

TROUBLESHOOTING MANUAL

INDUSTRIAL ENGINE

TNV

3TNV88C

3TNV86CT

4TNV88C

4TNV86CT

4TNV98C

4TNV98CT

YANMAR

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TROUBLESHOOTING MANUAL	MODEL	3TNV88C, 3TNV86CT, 4TNV88C, 4TNV86CT, 4TNV98C, 4TNV98CT
	CODE	0DTN5-EN1021

CONTENTS

1. DTC (Diagnostic Trouble Codes) General Description	1
DTC code list	1
Additional requirements for EU Stage V (less than 56kW) regulations	6
Power restrictions due to inducement when NCD abnormality occurs	6
Description	8
Sensor related	9
Crankshaft speed sensor	9
P0336: Crankshaft signal error	9
P0337: No signal from crankshaft	11
Camshaft speed sensor	13
P0341: Camshaft signal error	13
P0342: No signal from camshaft	15
P1341: Angle offset error	17
P0008: Crankshaft/camshaft speed sensor non-input (simultaneous)	19
Accelerator sensor	20
P0123: Accelerator sensor 1 error (voltage high)	20
P0122: Accelerator sensor 1 error (voltage low)	22
P0223: Accelerator sensor 2 error (voltage high)	24
P0222: Accelerator sensor 2 error (voltage low)	26
P1646: Dual accelerator sensor error (closed position)	28
P1647: Dual accelerator sensor error (open position)	30
P0228: Accelerator sensor 3 error (voltage high)	32
P0227: Accelerator sensor 3 error (voltage low)	34
P1227: Pulse accelerator sensor error (pulse communication)	36
P1126: Accelerator sensor 3 error (foot pedal in open position)	37
P1125: Accelerator sensor 3 error (foot pedal in closed position)	39
Intake throttle position sensor	40
P02E9: Intake throttle position sensor error (voltage high)	40
P02E8: Intake throttle position sensor error (voltage low)	42
EGR low pressure side pressure sensor	44
P0238: EGR low pressure side pressure sensor error (excessive sensor output)	44
P0237: EGR low pressure side pressure sensor error (insufficient sensor output)	46
P0236: EGR low pressure side pressure sensor error (abnormal learning value)	48
P1673: EGR low pressure side pressure sensor error (detected value error)	50
EGR high pressure side pressure sensor	52
P0473: EGR high pressure side pressure sensor error (excessive sensor output)	52
P0472: EGR high pressure side pressure sensor error (insufficient sensor output)	54
P0471: EGR high pressure side pressure sensor error (abnormal learning value)	56
P1679: EGR high pressure side pressure sensor error (detected value error)	58
Engine coolant temperature sensor	60
P0118: Engine coolant temperature sensor error (excessive sensor output)	60
P0117: Engine coolant temperature sensor error (insufficient sensor output)	62
P1674: Engine coolant temperature sensor error (detected value error)	64
P0217: Engine coolant temperature high (overheat)	66

Ambient air temperature sensor	68
P0113: Ambient air temperature sensor error (voltage high)	68
P0112: Ambient air temperature sensor error (voltage low).....	70
Fuel temperature sensor	72
P0183: Fuel temperature sensor error (voltage high)	72
P0182: Fuel temperature sensor error (voltage low)	74
P0168: Fuel temperature high	76
Rail pressure sensor	78
P0193: Rail pressure sensor error (voltage high)	78
P0192: Rail pressure sensor error (voltage low)	80
DPF differential pressure sensor	82
P2455: DPF differential pressure sensor error (excessive sensor output).....	82
P2454: DPF differential pressure sensor error (insufficient sensor output)	84
P2452: DPF differential pressure sensor abnormal rise in differential pressure	86
P2453: DPF differential pressure sensor error (abnormal learning value).....	88
DPF substrate/DPF differential pressure sensor	90
P226D: DPF substrate/DPF differential pressure sensor error (DPF substrate removal/DPF differential pressure sensor detected value error)	90
DPF high pressure side pressure sensor	92
P1455: DPF high pressure side pressure sensor error (excessive sensor output)	92
P1454: DPF high pressure side pressure sensor error (insufficient sensor output)	94
P167C: DPF high pressure side pressure sensor error (detected value error).....	96
DPF inlet temperature sensor	98
P1428: DPF inlet temperature sensor error (excessive sensor output)	98
P1427: DPF inlet temperature sensor error (insufficient sensor output)	100
P167E: DPF inlet temperature sensor error (detected value error).....	102
P1436: DPF inlet temperature sensor abnormal temperature (abnormally high)	104
DPF intermediate temperature sensor	105
P1434: DPF intermediate temperature sensor error (excessive sensor output)	105
P1435: DPF intermediate temperature sensor error (insufficient sensor output)	107
P167A: DPF intermediate temperature sensor error (detected value error)	109
P0420: DPF intermediate temperature sensor abnormal temperature (abnormally low)	111
Atmospheric pressure sensor	112
P2229: Atmospheric pressure sensor error (excessive sensor output)	112
P2228: Atmospheric pressure sensor error (insufficient sensor output).....	113
P1231: Atmospheric pressure sensor error (characteristic error)	114
EGR gas temperature sensor	116
P041D: EGR gas temperature sensor error (excessive sensor output)	116
P041C: EGR gas temperature sensor error (insufficient sensor output)	118
P1675: EGR gas temperature sensor error (detected value error)	120
Intake manifold temperature sensor	122
P040D: Intake manifold temperature sensor error (excessive sensor output)	122
P040C: Intake manifold temperature sensor error (insufficient sensor output)	124
P1676: Intake manifold temperature sensor error (detected value error)	126
Exhaust manifold temperature sensor	128
P0546: Exhaust manifold temperature sensor error (excessive sensor output)	128
P0545: Exhaust manifold temperature sensor error (insufficient sensor output)	130
P1677: Exhaust manifold temperature sensor error (detected value error)	132

Contact output related	134
Main relay	134
P068B: Main relay contact sticking	134
P068A: Main relay early opening	136
Starting aid relay	138
P0543: Starting aid relay disconnection	138
P0541: Starting aid relay GND short circuit	140
CRS (common rail system) related	142
Injector (No. 1 cylinder)	142
P0201: Injector (No. 1 cylinder) disconnection (injector-specific)	142
P0262: Injector (No. 1 cylinder) coil short circuit	144
P1262: Injector (No. 1 cylinder) short circuit	146
Injector (No. 2 cylinder)	148
P0202: Injector (No. 2 cylinder) disconnection (injector-specific)	148
P0265: Injector (No. 2 cylinder) coil short circuit	150
P1265: Injector (No. 2 cylinder) short circuit	152
Injector (No. 3 cylinder)	154
P0203: Injector (No. 3 cylinder) disconnection (injector-specific)	154
P0268: Injector (No. 3 cylinder) coil short circuit	156
P1268: Injector (No. 3 cylinder) short circuit	158
Injector (No. 4 cylinder)	160
P0204: Injector (No. 4 cylinder) disconnection (injector-specific)	160
P0271: Injector (No. 4 cylinder) coil short circuit	162
P1271: Injector (No. 4 cylinder) short circuit	164
All injectors	166
P0611: Injector drive IC error	166
P1146: Injector drive circuit (Bank 1) short circuit	167
P1149: Injector drive circuit (Bank 2) short circuit	169
P1648: Injector (No. 1 cylinder) correction value error	171
P1649: Injector (No. 2 cylinder) correction value error	172
P1650: Injector (No. 3 cylinder) correction value error	173
P1651: Injector (No. 4 cylinder) correction value error	174
SCV (MPROP)	175
P1641: SCV (MPROP) L side VB short circuit	175
P1643: SCV (MPROP) L side GND short circuit	176
P0629: SCV (MPROP) H side VB short circuit	178
P1642: SCV (MPROP) H side GND short circuit	180
P0627: SCV (MPROP) disconnection	181
P062A: SCV (MPROP) drive current (high level)	182
P1645: SCV (MPROP) pump overload error	184
Rail pressure error	186
P0088: Rail pressure too high	186
P0094: Rail pressure deviation error (low rail pressure)	188
P0093: Rail pressure deviation error (high rail pressure)	190

PLV (Common rail pressure limit valve)	192
P000F: PLV open valve	192
P1666: Rail pressure fault (The times of PLV valve opening error)	194
P1667: Rail pressure fault (The time of PLV valve opening error)	196
P1668: Rail pressure fault (The actual rail pressure is too high during PRV limp home)	198
P1665: Rail pressure fault (Controlled rail pressure error after PLV valve opening)	200
Rail pressure control	202
P1669: Rail pressure fault (Injector B/F temperature error during PLV4 limp home)	202
P1670: Rail pressure fault (Operation time error during RPS limp home)	204
Actuator	205
Intake throttle drive circuit	205
P0660: No-load of throttle valve drive H bridge circuit	205
P1658: Power short circuit of throttle valve drive H bridge output 1	206
P1659: GND short circuit of throttle valve drive H bridge output 1	207
P1660: Overload on the drive H bridge circuit of throttle valve	208
P1661: VB Power short circuit of throttle valve drive H bridge output 2	209
P1662: GND short circuit of throttle valve drive H bridge output 2	210
P02E4: Throttle valve sticking (sticking open)	211
P02E5: Throttle valve sticking (sticking closed)	213
EGR	215
P0404: EGR overvoltage error	215
P1404: EGR low voltage error	217
P1409: EGR feedback error	219
U0401: EGR ECM data error	220
P0403: Disconnection in EGR motor coils	222
P1405: Short circuit in EGR motor coils	223
P0488: EGR position sensor error	224
P148A: EGR valve sticking error	225
P049D: EGR initialization error	226
U1401: EGR target value out of range	227
P1410: EGR high temperature thermistor error	228
P1411: EGR low temperature thermistor error	229
Exhaust throttle	230
P1438: Exhaust throttle (voltage fault)	230
P1439: Exhaust throttle (motor fault)	231
P1440: Exhaust throttle (sensor system fault)	232
P1441: Exhaust throttle (MPU fault)	233
P1442: Exhaust throttle (PCB fault)	234
P1443: Exhaust throttle (CAN fault)	235
Communication related	236
CAN 1	236
U010B: CAN 1 (for EGR): Reception timeout from the EGR valve	236
U1107: CAN 1 (for exhaust throttle): Reception time out	238

CAN 2	239
U0292: TSC1 (SA1) reception timeout	239
U1301: TSC1 (SA2) reception timeout	241
U1292: Y_ECR1 reception timeout	243
U1293: Y_EC reception timeout	245
U1294: Y_RSS reception timeout	247
U0168: VI reception timeout	249
U3002: VI reception data error	250
U1300: Y_ETCP1 reception time out	251
U1302: EBC1 reception timeout	253
U1303: Y_DPFIF reception timeout	255
U0167: Immobilizer error (CAN communication)	257
U0426: Immobilizer error (system)	258
ECU related	259
EEPROM	259
P0601: EEPROM memory deletion error	259
P160E: EEPROM memory reading error	260
P160F: EEPROM memory writing error	261
ECU internal fault	262
P1613: CY146 SPI communication fault	262
P1608: Excessive voltage of supply 1	263
P1617: Insufficient voltage of supply 1	264
P1609: Sensor supply voltage error 1	265
P1618: Sensor supply voltage error 2	266
P1619: Sensor supply voltage error 3	267
P1626: Actuator drive circuit 1 short to ground	268
P1633: Actuator drive circuit 2 short to ground	269
P1467: Actuator drive circuit 3 short to ground	270
P1469: AD converter fault 1	271
P1470: AD converter fault 2	272
P1471: External monitoring IC and CPU fault 1	273
P1472: External monitoring IC and CPU fault 2	274
P1473: ROM fault	275
P1474: Shutoff path fault 1	276
P1475: Shutoff path fault 2	277
P1476: Shutoff path fault 3	278
P1477: Shutoff path fault 4	279
P1478: Shutoff path fault 5	280
P1479: Shutoff path fault 6	281
P1480: Shutoff path fault 7	282
P1481: Shutoff path fault 8	283
P1482: Shutoff path fault 9	284
P1483: Shutoff path fault 10	285
P1484: Recognition error of engine speed	286

Contact output related	287
Breather heater (Optional parts for 4TNV86CT and 4TNV98CT)	287
P053A: Breather heater disconnection	287
P053B: Breather heater short circuit (GND)	288
P053C: Breather heater short circuit (VB)	289
Contact input related	290
Air cleaner switch	290
P1101: Air cleaner clogged alarm	290
Water separator switch	292
P1151: Water separator alarm	292
Charge switch	294
P1562: Charge switch disconnection	294
P1568: Charge alarm	296
Oil pressure switch	298
P1192: Oil pressure switch disconnection	298
P1198: Low oil pressure alarm	300
After treatment control	302
DPF	302
P2463: Excessive PM accumulation (method C)	302
P1463: Excessive PM accumulation (method P)	303
P2458: Regeneration failure (stationary regeneration failure)	304
P2459: Regeneration failure (stationary regeneration not performed)	305
P1426: DPF intermediate temperature sensor temperature rise error (post-injection failure)	306
DPF OP interface	307
P242F: Ash cleaning request 1	307
P1420: Ash cleaning request 2	308
P1421: Stationary regeneration standby	309
P1424: Backup mode	310
P1425: Reset regeneration is inhibited	311
P1445: Regeneration failure (recovery regeneration failure)	312
P1446: Recovery regeneration is inhibited	313
Others	314
Overspeed	314
P0219: Overspeed	314
2. Method and Procedure of Failure Diagnosis	315
Description	315
ECU pin layout diagram	316
How to use the Tier 4 checker harness	318
Sensor related	319
Crankshaft speed sensor	319
Camshaft speed sensor	322
Accelerator sensor	325
Intake throttle position sensor	328
EGR low pressure side pressure sensor	331
EGR high pressure side pressure sensor	339
Engine coolant temperature sensor	342

Ambient air temperature sensor	351
Fuel temperature sensor	355
Rail pressure sensor	359
DPF differential pressure sensor.....	362
DPF inlet temperature sensor	365
DPF intermediate temperature sensor	369
EGR gas temperature sensor	373
Intake manifold temperature sensor	382
Exhaust manifold temperature sensor	391
Contact output related	400
Main relay	400
Starting aid relay (Glow relay)	404
Breather heater (Optional parts for 4TNV86CT and 4TNV98CT)	408
Contact input related	412
Contact input related 1	412
Contact input related 2	415
Post treatment related	418
DPF OP interface	418
Ash cleaning request	418
Stationary regeneration standby	419
Recovery regeneration is inhibited	420
Backup mode	421
DPF	422
Excessive PM accumulation.....	422
Regeneration failure 1	425
Regeneration failure 2	428
CRS (common rail system) related	431
Injector	431
Disconnection of the injector and coil short circuit	431
Injector short circuit	436
High-pressure pump (MPROP)	438
Actuator	440
Intake throttle drive circuit	440
Intake throttle	444
EGR valve	450
EGR valve	454
Communication related	455
CAN 1	455
CAN 2	458
ECU related	461
Others	463
Overspeed	463

TROUBLESHOOTING

DTC (Diagnostic Trouble Codes) General Description

DTC code list

P code	DTC code			Lamp that comes on	Part	Error	Reference page	
	SPN		FMI				Description	Diagnosis
	Decima number	Hexa-decimal number	Decima number					
P0336	522400	7F8A0	2	FAIL + AWL	Crankshaft speed sensor	Crankshaft signal error	P9	P319
P0337			5	FAIL + AWL		No signal from crankshaft	P11	P319
P0341	522401	7F8A1	2	FAIL + AWL	Camshaft speed sensor	Camshaft signal error	P13	P322
P0342			5	FAIL + AWL		No signal from camshaft	P15	P322
P1341			7	FAIL + AWL		Angle offset error	P17	–
P0008	523249	7FBF1	5	FAIL + RSL	Crankshaft speed sensor, Camshaft speed sensor	Crankshaft/camshaft speed sensor non-input (simultaneous)	P19	P319, P322
P0123	91	5B	3	FAIL + AWL	Accelerator sensor 1	Accelerator sensor 1 error (voltage high)	P20	P325
P0122			4	FAIL + AWL		Accelerator sensor 1 error (voltage low)	P22	P325
P0223	28	1C	3	FAIL + AWL	Accelerator sensor 2	Accelerator sensor 2 error (voltage high)	P24	P325
P0222			4	FAIL + AWL		Accelerator sensor 2 error (voltage low)	P26	P325
P1646	522624	7F980	7	FAIL + AWL	Accelerator sensor 1 + 2	Dual accelerator sensor error (closed position)	P28	–
P1647	522623	7F97F	7	FAIL + AWL		Dual accelerator sensor error (open position)	P30	–
P0228	29	1D	3	FAIL + AWL	Accelerator sensor 3	Accelerator sensor 3 error (voltage high)	P32	P325
P0227			4	FAIL + AWL		Accelerator sensor 3 error (voltage low)	P34	P325
P1227			8	FAIL + AWL	Pulse sensor	Pulse accelerator sensor error (pulse communication)	P36	–
P1126	28	1C	0	FAIL + AWL	Accelerator sensor 3	Accelerator sensor 3 error (foot pedal in open position)	P37	–
P1125			1	FAIL + AWL		Accelerator sensor 3 error (foot pedal in closed position)	P39	–
P02E9	51	33	3	FAIL + RSL	Intake throttle position sensor	Intake throttle position sensor error (voltage high)	P40	P328
P02E8			4	FAIL + RSL		Intake throttle position sensor error (voltage low)	P42	P328
P0238	102	66	3	FAIL + RSL	EGR low pressure side pressure sensor	EGR low pressure side pressure sensor error (excessive sensor output)	P44	P331
P0237			4	FAIL + RSL		EGR low pressure side pressure sensor error (insufficient sensor output)	P46	P331
P0236			13	FAIL + RSL		EGR low pressure side pressure sensor error (abnormal learning value)	P48	P331
P1673			10	FAIL + RSL		EGR low pressure side pressure sensor error (detected value error)	P50	P334
P0473	1209	4B9	3	FAIL + RSL	EGR high pressure side pressure sensor	EGR high pressure side pressure sensor error (excessive sensor output)	P52	P339
P0472			4	FAIL + RSL		EGR high pressure side pressure sensor error (insufficient sensor output)	P54	P339
P0471			13	FAIL + RSL		EGR high pressure side pressure sensor error (abnormal learning value)	P56	P339
P1679			10	FAIL + RSL		EGR high pressure side pressure sensor error (detected value error)	P58	P339
P0118	110	6E	3	FAIL + AWL	Engine coolant temperature sensor	Engine coolant temperature sensor error (excessive sensor output)	P60	P342
P0117			4	FAIL + AWL		Engine coolant temperature sensor error (insufficient sensor output)	P62	P342
P1674			10	FAIL + RSL		Engine coolant temperature sensor error (detected value error)	P64	P346
P0217			0	Application specific		Engine coolant temperature high (overheat)	P66	P342
P0113	172	AC	3	FAIL + AWL	Ambient air temperature sensor	Ambient air temperature sensor error (voltage high)	P68	P351
P0112			4	FAIL + AWL		Ambient air temperature sensor error (voltage low)	P70	P351
P0183	174	AE	3	FAIL + AWL	Fuel temperature sensor	Fuel temperature sensor error (voltage high)	P72	P355
P0182			4	FAIL + AWL		Fuel temperature sensor error (voltage low)	P74	P355
P0168			0	Application specific		Fuel temperature high	P76	P355

TROUBLESHOOTING

DTC code				Lamp that comes on	Part	Error	Reference page	
P code	SPN		FMI				State	Description
	Decima number	Hexa-decimal number	Decima number					
P0193	157	9D	3	FAIL + RSL	Rail pressure sensor	Rail pressure sensor error (voltage high)	P78	P359
P0192			4	FAIL + RSL		Rail pressure sensor error (voltage low)	P80	P359
P2455	3251	CB3	3	FAIL + RSL	DPF differential pressure sensor	DPF differential pressure sensor error (excessive sensor output)	P82	P362
P2454			4	FAIL + RSL		DPF differential pressure sensor error (insufficient sensor output)	P84	P362
P2452			0	FAIL + RSL		DPF differential pressure sensor abnormal rise in differential pressure	P86	P362
P2453			13	FAIL + RSL		DPF differential pressure sensor error (abnormal learning value)	P88	P362
P226D	4795	12BB	31	FAIL + AWL	DPF substrate/DPF differential pressure sensor	DPF substrate/DPF differential pressure sensor error (DPF substrate removal/DPF differential pressure sensor detected value error)	P90	P362
P1455	3609	E19	3	FAIL + RSL	DPF high pressure side pressure sensor	DPF high pressure side pressure sensor error (excessive sensor output)	P92	P362
P1454			4	FAIL + RSL		DPF high pressure side pressure sensor error (insufficient sensor output)	P94	P362
P167C			10	FAIL + AWL		DPF high pressure side pressure sensor error (detected value error)	P96	P362
P1428	3242	CAA	3	FAIL + RSL	DPF inlet temperature sensor	DPF inlet temperature sensor error (excessive sensor output)	P98	P365
P1427			4	FAIL + RSL		DPF inlet temperature sensor error (insufficient sensor output)	P100	P365
P167E			10	FAIL + AWL		DPF inlet temperature sensor error (detected value error)	P102	P365
P1436			0	FAIL + AWL		DPF inlet temperature sensor abnormal temperature (abnormally high)	P104	P365
P1434	3250	CB2	3	FAIL + RSL	DPF intermediate temperature sensor	DPF intermediate temperature sensor error (excessive sensor output)	P105	P369
P1435			4	FAIL + RSL		DPF intermediate temperature sensor error (insufficient sensor output)	P107	P369
P167A			10	FAIL + AWL		DPF intermediate temperature sensor error (detected value error)	P109	P369
P0420			1	FAIL + AWL		DPF intermediate temperature sensor abnormal temperature (abnormally low)	P111	P369
P2229	108	6C	3	FAIL + AWL	Atmospheric pressure sensor	Atmospheric pressure sensor error (excessive sensor output)	P112	P461
P2228			4	FAIL + AWL		Atmospheric pressure sensor error (insufficient sensor output)	P113	P461
P1231			10	FAIL + AWL		Atmospheric pressure sensor error (characteristic error)	P114	P461
P041D	412	19C	3	FAIL + AWL	EGR gas temperature sensor	EGR gas temperature sensor error (excessive sensor output)	P116	P373
P041C			4	FAIL + AWL		EGR gas temperature sensor error (insufficient sensor output)	P118	P373
P1675			10	FAIL + RSL		EGR gas temperature sensor error (detected value error)	P120	P377
P040D	105	69	3	FAIL + RSL	Intake manifold temperature sensor	Intake manifold temperature sensor error (excessive sensor output)	P122	P382
P040C			4	FAIL + RSL		Intake manifold temperature sensor error (insufficient sensor output)	P124	P382
P1676			10	FAIL + RSL		Intake manifold temperature sensor error (detected value error)	P126	P386
P0546	173	AD	3	FAIL + AWL	Exhaust manifold temperature sensor	Exhaust manifold temperature sensor error (excessive sensor output)	P128	P391
P0545			4	FAIL + AWL		Exhaust manifold temperature sensor error (insufficient sensor output)	P130	P391
P1677			10	FAIL + RSL		Exhaust manifold temperature sensor error (detected value error)	P132	P395
P068B	1485	5CD	7	FAIL + AWL	Main relay	Main relay contact sticking	P134	P400
P068A			2	FAIL + AWL		Main relay early opening	P136	P400
P0543	522243	7F803	5	FAIL + AWL	Starting aid relay	Starting aid relay disconnection	P138	P404
P0541			6	FAIL + AWL		Starting aid relay GND short circuit	P140	P404
P0201	654	28E	5	FAIL + RSL	Injector (No. 1 cylinder)	Disconnection (injector-specific)	P142	P431
P0262			6	FAIL + RSL		Coil short circuit	P144	P431
P1262			3	FAIL + RSL		Short circuit	P146	P436
P0202	653	28D	5	FAIL + RSL	Injector (No. 2 cylinder)	Disconnection (injector-specific)	P148	P431
P0265			6	FAIL + RSL		Coil short circuit	P150	P431
P1265			3	FAIL + RSL		Short circuit	P152	P436
P0203	652	28C	5	FAIL + RSL	Injector (No. 3 cylinder)	Disconnection (injector-specific)	P154	P431
P0268			6	FAIL + RSL		Coil short circuit	P156	P431
P1268			3	FAIL + RSL		Short circuit	P158	P436
P0204	651	28B	5	FAIL + RSL	Injector (No. 4 cylinder)	Disconnection (injector-specific)	P160	P431
P0271			6	FAIL + RSL		Coil short circuit	P162	P431
P1271			3	FAIL + RSL		Short circuit	P164	P436

DTC code				Lamp that comes on	Part	Error	Reference page		
P code	SPN		FMI				State	Descrip- tion	Diag- nosis
	Decima number	Hexa- decimal number	Decima number						
P0611	4257	10A1	12	FAIL + RSL	All injectors	Injector drive IC error	P166	-	
P1146	2797	AED	6	FAIL + RSL		Injector drive circuit (Bank 1) short circuit (4TN: Common circuit for No. 1, No. 4 and all 3TN cylinders)	P167	P436	
P1149	2798	AEE	6	FAIL + RSL		Injector drive circuit (Bank 2) short circuit (4TN: Circuit for No. 2 and No. 3 cylinders)	P169	P436	
P1648	523462	7FCC6	13	FAIL + RSL	Injector (correction value)	Injector (No. 1 cylinder) correction value error	P171	-	
P1649	523463	7FCC7	13	FAIL + RSL		Injector (No. 2 cylinder) correction value error	P172	-	
P1650	523464	7FCC8	13	FAIL + RSL		Injector (No. 3 cylinder) correction value error	P173	-	
P1651	523465	7FCC9	13	FAIL + RSL		Injector (No. 4 cylinder) correction value error	P174	-	
P1641	522571	7F94B	3	FAIL + RSL	SCV (MPROP)	SCV (MPROP) L side VB short circuit	P175	P438	
P1643			6	FAIL + RSL		SCV (MPROP) L side GND short circuit	P176	P438	
P0629	633	279	3	FAIL + RSL		SCV (MPROP) H side VB short circuit	P178	P438	
P1642			6	FAIL + RSL		SCV (MPROP) H side GND short circuit	P180	P438	
P0627			5	FAIL + RSL		SCV (MPROP) disconnection	P181	P438	
P062A	522572	7F94C	6	FAIL + RSL		SCV (MPROP) drive current (high level)	P182	P438	
P1645			11	FAIL + RSL		SCV (MPROP) pump overload error	P184	P438	
P0088	157	9D	0	FAIL + RSL		Rail pressure error	Rail pressure too high	P186	-
P0094			18	FAIL + RSL			Rail pressure deviation error (low rail pressure)	P188	-
P0093			15	FAIL + RSL			Rail pressure deviation error (high rail pressure)	P190	-
P000F			16	FAIL + RSL					
P1666	523469	7FCCD	0	FAIL + RSL	PLV (Common rail pressure limit valve)	PLV open valve	P192	-	
P1667	523470	7FCCE	0	FAIL + RSL		Rail pressure fault (The times of PLV valve opening error)	P194	-	
P1668	523489	7FCE1	0	FAIL + RSL		Rail pressure fault (The actual rail pressure is too high during PRV limp home)	P198	-	
P1665	523468	7FCCC	9	FAIL + RSL		Rail pressure fault (Controlled rail pressure error after PLV valve opening)	P200	-	
P1669	523491	7FCE3	0	FAIL + RSL	Rail pressure control	Rail pressure fault (Injector B/F temperature error during PLV4 limp home)	P202	-	
P1670	523460	7FCC4	7	FAIL + RSL		Rail pressure fault (Operation time error during RPS limp home)	P204	-	
P0219	190	BE	16	FAIL + RSL	Overspeed	Overspeed	P314	P463	
P0660	2950	B86	5	FAIL + AWL	Intake throttle drive circuit	No-load of throttle valve drive H bridge circuit	P205	P440	
P1658			3	FAIL + AWL		Power short circuit of throttle valve drive H bridge output 1	P206	P440	
P1659			4	FAIL + AWL		GND short circuit of throttle valve drive H bridge output 1	P207	P440	
P1660			6	FAIL + AWL		Overload on the drive H bridge circuit of throttle valve	P208	P440	
P1661	2951	B87	3	FAIL + AWL		VB Power short circuit of throttle valve drive H bridge output 2	P209	P440	
P1662			4	FAIL + AWL		GND short circuit of throttle valve drive H bridge output 2	P210	P440	
P02E4	2950	B86	7	FAIL + RSL		Throttle valve sticking (sticking open)	P211	P444	
P02E5	2951	B87	7	FAIL + RSL		Throttle valve sticking (sticking closed)	P213	P444	
U0292	522596	7F964	9	FAIL + AWL		CAN 2	TSC1 (SA1) reception timeout	P239	P458
U1301	522597	7F965	9	FAIL + AWL			TSC1 (SA2) reception timeout	P241	P458
U1292	522599	7F967	9	FAIL + AWL	Y_ECR1 reception timeout		P243	P458	
U1293	522600	7F968	9	FAIL + AWL	Y_EC reception timeout		P245	P458	
U1294	522601	7F969	9	FAIL + AWL	Y_RSS reception timeout		P247	P458	
U0168	237	ED	31	FAIL + AWL	VI reception timeout		P249	P458	
U3002			13	FAIL + AWL	VI reception data error		P250	P458	
U1300	522609	7F971	9	FAIL + AWL	Y_ETCP1 reception time out		P251	P458	
U1302	522618	7F97A	9	FAIL + AWL	EBC1 reception timeout		P253	P458	
U1303	522619	7F97B	9	FAIL + AWL	Y_DPFIF reception timeout		P255	P458	
U0167	522730	7F9EA	12	FAIL + AWL	Immobilizer error (CAN communication)		P257	P458	
U0426	1202	4B2	2	FAIL + AWL	Immobilizer error (system)		P258	-	

TROUBLESHOOTING

DTC code				Lamp that comes on	Error		Reference page		
P code	SPN		FMI		Part	State	Description	Diagnosis	
	Decima number	Hexa-decimal number	Decima number						
U010B	522610	7F972	9	FAIL + AWL	CAN 1	CAN 1 (for EGR): Reception timeout from the EGR valve	P236	P455	
U1107	522611	7F973	9	FAIL + AWL		CAN 1 (for exhaust throttle): Reception time out	P238	P455	
P0404	2791	AE7	0	FAIL + AWL	EGR valve	EGR overvoltage error	P215	P450	
P1404			1	FAIL + AWL		EGR low voltage error	P217	P450	
P1409			7	FAIL + AWL		EGR feedback error	P219	P454	
U0401			9	FAIL + AWL		EGR ECM data error	P220	P454	
P0403			12	FAIL + AWL		Disconnection in EGR motor coils	P222	P454	
P1405			522579	7F953		12	FAIL + AWL	Short circuit in EGR motor coils	P223
P0488	522580	7F954	12	FAIL + AWL		EGR position sensor error	P224	P454	
P148A	522581	7F955	7	FAIL + RSL		EGR valve sticking error	P225	P454	
P049D	522582	7F956	7	FAIL + RSL		EGR initialization error	P226	P454	
P1410	522183	7F957	1	FAIL + AWL		EGR high temperature thermistor error	P228	P454	
P1411	522184	7F958	1	FAIL + AWL		EGR low temperature thermistor error	P229	P454	
U1401	522617	7F979	12	FAIL + AWL		EGR target value out of range	P227	P454	
P1438	522746	7F9FA	12	FAIL + AWL		Exhaust throttle	Exhaust throttle (voltage fault)	P230	-
P1439	522747	7F9FB	12	FAIL + AWL			Exhaust throttle (motor fault)	P231	-
P1440	522748	7F9FC	12	FAIL + AWL			Exhaust throttle (sensor system fault)	P232	-
P1441	522749	7F9FD	12	FAIL + AWL			Exhaust throttle (MPU fault)	P233	-
P1442	522750	7F9FE	12	FAIL + AWL			Exhaust throttle (PCB fault)	P234	-
P1443	522751	7F9FF	19	FAIL + AWL			Exhaust throttle (CAN fault)	P235	-
P0601	630	276	12	FAIL + RSL	EEPROM	EEPROM memory deletion error	P259	P461	
P160E	522576	7F950	12	FAIL + RSL		EEPROM memory reading error	P260	P461	
P160F	522578	7F952	12	FAIL + RSL		EEPROM memory writing error	P261	P461	
P1613	522585	7F959	12	FAIL + RSL	ECU internal fault	CY146 SPI communication fault	P262	P461	
P1608	522588	7F95C	12	FAIL + RSL		Excessive voltage of supply 1	P263	P461	
P1617	522589	7F95D	12	FAIL + RSL		Insufficient voltage of supply 1	P264	P461	
P1609	522590	7F95E	12	None		Sensor supply voltage error 1	P265	-	
P1618	522591	7F95F	12	None		Sensor supply voltage error 2	P266	-	
P1619	522592	7F960	12	None		Sensor supply voltage error 3	P267	-	
P1626	522744	7F9F8	4	FAIL + AWL		Actuator drive circuit 1 short to ground	P268	-	
P1633	522994	7FAF2	4	FAIL + AWL		Actuator drive circuit 2 short to ground	P269	-	
P1467	523471	7FCCF	6	FAIL + AWL		Actuator drive circuit 3 short to ground	P270	-	
P1469	523473	7FCD1	12	FAIL + RSL		AD converter fault 1	P271	P461	
P1470	523474	7FCD2	12	FAIL + RSL	AD converter fault 2	P272	P461		
P1471	523475	7FCD3	12	FAIL + RSL	External monitoring IC and CPU fault 1	P273	P461		
P1472	523476	7FCD4	12	FAIL + RSL	External monitoring IC and CPU fault 2	P274	P461		
P1473	523477	7FCD5	12	FAIL + RSL	ROM fault	P275	P461		
P1474	523478	7FCD6	12	FAIL + RSL	Shutoff path fault 1	P276	P461		
P1475	523479	7FCD7	12	FAIL + RSL	Shutoff path fault 2	P277	P461		
P1476	523480	7FCD8	12	FAIL + RSL	Shutoff path fault 3	P278	P461		
P1477	523481	7FCD9	12	FAIL + RSL	Shutoff path fault 4	P279	P461		
P1478	523482	7FCDA	12	FAIL + RSL	Shutoff path fault 5	P280	P461		
P1479	523483	7FCDB	12	FAIL + RSL	Shutoff path fault 6	P281	P461		
P1480	523484	7FCDC	12	FAIL + RSL	Shutoff path fault 7	P282	P461		
P1481	523485	7FCDD	12	FAIL + RSL	Shutoff path fault 8	P283	P461		
P1482	523486	7FCDE	12	FAIL + RSL	Shutoff path fault 9	P284	P461		
P1483	523487	7FCDF	12	FAIL + RSL	Shutoff path fault 10	P285	P461		
P1484	523488	7FCE0	0	FAIL + RSL	Recognition error of engine speed	P286	-		

DTC code				Lamp that comes on	Error		Reference page	
P code	SPN		FMI		Part	State	Description	Diagnosis
	Decima number	Hexa-decimal number	Decima number					
P053A	3059	BF3	5	FAIL + AWL	Breather heater (Optional parts for 4TNV86CT and 4TNV98CT)	Breather heater disconnection	P287	P408
P053B			4	FAIL + AWL		Breather heater short circuit (GND)	P288	P408
P053C			3	FAIL + AWL		Breather heater short circuit (VB)	P289	P408
P1101	522323	7F853	0	Application specific	Air cleaner switch	Air cleaner clogged alarm	P290	P415
P1151	522329	7F859	0	Application specific	Water separator switch	Water separator alarm	P292	P415
P1562	167	A7	5	Application specific	Charge switch	Charge switch disconnection	P294	P412
P1568			1	Application specific		Charge alarm	P296	P412
P1192	100	64	4	Application specific	Oil pressure switch	Oil pressure switch disconnection	P298	P412
P1198			1	Application specific		Low oil pressure alarm	P300	P412
P2463	522573	7F94D	0	Not comes on	DPF	Excessive PM accumulation (method C)	P302	–
P1463	522574	7F94E	0	Not comes on		Excessive PM accumulation (method P)	P303	–
P2458	522575	7F94F	7	Not comes on		Regeneration failure (stationary regeneration failure)	P304	–
P2459	522577	7F951	11	Not comes on		Regeneration failure (stationary regeneration not performed)	P305	–
P1426	3250	CB2	0	FAIL + RSL	DPF intermediate temperature sensor	DPF intermediate temperature sensor abnormal rise in temperature (post-injection malfunction)	P306	P369
P242F	3720	E88	16	FAIL + AWL	DPF OP interface	Ash cleaning request 1	P307	–
P1420			0	FAIL + RSL		Ash cleaning request 2	P308	–
P1421	3719	E87	16	FAIL + AWL		Stationary regeneration standby	P309	–
P1424			0	FAIL + RSL		Backup mode	P310	–
P1425	3695	E6F	14	Not comes on		Reset regeneration is inhibited	P311	–
P1445	3719	E87	9	FAIL + RSL		Regeneration failure (recovery regeneration failure)	P312	–
P1446			7	FAIL + RSL		Recovery regeneration is inhibited	P313	–

Additional requirements for EU Stage V (less than 56kW) regulations

Due to the enactment of EU Stage V emission regulations from January 2019, the following additional legal requirements now apply to engines of less than 56 kW.

1. Installation of a NCD (NOx Control Diagnostic System) (EGR valve controls NOx)
 - Detects failure or illegal modification of NOx control system, and failure of the NCD itself.
 - Alerts operator when failure etc. is detected.
 - Incremental engine derating (inducement) is applied to prompt the operator to take action.
2. Installation of a PCD (Particulate Diagnostic System)
 - Detects removal/loss of function of DPF, and failure of the DPF itself.
 - Alerts operator when failure etc. is detected.
 - Addition of incident counter/timer

■ Power restrictions due to inducement when NCD abnormality occurs

Inducement refers to restrictions (limitations) which are placed on engine speed/fuel injection quantity in cases whereby emission reduction control ceases to function normally due to the occurrence of an abnormality in the emission reduction equipment (EGR system) installed to the engine. Inducement is activated when an abnormality is detected in the EGR system. This is to prevent the engine from continuing to be used while EGR control is not functioning normally. If the engine continues to be used once inducement is activated, the engine speed/fuel injection quantity are reduced to a point at which work is almost impossible. Repair the error, immediately.

There are three inducement levels caused by EGR system abnormality. The level increases incrementally according to the amount of operating time elapsed since the abnormality occurred.

a. Warning

When engine operation time is less than 36 hours since abnormality occurred.

In this case, restrictions on engine speed/fuel injection quantity vary depending on the error.

b. Inducement (Low level)

When engine operation time is 36 hours or more but less than 100 hours since abnormality occurred (or less than 5 hours (*1)). In this case, the torque is limited to 75 %.

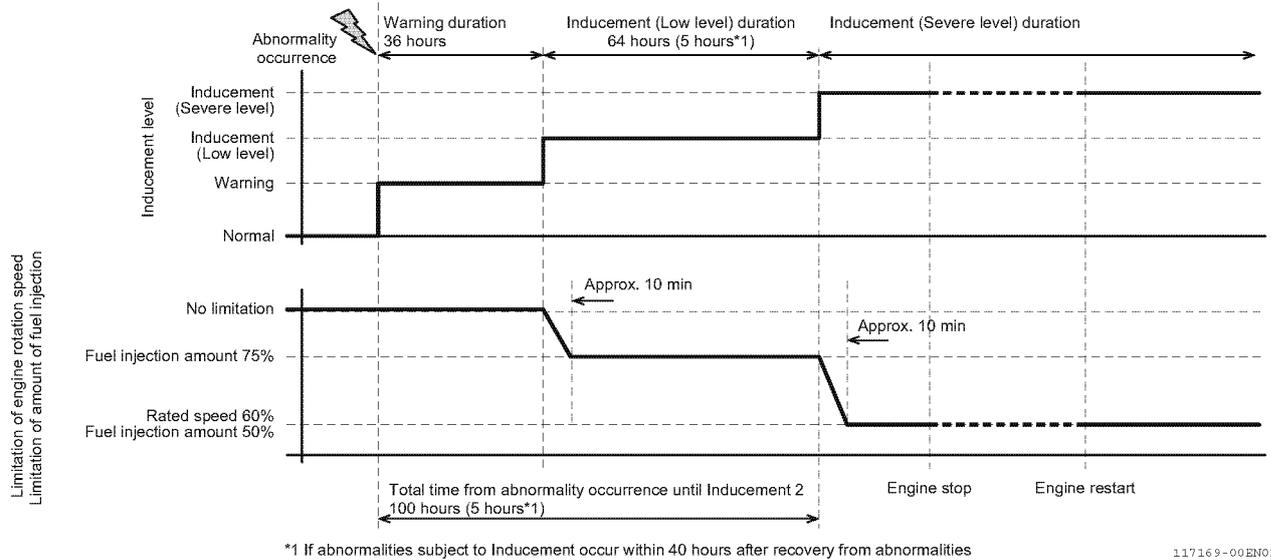
(For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.)

c. Inducement (Severe level)

When engine operation time is 100 hours or more since abnormality occurred (or 5 hours or more (*1)). In this case, the engine speed is restricted to 60 % of its rated speed (in some engine models), and the torque is restricted to 50 %.

(For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.)

The figure below shows a relation between inducement and the engine operation time since the abnormality occurred. Inducement cannot be canceled by stopping and re-starting the engine during an error occurrences. The inducement level at the time when the engine is stopped remains in effect.



Relation between inducement and the engine operation time elapsed since abnormality occurrence

(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.

When inducement is activated during a PCD abnormality, there is no error display or power restrictions.

Description

P code	P code	Name	Error name
SPN/FMI	SPN/FMI		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Prerequisite for detecting the error 2. Condition for detecting the error	Check point to specify the cause of the error. See "Diagnosis" for details.

● Actions when an error occurs

Fault mode	[Continuous operation] / [Limited operation] / [Engine stop]: Describes the engine operation when an error is detected. * [Continuous operation]: The engine continues to operate without limitations even after an error is detected. Engine control is not obstructed. [Limited operation]: The engine operation continues, but the high idle speed and engine power are limited. [Engine stop]: The engine stops immediately when an error is detected. If the error is detected before starting the engine, the key switch does not turn.
Limited operation	The details of limited operation at the time of error are listed.
Reset criteria	The condition to release the fault mode is listed.
Remarks	Precaution is listed.

● Presumed cause of the failure or the error condition

Judging from the detected DTC, the presumed location and cause of the error (e.g. disconnection of sensor wiring) or the error condition of the system (e.g. abnormal rise of engine coolant temperature) are listed.

* Malfunctions related to the detected DTC are listed.

● Diagnosis

The method and procedure of the failure diagnosis are listed. Use YANMAR failure diagnosis tool, SMARTASSIST-DIRECT (SA-D), for initial diagnosis.

Note: If replacing the ECU, sensor, or actuator fixes the malfunction, re-install the presumably broken parts and check that the malfunction re-occurs.

Sensor related

■ Crankshaft speed sensor

P0336: Crankshaft signal error

P code	P0336	Name	Crankshaft signal error
SPN/FMI	522400/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Abnormal pulse detected for a constant number of times (25 times).	Connector Wire-harness Crankshaft speed sensor ECU Pulser

● Actions when an error occurs

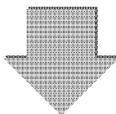
Fault mode	[Limited operation]: The engine operation is limited. (The operation continues with only the camshaft speed sensor.)
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

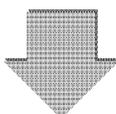
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Crankshaft speed sensor failure
4. ECU internal circuit failure
5. Pulser error and sensor installation condition error

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P319</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the crankshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the crankshaft speed sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the crankshaft speed sensor resistance value.• Check the conduction of the wire-harness.• Check the crankshaft speed sensor mounting condition and pulser. <p>* See Chapter 2 <i>P319</i> for details on the diagnosis method and procedure.</p>
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P0337: No signal from crankshaft

P code	P0337	Name	No signal from crankshaft
SPN/FMI	522400/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. No pulse input of crankshaft speed sensor while the cam is rotating for a certain number of rotations (2 rotations).	Connector Wire-harness Crankshaft speed sensor ECU Pulser

● Actions when an error occurs

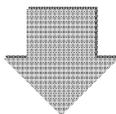
Fault mode	[Limited operation]: The engine operation is limited. (The operation continues with only the camshaft speed sensor.)
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

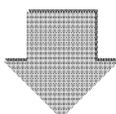
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Crankshaft speed sensor failure
4. ECU internal circuit failure
5. Pulser error and sensor installation condition error

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P319</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the crankshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the crankshaft speed sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the crankshaft speed sensor resistance value.• Check the conduction of the wire-harness.• Check the crankshaft speed sensor mounting condition and pulser. <p>* See Chapter 2 <i>P319</i> for details on the diagnosis method and procedure.</p>
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■ Camshaft speed sensor

P0341: Camshaft signal error

P code	P0341	Name	Camshaft signal error
SPN/FMI	522401/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Incorrect pulse number of camshaft speed sensor or incorrect position detected while the crank is rotating for a certain number of rotations (4 rotations).	Connector Wire-harness Camshaft speed sensor ECU Pulser

● Actions when an error occurs

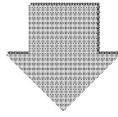
Fault mode	[Continuous operation]: Engine control is not obstructed. (The operation continues with only the crankshaft speed sensor.)
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

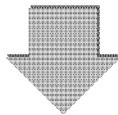
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Camshaft speed sensor fault
4. ECU internal circuit failure
5. Pulser error and sensor installation condition error

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P322 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the camshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the camshaft speed sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the ECU output voltage. <p>* See Chapter 2 P322 for details on the diagnosis method and procedure.</p>
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P0342: No signal from camshaft

P code	P0342	Name	No signal from camshaft
SPN/FMI	522401/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. No pulse input of camshaft speed sensor while the crank is rotating for a certain number of rotations (2.2 rotations).	Connector Wire-harness Camshaft speed sensor ECU Pulser

● Actions when an error occurs

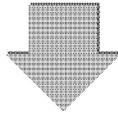
Fault mode	[Continuous operation]: Engine control is not obstructed. (The operation continues with only the crankshaft speed sensor.)
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

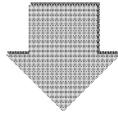
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Camshaft speed sensor failure
4. ECU internal circuit failure
5. Pulser error and sensor installation condition error

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P322 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the camshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the camshaft speed sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the ECU output voltage. <p>* See Chapter 2 P322 for details on the diagnosis method and procedure.</p>
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P1341: Angle offset error

P code	P1341	Name	Angle offset error
SPN/FMI	522401/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The condition with the phase difference of 30 degrees or larger, or -20 degrees or smaller between the cam and the crank is detected for 2 times.	Connector Wire-harness Camshaft speed sensor ECU Pulser

● Actions when an error occurs

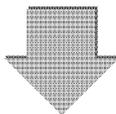
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

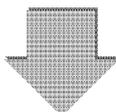
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Camshaft speed sensor failure
4. ECU internal circuit failure
5. Pulser error and sensor installation condition error

● Diagnosis

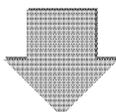
1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the crankshaft speed sensor, camshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the camshaft speed sensor wiring is not cut or the wiring coating is not peeled.
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3. Pulser check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check that there is no abnormality in distance and displacement of the pulser and the sensor.
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4. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the ECU output voltage.
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P0008: Crankshaft/camshaft speed sensor non-input (simultaneous)

P code	P0008	Name	Crankshaft/camshaft speed sensor non-input (simultaneous)
SPN/FMI	523249/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During cranking 2. For 10 seconds, no signal is detected from crankshaft speed sensor or camshaft speed sensor.	Connector Wire-harness Crankshaft speed, Camshaft speed sensor ECU Pulser

● Actions when an error occurs

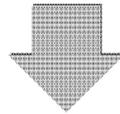
Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

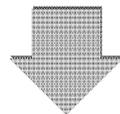
1. Crankshaft speed sensor failure and camshaft speed sensor failure occur at the same time
2. Starter system failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. <p>* See Chapter 2 P319, P322 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the power switch. • Check the pin of the crankshaft speed sensor, camshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the crankshaft speed sensor and camshaft speed sensor wiring is not cut or the wiring coating is not peeled. • If the starter is turned on but the engine does not turn, check the starter system.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Perform the failure diagnosis on the crankshaft speed sensor and camshaft speed sensor.
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■ Accelerator sensor

P0123: Accelerator sensor 1 error (voltage high)

P code	P0123	Name	Accelerator sensor 1 error (voltage high)
SPN/FMI	91/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The sensor voltage is above 4.6 V.	Connector Wire-harness Accelerator sensor ECU

● Actions when an error occurs

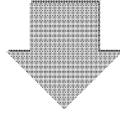
	Backup accelerator sensor function	
	No	Yes
Fault mode	[Limited operation]: The engine operates at a constant speed.	[Continuous operation]: Switches to engine operation through a backup accelerator sensor.
Limited operation	The target rotation speed is set to "target rotation speed during error" or "target rotation speed before error detection". (Action differs depending on each customer's settings.)	No
Reset criteria	When the ECU is turned off with the normal voltage (0.2 to 4.6 V) supplied, the fault mode is released.	When the ECU power off is detected, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

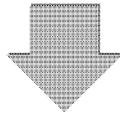
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Accelerator sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the connector pin of the accelerator sensor 2 for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the accelerator sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the accelerator sensor resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor output voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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P0122: Accelerator sensor 1 error (voltage low)

P code	P0122	Name	Accelerator sensor 1 error (voltage low)
SPN/FMI	91/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The sensor voltage is 0.2 V or lower.	Connector Wire-harness Accelerator sensor ECU

● Actions when an error occurs

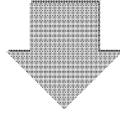
	Backup accelerator sensor function	
	No	Yes
Fault mode	[Limited operation]: The engine operates at a constant speed.	[Continuous operation]: Switches to engine operation through a backup accelerator sensor.
Limited operation	The target rotation speed is set to "target rotation speed during error" or "target rotation speed before error detection". (Action differs depending on each customer's settings.)	No
Reset criteria	When the ECU is turned off with the normal voltage (0.2 to 4.6 V) supplied, the fault mode is released.	When the ECU power off is detected, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

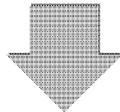
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the connector pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the accelerator sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the accelerator sensor resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor output voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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P0223: Accelerator sensor 2 error (voltage high)

P code	P0223	Name	Accelerator sensor 2 error (voltage high)
SPN/FMI	28/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The sensor voltage is above 4.6 V.	Connector Wire-harness Accelerator sensor ECU

● Actions when an error occurs

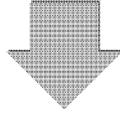
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

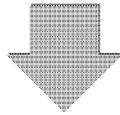
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the connector pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the accelerator sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the accelerator sensor resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor output voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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P0222: Accelerator sensor 2 error (voltage low)

P code	P0222	Name	Accelerator sensor 2 error (voltage low)
SPN/FMI	28/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The sensor voltage is below 0.2 V.	Connector Wire-harness Accelerator sensor ECU

● Actions when an error occurs

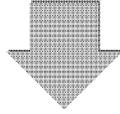
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

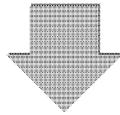
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the connector pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the accelerator sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the accelerator sensor resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor output voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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P1646: Dual accelerator sensor error (closed position)

P code	P1646	Name	Dual accelerator sensor error (closed position)
SPN/FMI	522624/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. (APS2 terminal voltage - Estimated APS2 terminal voltage) is greater than the [Detected value of the dual accelerator sensor fault].	Connector Wire-harness Accelerator sensor 1 Accelerator sensor 2 ECU

● Actions when an error occurs

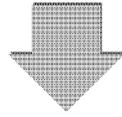
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

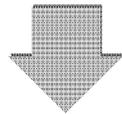
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or GND short circuit of sensor 5 V
3. Accelerator 1 sensor failure
4. Accelerator 2 sensor failure
5. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the connector pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the accelerator sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the accelerator sensor resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor output voltage.
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P1647: Dual accelerator sensor error (open position)

P code	P1647	Name	Dual accelerator sensor error (open position)
SPN/FMI	522623/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. (Estimated APS2 terminal voltage - APS2 terminal voltage) is greater than the [Detected value of the dual accelerator sensor fault].	Connector Wire-harness Accelerator sensor 1 Accelerator sensor 2 ECU

● Actions when an error occurs

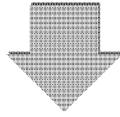
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

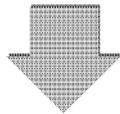
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or GND short circuit of sensor 5 V
3. Accelerator 1 sensor failure
4. Accelerator 2 sensor failure
5. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the connector pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the accelerator sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the accelerator sensor resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor output voltage.
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P0228: Accelerator sensor 3 error (voltage high)

P code	P0228	Name	Accelerator sensor 3 error (voltage high)
SPN/FMI	29/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The sensor voltage is above 4.6 V.	Connector Wire-harness Accelerator sensor 3 ECU

● Actions when an error occurs

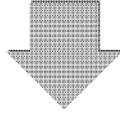
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

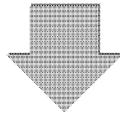
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection of the sensor GND wire
 - Power short circuit of the sensor signal wire
3. Accelerator sensor 3 failure
 - Sensor output failure by power short circuit of accelerator sensor 3 internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the power switch.• Check the connector pin of the accelerator sensor 3 for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the accelerator sensor 3 wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the accelerator sensor 3 resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor 3 output voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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P0227: Accelerator sensor 3 error (voltage low)

P code	P0227	Name	Accelerator sensor 3 error (voltage low)
SPN/FMI	29/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The sensor voltage is below 0.2 V.	Connector Wire-harness Accelerator sensor 3 ECU

● Actions when an error occurs

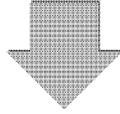
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

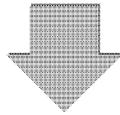
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or GND short circuit of the accelerator sensor 3 signal wire
 - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor 3 failure
 - Sensor output failure caused by disconnection or an increase in sliding friction of the accelerator sensor 3 internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the power switch.• Check the connector pin of the accelerator sensor 3 for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the accelerator sensor 3 wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the accelerator sensor 3 resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor 3 output voltage. <p>* See Chapter 2 P325 for details on the diagnosis method and procedure.</p>
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P1227: Pulse accelerator sensor error (pulse communication)

P code	P1227	Name	Pulse accelerator sensor error (pulse communication)
SPN/FMI	29/8		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Key switch ON. 2. No pulse accelerator signal input.	Connector Wire-harness ECU

● **Actions when an error occurs**

Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**● **Diagnosis**

P1126: Accelerator sensor 3 error (foot pedal in open position)

P code	P1126	Name	Accelerator sensor 3 error (foot pedal in open position)
SPN/FMI	28/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When the APS3 input voltage is 1.1 V or above and the PDLSW terminal is low level (PDLSW terminal: Open setting).	Connector Wire-harness Foot pedal ECU

● Actions when an error occurs

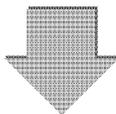
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

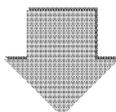
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or GND short circuit of the foot pedal signal wire
 - Disconnection or GND short circuit of sensor 5 V
3. Foot pedal failure
 - Sensor output failure caused by disconnection or an increase in sliding friction of the foot pedal internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the power switch.• Check the connector pin of the foot pedal for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the foot pedal wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the foot pedal resistance value.• Check the conduction of the wire-harness.• Check the accelerator sensor output voltage.
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P1125: Accelerator sensor 3 error (foot pedal in closed position)

P code	P1125	Name	Accelerator sensor 3 error (foot pedal in closed position)
SPN/FMI	28/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When the APS3 input voltage is 0.65 V or below and the PDLSW terminal is high level (PDLSW terminal: Open setting).	

● Actions when an error occurs

Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition**● Diagnosis**

■ Intake throttle position sensor

P02E9: Intake throttle position sensor error (voltage high)

P code	P02E9	Name	Intake throttle position sensor error (voltage high)
SPN/FMI	51/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is above 4.8 V.	Connector Wire-harness Intake throttle position sensor ECU

● Actions when an error occurs

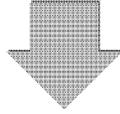
Fault mode	[Limited operation]: Intake throttle position is set to 100 % as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

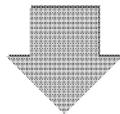
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Intake throttle position sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P328 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the connector pin of the intake throttle position sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the intake throttle position sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the intake throttle position sensor resistance value.• Check the conduction of the wire-harness.• Check the intake throttle position sensor output voltage. <p>* See Chapter 2 P328 for details on the diagnosis method and procedure.</p>
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P02E8: Intake throttle position sensor error (voltage low)

P code	P02E8	Name	Intake throttle position sensor error (voltage low)
SPN/FMI	51/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is 0.2 V or below.	Connector Wire-harness Intake throttle position sensor ECU

● Actions when an error occurs

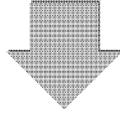
Fault mode	[Limited operation]: Intake throttle position is set to 100 % as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

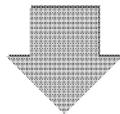
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Intake throttle position sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P328 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the connector pin of the intake throttle position sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the intake throttle position sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the intake throttle position sensor resistance value.• Check the conduction of the wire-harness.• Check the intake throttle position sensor output voltage. <p>* See Chapter 2 P328 for details on the diagnosis method and procedure.</p>
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■ EGR low pressure side pressure sensor

P0238: EGR low pressure side pressure sensor error (excessive sensor output)

P code	P0238	Name	EGR low pressure side pressure sensor error (excessive sensor output)
SPN/FMI	102/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness EGR pressure sensor ECU

● Actions when an error occurs

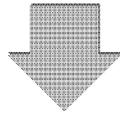
Fault mode	[Limited operation]: EGR low pressure side pressure is set to 900 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning <ul style="list-style-type: none"> When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) <ul style="list-style-type: none"> When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) <ul style="list-style-type: none"> When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

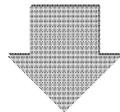
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. EGR pressure sensor failure
 - Sensor output failure caused by a GND short circuit of the EGR pressure sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 <i>P331</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed. • Make sure that the EGR pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the conduction of the wire-harness. • Check the EGR pressure sensor output voltage. <p>* See Chapter 2 <i>P331</i> for details on the diagnosis method and procedure.</p>
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P0237: EGR low pressure side pressure sensor error (insufficient sensor output)

P code	P0237	Name	EGR low pressure side pressure sensor error (insufficient sensor output)
SPN/FMI	102/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness EGR pressure sensor ECU

● Actions when an error occurs

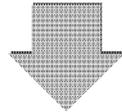
Fault mode	[Limited operation]: EGR low pressure side pressure is set to 900 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

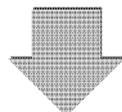
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. EGR pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P331 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed. • Make sure that the EGR pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the conduction of the wire-harness. • Check the EGR pressure sensor output voltage. <p>* See Chapter 2 P331 for details on the diagnosis method and procedure.</p>
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P0236: EGR low pressure side pressure sensor error (abnormal learning value)

P code	P0236	Name	EGR low pressure side pressure sensor error (abnormal learning value)
SPN/FMI	102/13		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied <ul style="list-style-type: none"> • Before engine starting is complete • Atmospheric pressure sensor voltage is normal • EGR low pressure side pressure sensor voltage normal • Atmospheric pressure characteristics are not abnormal * The above prerequisites are for calculating the final offset value of the intake manifold pressure 2. Final offset value of intake manifold pressure is lower than -150 kPa, or higher than 150 kPa	

● **Actions when an error occurs**

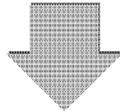
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning <ul style="list-style-type: none"> When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) <ul style="list-style-type: none"> When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) <ul style="list-style-type: none"> When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.)
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

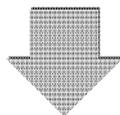
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. EGR pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P331 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed. • Make sure that the EGR pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the conduction of the wire-harness. • Check the EGR pressure sensor output voltage. <p>* See Chapter 2 P331 for details on the diagnosis method and procedure.</p>
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P1673: EGR low pressure side pressure sensor error (detected value error)

P code	P1673	Name	EGR low pressure side pressure sensor error (detected value error)
SPN/FMI	102/10		

● Purpose of DTC detection

When the pressure difference between the intake manifold pressure at engine stop and intake manifold pressure while engine is running is small, this error is detected. This detects errors such as the EGR low pressure side pressure sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied <ul style="list-style-type: none"> • No abnormalities in related sensors • Battery voltage is within the prescribed range • Not during forced operation by service tool • During engine operation • Not during DPF regeneration • Atmospheric pressure is 82.3 kPa or more • Current injection amount is equal to or more than the predetermined value determine by the engine rpm 2. After the prerequisite conditions have been established for set period of time, the difference between the pressure on the EGR low pressure side (after learning) and the atmospheric pressure shall be within the prescribed range	Connector Wire-harness EGR pressure sensor ECU

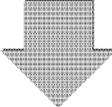
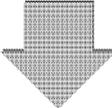
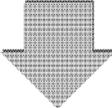
● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When a sensor abnormality occurs, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. At this time, the engine torque is limited to 75 % (the engine speed is limited to low idle speed in some errors while the maximum fuel injection quantity is limited to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is limited to 60 % of its rated speed (in some engine models), and the torque is limited to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) (*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.
Reset criteria	After the reset conditions (specified period of time has elapsed since prerequisites satisfied, and detection conditions not established) are satisfied, automatic reset occurs.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation failure of EGR pressure sensor
2. Poor connection of connector
3. Wiring failure of the wire-harness
4. EGR pressure sensor failure
5. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. <p>* See Chapter 2 P334 for details on the diagnosis method and procedure.</p>
	
2. Engine check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the key switch, and turn off the ECU power. • Check the installation condition of EGR pressure sensor. • Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.
	
3. Connector/wiring check	<ul style="list-style-type: none"> • Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the EGR pressure sensor wiring is not cut or the wiring coating is not peeled.
	
4. Failure diagnosis	<ul style="list-style-type: none"> • Check the ECU output voltage. • Check the EGR low pressure side pressure sensor output voltage. • Check the conduction of the wire-harness. <p>* See Chapter 2 P334 for details on the diagnosis method and procedure.</p>

■ EGR high pressure side pressure sensor

P0473: EGR high pressure side pressure sensor error (excessive sensor output)

P code	P0473	Name	EGR high pressure side pressure sensor error (excessive sensor output)
SPN/FMI	1209/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness EGR pressure sensor ECU

● Actions when an error occurs

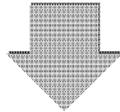
Fault mode	[Limited operation]: EGR high pressure side pressure is set to 900 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <p>a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error.</p> <p>b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.)</p> <p>c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.)</p> <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

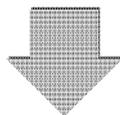
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. EGR pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P339 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed. • Make sure that the EGR pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the conduction of the wire-harness. • Check the EGR pressure sensor output voltage. <p>* See Chapter 2 P339 for details on the diagnosis method and procedure.</p>
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P0472: EGR high pressure side pressure sensor error (insufficient sensor output)

P code	P0472	Name	EGR high pressure side pressure sensor error (insufficient sensor output)
SPN/FMI	1209/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness EGR pressure sensor ECU

● Actions when an error occurs

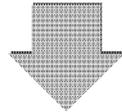
Fault mode	[Limited operation]: EGR high pressure side pressure is set to 900 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

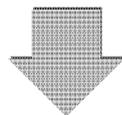
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. EGR pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P339 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed. • Make sure that the EGR pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the conduction of the wire-harness. • Check the EGR pressure sensor output voltage. <p>* See Chapter 2 P339 for details on the diagnosis method and procedure.</p>
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P0471: EGR high pressure side pressure sensor error (abnormal learning value)

P code	P0471	Name	EGR high pressure side pressure sensor error (abnormal learning value)
SPN/FMI	1209/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied <ul style="list-style-type: none"> • Before engine starting is complete • Atmospheric pressure sensor voltage is normal • EGR high pressure side pressure sensor voltage normal • Atmospheric pressure characteristics are not abnormal * The above prerequisites are for calculating the final offset value of the exhaust manifold pressure 2. Final offset value of exhaust manifold pressure is lower than -150 kPa, or higher than 150 kPa	

● Actions when an error occurs

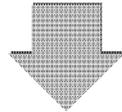
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) (*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

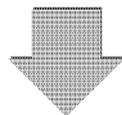
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. EGR pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P339 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed. • Make sure that the EGR pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the conduction of the wire-harness. • Check the EGR pressure sensor output voltage. <p>* See Chapter 2 P339 for details on the diagnosis method and procedure.</p>
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P1679: EGR high pressure side pressure sensor error (detected value error)

P code	P1679	Name	EGR high pressure side pressure sensor error (detected value error)
SPN/FMI	1209/10		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
<p>1. The following prerequisites should be satisfied</p> <ul style="list-style-type: none"> • No abnormalities in related sensors • Battery voltage is within the prescribed range • Not during forced operation by service tool • During engine operation • Not during DPF regeneration • Atmospheric pressure is 82.3 kPa or more • Current injection amount is equal to or more than the predetermined value determine by the engine rpm <p>2. After the prerequisite conditions have been established for 5 continual seconds, the difference between the pressure on the EGR high pressure side (after learning) and the atmospheric pressure shall be 0.4 kPa or less</p>	Connector Wire-harness EGR pressure sensor ECU

● **Actions when an error occurs**

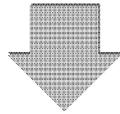
Fault mode	[Limited operation]: EGR high pressure side pressure is set to 90 kPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When a sensor abnormality occurs, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. <ol style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. At this time, the engine torque is limited to 75 % (the engine speed is limited to low idle speed in some errors while the maximum fuel injection quantity is limited to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is limited to 60 % of its rated speed (in some engine models), and the torque is limited to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	After the reset conditions have been established for 5 continual seconds, (prerequisites satisfied for 5 continual seconds, detection conditions not established) automatic reset occurs.
Remarks	

● Presumed cause of the failure or the error condition

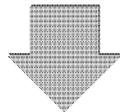
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. EGR pressure sensor failure
 - Sensor output failure caused by a GND short circuit of the EGR pressure sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P339 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the EGR pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the EGR pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the EGR pressure sensor output voltage. <p>* See Chapter 2 P339 for details on the diagnosis method and procedure.</p>
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■ Engine coolant temperature sensor

P0118: Engine coolant temperature sensor error (excessive sensor output)

P code	P0118	Name	Engine coolant temperature sensor error (excessive sensor output)
SPN/FMI	110/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness Engine coolant temperature sensor ECU

● Actions when an error occurs

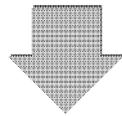
Fault mode	[Limited operation]: The engine coolant temperature is set to -15 °C at engine start and 50 °C after starting the engine as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning <ul style="list-style-type: none"> When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) <ul style="list-style-type: none"> When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) <ul style="list-style-type: none"> When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

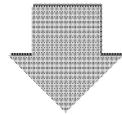
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or power short circuit of the sensor GND wire
 - Disconnection or power short circuit of the sensor signal wire
3. Engine coolant temperature sensor failure
 - Sensor output failure caused by an disconnection of the engine coolant temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P342 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, turn off the ECU power. • Check the pin of the engine coolant temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the engine coolant temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the engine coolant temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the engine coolant temperature sensor output voltage. <p>* See Chapter 2 P342 for details on the diagnosis method and procedure.</p>
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P0117: Engine coolant temperature sensor error (insufficient sensor output)

P code	P0117	Name	Engine coolant temperature sensor error (insufficient sensor output)
SPN/FMI	110/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness Engine coolant temperature sensor ECU

● Actions when an error occurs

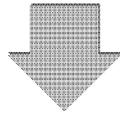
Fault mode	[Limited operation]: The engine coolant temperature is set to -15 °C at engine start and 50 °C after starting the engine as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

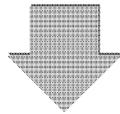
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. Engine coolant temperature sensor failure
 - Sensor output failure caused by a GND short circuit of the engine coolant temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P342 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the engine coolant temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the engine coolant temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the engine coolant temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the engine coolant temperature sensor output voltage. <p>* See Chapter 2 P342 for details on the diagnosis method and procedure.</p>
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P1674: Engine coolant temperature sensor error (detected value error)

P code	P1674	Name	Engine coolant temperature sensor error (detected value error)
SPN/FMI	110/10		

● Purpose of DTC detection

Compare the engine coolant temperature when the engine stops and while the engine is running. If the temperature difference is small, this error is detected. This detects errors such as the engine coolant temperature sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
<p>1. The following prerequisites should be satisfied</p> <ul style="list-style-type: none"> • No abnormality in water temperature sensor • Battery voltage is within the prescribed range • The last driving cycle has completely warmed up • The difference between the DPF intermediate temperature and the intake air temperature immediately after turning the key ON is within ± 12.8 °C • Low coolant temperature has caused EGR valve to close completely (coolant temperature is 60 °C or lower) • Atmospheric pressure is 82.3 kPa or more • The intake air temperature immediately after starting is between -7 °C and 35 °C • The engine is operated for 2400 s at an injection amount equal to or more than the predetermined value determined by the engine rpm <p>2. After the prerequisite conditions have been established, the following shall be satisfied</p> <ul style="list-style-type: none"> • The difference in the current coolant temperature, and the coolant temperature at engine start shall be 40 °C or less 	<p>Connector</p> <p>Wire-harness</p> <p>Engine coolant temperature sensor</p> <p>ECU</p>

● Actions when an error occurs

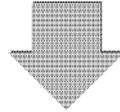
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When a sensor abnormality occurs, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. At this time, the engine torque is limited to 75 % (the engine speed is limited to low idle speed in some errors while the maximum fuel injection quantity is limited to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is limited to 60 % of its rated speed (in some engine models), and the torque is limited to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	After the reset conditions (coolant temperature of 60 °C or above) are satisfied, automatic reset occurs.
Remarks	

● Presumed cause of the failure or the error condition

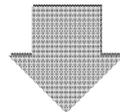
1. Installation failure of engine coolant temperature sensor
2. Poor connection of connector
3. Wiring failure of the wire-harness
4. Engine coolant temperature sensor failure
5. ECU internal circuit failure

● Diagnosis

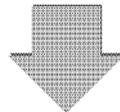
1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. <p>* See Chapter 2 P346 for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the key switch, and turn off the ECU power. • Check the installation condition of engine coolant temperature sensor. • Make sure that there is nothing wrong (disconnections and damages) with the engine coolant piping or cooling system.
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3. Connector/wiring check	<ul style="list-style-type: none"> • Check the pin of the engine coolant temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the engine coolant temperature sensor wiring is not cut or the wiring coating is not peeled.
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4. Failure diagnosis	<ul style="list-style-type: none"> • Check the engine coolant temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the engine coolant temperature sensor output voltage. <p>* See Chapter 2 P346 for details on the diagnosis method and procedure.</p>
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P0217: Engine coolant temperature high (overheat)

P code	P0217	Name	Engine coolant temperature high (overheat)
SPN/FMI	110/0		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. The engine coolant temperature sensor is normal, and 60 sec have passed since completion of the engine start. 2. Cooling water temperature 110 °C or above is continued for 20 sec.	Engine cooling water level Engine cooling equipment Engine coolant temperature sensor system

● **Actions when an error occurs**

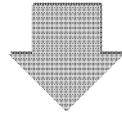
	Settings of the actions during a "cooling water temperature high" alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	<ul style="list-style-type: none"> The high idle speed or the maximum injection quantity is limited. (Action differs depending on each customer's settings.) EGR fully closes.
Reset criteria	<ul style="list-style-type: none"> When the ECU power off is detected, the fault mode is released. Automatic recovery is made when the cooling water temperature 105 °C or below. 	<ul style="list-style-type: none"> When the ECU power off is detected, the fault mode is released. Automatic recovery is made when the cooling water temperature 105 °C or below continues for 60 sec.
Remarks		

● **Presumed cause of the failure or the error condition**

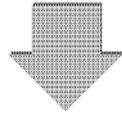
1. Engine overheat
2. Insufficient engine cooling water
3. Engine cooling equipment failure
4. Engine coolant temperature sensor system failure

● Diagnosis**1. Initial diagnosis using SA-D**

- Check the fault indication.
- * See Chapter 2 *P342* for details on the diagnosis method and procedure.

**2. Engine check**

- Turn off the ECU power and stop the engine.
- Check the engine cooling equipment.
- After a few moments, turn on the ECU power and make sure that the DTC is detected.

**3. Failure diagnosis**

- Check the engine coolant temperature sensor system.
- * See Chapter 2 *P342* for details on the diagnosis method and procedure.

