TROUBLESHOOTING MANUAL

INDUSTRIAL ENGINE

TNV, TN

4TNV94FHT

4TN101

4TN107

YANMAR

California
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

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TROUBLESHOOTING MANUAL	MODEL	4TNV94FHT, 4TN101, 4TN107
	CODE	0DTN4-EN0701

CONTENTS

GENERAL DESCRIPTION OF ENGINE ELECTRONIC CONTROL SYSTEM

Engines Applying in This Troubleshooting Manual

The following table shows the engine models that applies in this troubleshooting manual.

Table 1-1 Engine models applying in this troubleshooting manual

Engine model	ECU	DCU	Applicable or not	Remarks
4TNV94FHT	d33	HD01	NA	Refer to the conventional 4TNV94FHT troubleshooting manual.
4TNV94FHT	DC1V	VD1	Applicable	
4TN101HT • DT	DC1V	–	Applicable	
4TN101FHT • FDT	DC1V	VD1	Applicable	
4TN107HT • TT	DC1V	–	Applicable	
4TN107FHT • FTT	DC1V	HD01	Applicable	
		VD1	Applicable	

System Configuration of Engine Electronic Control System

General Description of Engine Electronic Control System (*: Applicable only to models with urea SCR system) is described below:

The following devices are adopted as electronic control devices to decrease the emission, and build an optimized electronic control system: common rail fuel injection system (CRS after this), exhaust gas recirculation system (EGR after this), diesel particulate filter* (DPF after this), and urea SCR* (Selective Catalytic Reduction) (SCR after this).

Engine system of "CRS + EGR + DPF*" is controlled with the engine controller (Engine ECU or ECU after this). SCR system* is controlled with the dosing control unit* (DCU after this).

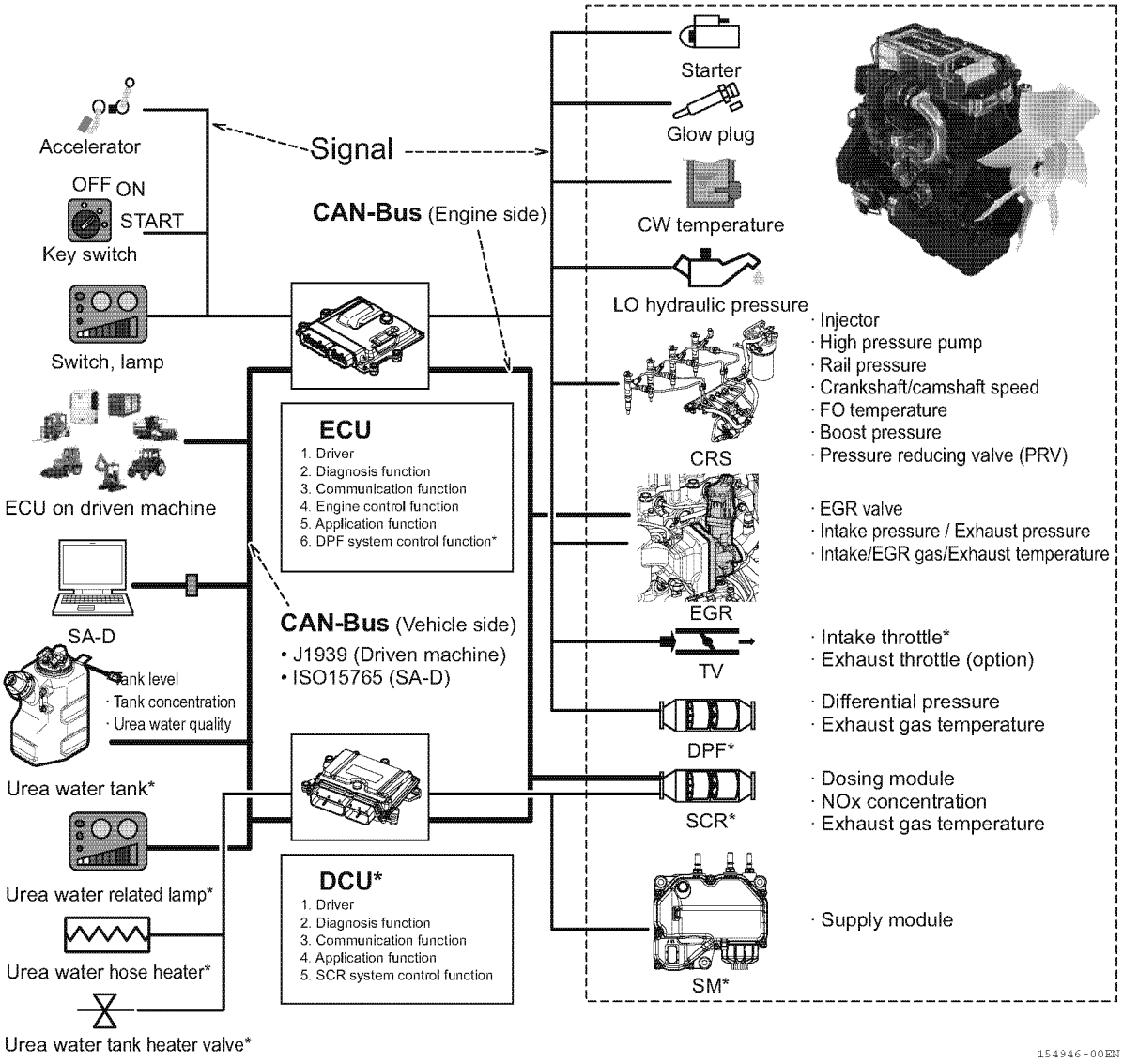


Figure 1-1 System outline of electronic control system (*: Applicable only to models with urea SCR system)

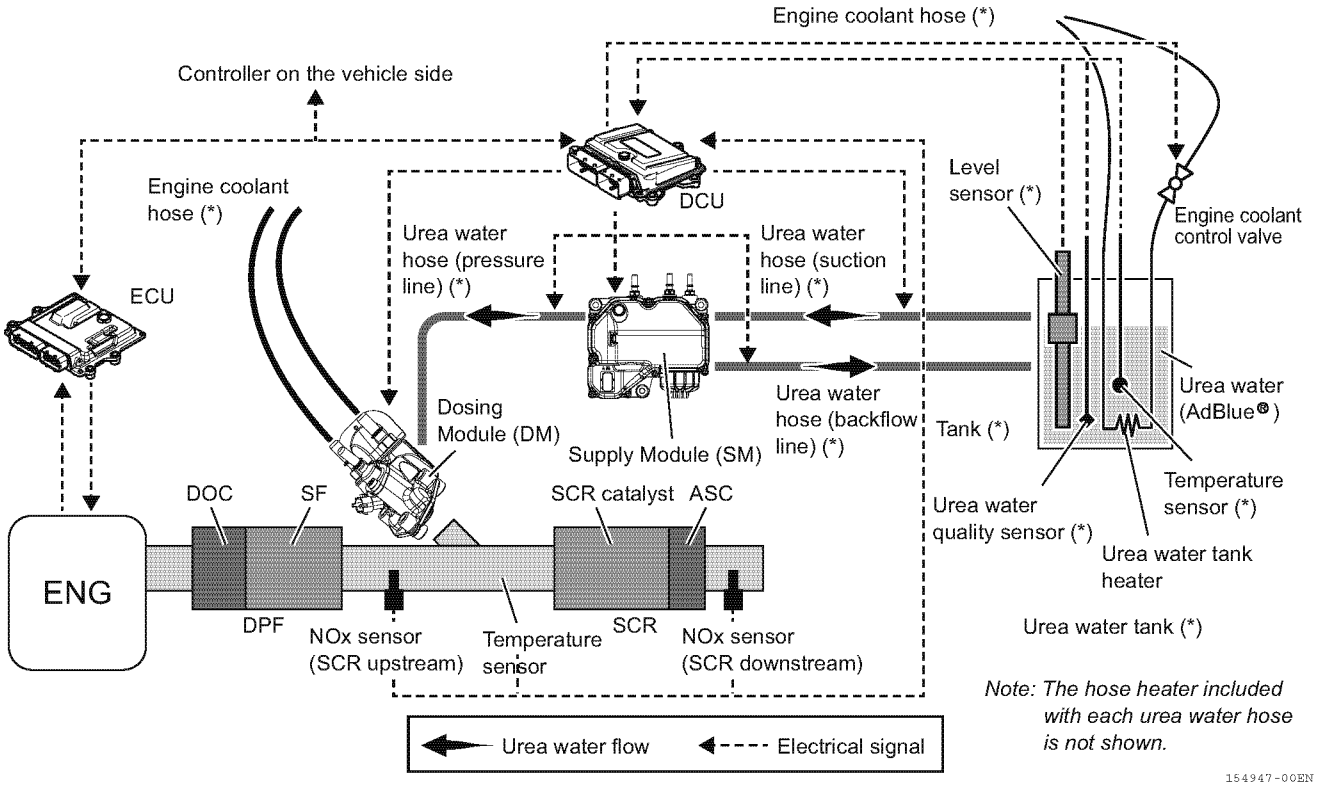


Figure 1-2 System outline of urea SCR system (Applicable only to models with urea SCR system)

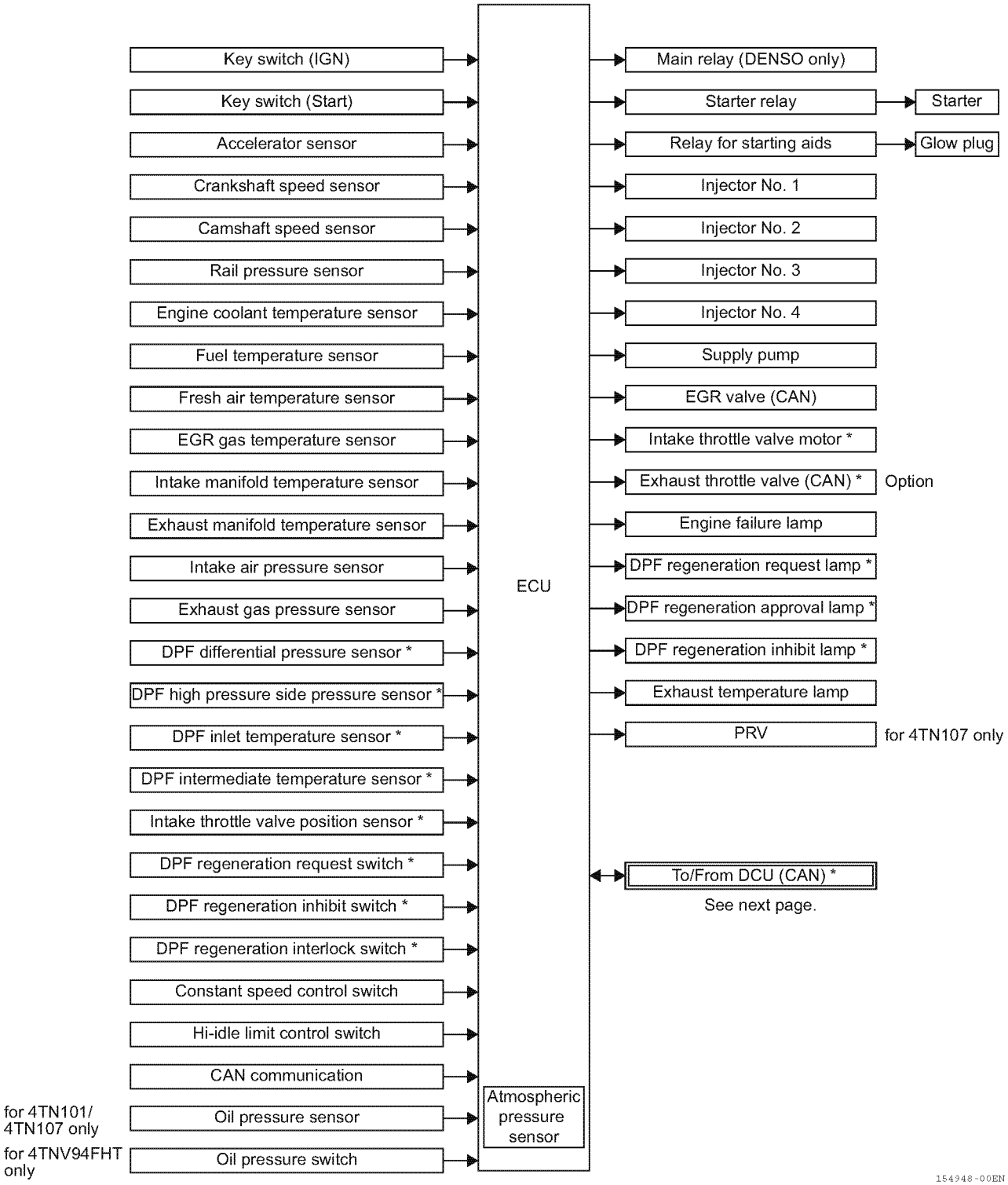


Figure 1-3 E-ECU system configuration (*: Applicable only to models with urea SCR system)

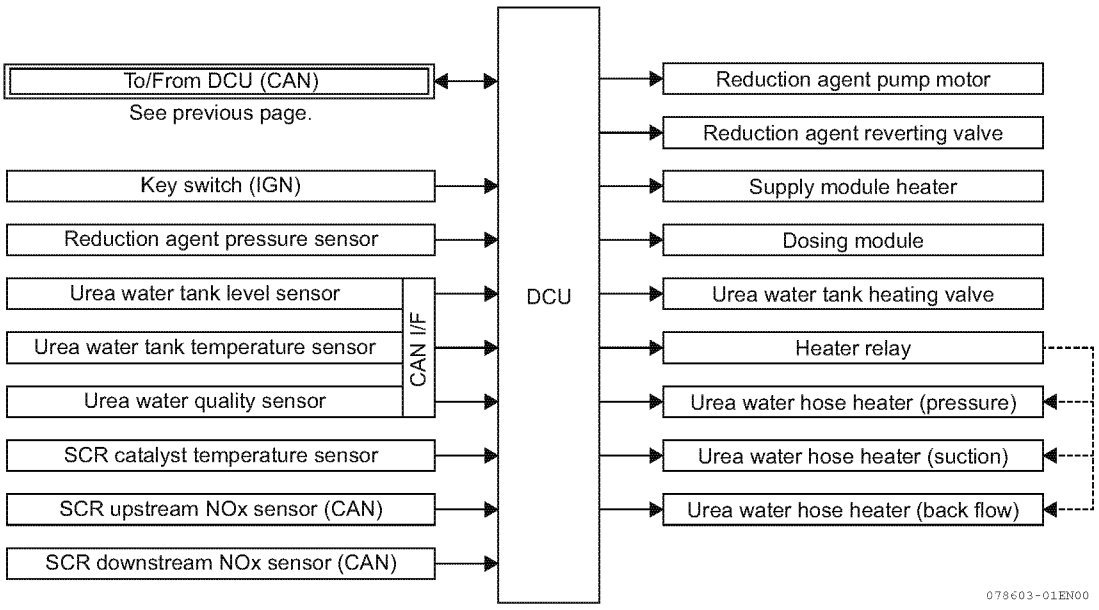


Figure 1-4 DCU system configuration (Applicable only to models with urea SCR system)

Engine ECU and DCU After-run Time

A certain length of time is required until ECU and DCU (Applicable only to models with urea SCR system) power supply is turned OFF after key switch is turned OFF. Do not remove the battery until this time passes. When ECU or DCU power supply needs to be switched from OFF to ON for error reset, turn OFF the key switch, make sure that the after-run is complete, and turn ON the key switch again.

ECU: 60 seconds are required until ECU power supply is turned OFF after key switch is turned OFF.
DCU: 7 minutes are required until DCU power supply is turned OFF after key switch is turned OFF.

With models with urea SCR system, the urea water inside the dosing module, supply module, and urea water hose is returned to the urea tank within 7 minutes, so there is an operating noise. When this operation is interrupted by actions such as removing the battery, urea water remains in the dosing module, supply module, or urea water hose. Such urea water causes its volume expansion on freezing, or its urea deposition (deposit) on drying, and damages these parts. Therefore, do not remove the battery for 7 minutes after turning off the key switch.

Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements

YANMAR's engines have functions like those indicated below. They are based on legal regulations such as the EPA emission regulations in the United States, the NRMM emission regulations in Europe, and Japan's regulations on special vehicles.

■ NOx control system diagnostic function (NCD: NOx Control Diagnostic) (Applicable only to models with urea SCR system)

- Detects failure or unauthorized modification of NOx control system*1, and failure of the NCD itself.
- Alerts operator when failure is detected.
- Incremental engine derating (Inducement*2) is applied to prompt the operator to take action.

■ Diagnosis functions for the PM control system (PCD: Particulate Control Diagnostic) (Applicable only to models with urea SCR system)

- Detects removal/loss of function of DPF, and failure of the DPF itself.
- Alerts operator when failure is detected.
- Addition of Incident counter/timer*3

■ Detection of remaining amount of urea water (Applicable only to models with urea SCR system)

- Output of a warning when a decrease in the remaining amount of urea water is detected
- Incremental engine derating (Inducement*2) is applied to prompt the operator to take action.

**1: The EGR system and SCR system (including abnormal reduction in the quality of the urea water) come under the NOx control system.*
**2: For details refer to P22 [Output limit by Inducement].*
**3: Cases where the equipment was operated for 20 hours or more with PCD abnormalities occurring must be recorded in the ECU's non-volatile memory and available to be checked by the relevant authorities. (Checking will be done using service tools.)*

With regard to the output of warnings to operators when failures are detected, customers' vehicles must be fitted with lamp displays or short message displays, in order to comply with the requirements for outputting a "Warning system using visual alarm".

Furthermore, the European NRMM emission regulations (EU Stage V) include detailed requirements regarding the warning indication methods. In addition, the matters that are specified by law must be indicated in the instruction manuals for the end users.

In addition to the above failure diagnostics and warning indications, P22 [Output limit by Inducement] and P29 [Other output limit] have been implemented in order to comply with the laws and regulations of each country.

Output limit by Inducement

(Applicable only to models with urea SCR system)

With regard to engines equipped with a NOx cleaning system such as SCR or EGR, when NOx control cannot be performed properly because of an abnormality, the engine speed and power output will be limited in order to prevent excessive emission of gas.

This limitation function called “Inducement”, and is stipulated in legal requirements. It operates in parallel with output limitation by Fail Safe, in order to protect the engine when a failure occurs. The operation of Inducement is specified in the emission regulations of each country, and the details regarding operation differ between the EPA emission regulations in the United States, the NRMM emission regulations in Europe, and Japan’s regulations on special vehicles. YANMAR’s Inducement is developed to enable compliance with these emission requirements.

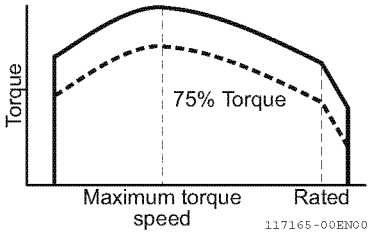
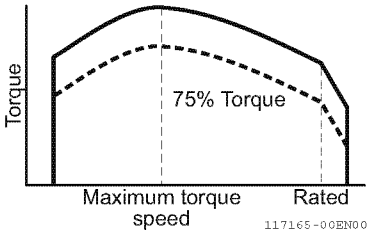
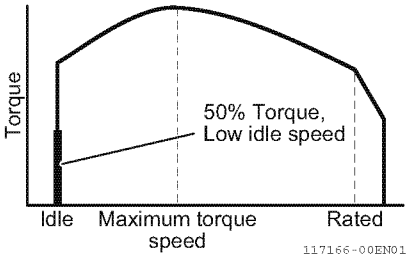
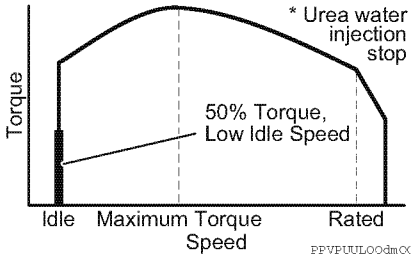
The conditions for Inducement to be performed are broadly divided into the three types indicated below.

- Inducement due to abnormalities in the SCR system (including abnormal reduction in the quality of the urea water) (NCD)
- Inducement due to abnormalities related to EGR valves (NCD)
- Inducement due to a decrease in the remaining amount of urea water in the urea water tank

For each of the above, the DCU judges whether **Warning, Inducement Level 1, or Inducement Level 2** is applicable.

For the engine behavior during Inducement, refer to **Table 1-2**. The system has an Inducement temporary release function (override mode) (option), to provide a means of evacuating the vehicle in an emergency.
The purposes of this include failure diagnosis, repairs, and movement to a safe place.

Table 1-2 Relationship between each type of Inducement state and engine behavior

<table>
<tr><th></th><th colspan="2">Operation in the event of an abnormality</th></tr>
<tr><td></td><td>• Inducement due to abnormalities in the SCR system (NCD)
• Inducement related to EGR valves (NCD)</td><td>• Inducement due to a decrease in the remaining amount of urea water in the urea water tank</td></tr>
<tr><td>Warning</td><td>• Warning indication: failure lamp + NCD lamp on (weak)
• Fuel injection quantity limitation: No
• Engine speed limitation: No</td><td>• Warning indication: urea water remaining amount warning lamp on (weak)
• Fuel injection quantity limitation: No
• Engine speed limitation: No</td></tr>
<tr><td>Inducement 1</td><td>• Warning indication: failure lamp + NCD lamp on (strong)
• Fuel injection quantity limitation: Limited to 75%
• Engine speed limitation: No
 
</td><td>• Warning indication: failure lamp + urea water remaining amount warning lamp on (strong)
• Fuel injection quantity limitation: Limited to 75%
• Engine speed limitation: No
 
</td></tr>
<tr><td>Inducement 2</td><td>• Warning indication: failure lamp + NCD lamp on (strong)
• Fuel injection quantity limitation: Limited to 50%
• Engine speed limitation: Limited to speed set for low idle
 
</td><td>• Warning indication: failure lamp + urea water remaining amount warning lamp on (strong)
• Fuel injection quantity limitation: Limited to 50%
• Engine speed limitation: Limited to speed set for low idle
• Urea water injection: stopped
 
</td></tr>
</table>

Precautions

(Applicable only to models with urea SCR system)

- **Distinction between strong and weak lighting-up patterns of the urea water remaining amount warning lamp and the NCD lamp**

With regard to the lighting-up patterns of the lamps, the regulations require an indication method that clearly distinguishes different levels, such as “weak” = flashing / “strong” = lit, or “weak” = on / “strong” = flashing. Measures must be taken to ensure that all vehicle operators will be able to understand the meanings of the indications, including lit/flashing lamps. Examples include taking into consideration the local areas where the products are sold, or clearly stating the meanings separately in the operation manuals.

- **After all of the failures and abnormalities are repaired and solved, and after the ECU/DCU is judged normal, the Inducement is canceled.**

With regard to rotation speed limitation, as indicated in **Figure 1-5**, taking into consideration the safety of the vehicle, the limit will be released after the instructed rotation speed from the vehicle is less than the limit rotation speed.

