

**YANMAR**

TROUBLESHOOTING  
MANUAL

**INDUSTRIAL ENGINES**

**TNV SERIES**

TROUBLESHOOTING MANUAL	Model	TNV Series
	Code No.	0DTN4-G00200

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# TROUBLESHOOTING

## DTC (Diagnostic Trouble Codes) General Description

### DTC code list

P code	DTC code			Number of the lamp flashes	Part	Error item	Reference page	
	SPN		FMI				Description	Failure diagnosis
	Decima number	Hexadecimal number	Decima number					
P0336	522400	7F8A0	2	MIL + AWL	Crank speed sensor	Crank signal malfunction	P7	P290
P0337			5	MIL + AWL		No crank signal	P9	P290
P0341	522401	7F8A1	2	MIL + AWL	Cam speed sensor	Cam signal malfunction	P11	P293
P0342			5	MIL + AWL		No cam signal	P13	P293
P1341			7	MIL + AWL		Angle offset failure	P15	-
P0008	523249	7FBF1	5	MIL + RSL	Crank speed, Cam speed sensor	No signal on both crank and cam speed sensor	P17	P290, P293
P0123	91	5B	3	MIL + AWL	Accelerator sensor 1	Accelerator sensor 1 (Excessive sensor output)	P18	P297
P0122			4	MIL + AWL		Accelerator sensor 1 (Insufficient sensor output)	P20	P297
P0223	28	1C	3	MIL + AWL	Accelerator sensor 2	Accelerator sensor 2 (Excessive sensor output)	P22	P297
P0222			4	MIL + AWL		Accelerator sensor 2 (Insufficient sensor output)	P24	P297
P1646	522624	7F980	7	MIL + AWL	Accelerator sensor 1 + 2	Dual accelerator sensor (closed position) failure	P26	-
P1647	522623	7F97F	7	MIL + AWL		Dual accelerator sensor (open position) failure	P28	-
P0228	29	1D	3	MIL + AWL	Accelerator sensor 3	Accelerator sensor 3 (Excessive sensor output)	P30	P297
P0227			4	MIL + AWL		Accelerator sensor 3 (Insufficient sensor output)	P32	P297
P1227			8	MIL + AWL	Pulse sensor	Pulse sensor failure (Pulse communication)	P34	-
P1126	28	1C	0	MIL + AWL	Accelerator sensor 3	Accelerator sensor 3 failure (Foot pedal in open position)	P35	-
P1125			1	MIL + AWL		Accelerator sensor 3 failure (Foot pedal in closed position)	P37	-
P02E9	51	33	3	MIL + RSL	Intake throttle opening sensor	Intake throttle opening sensor fault (High voltage)	P38	P301
P02E8			4	MIL + RSL		Intake throttle opening sensor fault (Low voltage)	P40	P301
P0238	102	66	3	MIL + RSL	EGR low pressure side sensor	EGR low pressure side sensor fault (High voltage)	P42	P304
P0237			4	MIL + RSL		EGR low pressure side sensor fault (Low voltage)	P44	P304
P0236			13	MIL + RSL		EGR low pressure side sensor (Abnormal learning value)	P46	P304
P0473	1209	4B9	3	MIL + RSL	EGR high pressure side sensor	EGR high pressure side sensor fault (High voltage)	P48	P307
P0472			4	MIL + RSL		EGR high pressure side sensor fault (Low voltage)	P50	P307
P0471			13	MIL + RSL		EGR high pressure side sensor (Abnormal learning value)	P52	P307
P0118	110	6E	3	MIL + AWL	Cooling water temperature sensor	Cooling water temperature sensor fault (High voltage)	P54	P310
P0117			4	MIL + AWL		Cooling water temperature sensor fault (Low voltage)	P56	P310
P0217			0	Select by application		Cooling water temperature sensor temperature abnormal high (Overheat)	P58	P310
P0113	172	AC	3	MIL + AWL	New air temperature sensor	New air temperature sensor fault (High voltage)	P60	P314
P0112			4	MIL + AWL		New air temperature sensor fault (Low voltage)	P62	P314
P0183	174	AE	3	MIL + AWL	Fuel temperature sensor	Fuel temperature sensor fault (High voltage)	P64	P318
P0182			4	MIL + AWL		Fuel temperature sensor fault (Low voltage)	P66	P318
P0168			0	Select by application		Fuel temperature sensor temperature abnormal high	P68	P318

# TROUBLESHOOTING

DTC code				Number of the lamp flashes	Part	Error item	Reference page		
P code	SPN		FMI				State	Description	Failure diagnosis
	Decima number	Hexadecimal number	Decima number						
P0193	157	9D	3	MIL + RSL	Rail pressure sensor	Rail pressure sensor fault (High voltage)	P70	P322	
P0192			4	MIL + RSL		Rail pressure sensor fault (Low voltage)	P72	P322	
P2455	3251	CB3	3	MIL + RSL	DPF differential pressure sensor	DPF differential pressure sensor fault (High voltage)	P74	P325	
P2454			4	MIL + RSL		DPF differential pressure sensor fault (Low voltage)	P76	P325	
P2452			0	MIL + RSL		DPF differential pressure sensor differential pressure abnormal high	P78	P325	
P2453			13	MIL + RSL		DPF differential pressure sensor (Abnormal learning value)	P80	P325	
P1455	3609	E19	3	MIL + RSL	DPF high pressure side sensor	DPF high pressure side sensor fault (High voltage)	P82	P325	
P1454			4	MIL + RSL		DPF high pressure side sensor fault (Low voltage)	P84	P325	
P1428	3242	CAA	3	MIL + RSL	DPF inlet temperature sensor	DPF inlet temperature sensor fault (High voltage)	P86	P329	
P1427			4	MIL + RSL		DPF inlet temperature sensor fault (Low voltage)	P88	P329	
P1436			0	MIL + AWL		DPF inlet temperature sensor temperature abnormal high	P90	P329	
P1434	3250	CB2	3	MIL + RSL	DPF intermediate temperature sensor	DPF intermediate temperature sensor fault (High voltage)	P91	P333	
P1435			4	MIL + RSL		DPF intermediate temperature sensor fault (Low voltage)	P93	P333	
P0420			1	MIL + AWL		DPF intermediate temperature sensor temperature abnormal low temperature	P95	P333	
P1426			0	MIL + RSL		DPF intermediate temperature sensor temperature abnormal high (Post-injection failure)	P96	P333	
P2229	108	6C	3	MIL + AWL	Atmospheric pressure sensor	Atmospheric pressure sensor fault (High voltage)	P97	P390	
P2228			4	MIL + AWL		Atmospheric pressure sensor fault (Low voltage)	P98	P390	
P1231			10	MIL + AWL		Atmospheric pressure sensor characteristic fault	P99	P390	
P041D	412	19C	3	MIL + AWL	EGR gas temperature sensor	EGR gas temperature sensor fault (High voltage)	P101	P337	
P041C			4	MIL + AWL		EGR gas temperature sensor fault (Low voltage)	P103	P337	
P040D	105	69	3	MIL + RSL	Intake manifold temperature sensor	Intake manifold temperature sensor fault (High voltage)	P105	P341	
P040C			4	MIL + RSL		Intake manifold temperature sensor fault (Low voltage)	P107	P341	
P0546	173	AD	3	MIL + AWL	Exhaust manifold temperature sensor	Exhaust manifold temperature sensor fault (High voltage)	P109	P345	
P0545			4	MIL + AWL		Exhaust manifold temperature sensor fault (Low voltage)	P111	P345	
P068B	1485	5CD	7	MIL + AWL	Main relay	Main relay contact stuck	P113	P349	
P068A			2	MIL + AWL		Main relay early opening	P115	P349	
P0543	522243	7F803	5	MIL + AWL	Startup assist relay	Startup assist relay interrupted	P117	P353	
P0541			6	MIL + AWL		Startup assist relay GND interrupted	P119	P353	
P0204 (4TNV), P0203 (3TNV)	651 (4TNV), 652 (3TNV)	28B (4TNV), 28C (3TNV)	5	MIL + RSL	Injector 1 4TNV: Cyl No. 4 3TNV: Cyl No. 3 Corresponding port 4TNV: 1 - 2 3TNV: 1 - 3	Injector 1 open circuit (Inherent location of the injector)	P121	P364	
P0271 (4TNV), P0268 (3TNV)			6	MIL + RSL		Injector 1 coil short circuit	P123	P364	
P1271 (4TNV), P1262 (3TNV)			3	MIL + RSL		Injector 1 short circuit	P125	P368	
P0202	653	28D	5	MIL + RSL	Injector 2 4TNV: Cyl No. 2 3TNV: Cyl No. 2 Corresponding port 4TNV: 2 - 1 3TNV: 1 - 2	Injector 2 open circuit (Inherent location of the injector)	P127	P364	
P0265			6	MIL + RSL		Injector 2 coil short circuit	P129	P364	
P1265			3	MIL + RSL		Injector 2 short circuit	P131	P368	

P code	DTC code			Number of the lamp flashes	Part	Error item	Reference page		
	SPN		FMI				Description	Failure diagnosis	
	Decima number	Hexadecimal number	Decima number						
P0201	654	28E	5	MIL + RSL	Injector 3 4TNV: Cyl No. 1 3TNV: Cyl No. 1 Corresponding port 4TNV: 2 - 2 3TNV: 1 - 1	Injector 3 open circuit (Inherent location of the injector)	P133	P364	
P0262			6	MIL + RSL		Injector 3 coil short circuit	P135	P364	
P1262			3	MIL + RSL		Injector 3 short circuit	P137	P368	
P0203	652	28C	5	MIL + RSL	Injector 4 4TNV: Cyl No. 3 Corresponding port 4TNV: 1 - 1	Injector 4 open circuit (Inherent location of the injector)	P139	P364	
P0268			6	MIL + RSL		Injector 4 coil short circuit	P141	P364	
P1268			3	MIL + RSL		Injector 4 short circuit	P143	P368	
P0611	4257	10A1	12	MIL + RSL	Injector (common)	Injector drive IC error	P145	-	
P1146	2797	AED	6	MIL + RSL		Injector drive circuit (Bank1) short circuit (4TN: Common circuit for No. 1, No. 4 and all 3TN cylinders)	P146	P368	
P1149	2798	AEE	6	MIL + RSL		Injector drive circuit (Bank 2) short circuit (4TN: Circuit for No. 2 and No. 3 cylinders)	P148	P368	
P1648	523462	7FCC6	13	MIL + RSL	Injector (correction value)	IQA corrected injection amount for injector 1 error	P150	-	
P1649	523463	7FCC7	13	MIL + RSL		IQA corrected injection amount for injector 2 error	P151	-	
P1650	523464	7FCC8	13	MIL + RSL		IQA corrected injection amount for injector 3 error	P152	-	
P1651	523465	7FCC9	13	MIL + RSL		IQA corrected injection amount for injector 4 error	P153	-	
P1641	522571	7F94B	3	MIL + RSL	SCV (MPROP)	High-pressure pump drive circuit (Low side VB short-circuit)	P154	P370	
P1643			6	MIL + RSL		High-pressure pump drive circuit (Low side GND short-circuit)	P155	P370	
P0629	633	279	3	MIL + RSL		High-pressure pump drive circuit (High side VB short-circuit)	P157	P370	
P1642			6	MIL + RSL		High-pressure pump drive circuit (High side GND short-circuit)	P159	P370	
P0627			5	MIL + RSL		High-pressure pump drive circuit (Open circuit)	P160	P370	
P062A	522572	7F94C	6	MIL + RSL		High-pressure pump drive circuit (Drive current (high level))	P161	P370	
P1645			11	MIL + RSL		High-pressure pump drive circuit (Pump overload error)	P163	P370	
P0088	157	9D	0	MIL + RSL		Abnormal rail pressure	Actual rail pressure rise error	P165	-
P0094			18	MIL + RSL			Rail pressure deviation error during the actual rail pressure drop	P167	-
P0093			15	MIL + RSL	Rail pressure deviation error during the actual rail pressure rise		P169	-	
P000F			16	MIL + RSL	PLV open valve		P171	-	
P1666	523469	7FCCD	0	MIL + RSL	PLV (Common rail pressure limit valve)	Rail pressure fault (The times of PLV valve opening error)	P173	-	
P1667	523470	7FCC E	0	MIL + RSL		Rail pressure fault (The time of PLV valve opening error)	P175	-	
P1668	523489	7FCE1	0	MIL + RSL		Rail pressure fault (The actual rail pressure is too high during PRV limp home)	P177	-	
P1665	523468	7FCCC	9	MIL + RSL		Rail pressure fault (Controlled rail pressure error after PLV valve opening)	P179	-	
P1669	523491	7FCE3	0	MIL + RSL	Rail pressure control	Rail pressure fault (Injector B/F temperature error during PLV4 limp home)	P181	-	
P1670	523460	7FCC4	7	MIL + RSL		Rail pressure fault (Operation time error during RPS limp home)	P183	-	
P0219	190	BE	16	MIL + RSL	Overspeed	Overspeed	P285	P393	
P0660	2950	B86	5	MIL + AWL	Intake throttle drive circuit	No-load of throttle valve drive H bridge circuit	P184	P373	
P1658			3	MIL + AWL		Power short circuit of throttle valve drive H bridge output 1	P185	P373	
P1659			4	MIL + AWL		GND short circuit of throttle valve drive H bridge output 1	P186	P373	
P1660			6	MIL + AWL		Overload on the drive H bridge circuit of throttle valve	P187	P373	
P1661	2951	B87	3	MIL + AWL		VB Power short circuit of throttle valve drive H bridge output 2	P188	P373	
P1662			4	MIL + AWL		GND short circuit of throttle valve drive H bridge output 2	P189	P373	

# TROUBLESHOOTING

DTC code				Number of the lamp flashes	Part	Error item	Reference page		
P code	SPN		FMI				State	Description	Failure diagnosis
	Decimal number	Hexadecimal number	Decimal number						
U0292	522596	7F964	9	MIL + AWL	CAN2	TSC1 (CAN message) reception time out (SA1)	P210	P387	
U1301	522597	7F965	9	MIL + AWL		TSC1 (CAN message) reception time out (SA2)	P212	P387	
U1292	522599	7F967	9	MIL + AWL		Y_EGR1 (CAN message) reception time out	P214	P387	
U1293	522600	7F968	9	MIL + AWL		Y_EC (CAN message) reception time out	P216	P387	
U1294	522601	7F969	9	MIL + AWL		Y_RSS (CAN message) reception time out	P218	P387	
U1296	522603	7F96B	9	MIL + AWL		VH (CAN message) reception time out	P220	P387	
U1298	522605	7F96D	9	MIL + AWL		Y_ECM3 (CAN message) reception time out	P222	P387	
U0168	237	ED	31	MIL + AWL		VI (CAN message) reception time out	P224	P387	
U3002			13	MIL + AWL		VI (CAN message) reception data fault	P226	P387	
U1300	522609	7F971	9	MIL + AWL		Y_ETCP1 (CAN message) reception time out	P228	P387	
U1302	522618	7F97A	9	MIL + AWL		EBC1 (CAN message) reception time out	P230	P387	
U1303	522619	7F97B	9	MIL + AWL		Y_DPFIF (CAN message) reception time out	P232	P387	
U010B	522610	7F972	9	MIL + AWL		CAN1	CAN1 (for EGR): Reception time out	P208	P384
U1107	522611	7F973	9	TBD			Exhaust throttle (CAN message from the exhaust throttle time out)	P209	P384
P0404	2791	AE7	0	MIL + AWL		EGR valve	EGR over-voltage fault	P190	P378
P1404			1	MIL + AWL	EGR under-voltage fault		P191	P378	
P1409			7	MIL + AWL	EGR feedback malfunction		P192	P382	
U0401			9	MIL + AWL	EGR ECM data fault		P193	P382	
P0403			12	MIL + AWL	Open circuit between the EGR motor coils		P194	P382	
P1405	522579	7F953	12	MIL + AWL	Short circuit between the EGR motor coils		P195	P382	
P0488	522580	7F954	12	MIL + AWL	EGR position sensor malfunction		P196	P382	
P148A	522581	7F955	7	MIL + RSL	EGR stuck open valve malfunction		P197	P382	
P049D	522582	7F956	7	MIL + RSL	EGR initialization malfunction		P198	P382	
P1410	522183	7F957	1	MIL + AWL	EGR high temperature thermistor malfunction		P200	P382	
P1411	522184	7F958	1	MIL + AWL	EGR low temperature thermistor malfunction		P201	P382	
U1401	522617	7F979	12	MIL + AWL	EGR target value out of range		P199	P382	
P1438	522746	7F9FA	12	TBD	Exhaust throttle		Exhaust throttle (Voltage fault)	P202	-
P1439	522747	7F9FB	12	TBD			Exhaust throttle (Motor fault)	P203	-
P1440	522748	7F9FC	12	TBD			Exhaust throttle (Sensor system fault)	P204	-
P1441	522749	7F9FD	12	TBD		Exhaust throttle (MPU fault)	P205	-	
P1442	522750	7F9FE	12	TBD		Exhaust throttle (PCB fault)	P206	-	
P1443	522751	7F9FF	19	TBD		Exhaust throttle (CAN fault)	P207	-	
P0601	630	276	12	MIL + RSL		EEPROM	EEPROM memory deletion error	P234	P390
P160E	522576	7F950	12	MIL + RSL	EEPROM memory read error		P235	P390	
P160F	522578	7F952	12	MIL + RSL	EEPROM memory writing error		P236	P390	

DTC code					Number of the lamp flashes	Error item		Reference page	
P code	SPN		FMI	Part		State	Description	Failure diagnosis	
	Decima number	Hexadecimal number	Decima number						
P1613	522585	7F959	12	MIL + RSL	ECU internal fault	CY146 SPI communication fault	P237	P390	
P1608	522588	7F95C	12	MIL + RSL		Excessive voltage of supply 1	P238	P390	
P1617	522589	7F95D	12	MIL + RSL		Insufficient voltage of supply 1	P239	P390	
P1609	522590	7F95E	12	None		Sensor supply voltage error 1	P240	-	
P1618	522591	7F95F	12	None		Sensor supply voltage error 2	P241	-	
P1619	522592	7F960	12	None		Sensor supply voltage error 3	P242	-	
P1626	522744	7F9F8	4	MIL + AWL		Actuator drive circuit 1 short to ground	P243	-	
P1633	522994	7FAF2	4	MIL + AWL		Actuator drive circuit 2 short to ground	P244	-	
P1467	523471	7FCCF	6	MIL + AWL		Actuator drive circuit 3 short to ground	P245	-	
P1469	523473	7FCD1	12	MIL + RSL		AD converter fault 1	P246	P390	
P1470	523474	7FCD2	12	MIL + RSL		AD converter fault 2	P247	P390	
P1471	523475	7FCD3	12	MIL + RSL		External monitoring IC and CPU fault 1	P248	P390	
P1472	523476	7FCD4	12	MIL + RSL		External monitoring IC and CPU fault 2	P249	P390	
P1473	523477	7FCD5	12	MIL + RSL		ROM fault	P250	P390	
P1474	523478	7FCD6	12	MIL + RSL		Shutoff path fault 1	P251	P390	
P1475	523479	7FCD7	12	MIL + RSL		Shutoff path fault 2	P252	P390	
P1476	523480	7FCD8	12	MIL + RSL		Shutoff path fault 3	P253	P390	
P1477	523481	7FCD9	12	MIL + RSL		Shutoff path fault 4	P254	P390	
P1478	523482	7FCDA	12	MIL + RSL		Shutoff path fault 5	P255	P390	
P1479	523483	7FCDB	12	MIL + RSL		Shutoff path fault 6	P256	P390	
P1480	523484	7FCDC	12	MIL + RSL		Shutoff path fault 7	P257	P390	
P1481	523485	7FCDD	12	MIL + RSL		Shutoff path fault 8	P258	P390	
P1482	523486	7FCDE	12	MIL + RSL		Shutoff path fault 9	P259	P390	
P1483	523487	7FCDF	12	MIL + RSL		Shutoff path fault 10	P260	P390	
P1484	523488	7FCE0	0	MIL + RSL		Recognition error of engine speed	P261	-	
P1101	522323	7F853	0	Select by application		Air cleaner switch	Air cleaner clogged alarm	P262	P361
P1151	522329	7F859	0	Select by application		Oil/water separator switch	Oil/water separator alarm	P264	P361
P1562	167	A7	5	Select by application		Charge switch	Charge switch open circuit	P266	P357
P1568			1	Select by application	Charge alarm		P268	P357	
P1192	100	64	4	Select by application	Oil pressure switch	Oil pressure switch open circuit	P270	P357	
P1198			1	Select by application		Low oil pressure fault alarm	P272	P357	
P2463	522573	7F94D	0	Not turned on	DPF	Overaccumulation (Method C)	P274	-	
P1463	522574	7F94E	0	Not turned on		Overaccumulation (Method P)	P275	-	
P2458	522575	7F94F	7	Not turned on		Regeneration defect (Stationary regeneration failure)	P276	-	
P2459	522577	7F951	11	Not turned on		Regeneration defect (Stationary regeneration not performed)	P277	-	
P242F	3720	E88	16	MIL + AWL	DPF OP interface	Ash cleaning request 1	P278	-	
P1420			0	MIL + RSL		Ash cleaning request 2	P279	-	
P1421	3719	E87	16	MIL + AWL		Stationary regeneration standby	P280	-	
P1424			0	MIL + RSL		Backup mode	P281	-	
P1425	3695	E6F	14	Not turned on		Reset regeneration prohibited	P282	-	
P1445	3719	E87	9	MIL + RSL		Recovery regeneration failure	P283	-	
P1446			7	MIL + RSL		Recovery regeneration prohibition	P284	-	

## 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 malfunction. 2. Condition for detecting the malfunction.	Check points to specify the cause of the malfunction. For details, refer to "Diagnosis Content".

### ● Actions when a malfunction occurs

Fault mode	[Continuous operation] / [Limited operation] / [Engine stop]: Describes the engine operation when a malfunction is detected.  * [Continuous operation]: The engine continues to operate without limitations after the malfunction is detected. Engine control is not obstructed. [Limited operation]: The engine operation continues, but the high idle speed and engine power are limited. The engine output is limited. [Engine stop]: The engine stops immediately when the malfunction is detected. If the malfunction is detected prior to starting the engine, the starter does not turn.
Limited operation	Yes/No: The details of limited operation at the time of the malfunction are listed.
Reset criteria	Yes/No: The condition to release the fault mode is listed.
Remarks	Safety precautions are listed.

### ● Presumed cause of the malfunction or the abnormal condition

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

\* Malfunctions related to the detected DTC are listed.

### ● Diagnosis

The method and procedure of the failure diagnosis are listed.

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

## Sensor related

### ■ Crank speed sensor

#### *P0336: Crank signal malfunction*

P code	P0336	Name	Crank signal malfunction
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 (15 times).	Connector Wire harness Crank speed sensor E-ECU Pulser

#### ● Actions when a malfunction occurs

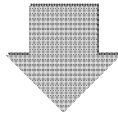
Fault mode	[Limited operation]: The engine operation is limited. (The operation continues with only the cam.)
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

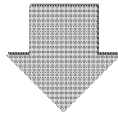
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Crank speed sensor failure
4. E-ECU internal circuit fault
5. Pulser fault and sensor installation condition fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 <i>P290</i>.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the crank speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the crank speed sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the crank speed sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the crank speed sensor installation condition and the pulse.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 <i>P290</i>.</p>
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**P0337: No crank signal**

P code	P0337	Name	No crank signal
SPN/FMI	522400/5		

**● DTC detection criteria**

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

**● Actions when a malfunction occurs**

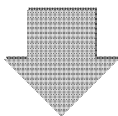
Fault mode	[Limited operation]: The engine operation is limited. (The operation continues with only the cam.)
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

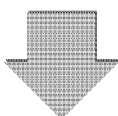
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Crank speed sensor failure
4. E-ECU internal circuit fault
5. Pulser fault and sensor installation condition fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P290.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the crank speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the crank speed sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the crank speed sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the crank speed sensor installation condition and the pulse.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P290.</p>
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## ■ Cam speed sensor

### ***P0341: Cam signal malfunction***

P code	P0341	Name	Cam signal malfunction
SPN/FMI	522401/2		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Incorrect cam pulser rotation or position detected while the crank is rotating for a certain number of rotations (2 rotations).	Connector Wire harness Cam speed sensor E-ECU Pulser

#### ● Actions when a malfunction occurs

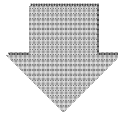
Fault mode	[Continuous operation]: Engine control is not obstructed. (The operation continues with only the crank.)
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

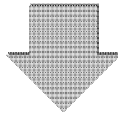
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Cam speed sensor fault
4. E-ECU internal circuit fault
5. Pulser fault and sensor installation condition fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P293.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the cam speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the cam speed sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the E-ECU output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P293.</p>
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**P0342: No cam signal**

P code	P0342	Name	No cam signal
SPN/FMI	522401/5		

**● DTC detection criteria**

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

**● Actions when a malfunction occurs**

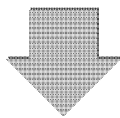
Fault mode	[Continuous operation]: Engine control is not obstructed. (The operation continues with only the crank.)
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

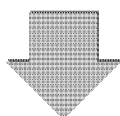
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Cam speed sensor fault
4. E-ECU internal circuit fault
5. Pulser fault and sensor installation condition fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P293.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the cam speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the cam speed sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the E-ECU output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P293.</p>
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**P1341: Angle offset failure**

P code	P1341	Name	Angle offset failure
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 Cam speed sensor E-ECU Pulser

**● Actions when a malfunction occurs**

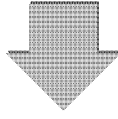
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

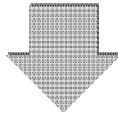
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Cam speed sensor fault
4. E-ECU internal circuit fault
5. Pulser fault and sensor installation condition fault

## ● Diagnosis

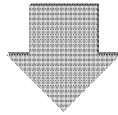
1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the crank speed sensor, cam speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the cam speed sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Pulser check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check that there is no abnormality in distance and displacement of the pulser and the sensor.</li></ul>
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4. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the E-ECU output voltage.</li></ul>
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**P0008: No signal on both crank and cam speed sensor**

P code	P0008	Name	No signal on both crank and cam speed sensor
SPN/FMI	523249/5		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. No.	Connector Wire harness Crank speed, Cam speed sensor E-ECU Pulser

**● Actions when a malfunction occurs**

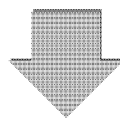
Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Yes: Fuel injection stops.
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

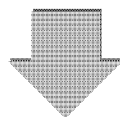
1. Crank speed sensor fault and cam speed sensor fault occur at the same time
2. Starter system fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P290, P293.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the power switch.</li> <li>• Check the pin of the crank speed sensor, cam speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li> <li>• Check whether the crank speed sensor, cam speed sensor wiring is disconnected or the wiring coating is peeled.</li> <li>• If the starter is turned on but the engine does not turn, check the starter system.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Perform the failure diagnosis on the crank speed sensor and cam speed sensor.</li> </ul>
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## ■ Accelerator sensor

### P0123: Accelerator sensor 1 (Excessive sensor output)

P code	P0123	Name	Accelerator sensor 1 (Excessive sensor output)
SPN/FMI	91/3		

#### ● DTC detection criteria

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

#### ● Actions when a malfunction occurs

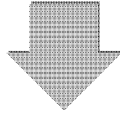
	Backup accelerator sensor function	
	No	Yes
Fault mode	[Limited operation]: The engine is operated at the constant rotation speed.	[Continuous operation]: Switched to the engine operation by the spare accelerator sensor.
Limited operation	Yes: The target rotation speed is set to "target rotation speed when a malfunction occurs (by map setting)" or "target rotation speed prior to detecting a malfunction".	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off while the normal voltage value (0.2 V to 4.6 V) is supplied.	Yes: The fault mode is released when the ECU power off is detected.
Remarks		

#### ● Presumed cause of the malfunction or the abnormal condition

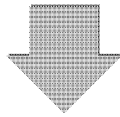
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Accelerator sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the accelerator sensor wiring is cut or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the accelerator sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the accelerator sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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**P0122: Accelerator sensor 1 (Insufficient sensor output)**

P code	P0122	Name	Accelerator sensor 1 (Insufficient sensor output)
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 E-ECU

● **Actions when a malfunction occurs**

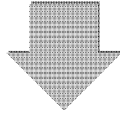
	Backup accelerator sensor function	
	No	Yes
Fault mode	[Limited operation]: The engine is operated at the constant rotation speed.	[Continuous operation]: Switched to the engine operation by the spare accelerator sensor.
Limited operation	Yes: The target rotation speed is set to "target rotation speed when a malfunction occurs (by map setting)" or "target rotation speed prior to detecting a malfunction".	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off while the normal voltage value (0.2 V to 4.6 V) is supplied.	Yes: The fault mode is released when the ECU power off is detected.
Remarks		

● **Presumed cause of the malfunction or the abnormal condition**

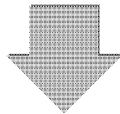
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or GND short circuit of sensor 5 V
3. Accelerator sensor failure
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the sensor voltage value.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• 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.</li> <li>• Check whether the accelerator sensor wiring is cut or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the accelerator sensor resistance value.</li> <li>• Check the conduction of the wire harness.</li> <li>• Check the accelerator sensor output voltage.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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**P0223: Accelerator sensor 2 (Excessive sensor output)**

P code	P0223	Name	Accelerator sensor 2 (Excessive sensor output)
SPN/FMI	28/3		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Voltage of sensor signal is greater than the threshold value of 4.6 V.	Connector Wire harness Accelerator sensor E-ECU

**● Actions when a malfunction occurs**

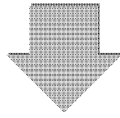
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

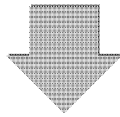
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or GND short circuit of sensor 5 V
3. Accelerator sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the accelerator sensor wiring is cut or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the accelerator sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the accelerator sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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**P0222: Accelerator sensor 2 (Insufficient sensor output)**

P code	P0222	Name	Accelerator sensor 2 (Insufficient sensor output)
SPN/FMI	28/4		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Voltage of sensor signal is less than the threshold value of 0.2 V.	Connector Wire harness Accelerator sensor E-ECU

**● Actions when a malfunction occurs**

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

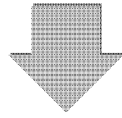
**● Presumed cause of the malfunction or the abnormal condition**

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

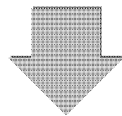


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the accelerator sensor wiring is cut or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the accelerator sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the accelerator sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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**P1646: Dual accelerator sensor (closed position) failure**

P code	P1646	Name	Dual accelerator sensor (closed position) failure
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 E-ECU

**● Actions when a malfunction occurs**

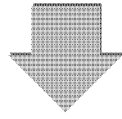
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

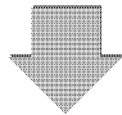
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or GND short circuit of sensor 5 V
3. Accelerator 1 sensor failure
4. Accelerator 2 sensor failure
5. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the accelerator sensor wiring is cut or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the accelerator sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the accelerator sensor output voltage.</li></ul>
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**P1647: Dual accelerator sensor (open position) failure**

P code	P1647	Name	Dual accelerator sensor (open position) failure
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 E-ECU

**● Actions when a malfunction occurs**

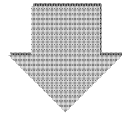
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

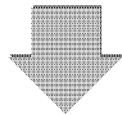
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or GND short circuit of sensor 5 V
3. Accelerator 1 sensor failure
4. Accelerator 2 sensor failure
5. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the accelerator sensor wiring is cut or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the accelerator sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the accelerator sensor output voltage.</li></ul>
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**P0228: Accelerator sensor 3 (Excessive sensor output)**

P code	P0228	Name	Accelerator sensor 3 (Excessive sensor output)
SPN/FMI	29/3		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Voltage of sensor signal is greater than the threshold value of 4.6 V.	Connector Wire harness Accelerator sensor 3 E-ECU

**● Actions when a malfunction occurs**

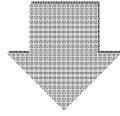
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

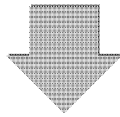
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit of the sensor GND wire
  - Power short circuit of the sensor signal wire
3. Accelerator sensor 3 failure
  - Sensor output failure by power short circuit of accelerator sensor 3 internal wiring
4. E-ECU internal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

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the power switch.</li><li>• 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.</li><li>• Check whether the accelerator sensor 3 wiring is cut or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the accelerator sensor 3 resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the accelerator sensor 3 output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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**P0227: Accelerator sensor 3 (Insufficient sensor output)**

P code	P0227	Name	Accelerator sensor 3 (Insufficient sensor output)
SPN/FMI	29/4		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Voltage of sensor signal is less than the threshold value of 0.2 V.	Connector Wire harness Accelerator sensor 3 E-ECU

**● Actions when a malfunction occurs**

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

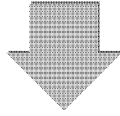
**● Presumed cause of the malfunction or the abnormal condition**

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

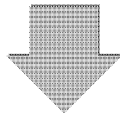


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the power switch.</li><li>• 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.</li><li>• Check whether the accelerator sensor 3 wiring is cut or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the accelerator sensor 3 resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the accelerator sensor 3 output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P297.</p>
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**P1227: Pulse sensor failure (Pulse communication)**

P code	P1227	Name	Pulse sensor failure (Pulse communication)
SPN/FMI	29/8		

● **DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. TBD.	Connector Wire harness E-ECU

● **Actions when a malfunction occurs**

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

● **Presumed cause of the malfunction or the abnormal condition**● **Diagnosis**

**P1126: Accelerator sensor 3 failure (Foot pedal in open position)**

P code	P1126	Name	Accelerator sensor 3 failure (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 E-ECU

**● Actions when a malfunction occurs**

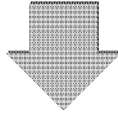
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

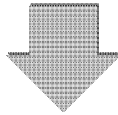
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or GND short circuit of the foot pedal signal wire
  - Open circuit or GND short circuit of sensor 5 V
3. Foot pedal failure
  - Sensor output failure caused by an open circuit or an increase in sliding friction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

### ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the power switch.</li><li>• 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.</li><li>• Check whether the foot pedal wiring is cut or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the foot pedal resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the accelerator sensor output voltage.</li></ul>
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**P1125: Accelerator sensor 3 failure (Foot pedal in closed position)**

P code	P1125	Name	Accelerator sensor 3 failure (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 a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition****● Diagnosis**

## ■ Intake throttle opening sensor

### **P02E9: Intake throttle opening sensor fault (High voltage)**

P code	P02E9	Name	Intake throttle opening sensor fault (High voltage)
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 opening sensor E-ECU

#### ● Actions when a malfunction occurs

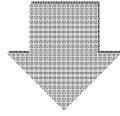
Fault mode	[Limited operation]: The engine operation is limited by setting the intake throttle opening to the default value 100 %.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The air intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

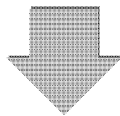
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Intake throttle opening sensor fault
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P301.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the connector pin of the intake throttle opening sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the intake throttle opening sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the intake throttle opening sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the intake throttle opening sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P301.</p>
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**P02E8: Intake throttle opening sensor fault (Low voltage)**

P code	P02E8	Name	Intake throttle opening sensor fault (Low voltage)
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 below 0.2 V.	Connector Wire harness Intake throttle opening sensor E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited by setting the intake throttle opening to the default value 100 %.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The air intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

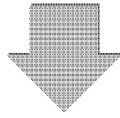
**● Presumed cause of the malfunction or the abnormal condition**

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

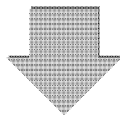


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P301.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the connector pin of the intake throttle opening sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the intake throttle opening sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the intake throttle opening sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the intake throttle opening sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P301.</p>
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## ■ EGR low pressure side sensor

### ***P0238: EGR low pressure side sensor fault (High voltage)***

P code	P0238	Name	EGR low pressure side sensor fault (High voltage)
SPN/FMI	102/3		

#### ● 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 EGR pressure sensor E-ECU

#### ● Actions when a malfunction occurs

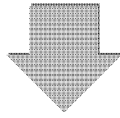
Fault mode	[Limited operation]: The engine operation is limited by setting the EGR low pressure side pressure to the default value 900 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

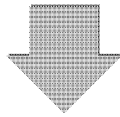
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - GND short circuit of the sensor signal wire
3. EGR pressure sensor failure
  - Sensor output failure caused by a GND short circuit of the EGR pressure sensor internal wiring
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P304.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.</li><li>• Check whether the EGR pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the EGR pressure sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P304.</p>
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**P0237: EGR low pressure side sensor fault (Low voltage)**

P code	P0237	Name	EGR low pressure side sensor fault (Low voltage)
SPN/FMI	102/4		

**● 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 below 0.2 V.	Connector Wire harness EGR pressure sensor E-ECU

**● Actions when a malfunction occurs**

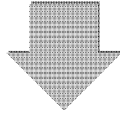
Fault mode	[Limited operation]: The engine operation is limited by setting the EGR low pressure side to the default value 900 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

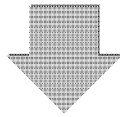
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. EGR pressure sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P304.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.</li><li>• Check whether the EGR pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the EGR pressure sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P304.</p>
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**P0236: EGR low pressure side sensor (Abnormal learning value)**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. • Before engine startup is completed. <ul style="list-style-type: none"> <li>• Atmospheric pressure sensor voltage is normal.</li> <li>• EGR low-pressure side sensor voltage is normal.</li> <li>• Atmospheric pressure characteristics do not fall into problem.</li> </ul> * The above conditions are prerequisites for the calculation of the final offset value of intake manifold pressure. 2. The final offset value of the intake manifold pressure is less than the thresh-old value. Or, the final offset value of the intake manifold pressure is greater than the threshold value.	

**● Actions when a malfunction occurs**

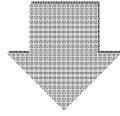
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

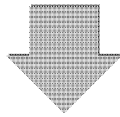
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. EGR pressure sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P304.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.</li><li>• Check whether the EGR pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the EGR pressure sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P304.</p>
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## ■ EGR high pressure side sensor

### ***P0473: EGR high pressure side sensor fault (High voltage)***

P code	P0473	Name	EGR high pressure side sensor fault (High voltage)
SPN/FMI	1209/3		

#### ● 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 EGR pressure sensor E-ECU

#### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited by setting the EGR high pressure side pressure to the default value 900 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

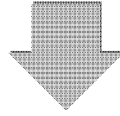
#### ● Presumed cause of the malfunction or the abnormal condition

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

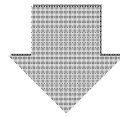


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P307.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.</li><li>• Check whether the EGR pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the EGR pressure sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P307.</p>
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**P0472: EGR high pressure side sensor fault (Low voltage)**

P code	P0472	Name	EGR high pressure side sensor fault (Low voltage)
SPN/FMI	1209/4		

**● 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 below 0.2 V.	Connector Wire harness EGR pressure sensor E-ECU

**● Actions when a malfunction occurs**

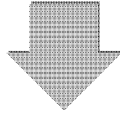
Fault mode	[Limited operation]: The engine operation is limited by setting the EGR high pressure side pressure to the default value 900 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

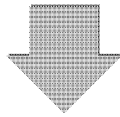
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. EGR pressure sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P307.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.</li><li>• Check whether the EGR pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the EGR pressure sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P307.</p>
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**P0471: EGR high pressure side sensor (Abnormal learning value)**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. • Before engine startup is completed. <ul style="list-style-type: none"> <li>• Atmospheric pressure sensor voltage is normal.</li> <li>• EGR low-pressure side sensor voltage is normal.</li> <li>• Atmospheric pressure characteristics do not fall into problem.</li> </ul> * The above conditions are prerequisites for the calculation of the final offset value of intake manifold pressure. 2. The final offset value of the exhaust manifold pressure is less than the threshold value. Or, the final offset value of the exhaust manifold pressure is greater than the threshold value.	

**● Actions when a malfunction occurs**

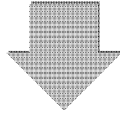
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

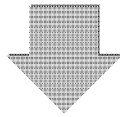
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. EGR pressure sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P307.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the EGR pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.</li><li>• Check whether the EGR pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the EGR pressure sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P307.</p>
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## ■ Cooling water temperature sensor

### *P0118: Cooling water temperature sensor fault (High voltage)*

P code	P0118	Name	Cooling water temperature sensor fault (High voltage)
SPN/FMI	110/3		

#### ● 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 Cooling water temperature sensor E-ECU

#### ● Actions when a malfunction occurs

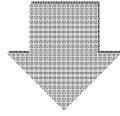
Fault mode	[Limited operation]: The engine operation is limited by setting the cooling water temperature to the default value of 50 °C (-15 °C at engine start).
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

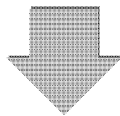
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or power short circuit of the sensor GND wire
  - Open circuit or power short circuit of the sensor signal wire
3. Cooling water temperature sensor fault
  - Sensor output failure caused by an open circuit of the cooling water temperature sensor internal wiring
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 <i>P310</i>.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, turn off the ECU power.</li><li>• Check the pin of the cooling water temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the cooling water temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the cooling water temperature sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the cooling water temperature sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 <i>P310</i>.</p>
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**P0117: Cooling water temperature sensor fault (Low voltage)**

P code	P0117	Name	Cooling water temperature sensor fault (Low voltage)
SPN/FMI	110/4		

**● 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 below 0.2 V.	Connector Wire harness Cooling water temperature sensor E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited by setting the cooling water temperature to the default value of 50 °C (-15 °C at engine start).
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

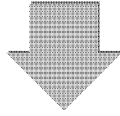
**● Presumed cause of the malfunction or the abnormal condition**

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

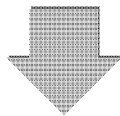


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P310.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the cooling water temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the cooling water temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the cooling water temperature sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the cooling water temperature sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P310.</p>
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**P0217: Cooling water temperature sensor temperature abnormal high (Overheat)**

P code	P0217	Name	Cooling water temperature sensor temperature abnormal high (Overheat)
SPN/FMI	110/0		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. The cooling water 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 Cooling water temperature sensor system

**● Actions when a malfunction occurs**

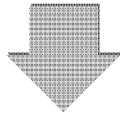
	Settings of the actions during a "cooling water temperature high" alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	Yes: • The high idle speed or the maximum injection quantity is limited. (Actions differ by the customer setting.) • The EGR is fully closed.
Reset criteria	Yes: • The fault mode is released when the ECU power off is detected. • Automatic recovery is made when the cooling water temperature 105 °C or below.	Yes: • The fault mode is released when the ECU power off is detected. • Automatic recovery is made when the cooling water temperature 105 °C or below continues for 60 sec.
Remarks		

**● Presumed cause of the malfunction or the abnormal condition**

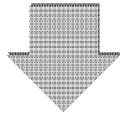
1. Engine overheat
2. Insufficient engine cooling water
3. Engine cooling equipment fault
4. Cooling water temperature sensor system fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P310.</p>
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2. Engine check	<ul style="list-style-type: none"><li>• Turn off the ECU power and stop the engine.</li><li>• Check the engine cooling equipment.</li><li>• After a few moments, turn on the ECU power and check whether DTC is detected.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the cooling water temperature sensor system.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P310.</p>
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## ■ New air temperature sensor

### *P0113: New air temperature sensor fault (High voltage)*

P code	P0113	Name	New air temperature sensor fault (High voltage)
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 New air temperature sensor E-ECU

#### ● Actions when a malfunction occurs

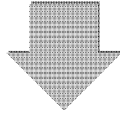
Fault mode	[Limited operation]: The engine operation is limited by setting the new air temperature to the default value 25 °C.
Limited operation	Yes: The reset of ash accumulation value is prohibited.
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

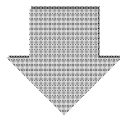
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or power short circuit of the sensor GND wire
  - Open circuit or power short circuit of the sensor signal wire
3. New air temperature sensor fault
  - Sensor output failure caused by an open circuit of the new air temperature sensor internal wiring
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 <i>P314</i>.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the new air temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the new air temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the new air temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the new air temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 page <i>P314</i>.</p>
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**P0112: New air temperature sensor fault (Low voltage)**

P code	P0112	Name	New air temperature sensor fault (Low voltage)
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 below 0.15 V.	Connector Wire harness New air temperature sensor E-ECU

**● Actions when a malfunction occurs**

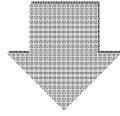
Fault mode	[Limited operation]: The engine operation is limited by setting the new air temperature to the default value 25 °C.
Limited operation	Yes: The reset of ash accumulation value is prohibited.
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

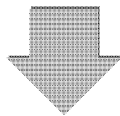
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - GND short circuit of the sensor signal wire
3. New air temperature sensor fault
  - Sensor output failure caused by a GND short circuit of the new air temperature sensor internal wiring
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P314.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the new air temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the new air temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the new air temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the new air temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P314.</p>
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## ■ Fuel temperature sensor

### ***P0183: Fuel temperature sensor fault (High voltage)***

P code	P0183	Name	Fuel temperature sensor fault (High voltage)
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 E-ECU

#### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited by setting the fuel temperature to the default value 40 °C.
Limited operation	Yes: • The reset of ash accumulation value is prohibited. • Engine derates immediately during sensor fails. • The maximum engine torque is limited to 85 %.
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

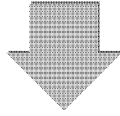
#### ● Presumed cause of the malfunction or the abnormal condition

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

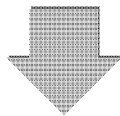


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P318.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the fuel temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the fuel temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the fuel temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P318.</p>
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**P0182: Fuel temperature sensor fault (Low voltage)**

P code	P0182	Name	Fuel temperature sensor fault (Low voltage)
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 below 0.2 V.	Connector Wire harness Fuel temperature sensor E-ECU

**● Actions when a malfunction occurs**

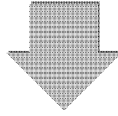
Fault mode	[Limited operation]: The engine operation is limited by setting the fuel temperature to the default value 40 °C.
Limited operation	Yes: • The reset of ash accumulation value is prohibited. • Engine derates immediately during sensor fails. • The maximum engine torque is limited to 85 %.
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

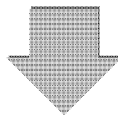
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - GND short circuit of the sensor signal wire
3. Fuel temperature sensor fault
  - Sensor output failure caused by a GND short circuit of the fuel temperature sensor internal wiring
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 <i>P318</i>.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the fuel temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the fuel temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the fuel temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 <i>P318</i>.</p>
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**P0168: Fuel temperature sensor temperature abnormal high**

P code	P0168	Name	Fuel temperature sensor temperature abnormal 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 a malfunction occurs**

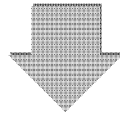
	Settings of the actions during a "fuel temperature high" alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	Yes: The high idle speed or the engine output maximum injection quantity is limited. (Actions differ by the customer setting.)
Reset criteria	Yes: • The fault mode is released when the ECU power off is detected. • Or automatic recovery is made when the fuel temperature alarm temperature 80 °C or below.	Yes: • The fault mode is released when the ECU power off is detected. • 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 malfunction or the abnormal condition**

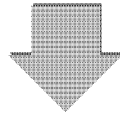
1. Insufficient fuel in the fuel tank
2. Cooling not possible due to a clogged fuel cooler
3. Fuel temperature sensor system fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P318.</p>
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2. Engine check	<ul style="list-style-type: none"><li>• Turn off the ECU power and stop the engine.</li><li>• Check the engine fuel system.</li><li>• After a few moments, turn on the ECU power and check whether DTC is detected.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel temperature sensor system.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P318.</p>
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## ■ Rail pressure sensor

### ***P0193: Rail pressure sensor fault (High voltage)***

P code	P0193	Name	Rail pressure sensor fault (High voltage)
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 E-ECU

#### ● Actions when a malfunction occurs

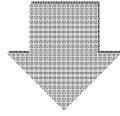
Fault mode	[Limited operation]: The engine operation is limited by setting the rail pressure to the default value of 160 MPa.
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> <li>• The EGR is fully closed.</li> <li>• The rail pressure back-up control functions.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

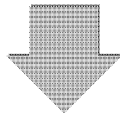
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Rail pressure sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P322.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the key switch.</li><li>• Check the pin of the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.</li><li>• Check whether the rail pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the E-ECU output voltage.</li><li>• Check the rail pressure sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P322.</p>
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**P0192: Rail pressure sensor fault (Low voltage)**

P code	P0192	Name	Rail pressure sensor fault (Low voltage)
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 below 0.24 V.	Connector Wire harness Rail pressure sensor E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited by setting the rail pressure to the default value of 160 MPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> <li>• The EGR is fully closed.</li> <li>• The rail pressure back-up control functions.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

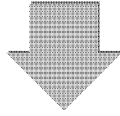
**● Presumed cause of the malfunction or the abnormal condition**

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

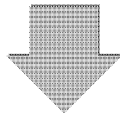


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P322.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is removed.</li><li>• Check whether the rail pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the E-ECU output voltage.</li><li>• Check the rail pressure sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P322.</p>
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## ■ DPF differential pressure sensor

### ***P2455: DPF differential pressure sensor fault (High voltage)***

P code	P2455	Name	DPF differential pressure sensor fault (High voltage)
SPN/FMI	3251/3		

#### ● 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 DPF differential pressure sensor E-ECU

#### ● Actions when a malfunction occurs

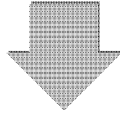
Fault mode	[Limited operation]: The engine operation is limited by setting the DPF differential pressure to the default value 0 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

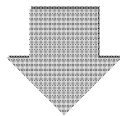
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. DPF differential pressure sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the DPF differential pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the DPF differential pressure sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF differential pressure sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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**P2454: DPF differential pressure sensor fault (Low voltage)**

P code	P2454	Name	DPF differential pressure sensor fault (Low voltage)
SPN/FMI	3251/4		

**● 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 below 0.2 V.	Connector Wire harness DPF differential pressure sensor E-ECU

**● Actions when a malfunction occurs**

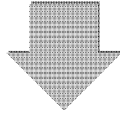
Fault mode	[Limited operation]: The engine operation is limited by setting the DPF differential pressure to the default value 0 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

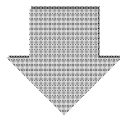
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. DPF differential pressure sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the DPF differential pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the DPF differential pressure sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF differential pressure sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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**P2452: DPF differential pressure sensor differential pressure abnormal high**

P code	P2452	Name	DPF differential pressure sensor differential pressure abnormal high
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 a malfunction occurs**

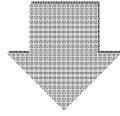
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

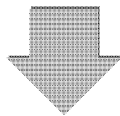
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. DPF differential pressure sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the key switch.</li><li>• 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.</li><li>• Check whether the DPF differential pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF differential pressure sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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**P2453: DPF differential pressure sensor (Abnormal learning value)**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. • Before engine startup is completed. <ul style="list-style-type: none"> <li>• DPF differential pressure sensor voltage is normal.</li> <li>* The above conditions are prerequisites for the calculation of the offset value of DPF differential pressure.</li> </ul> 2. The final DPF differential pressure offset value is less than the threshold value of XX hPa. Or, the final DPF differential pressure offset value is greater than the threshold value of YY hPa.	