■ Ambient air temperature sensor

P0113: Ambient air temperature sensor error (voltage high)

P code	P0113	Name	Ambient air temperature sensor error (voltage high)
SPN/FMI	172/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is above 4.85 V.	Connector Wire-harness Ambient air temperature sensor ECU

● Actions when an error occurs

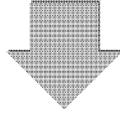
Fault mode	[Limited operation]: The fuel temperature is set to 25 °C as the default value. The engine operation is limited.
Limited operation	Ash amount reset is prohibited.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

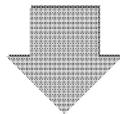
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or power short circuit of the sensor GND wire
 - Disconnection or power short circuit of the sensor signal wire
3. Ambient air temperature sensor failure
 - Sensor output failure caused by a disconnection of the ambient air temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 <i>P351</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the ambient air temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the ambient air temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the ambient air temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the ambient air temperature sensor. <p>* See Chapter 2 page <i>P351</i> for details on the diagnosis method and procedure.</p>
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P0112: Ambient air temperature sensor error (voltage low)

P code	P0112	Name	Ambient air temperature sensor error (voltage low)
SPN/FMI	172/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is 0.15 V or below.	Connector Wire-harness Ambient air temperature sensor ECU

● Actions when an error occurs

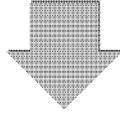
Fault mode	[Limited operation]: The fuel temperature is set to 25 °C as the default value. The engine operation is limited.
Limited operation	Ash amount reset is prohibited.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

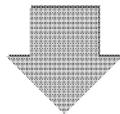
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. Ambient air temperature sensor failure
 - Sensor output failure caused by a GND short circuit of the ambient air temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P351 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the ambient air temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the ambient air temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the ambient air temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the ambient air temperature sensor. <p>* See Chapter 2 P351 for details on the diagnosis method and procedure.</p>
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■ Fuel temperature sensor

P0183: Fuel temperature sensor error (voltage high)

P code	P0183	Name	Fuel temperature sensor error (voltage high)
SPN/FMI	174/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is above 4.8 V.	Connector Wire-harness Fuel temperature sensor ECU

● Actions when an error occurs

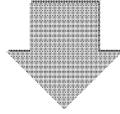
Fault mode	[Limited operation]: The fuel temperature is set to 40 °C as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • Ash amount reset is prohibited. • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

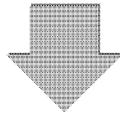
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or power short circuit of the sensor GND wire
 - Disconnection or power short circuit of the sensor signal wire
3. Fuel temperature sensor failure
 - Sensor output failure caused by a disconnection of the fuel temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P355 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the fuel temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the fuel temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the fuel temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the fuel temperature sensor. <p>* See Chapter 2 P355 for details on the diagnosis method and procedure.</p>
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P0182: Fuel temperature sensor error (voltage low)

P code	P0182	Name	Fuel temperature sensor error (voltage low)
SPN/FMI	174/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is 0.2 V or below.	Connector Wire-harness Fuel temperature sensor ECU

● Actions when an error occurs

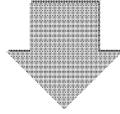
Fault mode	[Limited operation]: The fuel temperature is set to 40 °C as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • Ash amount reset is prohibited. • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

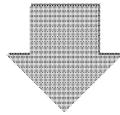
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. Fuel temperature sensor failure
 - Sensor output failure caused by a GND short circuit of the fuel temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P355 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the fuel temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the fuel temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the fuel temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the fuel temperature sensor. <p>* See Chapter 2 P355 for details on the diagnosis method and procedure.</p>
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P0168: Fuel temperature high

P code	P0168	Name	Fuel temperature high
SPN/FMI	174/0		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The engine start is complete and the fuel temperature is continuously 90 °C or more for a given length of time.	Fuel temperature sensor system Fuel tank Fuel cooler

● **Actions when an error occurs**

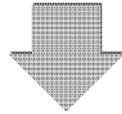
	Settings of the actions during a "fuel temperature high" alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The high idle speed or the engine output maximum injection quantity is limited. (Action differs depending on each customer's settings.)
Reset criteria	<ul style="list-style-type: none"> When the ECU power off is detected, the fault mode is released. Or automatic recovery is made when the fuel temperature alarm temperature 80 °C or below. 	<ul style="list-style-type: none"> When the ECU power off is detected, the fault mode is released. Or automatic recovery is made when the fuel temperature alarm temperature 80 °C or below continues for a given period of time.
Remarks		

● **Presumed cause of the failure or the error condition**

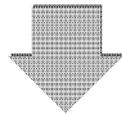
1. Insufficient fuel in the fuel tank
2. Cooling not possible due to a clogged fuel cooler
3. Fuel temperature sensor system failure

● Diagnosis**1. Initial diagnosis using SA-D**

- Check the fault indication.
- * See Chapter 2 *P355* for details on the diagnosis method and procedure.

**2. Engine check**

- Turn off the ECU power and stop the engine.
- Check the engine fuel system.
- After a few moments, turn on the ECU power and make sure that the DTC is detected.

**3. Failure diagnosis**

- Check the fuel temperature sensor system.
- * See Chapter 2 *P355* for details on the diagnosis method and procedure.

■ Rail pressure sensor

P0193: Rail pressure sensor error (voltage high)

P code	P0193	Name	Rail pressure sensor error (voltage high)
SPN/FMI	157/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is above 4.75 V.	Connector Wire-harness Rail pressure sensor ECU

● Actions when an error occurs

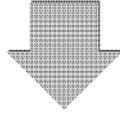
Fault mode	[Limited operation]: The rail pressure is set to 160 MPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • The rail pressure back-up control functions. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

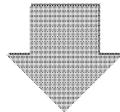
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Rail pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P359 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the key switch.• Check the pin of the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.• Make sure that the rail pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the ECU output voltage.• Check the rail pressure sensor output voltage. <p>* See Chapter 2 P359 for details on the diagnosis method and procedure.</p>
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P0192: Rail pressure sensor error (voltage low)

P code	P0192	Name	Rail pressure sensor error (voltage low)
SPN/FMI	157/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is 0.24 V or below.	Connector Wire-harness Rail pressure sensor ECU

● Actions when an error occurs

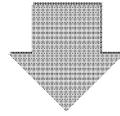
Fault mode	[Limited operation]: The rail pressure is set to 160 MPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • The rail pressure back-up control functions. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

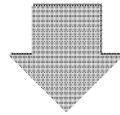
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Rail pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P359 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.• Make sure that the rail pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the ECU output voltage.• Check the rail pressure sensor output voltage. <p>* See Chapter 2 P359 for details on the diagnosis method and procedure.</p>
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■ DPF differential pressure sensor

P2455: DPF differential pressure sensor error (excessive sensor output)

P code	P2455	Name	DPF differential pressure sensor error (excessive sensor output)
SPN/FMI	3251/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness DPF differential pressure sensor ECU

● Actions when an error occurs

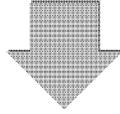
Fault mode	[Limited operation]: DPF differential pressure is set to 0 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

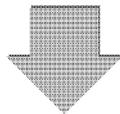
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF differential pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF differential pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF differential pressure sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF differential pressure sensor. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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P2454: DPF differential pressure sensor error (insufficient sensor output)

P code	P2454	Name	DPF differential pressure sensor error (insufficient sensor output)
SPN/FMI	3251/4		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness DPF differential pressure sensor ECU

● **Actions when an error occurs**

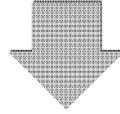
Fault mode	[Limited operation]: DPF differential pressure is set to 0 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● **Presumed cause of the failure or the error condition**

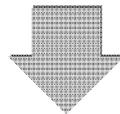
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF differential pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF differential pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF differential pressure sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF differential pressure sensor. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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P2452: DPF differential pressure sensor abnormal rise in differential pressure

P code	P2452	Name	DPF differential pressure sensor abnormal rise in differential pressure
SPN/FMI	3251/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. After the completion of startup. 2. DPF differential pressure is 50 kPa or more for a given period of time (15 s) after the completion of the engine start.	

● Actions when an error occurs

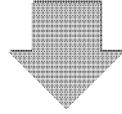
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

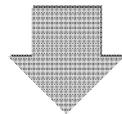
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF differential pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the key switch.• Check the pin of the DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF differential pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the output voltage of the DPF differential pressure sensor. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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P2453: DPF differential pressure sensor error (abnormal learning value)

P code	P2453	Name	DPF differential pressure sensor error (abnormal learning value)
SPN/FMI	3251/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied <ul style="list-style-type: none"> • Before engine starting is complete • DPF differential pressure sensor voltage is normal * The above prerequisites are for calculating the DPF differential pressure offset value 2. Final offset value of DPF differential pressure is lower than -38 kPa, or higher than 50 kPa	

● Actions when an error occurs

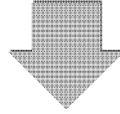
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

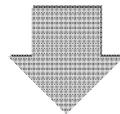
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. EGR pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF differential pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the output voltage of the DPF differential pressure sensor. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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■ DPF substrate/DPF differential pressure sensor

P226D: DPF substrate/DPF differential pressure sensor error

(DPF substrate removal/DPF differential pressure sensor detected value error)

P code	P226D	Name	DPF substrate/DPF differential pressure sensor error (DPF substrate removal/DPF differential pressure sensor detected value error)
SPN/FMI	4795/31		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied <ul style="list-style-type: none"> • During engine operation • Not during DPF regeneration • No abnormalities in related sensors • Battery voltage is within the prescribed range • Exhaust gas volumetric flow rate (calculated value) is at the prescribed m³/h value 2. After the prerequisites are satisfied for 30 continual seconds, and the current DPF differential pressure is 0.3 kPa	Connector Wire-harness DPF differential pressure sensor ECU

● Actions when an error occurs

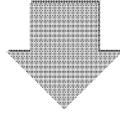
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	After the prerequisites are satisfied for 30 continual seconds, and detection conditions are not established, reset occurs.
Remarks	

● Presumed cause of the failure or the error condition

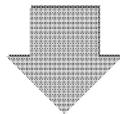
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Short circuit of the sensor signal wire and sensor 5 V
 - Power short circuit of the sensor signal wire
 - Disconnection of the sensor GND wire
 - Disconnection of sensor signal wire
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the key switch.• Check the pin of the DPF substrate/DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF substrate/DPF differential pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the DPF substrate/DPF differential pressure sensor resistance value.• Check the conduction of the wire-harness.• Check the DPF substrate/DPF differential pressure sensor output voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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■ DPF high pressure side pressure sensor

P1455: DPF high pressure side pressure sensor error (excessive sensor output)

P code	P1455	Name	DPF high pressure side pressure sensor error (excessive sensor output)
SPN/FMI	3609/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness DPF high pressure side pressure sensor ECU

● Actions when an error occurs

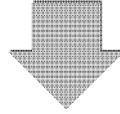
Fault mode	[Limited operation]: DPF high pressure side pressure is set to 900 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

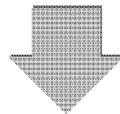
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF high pressure side pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF high pressure side pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF high pressure side pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF high pressure side pressure sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF high pressure side pressure sensor. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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P1454: DPF high pressure side pressure sensor error (insufficient sensor output)

P code	P1454	Name	DPF high pressure side pressure sensor error (insufficient sensor output)
SPN/FMI	3609/4		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness DPF high pressure side pressure sensor ECU

● **Actions when an error occurs**

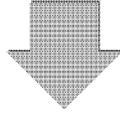
Fault mode	[Limited operation]: DPF high pressure side pressure is set to 900 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● **Presumed cause of the failure or the error condition**

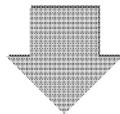
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF high pressure side pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF high pressure side pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF high pressure side pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF high pressure side pressure sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF high pressure side pressure sensor. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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P167C: DPF high pressure side pressure sensor error (detected value error)

P code	P167C	Name	DPF high pressure side pressure sensor error (detected value error)
SPN/FMI	3609/10		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied <ul style="list-style-type: none"> • No abnormalities in related sensors • Battery voltage is within the prescribed range • During engine operation • Not during DPF regeneration • Current injection amount is equal to or more than the predetermined value determine by the engine rpm • Not during forced operation by service tool • Atmospheric pressure is 82.3 kPa or more 2. After the prerequisite conditions have been established for 10 continual seconds, the difference between the pressure on the DPF high pressure side (after learning) and the atmospheric pressure shall be 0.3 kPa or less	Connector Wire-harness DPF high pressure side pressure sensor ECU

● Actions when an error occurs

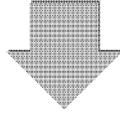
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	The prerequisites are satisfied for 10 continual seconds, and detection conditions are not established, reset occurs.
Remarks	

● Presumed cause of the failure or the error condition

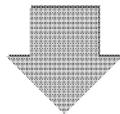
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF high pressure side pressure sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF high pressure side pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF high pressure side pressure sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF high pressure side pressure sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF high pressure side pressure sensor. <p>* See Chapter 2 P362 for details on the diagnosis method and procedure.</p>
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■ DPF inlet temperature sensor

P1428: DPF inlet temperature sensor error (excessive sensor output)

P code	P1428	Name	DPF inlet temperature sensor error (excessive sensor output)
SPN/FMI	3242/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness DPF inlet temperature sensor ECU

● Actions when an error occurs

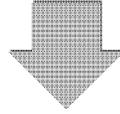
Fault mode	[Limited operation]: Set the DPF inlet temperature to 350 °C as default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

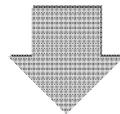
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or power short circuit of the sensor GND wire
 - Disconnection or power short circuit of the sensor signal wire
3. DPF inlet temperature sensor failure
 - Sensor output failure caused by an disconnection of the DPF inlet temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P365 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF inlet temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF inlet temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF inlet temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF inlet temperature sensor. <p>* See Chapter 2 P365 for details on the diagnosis method and procedure.</p>
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P1427: DPF inlet temperature sensor error (insufficient sensor output)

P code	P1427	Name	DPF inlet temperature sensor error (insufficient sensor output)
SPN/FMI	3242/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness DPF inlet temperature sensor ECU

● Actions when an error occurs

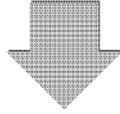
Fault mode	[Limited operation]: Set the DPF inlet temperature to 350 °C as default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

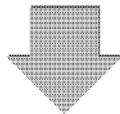
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. DPF inlet temperature sensor failure
 - Sensor output failure caused by a GND short circuit of the DPF inlet temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P365 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, turn off the ECU power.• Check the pin of the DPF inlet temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF inlet temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF inlet temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF inlet temperature sensor. <p>* See Chapter 2 P365 for details on the diagnosis method and procedure.</p>
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P167E: DPF inlet temperature sensor error (detected value error)

P code	P167E	Name	DPF inlet temperature sensor error (detected value error)
SPN/FMI	3242/10		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
<p>1. The following prerequisites should be satisfied</p> <ul style="list-style-type: none"> • No abnormalities in related sensors • Battery voltage is within the prescribed range • Not during forced operation by service tool • The last driving cycle has completely warmed up • The cooling water temperature is 40 °C or less immediately after turning the key ON • The DPF intermediate temperature is 47.3 °C or less immediately after turning the key ON • The difference between the coolant temperature and the intake air temperature immediately after turning the key ON is within 2.5 °C • The difference between the DPF intermediate temperature and the intake air temperature immediately after turning the key ON is within ± 12.8 °C • The current DPF intermediate temperature is equal to or more than, for 1 second, the DPF intermediate temperature immediately after the key is turned ON. • Not during DPF regeneration • Atmospheric pressure is 82.3 kPa or more * Completely warmed up: water temperature is 60 °C or more, and 600 seconds have elapsed since start up <p>2. After the prerequisite conditions have been established for 10 continual seconds, the following shall be satisfied</p> <ul style="list-style-type: none"> • (current DPF inlet temperature) - (DPF inlet temperature immediately after key is turned ON) ≤ 100 °C 	<p>Connector Wire-harness DPF inlet temperature sensor ECU</p>

● Actions when an error occurs

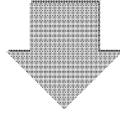
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	After the prerequisites are satisfied, and detection conditions are not established, reset occurs.
Remarks	

● Presumed cause of the failure or the error condition

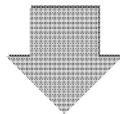
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. DPF inlet temperature sensor failure
 - Sensor output failure caused by a GND Short circuit of the DPF inlet temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P365 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the key switch.• Check the pin of the DPF inlet temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF inlet temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF inlet temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF inlet temperature sensor. <p>* See Chapter 2 P365 for details on the diagnosis method and procedure.</p>
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P1436: DPF inlet temperature sensor abnormal temperature (abnormally high)

P code	P1436	Name	DPF inlet temperature sensor abnormal temperature (abnormally high)
SPN/FMI	3242/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. DPF inlet temperature sensor normal 2. The DPF inlet temperature is 700 °C or more for a given period of time (15 s).	Connector Wire-harness DPF inlet temperature sensor ECU Injector Exhaust piping

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF inlet temperature sensor system failure
4. ECU internal circuit failure
5. Blow-by of combustion gas
 - Piping damage in the passage to DOC
6. Injector failure
 - Decrease in injection quantity
 - Injection timing error

■ DPF intermediate temperature sensor

P1434: DPF intermediate temperature sensor error (excessive sensor output)

P code	P1434	Name	DPF intermediate temperature sensor error (excessive sensor output)
SPN/FMI	3250/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness DPF intermediate temperature sensor ECU

● Actions when an error occurs

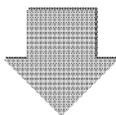
Fault mode	[Limited operation]: Set the DPF intermediate temperature to 350 °C as default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

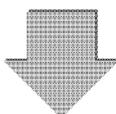
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or power short circuit of the sensor GND wire
 - Disconnection or power short circuit of the sensor signal wire
3. DPF intermediate temperature sensor failure
 - Sensor output failure caused by an disconnection of the DPF intermediate temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P369 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF intermediate temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF intermediate temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF intermediate temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF intermediate temperature sensor. <p>* See Chapter 2 P369 for details on the diagnosis method and procedure.</p>
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P1435: DPF intermediate temperature sensor error (insufficient sensor output)

P code	P1435	Name	DPF intermediate temperature sensor error (insufficient sensor output)
SPN/FMI	3250/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness DPF intermediate temperature sensor ECU

● Actions when an error occurs

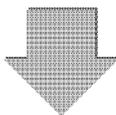
Fault mode	[Limited operation]: Set the DPF intermediate temperature to 350 °C as default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

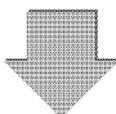
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. DPF intermediate temperature sensor failure
 - Sensor output failure caused by a GND short circuit of the DPF intermediate temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P369 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF intermediate temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF intermediate temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF intermediate temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF intermediate temperature sensor. <p>* See Chapter 2 P369 for details on the diagnosis method and procedure.</p>
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P167A: DPF intermediate temperature sensor error (detected value error)

P code	P167A	Name	DPF intermediate temperature sensor error (detected value error)
SPN/FMI	3250/10		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
<p>1. The following prerequisites should be satisfied</p> <ul style="list-style-type: none"> • No abnormalities in related sensors • Battery voltage is within the prescribed range • Not during forced operation by service tool • The last driving cycle has completely warmed up • The cooling water temperature is 40 °C or less immediately after turning the key ON • The DPF inlet temperature is 41.2 °C or less immediately after turning the key ON • The difference between the coolant temperature and the intake air temperature immediately after turning the key ON is within 2.5 °C • The difference between the DPF inlet temperature and the intake air temperature immediately after turning the key ON is within ±6.6 °C • The current DPF inlet temperature is equal to or more than, for 60 seconds, the DPF inlet temperature immediately after the key is turned ON. • Not during DPF regeneration • Atmospheric pressure is 82.3 kPa or more * Completely warmed up: water temperature is 60 °C or more, and 600 seconds have elapsed since start up <p>2. After the prerequisite conditions have been established for 10 continual seconds, the following shall be satisfied</p> <ul style="list-style-type: none"> • (current DPF inlet temperature) - (DPF inlet temperature immediately after key is turned ON) ≤ 100 °C 	<p>Connector Wire-harness DPF intermediate temperature sensor ECU</p>

● Actions when an error occurs

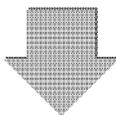
Fault mode	[Continuous operation]. The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	After the prerequisites are satisfied, and detection conditions are not established, reset occurs.
Remarks	

● Presumed cause of the failure or the error condition

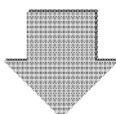
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the sensor signal wire
3. DPF intermediate temperature sensor failure
 - Sensor output failure caused by a GND Short circuit of the DPF intermediate temperature sensor internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Check the sensor voltage. <p>* See Chapter 2 P369 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the DPF intermediate temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the DPF intermediate temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the resistance value of the DPF intermediate temperature sensor.• Check the conduction of the wire-harness.• Check the output voltage of the DPF intermediate temperature sensor. <p>* See Chapter 2 P369 for details on the diagnosis method and procedure.</p>
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P0420: DPF intermediate temperature sensor abnormal temperature (abnormally low)

P code	P0420	Name	DPF intermediate temperature sensor abnormal temperature (abnormally low)
SPN/FMI	3250/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Any of the following conditions is kept for a given length of time (1200 seconds). <ul style="list-style-type: none"> • DPF intermediate temperature becomes 300 °C or lower during the stationary regeneration. • DPF intermediate temperature becomes 250 °C or lower during the recovery regeneration. 	Connector Wire-harness DPF intermediate temperature sensor system ECU Injector DOC Piping

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF intermediate temperature sensor system failure
4. ECU internal circuit failure
5. DOC deterioration due to the external factor such as sulfur poisoning
 - Increase in activated temperature
6. Blow-by of combustion gas
 - Catalytic damage
 - Piping damage in the passage to DOC
7. Injector failure
 - Decrease in injection quantity
 - Injection timing error

■ Atmospheric pressure sensor

P2229: Atmospheric pressure sensor error (excessive sensor output)

P code	P2229	Name	Atmospheric pressure sensor error (excessive sensor output)
SPN/FMI	108/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Atmospheric pressure sensor ECU

● Actions when an error occurs

Fault mode	[Limited operation]: Atmospheric pressure is set to 900 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal atmospheric pressure sensor failure
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. <p>* See Chapter 2 P461 for details on the diagnosis method and procedure.</p>
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P2228: Atmospheric pressure sensor error (insufficient sensor output)

P code	P2228	Name	Atmospheric pressure sensor error (insufficient sensor output)
SPN/FMI	108/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Atmospheric pressure sensor ECU

● Actions when an error occurs

Fault mode	[Limited operation]: Atmospheric pressure is set to 900 hPa as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal atmospheric pressure sensor failure
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. <p>* See Chapter 2 P461 for details on the diagnosis method and procedure.</p>
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P1231: Atmospheric pressure sensor error (characteristic error)

P code	P1231	Name	Atmospheric pressure sensor error (characteristic error)
SPN/FMI	108/10		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The intake manifold pressure final offset quantity 5 kPa or more and the exhaust manifold pressure final offset quantity 5 kPa or more continue for 600 ms. * Intake pressure = EGR low pressure side, Exhaust pressure = EGR high pressure side	Atmospheric pressure sensor ECU

● **Actions when an error occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

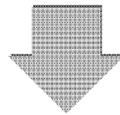
● Presumed cause of the failure or the error condition

1. ECU internal atmospheric pressure sensor failure
2. ECU internal circuit failure
3. * Simultaneous characteristic malfunction of EGR high pressure side pressure sensor and low pressure side sensor
4. Blockage or icing caused by foreign matters in the sensor parts

* This error can be detected by the simultaneous characteristic malfunction of EGR high pressure side pressure sensor and low pressure side sensor. However, the possibility of the occurrence of the characteristic malfunction at the same time is low. So, if the error is not released after replacing the ECU, perform failure diagnosis on EGR high pressure side pressure sensor and EGR low pressure side pressure sensor, respectively.

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. <p>* See Chapter 2 P461 for details on the diagnosis method and procedure.</p>
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2. Diagnosis for EGR high pressure side pressure sensor and low pressure side pressure sensor	<ul style="list-style-type: none"> • Check the sensor resistance value. • Check the conduction of the wire-harness. • Check the sensor output voltage. <p>* See Chapter 2 P461 for details on the diagnosis method and procedure.</p>
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■ EGR gas temperature sensor

P041D: EGR gas temperature sensor error (excessive sensor output)

P code	P041D	Name	EGR gas temperature sensor error (excessive sensor output)
SPN/FMI	412/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness EGR gas temperature sensor ECU

● Actions when an error occurs

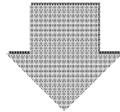
Fault mode	[Limited operation]: Set the EGR gas temperature to 30 °C as default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ol style="list-style-type: none"> a. Warning <ul style="list-style-type: none"> When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) <ul style="list-style-type: none"> When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) <ul style="list-style-type: none"> When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

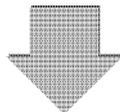
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. EGR gas temperature sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P373 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR gas temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the EGR gas temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the EGR gas temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the EGR gas temperature sensor. <p>* See Chapter 2 P373 for details on the diagnosis method and procedure.</p>
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P041C: EGR gas temperature sensor error (insufficient sensor output)

P code	P041C	Name	EGR gas temperature sensor error (insufficient sensor output)
SPN/FMI	412/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.07 V threshold	Connector Wire-harness EGR gas temperature sensor ECU

● Actions when an error occurs

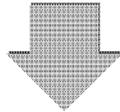
Fault mode	[Limited operation]: Set the EGR gas temperature to 30 °C as default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ol style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

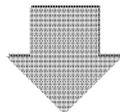
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. EGR gas temperature sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P373 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the EGR gas temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the EGR gas temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the EGR gas temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the EGR gas temperature sensor. <p>* See Chapter 2 P373 for details on the diagnosis method and procedure.</p>
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P1675: EGR gas temperature sensor error (detected value error)

P code	P1675	Name	EGR gas temperature sensor error (detected value error)
SPN/FMI	412/10		

● Purpose of DTC detection

Compare the EGR gas temperature when the engine stops and while the engine is running. If the temperature difference is small, this error is detected. This detects errors such as the EGR gas temperature sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
<p>1. The following prerequisites should be satisfied</p> <ul style="list-style-type: none"> • No abnormalities in related sensors • Battery voltage is within the prescribed range • The last driving cycle has completely warmed up • Not during DPF regeneration • The water temperature is 40 °C or less immediately after turning the key ON • The exhaust manifold temperature is 41.2 °C or less immediately after turning the key ON • The difference between the exhaust manifold temperature and the intake air temperature immediately after turning the key ON is within ± 6.6 °C • Atmospheric pressure is 82.3 kPa or more • The specified period of time has elapsed after the EGR valve opens. • With the above conditions established, the following shall be satisfied for a prescribed period of time <ul style="list-style-type: none"> • Exhaust manifold temperature equal to or more than the prescribed value • EGR valve opening equal to or more than the prescribed value • Current injection amount is equal to or more than the predetermined value determine by the engine rpm <p>* Completely warmed up: water temperature is 60 °C or more, and 600 seconds have elapsed since start up</p> <p>2. After the prerequisite conditions have been established, the following shall be satisfied</p> <ul style="list-style-type: none"> • (current EGR gas temperature) - (EGR gas temperature immediately after key is turned ON) ≤ 40 °C 	<p>Connector Wire-harness EGR gas temperature sensor ECU</p>

● Actions when an error occurs

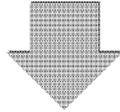
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When a sensor abnormality occurs, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. <ol style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. At this time, the engine torque is limited to 75 % (the engine speed is limited to low idle speed in some errors while the maximum fuel injection quantity is limited to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is limited to 60 % of its rated speed (in some engine models), and the torque is limited to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	After the reset conditions (prerequisites satisfied, detection conditions not satisfied?, the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

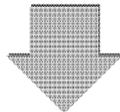
1. Installation failure of EGR gas temperature sensor
2. Poor connection of connector
3. Wiring failure of the wire-harness
4. EGR gas temperature sensor failure
5. ECU internal circuit failure

● Diagnosis

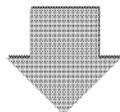
1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. <p>* See Chapter 2 P377 for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the key switch, and turn off the ECU power. • Check the installation condition of EGR gas temperature sensor. • Check the EGR pipe and EGR cooler for damage or failure.
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3. Connector/wiring check	<ul style="list-style-type: none"> • Check the pin of the EGR gas temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the EGR gas temperature sensor wiring is not disconnected or the wiring coating is not peeled.
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4. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the EGR gas temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the EGR gas temperature sensor. <p>* See Chapter 2 P377 for details on the diagnosis method and procedure.</p>
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■ Intake manifold temperature sensor

P040D: Intake manifold temperature sensor error (excessive sensor output)

P code	P040D	Name	Intake manifold temperature sensor error (excessive sensor output)
SPN/FMI	105/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness Intake manifold temperature sensor ECU

● Actions when an error occurs

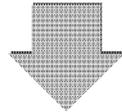
Fault mode	[Limited operation]: Intake air temperature is set to 100 °C (200 °C in the case with turbo) as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning <ul style="list-style-type: none"> When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) <ul style="list-style-type: none"> When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) <ul style="list-style-type: none"> When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

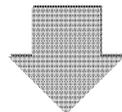
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Intake manifold temperature sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P382 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the intake manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake manifold temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the intake manifold temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the intake manifold temperature sensor. <p>* See Chapter 2 P382 for details on the diagnosis method and procedure.</p>
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P040C: Intake manifold temperature sensor error (insufficient sensor output)

P code	P040C	Name	Intake manifold temperature sensor error (insufficient sensor output)
SPN/FMI	105/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness Intake manifold temperature sensor ECU

● Actions when an error occurs

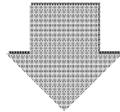
Fault mode	[Limited operation]: Intake air temperature is set to 100 °C (200 °C in the case with turbo) as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

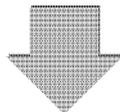
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Intake manifold temperature sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P382 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the intake manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake manifold temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the intake manifold temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the intake manifold temperature sensor. <p>* See Chapter 2 P382 for details on the diagnosis method and procedure.</p>
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P1676: Intake manifold temperature sensor error (detected value error)

P code	P1676	Name	Intake manifold temperature sensor error (detected value error)
SPN/FMI	105/10		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
<p>1. The following prerequisites should be satisfied</p> <ul style="list-style-type: none"> • No abnormalities in related sensors • Battery voltage is within the prescribed range • The last driving cycle has completely warmed up • The difference between the water temperature and the intake air temperature immediately after turning the key ON is within 2.5 °C * Completely warmed up: water temperature is 60 °C or more, and 600 seconds have elapsed since start up <p>2. The difference between the intake manifold temperature and the intake air temperature immediately after turning the key ON is ± 30 °C or more</p>	Connector Wire-harness Intake manifold temperature sensor ECU

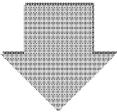
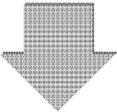
● **Actions when an error occurs**

Fault mode	[Limited operation]: Intake air temperature is set to 100 °C (200 °C in the case with turbo) as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When a sensor abnormality occurs, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. <ol style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. At this time, the engine torque is limited to 75 % (the engine speed is limited to low idle speed in some errors while the maximum fuel injection quantity is limited to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is limited to 60 % of its rated speed (in some engine models), and the torque is limited to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	After the reset conditions (prerequisites satisfied, detection conditions not satisfied), the fault mode is automatically released.
Remarks	

● **Presumed cause of the failure or the error condition**

1. Installation failure of intake manifold temperature sensor
2. Poor connection of connector
3. Wiring failure of the wire-harness
4. Intake manifold temperature sensor failure
5. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P386</i> for details on the diagnosis method and procedure.</p>
	
2. Engine check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the key switch, and turn off the ECU power.• Check the installation condition of intake manifold temperature sensor.
	
3. Connector/wiring check	<ul style="list-style-type: none">• Check the pin of the intake manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the intake manifold temperature sensor wiring is not disconnected or the wiring coating is not peeled.
	
4. Failure diagnosis	<ul style="list-style-type: none">• Check the intake manifold temperature sensor resistance value.• Check the conduction of the wire-harness.• Check the intake manifold temperature sensor output voltage. <p>* See Chapter 2 <i>P386</i> for details on the diagnosis method and procedure.</p>

■ Exhaust manifold temperature sensor

P0546: Exhaust manifold temperature sensor error (excessive sensor output)

P code	P0546	Name	Exhaust manifold temperature sensor error (excessive sensor output)
SPN/FMI	173/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is higher than the 4.8 V threshold	Connector Wire-harness Exhaust manifold temperature sensor ECU

● Actions when an error occurs

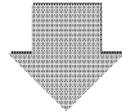
Fault mode	[Limited operation]: The exhaust temperature is set to 550 °C as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning <ul style="list-style-type: none"> When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) <ul style="list-style-type: none"> When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) <ul style="list-style-type: none"> When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) (*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.
Reset criteria	Reset criteria: (sensor output is lower than the 4.8 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

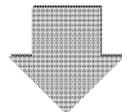
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Exhaust manifold temperature sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P391 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the exhaust manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust manifold temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the exhaust manifold temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the exhaust manifold temperature sensor. <p>* See Chapter 2 P391 for details on the diagnosis method and procedure.</p>
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P0545: Exhaust manifold temperature sensor error (insufficient sensor output)

P code	P0545	Name	Exhaust manifold temperature sensor error (insufficient sensor output)
SPN/FMI	173/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during engine cranking 2. Sensor output is lower than the 0.2 V threshold	Connector Wire-harness Exhaust manifold temperature sensor ECU

● Actions when an error occurs

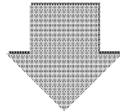
Fault mode	[Limited operation]: The exhaust temperature is set to 550 °C as the default value. The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Ash amount reset is prohibited. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	Reset criteria: (sensor output is lower than the 0.2 V threshold) the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

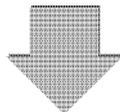
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Exhaust manifold temperature sensor failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the sensor voltage. <p>* See Chapter 2 P391 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the exhaust manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust manifold temperature sensor wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the exhaust manifold temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the exhaust manifold temperature sensor. <p>* See Chapter 2 P391 for details on the diagnosis method and procedure.</p>
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P1677: Exhaust manifold temperature sensor error (detected value error)

P code	P1677	Name	Exhaust manifold temperature sensor error (detected value error)
SPN/FMI	173/10		

● Purpose of DTC detection

Compare the exhaust manifold temperature when the engine stops and while the engine is running. If the temperature difference is small, this error is detected. This detects errors such as the exhaust manifold temperature sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
<p>1. The following prerequisites should be satisfied</p> <ul style="list-style-type: none"> • No abnormalities in related sensors • Battery voltage is within the prescribed range • Not during forced operation by service tool • The last driving cycle has completely warmed up • The water temperature is 40 °C or less immediately after turning the key ON • The DPF inlet temperature is 41.2 °C or less immediately after turning the key ON • The difference between the DPF inlet temperature and the intake air temperature immediately after turning the key ON is within ± 6.6 °C • The current DPF inlet temperature is equal to or more than, continuously for 1 second, the DPF inlet temperature immediately after the key is turned ON. • Not during DPF regeneration • Atmospheric pressure is 82.3 kPa or more <p>* Completely warmed up: water temperature is 60 °C or more, and 600 seconds have elapsed since start up</p> <p>2. After the prerequisite conditions have been established, the following shall be satisfied</p> <ul style="list-style-type: none"> • (current exhaust manifold temperature) - (exhaust manifold temperature immediately after key is turned ON) ≤ 100 °C 	<p>Connector</p> <p>Wire-harness</p> <p>Exhaust manifold temperature sensor</p> <p>ECU</p>

● Actions when an error occurs

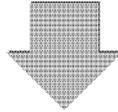
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When a sensor abnormality occurs, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. At this time, the engine torque is limited to 75 % (the engine speed is limited to low idle speed in some errors while the maximum fuel injection quantity is limited to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is limited to 60 % of its rated speed (in some engine models), and the torque is limited to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	After the reset conditions (prerequisites satisfied, detection conditions not satisfied), the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

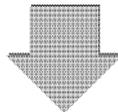
1. Installation failure of exhaust manifold temperature sensor
2. Poor connection of connector
3. Wiring failure of the wire-harness
4. Exhaust manifold temperature sensor failure
5. ECU internal circuit failure

● Diagnosis

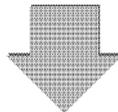
1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. <p>* See Chapter 2 P395 for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the key switch, and turn off the ECU power. • Check the installation condition of exhaust manifold temperature sensor. • Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.
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3. Connector/wiring check	<ul style="list-style-type: none"> • Check the pin of the exhaust manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust manifold temperature sensor wiring is not disconnected or the wiring coating is not peeled.
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4. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the exhaust manifold temperature sensor. • Check the conduction of the wire-harness. • Check the exhaust manifold temperature sensor output voltage. <p>* See Chapter 2 P395 for details on the diagnosis method and procedure.</p>
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Contact output related

■ Main relay

P068B: Main relay contact sticking

P code	P068B	Name	Main relay contact sticking
SPN/FMI	1485/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. A judgment is made when the ECU is shut off. 2. The main relay does not open after the elapse of 150 ms at the time of shutting off the ECU.	Connector Wire-harness Main relay ECU

● Actions when an error occurs

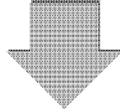
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

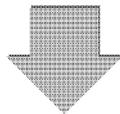
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of main relay coil side downstream wire
3. Main relay contact failure
 - Main relay contact sticking
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Make sure that you can log in to the SMARTASSIST-DIRECT (SA-D) after turning off the power switch and the elapse of a given period of time. <p>* See Chapter 2 <i>P400</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the main relay connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the main relay wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the main relay contact.• Check the main relay resistance value.• Check the conduction of the wire-harness. <p>* See Chapter 2 <i>P400</i> for details on the diagnosis method and procedure.</p>
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P068A: Main relay early opening

P code	P068A	Name	Main relay early opening
SPN/FMI	1485/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Judgment is made when the ECU is initialized. 2. ECU power shutdown without performing the after run (EEPROM write process after turning off the key switch).	Connector Wire-harness Main relay ECU

● Actions when an error occurs

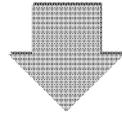
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of main relay coil side downstream wire
3. Main relay contact failure
 - Main relay contact sticking
4. ECU internal circuit failure

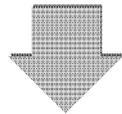
● Diagnosis

1. Initial diagnosis using
SA-D



2. Connector/wiring check

- Before beginning your work, be sure to turn off the ECU power.
- Check the pin of the main relay connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.
- Make sure that the main relay wiring is not cut or the wiring coating is not peeled.



3. Failure diagnosis

- Check the conduction of the main relay contact.
- Check the main relay resistance value.
- Check the conduction of the wire-harness.

* See Chapter 2 *P400* for details on the diagnosis method and procedure.

■ Starting aid relay

P0543: Starting aid relay disconnection

P code	P0543	Name	Starting aid relay disconnection
SPN/FMI	522243/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Current is OFF in the starting aid relay. 2. IC open circuit inside the ECU is detected.	Connector Wire-harness Starting aid relay ECU

● Actions when an error occurs

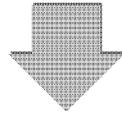
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

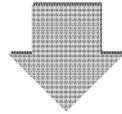
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection of starting aid relay power
 - Power short circuit of starting aid relay power
3. Starting aid relay failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P404</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the starting aid relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the starting aid Relay wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the starting aid relay resistance value.• Check the conduction of the wire-harness. <p>* See Chapter 2 <i>P404</i> for details on the diagnosis method and procedure.</p>
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P0541: Starting aid relay GND short circuit

P code	P0541	Name	Starting aid relay GND short circuit
SPN/FMI	522243/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Current is OFF in the starting aid relay. 2. IC open circuit inside the ECU is detected.	Connector Wire-harness Starting aid relay ECU

● Actions when an error occurs

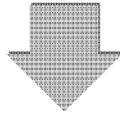
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

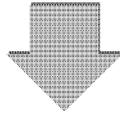
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of starting aid relay power
3. Starting aid relay failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P404</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the starting aid relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the starting aid relay wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the starting aid relay resistance value.• Check the conduction of the wire-harness. <p>* See Chapter 2 <i>P404</i> for details on the diagnosis method and procedure.</p>
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CRS (common rail system) related

■ Injector (No. 1 cylinder)

P0201: Injector (No. 1 cylinder) disconnection (injector-specific)

P code	P0201	Name	Injector (No. 1 cylinder) disconnection (injector-specific)
SPN/FMI	654/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. In the drive circuit, the detection is made as an open circuit of the high side or low side.	Connector Wire-harness ECU Injector

● Actions when an error occurs

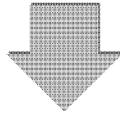
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

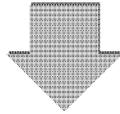
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system open circuit
3. ECU internal circuit failure
4. Disconnection of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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P0262: Injector (No. 1 cylinder) coil short circuit

P code	P0262	Name	Injector (No. 1 cylinder) coil short circuit
SPN/FMI	654/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. Short circuit on high side and low side of the injector coil is detected.	Connector Wire-harness ECU Injector

● Actions when an error occurs

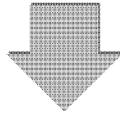
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

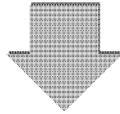
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system short circuit
3. ECU internal circuit failure
4. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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P1262: Injector (No. 1 cylinder) short circuit

P code	P1262	Name	Injector (No. 1 cylinder) short circuit
SPN/FMI	654/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. + B short circuit in the low side is detected in the drive circuit.	Connector Wire-harness ECU Injector

● Actions when an error occurs

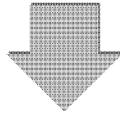
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

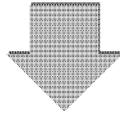
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system short circuit
3. ECU internal circuit failure
4. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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■ Injector (No. 2 cylinder)

P0202: Injector (No. 2 cylinder) disconnection (injector-specific)

P code	P0202	Name	Injector (No. 2 cylinder) disconnection (injector-specific)
SPN/FMI	653/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. In the TWV drive circuit, the detection is made as an open circuit of the high side or low side.	Connector Wire-harness ECU Injector

● Actions when an error occurs

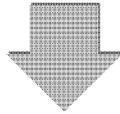
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

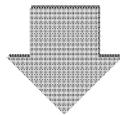
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system open circuit
3. ECU internal circuit failure
4. Disconnection of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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P0265: Injector (No. 2 cylinder) coil short circuit

P code	P0265	Name	Injector (No. 2 cylinder) coil short circuit
SPN/FMI	653/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. Short circuit on high side and low side of the injector coil is detected.	Connector Wire-harness ECU Injector

● Actions when an error occurs

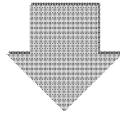
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

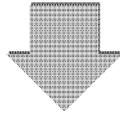
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system short circuit
3. ECU internal circuit failure
4. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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P1265: Injector (No. 2 cylinder) short circuit

P code	P1265	Name	Injector (No. 2 cylinder) short circuit
SPN/FMI	653/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. + B short circuit in the low side is detected in the drive circuit.	Connector Wire-harness ECU Injector

● Actions when an error occurs

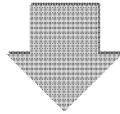
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

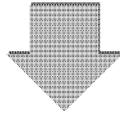
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system short circuit
3. ECU internal circuit failure
4. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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■ Injector (No. 3 cylinder)

P0203: Injector (No. 3 cylinder) disconnection (injector-specific)

P code	P0203	Name	Injector (No. 3 cylinder) disconnection (injector-specific)
SPN/FMI	652/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. In the drive circuit, the detection is made as an open circuit of the high side or low side.	Connector Wire-harness ECU Injector

● Actions when an error occurs

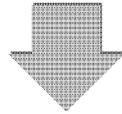
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

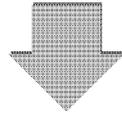
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system open circuit
3. ECU internal circuit failure
4. Disconnection of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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P0268: Injector (No. 3 cylinder) coil short circuit

P code	P0268	Name	Injector (No. 3 cylinder) coil short circuit
SPN/FMI	652/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. Short circuit on high side and low side of the injector coil is detected.	Connector Wire-harness ECU Injector

● Actions when an error occurs

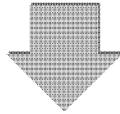
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

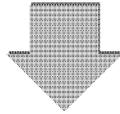
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system short circuit
3. ECU internal circuit failure
4. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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P1268: Injector (No. 3 cylinder) short circuit

P code	P1268	Name	Injector (No. 3 cylinder) short circuit
SPN/FMI	652/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. + B short circuit in the low side is detected in the drive circuit.	Connector Wire-harness ECU Injector

● Actions when an error occurs

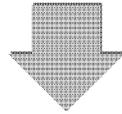
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

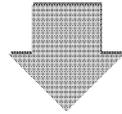
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system short circuit
3. ECU internal circuit failure
4. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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■ Injector (No. 4 cylinder)

P0204: Injector (No. 4 cylinder) disconnection (injector-specific)

P code	P0204	Name	Injector (No. 4 cylinder) disconnection (injector-specific)
SPN/FMI	651/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. In the drive circuit, the detection is made as an open circuit of the high side or low side.	Connector Wire-harness ECU Injector

● Actions when an error occurs

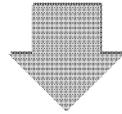
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

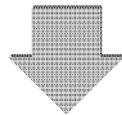
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system open circuit
3. ECU internal circuit failure
4. Disconnection of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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P0271: Injector (No. 4 cylinder) coil short circuit

P code	P0271	Name	Injector (No. 4 cylinder) coil short circuit
SPN/FMI	651/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. Short circuit on high side and low side of the injector coil is detected.	Connector Wire-harness ECU Injector

● Actions when an error occurs

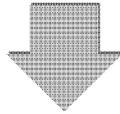
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

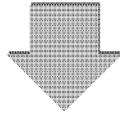
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system short circuit
3. ECU internal circuit failure
4. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P431</i> for details on the diagnosis method and procedure.</p>
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P1271: Injector (No. 4 cylinder) short circuit

P code	P1271	Name	Injector (No. 4 cylinder) short circuit
SPN/FMI	651/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. + B short circuit in the low side is detected in the drive circuit.	Connector Wire-harness ECU Injector

● Actions when an error occurs

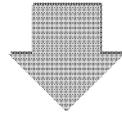
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The fuel injection of failed cylinder terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

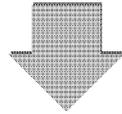
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Injector drive system short circuit
3. ECU internal circuit failure
4. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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■ All injectors

P0611: Injector drive IC error

P code	P0611	Name	Injector drive IC error
SPN/FMI	4257/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. ECU detects the drive IC fault.	

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The failed bank injection terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

P1146: Injector drive circuit (Bank 1) short circuit

P code	P1146	Name	Injector drive circuit (Bank 1) short circuit
SPN/FMI	2797/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. In the drive circuit, the detection is made as a GND short circuit of the high side or low side, or +B short circuit of the high side.	Connector Wire-harness Injector ECU

● Actions when an error occurs

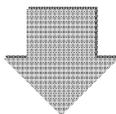
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The failed bank injection terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

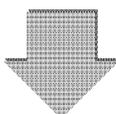
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Power short circuit of the high side of the injector Bank 1
 - GND short circuit of the high side of the injector Bank 1
 - Power short circuit of the low side of the injector Bank 1
 - GND short circuit of the low side of the injector Bank 1
3. Injector failure by power short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 <i>P436</i> for details on the diagnosis method and procedure.</p>
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P1149: Injector drive circuit (Bank 2) short circuit

P code	P1149	Name	Injector drive circuit (Bank 2) short circuit
SPN/FMI	2798/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Pulse of camshaft/crankshaft speed sensor is detected. 2. In the drive circuit, the detection is made as a GND short circuit of the high side or low side, or +B short circuit of the high side.	Connector Wire-harness Injector ECU

● Actions when an error occurs

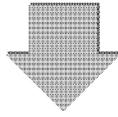
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • The failed bank injection terminates. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

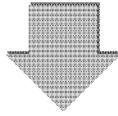
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Power short circuit of the high side of the injector Bank 2
 - GND short circuit of the high side of the injector Bank 2
 - Power short circuit of the low side of the injector Bank 2
 - GND short circuit of the low side of the injector Bank 2
3. Injector failure by power short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P436 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the injector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the injector resistance value. <p>* See Chapter 2 P436 for details on the diagnosis method and procedure.</p>
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P1648: Injector (No. 1 cylinder) correction value error

P code	P1648	Name	Injector (No. 1 cylinder) correction value error
SPN/FMI	523462/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During EEPROM initialization or value input. 2. The injector corrected value is not or mistakenly entered, and the EEPROM cannot be read.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Input failure of the injector correction value
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. Input the injector correction value again. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1649: Injector (No. 2 cylinder) correction value error

P code	P1649	Name	Injector (No. 2 cylinder) correction value error
SPN/FMI	523463/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During EEPROM initialization or value input. 2. The injector corrected value is not or mistakenly entered, and the EEPROM cannot be read.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Input failure of the injector correction value
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. Input the injector correction value again. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1650: Injector (No. 3 cylinder) correction value error

P code	P1650	Name	Injector (No. 3 cylinder) correction value error
SPN/FMI	523464/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During EEPROM initialization or value input. 2. The injector corrected value is not or mistakenly entered, and the EEPROM cannot be read.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Input failure of the injector correction value
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. Input the injector correction value again. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1651: Injector (No. 4 cylinder) correction value error

P code	P1651	Name	Injector (No. 4 cylinder) correction value error
SPN/FMI	523465/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During EEPROM initialization or value input. 2. The injector corrected value is not or mistakenly entered, and the EEPROM cannot be read.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Input failure of the injector correction value
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. Input the injector correction value again. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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■ SCV (MPROP)

P1641: SCV (MPROP) L side VB short circuit

P code	P1641	Name	SCV (MPROP) L side VB short circuit
SPN/FMI	522571/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The low side VB short circuit in the high pressure pump drive circuit continues for a given period of time (300 s).	Connector Wire-harness Injector ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Power short circuit of the SCV (MPROP) low side
3. SCV (MPROP) failure by the power short circuit
4. ECU internal circuit failure

P1643: SCV (MPROP) L side GND short circuit

P code	P1643	Name	SCV (MPROP) L side GND short circuit
SPN/FMI	522571/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. GND short circuit continues for fixed number of tests (5 times) at a fixed interval (1.0 seconds).	Connector Wire-harness SCV (MPROP) ECU

● Actions when an error occurs

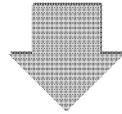
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

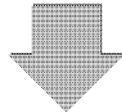
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - GND short circuit of the low side wiring of SCV (MPROP)
3. SCV (MPROP) low side GND short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P438 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) wiring is not shorted to the ground line or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the SCV (MPROP) resistance value. <p>* See Chapter 2 P438 for details on the diagnosis method and procedure.</p>
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P0629: SCV (MPROP) H side VB short circuit

P code	P0629	Name	SCV (MPROP) H side VB short circuit
SPN/FMI	633/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. VB short circuit continues for a fixed time (300 ms).	Connector Wire-harness SCV (MPROP) ECU

● Actions when an error occurs

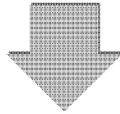
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

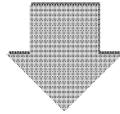
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Power short circuit of SCV (+) output
 - Power short circuit of SVC (-) output
3. SCV failure caused by a coil short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P438 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the power switch.• Check the pin of the SCV for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the SCV resistance value. <p>* See Chapter 2 P438 for details on the diagnosis method and procedure.</p>
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P1642: SCV (MPROP) H side GND short circuit

P code	P1642	Name	SCV (MPROP) H side GND short circuit
SPN/FMI	633/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. GND short circuit continues for fixed number of tests (5 times) at a fixed interval (1.0 seconds).	Connector Wire-harness SCV (MPROP) ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Power short circuit of the SCV (MPROP) high side
3. SCV (MPROP) failure by the power short circuit
4. ECU internal circuit failure

P0627: SCV (MPROP) disconnection

P code	P0627	Name	SCV (MPROP) disconnection
SPN/FMI	633/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The high pressure pump drive circuit detects the open circuit.	Connector Wire-harness SCV (MPROP) ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - SCV (MPROP) open circuit
3. SCV (MPROP) failure by the open circuit
4. ECU internal circuit failure

P062A: SCV (MPROP) drive current (high level)

P code	P062A	Name	SCV (MPROP) drive current (high level)
SPN/FMI	522572/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The drive current is greater than threshold value.	Connector Wire-harness SCV (MPROP) ECU

● Actions when an error occurs

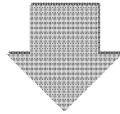
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

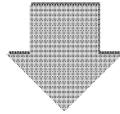
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. SCV (MPROP) failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P438 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the SCV (MPROP) resistance value. <p>* See Chapter 2 P438 for details on the diagnosis method and procedure.</p>
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P1645: SCV (MPROP) pump overload error

P code	P1645	Name	SCV (MPROP) pump overload error
SPN/FMI	522572/11		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Abnormal heating in drive circuit is detected.	Connector Wire-harness SCV (MPROP) ECU

● Actions when an error occurs

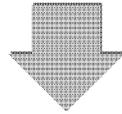
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

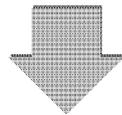
1. Poor connection of connector
2. Wiring failure of the wire-harness
3. SCV (MPROP) failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P438 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the SCV (MPROP) resistance value. <p>* See Chapter 2 P438 for details on the diagnosis method and procedure.</p>
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■ Rail pressure error

P0088: Rail pressure too high

P code	P0088	Name	Rail pressure too high
SPN/FMI	157/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. When the specified time (5 s) is continued with the rail pressure 170 MPa or more.	Fuel system Supply pump Rail pressure sensor

● Actions when an error occurs

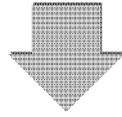
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

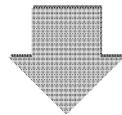
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the fuel system, common rail system, and supply pump.• If needed, exchange the parts of the fuel system or common rail system, supply pump. <p>* For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P0094: Rail pressure deviation error (low rail pressure)

P code	P0094	Name	Rail pressure deviation error (low rail pressure)
SPN/FMI	157/18		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. The actual rail pressure is smaller than the target rail pressure and the difference of 20 MPa or more is continued for a given period of time (10 seconds).	Fuel system Supply pump Rail pressure sensor

● **Actions when an error occurs**

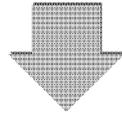
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

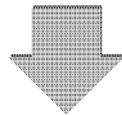
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV closed sticking
5. SCV intermittent failure
6. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the fuel system, common rail system, and supply pump.• If needed, exchange the parts of the fuel system or common rail system, supply pump. <p>* For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P0093: Rail pressure deviation error (high rail pressure)

P code	P0093	Name	Rail pressure deviation error (high rail pressure)
SPN/FMI	157/15		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. The actual rail pressure is larger than the target rail pressure and the difference of 20 MPa or more is continued for a given period of time (5 s).	Fuel system Supply pump Rail pressure sensor

● **Actions when an error occurs**

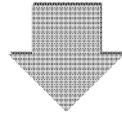
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

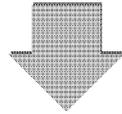
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis**1. Initial diagnosis using
SA-D**

- Check the fault indication.

**2. Connector/wiring check**

- Before beginning your work, be sure to turn off the ECU power.
- Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.
- Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.

**3. Failure diagnosis**

- Check the fuel system, common rail system, and supply pump.
 - If needed, exchange the parts of the fuel system or common rail system, supply pump.
- * For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.

■ PLV (Common rail pressure limit valve)

P000F: PLV open valve

P code	P000F	Name	PLV open valve
SPN/FMI	157/16		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Common rail pressure limit valve opens.	Fuel system Supply pump

● Actions when an error occurs

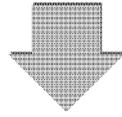
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

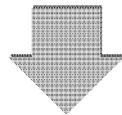
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the fuel system, common rail system, and supply pump.• If needed, exchange the parts of the fuel system or common rail system, supply pump. <p>* For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P1666: Rail pressure fault (The times of PLV valve opening error)

P code	P1666	Name	Rail pressure fault (The times of PLV valve opening error)
SPN/FMI	523469/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. The opening times of the pressure control valve of common rail exceeds 50.	Fuel system Supply pump Rail pressure sensor ECU

● Actions when an error occurs

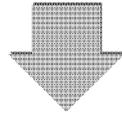
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

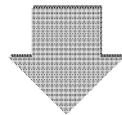
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the fuel system, common rail system, and supply pump. Exchange the PLV.• If needed, exchange the parts of the fuel system or common rail system, supply pump. <p>* For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P1667: Rail pressure fault (The time of PLV valve opening error)

P code	P1667	Name	Rail pressure fault (The time of PLV valve opening error)
SPN/FMI	523470/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. The cumulative opening time of the pressure control valve of common rail exceeds 5 hours.	Fuel system Supply pump Rail pressure sensor ECU

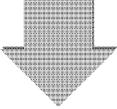
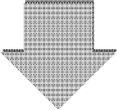
● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
	
2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.
	
3. Failure diagnosis	<ul style="list-style-type: none">• Check the fuel system, common rail system, and supply pump. Exchange the PLV.• If needed, exchange the parts of the fuel system or common rail system, supply pump. <p>* For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.</p>

P1668: Rail pressure fault (The actual rail pressure is too high during PRV limp home)

P code	P1668	Name	Rail pressure fault (The actual rail pressure is too high during PRV limp home)
SPN/FMI	523489/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. The pressure control valve of common rail fails to open when abnormally high pressure of common rail occurred (rail pressure of 160 MPa or higher continues for 10 seconds or longer).	Fuel system Supply pump Rail pressure sensor

● Actions when an error occurs

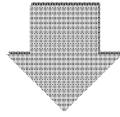
Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

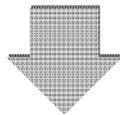
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the fuel system, common rail system, and supply pump.• If needed, exchange the parts of the fuel system or common rail system, supply pump. <p>* For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P1665: Rail pressure fault (Controlled rail pressure error after PLV valve opening)

P code	P1665	Name	Rail pressure fault (Controlled rail pressure error after PLV valve opening)
SPN/FMI	523468/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. Rail pressure deviates from the range from 50 to 120 MPa after common rail pressure control valve is opened.	Fuel system Supply pump Rail pressure sensor

● Actions when an error occurs

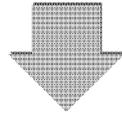
Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

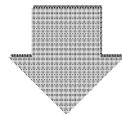
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the fuel system, common rail system, and supply pump.• If needed, exchange the parts of the fuel system or common rail system, supply pump. <p>* For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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■ Rail pressure control

P1669: Rail pressure fault (Injector B/F temperature error during PLV4 limp home)

P code	P1669	Name	Rail pressure fault (Injector B/F temperature error during PLV4 limp home)
SPN/FMI	523491/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. The fuel temperature exceeds 80 °C after common rail pressure control valve is opened.	Fuel system Supply pump Rail pressure sensor

● Actions when an error occurs

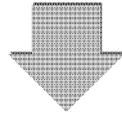
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

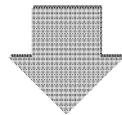
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Fuel system failure
 - Air intrusion
 - Insufficient gas

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the SCV (MPROP) and the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the SCV (MPROP) and the rail pressure sensor wiring is not cut or shorted to the power/ground line, or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the fuel system, common rail system, and supply pump.• If needed, exchange the parts of the fuel system or common rail system, supply pump. <p>* For details on the check method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P1670: Rail pressure fault (Operation time error during RPS limp home)

P code	P1670	Name	Rail pressure fault (Operation time error during RPS limp home)
SPN/FMI	523460/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Rail pressure sensor is normal. 2. Either of the following is true. <ul style="list-style-type: none"> • The rail pressure sensor and the high-pressure pump drive circuit (MPROP) are abnormal. • The rail pressure sensor and the fuel temperature sensor are abnormal. 	Connector Wire-harness SCV (MPROP) Fuel temperature sensor ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Rail pressure sensor failure or that wiring failure
2. SCV failure or that wiring failure
3. Fuel temperature sensor failure or that wiring failure

● Diagnosis

- Refer to “Rail pressure sensor error (voltage low) or (voltage high)”
- Refer to “SCV(MPROP) fault”
- Refer to “Fuel temperature sensor error (voltage low) or (voltage high)”

Actuator

■ Intake throttle drive circuit

P0660: No-load of throttle valve drive H bridge circuit

P code	P0660	Name	No-load of throttle valve drive H bridge circuit
SPN/FMI	2950/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. No-load (open circuit) of drive circuit is detected.	Connector Wire-harness Intake throttle ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - High side disconnection of the intake throttle drive circuit
 - Low side disconnection of the intake throttle drive circuit
3. Intake throttle failure due to disconnection
4. ECU internal circuit failure

P1658: Power short circuit of throttle valve drive H bridge output 1

P code	P1658	Name	Power short circuit of throttle valve drive H bridge output 1
SPN/FMI	2950/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Output terminal 1 of drive circuit is VB short circuit.	Connector Wire-harness Intake throttle ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - High side power short circuit of the intake throttle drive circuit
3. Intake throttle failure due to power short circuit
4. ECU internal circuit failure

P1659: GND short circuit of throttle valve drive H bridge output 1

P code	P1659	Name	GND short circuit of throttle valve drive H bridge output 1
SPN/FMI	2950/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Output terminal 1 of drive circuit is GND short circuit.	Connector Wire-harness Intake throttle ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - High side GND short circuit of the intake throttle drive circuit
3. Intake throttle failure due to GND short circuit
4. ECU internal circuit failure

P1660: Overload on the drive H bridge circuit of throttle valve

P code	P1660	Name	Overload on the drive H bridge circuit of throttle valve
SPN/FMI	2950/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The component temperature of the drive circuit exceeds the threshold value.	Connector Wire-harness Intake throttle ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Insulation failure of the connector
2. Wiring failure of the wire-harness
 - High side short circuit of the intake throttle drive circuit
 - Low side short circuit of the intake throttle drive circuit
3. Intake throttle failure due to short circuit
4. ECU internal circuit failure

P1661: VB Power short circuit of throttle valve drive H bridge output 2

P code	P1661	Name	VB Power short circuit of throttle valve drive H bridge output 2
SPN/FMI	2951/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Output terminal 2 of drive circuit is VB short circuit.	Connector Wire-harness Intake throttle ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Low side power short circuit of the intake throttle drive circuit
3. Intake throttle failure due to power short circuit
4. ECU internal circuit failure

P1662: GND short circuit of throttle valve drive H bridge output 2

P code	P1662	Name	GND short circuit of throttle valve drive H bridge output 2
SPN/FMI	2951/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Output terminal 2 of drive circuit is GND short circuit.	Connector Wire-harness Intake throttle ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Low side GND short circuit of the intake throttle drive circuit
3. Intake throttle failure due to GND short circuit
4. ECU internal circuit failure

P02E4: Throttle valve sticking (sticking open)

P code	P02E4	Name	Throttle valve sticking (sticking open)
SPN/FMI	2950/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When the actual degree of opening of the throttle valve is 50 % or less, if the difference between the target opening and the actual opening is ± 10 % or more for 1 second or more, this difference cannot be eliminated even if operation to release valve sticking is continued for the prescribed number of times. <ul style="list-style-type: none"> • 12 V: 10 times \times 8 • 24 V: 7 times \times 6 	Connector Wire-harness Intake throttle ECU

● Actions when an error occurs

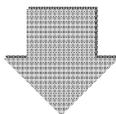
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

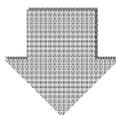
1. Intake throttle sticking
2. Poor connection of connector
3. Wiring failure of the wire-harness
4. Internal circuit of intake throttle failure

● Diagnosis

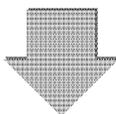
1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P444</i> for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the key switch, and turn off the ECU power.• Check the intake throttle condition.
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3. Connector/wiring check	<ul style="list-style-type: none">• Check the pin of the intake throttle for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the intake throttle wiring is not disconnected or the wiring coating is not peeled.
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4. Failure diagnosis	<ul style="list-style-type: none">• Check the intake throttle (motor) resistance value.• Check the ECU output voltage.• Check the intake throttle position sensor output voltage.• Check the conduction of the wire-harness. <p>* See Chapter 2 <i>P444</i> for details on the diagnosis method and procedure.</p>
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P02E5: Throttle valve sticking (sticking closed)

P code	P02E5	Name	Throttle valve sticking (sticking closed)
SPN/FMI	2951/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. With the actual degree of opening at 50 % or less, if the difference between the target opening and the actual opening is ± 10 % or more for 1 second or more, the difference cannot be eliminated even if operation (six sets \times 7 repetitions) to release valve sticking is continued for the prescribed number of times. <ul style="list-style-type: none"> • 12 V: 10 times \times 8 • 24 V: 7 times \times 6 	Connector Wire-harness Intake throttle ECU

● Actions when an error occurs

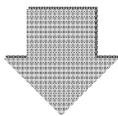
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

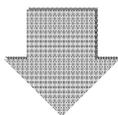
1. Intake throttle sticking
2. Poor connection of connector
3. Wiring failure of the wire-harness
4. Internal circuit of intake throttle failure

● Diagnosis

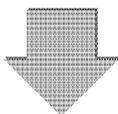
1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P444</i> for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the key switch, and turn off the ECU power.• Check the intake throttle condition.
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3. Connector/wiring check	<ul style="list-style-type: none">• Check the pin of the intake throttle for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the intake throttle wiring is not disconnected or the wiring coating is not peeled.
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4. Failure diagnosis	<ul style="list-style-type: none">• Check the intake throttle (motor) resistance value.• Check the ECU output voltage.• Check the intake throttle position sensor output voltage.• Check the conduction of the wire-harness. <p>* See Chapter 2 <i>P444</i> for details on the diagnosis method and procedure.</p>
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■ EGR

P0404: EGR overvoltage error

P code	P0404	Name	EGR overvoltage error
SPN/FMI	2791/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. Supply voltage to EGR valve is more than 18 V for more than 5 seconds.	Battery EGR valve

● Actions when an error occurs

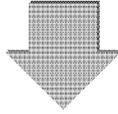
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Battery overcharging
2. Failure of EGR valve internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.
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2. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the battery voltage.
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P1404: EGR low voltage error

P code	P1404	Name	EGR low voltage error
SPN/FMI	2791/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. Supply voltage to EGR valve is less than 8 V for more than 13 seconds.	Wire-harness Battery EGR valve

● Actions when an error occurs

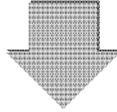
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Battery degradation
2. Power wire short circuit of the EGR valve
3. Failure of EGR valve internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
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2. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the battery voltage.
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P1409: EGR feedback error

P code	P1409	Name	EGR feedback error
SPN/FMI	2791/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. Motor drive duty at the excessive condition is continued for a given length of time.	EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of EGR valve internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the EGR valve. <p>* For details on the exchange method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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U0401: EGR ECM data error

P code	U0401	Name	EGR ECM data error
SPN/FMI	2791/9		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. EGR detects reception timeout for a certain amount of time.	Wire-harness EGR valve

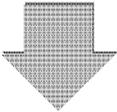
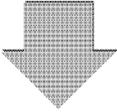
● **Actions when an error occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	Because this error is detected in the EGR valve and fault information is sent to the ECU, the indication timing of the information is when the communication is resumed. Therefore, this DTC is not outputted while the communication is stopped, but the receiving time of U010B: CAN 1 (for EGR): Reception timeout from the EGR valve is detected separately.

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
3. Failure of EGR valve internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.
	
2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the EGR valve for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the EGR valve or EGR valve relay wiring is not cut or the wiring coating is not peeled.
	
3. Failure diagnosis	<ul style="list-style-type: none">• Check the fault indication again.• If this DTC is detected again, exchange the wire-harness or EGR valve.

P0403: Disconnection in EGR motor coils

P code	P0403	Name	Disconnection in EGR motor coils
SPN/FMI	2791/12		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. Disconnection condition with the motor is detected.	EGR valve

● **Actions when an error occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

1. Failure of EGR valve DC motor

● **Diagnosis**

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the EGR valve. <p>* For details on the exchange method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P1405: Short circuit in EGR motor coils

P code	P1405	Name	Short circuit in EGR motor coils
SPN/FMI	522579/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. Overcurrent between the motor and coil is detected.	EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of EGR valve DC motor

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the EGR valve. <p>* For details on the exchange method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P0488: EGR position sensor error

P code	P0488	Name	EGR position sensor error
SPN/FMI	522580/12		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. Excessive or dropped position sensor signal voltage is detected.	EGR valve

● **Actions when an error occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

1. Failure of EGR valve internal circuit

● **Diagnosis**

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the EGR valve. <p>* For details on the exchange method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P148A: EGR valve sticking error

P code	P148A	Name	EGR valve sticking error
SPN/FMI	522581/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. Number of steps from fully open to fully closed at initialization is incorrect (40 steps or more).	EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve sticking

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, inspect and replace the EGR valve. <p>* For details on inspection and replacement, refer to TNV Tier4 CR engine service manual.</p>
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P049D: EGR initialization error

P code	P049D	Name	EGR initialization error
SPN/FMI	522582/7		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. The completion time of initialization exceeds the specified range.	EGR valve

● **Actions when an error occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <p>a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error.</p> <p>b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.)</p> <p>c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.)</p> <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

1. Failure of EGR valve internal circuit
2. EGR valve failure
3. EGR valve sticking

● **Diagnosis**

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the EGR valve. <p>* For details on the exchange method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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U1401: EGR target value out of range

P code	U1401	Name	EGR target value out of range
SPN/FMI	522617/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. The direction opening from ECU is out of range for a given period of time.	EGR valve ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU software error

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the EGR valve.
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P1410: EGR high temperature thermistor error

P code	P1410	Name	EGR high temperature thermistor error
SPN/FMI	522583/1		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. The high temperature side thermistor voltage inside the control unit is below 0.2 V.	EGR valve

● **Actions when an error occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

1. Failure of EGR valve internal circuit

● **Diagnosis**

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the EGR valve. <p>* For details on the exchange method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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P1411: EGR low temperature thermistor error

P code	P1411	Name	EGR low temperature thermistor error
SPN/FMI	522584/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Abnormality is determined by EGR reception data. 2. The low temperature side thermistor voltage inside the control unit is below 0.2 V.	EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) <p>(*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.</p>
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of EGR valve internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the EGR valve. <p>* For details on the exchange method and procedure, refer to TNV Tier4 CR engine service manual.</p>
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■ Exhaust throttle

P1438: Exhaust throttle (voltage fault)

P code	P1438	Name	Exhaust throttle (voltage fault)
SPN/FMI	522746/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When the power supply voltage detected by the exhaust throttle becomes either of the following: <ul style="list-style-type: none"> • The situation that the detected voltage is less than or equal to 6 V continues for 10 seconds. • The situation that the detected voltage is greater than or equal to 16 V continues for 1 second. 	Battery Exhaust throttle

● Actions when an error occurs

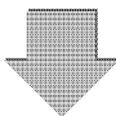
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Exhaust throttle fully opens.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Battery failure
2. Failure of exhaust throttle internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication.
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2. Failure diagnosis	<ul style="list-style-type: none"> • Check the conduction of the wire-harness. • Check the battery voltage.
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P1439: Exhaust throttle (motor fault)

P code	P1439	Name	Exhaust throttle (motor fault)
SPN/FMI	522747/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When any of the following is true inside the exhaust throttle: <ul style="list-style-type: none"> • Motor drive duty at the excessive condition is continued for a period of time. • Learning value exceeds normal range. • Overcurrent, overload, open circuit, or short circuit of the motor coil is detected. 	Exhaust throttle

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. DC motor failure of exhaust throttle
2. Failure of exhaust throttle internal circuit
3. Sticking of exhaust throttle valve

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, inspect and replace the exhaust throttle. <p>* For details on inspection and replacement, refer to TNV Tier4 CR engine service manual.</p>
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P1440: Exhaust throttle (sensor system fault)

P code	P1440	Name	Exhaust throttle (sensor system fault)
SPN/FMI	522748/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When any of the following is true in the exhaust throttle: <ul style="list-style-type: none"> • Excessive or insufficient sensor supply voltage is detected. • Excessive or insufficient voltage of location signal sensor is detected. • State where the target opening and the actual opening does not match continues for a certain period. 	Exhaust throttle

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of exhaust throttle internal circuit
2. Sticking of exhaust throttle valve

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, inspect and replace the exhaust throttle. <p>* For details on inspection and replacement, refer to TNV Tier4 CR engine service manual.</p>
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P1441: Exhaust throttle (MPU fault)

P code	P1441	Name	Exhaust throttle (MPU fault)
SPN/FMI	522749/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. MPU inside the exhaust throttle is fault.	Exhaust throttle

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Exhaust throttle fully opens.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of exhaust throttle internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, inspect and replace the exhaust throttle. <p>* For details on inspection and replacement, refer to TNV Tier4 CR engine service manual.</p>
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P1442: Exhaust throttle (PCB fault)

P code	P1442	Name	Exhaust throttle (PCB fault)
SPN/FMI	522750/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Excessive or insufficient voltage of temperature thermistor inside the exhaust throttle is detected.	Exhaust throttle

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of exhaust throttle internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, inspect and replace the exhaust throttle. <p>* For details on inspection and replacement, refer to TNV Tier4 CR engine service manual.</p>
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P1443: Exhaust throttle (CAN fault)

P code	P1443	Name	Exhaust throttle (CAN fault)
SPN/FMI	522751/19		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When any of the following is true: <ul style="list-style-type: none"> • CAN communication controller of the exhaust throttle detects initial error. • Exhaust throttle detects CAN reception time-out for a period of time. 	ECU Connector Wire-harness Exhaust throttle

● Actions when an error occurs

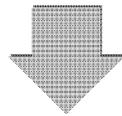
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Exhaust throttle fully opens.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	Because this error is detected in the exhaust throttle and information is sent to the ECU, the timing of the error indication is the time when the communication is resumed. Therefore, this DTC is not outputted while the communication is stopped, but the receiving timeout of U1107: CAN 1 (for exhaust throttle) determined on the ECU side is detected separately.