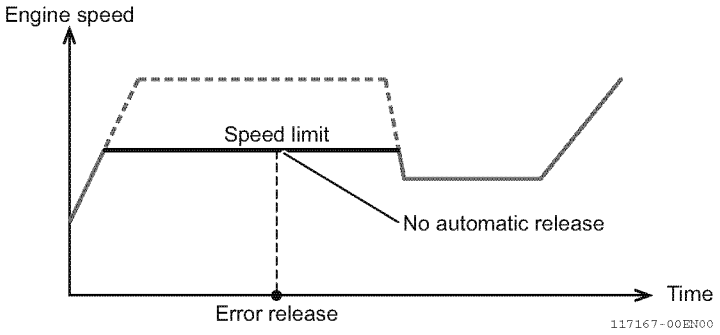


Figure 1-5 Method for releasing rotation speed limitation by Inducement

■ Inducement due to abnormalities in the SCR system

Function

In order to prevent the engine from continuing to be operated in a state in which urea water cannot be properly injected owing to abnormalities in the SCR system (including abnormal reduction in the quality of the urea water quality of the urea water), Inducement will be performed when abnormalities in the SCR system are detected. If the engine continues to be used once Inducement is activated, the engine speed/fuel injection quantity are reduced to a point at which work is almost impossible. Repair the abnormalities immediately.

Description

Figure 1-6 and **Table 1-3** show the relation between Inducement and the engine operation time from error occurrences.

If engine stop → engine restart is performed in a state in which an SCR system abnormality has occurred, Inducement will continue at the same level as when the engine was stopped. (Until the failure is repaired, Inducement will not be released even if the engine is stopped and then restarted.) Also, if an SCR system abnormality occurs again after the engine has been operating normally for 40 hours or less since the previous recovery from an SCR system abnormality, it will be regarded as a repeat occurrence (repeat offense), and a Inducement level will be selected that corresponds to the previous Inducement state.

Setting 3 levels has been provided for the operation time before judgment regarding Inducement level is made. Please choose which one to adopt, taking into consideration the circumstances of use. (You can choose using the DCU application menu.)

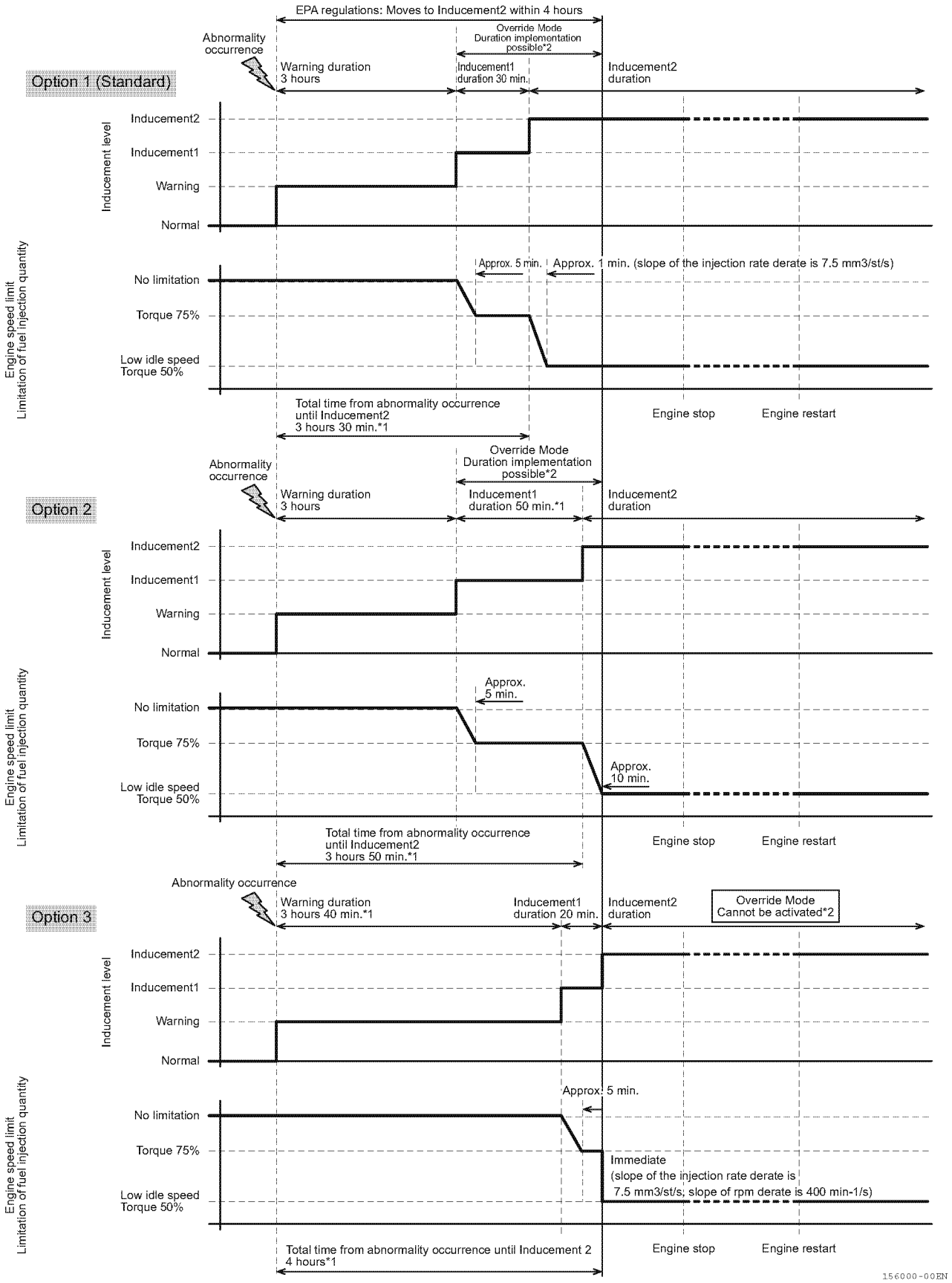


Figure 1-6 Relation between Inducement and the engine operation time from error occurrences (Applicable only to models with urea SCR system)

1: For Inducement periods during repeat occurrence, refer to **Table 1-3.*
**2: For the details on override mode, refer to the application manual.*

Table 1-3 Judgment of Inducement state due to an SCR system abnormality (Applicable only to models with urea SCR system)

Specification		Option 1 (standard)		Option 2		Option 3	
Applicability of the Inducement temporary release function		Applicable		Applicable		Not applicable	
Behavior when Inducement occurs	Inducement level	Switching operation when limited	Duration	Switching operation when limited	Duration	Switching operation when limited	Duration
First occurrence (not a repeat occurrence)	Warning	–	3 hours	–	3 hours	–	3 hours 40 minutes
	Inducement 1	Gradual change 5 minute	30 minutes	Gradual change 5 minute	50 minutes	Gradual change 5 minute	20 minutes
	Inducement 2	Gradual change 1 minute	Until normal state is recovered	Gradual change 10 minute	Until normal state is recovered	Switch immediately	Until normal state is recovered
	Period from when the error occurred until Inducement 2 judgment	–	Total 3 hours 30 minutes	–	Total 3 hours 50 minutes (gradual change 10 minutes)	–	Total 4 hours
When it is a repeat occurrence (Inducement level before recovery is Warning or Inducement 1)	–	Maintain switching operation and duration that correspond to Inducement level before previous recovery from abnormality					
When it is a repeat occurrence (Inducement level before recovery is Inducement 2)	Warning	–	0 minutes	–	0 minutes	–	10 minutes
	Inducement 1	–	–	Gradual change 5 minute	20 minutes	Gradual change 5 minute	20 minutes
	Inducement 2	Gradual change 1 minute	Until normal state is recovered	Gradual change 10 minute	Until normal state is recovered	Switch immediately	Until normal state is recovered
	Period from when the error occurred until Inducement 2 judgment	–	Total 0 minutes (immediate)	–	Total 20 minutes (gradual change 10 minutes)	–	Total 30 minutes

■ Inducement by EGR valve related abnormality

Function

In order to prevent the engine from continuing to be operated in a state in which EGR control cannot be performed properly owing to abnormalities in the EGR valve related, Inducement will be performed when abnormalities in the EGR valve related are detected. If the engine continues to be used once Inducement is activated, the engine speed/fuel injection quantity are reduced to a point at which work is almost impossible. Repair the abnormalities immediately.

Description

Figure 1-7 and **Table 1-4** show the relation between Inducement and the engine operation time from error occurrences after the occurrence of an error related to EGR valves. If engine stop → engine restart is performed in a state in which an abnormality related to EGR valves has occurred, Inducement will continue at the same level as when the engine was stopped. (Until the failure is repaired, Inducement will not be released even if the engine is stopped and then restarted.) Also, if an abnormality related to the EGR valves occurs again after the engine has been operating normally for 40 hours or less since the previous recovery from an abnormality related to the EGR valves, it will be regarded as a repeat occurrence, and an Inducement level will be selected that corresponds to the previous Inducement state.

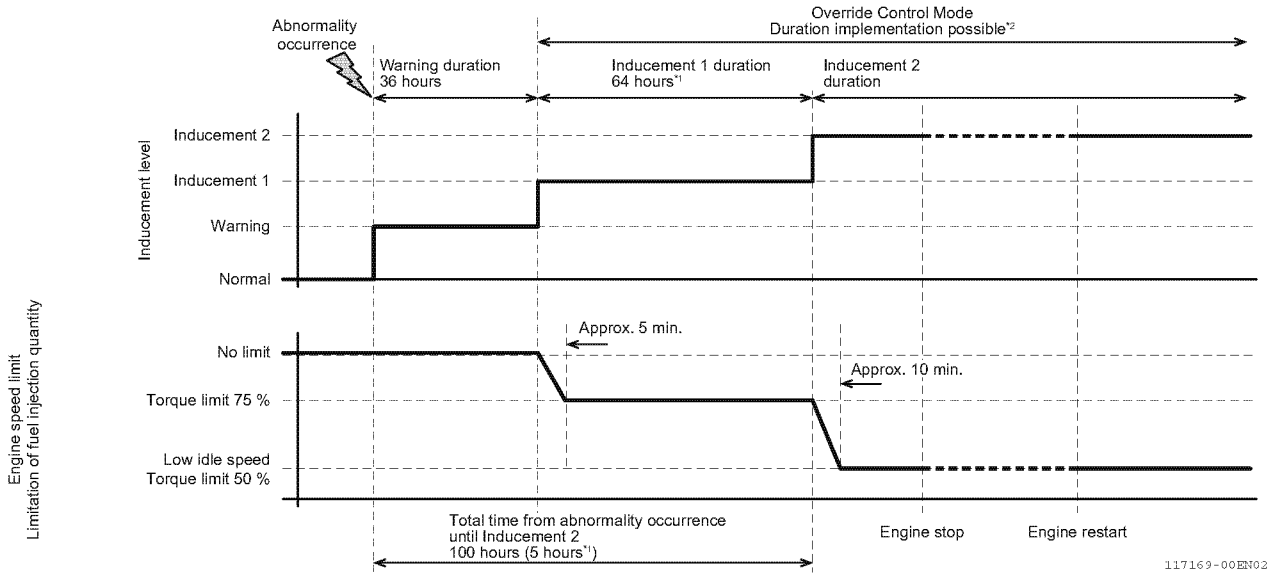


Figure 1-7 Relation between Inducement and the engine operation time from error occurrences after the occurrence of an error related to EGR valves (Applicable only to models with urea SCR system)

1: For Inducement periods during repeat occurrence, refer to **Table 1-4.*
**2: For the details on override mode, refer to the application manual.*

Table 1-4 Judgment of Inducement state due to an abnormality related to EGR valves (Applicable only to models with urea SCR system)

Specification		Standard	
Applicability of the Inducement temporary release function		Applicable	
Behavior when Inducement occurs	Inducement level	Switching operation when limited	Duration
First occurrence (not a repeat occurrence)	Warning	–	36 hours
	Inducement 1	Gradual change 5 minute	64 hours
	Inducement 2	Gradual change 10 minute	Until normal state is recovered
	Period from when the error occurred until Inducement 2 judgment	–	Total 100 hours
When it is a repeat occurrence (Inducement level before recovery is Warning or Inducement 1)	–	Maintain switching operation and duration that correspond to Inducement level before previous recovery from abnormality	
When it is a repeat occurrence (Inducement level before recovery is Inducement 2)	Warning	–	–
	Inducement1	–	5 hours
	Inducement2	Gradual change 10 minute	Until normal state is recovered
	Period from when the error occurred until Inducement 2 judgment	–	Total 5 hours

■ Inducement caused by a decrease in the remaining amount of urea water in the urea water tank (Applicable only to models with urea SCR system)

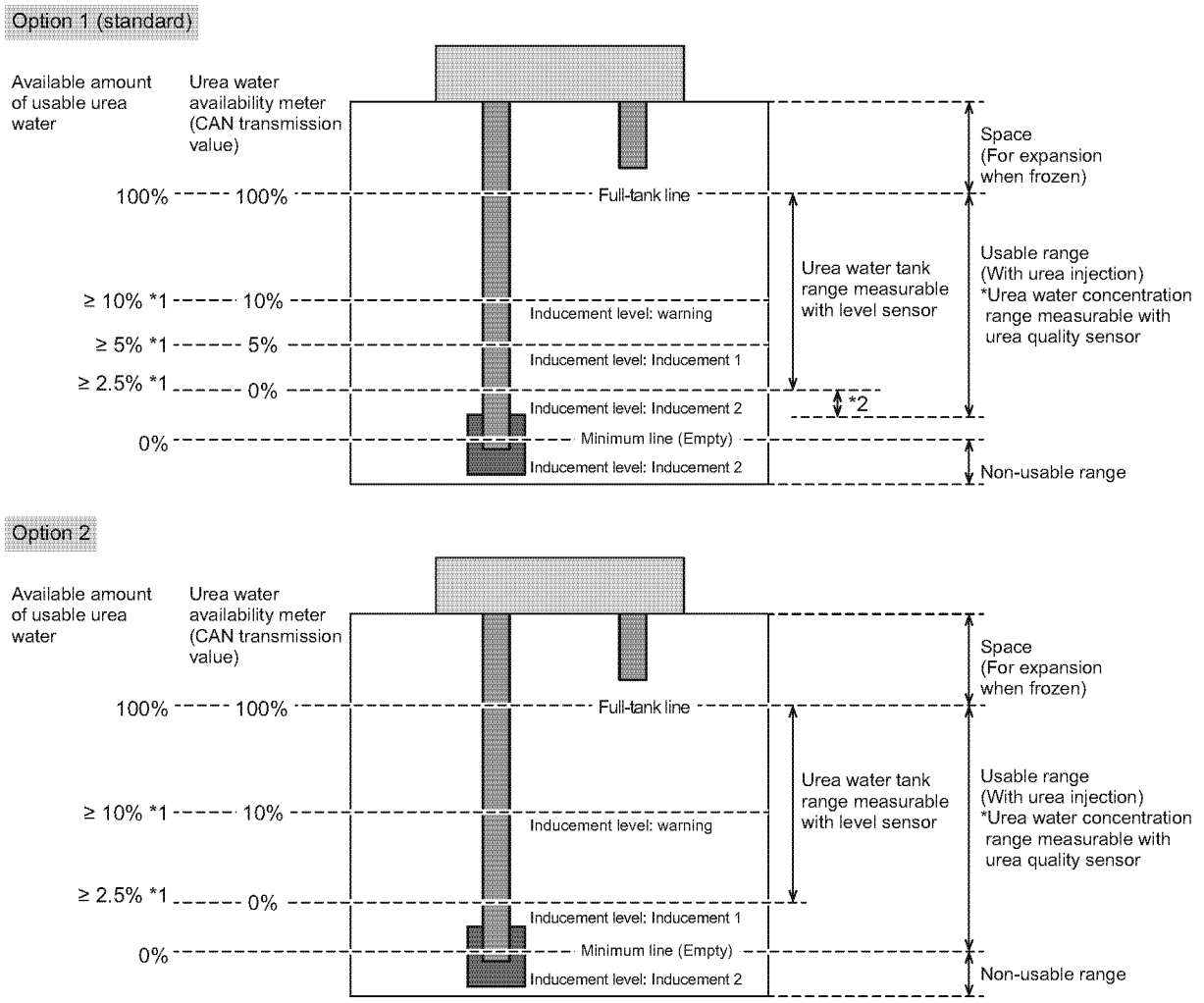
Function

In order to prevent the engine from continuing to be operated with the urea water tank left empty, Inducement will be performed when by detecting a decrease in the remaining amount of urea water. If the engine continues to be operated with Inducement in force, the engine speed and fuel injection amount will be more and more limited as operations become impossible. Therefore, please replenish the urea water immediately to release the Inducement.

Description

Figure 1-8 and **Table 1-5** show the relation between Inducement level and remaining amount of urea water in the urea water tank. The available remaining amount of urea water and output by the meter for remaining amount of urea water will differ depending on the shape and level sensor of the urea water tank.

Setting 2 levels has been provided for the remaining amount of urea water to use to judge the Inducement level. Please choose which one to adopt, taking into consideration the circumstances of use. (You can choose using the DCU application menu.)



*1: Changes depending on the urea water tank shape and the urea water tank level sensor.
*2: When using the Inducement temporary release function due to a decrease in the amount of urea water remaining, it is necessary to secure the remaining amount of urea water that can be injected urea during the temporary cancellation period. It is unnecessary to reserve when not in use.

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Figure 1-8 Relationship between Inducement level and remaining amount of urea water in the urea water tank

Table 1-5 Inducement judgment due to a decrease in the remaining amount of urea water in the urea water tank (Applicable only to models with urea SCR system)

Specification		Option 1 (standard)			Option 2		
Applicability of the Inducement temporary release function		Applicable			Not applicable		
Behavior when Inducement occurs	Inducement level	Switching operation when limited	Judgment condition	Release condition (tank level sensor value)	Switching operation when limited	Judgment condition	Release condition (tank level sensor value)
Inducement judgment due to a decrease in the remaining amount of urea water in the urea water tank	Warning	–	5% (*3) < Remaining amount of urea water ≤ 10% (*1)	Fill urea water to 20% (*2) or above	–	0% < Remaining amount of urea water ≤ 10% (*1)	Fill urea water to 20% (*2) or above
	Inducement 1	Gradual change 5 minute	0% < Remaining amount of urea water ≤ 5% (*3)	Fill urea water to more than 10% (*1)	Gradual change 5 minute	Remaining amount of urea water = 0%	Fill urea water to 2.5% or above
	Inducement 2	No	Remaining amount of urea water = 0%	Fill urea water to 2.5% or above	No	Remaining amount of urea water = 0% and SM pressure ≤ 0 kPa	Fill urea water to 2.5% or above

**1: Setting value for the Warning judgment level. Can be changed in the DCU application menu.*
In the case of Option 1, the cancellation conditions are the same as for Inducement 1.
**2: Setting value for the Warning cancellation level. Can be changed in the DCU application menu.*
**3: Setting value for the Inducement 1 judgment level. Can be changed in the DCU application menu.*
Must be 2.5% or above for EU regulations.

Other output limit

Besides P22 [Output limit by Inducement], abnormalities limits the engine speed and output for protecting and safety of the engine.

■ Limited operation

There are the following two limitations.

- Forecast operation: Preliminary limitations implemented when an error occurs
- Main operation: Full-scale limitations implemented after forecast operation

Forecast operation and main operation differ according to each error.
(For details, refer to P41 [Engine ECU Judgment Item])

■ Relationship with Inducement

If the Inducement limitation and the main operation limitation overlap, whichever is more restrictive will be implemented.

■ Output limitation diagram

Time

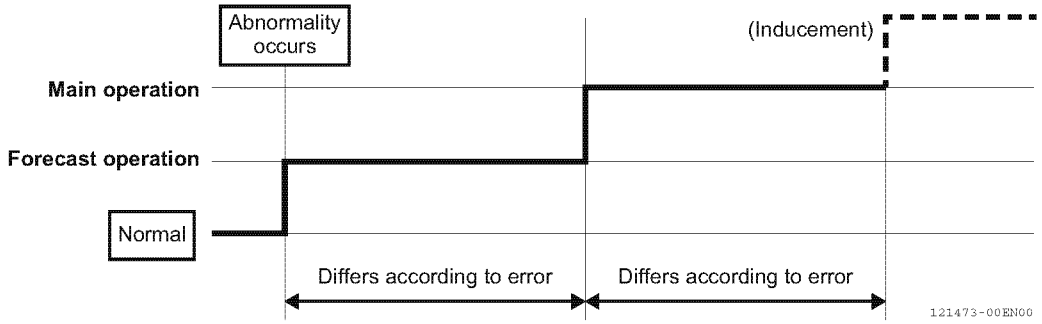


Figure 1-9

Fuel/speed limitation

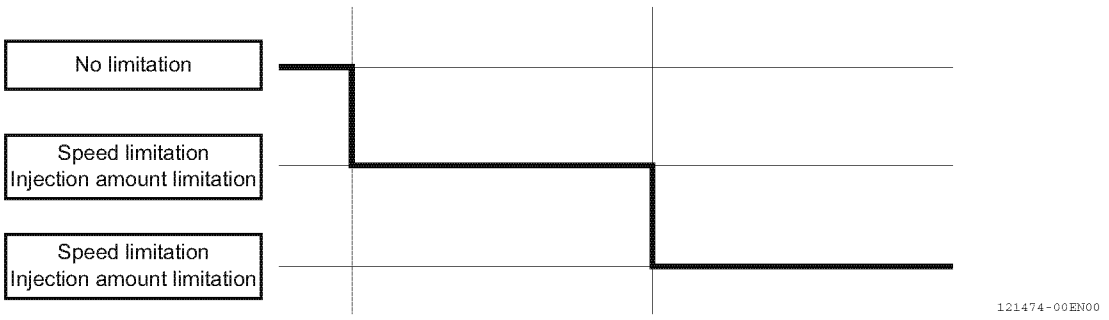


Figure 1-10

SCR System Limited Operation (Applicable only to models with urea SCR system)

Limited operation for SCR system may be performed in the error occurrences.

Contents of the limited operations are described here. See “Limited operation” in each error that is described afterwards for checking which limited operations are performed.

Table 1-6 Description of limited operation for SCR system

Description in limited operation	Description of limited operation
The urea water injection is limited to alternative mode.	When this limited operation is performed, the urea water injection is limited more than usual to prevent urea water deposition from being generated in exhaust pipe.
The urea water injection stops. The urea water is sucked back immediately.	When this limited operation is performed, the urea water injection stops. The urea water is sucked back before the key switch is turned OFF.
The urea water injection stops, and the urea water is sucked back immediately.	When this limited operation is performed, the urea water injection stops, and sucking back urea water also stops. In this case, urea water may remain in the dosing module, supply module, and urea water hose. Due to this remaining urea water, “supply module urea water sucking back failure” may be detected when turning on DCU power supply next time.
SCR heating stops.	SCR heating is to change injection patterns of common rail to increase the SCR catalyst temperature for improving NOx cleaning rate after starting the engine. This SCR heating stops when this limited operation is performed.
Defrosting/heat insulating control of urea water stops.	Defrosting/heat insulating control is a control which heats the urea water with urea water hose heater, supply module heater, and engine coolant at low temperatures to defrost the urea water or prevent it from being frozen at low temperatures. This defrosting/heat insulating control stops, when this limited operation is performed.