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

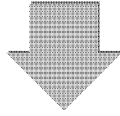
**● Presumed cause of the malfunction or the abnormal condition**

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

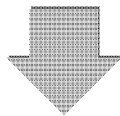


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the DPF differential pressure sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF differential pressure sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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## ■ DPF high pressure side sensor

### ***P1455: DPF high pressure side sensor fault (High voltage)***

P code	P1455	Name	DPF high pressure side sensor fault (High voltage)
SPN/FMI	3609/3		

#### ● 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 DPF high pressure side sensor E-ECU

#### ● Actions when a malfunction occurs

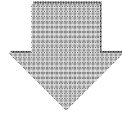
Fault mode	[Limited operation]: The engine operation is limited by setting the DPF high pressure side pressure to the default value 900 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

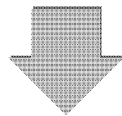
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. DPF high pressure side sensor failure
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the sensor voltage value.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• Check the pin of the DPF high pressure side sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li> <li>• Check whether the DPF high pressure side sensor wiring is disconnected or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the resistance value of the DPF high pressure side sensor.</li> <li>• Check the conduction of the wire harness.</li> <li>• Check the output voltage of the DPF high pressure side sensor.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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**P1454: DPF high pressure side sensor fault (Low voltage)**

P code	P1454	Name	DPF high pressure side sensor fault (Low voltage)
SPN/FMI	3609/4		

**● 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 below 0.2 V.	Connector Wire harness DPF high pressure side sensor E-ECU

**● Actions when a malfunction occurs**

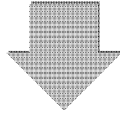
Fault mode	[Limited operation]: The engine operation is limited by setting the DPF high pressure side pressure to the default value 900 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

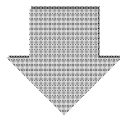
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. DPF high pressure side sensor failure
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the DPF high pressure side sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the DPF high pressure side sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the DPF high pressure side sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF high pressure side sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P325.</p>
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## ■ DPF inlet temperature sensor

### *P1428: DPF inlet temperature sensor fault (High voltage)*

P code	P1428	Name	DPF inlet temperature sensor fault (High voltage)
SPN/FMI	3242/3		

#### ● 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 DPF inlet temperature sensor E-ECU

#### ● Actions when a malfunction occurs

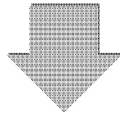
Fault mode	[Limited operation]: The engine operation is limited by setting the DPF inlet temperature to the default value 350 °C.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

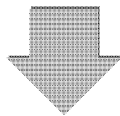
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or power short circuit of the sensor GND wire
  - Open circuit or power short circuit of the sensor signal wire
3. DPF inlet temperature sensor fault
  - Sensor output failure caused by an open circuit of the DPF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

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P329.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the DPF inlet temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the DPF inlet temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF inlet temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P329.</p>
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**P1427: DPF inlet temperature sensor fault (Low voltage)**

P code	P1427	Name	DPF inlet temperature sensor fault (Low voltage)
SPN/FMI	3242/4		

**● 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 below 0.2 V.	Connector Wire harness DPF inlet temperature sensor E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited by setting the DPF inlet temperature to the default value 350 °C.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

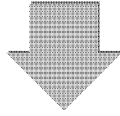
**● Presumed cause of the malfunction or the abnormal condition**

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

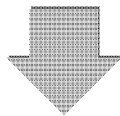


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P329.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, turn off the ECU power.</li><li>• 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.</li><li>• Check whether the DPF inlet temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the DPF inlet temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF inlet temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P329.</p>
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**P1436: DPF inlet temperature sensor temperature abnormal high**

P code	P1436	Name	DPF inlet temperature sensor temperature abnormal 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 E-ECU Injector Exhaust piping

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. • The maximum engine torque is limited to 85 %. • Engine derates further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

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

## ■ DPF intermediate temperature sensor

### ***P1434: DPF intermediate temperature sensor fault (High voltage)***

P code	P1434	Name	DPF intermediate temperature sensor fault (High voltage)
SPN/FMI	3250/3		

#### ● 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 DPF intermediate temperature sensor E-ECU

#### ● Actions when a malfunction occurs

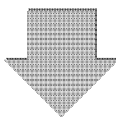
Fault mode	[Limited operation]: The engine operation is limited by setting the DPF intermediate temperature to the default value 350 °C.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

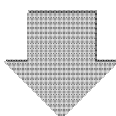
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit or power short circuit of the sensor GND wire
  - Open circuit or power short circuit of the sensor signal wire
3. DPF intermediate temperature sensor fault
  - Sensor output failure caused by an open circuit of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

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P333.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the DPF intermediate temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the DPF intermediate temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF intermediate temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P333.</p>
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**P1435: DPF intermediate temperature sensor fault (Low voltage)**

P code	P1435	Name	DPF intermediate temperature sensor fault (Low voltage)
SPN/FMI	3250/4		

**● 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 below 0.2 V.	Connector Wire harness DPF intermediate temperature sensor E-ECU

**● Actions when a malfunction occurs**

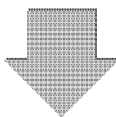
Fault mode	[Limited operation]: The engine operation is limited by setting the DPF intermediate temperature to the default value 350 °C.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

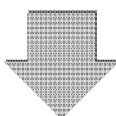
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - GND short circuit of the sensor signal wire
3. DPF intermediate temperature sensor fault
  - Sensor output failure caused by a GND short circuit of the DPF intermediate temperature sensor internal wiring
4. E-ECU internal circuit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

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P333.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the DPF intermediate temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the DPF intermediate temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the DPF intermediate temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P333.</p>
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**P0420: DPF intermediate temperature sensor temperature abnormal low temperature**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. DPF regeneration defect timer is more than the constant value (1200 s).	Connector Wire harness DPF intermediate temperature sensor system E-ECU Injector DOC Piping

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

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

**P1426: DPF intermediate temperature sensor temperature abnormal high (post-injection failure)**

P code	P1426	Name	DPF intermediate temperature sensor temperature abnormal high (post-injection failure)
SPN/FMI	3250/0		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Regeneration is active. 2. The DPF intermediate temperature 700 deg. or more is continued for a given period of time (30 s).	

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Poor connection of the connector
2. Wiring failure of the wire harness
3. DPF intermediate temperature sensor system fault
4. E-ECU internal circuit fault
5. Injector defect
  - Increase in injection quantity
  - Injection timing malfunction



## ■ Atmospheric pressure sensor

### P2229: Atmospheric pressure sensor fault (High voltage)

P code	P2229	Name	Atmospheric pressure sensor fault (High voltage)
SPN/FMI	108/3		

#### ● 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.	Atmospheric pressure sensor E-ECU

#### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited by setting the atmospheric pressure to the default value 900 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> </ul> </li> <li>• Engine derates further after 120 min. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

1. E-ECU internal atmospheric pressure sensor fault
2. E-ECU internal circuit fault

#### ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P390.</p>
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**P2228: Atmospheric pressure sensor fault (Low voltage)**

P code	P2228	Name	Atmospheric pressure sensor fault (Low voltage)
SPN/FMI	108/4		

● **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 below 0.2 V.	Atmospheric pressure sensor E-ECU

● **Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited by setting the atmospheric pressure to the default value 900 hPa.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

● **Presumed cause of the malfunction or the abnormal condition**

1. E-ECU internal atmospheric pressure sensor fault
2. E-ECU internal circuit fault

● **Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P390.</p>
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**P1231: Atmospheric pressure sensor characteristic fault**

P code	P1231	Name	Atmospheric pressure sensor characteristic fault
SPN/FMI	108/10		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. 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.	Atmospheric pressure sensor E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. • The maximum engine torque is limited to 85 %. • The EGR is fully closed. • Engine derates further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

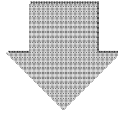
**● Presumed cause of the malfunction or the abnormal condition**

1. E-ECU internal atmospheric pressure sensor fault
2. E-ECU internal circuit fault
3. \* Simultaneous characteristic malfunction of EGR high pressure side 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 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 sensor and EGR low pressure side sensor, respectively.

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the fault indication again by turning the ECU power on and off.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P390.</p>
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2. Diagnosis for EGR high pressure side sensor and low pressure side sensor	<ul style="list-style-type: none"><li>• Check the sensor resistance value.</li><li>• Check the conduction of the wire harness.</li><li>• Check the sensor output voltage.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P390.</p>
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## ■ EGR gas temperature sensor

### P041D: EGR gas temperature sensor fault (High voltage)

P code	P041D	Name	EGR gas temperature sensor fault (High voltage)
SPN/FMI	412/3		

#### ● 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 EGR gas temperature sensor E-ECU

#### ● Actions when a malfunction occurs

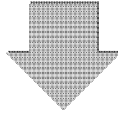
Fault mode	[Limited operation]: The engine operation is limited by setting the EGR gas temperature to the default value 30 °C.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

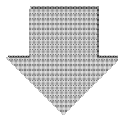
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. EGR gas temperature sensor fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P337.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the EGR gas temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the EGR gas temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the EGR gas temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P337.</p>
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**P041C: EGR gas temperature sensor fault (Low voltage)**

P code	P041C	Name	EGR gas temperature sensor fault (Low voltage)
SPN/FMI	412/4		

**● 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 below 0.2 V.	Connector Wire harness EGR gas temperature sensor E-ECU

**● Actions when a malfunction occurs**

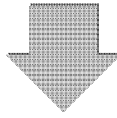
Fault mode	[Limited operation]: The engine operation is limited by setting the EGR gas temperature to the default value 30 °C.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> </ul> </li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

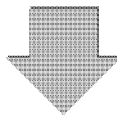
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. EGR gas temperature sensor fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P337.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the EGR gas temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the EGR gas temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the EGR gas temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P337.</p>
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## ■ Intake manifold temperature sensor

### ***P040D: Intake manifold temperature sensor fault (High voltage)***

P code	P040D	Name	Intake manifold temperature sensor fault (High voltage)
SPN/FMI	105/3		

#### ● 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 manifold temperature sensor E-ECU

#### ● Actions when a malfunction occurs

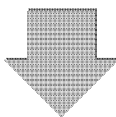
Fault mode	[Limited operation]: The engine operation is limited by setting the intake air temperature to the default value 100 °C (200 °C in the case with turbo).
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The air Intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

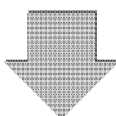
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Intake manifold temperature sensor fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P341.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the intake manifold temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the intake manifold temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the intake manifold temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P341.</p>
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**P040C: Intake manifold temperature sensor fault (Low voltage)**

P code	P040C	Name	Intake manifold temperature sensor fault (Low voltage)
SPN/FMI	105/4		

**● 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 below 0.2 V.	Connector Wire harness Intake manifold temperature sensor E-ECU

**● Actions when a malfunction occurs**

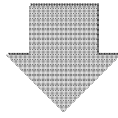
Fault mode	[Limited operation]: The engine operation is limited by setting the intake air temperature to the default value 100 °C (200 °C in the case with turbo).
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The air Intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> <li>• The calculation by DPF differential pressure on PM deposit amount terminates.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

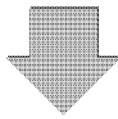
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Intake manifold temperature sensor fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P341.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the intake manifold temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the intake manifold temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the intake manifold temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P341.</p>
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## ■ Exhaust manifold temperature sensor

### **P0546: Exhaust manifold temperature sensor fault (High voltage)**

P code	P0546	Name	Exhaust manifold temperature sensor fault (High voltage)
SPN/FMI	173/3		

#### ● 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 Exhaust manifold temperature sensor E-ECU

#### ● Actions when a malfunction occurs

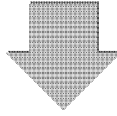
Fault mode	[Limited operation]: The engine operation is limited by setting the exhaust temperature to the default value of 550 °C.
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

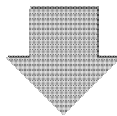
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Exhaust manifold temperature sensor fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P345.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the exhaust manifold temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the exhaust manifold temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the exhaust manifold temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P345.</p>
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**P0545: Exhaust manifold temperature sensor fault (Low voltage)**

P code	P0545	Name	Exhaust manifold temperature sensor fault (Low voltage)
SPN/FMI	173/4		

**● 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 below 0.2 V.	Connector Wire harness Exhaust manifold temperature sensor E-ECU

**● Actions when a malfunction occurs**

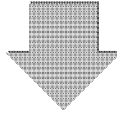
Fault mode	[Limited operation]: The engine operation is limited by setting the exhaust temperature to the default value of 550 °C.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> </ul> </li> <li>• The reset of ash accumulation value is prohibited.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

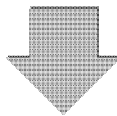
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Exhaust manifold temperature sensor fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check the sensor voltage value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P345.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the exhaust manifold temperature sensor wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the resistance value of the exhaust manifold temperature sensor.</li><li>• Check the conduction of the wire harness.</li><li>• Check the output voltage of the exhaust manifold temperature sensor.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P345.</p>
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## Contact output related

### ■ Main relay

#### ***P068B: Main relay contact stuck***

P code	P068B	Name	Main relay contact stuck
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 E-ECU

#### ● Actions when a malfunction occurs

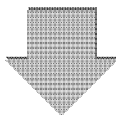
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

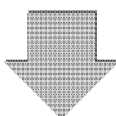
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - GND short circuit of the main relay coil side downstream wire
3. Main relay contact fault
  - Main relay contact stuck
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check whether you can log in to the diagnosis tool after turning off the power switch and the elapse of a given period of time.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P349</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the main relay wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the main relay contact.</li><li>• Check the main relay resistance value.</li><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P349.</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 E-ECU

**● Actions when a malfunction occurs**

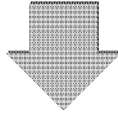
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

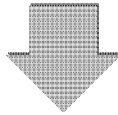
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - GND short circuit of the main relay coil side downstream wire
3. Main relay contact fault
  - Main relay contact stuck
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the main relay wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the main relay contact.</li><li>• Check the main relay resistance value.</li><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P349.</p>
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## ■ Startup assist relay

### ***P0543: Startup assist relay interrupted***

P code	P0543	Name	Startup assist relay interrupted
SPN/FMI	522243/5		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Current is OFF in the startup assist relay. 2. IC open circuit inside the ECU is detected.	Connector Wire harness Startup assist relay E-ECU

#### ● Actions when a malfunction occurs

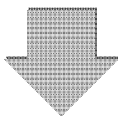
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

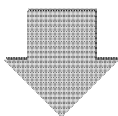
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Open circuit of startup assist relay power
  - Power short circuit of startup assist relay power
3. Startup assist relay fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P353.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the startup assist relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the startup assist relay wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the startup assist relay resistance value.</li><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P353.</p>
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**P0541: Startup assist relay GND interrupted**

P code	P0541	Name	Startup assist relay GND interrupted
SPN/FMI	522243/6		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Current is OFF in the startup assist relay. 2. IC open circuit inside the ECU is detected.	Connector Wire harness Startup assist relay E-ECU

**● Actions when a malfunction occurs**

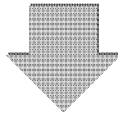
Fault mode	[Continuous operation]. Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

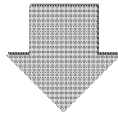
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - GND short circuit of startup assist relay power
3. Startup assist relay fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P353.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the startup assist relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the startup assist relay wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the startup assist relay resistance value.</li><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P353.</p>
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## CRS (common rail system) related

### ■ Injector 1

#### **P0204 (4TNV), P0203 (3TNV): Injector 1 open circuit (Inherent location of the injector)**

<b>P code</b>	P0204 (4TNV) P0203 (3TNV)	<b>Name</b>	Injector 1 open circuit (Inherent location of the injector)
<b>SPN/FMI</b>	651/5 (4TNV) 652/5 (3TNV)		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse 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 E-ECU Injector

#### ● Actions when a malfunction occurs

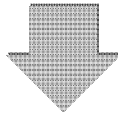
<b>Fault mode</b>	[Limited operation]: The engine operation is limited.
<b>Limited operation</b>	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
<b>Reset criteria</b>	Yes: The fault mode is released when the ECU power is turned off.
<b>Remarks</b>	

#### ● Presumed cause of the malfunction or the abnormal condition

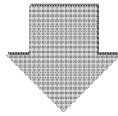
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system open circuit
3. E-ECU internal circuit fault
4. Open circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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**P0271 (4TNV), P0268 (3TNV): Injector 1 coil short circuit**

<b>P code</b>	P0271 (4TNV) P0268 (3TNV)	<b>Name</b>	Injector 1 coil short circuit
<b>SPN/FMI</b>	651/6 (4TNV) 652/6 (3TNV)		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse is detected. 2. In the injector coil, the detection is made as a short circuit of the high side and low side.	Connector Wire harness E-ECU Injector

**● Actions when a malfunction occurs**

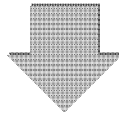
<b>Fault mode</b>	[Limited operation]: The engine operation is limited.
<b>Limited operation</b>	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
<b>Reset criteria</b>	Yes: The fault mode is released when the ECU power is turned off.
<b>Remarks</b>	

**● Presumed cause of the malfunction or the abnormal condition**

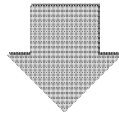
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system short circuit
3. E-ECU internal circuit fault
4. Short circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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**P1271 (4TNV), P1262 (3TNV): Injector 1 short circuit**

P code	P1271 (4TNV)	Name	Injector 1 short circuit
	P1262 (3TNV)		
SPN/FMI	651/3 (4TNV)		
	652/3 (3TNV)		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse is detected. 2. + B short circuit in the low side is detected in the drive circuit.	Connector Wire harness E-ECU Injector

**● Actions when a malfunction occurs**

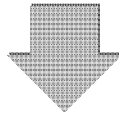
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

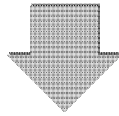
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system short circuit
3. E-ECU internal circuit fault
4. Short circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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## ■ Injector 2

### ***P0202: Injector 2 open circuit (Inherent location of the injector)***

P code	P0202	Name	Injector 2 open circuit (Inherent location of the injector)
SPN/FMI	653/5		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse 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 E-ECU Injector

#### ● Actions when a malfunction occurs

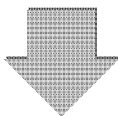
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

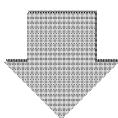
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system open circuit
3. E-ECU internal circuit fault
4. Open circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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**P0265: Injector 2 coil short circuit**

P code	P0265	Name	Injector 2 coil short circuit
SPN/FMI	653/6		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse is detected. 2. In the injector coil, the detection is made as a short circuit of the high side and low side.	Connector Wire harness E-ECU Injector

**● Actions when a malfunction occurs**

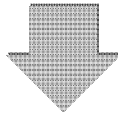
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

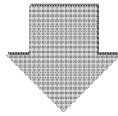
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system short circuit
3. E-ECU internal circuit fault
4. Short circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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**P1265: Injector 2 short circuit**

P code	P1265	Name	Injector 2 short circuit
SPN/FMI	653/3		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse is detected. 2. + B short circuit in the low side is detected in the drive circuit.	Connector Wire harness E-ECU Injector

**● Actions when a malfunction occurs**

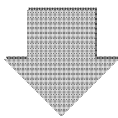
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

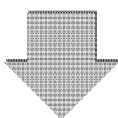
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system short circuit
3. E-ECU internal circuit fault
4. Short circuit of the injector internal circuit

### ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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## ■ Injector 3

### ***P0201: Injector 3 open circuit (Inherent location of the injector)***

P code	P0201	Name	Injector 3 open circuit (Inherent location of the injector)
SPN/FMI	654/5		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse 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 E-ECU Injector

#### ● Actions when a malfunction occurs

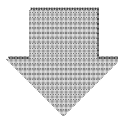
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

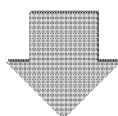
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system open circuit
3. E-ECU internal circuit fault
4. Open circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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**P0262: Injector 3 coil short circuit**

P code	P0262	Name	Injector 3 coil short circuit
SPN/FMI	654/6		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse is detected. 2. In the injector coil, the detection is made as a short circuit of the high side and low side.	Connector Wire harness E-ECU Injector

**● Actions when a malfunction occurs**

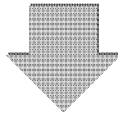
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

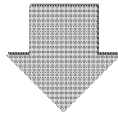
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system short circuit
3. E-ECU internal circuit fault
4. Short circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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**P1262: Injector 3 short circuit**

P code	P1262	Name	Injector 3 short circuit
SPN/FMI	654/3		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse is detected. 2. + B short circuit in the low side is detected in the drive circuit.	Connector Wire harness E-ECU Injector

**● Actions when a malfunction occurs**

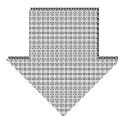
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

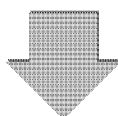
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system short circuit
3. E-ECU internal circuit fault
4. Short circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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## ■ Injector 4

### ***P0203: Injector 4 open circuit (Inherent location of the injector)***

P code	P0203	Name	Injector 4 open circuit (Inherent location of the injector)
SPN/FMI	652/5		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse 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 E-ECU Injector

#### ● Actions when a malfunction occurs

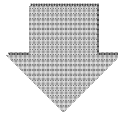
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

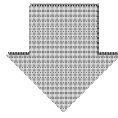
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system open circuit
3. E-ECU internal circuit fault
4. Open circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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**P0268: Injector 4 coil short circuit**

P code	P0268	Name	Injector 4 coil short circuit
SPN/FMI	652/6		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse is detected. 2. In the injector coil, the detection is made as a short circuit of the high side and low side.	Connector Wire harness E-ECU Injector

**● Actions when a malfunction occurs**

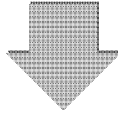
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

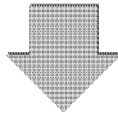
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system short circuit
3. E-ECU internal circuit fault
4. Short circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P364.</p>
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**P1268: Injector 4 short circuit**

P code	P1268	Name	Injector 4 short circuit
SPN/FMI	652/3		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse is detected. 2. + B short circuit in the low side is detected in the drive circuit.	Connector Wire harness E-ECU Injector

**● Actions when a malfunction occurs**

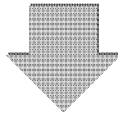
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The fuel injection of failed cylinder terminates.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

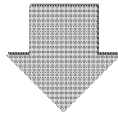
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Injector drive system short circuit
3. E-ECU internal circuit fault
4. Short circuit of the injector internal circuit

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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## ■ Injector (common)

### *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. Cam/crank pulse is detected. 2. ECU detects the drive IC fault.	

#### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The failed bank injection terminates.</li> <li>• Engine derates further after 120 min. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

**P1146: Injector drive circuit (Bank1) short circuit**

P code	P1146	Name	Injector drive circuit (Bank1) short circuit
SPN/FMI	2797/6		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse 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 E-ECU

**● Actions when a malfunction occurs**

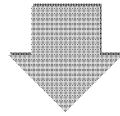
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The failed bank injection terminates.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

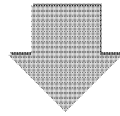
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Power short circuit of the high side of the injector bank1
  - GND short circuit of the high side of the injector bank1
  - Power short circuit of the low side of the injector bank1
  - GND short circuit of the low side of the injector bank1
3. Injector fault by power short circuit
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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**P1149: Injector drive circuit (Bank2) short circuit**

P code	P1149	Name	Injector drive circuit (Bank2) short circuit
SPN/FMI	2798/6		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Cam/crank pulse 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 E-ECU

**● Actions when a malfunction occurs**

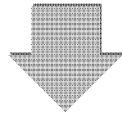
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The failed bank injection terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

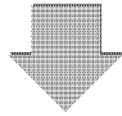
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Power short circuit of the high side of the injector bank2
  - GND short circuit of the high side of the injector bank2
  - Power short circuit of the low side of the injector bank2
  - GND short circuit of the low side of the injector bank2
3. Injector fault by power short circuit
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the injector wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the injector resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P368.</p>
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**P1648: IQA corrected injection amount for injector 1 error**

P code	P1648	Name	IQA corrected injection amount for injector 1 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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

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

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication. Input the injector correction value again.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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**P1649: IQA corrected injection amount for injector 2 error**

P code	P1649	Name	IQA corrected injection amount for injector 2 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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

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

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication. Input the injector correction value again.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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**P1650: IQA corrected injection amount for injector 3 error**

P code	P1650	Name	IQA corrected injection amount for injector 3 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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

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

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication. Input the injector correction value again.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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**P1651: IQA corrected injection amount for injector 4 error**

P code	P1651	Name	IQA corrected injection amount for injector 4 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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

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

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication. Input the injector correction value again.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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## ■ SCV (MPROP)

### *P1641: High-pressure pump drive circuit (Low side VB short-circuit)*

P code	P1641	Name	High-pressure pump drive circuit (Low 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 E-ECU

#### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

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

**P1643: High-pressure pump drive circuit (Low side GND short-circuit)**

P code	P1643	Name	High-pressure pump drive circuit (Low 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) E-ECU

**● Actions when a malfunction occurs**

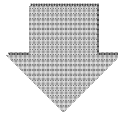
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

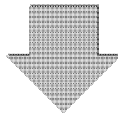
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - GND short circuit of the low side wiring of SCV (MPROP)
3. SCV (MPROP) low side GND short circuit
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P370.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the SCV (MPROP) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the SCV (MPROP) wiring is shorted to the ground line or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the SCV (MPROP) resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P370.</p>
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**P0629: High-pressure pump drive circuit (High side VB short-circuit)**

P code	P0629	Name	High-pressure pump drive circuit (High 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) E-ECU

**● Actions when a malfunction occurs**

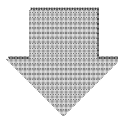
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

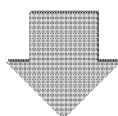
1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Power short circuit of SCV (+) output
  - Power short circuit of SVC (-) output
3. SCV fault caused by a coil short circuit
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P370.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the power switch.</li><li>• Check the pin of the SCV for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the SCV wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the SCV resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P370.</p>
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**P1642: High-pressure pump drive circuit (High side GND short-circuit)**

P code	P1642	Name	High-pressure pump drive circuit (High 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) E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

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

**P0627: High-pressure pump drive circuit (Open circuit)**

P code	P0627	Name	High-pressure pump drive circuit (Open circuit)
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) E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

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



**P062A: High-pressure pump drive circuit (Drive current (high level))**

P code	P062A	Name	High-pressure pump drive circuit (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) E-ECU

**● Actions when a malfunction occurs**

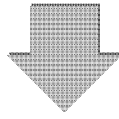
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

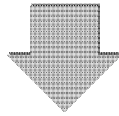
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. SCV (MPROP) fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P370.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the SCV (MPROP) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the SCV (MPROP) wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the SCV (MPROP) resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P370.</p>
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**P1645: High-pressure pump drive circuit (Pump overload error)**

P code	P1645	Name	High-pressure pump drive circuit (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) E-ECU

**● Actions when a malfunction occurs**

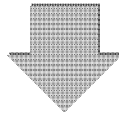
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

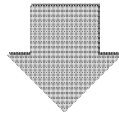
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. SCV (MPROP) fault
4. E-ECU internal circuit fault

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P370.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the SCV (MPROP) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the SCV (MPROP) wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the SCV (MPROP) resistance value.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P370.</p>
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## ■ Abnormal rail pressure

### ***P0088: Actual rail pressure rise error***

P code	P0088	Name	Actual rail pressure rise error
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 a malfunction occurs

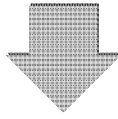
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

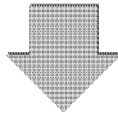
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV stuck open
4. SCV intermittent fault
5. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to Tier4 CR engine service manual.</p>
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**P0094: Rail pressure deviation error during the actual rail pressure drop**

P code	P0094	Name	Rail pressure deviation error during the actual rail pressure drop
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 (3 s).	Fuel system Supply pump Rail pressure sensor

**● Actions when a malfunction occurs**

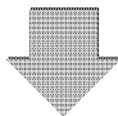
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

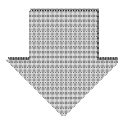
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV closed sticking
5. SCV intermittent fault
6. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to Tier4 CR engine service manual.</p>
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**P0093: Rail pressure deviation error during the actual rail pressure rise**

P code	P0093	Name	Rail pressure deviation error during the actual rail pressure rise
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 a malfunction occurs**

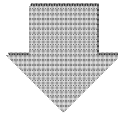
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

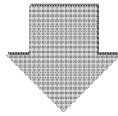
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent fault
5. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to Tier4 CR engine service manual.</p>
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## ■ 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 a malfunction occurs

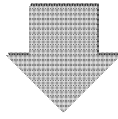
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

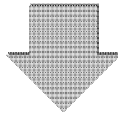
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent fault
5. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to 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 E-ECU

**● Actions when a malfunction occurs**

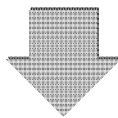
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

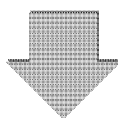
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent fault
5. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump. Exchange the PLV.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to 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 E-ECU

**● Actions when a malfunction occurs**

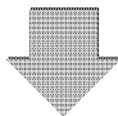
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

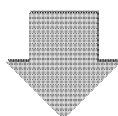
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent fault
5. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump. Exchange the PLV.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to Tier4 CR engine service manual.</p>
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**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 a malfunction occurs**

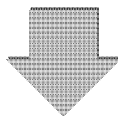
Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Yes: Fuel injection stops.
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

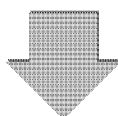
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent fault
5. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to 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 a malfunction occurs**

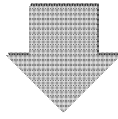
Fault mode	[Engine stop]: The engine operation stops.
Limited operation	Yes: Fuel injection stops.
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

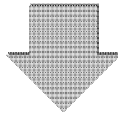
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent fault
5. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to 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 a malfunction occurs

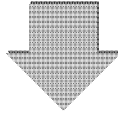
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

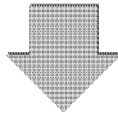
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent fault
5. Fuel system failure
  - Air intrusion
  - Insufficient gas

## ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication by using the Diagnosis tool.</li></ul>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the SCV (MPROP) and the rail pressure sensor wiring is disconnected or shorted to the power/ground line, or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the fuel system, common rail system, and supply pump.</li><li>• If needed, exchange the parts of the fuel system or common rail system, supply pump.</li></ul> <p>* For details on the check method and procedure, refer to 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"> <li>• The rail pressure sensor and the high-pressure pump drive circuit (MPROP) are abnormal.</li> <li>• The rail pressure sensor and the fuel temperature sensor are abnormal.</li> </ul>	Connector Wire harness SCV (MPROP) Fuel temperature sensor E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal 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 fault (high voltage) or (low voltage)”
- Refer to “SCV(MPROP) fault”
- Refer to “Fuel temperature sensor fault (high voltage) or (low voltage)”

## 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 E-ECU

#### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The air Intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

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



**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 E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The air Intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

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

**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 E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The air Intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

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

**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 E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The air Intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal 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 fault due to short circuit
4. E-ECU internal circuit fault

**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 E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• The air Intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

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

**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 E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• The air Intake throttle is fully opened.</li> <li>• The DPF regeneration terminates.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

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

## ■ EGR

### **P0404: EGR over-voltage fault**

P code	P0404	Name	EGR over-voltage fault
SPN/FMI	2791/0		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Supply voltage to EGR is detected for more than 18 V for 5 seconds. 2. Supply voltage to EGR valve is more than 18 V for more than 5 seconds.	Battery EGR valve

#### ● Actions when a malfunction occurs

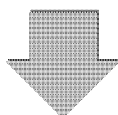
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

1. Overcharge of the battery
2. Internal circuit failure of the EGR valve

#### ● Diagnosis

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the conduction of the wire harness.</li> <li>• Check the battery voltage.</li> </ul>
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**P1404: EGR under-voltage fault**

P code	P1404	Name	EGR under-voltage fault
SPN/FMI	2791/1		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Supply voltage to EGR is detected for less than 8 V for 13 seconds. 2. Supply voltage to EGR valve is less than 8 V for more than 13 seconds.	Wire harness Battery EGR valve

**● Actions when a malfunction occurs**

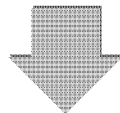
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Deterioration of the battery
2. Power wire short-circuit of the EGR valve
3. Internal circuit failure of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the conduction of the wire harness.</li> <li>• Check the battery voltage.</li> </ul>
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**P1409: EGR feedback malfunction**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Drive duty at 95 % is continued for 3 sec. 2. Motor drive duty at the excessive condition is continued for a give period of time.	EGR valve

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Internal circuit failure of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul> <p>* For details on the exchange method and procedure, refer to Tier4 CR engine service manual.</p>
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**U0401: EGR ECM data fault**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Transmission signal from ECU to ERG is lost for more than 1 second. 2. Instruction packet cut-off from ECU is detected.	EGR valve

**● Actions when a malfunction occurs**

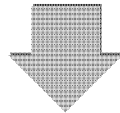
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

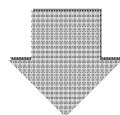
1. Poor connection of the connector
2. Wiring failure of the wire harness
3. Internal circuit failure of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• Check the pin of the EGR valve for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li> <li>• Check whether the EGR valve or EGR valve relay wiring is disconnected or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the fault indication again.</li> <li>• If this DTC is detected again, exchange the harness or EGR valve.</li> </ul>
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**P0403: Open circuit between the EGR motor coils**

P code	P0403	Name	Open circuit between the EGR motor coils
SPN/FMI	2791/12		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Open circuit is detected in one of the phases of UVW. 2. Open circuit condition with the motor is detected.	EGR valve

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. DC motor failure of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul> <p>* For details on the exchange method and procedure, refer to Tier4 CR engine service manual.</p>
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**P1405: Short circuit between the EGR motor coils**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Overcurrent 18 A is detected. The energization is stopped after the detection and the energization starts again after 1 sec. Malfunction is notified after it is detected for 3 times. 2. Overcurrent between the motor coils caused by short circuit is detected.	EGR valve

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. DC motor failure of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul> <p>* For details on the exchange method and procedure, refer to Tier4 CR engine service manual.</p>
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**P0488: EGR position sensor malfunction**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Signal output is excessive or dropped. 2. Excessive or dropped position sensor signal voltage is detected.	EGR valve

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Internal circuit failure of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul> <p>* For details on the exchange method and procedure, refer to Tier4 CR engine service manual.</p>
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**P148A: EGR stuck open valve malfunction**

P code	P148A	Name	EGR stuck open valve malfunction
SPN/FMI	522581/7		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. There are 45 steps or more in the stopper all closed position and the open valve starting point at the time of initialization. 2. The number of steps between front opening and all closed at the time of initialization is fault.	EGR valve

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Sticking of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul> <p>* For details on the exchange method and procedure, refer to Tier4 CR engine service manual.</p>
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**P049D: EGR initialization malfunction**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Output signal of position sensor does not change in 64 ms or 128 ms or continuously changes in 1.6 sec or more. 2. The completion time of initialization exceeds the specified range.	EGR valve

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Internal circuit failure of the EGR valve
2. Malfunction of the EGR valve
3. Sticking of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul> <p>* For details on the exchange method and procedure, refer to 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. The target position information from ECU is out of range for 10 - 40 hours. 2. The direction opening from ECU is out of range for a given period of time.	EGR valve E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> </ul> </li> <li>• Engine derates further after 120 min. <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. E-ECU software fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul>
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**P1410: EGR high temperature thermistor malfunction**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Thermistor output at 0.2 V or below is continued for 3 sec or more. 2. The high temperature side thermistor inside the control unit is below 0.2 V.	EGR valve

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Internal circuit failure of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul> <p>* For details on the exchange method and procedure, refer to Tier4 CR engine service manual.</p>
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**P1411: EGR low temperature thermistor malfunction**

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

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. Thermistor output at 0.2 V or below is continued for 3 sec or more. 2. The low temperature side thermistor inside the control unit is below 0.2 V.	EGR valve

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Internal circuit failure of the EGR valve

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication by using the Diagnosis tool.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the EGR valve.</li> </ul> <p>* For details on the exchange method and procedure, refer to 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 becomes either of the following: <ul style="list-style-type: none"> <li>• The situation that the detected voltage is less than or equal to 6 V continues for 10 seconds.</li> <li>• The situation that the detected voltage is greater than or equal to 16 V continues for 1 second.</li> </ul>	

#### ● Actions when a malfunction occurs

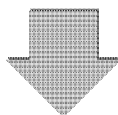
Fault mode	
Limited operation	
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

1. Malfunction of the battery
2. Internal circuit failure of the EGR valve

#### ● Diagnosis

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the conduction of the wire harness.</li> <li>• Check the battery voltage.</li> </ul>
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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
<p>1. No prerequisite.</p> <p>2. When any of the following is true:</p> <ul style="list-style-type: none"> <li>• For every calculation cycle (5 ms) of control, The situation that IPD DIAG output is equal to Low Edge input is detected for more than 4 times or 2 times consecutively.</li> <li>• In a 4 ms cycle, The situation of high-level output of IPD is detected for 10 times consecutively.</li> <li>• Full-close learning voltage is greater than or equal to 0.295, and less than or equal to 0.803.</li> <li>• Full-open learning voltage is greater than or equal to 4.070, and less than or equal to 4.578.</li> <li>• The situation that motor drive duty is greater than <math>\pm 90</math> % continues for 10 seconds.</li> </ul>	

● **Actions when a malfunction occurs**

Fault mode	
Limited operation	
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

● **Presumed cause of the malfunction or the abnormal condition**

● **Diagnosis**

**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: <ul style="list-style-type: none"> <li>• The situation that the TPS supply voltage is less than or equal to 4.496 V continues for 100 ms.</li> <li>• The situation that the TPS supply voltage is greater than or equal to 5.501 V continues for 100 ms.</li> <li>• The situation that TPS is less than or equal to 0.295 V continues for 100 ms.</li> <li>• The situation that TPS is greater than or equal to 4.578 V continues for 100 ms.</li> <li>• The situation that the current position is less than or equal to (target value - 20AD) or the current position is greater than or equal to (target value + 20AD) continues for 10 seconds.</li> </ul>	

● **Actions when a malfunction occurs**

Fault mode	
Limited operation	
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

● **Presumed cause of the malfunction or the abnormal condition**● **Diagnosis**

**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. When any of the following is true: <ul style="list-style-type: none"> <li>• ALU is abnormal.</li> <li>• Mismatch in the checksum value of the ROM area used.</li> <li>• The values written in and read by RAM don't match.</li> <li>• Register is abnormal.</li> <li>• ADC is abnormal.</li> <li>• Status is abnormal.</li> <li>• WDT is abnormal.</li> </ul>	

**● Actions when a malfunction occurs**

Fault mode	
Limited operation	
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition****● Diagnosis**

**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. When any of the following is true: <ul style="list-style-type: none"> <li>• The ambient temperature thermistor is greater than or equal to 160 °C and it continues for 100 ms.</li> <li>• The ambient temperature thermistor is less than or equal to 50 °C and it continues for 100 ms.</li> </ul>	

● **Actions when a malfunction occurs**

Fault mode	
Limited operation	
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

● **Presumed cause of the malfunction or the abnormal condition**● **Diagnosis**

**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"> <li>• An initialization error of A CAN controller is detected.</li> <li>• Any of the following is detected for 125 times.               <ul style="list-style-type: none"> <li>• A CAN BusOff error is detected.</li> <li>• A CAN CheckSum Diag error is detected.</li> <li>• A CAN Reliability error is detected.</li> <li>• A CAN Err Passive error is detected.</li> <li>• A CAN reception time-out is detected.</li> <li>• A CAN ACK error is detected.</li> </ul> </li> </ul>	

**● Actions when a malfunction occurs**

Fault mode	
Limited operation	
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition****● Diagnosis**

## Communication related

### ■ CAN1

#### ***U010B: CAN1 (for EGR): Reception time out***

P code	U010B	Name	CAN1 (for EGR): Reception time out
SPN/FMI	522610/9		

#### ● DTC detection criteria

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

#### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

1. Poor connection of the connector
2. Open-circuit or short-circuit of the wire harness
3. E-ECU internal circuit fault
4. EGR valve internal circuit fault



**U1107: Exhaust throttle (CAN message from the exhaust throttle time out)**

P code	U1107	Name	Exhaust throttle (CAN message from the exhaust throttle time out)
SPN/FMI	522611/9		

**● DTC detection criteria**

1. Prerequisite, 2. Judgment criteria	Check points
1. 2 seconds after the key switch was turned ON. 2. No.	E-ECU Connector Wire harness Exhaust throttle

**● Actions when a malfunction occurs**

Fault mode	
Limited operation	
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Poor connection of the connector
2. Open-circuit or short-circuit of the wire harness
3. E-ECU internal circuit fault
4. Exhaust throttle internal circuit fault

## ■ CAN2

### U0292: TSC1 (CAN message) reception time out (SA1)

P code	U0292	Name	TSC1 (CAN message) reception time out (SA1)
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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. A reception time out is detected at a fixed time.	Connector Wire harness Controller of machine side E-ECU

#### ● Actions when a malfunction occurs

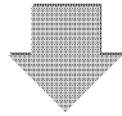
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The following operations are selectable by application settings. <ul style="list-style-type: none"> <li>• ECU power OFF.</li> <li>• TSC1 message reception recoveries.</li> </ul>
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

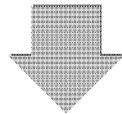
1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1301: TSC1 (CAN message) reception time out (SA2)**

P code	U1301	Name	TSC1 (CAN message) reception time out (SA2)
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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. A reception time out is detected at a fixed time.	Connector Wire harness Controller of machine side E-ECU

**● Actions when a malfunction occurs**

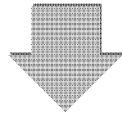
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

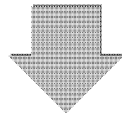
1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1292: Y\_ECR1 (CAN message) reception time out**

P code	U1292	Name	Y_EGR1 (CAN message) reception time out
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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. A reception time out is detected at a fixed time.	Connector Wire harness Controller of machine side E-ECU

**● Actions when a malfunction occurs**

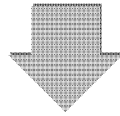
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The following operations are selectable by application settings. <ul style="list-style-type: none"> <li>• ECU power OFF.</li> <li>• Y_ECR1 message reception recovers.</li> </ul>
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

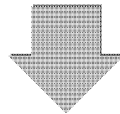
1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1293: Y\_EC (CAN message) reception time out**

P code	U1293	Name	Y_EC (CAN message) reception time out
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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. A reception time out is detected at a fixed time.	Connector Wire harness Controller of machine side E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The following operations are selectable by application settings. <ul style="list-style-type: none"> <li>• ECU power OFF.</li> <li>• Y_EC message reception recovers.</li> </ul>
Remarks	

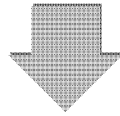
**● Presumed cause of the malfunction or the abnormal condition**

1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

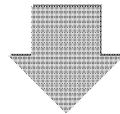


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1294: Y\_RSS (CAN message) reception time out**

P code	U1294	Name	Y_RSS (CAN message) reception time out
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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. A reception time out is detected at a fixed time.	Connector Wire harness Controller of machine side E-ECU

**● Actions when a malfunction occurs**

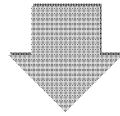
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The following operations are selectable by application settings. <ul style="list-style-type: none"> <li>• ECU power OFF.</li> <li>• Y_RSS message reception recovers.</li> </ul>
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

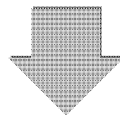
1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1296: VH (CAN message) reception time out**

P code	U1296	Name	VH (CAN message) reception time out
SPN/FMI	522603/9		

**● DTC detection criteria**

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

**● Actions when a malfunction occurs**

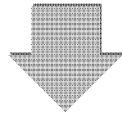
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The following operations are selectable by application settings. <ul style="list-style-type: none"> <li>• ECU power OFF.</li> <li>• VH message reception recovers.</li> </ul>
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

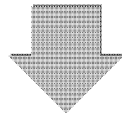
1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1298: Y\_ECM3 (CAN message) reception time out**

P code	U1298	Name	Y_ECM3 (CAN message) reception time out
SPN/FMI	522605/9		

**● DTC detection criteria**

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

**● Actions when a malfunction occurs**

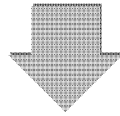
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The following operations are selectable by application settings. <ul style="list-style-type: none"> <li>• ECU power OFF.</li> <li>• Y_ECM3 message reception recovers.</li> </ul>
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

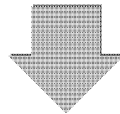
1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U0168: VI (CAN message) reception time out**

P code	U0168	Name	VI (CAN message) reception time out
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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. There is no response to the VIN request for 3 times.	Connector Wire harness Controller of machine side E-ECU

**● Actions when a malfunction occurs**

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

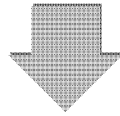
**● Presumed cause of the malfunction or the abnormal condition**

1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

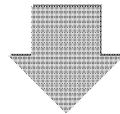


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U3002: VI (CAN message) reception data fault**

P code	U3002	Name	VI (CAN message) reception data fault
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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. The received VI does not match the existed VI in ECU.	Connector Wire harness Controller of machine side E-ECU

**● Actions when a malfunction occurs**

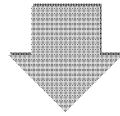
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

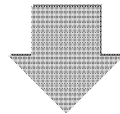
1. CAN communication error of the machine side controller
2. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1300: Y\_ETCP1 (CAN message) reception time out**

P code	U1300	Name	Y_ETCP1 (CAN message) 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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. A reception time out is detected at a fixed time.	Connector Wire harness Controller of machine side E-ECU

**● Actions when a malfunction occurs**

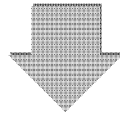
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The following operations are selectable by application settings. <ul style="list-style-type: none"> <li>• ECU power OFF.</li> <li>• Y_ETCP1 message reception recovers.</li> </ul>
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

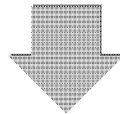
1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1302: EBC1 (CAN message) reception time out**

P code	U1302	Name	EBC1 (CAN message) reception time out
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"> <li>• 2 seconds passes after the key switch was turned ON.</li> <li>• Not in cranking status.</li> <li>• ECU power is not OFF.</li> <li>• Voltage value is 10 V or higher.</li> </ul> 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 E-ECU

**● Actions when a malfunction occurs**

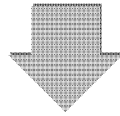
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: • ECU power OFF. • EBC1 message reception recoveries.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

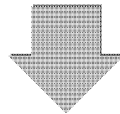
1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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**U1303: Y\_DPFIF (CAN message) reception time out**

P code	U1303	Name	Y_DPFIF (CAN message) reception time out
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"> <li>• Key switch is ON.</li> <li>• Not in cranking status.</li> <li>• Battery voltage is 10 V or higher.</li> </ul> 2. A reception time out is detected at a fixed time.	Connector Wire harness Controller of machine side E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The following operations are selectable by application settings. <ul style="list-style-type: none"> <li>• ECU power OFF.</li> <li>• Y_DPFIF message reception recovers.</li> </ul>
Remarks	

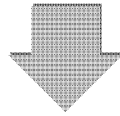
**● Presumed cause of the malfunction or the abnormal condition**

1. CAN communication error of the machine side controller
2. Poor connection of the connector
3. Open-circuit or short-circuit of the wire harness
4. E-ECU internal circuit fault

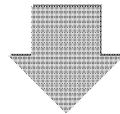


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the wiring of CAN communication connector is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P387.</p>
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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.	E-ECU

#### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

1. Malfunction of the E-ECU internal circuit

#### ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 <i>P390</i>.</p>
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**P160E: EEPROM memory read error**

P code	P160E	Name	EEPROM memory read 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.	E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> </ul> </li> <li>• Engine derates further after 120 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P390.</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.	E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.</li> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 120 min.</li> <li>• The maximum engine torque is limited to 50 %.</li> </ul>
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P390.</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.	E-ECU

#### ● Actions when a malfunction occurs

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

#### ● Presumed cause of the malfunction or the abnormal condition

1. Malfunction of the E-ECU internal circuit

#### ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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 E-ECU

**● Actions when a malfunction occurs**

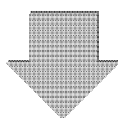
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

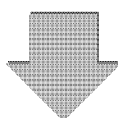
1. Poor connection of the connector of the sensor that uses sensor power supply 1 (K43 or K44 terminal)
2. Wiring failure of the wire harness
3. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• 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.</li> <li>• Check whether the sensor that uses sensor power supply 1 wiring is disconnected or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the fault indication again.</li> <li>• If this DTC is detected again, exchange the harness or E-ECU.</li> </ul>
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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 E-ECU

**● Actions when a malfunction occurs**

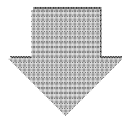
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

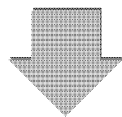
1. Poor connection of the connector of the sensor that uses sensor power supply 2 (K45 or A08 terminal)
2. Wiring failure of the wire harness
3. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• 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.</li> <li>• Check whether the sensor that uses sensor power supply 2 wiring is disconnected or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the fault indication again.</li> <li>• If this DTC is detected again, exchange the harness or E-ECU.</li> </ul>
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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 E-ECU

**● Actions when a malfunction occurs**

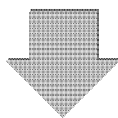
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

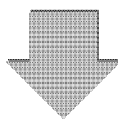
1. Poor connection of the connector of the sensor that uses sensor power supply 3 (A07 terminal)
2. Wiring failure of the wire harness
3. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• 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.</li> <li>• Check whether the sensor that uses sensor power supply 3 wiring is disconnected or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the fault indication again.</li> <li>• If this DTC is detected again, exchange the harness or E-ECU.</li> </ul>
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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 E-ECU

**● Actions when a malfunction occurs**

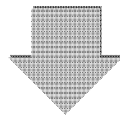
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

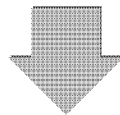
1. Poor connection of the connector of the actuator that uses 12 V power supply 1 (UB2: K68 terminal)
2. Wiring failure of the wire harness
  - GND short circuit of the 12 V power supply 1 (UB2: K68 terminal) wire
3. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• 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.</li> <li>• Check whether the actuator that uses 12 V power supply 1 wiring is disconnected or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the fault indication again.</li> <li>• If this DTC is detected again, exchange the harness or E-ECU.</li> </ul>
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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 E-ECU

**● Actions when a malfunction occurs**

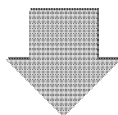
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

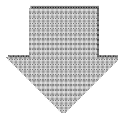
1. Poor connection of the connector of the actuator that uses 12 V power supply 2 (UB3: K90 or A50 terminal)
2. Wiring failure of the wire harness
  - GND short circuit of the 12 V power supply 2 (UB3: K90 or A50 terminal) wire
3. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• 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.</li> <li>• Check whether the actuator that uses 12 V power supply 2 wiring is disconnected or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the fault indication again.</li> <li>• If this DTC is detected again, exchange the harness or E-ECU.</li> </ul>
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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 E-ECU