● Presumed cause of the failure or the error condition

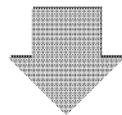
1. Poor connection of connector
2. Poor wiring of the wire-harness
3. Failure of exhaust throttle internal circuit
4. ECU software error

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the exhaust throttle for deformation and cracks, fittings, and whether the retainer is loose or removed. • Make sure that the exhaust throttle wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the fault indication again. • If this DTC is detected again, exchange the wire-harness or exhaust throttle.
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Communication related

■ CAN 1

U010B: CAN 1 (for EGR): Reception timeout from the EGR valve

P code	U010B	Name	CAN 1 (for EGR): Reception timeout from the EGR valve
SPN/FMI	522610/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied <ul style="list-style-type: none"> • Elapse of 2 seconds after turning on the key switch • Not during engine cranking • Key switch ON • Battery voltage is 10 V or above 2. ECU detects the reception timeout for a certain amount of time	ECU Connector Wire-harness EGR valve EGR valve relay

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %. • Simultaneous to the above operating restrictions, engine operation restrictions are applied according to the inducement level of the EGR system abnormality. The level of restriction applied will whichever level is higher. <ul style="list-style-type: none"> a. Warning <ul style="list-style-type: none"> When engine operation time is less than 36 hours since abnormality occurred. In this case, restrictions on engine speed/fuel injection quantity vary depending on the error. b. Inducement (Low level) <ul style="list-style-type: none"> When engine operation time 36 hours or more and less than 100 hours from error occurrences (or less than 5 hours (*1)), Inducement level becomes Low level. In this case, the torque is limited to 75 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) c. Inducement (Severe level) <ul style="list-style-type: none"> When engine operation time is 100 hours or more from error occurrences (or 5 hours or more (*1)), Inducement level becomes Severe level. In this case, the engine speed is restricted to 60% of its rated speed (in some engine models), and the torque is restricted to 50 %. (For some errors, the engine speed is restricted to low idle and the maximum fuel injection quantity is restricted to 50 %.) (*1) This time indicates a case when another abnormality that results in inducement occurs within 40 hours of recovery from a previous abnormality.
Reset criteria	When the CAN message from the EGR valve is received, the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wire-harness disconnection/short circuit
3. ECU internal circuit failure
4. EGR valve internal circuit failure
5. EGR valve relay failure

U1107: CAN 1 (for exhaust throttle): Reception time out

P code	U1107	Name	CAN 1 (for exhaust throttle): Reception time out
SPN/FMI	522611/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When any of the following is true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. A reception time out is eased at a fixed time.	ECU Connector Wire-harness Exhaust throttle EGR valve relay

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Exhaust throttle fully opens.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wire-harness disconnection/short circuit
3. ECU internal circuit failure
4. Failure of exhaust throttle internal circuit
5. EGR valve relay failure

■ CAN 2

U0292: TSC1 (SA1) reception timeout

P code	U0292	Name	TSC1 (SA1) reception timeout
SPN/FMI	522596/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. A reception time out is detected at a fixed time.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

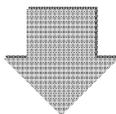
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. <ul style="list-style-type: none"> • When the ECU power is turned off, the fault mode is released. • The fault mode is automatically reset when TSC1 message is received.
Remarks	

● Presumed cause of the failure or the error condition

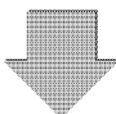
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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U1301: TSC1 (SA2) reception timeout

P code	U1301	Name	TSC1 (SA2) reception timeout
SPN/FMI	522597/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. A reception time out is detected at a fixed time.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

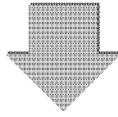
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

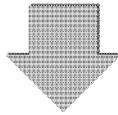
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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U1292: Y_ECR1 reception timeout

P code	U1292	Name	Y_ECR1 reception timeout
SPN/FMI	522599/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. A reception time out is detected at a fixed time.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

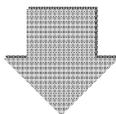
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. <ul style="list-style-type: none"> • When the ECU power is turned off, the fault mode is released. • The fault mode is automatically reset when Y_ECR1 message is received.
Remarks	

● Presumed cause of the failure or the error condition

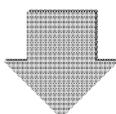
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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U1293: Y_EC reception timeout

P code	U1293	Name	Y_EC reception timeout
SPN/FMI	522600/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. A reception time out is detected at a fixed time.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

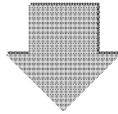
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. <ul style="list-style-type: none"> • When the ECU power is turned off, the fault mode is released. • The fault mode is automatically reset when Y_EC message is received.
Remarks	

● Presumed cause of the failure or the error condition

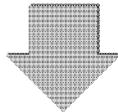
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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U1294: Y_RSS reception timeout

P code	U1294	Name	Y_RSS reception timeout
SPN/FMI	522601/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. A reception time out is detected at a fixed time.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

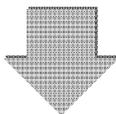
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. <ul style="list-style-type: none"> • When the ECU power is turned off, the fault mode is released. • The fault mode is automatically reset when Y_RSS message is received.
Remarks	

● Presumed cause of the failure or the error condition

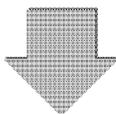
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness. <p>* See Chapter 2 P458 for details on the diagnosis method and procedure.</p>
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U0168: VI reception timeout

P code	U0168	Name	VI reception timeout
SPN/FMI	237/31		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. There is no response to the VIN request for 3 times.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

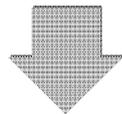
Fault mode	Limited operation is applied depending on each customer's setting.
Limited operation	The high idle speed or the engine output maximum injection quantity is limited. (Actions differ by the customer setting.)
Reset criteria	Resumes start when VI message is received.
Remarks	This function only applies to special models.

● Presumed cause of the failure or the error condition

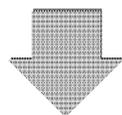
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. * See Chapter 2 P458 for details on the diagnosis method and procedure.
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the conduction of the wire-harness. * See Chapter 2 P458 for details on the diagnosis method and procedure.
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U3002: VI reception data error

P code	U3002	Name	VI reception data error
SPN/FMI	237/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. The received VI does not match the existed VI in ECU.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

Fault mode	Limited operation is applied depending on each customer's setting.
Limited operation	The high idle speed or the engine output maximum injection quantity is limited. (Actions differ by the customer setting.)
Reset criteria	Resumes start when VI message is received.
Remarks	This function only applies to special models.

● Presumed cause of the failure or the error condition

1. CAN communication error from the controller on the driven machine
2. ECU internal circuit failure

U1300: Y_ETCP1 reception time out

P code	U1300	Name	Y_ETCP1 reception time out
SPN/FMI	522609/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. A reception time out is detected at a fixed time.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

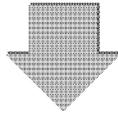
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. <ul style="list-style-type: none"> • When the ECU power is turned off, the fault mode is released. • The fault mode is automatically reset when Y_ETCP1 message is received.
Remarks	

● Presumed cause of the failure or the error condition

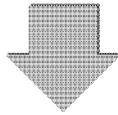
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P458</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness. <p>* See Chapter 2 <i>P458</i> for details on the diagnosis method and procedure.</p>
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U1302: EBC1 reception timeout

P code	U1302	Name	EBC1 reception timeout
SPN/FMI	522618/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • 2 seconds passes after the key switch was turned ON. • Not in cranking status. • ECU power is not OFF. • Voltage value is 10 V or higher. 2. A fixed time passes after a reception time out was detected for certain times. Count resets after normal communication.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

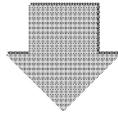
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. <ul style="list-style-type: none"> • When the ECU power is turned off, the fault mode is released. • The fault mode is automatically reset when EBC1 message is received.
Remarks	

● Presumed cause of the failure or the error condition

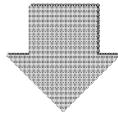
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P458</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness. <p>* See Chapter 2 <i>P458</i> for details on the diagnosis method and procedure.</p>
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U1303: Y_DPFIF reception timeout

P code	U1303	Name	Y_DPFIF reception timeout
SPN/FMI	522619/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following conditions are all true: <ul style="list-style-type: none"> • Key switch is ON. • Not in cranking status. • Battery voltage is 10 V or higher. 2. A reception time out is detected at a fixed time.	Connector Wire-harness Controller of machine side ECU

● Actions when an error occurs

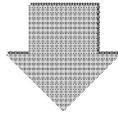
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. <ul style="list-style-type: none"> • When the ECU power is turned off, the fault mode is released. • The fault mode is automatically reset when Y_DPFIF message is received.
Remarks	

● Presumed cause of the failure or the error condition

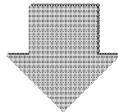
1. CAN communication error from the controller on the driven machine
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication. <p>* See Chapter 2 <i>P458</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the CAN communication connector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the CAN communication connector wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness. <p>* See Chapter 2 <i>P458</i> for details on the diagnosis method and procedure.</p>
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U0167: Immobilizer error (CAN communication)

P code	U0167	Name	Immobilizer error (CAN communication)
SPN/FMI	522730/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1-The key switch is turned on for a given length of time. 2-The battery normal condition is continued for given length of time. 3-Immobilizer is active. 4-Unit ID is stored. 2. There is no reply from the immobilizer even after requesting to start authentication.	ECU Connector Wire-harness Immobilizer of machine side

● Actions when an error occurs

Fault mode	[Engine stop]: The engine does not start to operate.
Limited operation	The starter does not start.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. CAN communication error of immobilizer (or the machine side controller)
2. Poor connection of connector
3. Wire-harness disconnection/short circuit
4. ECU internal circuit failure

U0426: Immobilizer error (system)

P code	U0426	Name	Immobilizer error (system)
SPN/FMI	1202/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The immobilizer is active and the unit ID is stored. 2. Authentication on CAN communication between the engine ECU and immobilizer failed.	Immobilizer authentication key Immobilizer of machine side

● Actions when an error occurs

Fault mode	[Engine stop]: The engine does not start to operate.
Limited operation	The starter does not start.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Immobilizer authentication key inconsistency

● Diagnosis

1. Check authentication key	• Make sure that the immobilizer authentication key is correct.
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ECU related

■ EEPROM

P0601: EEPROM memory deletion error

P code	P0601	Name	EEPROM memory deletion error
SPN/FMI	630/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When page (sector) switches. 2. EEPROM deletion malfunctions. The EEPROM has two pages and uses them alternately. When the first page becomes full, the second page will be cleared for writing into. Similarly, when the second page becomes full, the first page will be cleared for writing into. This error occurs when the page fails to be cleared during page switching.	ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. <p>* See Chapter 2 P461 for details on the diagnosis method and procedure.</p>
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P160E: EEPROM memory reading error

P code	P160E	Name	EEPROM memory reading error
SPN/FMI	522576/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When read-accessing. 2. EEPROM reading malfunctions. This error is determined based on the check sum, and this is performed on all EEPROM.	ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. <p>* See Chapter 2 P461 for details on the diagnosis method and procedure.</p>
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P160F: EEPROM memory writing error

P code	P160F	Name	EEPROM memory writing error
SPN/FMI	522578/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When write-accessing. 2. EEPROM writing malfunctions. This error occurs when there are 3 failed attempts to write one data.	ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. <p>* See Chapter 2 P461 for details on the diagnosis method and procedure.</p>
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■ ECU internal fault

P1613: CY146 SPI communication fault

P code	P1613	Name	CY146 SPI communication fault
SPN/FMI	522585/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. A communication fault between the CPU and the H bridge control IC.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1608: Excessive voltage of supply 1

P code	P1608	Name	Excessive voltage of supply 1
SPN/FMI	522588/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The 5 V supply voltage to the actuator drive is excessive.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1617: Insufficient voltage of supply 1

P code	P1617	Name	Insufficient voltage of supply 1
SPN/FMI	522589/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The 5 V supply voltage to the actuator drive is insufficient.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1609: Sensor supply voltage error 1

P code	P1609	Name	Sensor supply voltage error 1
SPN/FMI	522590/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The 5 V supply voltage of sensor exceeds the threshold value.	Connector Wire-harness ECU

● Actions when an error occurs

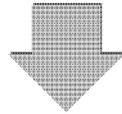
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

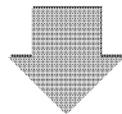
1. Poor connection of connector of the sensor that uses sensor power supply 1 (K43 or K44 terminal)
2. Wiring failure of the wire-harness
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of sensor that uses sensor power supply 1 (K43 or K44 terminal) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the sensor that uses sensor power supply 1 wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the fault indication again. • If this DTC is detected again, exchange the wire-harness or ECU.
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P1618: Sensor supply voltage error 2

P code	P1618	Name	Sensor supply voltage error 2
SPN/FMI	522591/12		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The 5 V supply voltage of sensor exceeds the threshold value.	Connector Wire-harness ECU

● **Actions when an error occurs**

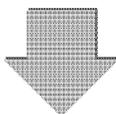
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

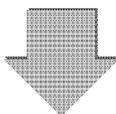
1. Poor connection of connector of the sensor that uses sensor power supply 2 (K45 or A08 terminal)
2. Wiring failure of the wire-harness
3. ECU internal circuit failure

● **Diagnosis**

1. Initial diagnosis using SA-D	• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of sensor that uses sensor power supply 2 (K45 or A08 terminal) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the sensor that uses sensor power supply 2 wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the fault indication again. • If this DTC is detected again, exchange the wire-harness or ECU.
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P1619: Sensor supply voltage error 3

P code	P1619	Name	Sensor supply voltage error 3
SPN/FMI	522592/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The 5 V supply voltage of sensor exceeds the threshold value.	Connector Wire-harness ECU

● Actions when an error occurs

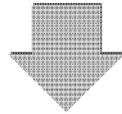
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

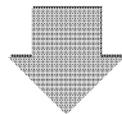
1. Poor connection of connector of the sensor that uses sensor power supply 3 (A07 terminal)
2. Wiring failure of the wire-harness
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of sensor that uses sensor power supply 3 (A07 terminal) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the sensor that uses sensor power supply 3 wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the fault indication again. • If this DTC is detected again, exchange the wire-harness or ECU.
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P1626: Actuator drive circuit 1 short to ground

P code	P1626	Name	Actuator drive circuit 1 short to ground
SPN/FMI	522744/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The overcurrent in UB2 terminal is detected by IC in the ECU.	Connector Wire-harness ECU

● Actions when an error occurs

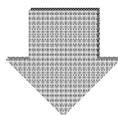
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

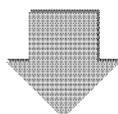
1. Poor connection of connector of the actuator that uses 12 V power supply 1 (UB2: K68 terminal)
2. Wiring failure of the wire-harness
 - GND short circuit of the 12 V power supply 1 (UB2: K68 terminal) wire
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the actuator that uses 12 V power supply 1 (UB2: K68 terminal) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the actuator that uses 12 V power supply 1 wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the fault indication again. • If this DTC is detected again, exchange the wire-harness or ECU.
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P1633: Actuator drive circuit 2 short to ground

P code	P1633	Name	Actuator drive circuit 2 short to ground
SPN/FMI	522994/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The overcurrent in UB3 terminal is detected by IC in the ECU.	Connector Wire-harness ECU

● Actions when an error occurs

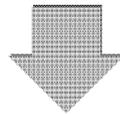
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

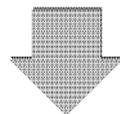
1. Poor connection of connector of the actuator that uses 12 V power supply 2 (UB3: K90 or A50 terminal)
2. Wiring failure of the wire-harness
 - GND short circuit of the 12 V power supply 2 (UB3: K90 or A50 terminal) wire
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the actuator that uses 12 V power supply 2 (UB3: K90 or A50 terminal) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the actuator that uses 12 V power supply 2 wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the fault indication again. • If this DTC is detected again, exchange the wire-harness or ECU.
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P1467: Actuator drive circuit 3 short to ground

P code	P1467	Name	Actuator drive circuit 3 short to ground
SPN/FMI	523471/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The overcurrent in UB5 terminal is detected by IC in the ECU.	Connector Wire-harness ECU

● Actions when an error occurs

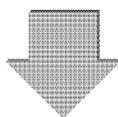
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

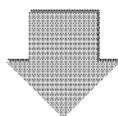
1. Poor connection of connector of the actuator that uses 12 V power supply 3 (UB5: K73 terminal)
2. Wiring failure of the wire-harness
 - GND short circuit of the 12 V power supply 3 (UB5: K73 terminal) wire
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.
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2. Connector/wiring check	<ul style="list-style-type: none"> • Before beginning your work, be sure to turn off the ECU power. • Check the pin of the actuator that uses 12 V power supply 3 (UB5: K73 terminal) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the actuator that uses 12 V power supply 3 wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none"> • Check the fault indication again. • If this DTC is detected again, exchange the wire-harness or ECU.
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P1469: AD converter fault 1

P code	P1469	Name	AD converter fault 1
SPN/FMI	523473/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. A pulse error is detected through diagnosis of the AD converter.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1470: AD converter fault 2

P code	P1470	Name	AD converter fault 2
SPN/FMI	523474/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. A voltage error is detected through diagnosis of the AD converter.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1471: External monitoring IC and CPU fault 1

P code	P1471	Name	External monitoring IC and CPU fault 1
SPN/FMI	523475/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. An error is detected through mutual diagnosis of the external monitoring IC and the CPU.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1472: External monitoring IC and CPU fault 2

P code	P1472	Name	External monitoring IC and CPU fault 2
SPN/FMI	523476/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. A communication error is detected between the external monitoring IC and the CPU.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1473: ROM fault

P code	P1473	Name	ROM fault
SPN/FMI	523477/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. ECU power self-maintains after the key switch was turned OFF. 2. The checksum of the all ROM areas is abnormal.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1474: Shutoff path fault 1

P code	P1474	Name	Shutoff path fault 1
SPN/FMI	523478/12		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. A response error from CPU to the external monitoring IC is detected by the external monitoring IC.	ECU

● **Actions when an error occurs**

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

1. ECU internal circuit failure

● **Diagnosis**

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1475: Shutoff path fault 2

P code	P1475	Name	Shutoff path fault 2
SPN/FMI	523479/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. An operation error of shutoff path test is detected by the external monitoring IC.	ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • EGR fully closes. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure
2. When turning on the ECU power, all the injectors in the same bank (4-cylinder engines: 1st and 4th cylinders or 2nd and 3rd cylinders. 3-cylinder engines: All cylinders) are disconnected.

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Start the engine. If an error occurs to the injector driving circuit (bank 1 (or 2) error), the injectors may be disconnected at the same time. Refer to the pages that describes the injector disconnection, and troubleshoot the injector circuit of the said bank. • If the engine does not start and shut-off bus error other than this error also occurs, there may be other failure causes. Perform troubleshooting for the detected error code. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1476: Shutoff path fault 3

P code	P1476	Name	Shutoff path fault 3
SPN/FMI	523480/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. A response time error of shutoff path test is detected by the external monitoring IC.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1477: Shutoff path fault 4

P code	P1477	Name	Shutoff path fault 4
SPN/FMI	523481/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. A communication error of shutoff path test is detected by the external monitoring IC.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1478: Shutoff path fault 5

P code	P1478	Name	Shutoff path fault 5
SPN/FMI	523482/12		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. An insufficient value of voltage in shutoff path test is detected by the external monitoring IC.	ECU

● **Actions when an error occurs**

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

1. ECU internal circuit failure

● **Diagnosis**

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1479: Shutoff path fault 6

P code	P1479	Name	Shutoff path fault 6
SPN/FMI	523483/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. An error of the external monitoring IC in shutoff path test is detected by the external monitoring IC.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1480: Shutoff path fault 7

P code	P1480	Name	Shutoff path fault 7
SPN/FMI	523484/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. An error of OS call time in shutoff path test is detected by the external monitoring IC.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1481: Shutoff path fault 8

P code	P1481	Name	Shutoff path fault 8
SPN/FMI	523485/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. An error of positive test of shutoff path test is detected by the external monitoring IC.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1482: Shutoff path fault 9

P code	P1482	Name	Shutoff path fault 9
SPN/FMI	523486/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. An error of operation time of shutoff path test is detected by the external monitoring IC.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1483: Shutoff path fault 10

P code	P1483	Name	Shutoff path fault 10
SPN/FMI	523487/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During shutoff path test (operation diagnosis of the isolation function of injector current) by the external monitoring IC, which is implemented after turning on the ECU power. 2. An excessive value of voltage in shutoff path test is detected by the external monitoring IC.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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P1484: Recognition error of engine speed

P code	P1484	Name	Recognition error of engine speed
SPN/FMI	523488/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. An error is detected through mutual diagnosis of engine speed.	ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. • If this DTC is detected again, exchange the ECU.
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Contact output related

■ Breather heater (Optional parts for 4TNV86CT and 4TNV98CT)

P053A: Breather heater disconnection

P code	P053A	Name	Breather heater disconnection
SPN/FMI	3059/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied <ul style="list-style-type: none"> • The heater is not energized (1 second after ECU is activated) • No abnormality is coolant temperature sensor • Engine coolant temperature is 40 °C or lower. 2. Disconnection detected in the ECU internal circuit of the A34 terminal	Breather heater Wire-harness

● Actions when an error occurs

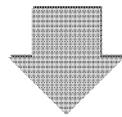
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Disconnection in the internal circuit of the breather heater

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the fault indication again by turning the ECU on and off. • If DTC is detected again, inspect the breather heater and wire-harness, and replace them if necessary.
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2. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the breather heater. • Check the continuity of the harness. <p>* See Chapter 2 P408 for details on the diagnosis method and procedure.</p>
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P053B: Breather heater short circuit (GND)

P code	P053B	Name	Breather heater short circuit (GND)
SPN/FMI	3059/4		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied <ul style="list-style-type: none"> • The heater is not energized (1 second after ECU is activated) • No abnormality is coolant temperature sensor • Engine coolant temperature is 40 °C or lower. 2. GND short circuit detected in the ECU internal circuit of the A34 terminal.	Breather heater Wire-harness

● **Actions when an error occurs**

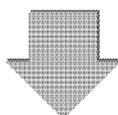
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● **Presumed cause of the failure or the error condition**

1. Short circuit (GND) in the internal circuit of the breather heater

● **Diagnosis**

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Check the fault indication again by turning the ECU on and off. • If DTC is detected again, inspect the breather heater and wire-harness, and replace them if necessary.
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2. Failure diagnosis	<ul style="list-style-type: none"> • Check the resistance value of the breather heater. • Check the resistance value of the wire-harness. <p>* See Chapter 2 P408 for details on the diagnosis method and procedure.</p>
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P053C: Breather heater short circuit (VB)

P code	P053C	Name	Breather heater short circuit (VB)
SPN/FMI	3059/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The heater is energized 2. VB short circuit (overcurrent) detected in the ECU internal circuit of the A34 terminal	Breather heater Wire-harness

● Actions when an error occurs

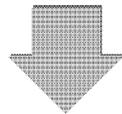
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

- Short circuit (VB) in the internal circuit of the breather heater

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> Check the fault indication. Check the fault indication again by turning the ECU on and off. If DTC is detected again, inspect the breather heater and wire-harness, and replace them if necessary.
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2. Failure diagnosis	<ul style="list-style-type: none"> Check the resistance value of the breather heater. Check the resistance value of the wire-harness. <p>* See Chapter 2 P408 for details on the diagnosis method and procedure.</p>
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Contact input related

■ Air cleaner switch

P1101: Air cleaner clogged alarm

P code	P1101	Name	Air cleaner clogged alarm
SPN/FMI	522323/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned on and the battery voltage is 9 V or higher. 2. The air cleaner switch is turned on for 10 seconds.	Air cleaner Wire-harness Air cleaner switch ECU

● Actions when an error occurs

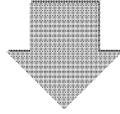
	Settings of the actions during a air cleaner error	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The high idle speed or the engine output maximum injection quantity is limited. (Action differs depending on each customer's settings.)
Reset criteria	When the ECU power off is detected, the fault mode is released.	When the ECU power off is detected, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

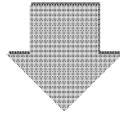
1. Clogged air cleaner
2. Wiring failure of the wire-harness
 - Power short circuit of the air cleaner switch wiring
3. Air cleaner switch failure
 - Power short circuit of the air cleaner switch internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Make sure that the input signal of the air cleaner switch is correctly recognized. <p>* See Chapter 2 <i>P415</i> for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none">• Turn off the ECU power and stop the engine.• Check the air cleaner.• After a few moments, turn on the key switch and make sure that DTC is detected.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the air cleaner switch system. <p>* See Chapter 2 <i>P415</i> for details on the diagnosis method and procedure.</p>
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■ Water separator switch

P1151: Water separator alarm

P code	P1151	Name	Water separator alarm
SPN/FMI	522329/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned on and the battery voltage is 9 V or higher. 2. The water separator is turned on for 10 seconds.	Water separator Connector Wire-harness Water separator switch ECU

● Actions when an error occurs

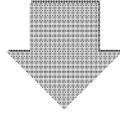
	Settings of the actions during a water separator error	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The high idle speed or the engine output maximum injection quantity is limited. (Action differs depending on each customer's settings.)
Reset criteria	When the ECU power off is detected, the fault mode is released.	When the ECU power off is detected, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

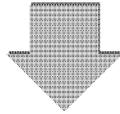
1. Water separator failure
2. Wiring failure of the wire-harness
 - Power short circuit of the water separator switch wiring
3. Water separator switch failure
 - Power short circuit of the water separator switch internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Make sure that the input signal of the water separator switch is correctly recognized. <p>* See Chapter 2 <i>P415</i> for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none">• Turn off the ECU power and stop the engine.• Check the water separator.• After a few moments, turn on the key switch and make sure that DTC is detected.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the water separator switch system. <p>* See Chapter 2 <i>P415</i> for details on the diagnosis method and procedure.</p>
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■ Charge switch

P1562: Charge switch disconnection

P code	P1562	Name	Charge switch disconnection
SPN/FMI	167/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned on and the judgment completion criteria is incomplete. 2. The charge switch is turned off continuously for 1 sec and the judgment is formed.	Connector Wire-harness Charge switch ECU

● Actions when an error occurs

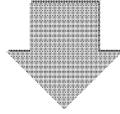
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	The fault mode is automatically released when the charge switch is turned on. Or released when the ECU power is turned off.
Remarks	

● Presumed cause of the failure or the error condition

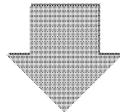
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or power short circuit of the charge switch wiring
3. Charge switch failure
 - Disconnection or power short circuit of the charge switch internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Make sure that the input signal of the charge switch is correctly recognized. <p>* See Chapter 2 <i>P412</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the charge switch for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the charge switch wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the wire-harness.• Check the operation of the charge switch. <p>* See Chapter 2 <i>P412</i> for details on the diagnosis method and procedure.</p>
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P1568: Charge alarm

P code	P1568	Name	Charge alarm
SPN/FMI	167/1		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite 2. The power switch is turned on and the charge switch is turned on and * (engine speed > 600 min ⁻¹) continues for 10 sec after the completion of the engine start. * The CAL value allows switching between "after the completion of the engine start" and "engine speed > 600 min ⁻¹ ".	Alternator Connector Wire-harness Charge switch ECU

● **Actions when an error occurs**

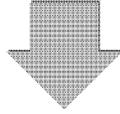
	Setting of the charge alarm operation	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The high idle speed or the maximum injection quantity is limited. (Action differs depending on each customer's settings.)
Reset criteria	The fault mode is automatically released when the charge switch is turned off. Or released when the ECU power is turned off.	The fault mode is automatically released when the charge switch is turned off.
Remarks		

● **Presumed cause of the failure or the error condition**

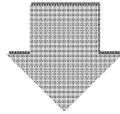
1. Battery charge error
2. Alternator failure
3. Wiring failure of the wire-harness
 - GND short circuit of the charge switch wiring
4. Charge switch failure
 - GND short circuit of the charge switch internal wiring
5. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Make sure that the input signal of the charge switch is correctly recognized. <p>* See Chapter 2 <i>P412</i> for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none">• Turn off the ECU power and stop the engine.• Check the engine charging equipment.• After checking, turn on the key switch and check for the DTC detection.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the charge switch system. <p>* See Chapter 2 <i>P412</i> for details on the diagnosis method and procedure.</p>
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■ Oil pressure switch

P1192: Oil pressure switch disconnection

P code	P1192	Name	Oil pressure switch disconnection
SPN/FMI	100/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- The key switch is turned on. 2- The battery voltage ≥ 9 V. 3- The judgment completion criteria is incomplete. 2. Judged when the oil pressure switch is turned off for one second.	Connector Wire-harness Oil pressure switch ECU

● Actions when an error occurs

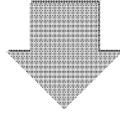
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	The fault mode is automatically released when the oil pressure switch is turned on. Or released when the ECU power is turned off.
Remarks	

● Presumed cause of the failure or the error condition

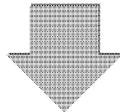
1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Disconnection or power short circuit of the oil pressure switch wiring
3. Oil pressure switch failure
 - Disconnection or power short circuit of the oil pressure switch internal wiring
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Make sure that the input signal of the oil pressure switch is correctly recognized. <p>* See Chapter 2 <i>P412</i> for details on the diagnosis method and procedure.</p>
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2. Connector/wiring check	<ul style="list-style-type: none">• Before beginning your work, be sure to turn off the ECU power.• Check the pin of the oil pressure switch for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.• Make sure that the oil pressure switch wiring is not cut or the wiring coating is not peeled.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the conduction of the oil pressure switch.• Check the conduction of the wire-harness.• Check the operation of the oil pressure switch. <p>* See Chapter 2 <i>P412</i> for details on the diagnosis method and procedure.</p>
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P1198: Low oil pressure alarm

P code	P1198	Name	Low oil pressure alarm
SPN/FMI	100/1		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned on * and the engine speed > 600 min ⁻¹ after the completion of the engine start and the battery voltage is 9 V or more. 2. The oil pressure switch is turned on for a certain amount of time. * The CAL value allows switching between “after the completion of the engine start” and “engine speed > 600 min ⁻¹ ”.	Oil pressure equipment Wire-harness Oil pressure switch ECU

● **Actions when an error occurs**

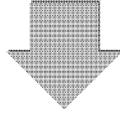
	Settings of the actions during a low oil pressure alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The high idle speed or the maximum injection quantity is limited. (Action differs depending on each customer's settings.)
Reset criteria	When the ECU power is turned off, the fault mode is released.	When the ECU power is turned off, the fault mode is released.
Remarks		

● **Presumed cause of the failure or the error condition**

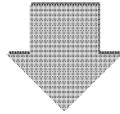
1. Oil pressure low
2. Oil pressure equipment failure
3. Wiring failure of the wire-harness
 - GND short circuit of the oil pressure switch wiring
4. Oil pressure switch failure
 - GND short circuit of the oil pressure switch internal wiring
5. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none">• Check the fault indication.• Make sure that the input signal of the oil pressure switch is correctly recognized. <p>* See Chapter 2 <i>P412</i> for details on the diagnosis method and procedure.</p>
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2. Engine check	<ul style="list-style-type: none">• Turn off the ECU power and stop the engine.• Check the lubrication system.• After checking, turn on the power switch and check for the DTC detection.
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3. Failure diagnosis	<ul style="list-style-type: none">• Check the oil pressure switch system. <p>* See Chapter 2 <i>P412</i> for details on the diagnosis method and procedure.</p>
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After treatment control

■ DPF

P2463: Excessive PM accumulation (method C)

P code	P2463	Name	Excessive PM accumulation (method C)
SPN/FMI	522573/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. If the operation mode changes to the backup mode when the following state continues for 600 seconds, <ul style="list-style-type: none"> • PM amount (method C) \geq 12 (g/L) 	DPF intermediate temperature sensor system

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the operation mode is reset from the backup mode, the fault mode is automatically released.
Remarks	Then this error occurs, "Backup mode" error is also detected at the same time.

Note: The lamp does not come on when this error is detected during control. However, when this error is detected, backup mode is detected at the same time. Therefore, MIL + RSL always come on. This error indicates the reasons for executing backup mode. Therefore, no FS action is executed.

● Presumed cause of the failure or the error condition

1. Insufficient regeneration capability due to the low operation load
2. Regeneration for the stationary regeneration request is not performed
3. * DPF intermediate temperature sensor system failure

* Be sure to perform the failure diagnosis for "P0420: DPF intermediate temperature sensor abnormal temperature (abnormally low)" first when this error is detected at the same time. The regeneration volume may be estimated too low by "P0420: DPF intermediate temperature sensor abnormal temperature (abnormally low)".

P1463: Excessive PM accumulation (method P)

P code	P1463	Name	Excessive PM accumulation (method P)
SPN/FMI	522574/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. If the operation mode changes to the backup mode when the following state continues for 600 seconds, • PM amount (method C) ≥ 12 (g/L)	DPF differential pressure sensor system

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the operation mode is reset from the backup mode, the fault mode is automatically released.
Remarks	Then this error occurs, "Backup mode" error is also detected at the same time.

Note: The lamp does not come on when this error is detected during control. However, when this error is detected, backup mode is detected at the same time. Therefore, MIL + RSL always come on. This error indicates the reasons for executing backup mode. Therefore, no FS action is executed.

● Presumed cause of the failure or the error condition

1. Insufficient regeneration capability due to the low operation load
2. Regeneration for the stationary regeneration request is not performed
3. * DPF differential pressure sensor failure

* Be sure to perform the failure diagnosis for "P2452: DPF differential pressure sensor abnormal rise in differential pressure" first when this error is detected at the same time. The accumulated amount by P method may be estimated too high by "P2452: DPF differential pressure sensor abnormal rise in differential pressure".

P2458: Regeneration failure (stationary regeneration failure)

P code	P2458	Name	Regeneration failure (stationary regeneration failure)
SPN/FMI	522575/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When the transition is made to the recovery regeneration mode due to incomplete stationary regeneration within the specified time.	DPF intermediate temperature sensor system Injector DOC

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When resetting from the recovery regeneration mode, the fault mode is automatically released.
Remarks	Then this error occurs, "Backup mode" error is also detected at the same time.

● Presumed cause of the failure or the error condition

1. * DPF intermediate temperature sensor system failure
2. DOC deterioration or DOC breakage due to the external factor such as sulfur poisoning
3. Injector failure
 - Decrease in injection quantity
 - Injection timing error

* Be sure to perform the failure diagnosis for "P0420: DPF intermediate temperature sensor abnormal temperature (abnormally low)" first when this error is detected at the same time. The regeneration failure may be detected by "P0420: DPF intermediate temperature sensor abnormal temperature (abnormally low)".

P2459: Regeneration failure (stationary regeneration not performed)

P code	P2459	Name	Regeneration failure (stationary regeneration not performed)
SPN/FMI	522577/11		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When the transition is made to the recovery regeneration mode due to the stationary regeneration not performed in the specified time or the stationary regeneration is being requested.	Connector Wire-harness Regeneration request lamp Regeneration request switch ECU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When resetting from the recovery regeneration mode, the fault mode is automatically released.
Remarks	Then this error occurs, "Backup mode" error is also detected at the same time.

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
 - Regeneration for the stationary regeneration request is not performed
 - Oversight due to the regeneration request lamp failure
 - Regeneration not performed due to the regeneration request switch failure
3. When the engine speed is dropped to low idling during regeneration and abandoned
4. ECU internal circuit failure

P1426: DPF intermediate temperature sensor abnormal rise in temperature (post-injection malfunction)

P code	P1426	Name	DPF intermediate temperature sensor abnormal rise in temperature (post-injection malfunction)
SPN/FMI	3250/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. DPF intermediate temperature ≥ 750 °C	

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ol style="list-style-type: none"> 1. Default <ul style="list-style-type: none"> • The engine stops when a sensor abnormality occurs. • No delayed operation. • EGR fully opens. • DPF regeneration stops. 2. Option <ul style="list-style-type: none"> • Rated power decreases. • The maximum torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • DPF regeneration stops. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

Note: If this error occurs, incorrect injection quantity is expected. If the exhaust temperature excessively rises, it is dangerous. Therefore, "Lv1: Engine stop" is set to FS action by default. When stopping the engine should be avoided due to characteristics of the driven machine, conventional FS action (Lv2) can be selected (no engine stop).

● Presumed cause of the failure or the error condition

1. Poor connection of connector
2. Wiring failure of the wire-harness
3. DPF intermediate temperature sensor system failure
4. ECU internal circuit failure
5. Injector failure
 - Increase in injection quantity
 - Injection timing error

■ DPF OP interface

P242F: Ash cleaning request 1

P code	P242F	Name	Ash cleaning request 1
SPN/FMI	3720/16		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The ash accumulation density is greater than or equal to 50 g/L, and less than 60 g/L.	DPF ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	The maximum engine torque is limited to 85 %.
Reset criteria	The fault mode is automatically released when the ash cleaning request is not detected.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure
2. * Increase in the actual differential pressure of the soot filter
 - Ash is accumulated

* There are cases in which the differential pressure does not rise drastically and the actual ash accumulation is little. When this error occurs, it is highly possible that the engine has not been used for a long time. In such a case, it is required to perform the DPF maintenance.

P1420: Ash cleaning request 2

P code	P1420	Name	Ash cleaning request 2
SPN/FMI	3720/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Ash accumulation density is 60 g/L or more.	DPF ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	The fault mode is automatically released when the ash cleaning request is not detected.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure
2. * Increase in the actual differential pressure of the soot filter
 - Ash is accumulated

* There are cases in which the differential pressure does not rise drastically and the actual ash accumulation is little. When this error occurs, it is highly possible that the engine has not been used for a long time. In such a case, it is required to perform the DPF maintenance.

P1421: Stationary regeneration standby

P code	P1421	Name	Stationary regeneration standby
SPN/FMI	3719/16		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The transition is made to the stationary regeneration mode for the factors except for the SW/CAN direction from the outside during the stationary regeneration.	Injector ECU DOC Piping

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • Rated output of the engine is reduced further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	The fault mode is automatically released when the stationary regeneration standby is not detected.
Remarks	

● Presumed cause of the failure or the error condition

1. Insufficient regeneration capability due to the low operation load
2. Because the conditions of reset regeneration and regeneration forbidden switch turned on are continued for a given period of time
3. ECU internal circuit failure
4. DOC deterioration due to the external factor such as sulfur poisoning
 - Increase in activated temperature
5. Blow-by of combustion gas
 - Catalytic damage
 - Piping damage in the passage to DOC
6. Injector failure
 - Decrease in injection quantity
 - Injection timing error

P1424: Backup mode

P code	P1424	Name	Backup mode
SPN/FMI	3719/0		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The transition is made to the recovery regeneration mode and while the recovery regeneration is not performed.	Injector ECU DOC Piping

● **Actions when an error occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	<ul style="list-style-type: none"> • When sensor error occurs, rated output of the engine is reduced immediately. • The maximum engine torque is limited to 85 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹]. • EGR fully closes. • Rated output of the engine is reduced further after 15 min. • The maximum engine torque is limited to 50 %. • The engine speed is limited to the [maximum torque speed +200 min⁻¹].
Reset criteria	The fault mode is automatically released when the backup mode is not detected.
Remarks	

● **Presumed cause of the failure or the error condition**

1. It is abandoned for a given period of time in the stationary regeneration standby emergency mode
2. ECU internal circuit failure
3. DOC deterioration due to the external factor such as sulfur poisoning
 - Increase in activated temperature
4. Blow-by of combustion gas
 - Catalytic damage
 - Piping damage in the passage to DOC
5. Injector failure
 - Decrease in injection quantity
 - Injection timing error

Note: When this error is detected, either "Excessive PM accumulation (method C)", "Excessive PM accumulation (method P)", "Regeneration failure (stationary regeneration failure)", or "Regeneration failure (stationary regeneration not performed)" is detected at the same time. When recovery regeneration fails, "Regeneration failure (recovery regeneration failure)" or "Recovery regeneration is inhibited" may be detected. Be sure to perform the failure diagnosis for the respective part.

P1425: Reset regeneration is inhibited

P code	P1425	Name	Reset regeneration is inhibited
SPN/FMI	3695/14		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The post injection is inhibited by prohibition SW of DPF regeneration when the operation transmitted to the reset regeneration mode.	Regeneration inhibit switch (including CAN control)

● Actions when an error occurs

Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Error determination conditions are not met.
Remarks	This function only applies to special models.

● Presumed cause of the failure or the error condition

The mode is reset regeneration, but the regeneration is prohibited by the regeneration Inhibit switch (including CAN control) and the regeneration cannot be performed.

P1445: Regeneration failure (recovery regeneration failure)

P code	P1445	Name	Regeneration failure (recovery regeneration failure)
SPN/FMI	3719/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The recovery regeneration fails.	DPF intermediate temperature sensor system Injector DOC

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. * DPF intermediate temperature sensor system failure
2. DOC deterioration or DOC breakage due to the external factor such as sulfur poisoning
3. Injector failure
 - Decrease in injection quantity
 - Injection timing error

* There are cases in which this error occurs due to the regeneration failure judgment caused by “DPF intermediate temperature sensor abnormal temperature (abnormally low)”. When this is detected at the same time, be sure to perform the failure diagnosis for “DPF intermediate temperature sensor abnormal temperature (abnormally low)” in advance.

P1446: Recovery regeneration is inhibited

P code	P1446	Name	Recovery regeneration is inhibited
SPN/FMI	3719/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When recovery regeneration occurs, either of the following conditions is true: <ul style="list-style-type: none"> •“DPF PM accumulation density (C method)” is greater than or equal to the threshold value of “PM accumulation density (for prohibition determination of recovery regeneration)” and it continues for the time same to the “prohibition determining time of recovery regeneration (C method)”. •“DPF PM accumulation density (P method)” is greater than or equal to the threshold value of “PM accumulation density (for prohibition determination of recovery regeneration)” and it continues for the time more than the “prohibition determining time of recovery regeneration (P method)”. 	SF

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power is turned off, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

The PM is overaccumulated and the recovery regeneration cannot be performed.

Others

■ Overspeed

P0219: Overspeed

P code	P0219	Name	Overspeed
SPN/FMI	190/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The engine speed is greater than the following threshold value. YMR standard: •Maximum idling speed + 600 min ⁻¹ . JD exclusive: •NV2 engine: 3,800 min ⁻¹ . •NV3 engine: 3,300 min ⁻¹ .	Crankshaft speed sensor Camshaft speed sensor Injector ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Fuel injection stops.
Reset criteria	When the ECU power off is detected, the fault mode is released.
Remarks	Detected speed is different in some engines with special specifications.

● Presumed cause of the failure or the error condition

1. Crankshaft speed sensor failure
 - Temporary failure caused by external factors such as radio waves
2. Camshaft speed sensor failure
 - Temporary failure caused by external factors such as radio waves
3. ECU internal circuit failure
4. Injector failure

● Diagnosis

1. Initial diagnosis using SA-D	<ul style="list-style-type: none"> • Check the fault indication. • Switch the ECU power from ON to OFF to check the fault indication again. <p>* See Chapter 2 P463 for details on the diagnosis method and procedure.</p>
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Method and Procedure of Failure Diagnosis

Description

● Related DTC

The related DTCs are listed.

P code	P code	Name	Error name
SPN/FMI	SPM/FMI		

● Workflow

The workflow for failure diagnosis is listed.

● Wire diagram

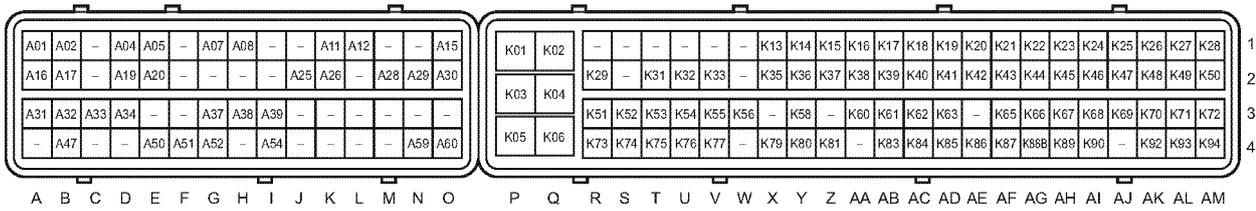
The wire diagram for the parts related to faults is listed.

● Work description

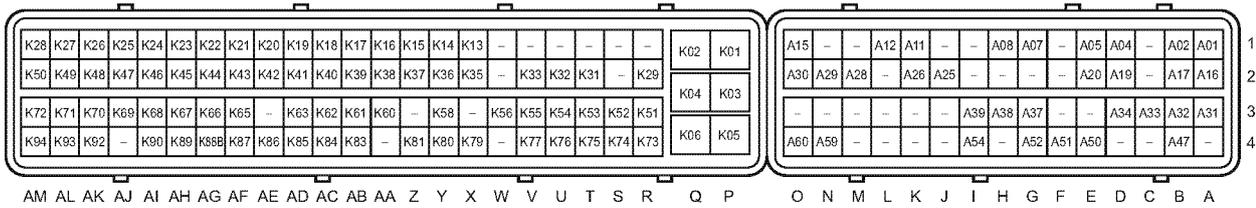
The corrective action and procedure for failure diagnosis is listed.

■ ECU pin layout diagram

Coupler on the wire-harness side
(fitting side)



Coupler on the ECU side
(fitting side)



044375-00EN00

No.	Terminal function name	Code
A01	1-A Injector L	INJL1 - 4
A02	1-B Injector L	INJL1 - 4
A04	1-D SCV H	MPROP-H
A05	1-E SCV L	HPPSOL
A07	1-G Sensor 5 V	5VS
A08	1-H Sensor 5 V	5VS
A11	1-K FO temperature sensor	TFO
A12	1-L DPF hi-side pressure sensor	PDPFH
A15	1-O FO temperature sensor	REOP2
A16	2-A Injector L	INJL1 - 4
A17	2-B Injector L	INJL1 - 4
A19	2-D Intake valve motor	IVDCM-H, L
A20	2-E Intake valve motor	IVDCM-H, L
A25	2-J Analog GND	A-GND
A26	2-K Rail pressure	PRAIL
A28	2-M CW temperature sensor	TW
A29	2-N Analog GND	A-GND
A30	2-O External 12 V	UB5
A31	3-A Injector H	INJH1 - 4
A32	3-B Injector H	INJH1 - 4
A33	3-C Injector H	INJH1 - 4
A34	3-D Reserve	REOP1
A37	3-G Cam speed	CMSPD
A38	3-H Analog GND	A-GND

No.	Terminal function name	Code
A54	4-I Crank speed	CKSPD
A59	4-N intake manifold temperature sensor	TIAIR
A60	4-O External 12 V	UB2
K01	1-P VB	VB
K02	1-Q ECU GND	GND
K03	2-P VB	VB
K04	2-Q ECU GND	GND
K05	3-P VB	VB
K06	3-Q ECU GND	GND
K13	1-X Speed selection enable	APP-IP6
K14	1-Y Starter permission 1	APP-IP9
K15	1-Z LO pressure switch	LOPSW
K16	1-AA Speed 2	APP-IP4
K17	1-AB Hi-idle speed select	APP-IP8
K18	1-AC DPF regeneration request	REGSW
K19	1-AD Speed 1	APP-IP3
K20	1-AE Intake valve sensor	IVPS
K21	1-AF Analog GND	A-GND
K22	1-AG Accelerator pedal	PDLSW
K23	1-AH Sensor 5 V	5VS
K24	1-AI Sensor 5 V	5VS
K25	1-AJ DPF regeneration request	DPF-M1
K26	1-AK Iso-chronous lamp	APP-OP2
K27	1-AL DPF regeneration inhibit lamp	DPF-M2

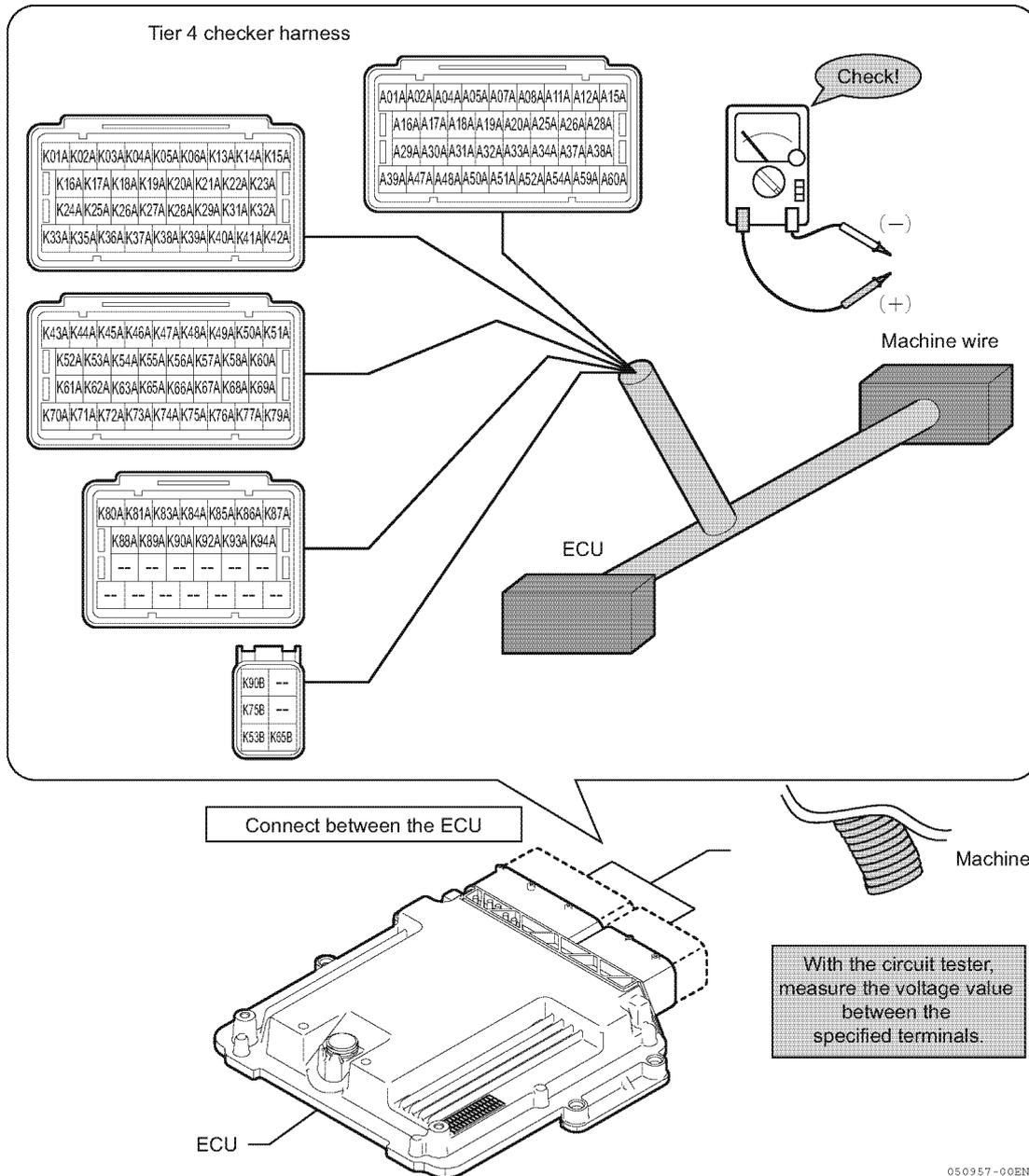
No.	Terminal function name	Code	No.	Terminal function name	Code
A39	3-I Crank speed	CKSPD	K28	1-AM Starter relay	STR-RLY
A47	4-B Injector H	INJH1 - 4	K29	2-R External 12 V	UB2
A50	4-E External 12 V	UB3	K31	2-T DPF regeneration inhibit	REGMSW
A51	4-F Analog GND	A-GND	K32	2-U Engine stop 1	SHUDNSW
A52	4-G Analog GND	A-GND	K33	2-V EGR gas temperature sensor	TEGR
K35	2-X Key switch start	STARTSW	K67	3-AH Engine stop 2	APP-IP7
K36	2-Y Reserve analog	REAN	K68	3-AI External 12 V	UB2
K37	2-Z Droop	APP-IP1	K69	3-AJ EGT lamp	DPF-M3
K38	2-AA Starter permission 2	APP-IP2	K70	3-AK Starting aid relay	SAID-RLY
K39	2-AB EGR low-side pressure sensor	PEGRL	K71	3-AL DPF regeneration acknowledge lamp	DPF-M4
K40	2-AC Water separator sensor	WSSW	K72	3-AM Amber warning lamp	REOP3
K41	2-AD Air cleaner sensor	ACLSW	K73	4-R External 12 V	UB5
K42	2-AE Hi-idle limit enable	APP-IP5	K74	4-S Analog GND	A-GND
K43	2-AF Sensor 5 V	5VS	K75	4-T CAN-H2	CAN2H
K44	2-AG Sensor 5 V	5VS	K76	4-U CAN-L1	CAN1L
K45	2-AH Sensor 5 V	5VS	K77	4-V Analog GND	A-GND
K46	2-AI Sensor 5 V	5VS	K79	4-X Fresh air temperature sensor	TFAIR
K47	2-AJ Load ratio monitor	LOAD-M	K80	4-Y DPF inside temperature sensor	TDPFM
K48	2-AK Red engine stop lamp	REOP4	K81	4-Z DPF inlet temperature sensor	TDPFI
K49	2-AL CWT warning lamp	OVHT-LMP	K83	4-AB Accelerator sensor 2	APS2
K50	2-AM Pre-heat lamp	PREHT-LMP	K84	4-AC Analog GND	A-GND
K51	3-R External 12 V	UB3	K85	4-AD EGR hi-side pressure sensor	PEGR
K52	3-S Analog GND	A-GND	K86	4-AE Regeneration interlock	WDSBSW
K53	3-T CAN-L2	CAN2L	K87	4-AF Analog GND	D-GND
K54	3-U CAN-H1	CAN1H	K88B	4-AG Key switch on	IGNSW
K55	3-V Analog GND	A-GND	K89	4-AH External 12 V	UB3
K56	3-W Exhaust gas temperature sensor	TEXMN	K90	4-AI External 12 V	UB3
K58	3-Y Accelerator sensor 3	APS3	K92	4-AK Failure lamp	FAIL-LMP
K60	3-AA Analog GND	A-GND	K93	4-AL Speed selection lamp	APP-OP1
K61	3-AB Accelerator sensor 1	APS1	K94	4-AM Speed monitor	NRPM-M
K62	3-AC Analog GND	A-GND			
K63	3-AD DPF differential pressure sensor	PDPF			
K65	3-AF Analog GND	D-GND			
K66	3-AG Alternator L terminal	CHGSW			

■ How to use the Tier 4 checker harness

When you perform the ECU related failure diagnosis, use the Tier 4 checker harness to measure the voltage value. Therefore, remove the ECU and the machine wire-harness and connect the Tier 4 checker harness between the ECU and the machine wire-harness prior to the failure diagnosis.

Note • For the details of the failure diagnosis on each part, refer to the following description.

- Use the circuit tester to measure the voltage value in accordance with the following table as a reference.



Sensor related

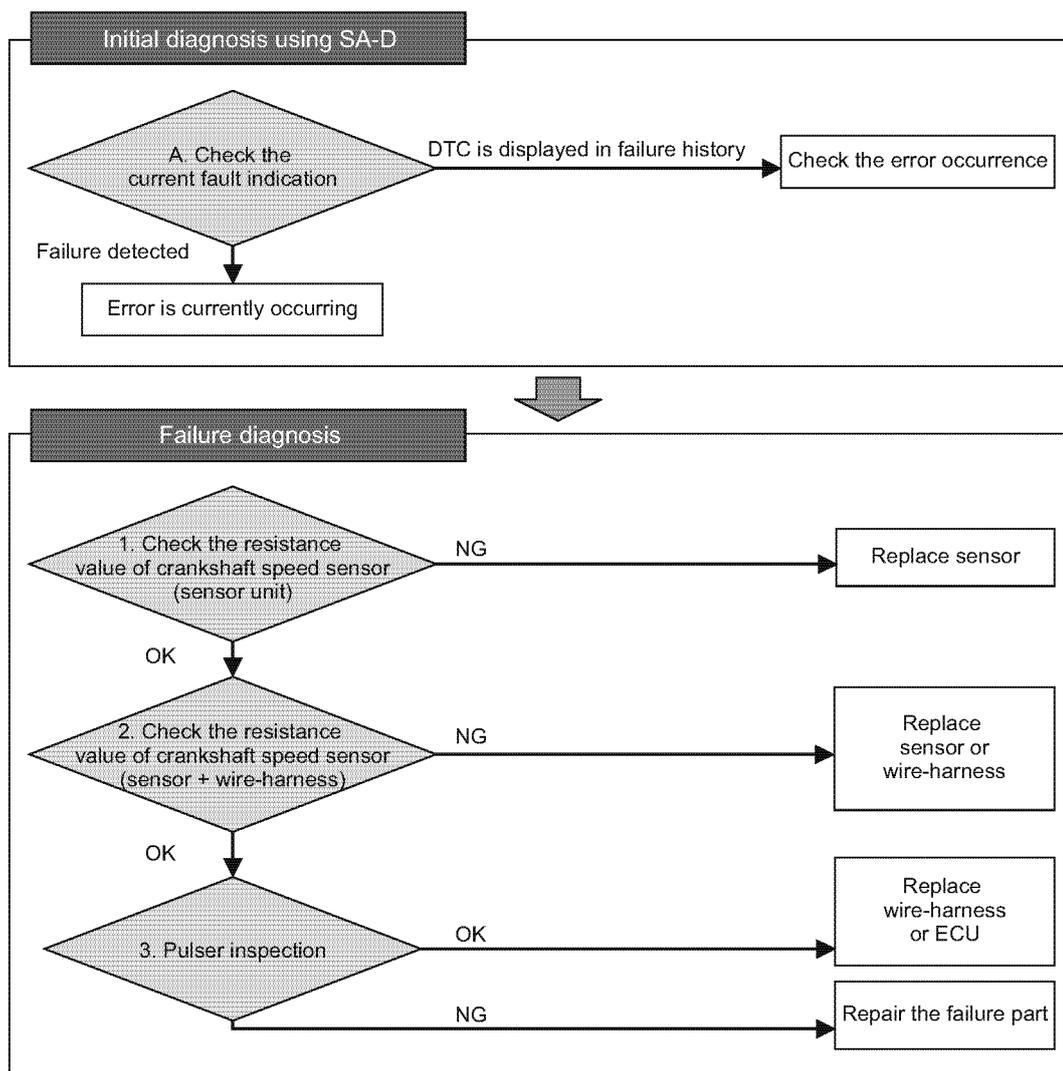
■ Crankshaft speed sensor

● Related DTC

P code	SPN/FMI	Name
P0336	522400/2	Crankshaft signal error
P0337	522400/5	No signal from crankshaft
P0008	523249/5	Crankshaft/camshaft speed sensor non-input (simultaneous)

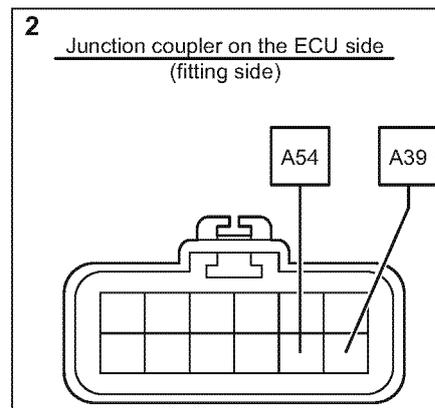
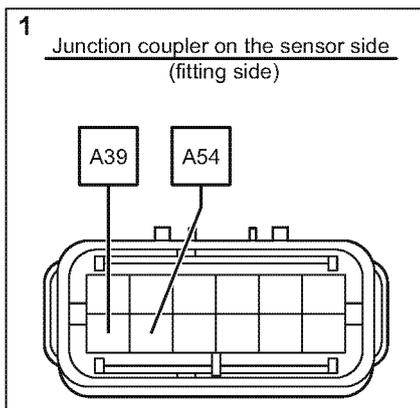
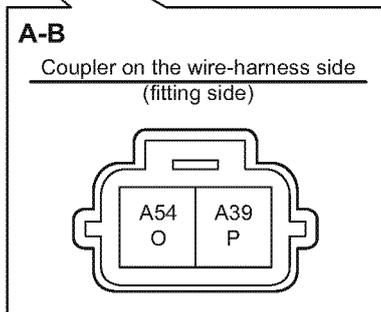
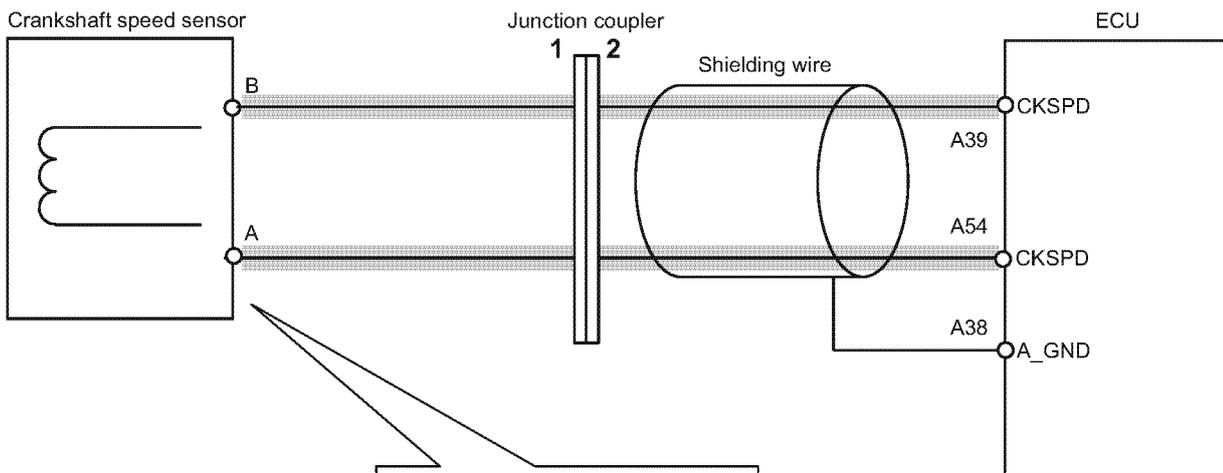
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



045705-00 EN00

● Wire diagram



045706-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the resistance values of the crankshaft speed sensor

- 1- Remove the crankshaft speed sensor from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between crankshaft speed sensors A and B.

Reference: Resistance value between crankshaft speed sensor terminals

Terminal	Specifications
Sensor A - B	1050 Ω (Error 10 %)

NG	Replace the crankshaft speed sensor.
OK	Go to "Checking the resistance values of the crankshaft speed sensor (sensor and wire-harness)".

2. Checking the resistance values of the crankshaft speed sensor (sensor and wire-harness)

- 1- Remove the ECU from the wire-harness while the crankshaft speed sensor and the wire-harness are connected.
- 2- Using a circuit tester, measure the resistance value between ECU connector terminals A39 - A54 on the wire-harness side.

Note: See the above "Reference: Resistance value between crankshaft speed sensor terminals".

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Pulser inspection".

3. Pulser inspection

- 1- Check the pulser for cracks, pieces of metal, distortion, etc.

NG	Repair the failure part.
OK	<ul style="list-style-type: none"> • The coupler between the ECU and the wire-harness may be defective. Replace the wire-harness. • Replace the ECU.

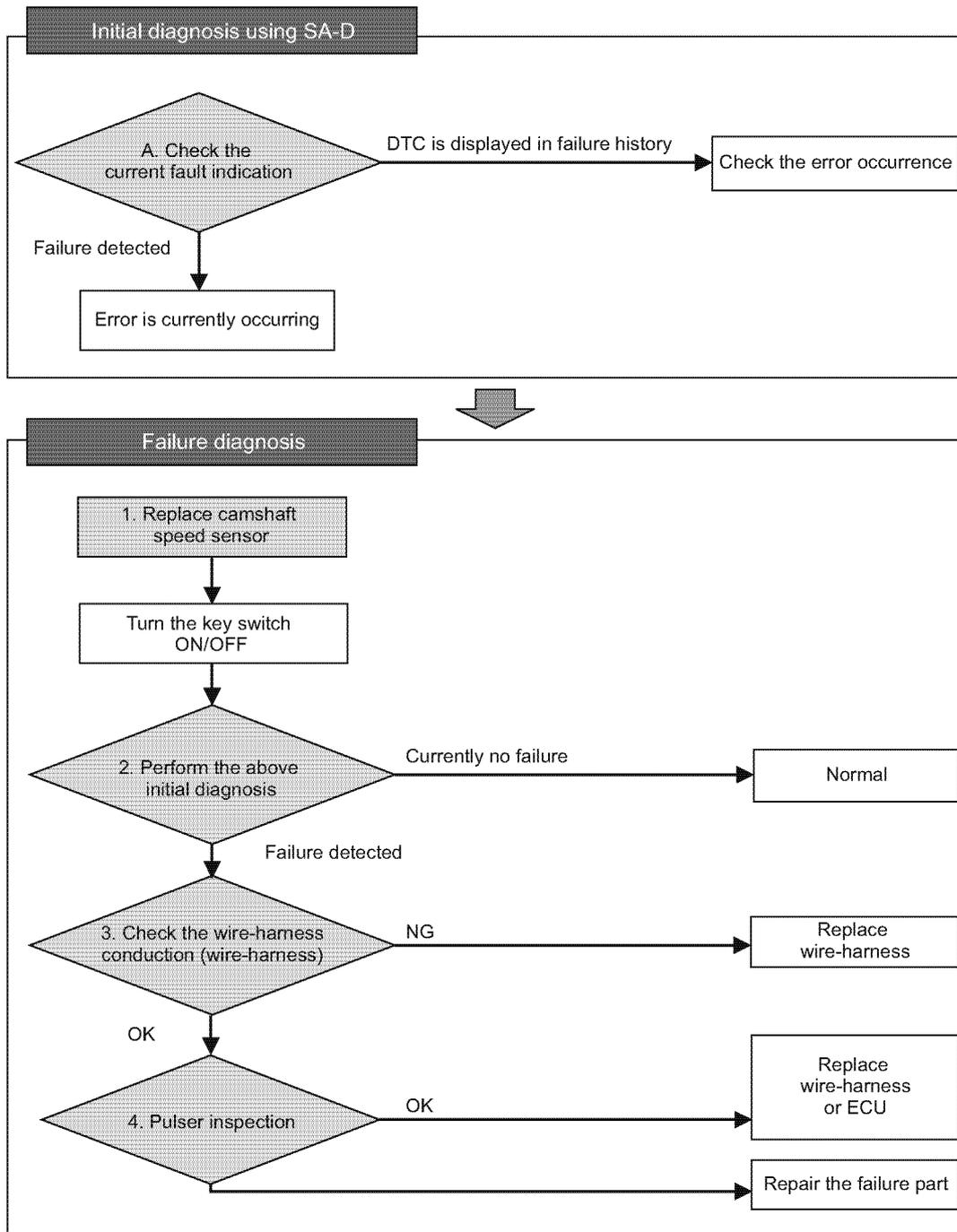
■ Camshaft speed sensor

● Related DTC

P code	SPN/FMI	Name
P0341	522401/2	Camshaft signal error
P0342	522401/5	No signal from camshaft
P0008	523249/5	Crankshaft/camshaft speed sensor non-input (simultaneous)

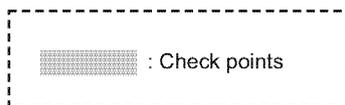
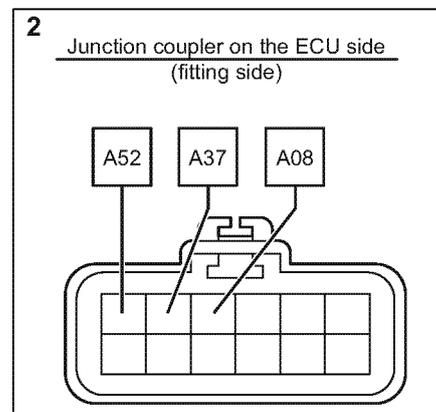
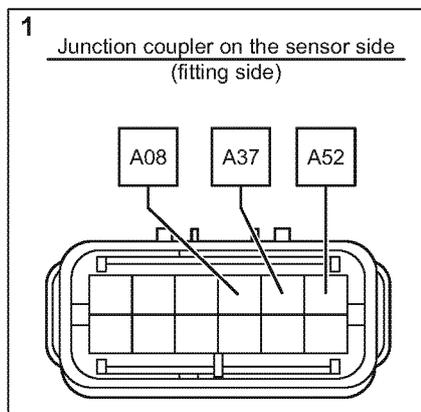
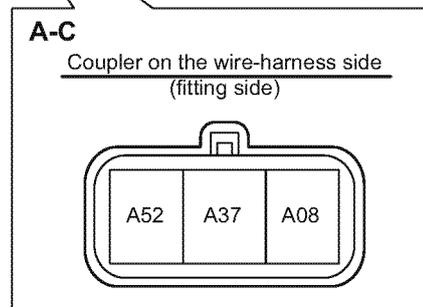
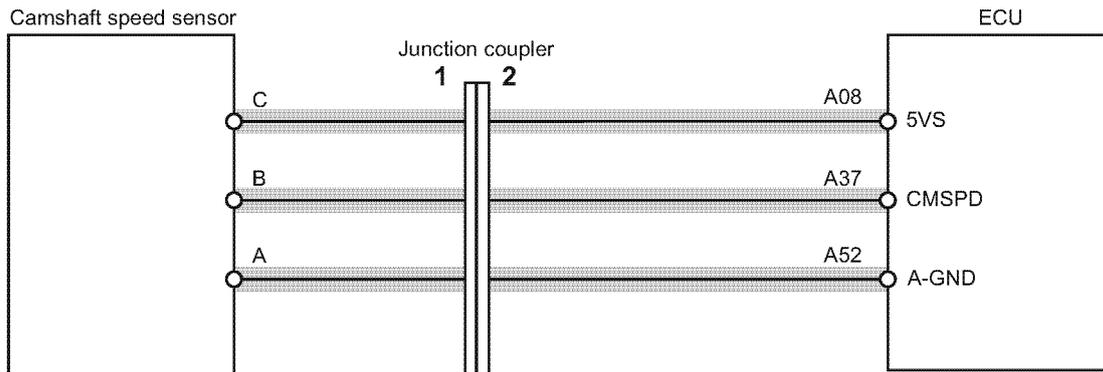
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



04 35 66-02EN01

● Wire diagram



045708-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Replacing the camshaft speed sensor

1-Remove the camshaft speed sensor from the wire-harness and replace it.

2. Operation using SA-D

1-Turn off the key switch, turn on the key switch again, and start the engine.

2-Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Go to "Checking the wire-harness conduction".

3. Checking the wire-harness conduction

1-Remove the wire-harness from the camshaft speed sensor and the ECU. However, connect the junction coupler.

2-While referring to the P316 "ECU pin layout diagram", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Pattern for checking the conduction of the camshaft speed sensor 1

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on camshaft speed sensor side)	Conduction	State
A08	Camshaft speed sensor terminal C	No	NG: Error
		Yes	OK: Normal
A37	Camshaft speed sensor terminal B	No	No
		Yes	Yes
A52	Camshaft speed sensor terminal A	No	No
		Yes	Yes

Reference: Pattern for checking the conduction of the camshaft speed sensor 2

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on ECU side)	Conduction	State
A08	All other terminals	Yes	NG: Error
		No	OK: Normal
A37		Yes	NG: Error
		No	OK: Normal
A52		Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to "Pulser inspection".

4. Pulser inspection

1-Check the pulser for cracks, pieces of metal, distortion, etc.

NG	Repair the failure part.
OK	<ul style="list-style-type: none"> Replace the wire-harness. Replace the ECU.

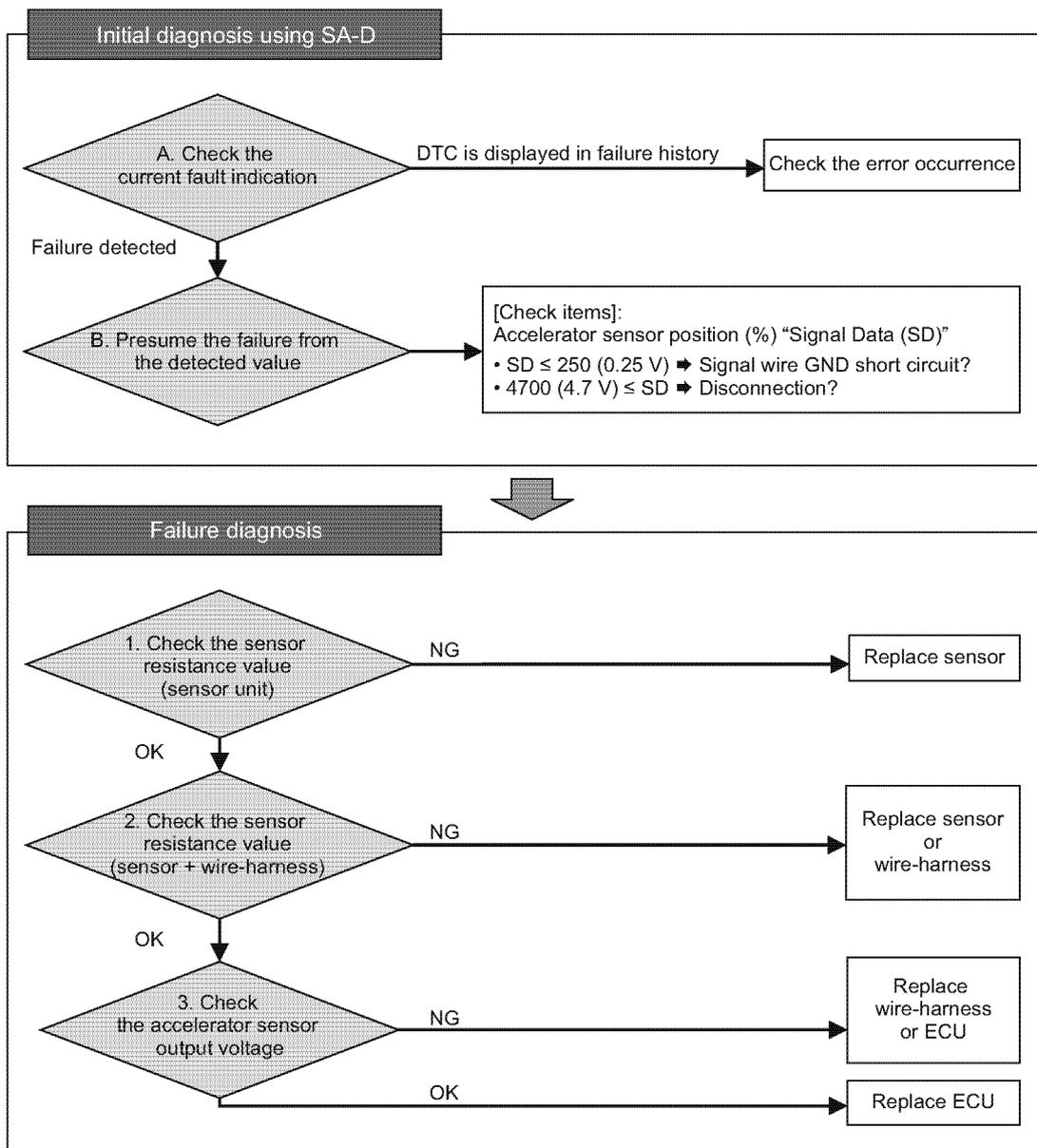
■ Accelerator sensor

● Related DTC

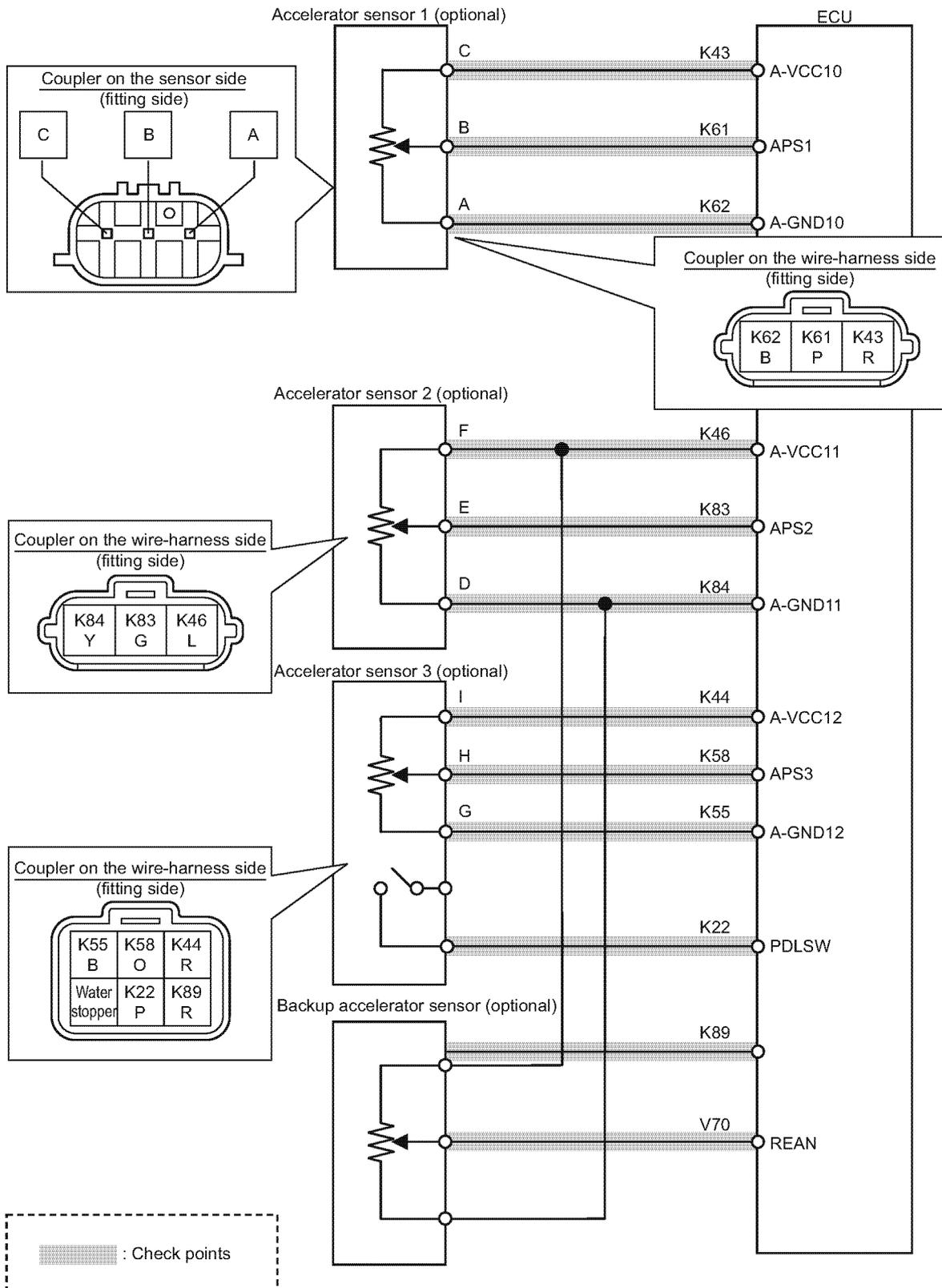
P code	SPN/FMI	Name
P0123	91/3	Accelerator sensor 1 error (voltage high)
P0122	91/4	Accelerator sensor 1 error (voltage low)
P0223	28/3	Accelerator sensor 2 error (voltage high)
P0222	28/4	Accelerator sensor 2 error (voltage low)
P0228	29/3	Accelerator sensor 3 error (voltage high)
P0227	29/4	Accelerator sensor 3 error (voltage low)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wiring diagram



043363-01EN02

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)

- Between the accelerator sensor 1 terminals A and C (accelerator sensor 2 terminals D and F) (accelerator sensor 3 terminals G and I) (overall resistance value)

1- Remove the accelerator sensor from the wire-harness.