■ How to delete the indication of Inducement applying error (NCD error)

The display of the Inducement applying error (NCD error) triggered by “current failure (error occurrence)” cannot be cleared by the failure indication clearing function of SA-D (SmartAssist Direct). If you need to clear the indication, use the Inducement clearing function of SA-D (SmartAssist Direct).

Clearing of each error display

ECU/DCU	SA-D failure indication clearing command	Clearing of error display			
		Error not subject to Inducement		Error subject to Inducement	
		Current failure	Failure history	Current failure	Failure history
ECU	Failure indication clear	Able to clear	Able to clear	Not able to clear	Able to clear
	Inducement clear	Able to clear	Not able to clear	Able to clear	Not able to clear
DCU	Failure indication clear	Able to clear	Able to clear	Not able to clear	Able to clear
	Inducement clear	Not able to clear	Not able to clear	Able to clear	Not able to clear

DTC (DIAGNOSTIC TROUBLE CODES) GENERAL DESCRIPTION

DTC Code List

There are three types of lamps that come on when detecting errors. The lamp type may vary depending on the driven machine.

1. Failure lamp (FAIL)
2. Amber warning lamp (AWL)
3. Red engine stop lamp (RSL)

■ Engine ECU judgment item

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
P code	SPN		FMI		Part	State	4TNV94	4TN101		4TN107			Description	Diagnosis
	Decimal number	Hexadecimal number	Decimal number				FHT (ECU: DC1V, DCU: VD1)	HT-DT	FHT-FDT	HT-TT	FHT-FTT (DCU: HD01)	FHT-FTT (DCU: VD1)		
P0336	522400	7F8A0	2	FAIL + RSL	Crankshaft speed sensor	Crankshaft signal error	O	O	O	O	O	O	*P41*	*P679*
P0337	522400	7F8A0	5	FAIL + RSL	Crankshaft speed sensor	No signal from crankshaft	O	O	O	O	O	O	*P43*	*P682*
P0341	522401	7F8A1	2	FAIL + AWL	Camshaft speed sensor	Camshaft signal error	O	O	O	O	O	O	*P45*	*P685*
P0342	522401	7F8A1	5	FAIL + AWL	Camshaft speed sensor	No signal from camshaft	O	O	O	O	O	O	*P47*	*P688*
P0008	523249	7FBF1	5	FAIL + RSL	Crank/Camshaft speed sensor	Crank/Camshaft speed sensor non-input (simultaneous)	O	O	O	O	O	O	*P49*	*P691*
P0123	91	5B	3	FAIL + AWL	Accelerator sensor 1	Accelerator sensor 1 error (voltage high)	O	O	O	O	O	O	*P51*	*P592*
P0122	91	5B	4	FAIL + AWL	Accelerator sensor 1	Accelerator sensor 1 error (voltage low)	O	O	O	O	O	O	*P53*	*P592*
P0223	28	1C	3	FAIL + AWL	Accelerator sensor 2	Accelerator sensor 2 error (voltage high)	O	O	O	O	O	O	*P55*	*P592*
P0222	28	1C	4	FAIL + AWL	Accelerator sensor 2	Accelerator sensor 2 error (voltage low)	O	O	O	O	O	O	*P57*	*P592*
P1646	522624	7F980	7	FAIL + AWL	Accelerator sensor 1,2	Dual accelerator sensor error (closed position error)	O	O	O	O	O	O	*P59*	*P592*
P1647	522623	7F97F	7	FAIL + AWL	Accelerator sensor 1,2	Dual accelerator sensor error (open position error)	O	O	O	O	O	O	*P61*	*P592*
P0228	29	1D	3	FAIL + AWL	Accelerator sensor 3	Accelerator sensor 3 error (voltage high)	O	O	O	O	O	O	*P63*	*P592*
P0227	29	1D	4	FAIL + AWL	Accelerator sensor 3	Accelerator sensor 3 error (voltage low)	O	O	O	O	O	O	*P65*	*P592*
P1126	28	1C	0	FAIL + AWL	Accelerator sensor 3	Accelerator sensor 3 foot pedal error (open position error)	O	O	O	O	O	O	*P67*	*P592*
P1125	28	1C	1	FAIL + AWL	Accelerator sensor 3	Accelerator sensor 3 foot pedal error (closed position error)	O	O	O	O	O	O	*P69*	*P592*
P02E9	51	33	3	FAIL + AWL	Intake throttle valve position sensor	Intake throttle valve position sensor error (voltage high)	O	–	O	–	O	O	*P71*	*P652*
P02E8	51	33	4	FAIL + AWL	Intake throttle valve position sensor	Intake throttle valve position sensor error (voltage low)	O	–	O	–	O	O	*P73*	*P652*
P0238	102	66	3	FAIL + RSL	Intake air pressure sensor	Intake air pressure sensor error (high voltage)	O	O	O	O	O	O	*P75*	*P655*
P0237	102	66	4	FAIL + RSL	Intake air pressure sensor	Intake air pressure sensor error (low voltage)	O	O	O	O	O	O	*P77*	*P655*
P0236	102	66	13	FAIL + RSL	Intake air pressure sensor	Intake air pressure sensor error (abnormal learning value)	O	O	O	O	O	O	*P79*	*P658*
P1673	102	66	10	FAIL + RSL	Intake air pressure sensor	Intake air pressure sensor error (detected value error)	O	–	O	–	O	O	*P81*	*P660*
P0473	1209	4B9	3	FAIL + RSL	Exhaust gas pressure sensor	Exhaust gas pressure sensor error (high voltage)	O	O	O	O	O	O	*P83*	*P655*
P0472	1209	4B9	4	FAIL + RSL	Exhaust gas pressure sensor	Exhaust gas pressure sensor error (low voltage)	O	O	O	O	O	O	*P85*	*P655*
P0471	1209	4B9	13	FAIL + RSL	Exhaust gas pressure sensor	Exhaust gas pressure sensor error (abnormal learning value)	O	O	O	O	O	O	*P87*	*P658*
P1679	1209	4B9	10	FAIL + RSL	Exhaust gas pressure sensor	Exhaust gas pressure sensor error (detected value error)	O	–	O	–	O	O	*P89*	*P660*
P0118	110	6E	3	FAIL + RSL	Cooling water temperature sensor	Cooling water temperature sensor error (voltage high)	O	O	O	O	O	O	*P91*	*P626*
P0117	110	6E	4	FAIL + RSL	Cooling water temperature sensor	Cooling water temperature sensor error (voltage low)	O	O	O	O	O	O	*P93*	*P626*
P0217	110	6E	0	Application specific	Cooling water temperature sensor	Cooling water temperature high (overheat)	O	O	O	O	O	O	*P95*	*P630*

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
	SPN		FMI				4TNV94	4TN101		4TN107				
P code	Decimal number	Hexadecimal number	Decimal number		Part	State	FHT (ECU: DC1V, DCU: VD1)	HT-DT	FHT-FDT	HT-TT	FHT-FTT (DCU: HD01)	FHT-FTT (DCU: VD1)	Description	Diagnosis
P1674	110	6E	10	FAIL + RSL	Cooling water temperature sensor	Cooling water temperature sensor error (detected value error)	O	–	O	–	O	O	*P97*	*P634*
P0113	172	AC	3	FAIL + RSL	Fresh air temperature sensor	Fresh air temperature sensor error (voltage high)	O	O	O	O	O	O	*P99*	*P639*
P0112	172	AC	4	FAIL + RSL	Fresh air temperature sensor	Fresh air temperature sensor error (voltage low)	O	O	O	O	O	O	*P101*	*P639*
P1678	172	AC	10	FAIL + RSL	Fresh air temperature sensor	Fresh air temperature sensor error (detected value error)	O	–	O	–	O	O	*P103*	*P643*
P0183	174	AE	3	FAIL + AWL	Fuel temperature sensor	Fuel temperature sensor error (voltage high)	O	O	O	O	O	O	*P105*	*P648*
P0182	174	AE	4	FAIL + AWL	Fuel temperature sensor	Fuel temperature sensor error (voltage low)	O	O	O	O	O	O	*P107*	*P648*
P0168	174	AE	0	Application specific	Fuel temperature sensor	Fuel temperature high	O	O	O	O	O	O	*P109*	*P648*
P0193	157	9D	3	FAIL + RSL	Rail pressure sensor	Rail pressure sensor error (voltage high)	O	O	O	O	O	O	*P111*	*P597*
P0192	157	9D	4	FAIL + RSL	Rail pressure sensor	Rail pressure sensor error (voltage low)	O	O	O	O	O	O	*P113*	*P597*
P2455	3251	CB3	3	FAIL + RSL	DPF differential pressure sensor	DPF differential pressure sensor error (voltage high)	O	–	O	–	O	O	*P115*	*P664*
P2454	3251	CB3	4	FAIL + RSL	DPF differential pressure sensor	DPF differential pressure sensor error (voltage low)	O	–	O	–	O	O	*P117*	*P664*
P2453	3251	CB3	13	FAIL + RSL	DPF differential pressure sensor	DPF differential pressure sensor error (abnormal learning value)	O	–	O	–	O	O	*P119*	*P670*
P2452	3251	CB3	0	FAIL + RSL	DPF differential pressure sensor	DPF differential pressure sensor abnormal rise in differential pressure	O	–	O	–	O	O	*P121*	*P667*
P226D	4795	12BB	31	FAIL + AWL	DPF substrate/DPF differential pressure sensor	DPF substrate/DPF differential pressure sensor error (DPF substrate removal/DPF differential pressure sensor detected value error)	O	–	O	–	O	O	*P123*	*P672*
P1455	3609	E19	3	FAIL + RSL	DPF high pressure sensor	DPF high pressure sensor error (voltage high)	O	–	O	–	O	O	*P125*	*P664*
P1454	3609	E19	4	FAIL + RSL	DPF high pressure sensor	DPF high pressure sensor error (voltage low)	O	–	O	–	O	O	*P127*	*P664*
P167C	3609	E19	10	FAIL + AWL	DPF high pressure sensor	DPF high pressure sensor error (detected value error)	O	–	O	–	O	O	*P129*	*P672*
P1428	3242	CAA	3	FAIL + RSL	DPF inlet temperature sensor	DPF inlet temperature sensor error (voltage high)	O	–	O	–	O	O	*P131*	*P600*
P1427	3242	CAA	4	FAIL + RSL	DPF inlet temperature sensor	DPF inlet temperature sensor error (voltage low)	O	–	O	–	O	O	*P133*	*P600*
P167E	3242	CAA	10	FAIL + AWL	DPF inlet temperature sensor	DPF inlet temperature sensor error (detected value error)	O	–	O	–	O	O	*P135*	*P604*
P1436	3242	CAA	0	FAIL + AWL	DPF inlet temperature sensor	DPF inlet temperature sensor abnormal temperature (abnormally high)	O	–	O	–	O	O	*P137*	*P600*
P1434	3250	CB2	3	FAIL + RSL	DPF intermediate temperature sensor	DPF intermediate temperature sensor error (voltage high)	O	–	O	–	O	O	*P138*	*P609*
P1435	3250	CB2	4	FAIL + RSL	DPF intermediate temperature sensor	DPF intermediate temperature sensor error (voltage low)	O	–	O	–	O	O	*P140*	*P609*
P167A	3250	CB2	10	FAIL + AWL	DPF intermediate temperature sensor	DPF intermediate temperature sensor error (detected value error)	O	–	O	–	O	O	*P142*	*P621*
P0420	3250	CB2	1	FAIL + AWL	DPF intermediate temperature sensor	DPF intermediate temperature abnormal (abnormally low)	O	–	O	–	O	O	*P144*	*P613*
P1426	3250	CB2	0	FAIL + RSL	DPF intermediate temperature sensor	DPF intermediate temperature abnormal (abnormal rise in temperature)	O	–	O	–	O	O	*P145*	*P617*
P2229	108	6C	3	FAIL + RSL	Atmospheric pressure sensor	Atmospheric pressure sensor error (voltage high)	O	O	O	O	O	O	*P146*	*P786*
P2228	108	6C	4	FAIL + RSL	Atmospheric pressure sensor	Atmospheric pressure sensor error (voltage low)	O	O	O	O	O	O	*P147*	*P786*
P1231	108	6C	10	FAIL + RSL	Atmospheric pressure sensor	Atmospheric pressure sensor error (characteristic error)	O	O	O	O	O	O	*P148*	*P787*
P041D	412	19C	3	FAIL + RSL	EGR gas temperature sensor	EGR gas temperature sensor error (voltage high)	O	O	O	O	O	O	*P149*	*P693*
P041C	412	19C	4	FAIL + RSL	EGR gas temperature sensor	EGR gas temperature sensor error (voltage low)	O	O	O	O	O	O	*P151*	*P693*
P1675	412	19C	10	FAIL + RSL	EGR gas temperature sensor	EGR gas temperature sensor error (detected value error)	O	–	O	–	O	O	*P153*	*P697*
P040D	105	69	3	FAIL + RSL	Intake manifold temperature sensor	Intake manifold temperature sensor error (voltage high)	O	O	O	O	O	O	*P155*	*P703*
P040C	105	69	4	FAIL + RSL	Intake manifold temperature sensor	Intake manifold temperature sensor error (voltage low)	O	O	O	O	O	O	*P157*	*P703*
P1676	105	69	10	FAIL + RSL	Intake manifold temperature sensor	Intake manifold temperature sensor error (detected value error)	O	–	O	–	O	O	*P159*	*P707*
P0546	173	AD	3	FAIL + RSL	Exhaust manifold temperature sensor	Exhaust manifold temperature sensor error (voltage high)	O	O	O	O	O	O	*P161*	*P713*
P0545	173	AD	4	FAIL + RSL	Exhaust manifold temperature sensor	Exhaust manifold temperature sensor error (voltage low)	O	O	O	O	O	O	*P163*	*P713*
P1677	173	AD	10	FAIL + RSL	Exhaust manifold temperature sensor	Exhaust manifold temperature sensor error (detected value error)	O	–	O	–	O	O	*P165*	*P721*
P2428	173	AD	0	FAIL + RSL	Exhaust manifold temperature sensor	Exhaust manifold temperature sensor error (detected value error) (temperature high)	–	O	–	O	–	–	*P167*	*P717*
P068A	1485	5CD	2	FAIL + AWL	Main relay	Main relay premature opening	O	O	O	O	O	O	*P168*	–
P0543	522243	7F803	5	FAIL + AWL	Starting aid relay	Starting aid relay disconnection/VB short circuit	O	O	O	O	O	O	*P169*	*P727*

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
P code	SPN		FMI		Part	State	4TNV94	4TN101		4TN107			Description	Diagnosis
	Decimal number	Hexadecimal number	Decimal number				FHT (ECU: DC1V, DCU: VD1)	HT-DT	FHT-FDT	HT-TT	FHT-FTT (DCU: HD01)	FHT-FTT (DCU: VD1)		
P0541	522243	7F803	6	FAIL + AWL	Starting aid relay	Starting aid relay GND short circuit	O	O	O	O	O	O	P171	P727
P0201	651	28B	5	FAIL + RSL	Injector (No.1 cylinder)	Injector (No. 1 cylinder) disconnection (injector-specific)	O	O	O	O	O	O	P172	P764
P0202	652	28C	5	FAIL + RSL	Injector (No.2 cylinder)	Injector (No. 2 cylinder) disconnection (injector-specific)	O	O	O	O	O	O	P174	P764
P0203	653	28D	5	FAIL + RSL	Injector (No.3 cylinder)	Injector (No. 3 cylinder) disconnection (injector-specific)	O	O	O	O	O	O	P176	P764
P0204	654	28E	5	FAIL + RSL	Injector (No.4 cylinder)	Injector (No. 4 cylinder) disconnection (injector-specific)	O	O	O	O	O	O	P178	P764
P2148	2797	AED	3	FAIL + RSL	All injectors	Injector bank 1 + B short circuit	O	O	O	O	O	O	P180	P767
P2147	2797	AED	6	FAIL + RSL	All injectors	Injector bank 1 GND short circuit	O	O	O	O	O	O	P182	P767
P2146	2797	AED	5	FAIL + RSL	All injectors	Injector bank 1 disconnection	O	O	O	O	O	O	P184	P764
P2151	2798	AEE	3	FAIL + RSL	All injectors	Injector bank 2 + B short circuit	O	O	O	O	O	O	P186	P767
P2150	2798	AEE	6	FAIL + RSL	All injectors	Injector bank 2 GND short circuit	O	O	O	O	O	O	P188	P767
P2149	2798	AEE	5	FAIL + RSL	All injectors	Injector bank 2 disconnection	O	O	O	O	O	O	P190	P764
P0611	522996	7FAF4	4	FAIL + RSL	Injector drive circuit	Low charge error	O	O	O	O	O	O	P192	P789
P0200	522997	7FAF5	3	FAIL + RSL	Injector drive circuit	Overcharge error	O	O	O	O	O	O	P193	P791
P1710	651	28B	6	FAIL + RSL	Injector drive circuit (No.1 cylinder)	Coil short circuit between COM/TWV terminals	O	O	O	O	O	O	P194	–
P1711	651	28B	12	FAIL + RSL	Injector drive circuit (No.1 cylinder)	Discharge MOS open failure	O	O	O	O	O	O	P196	–
P1712	653	28D	6	FAIL + RSL	Injector drive circuit (No. 3 cylinder)	Coil short circuit between COM/TWV terminals	O	O	O	O	O	O	P197	–
P1713	653	28D	12	FAIL + RSL	Injector drive circuit (No. 3 cylinder)	Discharge MOS open failure	O	O	O	O	O	O	P199	–
P1714	654	28E	6	FAIL + RSL	Injector drive circuit (No. 4 cylinder)	Coil short circuit between COM/TWV terminals	O	O	O	O	O	O	P200	–
P1715	654	28E	12	FAIL + RSL	Injector drive circuit (No. 4 cylinder)	Discharge MOS open failure	O	O	O	O	O	O	P202	–
P1716	652	28C	6	FAIL + RSL	Injector drive circuit (No. 2 cylinder)	Coil short circuit between COM/TWV terminals	O	O	O	O	O	O	P203	–
P1717	652	28C	12	FAIL + RSL	Injector drive circuit (No. 2 cylinder)	Discharge MOS open failure	O	O	O	O	O	O	P205	–
P1718	2797	AED	12	FAIL + RSL	Injector driver IC-1	VDIC3 internal clock error	O	O	O	O	O	O	P206	–
P1719	2797	AED	9	FAIL + RSL	Injector driver IC-1	Communication error between VDIC3 and micro computer	O	O	O	O	O	O	P207	–
P1720	2798	AEE	12	FAIL + RSL	Injector driver IC-2	VDIC3 internal clock error	O	O	O	O	O	O	P208	–
P1721	2798	AEE	9	FAIL + RSL	Injector driver IC-2	Communication error between VDIC3 and micro computer	O	O	O	O	O	O	P209	–
P0629	633	279	3	FAIL + RSL	SCV (Suction control valve)	SCV (Suction control valve) H/L side VB short circuit	O	O	O	O	O	O	P210	P770
P0627	633	279	5	FAIL + RSL	SCV (Suction control valve)	SCV (Suction control valve) H side GND short circuit/disconnection	O	O	O	O	O	O	P212	P770
P2635	633	279	7	FAIL + RSL	SCV (Suction control valve)	Drive circuit error (SCV sticking)	O	O	O	O	O	O	P214	P773
P1235	1347	543	0	FAIL + RSL	High pressure pump	Pump protection failure	O	O	O	O	O	O	P227	P775
P1236	1347	543	15	FAIL + RSL	High pressure pump	Pump replacement failure	O	O	O	O	O	O	P229	P775
P1237	522803	7FA33	13	FAIL + AWL	High pressure pump	Pump learning not performed alarm	O	O	O	O	O	O	P231	P799
P0088	157	9D	0	FAIL + RSL	Rail pressure error	Rail pressure too high	O	O	O	O	O	O	P232	P775
P0094	157	9D	18	FAIL + RSL	Rail pressure error	Rail pressure deviation error (rail pressure too low)	O	O	O	O	O	O	P233	P777
P009B	5571	15C3	5	FAIL + RSL	PRV (Pressure reducing valve)	Disconnection	–	–	–	O	O	O	P216	–
P1722	5571	15C3	6	FAIL + RSL	PRV (Pressure reducing valve)	Coil short-circuit	–	–	–	O	O	O	P218	–
P1723	5571	15C3	12	FAIL + RSL	PRV (Pressure reducing valve)	ECU internal failure	–	–	–	O	O	O	P220	–
P009F	5571	15C3	7	FAIL + RSL	PRV (Pressure reducing valve)	PRV (Pressure reducing valve) sticking error (closed position)	–	–	–	O	O	O	P221	–
P009D	518287	7E88F	3	FAIL + RSL	PRV (Pressure reducing valve)	+B short circuit	–	–	–	O	O	O	P223	–
P009C	518287	7E88F	6	FAIL + RSL	PRV (Pressure reducing valve)	Disconnection/GND short circuit	–	–	–	O	O	O	P225	–
P1219	–	–	–	Not comes on	Overspeed	Overspeed 1	O	O	O	O	O	O	P234	P678
P0219	190	BE	0	FAIL + RSL	Overspeed	Overspeed 2	O	O	O	O	O	O	P235	P678
P1631	523221	7FBD5	12	FAIL + RSL	QR data	QR data not written	O	O	O	O	O	O	P236	P795
P1632	523221	7FBD5	13	FAIL + RSL	QR data	QR data error	O	O	O	O	O	O	P237	P797
P1630	522995	7FAF3	12	FAIL + RSL	QR data	QR data correction input error	O	O	O	O	O	O	P238	P797
P0660	2950	B86	5	FAIL + AWL	Intake throttle drive circuit	Intake throttle drive circuit disconnection	O	–	O	–	O	O	P239	P801
P1658	2950	B86	3	FAIL + AWL	Intake throttle drive circuit	Intake throttle drive circuit VB/GND short circuit	O	–	O	–	O	O	P240	P801
P1655	2950	B86	7	FAIL + RSL	Intake throttle drive circuit	Intake throttle drive circuit deviation error	O	–	O	–	O	O	P241	P780
P1656	2950	B86	8	FAIL + RSL	Intake throttle drive circuit	Intake throttle drive circuit drive duty error	O	–	O	–	O	O	P243	P780
U0292	522596	7F964	9	FAIL + AWL	TSC1 (CAN message)	TSC1 reception timeout (SA1)	O	O	O	O	O	O	P245	P804
U1301	522597	7F965	9	FAIL + AWL	TSC1 (CAN message)	TSC1 reception timeout (SA2)	O	O	O	O	O	O	P246	P804