**● Actions when a malfunction occurs**

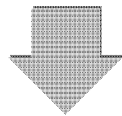
Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

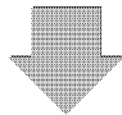
1. Poor connection of the connector of the actuator that uses 12 V power supply 3 (UB5: K73 terminal)
2. Wiring failure of the wire harness
  - GND short circuit of the 12 V power supply 3 (UB5: K73 terminal) wire
3. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	• Check the fault indication by using the Diagnosis tool.
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2. Connector/wiring check	<ul style="list-style-type: none"> <li>• Before beginning your work, be sure to turn off the ECU power.</li> <li>• 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.</li> <li>• Check whether the actuator that uses 12 V power supply 3 wiring is disconnected or the wiring coating is peeled.</li> </ul>
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3. Failure diagnosis	<ul style="list-style-type: none"> <li>• Check the fault indication again.</li> <li>• If this DTC is detected again, exchange the harness or E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

● **Actions when a malfunction occurs**

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

● **Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

● **Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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.	E-ECU

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. Malfunction of the E-ECU internal circuit

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power on and off.</li> <li>• If this DTC is detected again, exchange the E-ECU.</li> </ul>
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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 power switch is turned on and the battery voltage is 9 V or more. 2. The air cleaner switch is turned on continuously for 10 sec.	Air cleaner Wire harness Air cleaner switch E-ECU

#### ● Actions when a malfunction occurs

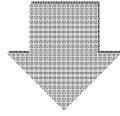
	Settings of the actions during a air cleaner fault	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	Yes: The high idle speed or the engine output maximum injection quantity is limited. (Actions differ by the customer setting.)
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.	Yes: The fault mode is released when the ECU power off is detected.
Remarks		

#### ● Presumed cause of the malfunction or the abnormal condition

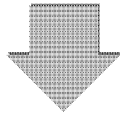
1. Clogged air cleaner
2. Wiring failure of the wire harness
  - Power short circuit of the air cleaner switch wiring
3. Air cleaner switch malfunction
  - Power short circuit of the air cleaner switch internal wiring
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check whether the input signal of the air cleaner switch is correctly recognized.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P361.</p>
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2. Engine check	<ul style="list-style-type: none"><li>• Turn off the ECU power and stop the engine.</li><li>• Check the air cleaner.</li><li>• After a few moments, turn on the power switch and check whether DTC is detected.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the air cleaner switch system.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P361.</p>
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## ■ Oil/water separator switch

### ***P1151: Oil/water separator alarm***

P code	P1151	Name	Oil/water separator alarm
SPN/FMI	522329/0		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The power switch is turned on and the battery voltage is 9 V or more. 2. The oil/water separator switch is turned on continuously for 10 sec.	Oil/water separator Connector Wire harness Oil/water separator switch E-ECU

#### ● Actions when a malfunction occurs

	Settings of the actions during a oil/water separator fault	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	Yes: The high idle speed or the engine output maximum injection quantity is limited. (Actions differ by the customer setting.)
Reset criteria	Yes: The fault mode is released when the ECU power off is detected.	Yes: The fault mode is released when the ECU power off is detected.
Remarks		

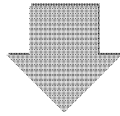
#### ● Presumed cause of the malfunction or the abnormal condition

1. Oil/water separator malfunction
2. Wiring failure of the wire harness
  - Power short circuit of the oil/water separator switch wiring
3. Oil/water separator switch malfunction
  - Power short circuit of the oil/water separator switch internal wiring
4. E-ECU internal circuit fault

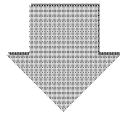


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check whether the input signal of the water separator switch is correctly recognized.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P361.</p>
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2. Engine check	<ul style="list-style-type: none"><li>• Turn off the ECU power and stop the engine.</li><li>• Check the oil/water separator.</li><li>• After a few moments, turn on the power switch and check whether DTC is detected.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the oil/water separator switch system.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P361.</p>
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## ■ Charge switch

### *P1562: Charge switch open circuit*

P code	P1562	Name	Charge switch open circuit
SPN/FMI	167/5		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The power 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 E-ECU

#### ● Actions when a malfunction occurs

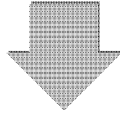
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.
Limited operation	No
Reset criteria	Yes: The fault mode is automatically released when the charge switch is turned on. Or released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

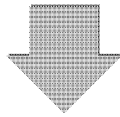
1. Poor connection of connector
2. Wiring failure of the wire harness
  - Open circuit or power short circuit of the charge switch wiring
3. Charge switch malfunction
  - Open circuit or power short circuit of the charge switch internal wiring
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check whether the input signal of the charge switch is correctly recognized.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P357.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• Check the pin of the charge switch for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.</li><li>• Check whether the charge switch wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the wire harness.</li><li>• Check the operation of the charge switch.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P357.</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 <sup>-1</sup> ) 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 <sup>-1</sup> ".	Alternator Connector Wire harness Charge switch E-ECU

● **Actions when a malfunction occurs**

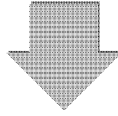
	Setting of the charge alarm operation	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	Yes: The high idle speed or the maximum injection quantity is limited. (Actions differ by the customer setting.)
Reset criteria	Yes: The fault mode is automatically released when the charge switch is turned off. Or released when the ECU power is turned off.	Yes: The fault mode is automatically released when the charge switch is turned off.
Remarks		

● **Presumed cause of the malfunction or the abnormal condition**

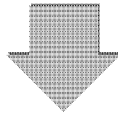
1. Battery charge malfunction
2. Alternator malfunction
3. Wiring failure of the wire harness
  - GND short circuit of the charge switch wiring
4. Charge switch malfunction
  - GND short circuit of the charge switch internal wiring
5. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check whether the input signal of the charge switch is correctly recognized.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P357.</p>
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2. Engine check	<ul style="list-style-type: none"><li>• Turn off the ECU power and stop the engine.</li><li>• Check the engine charging equipment.</li><li>• After checking, turn on the power switch and check for the DTC detection.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the charge switch system.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P357.</p>
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## ■ Oil pressure switch

### *P1192: Oil pressure switch open circuit*

P code	P1192	Name	Oil pressure switch open circuit
SPN/FMI	100/4		

#### ● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The power switch is turned on and the battery voltage $\geq 9$ V and the judgment completion criteria is incomplete. 2. Judged when the oil pressure SW-OFF condition continues for 1 sec.	Connector Wire harness Oil pressure switch E-ECU

#### ● Actions when a malfunction occurs

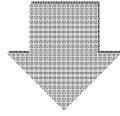
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.
Limited operation	No
Reset criteria	Yes: The fault mode is automatically released when the oil pressure switch is turned on. Or released when the ECU power is turned off.
Remarks	

#### ● Presumed cause of the malfunction or the abnormal condition

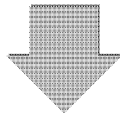
1. Poor connection of connector
2. Wiring failure of the wire harness
  - Open circuit or power short circuit of the oil pressure switch wiring
3. Oil pressure switch fault
  - Open circuit or power short circuit of the oil pressure switch internal wiring
4. E-ECU internal circuit fault

**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check whether the input signal is correctly recognized.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P357.</p>
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2. Connector/wiring check	<ul style="list-style-type: none"><li>• Before beginning your work, be sure to turn off the ECU power.</li><li>• 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.</li><li>• Check whether the oil pressure switch wiring is disconnected or the wiring coating is peeled.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the conduction of the oil pressure switch.</li><li>• Check the conduction of the wire harness.</li><li>• Check the operation of the oil pressure switch.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P357.</p>
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**P1198: Low oil pressure fault alarm**

P code	P1198	Name	Low oil pressure fault 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 <sup>-1</sup> 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 <sup>-1</sup> ".	Oil pressure equipment Wire harness Oil pressure switch E-ECU

● **Actions when a malfunction 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 malfunction is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	Yes: The high idle speed or the maximum injection quantity is limited. (Actions differ by the customer setting.)
Reset criteria	Yes: The fault mode is released when the ECU power is turned off.	Yes: The fault mode is released when the ECU power is turned off.
Remarks		

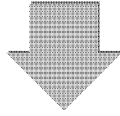
● **Presumed cause of the malfunction or the abnormal condition**

1. Oil pressure low
2. Oil pressure equipment malfunction
3. Wiring failure of the wire harness
  - GND short circuit of the oil pressure switch wiring
4. Oil pressure switch fault
  - GND short circuit of the oil pressure switch internal wiring
5. E-ECU internal circuit fault

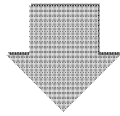


**● Diagnosis**

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"><li>• Check the fault indication.</li><li>• Check whether the input signal is correctly recognized.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P357.</p>
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2. Engine check	<ul style="list-style-type: none"><li>• Turn off the ECU power and stop the engine.</li><li>• Check the lubrication system.</li><li>• After checking, turn on the power switch and check for the DTC detection.</li></ul>
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3. Failure diagnosis	<ul style="list-style-type: none"><li>• Check the oil pressure switch system.</li></ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P357.</p>
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## Post treatment control

### ■ DPF

#### ***P2463: Overaccumulation (Method C)***

P code	P2463	Name	Overaccumulation (Method C)
SPN/FMI	522573/0		

#### ● 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 overaccumulation judgment of PM accumulated quantity (method C).	DPF intermediate temperature sensor system

#### ● Actions when a malfunction occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.
Limited operation	No
Reset criteria	Yes: The fault mode is automatically released when the recovery is made from the condition in which the recovery regeneration is requested.
Remarks	When this error occurred, the "recovery regeneration standby" error is detected at the same time.

#### ● Presumed cause of the malfunction or the abnormal 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 fault

\* There are cases in which this error occurs due to the low estimation of the regeneration quantity due to "DPF intermediate temperature sensor abnormal low temperature". When this occurs at the same time, be sure to perform the failure diagnosis for "DPF intermediate temperature sensor temperature abnormal low temperature" in advance.

**P1463: Overaccumulation (Method P)**

P code	P1463	Name	Overaccumulation (Method P)
SPN/FMI	522574/0		

**● 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 overaccumulation judgment of PM accumulated quantity (method P).	DPF differential pressure sensor system

**● Actions when a malfunction occurs**

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.
Limited operation	No
Reset criteria	Yes: The fault mode is automatically released when the recovery is made from the condition in which the recovery regeneration is requested.
Remarks	When this error occurred, the "recovery regeneration standby" error is detected at the same time.

**● Presumed cause of the malfunction or the abnormal 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 fault

\* There are cases in which this error occurs due to the high estimation of the method P regeneration quantity due to "DPF differential pressure sensor differential pressure abnormal rise". When this occurs at the same time, be sure to perform the failure diagnosis for "DPF differential pressure sensor differential pressure abnormal rise" in advance.

**P2458: Regeneration defect (Stationary regeneration failure)**

P code	P2458	Name	Regeneration defect (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 a malfunction occurs**

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.
Limited operation	No
Reset criteria	Yes: The fault mode is automatically released when the recovery is made from the condition in which the recovery regeneration is requested.
Remarks	When this error occurred, the "recovery regeneration standby" error is detected at the same time.

**● Presumed cause of the malfunction or the abnormal condition**

1. \* DPF intermediate temperature sensor system fault
2. DOC deterioration or DOC breakage due to the external factor such as sulfur poisoning
3. Injector defect
  - Decrease in injection quantity
  - Injection timing malfunction

\* There are cases in which this error occurs due to the regeneration defect judgment caused by "DPF intermediate temperature sensor temperature abnormal low temperature". When this is detected at the same time, be sure to perform the failure diagnosis for "DPF intermediate temperature sensor temperature abnormal low temperature" in advance.

**P2459: Regeneration defect (Stationary regeneration not performed)**

P code	P2459	Name	Regeneration defect (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 backup mode due to the stationary regeneration not performed in the specified time during the stationary regeneration request.	Connector Wire harness Regeneration request lamp Regeneration request switch E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the malfunction is detected.
Limited operation	No
Reset criteria	Yes: The fault mode is automatically released when the recovery is made from the condition in which the recovery regeneration is requested.
Remarks	When this error occurred, the "recovery regeneration standby" error is detected at the same time.

**● Presumed cause of the malfunction or the abnormal condition**

1. Poor connection of the connector
2. Wiring failure of the wire harness
  - Regeneration for the stationary regeneration request is not performed
  - Oversight due to the regeneration request lamp malfunction
  - Regeneration not performed due to the regeneration request switch malfunction
3. When the engine speed is dropped to low idling during regeneration and abandoned
4. E-ECU internal circuit fault

## ■ 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 E-ECU

### ● Actions when a malfunction occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: The maximum engine torque is limited to 85 %.
Reset criteria	Yes: The fault mode is automatically released when the ash cleaning request is not detected.
Remarks	

### ● Presumed cause of the malfunction or the abnormal condition

1. E-ECU internal circuit fault
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 E-ECU

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. • The maximum engine torque is limited to 85 %. • Engine derates further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	Yes: The fault mode is automatically released when the ash cleaning request is not detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. E-ECU internal circuit fault
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 E-ECU DOC Piping

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: • Engine derates immediately during sensor fails. • The maximum engine torque is limited to 85 %. • Engine derates further after 120 min. • The maximum engine torque is limited to 50 %.
Reset criteria	Yes: The fault mode is automatically released when the stationary regeneration standby is not detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal 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. E-ECU internal circuit fault
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 defect
  - Decrease in injection quantity
  - Injection timing malfunction



**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 E-ECU DOC Piping

**● Actions when a malfunction occurs**

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Yes: <ul style="list-style-type: none"> <li>• Engine derates immediately during sensor fails.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 85 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> <li>• The EGR is fully closed.</li> <li>• Engine derates further after 15 min.               <ul style="list-style-type: none"> <li>• The maximum engine torque is limited to 50 %.</li> <li>• The engine speed is limited to the [maximum torque speed +200 min<sup>-1</sup>].</li> </ul> </li> </ul>
Reset criteria	Yes: The fault mode is automatically released when the recovery regeneration standby is not detected.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

1. It is abandoned for a given period of time in the stationary regeneration standby emergency mode
2. E-ECU internal circuit fault
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 defect
  - Decrease in injection quantity
  - Injection timing malfunction

*Note: When this error is detected, the “overaccumulation (method C)”, “overaccumulation (method P)”, “regeneration defect (stationary regeneration failure)”, “regeneration defect (stationary regeneration not performed)” are detected at the same time. Be sure to perform the failure diagnosis for the respective part.*

**P1425: Reset regeneration prohibition**

P code	P1425	Name	Reset regeneration prohibition
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 prohibition switch (including CAN control)

**● Actions when a malfunction occurs**

Fault mode	[Continuous operation]: Engine control is not obstructed.
Limited operation	No
Reset criteria	Yes: Error determination conditions are not met.
Remarks	

**● Presumed cause of the malfunction or the abnormal condition**

The mode is reset regeneration, but the regeneration is prohibited by the regeneration prohibition switch (including CAN control) and the regeneration cannot be performed.

**P1445: Recovery regeneration failure**

P code	P1445	Name	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 a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal condition**

1. \* DPF intermediate temperature sensor system fault
2. DOC deterioration or DOC breakage due to the external factor such as sulfur poisoning
3. Injector defect
  - Decrease in injection quantity
  - Injection timing malfunction

\* There are cases in which this error occurs due to the regeneration defect judgment caused by “DPF intermediate temperature sensor temperature abnormal low temperature”. When this is detected at the same time, be sure to perform the failure diagnosis for “DPF intermediate temperature sensor temperature abnormal low temperature” in advance.

**P1446: Recovery regeneration prohibition**

P code	P1446	Name	Recovery regeneration prohibition
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"> <li>• “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)”.</li> <li>• “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)”.</li> </ul>	SF

**● Actions when a malfunction occurs**

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

**● Presumed cause of the malfunction or the abnormal 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: <ul style="list-style-type: none"> <li>• Maximum idling speed + 600 min<sup>-1</sup>.</li> </ul> JD exclusive: <ul style="list-style-type: none"> <li>• NV2 engine: 3,800 min<sup>-1</sup>.</li> <li>• NV3 engine: 3,300 min<sup>-1</sup>.</li> </ul>	Crank speed sensor Cam speed sensor Injector E-ECU

#### ● Actions when a malfunction occurs

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

#### ● Presumed cause of the malfunction or the abnormal condition

1. Crank speed sensor fault
  - Temporary failure caused by external factors such as radio waves
2. Cam speed sensor fault
  - Temporary failure caused by external factors such as radio waves
3. E-ECU internal circuit fault
4. Injector failure

#### ● Diagnosis

1. Initial diagnosis with the diagnosis tool	<ul style="list-style-type: none"> <li>• Check the fault indication.</li> <li>• Check the fault indication again by turning the ECU power ON and OFF.</li> </ul> <p>* For details on the diagnosis method and procedure, see Chapter 2 P393.</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.

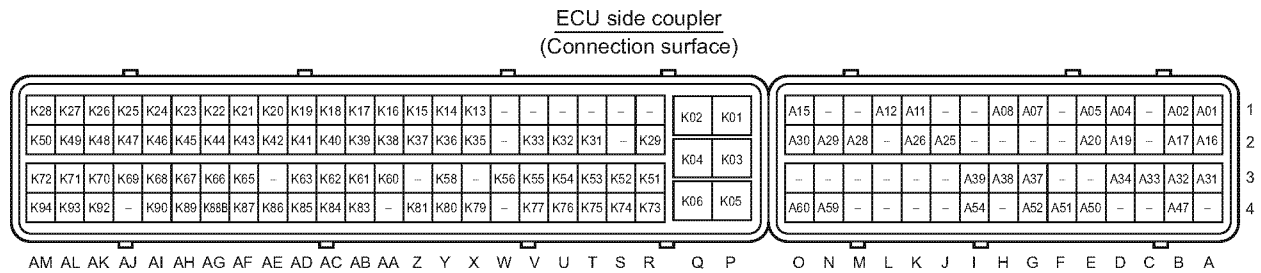
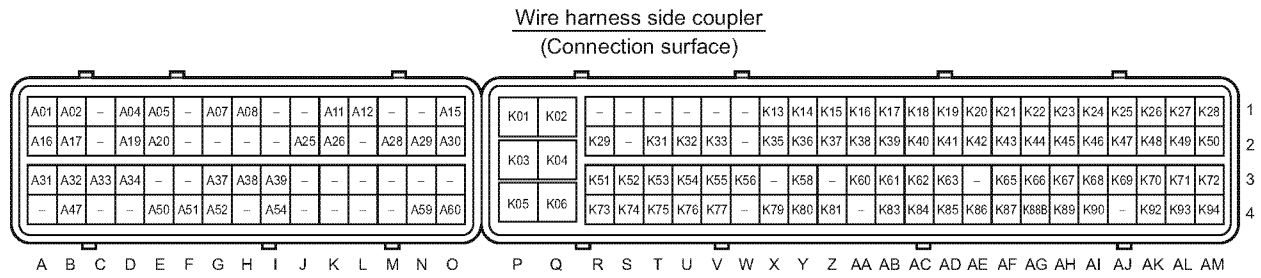
### ● Wire diagram

The wire diagram for the parts related to faults is listed.

### ● Work description

The corrective action and procedure for failure diagnosis is listed.

■ E-ECU pin layout diagram



044375-00EN00

No.	Terminal function name	Code	No.	Terminal function name	Code
A01	1-A Injector L	INJL1 - 4	A54	4-I Crank speed	CKSPD
A02	1-B Injector L	INJL1 - 4	A59	4-N intake manifold temperature sensor	TIAIR
A04	1-D SCV H	MPROP-H	A60	4-O External 12 V	UB2
A05	1-E SCV L	HPPSOL	K01	1-P VB	VB
A07	1-G Sensor 5 V	5VS	K02	1-Q ECU GND	GND
A08	1-H Sensor 5 V	5VS	K03	2-P VB	VB
A11	1-K FO temperature sensor	TFO	K04	2-Q ECU GND	GND
A12	1-L DPF hi-side pressure sensor	PDPFH	K05	3-P VB	VB
A15	1-O FO temperature sensor	REOP2	K06	3-Q ECU GND	GND
A16	2-A Injector L	INJL1 - 4	K13	1-X Speed selection enable	APP-IP6
A17	2-B Injector L	INJL1 - 4	K14	1-Y Starter permission 1	APP-IP9
A19	2-D Intake valve motor	IVDCM-H, L	K15	1-Z LO pressure switch	LOPSW
A20	2-E Intake valve motor	IVDCM-H, L	K16	1-AA Speed 2	APP-IP4
A25	2-J Analog GND	A-GND	K17	1-AB Hi-idle speed select	APP-IP8
A26	2-K Rail pressure	PRAIL	K18	1-AC DPF regeneration request	REGSW
A28	2-M CW temperature sensor	TW	K19	1-AD Speed 1	APP-IP3
A29	2-N Analog GND	A-GND	K20	1-AE Intake valve sensor	IVPS
A30	2-O External 12 V	UB5	K21	1-AF Analog GND	A-GND
A31	3-A Injector H	INJH1 - 4	K22	1-AG Accelerator pedal	PDLSW
A32	3-B Injector H	INJH1 - 4	K23	1-AH Sensor 5 V	5VS
A33	3-C Injector H	INJH1 - 4	K24	1-AI Sensor 5 V	5VS
A34	3-D Reserve	REOP1	K25	1-AJ DPF regeneration request	DPF-M1
A37	3-G Cam speed	CMSPD	K26	1-AK Iso-chronous lamp	APP-OP2
A38	3-H Analog GND	A-GND	K27	1-AL DPF regeneration inhibit lamp	DPF-M2

## TROUBLESHOOTING

No.	Terminal function name	Code
A39	3-I Crank speed	CKSPD
A47	4-B Injector H	INJH1 - 4
A50	4-E External 12 V	UB3
A51	4-F Analog GND	A-GND
A52	4-G Analog GND	A-GND
K35	2-X Key switch start	STARTSW
K36	2-Y Reserve analog	REAN
K37	2-Z Droop	APP-IP1
K38	2-AA Starter permission 2	APP-IP2
K39	2-AB EGR low-side pressure sensor	PEGRL
K40	2-AC Water separator sensor	WSSW
K41	2-AD Air cleaner sensor	ACLSW
K42	2-AE Hi-idle limit enable	APP-IP5
K43	2-AF Sensor 5 V	5VS
K44	2-AG Sensor 5 V	5VS
K45	2-AH Sensor 5 V	5VS
K46	2-AI Sensor 5 V	5VS
K47	2-AJ Load ratio monitor	LOAD-M
K48	2-AK Red engine stop lamp	REOP4
K49	2-AL CWT warning lamp	OVHT-LMP
K50	2-AM Pre-heat lamp	PREHT-LMP
K51	3-R External 12 V	UB3
K52	3-S Analog GND	A-GND
K53	3-T CAN-L2	CAN2L
K54	3-U CAN-H1	CAN1H
K55	3-V Analog GND	A-GND
K56	3-W Exhaust gas temperature sensor	TEXMN
K58	3-Y Accelerator sensor 3	APS3
K60	3-AA Analog GND	A-GND
K61	3-AB Accelerator sensor 1	APS1
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

No.	Terminal function name	Code
K28	1-AM Starter relay	STR-RLY
K29	2-R External 12 V	UB2
K31	2-T DPF regeneration inhibit	REGMSW
K32	2-U Engine stop 1	SHUDNSW
K33	2-V EGR gas temperature sensor	TEGR
K67	3-AH Engine stop 2	APP-IP7
K68	3-AI External 12 V	UB2
K69	3-AJ EGT lamp	DPF-M3
K70	3-AK Starting aid relay	SAID-RLY
K71	3-AL DPF regeneration acknowledge lamp	DPF-M4
K72	3-AM Amber warning lamp	REOP3
K73	4-R External 12 V	UB5
K74	4-S Analog GND	A-GND
K75	4-T CAN-H2	CAN2H
K76	4-U CAN-L1	CAN1L
K77	4-V Analog GND	A-GND
K79	4-X Fresh air temperature sensor	TFAIR
K80	4-Y DPF inside temperature sensor	TDPFM
K81	4-Z DPF inlet temperature sensor	TDPFI
K83	4-AB Accelerator sensor 2	APS2
K84	4-AC Analog GND	A-GND
K85	4-AD EGR hi-side pressure sensor	PEGR
K86	4-AE Regeneration interlock	WDSBSW
K87	4-AF Analog GND	D-GND
K88B	4-AG Key switch on	IGNSW
K89	4-AH External 12 V	UB3
K90	4-AI External 12 V	UB3
K92	4-AK Failure lamp	FAIL-LMP
K93	4-AL Speed selection lamp	APP-OP1
K94	4-AM Speed monitor	NRPM-M

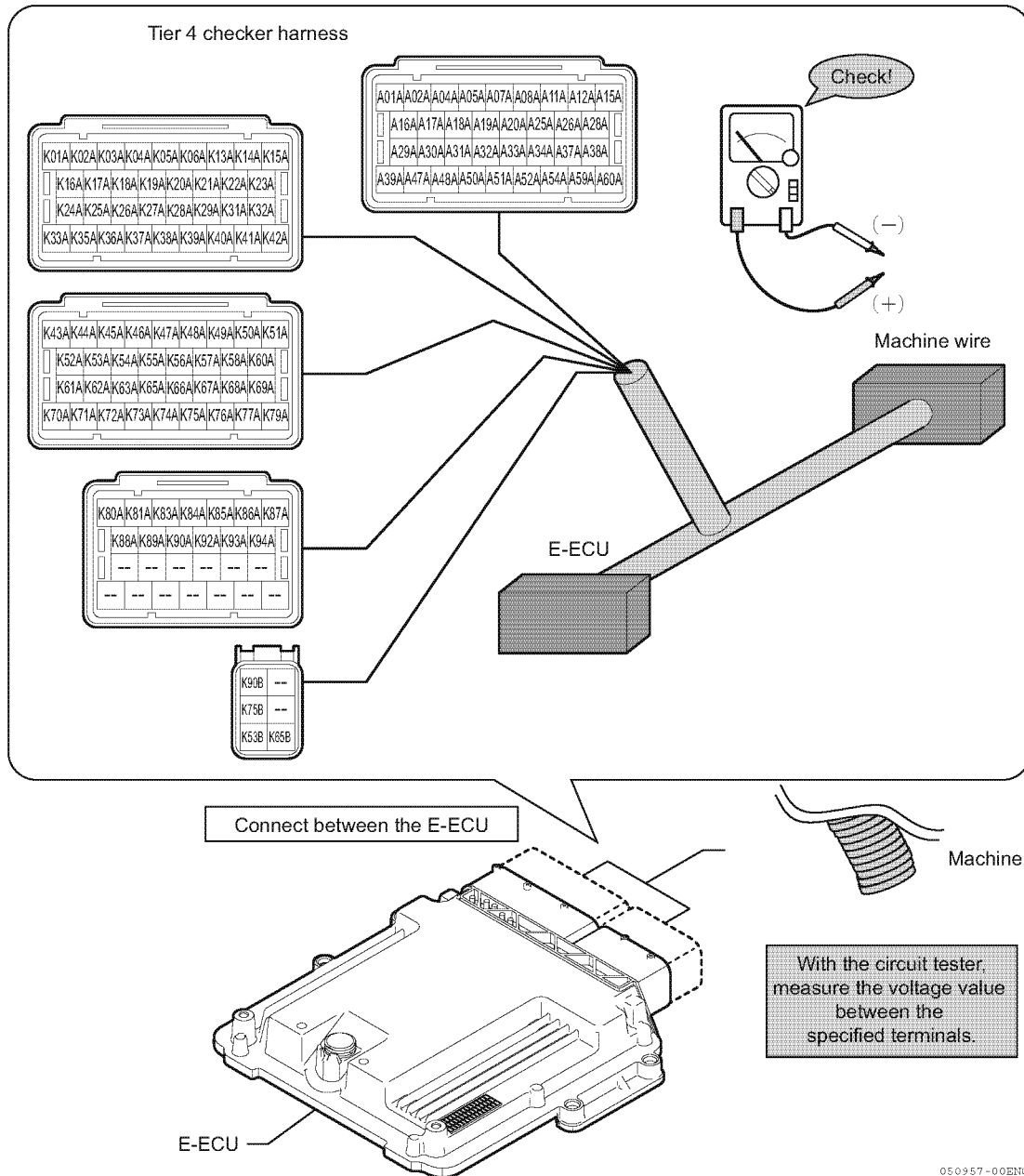


■ How to use the Tier 4 checker harness

When you perform the E-ECU related failure diagnosis, use the Tier 4 checker harness to measure the voltage value. Therefore, remove the E-ECU and the machine wire harness and connect the Tier 4 checker harness between the E-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.



050957-00EN00

## Sensor related

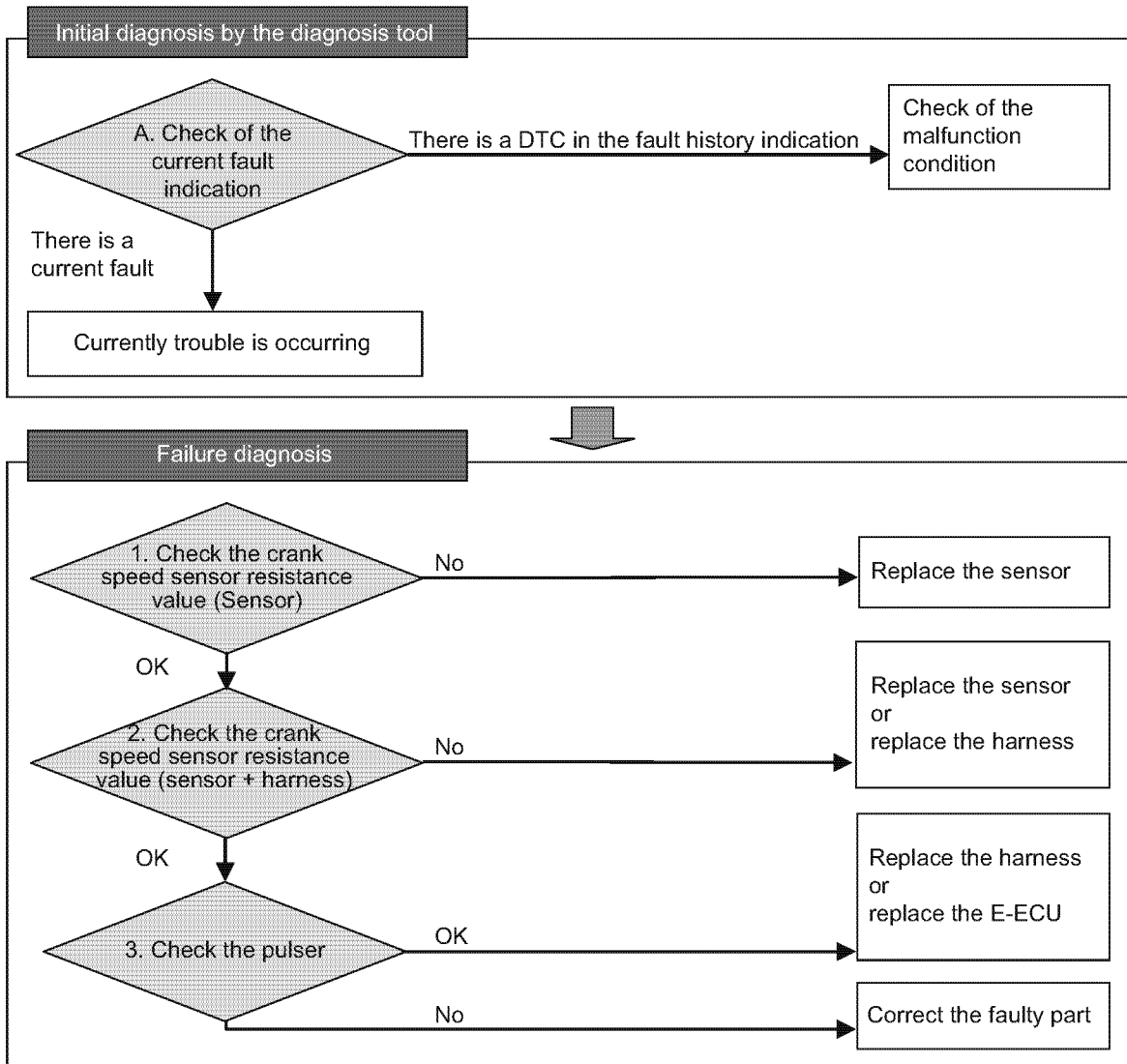
### ■ Crank speed sensor

#### ● Related DTC

P code	P0336	Name	Crank signal malfunction
SPN/FMI	522400/2		
P code	P0337	Name	No crank signal
SPN/FMI	522400/5		
P code	P0008	Name	No signal on both crank and cam speed sensor
SPN/FMI	523249/5		

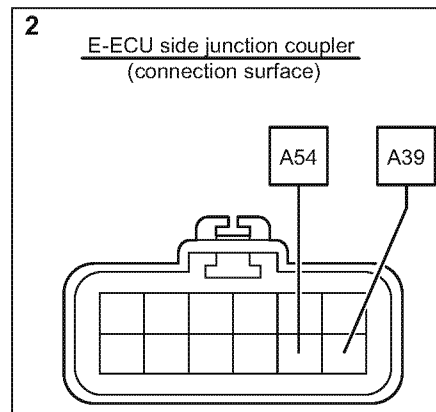
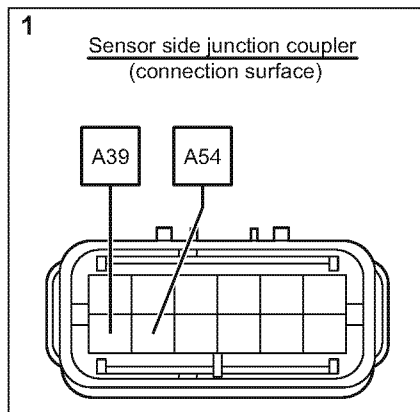
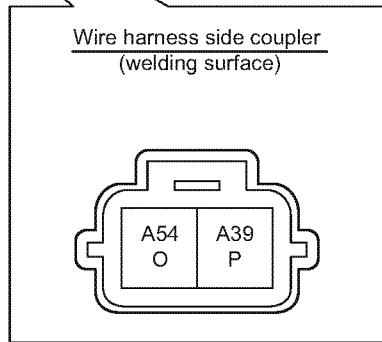
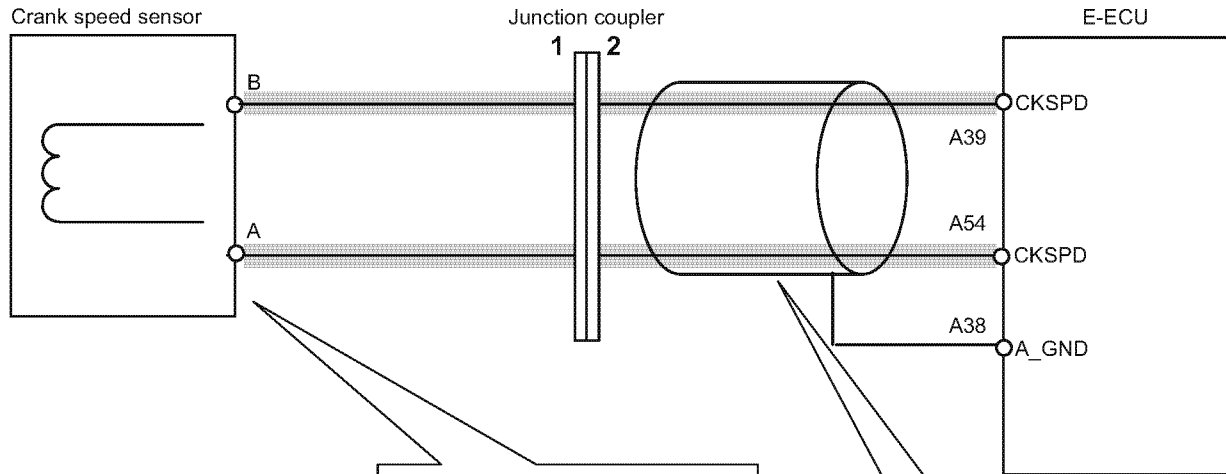
#### ● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



045705-00EN00

● Wire diagram



: Check points

045706-00EN00

Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Checking the crank speed sensor resistance value (sensor):

- 1- Remove the wire harness from the accelerator speed sensor.
- 2- Use the circuit tester to measure the resistance value between the crank speed sensors A and B.

**Reference: The resistance value between the crank speed sensor terminals**

Terminal	Specification
Sensor A - B	1050 Ω (Error 10 %)

<b>Not OK</b>	Replace the crank speed sensor.
<b>OK</b>	Refer to "Checking the crank speed sensor resistance value (sensor + harness):"

### 2. Checking the crank speed sensor resistance value (sensor + harness):

- 1- Remove the E-ECU from the harness while the crank speed sensor and the harness are connected.
- 2- Use the circuit tester to measure the resistance value between the harness side E-ECU connector terminals A39 - A54.

*Note: Refer to the above-mentioned reference "The resistance value between the crank speed sensor terminals".*

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Checking the pulser:"

### 3. Checking the pulser:

- 1- Check the pulser condition (cracks, metallic sticking, and distortion).

<b>Not OK</b>	Correct the faulty parts.
<b>OK</b>	<ul style="list-style-type: none"> <li>• A coupler failure between the E-ECU and the harness may be caused. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

**■ Cam speed sensor****● Related DTC**

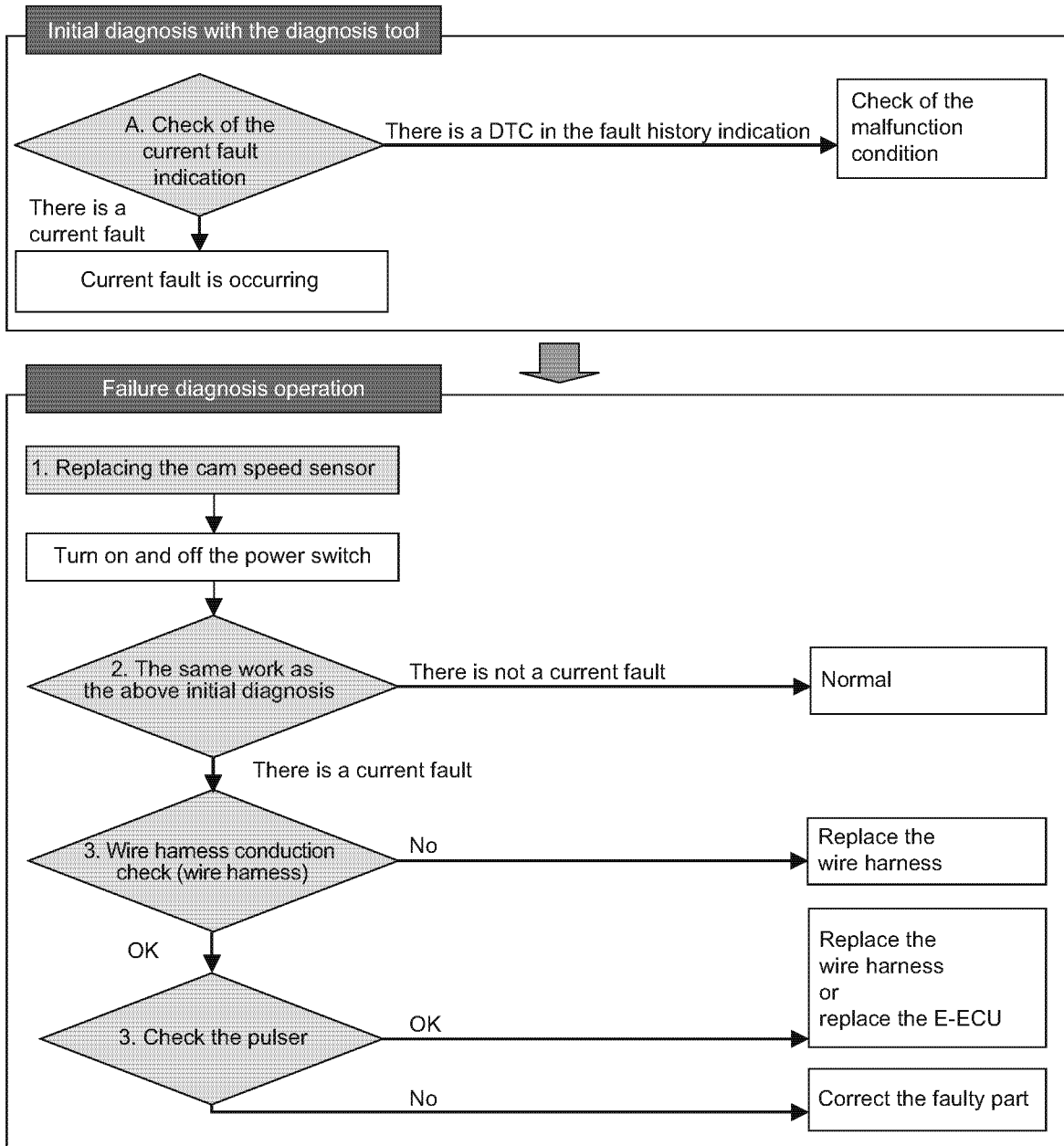
P code	P0341	Name	Cam signal malfunction
SPN/FMI	522401/2		

P code	P0342	Name	No cam signal
SPN/FMI	522401/5		

P code	P0008	Name	No signal on both crank and cam speed sensor
SPN/FMI	523249/5		

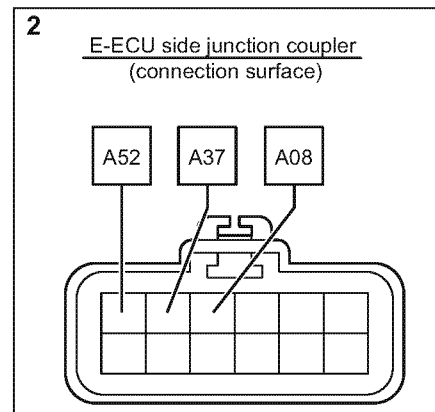
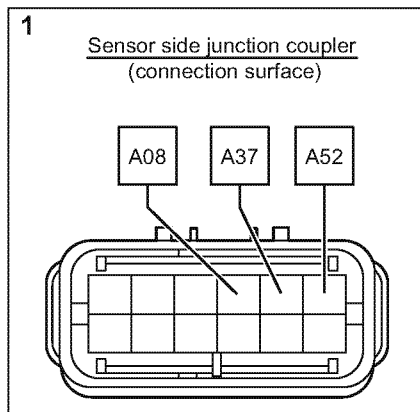
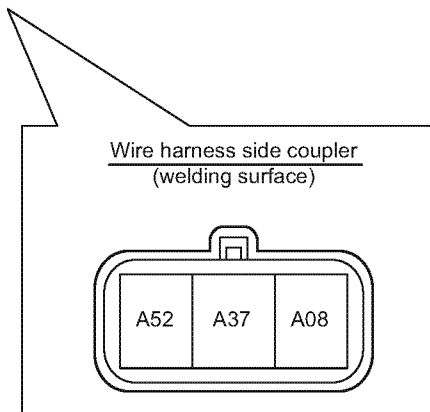
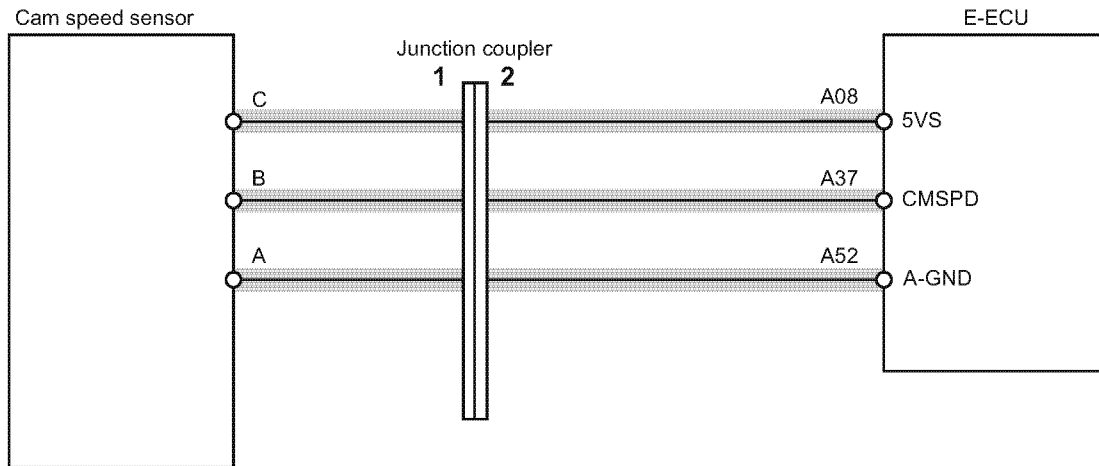
● Workflow


Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



045707-00EN00

● Wire diagram



 : Check points

Note: For the E-ECU pin layout, refer to P287.

045708-00EN00

## ● Work description

### 1. Replacing the cam speed sensor:

- 1- Remove and replace the cam speed sensor from the wire harness.

### 2. Using the diagnosis tool:

- 1- Turn off the power switch. Turn on the power switch and start the engine.
- 2- Connect the diagnosis tool and check the Active Diagnostic Trouble Code for the error detection.

<b>No</b>	Normal
<b>Applied</b>	Refer to "Check the wire harness conduction."

### 3. Check the wire harness conduction:

- 1- Remove the wire harness from the cam speed sensor and the E-ECU. Here, keep the junction coupler connected.
- 2- Perform the wire harness conduction check between the terminal 1 and the terminal 2 in the below table while referring to P287 "E-ECU pin layout diagram".

#### Reference: Cam speed sensor conduction check pattern 1

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (cam speed sensor side wire harness connector)	Conduction	Condition
A08	Cam speed sensor terminal C	No	Not OK: Abnormal
		Yes	OK: Normal
A37	Cam speed sensor terminal B	No	No
		Yes	Yes
A52	Cam speed sensor terminal A	No	No
		Yes	Yes

#### Reference: Cam speed sensor conduction check pattern 2

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (E-ECU side wire harness connector)	Conduction	Condition	
A08	All other terminals	Yes	Not OK: Abnormal	
		No	OK: Normal	
Yes		Not OK: Abnormal		
No		OK: Normal		
A37		Yes	Yes	Not OK: Abnormal
			No	OK: Normal
A52	No	Yes	Not OK: Abnormal	
		No	OK: Normal	

<b>Not OK</b>	Interrupted or short circuited between the wire harnesses. Replace the wire harness.
<b>OK</b>	Refer to "Checking the pulser."

### 4. Checking the pulser:

- 1- Check the pulser condition (cracks, metallic sticking, and distortion).

<b>Not OK</b>	Correct the faulty parts.
<b>OK</b>	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>



## ■ Accelerator sensor

### ● Related DTC

P code	P0123	Name	Accelerator sensor 1 (Excessive sensor output)
SPN/FMI	91/3		

P code	P0122	Name	Accelerator sensor 1 (Insufficient sensor output)
SPN/FMI	91/4		

P code	P0223	Name	Accelerator sensor 2 (Excessive sensor output)
SPN/FMI	28/3		

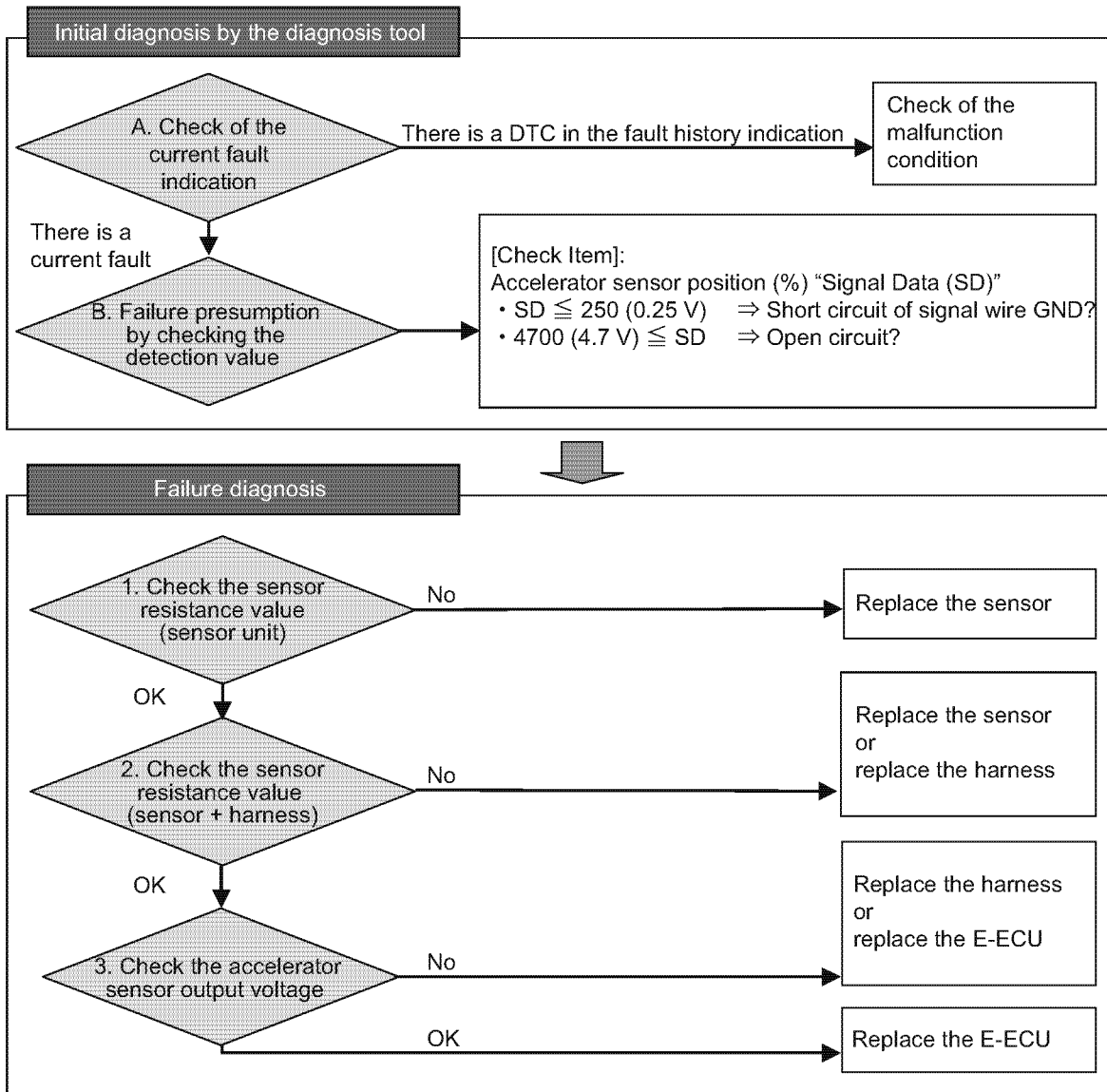
P code	P0222	Name	Accelerator sensor 2 (Insufficient sensor output)
SPN/FMI	28/4		

P code	P0228	Name	Accelerator sensor 3 (Excessive sensor output)
SPN/FMI	29/3		

P code	P0227	Name	Accelerator sensor 3 (Insufficient sensor output)
SPN/FMI	29/4		

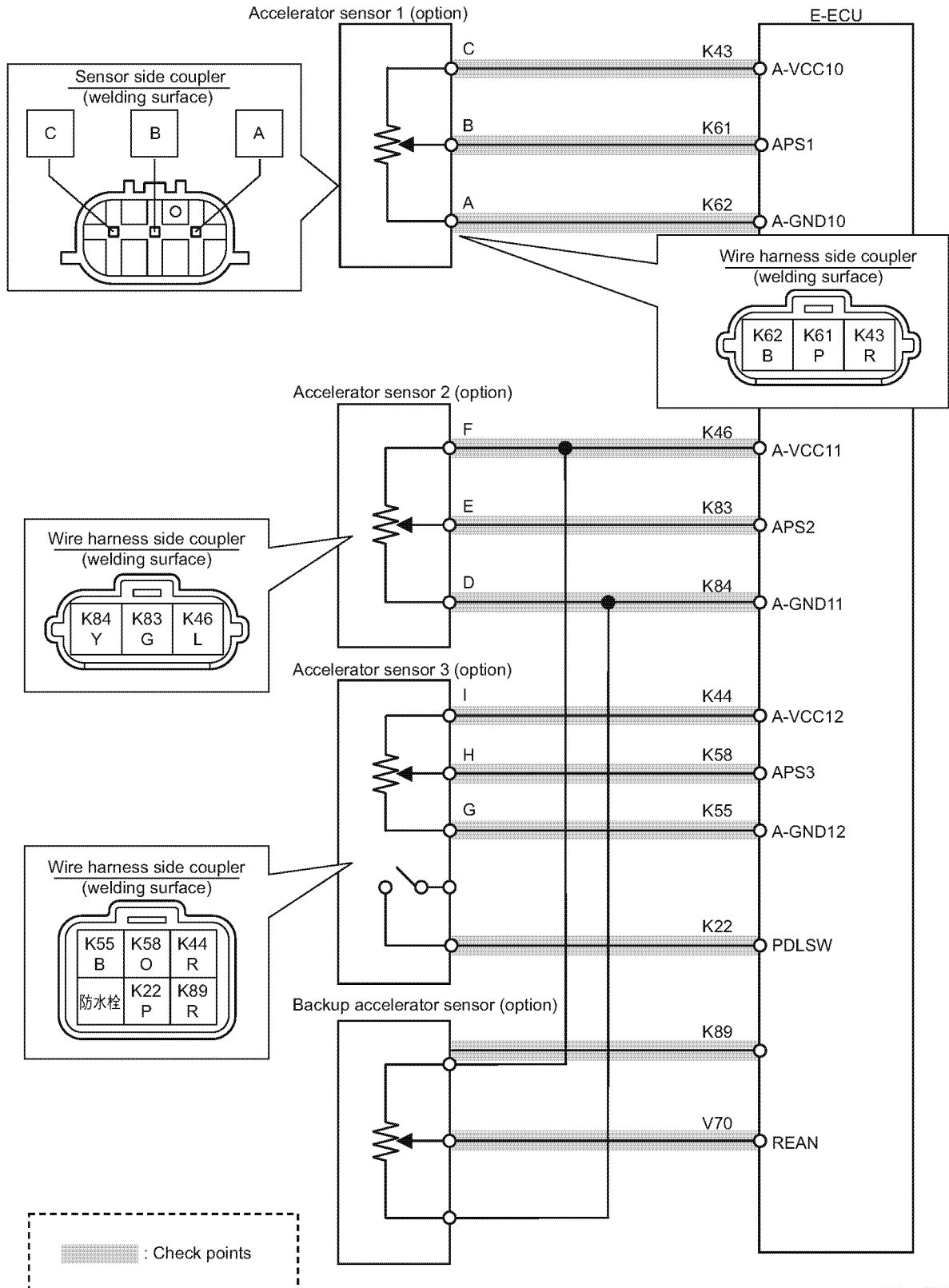
## ● Workflow

Note: For the work details, refer to "Work description" below. For operating procedure of the diagnosis tool, refer to the separate "Diagnosis Tool Operation Manual".