2- Using a circuit tester, measure the resistance value between sensor terminals A and C (D and F) (G and I) (overall resistance value).

Reference: YANMAR standard accelerator sensor overall resistance value

Terminal	Specifications
Sensor A to C (sensor D to F)	$5 \pm 1.5 \text{ k}\Omega$

NG	Replace the accelerator sensor.
OK	Go to "Between accelerator sensor terminals A and B (D and E) (G and H)".

- Between accelerator sensor terminals A and B (D and E) (G and H)

1- Using a circuit tester, measure the resistance value between accelerator sensor terminals A and B (D and E) (G and H).

2- Move the accelerator throttle, and check if the resistance value between accelerator sensor terminals A and B fluctuates.

NG	Replace the accelerator sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- Between wire-harnesses K43 and K62 (K46 and K84) (K44 and K55) (overall resistance value)

1- Connect the accelerator sensor and wire-harness then remove the ECU from the wire-harness.

2- Using a circuit tester, measure the resistance value (overall resistance value) between ECU connectors K43 and K62 (K46 and K84) (K44 and K55) on the wire-harness side.

Note: See above "Reference: YANMAR standard accelerator sensor overall resistance value".

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Between wire-harnesses K61 and K62 (K83 and K84) (K58 and K55)".

- Between wire-harnesses K61 and K62 (K83 and K84) (K58 and K55)

1- Using a circuit tester, measure the resistance value between ECU connectors K61 and K62 (K83 and K84) (K58 and K55).

2- Move the accelerator throttle, and check if the resistance value between ECU connectors K61 and K62 (K83 and K84) (K58 and K55) fluctuates.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the accelerator sensor output voltage".

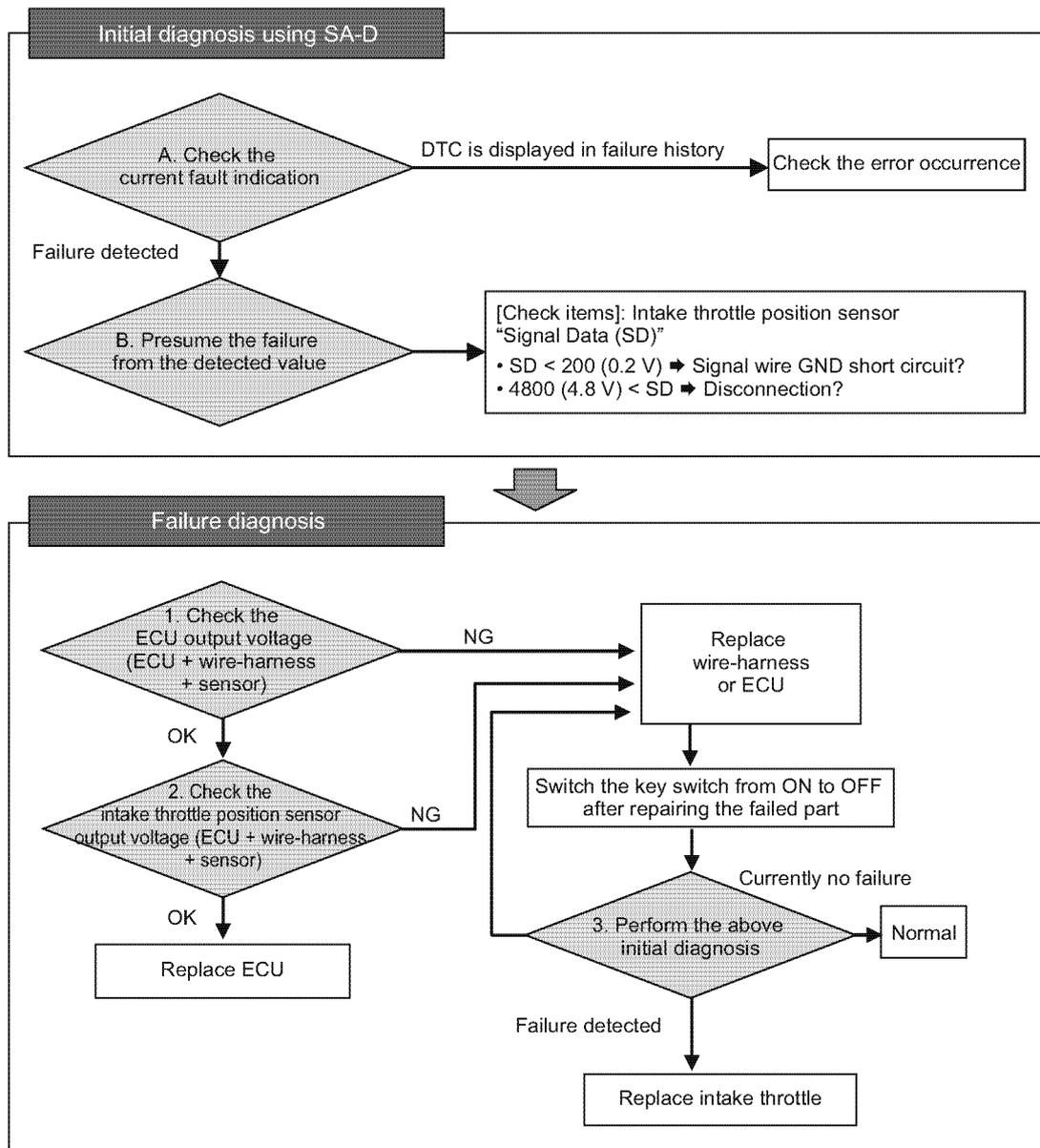
■ Intake throttle position sensor

● Related DTC

P code	SPN/FMI	Name
P02E8	51/4	Intake throttle position sensor error (voltage low)
P02E9	51/3	Intake throttle position sensor error (voltage high)

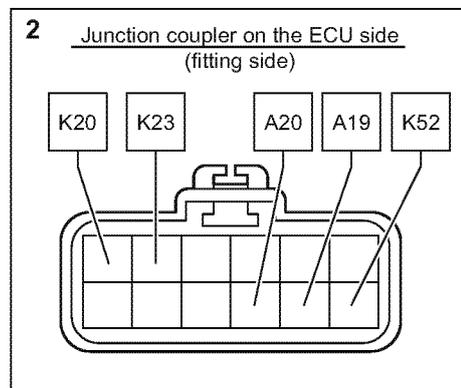
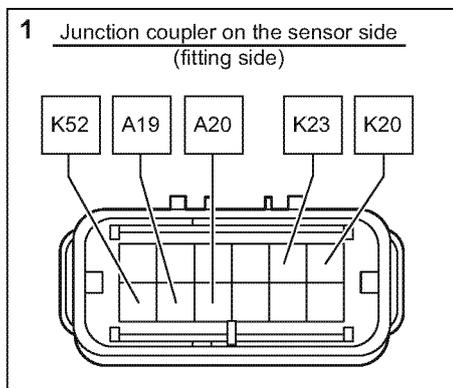
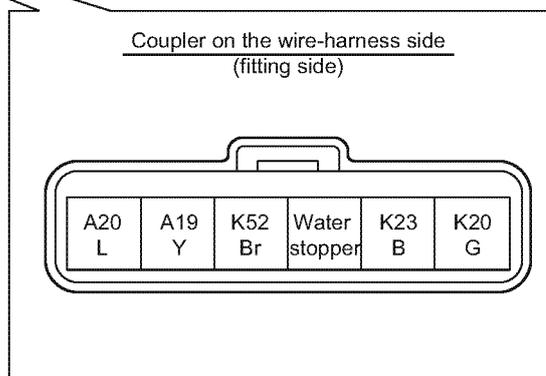
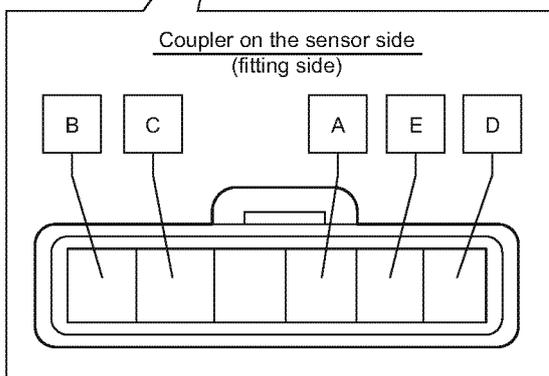
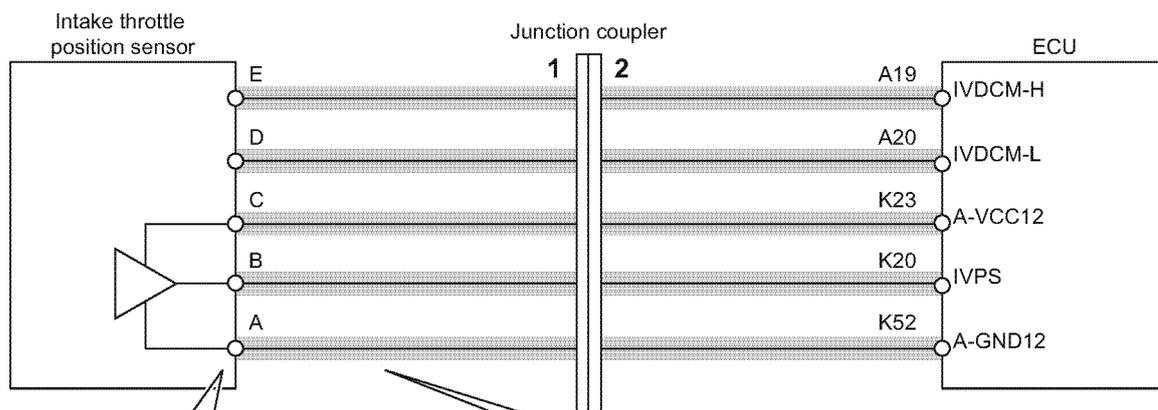
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



050230-01EN01

● Wiring diagram



: Check points

050240-00EN01

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the ECU output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).
- 2-Using a circuit tester, measure the voltage between the intake throttle position sensors 5 V K23 and K52.

Voltage	State	Corrective action
$K23 < 4.375 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$4.375 \text{ V} \leq K23 \leq 5.625 \text{ V}$	OK (Normal range)	Check the intake throttle position sensor output voltage.
$5.625 \text{ V} < K23$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness or ECU, and turn off and on the key switch and perform the diagnosis using the SMARTASSIST-DIRECT (SA-D).
OK	Go to "Checking the intake throttle position sensor output voltage".

2. Checking the intake throttle position sensor output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).
- 2-Using a circuit tester, measure the voltage between the sensor signals K20 and K52.

Voltage	State	Corrective action
$K20 < 0.6 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.65 \text{ V} \leq K20 \leq 4.4 \text{ V}$	OK (Normal range)	Replace the ECU.
$4.4 \text{ V} < K20$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness or ECU, and turn off and on the key switch and perform the diagnosis using the SMARTASSIST-DIRECT (SA-D).
OK	Replace the ECU.

3. Operation using SA-D

- 1-Turn off the key switch, turn on the key switch again, and start the engine.
- 2-Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Applied	Replace the intake throttle.

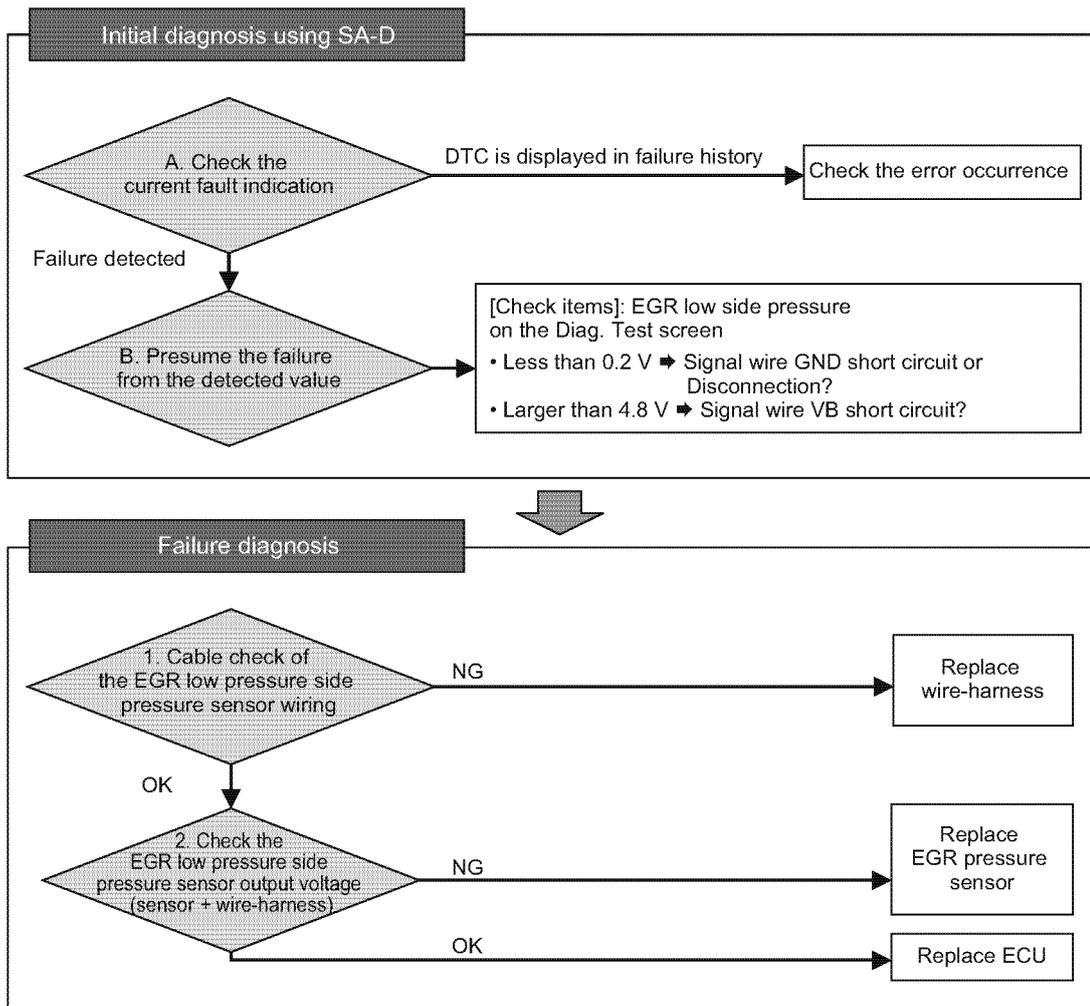
■ EGR low pressure side pressure sensor

● Related DTC

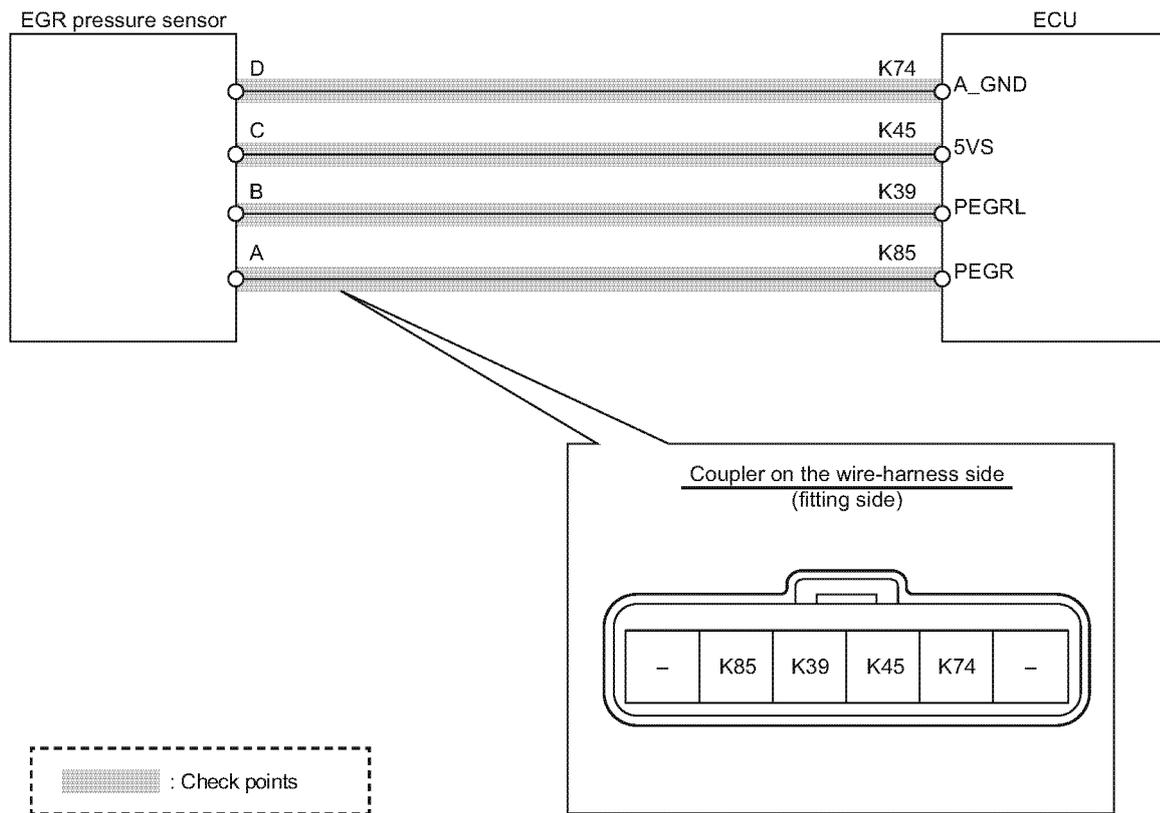
P code	SPN/FMI	Name
P0238	102/3	EGR low pressure side pressure sensor error (excessive sensor output)
P0237	102/4	EGR low pressure side pressure sensor error (insufficient sensor output)
P0236	102/13	EGR low pressure side pressure sensor error (abnormal learning value)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



050737-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Cable check of the EGR low pressure side pressure sensor wiring

- 1- Remove the wire-harness from the EGR pressure sensor and the ECU.
- 2- Using a circuit tester, check the cable of the wire-harness.

Terminal	Cable check	State
Between B and K39	OK	Normal
	NG	Wire-harness failure
Between C and K45	OK	Normal
	NG	Wire-harness failure
Between D and K74	OK	Normal
	NG	Wire-harness failure

NG	<ul style="list-style-type: none"> • Check if the wire-harness is damaged or there is mis-wiring. • Replace the wire-harness.
OK	Go to "Check the EGR low pressure side pressure sensor output voltage (sensor + wire-harness)".

2. Checking the EGR low pressure side pressure sensor output voltage (sensor + wire-harness)

- 1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, ECU).
- 2- Using a circuit tester, measure the voltage value between the EGR low pressure side pressure sensor signals K39 and K74.

Voltage	State	Corrective action
$K39 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq K39 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < K39$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

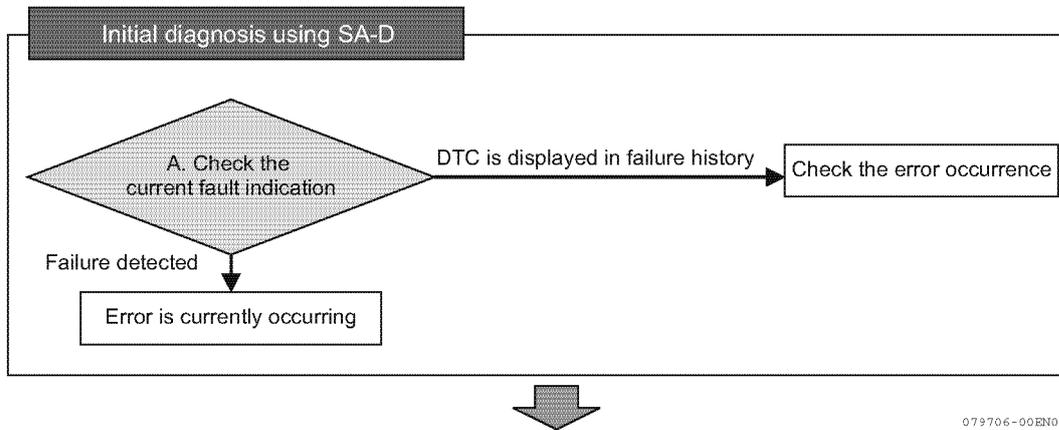
NG	Replace the EGR pressure sensor. Then, check the output voltage again.
OK	Replace the ECU.

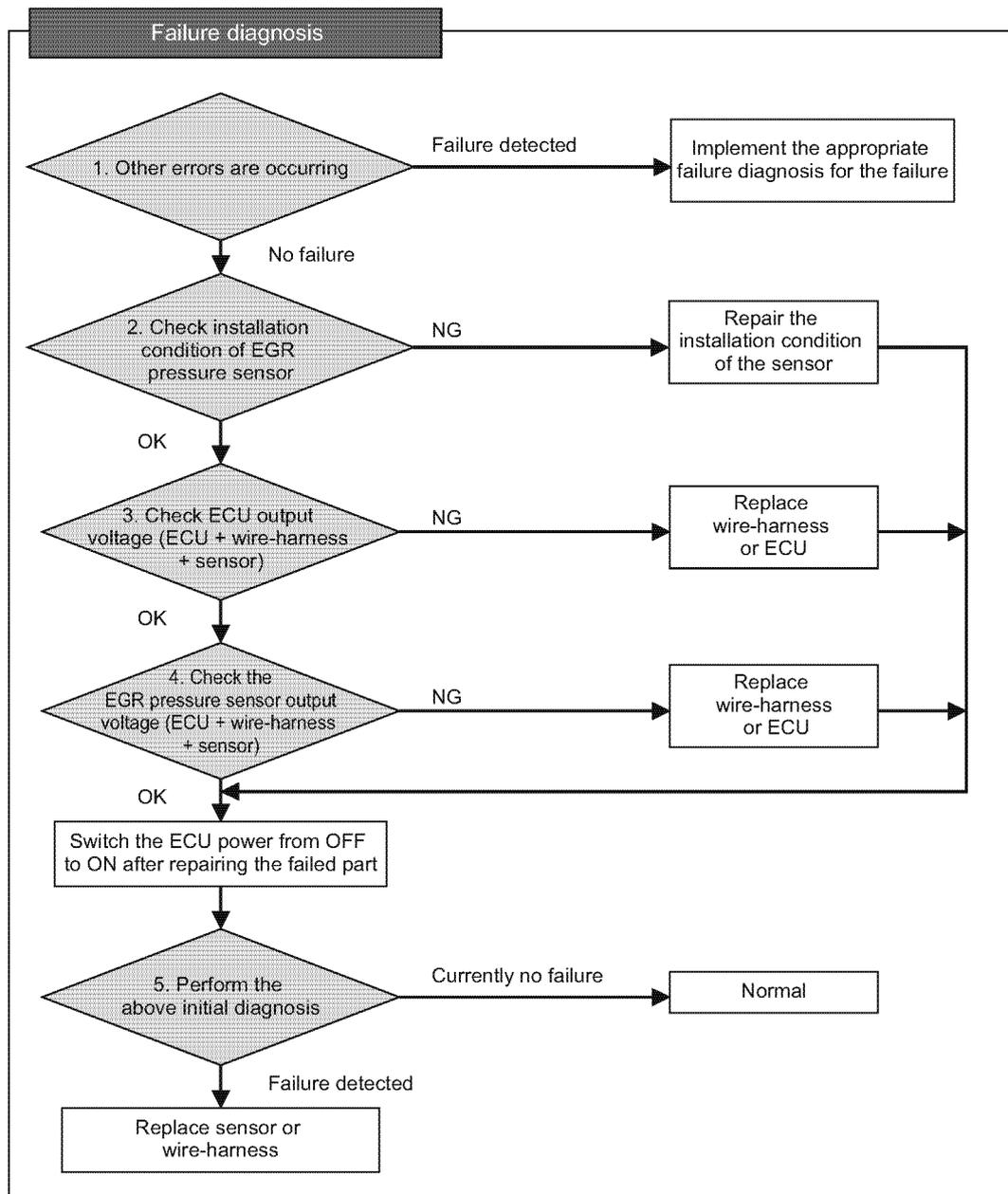
● Related DTC

P code	SPN/FMI	Name
P1673	102/10	EGR low pressure side pressure sensor error (detected value error)

● Workflow

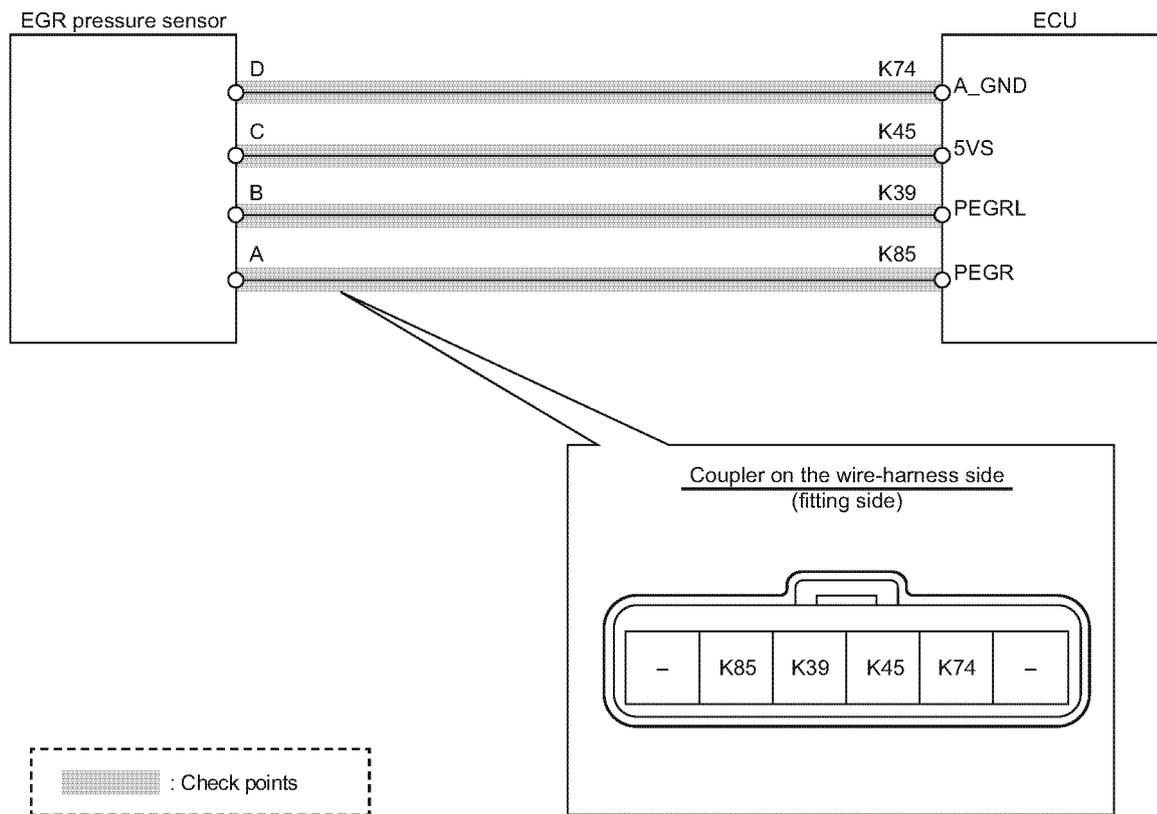
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





079739-00EN00

● Wire diagram



050737-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Checking for other errors

1-Turn off the key switch and turn on the key switch again.

2-Connect the SA-D and check the current fault indication to see whether any other errors are detected.

Particularly, check to see whether any errors are detected for EGR pressure sensor, atmospheric pressure sensor, engine coolant temperature sensor, ambient air temperature sensor, sensor 5 V circuit 2, or inside the ECU.

Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to "Checking the installation condition of EGR pressure sensor".

2. Checking the installation condition of EGR pressure sensor

1-Turn off the key switch.

2-Check the installation condition of EGR pressure sensor.

3-Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

NG	Reinstall the sensor, and turn off/on the ECU power for failure diagnosis using SA-D.
OK	Go to "Checking the ECU output voltage".

3. Checking the ECU output voltage

1-Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).

2-Using a circuit tester, measure the voltage between EGR pressure sensors 5 V K45 and K74.

Voltage	State	Corrective action
$K45 < 4.375 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$4.375 \text{ V} \leq K45 \leq 5.625 \text{ V}$	OK (normal range)	Check the EGR pressure sensor output voltage.
$5.625 \text{ V} < K45$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness or ECU, and turn off and on the ECU power for failure diagnosis using SA-D.
OK	Go to "Checking the EGR pressure sensor output voltage".

4. Checking the EGR pressure sensor output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).
- 2-Using a circuit tester, measure the voltage of the sensor signal between K45 (K85) and K74.

Voltage	State	Corrective action
$K45 (K85) < 0.5 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.5 \text{ V} \leq K45 (K85) \leq 4.5 \text{ V}$	OK (normal range)	Perform failure diagnosis using SA-D.
$4.5 \text{ V} < K45 (K85)$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness or ECU, and turn off and on the ECU power for failure diagnosis using SA-D.
OK	Switch the ECU power from OFF to ON for failure diagnosis using SA-D.

5. Operation using SA-D

- 1-Turn off the key switch and turn on the key switch again to start the engine. Operate the engine that satisfies the reset criteria for P1673: EGR low pressure side pressure sensor error (detected value error) (P50).
- 2-Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the EGR pressure sensor or ECU.

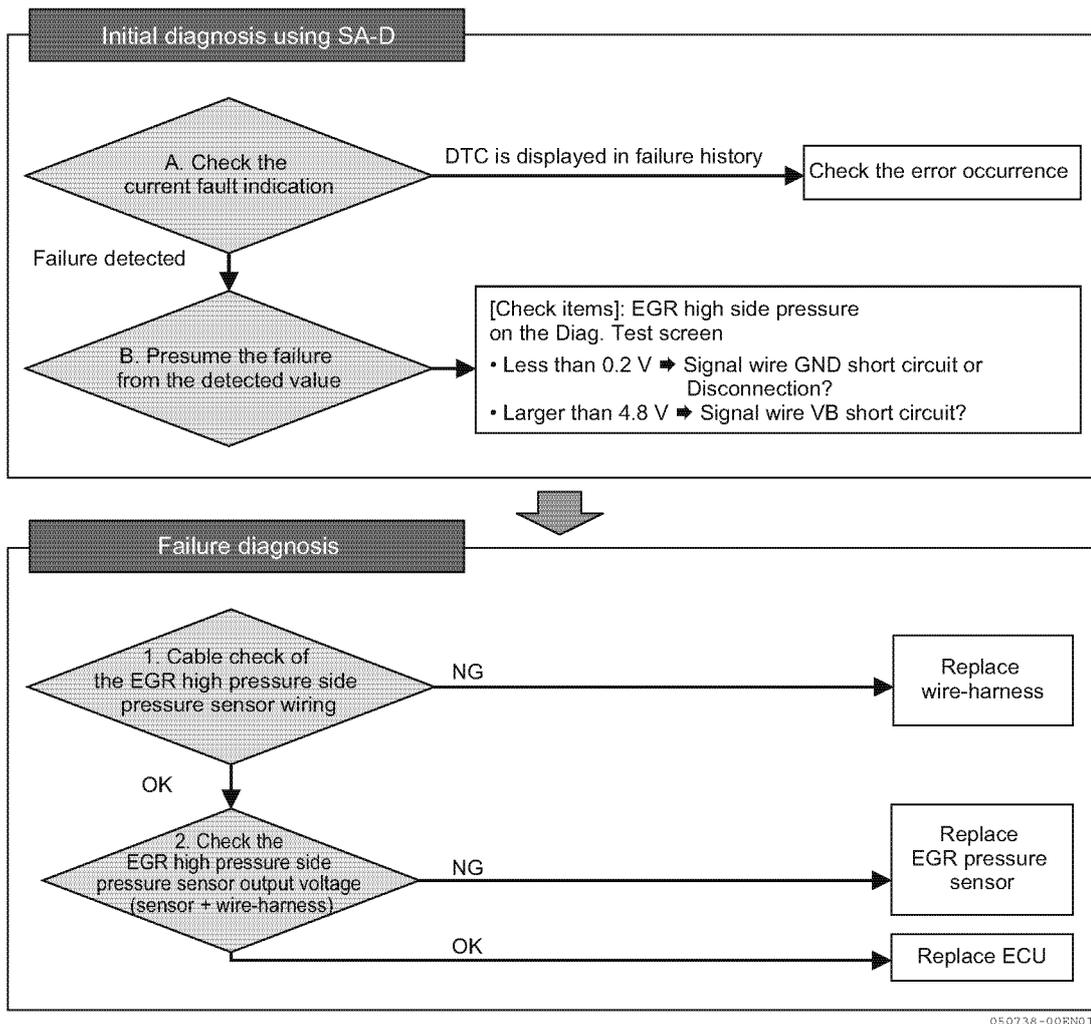
■ EGR high pressure side pressure sensor

● Related DTC

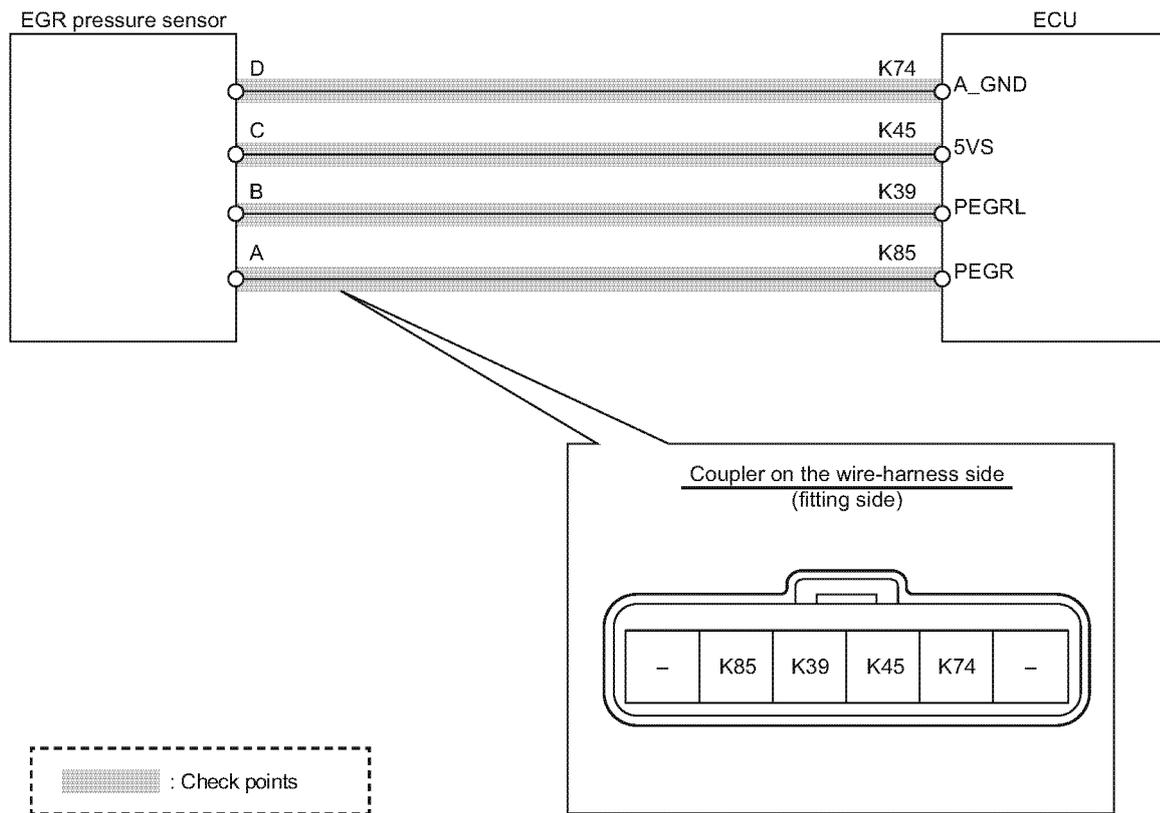
P code	SPN/FMI	Name
P0473	1209/3	EGR high pressure side pressure sensor error (excessive sensor output)
P0472	1209/4	EGR high pressure side pressure sensor error (insufficient sensor output)
P0471	1209/13	EGR high pressure side pressure sensor error (abnormal learning value)
P1679	1209/10	EGR high pressure side pressure sensor error (detected value error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P316 for the ECU pin layout.

● Work description

1. Cable check of the EGR high pressure side pressure sensor wiring

- 1- Remove the wire-harness from the EGR pressure sensor and the ECU.
- 2- Using a circuit tester, check the cable of the wire-harness.

Terminal	Cable check	State
Between A and K85	OK	Normal
	NG	Wire-harness failure
Between C and K45	OK	Normal
	NG	Wire-harness failure
Between D and K74	OK	Normal
	NG	Wire-harness failure

NG	<ul style="list-style-type: none"> • Check if the wire-harness is damaged or there is mis-wiring. • Replace the wire-harness.
OK	Go to "Check the EGR high pressure side pressure sensor output voltage (sensor + wire-harness)".

2. Checking the EGR high pressure side pressure sensor output voltage (sensor + wire-harness)

- 1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, ECU).
- 2- Using a circuit tester, measure the voltage value between the EGR high pressure side pressure sensor signals K85 and K74.

Voltage	State	Corrective action
$K85 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq K85 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < K85$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the EGR pressure sensor. Then, check the output voltage again.
OK	Replace the ECU.

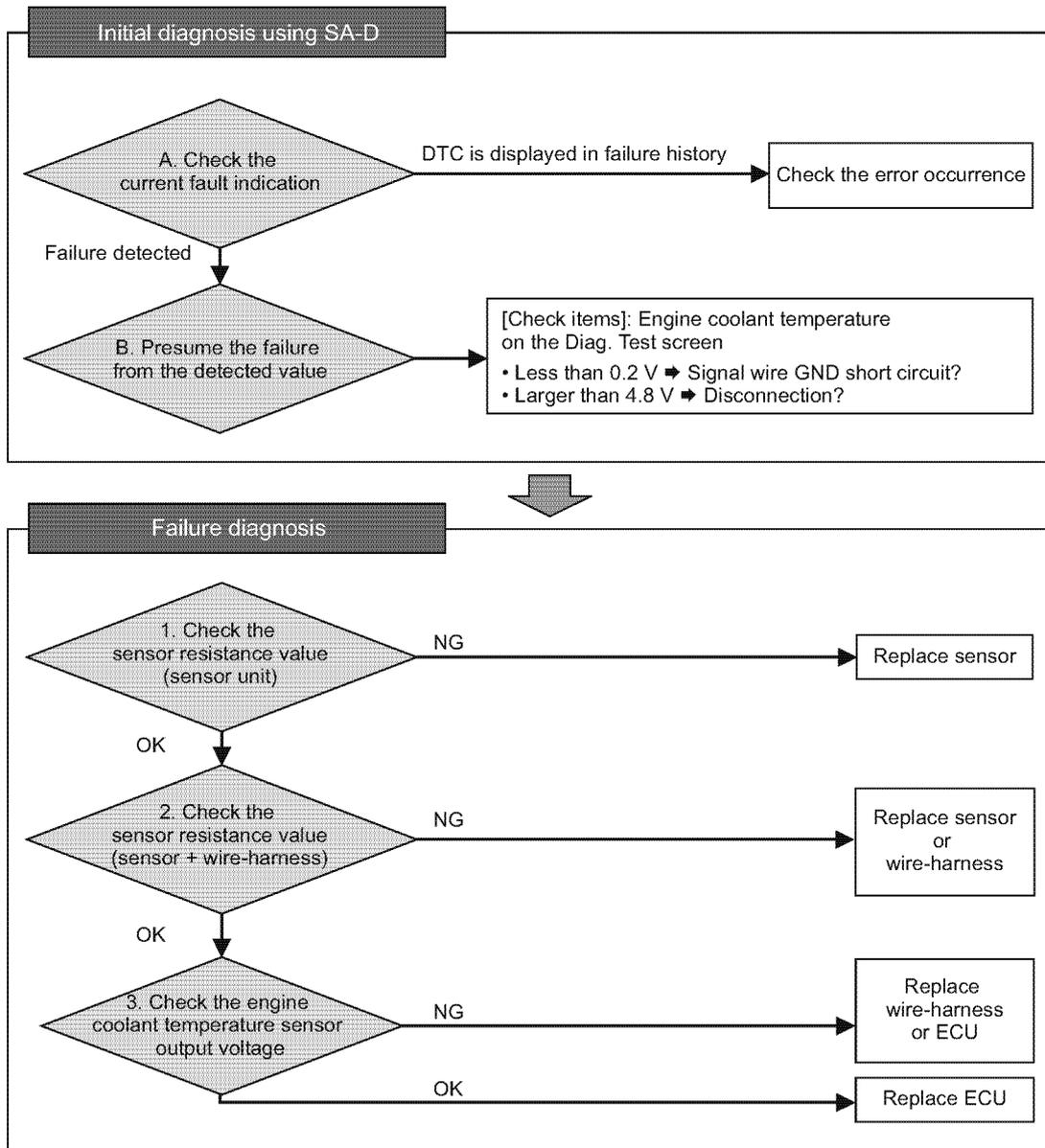
■ Engine coolant temperature sensor

● Related DTC

P code	SPN/FMI	Name
P0118	110/3	Engine coolant temperature sensor error (excessive sensor output)
P0117	110/4	Engine coolant temperature sensor error (insufficient sensor output)
P0217	110/0	Engine coolant temperature high (overheat)

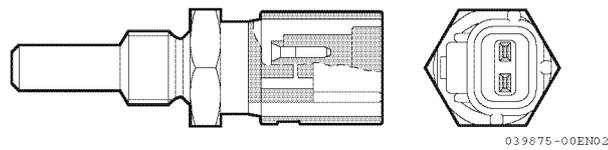
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

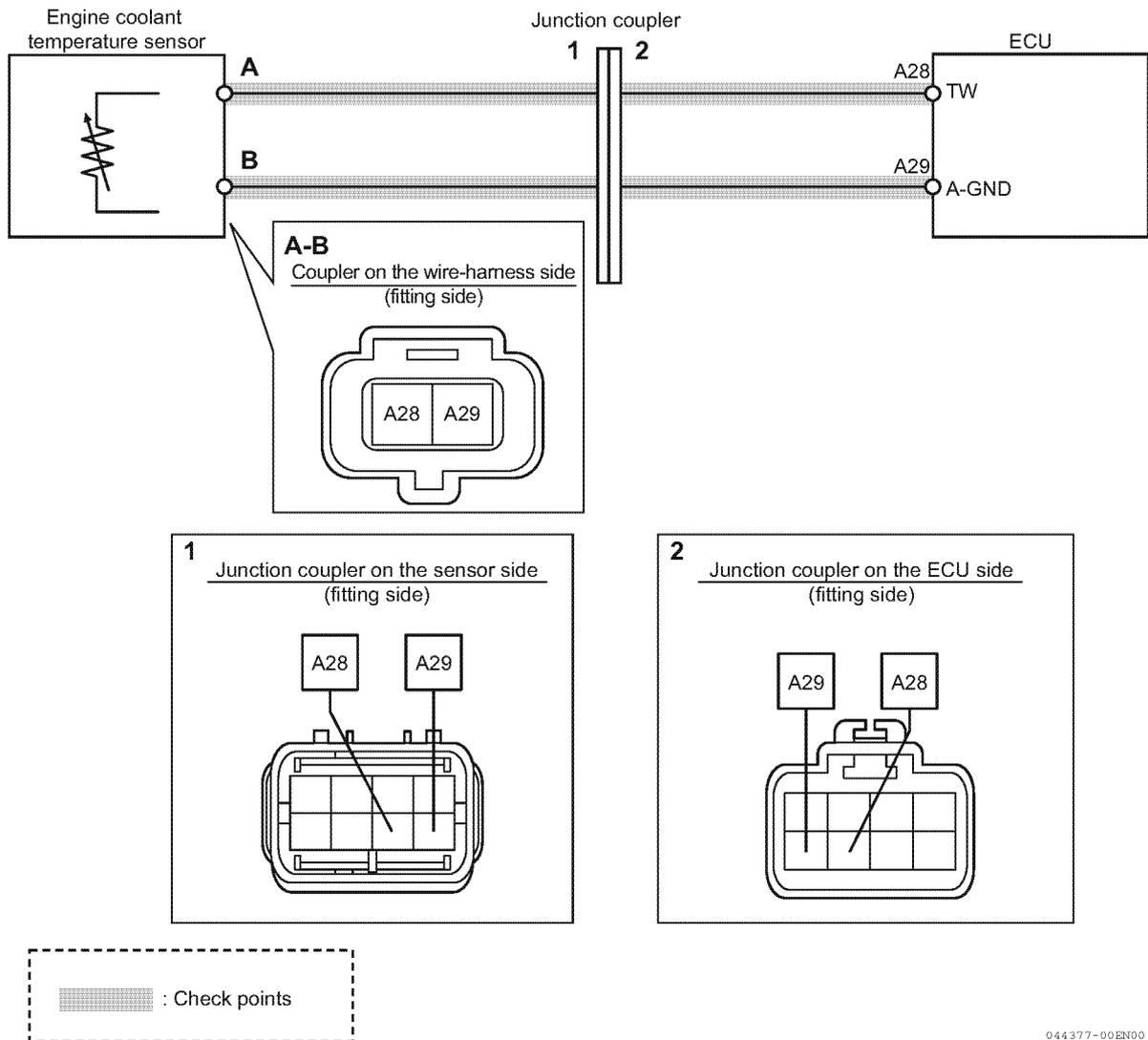


044383-01EN01

● Sensor diagram



● Wire diagram



044377-00EN00

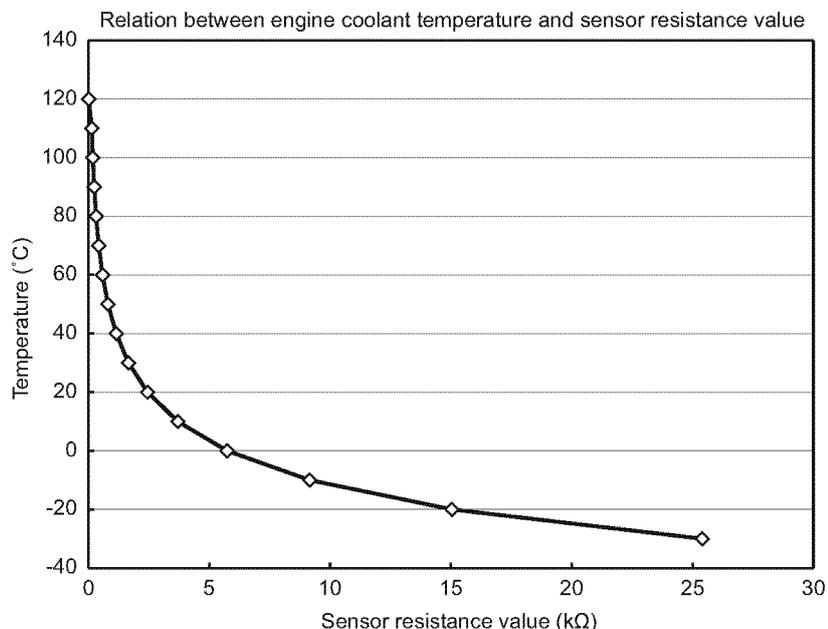
Note: See P316 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)

- 1-Remove the wire-harness from the engine coolant temperature sensor.
- 2-Using a circuit tester, measure the resistance value between engine coolant temperature sensor terminals A and B.
- 3-Using "Engine coolant temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

Engine coolant temperature sensor characteristics



Temperature (°C)	Sensor resistance value (kΩ)
-30	25.40
-20	15.04
-10	9.16
0	5.74
10	3.70
20	2.45
30	1.66
40	1.15
50	0.811
60	0.584
70	0.428
80	0.318
90	0.240
100	0.184
110	0.142
120	0.111

043366-01EN00

NG	Replace the engine coolant temperature sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- 1-Connect the engine coolant temperature sensor and wire-harness, then remove the ECU from the wire-harness.
- 2-Using a circuit tester, measure the resistance value between ECU connector terminals A28 and A29 on the wire-harness side.
- 3-Using "Engine coolant temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the engine coolant temperature sensor output voltage".

3. Checking the engine coolant temperature sensor output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2-Using a circuit tester, measure the voltage of the engine coolant temperature sensor signals between A28 and A29.

Voltage	State	Corrective action
$A28 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq A28 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < A28$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

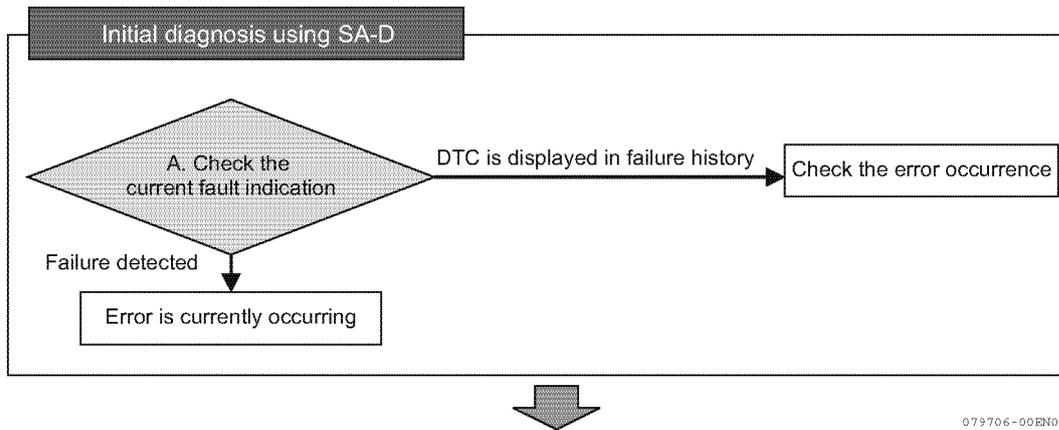
NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

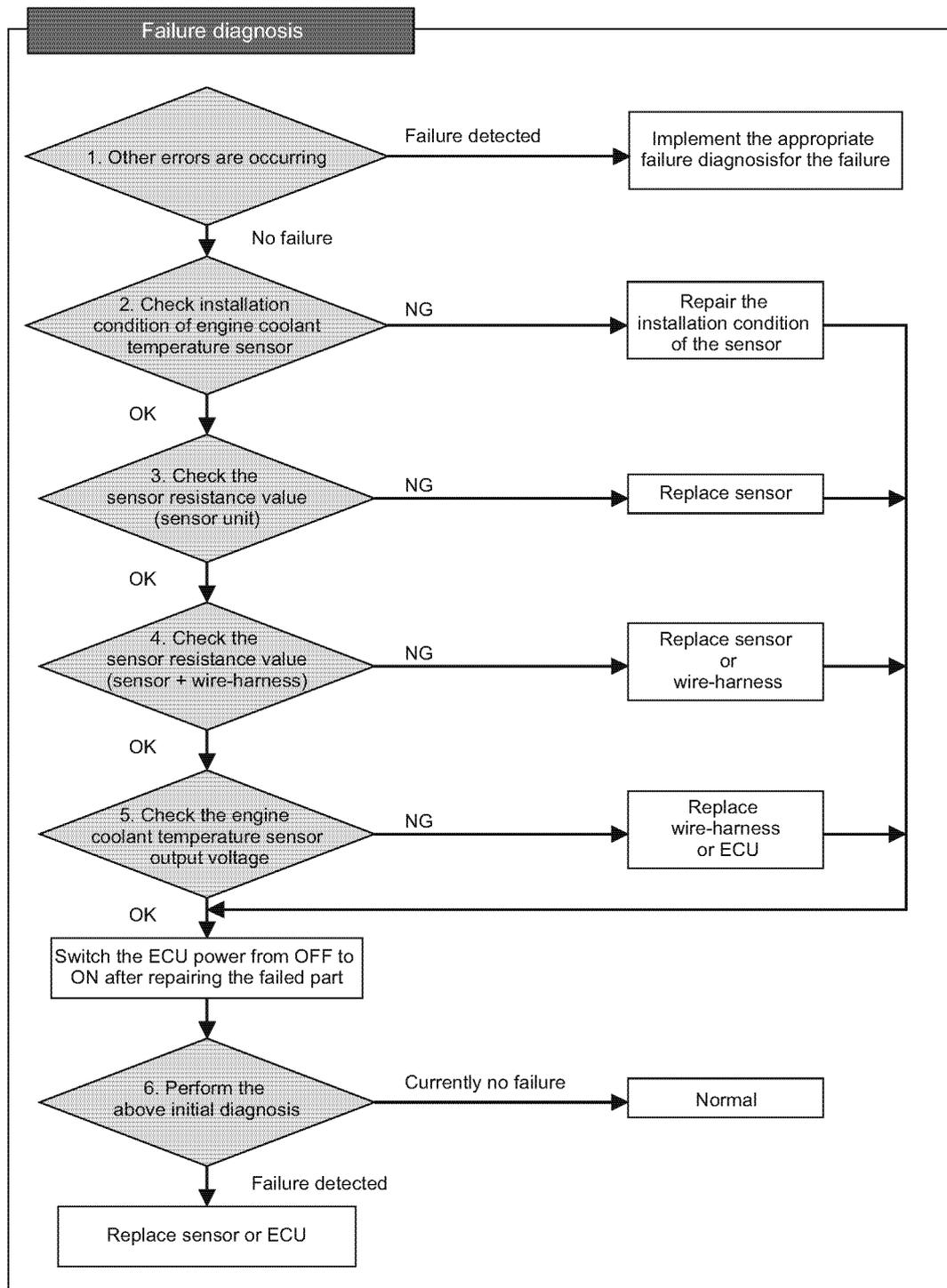
● Related DTC

P code	SPN/FMI	Name
P1674	110/10	Engine coolant temperature sensor error (detected value error)

● Workflow

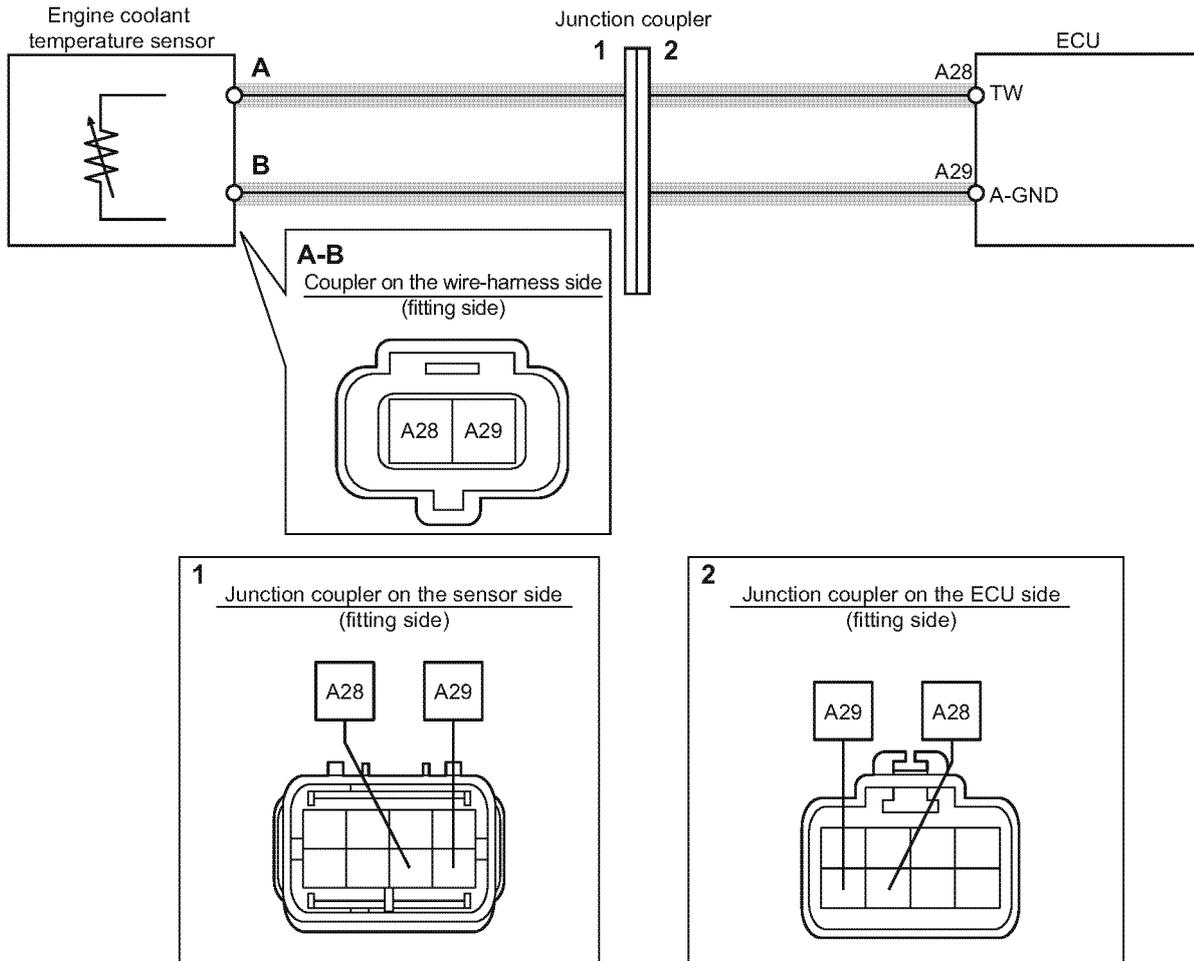
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





079723-00E3100

● Wire diagram



 : Check points

Note: See P316 for the ECU pin layout.

044377-00BNO0

● Work description

1. Checking for other errors

1-Turn off the key switch and turn on the key switch again.

2-Connect the SA-D and check the current fault indication to see whether any other errors are detected.

Particularly, check to see whether any errors are detected for engine coolant temperature sensor or inside the ECU.

Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to "Checking installation condition of engine coolant temperature sensor".

2. Checking installation condition of engine coolant temperature sensor

1-Turn off the key switch.

2-Check the installation condition of engine coolant temperature sensor.

3-Make sure that there is nothing wrong (disconnections and damages) with the engine coolant piping or cooling system.

NG	Reinstall the sensor, and turn off/on the ECU power for failure diagnosis using SA-D.
OK	Go to "Checking the sensor resistance value (sensor unit)".

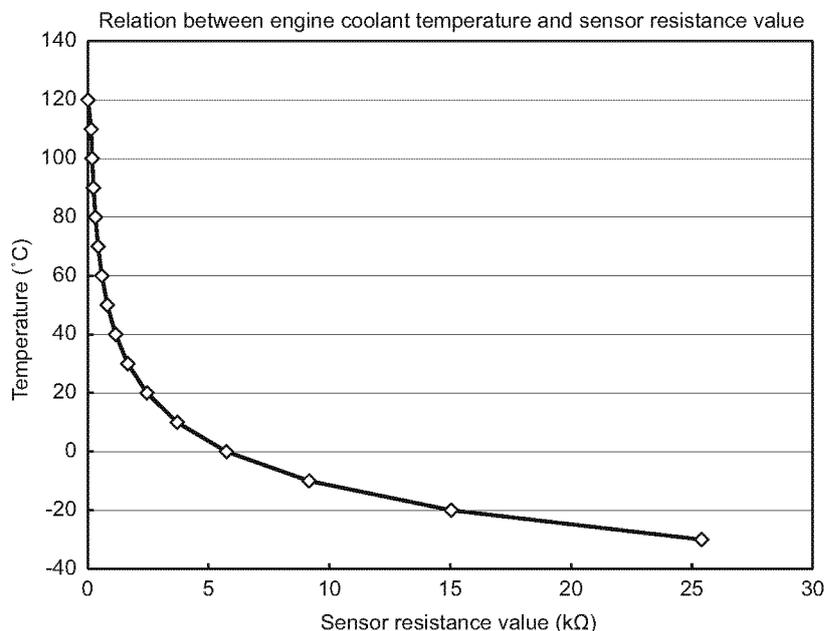
3. Checking the sensor resistance value (sensor unit)

1-Remove the wire-harness from the engine coolant temperature sensor.

2-Using a circuit tester, measure the resistance value between engine coolant temperature sensor terminals A and B.

3-Using "Engine coolant temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

Engine coolant temperature sensor characteristics



Temperature (°C)	Sensor resistance value (kΩ)
-30	25.40
-20	15.04
-10	9.16
0	5.74
10	3.70
20	2.45
30	1.66
40	1.15
50	0.811
60	0.584
70	0.428
80	0.318
90	0.240
100	0.184
110	0.142
120	0.111

043366-01EN00

NG	Replace the engine coolant temperature sensor, and switch the ECU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

4. Checking the sensor resistance value (sensor and wire-harness)

- 1-Connect the engine coolant temperature sensor and wire-harness, then remove the ECU from the wire-harness.
- 2-Using a circuit tester, measure the resistance value between ECU connector terminals A28 and A29 on the wire-harness side.
- 3-Using "Engine coolant temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. Switch the ECU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to "Checking the engine coolant temperature sensor output voltage".

5. Checking the engine coolant temperature sensor output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2-Using a circuit tester, measure the voltage of the engine coolant temperature sensor signals between A28 and A29.

Voltage	State	Corrective action
A28 < 0.1 V	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
0.1 V ≤ A28 ≤ 4.8 V	OK (normal range)	Perform failure diagnosis using SA-D.
4.8 V < A28	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU. Switch the ECU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Switch the ECU power from OFF to ON for failure diagnosis using SA-D.

6. Operation using SA-D

- 1-Turn off the key switch and turn on the key switch again to start the engine. Operate the engine that satisfies the reset criteria for P1674: Engine coolant temperature sensor error (detected value error) (P64).
- 2-Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the engine coolant temperature sensor or ECU.

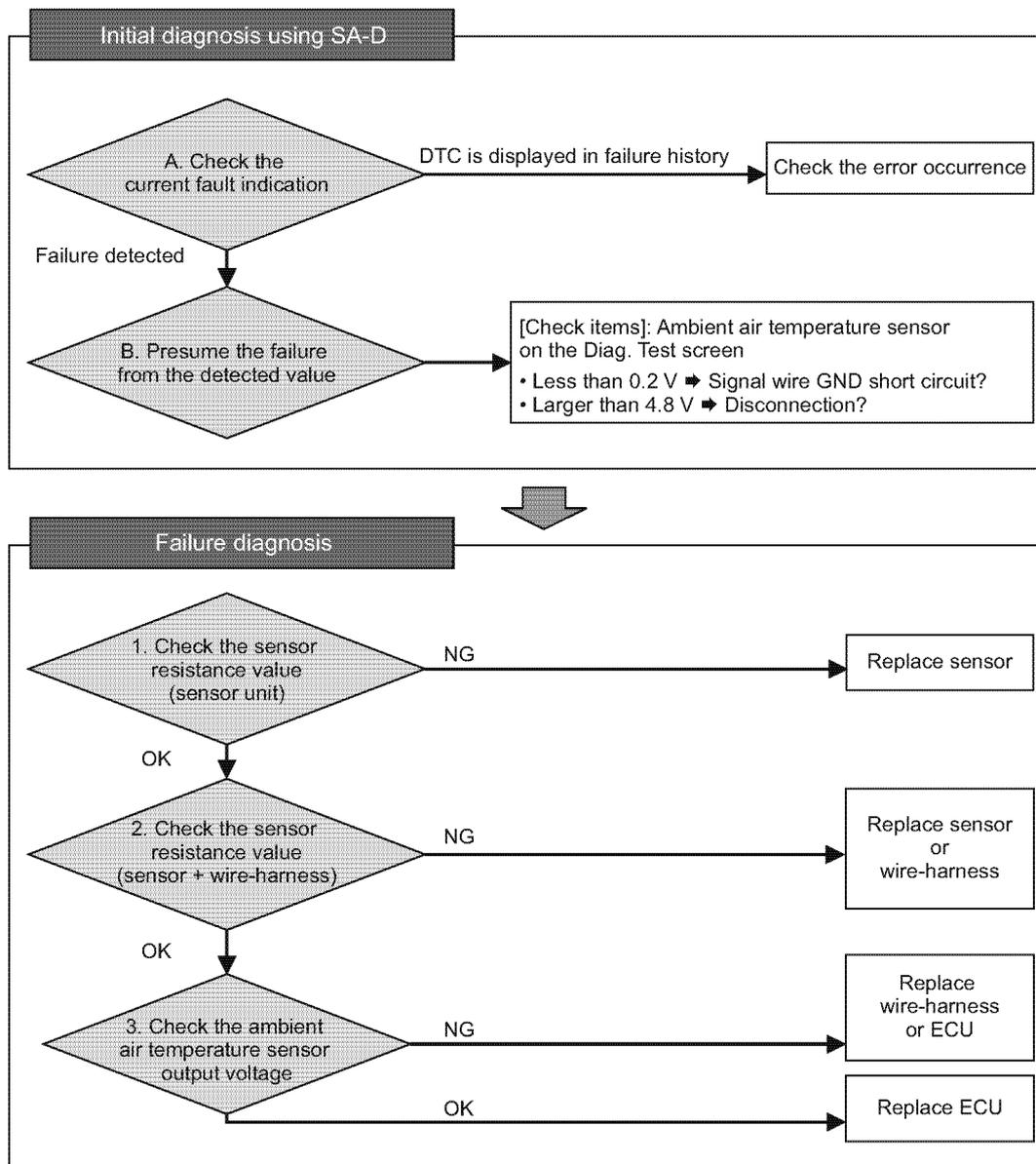
■ Ambient air temperature sensor

● Related DTC

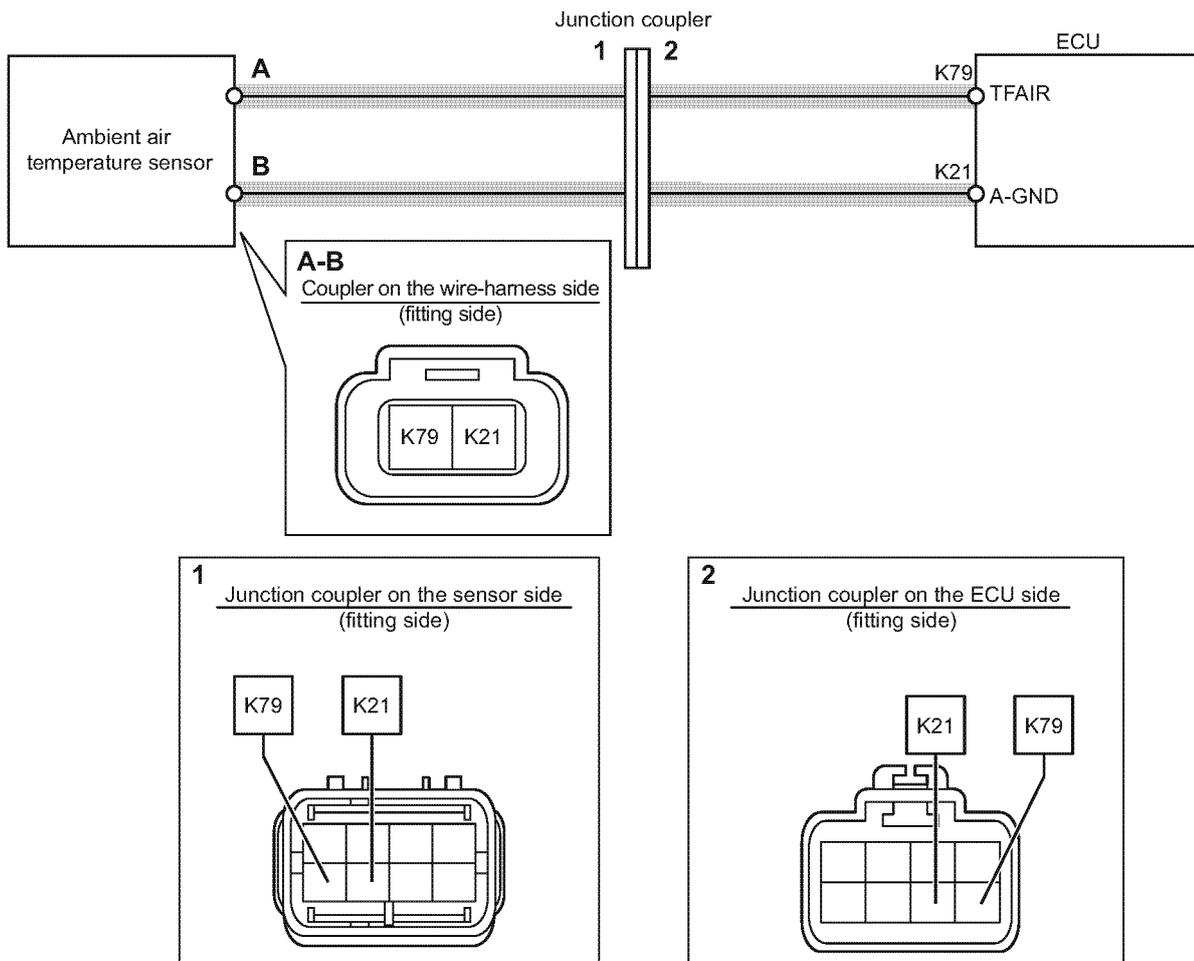
P code	SPN/FMI	Name
P0113	172/3	Ambient air temperature sensor error (voltage high)
P0112	172/4	Ambient air temperature sensor error (voltage low)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



 : Check points

044378-00EN100

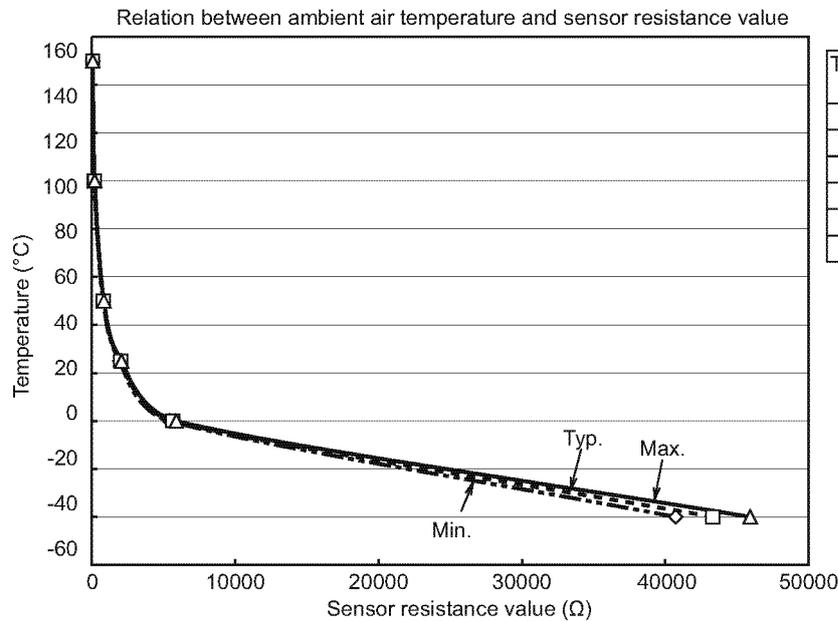
Note: See P316 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)

- 1- Remove the wire-harness from the ambient air temperature sensor.
- 2- Using a circuit tester, measure the resistance value between ambient air temperature sensor terminals A and B.
- 3- Using "Ambient air temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

Ambient air temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Typ.	Max.
-40	40720	43318	45918
0	5417	5652	5886
25	1940	2000	2060
50	783.6	812.8	842.1
100	177.1	186	194.4
150	54.48	57.96	61.44

044398-00EN01

NG	Replace the ambient air temperature sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- 1- Connect the ambient air temperature sensor and wire-harness then remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between ECU connector terminals K79 and K21 on the wire-harness side.
- 3- Using "Ambient air temperature sensor characteristics", make sure that not the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the ambient air temperature sensor output voltage".

