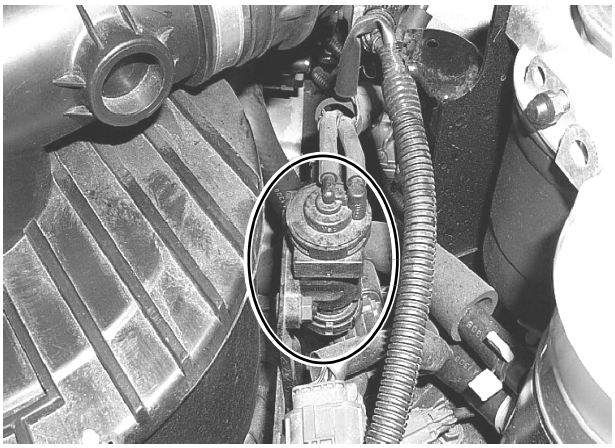
NOTE: Verify any DTCs (diagnosis Trouble Code) are not stored after replacement.

EGR EVRV (Electrical Vacuum Regulating Valve)

Location
Back of the air cleaner case.

Removal Procedure

1. Disconenct the negative battery cable.
2. Disconnect a EVRV connector from the EVRV.
3. Disconnect two hoses from the EVRV.
4. Loosen two bolts and remove the EVRV from the bracket.

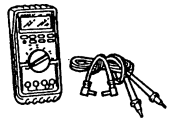
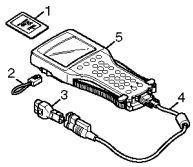
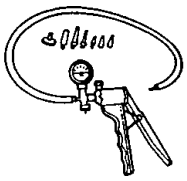


Installation Procedure

1. Tighten the purge solenoid by tow bolts.
2. Connect a connector to the EVRV.
3. Connect two hoses to the EVRV.
4. Connect the negative battery cable.

NOTE: Verify any DTCs (diagnosis Trouble Code) are not stored after replacement.
Verify proper connection of two hoses.

SPECIAL SERVICE TOOLS

ILLUSTRATION	TOOL NO. TOLL NAME
 TS 22900	**5-8840-0285-0** **(J 39200)** High Impedance Multimeter (Digital Voltmeter -DVM)
	(1) PCMCIA Card (2) RS232 Loop Back Connector (3) SAE 16/19 Adapter (4) DLC Cable (5) TECH 2
 TS 23369	**5-8840-0385-0** **(J 35616-A/BT-8637)** Connector Test Adapter Kit
	Breaker Box
	**5-8840-0279-0** **(J 23738-A)** Vacuum Pump with Gauge

4JEED-WE-0221T

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Tokyo, Japan

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