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
	SPN		FMI				4TNV94	4TN101		4TN107				
P code	Decimal number	Hexadecimal number	Decimal number		Part	State	FHT (ECU: DC1V, DCU: VD1)	HT·DT	FHT·FDT	HT·TT	FHT·FTT (DCU: HD01)	FHT·FTT (DCU: VD1)	Description	Diagnosis
U1292	522599	7F967	9	FAIL + AWL	Y_ECR1 (CAN message)	Y_ECR1 reception timeout	O	O	O	O	O	O	*P247*	*P804*
U1293	522600	7F968	9	FAIL + AWL	Y_EC (CAN message)	Y_EC reception timeout	O	O	O	O	O	O	*P248*	*P804*
U0168	237	ED	31	FAIL + RSL	VI (CAN message)	VI reception timeout	O	O	O	O	O	O	*P249*	*P804*
U3002	237	ED	13	FAIL + RSL	VI (CAN message)	VI reception data error	O	O	O	O	O	O	*P250*	*P804*
U1303	522619	7F97B	9	FAIL + AWL	Y_DPFIF (CAN message)	Y_DPFIF reception timeout	O	–	O	–	O	O	*P251*	*P804*
U1302	522618	7F97A	9	FAIL + AWL	EBC1 (CAN message)	EBC1 reception timeout	O	O	O	O	O	O	*P252*	*P804*
U010B	522610	7F972	9	FAIL + RSL	EGR	CAN reception timeout from the EGR valve	O	O	O	O	O	O	*P253*	*P804*
U1294	522601	7F969	9	FAIL + AWL	Y_RSS (CAN message)	Y_RSS reception timeout	O	O	O	O	O	O	*P254*	*P810*
U0167	522730	7F9EA	12	FAIL + AWL	Immobilizer (CAN message)	Immobilizer error (CAN communication)	O	O	O	O	O	O	*P255*	*P810*
U0426	1202	4B2	2	FAIL + AWL	Immobilizer (CAN message)	Immobilizer error (system)	O	O	O	O	O	O	*P256*	–
U1501	523513	7FCF9	9	FAIL + RSL	DCU	CAN reception timeout from DCU	O	–	O	–	O	O	*P257*	*P807*
U1503	–	–	–	Not comes on	DCU (DCU system error)	DCU system error (FS action instruction 1 from DCU)	O	–	O	–	O	O	*P259*	*P820*
U1504	–	–	–	Not comes on	DCU (DCU system error)	DCU system error (FS action instruction 2 from DCU)	O	–	O	–	O	O	*P260*	*P820*
U1505	–	–	–	Not comes on	DCU (DCU system error)	DCU system error (FS action instruction 3 from DCU)	O	–	O	–	O	O	*P261*	*P820*
U1506	–	–	–	Not comes on	DCU (DCU system error)	DCU system error (FS action instruction 4 from DCU)	O	–	O	–	O	O	*P262*	*P820*
U1507	–	–	–	Not comes on	DCU (DCU system error)	DCU system error (FS action instruction 5 from DCU)	O	–	O	–	O	O	*P263*	*P820*
U1508	–	–	–	Not comes on	DCU (DCU system error)	DCU system error (FS action instruction 6 from DCU)	O	–	O	–	O	O	*P264*	*P820*
U1509	–	–	–	Not comes on	DCU (DCU system error)	DCU system error (FS action instruction 7 from DCU)	O	–	O	–	O	O	*P265*	*P820*
U1510	–	–	–	Not comes on	DCU (DCU system error)	DCU system error (FS action instruction 8 from DCU)	O	–	O	–	O	O	*P266*	*P820*
P1672	587	24B	2	FAIL + RSL	Data verification between ECU and DCU	Data verification error between ECU and DCU (engine model unmatched)	O	–	O	–	O	O	*P267*	*P821*
P264F	588	24C	2	FAIL + AWL	Data verification between ECU and DCU	Data verification error between ECU and DCU (serial No. unmatched)	O	–	O	–	O	O	*P268*	*P821*
U1502	523643	7FD7B	9	FAIL + AWL	Data verification between ECU and DCU	Data verification error between ECU and DCU (verification timeout)	O	–	O	–	O	O	*P269*	*P807*
P0403	2791	AE7	12	FAIL + RSL	EGR	Disconnection in EGR motor coils	O	O	O	O	O	O	*P271*	*P818*
P1405	522579	7F953	12	FAIL + RSL	EGR	EGR valve short circuit in motor coils	O	O	O	O	O	O	*P272*	*P818*
P0488	522580	7F954	12	FAIL + RSL	EGR	EGR position sensor error	O	O	O	O	O	O	*P273*	*P818*
P1409	2791	AE7	7	FAIL + RSL	EGR	EGR feedback error	O	O	O	O	O	O	*P274*	*P818*
P148A	522581	7F955	7	FAIL + RSL	EGR	EGR valve sticking error	O	O	O	O	O	O	*P275*	*P818*
P049D	522582	7F956	7	FAIL + RSL	EGR	EGR initialization error	O	O	O	O	O	O	*P276*	*P818*
U0401	2791	AE7	9	FAIL + RSL	EGR	EGR ECM data error	O	O	O	O	O	O	*P277*	*P818*
U1401	522617	7F979	12	FAIL + RSL	EGR	Out of EGR target range	O	O	O	O	O	O	*P278*	*P818*
P0404	2791	AE7	0	FAIL + RSL	EGR	EGR overvoltage error	O	O	O	O	O	O	*P279*	*P814*
P1404	2791	AE7	1	FAIL + RSL	EGR	EGR low voltage error	O	O	O	O	O	O	*P280*	*P814*
P1410	522583	7F957	1	FAIL + RSL	EGR	EGR high temperature thermistor error	O	O	O	O	O	O	*P281*	*P818*
P1411	522584	7F958	1	FAIL + RSL	EGR	EGR low temperature thermistor error	O	O	O	O	O	O	*P282*	*P818*
P1601	630	276	2	FAIL + AWL	EEPROM	EEPROM error	O	O	O	O	O	O	*P283*	*P793*
P0652	523074	7FB42	1	FAIL + RSL	ECU internal error	Sensor 5 V circuit 1 error (voltage low)	O	O	O	O	O	O	*P284*	*P674*
P0653	523074	7FB42	0	FAIL + RSL	ECU internal error	Sensor 5 V circuit 1 error (voltage high)	O	O	O	O	O	O	*P286*	*P674*
P0698	523075	7FB43	1	FAIL + RSL	ECU internal error	Sensor 5 V circuit 2 error (voltage low)	O	O	O	O	O	O	*P288*	*P676*
P0699	523075	7FB43	0	FAIL + RSL	ECU internal error	Sensor 5 V circuit 2 error (voltage high)	O	O	O	O	O	O	*P290*	*P676*
P0607	522993	7FAF1	12	FAIL + AWL	ECU internal error	CPU monitoring IC error	O	O	O	O	O	O	*P292*	*P793*
P0606	522994	7FAF2	12	FAIL + AWL	ECU internal error	CPU error	O	O	O	O	O	O	*P293*	*P793*
P1602	522998	7FAF6	12	FAIL + RSL	ECU internal error	Flash ROM error (checksum error)	O	O	O	O	O	O	*P294*	*P793*
P1724	518267	7E87B	9	FAIL + RSL	ECU internal error	Communication error between micro computers (MSC communication error)	O	O	O	O	O	O	*P295*	*P793*
P1725	518268	7E87C	9	FAIL + RSL	ECU internal error	Communication error between micro computers, SPI communication error (diagnosis: atmospheric pressure sensor abnormal)	O	O	O	O	O	O	*P296*	*P793*
P1726	518269	7E87D	9	FAIL + RSL	ECU internal error	Communication error between micro computers, SPI communication error (diagnosis: monitoring micro computer abnormal)	O	O	O	O	O	O	*P297*	*P793*
P060B	518270	7E87E	12	FAIL + RSL	ECU internal error	Micro computer internal A/D converter abnormal	O	O	O	O	O	O	*P298*	*P793*
P1727	518271	7E87F	12	FAIL + RSL	ECU internal error	Injection stop circuit error during micro computer abnormality	O	O	O	O	O	O	*P299*	*P793*
P1101	522323	7F853	0	Application specific	Air cleaner switch	Air cleaner clogged alarm	O	O	O	O	O	O	*P300*	*P743*

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
	SPN		FMI				4TNV94	4TN101		4TN107				
P code	Decimal number	Hexadecimal number	Decimal number		Part	State	FHT (ECU: DC1V, DCU: VD1)	HT-DT	FHT-FDT	HT-TT	FHT-FTT (DCU: HD01)	FHT-FTT (DCU: VD1)	Description	Diagnosis
P1151	522329	7F859	0	Application specific	Water separator switch	Water separator alarm	O	O	O	O	O	O	*P302*	*P747*
P1562	167	A7	5	FAIL + AWL	Charge switch	Charge switch disconnection	O	O	O	O	O	O	*P304*	*P731*
P1568	167	A7	1	FAIL + AWL	Charge switch	Charge alarm	O	O	O	O	O	O	*P306*	*P739*
P1198	100	64	1	FAIL + AWL	Oil pressure switch	Low oil pressure alarm	O	–	–	–	–	–	*P314*	*P734*
P1192	100	64	4	FAIL + AWL	Oil pressure switch	Oil pressure switch disconnection	O	–	–	–	–	–	*P310*	*P731*
P1192	100	64	4	FAIL + AWL	Oil pressure sensor	Oil pressure sensor error (voltage low)	–	O	O	O	O	O	*P312*	*P731*
P1193	100	64	3	FAIL + AWL	Oil pressure sensor	Oil pressure sensor error (voltage high)	–	O	O	O	O	O	*P308*	*P731*
P1198	100	64	1	Application specific	Oil pressure sensor	Low oil pressure alarm	–	O	O	O	O	O	*P316*	*P734*
P2463	522573	7F94D	0	Not comes on	DPF	Excessive PM accumulation (method C)	O	–	O	–	O	O	*P318*	*P751*
P1463	522574	7F94E	0	Not comes on	DPF	Excessive PM accumulation (method P)	O	–	O	–	O	O	*P319*	*P751*
P2459	522577	7F951	11	Not comes on	DPF	Regeneration failure (stationary regeneration not performed)	O	–	O	–	O	O	*P320*	*P756*
P2458	522575	7F94F	7	Not comes on	DPF	Regeneration failure (stationary regeneration failure)	O	–	O	–	O	O	*P321*	*P754*
P1445	3719	E87	9	FAIL + RSL	DPF	Regeneration failure (recovery regeneration failure)	O	–	O	–	O	O	*P322*	*P754*
P242F	3720	E88	16	FAIL + AWL	DPF OP interface	Ash cleaning request 1	O	–	O	–	O	O	*P323*	*P759*
P1420	3720	E88	0	FAIL + RSL	DPF OP interface	Ash cleaning request 2	O	–	O	–	O	O	*P324*	*P759*
P1421	3719	E87	16	FAIL + AWL	DPF OP interface	Stationary regeneration standby	O	–	O	–	O	O	*P325*	*P761*
P1424	3719	E87	0	FAIL + RSL	DPF OP interface	Backup mode	O	–	O	–	O	O	*P326*	*P763*
P1446	3719	E87	7	FAIL + RSL	DPF OP interface	Recovery regeneration is inhibited	O	–	O	–	O	O	*P327*	*P762*
P1728	518272	7E880	6	FAIL + AWL	Preheating lamp	+B short circuit	O	O	O	O	O	O	*P328*	–
P1729	518273	7E881	6	FAIL + AWL	Failure lamp	+B short circuit	O	O	O	O	O	O	*P329*	–
P0617	518274	7E882	6	FAIL + AWL	Starter relay	+B short circuit	O	O	O	O	O	O	*P330*	–
P1730	518275	7E883	6	FAIL + AWL	Low oil pressure alarm lamp	+B short circuit	O	O	O	O	O	O	*P331*	–
P1731	518276	7E884	6	FAIL + AWL	Amber warning lamp	+B short circuit	O	O	O	O	O	O	*P332*	–
P1732	518277	7E885	6	FAIL + AWL	Speed change display lamp	+B short circuit	O	O	O	O	O	O	*P333*	–
P1733	518278	7E886	6	FAIL + AWL	Exhaust temperature alarm lamp	+B short circuit	O	–	O	–	O	O	*P334*	–
P1734	518279	7E887	6	FAIL + AWL	Cooling water temperature alarm lamp	+B short circuit	O	O	O	O	O	O	*P335*	–
P1735	518280	7E888	6	FAIL + AWL	Buzzer	+B short circuit	O	O	O	O	O	O	*P336*	–
P1736	518281	7E889	6	FAIL + AWL	Red engine stop lamp	+B short circuit	O	O	O	O	O	O	*P337*	–
P1737	518282	7E88A	6	FAIL + AWL	Isochronous lamp	+B short circuit	O	O	O	O	O	O	*P338*	–
P1738	518283	7E88B	6	FAIL + AWL	DPF regeneration acknowledgement lamp	+B short circuit	O	–	O	–	O	O	*P339*	–
P1739	518284	7E88C	6	FAIL + AWL	DPF regeneration inhibit lamp	+B short circuit	O	–	O	–	O	O	*P340*	–
P1740	518285	7E88D	6	FAIL + AWL	DPF regeneration request lamp	+B short circuit	O	–	O	–	O	O	*P341*	–
P053A	3059	BF3	5	FAIL + AWL	Breather heater	Disconnection	O	–	–	–	–	–	*P342*	–
P053B	3059	BF3	4	FAIL + AWL	Breather heater	GND short circuit	O	–	–	–	–	–	*P343*	–
P053C	3059	BF3	3	FAIL + AWL	Breather heater	VB short circuit	O	–	–	–	–	–	*P344*	–

■ DCU judgment item

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
P code	SPN		FMI		Part	State	4TNV94	4TN101		4TN107			Description	Diagnosis
	Decimal number	Hexadecimal number	Decimal number				FHT (ECU: DC1V, DCU: VD1)	HT-DT	FHT-FDT	HT-TT	FHT-FTT (DCU: HD01)	FHT-FTT (DCU: VD1)		
P1545	523595	7FD4B	0	FAIL + RSL	SCR upstream NOx sensor	SCR upstream NOx value rise error	O	–	O	–	O	O	*P345*	*P825*
P2209	523597	7FD4D	7	FAIL + RSL	SCR upstream NOx sensor	SCR upstream NOx sensor incomplete heating error	O	–	O	–	O	O	*P346*	*P829*
P2203	523595	7FD4B	3	FAIL + RSL	SCR upstream NOx sensor	SCR upstream NOx sensor internal circuit short circuit	O	–	O	–	O	O	*P347*	*P829*
P151C	523595	7FD4B	5	FAIL + RSL	SCR upstream NOx sensor	SCR upstream NOx sensor internal circuit disconnection	O	–	O	–	O	O	*P348*	*P829*
P1525	3216	C90	15	FAIL + RSL	SCR upstream NOx sensor	SCR upstream NOx sensor detected value error (upper limit error)	O	–	O	–	O	O	*P349*	*P831*
P1526	3216	C90	17	FAIL + RSL	SCR upstream NOx sensor	SCR upstream NOx sensor detected value error (lower limit error)	O	–	O	–	O	O	*P350*	*P831*
P1546	523596	7FD4C	0	FAIL + RSL	SCR downstream NOx sensor	SCR downstream NOx value rise error	O	–	O	–	O	O	*P351*	*P835*
P2222	523598	7FD4E	7	FAIL + RSL	SCR downstream NOx sensor	SCR downstream NOx sensor incomplete heating error	O	–	O	–	O	O	*P352*	*P839*
P2216	523596	7FD4C	3	FAIL + RSL	SCR downstream NOx sensor	SCR downstream NOx sensor internal circuit short circuit	O	–	O	–	O	O	*P353*	*P839*
P151D	523596	7FD4C	5	FAIL + RSL	SCR downstream NOx sensor	SCR downstream NOx sensor internal circuit disconnection	O	–	O	–	O	O	*P354*	*P839*
P1524	523606	7FD56	10	FAIL + RSL	SCR downstream NOx sensor	SCR downstream NOx sensor detected value error	–	–	–	–	O	–	*P355*	*P841*
P1778	518343	7E8C7	10	FAIL + RSL	SCR downstream NOx sensor	SCR downstream NOx sensor detected value error (O_2 concentration))	O	–	O	–	–	O	*P356*	*P841*
P0428	4360	1108	3	FAIL + RSL	SCR catalyst temperature sensor	SCR catalyst temperature sensor error (voltage high)	O	–	O	–	O	O	*P357*	*P845*
P0427	4360	1108	4	FAIL + RSL	SCR catalyst temperature sensor	SCR catalyst temperature sensor error (voltage low)	O	–	O	–	O	O	*P359*	*P845*
P0426	4360	1108	0	FAIL + RSL	SCR catalyst temperature sensor	SCR catalyst temperature sensor error (temperature rise error)	O	–	O	–	O	O	*P361*	*P849*
P153B	4360	1108	15	FAIL + RSL	SCR catalyst temperature sensor	SCR catalyst temperature sensor detected value error (upper limit error)	O	–	O	–	O	O	*P362*	*P851*
P1541	4360	1108	17	FAIL + RSL	SCR catalyst temperature sensor	SCR catalyst temperature sensor detected value error (lower limit error)	O	–	O	–	O	O	*P363*	*P851*
P1542	4360	1108	10	FAIL + RSL	SCR catalyst temperature sensor	SCR catalyst temperature sensor detected value error (at cold start check)	O	–	O	–	O	O	*P364*	*P855*
P204D	4334	10EE	3	FAIL + RSL	Supply module pressure sensor	Supply module pressure sensor error (voltage high)	O	–	O	–	O	O	*P365*	*P858*
P204C	4334	10EE	4	FAIL + RSL	Supply module pressure sensor	Supply module pressure sensor error (voltage low)	O	–	O	–	O	O	*P367*	*P858*
P153C	4334	10EE	15	FAIL + RSL	Supply module pressure sensor	Supply module pressure sensor detected value error (upper limit error)	O	–	O	–	O	O	*P369*	*P861*
P153D	4334	10EE	17	FAIL + RSL	Supply module pressure sensor	Supply module pressure sensor detected value error (lower limit error)	O	–	O	–	O	O	*P371*	*P861*
P1516	523576	7FD38	12	FAIL + RSL	DCU internal error	Sensor supply voltage error	O	–	O	–	O	O	*P373*	*P864*
P1559	3515	DBB	2	FAIL + RSL	Urea water quality sensor/urea water tank temperature sensor (A1DEFI)	Urea water quality sensor/Urea water tank temperature sensor (A1DEFI) controller temperature rise error	O	–	O	–	O	O	*P375*	*P867*
P206D	3516	DBC	3	FAIL + RSL	Urea water quality sensor (A1DEFI)	Urea water quality sensor (A1DEFI) internal circuit disconnection	O	–	O	–	O	O	*P377*	*P869*
P206C	3516	DBC	4	FAIL + RSL	Urea water quality sensor (A1DEFI)	Urea water quality sensor (A1DEFI) internal circuit short circuit	O	–	O	–	O	O	*P378*	*P869*
P154F	3516	DBC	13	FAIL + RSL	Urea water quality sensor (A1DEFI)	Urea water quality sensor (A1DEFI) controller internal failure	O	–	O	–	O	O	*P379*	*P869*
P1551	3515	DBB	3	FAIL + RSL	Urea water tank temperature sensor (A1DEFI)	Urea water tank temperature sensor (A1DEFI) internal circuit disconnection	O	–	O	–	O	O	*P380*	*P870*
P1552	3515	DBB	4	FAIL + RSL	Urea water tank temperature sensor (A1DEFI)	Urea water tank temperature sensor (A1DEFI) internal circuit short circuit	O	–	O	–	O	O	*P381*	*P870*
P1550	3515	DBB	13	FAIL + RSL	Urea water tank temperature sensor (A1DEFI)	Urea water tank temperature sensor (A1DEFI) controller internal failure	O	–	O	–	O	O	*P382*	*P870*
P1557	3031	BD7	2	FAIL + RSL	Urea water tank temperature sensor/urea water tank level sensor (AT1T1I)	Urea water tank temperature sensor/Urea water tank level sensor (AT1T1I) controller temperature rise error	O	–	O	–	O	O	*P383*	*P871*
P203D	1761	6E1	3	FAIL + RSL	Urea water tank level sensor (AT1T1I)	Urea water tank level sensor (AT1T1I) internal circuit disconnection	O	–	O	–	O	O	*P385*	*P873*
P203C	1761	6E1	4	FAIL + RSL	Urea water tank level sensor (AT1T1I)	Urea water tank level sensor (AT1T1I) internal circuit short circuit	O	–	O	–	O	O	*P386*	*P873*
P155A	1761	6E1	13	FAIL + RSL	Urea water tank level sensor (AT1T1I)	Urea water tank level sensor (AT1T1I) controller internal failure	O	–	O	–	O	O	*P387*	*P873*
P205D	3031	BD7	3	FAIL + RSL	Urea water tank temperature sensor (AT1T1I)	Urea water tank temperature sensor (AT1T1I) internal circuit disconnection	O	–	O	–	O	O	*P388*	*P874*
P205C	3031	BD7	4	FAIL + RSL	Urea water tank temperature sensor (AT1T1I)	Urea water tank temperature sensor (AT1T1I) internal circuit short circuit	O	–	O	–	O	O	*P389*	*P874*