043556-01E00

● Wiring diagram



043363-01EN02

Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Checking the sensor resistance value (sensor unit):

- Between the accelerator sensor1 terminals A and C (accelerator sensor2 terminals D and F) (accelerator sensor3 terminals G and I) (total resistance value)

1- Remove the wire harness from the accelerator sensor.

2- Use the circuit tester to measure the resistance value (total resistance value) between the sensor terminals A and C (D and F) (G and I).

**Reference: Total resistance value of the YANMAR standard accelerator sensor**

Terminal	Name
Sensor A - C (D - F)	$5 \pm 1.5 \text{ k}\Omega$

<b>Not OK</b>	Replace the accelerator sensor.
<b>OK</b>	Refer to "Between the accelerator sensor terminals A and B (D and E) (G and H)"

- Between the accelerator sensor terminals A and B (D and E) (G and H)

1- Use the circuit tester to measure the resistance value between the accelerator sensor terminals A and B (D and E) (G and H).

2- Move the acceleration throttle to check whether or not the resistance value between the accelerator sensor terminals A and B changes.

<b>Not OK</b>	Replace the accelerator sensor.
<b>OK</b>	Refer to "Checking the sensor resistance value (sensor + wire harness)."

### 2. Checking the sensor resistance value (sensor + wire harness):

- Between the wire harnesses K43 and K62 (K46 and K84) (K44 and K55) (total resistance value)

1- Connect the accelerator sensor and the wire harness. Remove the wire harness from the E-ECU.

2- Use the circuit tester to measure the resistance value (total resistance value) between the wire harness side E-ECU connectors K43 and K62 (K46 and K84) (K44 and K55).

*Note: Refer to the above-mentioned reference "Total resistance value of the YANMAR standard accelerator sensor".*

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• A coupler failure between the sensor and the wire harness may be caused. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Between the wire harnesses K61 and K62 (K83 and K84) (K58 and K55)"

- Between the wire harnesses K61 and K62 (K83 and K84) (K58 and K55)

1- Use the circuit tester to measure the resistance value between the E-ECU connectors K61 - K62 (K83 - K84) (K58 - K55).

2- Move the acceleration throttle to check whether or not the resistance value between the E-ECU connectors K61 - K62 (K83 - K84) (K58 - K55) changes.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• A coupler failure between the sensor and the wire harness may be caused. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Check the output voltage of the accelerator sensor."

■ Intake throttle position sensor

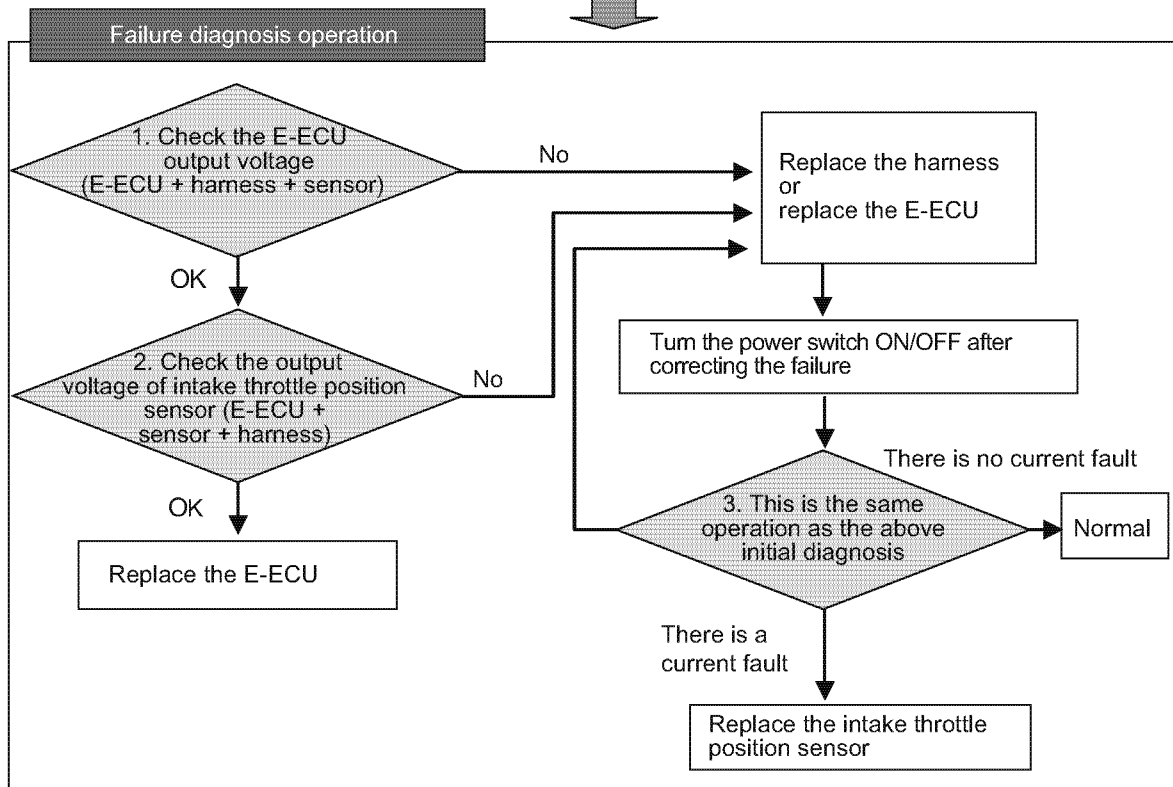
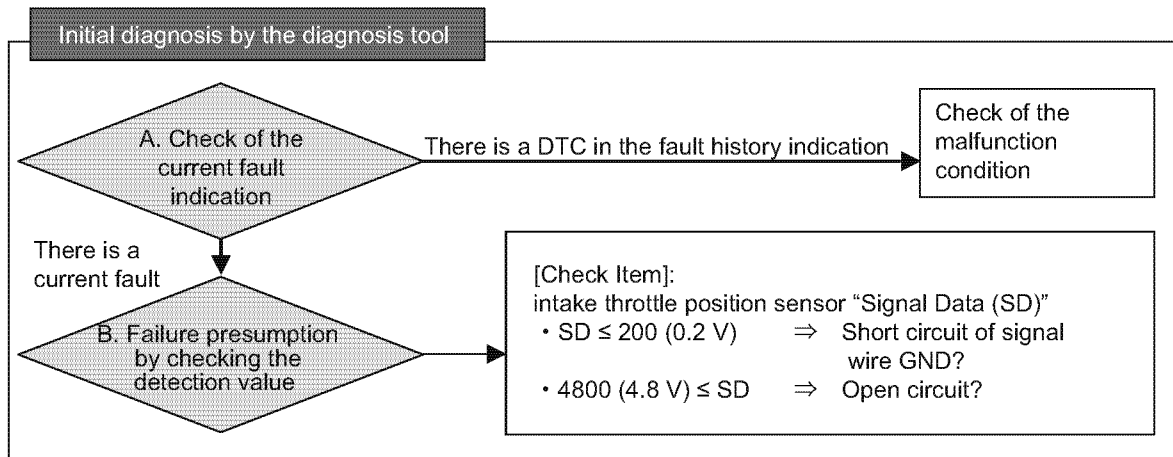
● Related DTC

P code	P02E8	Name	Intake throttle opening sensor fault (Low voltage)
SPN/FMI	51/4		

P code	P02E9	Name	Intake throttle opening sensor fault (High voltage)
SPN/FMI	51/3		

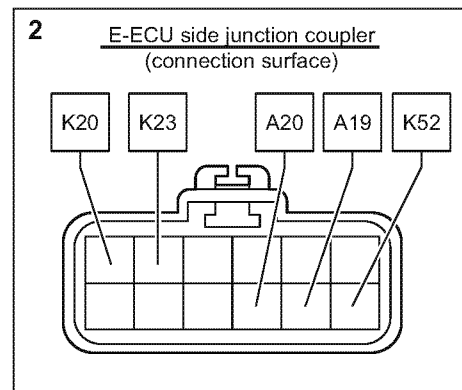
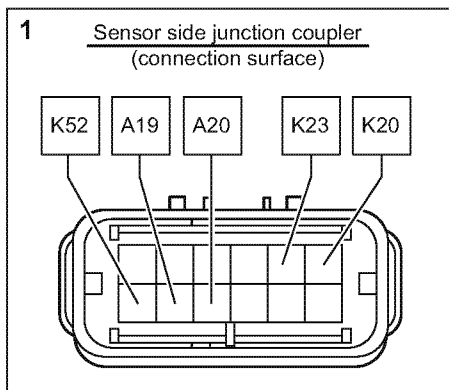
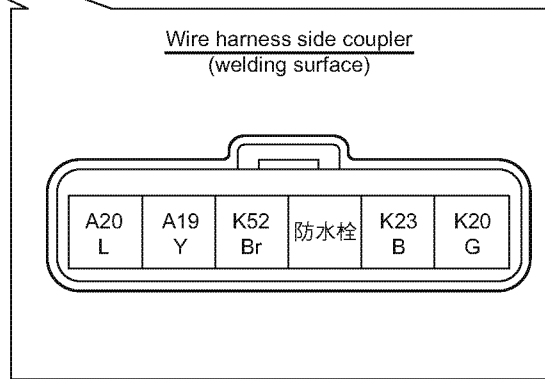
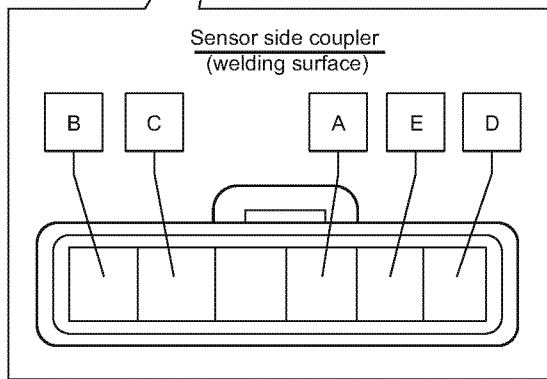
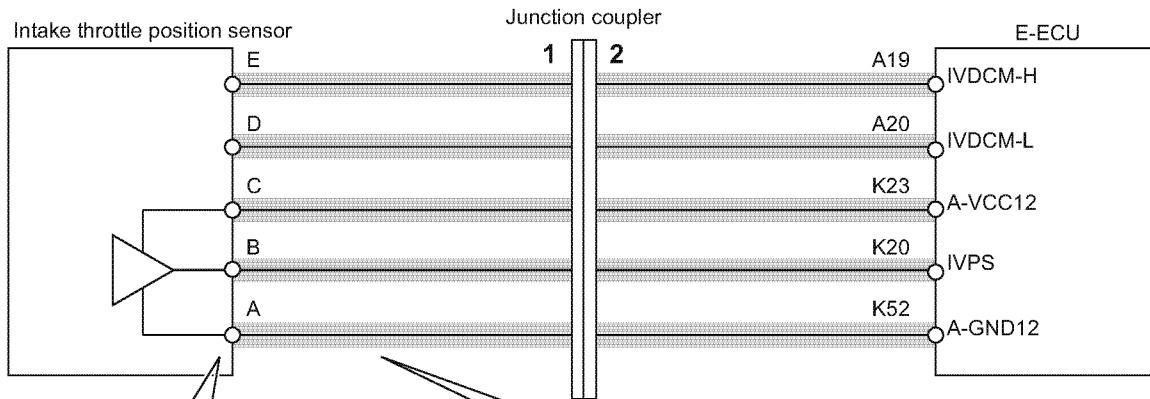
● Workflow


Note: For the work details, refer to "Work description" below. For operating procedure of the diagnosis tool, refer to the separate "Diagnosis Tool Operation Manual".



050230-00EN100

● Wiring diagram



 : Check points

Note: For the E-ECU pin layout, refer to P287.

050240-00E01

### ● Work description

#### 1. Check the E-ECU output voltage:

- 1- Connect the checker wire harness between the E-ECU and the wire harness on the equipment. Also, connect all connectors (sensors and wire harness E-ECU).
- 2- Use the circuit tester to measure the voltage value between the intake throttle position sensor 5 V K23 - K52.

Voltage value	Condition	Corrective action
$K23 < 4.375 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$4.375 \text{ V} \leq K23 \leq 5.625 \text{ V}$	OK (Normal range)	Check the output voltage of the intake throttle position sensor.
$5.625 \text{ V} < K23$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	Replace the wire harness or the E-ECU. Turn the power switch OFF/ON and perform the diagnosis using the diagnosis tool.
<b>OK</b>	Refer to "Check the output voltage of the intake throttle position sensor:"

#### 2. Check the output voltage of the intake throttle position sensor:

- 1- Connect the checker wire harness between the E-ECU and the wire harness on the equipment. Also, connect all connectors (sensors and wire harness E-ECU).
- 2- Use the circuit tester to measure the voltage value between the sensor signals K20 - K52.

Voltage value	Condition	Corrective action
$K20 < 0.6 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.65 \text{ V} \leq K20 \leq 4.4 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.4 \text{ V} < K20$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	Replace the wire harness or the E-ECU. Turn the power switch OFF/ON and perform the diagnosis using the diagnosis tool.
<b>OK</b>	Replace the E-ECU.

#### 3. Using the diagnosis tool:

- 1- Turn off the power switch. Turn on the power switch and start the engine.
- 2- Connect the diagnosis tool and check the Active Diagnostic Trouble Code for the error detection.

<b>No</b>	Normal
<b>Applied</b>	Replace the intake throttle position sensor.

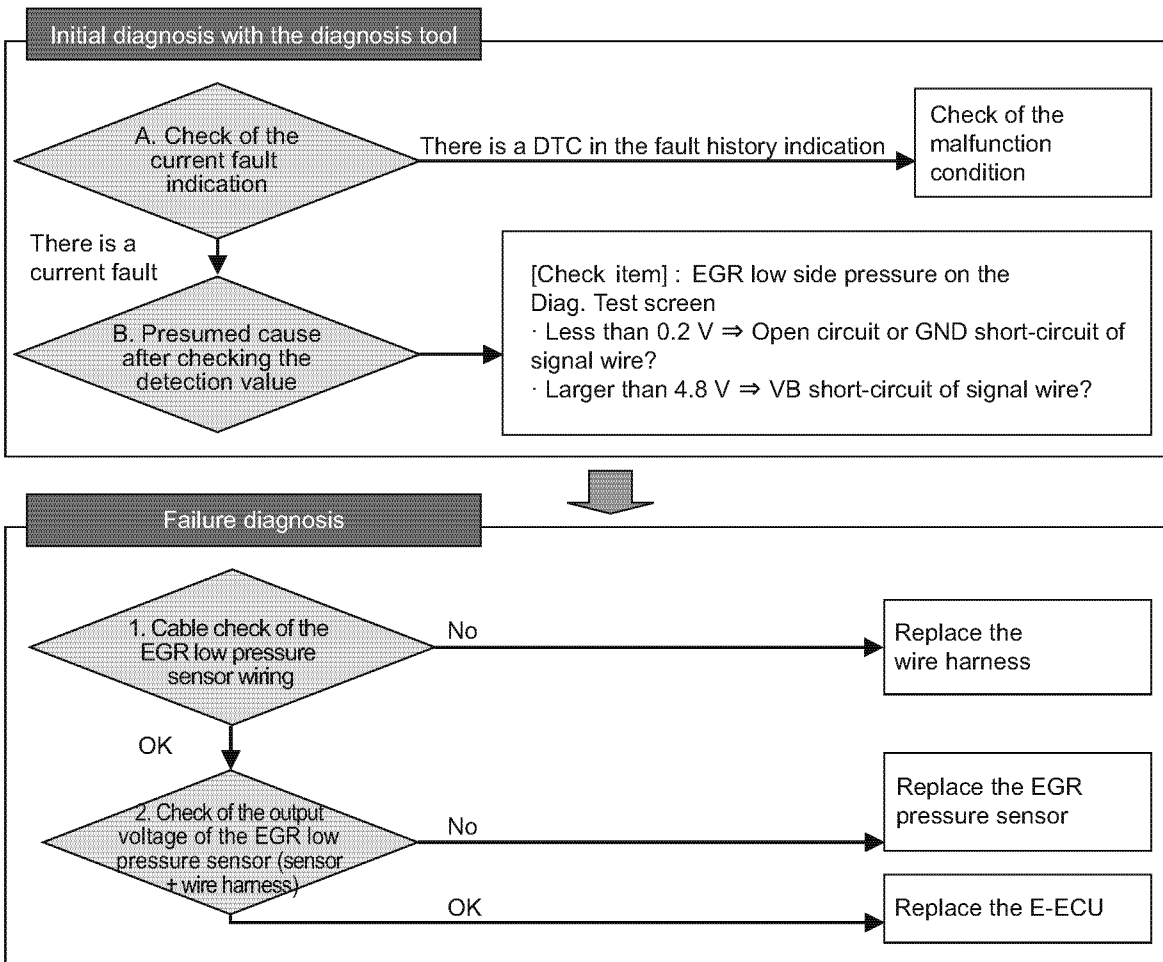
■ EGR low pressure side sensor

● Related DTC

P code	P0238	Name	EGR low pressure side sensor fault (High voltage)
SPN/FMI	102/3		
P code	P0237	Name	EGR low pressure side sensor fault (Low voltage)
SPN/FMI	102/4		
P code	P0236	Name	EGR low pressure side sensor (Abnormal learning value)
SPN/FMI	102/13		

● Workflow

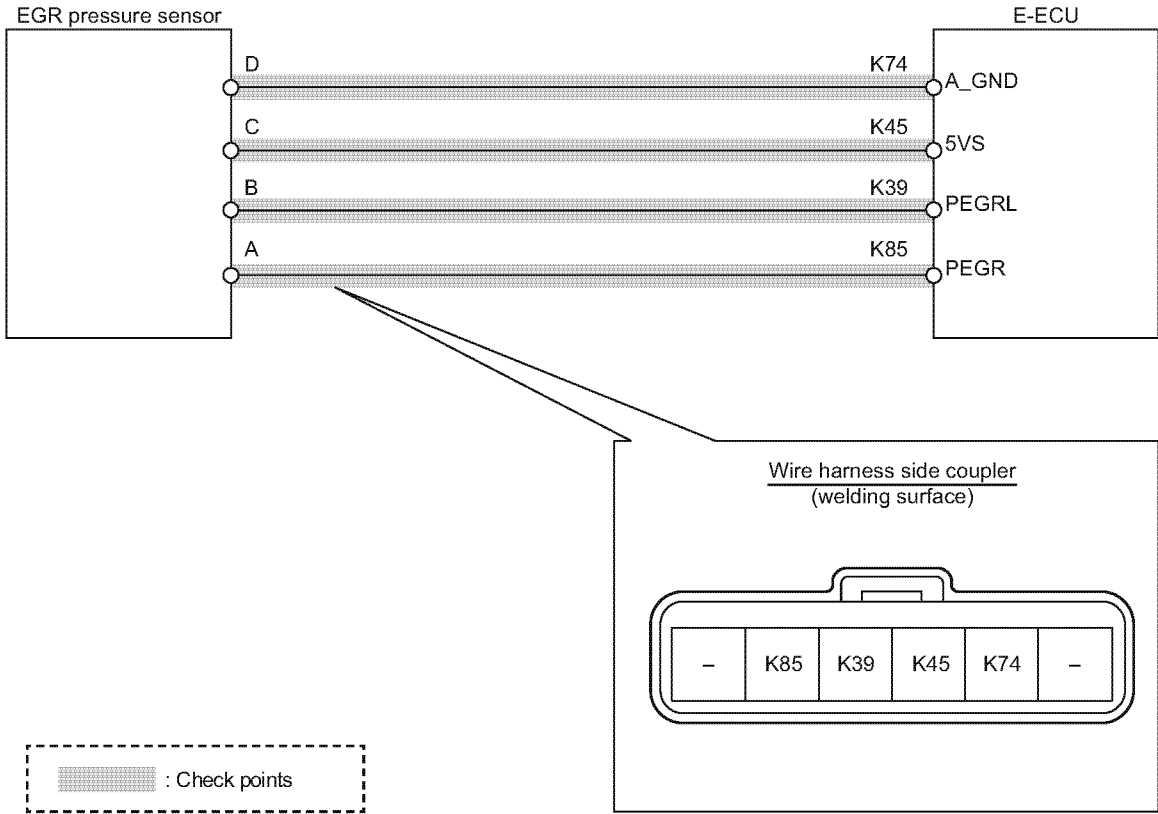
Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



050736-00EN00



● Wire diagram



Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Cable check of the EGR low pressure sensor wiring:

- 1- Remove the wire harness from the EGR pressure sensor and the E-ECU.
- 2- Using the circuit tester, check the cable of the wire harness.

Terminal	Cable check	Condition
Between B and K39	OK	Normal
	Not OK	Wire harness failure
Between C and K45	OK	Normal
	Not OK	Wire harness failure
Between D and K74	OK	Normal
	Not OK	Wire harness failure

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• Check if the wire harness is damaged or there is mis-wiring.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Check of the output voltage of the EGR low pressure sensor. (sensor + wire harness):"

### 2. Check of the output voltage of the EGR low pressure sensor. (sensor + wire harness):

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the EGR low pressure sensor signals K39 and K74.

Voltage value	State	Treatment
$K39 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq K39 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < K39$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	Replace the EGR pressure sensor. Then, check the output voltage again.
<b>OK</b>	Replace the E-ECU.

## ■ EGR high pressure side sensor

### ● Related DTC

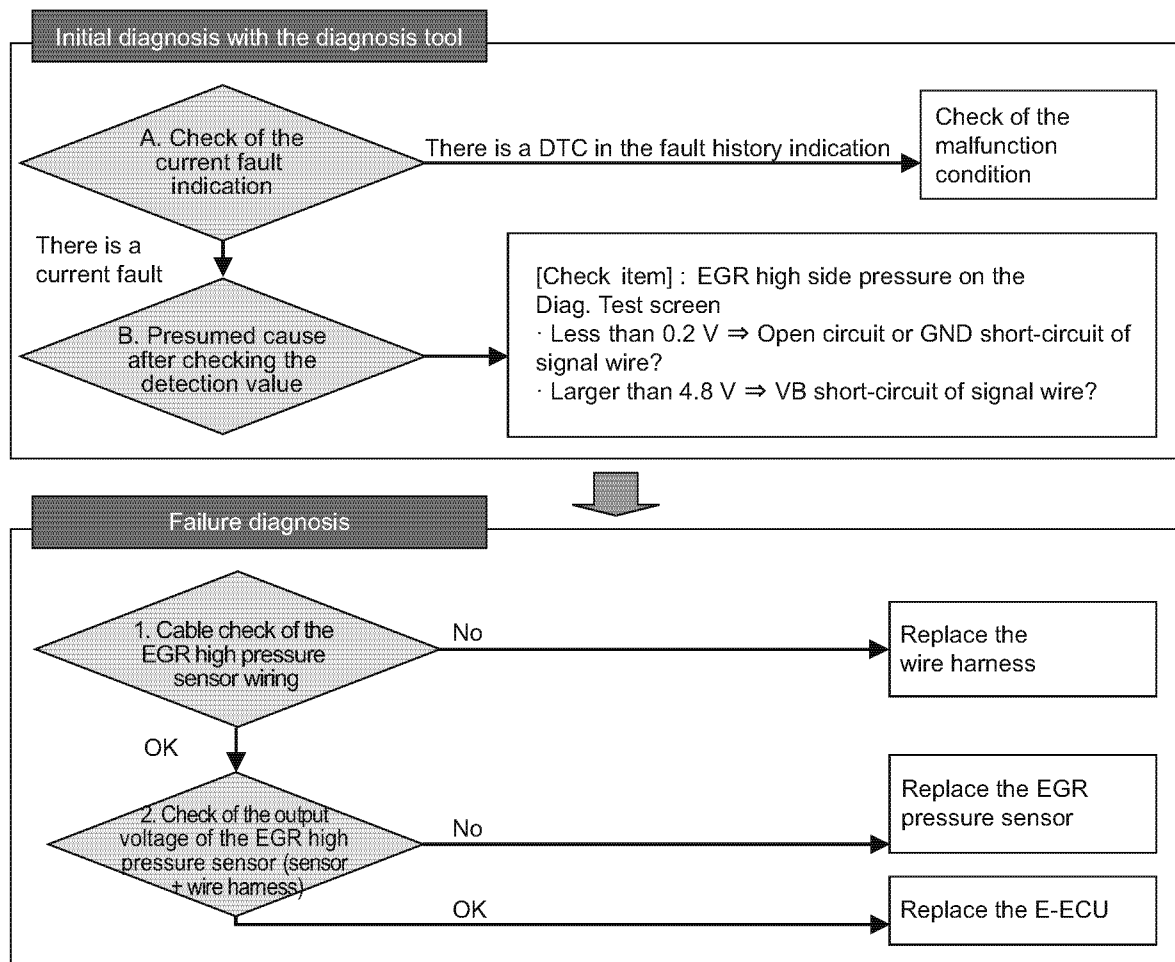
P code	P0473	Name	EGR high pressure side sensor fault (High voltage)
SPN/FMI	1209/3		

P code	P0472	Name	EGR high pressure side sensor fault (Low voltage)
SPN/FMI	1209/4		

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

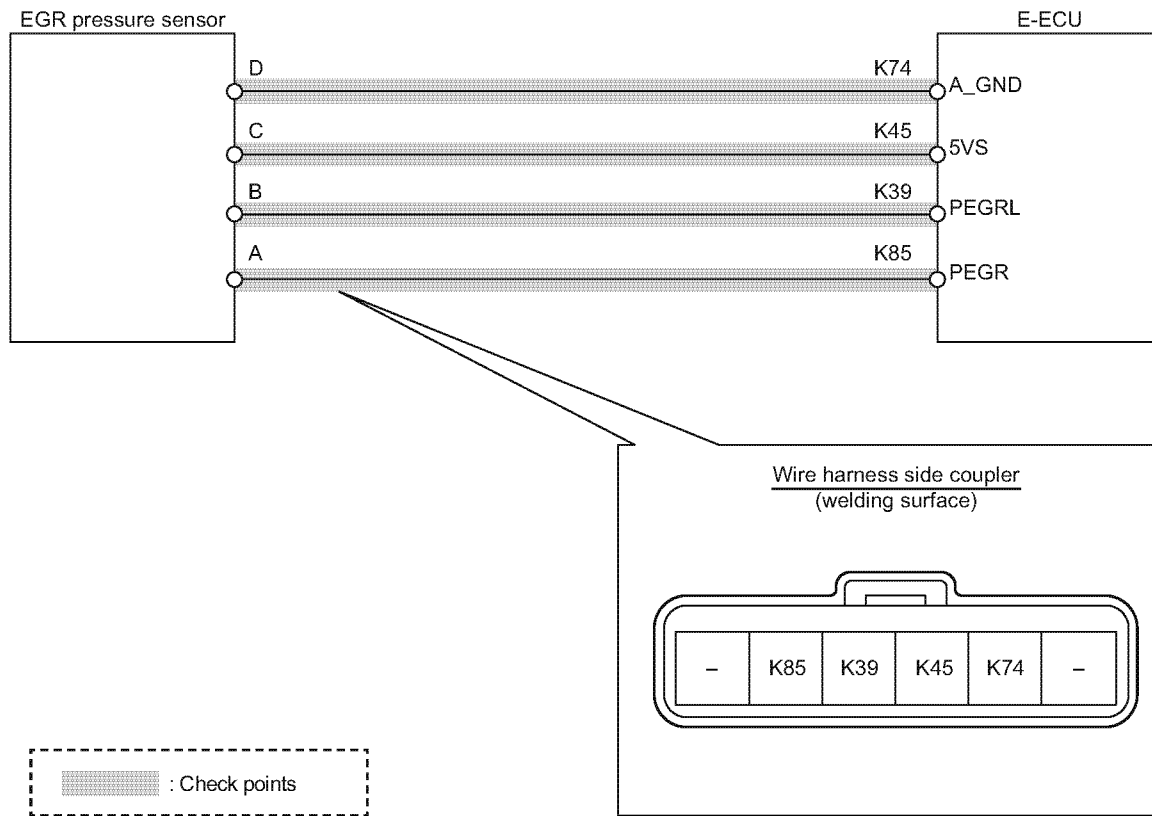
### ● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



050738-00EN00

● Wire diagram



050737-00 E3100

Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Cable check of the EGR high pressure sensor wiring:

- 1- Remove the wire harness from the EGR pressure sensor and the E-ECU.
- 2- Using the circuit tester, check the cable of the wire harness.

Terminal	Cable check	Condition
Between A and K85	OK	Normal
	Not OK	Wire harness failure
Between C and K45	OK	Normal
	Not OK	Wire harness failure
Between D and K74	OK	Normal
	Not OK	Wire harness failure

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• Check if the wire harness is damaged or there is mis-wiring.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Check of the output voltage of the EGR high pressure sensor. (sensor + wire harness):"

### 2. Check of the output voltage of the EGR high pressure sensor. (sensor + wire harness):

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the EGR high pressure sensor signals K85 and K74.

Voltage value	State	Treatment
$K85 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq K85 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < K85$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	Replace the EGR pressure sensor. Then, check the output voltage again.
<b>OK</b>	Replace the E-ECU.

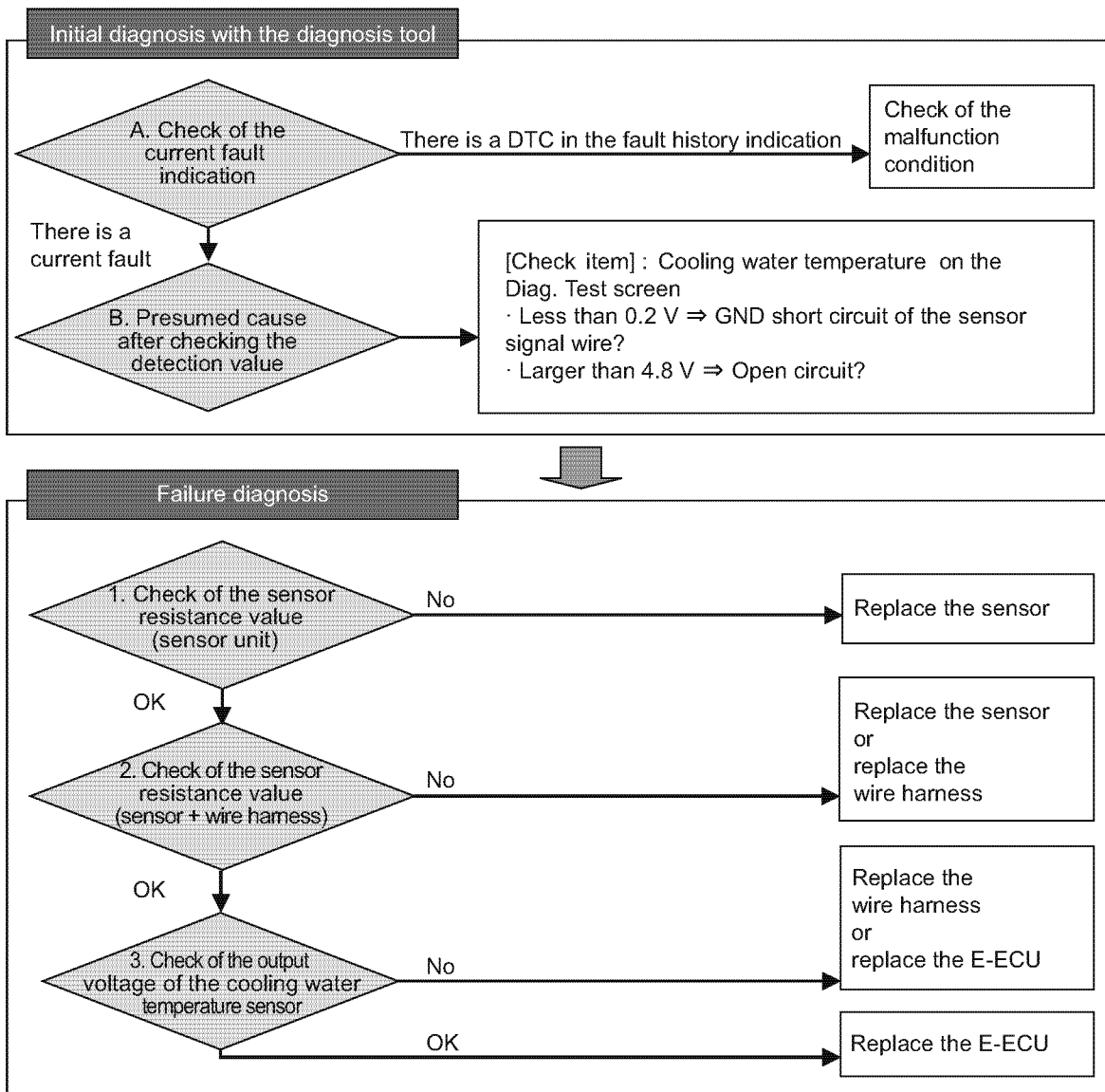
■ Cooling water temperature sensor

● Related DTC

P code	P0117	Name	Cooling water temperature sensor fault (low voltage)
SPN/FMI	110/4		
P code	P0118	Name	Cooling water temperature sensor fault (high voltage)
SPN/FMI	110/3		
P code	P0217	Name	Cooling water temperature sensor temperature abnormal high (overheat)
SPN/FMI	110/0		

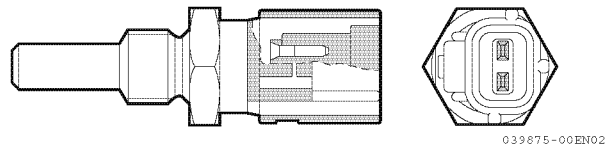
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".

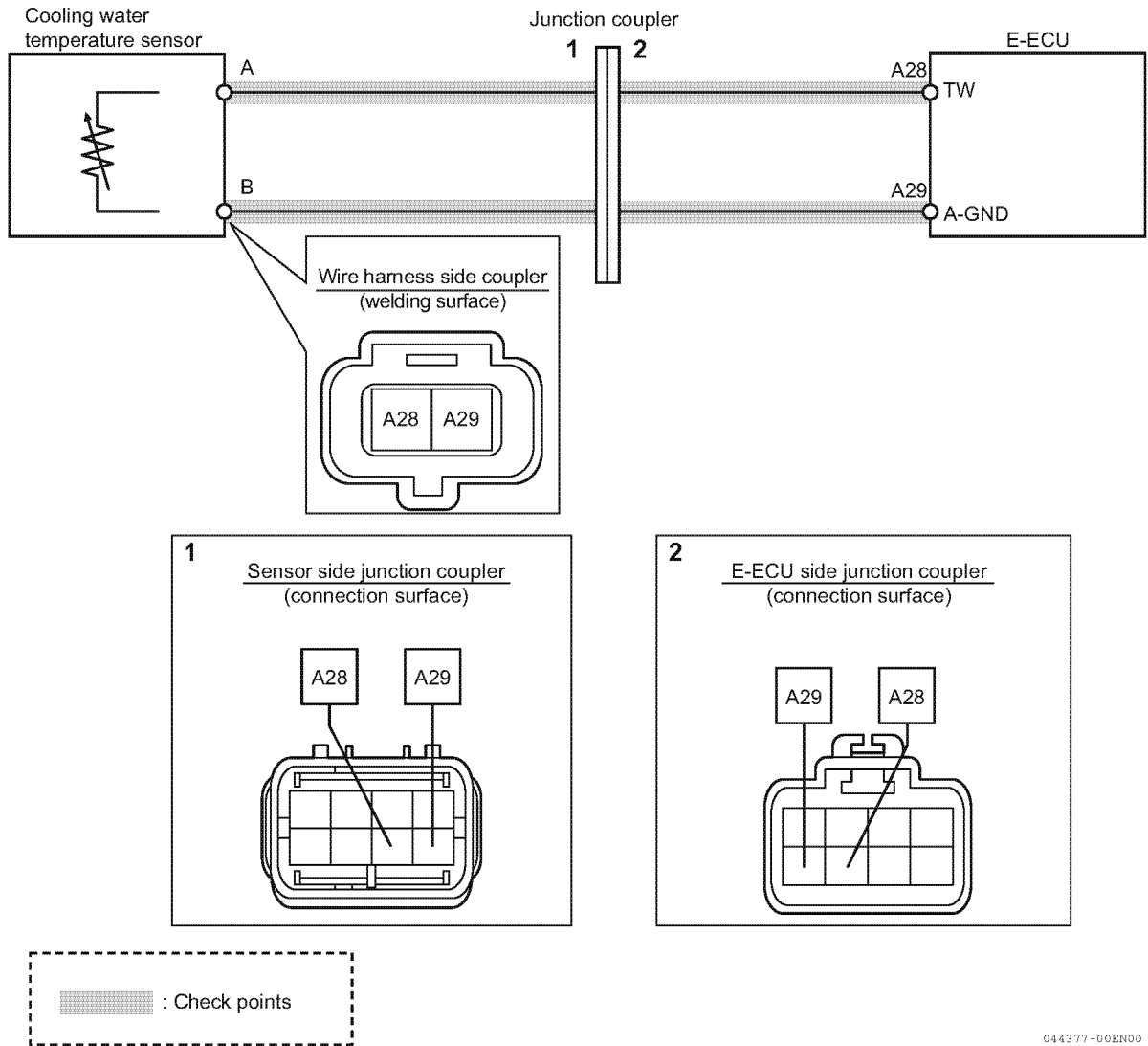


044383-01EN00

● Sensor diagram



● Wire diagram



Note: For the E-ECU pin layout, refer to P287.

● **Work description**

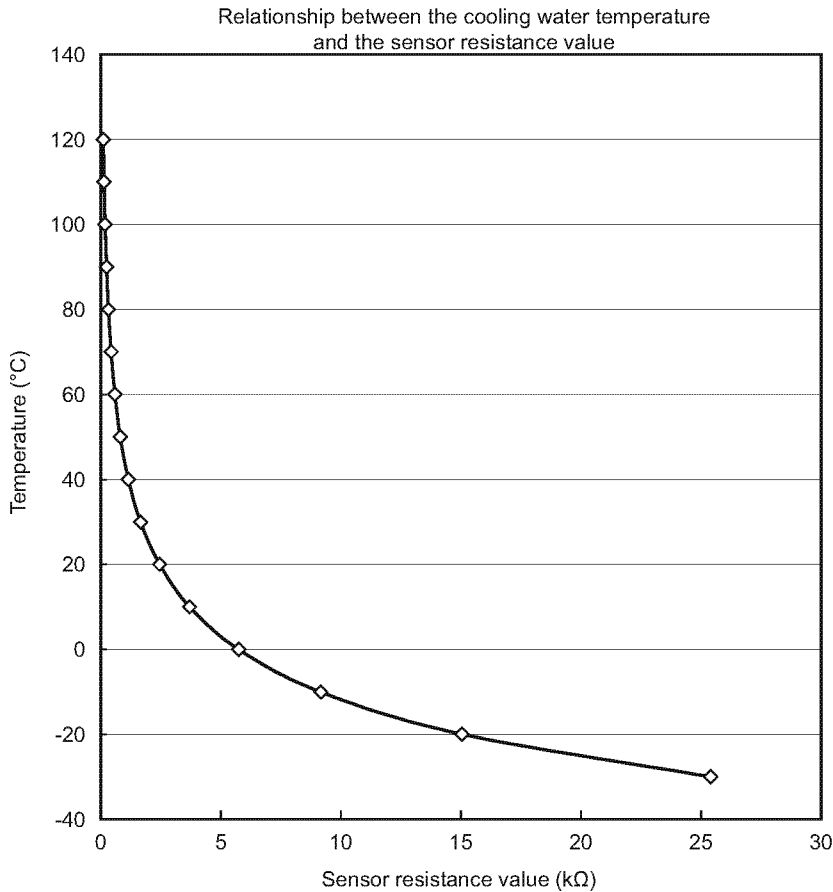
1. Check of the sensor resistance value (sensor unit):

1- Remove the wire harness from the cooling water temperature sensor.

2- Using the circuit tester, measure the resistance value between the cooling water temperature sensor terminals A and B.

3- Refer to the following diagram “Cooling water temperature sensor characteristics” to check that the measured resistance value is in the normal range.

**Cooling water temperature sensor characteristics**



Temp. (°C)	Resistance (kΩ)
-30	25.4
-20	15.04
-10	9.16
0	5.74
10	3.7
20	2.45
30	1.66
40	1.15
50	0.811
60	0.584
70	0.428
80	0.318
90	0.24
100	0.1836
110	0.1417
120	0.1108

044402-00EN00

<b>Not OK</b>	Replace the cooling water temperature sensor.
<b>OK</b>	Refer to “Check of the sensor resistance value (sensor + wire-harness):”



## 2. Check of the sensor resistance value (sensor + wire-harness):

- 1- Connect the cooling water temperature sensor and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value between the wire harness side E-ECU connector terminals A28 and A29.
- 3- Refer to the above diagram "Cooling water temperature sensor characteristics" to check that the measured resistance value is in the normal range.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Check of the output voltage of the cooling water temperature sensor."

## 3. Check of the output voltage of the cooling water temperature sensor:

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the cooling water temperature sensor signals A28 and A29.

Voltage value	State	Treatment
$A28 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq A28 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < A28$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.

■ New air temperature sensor

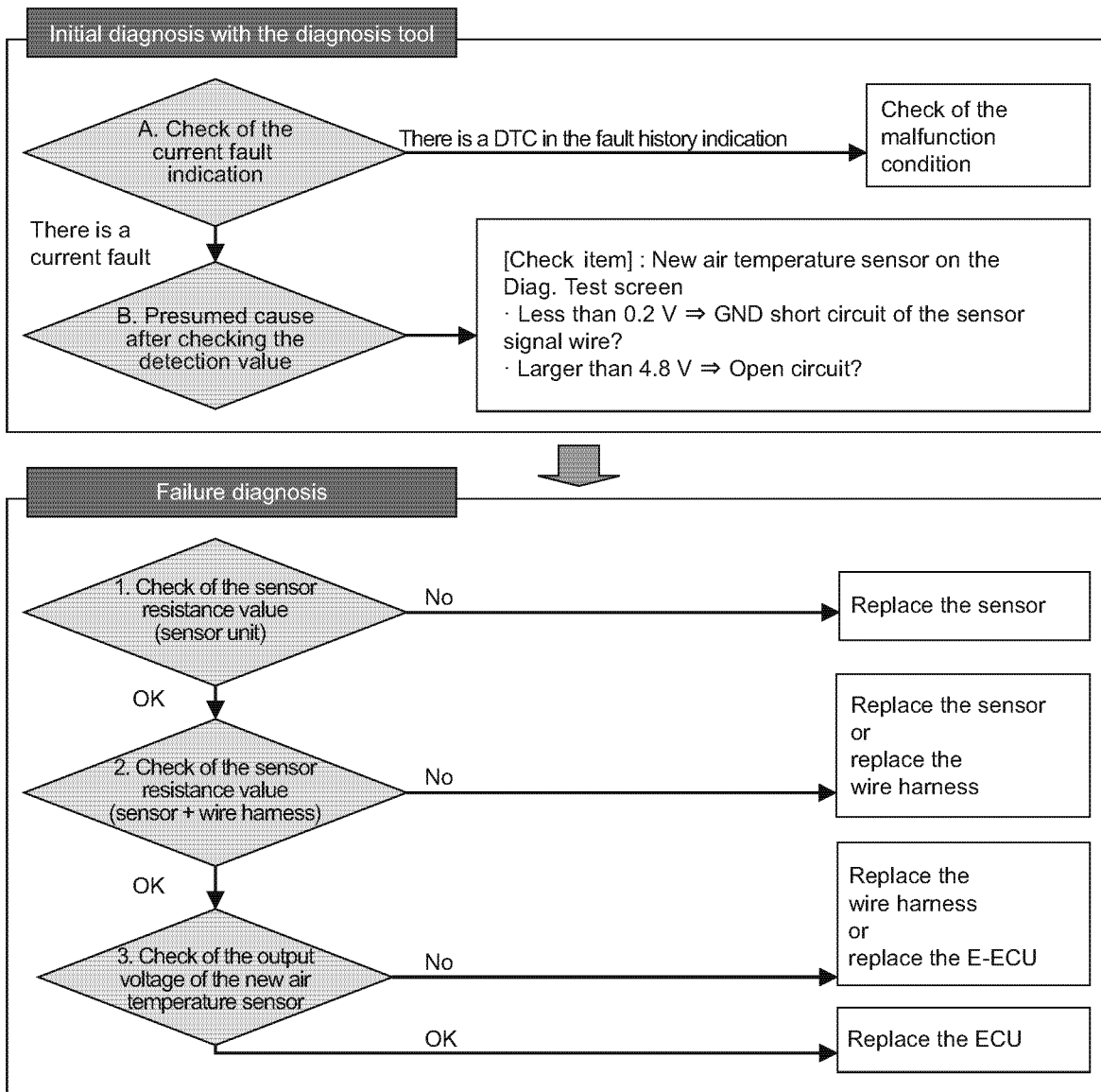
● Related DTC

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

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

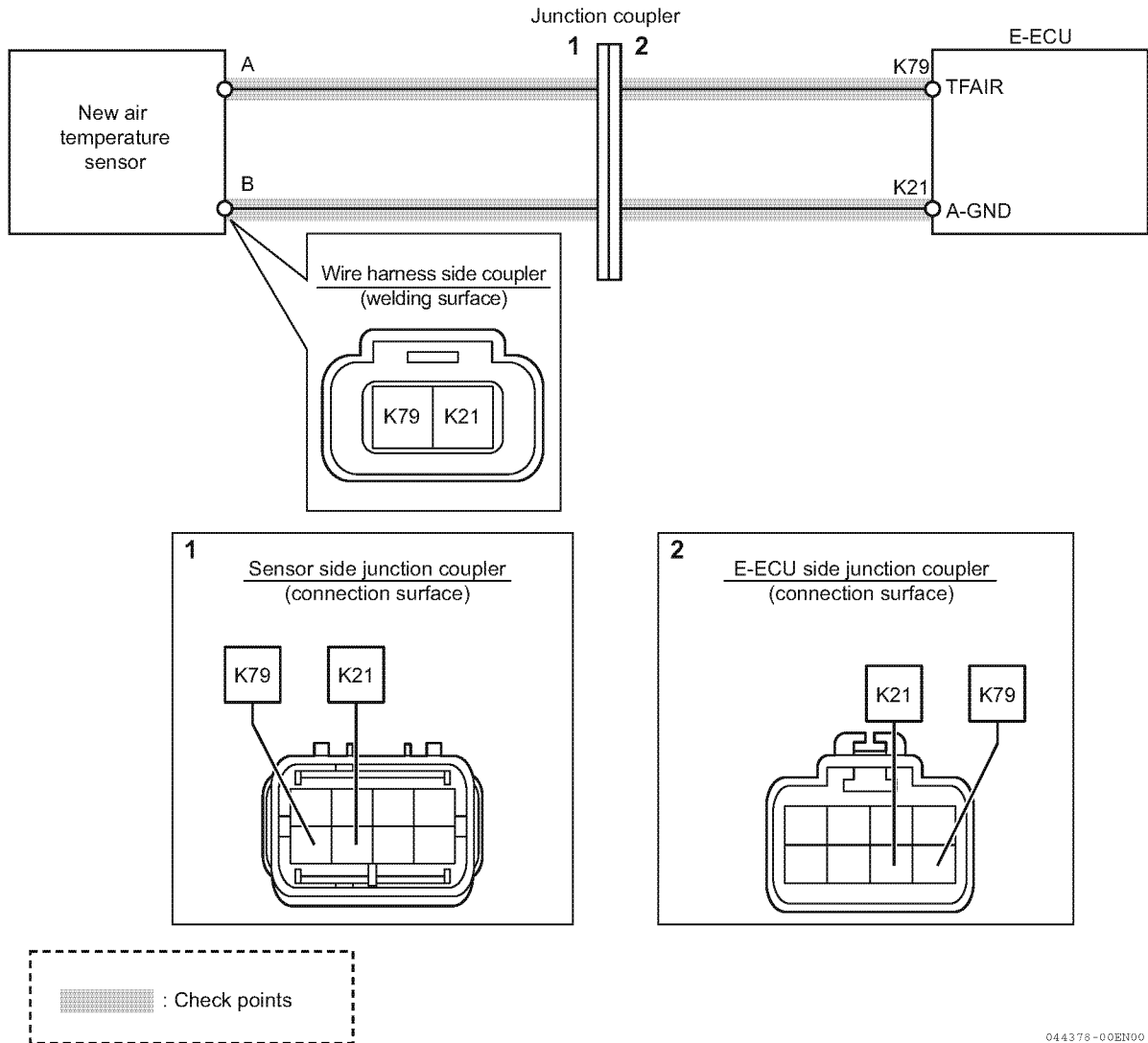
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044384-01EN00

● Wire diagram



Note: For the E-ECU pin layout, refer to P287.