3. Checking the ambient air temperature sensor output voltage

1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).

2-Using a circuit tester, measure the voltage between ambient air temperature sensor signals K79 and A21.

Voltage	State	Corrective action
$K79 < 0.15 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.15 \text{ V} \leq K79 \leq 4.85 \text{ V}$	OK (normal range)	Replace the ECU.
$4.85 \text{ V} < K79$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

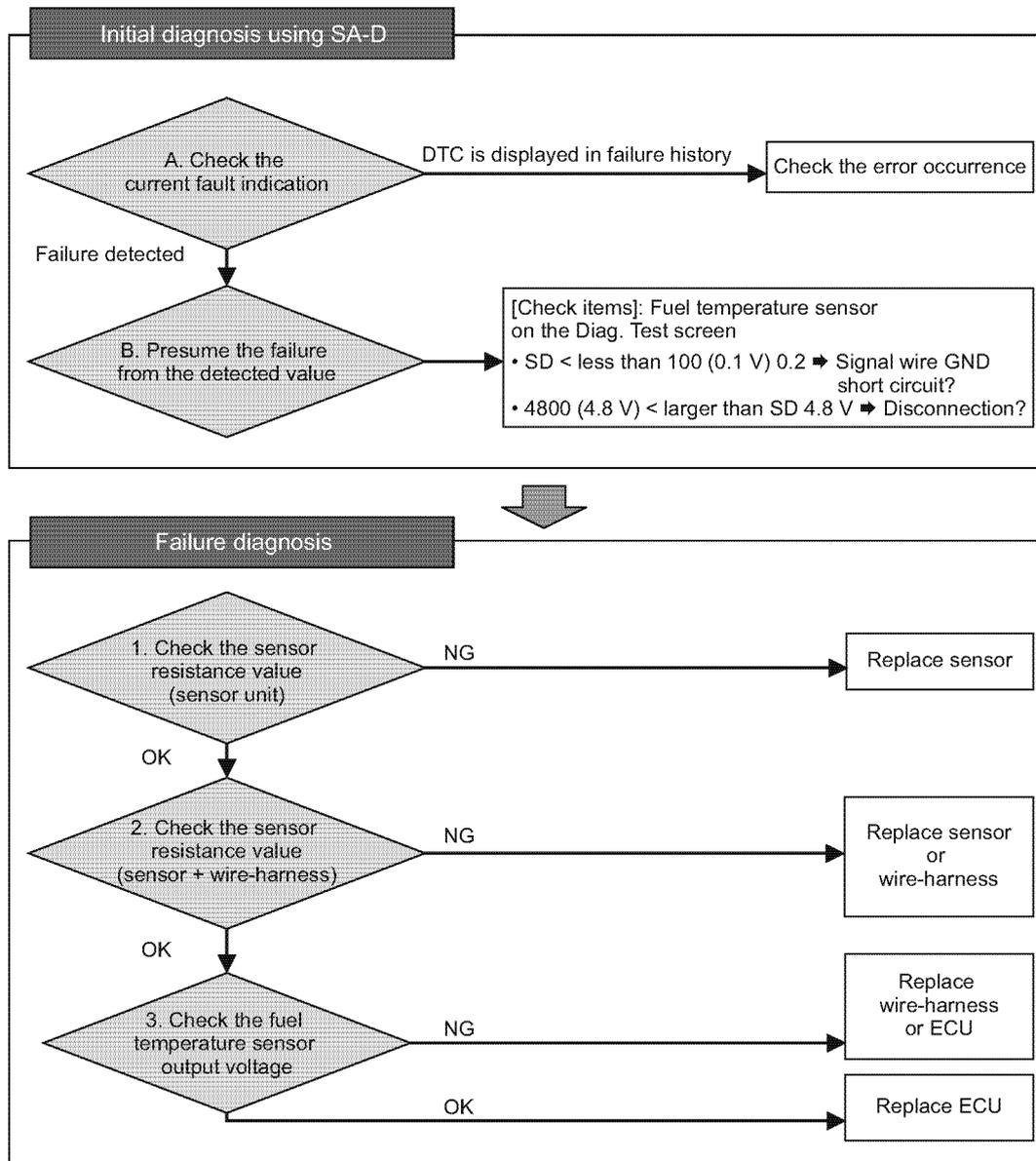
■ Fuel temperature sensor

● Related DTC

P code	SPN/FMI	Name
P0182	174/4	Fuel temperature sensor error (voltage low)
P0183	174/3	Fuel temperature sensor error (voltage high)
P0168	174/0	Fuel temperature high

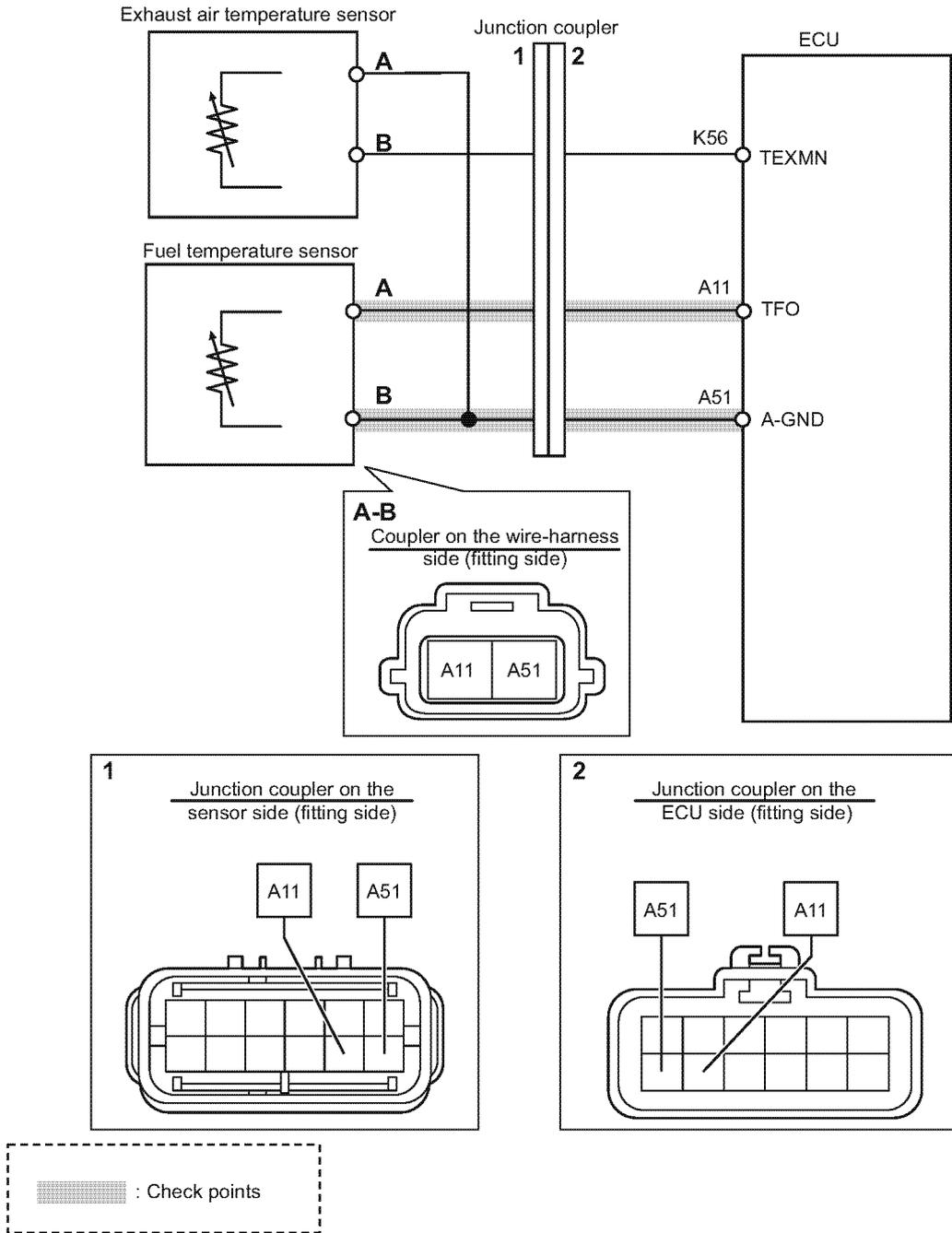
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



044385-01EN01

● Wire diagram



044379-00EN00

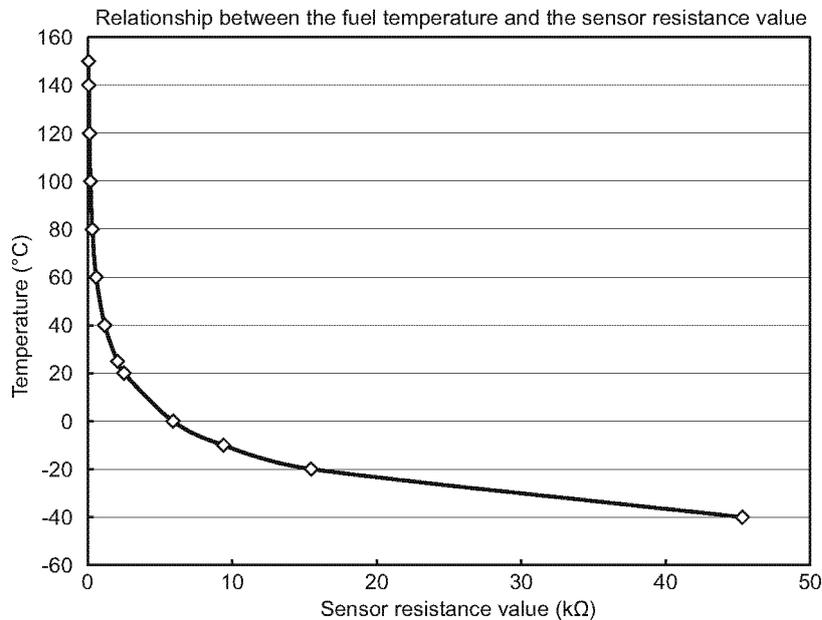
Note: See P316 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)

- 1- Remove the wire-harness from the fuel temperature sensor.
- 2- Using a circuit tester, measure the resistance value between fuel temperature sensor terminals A and B.
- 3- Using "Fuel temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

Fuel temperature sensor characteristics



Temp. (°C)	Resistance[kΩ]
-40	45.313
-20	15.462
-10	9.397
0	5.896
20	2.5
25	2.057
40	1.175
60	0.596
80	0.323
100	0.186
120	0.113
140	0.071
150	0.057

044399-00EN00

NG	Replace the fuel temperature sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- 1- Connect the fuel temperature sensor and wire-harness, then remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between ECU connector terminals A11 and A51. on the wire-harness side.
- 3- Using "Fuel temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the fuel temperature sensor output voltage".

3. Checking the fuel temperature sensor output voltage

1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).

2-Using a circuit tester, measure the voltage between the sensor signals A11 and A51.

Voltage	State	Corrective action
$A11 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq A11 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < A11$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	<ul style="list-style-type: none"> • The coupler between the fuel temperature sensor and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

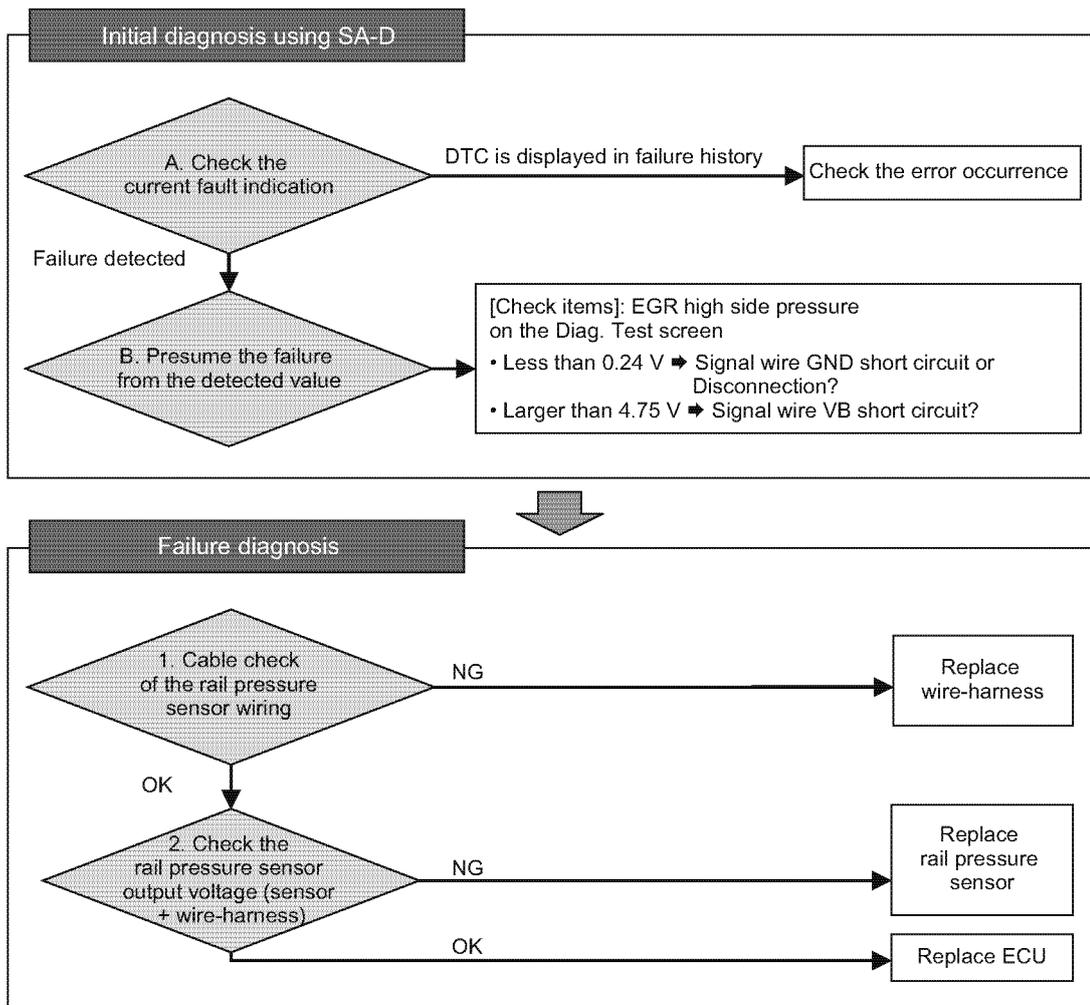
■ Rail pressure sensor

● Related DTC

P code	SPN/FMI	Name
P0193	157/3	Rail pressure sensor error (voltage high)
P0192	157/4	Rail pressure sensor error (voltage low)

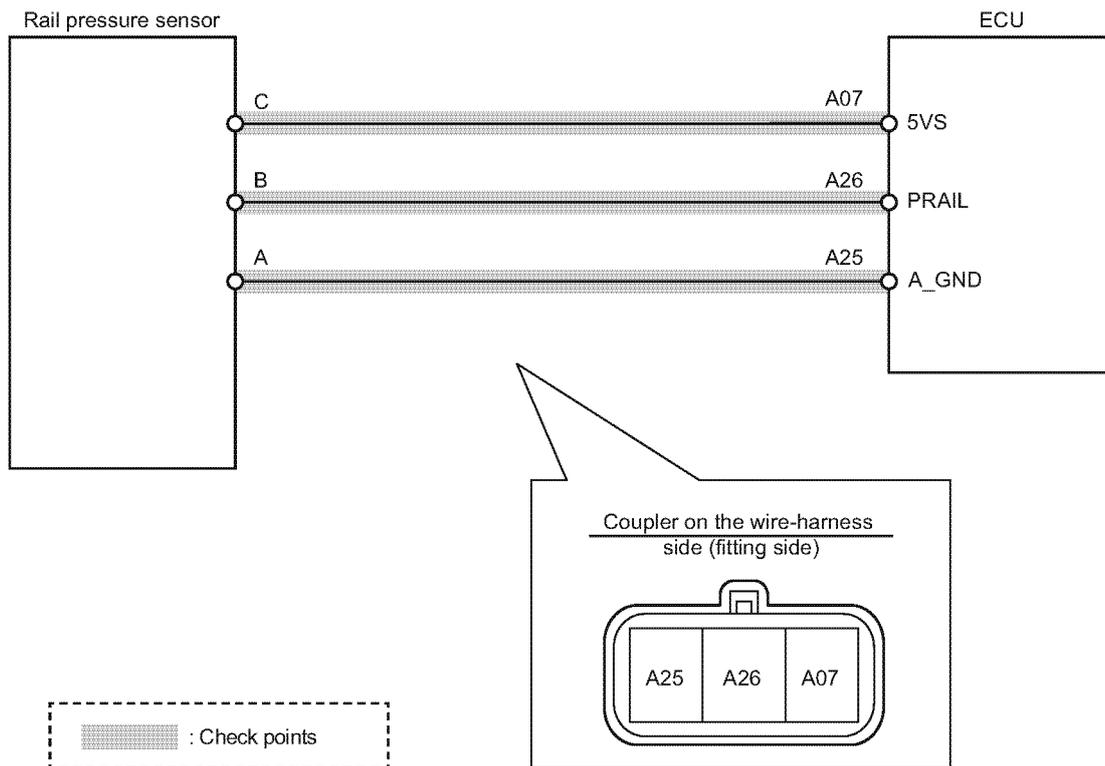
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



050738-01EN01

● Wire diagram



050749-00ENG0

Note: See P316 for the ECU pin layout.

● Work description

1. Cable check of the rail pressure sensor wiring

- 1- Remove the wire-harness from the rail pressure sensor and the ECU.
- 2- Using a circuit tester, check the cable of the wire-harness.

Terminal	Cable check	State
Between A and A25	OK	Normal
	NG	Wire-harness failure
Between B and A26	OK	Normal
	NG	Wire-harness failure
Between C and A07	OK	Normal
	NG	Wire-harness failure

NG	<ul style="list-style-type: none"> • Check if the wire-harness is damaged or there is mis-wiring. • Replace the wire-harness.
OK	Go to "Check the rail pressure sensor output voltage (sensor + wire-harness)".

2. Checking the rail pressure sensor output voltage (sensor + wire-harness)

- 1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, ECU).
- 2- Using a circuit tester, measure the voltage value between the rail pressure sensor signals K26 and K25.

Voltage	State	Corrective action
$A26 < 0.24 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.24 \text{ V} \leq A26 \leq 4.75 \text{ V}$	OK (normal range)	Replace the ECU.
$4.75 \text{ V} < A26$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the rail pressure sensor. Then, check the output voltage again.
OK	Replace the ECU.

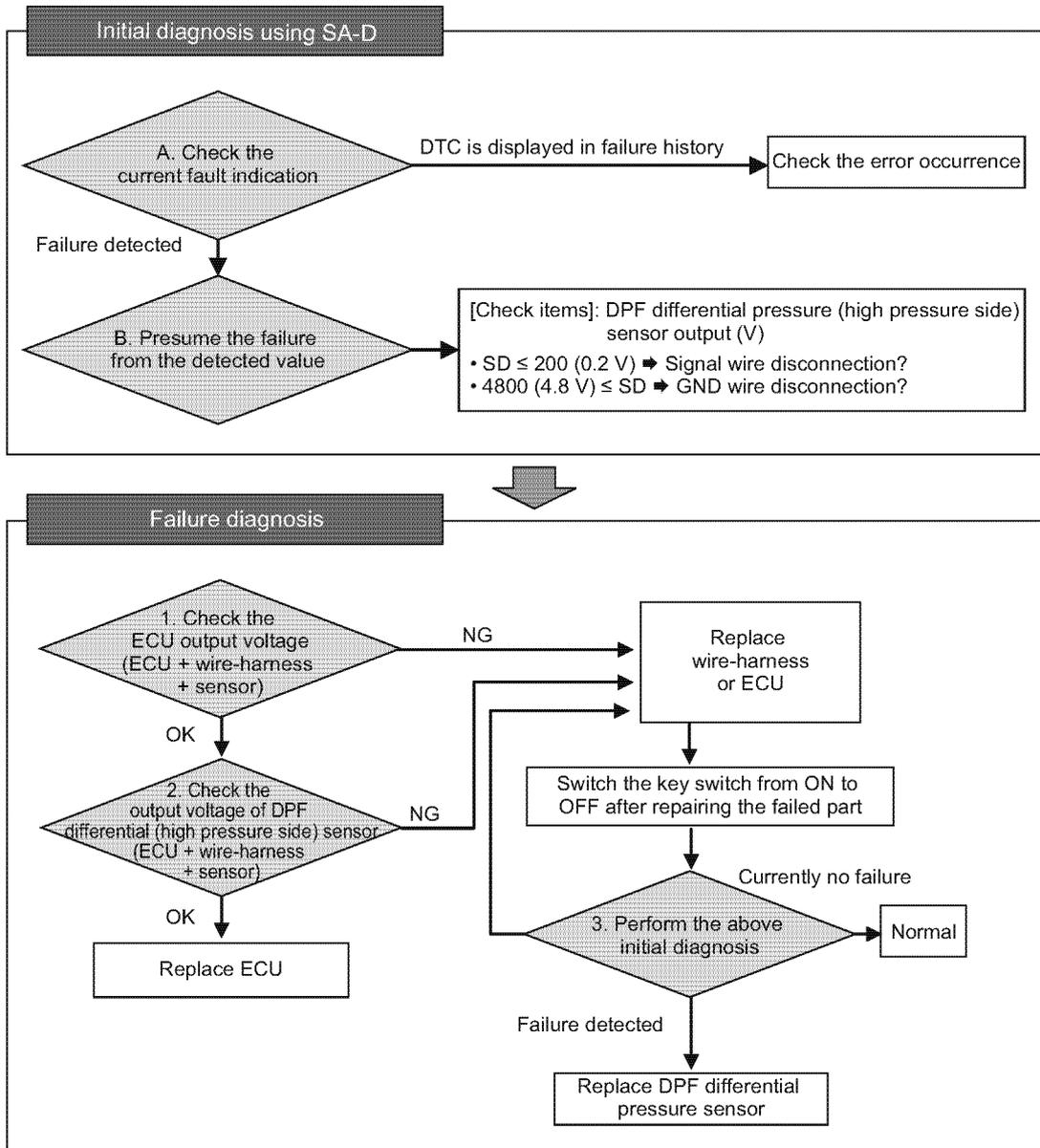
■ DPF differential pressure sensor

● Related DTC

P code	SPN/FMI	Name
P2455	3251/3	DPF differential pressure sensor error (excessive sensor output)
P2454	3251/4	DPF differential pressure sensor error (insufficient sensor output)
P1455	3609/3	DPF high pressure side pressure sensor error (excessive sensor output)
P1454	3609/4	DPF high pressure side pressure sensor error (insufficient sensor output)
P167C	3609/10	DPF high pressure side pressure sensor error (detected value error)
P2453	3251/13	DPF differential pressure sensor error (abnormal learning value)
P2452	3251/0	DPF differential pressure sensor abnormal rise in differential pressure
P226D	4795/31	DPF substrate/DPF differential pressure sensor error (DPF substrate removal/DPF differential pressure sensor detected value error)

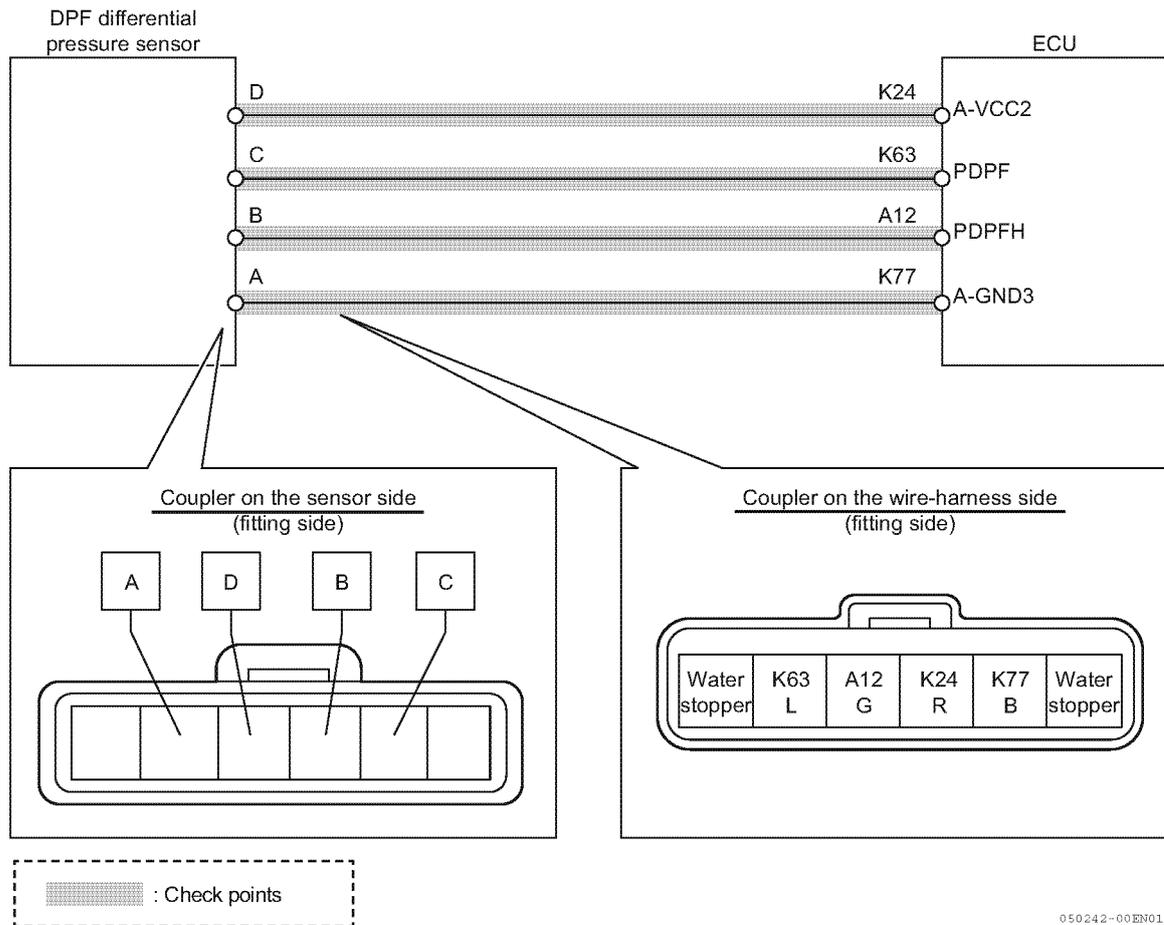
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



050233-01EN01

● Wiring diagram



050242-00 EN01

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the ECU output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).
- 2-Using a circuit tester, measure the voltage between DPF differential pressure sensors 5 V K24 and K77.

Voltage	State	Corrective action
$K24 < 4.375\text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$4.375\text{ V} \leq K24 \leq 5.625\text{ V}$	OK (normal range)	Check the DPF differential pressure sensor output voltage.
$5.625\text{ V} < K24$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness or ECU, and turn off and on the key switch and perform the diagnosis using the SMARTASSIST-DIRECT (SA-D).
OK	Go to "Checking the DPF differential pressure sensor output voltage".

2. Checking the DPF differential pressure sensor output voltage

1-Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).

2-Using a circuit tester, measure the voltage between the sensor signals K63 and K77.

Voltage	State	Corrective action
$K63 < 0.5 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.5 \text{ V} \leq K63 \leq 4.5 \text{ V}$	OK (normal range)	Replace the ECU.
$4.5 \text{ V} < K63$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness or ECU, and turn off and on the key switch and perform the diagnosis using the SMARTASSIST-DIRECT (SA-D).
OK	Replace the ECU.

3. Checking the DPF high pressure side pressure sensor output voltage

1-Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).

2-Using a circuit tester, measure the voltage between the sensor signals A12 and K77.

Voltage	State	Corrective action
$A12 < 0.5 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.5 \text{ V} \leq A12 \leq 4.5 \text{ V}$	OK (normal range)	Replace the ECU.

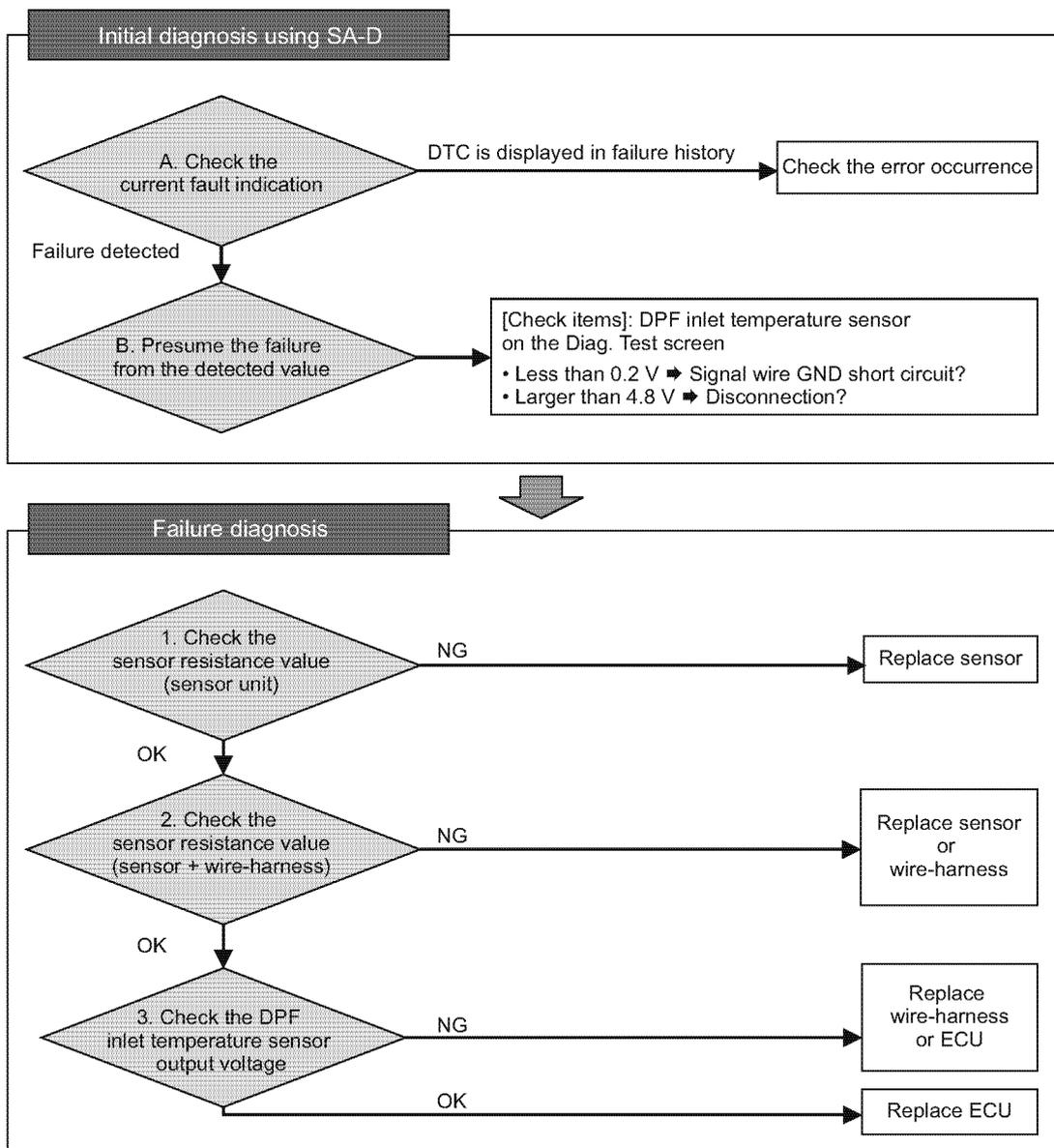
■ DPF inlet temperature sensor

● Related DTC

P code	SPN/FMI	Name
P1428	3242/3	DPF inlet temperature sensor error (excessive sensor output)
P1427	3242/4	DPF inlet temperature sensor error (insufficient sensor output)
P167E	3242/10	DPF inlet temperature sensor error (detected value error)
P1436	3242/0	DPF inlet temperature sensor abnormal temperature (abnormally high)

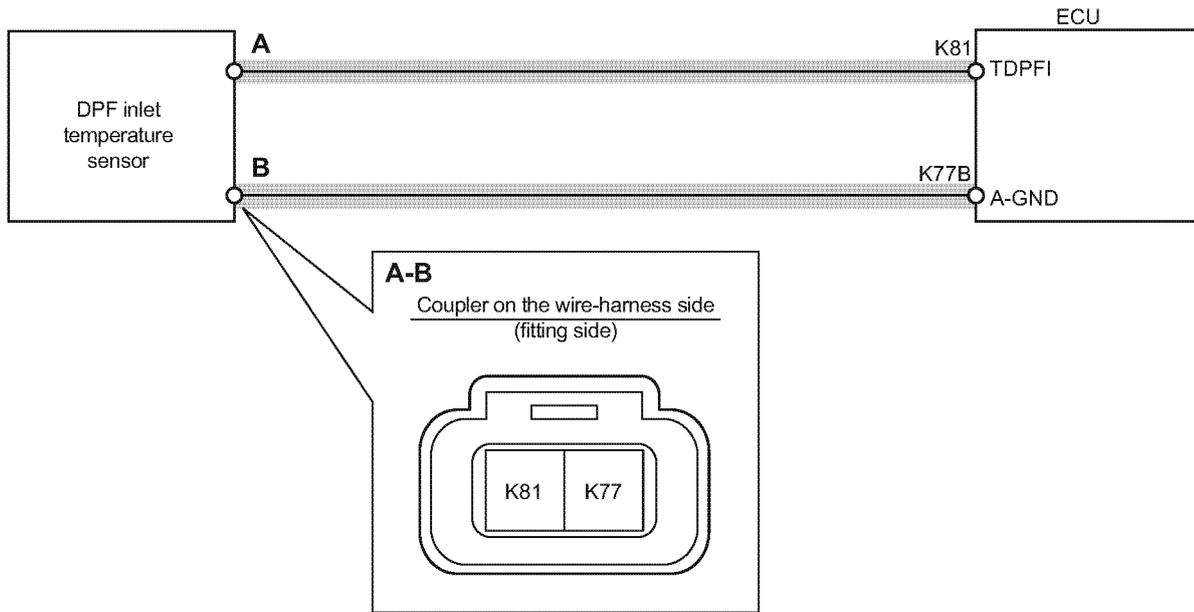
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



044386-01EN01

● Wire diagram



 : Check points

044376-00EN00

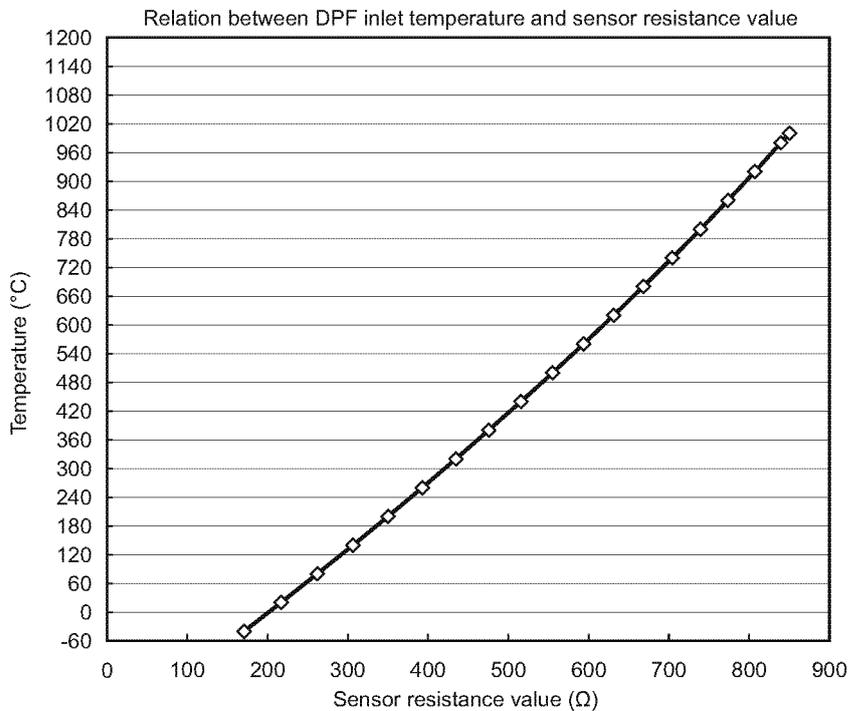
Note: See P316 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)

- 1- Remove the wire-harness from the DPF inlet temperature sensor.
- 2- Using a circuit tester, measure the resistance value between DPF inlet temperature sensor terminals A and B.
- 3- Using "DPF inlet temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

DPF inlet temperature sensor characteristics



Temp. (°C)	Resistance[Ω]
-40	170.68
20	216.77
80	262.01
140	306.40
200	349.96
260	392.67
320	434.54
380	475.57
440	515.76
500	555.10
560	593.60
620	631.26
680	668.08
740	704.05
800	739.18
860	773.47
920	806.92
980	839.52
1000	850.20

044400-00EN00

NG	Replace the DPF inlet temperature sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- 1- Connect the DPF inlet temperature sensor and wire-harness then remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between ECU connector terminals K81 and K77B on the wire-harness side.
- 3- Using "DPF inlet temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the DPF inlet temperature sensor output voltage".

3. Checking the DPF inlet temperature sensor output voltage

1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).

2-Using a circuit tester, measure the voltage between DPF inlet temperature sensor signals K81 and K77B.

Voltage	State	Corrective action
$K81 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq K81 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < K81$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

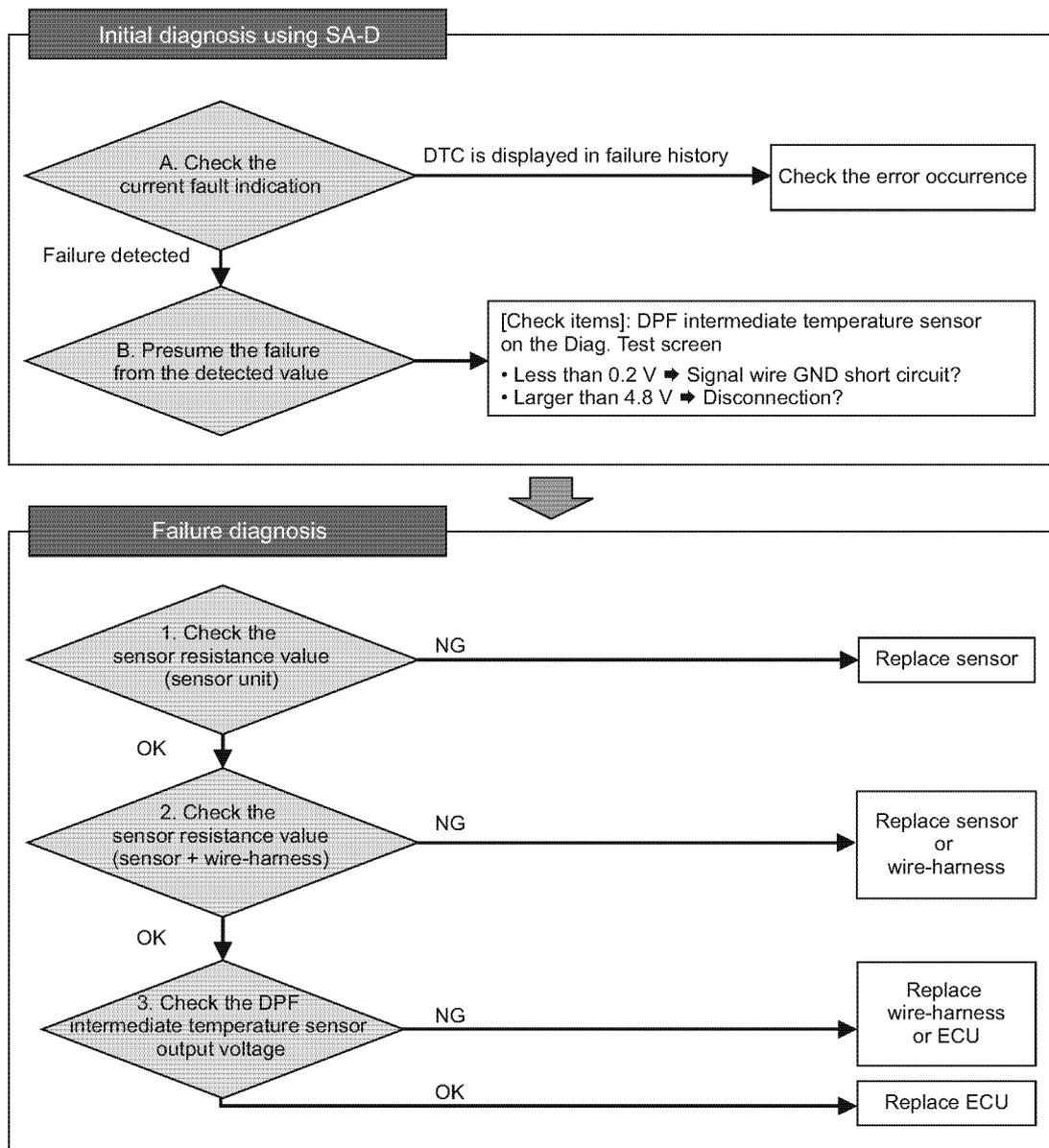
■ DPF intermediate temperature sensor

● Related DTC

P code	SPN/FMI	Name
P1434	3250/3	DPF intermediate temperature sensor error (excessive sensor output)
P1435	3250/4	DPF intermediate temperature sensor error (insufficient sensor output)
P167A	3250/10	DPF intermediate temperature sensor error (detected value error)
P0420	3250/1	DPF intermediate temperature sensor abnormal temperature (abnormally low)
P1426	3250/0	DPF intermediate temperature sensor abnormal rise in temperature (post-injection malfunction)

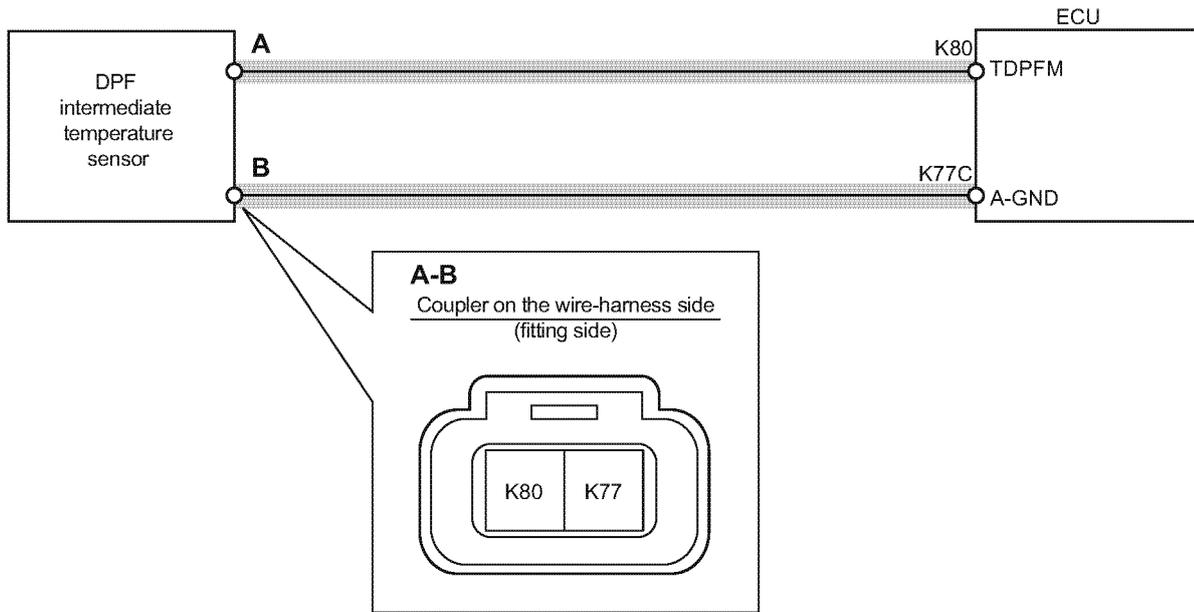
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



044387-01EN01

● Wire diagram



 : Check points

044376-00EN01

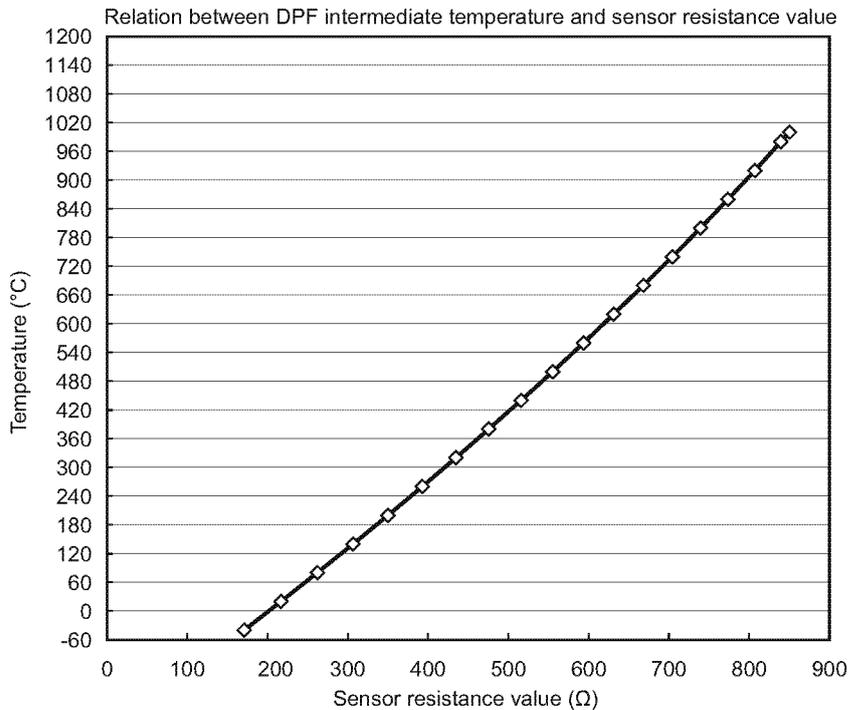
Note: See P316 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)

- 1- Remove the wire-harness from the DPF intermediate temperature sensor.
- 2- Using a circuit tester, measure the resistance value between DPF intermediate temperature sensor terminals A and B.
- 3- Using "DPF intermediate temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

DPF intermediate temperature sensor characteristics



Temp. (°C)	Resistance[Ω]
-40	170.68
20	216.77
80	262.01
140	306.40
200	349.96
260	392.67
320	434.54
380	475.57
440	515.76
500	555.10
560	593.60
620	631.26
680	668.08
740	704.05
800	739.18
860	773.47
920	806.92
980	839.52
1000	850.20

044400-00EN01

NG	Replace the DPF intermediate temperature sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- 1- Connect the DPF intermediate temperature sensor and wire-harness, then remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between ECU connector terminals K80 and K77C on the wire-harness side.
- 3- Using "DPF intermediate temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the DPF intermediate temperature sensor output voltage".

3. Checking the DPF intermediate temperature sensor output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2-Using a circuit tester, measure the voltage between DPF intermediate temperature sensor signals K80 and K77C.

Voltage	State	Corrective action
$K80 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq K80 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < K80$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

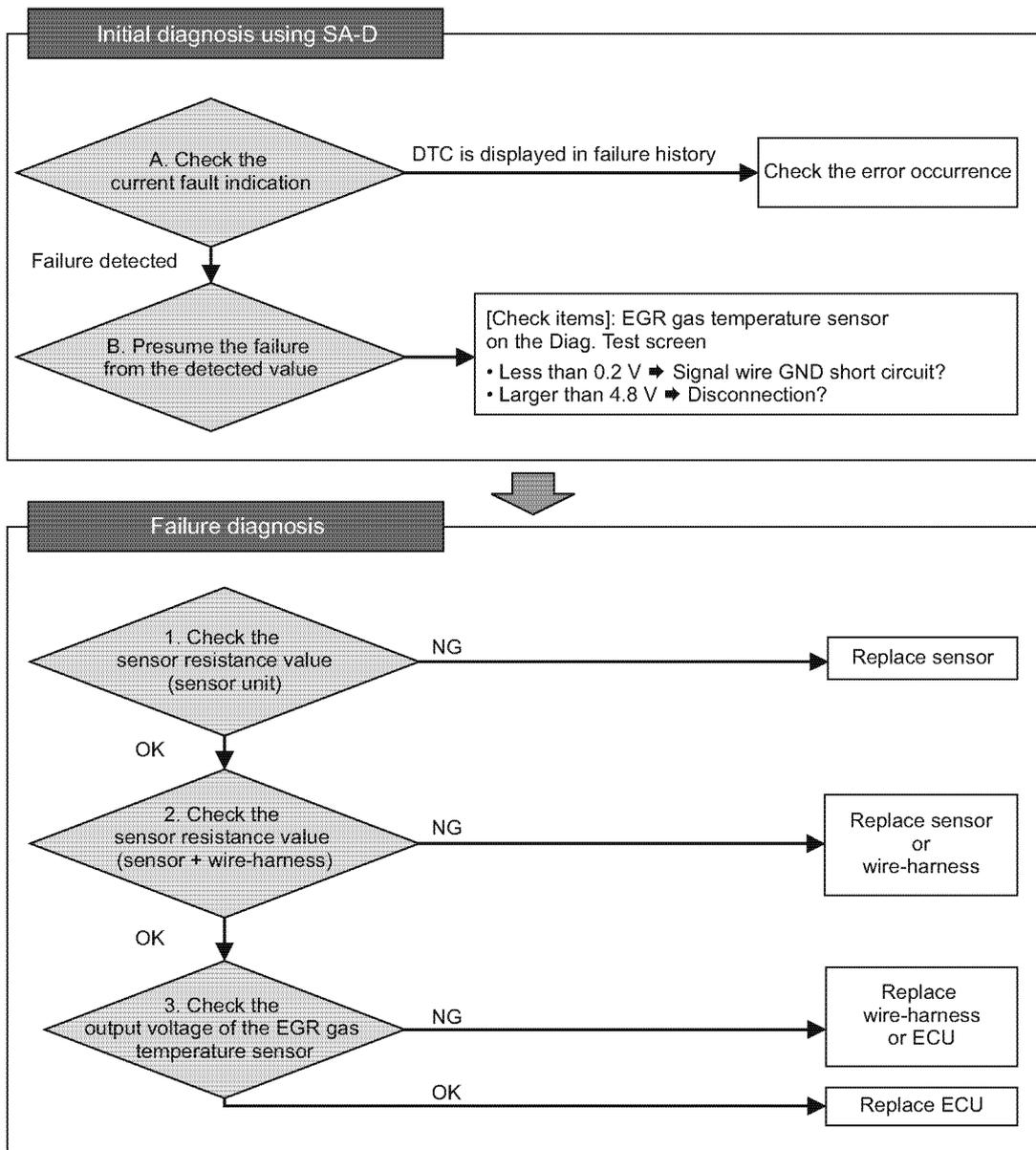
■ EGR gas temperature sensor

● Related DTC

P code	SPN/FMI	Name
P041D	412/3	EGR gas temperature sensor error (excessive sensor output)
P041C	412/4	EGR gas temperature sensor error (insufficient sensor output)

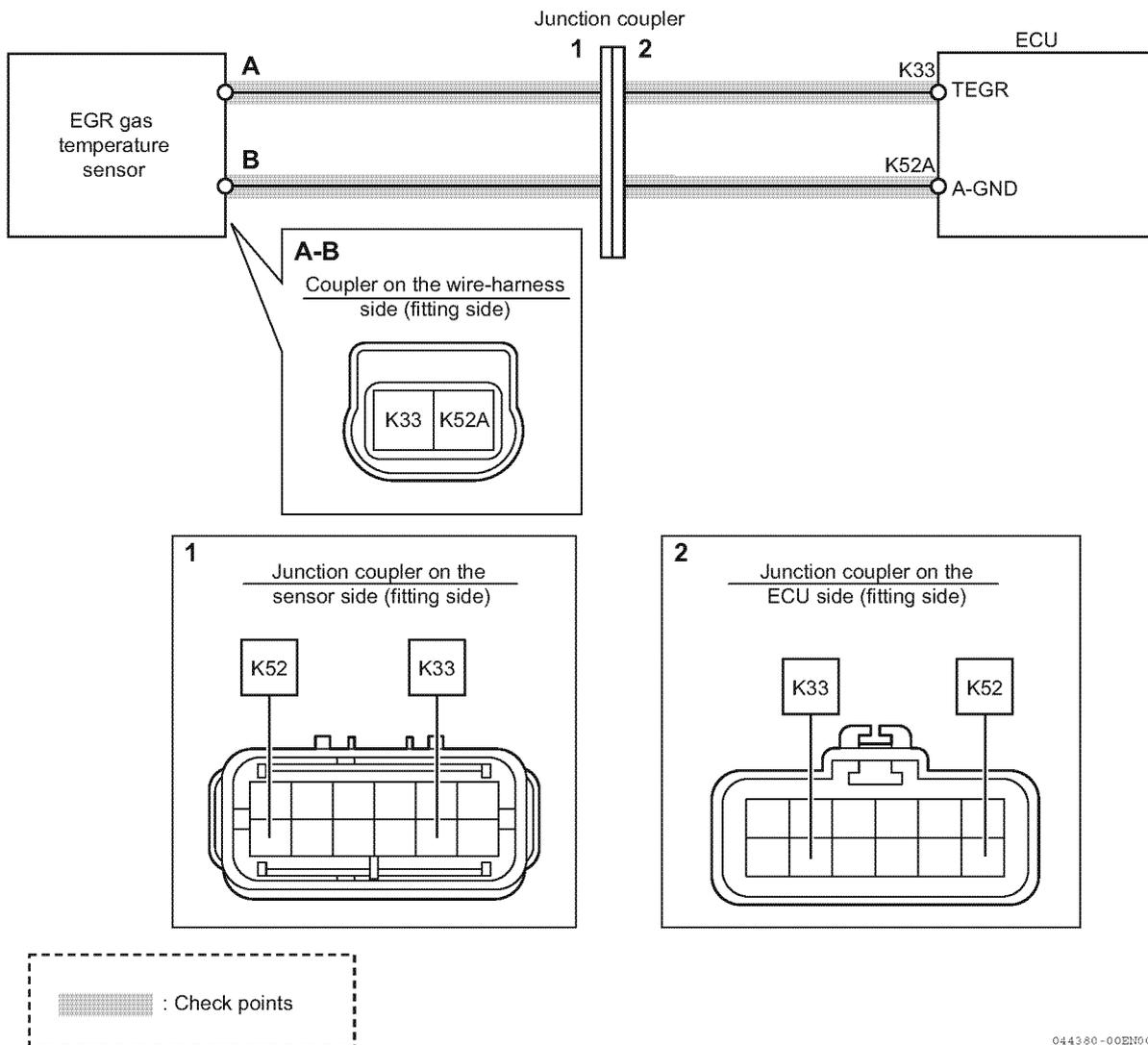
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



044388-01EN01

● Wire diagram



Note: See P316 for the ECU pin layout.

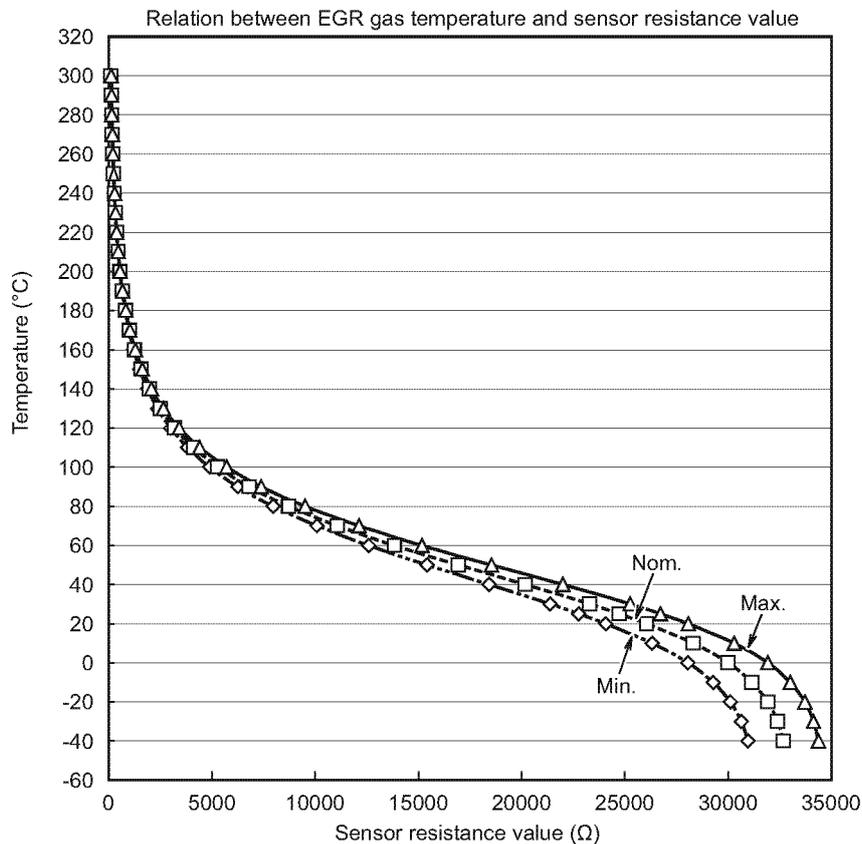
044380-00E1100

● Work description

1. Checking the sensor resistance value (sensor unit)

- 1- Remove the wire-harness from the EGR gas temperature sensor.
- 2- Using a circuit tester, measure the resistance value between EGR gas temperature sensor terminals A and B.
- 3- Using "EGR gas temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

EGR gas temperature sensor characteristic



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Nom.	Max.
-40	30968	32683	34388
-30	30647	32402	34144
-20	30117	31926	33719
-10	29286	31159	33019
0	28057	29995	31927
10	26319	28308	30298
20	24067	26055	28069
25	22771	24727	26728
30	21380	23288	25253
40	18422	20169	21995
50	15421	16936	18541
60	12590	13838	15172
70	10081	11062	12120
80	7966	8708	9511
90	6245	6794	7385
100	4881	5277	5702
110	3816	4098	4398
120	2992	3191	3401
130	2357	2496	2641
140	1869	1964	2063
150	1491	1555	1623
160	1197	1241	1286
170	968.7	996.9	1026.7
180	789.3	807.5	826.0
190	647.7	658.6	669.6
200	535.2	541.0	546.7
210	440.2	447.4	454.7
220	364.6	372.5	380.6
230	303.9	312.1	320.5
240	255.0	263.2	271.6
250	215.2	223.2	231.3
260	182.7	190.3	198.3
270	156.0	163.2	170.8
280	133.8	140.7	147.8
290	115.5	121.8	128.5
300	100.1	106.1	112.2

044401-00EN00

NG	Replace the EGR gas temperature sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- 1-Connect the EGR gas temperature sensor and the wire-harness, and then remove the ECU from the wire-harness.
- 2-Using a circuit tester, measure the resistance value between the ECU side wire-harness connector terminals K33 and K52A.
- 3-Using "EGR gas temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the output voltage of the EGR gas temperature sensor".

3. Checking the output voltage of the EGR gas temperature sensor

- 1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2-Using a circuit tester, measure the voltage between EGR gas temperature sensor signals K33 and K52A.

Voltage	State	Corrective action
$K33 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq K33 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < K33$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

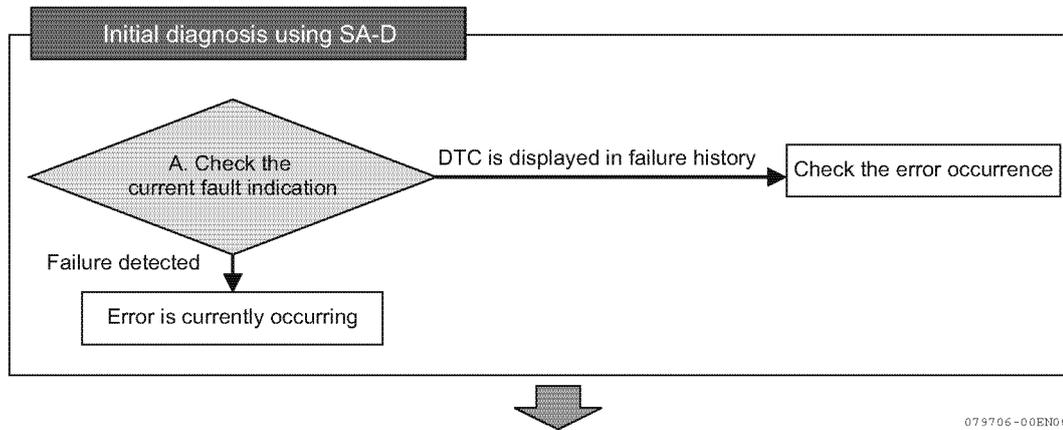
NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

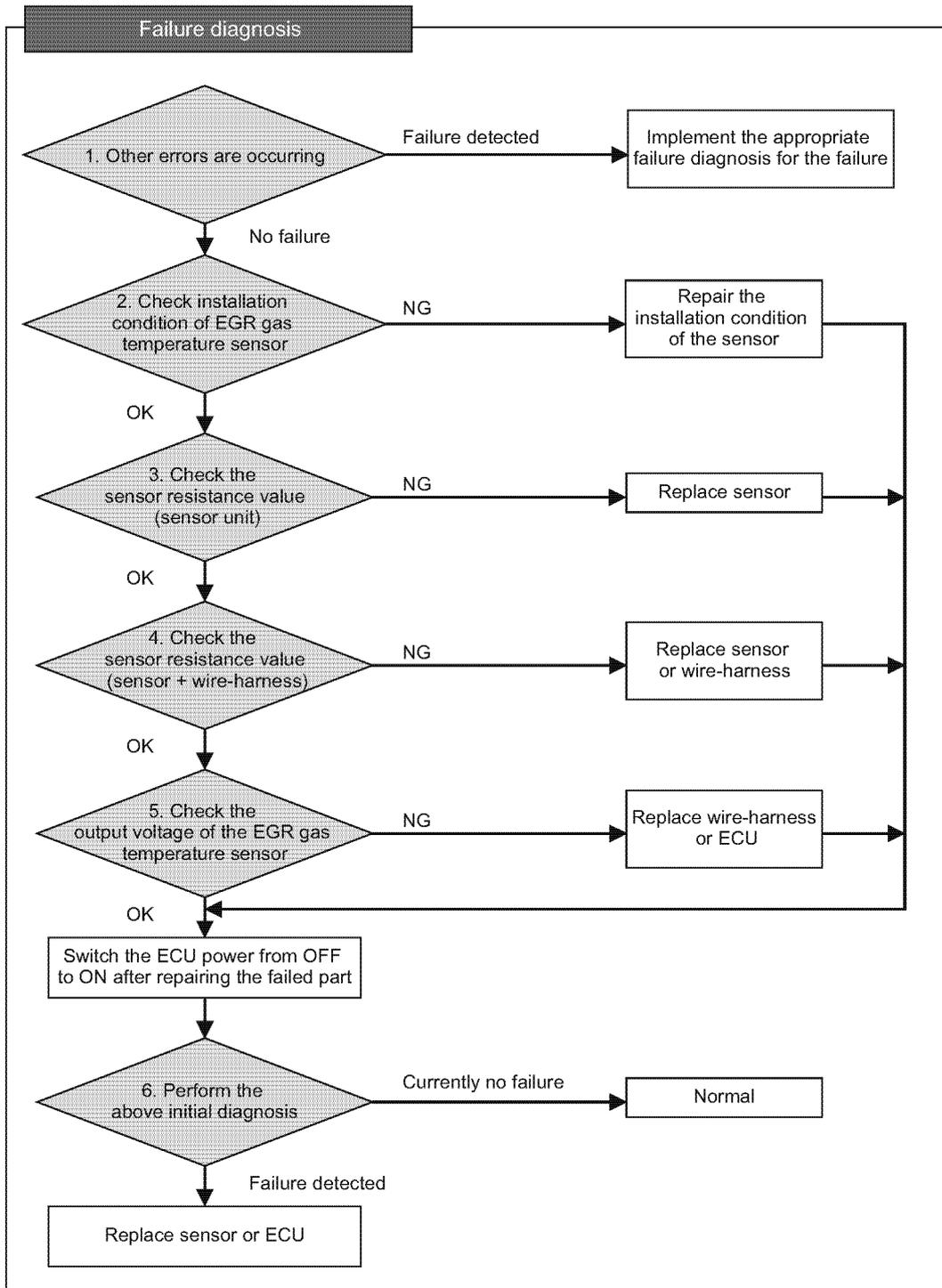
● Related DTC

P code	SPN/FMI	Name
P1675	412/10	EGR gas temperature sensor error (detected value error)

● Workflow

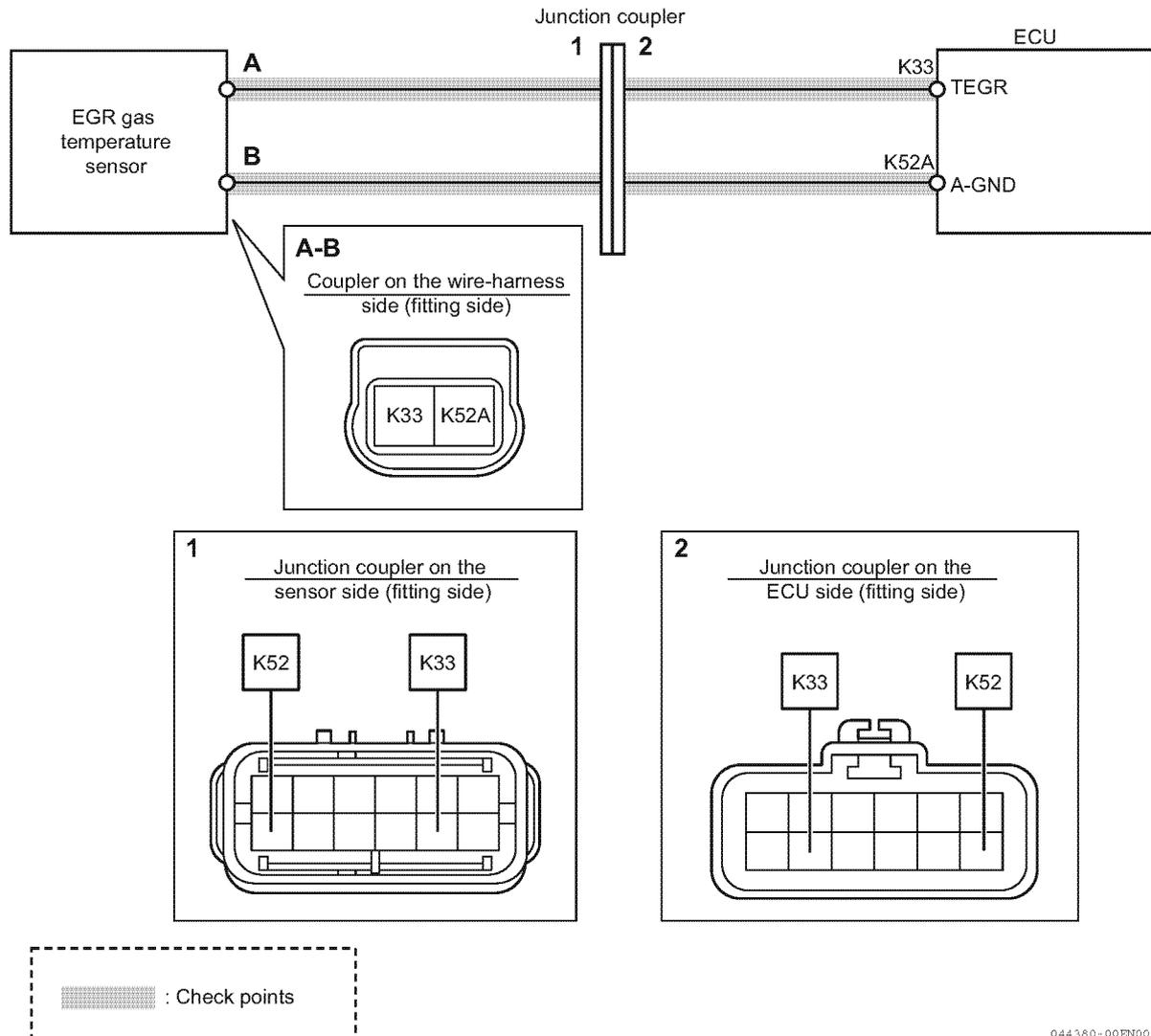
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





079723-00 EN02

● Wire diagram



044380-00EJ700

Note: See P316 for the ECU pin layout.

● Work description

1. Checking for other errors

- 1-Turn off the key switch and turn on the key switch again.
- 2-Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for EGR gas temperature sensor, engine coolant temperature sensor, DPF inlet temperature sensor, EGR valve, or inside the ECU.

Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to "Checking installation condition of EGR gas temperature sensor".

2. Checking installation condition of EGR gas temperature sensor

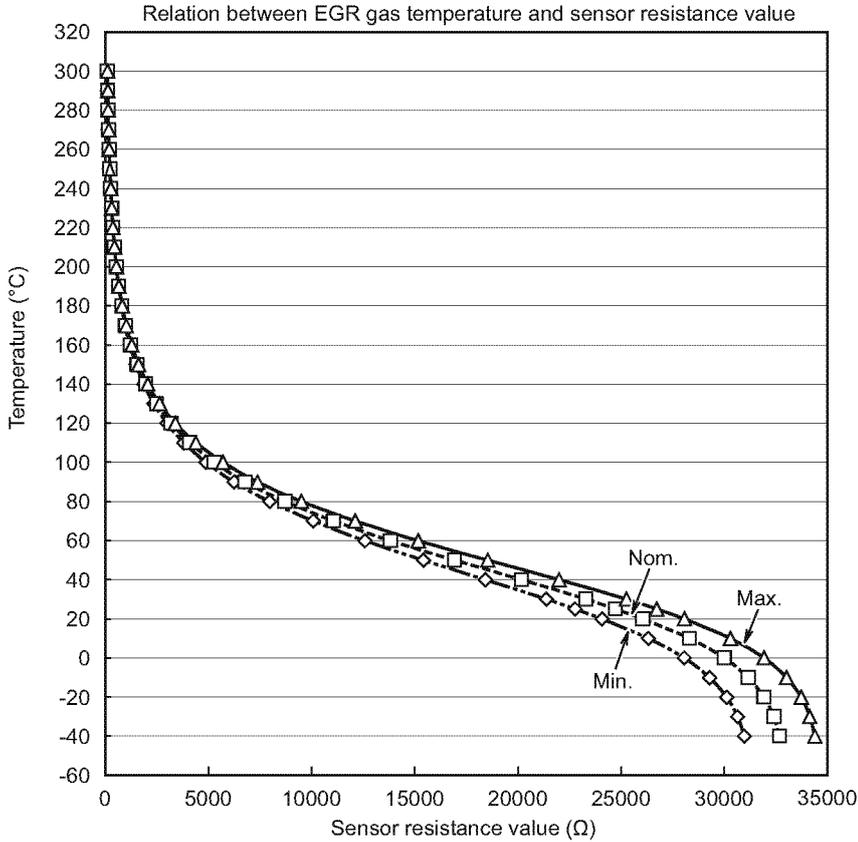
- 1-Turn off the key switch.
- 2-Check the installation condition of EGR gas temperature sensor.
- 3-Check the EGR pipe and EGR cooler for damage or failure.

NG	Reinstall the sensor, and turn off/on the ECU power for failure diagnosis using SA-D.
OK	Go to "Checking the sensor resistance value (sensor unit)"

3. Checking the sensor resistance value (sensor unit)

- 1-Remove the wire-harness from the EGR gas temperature sensor.
- 2-Using a circuit tester, measure the resistance value between EGR gas temperature sensor terminals A and B.
- 3-Using "EGR gas temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

EGR gas temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Nom.	Max.
-40	30968	32683	34388
-30	30647	32402	34144
-20	30117	31926	33719
-10	29286	31159	33019
0	28057	29995	31927
10	26319	28308	30298
20	24067	26055	28069
25	22771	24727	26728
30	21380	23288	25253
40	18422	20169	21995
50	15421	16936	18541
60	12590	13838	15172
70	10081	11062	12120
80	7966	8708	9511
90	6245	6794	7385
100	4881	5277	5702
110	3816	4098	4398
120	2992	3191	3401
130	2357	2496	2641
140	1869	1964	2063
150	1491	1555	1623
160	1197	1241	1286
170	968.7	996.9	1026.7
180	789.3	807.5	826.0
190	647.7	658.6	669.6
200	535.2	541.0	546.7
210	440.2	447.4	454.7
220	364.6	372.5	380.6
230	303.9	312.1	320.5
240	255.0	263.2	271.6
250	215.2	223.2	231.3
260	182.7	190.3	198.3
270	156.0	163.2	170.8
280	133.8	140.7	147.8
290	115.5	121.8	128.5
300	100.1	106.1	112.2

044401-00EN00

NG	Replace the EGR gas temperature sensor, and switch the ECU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

4. Checking the sensor resistance value (sensor and wire-harness)

- 1- Connect the EGR gas temperature sensor and the wire-harness, and then remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between ECU connector terminals K33 and K52A on the wire-harness side.
- 3- Using "EGR gas temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. Switch the ECU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to "Checking the output voltage of the EGR gas temperature sensor".

5. Checking the output voltage of the EGR gas temperature sensor

- 1- Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2- Using a circuit tester, measure the voltage between EGR gas temperature sensor signals K33 and K52A.

Voltage	State	Corrective action
$K33 < 0.15 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.15 \text{ V} \leq K33 \leq 4.8 \text{ V}$	OK (normal range)	Perform failure diagnosis using SA-D.
$4.8 \text{ V} < K33$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU. Switch the ECU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Switch the ECU power from OFF to ON for failure diagnosis using SA-D.

6. Operation using SA-D

- 1- Turn off the key switch and turn on the key switch again to start the engine. Operate the engine that satisfies the reset criteria for P1675: EGR gas temperature sensor error (detected value error) (P120).
- 2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the EGR gas temperature sensor or ECU.