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
P code	SPN		FMI		Part	State	4TNV94	4TN101		4TN107			Description	Diagnosis
	Decimal number	Hexadecimal number	Decimal number				FHT (ECU: DC1V, DCU: VD1)	HT·DT	FHT·FDT	HT·TT	FHT·FTT (DCU: HD01)	FHT·FTT (DCU: VD1)		
P1556	3031	BD7	13	FAIL + RSL	Urea water tank temperature sensor (AT1T1I)	Urea water tank temperature sensor (AT1T1I) controller internal failure	O	–	O	–	O	O	*P390*	*P874*
P155B	1761	6E1	15	FAIL + RSL	Urea water tank level sensor	Urea water tank level sensor detected value error	O	–	O	–	O	O	*P391*	*P875*
P205B	3031	BD7	0	FAIL + RSL	Urea water tank temperature sensor	Urea water tank temperature rise error	O	–	O	–	O	O	*P392*	*P879*
P1539	3031	BD7	15	FAIL + RSL	Urea water tank temperature sensor	Urea water tank temperature sensor detected value error (upper limit error)	O	–	O	–	O	O	*P393*	*P882*
P153A	3031	BD7	17	FAIL + RSL	Urea water tank temperature sensor	Urea water tank temperature sensor detected value error (lower limit error)	O	–	O	–	O	O	*P394*	*P882*
P154B	523630	7FD6E	2	FAIL + RSL	Urea water tank temperature sensor	Urea water tank temperature rise error	O	–	O	–	O	O	*P395*	*P885*
P1504	523581	7FD3D	0	FAIL + RSL	DCU internal temperature sensor	DCU internal temperature rise error	–	–	–	–	O	–	*P396*	*P889*
P21C4	523592	7FD48	3	FAIL + AWL	Heater relay	Heater relay L side VB short circuit	O	–	O	–	O	O	*P398*	*P891*
P21C3	523592	7FD48	4	FAIL + AWL	Heater relay	Heater relay L side GND short circuit	O	–	O	–	O	O	*P400*	*P891*
P21C2	523592	7FD48	5	FAIL + AWL	Heater relay	Heater relay disconnection	O	–	O	–	O	O	*P402*	*P891*
P1509	523592	7FD48	0	FAIL + AWL	Heater relay	Heater relay power stage temperature rise error	–	–	–	–	O	–	*P404*	*P896*
P2049	523586	7FD42	3	FAIL + RSL	Dosing module	Dosing module H side VB short circuit/disconnection	–	–	–	–	O	–	*P406*	*P901*
P2047	523586	7FD42	5	FAIL + RSL	Dosing module	Dosing module H side GND short circuit	–	–	–	–	O	–	*P408*	*P901*
P151B	523585	7FD41	3	FAIL + RSL	Dosing module	Dosing module H side - L side short circuit	O	–	O	–	–	O	*P410*	*P901*
P151B	523585	7FD41	3	FAIL + RSL	Dosing module	Dosing module L side VB short circuit	O	–	O	–	O	O	*P412*	*P901*
P2048	523586	7FD42	4	FAIL + RSL	Dosing module	Dosing module L side GND short circuit	–	–	–	–	O	–	*P414*	*P901*
P1771	523586	7FD42	5	FAIL + RSL	Dosing module	Dosing module disconnection	O	–	O	–	–	O	*P416*	*P901*
P1770	523586	7FD42	3	FAIL + RSL	Dosing module	Dosing module VB short circuit	O	–	O	–	–	O	*P418*	*P901*
P1772	523586	7FD42	4	FAIL + RSL	Dosing module	Dosing module GND short circuit	O	–	O	–	–	O	*P420*	*P901*
P1505	523584	7FD40	0	FAIL + RSL	Dosing module	Dosing module power stage temperature rise error	–	–	–	–	O	–	*P422*	*P901*
P208E	523588	7FD44	7	FAIL + RSL	Dosing module	Dosing module valve sticking	O	–	O	–	O	O	*P424*	*P905*
P208D	4375	1117	3	FAIL + RSL	Supply module	Supply module (pump motor) PWM signal wire VB short circuit	O	–	O	–	O	O	*P426*	*P909*
P208C	4375	1117	4	FAIL + RSL	Supply module	Supply module (pump motor) PWM signal wire GND short circuit	O	–	O	–	O	O	*P428*	*P909*
P208A	4375	1117	5	FAIL + RSL	Supply module	Supply module (pump motor) PWM signal wire disconnection	O	–	O	–	O	O	*P430*	*P909*
P150D	4375	1117	0	FAIL + RSL	Supply module	Supply module (pump motor) power stage temperature rise error	–	–	–	–	O	–	*P432*	*P913*
P151F	4375	1117	10	FAIL + RSL	Supply module	Supply module (pump motor) pump motor drive error 1	O	–	O	–	O	O	*P434*	*P913*
P208B	4375	1117	7	FAIL + RSL	Supply module	Supply module (pump motor) pump motor drive error 2	O	–	O	–	O	O	*P436*	*P913*
P20AD	523618	7FD62	7	FAIL + RSL	Supply module	Supply module (pump motor) not starting to measure temperature	O	–	O	–	O	O	*P438*	*P909*
P152F	523614	7FD5E	8	FAIL + AWL	Supply module	Supply module temperature information PWM cycle error	O	–	O	–	O	O	*P440*	*P918*
P152E	523615	7FD5F	8	FAIL + AWL	Supply module	Supply module temperature information PWM signal error	O	–	O	–	O	O	*P442*	*P918*
P1530	523616	7FD60	2	FAIL + AWL	Supply module	Supply module (supply module temperature sensor) fault value for temperature information duty value received	O	–	O	–	O	O	*P444*	*P922*
P1531	523617	7FD61	2	FAIL + AWL	Supply module	Supply module (supply module temperature sensor) invalid value for temperature information duty value received	O	–	O	–	O	O	*P446*	*P922*
P152B	523611	7FD5B	1	FAIL + AWL	Supply module	Supply module (supply module temperature sensor) detected value error	O	–	O	–	O	O	*P448*	*P927*
P1544	523611	7FD5B	10	FAIL + AWL	Supply module	Supply module (supply module temperature sensor) detected value error (at cold start check)	O	–	O	–	O	O	*P449*	*P931*
P20A3	523600	7FD50	3	FAIL + RSL	Supply module	Supply module (reverting valve) L side VB short circuit	O	–	O	–	O	O	*P450*	*P934*
P20A2	523600	7FD50	4	FAIL + RSL	Supply module	Supply module (reverting valve) L side GND short circuit	O	–	O	–	O	O	*P452*	*P934*
P20A0	523600	7FD50	5	FAIL + AWL	Supply module	Supply module (reverting valve) disconnection	O	–	O	–	O	O	*P454*	*P938*
P150E	523599	7FD4F	0	FAIL + AWL	Supply module	Supply module (reverting valve) power stage temperature rise error	–	–	–	–	O	–	*P456*	*P938*
P26E9	523556	7FD24	3	FAIL + AWL	Supply module	Supply module (supply module heater) H side VB short circuit	O	–	O	–	O	O	*P458*	*P943*
P26E8	523556	7FD24	4	FAIL + RSL	Supply module	Supply module (supply module heater) H side GND short circuit	O	–	O	–	O	O	*P460*	*P948*
P20C8	523593	7FD49	3	FAIL + RSL	Supply module	Supply module (supply module heater) L side VB short circuit	O	–	O	–	O	O	*P462*	*P948*

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
	SPN		FMI				4TNV94	4TN101		4TN107				
P code	Decimal number	Hexadecimal number	Decimal number		Part	State	FHT (ECU: DC1V, DCU: VD1)	HT·DT	FHT·FDT	HT·TT	FHT·FTT (DCU: HD01)	FHT·FTT (DCU: VD1)	Description	Diagnosis
P1773	523556	7FD24	4	FAIL + RSL	Supply module	Supply module (supply module heater) L side GND short circuit	○	–	○	–	–	○	*P464*	*P948*
P20C5	523556	7FD24	5	FAIL + RSL	Supply module	Supply module (supply module heater) disconnection	○	–	○	–	○	○	*P466*	*P948*
P150B	523610	7FD5A	0	FAIL + AWL	Supply module	Supply module (supply module heater) power stage temperature rise error	–	–	–	–	○	–	*P468*	*P943*
P20B6	523556	7FD24	10	FAIL + RSL	Supply module	Supply module (supply module heater) detected value error	○	–	○	–	○	○	*P470*	*P927*
P152C	523612	7FD5C	2	FAIL + AWL	Supply module	Supply module (supply module heater temperature sensor) fault value for temperature information duty value received	○	–	○	–	○	○	*P471*	*P922*
P152D	523613	7FD5D	2	FAIL + AWL	Supply module	Supply module (supply module heater temperature sensor) invalid value for temperature information duty value received	○	–	○	–	○	○	*P473*	*P922*
P152A	523610	7FD5A	1	FAIL + AWL	Supply module	Supply module (supply module heater temperature sensor) detected value error	○	–	○	–	○	○	*P475*	*P927*
P1543	523610	7FD5A	10	FAIL + AWL	Supply module	Supply module (supply module heater temperature sensor) detected value error (at cold start check)	○	–	○	–	○	○	*P476*	*P931*
P2671	523554	7FD22	3	FAIL + AWL	Supply module	Supply module (reverting valve) H side VB short circuit	○	–	○	–	○	○	*P477*	*P953*
P2670	523554	7FD22	4	FAIL + RSL	Supply module	Supply module (reverting valve) H side GND short circuit	○	–	○	–	○	○	*P479*	*P953*
P2686	523555	7FD23	3	FAIL + AWL	Heater relay/urea water tank heating valve	Heater relay/urea water tank heating valve H side VB short circuit	○	–	○	–	○	○	*P481*	*P960*
P2685	523555	7FD23	4	FAIL + AWL	Heater relay/urea water tank heating valve	Heater relay/urea water tank heating valve H side GND short circuit	○	–	○	–	○	○	*P483*	*P960*
P1510	523557	7FD25	3	FAIL + AWL	Urea water hose heater (back flow, pressure, suction)	Urea water hose heater (back flow, pressure, suction) H side VB short circuit/L side VB short circuit	–	–	–	–	○	–	*P485*	*P966*
P20BC	4343	10F7	3	FAIL + AWL	Urea water hose heater (back flow)	Urea water hose heater (back flow) L side VB short circuit	○	–	○	–	○	○	*P487*	*P971*
P1775	4343	10F7	4	FAIL + AWL	Urea water hose heater (back flow)	Urea water hose heater (back flow) L side GND short circuit	○	–	○	–	–	○	*P489*	*P971*
P20B9	4343	10F7	5	FAIL + AWL	Urea water hose heater (back flow)	Urea water hose heater (back flow) disconnection	○	–	○	–	○	○	*P491*	*P971*
P1507	4343	10F7	0	FAIL + AWL	Urea water hose heater (back flow)	Urea water hose heater (back flow) power stage temperature rise error	–	–	–	–	○	–	*P493*	*P971*
P20C0	4341	10F5	3	FAIL + AWL	Urea water hose heater (pressure)	Urea water hose heater (pressure) L side VB short circuit	○	–	○	–	○	○	*P495*	*P977*
P1774	4341	10F5	4	FAIL + AWL	Urea water hose heater (pressure)	Urea water hose heater (pressure) L side GND short circuit	○	–	○	–	–	○	*P497*	*P977*
P20BD	4341	10F5	5	FAIL + AWL	Urea water hose heater (pressure)	Urea water hose heater (pressure) disconnection	○	–	○	–	○	○	*P499*	*P977*
P1508	4341	10F5	0	FAIL + AWL	Urea water hose heater (pressure)	Urea water hose heater (pressure) power stage temperature rise error	–	–	–	–	○	–	*P501*	*P977*
P20C4	4345	10F9	3	FAIL + AWL	Urea water hose heater (suction)	Urea water hose heater (suction) L side VB short circuit	○	–	○	–	○	○	*P503*	*P983*
P1776	4345	10F9	4	FAIL + AWL	Urea water hose heater (suction)	Urea water hose heater (suction) L side GND short circuit	○	–	○	–	–	○	*P505*	*P983*
P20C1	4345	10F9	5	FAIL + AWL	Urea water hose heater (suction)	Urea water hose heater (suction) disconnection	○	–	○	–	○	○	*P507*	*P983*
P150A	4345	10F9	0	FAIL + AWL	Urea water hose heater (suction)	Urea water hose heater (suction) power stage temperature rise error	–	–	–	–	○	–	*P509*	*P983*
P202C	523594	7FD4A	3	FAIL + AWL	Urea water tank heating valve	Urea water tank heating valve L side VB short circuit	○	–	○	–	○	○	*P511*	*P989*
P202B	5137	1411	4	FAIL + AWL	Urea water tank heating valve	Urea water tank heating valve L side GND short circuit	○	–	○	–	○	○	*P513*	*P989*
P202A	5137	1411	5	FAIL + AWL	Urea water tank heating valve	Urea water tank heating valve disconnection	○	–	○	–	○	○	*P515*	*P989*
P150C	5137	1411	0	FAIL + AWL	Urea water tank heating valve	Urea water tank heating valve power stage temperature rise error	–	–	–	–	○	–	*P517*	*P989*
U029D	523562	7FD2A	9	FAIL + RSL	SCR upstream NOx sensor	CAN reception timeout from SCR upstream NOx sensor	○	–	○	–	○	○	*P519*	*P994*
U029E	523563	7FD2B	9	FAIL + RSL	SCR downstream NOx sensor	CAN reception timeout from SCR downstream NOx sensor	○	–	○	–	○	○	*P521*	*P997*
U1607	523570	7FD32	9	FAIL + RSL	ECU	CAN reception timeout from ECU	○	–	○	–	○	○	*P523*	*P1000*
P1555	172	AC	19	Not comes on	ECU (ECU system error)	ECU system error (invalid fresh air temperature value is received)	○	–	○	–	○	○	*P525*	*P1003*
P155C	523637	7FD75	0	Not comes on	ECU (ECU system error)	ECU system error (FS action instruction 1 from ECU)	○	–	○	–	○	○	*P526*	*P1004*
P1565	518339	7E8C3	0	Not comes on	ECU (ECU system error)	ECU system error (FS action instruction 2 from ECU)	○	–	○	–	○	○	*P528*	*P1004*
U1610	523634	7FD72	9	FAIL + RSL	Urea water quality sensor/Urea water tank temperature sensor (A1DEFI)	Urea water quality sensor/Urea water tank temperature sensor (A1DEFI) reception timeout	○	–	○	–	○	○	*P530*	*P1005*
U1611	523635	7FD73	9	FAIL + RSL	Urea water tank temperature sensor/Urea water tank level sensor (AT1T1I)	Urea water tank temperature sensor/Urea water tank level sensor (AT1T1I) reception timeout	○	–	○	–	○	○	*P532*	*P1008*

DTC code				Lamp that comes on	Error		Applicable model						Reference page	
P code	SPN		FMI		Part	State	4TNV94	4TN101		4TN107			Description	Diagnosis
	Decimal number	Hexadecimal number	Decimal number				FHT (ECU: DC1V, DCU: VD1)	HT-DT	FHT-FDT	HT-TT	FHT-FTT (DCU: HD01)	FHT-FTT (DCU: VD1)		
P1512	523558	7FD26	3	FAIL + RSL	DCU supply voltage	DCU supply voltage error (Voltage high 1)	O	–	O	–	O	O	*P534*	–
P1514	523559	7FD27	3	FAIL + RSL	DCU supply voltage	DCU supply voltage error (Voltage high 2)	O	–	O	–	O	O	*P536*	–
P1511	523559	7FD27	4	FAIL + RSL	DCU supply voltage	DCU supply voltage error (Voltage low 1)	O	–	O	–	O	O	*P538*	–
P1513	523558	7FD26	4	FAIL + RSL	DCU supply voltage	DCU supply voltage error (Voltage low 2)	O	–	O	–	O	O	*P540*	–
P20EA	523560	7FD28	2	FAIL + AWL	Main relay	Main relay opens early	O	–	O	–	O	O	*P542*	*P1011*
P1600	523589	7FD45	12	FAIL + RSL	EEPROM	EEPROM memory deletion error	–	–	–	–	O	–	*P543*	*P1015*
P160E	523590	7FD46	12	FAIL + RSL	EEPROM	EEPROM memory reading error	O	–	O	–	O	O	*P544*	*P1015*
P160F	523591	7FD47	12	FAIL + RSL	EEPROM	EEPROM memory writing error	O	–	O	–	O	O	*P545*	*P1015*
P1500	523577	7FD39	12	FAIL + RSL	DCU internal error	SPI communication error 1	O	–	O	–	O	O	*P546*	*P1015*
P1501	523578	7FD3A	12	FAIL + RSL	DCU internal error	SPI communication error 2	O	–	O	–	O	O	*P547*	*P1015*
P21CC	523574	7FD36	3	FAIL + RSL	DCU internal error	Supply 1 overvoltage error	–	–	–	–	O	–	*P548*	*P1015*
P21CB	523574	7FD36	4	FAIL + RSL	DCU internal error	Supply 1 low voltage error	–	–	–	–	O	–	*P549*	*P1015*
P1502	523579	7FD3B	12	FAIL + RSL	DCU internal error	AD converter error 1	–	–	–	–	O	–	*P550*	*P1015*
P1503	523580	7FD3C	12	FAIL + RSL	DCU internal error	AD converter error 2	–	–	–	–	O	–	*P551*	*P1015*
P1517	523582	7FD3E	3	FAIL + RSL	DCU internal temperature sensor	DCU internal temperature sensor error (voltage high)	–	–	–	–	O	–	*P552*	*P1015*
P1519	523582	7FD3E	4	FAIL + RSL	DCU internal temperature sensor	DCU internal temperature sensor error (voltage low)	–	–	–	–	O	–	*P553*	*P1015*
P20EB	523560	7FD28	7	FAIL + AWL	Main relay	Main relay sticking	O	–	O	–	O	O	*P554*	*P1011*
P1561	523640	7FD78	5	FAIL + AWL	Key switch	Key switch disconnection	O	–	O	–	O	O	*P555*	*P1017*
P1533	523621	7FD65	0	FAIL + RSL	Urea water hose (back flow side)	Urea water hose (back flow side) pressure rise error	O	–	O	–	O	O	*P557*	*P1020*
P1534	523622	7FD66	7	FAIL + RSL	Urea water hose (pressure side)	Urea water hose (pressure side) pressure rise error	O	–	O	–	O	O	*P558*	*P1024*
P20E9	523619	7FD63	0	FAIL + RSL	Supply module	Supply module (pump motor) pressure rise error 1	O	–	O	–	O	O	*P559*	*P1028*
P1536	523626	7FD6A	0	FAIL + RSL	Supply module	Supply module (pump motor) pressure rise error 2	O	–	O	–	O	O	*P560*	*P1028*
P1532	523620	7FD64	7	FAIL + AWL	Supply module	Supply module (pump motor) pressure reduction failure	O	–	O	–	O	O	*P561*	*P1032*
P1535	523624	7FD68	7	FAIL + RSL	Supply module	Supply module (reverting valve) failure	O	–	O	–	O	O	*P562*	*P1036*
P150F	523623	7FD67	2	FAIL + RSL	Supply module	Supply module (pump motor) pressure stability error	O	–	O	–	O	O	*P563*	*P1040*
P1537	523627	7FD6B	1	FAIL + RSL	Supply module	Supply module pressure drop error	O	–	O	–	O	O	*P564*	*P1046*
P1538	523628	7FD6C	10	FAIL + RSL	Supply module	Supply module urea water pressure rise failure	O	–	O	–	O	O	*P565*	*P1046*
P204F	523625	7FD69	0	FAIL + AWL	Supply module	Supply module urea water sucking back failure	O	–	O	–	O	O	*P566*	*P1052*
P1520	523601	7FD51	1	FAIL + RSL	SCR system	Inefficient NOx cleaning	O	–	O	–	O	O	*P567*	*P1055*
P1506	523557	7FD25	7	FAIL + RSL	SCR system	SCR system forced termination	O	–	O	–	O	O	*P569*	*P1059*
P1553	523636	7FD74	16	FAIL + RSL	SCR system	SCR system error (Inducement 1)	O	–	O	–	O	O	*P571*	*P1059*
P1554	523636	7FD74	0	FAIL + RSL	SCR system	SCR system error (Inducement 2)	O	–	O	–	O	O	*P572*	*P1059*
P1563	518289	7E891	16	FAIL + RSL	EGR system	EGR system error (Inducement 1)	O	–	O	–	O	O	*P573*	*P1060*
P1564	518289	7E891	0	FAIL + RSL	EGR system	EGR system error (Inducement 2)	O	–	O	–	O	O	*P574*	*P1060*
P1549	1761	6E1	18	FAIL + AWL	Urea water tank level	Low urea water tank level (Inducement 1)	O	–	O	–	O	O	*P575*	*P1061*
P154A	1761	6E1	1	FAIL + RSL	Urea water tank level	Low urea water tank level (Inducement 2)	O	–	O	–	O	O	*P577*	*P1061*
P154E	3516	DBC	1	FAIL + RSL	Urea water quality sensor	Urea water quality sensor concentration error (small deviation)	O	–	O	–	O	O	*P579*	*P1064*
P154D	3516	DBC	0	FAIL + RSL	Urea water quality sensor	Urea water quality sensor concentration error (large deviation)	O	–	O	–	O	O	*P581*	*P1064*
P1558	3521	DC1	13	FAIL + RSL	Urea water quality sensor	Urea water quality sensor contamination error in urea water tank	O	–	O	–	O	O	*P583*	*P1064*

Description

POOOO: Error name

P code	POOOO	Name	Error name
SPN/FMI	△△····△/□□		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Prerequisite for detecting the error *Note: The voltage value described as "Battery voltage is within normal range" in the prerequisites is within the range shown below.* • *ECU:* *12 V system: 8.0 V ≤ Battery voltage ≤ 16.0 V* *24 V system: 16.0 V ≤ Battery voltage ≤ 32.0 V* • *DCU:* *12 V system: 9.0 V ≤ Battery voltage ≤ 17.0 V* *24 V system: 18.0 V ≤ Battery voltage ≤ 33.0 V* 2. Condition for detecting the error	Check point to specify the cause of the error. See "Diagnosis" for details.

● Actions when an error occurs

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

● Presumed cause of the failure or the error condition

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

* Malfunctions related to the detected DTC are listed.

● Diagnosis

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

Note: After the normal recovery upon replacement of electrical components, replace the parts again to check that the malfunction occurs with the original parts.

Engine ECU Judgment Item

Sensor related

■ Crankshaft speed sensor

P0336: Crankshaft signal error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Battery voltage is within normal range, and the engine speed is above the specified value. 2. The number of teeth detected by the crankshaft speed sensor is not 56.	• Coupler • Wire-harness • Crankshaft speed sensor • ECU • Pulser

● Actions when an error occurs

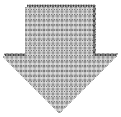
Fault mode	[Limited operation]: The engine operation is limited. (The operation continues controlled with only the camshaft speed sensor signal.)
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when correct number of pulse is detected before satisfying detection criteria again, the fault mode is detected.
Remarks	

● Presumed cause of the failure or the error condition

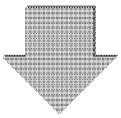
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the sensor signal wire (+) and (–), GND short circuit, power short circuit or shielding wire short circuit
   - Short circuit of sensor signal wire (+) and (–)
3. Crankshaft speed sensor failure
4. Pulser (Ring gear) error and sensor installation condition error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P679* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the crankshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check the wiring of the crankshaft speed sensor for disconnection, and whether the wiring coating is peeled.



3. Failure diagnosis	• Check the resistance value of the crankshaft speed sensor. • Check the conduction of the wire-harness. • Check the crankshaft speed sensor mounting condition and pulser. *See Chapter 3 *P679* for details on the diagnosis method and procedure.

P0337: No signal from crankshaft

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Battery voltage is within normal range. 2. The number of crank pulses is 1 or less per 360° CA (per rotation of the crank shaft).	• Coupler • Wire-harness • Crankshaft speed sensor • ECU • Pulser

● Actions when an error occurs

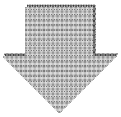
Fault mode	[Limited operation]: The engine operation is limited. (The operation continues controlled with only the camshaft speed sensor signal.)
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when correct number of pulse is detected before satisfying detection criteria again, the fault mode is detected.
Remarks	

● Presumed cause of the failure or the error condition

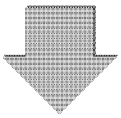
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the sensor signal wire (+) and (–), GND short circuit, power short circuit or shielding wire short circuit
   - Short circuit of sensor signal wire (+) and (–)
3. Crankshaft speed sensor failure
4. Pulser (Ring gear) error and sensor installation condition error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P682* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the crankshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check the wiring of the crankshaft speed sensor for disconnection, and whether the wiring coating is peeled.



3. Failure diagnosis	• Check the resistance value of the crankshaft speed sensor. • Check the conduction of the wire-harness. • Check the crankshaft speed sensor mounting condition and pulser. *See Chapter 3 *P682* for details on the diagnosis method and procedure.

■ Camshaft speed sensor

P0341: Camshaft signal error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The engine speed is above the specified value. 3- The sensor 5 V circuit 2 error (voltage high) is not occurring. 4- The sensor 5 V circuit 2 error (voltage low) is not occurring. 2. The number of teeth detected between the extra teeth by the camshaft speed sensor (including the extra teeth themselves) is not 5.	• Coupler • Wire-harness • Camshaft speed sensor • ECU • Pulser

● Actions when an error occurs

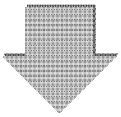
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected. (The operation continues controlled with only the crankshaft speed sensor signal.)
Limited operation	No
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

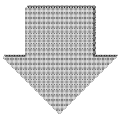
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of sensor 5 V
   - Disconnection of sensor signal wire, GND short circuit, power short circuit or shielding wire short circuit
   - Short circuit of sensor signal wire and sensor 5 V
   - Disconnection of the sensor GND wire
3. Camshaft speed sensor failure
4. Pulser error and sensor installation condition error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P685* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the camshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the camshaft speed sensor is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the ECU output voltage. *See Chapter 3 *P685* for details on the diagnosis method and procedure.