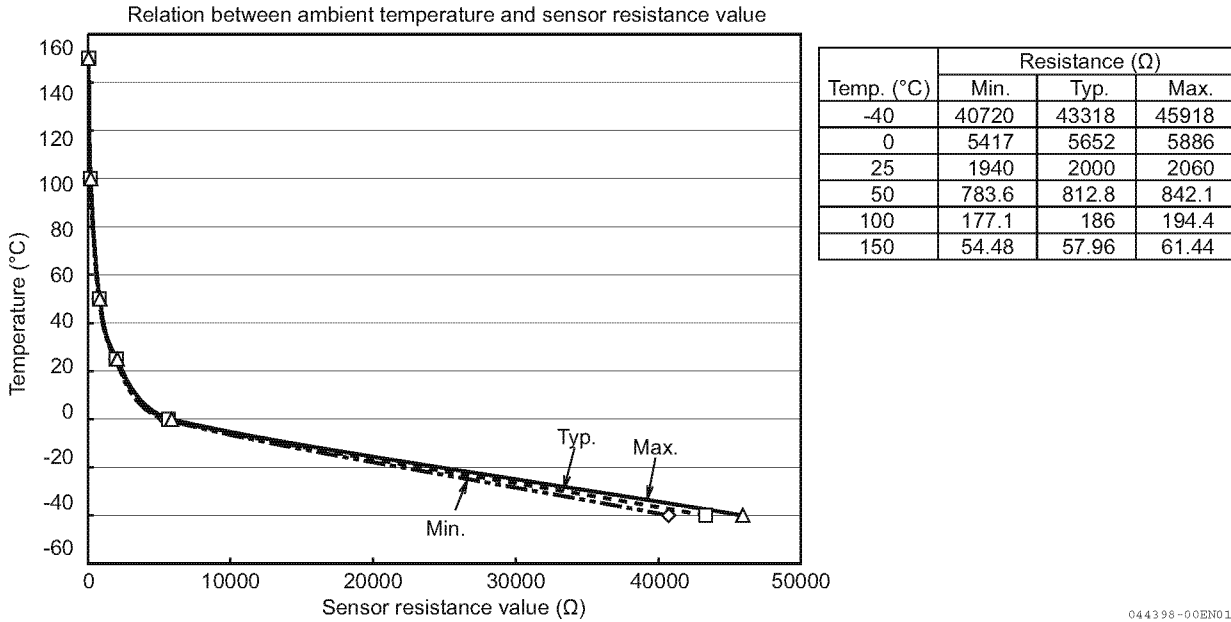
044376-00EN00

● Work description

1. Check of the sensor resistance value (sensor unit):

- 1- Remove the wire harness from the new air temperature sensor.
- 2- Using the circuit tester, measure the resistance value between the new air temperature sensor terminals A and B.
- 3- Refer to the following diagram “New air temperature sensor characteristics” to check that the measured resistance value is in the normal range.

New air temperature sensor characteristics



<b>Not OK</b>	Replace the new air temperature sensor.
<b>OK</b>	Refer to “Check of the sensor resistance value (sensor + wire-harness):”

2. Check of the sensor resistance value (sensor + wire-harness):

- 1- Connect the new air temperature sensor and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value between the E-ECU side wire harness connector terminals K79 and K21.
- 3- Refer to the above diagram “New air temperature sensor characteristics” to check that the measured resistance value is in the normal range.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to “Check of the output voltage of the new air temperature sensor:”

## 3. Check of the output voltage of the new air temperature sensor:

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the new air temperature sensor signals K79 and A21.

Voltage value	State	Treatment
$K79 < 0.15 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.15 \text{ V} \leq K79 \leq 4.85 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.85 \text{ V} < K79$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

Not OK	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
OK	Replace the E-ECU.

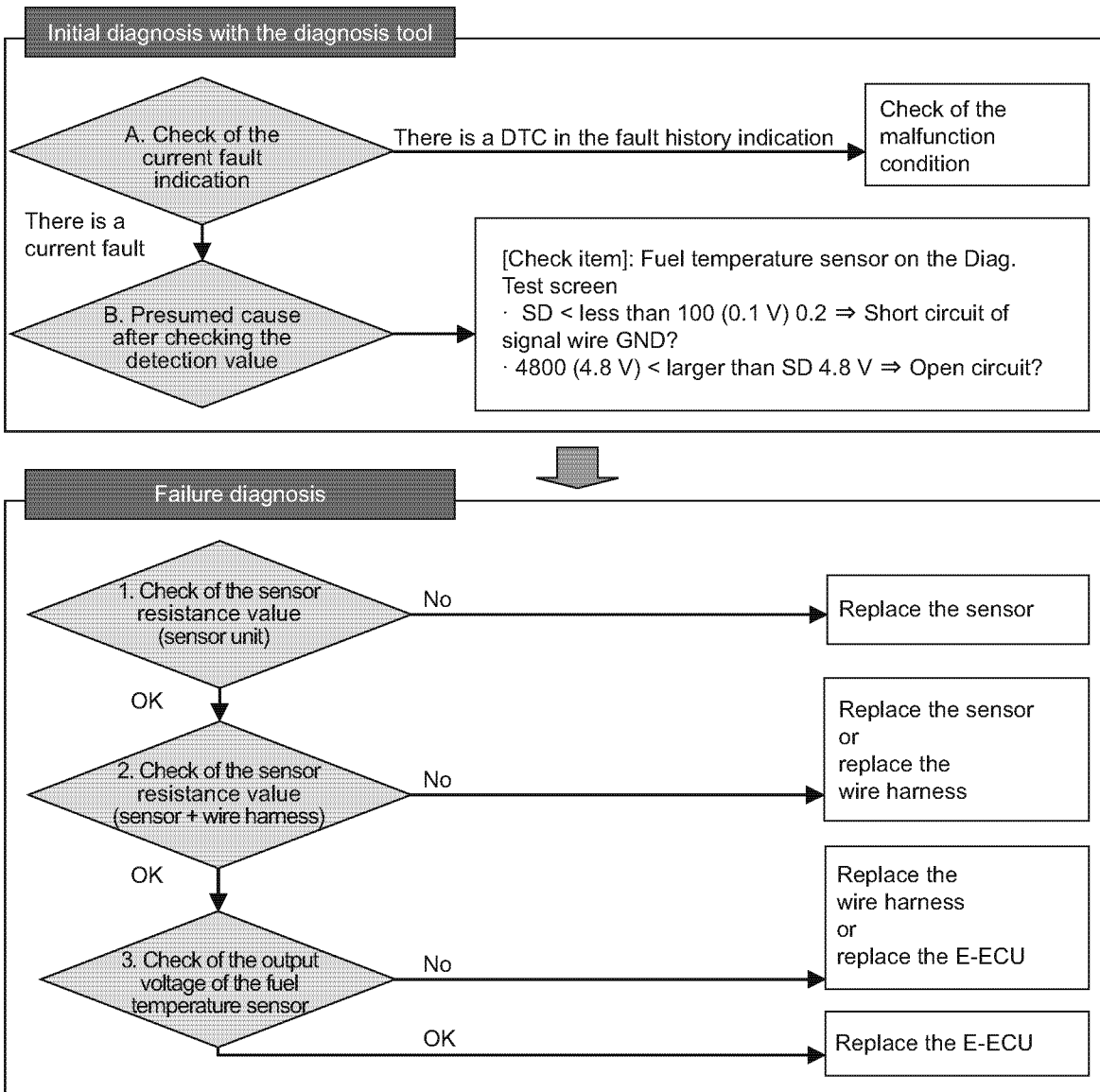
■ Fuel temperature sensor

● Related DTC

P code	P0182	Name	Fuel temperature sensor fault (low voltage)
SPN/FMI	174/4		
P code	P0183	Name	Fuel temperature sensor fault (high voltage)
SPN/FMI	174/3		
P code	P0168	Name	Fuel temperature sensor temperature abnormal high
SPN/FMI	174/0		

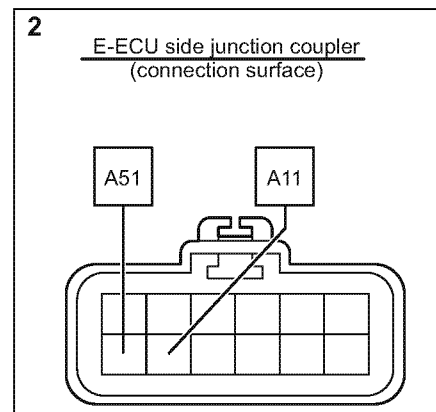
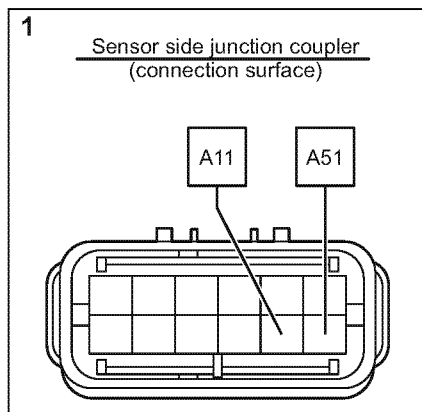
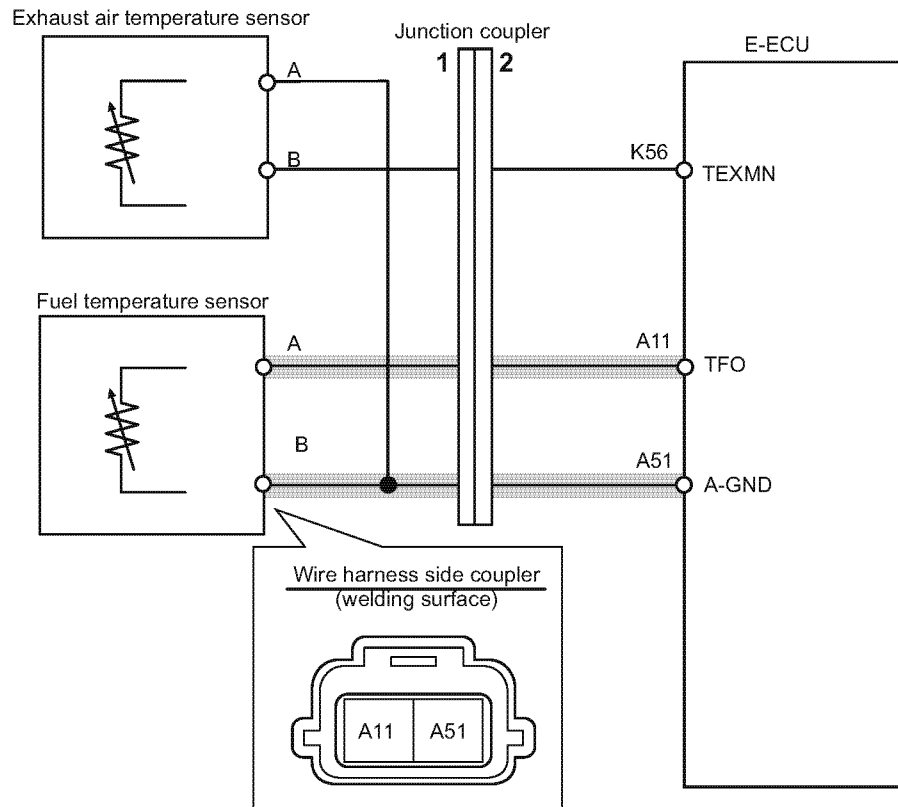
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044385-01EN00

● Wire diagram



: Check points

044379-00EN00

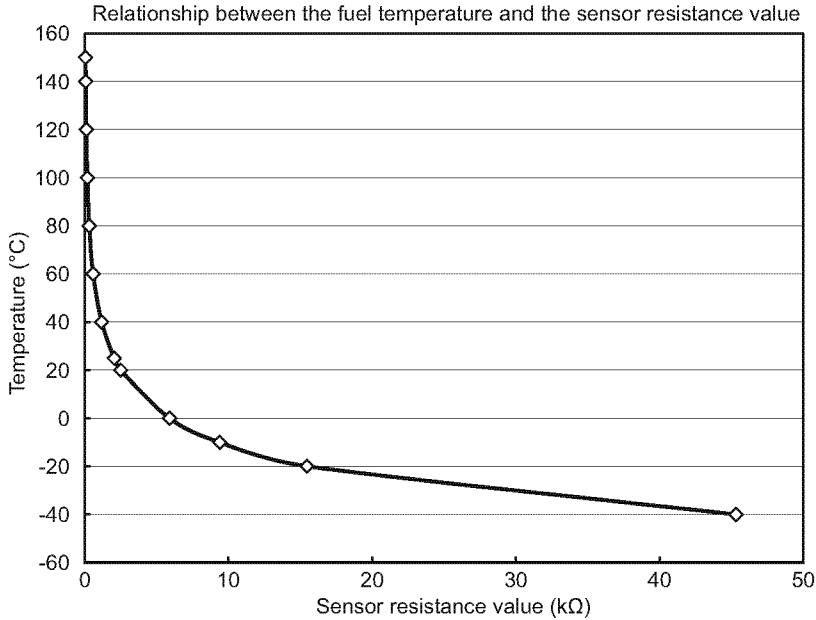
Note: For the E-ECU pin layout, refer to P287.

● **Work description**

1. Check the sensor resistance value (sensor unit):

- 1- Remove the wire harness from the fuel temperature sensor.
- 2- Using the circuit tester, measure the resistance value between the fuel temperature sensor terminals A and B.
- 3- Refer to the following diagram “Fuel temperature sensor characteristics” to check that the measured resistance value is in 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

<b>Not OK</b>	Replace the fuel temperature sensor.
<b>OK</b>	Refer to “Check of the sensor resistance value (sensor + wire-harness).”

2. Check of the sensor resistance value (sensor + wire-harness):

- 1- Connect the fuel temperature sensor and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value between the wire harness side E-ECU connector terminals A11 and A51.
- 3- Refer to the below diagram “Fuel temperature sensor characteristics” to check that the measured resistance value is in the normal range.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to “Check of the output voltage of the fuel temperature sensor.”



## 3. Check of the output voltage of the fuel temperature sensor:

1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).

2- Using the circuit tester, measure the voltage value between the sensor signals A11 and A51.

Voltage value	State	Treatment
$A11 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq A11 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < A11$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the fuel temperature sensor and the E-ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.

■ Rail pressure sensor

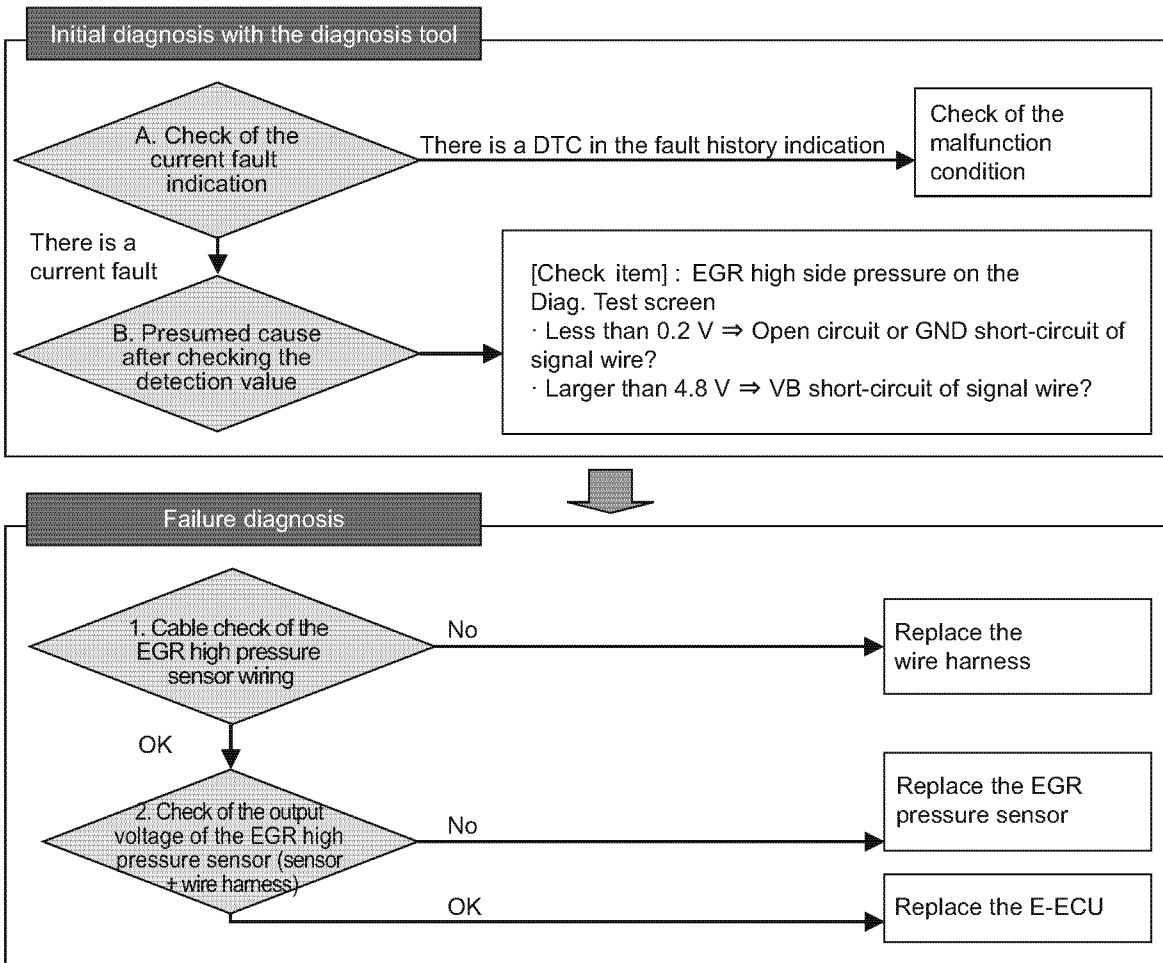
● Related DTC

P code	P0193	Name	Rail pressure sensor fault (High voltage)
SPN/FMI	157/3		

P code	P0192	Name	Rail pressure sensor fault (Low voltage)
SPN/FMI	157/4		

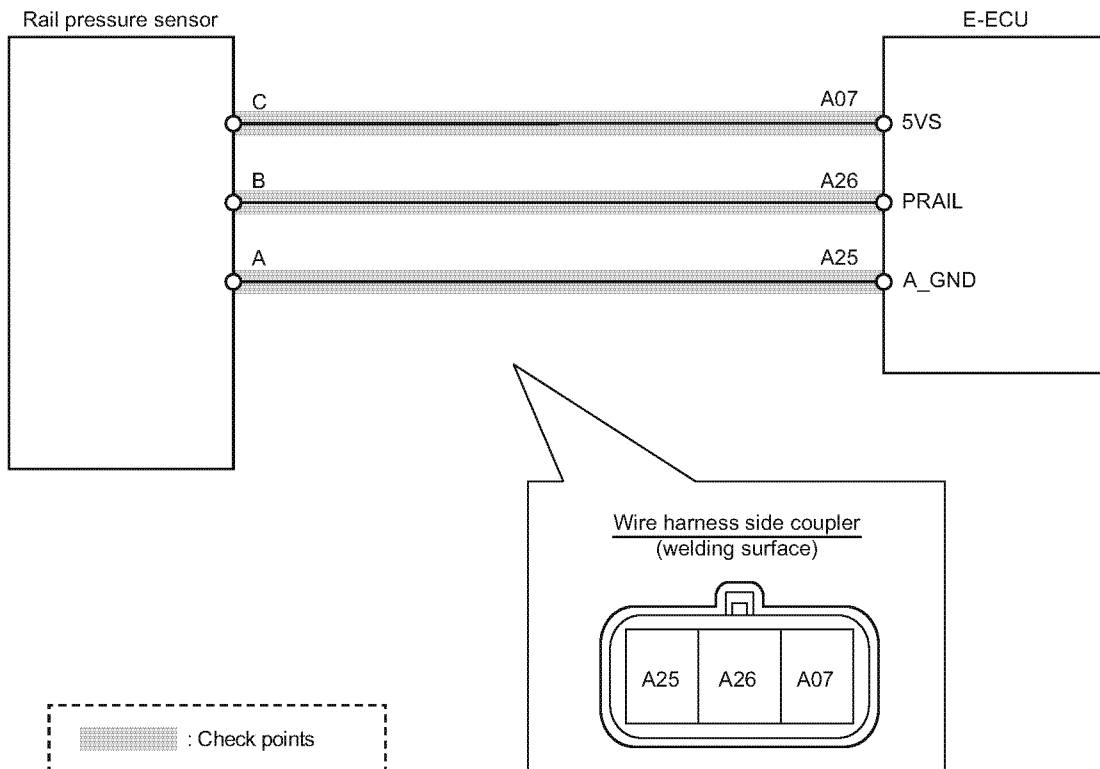
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



050738-06EN00

● Wire diagram



Note: For the E-ECU pin layout, refer to P287.

050749-00EN00

### ● Work description

#### 1. Cable check of the rail pressure sensor wiring:

- 1- Remove the wire harness from the rail pressure sensor and the E-ECU.
- 2- Using the circuit tester, check the cable of the wire harness.

Terminal	Cable check	Condition
Between A and A25	OK	Normal
	Not OK	Wire harness failure
Between B and A26	OK	Normal
	Not OK	Wire harness failure
Between C and A07	OK	Normal
	Not OK	Wire harness failure

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• Check if the wire harness is damaged or there is mis-wiring.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Check of the output voltage of the rail pressure sensor. (sensor + wire harness):"

#### 2. Check of the output voltage of the rail pressure sensor. (sensor + wire harness):

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the rail pressure sensor signals K26 and K25.

Voltage value	State	Treatment
$A26 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq A26 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < A26$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	Replace the rail pressure sensor. Then, check the output voltage again.
<b>OK</b>	Replace the E-ECU.

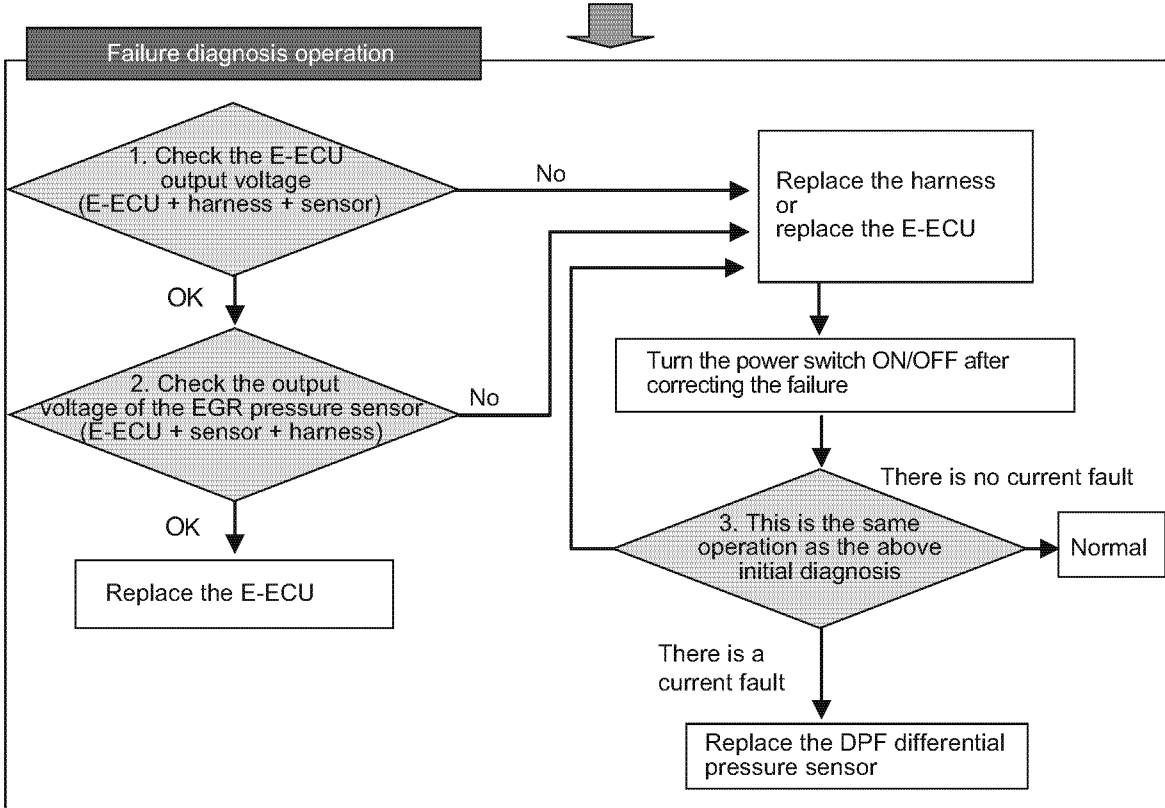
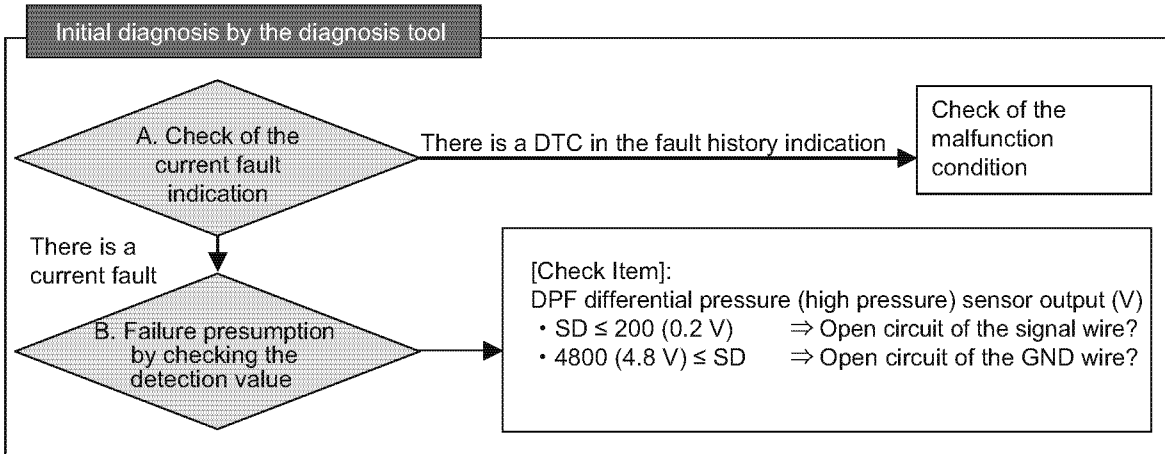
## ■ DPF differential pressure sensor

### ● Related DTC

P code	P2454	Name	DPF differential pressure sensor fault (Low voltage)
SPN/FMI	3251/4		
P code	P2455	Name	DPF differential pressure sensor fault (High voltage)
SPN/FMI	3251/3		
P code	P1454	Name	DPF high pressure side sensor fault (Low voltage)
SPN/FMI	3609/4		
P code	P1455	Name	DPF high pressure side sensor fault (High voltage)
SPN/FMI	3609/3		
P code	P2453	Name	DPF differential pressure sensor (Abnormal learning value)
SPN/FMI	3251/13		
P code	P2452	Name	DPF differential pressure sensor differential pressure abnormal high
SPN/FMI	3251/0		

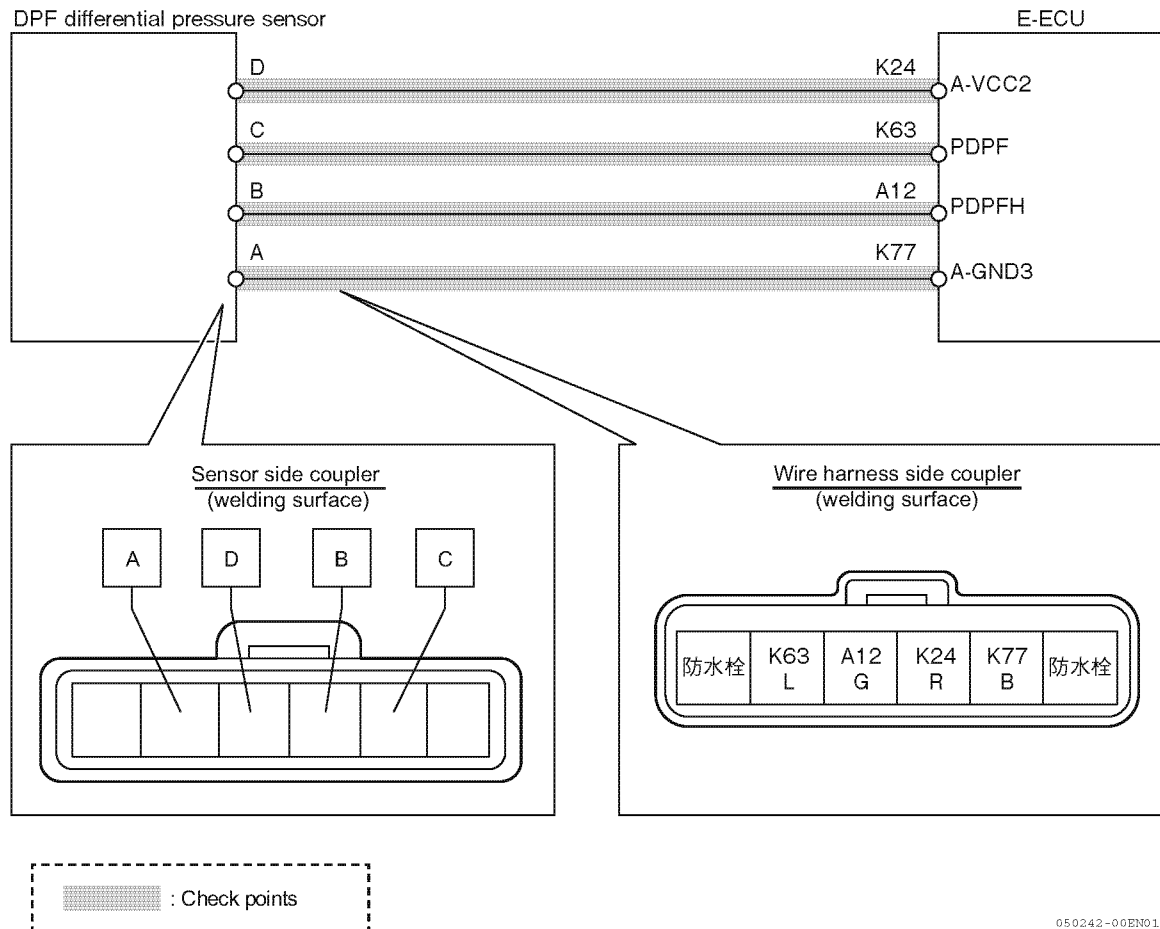
● Workflow

Note: For the work details, refer to “Work description” below. For operating procedure of the diagnosis tool, refer to the separate “Diagnosis Tool Operation Manual”.



050233-00EN01

## ● Wiring diagram



050242-00EN01

Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Check the E-ECU output voltage:

- 1- Connect the checker wire harness between the E-ECU and the wire harness on the equipment. Also, connect all connectors (sensors and wire harness E-ECU).
- 2- Use the circuit tester to measure the voltage value between the DPF differential pressure sensor 5 V K24 - K77.

Voltage value	Condition	Corrective action
$K24 < 4.375 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$4.375 \text{ V} \leq K24 \leq 5.625 \text{ V}$	OK (Normal range)	Check the output voltage of the DPF differential pressure sensor.
$5.625 \text{ V} < K24$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

Not OK	Replace the wire harness or the E-ECU. Turn the power switch OFF/ON and perform the diagnosis using the diagnosis tool.
OK	Refer to "Check the output voltage of the DPF differential pressure sensor."

### 2. Check the output voltage of the DPF differential pressure sensor:

1- Connect the checker wire harness between the E-ECU and the wire harness on the equipment. Also, connect all connectors (sensors and wire harness E-ECU).

2- Use the circuit tester to measure the voltage value between the sensor signals K63 - K77.

Voltage value	Condition	Corrective action
$K63 < 0.5 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>Replace the wire harness.</li> <li>Replace the E-ECU.</li> </ul>
$0.5 \text{ V} \leq K63 \leq 4.5 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.5 \text{ V} < K63$	Not OK	<ul style="list-style-type: none"> <li>Replace the wire harness.</li> <li>Replace the E-ECU.</li> </ul>

<b>Not OK</b>	Replace the wire harness or the E-ECU. Turn the power switch OFF/ON and perform the diagnosis using the diagnosis tool.
<b>OK</b>	Replace the E-ECU.

### 3. Check the output voltage of the DPF high pressure sensor:

1- Connect the checker wire harness between the E-ECU and the wire harness on the equipment. Also, connect all connectors (sensors and wire harness E-ECU).

2- Use the circuit tester to measure the voltage value between the sensor signals A12 - K77.

Voltage value	Condition	Corrective action
$A12 < 0.5 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>Replace the wire harness.</li> <li>Replace the E-ECU.</li> </ul>
$0.5 \text{ V} \leq A12 \leq 4.5 \text{ V}$	OK (Normal range)	Replace the E-ECU.



## ■ DPF inlet temperature sensor

### ● Related DTC

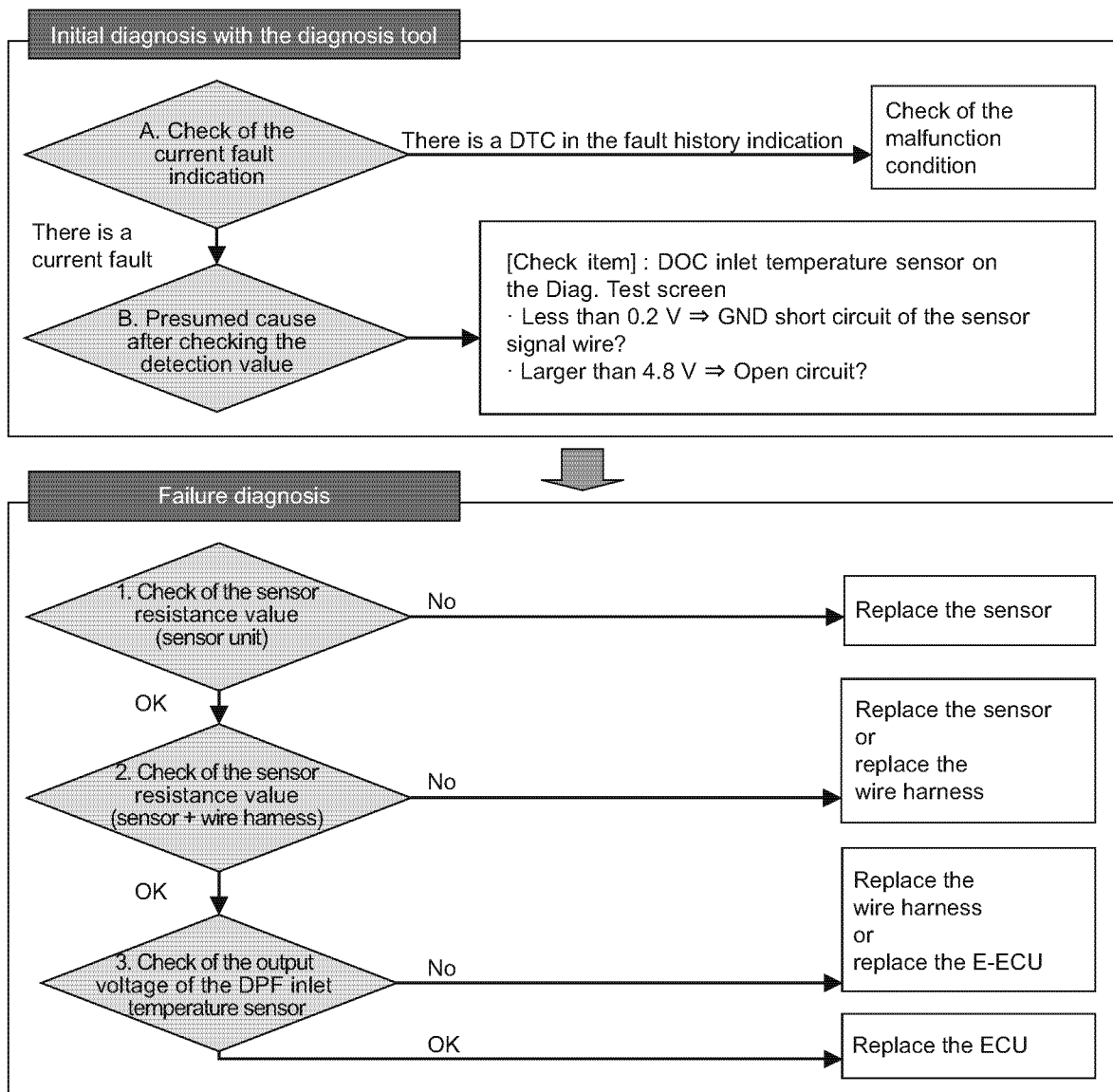
P code	P1427	Name	DPF inlet temperature sensor fault (low voltage)
SPN/FMI	3242/4		

P code	P1428	Name	DPF inlet temperature sensor fault (high voltage)
SPN/FMI	3242/3		

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

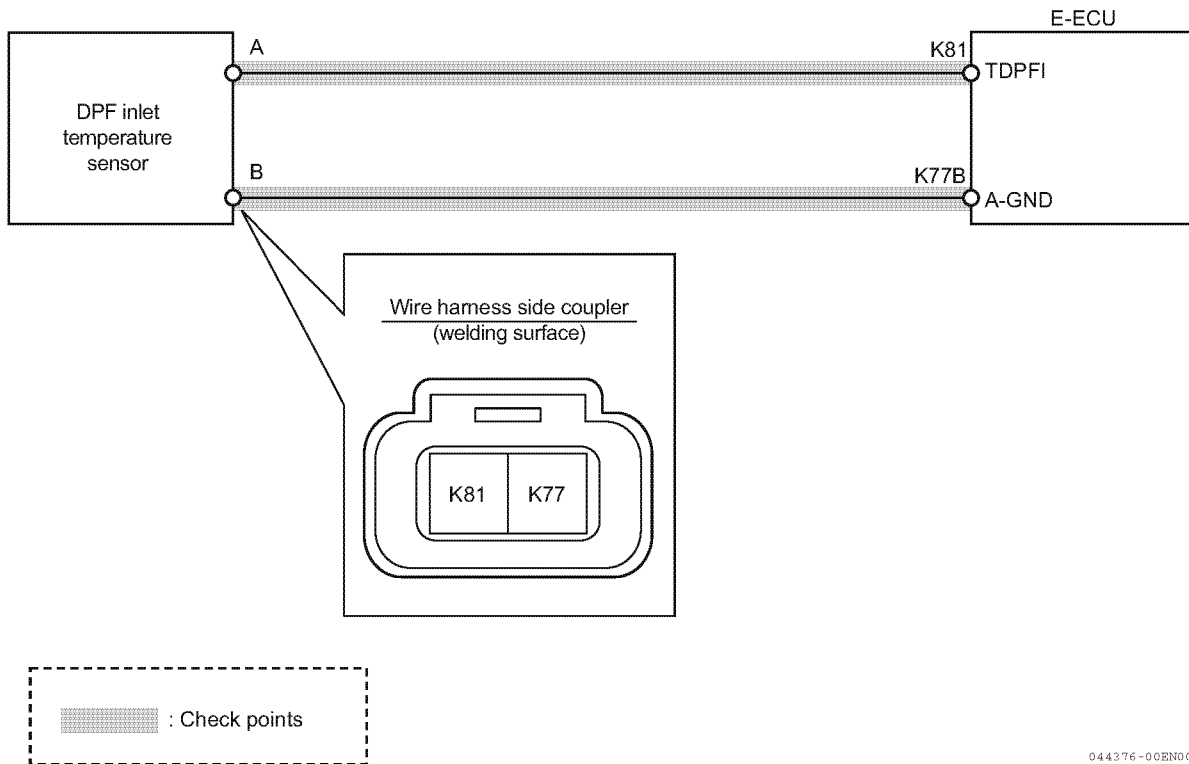
### ● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044386-01EN00

● Wire diagram



Note: For the E-ECU pin layout, refer to P287.

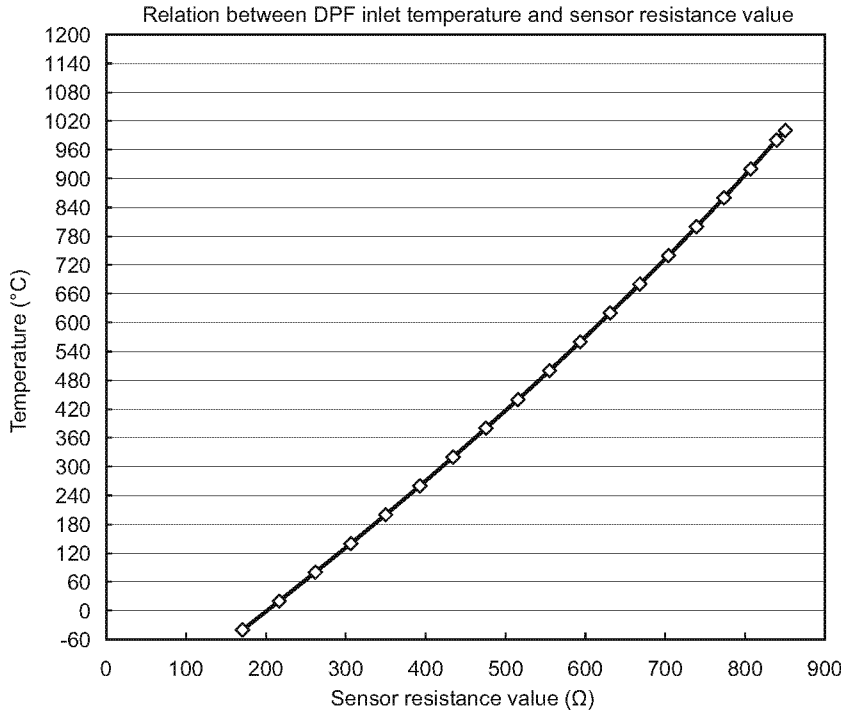
044376-00BN00

● **Work description**

1. Check of the sensor resistance value (sensor unit):

- 1- Remove the wire harness from the DPF inlet temperature sensor.
- 2- Using the circuit tester, measure the resistance value between the DPF inlet temperature sensor terminals A and B.
- 3- Refer to the following diagram “DPF inlet temperature sensor characteristics” to check that the measured resistance value is in 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

<b>Not OK</b>	Replace the DPF inlet temperature sensor.
<b>OK</b>	Refer to “Check of the sensor resistance value (sensor + wire-harness).”

2. Check of the sensor resistance value (sensor + wire-harness):

- 1- Connect the DPF inlet temperature sensor and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value between the E-ECU side wire harness connector terminals K81 and K77B.
- 3- Refer to the above diagram “DPF inlet temperature sensor characteristics” to check that the measured resistance value is in the normal range.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to “Check of the output voltage of the DPF inlet temperature sensor:”

### 3. Check of the output voltage of the DPF inlet temperature sensor:

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the DPF inlet temperature sensor signals K81 and K77B.

Voltage value	State	Treatment
$K81 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq K81 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < K81$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.

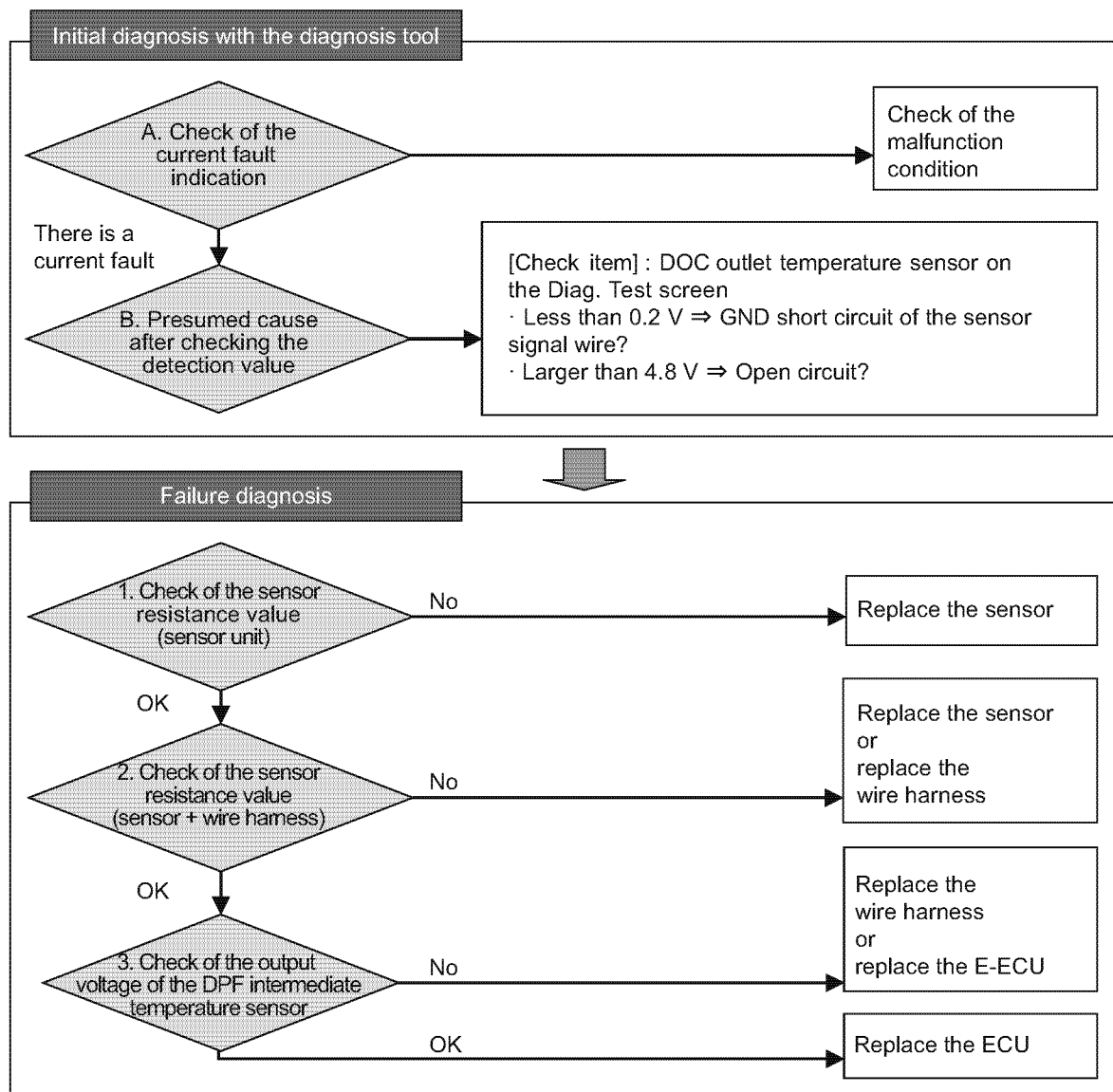
## ■ DPF intermediate temperature sensor

### ● Related DTC

P code	P1435	Name	DPF intermediate temperature sensor fault (low voltage)
SPN/FMI	3250/4		
P code	P1434	Name	DPF intermediate temperature sensor fault (high voltage)
SPN/FMI	3250/3		
P code	P0420	Name	DPF intermediate temperature sensor temperature abnormal low temperature
SPN/FMI	3250/1		
P code	P1426	Name	DPF intermediate temperature sensor temperature abnormal high (post-injection failure)
SPN/FMI	3250/0		

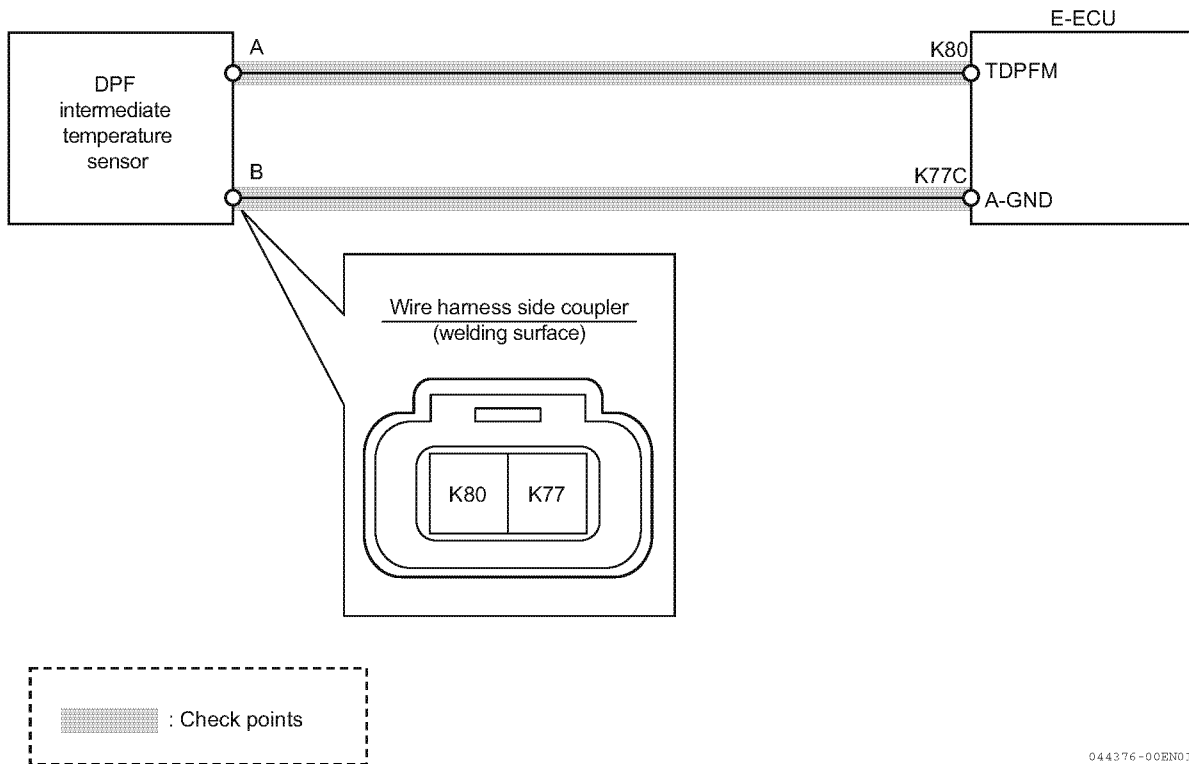
### ● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044387-01EN00

● Wire diagram



Note: For the E-ECU pin layout, refer to P287.