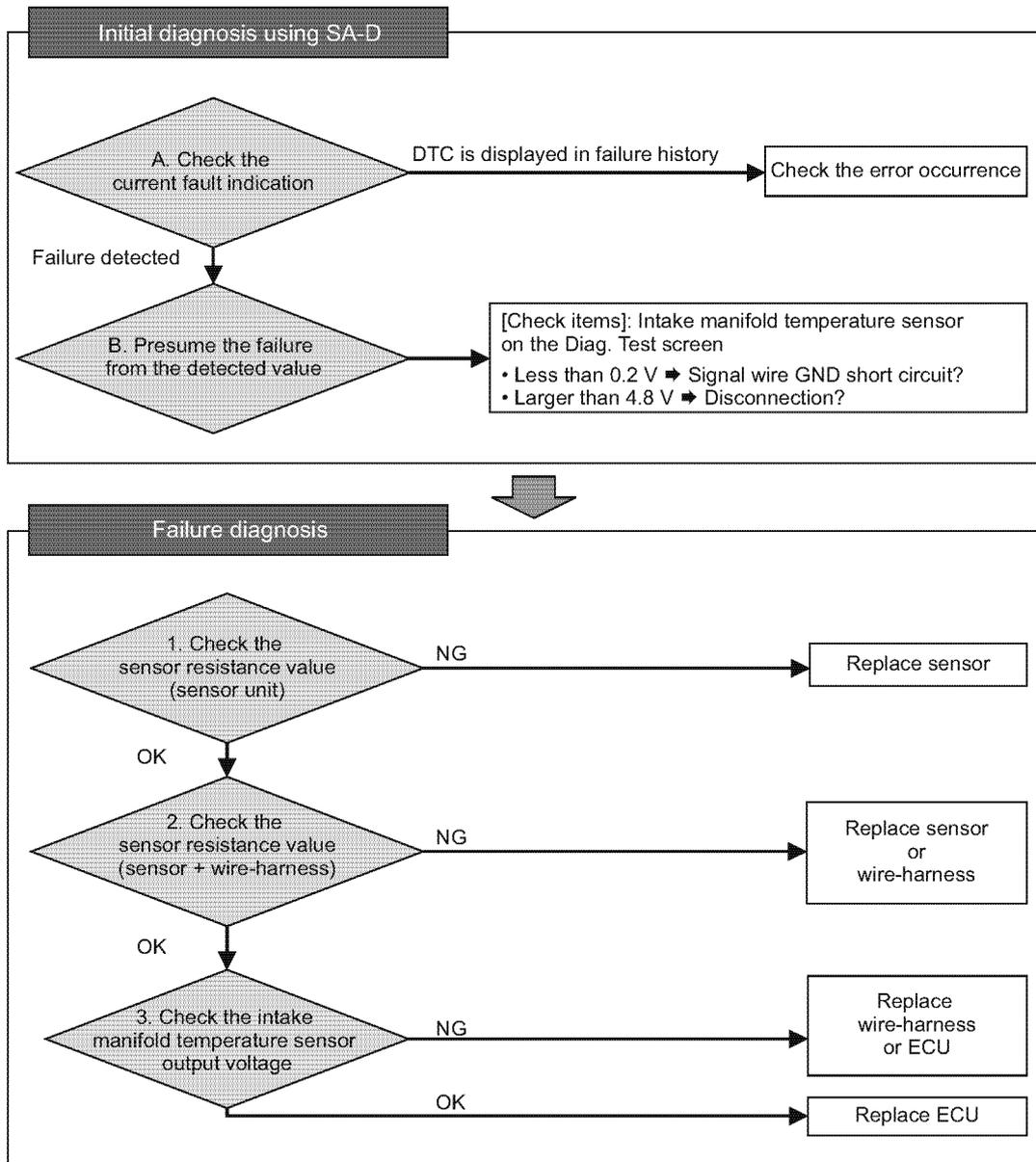
■ Intake manifold temperature sensor

● Related DTC

P code	SPN/FMI	Name
P040D	105/3	Intake manifold temperature sensor error (excessive sensor output)
P040C	105/4	Intake manifold temperature sensor error (insufficient sensor output)

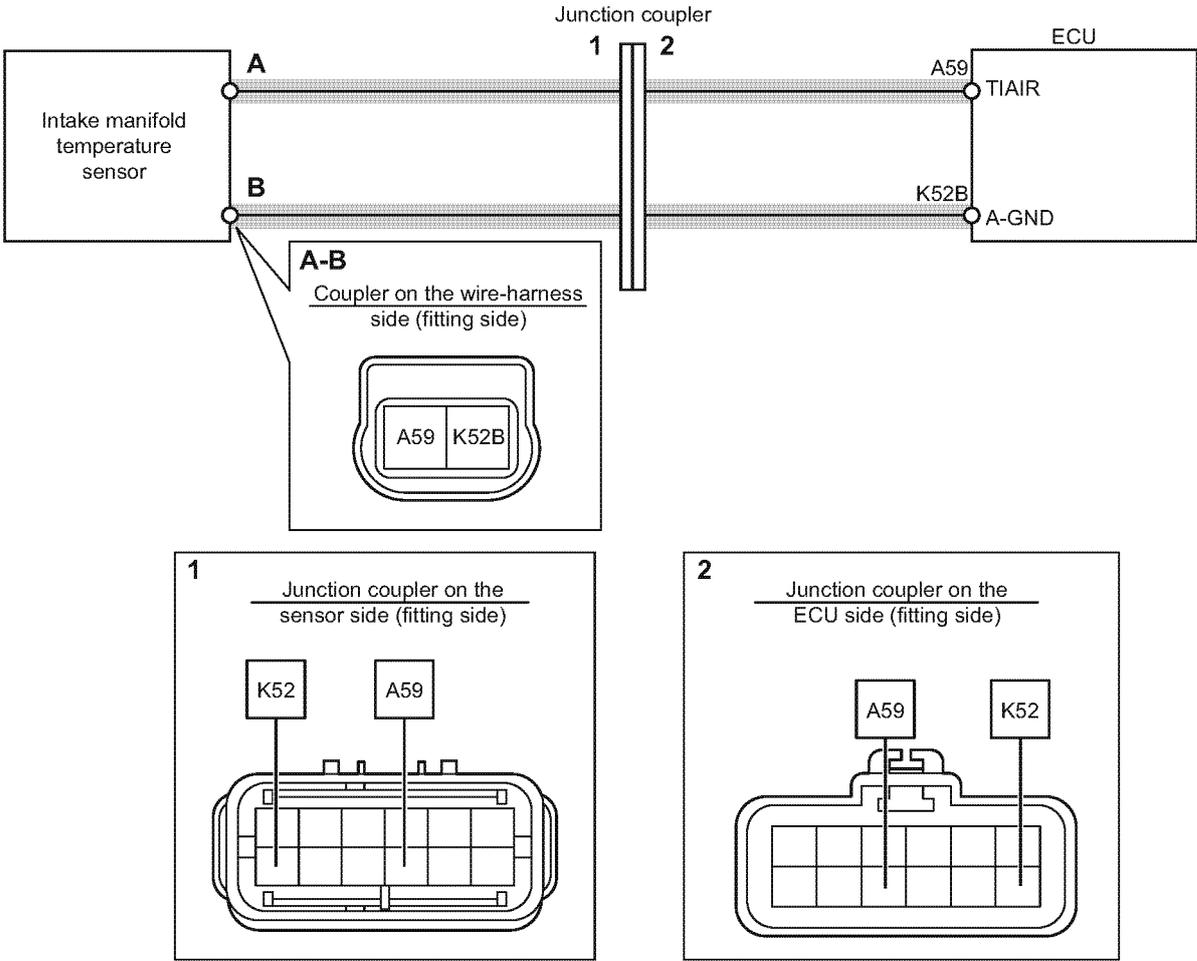
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



044389-01EN02

● Wire diagram



 : Check points

044380-00EN01

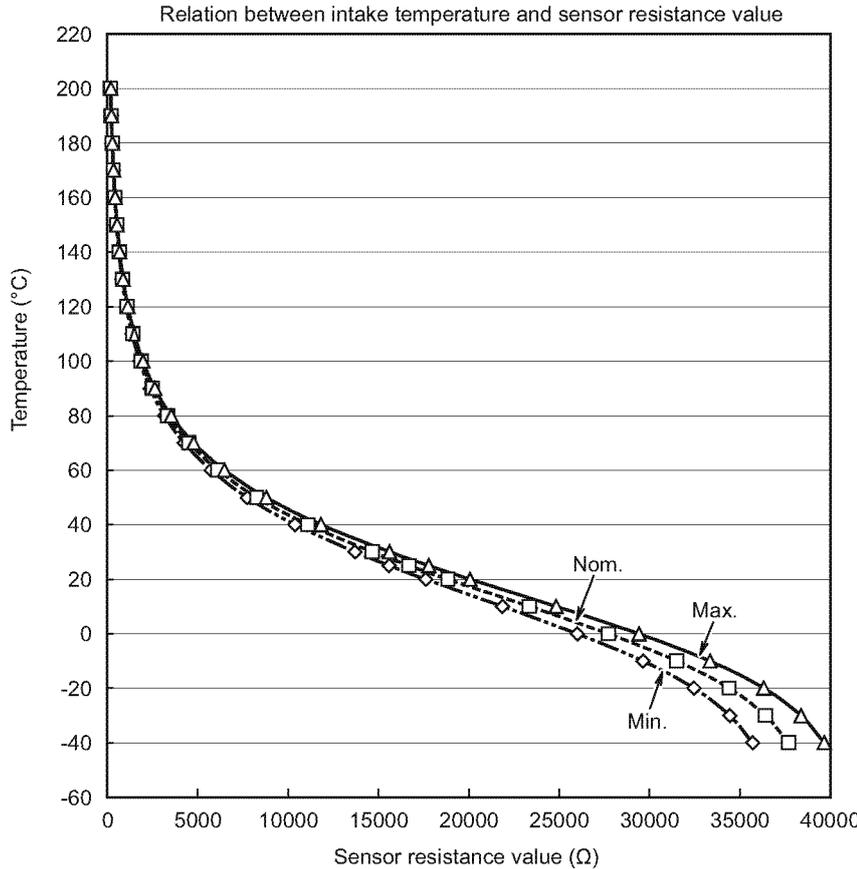
Note: See P316 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)

- 1-Remove the wire-harness from the intake manifold temperature sensor.
- 2-Using a circuit tester, measure the resistance value between intake manifold temperature sensor terminals A and B.
- 3-Using "Intake manifold temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

Intake manifold temperature sensor characteristics



Temp. (°C)	Resistance[Ω]		
	Min.	Nom.	Max.
-40	35699	37683	39656
-30	34434	36412	38374
-20	32455	34400	36325
-10	29633	31496	33339
0	26009	27723	29420
10	21858	23354	24838
20	17614	18847	20073
25	15595	16691	17782
30	13701	14664	15623
40	10386	11106	11825
50	7750	8273	8795
60	5742	6116	6488
70	4252	4516	4780
80	3162	3347	3534
90	2366	2499	2631
100	1787	1881	1975
110	1362	1431	1498
120	1050	1098	1148
130	816.2	852.3	888.3
140	641.2	667.8	694.6
150	508.9	528.5	548.1
160	405.3	422.1	438.9
170	325.9	340.2	354.4
180	264.4	276.5	288.7
190	216.2	226.6	236.9
200	178.2	187.1	196.1

044402-00E000

NG	Replace the intake manifold temperature sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- 1-Connect the intake manifold temperature sensor and wire-harness, then remove the ECU from the wire-harness.
- 2-Using a circuit tester, measure the resistance value between the ECU side wire harness connector terminals K59 and K52B.
- 3-Using "Intake manifold temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the intake manifold temperature sensor output voltage".

3. Checking the intake manifold temperature sensor output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2-Using a circuit tester, measure the voltage between intake manifold temperature sensor signals A59 and K52B.

Voltage	State	Corrective action
$A59 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq A59 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < A59$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

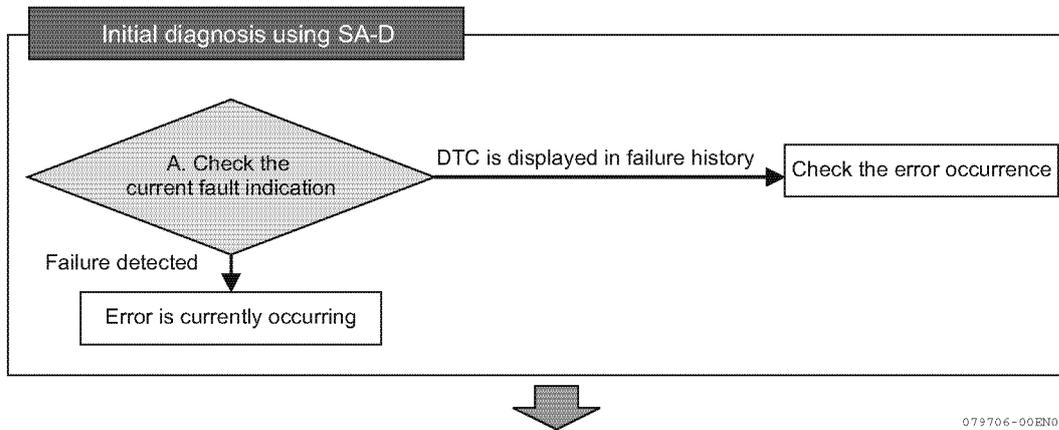
NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

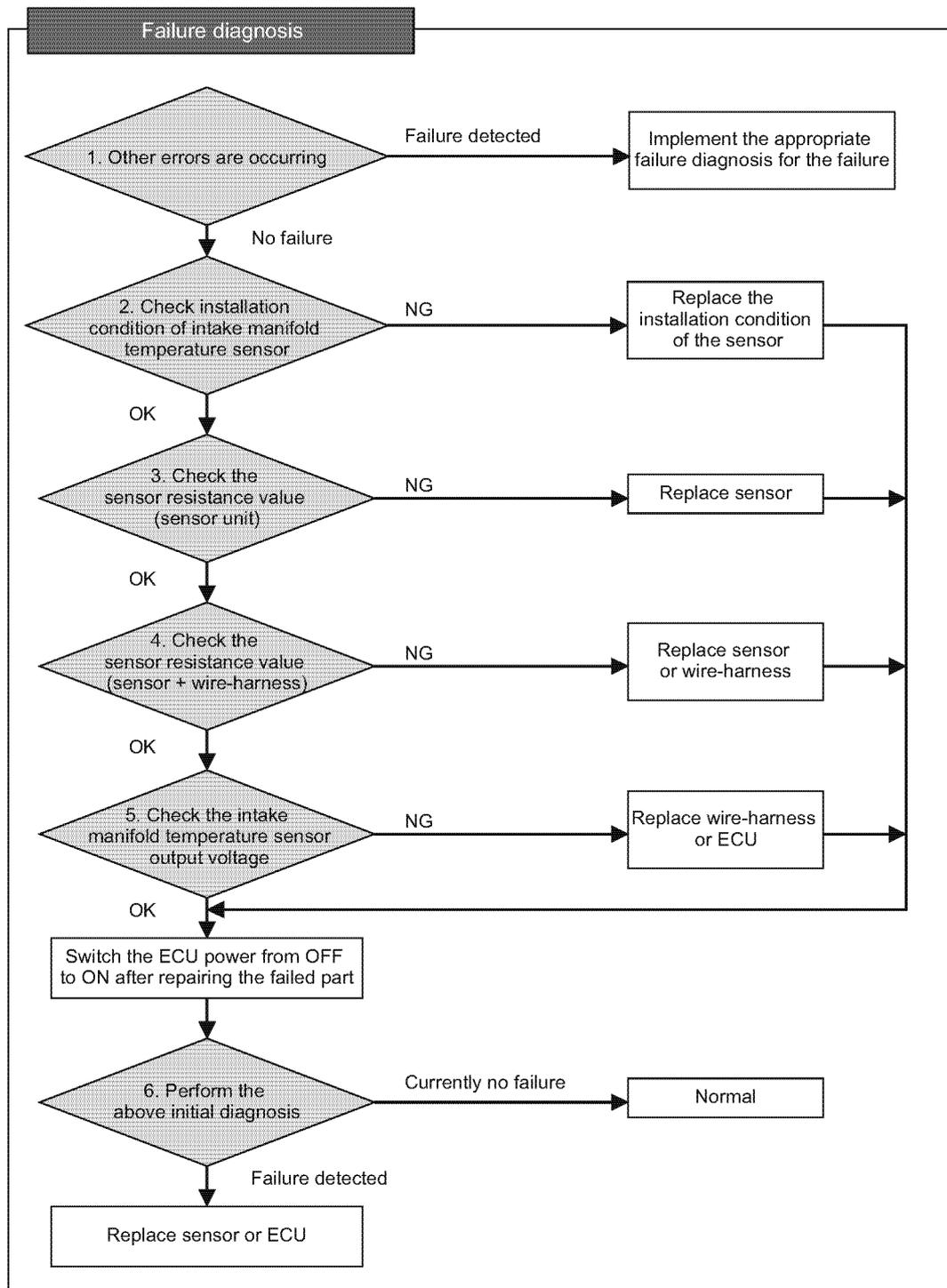
● Related DTC

P code	SPN/FMI	Name
P1676	105/10	Intake manifold temperature sensor error (detected value error)

● Workflow

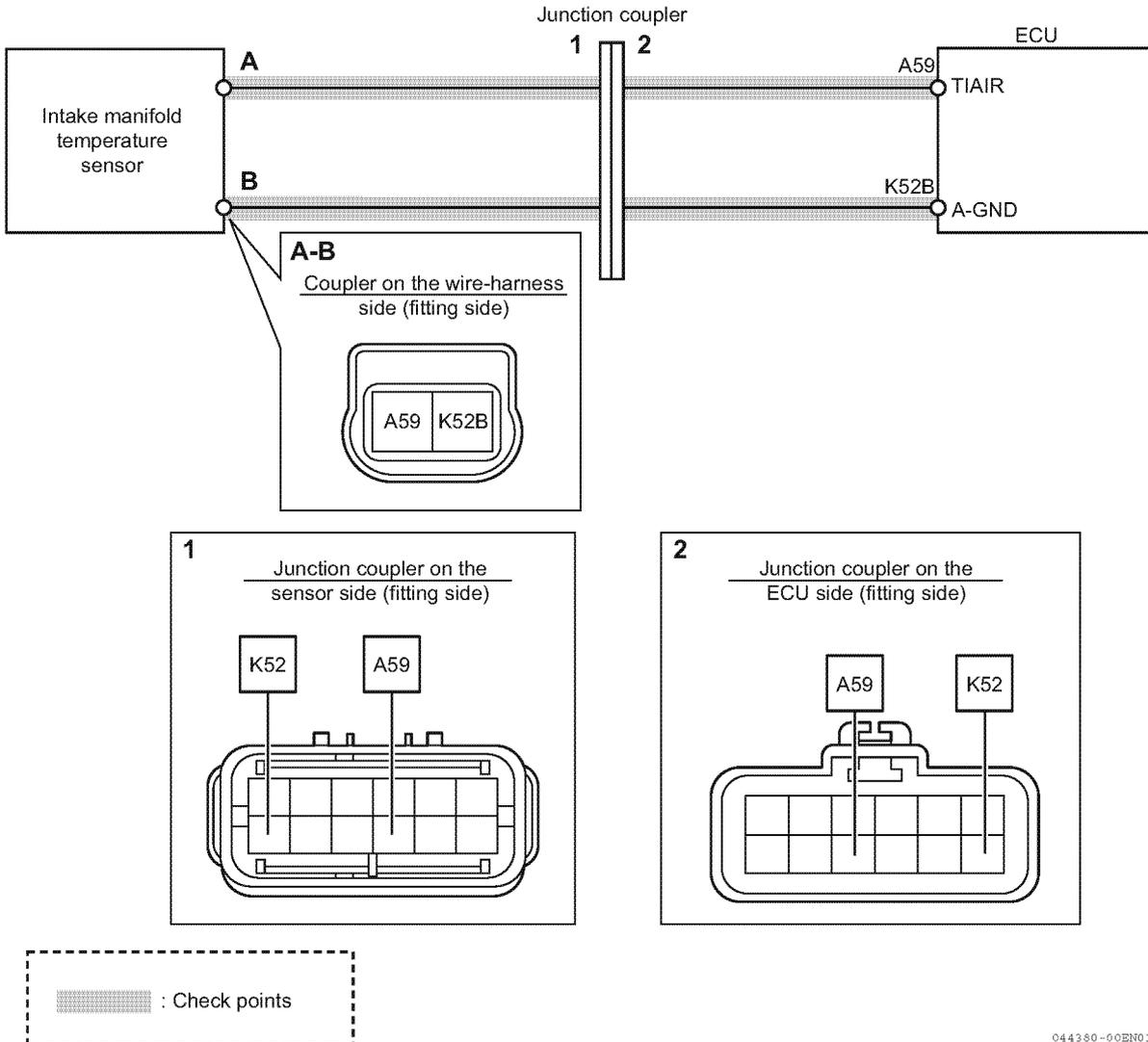
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





079723-00EN03

● Wire diagram



Note: See P316 for the ECU pin layout.

044380-00EN01

● Work description

1. Checking for other errors

- 1-Turn off the key switch and turn on the key switch again.
- 2-Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for intake manifold temperature sensor, engine coolant temperature sensor, ambient air temperature sensor, or inside the ECU.

Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to "Checking installation condition of intake manifold temperature sensor".

2. Checking installation condition of intake manifold temperature sensor

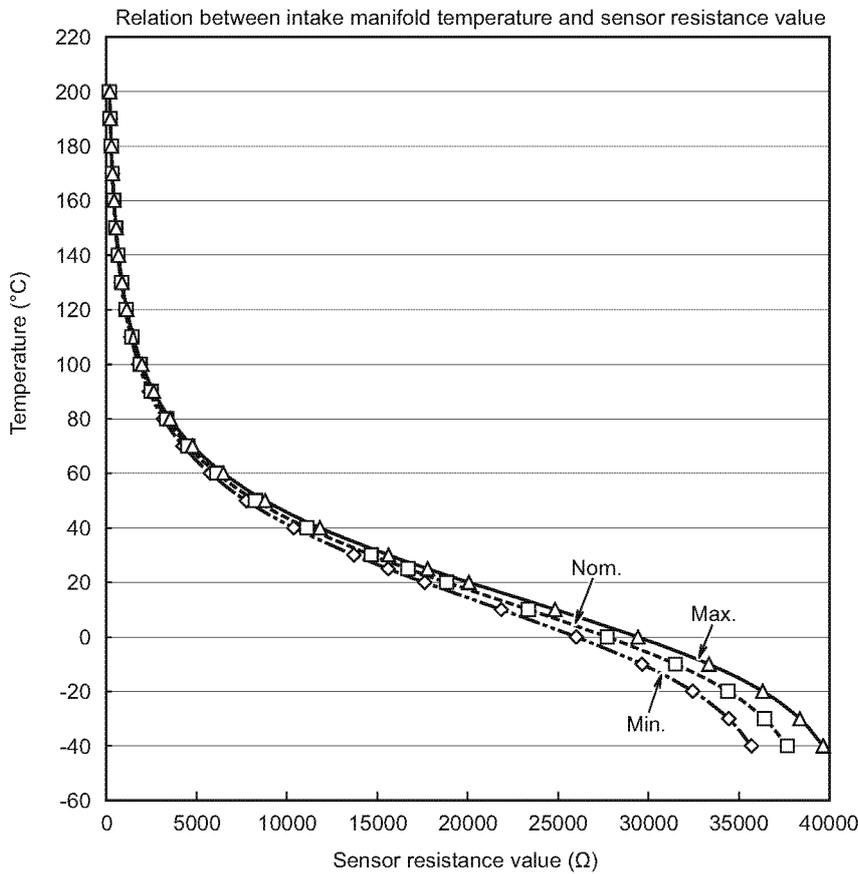
- 1-Turn off the key switch.
- 2-Check the installation condition of intake manifold temperature sensor.

NG	Reinstall the sensor, and turn off/on the ECU power for failure diagnosis using SA-D.
OK	Go to "Checking the sensor resistance value (sensor unit)"

3. Checking the sensor resistance value (sensor unit)

- 1- Remove the wire-harness from the intake manifold temperature sensor.
- 2- Using a circuit tester, measure the resistance value between intake manifold temperature sensor terminals A and B.
- 3- Using "Intake manifold temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

Intake manifold temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Nom.	Max.
-40	35699	37683	39656
-30	34434	36412	38374
-20	32455	34400	36325
-10	29633	31496	33339
0	26009	27723	29420
10	21858	23354	24838
20	17614	18847	20073
25	15595	16691	17782
30	13701	14664	15623
40	10386	11106	11825
50	7750	8273	8795
60	5742	6116	6488
70	4252	4516	4780
80	3162	3347	3534
90	2366	2499	2631
100	1787	1881	1975
110	1362	1431	1498
120	1050	1098	1148
130	816.2	852.3	888.3
140	641.2	667.8	694.6
150	508.9	528.5	548.1
160	405.3	422.1	438.9
170	325.9	340.2	354.4
180	264.4	276.5	288.7
190	216.2	226.6	236.9
200	178.2	187.1	196.1

044402-00EN01

NG	Replace the intake manifold temperature sensor, and switch the ECU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

TROUBLESHOOTING

4. Checking the sensor resistance value (sensor and wire-harness)

- 1-Connect the intake manifold temperature sensor and wire-harness, then remove the ECU from the wire-harness.
- 2-Using a circuit tester, measure the resistance value between ECU connector terminals A59 and K52B on the wire-harness side.
- 3-Using "Intake manifold temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. Switch the ECU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to "Checking the intake manifold temperature sensor output voltage".

5. Checking the intake manifold temperature sensor output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2-Using a circuit tester, measure the voltage between intake manifold temperature sensor signals A59 and K52B.

Voltage	State	Corrective action
A59 < 0.2 V	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
0.2 V ≤ A59 ≤ 4.8 V	OK (normal range)	Perform failure diagnosis using SA-D.
4.8 V < A59	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU. Switch the ECU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Switch the ECU power from OFF to ON for failure diagnosis using SA-D.

6. Operation using SA-D

- 1-Turn off the key switch and turn on the key switch again to start the engine. Operate the engine that satisfies the reset criteria for P1676: Intake manifold temperature sensor error (detected value error) (P126).
- 2-Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the intake manifold temperature sensor or ECU.

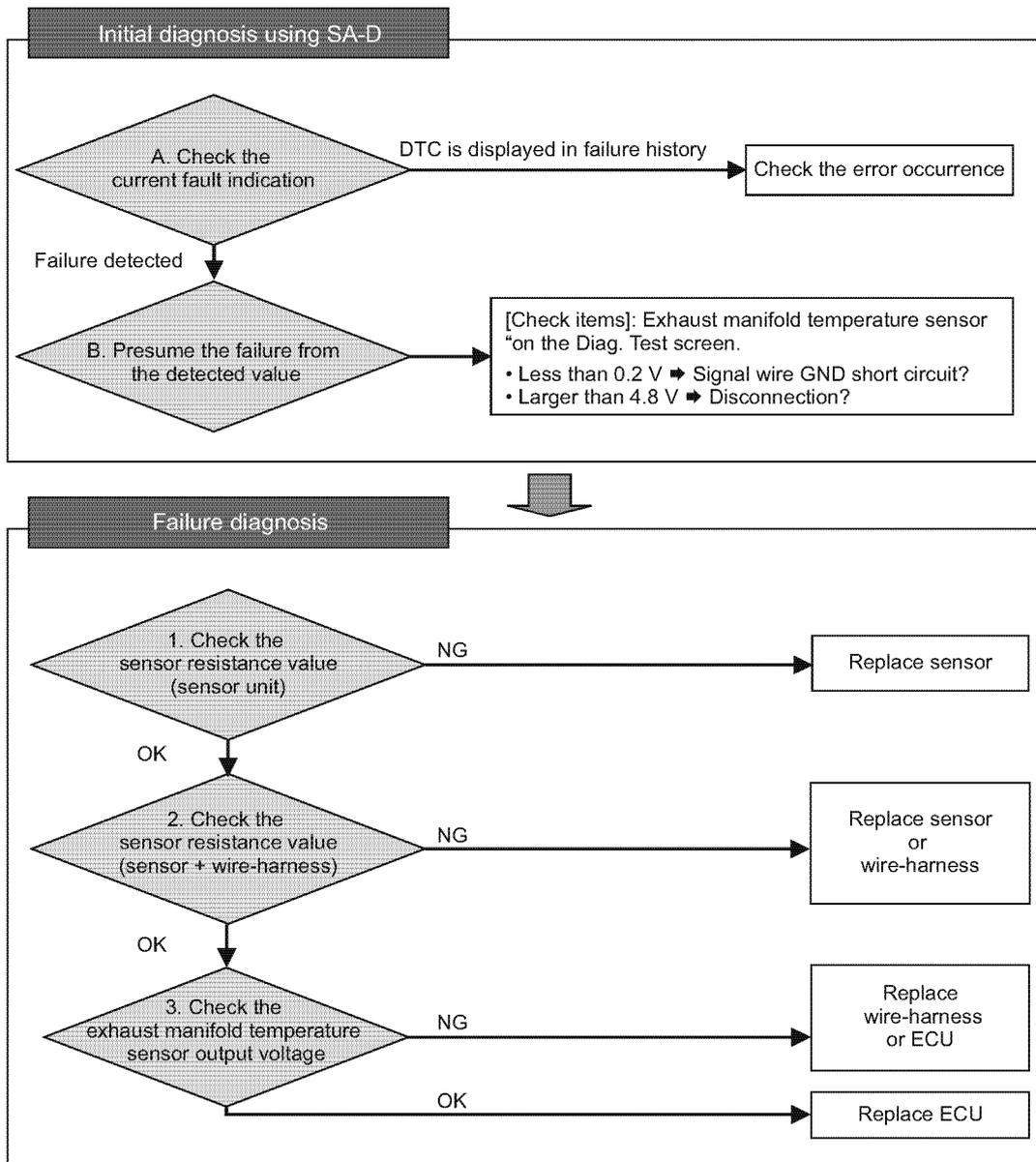
■ Exhaust manifold temperature sensor

● Related DTC

P code	SPN/FMI	Name
P0546	173/3	Exhaust manifold temperature sensor error (excessive sensor output)
P0545	173/4	Exhaust manifold temperature sensor error (insufficient sensor output)

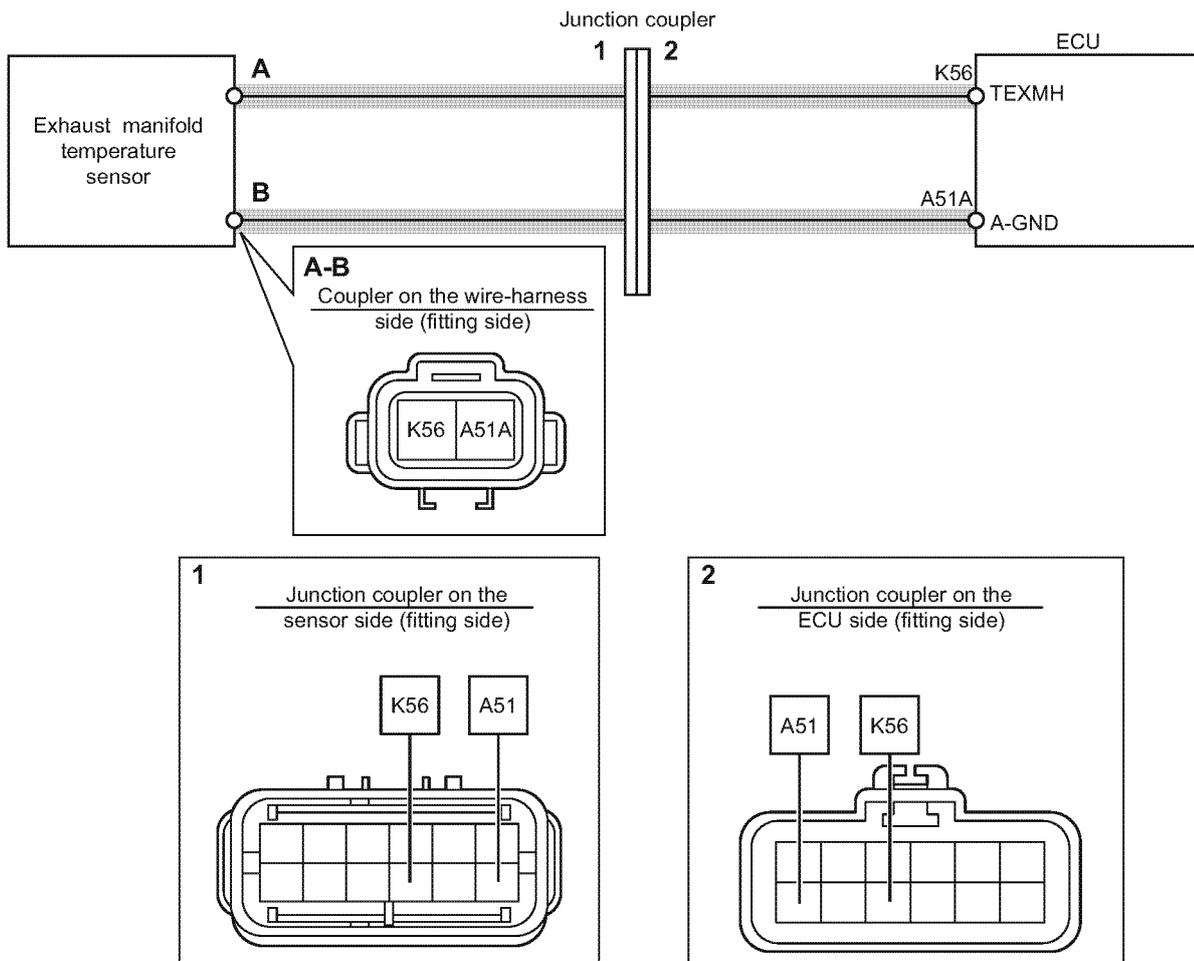
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



044390-01EN02

● Wire diagram



 : Check points

044381-00EN00

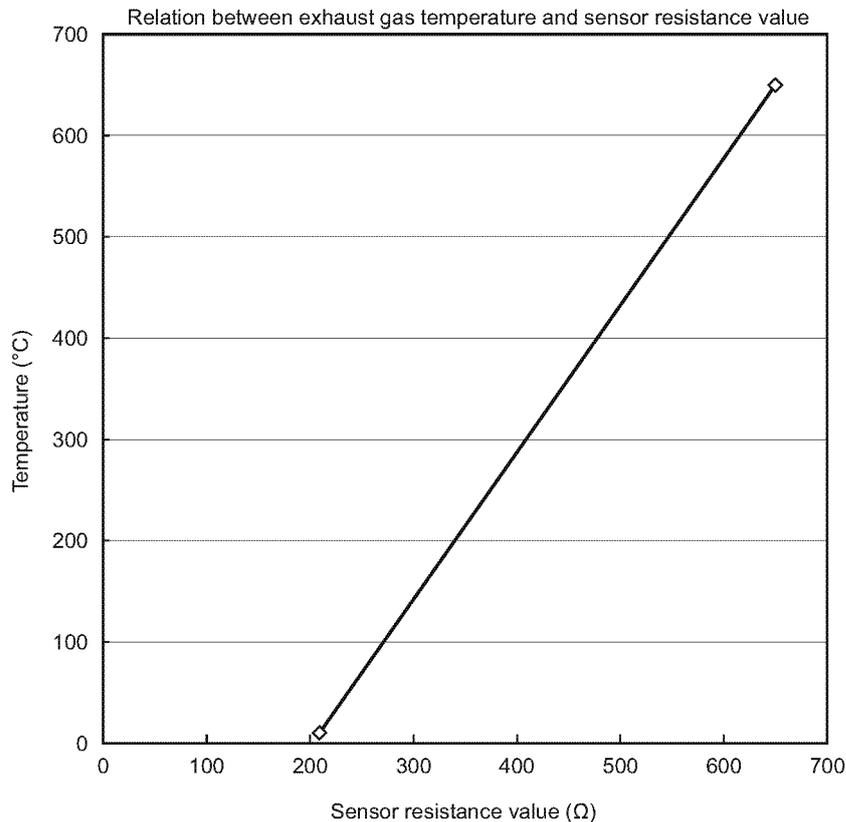
Note: See P316 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)

- 1- Remove the wire-harness from the exhaust manifold temperature sensor.
- 2- Using a circuit tester, measure the resistance value between exhaust manifold temperature sensor terminals A and B.
- 3- Using "Exhaust manifold temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

Exhaust manifold temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

044404-00EN00

NG	Replace the exhaust manifold temperature sensor.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

2. Checking the sensor resistance value (sensor and wire-harness)

- 1-Connect the exhaust manifold temperature sensor and wire-harness, and then remove the ECU from the wire-harness.
- 2-Using a circuit tester, measure the resistance value between the ECU side wire harness connector terminals K56 and A51A.
- 3-Using "Exhaust manifold temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Checking the exhaust manifold temperature sensor output voltage".

3. Checking the exhaust manifold temperature sensor output voltage

- 1-Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2-Using a circuit tester, measure the voltage between exhaust manifold temperature sensor signals A56 and A51A.

Voltage	State	Corrective action
$K56 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq K56 \leq 4.8 \text{ V}$	OK (normal range)	Replace the ECU.
$4.8 \text{ V} < K56$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

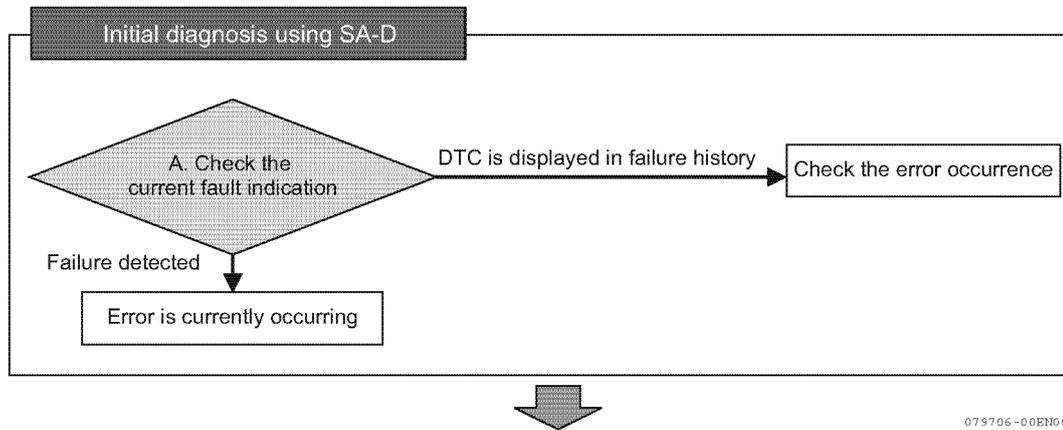
NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

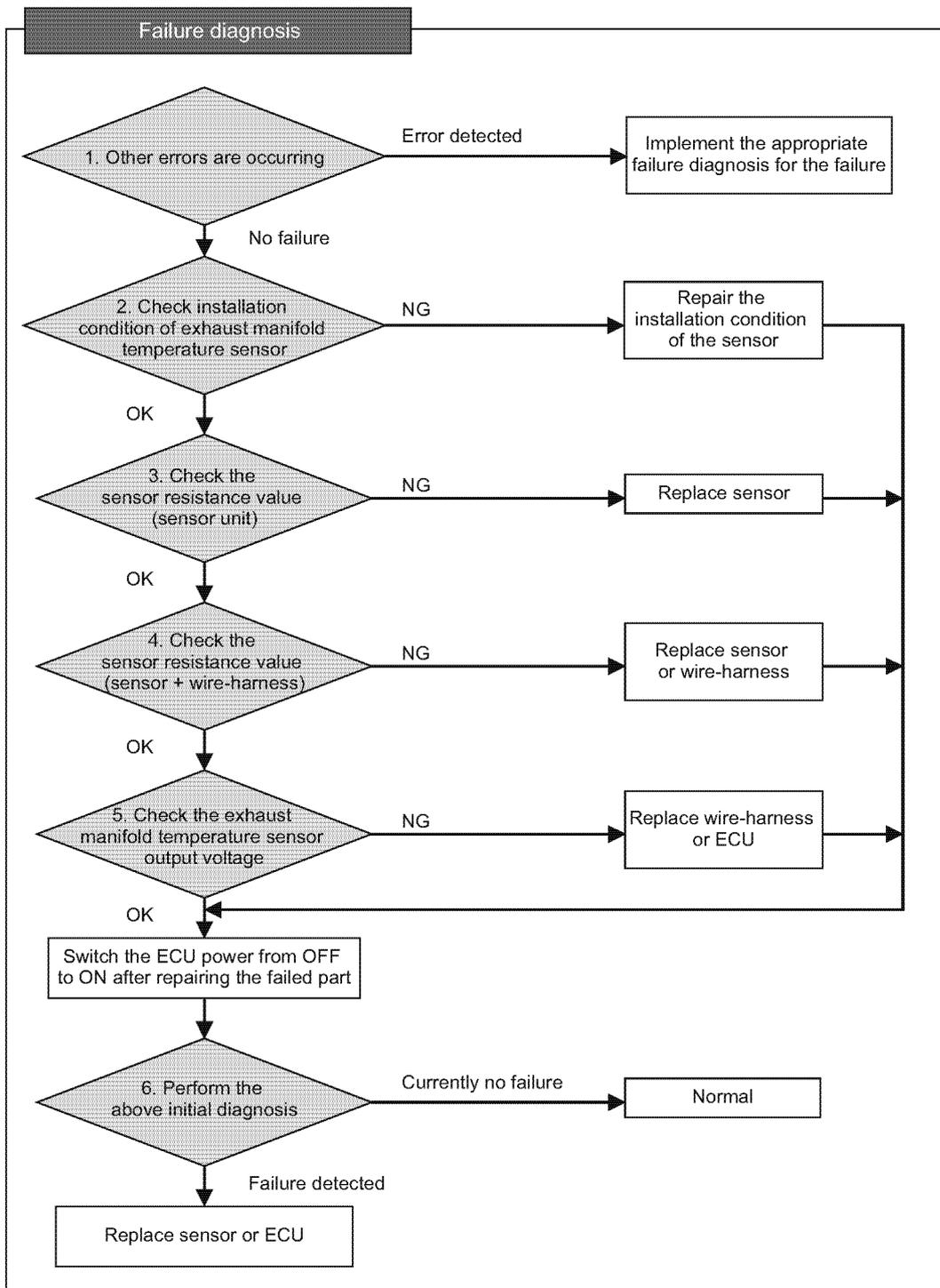
● Related DTC

P code	SPN/FMI	Name
P1677	173/10	Exhaust manifold temperature sensor error (detected value error)

● Workflow

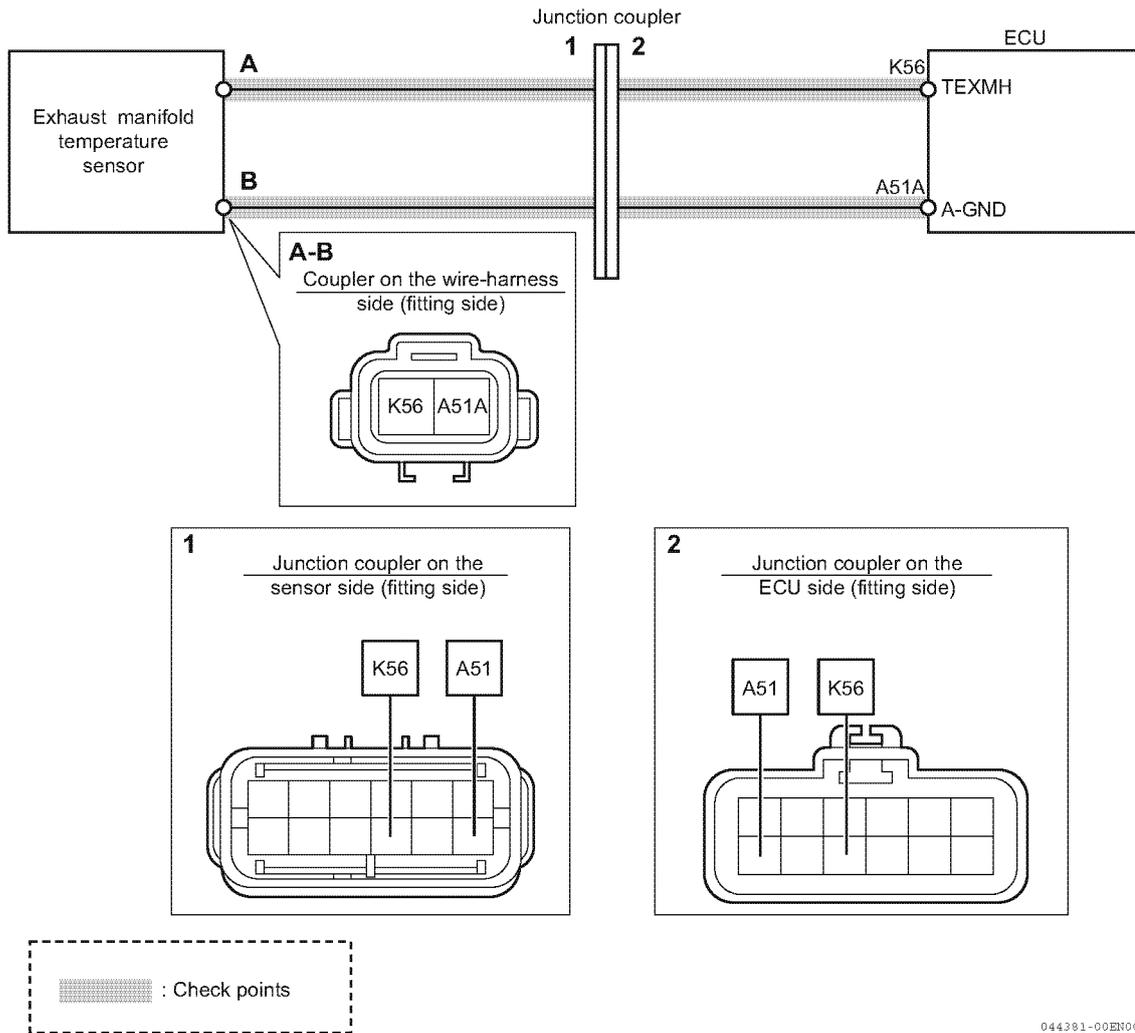
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





079723-00 EN04

● Wire diagram



044381-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Checking for other errors

- 1-Turn off the key switch and turn on the key switch again.
- 2-Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for exhaust manifold temperature sensor, engine coolant temperature sensor, DPF inlet temperature sensor, or inside the ECU.

Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to "Checking installation condition of exhaust manifold temperature sensor".

2. Checking installation condition of exhaust manifold temperature sensor

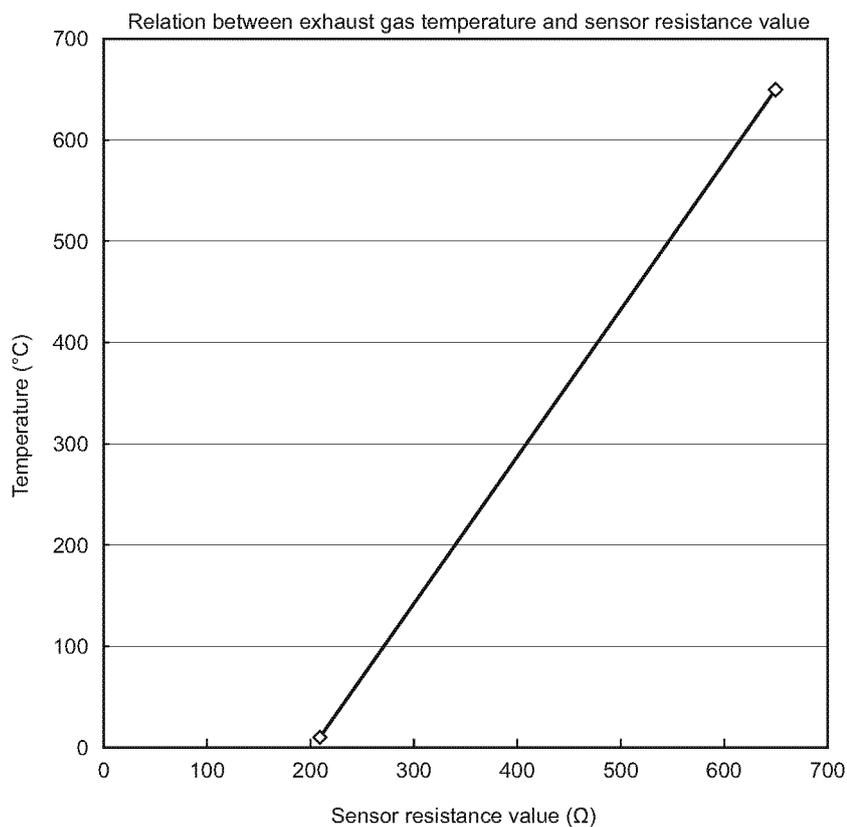
- 1-Turn off the key switch.
- 2-Check the installation condition of exhaust manifold temperature sensor.
- 3-Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

NG	Reinstall the sensor, and turn off/on the ECU power for failure diagnosis using SA-D.
OK	Go to "Checking the sensor resistance value (sensor unit)"

3. Checking the sensor resistance value (sensor unit)

- 1- Remove the wire-harness from the exhaust manifold temperature sensor.
- 2- Using a circuit tester, measure the resistance value between exhaust manifold temperature sensor terminals A and B.
- 3- Using "Exhaust manifold temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

Exhaust manifold temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

044404-00EN00

NG	Replace the exhaust manifold temperature sensor, and switch the ECU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to "Checking the sensor resistance value (sensor and wire-harness)".

4. Checking the sensor resistance value (sensor and wire-harness)

- 1- Connect the exhaust manifold temperature sensor and wire-harness, and then remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between ECU connector terminals K56 and A51A on the wire-harness side.
- 3- Using "Exhaust manifold temperature sensor characteristics", make sure that the measured resistance value is within the normal range.

NG	<ul style="list-style-type: none"> • The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. Switch the ECU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to "Checking the exhaust manifold temperature sensor output voltage".

5. Checking the exhaust manifold temperature sensor output voltage

- 1- Connect the checker harness between the ECU and engine wire-harness. Also connect all connectors (sensor, ECU).
- 2- Using a circuit tester, measure the voltage between exhaust manifold temperature sensor signals K56 and A51A.

Voltage	State	Corrective action
$K56 < 0.2 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.2 \text{ V} \leq K56 \leq 4.8 \text{ V}$	OK (normal range)	Perform failure diagnosis using SA-D.
$4.8 \text{ V} < K56$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU. Switch the ECU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Switch the ECU power from OFF to ON for failure diagnosis using SA-D.

6. Operation using SA-D

- 1- Turn off the key switch and turn on the key switch again to start the engine. Operate the engine that satisfies the reset criteria for P1677: Exhaust manifold temperature sensor error (detected value error) (P132).
- 2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the exhaust manifold temperature sensor or ECU.

Contact output related

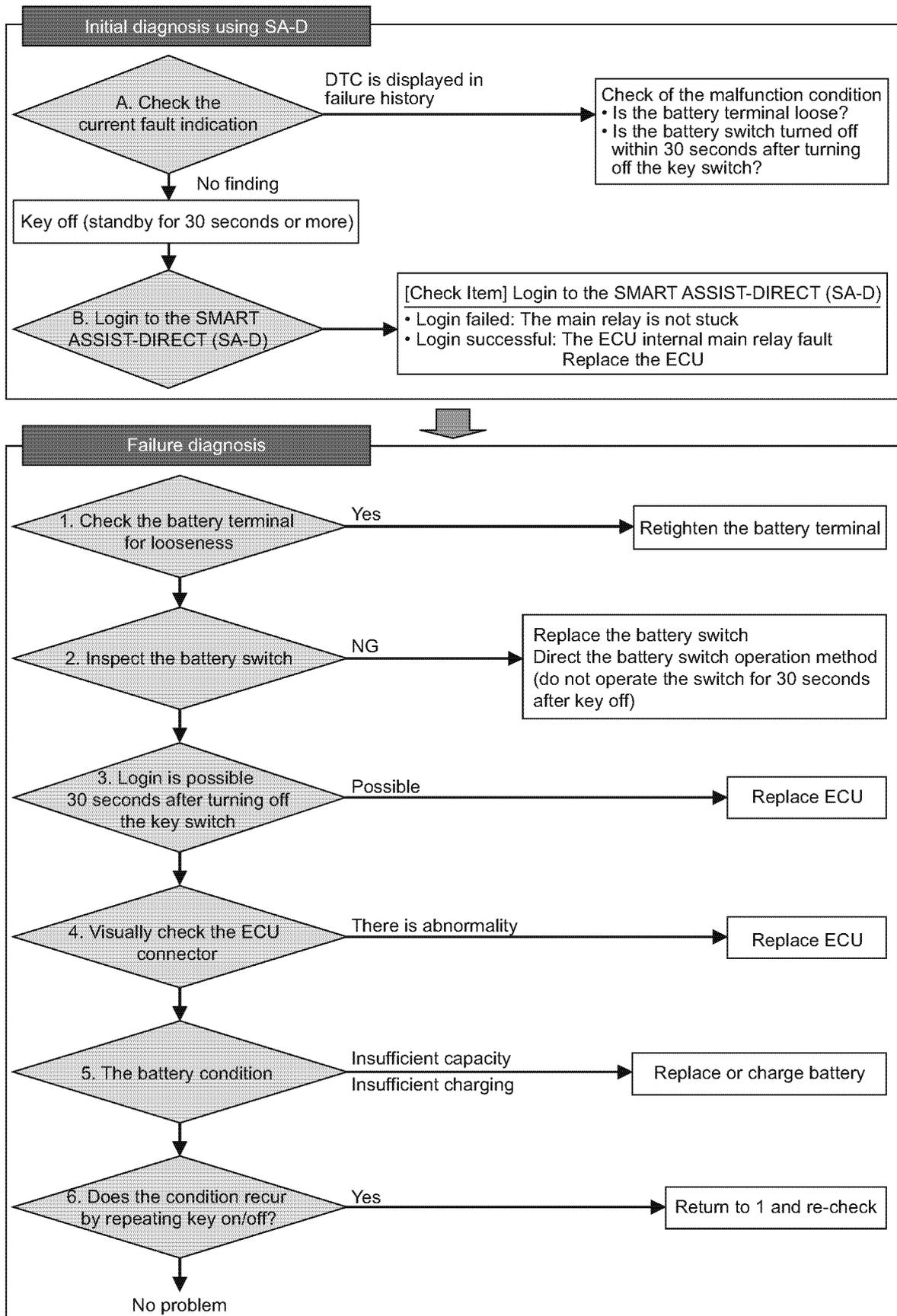
■ Main relay

● Related DTC

P code	SPN/FMI	Name
P068B	1485/7	Main relay contact sticking
P068A	1485/2	Main relay early opening

● Workflow

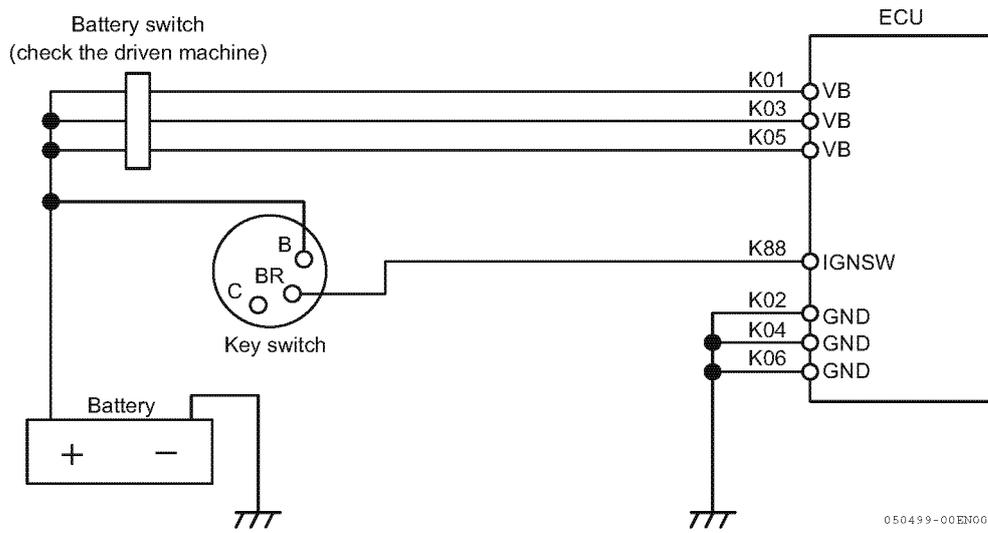
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



050498-00EN03

● Wire diagram

Note: The main relay is equipped with an ECU.



Note: See P316 for the ECU pin layout.

● Work description**1. Check the battery terminal for looseness**

- Check whether or not the wiring from the battery to the ECU VB terminal is loose or damaged.
- Check whether or not the joints to the battery GND terminal and the frame are loose.
- Check whether or not the wiring from the ECU GND terminal to the frame GND is loose or damaged.
- Check whether or not the wiring from the ECU IGN terminal to the key switch is loose or damaged.

2. Inspect the battery switch

Depending on the driven machine, there is a battery switch for the purpose of long-term storage besides the key switch. For details, contact the driven machine manufacturer.

- Check the wiring of the battery switch for looseness.
- Check the battery switch for abnormality.
- Do not perform the cutoff operation of the battery switch within 30 seconds after the key off. Direct the operation method to the operator.

3. Login check to the SMARTASSIST-DIRECT (SA-D)

When 30 seconds or more are elapsed after turning off the key switch, the ECU operation stops completely. Connect the SMARTASSIST-DIRECT (SA-D) after the elapse of 30 seconds or more after the key off and check whether or not you can login. If you can login after the elapse of 30 seconds or more, there is a possibility that the ECU internal main relay is faulty. Replace the ECU.

4. Visually check the ECU connector

Visually check the VB pins (K01, K03, K05) and the GND pins (K02, K04, K06) of the ECU connector. If there is broken or bent pin, replace the ECU.

5. The battery condition

The insufficient battery charging or the battery capacity reduction may lead to the supply voltage reduction, resulting in the early opening abnormality of the main relay. Inspect the battery.

6. Check the recurrence

Repeat turning on/off the key switch for a few times and check that the concerned abnormality does not recur. If the abnormality recurs, perform the inspection again from Step 1. If the abnormality does not recur, there is no problem with the main relay.

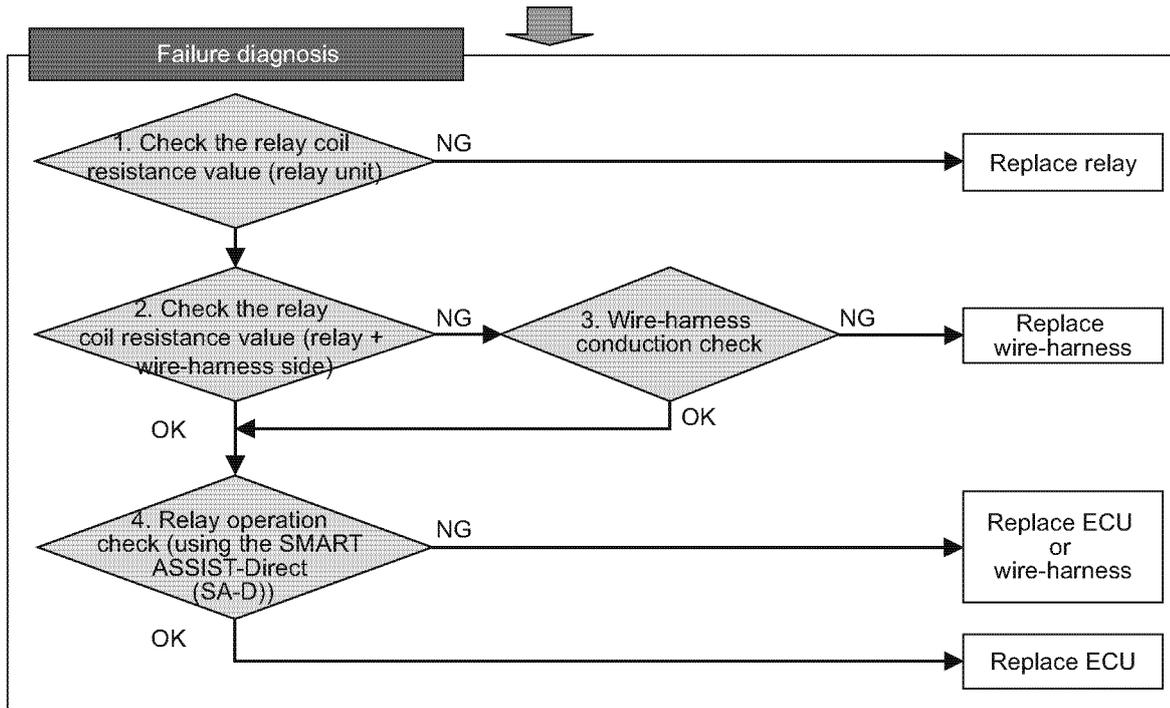
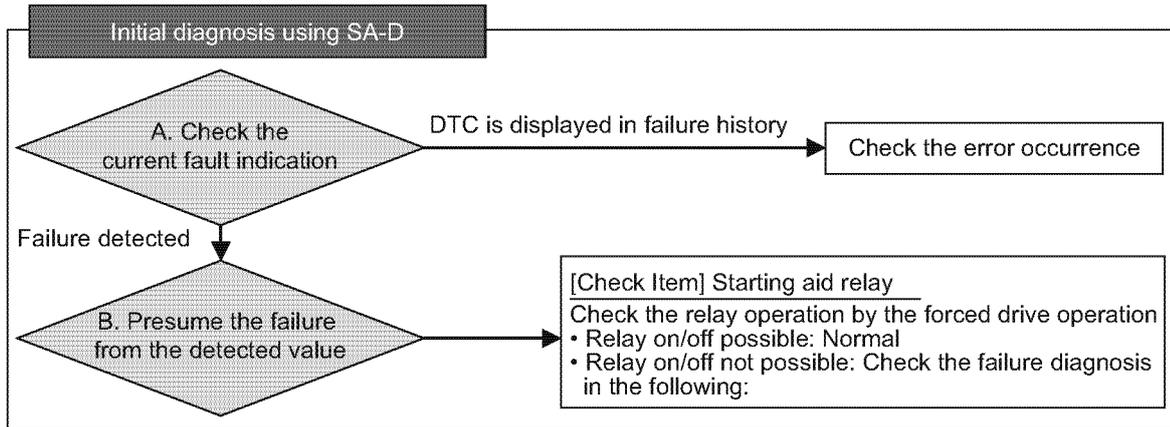
■ Starting aid relay (Glow relay)

● Related DTC

P code	SPN/FMI	Name
P0543	522243/5	Starting aid relay disconnection
P0541	522243/6	Starting aid relay GND short circuit

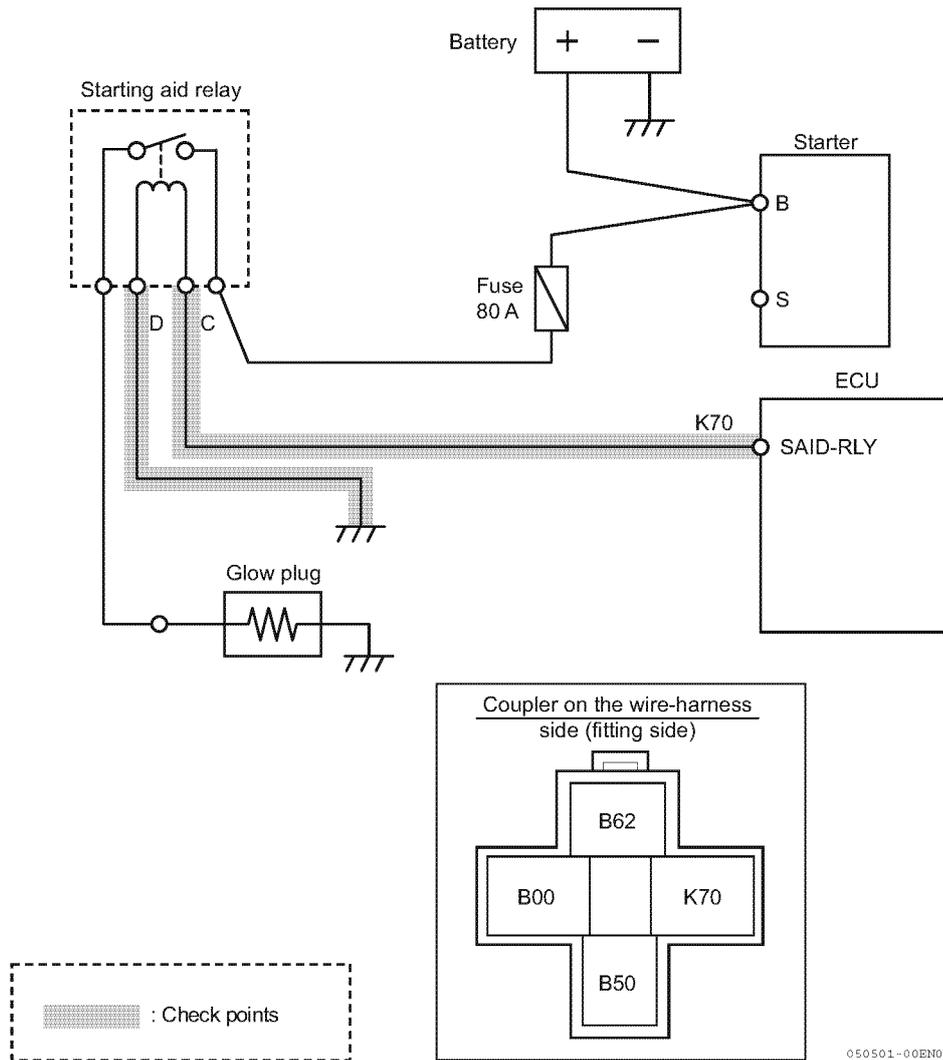
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



050500-00EN01

● Wire diagram



Note: See P316 for the ECU pin layout.

● Work description

1. Checking the relay coil resistance value (relay unit)

- 1- Remove the wire-harness from the starting aid relay.
- 2- Using a circuit tester, measure the resistance value between the relay side terminals C and D.

Resistance value of YANMAR standard starting aid relay

Relay	Terminal	Specifications
129927-77930 (40 A)	Relay coil side C - D	103 Ω ± 10 % (at 20 °C)
129927-77920 (70 A)	Relay coil side C - D	103 Ω ± 10 % (at 20 °C)
129927-77900 (90 A)	Relay coil side C - D	80 Ω (at 20 °C)

NG	Replace the starting aid relay.
OK	Check the relay coil resistance value while the starting aid relay and the wire-harness are connected. Go to "Checking the relay coil resistance value (relay + wire-harness side)".

2. Checking the relay coil resistance value (relay + wire-harness side)

- 1- Connect the starting aid relay to the wire-harness. Remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between the ECU connectors K70 and K02.

Note: See the above "Resistance value of YANMAR standard starting aid relay".

NG	Check the wire-harness conduction. Go to "Wire-harness conduction check".
OK	Use the SMARTASSIST-DIRECT (SA-D) to check the operation of the starting aid relay. Go to "Relay operation check".

3. Wire-harness conduction check

- 1- Remove the wire-harness from the starting aid relay and the ECU.
- 2- Using a circuit tester, measure the wire-harness conduction.

Terminal	Conduction	State
Relay coil E70 side (between ECU and relay connector)	Yes	OK: Normal
	No	NG: Wire-harness open circuit
Relay coil E00 side (between ECU and relay connector)	Yes	OK: Normal
	No	NG: Wire-harness open circuit
Between K70 - GND/K02/K04/K06	No	OK: Normal
	Yes	NG: Wire-harness open circuit
Between E70 - VB/K01/K03/K05	No	OK: Normal
	Yes	NG: Wire-harness open circuit

NG	<ul style="list-style-type: none"> • Check the wire-harness for damage. Check the wiring for mis-connection. • Replace the wire-harness.
OK	Use the SMARTASSIST-DIRECT (SA-D) to check the operation of the starting aid relay. Go to "Relay operation check".

4. Relay operation check

1- Connect the checker harness between the ECU and the machine wire-harness (For details, refer to "How to use the Tier 4 checker harness" on page 318). Also, connect all connectors (starting aid relay, ECU).

2- Turn on the key switch. Login to the SMARTASSIST-DIRECT (SA-D).

3- Operate the starting aid relay on the "Diagnosis Test: Forced Drive" of the SMARTASSIST-DIRECT (SA-D).

At this time, measure the voltage between the terminals K70 and K02.

ON/OFF setting condition	Voltage	State
ON	2.5 V or more	OK: Normal
	Less than 2.5 V	NG: Wire-harness GND short circuit or ECU failure
OFF	1.75 V or below	OK: Normal
	Over 1.75 V	NG: Wire-harness power short circuit or ECU failure

NG	<ul style="list-style-type: none"> • Check the wire-harness for damage. Check the wiring for mis-connection. • Replace the wire-harness.
OK	Replace the ECU.

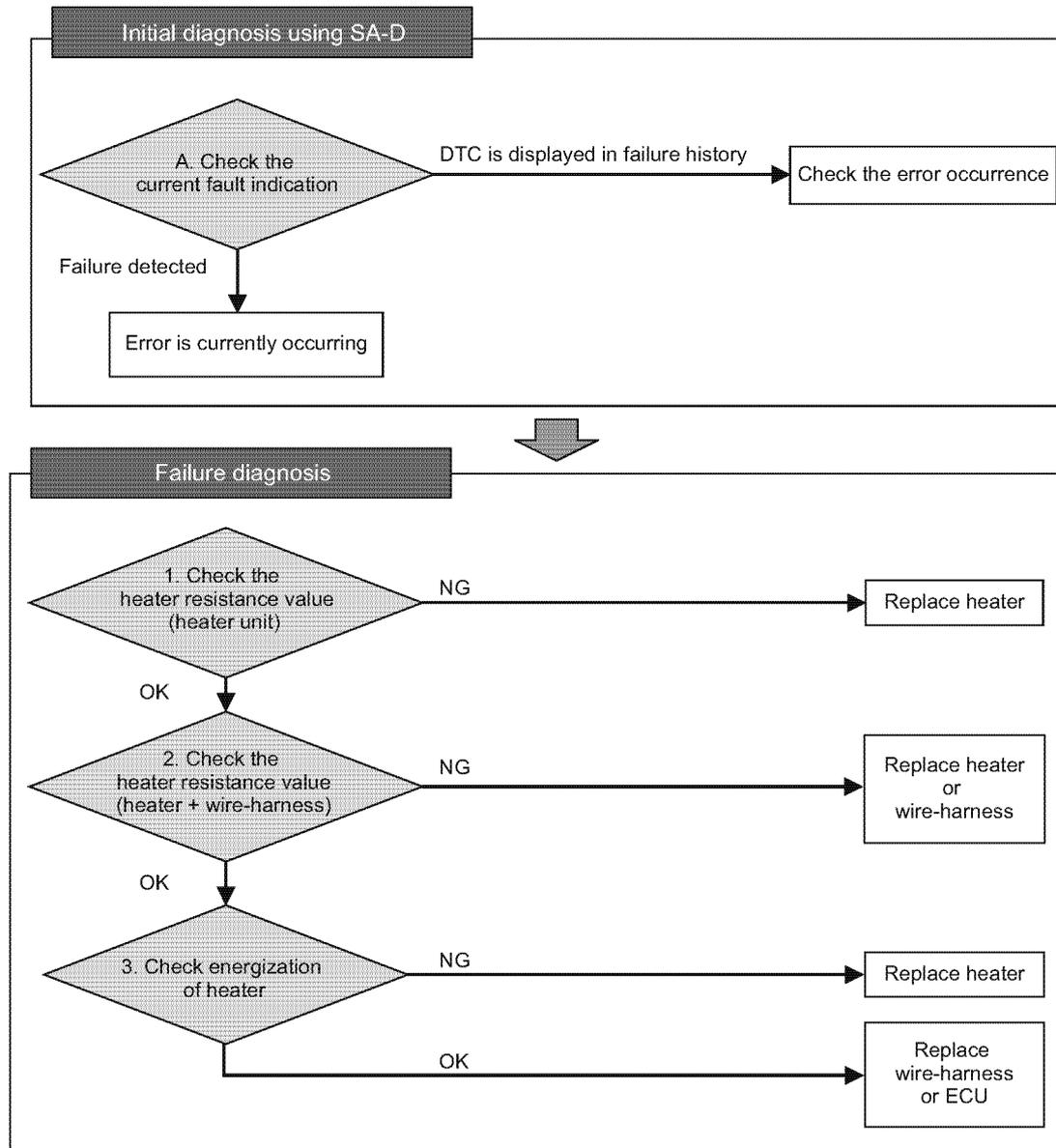
■ Breather heater (Optional parts for 4TNV86CT and 4TNV98CT)

● Related DTC

P code	SPN/FMI	Name
P053A	3059/5	Breather heater disconnection
P053B	3059/4	Breather heater short circuit (GND)
P053C	3059/3	Breather heater short circuit (VB)

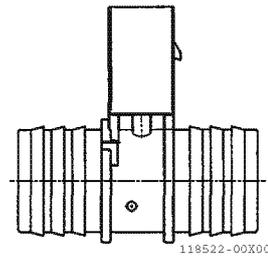
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

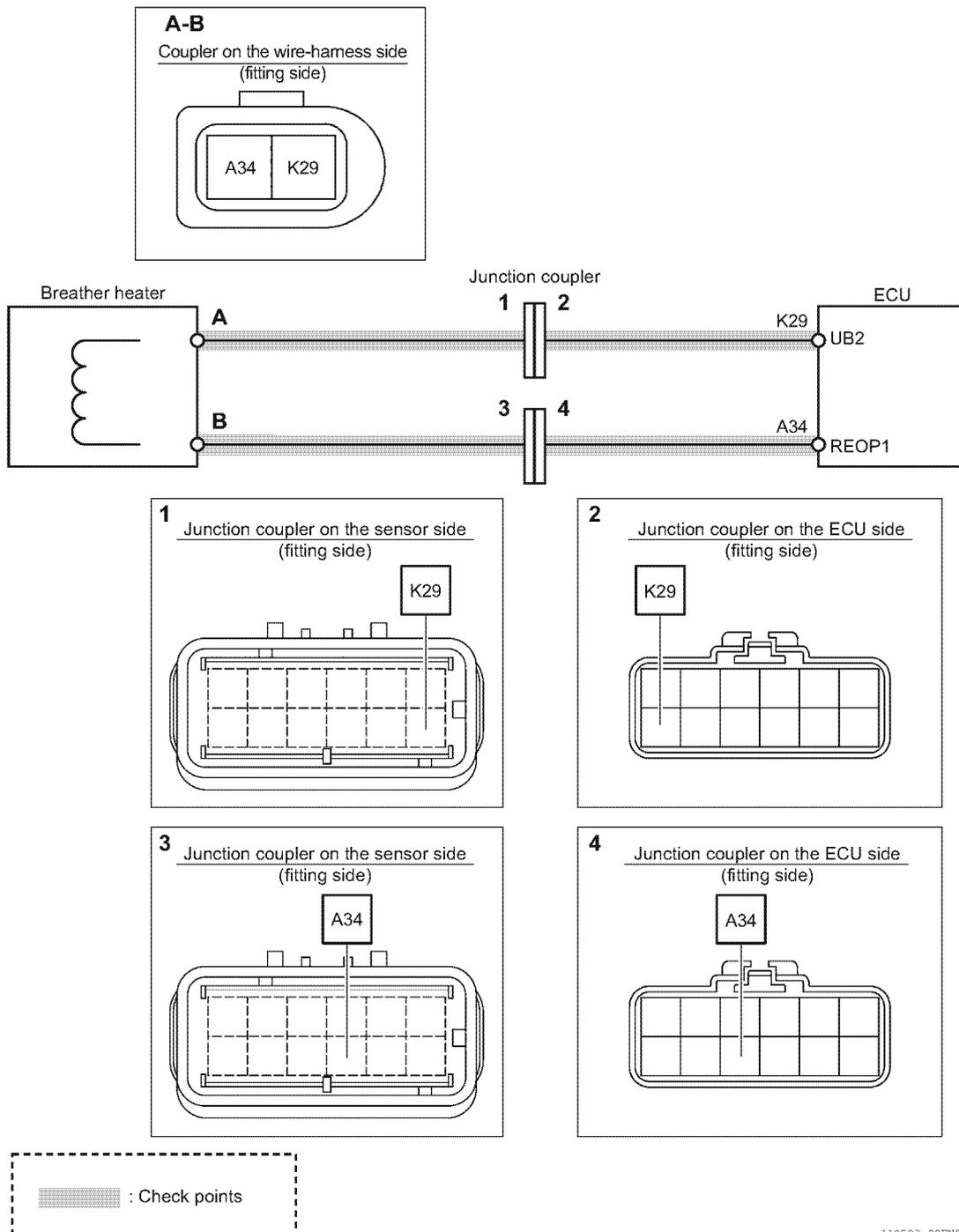


118521-00EN00

● Heater diagram



● Wire diagram



118523-00EN00

Note: See P316 for the ECU pin layout.