P0342: No signal from camshaft

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The sensor 5 V circuit 2 error (voltage high) is not occurring. 3- The sensor 5 V circuit 2 error (voltage low) is not occurring. 2. The number of cam pulses is 1 or less per 360° CA (per rotation of the crank shaft).	• Coupler • Wire-harness • Camshaft speed sensor • ECU • Pulser

● Actions when an error occurs

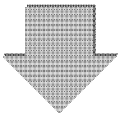
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected. (The operation continues controlled with only the crankshaft speed sensor signal.)
Limited operation	No
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

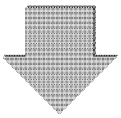
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of sensor 5 V
   - Disconnection of sensor signal wire, GND short circuit, power short circuit or shielding wire short circuit
   - Short circuit of sensor signal wire and sensor 5 V
   - Disconnection of the sensor GND wire
3. Camshaft speed sensor failure
4. Pulser error and sensor installation condition error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P688* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the camshaft speed sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the camshaft speed sensor is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the ECU output voltage. *See Chapter 3 *P688* for details on the diagnosis method and procedure.

■ Crankshaft speed sensor/Camshaft speed sensor

P0008: Crank/Camshaft speed sensor non-input (simultaneous)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- The key switch is turned ON for a given length of time. 2- The key switch is in a operating state. 3- The sensor 5 V circuit 2 error (voltage high) is not occurring. 4- The sensor 5 V circuit 2 error (voltage low) is not occurring. 2. Engine stalled for 10 seconds.	• Coupler • Wire-harness • Crankshaft speed sensor/Camshaft speed sensor • ECU • Pulser

● Actions when an error occurs

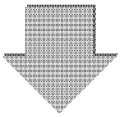
Fault mode	[Engine stop]: The engine stops.
Limited operation	• The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

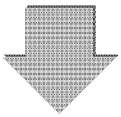
1. Low battery voltage
2. Starter system failure
3. Crankshaft speed sensor error and camshaft speed sensor error occur at the same time

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P691* for details on the diagnosis method and procedure.



2. Coupler, wiring and engine check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the crankshaft speed sensor and camshaft speed sensor for damage, deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the crankshaft speed sensor and camshaft speed sensor wiring is not disconnected or the wiring coating is not peeled. • Check the starter system if the engine is not started.



3. Failure diagnosis	• Perform the failure diagnosis on the crankshaft speed sensor and camshaft speed sensor.

■ Accelerator sensor 1

P0123: Accelerator sensor 1 error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- The sensor 5 V circuit 1 error (voltage high) is not occurring. 4- The sensor 5 V circuit 1 error (voltage low) is not occurring. 5- The accelerator sensor 1 is used. 2. The sensor voltage is above the 4.75 V threshold.	• Coupler • Wire-harness • Accelerator sensor • ECU

● Actions when an error occurs

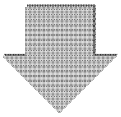
	Backup accelerator sensor function	
	No	Yes
Fault mode	[Limited operation]: The engine operates at a constant speed.	[Continuous operation]: Switches to engine operation through a backup accelerator sensor.
Limited operation	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.	No
Reset criteria	When the ECU is turned OFF with the normal voltage (0.2 to 4.6 V) supplied, the fault mode is released.	When the normal voltage (0.2 to 4.6 V) is supplied, the fault mode is automatically released.
Remarks		

● Presumed cause of the failure or the error condition

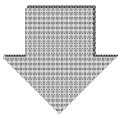
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the sensor GND wire
   - Power short circuit of the sensor signal wire
3. Accelerator sensor failure
   - Sensor output failure by disconnection of accelerator sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the accelerator sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the accelerator sensor resistance value. • Check the conduction of the wire-harness. • Check the accelerator sensor output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

P0122: Accelerator sensor 1 error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit 1 error (voltage low) is not occurring. 6- The accelerator sensor 1 is used. 2. The sensor voltage is below the 0.25 V threshold.	• Coupler • Wire-harness • Accelerator sensor • ECU

● Actions when an error occurs

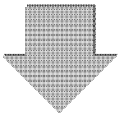
	Backup accelerator sensor function	
	No	Yes
Fault mode	[Limited operation]: The engine operates at a constant speed.	[Continuous operation]: Switches to engine operation through a backup accelerator sensor.
Limited operation	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.	No
Reset criteria	When the ECU is turned OFF with the normal voltage (0.2 to 4.6 V) supplied, the fault mode is released.	When the normal voltage (0.2 to 4.6 V) is supplied, the fault mode is automatically released.
Remarks		

● Presumed cause of the failure or the error condition

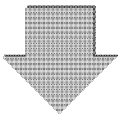
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or GND short circuit of the sensor signal wire
   - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor failure
   - Sensor output failure by disconnection of accelerator sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the accelerator sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the accelerator sensor resistance value. • Check the conduction of the wire-harness. • Check the accelerator sensor output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

■ Accelerator sensor 2

P0223: Accelerator sensor 2 error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. Sensor output is higher than the 4.75 V threshold.	• Coupler • Wire-harness • Accelerator sensor • ECU

● Actions when an error occurs

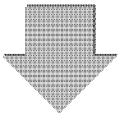
	Settings for accelerator 2 abnormality operation	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.
Reset criteria	It is canceled when the battery voltage is within the specified range, the key switch is ON, and the sensor voltage is below the 4.75 V threshold.	It is canceled when the battery voltage is within the specified range, the key switch is ON, and the sensor voltage is below the 4.75 V threshold.
Remarks		

● Presumed cause of the failure or the error condition

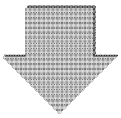
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the sensor GND wire
   - Power short circuit of the sensor signal wire
3. Accelerator sensor failure
   - Sensor output failure by disconnection of accelerator sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the accelerator sensor coupler for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the accelerator sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the accelerator sensor resistance value. • Check the conduction of the wire-harness. • Check the accelerator sensor output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

P0222: Accelerator sensor 2 error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. Sensor output is lower than the 0.25 V threshold.	• Coupler • Wire-harness • Accelerator sensor • ECU

● Actions when an error occurs

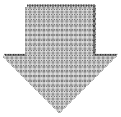
	Settings for accelerator 2 abnormality operation	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.
Reset criteria	It is canceled when the battery voltage is within the specified range, the key switch is ON, not during engine cranking, and the sensor voltage is at or above the 0.25 V threshold.	It is canceled when the battery voltage is within the specified range, the key switch is ON, not during engine cranking, and the sensor voltage is at or above the 0.25 V threshold.
Remarks		

● Presumed cause of the failure or the error condition

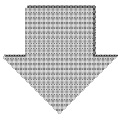
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or GND short circuit of the sensor signal wire
   - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor failure
   - Sensor output failure by disconnection of accelerator sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the accelerator sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the accelerator sensor resistance value. • Check the conduction of the wire-harness. • Check the accelerator sensor output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

■ Accelerator sensor 1 and 2

P1646: Dual accelerator sensor error (closed position error)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. (APS2 terminal voltage - Estimated APS2 terminal voltage) is larger than [Double analog accelerator sensor error judgment value].	• Coupler • Wire-harness • Accelerator sensor 1 • Accelerator sensor 2 • ECU

● Actions when an error occurs

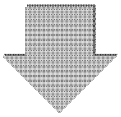
	Settings for dual accelerator sensor abnormality operation (closed position error)	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks		

● Presumed cause of the failure or the error condition

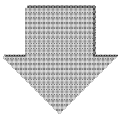
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the accelerator sensor 1 sensor signal wire, or GND short circuit
   - Disconnection of the accelerator sensor 2 sensor signal wire, or GND short circuit
   - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor 1 failure
4. Accelerator sensor 2 failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the accelerator sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the accelerator sensor resistance value. • Check the conduction of the wire-harness. • Check the accelerator sensor output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

P1647: Dual accelerator sensor error (open position error)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. (Estimated APS2 terminal voltage - APS2 terminal voltage) is larger than [Double analog accelerator sensor error judgment value].	• Coupler • Wire-harness • Accelerator sensor 1 • Accelerator sensor 2 • ECU

● Actions when an error occurs

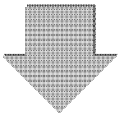
	Settings for dual accelerator sensor abnormality operation (open position error)	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks		

● Presumed cause of the failure or the error condition

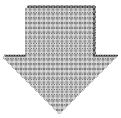
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the accelerator sensor 1 sensor signal wire, or GND short circuit
   - Disconnection of the accelerator sensor 2 sensor signal wire, or GND short circuit
   - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor 1 failure
4. Accelerator sensor 2 failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the accelerator sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the accelerator sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the accelerator sensor resistance value. • Check the conduction of the wire-harness. • Check the accelerator sensor output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

■ Accelerator sensor 3

P0228: Accelerator sensor 3 error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- The sensor 5 V circuit 1 error (voltage high) is not occurring. 4- The sensor 5 V circuit 1 error (voltage low) is not occurring. 5- The accelerator sensor 3 is used. 2. The sensor voltage is above the 4.75 V threshold.	• Coupler • Wire-harness • Accelerator sensor 3 • ECU

● Actions when an error occurs

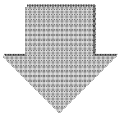
	Detection of main accelerator sensor error	
	No	Yes
Fault mode	[Continuous operation]: Switches to engine operation through the main accelerator sensor.	[Limited operation]: The engine operates at a constant speed.
Limited operation	No	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.
Reset criteria	When the normal voltage (0.2 to 4.6 V) is supplied, the fault mode is automatically released.	When the normal voltage (0.2 to 4.6 V) is supplied, the fault mode is automatically released.
Remarks		

● Presumed cause of the failure or the error condition

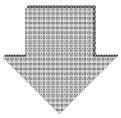
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the sensor GND wire
   - Power short circuit of the sensor signal wire
3. Accelerator sensor 3 failure
   - Sensor output failure by power short circuit of accelerator sensor 3 internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the accelerator sensor 3 for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the accelerator sensor 3 wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the accelerator sensor 3. • Check the conduction of the wire-harness. • Check the accelerator sensor 3 output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

P0227: Accelerator sensor 3 error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit 1 error (voltage low) is not occurring. 6- The accelerator sensor 3 is used. 2. The sensor voltage is below the 0.25 V threshold.	• Coupler • Wire-harness • Accelerator sensor 3 • ECU

● Actions when an error occurs

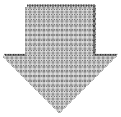
	Detection of main accelerator sensor error	
	No	Yes
Fault mode	[Continuous operation]: Switches to engine operation through the main accelerator sensor.	[Limited operation]: The engine operates at a constant speed.
Limited operation	No	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.
Reset criteria	When the normal voltage (0.2 to 4.6 V) is supplied, the fault mode is automatically released.	When the normal voltage (0.2 to 4.6 V) is supplied, the fault mode is automatically released.
Remarks		

● Presumed cause of the failure or the error condition

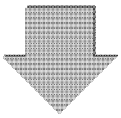
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or GND short circuit of the accelerator sensor 3 signal wire
   - Disconnection or GND short circuit of sensor 5 V
3. Accelerator sensor 3 failure
   - Sensor output failure caused by disconnection of the accelerator sensor 3 internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the accelerator sensor 3 for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the accelerator sensor 3 wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the accelerator sensor 3. • Check the conduction of the wire-harness. • Check the accelerator sensor 3 output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

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

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. When the APS3 input voltage is 1.1 V or above and the PDLSW terminal is low level. (PDLSW terminal is set to NO)	• Coupler • Wire-harness • Foot pedal • ECU

● Actions when an error occurs

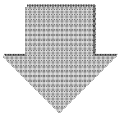
	Settings for dual accelerator sensor abnormality operation (open position error)	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks		

● Presumed cause of the failure or the error condition

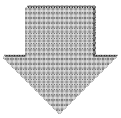
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or GND short circuit of the foot pedal signal wire
   - Disconnection or GND short circuit of sensor 5 V
3. Foot pedal failure
   - Sensor output failure caused by disconnection or an increase in sliding friction of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

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the power switch. • Check the coupler pin of the foot pedal for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the foot pedal wiring is not cut or the wiring coating is not peeled.



3. Failure diagnosis	• Check the foot pedal resistance value. • Check the conduction of the wire-harness. • Check the accelerator sensor output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

P1125: Accelerator sensor 3 foot pedal error (closed position error)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. When the APS3 input voltage is 0.65 V or below and the PDLSW terminal is high level. (PDLSW terminal is set to NO)	

● Actions when an error occurs

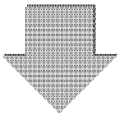
	Settings for dual accelerator sensor abnormality operation (closed position error)	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The target rotation speed is set to “target rotation speed during error (application specific)” or “target rotation before error detection”.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks		

● Presumed cause of the failure or the error condition

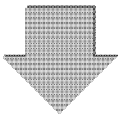
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Battery short circuit of foot pedal signal wire
   - Battery short circuit of sensor 5 V
3. Foot pedal failure
   - Sensor output failure caused by a short circuit of the foot pedal internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the power switch. • Check the coupler pin of the foot pedal for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check that the insulation of the foot pedal wiring is not peeling off. • Check that the foot pedal wiring is not short circuited with the power wire.



3. Failure diagnosis	• Check the foot pedal resistance value. • Check the conduction of the wire-harness. • Check the accelerator sensor output voltage. *See Chapter 3 *P592* for details on the diagnosis method and procedure.

■ Intake throttle valve position sensor

P02E9: Intake throttle valve position sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit 1 error (voltage low) is not occurring. 2. The sensor voltage is above the 4.9 V threshold.	• Coupler • Wire-harness • Intake throttle valve position sensor • ECU

● Actions when an error occurs

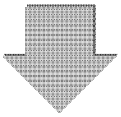
Fault mode	[Limited operation]: Intake throttle position is set to 100% as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • SCR heating stops • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

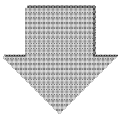
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Short circuit of the sensor signal wire and sensor 5 V
   - Power short circuit of the sensor signal wire
   - Disconnection of the sensor GND wire
   - Disconnection of sensor signal wire
3. Intake throttle valve position sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P652* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the ECU power. • Check the coupler pin of the intake throttle valve position sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake throttle valve position sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the intake throttle valve position sensor resistance value. • Check the conduction of the wire-harness. • Check the intake throttle valve position sensor output voltage. *See Chapter 3 *P652* for details on the diagnosis method and procedure.

P02E8: Intake throttle valve position sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit 1 error (voltage low) is not occurring. 2. The sensor voltage is below the 0.2 V threshold.	• Coupler • Wire-harness • Intake throttle valve position sensor • ECU

● Actions when an error occurs

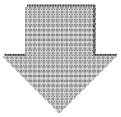
Fault mode	[Limited operation]: Intake throttle position is set to 100% as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • SCR heating stops • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

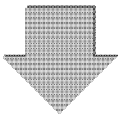
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Short circuit of the sensor signal wire and sensor 5 V
   - Power short circuit of the sensor signal wire
   - Disconnection of the sensor GND wire
   - Disconnection of sensor signal wire
3. Intake throttle valve position sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P652* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the ECU power. • Check the coupler pin of the intake throttle valve position sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake throttle valve position sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the intake throttle valve position sensor resistance value. • Check the conduction of the wire-harness. • Check the intake throttle valve position sensor output voltage. *See Chapter 3 *P652* for details on the diagnosis method and procedure.

■ Intake air pressure sensor

P0238: Intake air pressure sensor error (voltage high)

P code	P0238	Name	Intake air pressure sensor error (voltage high)
SPN/FMI	102/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 2 error (voltage low) is not occurring. 5- The sensor 5 V circuit 2 error (voltage high) is not occurring. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • Intake air pressure sensor • ECU

● Actions when an error occurs

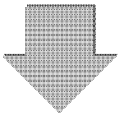
Fault mode	[Limited operation]: Intake air pressure is set to 90 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

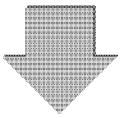
1. Wiring failure of the wire-harness
   - Short circuit of sensor signal wire and sensor 5 V
   - Disconnection of the GND wire
2. Intake air pressure sensor failure
   - Sensor output failure caused by a 5 V short circuit of the intake air pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P655* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the intake air pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake air pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the intake air pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the intake air pressure sensor output voltage. *See Chapter 3 *P655* for details on the diagnosis method and procedure.

P0237: Intake air pressure sensor error (voltage low)

P code	P0237	Name	Intake air pressure sensor error (voltage low)
SPN/FMI	102/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 2 error (voltage low) is not occurring. 5- The sensor 5 V circuit 2 error (voltage high) is not occurring. 6- The engine speed is 700 min^{-1} (rpm) or more. 7- The final injection volume is 5 mm^3/st. 2. The sensor voltage is below the 0.2 V threshold.	• Coupler • Wire-harness • Intake air pressure sensor • ECU

● Actions when an error occurs

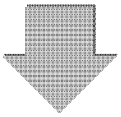
Fault mode	[Limited operation]: Intake air pressure is set to 90 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

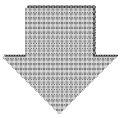
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
   - Short circuit of sensor signal wire and sensor 5 V
3. Intake air pressure sensor failure
   - Sensor output failure caused by a GND Short circuit of the intake air pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P655* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the intake air pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake air pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the intake air pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the intake air pressure sensor output voltage. *See Chapter 3 *P655* for details on the diagnosis method and procedure.

P0236: Intake air pressure sensor error (abnormal learning value)

P code	P0236	Name	Intake air pressure sensor error (abnormal learning value)
SPN/FMI	102/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- Battery voltage is within normal range 2- Key switch ON 3- Not during engine cranking 4- Engine rpm of ≥ 700 min^{-1} 5- Calculation is complete for final offset value of intake air pressure (offset value calculation shall be performed when all of the following prerequisites are satisfied 1- When running the engine, sufficient warm-up (Coolant temperature ≥ 60 °C, Intake air temperature ≥ 0 °C, Exhaust air temperature ≥ 150 °C) is done, key is ON, and 12 seconds have elapsed since engine stalled 2- Voltage of each temperature sensor in 1 is not too high or too low 3- Voltage at the intake air pressure sensor is not at maximum or minimum 4- Voltage at the atmospheric pressure sensor is not at maximum or minimum 5- Atmospheric pressure sensor characteristic error has not occurred 6- Sensor power voltage is not too high/low) 2. Final offset value of intake air pressure is lower than -25 kPa, or higher than 25 kPa.	• Intake air pressure sensor failure

● Actions when an error occurs

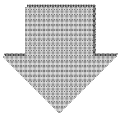
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from off to ON, when the prerequisite is satisfied, and intake manifold pressure offset value is between -25 kPa to 25 kPa, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Wiring failure of the wire-harness
2. Intake air pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P658* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Replace the intake air pressure sensor. *See Chapter 3 *P658* for details on the diagnosis method and procedure.

P1673: Intake air pressure sensor error (detected value error)

P code	P1673	Name	Intake air pressure sensor error (detected value error)
SPN/FMI	102/10		

● Purpose of DTC detection

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Key switch is ON 3- During engine operation 4- Batter voltage is within the prescribed range 5- Not during DPF regeneration nor SCR heating mode 6- Atmospheric pressure is 82.3 kPA or above 7- Current injection amount is equal to or more than the predetermined value determine by the engine rpm 2. The difference between the pressure on the EGR low pressure side (after learning) and the atmospheric pressure is within the prescribed range.	• Coupler • Wire-harness • Intake air pressure sensor • ECU

● Actions when an error occurs

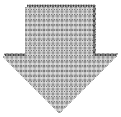
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

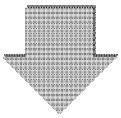
1. Installation condition failure of intake air pressure sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. Intake air pressure sensor failure

● Diagnosis

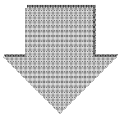
1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P660* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the installation condition of intake air pressure sensor. • Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.



3. Coupler/wiring check	• Check the coupler pin of the intake air pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake air pressure sensor wiring is not disconnected or the wiring coating is not peeled.



4. Failure diagnosis	• Check the ECU output voltage. • Check the intake air pressure sensor output voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P660* for details on the diagnosis method and procedure.

■ Exhaust gas pressure sensor

P0473: Exhaust gas pressure sensor error (voltage high)

P code	P0473	Name	Exhaust gas pressure sensor error (voltage high)
SPN/FMI	1209/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 2 error (voltage low) is not occurring. 5- The sensor 5 V circuit 2 error (voltage high) is not occurring. 2. The sensor voltage is above the 4.9 V threshold.	• Coupler • Wire-harness • Exhaust gas pressure sensor • ECU

● Actions when an error occurs

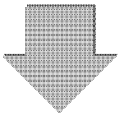
Fault mode	[Limited operation]: Exhaust gas pressure is set to 90 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

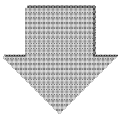
1. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
2. Exhaust gas pressure sensor failure
   - Sensor output failure caused by a GND short circuit of the exhaust gas pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P655* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the exhaust gas pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust gas pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the exhaust gas pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the exhaust gas pressure sensor output voltage. *See Chapter 3 *P655* for details on the diagnosis method and procedure.

P0472: Exhaust gas pressure sensor error (voltage low)

P code	P0472	Name	Exhaust gas pressure sensor error (voltage low)
SPN/FMI	1209/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 2 error (voltage low) is not occurring. 5- The sensor 5 V circuit 2 error (voltage high) is not occurring. 2. The sensor voltage is below the 0.1 V threshold.	• Coupler • Wire-harness • Exhaust gas pressure sensor • ECU

● Actions when an error occurs

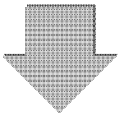
Fault mode	[Limited operation]: Exhaust gas pressure is set to 90 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

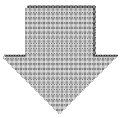
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
3. Exhaust gas pressure sensor failure
   - Sensor output failure caused by a GND Short circuit of the exhaust gas pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P655* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the exhaust gas pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust gas pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the exhaust gas pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the exhaust gas pressure sensor output voltage. *See Chapter 3 *P655* for details on the diagnosis method and procedure.