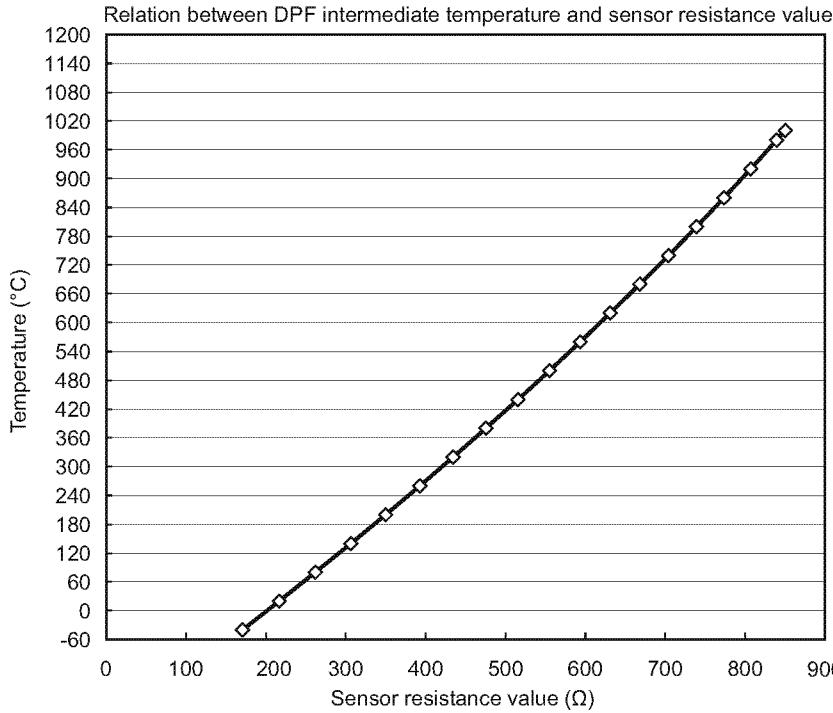
044376-00BN01

● **Work description**

1. Check of the sensor resistance value (sensor unit):

- 1- Remove the wire harness from the DPF intermediate temperature sensor.
- 2- Using the circuit tester, measure the resistance value between the DPF intermediate temperature sensor terminals A and B.
- 3- Refer to the following diagram “DPF intermediate temperature sensor characteristics” to check that the measured resistance value is in 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

<b>Not OK</b>	Replace the DPF intermediate temperature sensor.
<b>OK</b>	Refer to “Check of the sensor resistance value (sensor + wire harness).”

2. Check of the sensor resistance value (sensor + wire harness):

- 1- Connect the DPF intermediate temperature sensor and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value between the E-ECU side wire harness connector terminals K80 and K77C.
- 3- Refer to the above diagram “DPF intermediate temperature sensor characteristics” to check that the measured resistance value is in the normal range.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to “Check of the output voltage of the DPF intermediate temperature sensor.”

### 3. Check of the output voltage of the DPF intermediate temperature sensor:

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the DPF intermediate temperature sensor signals K80 and K77C.

Voltage value	State	Treatment
$K80 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq K80 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < K80$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.



■ EGR gas temperature sensor

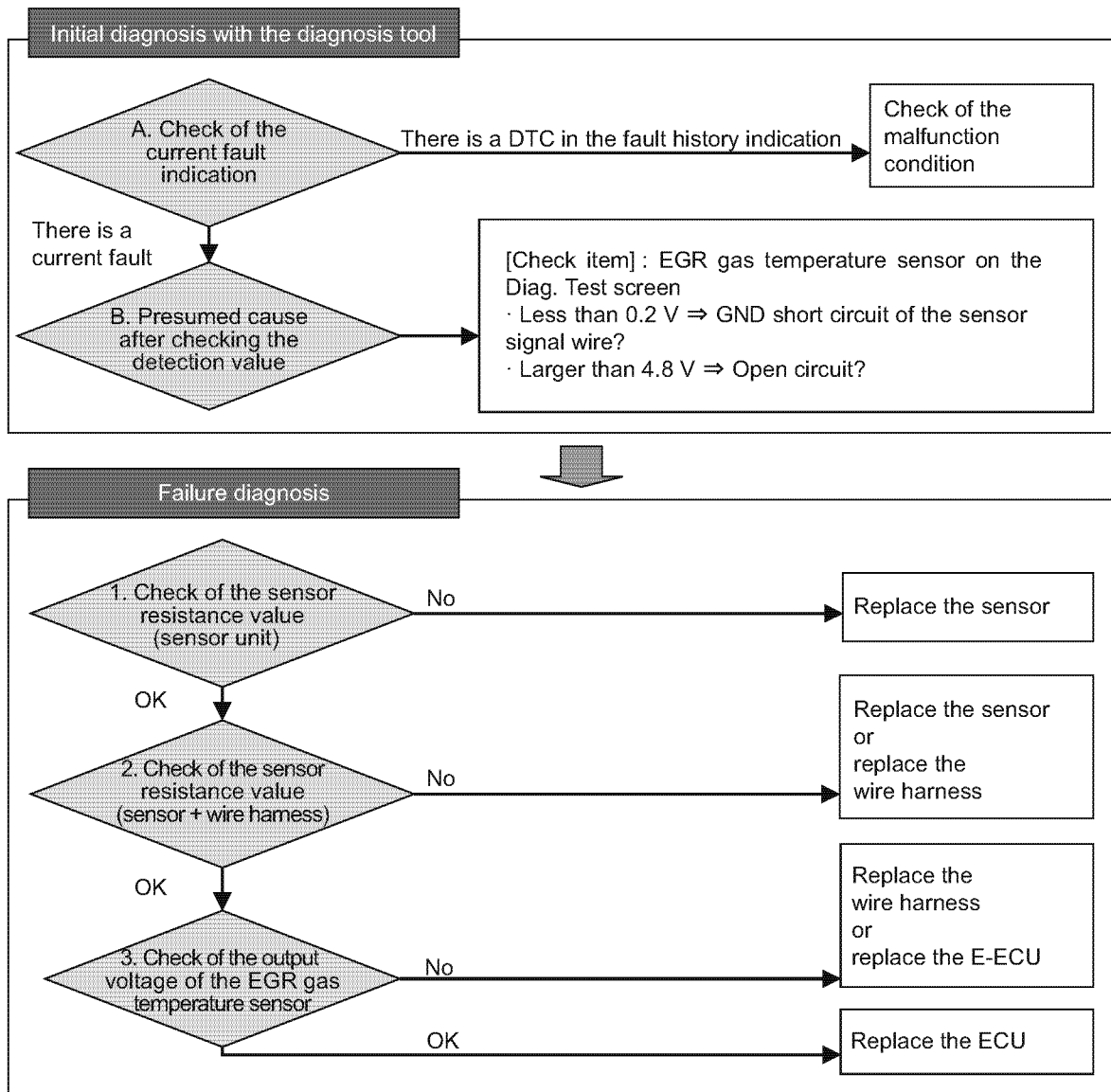
● Related DTC

P code	P041C	Name	EGR gas temperature sensor fault (low voltage)
SPN/FMI	412/4		

P code	P041D	Name	EGR gas temperature sensor fault (high voltage)
SPN/FMI	412/3		

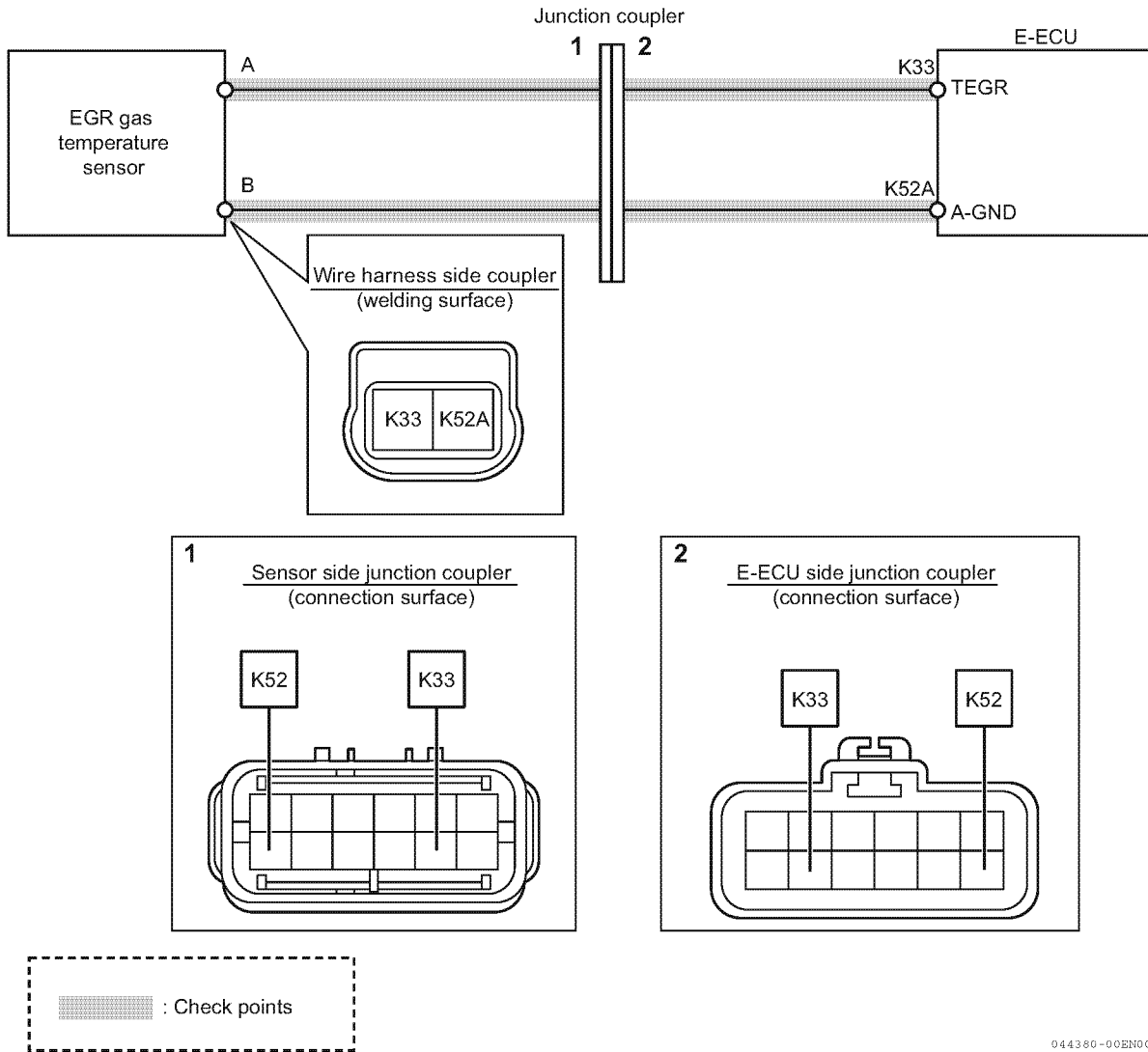
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044388-01EN00

● Wire diagram



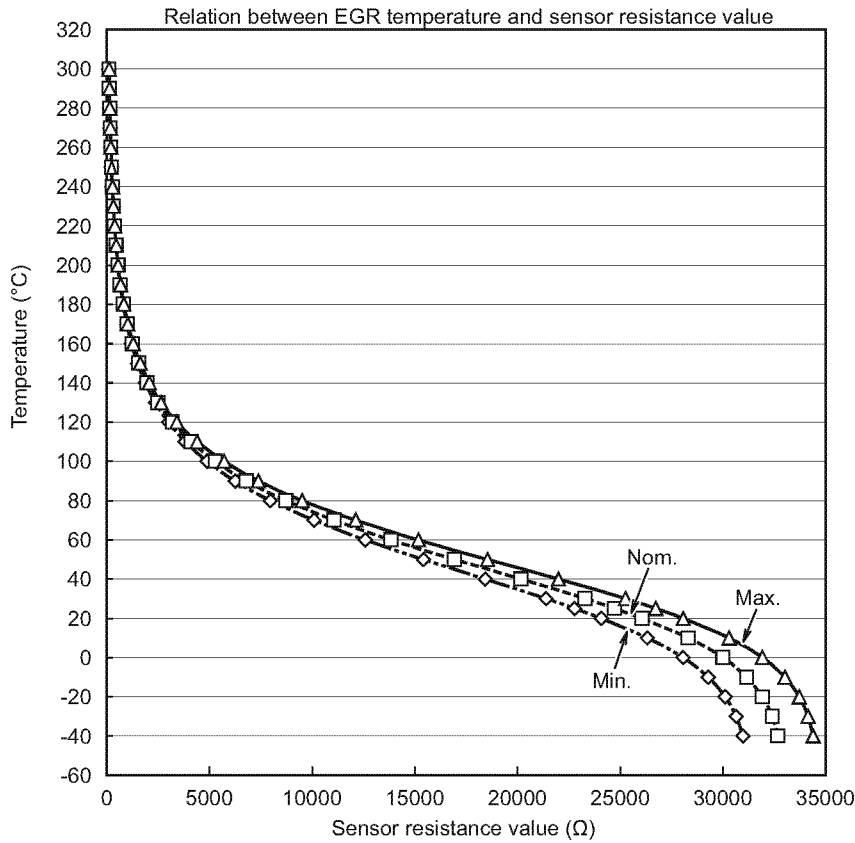
Note: For the E-ECU pin layout, refer to P287.

044380-00EN00

● Work description

1. Check of the sensor resistance value (sensor unit):
  - 1- Remove the wire harness from the EGR gas temperature sensor.
  - 2- Using the circuit tester, measure the resistance value between the EGR gas temperature sensor terminals A and B.
  - 3- Refer to the following diagram “EGR gas temperature sensor characteristics” to check that the measured resistance value is in the normal range.

EGR gas temperature sensor characteristic



Temp. (°C)	Resistance[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

Not OK	Replace the EGR gas temperature sensor.
OK	Refer to “Check of the sensor resistance value (sensor + wire harness):”

### 2. Check of the sensor resistance value (sensor + wire harness):

- 1- Connect the EGR gas temperature sensor and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value between the E-ECU side wire harness connector terminals K33 and K52A.
- 3- Refer to the above diagram "EGR gas temperature sensor characteristics" to check that the measured resistance value is in the normal range.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Check of the output voltage of the EGR gas temperature sensor."

### 3. Check of the output voltage of the EGR gas temperature sensor:

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the EGR gas temperature sensor signals K33 and K52A.

Voltage value	State	Treatment
$K33 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq K33 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < K33$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.

■ Intake manifold temperature sensor

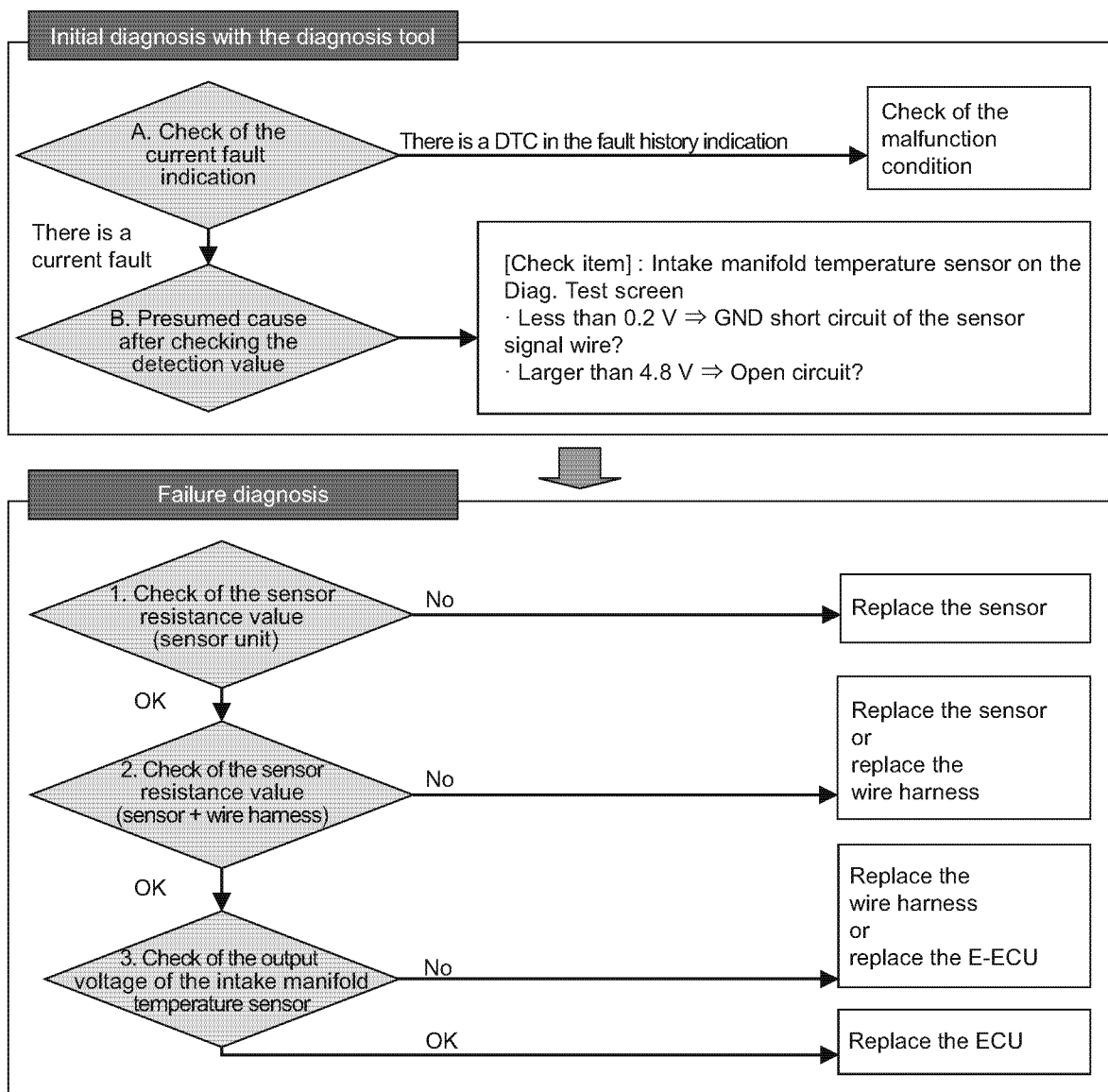
● Related DTC

P code	P040C	Name	Intake manifold temperature sensor fault (low voltage)
SPN/FMI	105/4		

P code	P040D	Name	Intake manifold temperature sensor fault (high voltage)
SPN/FMI	105/3		

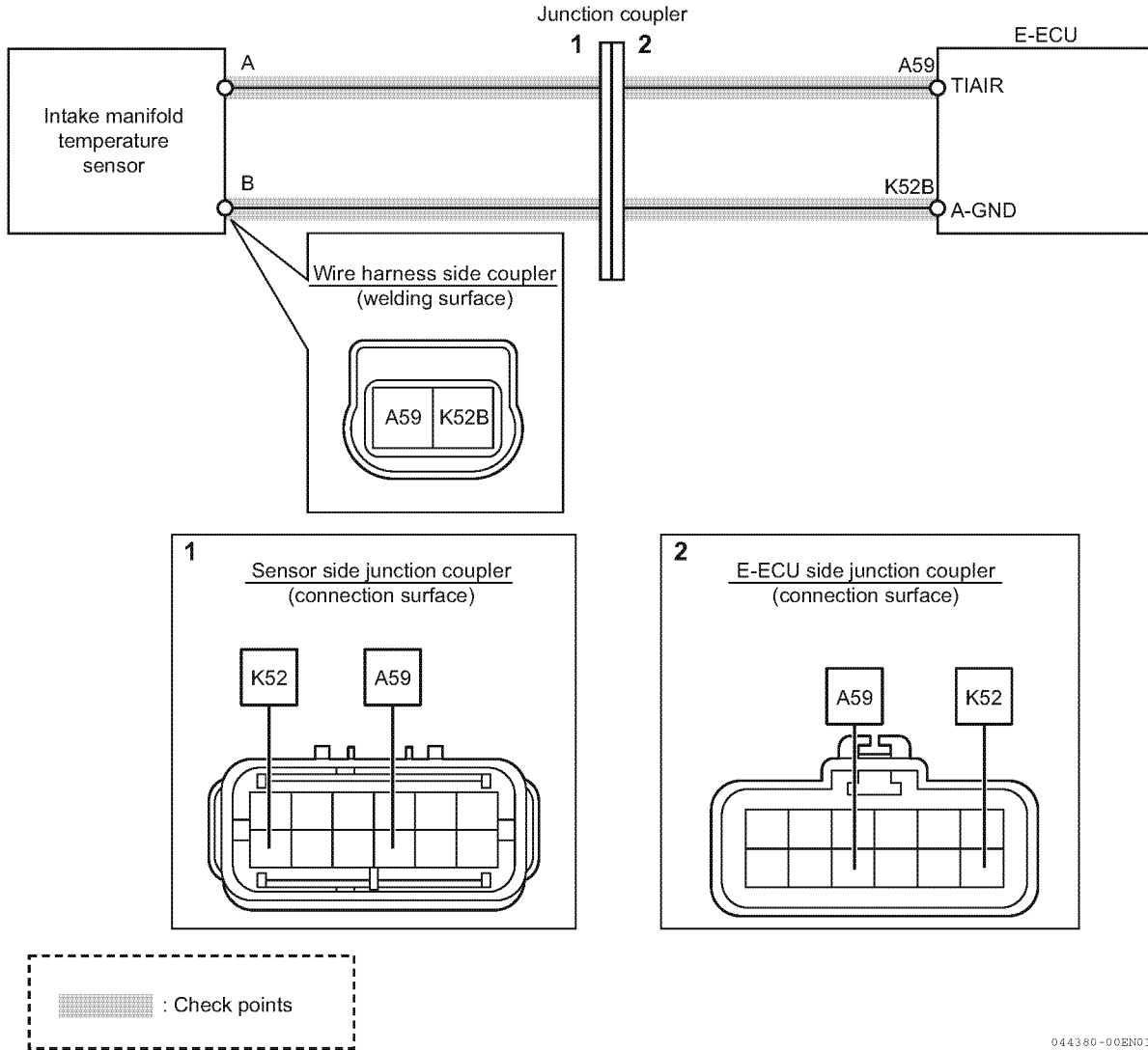
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044389-01EN00

● Wire diagram



044380-00EN01

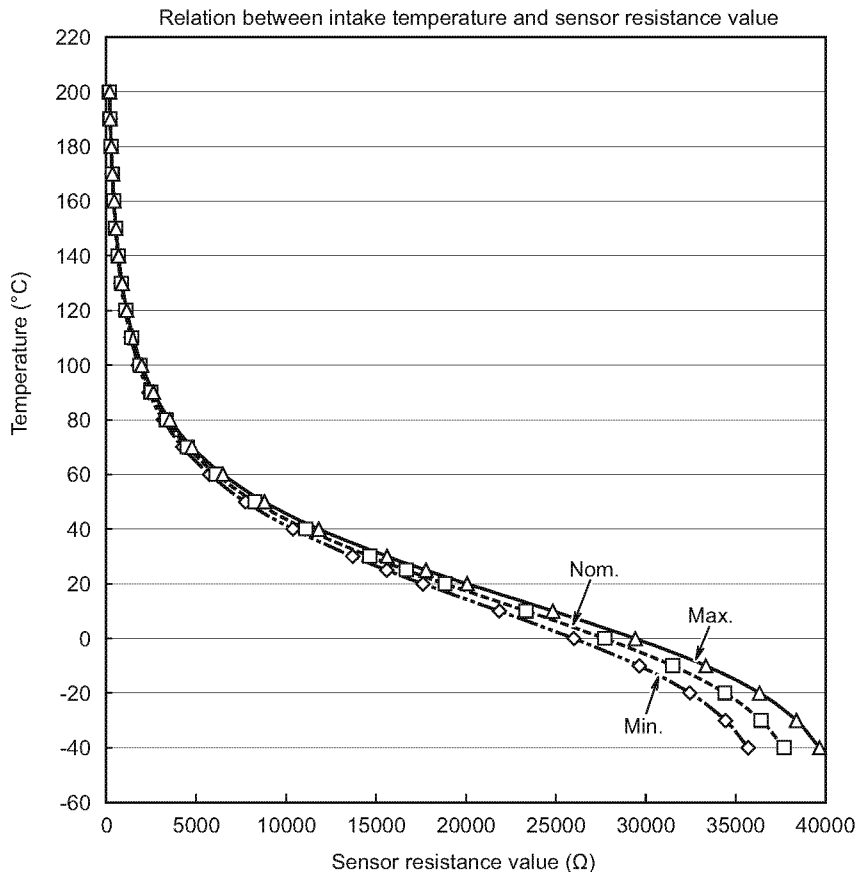
Note: For the E-ECU pin layout, refer to P287.

● Work description

1. Check of the sensor resistance value (sensor unit):

- 1- Remove the wire harness from the intake manifold temperature sensor.
- 2- Using the circuit tester, measure the resistance value between the intake manifold temperature sensor terminals A and B.
- 3- Refer to the following diagram “Intake manifold temperature sensor characteristics” to check that the measured resistance value is in 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

044402-00EN00

<b>Not OK</b>	Replace the intake manifold temperature sensor.
<b>OK</b>	Refer to “Check of the sensor resistance value (sensor + wire harness):”

### 2. Check of the sensor resistance value (sensor + wire harness):

- 1- Connect the intake manifold temperature sensor and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value between the E-ECU side wire harness connector terminals K59 and K52B.
- 3- Refer to the above diagram "Intake manifold temperature sensor characteristics" to check that the measured resistance value is in the normal range.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Check of the output voltage of the intake manifold temperature sensor."

### 3. Check of the output voltage of the intake manifold temperature sensor:

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the intake manifold temperature sensor signals A59 and K52B.

Voltage value	State	Treatment
$A59 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq A59 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < A59$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.



■ Exhaust manifold temperature sensor

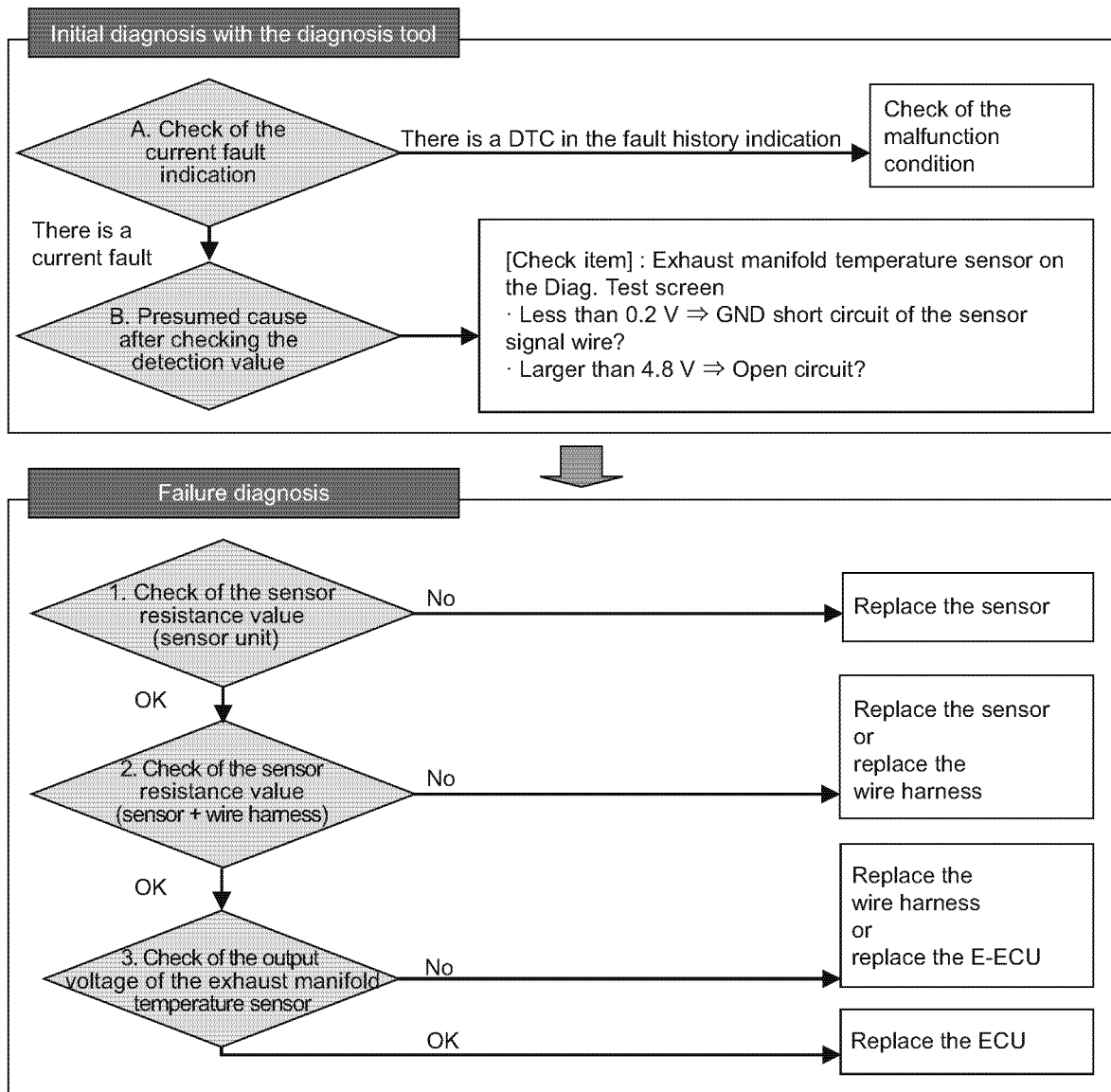
● Related DTC

P code	P0545	Name	Exhaust manifold temperature sensor fault (low voltage)
SPN/FMI	173/4		

P code	P0546	Name	Exhaust manifold temperature sensor fault (high voltage)
SPN/FMI	173/3		

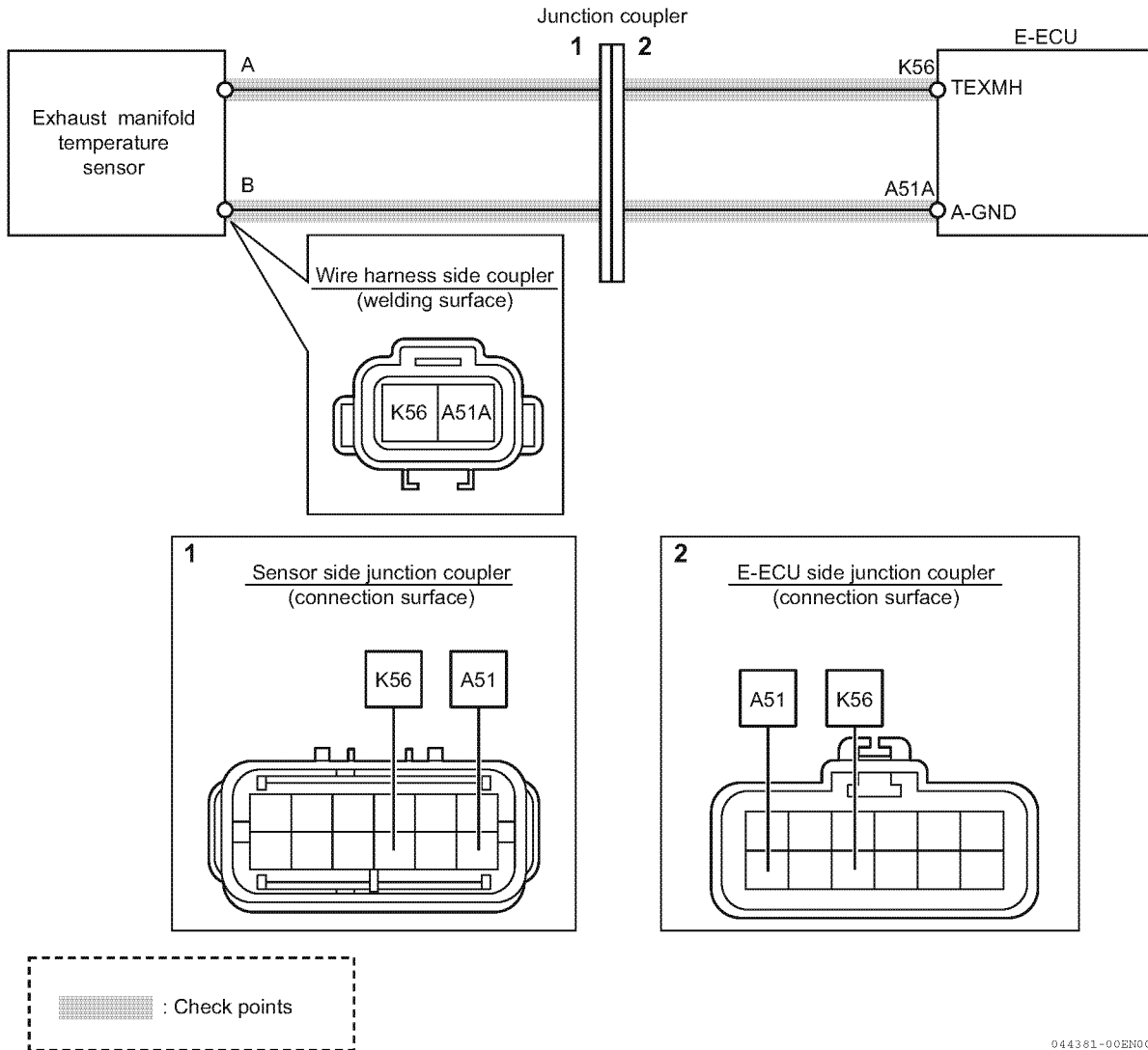
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044390-01EN00

● Wire diagram



044381-00EN00

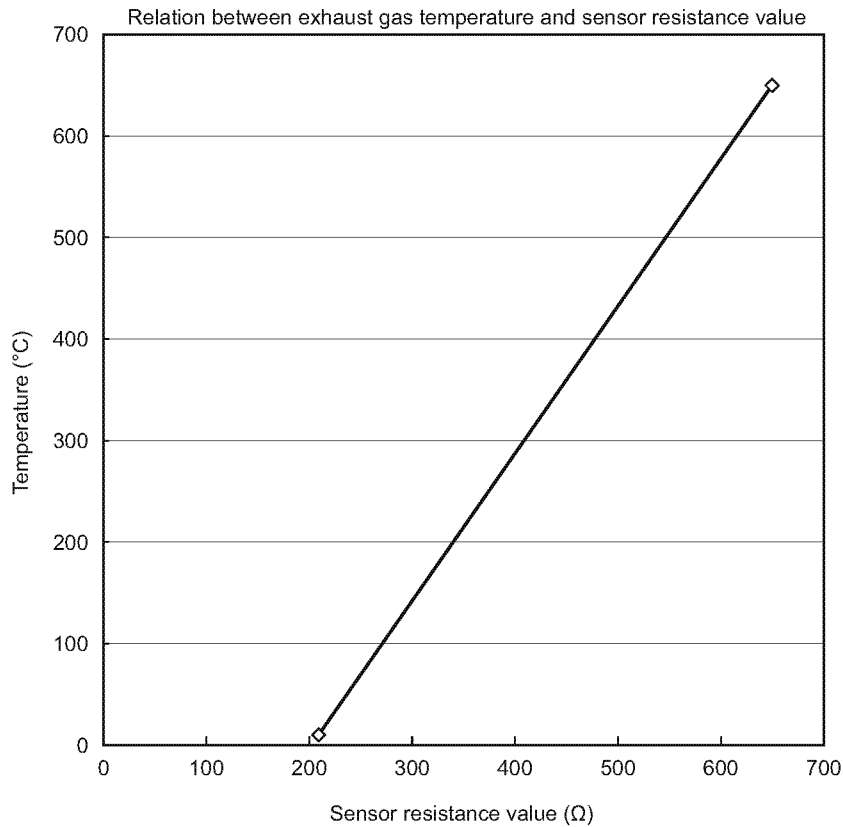
Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Check of the sensor resistance value (sensor unit):

- 1- Remove the wire harness from the exhaust manifold temperature sensor.
- 2- Using the circuit tester, measure the resistance value between the exhaust manifold temperature sensor terminals A and B.
- 3- Refer to the following diagram "exhaust manifold temperature sensor characteristics" to check that the measured resistance value is in the normal range.

#### Exhaust manifold temperature sensor characteristics



Temp. (°C)	Resistance[Ω]
10	209.15
650	649.77

044404-00EN00

<b>Not OK</b>	Replace the exhaust manifold temperature sensor.
<b>OK</b>	Refer to "Check of the sensor resistance value (sensor + wire harness)."

### 2. Check of the sensor resistance value (sensor + wire harness):

- 1- Connect the exhaust manifold temperature sensor and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value between the E-ECU side wire harness connector terminals K56 and A51A.
- 3- Refer to the above diagram "exhaust manifold temperature sensor characteristics" to check that the measured resistance value is in the normal range.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the sensor and the wire harness may be defective. Replace the sensor.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Check of the output voltage of the exhaust manifold temperature sensor:"

### 3. Check of the output voltage of the exhaust manifold temperature sensor:

- 1- Connect the checker harness between the E-ECU and the machine wire harness. Also, connect all connectors (sensor and E-ECU).
- 2- Using the circuit tester, measure the voltage value between the exhaust manifold temperature sensor signals A56 and A51A.

Voltage value	State	Treatment
$K56 < 0.2 \text{ V}$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
$0.2 \text{ V} \leq K56 \leq 4.8 \text{ V}$	OK (Normal range)	Replace the E-ECU.
$4.8 \text{ V} < K56$	Not OK	<ul style="list-style-type: none"> <li>• Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.

## Contact output related

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### ■ Main relay

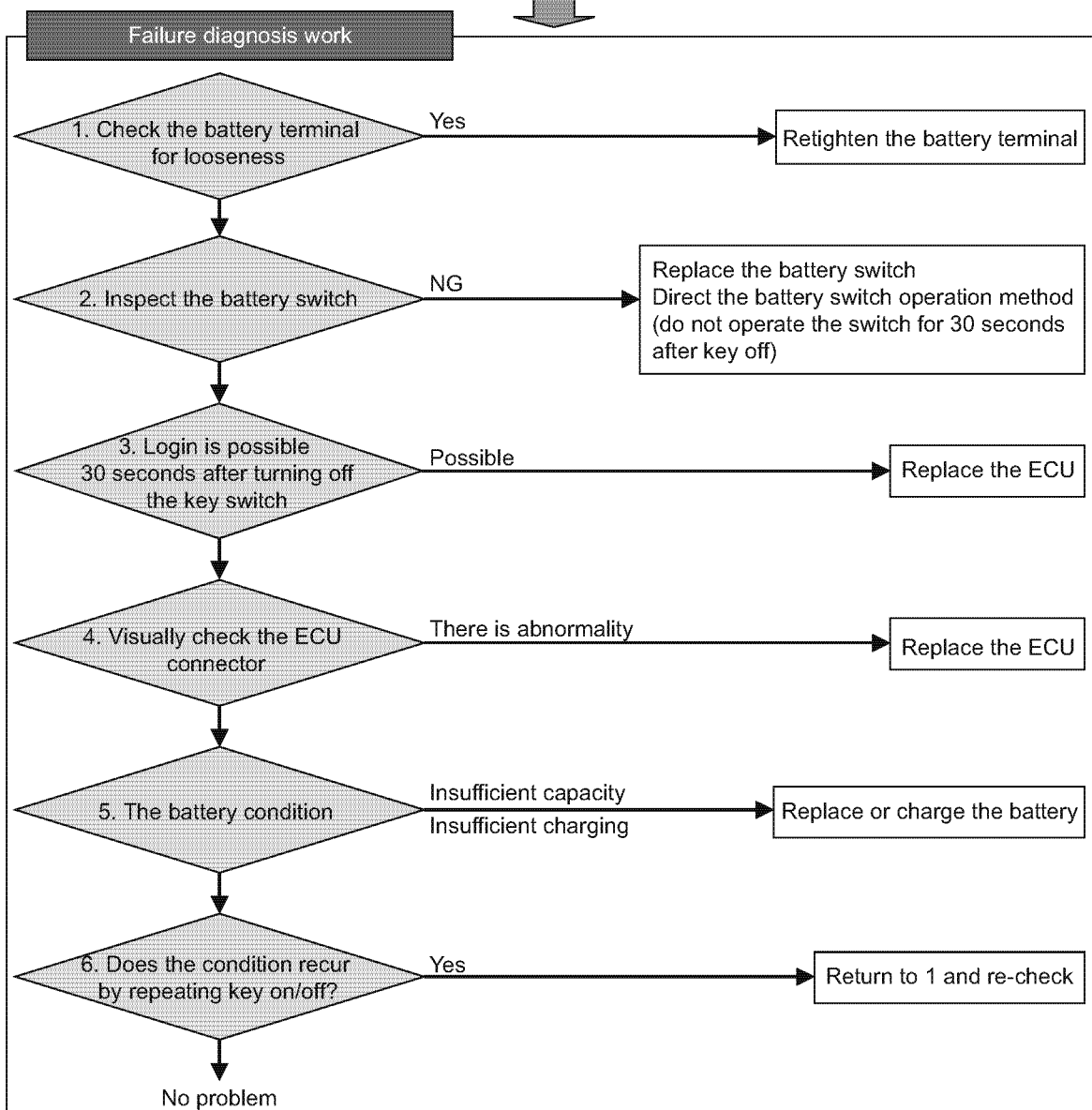
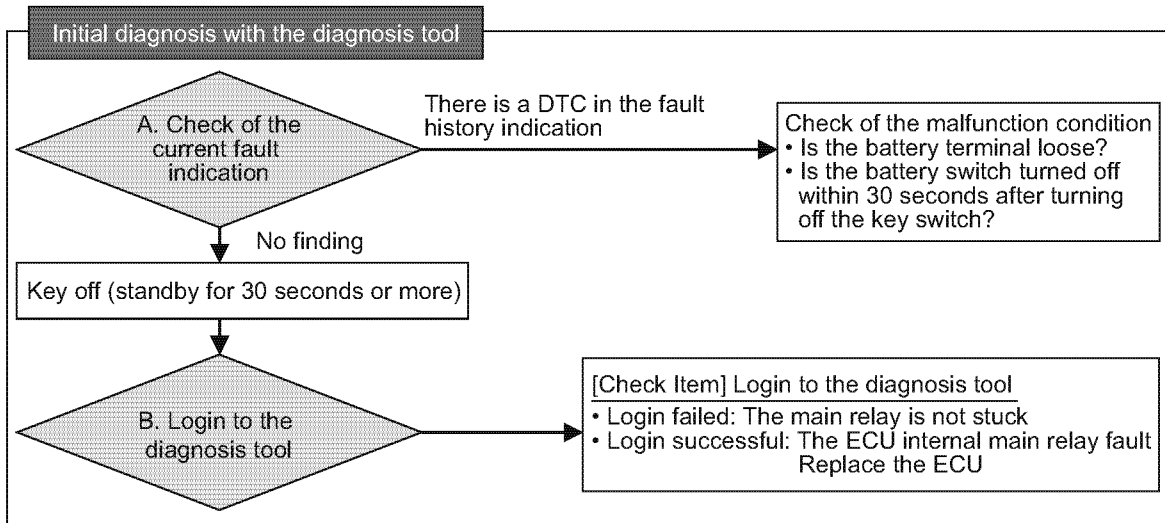
#### ● Related DTC

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

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

● Workflow

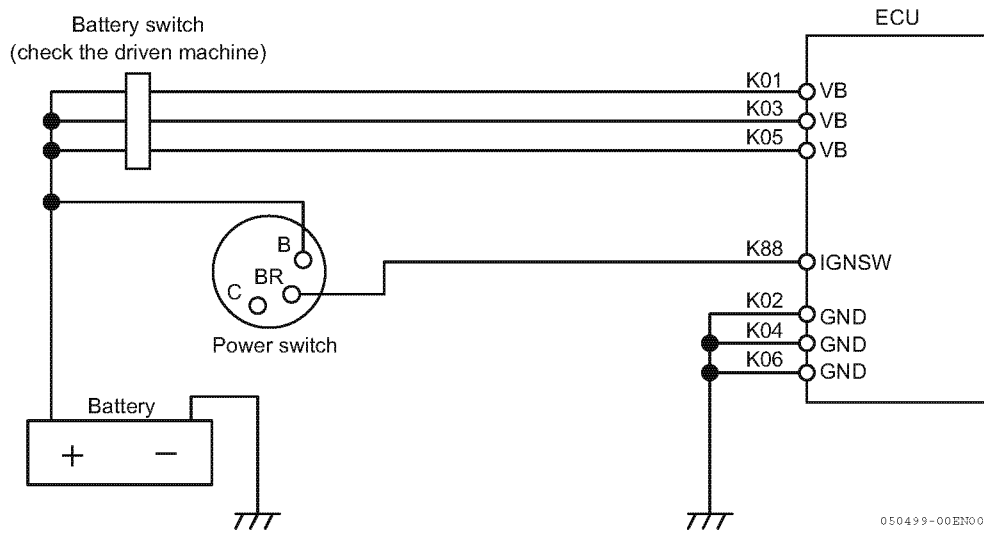
Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



0504 98-00EN00

● Wire diagram

Note: The main relay is equipped with an ECU.



Note: For the E-ECU pin layout, refer to P287.

### ● 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 diagnosis tool

When 30 seconds or more are elapsed after turning off the key switch, the ECU operation stops completely. Connect the diagnosis tool 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 E-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.



## ■ Startup assist relay (Glow relay)

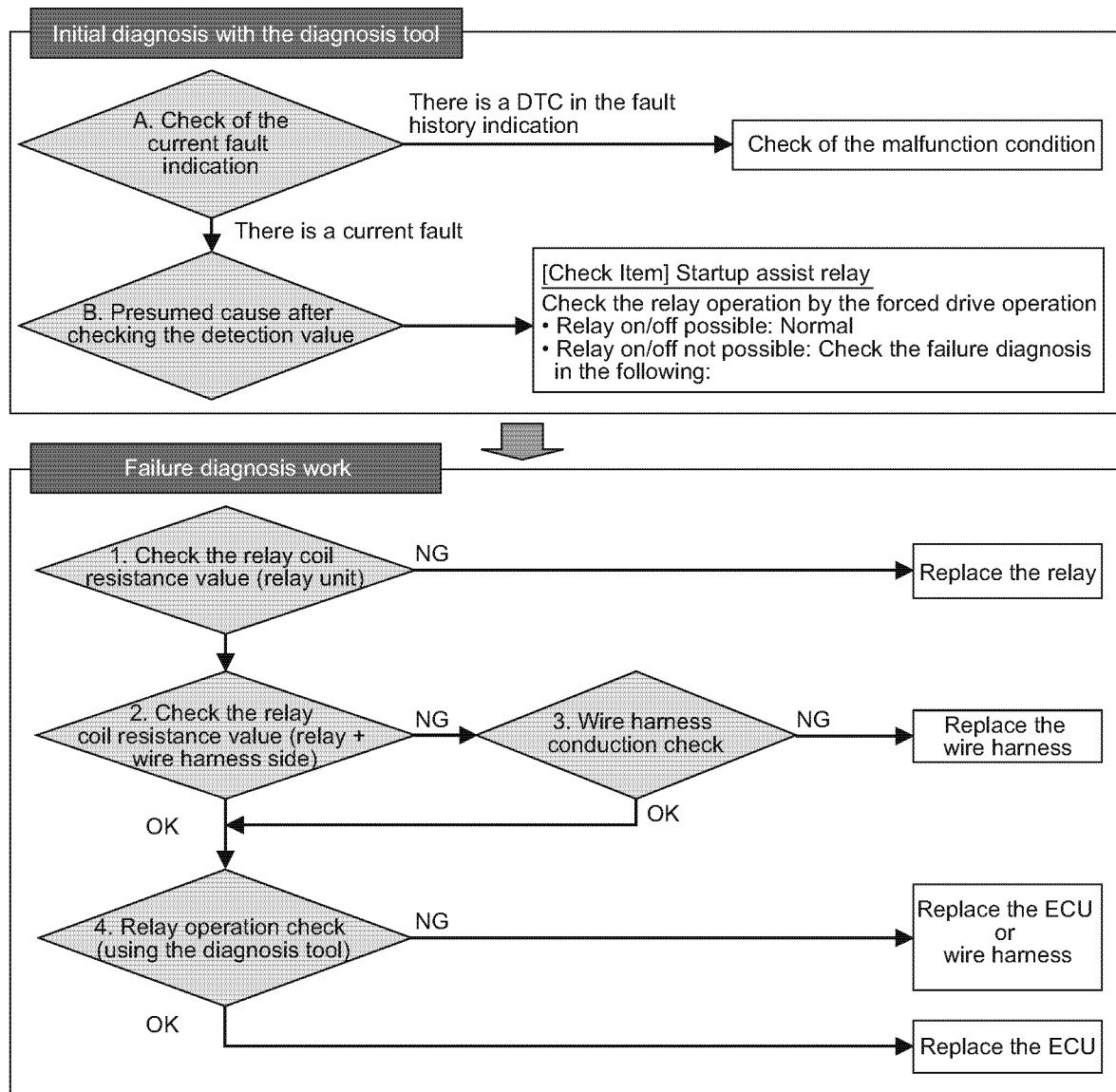
### ● Related DTC

P code	P0543	Name	Startup assist relay interrupted
SPN/FMI	522243/5		

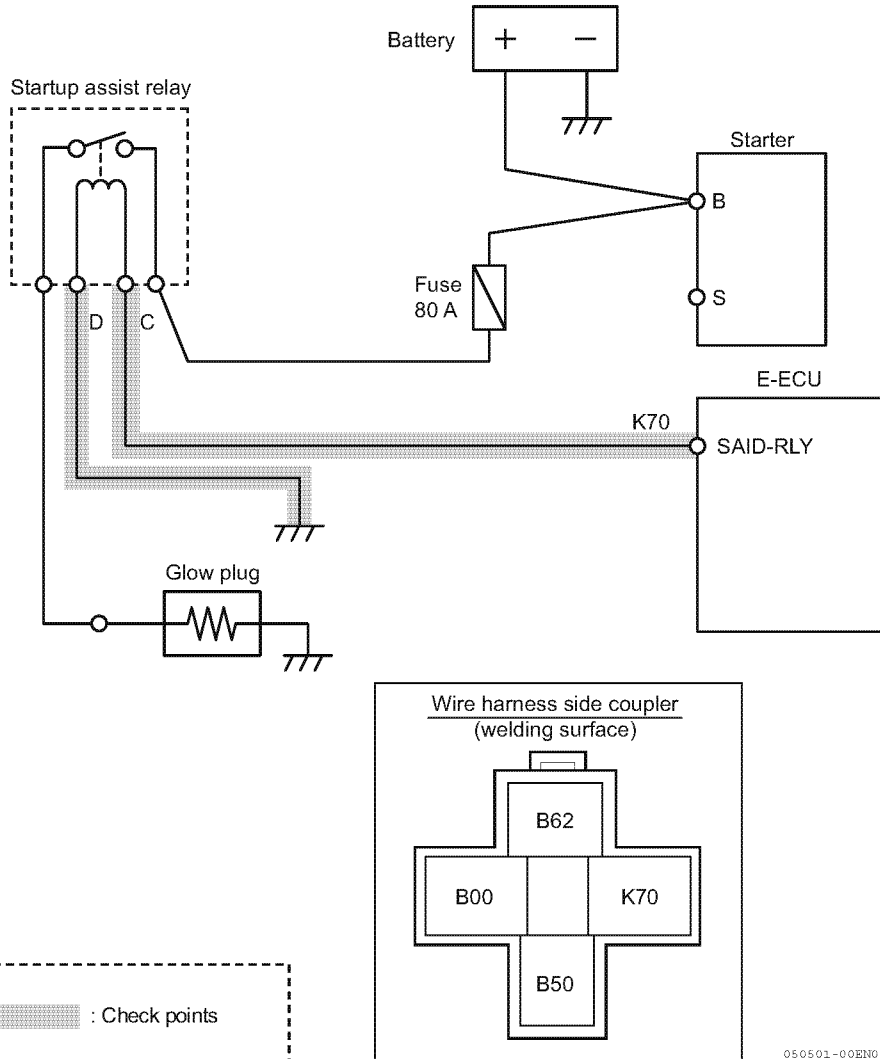
P code	P0541	Name	Startup assist relay GND interrupted
SPN/FMI	522243/6		

### ● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



● Wire diagram



Note: For the E-ECU pin layout, refer to P287.