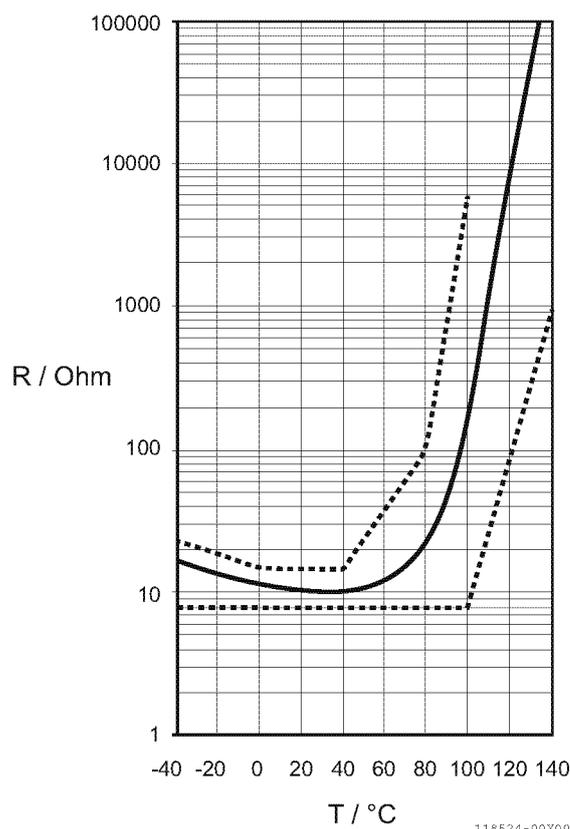
● Work description

1. Checking the resistance values of the breather heater (heater unit)

- 1- Remove the breather heater from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between the breather heater terminals A and B.

Reference: Resistance value between breather heater terminals

Terminal	Specification
Heater A to B	Criteria: $10 \pm 5 \Omega$ with the heater temperature between 20 to 40 °C. The heater resistance changes depending on the temperature. (see the figure below)



NG	Replace the breather heater.
OK	See "Checking the resistance values of the breather heater (heater and wire-harness)".

2. Checking the resistance values of the breather heater (heater and wire-harness)

- 1- Remove the ECU from the wire-harness while the breather heater and the wire-harness are connected.
- 2- Using a circuit tester, measure the resistance value between the ECU connector terminals K29 and A34 on the wire-harness side.

Note: See "Reference: Resistance value between breather heater terminals".

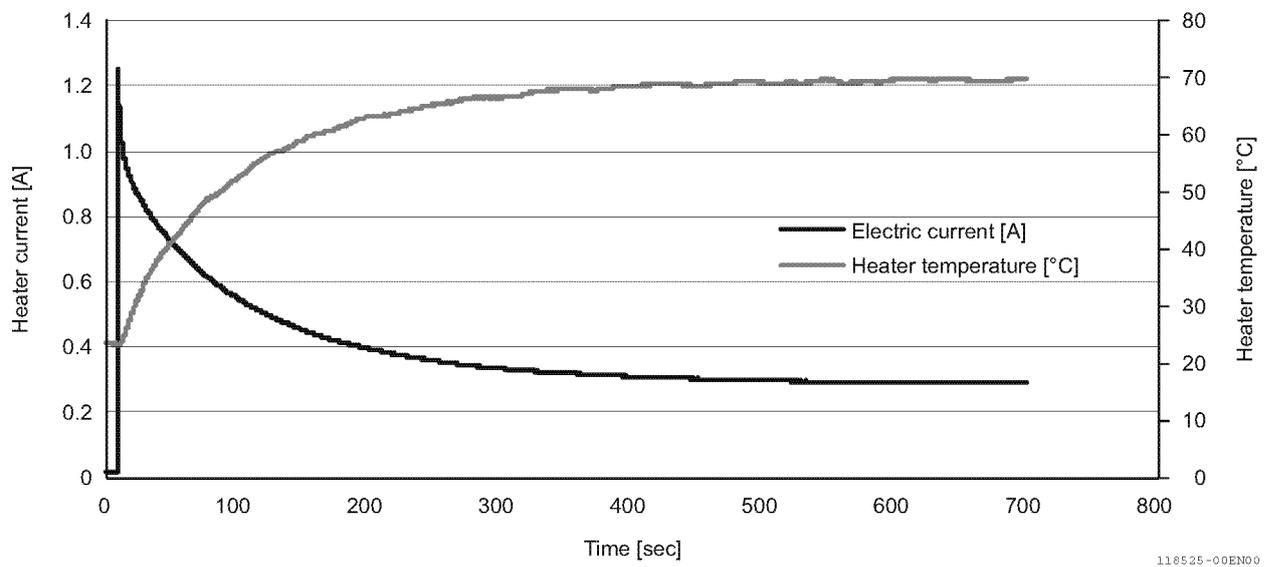
NG	<ul style="list-style-type: none"> • The coupler connecting the heater and wire-harness might have failed. Replace the heater. • Replace the wire-harness.
OK	See "Checking energization of heater".

3. Checking energization of heater

1- Apply 12 V between the breather heater A and B, then measure the current.

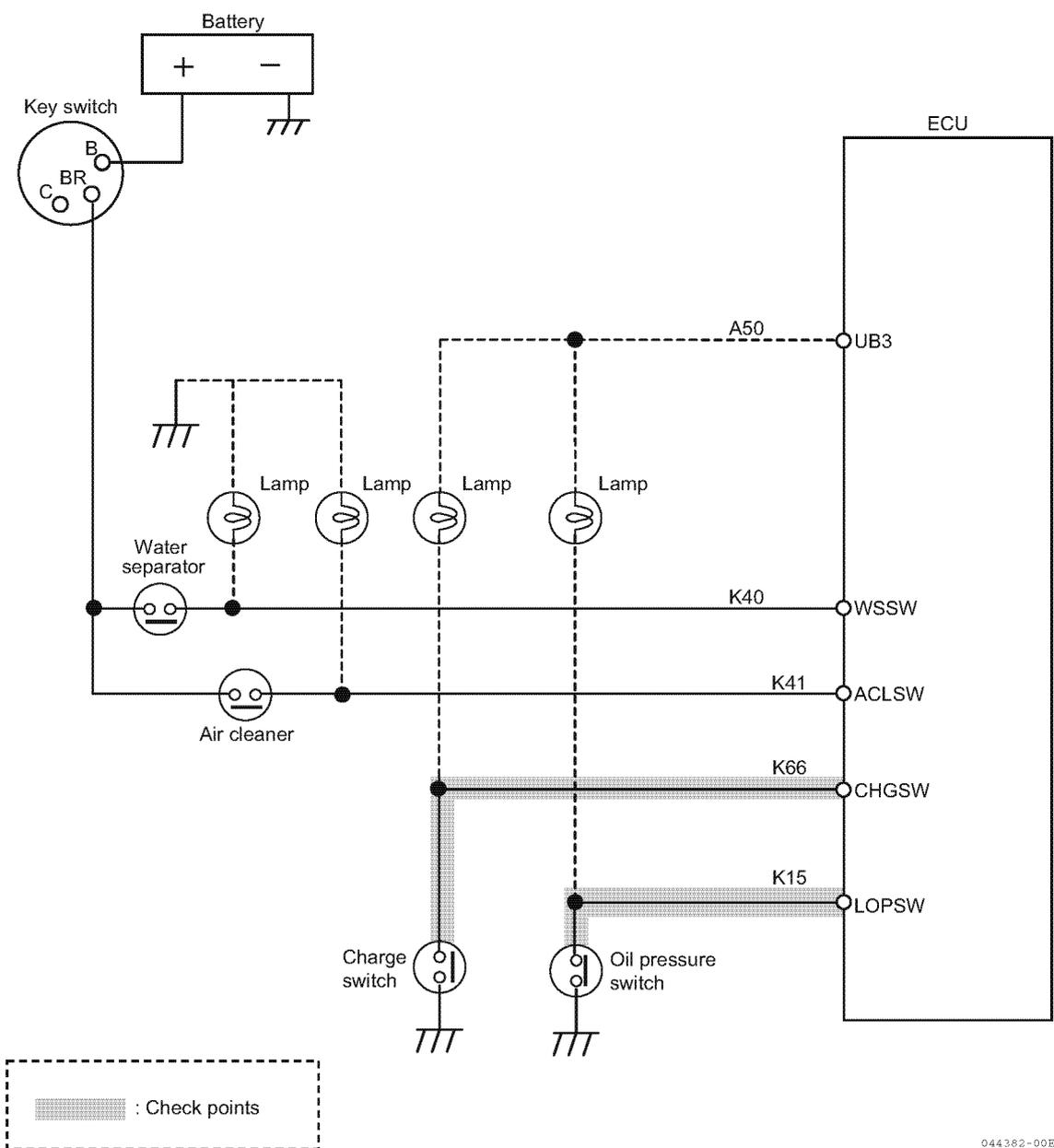
Note: See "Reference: Relation between the heater current and temperature".

Reference: Relation between the heater current and temperature



NG	Replace the heater.
OK	<ul style="list-style-type: none"> • The coupler connecting the ECU and wire-harness might have failed. Replace the wire-harness. • Replace the ECU.

● Wire diagram



044382-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the conduction (contact input switch unit)

- 1-Turn off the ECU power.
- 2-Remove the wire-harness from each contact input switch.
- 3-Using a circuit tester, check the conduction between the contact input terminal and the body frame while referring to the following table.

Item	Terminal No.	Conduction (between terminal and body frame)	State
Oil pressure switch	K15	Yes	OK: Normal
		No	NG: Error
Charge switch	K66	No	OK: Normal
		Yes	NG: Error

NG	Replace the contact input switch.
OK	Go to "Checking the conduction (contact input switch and wire-harness)".

2. Checking the conduction (contact input switch and wire-harness)

- 1-Connect the contact input switch to the wire-harness. Remove the ECU from the wire-harness.
- 2-Using a circuit tester, measure the conduction between the ECU connector terminal and the body frame of the wire-harness. For the number of the terminal that is checked, refer to 1. above.

NG	<ul style="list-style-type: none"> • A coupler failure between the contact input switch and the wire-harness may be caused. Replace the contact input switch. • Replace the wire-harness.
OK	Go to "Check the operation of the contact input switch".

3. Check the operation of the contact input switch

- 1-Connect all connectors (contact input switch, ECU, junction coupler).
- 2-Connect SA-D, turn on the key switch, and then log in to SA-D.
- 3-Using SA-D's "Diagnosis Test: Digital input", monitor each indicated item, and check the ON/OFF display of the contact input switch under specific conditions.

Item	Check condition	ON/OFF indication	State
Oil pressure switch	Before engine start	ON (1)	OK: Normal
		OFF (0)	NG: Error
	During engine operation	OFF (0)	OK: Normal
		ON (1)	NG: Error
Charge switch	Before engine start	ON (1)	OK: Normal
		OFF (0)	NG: Error
	During engine operation	OFF (0)	OK: Normal
		ON (1)	NG: Error

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

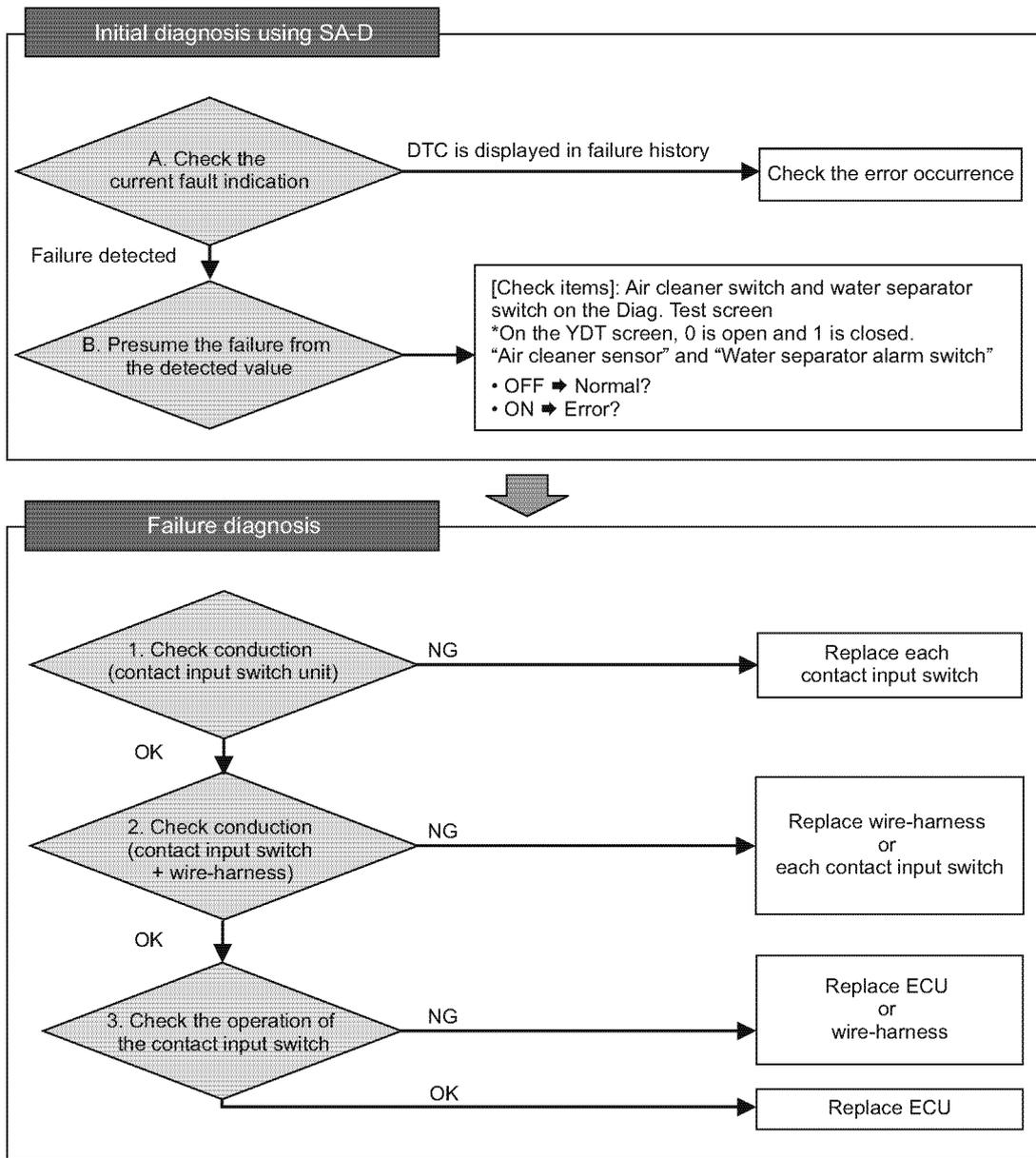
■ Contact input related 2

● Related DTC

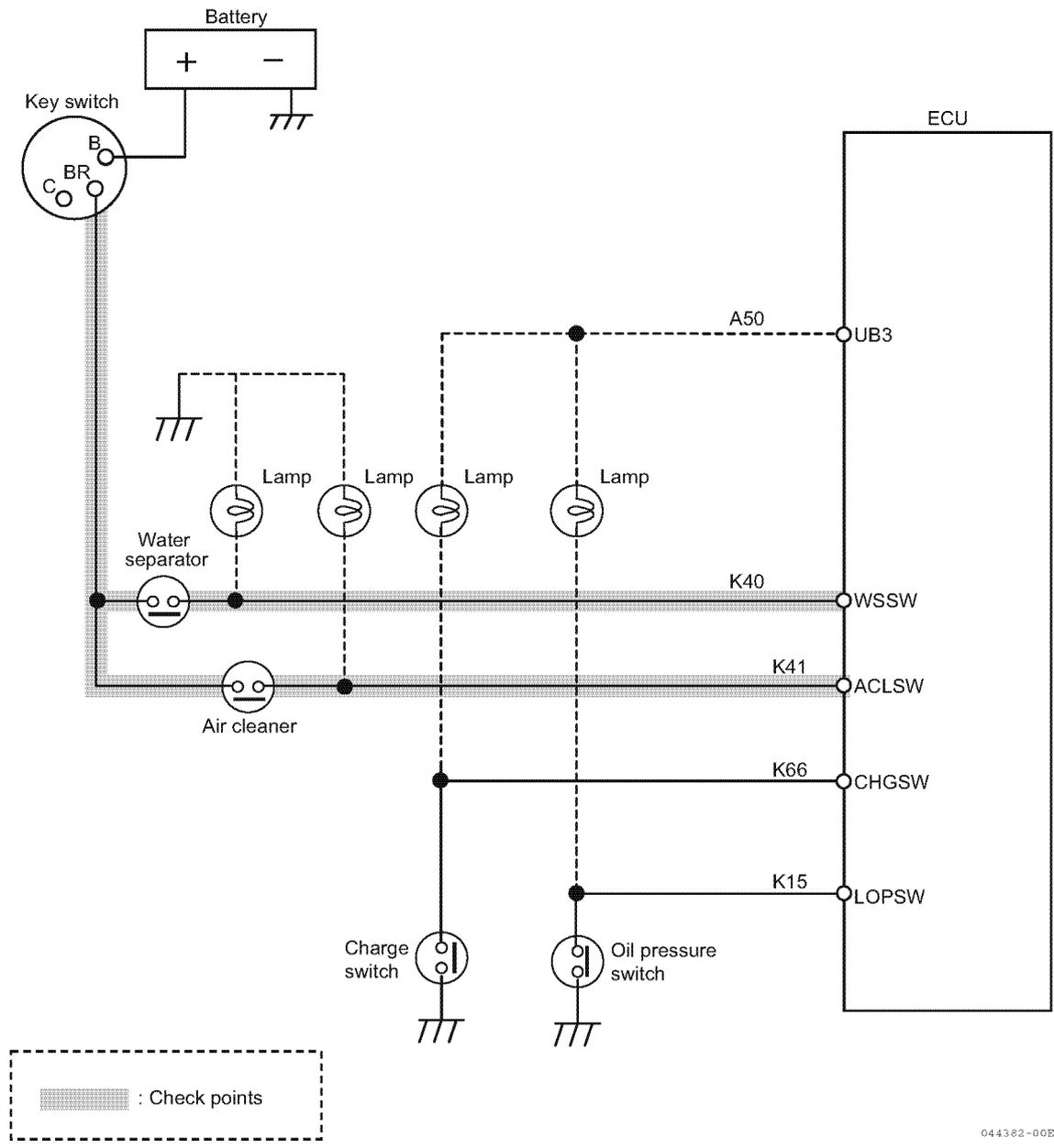
P code	SPN/FMI	Name
P1101	522323/0	Air cleaner clogged alarm
P1151	522329/0	Water separator alarm

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P316 for the ECU pin layout.

044382-00EN01

● Work description

1. Checking the conduction (contact input switch unit)

- 1- Turn off the ECU power.
- 2- Remove the wire-harness from each contact input switch.
- 3- Using a circuit tester, check the conduction between the contact input terminals of each switch while referring to the following table.

Item	Terminal No.	Conduction (between each switch terminal)	State
Air cleaner switch	K41	No	OK: Normal
		Yes	NG: Error
Water separator switch	K40	No	OK: Normal
		Yes	NG: Error

NG	Replace the contact input switch.
OK	Go to "Checking the conduction (contact input switch and wire-harness)".

2. Checking the conduction (contact input switch and wire-harness)

- 1- Connect the contact input switch and the wire-harness and remove the ECU and key switch terminal (BR) from the wire-harness.
- 2- Using a circuit tester to check the conduction between the ECU connector terminal and the key switch terminal (BR) of the wire-harness. For the number of the terminal that is checked, refer to 1. above.

NG	<ul style="list-style-type: none"> • A coupler failure between the contact input switch and the wire-harness may be caused. Replace the contact input switch. • Replace the wire-harness.
OK	Go to "Checking the operation of the contact input switch".

3. Checking the operation of the contact input switch

- 1- Connect all connectors (contact input switch, ECU, key switch terminal (BR)).
- 2- Connect SA-D, turn on the key switch, and then log in to SA-D.
- 3- Using SA-D's "Diagnosis Test: Digital input", monitor each indicated item, and check the ON/OFF display of the contact input switch under specific conditions.

Item	ON/OFF indication	State
Air cleaner switch	OFF (0)	OK: Normal
	ON (1)	NG: Error
Water separator switch	OFF (0)	OK: Normal
	ON (1)	NG: Error

NG	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.
OK	Replace the ECU.

Post treatment related

■ DPF OP interface

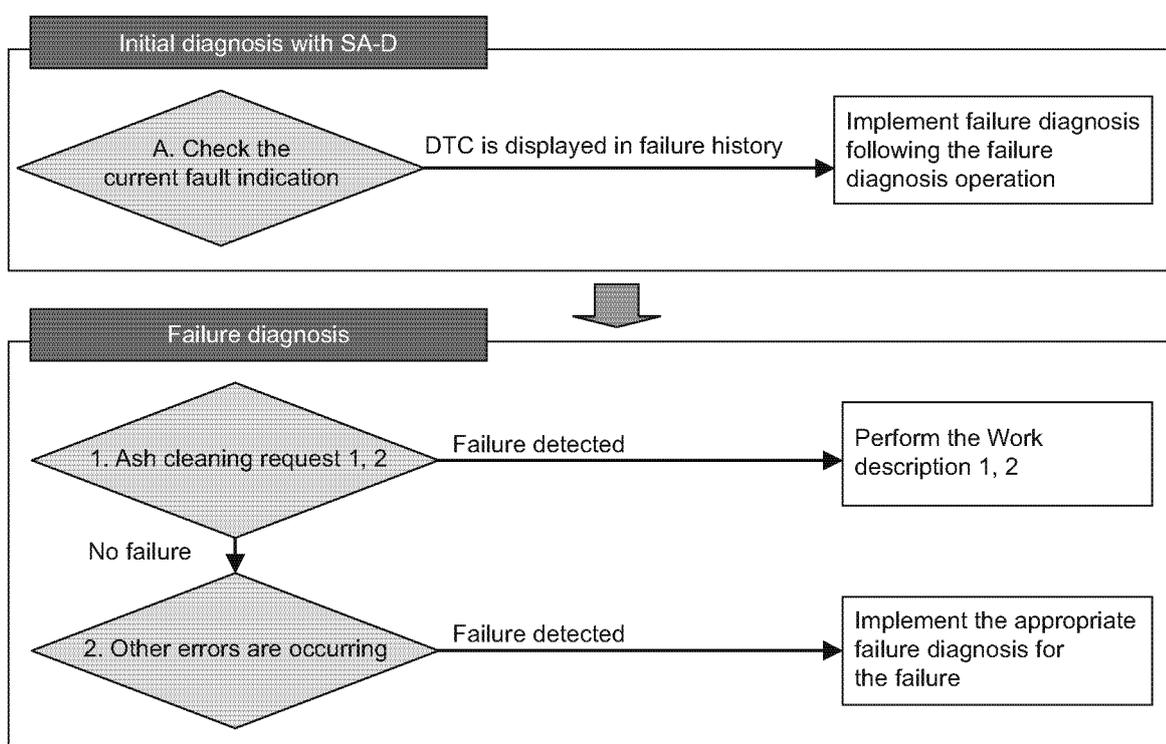
Ash cleaning request

● Related DTC

P code	SPN/FMI	Name
P242F	3720/16	Ash cleaning request 1
P1420	3720/20	Ash cleaning request 2

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



077776-00EN00

● Work description

1. Clean (replace) the soot filter (SF).

Connect to SA-D, and clean (replace) the SF according to the SF replacement procedure.

See "SA-D Operation Manual" for details on SF replacement.

Consult your authorized YANMAR dealer or distributor for SF cleaning.

2. Make sure that Ash cleaning request 1 and 2 are not shown now.

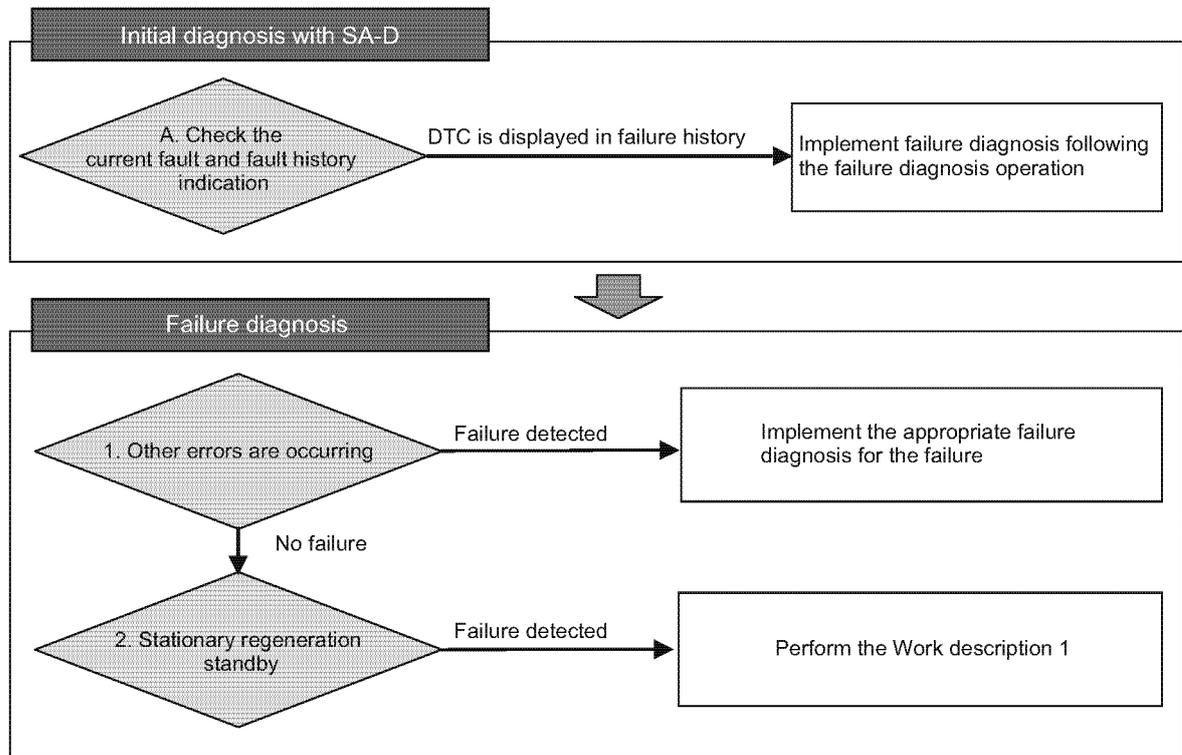
Stationary regeneration standby

● Related DTC

P code	SPN/FMI	Name
P1421	3719/16	Stationary regeneration standby

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



058963-00EN00

● Work description

1. PM may be accumulated, which required stationary regeneration.
Perform the stationary regeneration.

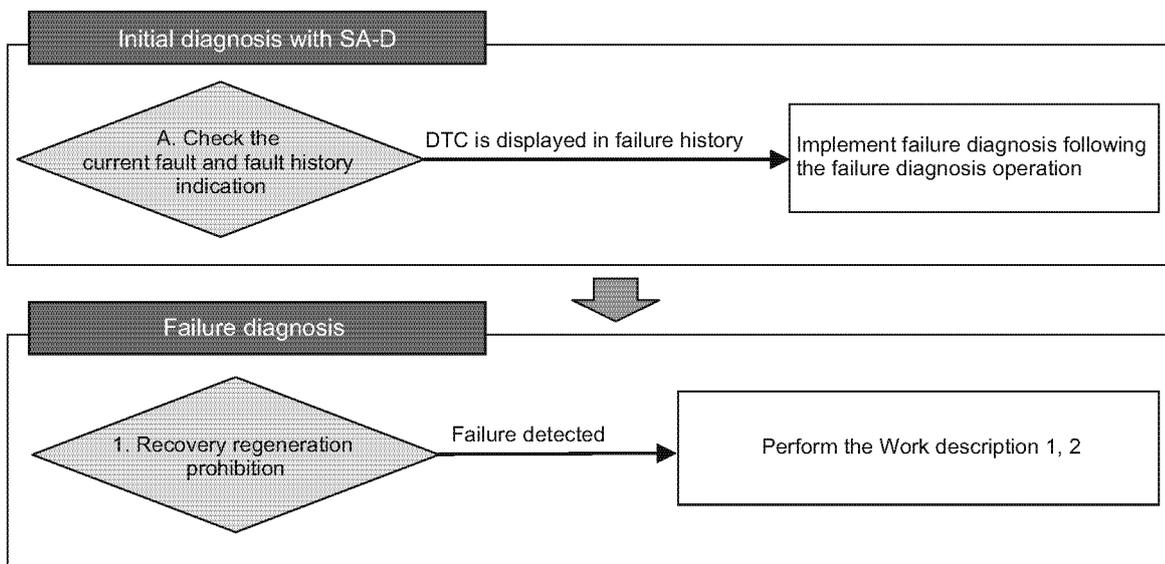
Recovery regeneration is inhibited

● Related DTC

P code	SPN/FMI	Name
P1446	3719/7	Recovery regeneration is inhibited

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



058964-00EN00

● Work description

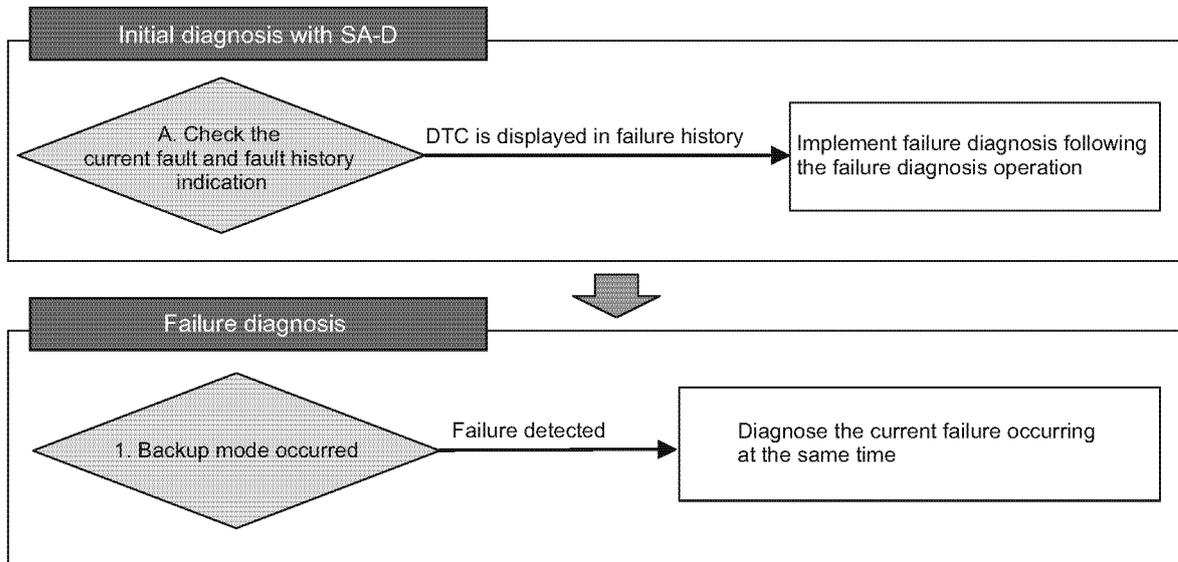
1. Too much PM is accumulated in soot filter (SF). Replace the SF.
Connect to SA-D, and clean (replace) the SF according to the SF replacement procedure.
See "SA-D Operation Manual" for details on SF replacement.
2. Make sure that "recovery regeneration is inhibited" is not shown now.

Backup mode**● Related DTC**

P code	SPN/FMI	Name
P1424	3719/0	Backup mode

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



058965-00EN00

● Work description

When this error occurs, either of the following that shows the cause of backup mode is detected at the same time: "Excessive PM accumulation (method C)", "Excessive PM accumulation (method P)", "Regeneration failure (stationary regeneration failure)", and "Regeneration failure (stationary regeneration not performed)".

What to check is different depending on the details of the failures detected at the same time. Perform failure diagnosis for them first.

■ DPF

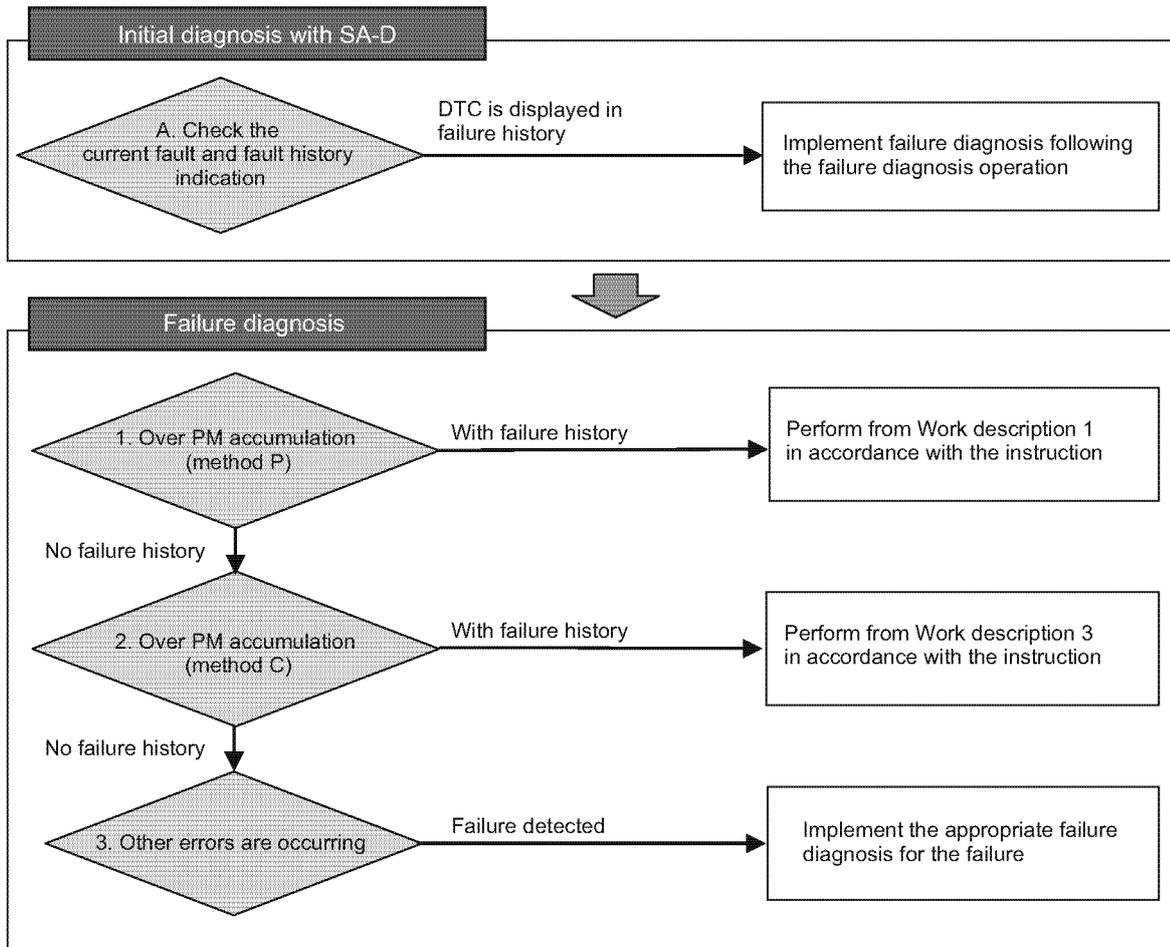
Excessive PM accumulation

● Related DTC

P code	SPN/FMI	Name
P2463	522573/0	Excessive PM accumulation (Method C)
P1463	522574/0	Excessive PM accumulation (Method P)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

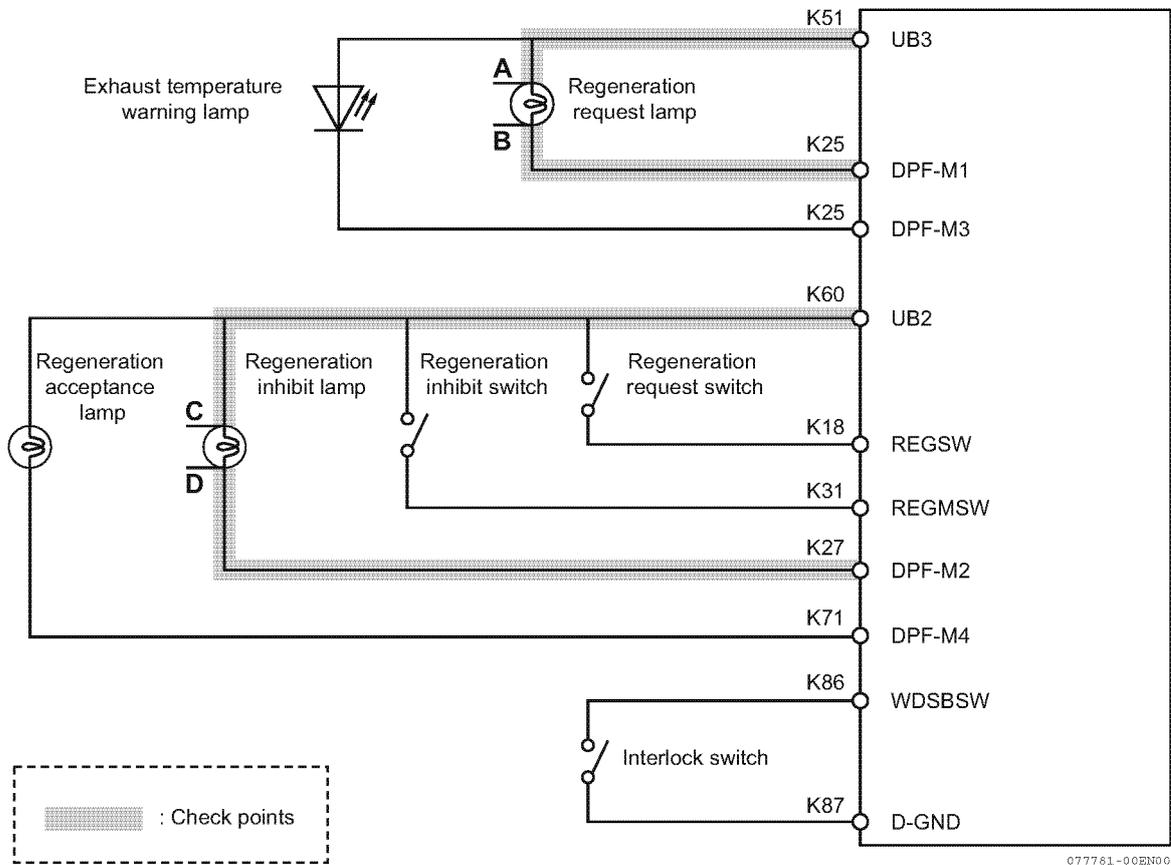


077780-00EN01

● Wire diagram

Follow the work procedure described later in “Work description”.

The diagram below is a wiring for YANMAR standard application. DPF operator interface differ depending on the application setting for each customer. Go through checkup following the system for the main machine.



077781-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Exhaust piping, pressure hose, and pressure pipe error

- 1- Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

If there is something wrong with the exhaust pipe system	Fix the problem and proceed to step 2 of Work description.
If the exhaust pipe system is fine	Proceed to step 2 of Work description.

2. DPF differential pressure sensor system error

- 1- If “P2452: DPF differential pressure sensor abnormal rise in differential pressure” is occurring at the same time, refer to the procedure for “P2452: DPF differential pressure sensor abnormal rise in differential pressure”.

When DPF differential pressure sensor error is occurring	Fix the DPF differential pressure sensor system error, and then proceed to step 4 of Work description.
When DPF differential pressure sensor error is not occurring	Proceed to step 4 of Work description.

3. DPF intermediate temperature sensor system error

- 1-Make sure that "P0420: DPF intermediate temperature sensor abnormal temperature (abnormally low)" is not occurring at the same time.

When DPF intermediate temperature sensor system error is occurring	Fix the DPF intermediate temperature sensor, and then proceed to step 4 of Work description.
When DPF intermediate temperature sensor system error is not occurring	Proceed to step 4 of Work description.

4. Ask the operator if he/she has been doing the stationary regeneration

If the stationary regeneration has been done	Proceed to step 5 of Work description.
If the stationary regeneration has not been done	Explain the operator how to use the stationary regeneration, and then proceed to step 5 of Work description.

5. Checking the DPF regeneration request lamp, DPF regeneration inhibit lamp, regeneration request switch, regeneration inhibit switch, and interlock switch

- Make sure all the lamps that are related to DPF regeneration are connected correctly. If they are not properly connected, notification may not reach the operator when regeneration is needed or regeneration is prohibited. The following procedure is for YANMAR's standard wiring. For machines with different wirings, check the wiring according to the said machine.

1-Turn off the ECU power.

2-Remove the wire-harness from the ECU and each contact point output (lamp).

3-Using a circuit tester, check the conduction between the contact input terminals of each lamp while referring to the following table.

Item	Terminal No.		Conduction	State
DPF regeneration request lamp	K51	A (See wiring diagram)	Yes	OK: Normal
	K25	B (See wiring diagram)		
DPF regeneration inhibit lamp	K60	C (See wiring diagram)	No	NG: Error
	K27	D (See wiring diagram)		

- Checking the regeneration request switch, the regeneration inhibit switch, and the interlock switch

1-Connect the SA-D, operate the regeneration request switch, the regeneration inhibit switch, and the interlock switch to make sure that the contact ON/OFF switches properly.

See "SA-D Operation Manual" for details on SA-D operation.

Note: The ON/OFF can either be switched with contact points or CAN communication depending on the specifications.

2-DPF regeneration inhibit switch: Inhibited

When the inhibited state is continued, turn off the DPF regeneration inhibit switch.

If there is something wrong with the lamp or switch	Replace the wire-harness, and then proceed to step 6 of Work description.
If the lamp and switch are fine	Proceed to step 6 of Work description.

6. Perform the recovery regeneration. See "SA-D Operation Manual" for details on recovery regeneration.

After the recovery regeneration, check that the failure has been solved.

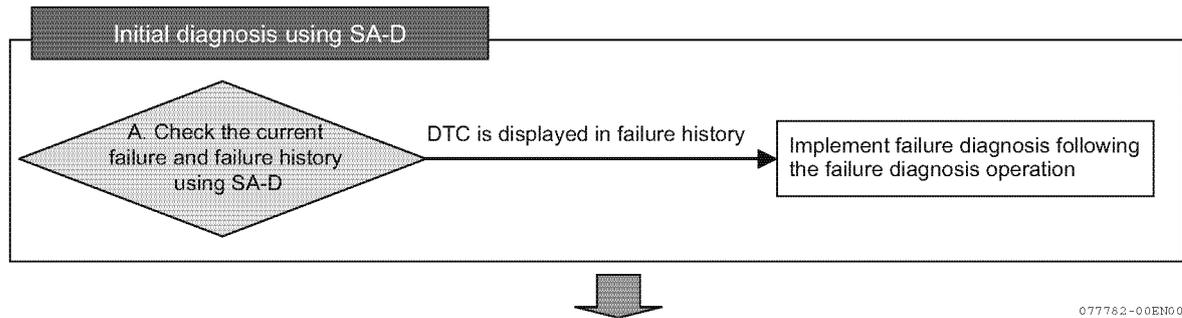
Regeneration failure 1

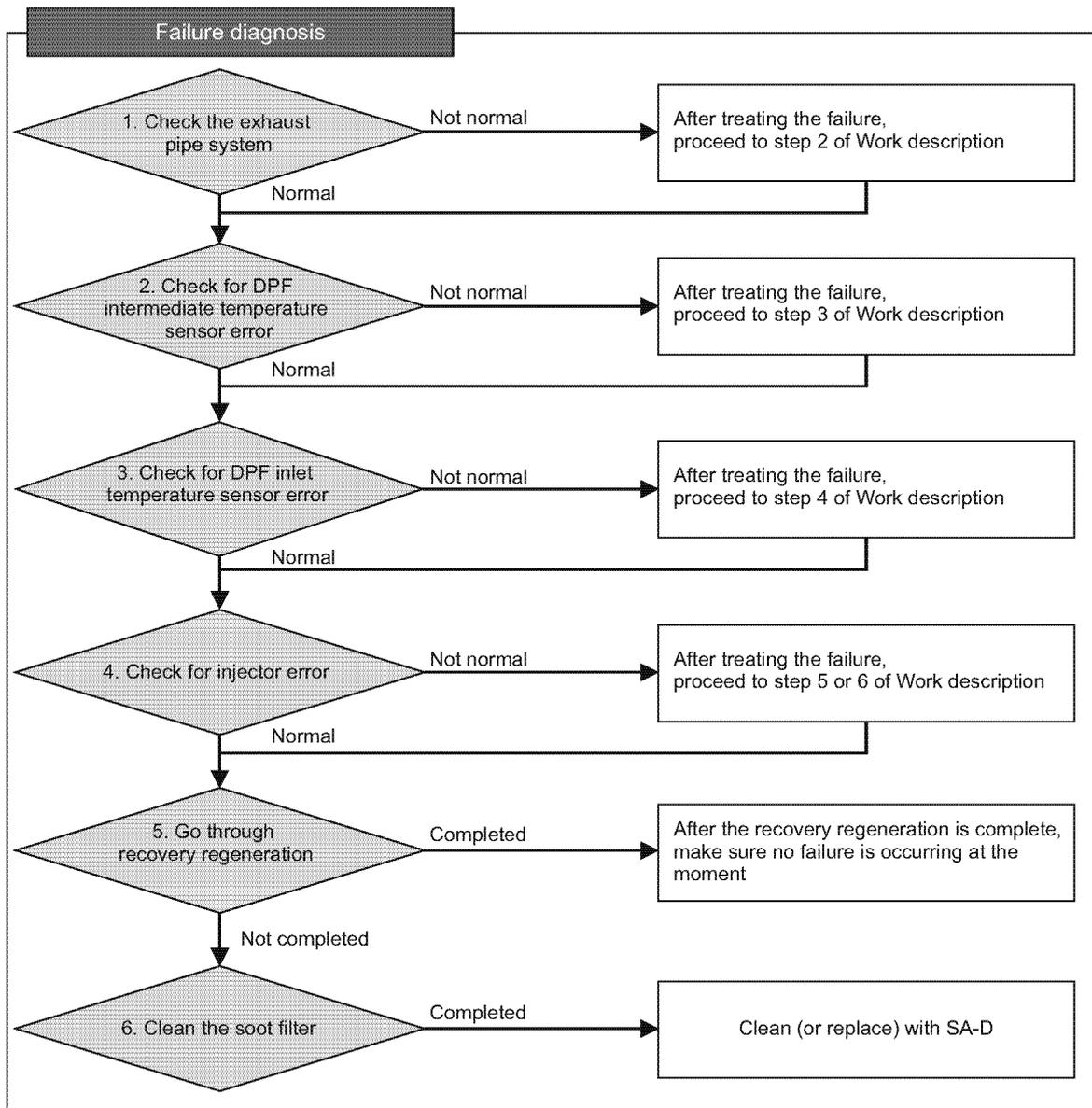
● Related DTC

P code	SPN/FMI	Name
P2458	522575/7	Regeneration failure (stationary regeneration failure)
P1445	3719/9	Regeneration failure (recovery regeneration failure)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





077783-00EN00

● Work description

1. Exhaust piping, pressure hose, and pressure pipe error

- 1- Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

If there is something wrong with the exhaust pipe system	Fix the problem and proceed to step 2 of Work description.
If the exhaust pipe system is fine	Proceed to step 2 of Work description.

2. DPF intermediate temperature sensor system error

- 1- Make sure that “P0420: DPF intermediate temperature sensor abnormal temperature (abnormally low)” is not occurring at the same time.

When DPF intermediate temperature sensor system error is occurring	Fix the DPF intermediate temperature sensor, and then proceed to step 3 of Work description.
When DPF intermediate temperature sensor system error is not occurring	Proceed to step 3 of Work description.

3. DPF inlet temperature sensor error

- 1- Check the resistance value of the DPF inlet temperature sensor with reference to the failure diagnosis items in “P1427: DPF inlet temperature sensor error (insufficient sensor output)”, etc.

If the resistance value of the DPF inlet temperature sensor is out of the range	Fix the DPF inlet temperature sensor failure, and then proceed to step 4 of Work description.
If the resistance value of the DPF inlet temperature sensor is within the range	Proceed to step 4 of Work description.

4. Injector failure

- 1- Remove the injector, and replace the nozzle.

If there is something wrong such deposits	Fix the injector failure in accordance with the Service Manual. If the recovery regeneration (optional) function is equipped, proceed to step 5 of Work description. If the recovery regeneration (optional) function is not equipped, proceed to step 6 of Work description.
If the injector works properly	Install the injector again. If the recovery regeneration (optional) function is equipped, proceed to step 5 of Work description. If the recovery regeneration (optional) function is not equipped, proceed to step 6 of Work description.

5. Perform the recovery regeneration. There are two ways to perform the recovery regeneration.

- SA-D Changing Operation Manual
- See the long press of switch

The long press time varies according to models. Consult your authorized YANMAR industrial engine dealer or distributor for details.

If the recovery regeneration is completed	After the recovery regeneration, check that the failure has been solved.
If the recovery regeneration is not completed	After recovery regeneration is completed, and if the recovery regeneration is failed, proceed to step 6 of Work description.

6. Clean the soot filter (SF)

Using SA-D, clean (replace) the SF. See “SA-D Operation Manual” for details.

Note: Replace the DPF (DOC + SF), when “P1445: Regeneration failure (recovery regeneration failure)” occurs again.

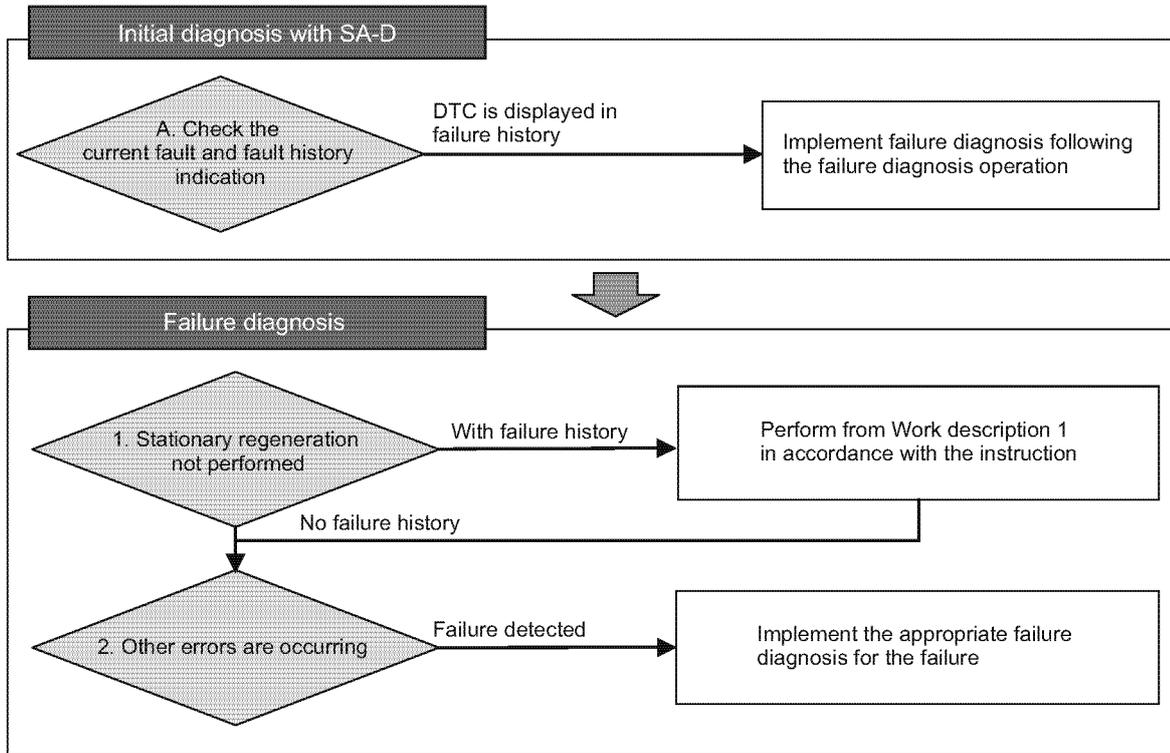
Regeneration failure 2

● Related DTC

P code	SPN/FMI	Name
P2459	522577/11	Regeneration failure (stationary regeneration not performed)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

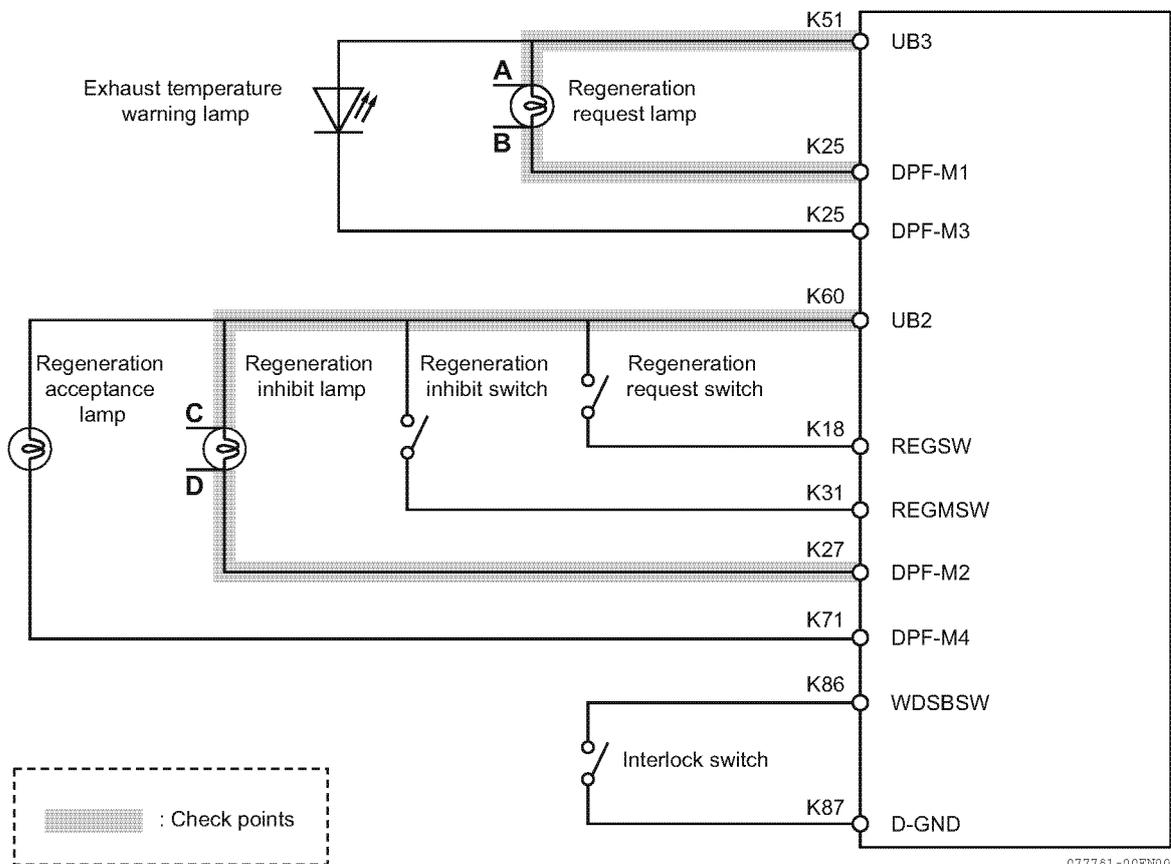


056961-00EN00

● Wire diagram

Follow the work procedure described later in “Work description”.

The diagram below is a wiring for YANMAR standard application. DPF operator interface differ depending on the application setting for each customer. Go through checkup following the system for the driven machine.



Note: See P316 for the ECU pin layout.

● Work description

1. Regeneration for the stationary regeneration request is not performed

- Ask the operator if the regeneration request lamp and failure indication lamp (Fail lamp or Amber warning lamp) was on before the failure occurred.

Explain to the customer that stationary regeneration is needed when the lamp turns on.

- If they know the necessity of the stationary regeneration, but still this error occurs, there might be some thing wrong with the lamp or switch itself. Make sure that the connections of the switches and lamps related to the DPF regeneration are as indicated on the above diagram.

Note: The ON/OFF can either be switched with contact points or CAN communication depending on the specifications.

- Checking the conduction of the lamp related to the regeneration (contact output only)

1-Turn off the ECU power.

2-Remove the wire-harness from the ECU and each contact point output (lamp).

3-Using a circuit tester, check the conduction between the contact input terminals of each lamp while referring to the following table.

Item	Terminal No.		Conduction	State
DPF regeneration request lamp	K51	A (See wiring diagram)	Yes	OK: Normal
	K25	B (See wiring diagram)		
DPF regeneration inhibit lamp	K60	C (See wiring diagram)	No	NG: Error
	K27	D (See wiring diagram)		

- Checking the regeneration request switch, the regeneration inhibit switch, and the interlock switch

1-Connect the SA-D, operate the regeneration request switch, the regeneration inhibit switch, and the interlock switch to make sure that the contact ON/OFF switches properly.

See "SA-D Operation Manual" for details on SA-D operation.

2-DPF regeneration inhibit switch: Inhibited

When the inhibited state is continued, turn off the DPF regeneration inhibit switch.

If the conduction in switch or lamp is failed	Replace the wire-harness, and then proceed to step 2 of Work description.
When DPF differential pressure sensor error is not occurring	Proceed to step 2 of Work description.

2. Perform the recovery regeneration. There are two ways to perform the recovery regeneration

- SA-D Changing Operation Manual
- See the long press of switch

The long press time varies according to models. Consult your authorized YANMAR industrial engine dealer or distributor for details.

CRS (common rail system) related

■ Injector

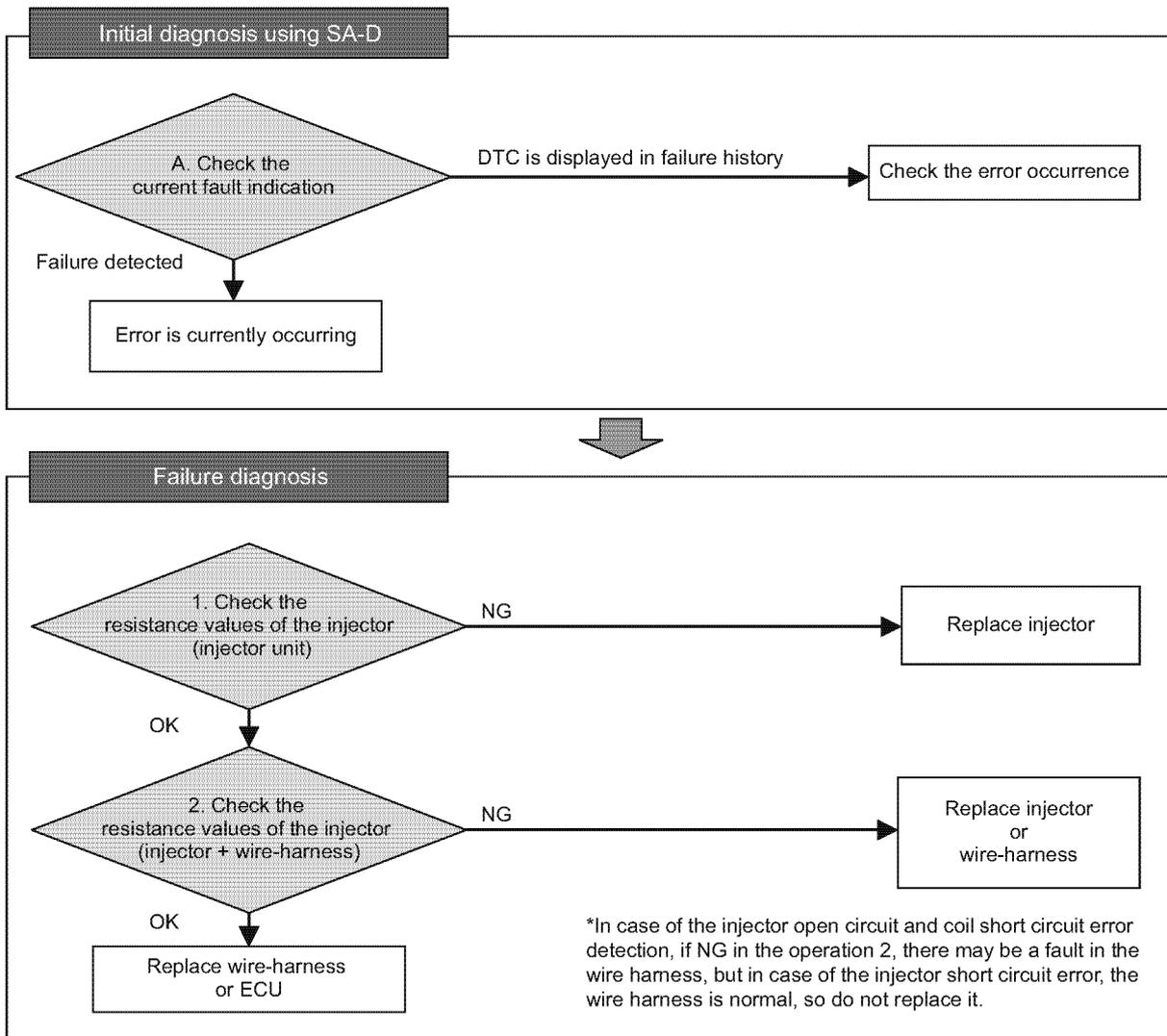
Disconnection of the injector and coil short circuit

● Related DTC

P code	SPN/FMI	Name
P0201	654/5	Injector (No. 1 cylinder) disconnection (injector-specific)
P0202	653/5	Injector (No. 2 cylinder) disconnection (injector-specific)
P0203	652/5	Injector (No. 3 cylinder) disconnection (injector-specific)
P0204	651/5	Injector (No. 4 cylinder) disconnection (injector-specific)
P0262	654/6	Injector (No. 1 cylinder) coil short circuit
P0265	653/6	Injector (No. 2 cylinder) coil short circuit
P0268	652/6	Injector (No. 3 cylinder) coil short circuit
P0271	651/6	Injector (No. 4 cylinder) coil short circuit

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

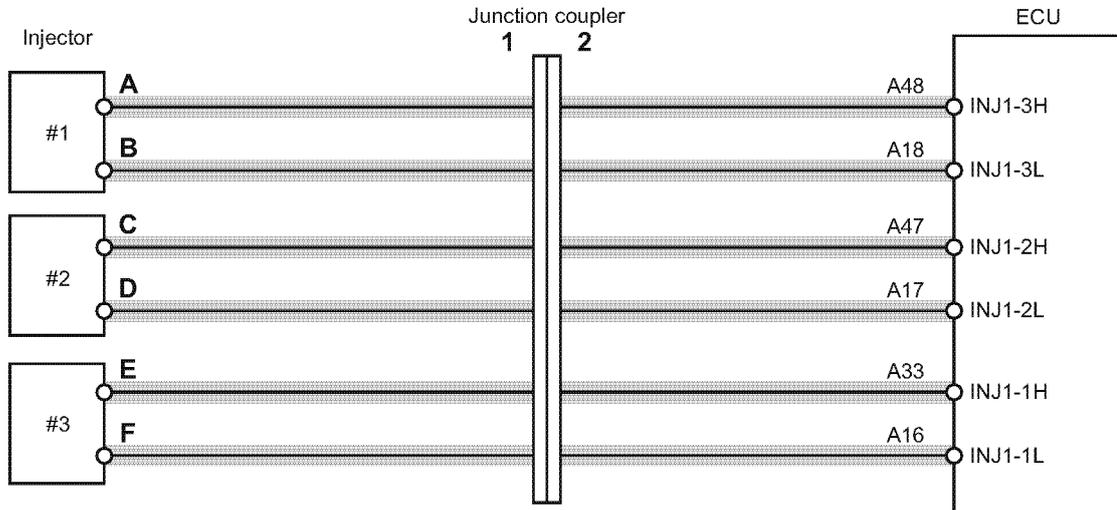


044393-01EN01

● Wire diagram

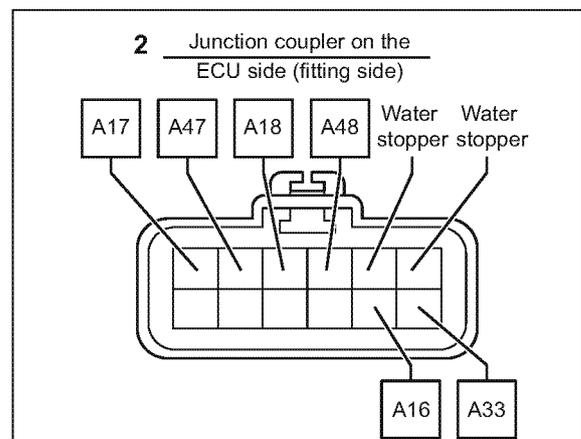
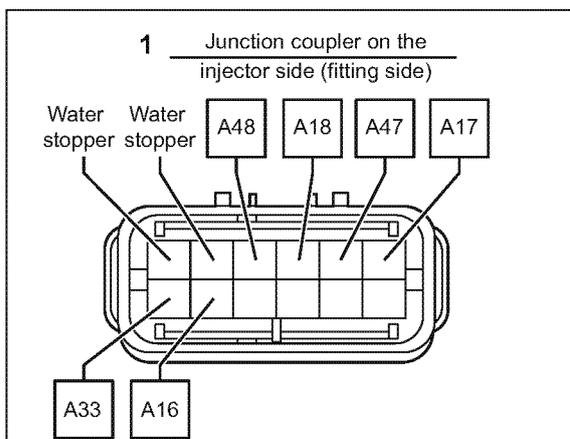
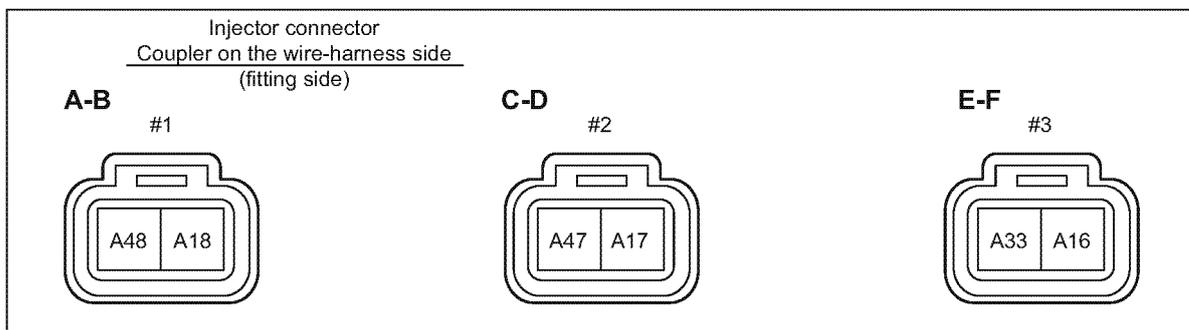
The wiring of the injector differs depending on the number of cylinders of each engine.
When diagnosing the wire-harness, refer to the diagram below to check the correct connection.

3-Cylinder engine



077785-00EN00

Note: #1 to #3 are numbers counted from the flywheel side. Note that it is different from the ECU circuit name.

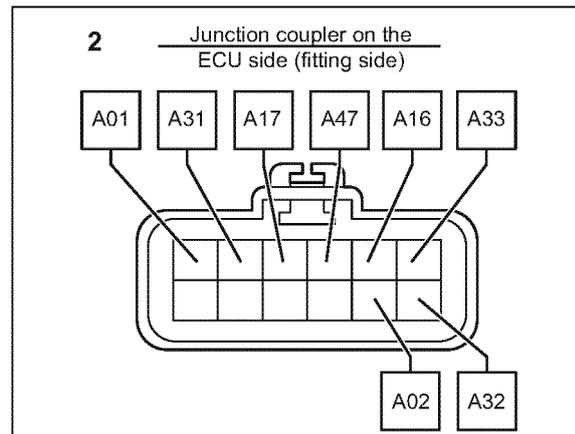
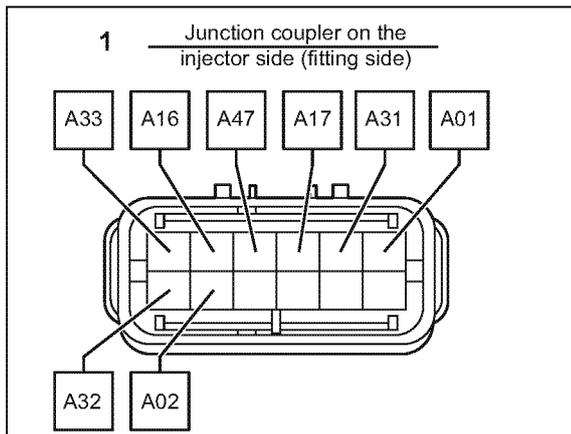
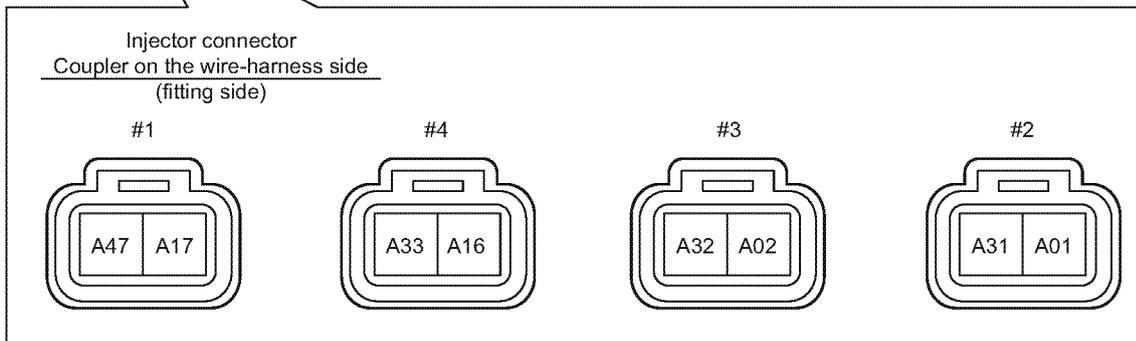
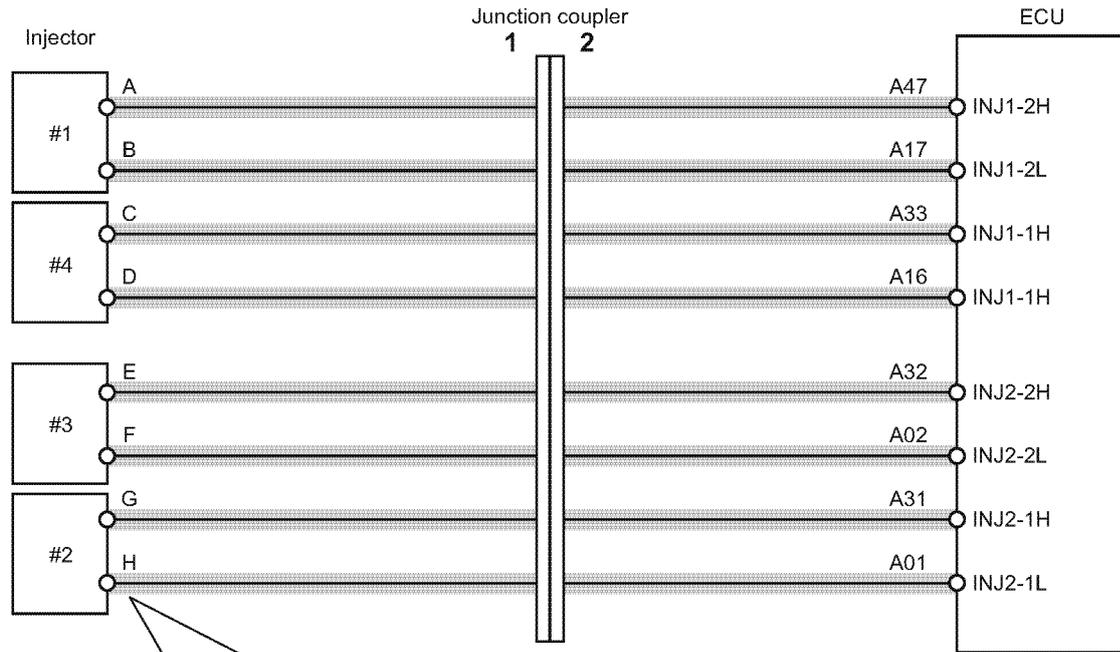


▨ : Check points

077788-00EN00

Note: See P316 for the ECU pin layout.