P0471: Exhaust gas pressure sensor error (abnormal learning value)

P code	P0471	Name	Exhaust gas pressure sensor error (abnormal learning value)
SPN/FMI	1209/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- Battery voltage is within normal range 2- Key switch ON 3- Not during engine cranking 4- Calculation is complete for final offset value of exhaust gas pressure (offset value calculation shall be performed when all of the following prerequisites are satisfied 1- When running the engine, sufficient warm-up (Coolant temperature ≥ 60 °C, Intake air temperature ≥ 0 °C, Exhaust air temperature ≥ 150 °C) is done, key is ON, and 12 seconds have elapsed since engine stalled 2- Voltage of each temperature sensor in 1 is not too high or too low 3- Voltage at the exhaust gas pressure sensor is not at maximum or minimum 4- Voltage at the atmospheric pressure sensor is not at maximum or minimum 5- Atmospheric pressure sensor characteristic error has not occurred 6- Sensor power voltage is not too high/low) 2. Final offset value of exhaust gas pressure is lower than -25 kPa, or higher than 25 kPa.	• Exhaust gas pressure sensor failure

● Actions when an error occurs

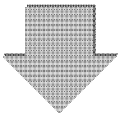
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when the prerequisite is satisfied, and exhaust manifold pressure offset value is between -25 kPa to 25 kPa, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Wiring failure of the wire-harness
2. Exhaust gas pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P658* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Replace the exhaust gas pressure sensor. *See Chapter 3 *P658* for details on the diagnosis method and procedure.

P1679: Exhaust gas pressure sensor error (detected value error)

P code	P1679	Name	Exhaust gas pressure sensor error (detected value error)
SPN/FMI	1209/10		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Key switch is ON 3- During engine operation 4- Batter voltage is within the prescribed range 5- Not during DPF regeneration nor SCR heating mode 6- Atmospheric pressure is 82.3 kPA or above 7- Current injection amount is equal to or more than the predetermined value determine by the engine rpm 2. The difference between the pressure on the EGR high pressure side (after learning) and the atmospheric pressure is within the prescribed range.	• Coupler • Wire-harness • Exhaust gas pressure sensor • ECU

● Actions when an error occurs

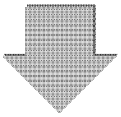
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

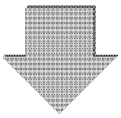
1. Installation condition failure of exhaust gas pressure sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
   • GND short circuit of the sensor signal wire
4. Exhaust gas pressure sensor failure
   • Sensor output failure caused by a GND short circuit of the exhaust gas pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P660* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the exhaust gas pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust gas pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the exhaust gas pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the exhaust gas pressure sensor output voltage. *See Chapter 3 *P660* for details on the diagnosis method and procedure.

■ Cooling water temperature sensor

P0118: Cooling water temperature sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • Cooling water temperature sensor • ECU

● Actions when an error occurs

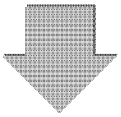
Fault mode	[Limited operation]: The cooling water temperature is set to -15 °C at engine start and 50 °C after starting the engine as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

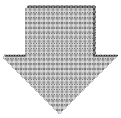
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or power short circuit of the sensor GND wire
   - Disconnection or power short circuit of the sensor signal wire
3. Cooling water temperature sensor failure
   - Sensor output failure caused by an disconnection of the cooling water temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P626* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the cooling water temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the cooling water temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the cooling water temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the cooling water temperature sensor output voltage. *See Chapter 3 *P626* for details on the diagnosis method and procedure.

P0117: Cooling water temperature sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is below the 0.1 V threshold.	• Coupler • Wire-harness • Cooling water temperature sensor • ECU

● Actions when an error occurs

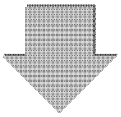
Fault mode	[Limited operation]: The cooling water temperature is set to -15 °C at engine start and 50 °C after starting the engine as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

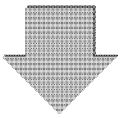
1. Wiring failure of the wire-harness
   • GND short circuit of the sensor signal wire
2. Cooling water temperature sensor failure
   • Sensor output failure caused by a GND short circuit of the cooling water temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P626* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the cooling water temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the cooling water temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the cooling water temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the cooling water temperature sensor output voltage. *See Chapter 3 *P626* for details on the diagnosis method and procedure.

P0217: Cooling water temperature high (overheat)

P code	P0217	Name	Cooling water temperature high (overheat)
SPN/FMI	110/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The cooling water temperature sensor is normal. 5- Elapse of 60 seconds after the completion of engine start. 2. Cooling water temperature is 110 °C or higher for 20 seconds.	• Cooling water level • Engine cooling equipment • Cooling water temperature sensor system

● Actions when an error occurs

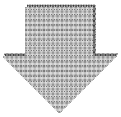
	Settings of the actions during a "Cooling water temperature high" alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected. (Application specific)	[Limited operation]: The engine operation is limited.
Limited operation	No	The engine is stopped, and the high idle speed or the maximum injection amount is limited. (Differs according to customer settings.)
Reset criteria	No	Canceled when the cooling water temperature is 105 °C or below at the time that powering off of the ECU is detected.
Remarks		

● Presumed cause of the failure or the error condition

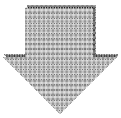
1. Insufficient cooling water
2. Engine cooling equipment failure
3. Cooling water temperature sensor system failure
4. Short circuit between wire-harness or terminal

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P630* for details on the diagnosis method and procedure.



2. Engine check	• Turn OFF the key switch and stop the engine. • Check the engine cooling equipment. • After a few moments, turn ON the key switch and make sure that DTC is detected.



3. Failure diagnosis	• Check the cooling water temperature sensor system. *See Chapter 3 *P630* for details on the diagnosis method and procedure.

P1674: Cooling water temperature sensor error (detected value error)

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

● Purpose of DTC detection

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Battery voltage is within normal range 3- The last driving cycle has completely warmed up 4- Immediately after turning the key ON, the difference between DPF intermediate temperature and intake air temperature is within the prescribed range 5- Low cooling water temperature has caused EGR valve to open completely 6- Atmospheric pressure is 82.3 kPA or above 7- Immediately after starting, intake air temperature is within the prescribed range 8- Current injection amount is equal to or more than the predetermined value determine by the engine rpm 2. The difference between the current coolant temperature and the coolant temperature at the time the engine was started is within the prescribed range.	• Coupler • Wire-harness • Cooling water temperature sensor • ECU

● Actions when an error occurs

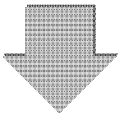
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

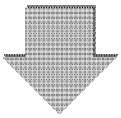
1. Installation condition failure of cooling water temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. Cooling water temperature sensor failure

● Diagnosis

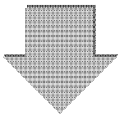
1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P634* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the installation condition of cooling water temperature sensor. • Make sure that there is nothing wrong (disconnections and damages) with the cooling water piping or cooling system.



3. Coupler/wiring check	• 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. • Make sure that the cooling water temperature sensor wiring is not disconnected or the wiring coating is not peeled.



4. Failure diagnosis	• Check the cooling water temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the cooling water temperature sensor output voltage. *See Chapter 3 *P634* for details on the diagnosis method and procedure.

■ Fresh air temperature sensor

P0113: Fresh air temperature sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is above the 4.85 V threshold.	• Coupler • Wire-harness • Fresh air temperature sensor • ECU

● Actions when an error occurs

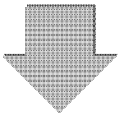
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

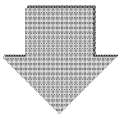
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Short circuit of sensor signal wire and 5 V
   - Disconnection of the GND wire
3. Fresh air temperature sensor failure
   - Sensor output failure caused by a 5 V short circuit of the fresh air temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P639* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the fresh air temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the fresh air temperature sensor is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the fresh air temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the fresh air temperature sensor. *See Chapter 3 *P639* for details on the diagnosis method and procedure.

P0112: Fresh air temperature sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is below the 0.15 V threshold.	• Coupler • Wire-harness • Fresh air temperature sensor • ECU

● Actions when an error occurs

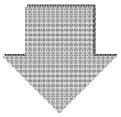
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

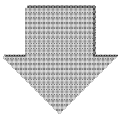
1. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
2. Fresh air temperature sensor failure
   - Sensor output failure caused by a GND short circuit of the fresh air temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P639* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the fresh air temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the fresh air temperature sensor is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the fresh air temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the fresh air temperature sensor. *See Chapter 3 *P639* for details on the diagnosis method and procedure.

P1678: Fresh air temperature sensor error (detected value error)

P code	P1678	Name	Fresh air temperature sensor error (detected value error)
SPN/FMI	172/10		

● Purpose of DTC detection

When the difference between fresh air temperature and exhaust gas temperature at engine stop (cold state) is large, this error is detected. This checks the fresh air temperature state.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Battery voltage is within normal range 3- Key switch is ON 4- The last driving cycle has completely warmed up 5- Water temperature when key turned ON is at or below the prescribed value 6- Difference between water temperature and exhaust temperature when key turned ON is within the prescribed range 2. The absolute value of temperature difference between the intake temperature and exhaust temperature when key is turned ON is at or above the prescribed value.	• Coupler • Wire-harness • Fresh air temperature sensor • ECU

● Actions when an error occurs

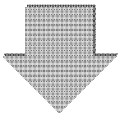
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

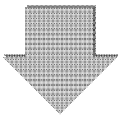
1. Installation condition failure of fresh air temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. Fresh air temperature sensor failure

● Diagnosis

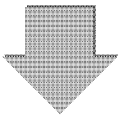
1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P643* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the installation condition of fresh air temperature sensor.



3. Coupler/wiring check	• Check the coupler pin of the fresh air temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the fresh air temperature sensor is not disconnected or the wiring coating is not peeled.



4. Failure diagnosis	• Check the resistance value of the fresh air temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the fresh air temperature sensor. *See Chapter 3 *P643* for details on the diagnosis method and procedure.

■ Fuel temperature sensor

P0183: Fuel temperature sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • Fuel temperature sensor • ECU

● Actions when an error occurs

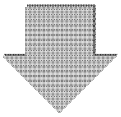
Fault mode	[Limited operation]: The fuel temperature is set to 40 °C as the default value. The engine operation is limited.
Limited operation	• The fuel injection quantity is limited to 75% of the rated operation. • Ash amount reset is prohibited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

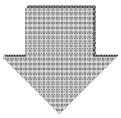
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or power short circuit of the sensor GND wire
   - Disconnection or power short circuit of the sensor signal wire
3. Fuel temperature sensor failure
   - Sensor output failure caused by disconnection of the fuel temperature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

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P648* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the fuel temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the fuel temperature sensor is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the fuel temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the fuel temperature sensor. *See Chapter 3 *P648* for details on the diagnosis method and procedure.

P0182: Fuel temperature sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is below the 0.1 V threshold.	• Coupler • Wire-harness • Fuel temperature sensor • ECU

● Actions when an error occurs

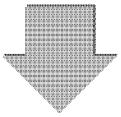
Fault mode	[Limited operation]: The fuel temperature is set to 40 °C as the default value. The engine operation is limited.
Limited operation	• The fuel injection quantity is limited to 75% of the rated operation. • Ash amount reset is prohibited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

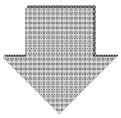
1. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
2. Fuel temperature sensor failure
   - Sensor output failure caused by a GND short circuit of the fuel temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P648* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the fuel temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the fuel temperature sensor is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the fuel temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the fuel temperature sensor. *See Chapter 3 *P648* for details on the diagnosis method and procedure.

P0168: Fuel temperature high

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The fuel temperature sensor is normal. 2. After the completion of engine start and the fuel temperature is 90 °C or higher for 60 seconds.	• Fuel temperature sensor system • Fuel tank • Fuel cooler

● Actions when an error occurs

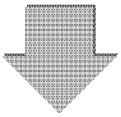
	Settings of the actions during a "Fuel temperature high" alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The engine is stopped, and the high idle speed or the maximum injection amount is limited. (Differs according to customer settings.)
Reset criteria	No	When the ECU power is turned OFF or the fuel temperature becomes 80 °C or lower, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

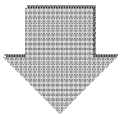
1. Insufficient fuel in the fuel tank
2. Decreased performance due to a clogged fuel cooler
3. Fuel temperature sensor system failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P648* for details on the diagnosis method and procedure.



2. Engine check	• Turn OFF the key switch and stop the engine. • Check the engine fuel system. • After a few moments, turn ON the key switch and make sure that DTC is detected.



3. Failure diagnosis	• Check the fuel temperature sensor system. *See Chapter 3 *P648* for details on the diagnosis method and procedure.

■ Rail pressure sensor

P0193: Rail pressure sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. The sensor voltage is above the threshold. (4TNV94FHT: 4.84 V, 4TN101 • 107: 4.46 V)	• Coupler • Wire-harness • Rail pressure sensor • ECU

● Actions when an error occurs

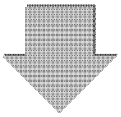
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

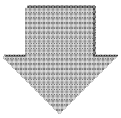
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Short circuit of sensor signal wire and sensor 5 V
   - Power short circuit of the sensor signal wire
   - Disconnection of the sensor GND wire
   - Disconnection of sensor signal wire
3. Rail pressure sensor failure
   - Sensor output failure caused by disconnection or a pressure detection error of the rail pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P597* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the rail pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the ECU output voltage. • Check the rail pressure sensor output voltage. *See Chapter 3 *P597* for details on the diagnosis method and procedure.

P0192: Rail pressure sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. The sensor voltage is below the 0.15 V threshold. (4TNV94FHT: 0.65 V, 4TN101 • 107: 0.51 V)	• Coupler • Wire-harness • Rail pressure sensor • ECU

● Actions when an error occurs

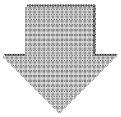
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

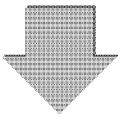
1. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
   - Disconnection or GND short circuit of sensor 5 V
2. Rail pressure sensor failure
   - Sensor output failure due to a GND short circuit or a pressure detection error of the rail pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P597* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the rail pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the ECU output voltage. • Check the rail pressure sensor output voltage. *See Chapter 3 *P597* for details on the diagnosis method and procedure.

■ DPF differential pressure sensor

P2455: DPF differential pressure sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit error (voltage low) is not occurring. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • DPF differential pressure sensor • ECU

● Actions when an error occurs

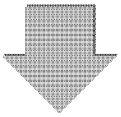
Fault mode	[Limited operation]: DPF differential pressure is set to 0 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

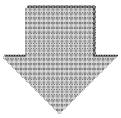
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Short circuit of the sensor signal wire and sensor 5 V
   - Power short circuit of the sensor signal wire
   - Disconnection of the sensor GND wire
3. DPF differential pressure sensor failure
   - Sensor output failure caused by a 5 V short circuit of the DPF differential pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P664* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF differential pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the DPF differential pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the DPF differential pressure sensor output voltage. *See Chapter 3 *P664* for details on the diagnosis method and procedure.

P2454: DPF differential pressure sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit 1 error (voltage low) is not occurring. 2. The sensor voltage is below the 0.2 V threshold.	• Coupler • Wire-harness • DPF differential pressure sensor • ECU

● Actions when an error occurs

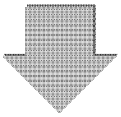
Fault mode	[Limited operation]: DPF differential pressure is set to 0 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

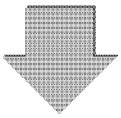
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the sensor signal wire
   - Disconnection of the sensor 5 V short circuit
   - Short circuit of the sensor signal wire and GND wire
3. DPF differential pressure sensor failure
   - Sensor output failure caused by a GND short circuit of the DPF differential pressure sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P664* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF differential pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the DPF differential pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the DPF differential pressure sensor output voltage. *See Chapter 3 *P664* for details on the diagnosis method and procedure.

P2453: DPF differential pressure sensor error (abnormal learning value)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- The battery voltage is 8 V or higher and 18 V or lower. 2- The key switch is turned ON. 3- No crankshaft rotation. 4- Calculation for the DPF differential pressure final offset value is completed. (1. Before engine start, 2. Elapse of 800 ms after ECU power is turned ON, 3. DPF differential pressure normal) 5- The sensor 5 V circuit 2 error (voltage high) and sensor 5 V circuit 2 error (voltage low) are not occurring. 2. DPF differential pressure final offset value is below -3.5 kPa or above 5.0 kPa.	• DPF differential pressure sensor failure

● Actions when an error occurs

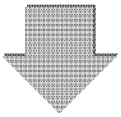
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when the prerequisite is satisfied, and DPF differential pressure offset value is between -3.5 kPa to 5.0 kPa, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Deviation of learned value due to increase in GND resistance value (increase in voltage of sensor signal line)
2. DPF differential pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P670* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Replace the DPF differential pressure sensor. *See Chapter 3 *P670* for details on the diagnosis method and procedure.

P2452: DPF differential pressure sensor abnormal rise in differential pressure

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- DPF differential pressure sensor is normal. 2- The sensor 5 V circuit 1 error (voltage high) is not occurring. 3- The sensor 5 V circuit 1 error (voltage low) is not occurring. 2. DPF differential pressure is 50 kPa or more for a given length of time (15 seconds) after the completion of the engine start.	• Coupler • Wire-harness • DPF differential pressure sensor • ECU

● Actions when an error occurs

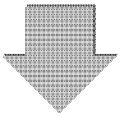
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

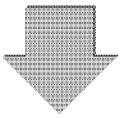
1. Blockage of soot filter (SF)
2. DPF differential pressure sensor failure
3. Poor connection of coupler
4. Wiring failure of the wire-harness, GND failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P667* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF differential pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the DPF differential pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the DPF differential pressure sensor output voltage. *See Chapter 3 *P667* for details on the diagnosis method and procedure.

■ DPF substrate/DPF differential pressure sensor

P226D: DPF substrate/DPF differential pressure sensor error (DPF substrate removal/DPF differential pressure sensor detected value error)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Battery voltage is within normal range 3- Key switch is ON 4- During engine operation 5- Not during DPF regeneration nor SCR heating mode 6- Exhaust gas volumetric flow rate (calculated value) is at or above the prescribed value 2. The current DPF differential pressure remains below the value prescribed for each exhaust gas volumetric flow rate (calculated value) and PM deposition amount, for a certain period of time.	• Coupler • Wire-harness • DPF differential pressure sensor • ECU

● Actions when an error occurs

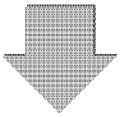
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is automatically reset when all prerequisites are established. • Key switch turned from OFF to ON, and Engine speed is 0 or ECU power is OFF.
Remarks	

● Presumed cause of the failure or the error condition

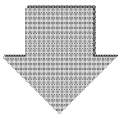
1. Loss of soot filter (SF), hose coming off, or leakage of exhaust gas from the gasket
2. Deviation of learned value due to increase in GND resistance value (increase in voltage of sensor signal line)
3. Wiring failure of the wire-harness
   - Short circuit of the sensor signal wire and GND
   - Power short circuit of the sensor signal wire
   - GND short circuit of the sensor signal wire
   - Disconnection of sensor GND wire
     (Sensor GND disconnection or momentary disconnection (temporary resistance increase) at key ON)
4. Poor connection of coupler

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P672* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF differential pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF differential pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the DPF differential pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the DPF differential pressure sensor output voltage. *See Chapter 3 *P672* for details on the diagnosis method and procedure.

■ DPF high pressure sensor

P1455: DPF high pressure sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit 1 error (voltage low) is not occurring. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • DPF high pressure sensor • ECU

● Actions when an error occurs

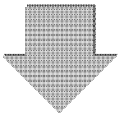
Fault mode	[Limited operation]: DPF high pressure side pressure is set to 90 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

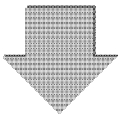
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Short circuit of the sensor signal wire and sensor 5 V
   - Power short circuit of the sensor signal wire
   - Disconnection of the sensor GND wire
   - Disconnection of sensor signal wire
3. DPF high pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P664* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF high pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF high pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the DPF high pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the DPF high pressure output voltage. *See Chapter 3 *P664* for details on the diagnosis method and procedure.

P1454: DPF high pressure sensor error (voltage low)

P code	P1454	Name	DPF high pressure sensor error (voltage low)
SPN/FMI	3609/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit 1 error (voltage low) is not occurring. 2. The sensor voltage is below the 0.2 V threshold.	• Coupler • Wire-harness • DPF high pressure sensor • ECU

● Actions when an error occurs

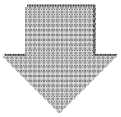
Fault mode	[Limited operation]: DPF high pressure side pressure is set to 90 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

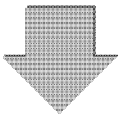
1. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
   - Power short circuit of the sensor signal wire
2. DPF high pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P664* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF high pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF high pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the DPF high pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the DPF high pressure output voltage. *See Chapter 3 *P664* for details on the diagnosis method and procedure.

P167C: DPF high pressure sensor error (detected value error)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Key switch is ON 3- During engine operation 4- Battery voltage is within normal range 5- Not during DPF regeneration nor SCR heating mode 6- Atmospheric pressure is 82.3 kPA or above 7- Current injection amount is equal to or more than the predetermined value determine by the engine rpm 2. The difference between the DPF high pressure (after learning) and the atmospheric pressure is within the prescribed range.	• Coupler • Wire-harness • DPF high pressure sensor • ECU

● Actions when an error occurs

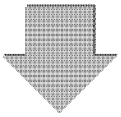
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

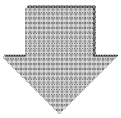
1. Loss of soot filter (SF), hose coming off, or leakage of exhaust gas from the gasket.
2. Deviation of learned value due to increase in GND resistance value (increase in voltage of sensor signal line)
3. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
   - Power short circuit of the sensor signal wire
   - Sensor GND disconnection or momentary disconnection (temporary resistance increase) at key ON
4. Poor connection of coupler

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P672* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF high pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF high pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the DPF high pressure sensor resistance value. • Check the conduction of the wire-harness. • Check the DPF high pressure output voltage. *See Chapter 3 *P672* for details on the diagnosis method and procedure.

■ DPF inlet temperature sensor

P1428: DPF inlet temperature sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • DPF inlet temperature sensor • ECU

● Actions when an error occurs

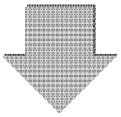
Fault mode	[Limited operation]: Set the DPF inlet temperature to 350 °C as default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

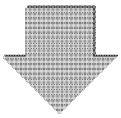
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit or short circuit of the sensor signal wire 5 V
   - Disconnection of the GND wire
3. DPF inlet temperature sensor failure
   - Disconnection of the DPF inlet temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P600* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF inlet temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF inlet temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the DPF inlet temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the DPF inlet temperature sensor. *See Chapter 3 *P600* for details on the diagnosis method and procedure.

P1427: DPF inlet temperature sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is below the 0.2 V threshold.	• Coupler • Wire-harness • DPF inlet temperature sensor • ECU

● Actions when an error occurs

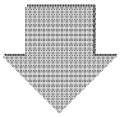
Fault mode	[Limited operation]: Set the DPF inlet temperature to 350 °C as default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

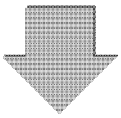
1. Wiring failure of the wire-harness
   • GND short circuit of the sensor signal wire
2. DPF inlet temperature sensor failure
   • Sensor output failure caused by a GND Short circuit of the DPF inlet temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P600* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF inlet temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF inlet temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the DPF inlet temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the DPF inlet temperature sensor. *See Chapter 3 *P600* for details on the diagnosis method and procedure.