050501-00ENG00

## ● Work description

### 1. Check the relay coil resistance value (relay unit)

- 1- Remove the wire harness from the startup assist relay.
- 2- Use the circuit tester to measure the resistance value between the relay side terminals C - D.

**Reference: Total resistance value of the Yanmar standard startup assist relay**

Relay	Terminal	Specification
129927-77930 (40 A)	Relay coil side C - D	103 $\Omega$ $\pm$ 10 % (at 20 °C)
129927-77920 (70 A)	Relay coil side C - D	103 $\Omega$ $\pm$ 10 % (at 20 °C)
129927-77900 (90 A)	Relay coil side C - D	80 $\Omega$ (at 20 °C)

<b>NG</b>	Replace the startup assist relay.
<b>OK</b>	Check the relay coil resistance value while the startup assist relay and the wire harness are connected. Refer to "Check the relay coil resistance value (relay + wire harness side)"

### 2. Check the relay coil resistance value (relay + wire harness side)

- 1- Connect the startup assist relay to the wire harness. Remove the E-ECU from the wire harness.
- 2- Use the circuit tester to measure the resistance value between the ECU connectors K70 - K02.

*Note: Refer to the above-mentioned reference "Total resistance value of the Yanmar standard startup assist relay".*

<b>NG</b>	Check the wire-harness conduction. Refer to "Wire harness conduction check".
<b>OK</b>	Use the diagnosis tool to check the operation of the startup assist relay. Refer to "Relay operation check".

### 3. Wire harness conduction check

- 1- Remove the wire harness from the startup assist relay and the E-ECU.
- 2- Use the circuit tester to measure the wire harness conduction.

Terminal	Conduction	Condition
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

<b>NG</b>	<ul style="list-style-type: none"> <li>• Check the wire harness for damage. Check the wiring for mis-connection.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Use the diagnosis tool to check the operation of the startup assist relay. Refer 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 289). Also, connect all connectors (startup assist relay, ECU).
- 2- Turn on the key switch. Login to the diagnosis tool.
- 3- Operate the startup assist relay on the "Diagnosis Test: Forced Drive" of the diagnosis tool. At this time, measure the voltage between the terminals K70 - K02.

ON/OFF setting condition	Voltage value	Voltage value
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

<b>NG</b>	<ul style="list-style-type: none"> <li>• Check the wire harness for damage. Check the wiring for mis-connection.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Replace the E-ECU.

## Contact input related

### ■ Contact input related 1

#### ● Related DTC

P code	P1192	Name	Oil pressure switch open circuit
SPN/FMI	100/4		

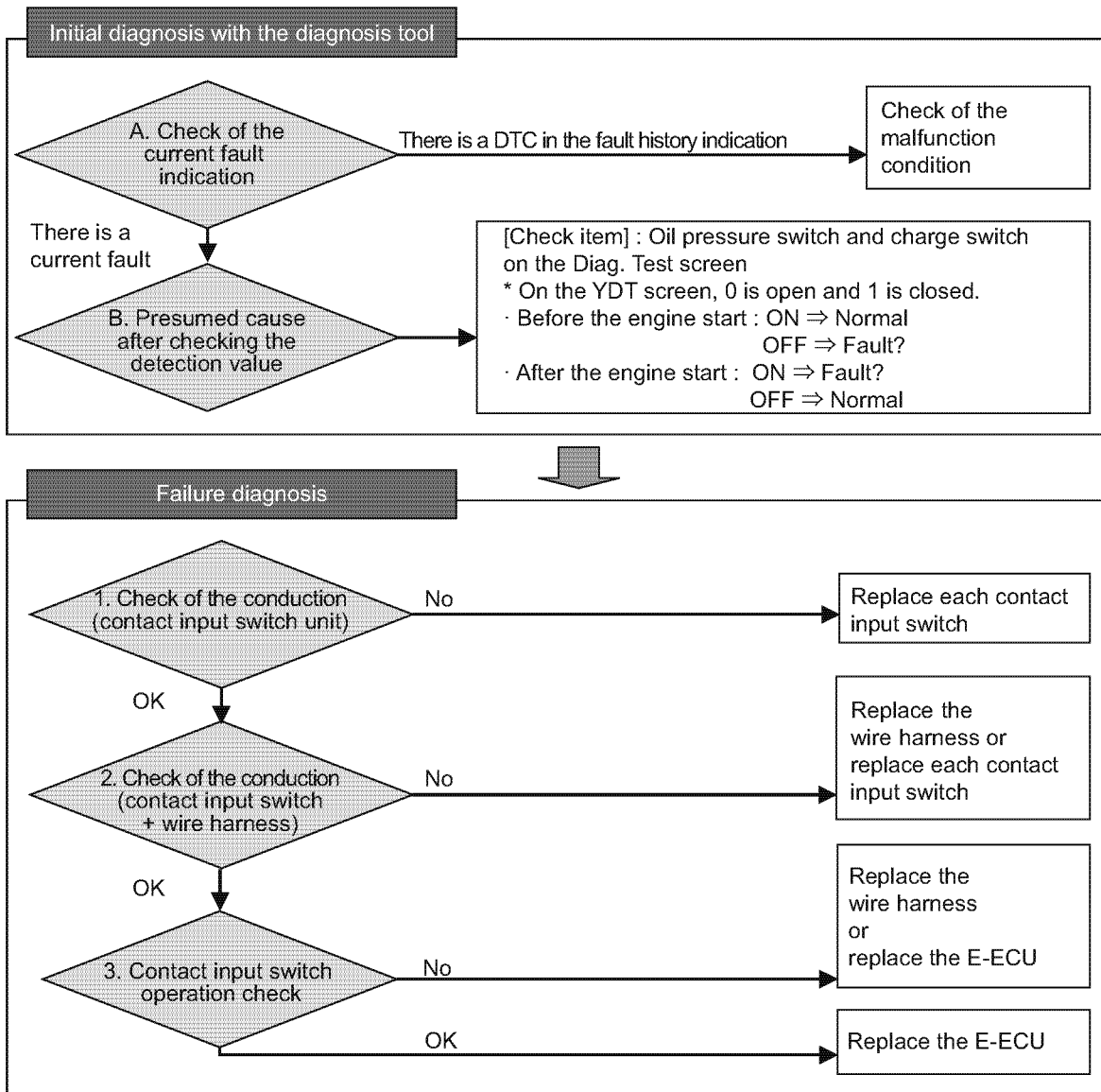
P code	P1198	Name	Low oil pressure fault alarm
SPN/FMI	100/1		

P code	P1562	Name	Charge switch open circuit
SPN/FMI	167/5		

P code	P1568	Name	Charge alarm
SPN/FMI	167/1		

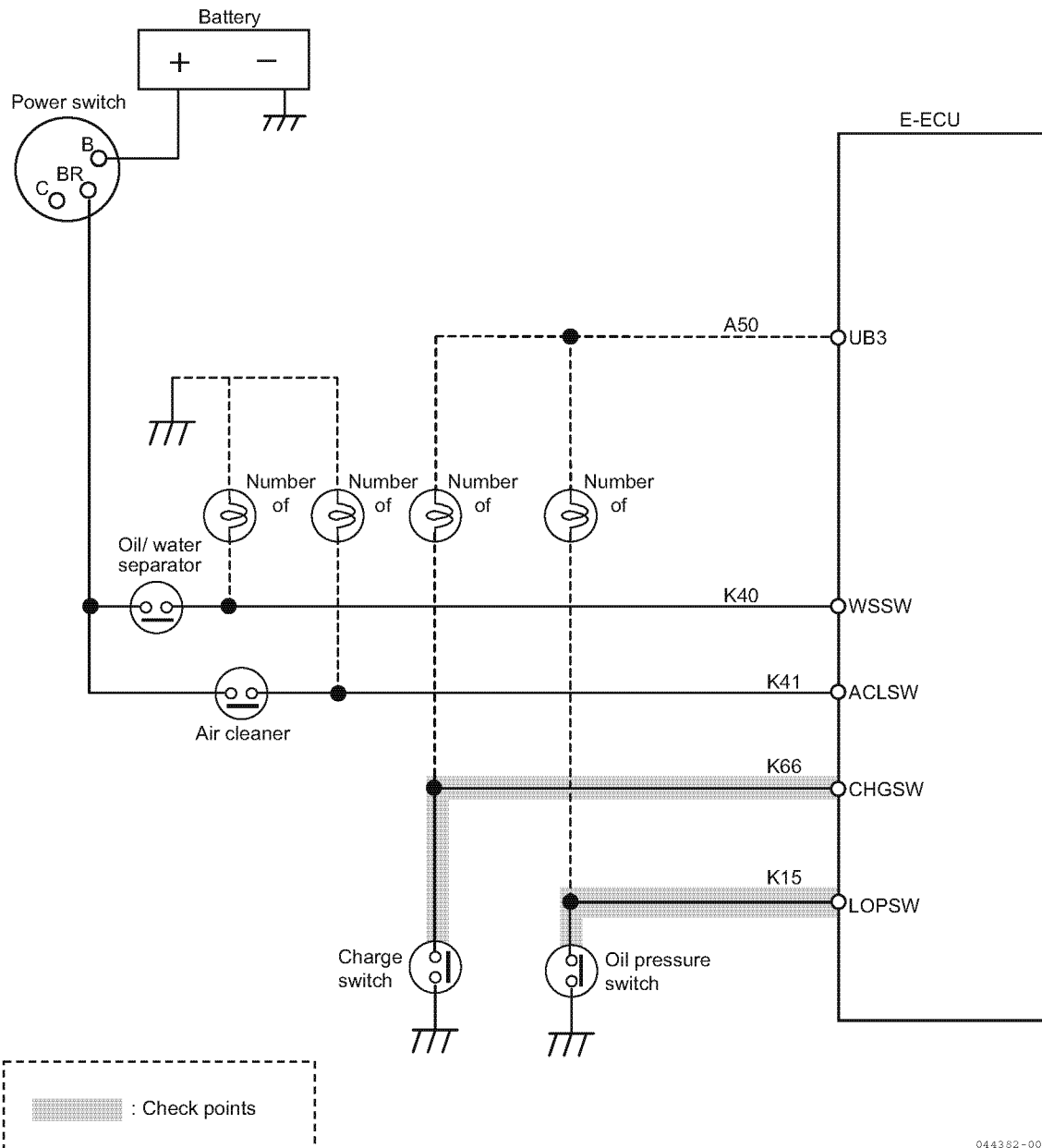
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



0443 91-01EN00

● Wire diagram



044382-00EN00

Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Check of the conduction (contact input switch unit):

- 1- Turn off the ECU power.
- 2- Remove the wire harness from each contact input switch.
- 3- Using the circuit tester and seeing the below table, check the conduction between the contact input terminal and the body frame.

Item	Terminal No.	Conduction (Between the terminal and the body frame)	State
Oil pressure switch	K15	Yes	OK: Normal
		No	NG: Abnormal
Charge switch	K66	No	OK: Normal
		Yes	NG: Abnormal

<b>Not OK</b>	Replace the contact input switch.
<b>OK</b>	Refer to "Check of the conduction (contact input switch + wire harness)."

### 2. Check of the conduction (contact input switch + wire harness):

- 1- Connect the contact input switch and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the conduction between the E-ECU connector terminal and the body frame of the wire harness. For the number of the terminal that is checked, refer to 1. above.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the contact input switch and the wire harness may be defective. Replace the contact input switch.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Contact input switch operation check."

### 3. Contact input switch operation check:

- 1- Connect all connectors (contact input switch, E-ECU, junction coupler).
- 2- Connect the diagnosis tool and login to the diagnosis tool after turning on the power switch.
- 3- Monitor each item on the "Diagnosis Test: Digital input, etc. Diag. Test" and check the ON/OFF display of the contact input switch in the specified condition.

Item	Check condition	ON/OFF indication	State
Oil pressure switch	Before engine start	ON (1)	OK: Normal
		OFF (0)	NG: Abnormal
	During engine operation	OFF (0)	OK: Normal
		ON (1)	NG: Abnormal
Charge switch	Before engine start	ON (1)	OK: Normal
		OFF (0)	NG: Abnormal
	During engine operation	OFF (0)	OK: Normal
		ON (1)	NG: Abnormal

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.



■ Contact input related 2

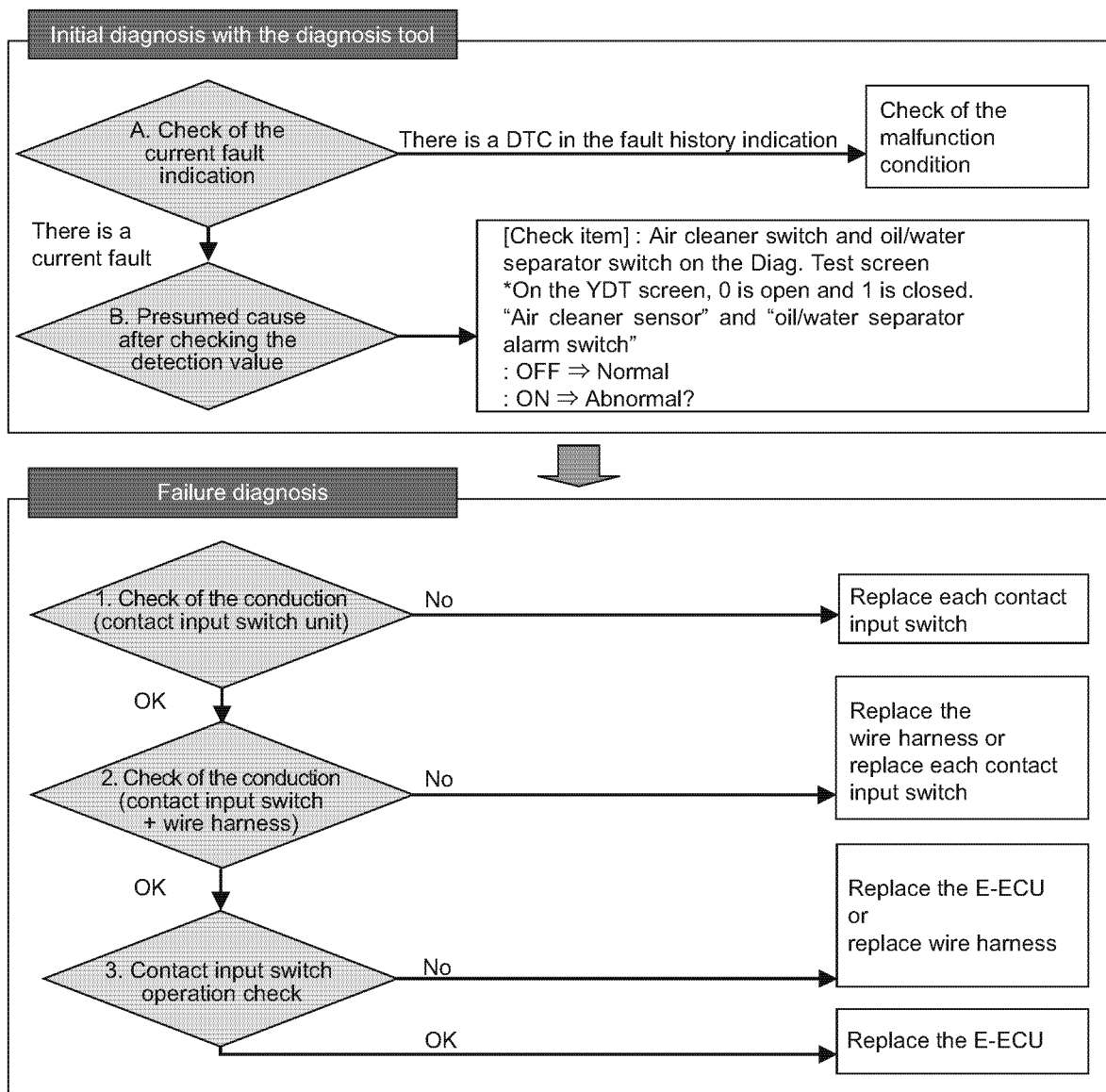
● Related DTC

P code	P1101	Name	Air cleaner clogged alarm?
SPN/FMI	522323/0		

P code	P1151	Name	Oil/water separator alarm
SPN/FMI	522329/0		

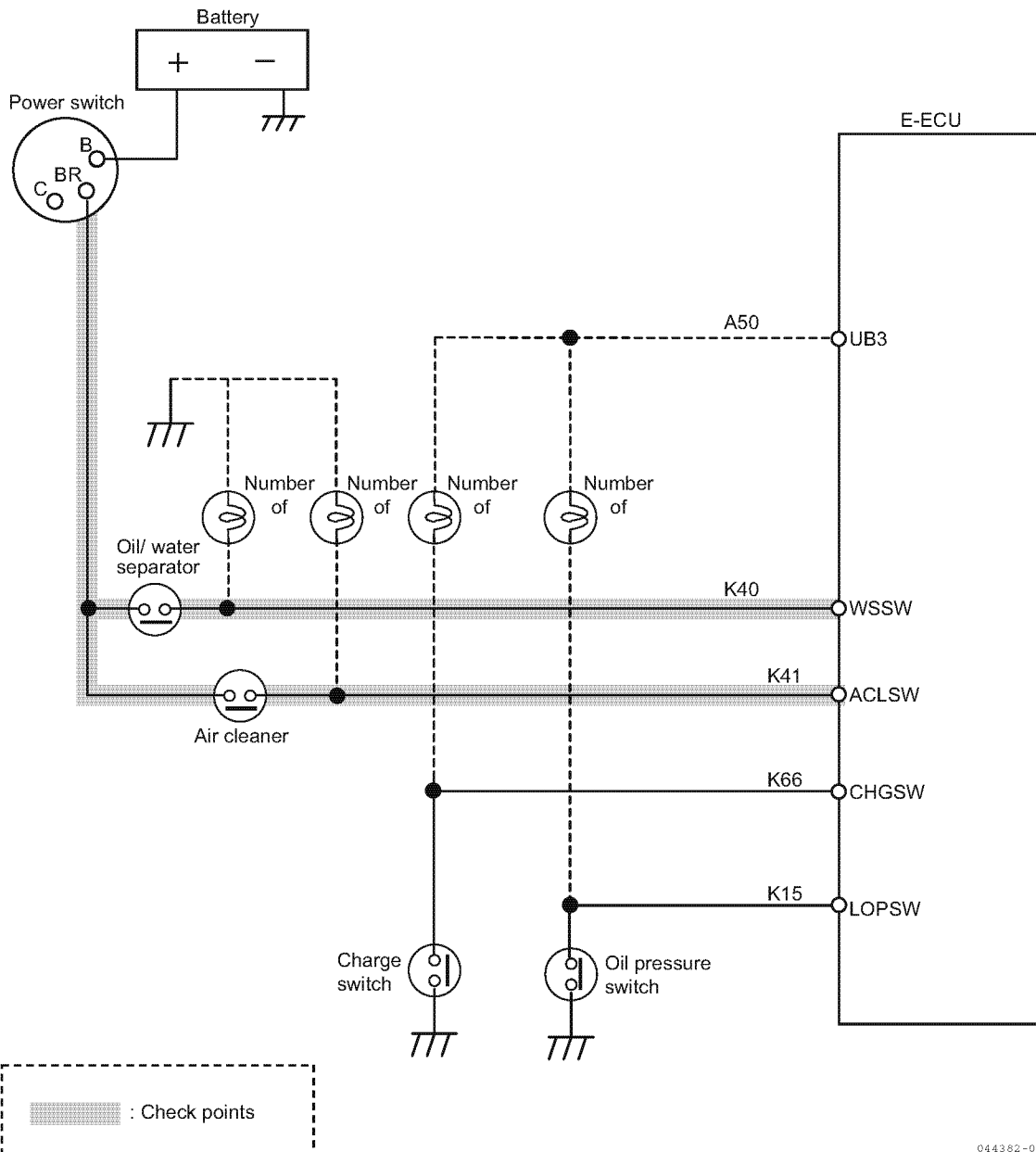
● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044392-01EN00

● Wire diagram



044382-00EN01

Note: For the E-ECU pin layout, refer to P287.

### ● Work description

#### 1. Check of the conduction (contact input switch unit):

- 1- Turn off the ECU power.
- 2- Remove the wire harness from each contact input switch.
- 3- Using the circuit tester and seeing the below table, check the conduction between the contact input terminals of each switch.

Item	Terminal No.	Conduction (Between each switch terminal)	State
Air cleaner switch	K41	No	OK: Normal
		Yes	NG: Abnormal
Oil/water separator switch	K40	No	OK: Normal
		Yes	NG: Abnormal

<b>Not OK</b>	Replace the contact input switch.
<b>OK</b>	Refer to "Check of the conduction (contact input switch + wire harness):"

#### 2. Check of the conduction (contact input switch + wire harness):

- 1- Connect the contact input switch and the wire harness and remove the E-ECU and key switch terminal (BR) from the wire harness.
- 2- Using the circuit tester, check the conduction between the E-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.

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the contact input switch and the wire harness may be defective. Replace the contact input switch.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Contact input switch operation check:"

#### 3. Contact input switch operation check:

- 1- Connect all connectors (contact input switch, E-ECU, key switch terminal (BR)).
- 2- Connect the diagnosis tool and login to the diagnosis tool after turning on the power switch.
- 3- Monitor each item on the "Diag. Test" and check the ON/OFF display of the contact input switch in the specified condition.

Item	ON/OFF indication	State
Air cleaner switch	OFF (0)	OK: Normal
	ON (1)	NG: Abnormal
Oil/water separator switch	OFF (0)	OK: Normal
	ON (1)	NG: Abnormal

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the E-ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>
<b>OK</b>	Replace the E-ECU.

## CRS (common rail system) related

### ■ Injector

#### *Injector open circuit and coil short circuit*

#### ● Related DTC

P code	P0204 (4TNV) P0203 (3TNV)	Name	Injector 1 open circuit (inherent location of the injector)
SPN/FMI	651/5 (4TNV) 652/5 (3TNV)		

P code	P0202	Name	Injector 2 open circuit (inherent location of the injector)
SPN/FMI	653/5		

P code	P0201	Name	Injector 3 open circuit (inherent location of the injector)
SPN/FMI	654/5		

P code	P0203	Name	Injector 4 open circuit (inherent location of the injector)
SPN/FMI	652/5		

P code	P0271 (4TNV) P0268 (3TNV)	Name	Injector 1 coil short circuit
SPN/FMI	651/6 (4TNV) 652/6 (3TNV)		

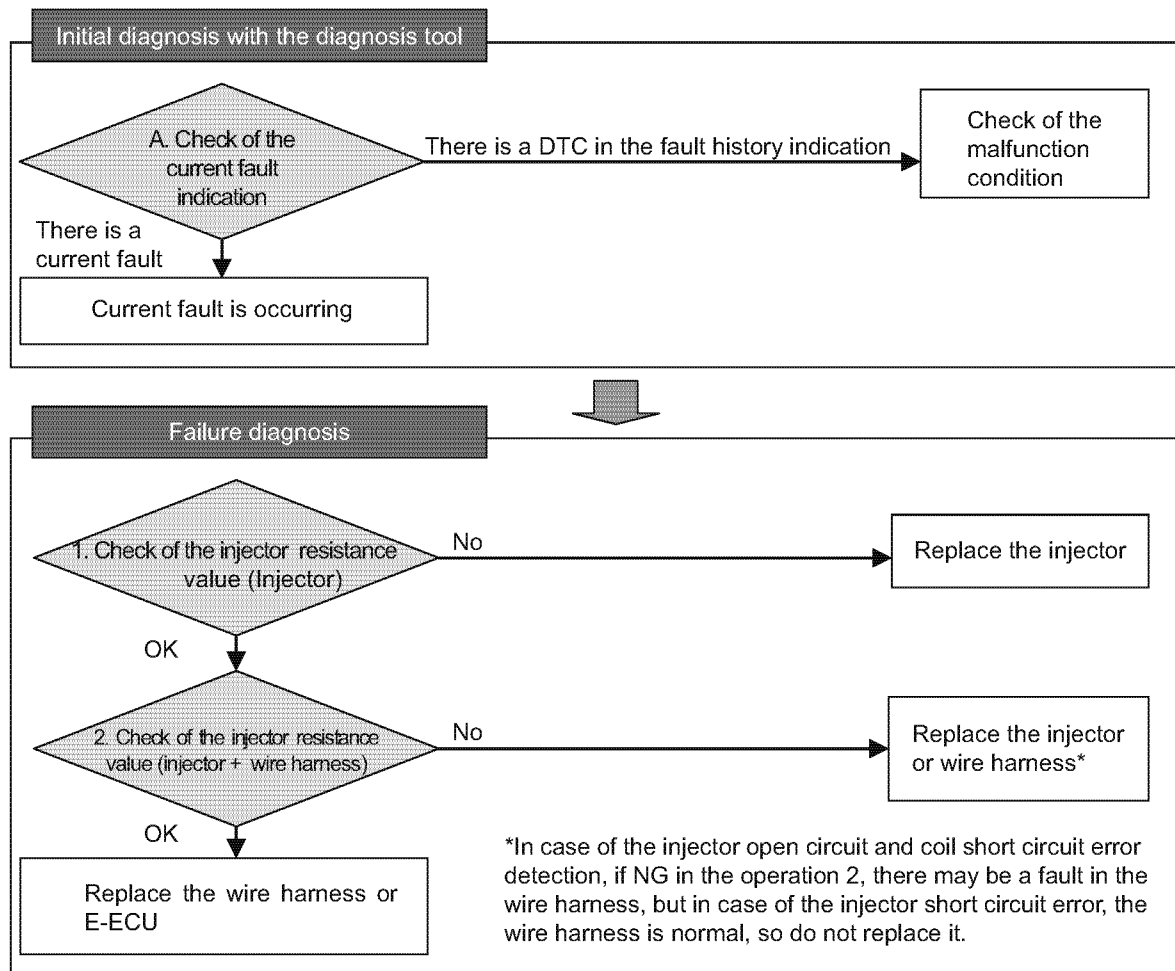
P code	P0265	Name	Injector 2 coil short circuit
SPN/FMI	653/6		

P code	P0262	Name	Injector 3 coil short circuit
SPN/FMI	654/6		

P code	P0268	Name	Injector 4 coil short circuit
SPN/FMI	652/6		

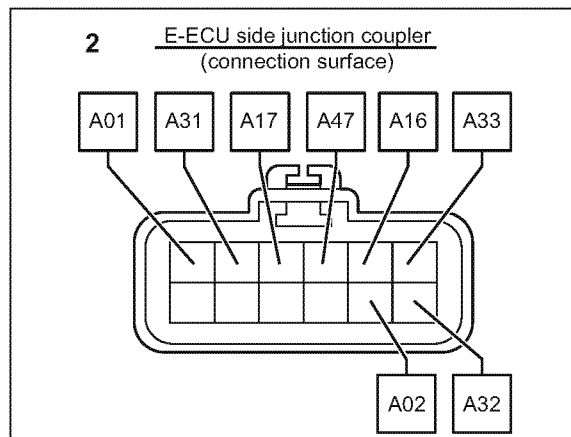
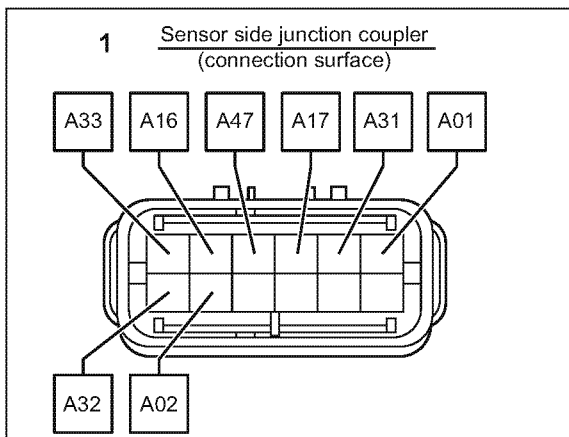
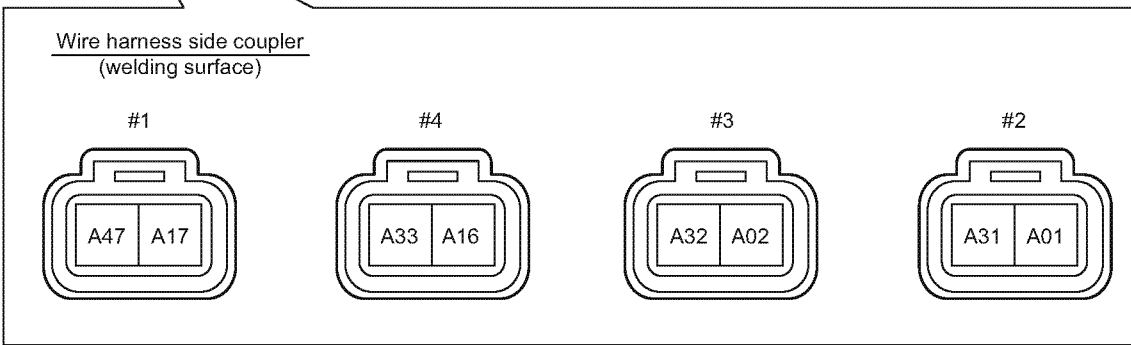
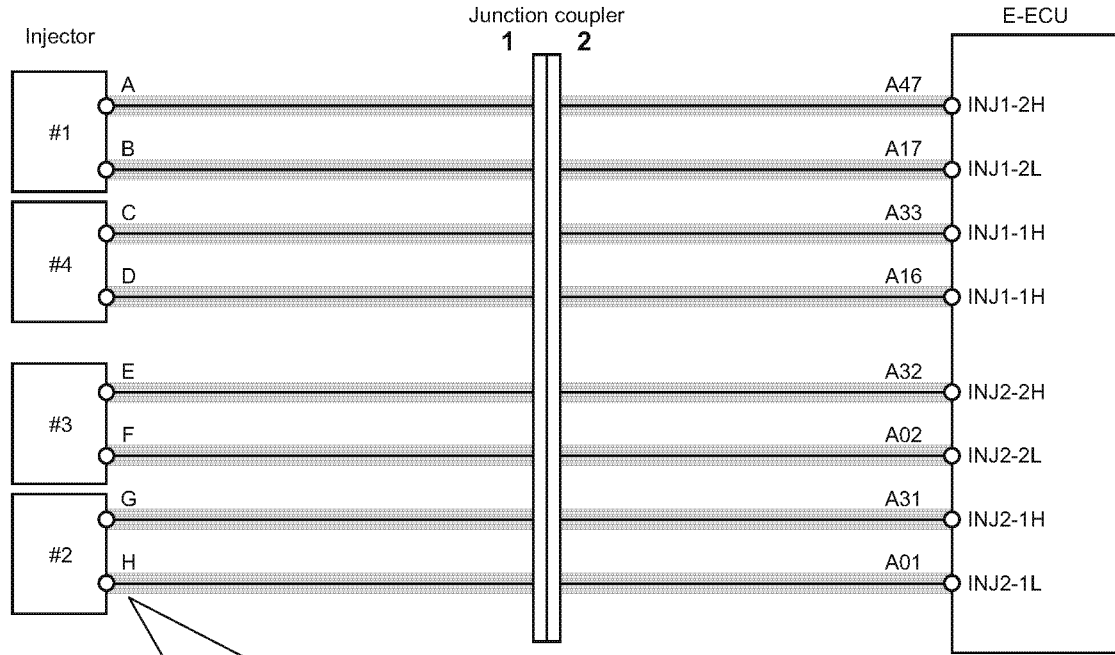
## ● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044393-01EN00

● Wire diagram



: Check points

044394-00EN00

Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Check of the injector resistance value (injector unit):

- 1- Remove the wire harness from the injector.
- 2- Using the circuit tester, measure the resistance value (total resistance) between the injector terminals A and B, E and F, and G and H.

**Reference: Total resistance of the injector**

Terminal	Specification
Between the injector terminals	TBD

<b>Not OK</b>	Replace the injector
<b>OK</b>	Refer to "Check of the injector resistance value (injector + wire harness):"

### 2. Check of the injector resistance value (injector + wire harness):

#### ● Junction coupler is not connected

- 1- Connect the injector and the wire harness and remove the E-ECU from the wire harness. Here, refer to the above wire diagram and remove the wire harness of the junction coupler (2) side from the wire harness of the junction coupler (1) side.
- 2- Using the circuit tester, measure the resistance value (total resistance) between A47 and A17, A33 and A16, A32 and A02, and A31 and A01 of the junction coupler (1) side wire harness.

*Note: Refer to the above-mentioned reference "Total resistance of the injector".*

<b>Not OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the injector and the wire harness may be defective. Replace the injector.</li> <li>• Replace the wire harness.</li> </ul>
<b>OK</b>	Refer to "Junction coupler is connected"

#### ● Junction coupler is connected

- 1- Connect the injector and the wire harness and remove the E-ECU from the wire harness. Here, refer to the above wire diagram and remove the wire harness of the junction coupler (2) side to the wire harness of the junction coupler (1) side.
- 2- Using the circuit tester, measure the resistance value (total resistance) between A47 and A17, A33 and A16, A32 and A02, and A31 and A01 of the E-ECU side wire harness.

*Note: Refer to the above-mentioned reference "Total resistance of the injector".*

<b>Not OK</b>	The junction coupler may be defective. Replace the wire harness.
<b>OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the E-ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

**Injector short circuit**

## ● Related DTC

<b>P code</b>	P1271 (4TNV) P1262 (3TNV)	<b>Name</b>	Injector 1 short circuit
<b>SPN/FMI</b>	651/3 (4TNV) 652/3 (3TNV)		

<b>P code</b>	<b>P1265</b>	<b>Name</b>	Injector 2 short circuit
<b>SPN/FMI</b>	<b>653/3</b>		

<b>P code</b>	<b>P1262</b>	<b>Name</b>	Injector 3 short circuit
<b>SPN/FMI</b>	<b>654/3</b>		

<b>P code</b>	<b>P1268</b>	<b>Name</b>	Injector 4 short circuit
<b>SPN/FMI</b>	<b>652/3</b>		

<b>P code</b>	<b>P1146</b>	<b>Name</b>	Injector drive circuit (Bank1) short circuit
<b>SPN/FMI</b>	<b>2797/6</b>		

<b>P code</b>	<b>P1149</b>	<b>Name</b>	Injector drive circuit (Bank2) short circuit
<b>SPN/FMI</b>	<b>2798/6</b>		

## ● Workflow

Refer to "Injector open circuit and coil short circuit"

## ● Wire diagram

Refer to "Injector open circuit and coil short circuit"



## ● Work description

### 1. Check of the injector resistance value (injector unit):

- 1- Remove the wire harness from the injector.
- 2- Using the circuit tester, measure the resistance value (total resistance) between the injector terminals A and B, C and D, E and F, and G and H.

**Reference: Total resistance of the injector**

Terminal	Specification
Between the injector terminals	TBD

<b>Not OK</b>	Replace the injector
<b>OK</b>	Refer to "Check of the injector resistance value (injector + wire harness):"

### 2. Check of the injector resistance value (injector + wire harness):

#### ● Junction coupler is not connected

- 1- Connect the injector and the wire harness and remove the E-ECU from the wire harness. Here, refer to the above wire diagram and remove the wire harness of the junction coupler (2) side from the wire harness of the junction coupler (1) side.
- 2- Using the circuit tester, measure the resistance value (total resistance) between A47 and A17, A33 and A16, A32 and A02, and A31 and A01 of the junction coupler (1) side wire harness.

*Note: Refer to the above-mentioned reference "Total resistance of the injector".*

<b>Not OK</b>	Replace the wire harness.
<b>OK</b>	Refer to "Junction coupler is connected"

#### ● Junction coupler is connected

- 1- Connect the injector and the wire harness and remove the E-ECU from the wire harness. Here, refer to the above wire diagram and remove the wire harness of the junction coupler (2) side to the wire harness of the junction coupler (1) side.
- 2- Using the circuit tester, measure the resistance value (total resistance) between A47 and A17, A33 and A16, A32 and A02, and A31 and A01 of the E-ECU side wire harness.

*Note: Refer to the above-mentioned reference "Total resistance of the injector".*

<b>Not OK</b>	Replace the wire harness.
<b>OK</b>	<ul style="list-style-type: none"> <li>• The coupler between the wire harness and the E-ECU may be defective. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

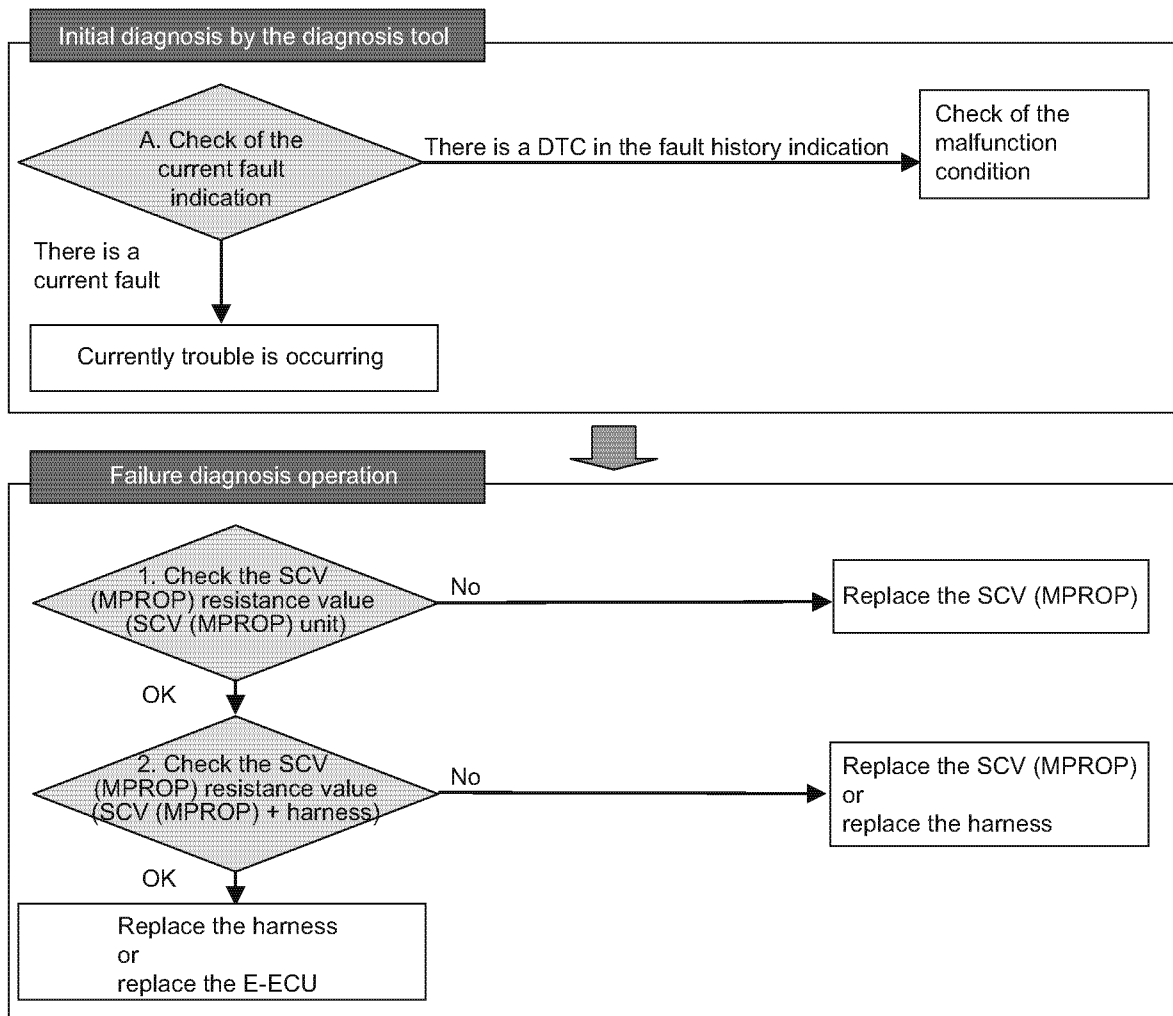
## ■ High-pressure pump (MPROP)

### ● Related DTC

P code	P1641	Name	High-pressure pump drive circuit (Low side VB short-circuit)
SPN/FMI	522571/3		
P code	P1643	Name	High-pressure pump drive circuit (Low side GND short-circuit)
SPN/FMI	522571/6		
P code	P0629	Name	High-pressure pump drive circuit (High side VB short-circuit)
SPN/FMI	633/3		
P code	P1642	Name	High-pressure pump drive circuit (High side GND short-circuit)
SPN/FMI	633/6		
P code	P0627	Name	High-pressure pump drive circuit (Open circuit)
SPN/FMI	633/5		
P code	P1645	Name	High-pressure pump drive circuit (Pump overload error)
SPN/FMI	522572/11		
P code	P062A	Name	High-pressure pump drive circuit (Drive current (high level))
SPN/FMI	522572/6		

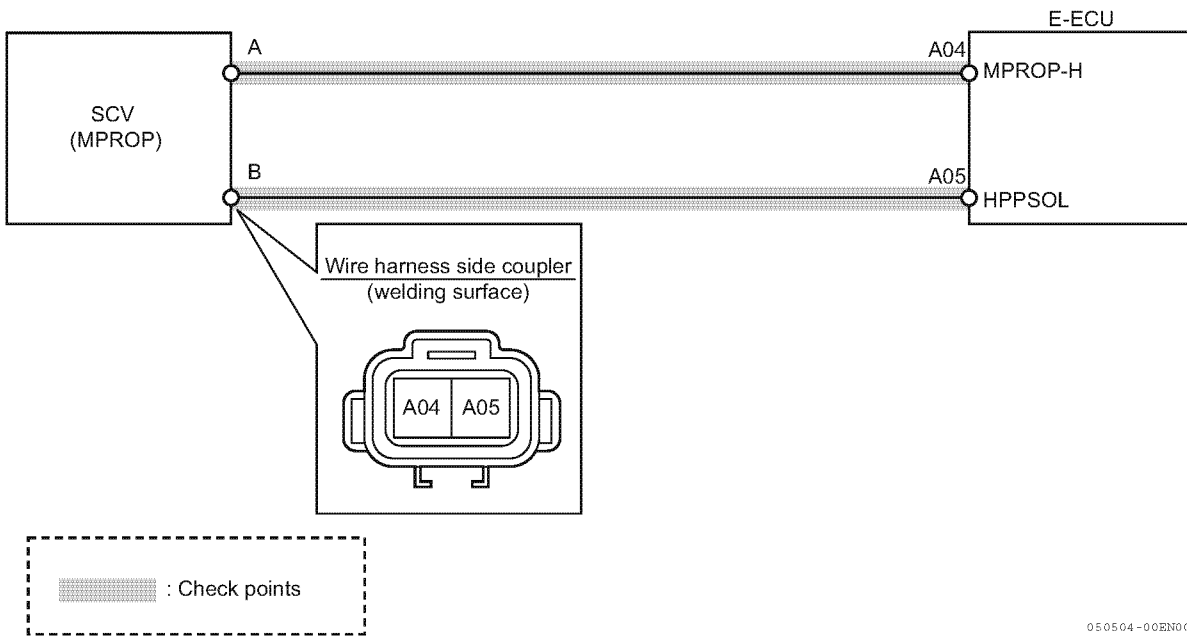
● Workflow

Note: For the work details, refer to “Work description” below. For operating procedure of the diagnosis tool, refer to the separate “Diagnosis Tool Operation Manual”.



050503-00 5N00

● Wiring diagram



Note: For the E-ECU pin layout, refer to P287.

● Work description

1. Check of the SCV (MPROP) resistance value (SCV (MPROP) unit):

- 1- Remove the wire harness from the SCV (MPROP).
- 2- Using the circuit tester, measure the resistance value (total resistance) between the SCV (MPROP) terminals A and B.

**Reference: Total resistance of the SCV (MPROP)**

Terminal	Specification
Between the SCV (MPROP) terminals	2.60 - 3.15 Ω

<b>Not OK</b>	Replace the SCV (MPROP).
<b>OK</b>	Refer to "Check of the SCV (MPROP) resistance value (SCV (MPROP) + wire harness)."

2. Check of the SCV (MPROP) resistance value (SCV (MPROP) + wire harness):

- 1- Connect the SCV (MPROP) and the wire harness and remove the E-ECU from the wire harness.
- 2- Using the circuit tester, measure the resistance value (total resistance) between A04 and A05 of the E-ECU side wire harness.

Note: Refer to the above-mentioned reference "Total resistance of the SCV (MPROP)".

<b>Not OK</b>	The wire harness may be defective. Replace the wire harness.
<b>OK</b>	Replace the E-ECU.

## Actuator

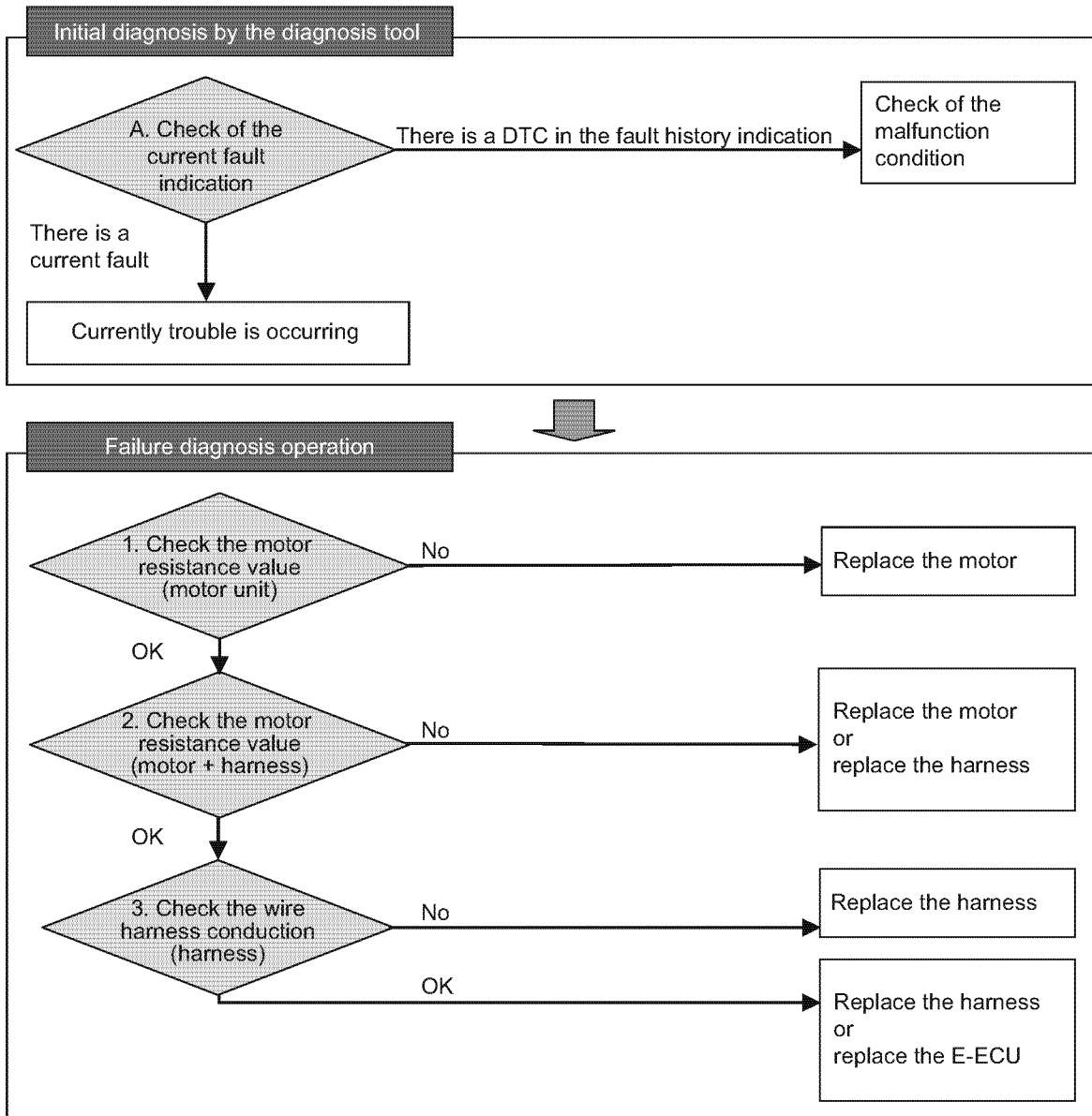
### ■ Intake throttle drive circuit

#### ● Related DTC

P code	P0660	Name	No-load of throttle valve drive H bridge circuit
SPN/FMI	2950/5		
P code	P1660	Name	Overload on the drive H bridge circuit of throttle valve
SPN/FMI	2950/6		
P code	P1658	Name	Power short circuit of throttle valve drive H bridge output 1
SPN/FMI	2950/3		
P code	P1661	Name	Power short circuit of throttle valve drive H bridge output 2
SPN/FMI	2951/3		
P code	P1659	Name	GND short circuit of throttle valve drive H bridge output 1
SPN/FMI	2950/4		
P code	P1662	Name	GND short circuit of throttle valve drive H bridge output 2
SPN/FMI	2951/4		

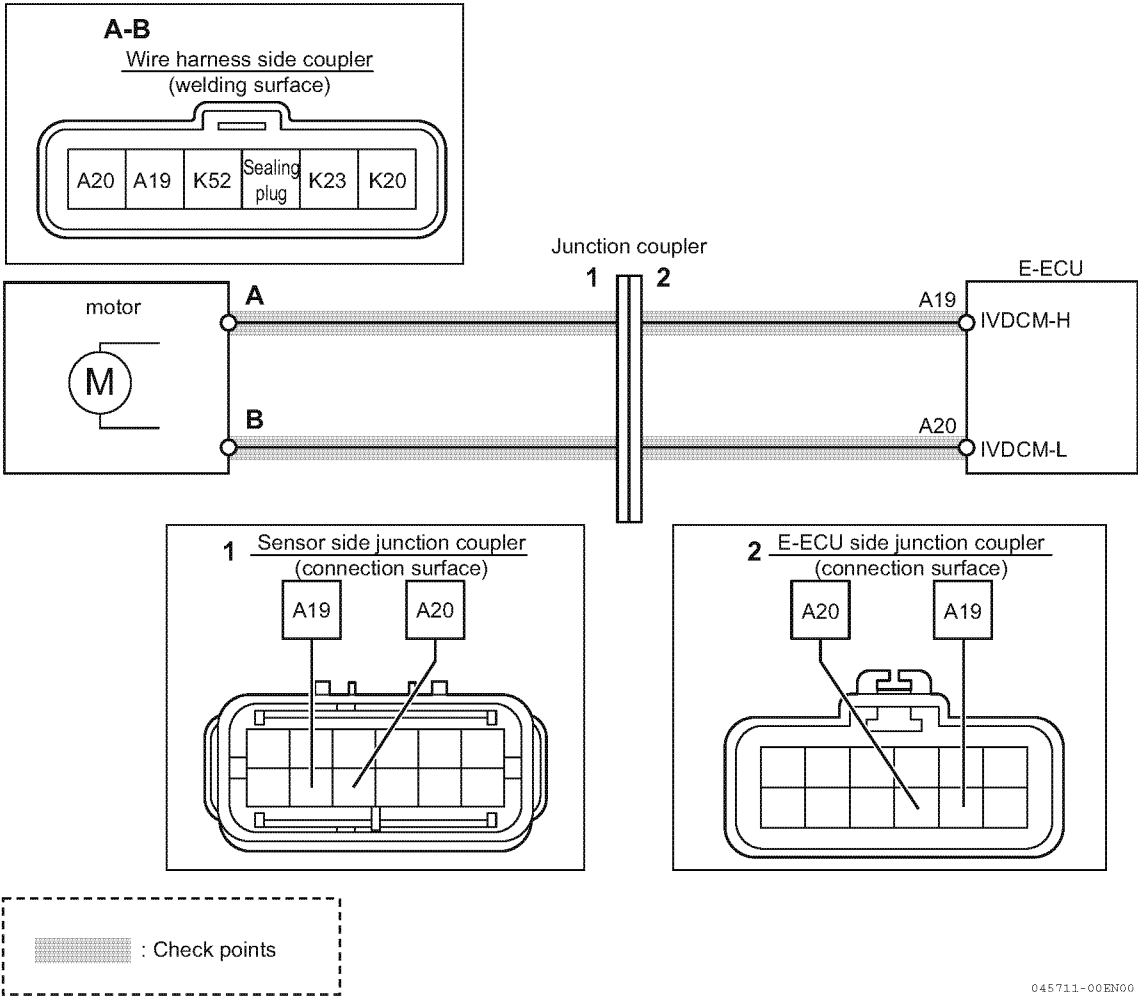
## ● Workflow

Note: For the work details, refer to "Work description" below. For operating procedure of the diagnosis tool, refer to the separate "Diagnosis Tool Operation Manual".