4-Cylinder engine



: Check points

044394-01EN00

Note • See P316 for the ECU pin layout.

• Injector numbers (#1-#4) are counted up from the flywheel side. Be careful, it is different from the ECU circuit name.

● Work description

1. Checking the injector resistance value (injector unit)

- 1- Remove the injector from the wire-harness.
- 2- Using a circuit tester, measure the resistance value (total resistance) of the part which detected an error between the injector terminals A and B, C and D, E and F, or G and H.

Reference: Injector's overall resistance value

Terminal	Specifications
Between the injector terminals	$255 \pm 40 \text{ m}\Omega$

NG	Replace the injector.
OK	Go to "Checking the resistance values of the injector (injector and wire-harness)".

2. Checking the resistance values of the injector (injector and wire-harness)

● Junction coupler not connected

- 1- Connect the injector and the wire-harness, and remove the ECU from the wire-harness. However, see the above wiring diagram to remove the wire-harness of junction coupler (2) from the wire-harness of junction coupler (1).
- 2- Using a circuit tester, measure the resistance value (overall resistance value) between the junction coupler (1) side wire-harness connectors A47 and A17, A33 and A16, A32 and A02, and A31 and A01.

Note: See "Reference: Injector's overall resistance value".

NG	<ul style="list-style-type: none"> • The coupler between the injector and the wire-harness may be defective. Replace the injector. • Replace the wire-harness.
OK	Go to "While junction coupler is connected".

● While junction coupler is connected

- 1- Connect the injector and the wire-harness, and remove the ECU from the wire-harness. However, see the above wiring diagram to connect the wire-harness of junction coupler (2) to the wire-harness of junction coupler (1).
- 2- Using a circuit tester, measure the resistance value (overall resistance value) between the ECU side wire-harness connectors A47 and A17, A33 and A16, A32 and A02, and A31 and A01.

Note: See "Reference: Injector's overall resistance value".

NG	The junction coupler may be defective. Replace the wire-harness.
OK	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.

Injector short circuit**● Related DTC**

P code	SPN/FMI	Name
P1262	654/3	Injector (No. 1 cylinder) short circuit
P1265	653/3	Injector (No. 2 cylinder) short circuit
P1268	652/3	Injector (No. 3 cylinder) short circuit
P1271	651/3	Injector (No. 4 cylinder) short circuit
P1146	2797/6	Injector drive circuit (Bank 1) short circuit
P1149	2798/6	Injector drive circuit (Bank 2) short circuit

● Workflow

Refer to “Disconnection of the injector and coil short circuit”

● Wire diagram

Refer to “Disconnection of the injector and coil short circuit”

● Work description

1. Checking the injector resistance value (injector unit)

- 1- Remove the injector from the wire-harness.
- 2- Using a circuit tester, measure the resistance value (overall resistance value) between injector terminals A and B, C and D, E and F, and G and H.

Reference: Injector's overall resistance value

Terminal	Specifications
Between the injector terminals	TBD

NG	Replace the injector
OK	Go to "Checking the resistance values of the injector (injector and wire-harness)".

2. Checking the resistance values of the injector (injector and wire-harness)

● Junction coupler not connected

- 1- Connect the injector and the wire-harness, and remove the ECU from the wire-harness. However, see the above wiring diagram to remove the wire-harness of junction coupler (2) from the wire-harness of junction coupler (1).
- 2- Using a circuit tester, measure the resistance value (overall resistance value) between the junction coupler (1) side wire-harness connectors A47 and A17, A33 and A16, A32 and A02, and A31 and A01.

Note: See "Reference: Injector's overall resistance value".

NG	Replace the wire-harness.
OK	Go to "While junction coupler is connected".

● While junction coupler is connected

- 1- Connect the injector and the wire-harness, and remove the ECU from the wire-harness. However, see the above wiring diagram to connect the wire-harness of junction coupler (2) to the wire-harness of junction coupler (1).
- 2- Using a circuit tester, measure the resistance value (overall resistance value) between the ECU side wire-harness connectors A47 and A17, A33 and A16, A32 and A02, and A31 and A01.

Note: See "Reference: Injector's overall resistance value".

NG	Replace the wire-harness.
OK	<ul style="list-style-type: none"> • The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU.

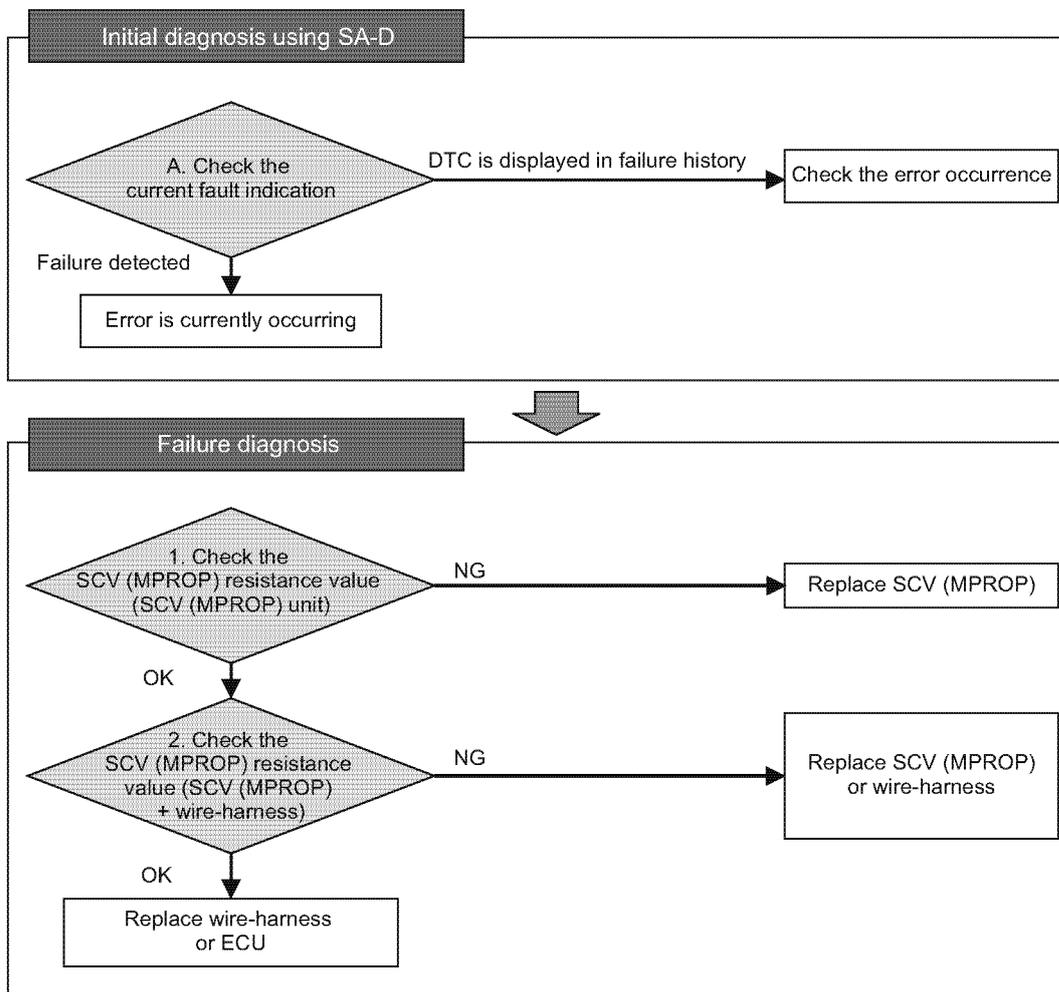
■ High-pressure pump (MPROP)

● Related DTC

P code	SPN/FMI	Name
P1641	522571/3	SCV (MPROP) L side VB short circuit
P1643	522571/6	SCV (MPROP) L side GND short circuit
P0629	633/3	SCV (MPROP) H side VB short circuit
P1642	633/6	SCV (MPROP) H side GND short circuit
P0627	633/5	SCV (MPROP) disconnection
P1645	522572/11	SCV (MPROP) Pump overload error
P062A	522572/6	SCV (MPROP) Drive current (high level)

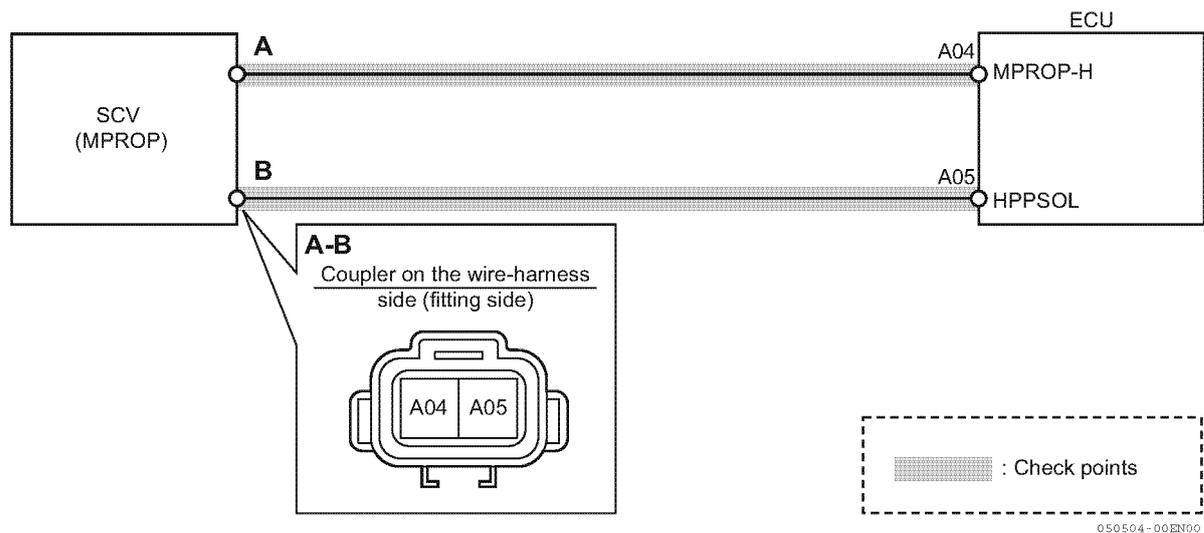
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



050503-00BN01

● Wiring diagram



Note: See P316 for the ECU pin layout.

● Work description

1. Checking the SCV (MPROP) resistance value (SCV (MPROP) unit)

- 1- Remove the SCV (MPROP) from the wire-harness.
- 2- Using a circuit tester, measure the resistance value (overall resistance value) between SCV (MPROP) terminals A and B.

Reference: SCV (MPROP)'s overall resistance value

Terminal	Specifications
Between the SCV (MPROP) terminals	2.60 - 3.15 Ω

NG	Replace the SCV (MPROP).
OK	Go to "Checking the SCV (MPROP) resistance value (SCV (MPROP) + wire-harness)".

2. Checking the SCV (MPROP) resistance value (SCV (MPROP) + wire-harness)

- 1- Connect the SCV (MPROP) and the wire-harness. Remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between ECU wire-harness connectors A04 and A05.

Note: See the above "Reference: SCV (MPROP)'s overall resistance value".

NG	The wire-harness may be defective. Replace the wire-harness.
OK	Replace the ECU.

Actuator

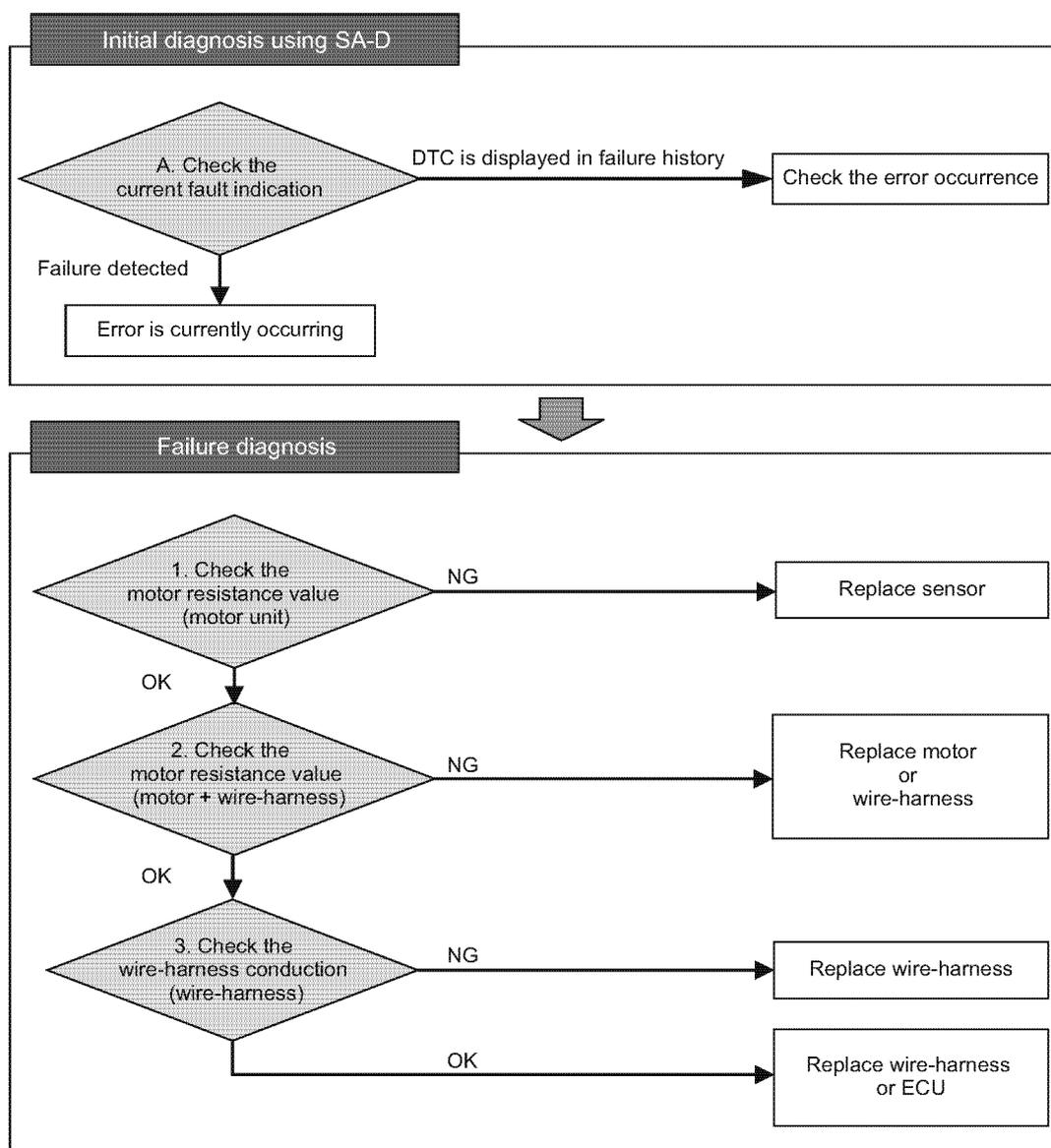
■ Intake throttle drive circuit

● Related DTC

P code	SPN/FMI	Name
P0660	2950/5	No-load of throttle valve drive H bridge circuit
P1660	2950/6	Overload on the drive H bridge circuit of throttle valve
P1658	2950/3	Power short circuit of throttle valve drive H bridge output 1
P1661	2951/3	Power short circuit of throttle valve drive H bridge output 2
P1659	2950/4	GND short circuit of throttle valve drive H bridge output 1
P1662	2951/4	GND short circuit of throttle valve drive H bridge output 2

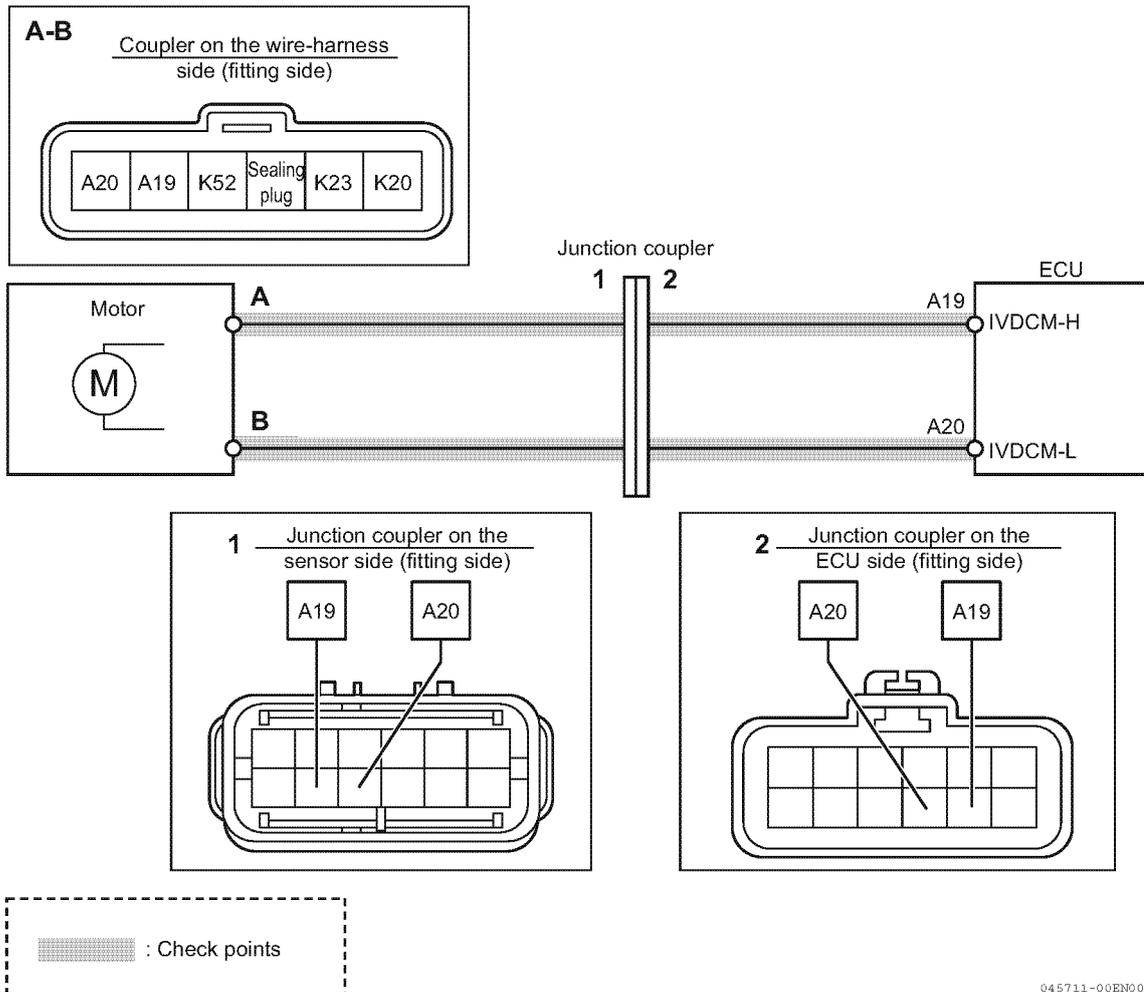
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



045710-00ENG1

● Wiring diagram



045711-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the motor resistance value (motor unit)

1- Remove the motor from the wire-harness.

2- Using a circuit tester, measure the resistance value (overall resistance value) between motor terminals A and B.

Reference: Overall resistance value of motor

Terminal	Specifications
Between terminal A and B	Under investigation

NG	Replace the motor.
OK	Go to "Checking the motor resistance value (motor + wire-harness)".

2. Checking the motor resistance value (motor + wire-harness)

1- Connect the motor and the wire-harness. Remove the ECU from the wire-harness.

2- Using a circuit tester, measure the resistance value (overall resistance value) between ECU wire-harness connectors A19 and A20.

Note: See the above "Reference: Overall resistance value of motor".

No	<ul style="list-style-type: none"> • A coupler failure between the motor and the wire-harness may be caused. Replace the motor. • Replace the wire-harness.
Applied	Go to "Checking the wire-harness conduction".

3. Checking the wire-harness conduction

1- Remove the wire-harness from the motor and ECU. However, connect the junction coupler.

2- While referring to the P316 "ECU pin layout diagram", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Detection error	Check method
No-load of throttle valve drive H bridge circuit	Perform the check pattern 1
Power short circuit of throttle valve drive H bridge output 1	Perform the check pattern 2
Power short circuit of throttle valve drive H bridge output 2	Perform the check pattern 3
GND short circuit of throttle valve drive H bridge output 1	Perform the check pattern 4
GND short circuit of throttle valve drive H bridge output 2	Perform the check pattern 5

Reference: Intake throttle drive circuit conduction check pattern 1

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on DC motor side)	Conduction	State
A19	Motor terminal A	Yes	OK: Normal
		No	NG: Error
A20	Motor terminal B	Yes	OK: Normal
		No	NG: Error

Reference: Intake throttle drive circuit conduction check pattern 2

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on ECU side)	Conduction	State
A19	VB terminal	Yes	NG: Error
		No	OK: Normal

Reference: Intake throttle drive circuit conduction check pattern 3

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on ECU side)	Conduction	State
A20	VB terminal	Yes	NG: Error
		No	OK: Normal

Reference: Intake throttle drive circuit conduction check pattern 4

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on ECU side)	Conduction	State
A19	GND terminal	Yes	NG: Error
		No	OK: Normal

Reference: Intake throttle drive circuit conduction check pattern 5

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on ECU side)	Conduction	State
A20	GND terminal	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	<ul style="list-style-type: none"> • A coupler failure between the ECU and the wire-harness may be caused. Replace the wire-harness. • Replace the ECU.

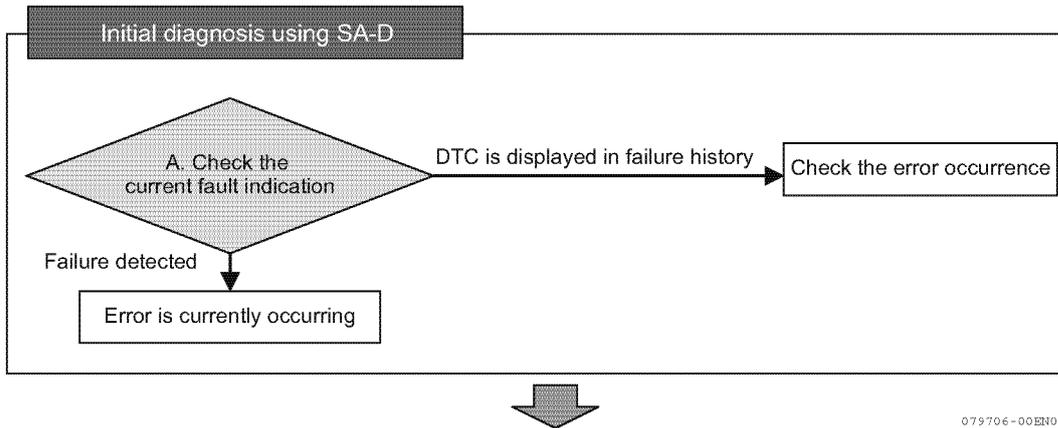
■ Intake throttle

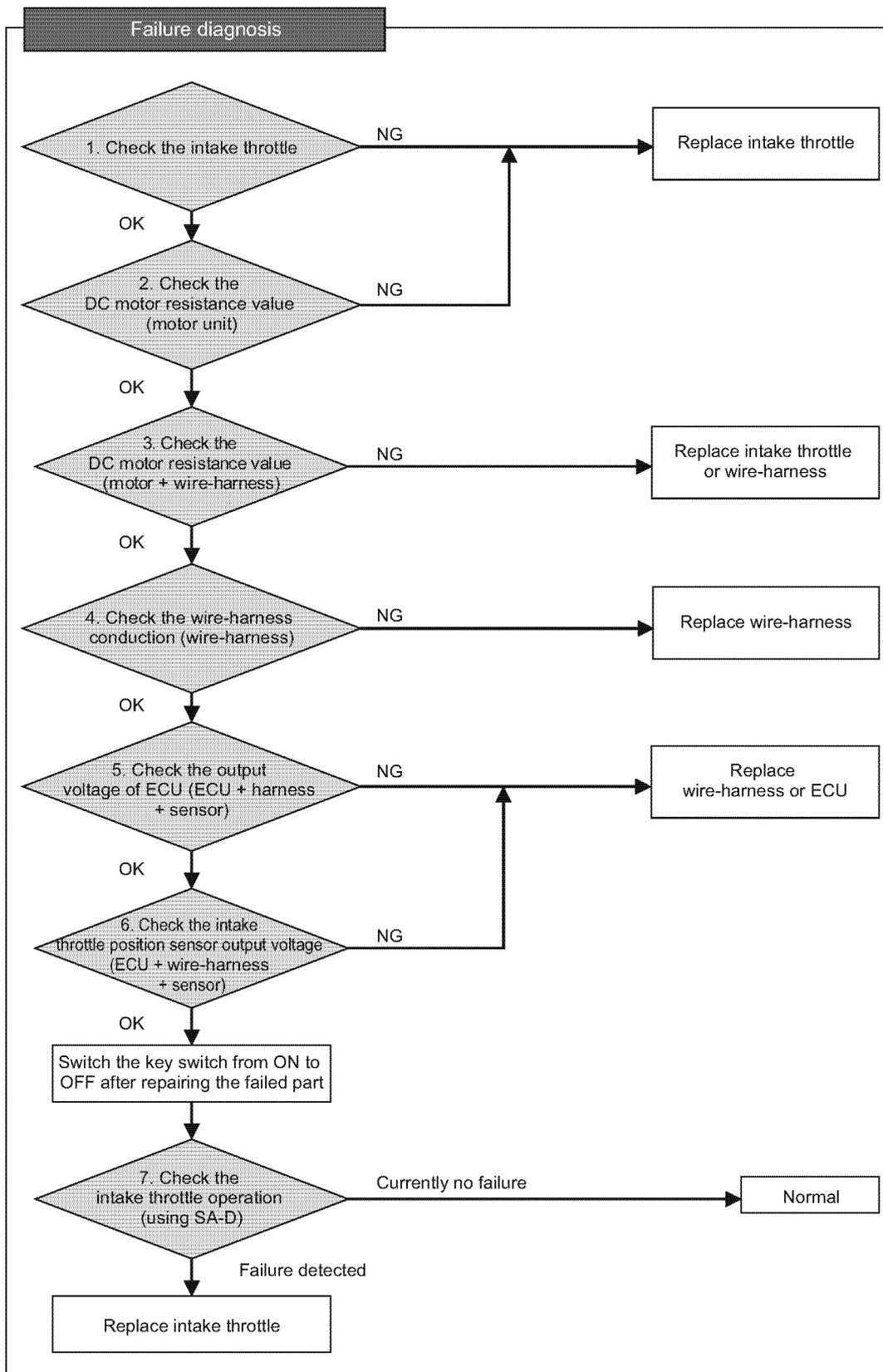
● Related DTC

P code	SPN/FMI	Name
P02E4	2950/7	Throttle valve sticking (sticking open)
P02E5	2951/7	Throttle valve sticking (sticking closed)

● Workflow

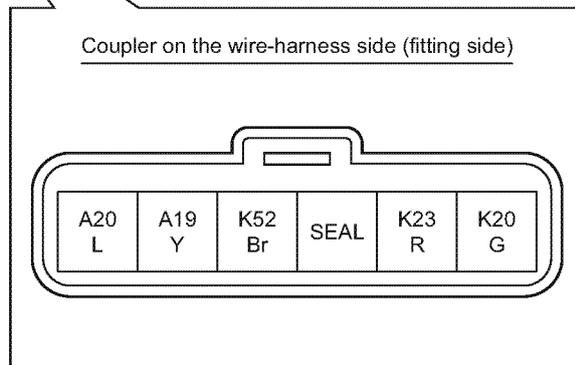
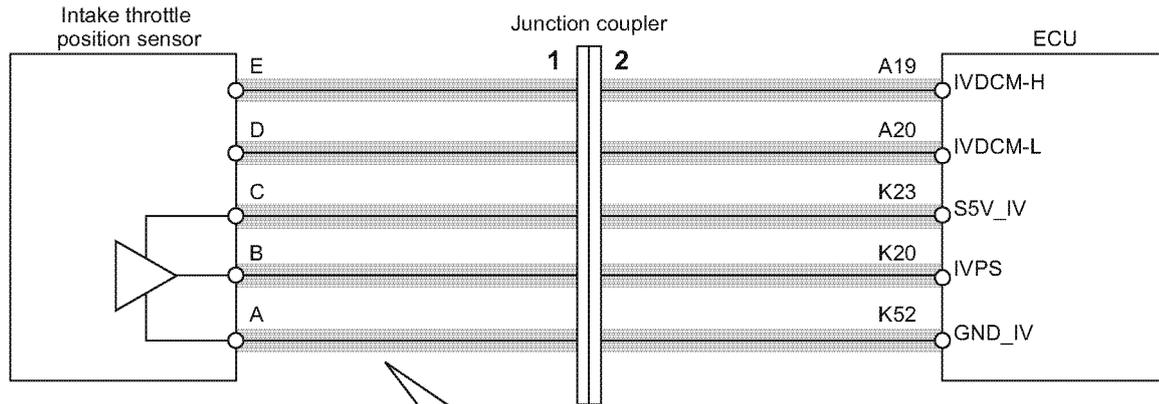
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

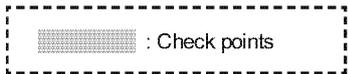




079777-00EN00

● Wire diagram



 : Check points

Note: See P316 for the ECU pin layout.

050240-00EN03

● Work description

1. Checking the intake throttle

- 1- Remove the intake throttle from the engine.
- 2- Make sure that the throttle valve is not bent or stuck.

NG	Replace the intake throttle
OK	Go to "Checking the DC motor resistance value (motor unit)"

2. Checking the DC motor resistance value (motor unit)

- 1- Remove the intake throttle from the wire-harness.
- 2- Using a circuit tester, measure the resistance value (overall resistance value) between intake throttle DC motor terminals A and B.

Reference: Overall resistance value of DC motor

The resistance value of DC motor is under investigation.	
----------------------------------------------------------	--

NG	Replace the intake throttle
OK	Go to "Checking the resistance value (motor + wire-harness)"

3. Checking the resistance value (motor + wire-harness)

- 1- Connect the intake throttle and the wire-harness. Remove the ECU from the wire-harness.
- 2- Using a circuit tester, measure the resistance value between ECU wire-harness connectors A19 and A20.

Note: See the above "Reference: Overall resistance value of DC motor".

NG	<ul style="list-style-type: none"> • A coupler between the motor and the wire-harness may be defective. Replace the intake throttle • Replace the wire-harness.
OK	Go to "Checking the wire-harness conduction".

4. Checking the wire-harness conduction

- 1- Remove the wire-harness from the intake throttle and ECU. However, connect the junction coupler.
- 2- While referring to the P316 "ECU pin layout diagram", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Intake throttle drive circuit conduction check pattern 1

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on ECU side)	Conduction	State
A19	VB/GND terminal	Yes	NG: Error
		No	OK: Normal
A20		Yes	NG: Error
		No	OK: Normal

Reference: Intake throttle drive circuit conduction check pattern 2

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on intake throttle side)	Conduction	State
A19	Motor terminal E	Yes	OK: Normal
		No	NG: Error
A20	Motor terminal D	Yes	OK: Normal
		No	NG: Error

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to "Checking the ECU output voltage".

5. Checking the ECU output voltage

- 1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).
- 2- Using a circuit tester, measure the voltage between the intake throttle position sensors 5 V K23 and K52.

Voltage	State	Corrective action
$K23 < 4.375 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$4.375 \text{ V} \leq K23 \leq 5.625 \text{ V}$	OK (normal range)	Check the intake throttle position sensor output voltage.
$5.625 \text{ V} < K23$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness or ECU.
OK	Go to "Checking the intake throttle position sensor output voltage".

6. Checking the intake throttle position sensor output voltage

1-Connect the checker harness between the ECU and engine wire-harness. Also, connect all connectors (sensor, wire-harness, ECU).

2-Using a circuit tester, measure the voltage between the sensor signals K20 and K52.

Voltage	State	Corrective action
$K20 < 0.6 \text{ V}$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.
$0.6 \text{ V} \leq K20 \leq 4.4 \text{ V}$	OK (normal range)	Replace the ECU.
$4.4 \text{ V} < K20$	NG	<ul style="list-style-type: none"> • Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness or ECU.
OK	Go to "Checking the intake throttle operation (using SA-D)"

7. Checking the intake throttle operation (using SA-D)

1-Turn off the key switch and turn on the key switch again.

2-Activate the intake throttle using "Active control of Diagnosis Test" of SMARTASSIST-Direct (SA-D), and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the intake throttle

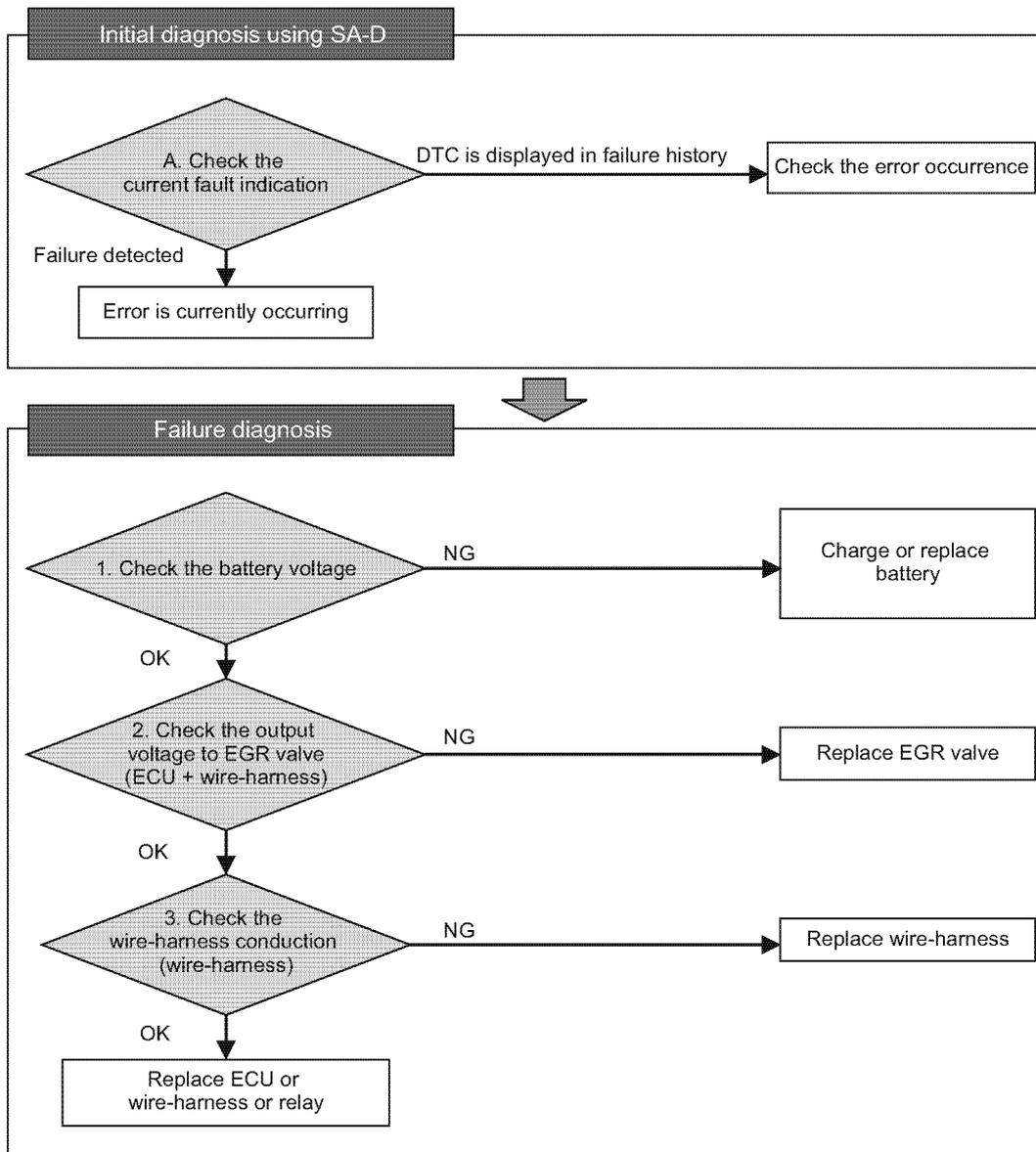
■ EGR valve

● Related DTC

P code	SPN/FMI	Name
P0404	2791/0	EGR overvoltage error
P1404	2791/1	EGR low voltage error

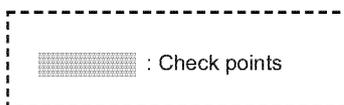
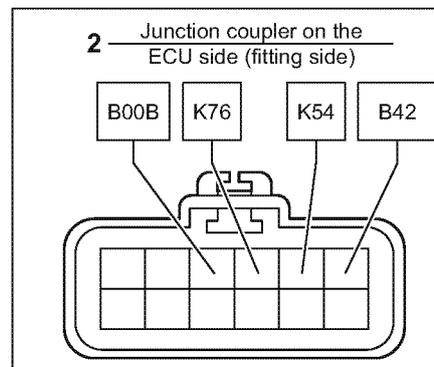
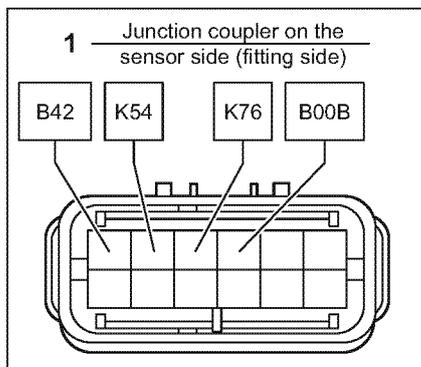
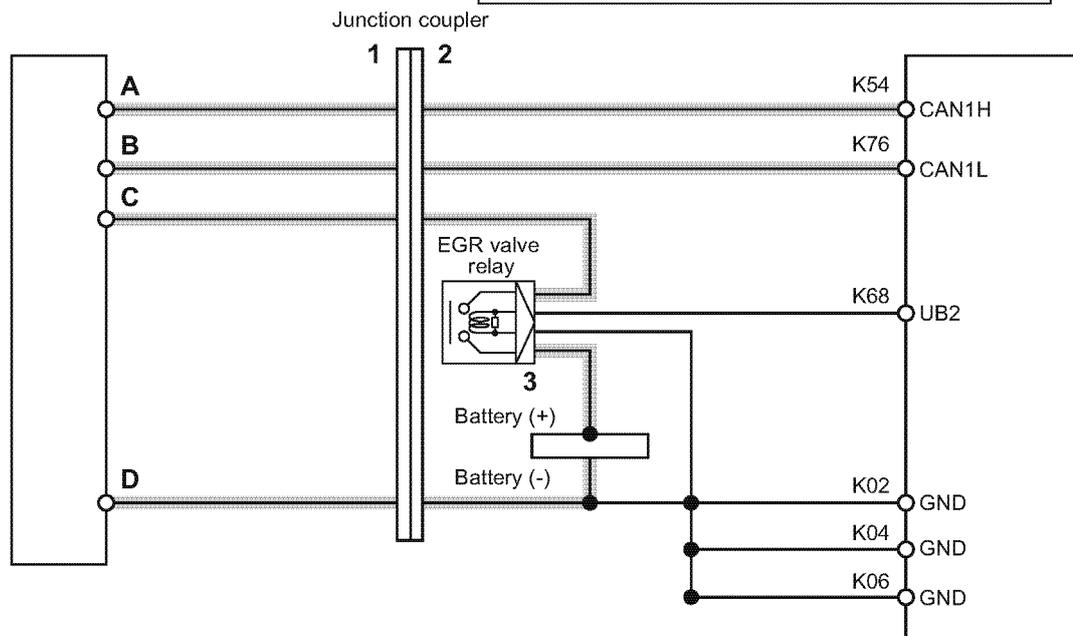
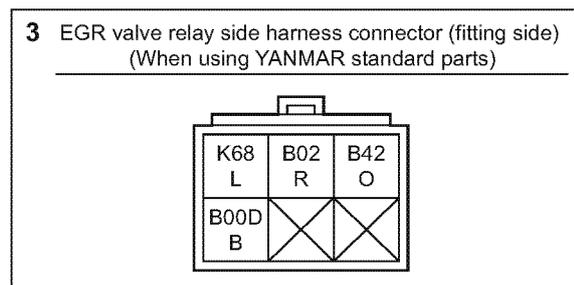
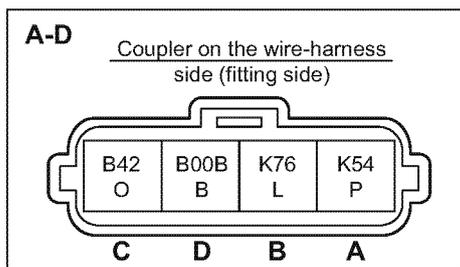
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



045809-02EN01

● Wiring diagram



045810-00E2703

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the battery voltage

Turn on the key switch and check the battery voltage.

- 1- Make sure that the battery voltage is not reduced due to the battery life.
- 2- Make sure that the battery output is not too high.

Reference: Battery voltage check pattern 1

Terminal 1 (Battery)	Terminal 2 (Battery)	Voltage	State
Battery (+)	Battery (-)	8 V or below	NG: Error
		8 V - 16 V	OK: Normal
		16 V or above	NG: Error

NG	Charge or replace the battery.
OK	Check the operation of other ECUs.

2. Checking the output voltage to the EGR valve

- 1- Remove the EGR valve from the wire-harness.
- 2- Turn on the key switch and check the battery voltage. Measure the wire-harness between C and D with reference to "Wire diagram".

Reference: Battery voltage check pattern 2

Terminal 1 (EGR valve side wire-harness connector)	Terminal 2 (EGR valve side wire-harness connector)	Voltage	State
C (B42)	D (B00B)	8 V or below	NG: Error
		8 V - 18 V	OK: Normal
		18 V or above	NG: Error

NG	Go to "Checking the wire-harness conduction".
OK	Replace the EGR valve.

3. Checking the wire-harness conduction

- 1- Remove the wire-harness from the EGR valve and the ECU. Also remove the EGR valve relay from the coupler.
- 2- While referring to the P316 "ECU pin layout diagram", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (EGR valve side wire-harness connector)	Conduction	State
K01/K03/K05	EGR valve terminal C	Yes	OK: Normal
		No	NG: Error
K02/K04/K06	EGR valve terminal D	Yes	OK: Normal
		No	NG: Error
K54*1	EGR valve terminal A	Yes	OK: Normal
		No	NG: Error
K76*1	EGR valve terminal B	Yes	OK: Normal
		No	NG: Error

*1: Although it is not a battery line, the abnormal signal may be transmitted due to open circuit/short circuit. Check for precaution.

Reference: EGR valve conduction check pattern 1 (Checking the conduction of EGR valve power line)

Terminal 1 (EGR valve side wire-harness connector)	Terminal 2 (EGR valve relay side wire-harness connector)	Conduction	State
EGR valve terminal C	B42	Yes	OK: Normal
		No	NG: Error

Terminal 1 (EGR valve relay side wire-harness connector)	Terminal 2 (Battery)	Conduction	State
B02	Battery (+)	Yes	OK: Normal
		No	NG: Error

Terminal 1 (EGR valve side wire-harness connector)	Terminal 2 (Battery)	Conduction	State
EGR valve terminal D	Battery (-)	Yes	OK: Normal
		No	NG: Error

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on ECU side)	Conduction	State
K54*1	EGR valve terminal A	Yes	OK: Normal
		No	NG: Error
K76*1	EGR valve terminal B	Yes	OK: Normal
		No	NG: Error

*1: Although it is not a power line, the abnormal signal may be transmitted due to open circuit/short circuit. Check for precaution.

Reference: EGR valve conduction check pattern 2 (Check for short circuit)

Terminal 1 (EGR valve side wire-harness connector)	Terminal 2 (Wire-harness connector ECU side)	Conduction	State
EGR valve terminal C	All terminals other than the below: K01, K03, K05	Yes	NG: Error
		No	OK: Normal
EGR valve terminal D	All terminals other than GND	Yes	NG: Error
		No	OK: Normal
EGR valve terminal A*1	All terminals other than K54	Yes	NG: Error
		No	OK: Normal
EGR valve terminal B*1	All terminals other than K76	Yes	NG: Error
		No	OK: Normal

*1: Although it is not a battery line, the abnormal signal may be transmitted due to open circuit/short circuit. Check for precaution.

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	<ul style="list-style-type: none"> The coupler between the ECU and the wire-harness may be defective. Replace the wire-harness. Possibly an EGR valve relay error. Replace the EGR valve relay. Replace the ECU.

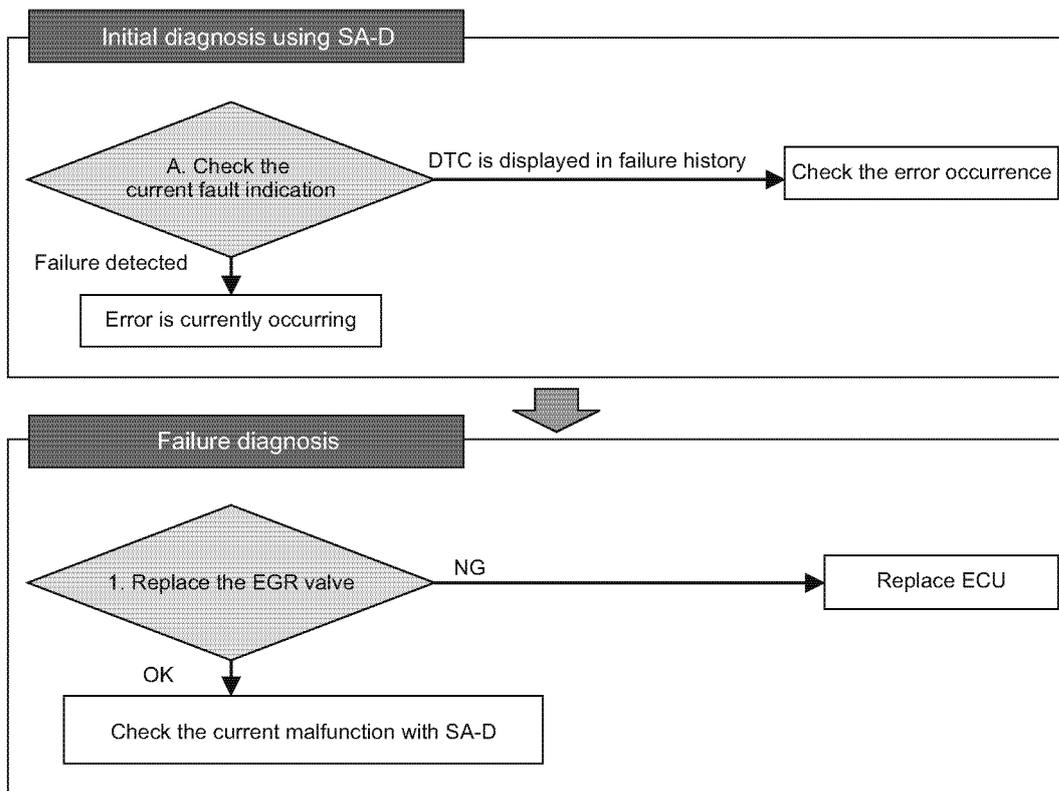
■ EGR valve

● Related DTC

P code	SPN/FMI	Name
P0403	2791/12	Disconnection in EGR motor coils
P1405	522579/12	Short circuit in EGR motor coils
P0488	522580/12	EGR position sensor error
P1409	2791/7	EGR feedback error
P148A	522581/7	EGR valve sticking error
P049D	522582/7	EGR initialization error
U0401	2791/9	EGR ECM data error
U1401	522617/12	EGR target value out of range
P1410	522583/1	EGR high temperature thermistor error
P1411	522584/1	EGR low temperature thermistor error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



050234-01EN01

● Work description

1. Replacing the EGR valve

EGR valve internal circuit may be defective.

Replace the EGR valve.

NG	Replace the ECU.
OK	Checking the current failure with SA-D.

Communication related

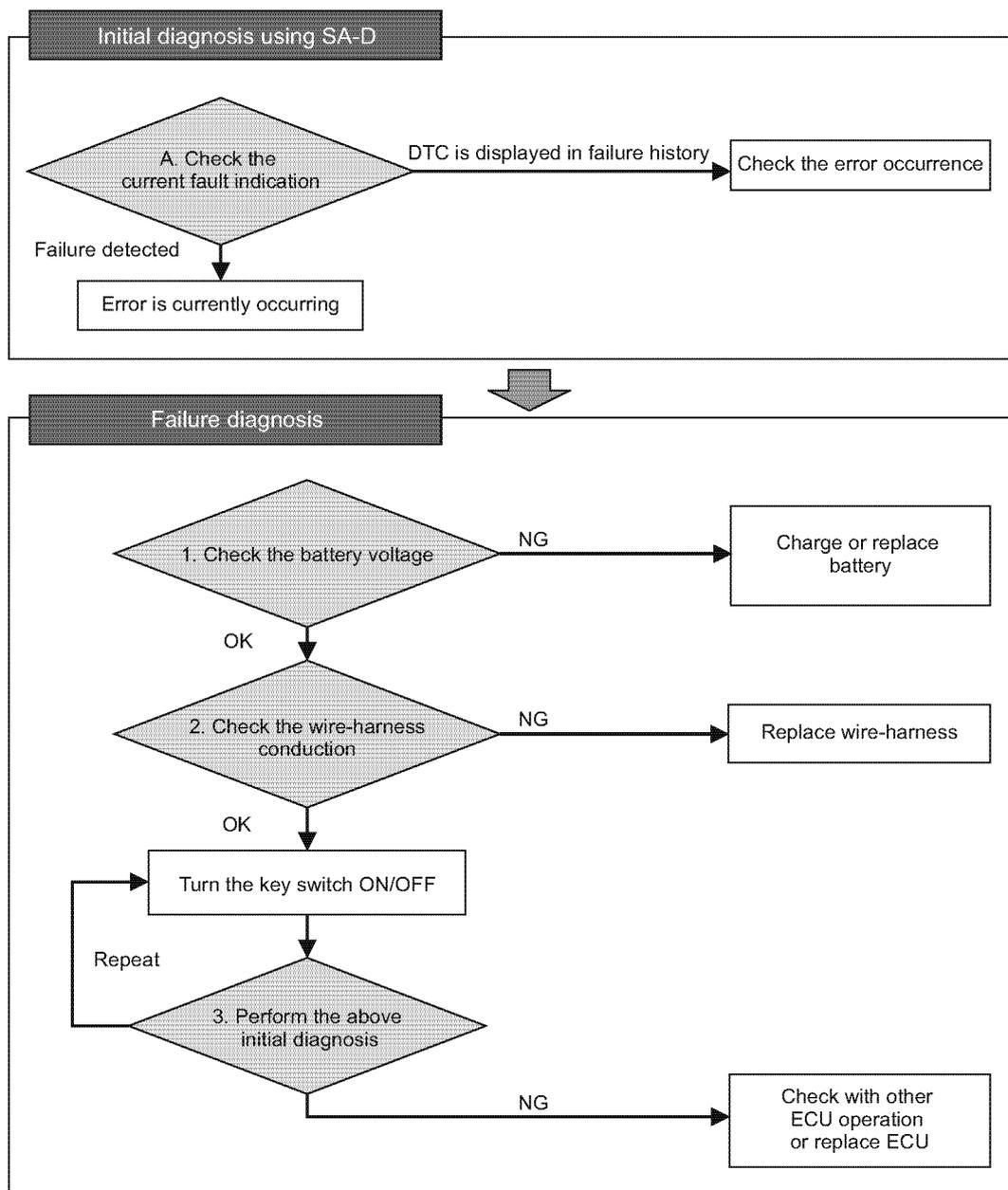
■ CAN 1

● Related DTC

P code	SPN/FMI	Name
U010B	522610/9	CAN 1 (for EGR): Reception timeout from the EGR valve
U1107	522611/9	CAN 1 (for exhaust throttle): Reception time out

● Workflow

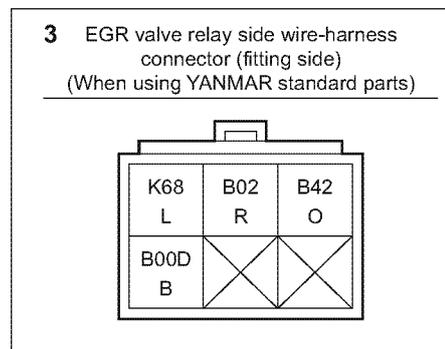
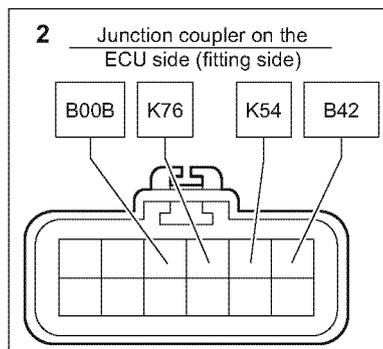
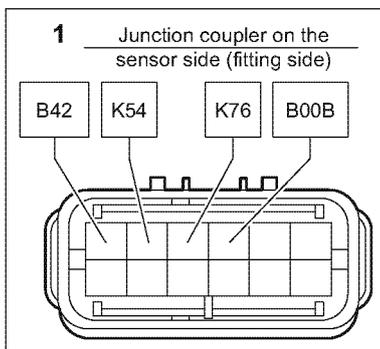
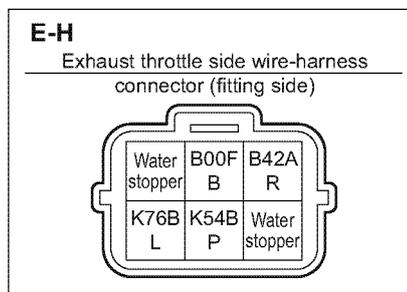
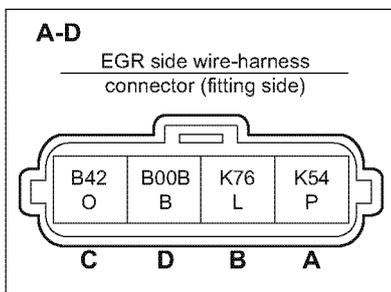
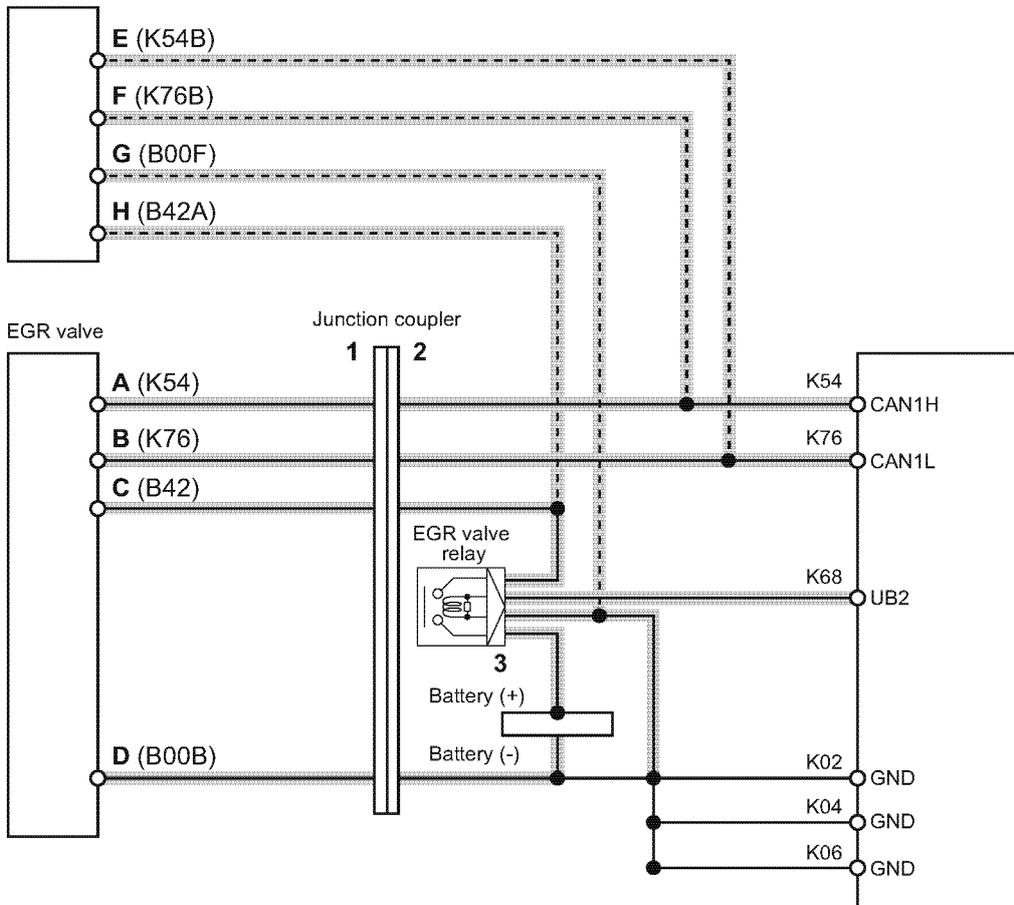
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



045712-00EN02

● Wiring diagram

Exhaust throttle (only when option is selected)



: Check points

077789-00E200

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the battery voltage

Turn on the key switch and check the battery voltage.

- 1- Make sure that the battery voltage is not reduced due to the battery life.
- 2- Make sure that the battery output is not too high.

NG	Charge or replace the battery.
OK	Go to "Checking the wire-harness conduction".

2. Checking the wire-harness conduction

- 1- Remove the wire-harness from the ECU and ECU of driven machine side.
- 2- While referring to P316 "ECU pin layout diagram", check the wire-harness conduction for the error-detected actuator (EGR valve or exhaust throttle) between terminal 1 and terminal 2 using the table below.

Reference: CAN 1 line conduction check pattern 1

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Actuator side wire-harness connector)	Conduction	State
K54	K54	Yes	OK: Normal
		No	NG: Error
K76	K76	Yes	OK: Normal
		No	NG: Error

Reference: CAN 1 line conduction check pattern 2

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on ECU side)	Conduction	State
K54	All terminals other than K54 and K76	Yes	NG: Error
		No	OK: Normal
K76	All terminals other than K54 and K76	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to "Operation using SA-D".

3. Operation using SA-D

- 1- Turn off the key switch, turn on the key switch again, and start the engine.
- 2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Applied	<ul style="list-style-type: none"> • Check the actuator operation. <ol style="list-style-type: none"> 1. Check the power supply to the actuator. 2. If there is no power supply, check the EGR valve relay, fuse, and power line connection. 3. If there is nothing wrong with the power system, replace the actuator that detected communication error. • Replace the ECU.

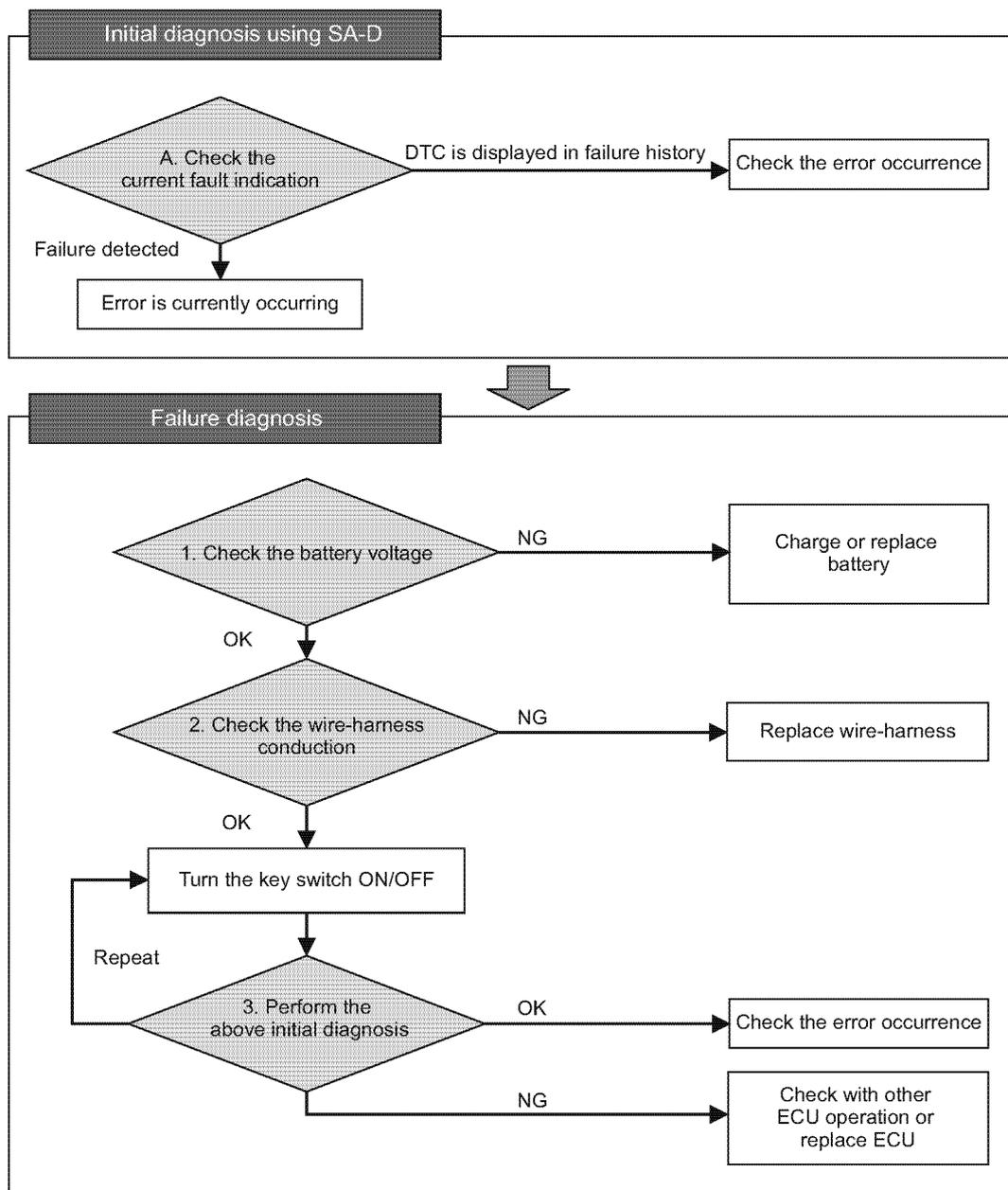
■ CAN 2

● Related DTC

P code	SPN/FMI	Name
U0292	522596/9	TSC1 (SA1) reception timeout
U1301	522597/9	TSC1 (SA2) reception timeout
U1292	522599/9	Y_ECR1 reception timeout
U1293	522600/9	Y_EC reception timeout
U1294	522601/9	Y_RSS reception timeout
U0168	237/31	VI reception timeout
U3002	237/13	VI reception data error
U1300	522609/9	Y_ETCP1 reception time out
U1303	522619/9	Y_DPFIF reception timeout
U1302	522681/9	EBC1 reception timeout
U0167	522730/12	Immobilizer error (CAN communication)

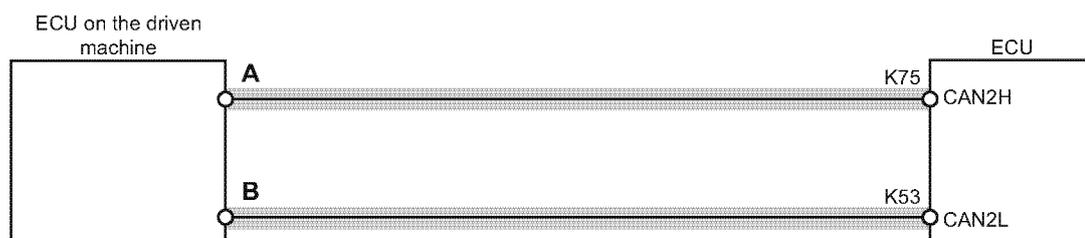
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



045712-01EN03

● Wiring diagram



045714-00EN00

Note: See P316 for the ECU pin layout.

● Work description

1. Checking the battery voltage

Turn on the key switch and check the battery voltage.

- 1- Make sure that the battery voltage is not reduced due to the battery life.
- 2- Make sure that the battery output is not too high.

NG	Charge or replace the battery.
OK	Go to: "Checking the wire-harness conduction".

2. Checking the wire-harness conduction

- 1- Remove the wire-harness from the ECU and ECU of driven machine side.
- 2- While referring to the P316 "ECU pin layout diagram", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: CAN 2 line conduction check pattern 1

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector on driven machine ECU side)	Conduction	State
K75	Driven machine ECU terminal A	Yes	OK: Normal
		No	NG: Error
K53	Driven machine ECU terminal B	Yes	OK: Normal
		No	NG: Error

Reference: CAN 2 line conduction check pattern 2

Terminal 1 (Wire-harness connector on ECU side)	Terminal 2 (Wire-harness connector ECU side)	Conduction	State
K75	All terminals other than K75	Yes	NG: Error
		No	OK: Normal
K53	All terminals other than K53	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to "Operation using SA-D".

3. Operation using SA-D

- 1- Turn off the key switch, turn on the key switch again, and start the engine.
- 2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Applied	<ul style="list-style-type: none"> • Check the operation of other ECUs. • Replace the ECU.

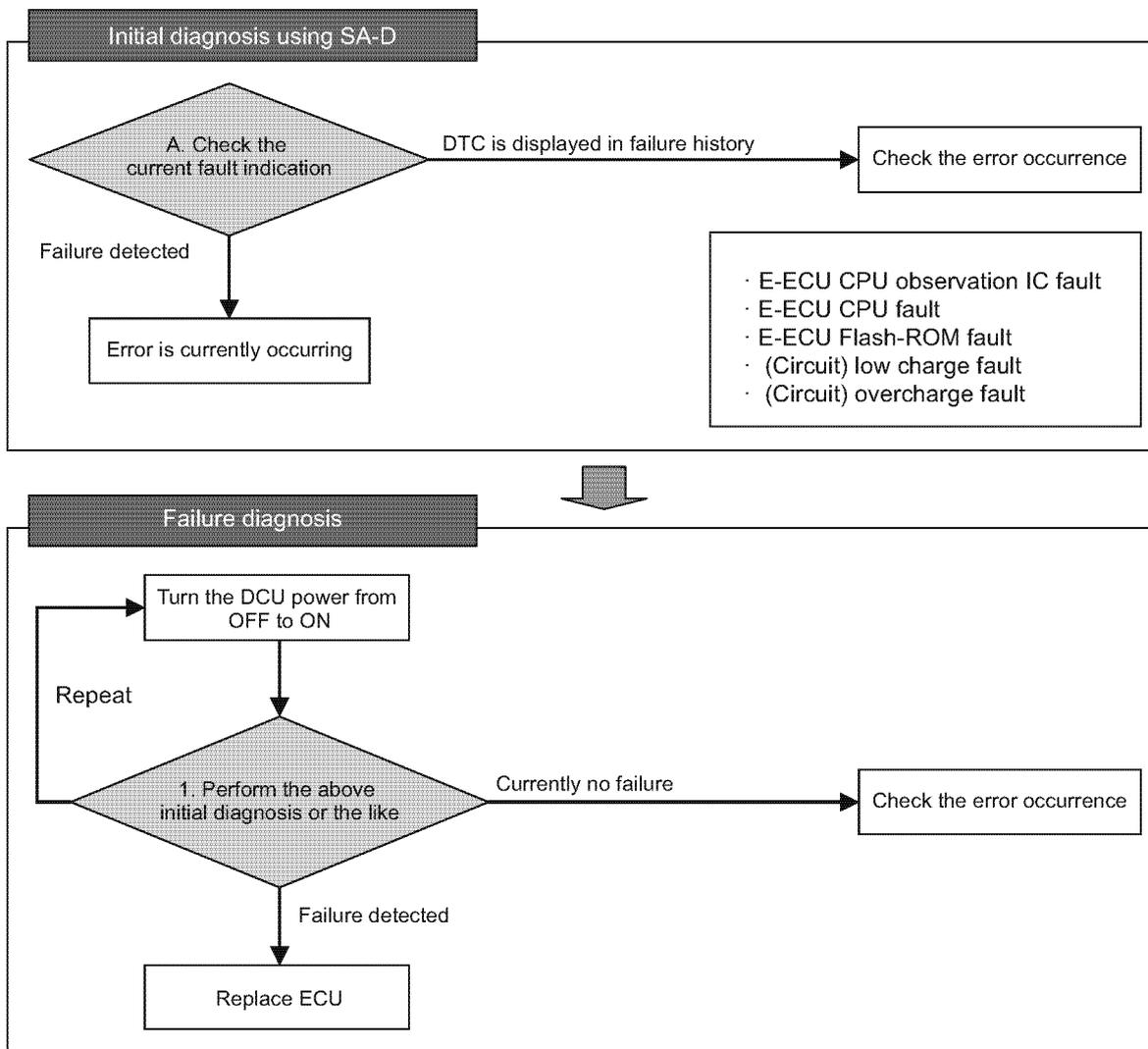
ECU related

● Related DTC

P code	SPN/FMI	Name
P0601	630/12	EEPROM memory deletion error
P160E	630/12	EEPROM memory reading error
P160F	630/12	EEPROM memory writing error
P2229	108/3	Atmospheric pressure sensor error (excessive sensor output)
P2228	108/4	Atmospheric pressure sensor error (insufficient sensor output)
P1231	108/10	Atmospheric pressure sensor error (characteristic error)
P1613	522585/12	CY146 SPI communication fault
P1608	522588/12	Excessive voltage of supply 1
P1617	522589/12	Insufficient voltage of supply 1
P1469	523473/12	AD converter fault 1
P1470	523474/12	AD converter fault 2
P1471	523475/12	External monitoring IC and CPU fault 1
P1472	523476/12	External monitoring IC and CPU fault 2
P1473	523477/12	ROM fault
P1474	523478/12	Shutoff path fault 1
P1475	523479/12	Shutoff path fault 2
P1476	523480/12	Shutoff path fault 3
P1477	523481/12	Shutoff path fault 4
P1478	523482/12	Shutoff path fault 5
P1479	523483/12	Shutoff path fault 6
P1480	523484/12	Shutoff path fault 7
P1481	523485/12	Shutoff path fault 8
P1482	523486/12	Shutoff path fault 9
P1483	523487/12	Shutoff path fault 10

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



044395-01EN01

● Work description

1. Checking the current failure with SA-D

- 1-Turn off the ECU power and turn on the key switch again.
- 2-Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	<ul style="list-style-type: none"> • Switch the ECU power from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

Others

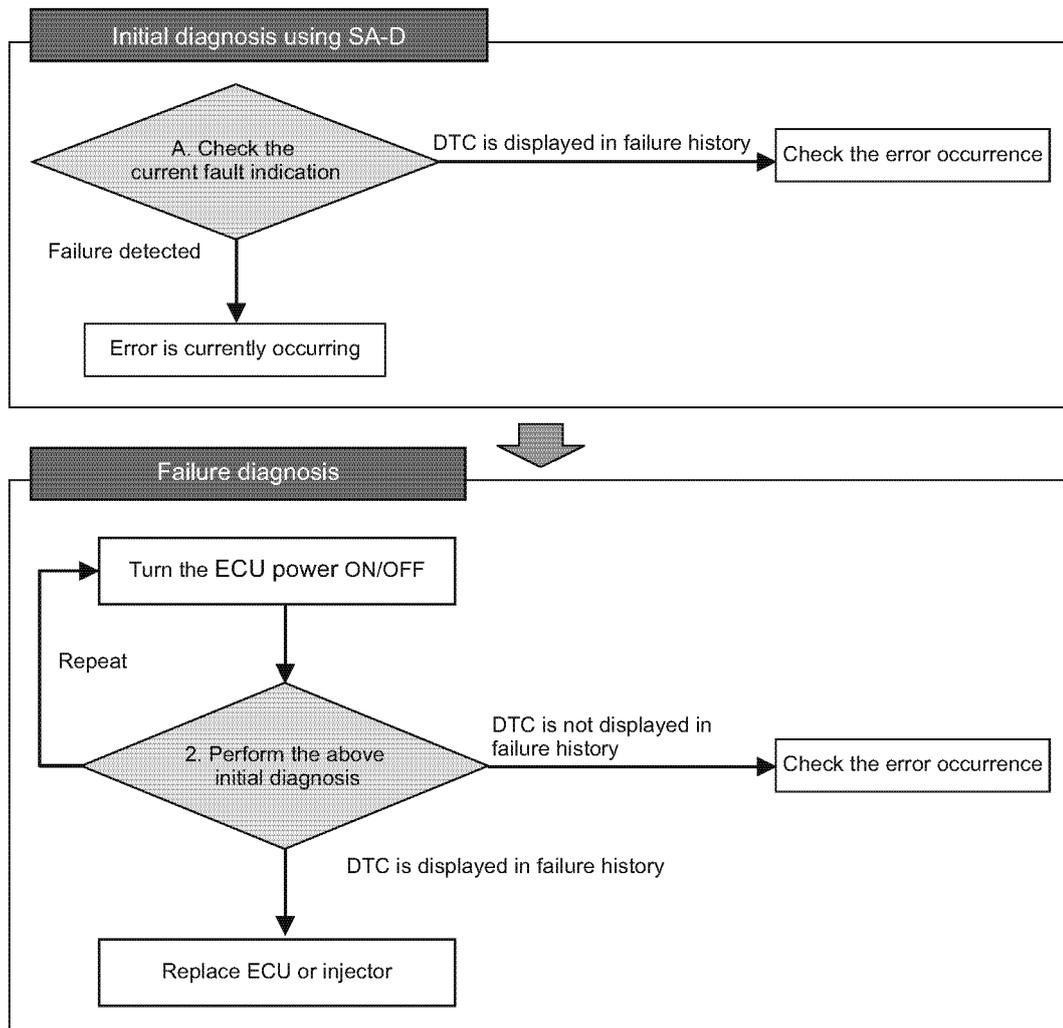
■ Overspeed

● Related DTC

P code	SPN/FMI	Name
P0219	190/0	Overspeed

● Workflow

Note: For the details of work, refer to the following <Work description>. For the operation method of the diagnosis, refer to the separate "SMARTASSIST-DIRECT (SA-D) operation manual".



044396-01EN01

● Work description

1. Operation using SA-D

1-Turn off the ECU power, turn on the key switch again, and start the engine.

2-Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	<ul style="list-style-type: none">• Switch the ECU power from ON to OFF again and perform the work indicated above 1.• Replace the ECU or injector.

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