045710-00EN00

● Wiring diagram



Note: For the E-ECU pin layout, refer to P287.

045711-00EN00

## ● Work description

### 1. Check of the motor resistance value (motor unit):

1- Remove the motor from the wire harness.

2- Use the circuit tester to measure the resistance value (total resistance value) between the motor terminals A and B.

**Reference: Total resistance of the motor**

Terminal	Specification
Between terminal A and B	Under investigation
<b>Not OK</b>	Replace the motor.
<b>OK</b>	Refer to "Check of the motor resistance value (motor + wire harness):"

### 2. Check of the motor resistance value (motor + wire harness):

1- Connect the motor and the wire harness. Remove the E-ECU from the harness.

2- Use the circuit tester to measure the resistance value (total resistance value) between the E-ECU side wire harness connectors A19 and A20.

*Note: Refer to the above-mentioned reference "Total resistance of the motor".*

<b>No</b>	<ul style="list-style-type: none"> <li>• A coupler failure between the motor and the wire harness may be caused. Replace the motor.</li> <li>• Replace the wire harness.</li> </ul>
<b>Applied</b>	Refer to "Check the wire harness conduction:"

### 3. Check the wire harness conduction:

1- Remove the wire harness from the motor and the E-ECU. Here, keep the junction coupler connected.

2- Perform the wire harness conduction check between the terminal 1 and the terminal 2 in the below table while referring to P287 "E-ECU pin layout diagram".

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 (E-ECU side wire harness connector)	Terminal 2 (DC motor side wire harness connector)	Conduction	Condition
A19	Motor terminal A	Yes	OK: Normal
		No	Not OK: Abnormal
A20	Motor terminal B	Yes	OK: Normal
		No	Not OK: Abnormal

## Reference: Intake throttle drive circuit conduction check pattern 2

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (E-ECU side wire harness connector)	Conduction	Condition
A19	VB terminal	Yes	Not OK: Abnormal
		No	OK: Normal

## Reference: Intake throttle drive circuit conduction check pattern 3

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (E-ECU side wire harness connector)	Conduction	Condition
A20	VB terminal	Yes	Not OK: Abnormal
		No	OK: Normal

## Reference: Intake throttle drive circuit conduction check pattern 4

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (E-ECU side wire harness connector)	Conduction	Condition
A19	GND terminal	Yes	Not OK: Abnormal
		No	OK: Normal

## Reference: Intake throttle drive circuit conduction check pattern 5

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (E-ECU side wire harness connector)	Conduction	Condition
A20	GND terminal	Yes	Not OK: Abnormal
		No	OK: Normal

<b>Not OK</b>	Interrupted or short circuited between the wire harnesses. Replace the wire harness.
<b>OK</b>	<ul style="list-style-type: none"> <li>• A coupler failure between the E-ECU and the wire harness may be caused. Replace the wire harness.</li> <li>• Replace the E-ECU.</li> </ul>

■ EGR valve

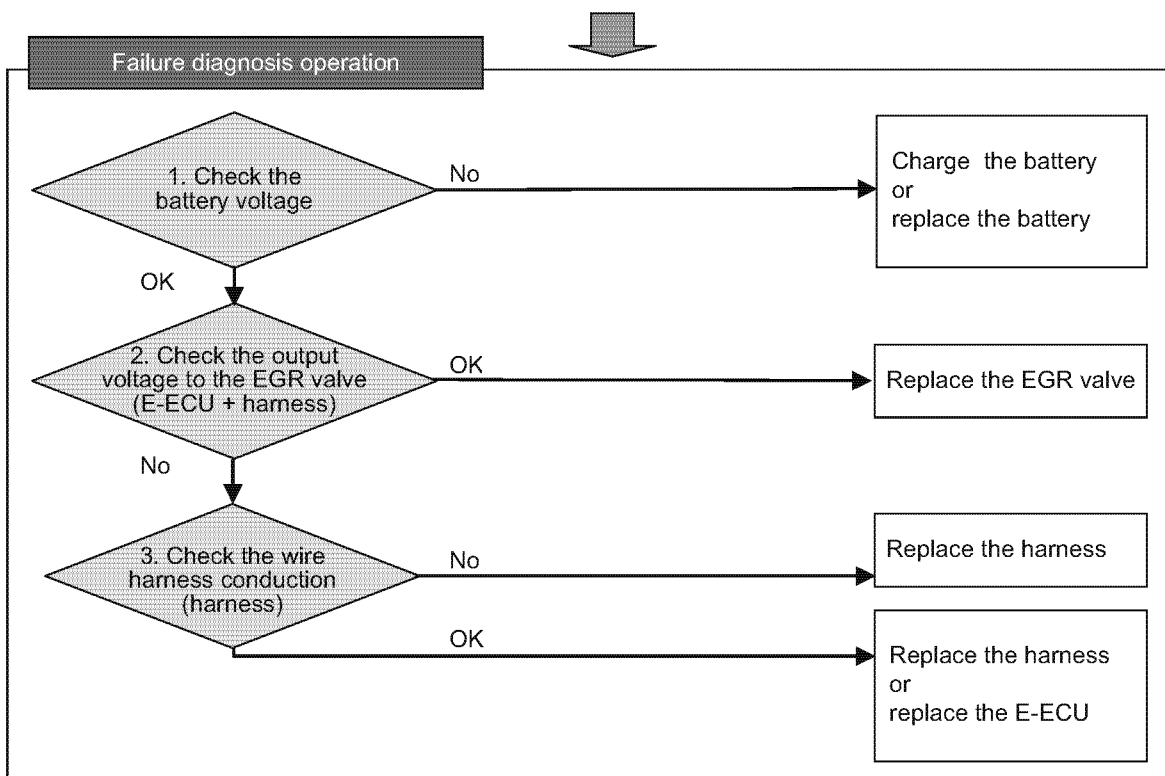
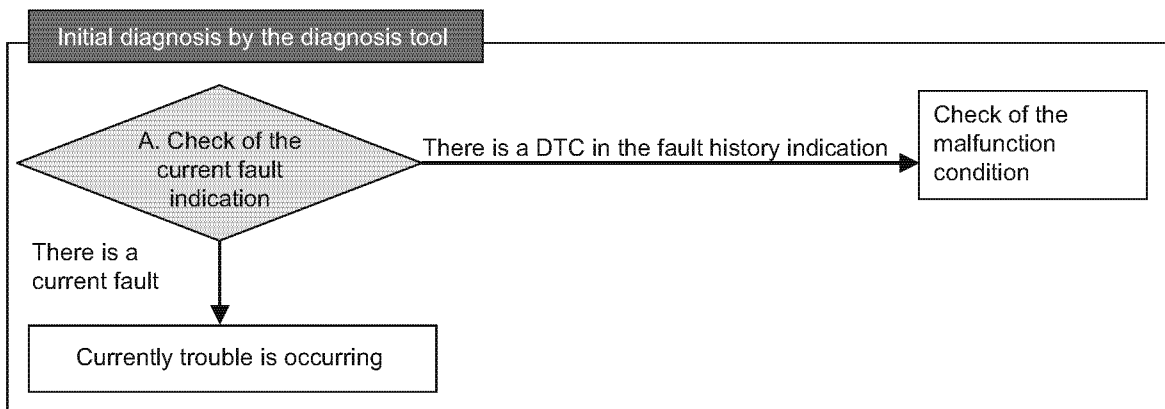
● Related DTC

P code	P0404	Name	EGR over-voltage fault
SPN/FMI	2791/0		

P code	P1404	Name	EGR under-voltage fault
SPN/FMI	2791/1		

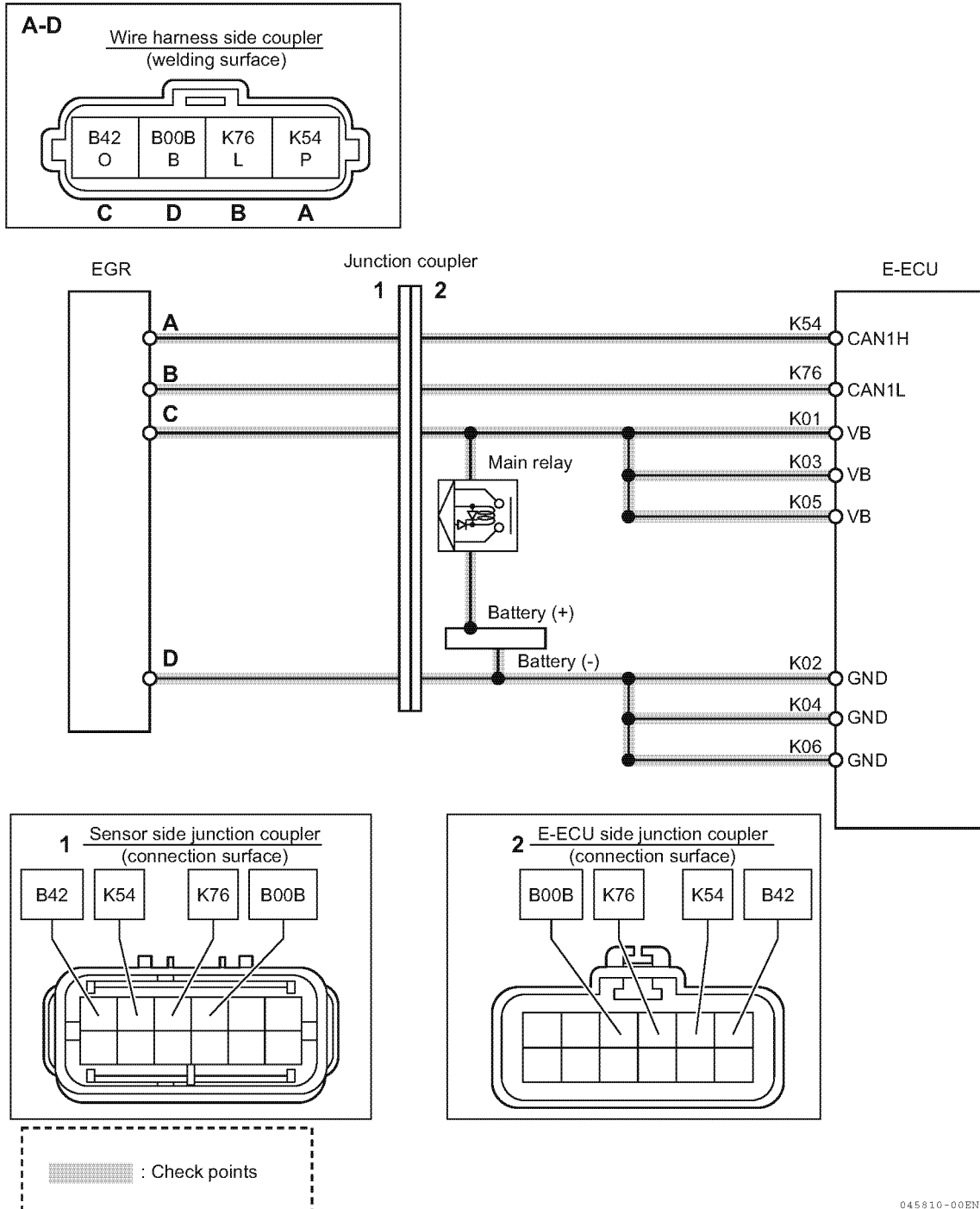
● Workflow

Note: For the work details, refer to "Work description" below. For operating procedure of the diagnosis tool, refer to the separate "Diagnosis Tool Operation Manual".



045809-00EN00

● Wiring diagram



045810-00EN02

Note: For the E-ECU pin layout, refer to P287.

### ● Work description

#### 1. Check the battery voltage:

Turn on the power switch and check the battery voltage.

1- Check whether or not the battery voltage is reduced due to the battery life.

2- Check whether or not the battery output is too high.

Reference: Battery voltage check pattern 1

Terminal 1 (battery)	Terminal 2 (battery)	Voltage value	Condition
Battery (+)	Battery (-)	8 V or below	Not OK: Abnormal
		8 V - 16 V	OK: Normal
		16 V or above	Not OK: Abnormal

<b>Not OK</b>	Charge or replace the battery.
<b>OK</b>	Check the actions of the other E-ECU.

#### 2. Check the output voltage to the EGR valve:

1- Remove the EGR valve from the wire harness.

2- Turn on the power switch and check the battery voltage. Refer to the wire diagram and measure the wire harness between C and D.

Reference: Battery voltage check pattern 2

Terminal 1 (EGR valve side wire harness connector)	Terminal 2 (EGR valve side wire harness connector)	Voltage value	Condition
C (B42)	D (B00B)	8 V or below	Not OK: Abnormal
		8 V - 18 V	OK: Normal
		18 V or above	Not OK: Abnormal

<b>Not OK</b>	Refer to "Check the wire harness conduction:".
<b>OK</b>	Replace the EGR valve.

## 3. Check the wire harness conduction:

1- Remove the wire harness from the EGR valve and the E-ECU.

2- Perform the wire harness conduction check between the terminal 1 and the terminal 2 in the below table while referring to P287 "E-ECU pin layout diagram".

## Reference: EGR valve conduction check pattern 1

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (EGR valve side wire harness connector)	Conduction	Condition
K01/K03/K05	EGR valve terminal C	Yes	OK: Normal
		No	Not OK: Abnormal
K02/K04/K06	EGR valve terminal D	Yes	OK: Normal
		No	Not OK: Abnormal
K54*1	EGR valve terminal A	Yes	OK: Normal
		No	Not OK: Abnormal
K76*1	EGR valve terminal B	Yes	OK: Normal
		No	Not OK: Abnormal

\*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 2

Terminal 1 (EGR valve side wire harness connector)	Terminal 2 (E-ECU side wire harness connector)	Conduction	Condition
EGR valve terminal C	All terminals except for the below: K01, K03, K05	Yes	Not OK: Abnormal
		No	OK: Normal
EGR valve terminal D	All terminals except for GND	Yes	Not OK: Abnormal
		No	OK: Normal
EGR valve terminal A*1	All terminals except for K54	Yes	Not OK: Abnormal
		No	OK: Normal
EGR valve terminal B*1	All terminals except for K76	Yes	Not OK: Abnormal
		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.

<b>Not OK</b>	Interrupted or short circuited between the wire harnesses. Replace the wire harness.
<b>OK</b>	<ul style="list-style-type: none"> <li>A coupler failure between the ECU and the wire harness may be caused. Replace the wire harness.</li> <li>Replace the E-ECU.</li> </ul>

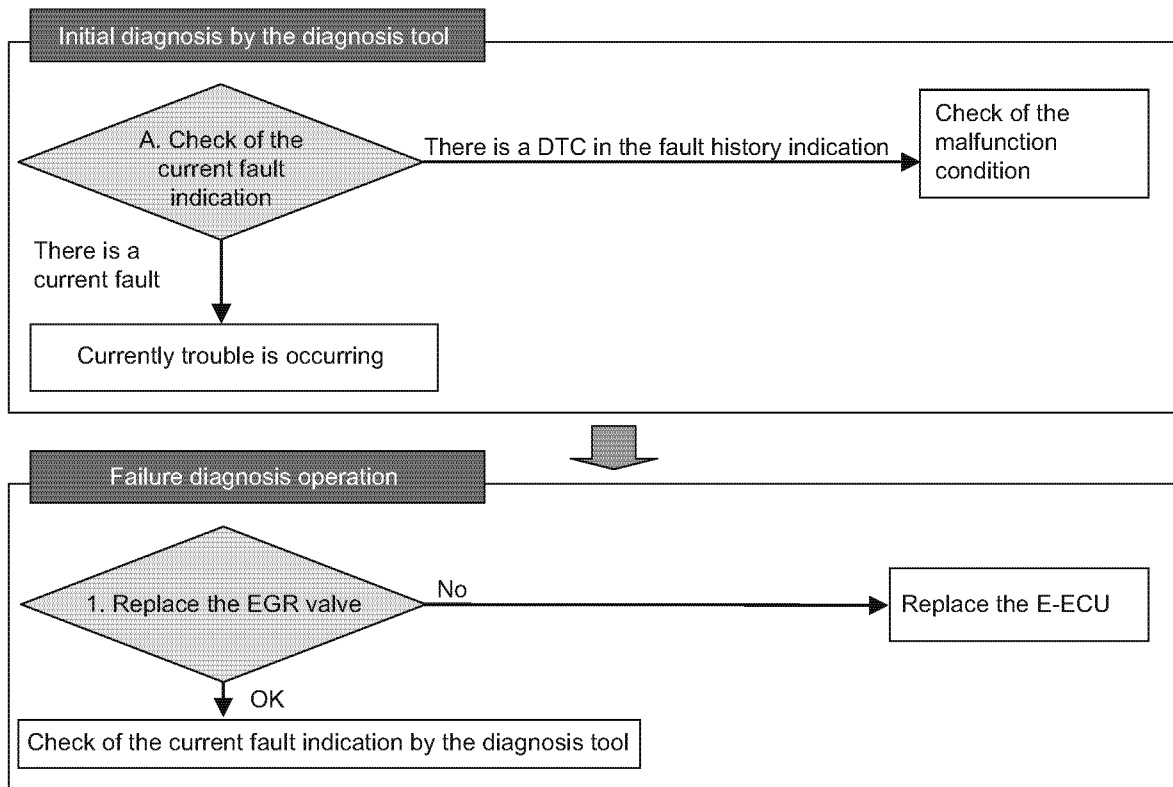
## ■ EGR valve

### ● Related DTC

P code	P0403	Name	Open circuit between the EGR motor coils
SPN/FMI	2791/12		
P code	P1405	Name	Short circuit between the EGR motor coils
SPN/FMI	522579/12		
P code	P0488	Name	EGR position sensor malfunction
SPN/FMI	522580/12		
P code	P1409	Name	EGR feedback malfunction
SPN/FMI	2791/7		
P code	P148A	Name	EGR stuck open valve malfunction
SPN/FMI	522581/7		
P code	P049D	Name	EGR initialization malfunction
SPN/FMI	522582/7		
P code	U0401	Name	EGR ECM data fault
SPN/FMI	2791/9		
P code	U1401	Name	EGR target value out of range
SPN/FMI	522617/12		
P code	P1410	Name	EGR high temperature thermistor malfunction
SPN/FMI	522583/1		
P code	P1411	Name	EGR low temperature thermistor malfunction
SPN/FMI	522584/1		

● Workflow

Note: For the work details, refer to “Work description” below. For operating procedure of the diagnosis tool, refer to the separate “Diagnosis Tool Operation Manual”.



050234-00EN00

● Work description

1. Replace the EGR valve

There is a possibility of the internal circuit failure of the EGR valve.

Replace the EGR valve.

Not OK	Replace the E-ECU.
OK	Check of the current fault indication by the diagnosis tool

## Communication related

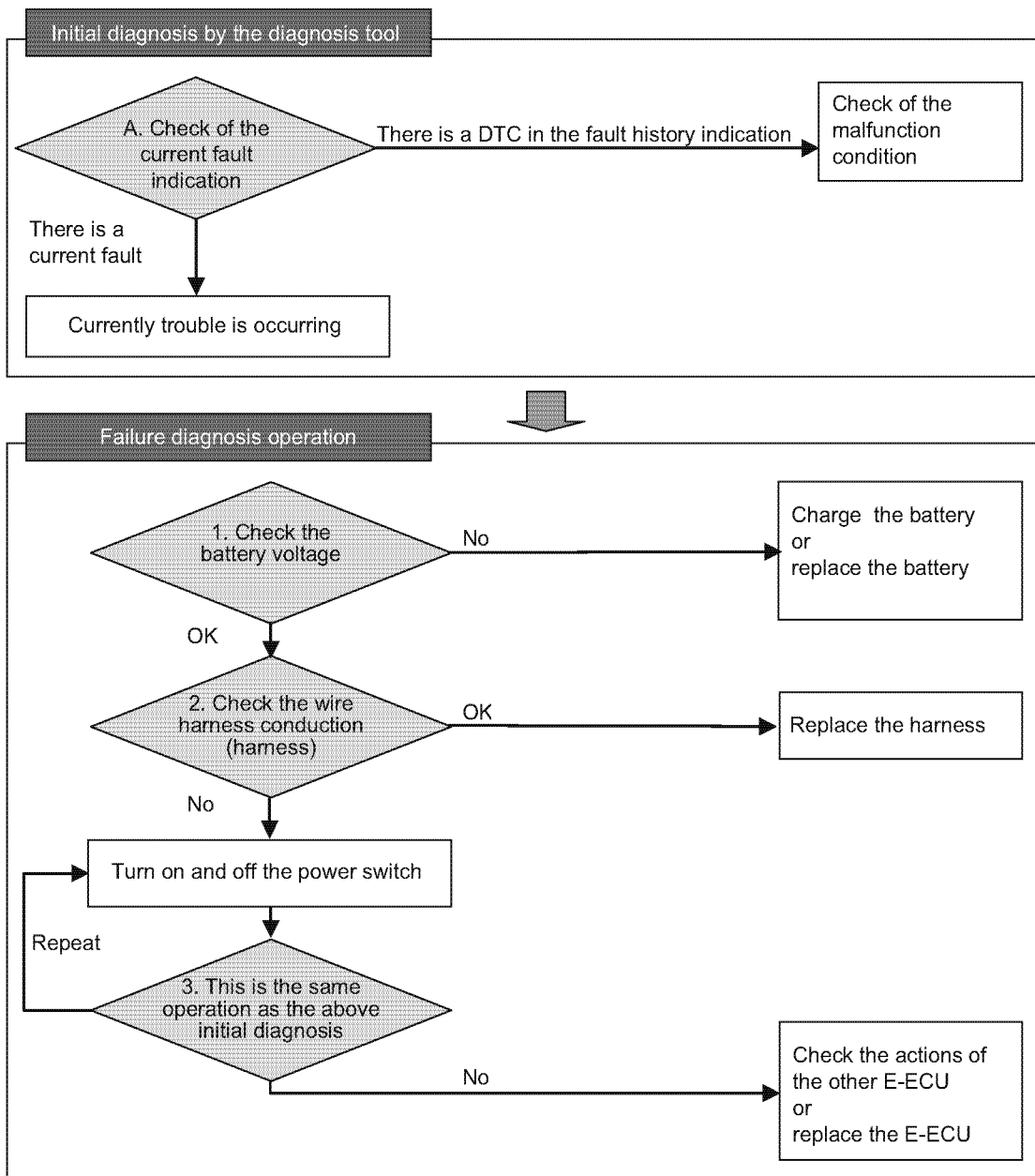
### ■ CAN1

#### ● Related DTC

P code	U010B	Name	CAN1 (for EGR): Reception time out
SPN/FMI	522610/9		
P code	U1107	Name	Exhaust throttle (CAN message from the exhaust throttle time out)
SPN/FMI	522611/9		

#### ● Workflow

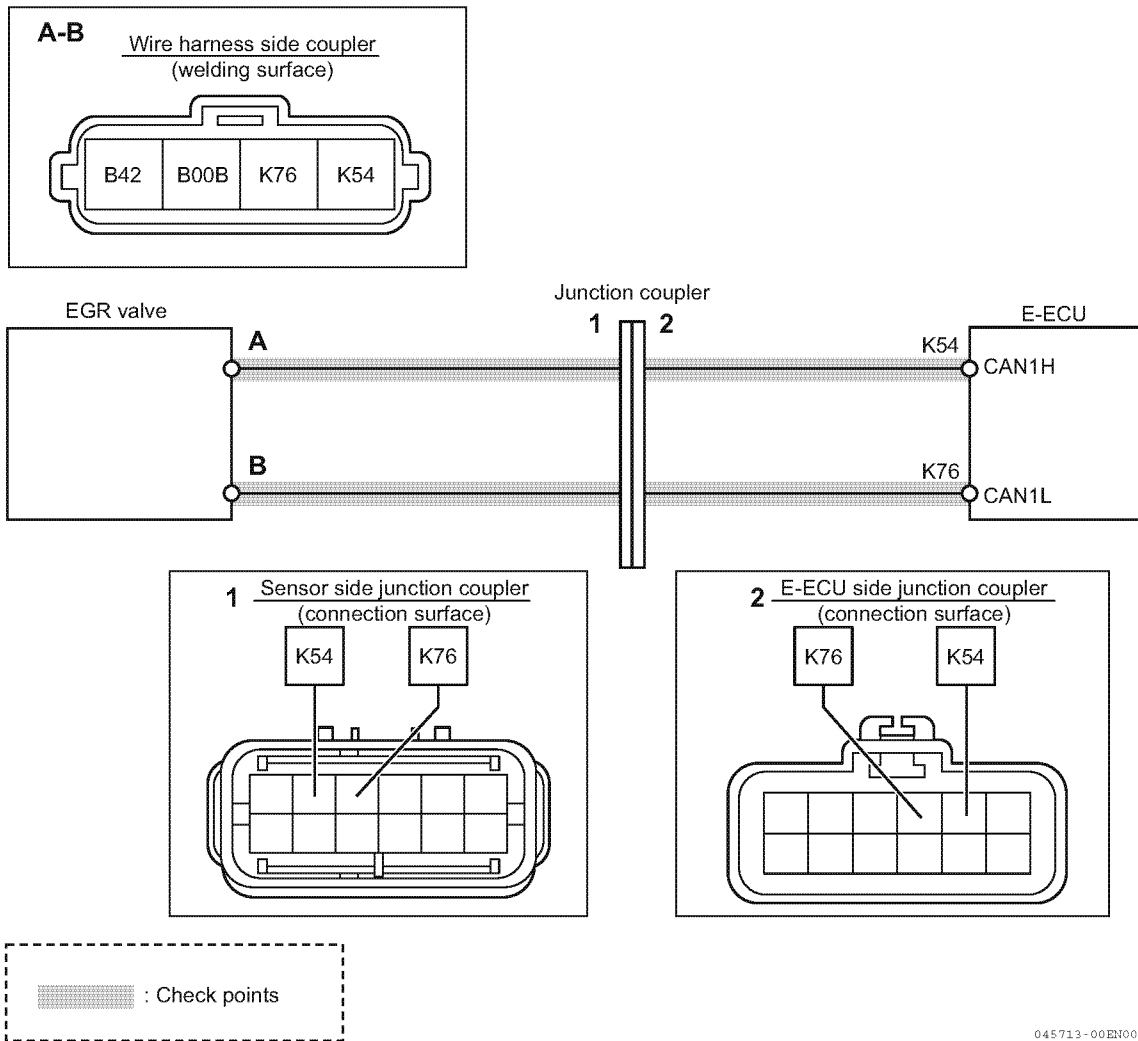
Note: For the work details, refer to "Work description" below. For operating procedure of the diagnosis tool, refer to the separate "Diagnosis Tool Operation Manual".



045712-00EN01



● Wiring diagram



045713-00EN00

Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Check the battery voltage:

Turn on the power switch and check the battery voltage.

- 1- Check whether or not the battery voltage is reduced due to the battery life.
- 2- Check whether or not the battery output is too high.

<b>Not OK</b>	Charge or replace the battery.
<b>OK</b>	Refer to "Check the wire harness conduction."

### 2. Check the wire harness conduction:

- 1- Remove the wire harness from the driven machine side ECU and the E-ECU.
- 2- Perform the wire harness conduction check between the terminal 1 and the terminal 2 in the below table while referring to P287 "E-ECU pin layout diagram".

#### Reference: CAN1 line conduction check pattern 1

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (Driven machine ECU side wire harness connector)	Conduction	Condition
K54	Driven machine ECU terminal A	Yes	OK: Normal
		No	Not OK: Abnormal
K76	Driven machine ECU terminal B	Yes	OK: Normal
		No	Not OK: Abnormal

#### Reference: CAN1 line conduction check pattern 2

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (E-ECU side wire harness connector)	Conduction	Condition
V54	All terminals except for V54 and V76	Yes	Not OK: Abnormal
		No	OK: Normal
V76	All terminals except for V54 and V76	Yes	Not OK: Abnormal
		No	OK: Normal

<b>Not OK</b>	Interrupted or short circuited between the wire harnesses. Replace the wire harness.
<b>OK</b>	Refer to "Work by the diagnosis tool."

### 3. Work by the diagnosis tool:

- 1- Turn off the power switch. Turn on the power switch and start the engine.
- 2- Connect the diagnosis tool and check whether an error is detected or not on the current fault indication.

<b>No</b>	Normal
<b>Applied</b>	<ul style="list-style-type: none"> <li>• Check the operation of the other ECU.</li> <li>• Replace the E-ECU.</li> </ul>

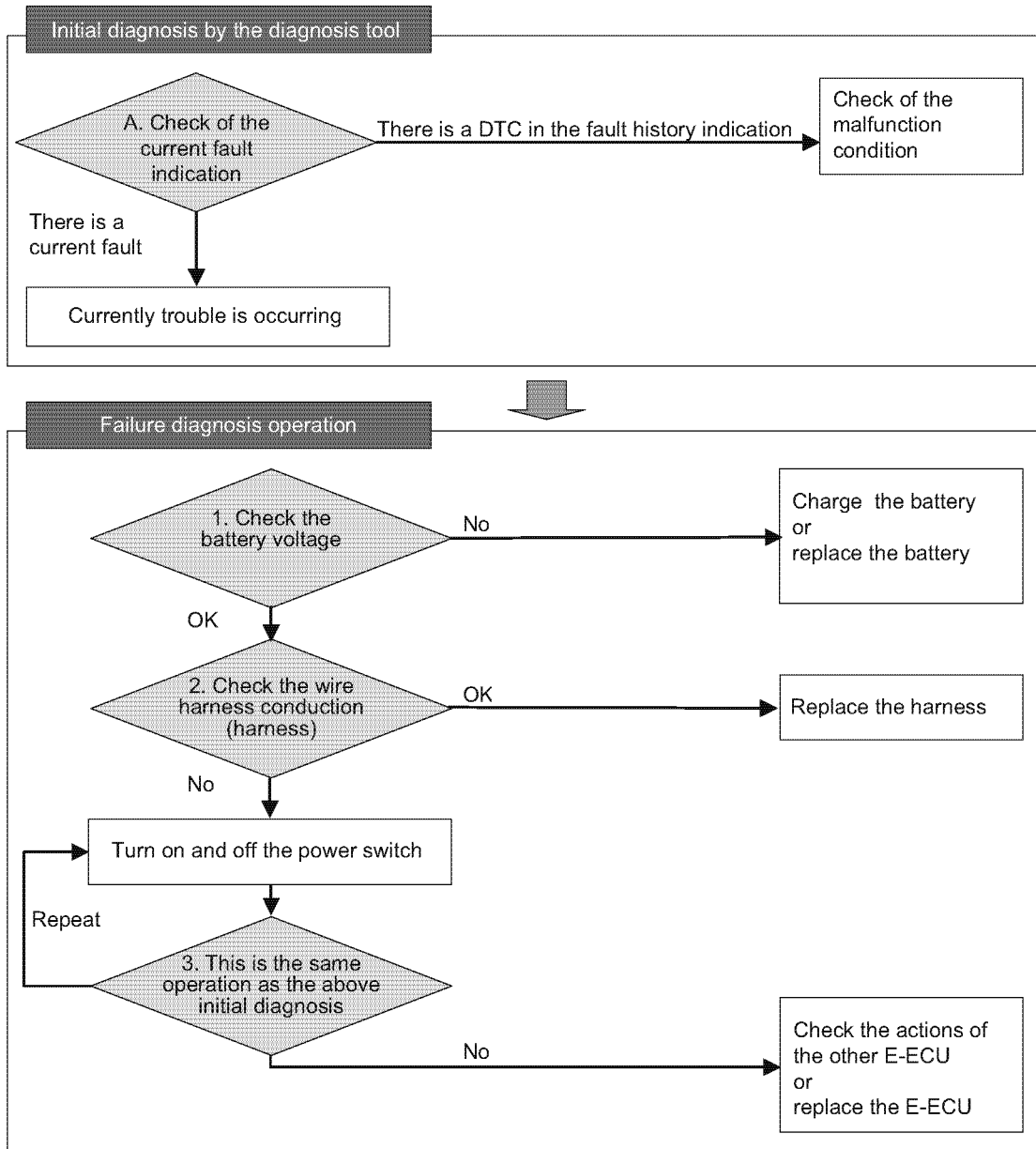
## ■ CAN2

### ● Related DTC

P code	U0292	Name	TSC1 (CAN message) reception time out (SA1)
SPN/FMI	522596/9		
P code	U1301	Name	TSC1 (CAN message) reception time out (SA2)
SPN/FMI	522597/9		
P code	U1292	Name	Y_ECR1 (CAN message) reception time out
SPN/FMI	522599/9		
P code	U1293	Name	Y_EC (CAN message) reception time out
SPN/FMI	522600/9		
P code	U1294	Name	Y_RSS (CAN message) reception time out
SPN/FMI	522601/9		
P code	U1296	Name	VH (CAN message) reception time out
SPN/FMI	522603/9		
P code	U1298	Name	Y_ECM3 (CAN message) reception time out
SPN/FMI	522605/9		
P code	U0168	Name	VI (CAN message) reception time out
SPN/FMI	237/31		
P code	U3002	Name	VI (CAN message) reception data fault
SPN/FMI	237/13		
P code	U1300	Name	Y_ETCP1 (CAN message) reception time out
SPN/FMI	522609/9		
P code	U1303	Name	Y_DPFIF (CAN message) reception time out
SPN/FMI	522619/9		
P code	U1302	Name	EBC1 (CAN message) reception time out
SPN/FMI	522681/9		

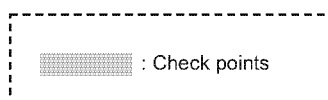
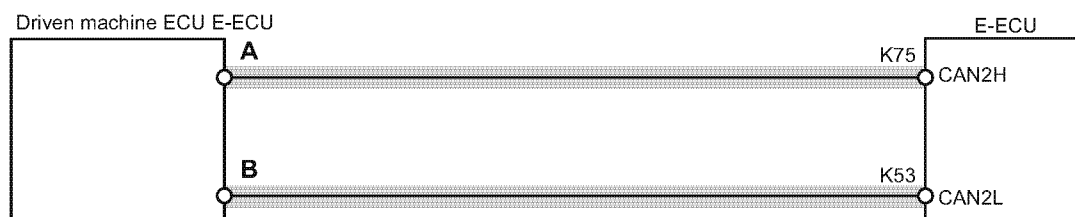
## ● Workflow

Note: For the work details, refer to "Work description" below. For operating procedure of the diagnosis tool, refer to the separate "Diagnosis Tool Operation Manual".



045712-00EN01

## ● Wiring diagram



045714-00EN00

Note: For the E-ECU pin layout, refer to P287.

## ● Work description

### 1. Check the battery voltage:

Turn on the power switch and check the battery voltage.

- 1- Check whether or not the battery voltage is reduced due to the battery life.
- 2- Check whether or not the battery output is too high.

<b>Not OK</b>	Refer to "Check the wire harness conduction."
<b>OK</b>	Check the actions of the other E-ECU.

### 2. Check the wire harness conduction:

- 1- Remove the wire harness from the driven machine side ECU and the E-ECU.
- 2- Perform the wire harness conduction check between the terminal 1 and the terminal 2 in the below table while referring to P287 "E-ECU pin layout diagram".

#### Reference: CAN2 line conduction check pattern 1

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (Driven machine ECU side wire harness connector)	Conduction	Condition
V75	Driven machine ECU terminal A	Yes	OK: Normal
		No	Not OK: Abnormal
V53	Driven machine ECU terminal B	Yes	OK: Normal
		No	Not OK: Abnormal

#### Reference: CAN2 line conduction check pattern 2

Terminal 1 (E-ECU side wire harness connector)	Terminal 2 (E-ECU side wire harness connector)	Conduction	Condition
V75	All terminals except for V75	Yes	Not OK: Abnormal
		No	OK: Normal
V53	All terminals except for V53	Yes	Not OK: Abnormal
		No	OK: Normal

<b>Not OK</b>	Interrupted or short circuited between the wire harnesses. Replace the wire harness.
<b>OK</b>	Refer to "Work by the diagnosis tool."

### 3. Work by the diagnosis tool:

- 1- Turn off the power switch. Turn on the power switch and start the engine.
- 2- Connect the diagnosis tool and check whether an error is detected or not on the current fault indication.

<b>No</b>	Normal
<b>Applied</b>	<ul style="list-style-type: none"> <li>• Check the operation of the other ECU.</li> <li>• Replace the E-ECU.</li> </ul>

## ECU related

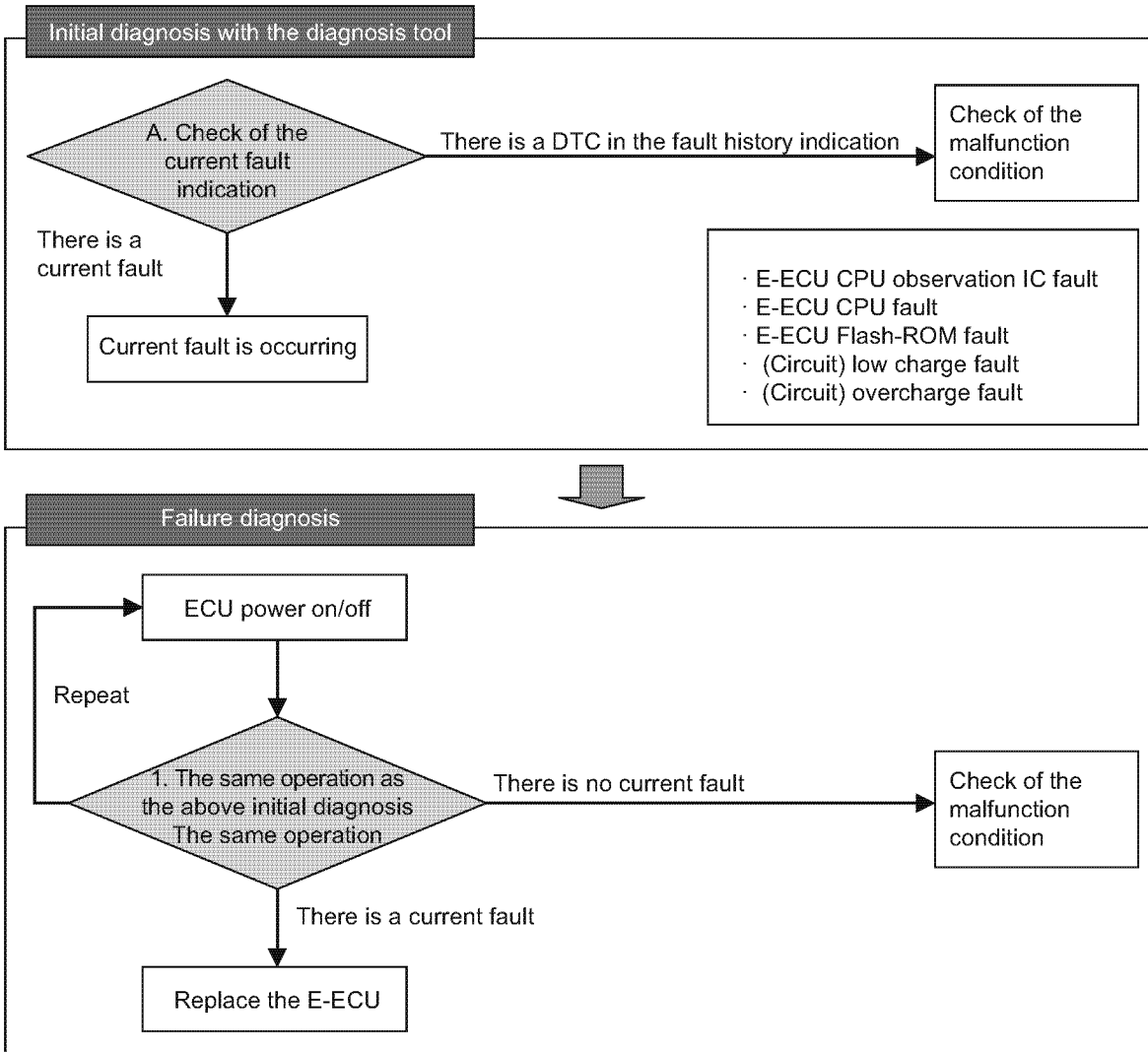
### ● Related DTC

P code	P0601	Name	EEPROM memory deletion error
SPN/FMI	630/12		
P code	P160E	Name	EEPROM memory read error
SPN/FMI	630/12		
P code	P160F	Name	EEPROM memory write error
SPN/FMI	630/12		
P code	P2228	Name	Atmospheric pressure sensor fault (low voltage)
SPN/FMI	108/4		
P code	P2229	Name	Atmospheric pressure sensor fault (high voltage)
SPN/FMI	108/3		
P code	P1231	Name	Atmospheric pressure sensor characteristic fault
SPN/FMI	108/10		
P code	P1613	Name	CY146 SPI communication fault
SPN/FMI	522585/12		
P code	P1608	Name	Excessive voltage of supply 1
SPN/FMI	522588/12		
P code	P1617	Name	Insufficient voltage of supply 1
SPN/FMI	522589/12		
P code	P1469	Name	AD converter fault 1
SPN/FMI	523473/12		
P code	P1470	Name	AD converter fault 2
SPN/FMI	523474/12		
P code	P1471	Name	External monitoring IC and CPU fault 1
SPN/FMI	523475/12		
P code	P1472	Name	External monitoring IC and CPU fault 2
SPN/FMI	523476/12		
P code	P1473	Name	ROM fault
SPN/FMI	523477/12		
P code	P1474	Name	Shutoff path fault 1
SPN/FMI	523478/12		

P code	P1475	Name	Shutoff path fault 2
SPN/FMI	523479/12		
P code	P1476	Name	Shutoff path fault 3
SPN/FMI	523480/12		
P code	P1477	Name	Shutoff path fault 4
SPN/FMI	523481/12		
P code	P1478	Name	Shutoff path fault 5
SPN/FMI	523482/12		
P code	P1479	Name	Shutoff path fault 6
SPN/FMI	523483/12		
P code	P1480	Name	Shutoff path fault 7
SPN/FMI	523484/12		
P code	P1481	Name	Shutoff path fault 8
SPN/FMI	523485/12		
P code	P1482	Name	Shutoff path fault 9
SPN/FMI	523486/12		
P code	P1483	Name	Shutoff path fault 10
SPN/FMI	523487/12		

● Workflow

Note: For the details of work, refer to the following "Work description". For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044395-01EN00

● Work description

1. Operation by the diagnosis tool:

- 1- Turn off the ECU power and then turn the key switch on again.
- 2- Connect the diagnosis tool and check whether an error is detected or not on the current fault indication.

No	Check the fault history indication and if there is an indication, check the malfunction condition.
Yes	<ul style="list-style-type: none"> <li>• Turn the ECU power on and off again and perform operation 1.</li> <li>• Replace the E-ECU.</li> </ul>



## Others

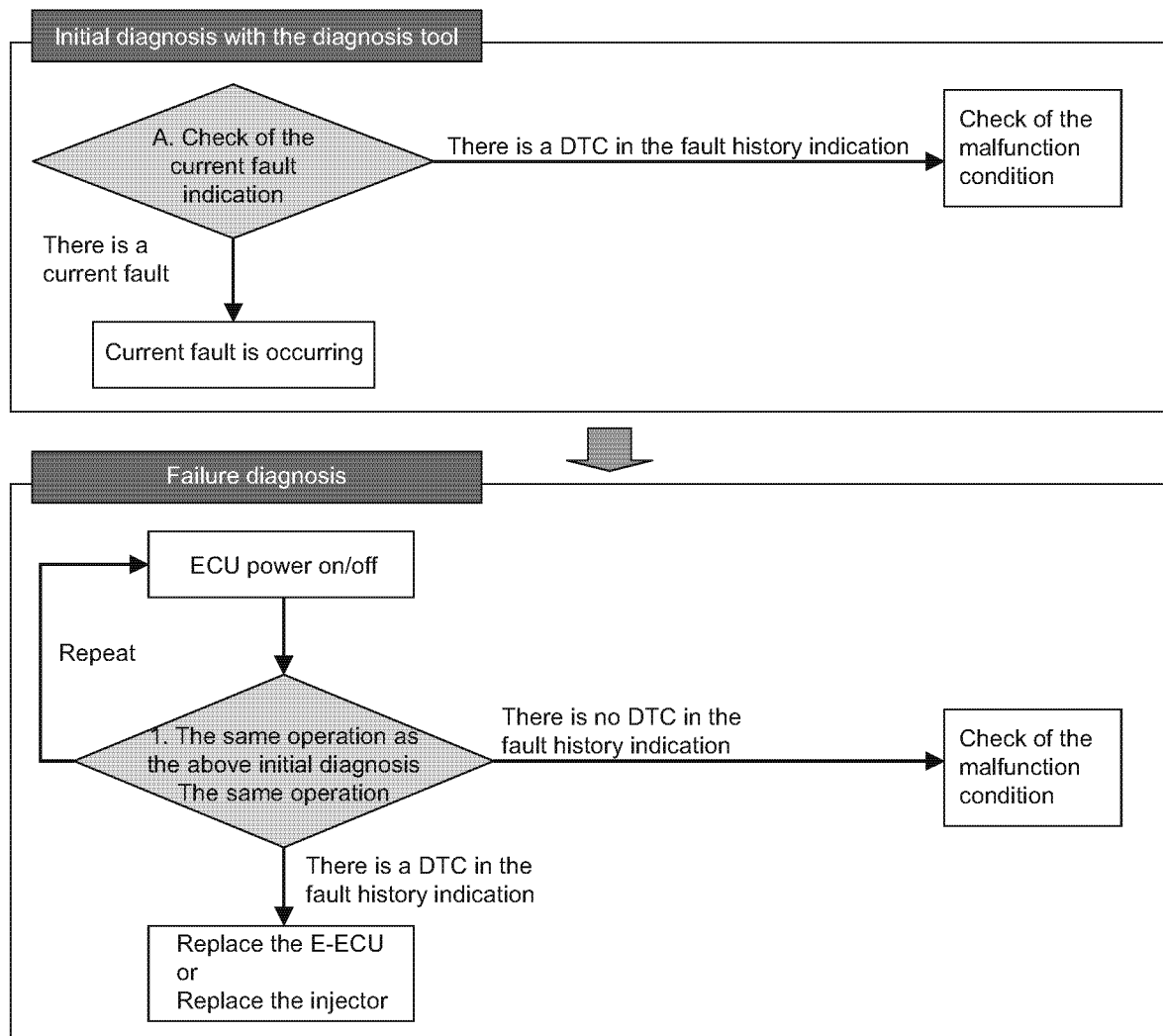
### ■ Overspeed

#### ● Related DTC

P code	P0219	Name	Overspeed
SPN/FMI	190/0		

#### ● Workflow

Note: For the details of work, refer to the following <Work description>. For the operation method of the diagnosis, refer to the separate "Diagnosis tool operation manual".



044396-01EN00

### ● Work description

1. Operation by the diagnosis tool:

- 1- Turn off the ECU power and start the engine after turning the power switch on again.
- 2- Connect the diagnosis tool and check whether an error is detected or not on the current fault indication.

<b>No</b>	Check the fault history indication and if there is an indication, check the malfunction condition.
<b>Yes</b>	<ul style="list-style-type: none"><li>• Turn the ECU power on and off again and perform operation 1.</li><li>• Replace the E-ECU or injector.</li></ul>

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