P167E: DPF inlet temperature sensor error (detected value error)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Battery voltage is within normal range 3- Key switch is ON 4- The last driving cycle has completely warmed up 5- Coolant temperature immediately after key turned ON is at or below the prescribed value 6- DPF intermediate temperature immediately after key turned ON is below the prescribed value 7- Immediately after turning the key ON, the difference between coolant temperature and intake air temperature is within the prescribed range 8- Immediately after turning the key ON, the difference between DPF intermediate temperature and intake air temperature is within the prescribed range 9- Current DPF intermediate temperature is higher for a prescribed value than the DPF intermediate temperature immediately after key turned ON for a certain period of time 10- Not during DPF regeneration nor SCR heating mode 11- Atmospheric pressure is 82.3 kPA or above 2. (Current DPF inlet temperature) - (DPF inlet temperature immediately after key turned ON) is within the prescribed range.	• Coupler • Wire-harness • DPF inlet temperature sensor • ECU

● Actions when an error occurs

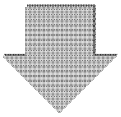
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

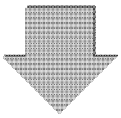
1. Installation condition failure of DPF inlet temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire (During engine operation only)
   - Sensor GND disconnection or momentary disconnection (temporary resistance increase) at key ON
4. DPF inlet temperature sensor failure
   - Sensor output failure caused by a GND Short circuit of the DPF inlet temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P604* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF inlet temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF inlet temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the DPF inlet temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the DPF inlet temperature sensor. *See Chapter 3 *P604* for details on the diagnosis method and procedure.

P1436: DPF inlet temperature sensor abnormal temperature (abnormally high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • After starting is complete • DPF inlet temperature sensor voltage is normal 2. DPF inlet temperature is 700 °C or higher for a given length of time (15 seconds).	• Coupler • Wire-harness • DPF inlet temperature sensor • ECU • Injector

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Injector failure
   - Increase in injection quantity
   - Injection timing error
2. Wiring failure of the wire-harness
   - Sensor GND disconnection or momentary disconnection (temporary resistance increase, only during operation)
3. DPF inlet temperature sensor failure
4. Poor connection of coupler

■ DPF intermediate temperature sensor

P1434: DPF intermediate temperature sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • DPF intermediate temperature sensor • ECU

● Actions when an error occurs

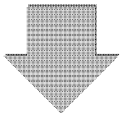
Fault mode	[Limited operation]: Set the DPF intermediate temperature to 350 °C as default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

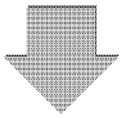
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit or short circuit of the sensor signal wire 5 V
   - Disconnection of the GND wire
3. DPF intermediate temperature sensor failure
   - Disconnection of the DPF intermediate temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P609* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF intermediate temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF intermediate temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the DPF intermediate temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the DPF intermediate temperature sensor. *See Chapter 3 *P609* for details on the diagnosis method and procedure.

P1435: DPF intermediate temperature sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is below the 0.2 V threshold.	• Coupler • Wire-harness • DPF intermediate temperature sensor • ECU

● Actions when an error occurs

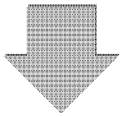
Fault mode	[Limited operation]: Set the DPF intermediate temperature to 350 °C as default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

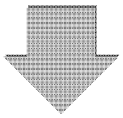
1. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
2. DPF intermediate temperature sensor failure
   - Sensor output failure caused by a GND Short circuit of the DPF intermediate temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P609* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF intermediate temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF intermediate temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the DPF intermediate temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the DPF intermediate temperature sensor. *See Chapter 3 *P609* for details on the diagnosis method and procedure.

P167A: DPF intermediate temperature sensor error (detected value error)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Battery voltage is within normal range 3- Key switch is ON 4- The last driving cycle has completely warmed up 5- Coolant temperature immediately after key turned ON is at or below the prescribed value 6- DPF inlet temperature immediately after key turned ON is at or below the prescribed value 7- Immediately after turning the key ON, the difference between coolant temperature and intake air temperature is within the prescribed range 8- Immediately after turning the key ON, the difference between DPF inlet temperature and intake air temperature is within the prescribed range 9- Current DPF inlet temperature is higher by a prescribed value than the DPF inlet temperature for a certain period of time immediately after key turned ON 10- Not during DPF regeneration 11- Atmospheric pressure is 82.3 kPA or above 2. (Current DPF intermediate temperature) - (DPF intermediate temperature immediately after key turned ON) is within the prescribed range.	• Coupler • Wire-harness • DPF intermediate temperature sensor • ECU

● Actions when an error occurs

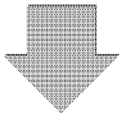
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

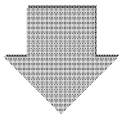
1. Installation condition failure of DPF intermediate temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire (During engine operation only)
   - Sensor GND disconnection or momentary disconnection (temporary resistance increase) at key ON
4. DPF intermediate temperature sensor failure
   - Sensor output failure caused by a GND Short circuit of the DPF intermediate temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P621* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the DPF intermediate temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the DPF intermediate temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the DPF intermediate temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the DPF intermediate temperature sensor. *See Chapter 3 *P621* for details on the diagnosis method and procedure.

P0420: DPF intermediate temperature abnormal (abnormally low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No 2. Any of the following conditions is kept for a given length of time (1200 seconds). • DPF intermediate temperature becomes 300 °C or lower during the stationary regeneration. • DPF intermediate temperature becomes 250 °C or lower during the recovery regeneration.	• Coupler • Wire-harness • DPF intermediate temperature sensor system • ECU • Injector • DOC/Piping

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Post-injection limit due to other errors during stationary regeneration
2. Wiring failure of the wire-harness (Short circuit)
3. DPF intermediate temperature sensor failure

P1426: DPF intermediate temperature abnormal (abnormal rise in temperature)

P code	P1426	Name	DPF intermediate temperature abnormal (abnormal rise in temperature)
SPN/FMI	3250/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. DPF intermediate temperature sensor voltage is normal. 2. DPF intermediate temperature is 750 °C or higher for a given length of time (30 seconds).	• Sensor • Wire-harness • Injector • Turbocharger

● Actions when an error occurs

	Settings when DPF intermediate temperature sensor temperature rises abnormally	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The engine is stopped, the high idle speed and engine output are limited, and the failsafe action is set (Set using application)
Reset criteria	When the ECU power is turned OFF, the fault mode is released.	When the ECU power is turned OFF, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

1. DPF intermediate temperature sensor failure
2. Increase in injector injection quantity
3. Increase in wire-harness GND resistance
4. Oil inflow from another check point

■ Atmospheric pressure sensor

P2229: Atmospheric pressure sensor error (voltage high)

P code	P2229	Name	Atmospheric pressure sensor error (voltage high)
SPN/FMI	108/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. Atmospheric pressure of 115 kPA or above is detected.	• Atmospheric pressure sensor inside the ECU

● Actions when an error occurs

Fault mode	[Limited operation]: Atmospheric pressure is set to 55 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal atmospheric pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P786* for details on the diagnosis method and procedure.

P2228: Atmospheric pressure sensor error (voltage low)

P code	P2228	Name	Atmospheric pressure sensor error (voltage low)
SPN/FMI	108/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. Atmospheric pressure of 40 kPA or below is detected.	• Atmospheric pressure sensor inside the ECU

● Actions when an error occurs

Fault mode	[Limited operation]: Atmospheric pressure is set to 55 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal atmospheric pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P786* for details on the diagnosis method and procedure.

P1231: Atmospheric pressure sensor error (characteristic error)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- The battery voltage is 8 V or higher and 18 V or lower 2- The key switch is turned ON 3- No crankshaft rotation 4- Calculation for the intake manifold pressure final offset value is completed 5- Calculation for the exhaust manifold pressure final offset value is completed 6- Sensor power voltage is not too high/low * Above 4 and 5 are satisfied under the following conditions (1. Before engine start, 2. Elapse of 400 ms after ECU power is turned ON, 3. Intake air pressure sensor voltage normal, 4. Exhaust gas pressure sensor voltage normal, 5. Atmospheric pressure sensor voltage normal) 2. The following conditions are satisfied in a cycle of 1000 ms. • The intake air pressure final offset value exceeds 25 kPa of the threshold value. • The exhaust gas pressure final offset value exceeds 25 kPa of the threshold value.	• ECU • Intake air pressure sensor • Exhaust gas pressure sensor

● Actions when an error occurs

Fault mode	[Limited operation]: Atmospheric pressure is set to 55 kPa as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when the prerequisite is satisfied, and intake or exhaust manifold pressure offset value is between -25 kPa to 25 kPa, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Intake air pressure sensor/exhaust gas pressure sensor failure (large deviation from atmospheric pressure)
2. Wire-harness GND wire or output wire of both intake air pressure sensor and exhaust gas pressure sensor is disconnected or short circuited (large deviation from atmospheric pressure)
3. ECU breathing hole blockage due to adhesion of foreign matter (mud, dust, etc.)
4. ECU internal atmospheric pressure sensor failure

■ EGR gas temperature sensor

P041D: EGR gas temperature sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • EGR gas temperature sensor • ECU

● Actions when an error occurs

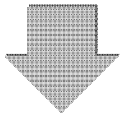
Fault mode	[Limited operation]: Set the EGR gas temperature to 30 °C as default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

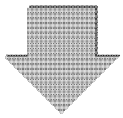
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit or short circuit of the sensor signal wire 5 V
   - Disconnection of the GND wire
3. EGR gas temperature sensor failure
   - Disconnection of the EGR gas temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P693* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the EGR gas temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the EGR gas temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the EGR gas temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the EGR gas temperature sensor. *See Chapter 3 *P693* for details on the diagnosis method and procedure.

P041C: EGR gas temperature sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is below the 0.07 V threshold.	• Coupler • Wire-harness • EGR gas temperature sensor • ECU

● Actions when an error occurs

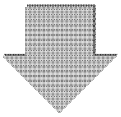
Fault mode	[Limited operation]: Set the EGR gas temperature to 30 °C as default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

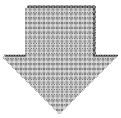
1. Wiring failure of the wire-harness
   • GND short circuit of the sensor signal wire
2. EGR gas temperature sensor failure
   • Sensor output failure caused by a GND Short circuit of the EGR gas temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P693* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the EGR gas temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the EGR gas temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the EGR gas temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the EGR gas temperature sensor. *See Chapter 3 *P693* for details on the diagnosis method and procedure.

P1675: EGR gas temperature sensor error (detected value error)

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

● Purpose of DTC detection

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- No abnormalities in related sensors 2- Battery voltage is within normal range 3- Key switch is ON 4- The last driving cycle has completely warmed up 5- Not during DPF regeneration 6- Coolant temperature immediately after key turned ON is at or below the prescribed value 7- Exhaust manifold temperature immediately after key turned ON is at or below the prescribed value 8- Difference between exhaust manifold temperature and intake air temperature immediately after key turned ON is within the prescribed range 9- While the above conditions are all met, the following conditions remain established for a prescribed amount of time • Exhaust manifold temperature is at or above the prescribed value • EGR valve opening is at or above the prescribed value • Current injection amount is equal to or more than the predetermined value determine by the engine rpm 10- Atmospheric pressure is 82.3 kPA or above 2. (Current EGR gas temperature) - (EGR gas temperature immediately after key turned ON) is below the prescribed range.	• Coupler • Wire-harness • EGR gas temperature sensor • ECU

● Actions when an error occurs

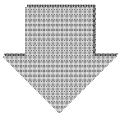
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

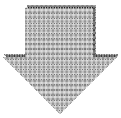
1. Installation condition failure of EGR gas temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. GND short circuit of the sensor signal wire (During engine operation only)
5. Sensor GND disconnection or momentary disconnection (temporary resistance increase) at key ON
6. EGR gas temperature sensor failure

● Diagnosis

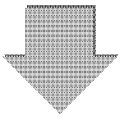
1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P697* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the installation condition of EGR gas temperature sensor. • Check the EGR pipe and EGR cooler for damage or failure.



3. Coupler/wiring check	• Check the coupler pin of the EGR gas temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the EGR gas temperature sensor wiring is not disconnected or the wiring coating is not peeled.



4. Failure diagnosis	• Check the resistance value of the EGR gas temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of the EGR gas temperature sensor. *See Chapter 3 *P697* for details on the diagnosis method and procedure.

■ Intake manifold temperature sensor

P040D: Intake manifold temperature sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is above the 4.8 V threshold.	• Coupler • Wire-harness • Intake manifold temperature sensor • ECU

● Actions when an error occurs

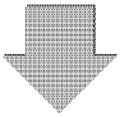
Fault mode	[Limited operation]: Temperature after EGR gas conflux is set to the default value (TC 200 °C). The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

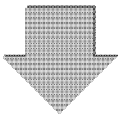
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit or short circuit of the sensor signal wire 5 V
   - Disconnection of the GND wire
3. Intake manifold temperature sensor failure
   - Disconnection of the intake manifold temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P703* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the intake manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake manifold temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the intake manifold temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the intake manifold temperature sensor output voltage. *See Chapter 3 *P703* for details on the diagnosis method and procedure.

P040C: Intake manifold temperature sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor voltage is below the 0.2 V threshold.	• Coupler • Wire-harness • Intake manifold temperature sensor • ECU

● Actions when an error occurs

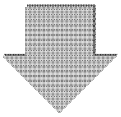
Fault mode	[Limited operation]: Temperature after EGR gas conflux is set to the default value (TC 200 °C). The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

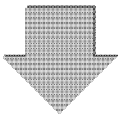
1. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
2. Intake manifold temperature sensor failure
   - Sensor output failure caused by a GND short circuit of the intake manifold temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P703* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the intake manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake manifold temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the intake manifold temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the intake manifold temperature sensor output voltage. *See Chapter 3 *P703* for details on the diagnosis method and procedure.

P1676: Intake manifold temperature sensor error (detected value error)

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

● Purpose of DTC detection

When the difference between the intake air temperature and the fresh air temperature at engine stop (cold state) is large, this error is detected. This checks the intake air temperature state.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Battery voltage is within normal range 3- Key switch is ON 4- The last driving cycle has completely warmed up 5- Immediately after turning the key ON, the difference between coolant temperature and intake air temperature is within the prescribed range 2. The difference between the intake air temperature immediately after the key is turned ON, and the fresh air temperature immediately after the key is turned ON, is above the prescribed range.	• Coupler • Wire-harness • Intake manifold temperature sensor • Fresh air temperature sensor • ECU

● Actions when an error occurs

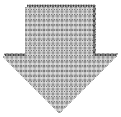
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

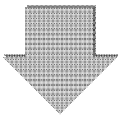
1. Installation condition failure of intake manifold temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. Sensor GND disconnection or momentary disconnection (temporary resistance increase) at key ON
5. Intake manifold temperature sensor failure
6. Fresh air temperature sensor failure

● Diagnosis

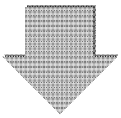
1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P707* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the installation condition of intake manifold temperature sensor.



3. Coupler/wiring check	• Check the coupler pin of the intake manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake manifold temperature sensor wiring is not disconnected or the wiring coating is not peeled.



4. Failure diagnosis	• Check the intake manifold temperature sensor resistance value. • Check the conduction of the wire-harness. • Check the intake manifold temperature sensor output voltage. *See Chapter 3 *P707* for details on the diagnosis method and procedure.

■ Exhaust manifold temperature sensor

P0546: Exhaust manifold temperature sensor error (voltage high)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor output is higher than the 4.8 V threshold.	• Coupler • Wire-harness • Intake manifold temperature sensor • Fresh air temperature sensor • ECU

● Actions when an error occurs

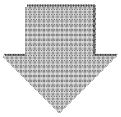
Fault mode	[Limited operation]: The exhaust temperature is set to 550 °C as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

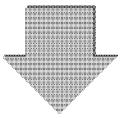
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit or short circuit of the sensor signal wire 5 V
   - Disconnection of the GND wire
3. Exhaust manifold temperature sensor failure
   - Disconnection of the exhaust manifold temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P713* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the exhaust manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust manifold temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the exhaust manifold temperature sensor. • Check the conduction of the wire-harness. • Check the exhaust manifold temperature sensor output voltage. *See Chapter 3 *P713* for details on the diagnosis method and procedure.

P0545: Exhaust manifold temperature sensor error (voltage low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 2. The sensor output is higher than the 0.2 V threshold.	• Coupler • Wire-harness • Exhaust manifold temperature sensor • ECU

● Actions when an error occurs

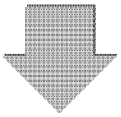
Fault mode	[Limited operation]: The exhaust temperature is set to 550 °C as the default value. The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • SCR heating stops. • Ash amount reset is prohibited. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

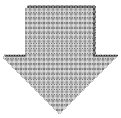
1. Wiring failure of the wire-harness
   • GND short circuit of the sensor signal wire
2. Exhaust manifold temperature sensor failure
   • Sensor output failure caused by a GND short circuit of the exhaust manifold temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P713* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the exhaust manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust manifold temperature sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of the exhaust manifold temperature sensor. • Check the conduction of the wire-harness. • Check the exhaust manifold temperature sensor output voltage. *See Chapter 3 *P713* for details on the diagnosis method and procedure.

P1677: Exhaust manifold temperature sensor error (detected value error)

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

● Purpose of DTC detection

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. 1- No abnormalities in related sensors 2- Battery voltage is within normal range 3- Key switch is ON 4- The last driving cycle has completely warmed up 5- Coolant temperature immediately after key turned ON is at or below the prescribed value 6- DPF inlet temperature immediately after key turned ON is at or below the prescribed value 7- Difference between DPF inlet temperature and intake air temperature immediately after key turned ON is within the prescribed range 8- DPF inlet temperature is higher for a prescribed value for 1 second immediately after key turned ON 9- Atmospheric pressure is 82.3 kPA or above 2. The current exhaust temperature and exhaust temperature at the time the key is turned ON (temperature difference absolute value) are below the prescribed value.	• Coupler • Wire-harness • Exhaust manifold temperature sensor • ECU

● Actions when an error occurs

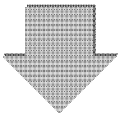
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

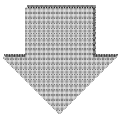
1. Installation condition failure of exhaust manifold temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. GND short circuit of the sensor wire (During engine operation only)
5. Sensor GND disconnection or momentary disconnection (temporary resistance increase) at key ON
6. Exhaust manifold temperature sensor failure

● Diagnosis

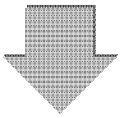
1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P721* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the installation condition of exhaust manifold temperature sensor. • Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.



3. Coupler/wiring check	• Check the coupler pin of the exhaust manifold temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the exhaust manifold temperature sensor wiring is not disconnected or the wiring coating is not peeled.



4. Failure diagnosis	• Check the resistance value of the exhaust manifold temperature sensor. • Check the conduction of the wire-harness. • Check the exhaust manifold temperature sensor output voltage. *See Chapter 3 *P721* for details on the diagnosis method and procedure.

P2428: Exhaust manifold temperature sensor error (detected value error) (temperature high) (Applicable only to EU Stage IIIA equivalent certified model)

P code	P2428	Name	Exhaust manifold temperature sensor error (detected value error) (temperature high)
SPN/FMI	173/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Exhaust manifold temperature sensor voltage is normal. 2. Exhaust manifold temperature is kept 740 °C or higher for 15 seconds.	• Coupler • Wire-harness • Exhaust manifold temperature sensor • ECU • Injector • Exhaust piping

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Injector failure
   - Increase in injection quantity
   - Injection timing error
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. Exhaust manifold temperature sensor failure

Contact output related

■ Main relay

P068A: Main relay premature opening

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Battery voltage is within normal range, and the key switch is turned ON for a given length of time. 2. ECU power OFF detected twice in a row before completion of after-run.	• Coupler • Wire-harness • Main relay • ECU

● Actions when an error occurs

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

● Presumed cause of the failure or the error condition

1. Battery cut during after-run
2. Poor connection of coupler
3. Wiring failure of the wire-harness
   - GND short circuit of main relay coil side downstream wire
4. Main relay contact failure
   - Main relay contact sticking

■ Starting aid relay

P0543: Starting aid relay disconnection/VB short circuit

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON. 3- Energization instruction to the glow signal is OFF. 2. IC disconnection/VB short circuit is detected inside the ECU.	• Coupler • Wire-harness • Starting aid relay • ECU

● Actions when an error occurs

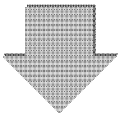
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

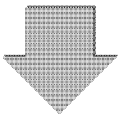
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of starting aid relay power
   - Power short circuit of starting aid relay power
3. Starting aid relay failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P727* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the starting aid relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the starting aid relay wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the starting aid relay resistance value. • Check the conduction of the wire-harness. *See Chapter 3 *P727* for details on the diagnosis method and procedure.

P0541: Starting aid relay GND short circuit

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- The key switch is turned ON. 2- Battery voltage is within normal range. 3- The glow signal is being energized. 2. IC disconnection/GND short circuit is detected inside the ECU.	• Coupler • Wire-harness • Starting aid relay • ECU

● Actions when an error occurs

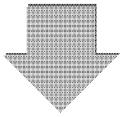
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

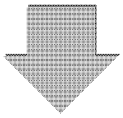
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of starting aid relay power
3. Starting aid relay failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P727* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the starting aid relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the starting aid relay wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the starting aid relay resistance value. • Check the conduction of the wire-harness. *See Chapter 3 *P727* for details on the diagnosis method and procedure.

CRS (common rail system) related

■ Injector-specific

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

P code	P0201	Name	Injector (No. 1 cylinder) disconnection (injector-specific)
SPN/FMI	651/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Injection other than post-injection exists • CPU is normal • Driver IC is normal 2. Disconnection of No. 1 cylinder injector has been detected in the drive circuit, and no disconnection of injector bank 1 has occurred.	• Coupler • Wire-harness • ECU • Injector

● Actions when an error occurs

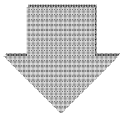
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • The injection by the failed cylinder stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

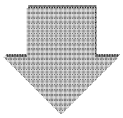
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Disconnection of the injector (No. 1 cylinder) drive circuit (TWV1)
3. Disconnection of the injector internal circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P764* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the injector resistance value. *See Chapter 3 *P764* for details on the diagnosis method and procedure.

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

P code	P0202	Name	Injector (No. 2 cylinder) disconnection (injector-specific)
SPN/FMI	652/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Injection other than post-injection exists • CPU is normal • Driver IC is normal 2. Disconnection of No. 2 cylinder injector has been detected in the drive circuit, and no disconnection of injector bank 2 has occurred.	• Coupler • Wire-harness • ECU • Injector

● Actions when an error occurs

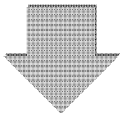
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • The injection by the failed cylinder stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

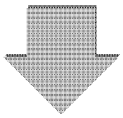
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Disconnection of the injector (No. 2 cylinder) drive circuit (TWV4)
3. Disconnection of the injector internal circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P764* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the injector resistance value. *See Chapter 3 *P764* for details on the diagnosis method and procedure.

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

P code	P0203	Name	Injector (No. 3 cylinder) disconnection (injector-specific)
SPN/FMI	653/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Injection other than post-injection exists • CPU is normal • Driver IC is normal 2. Disconnection of No. 3 cylinder injector has been detected in the drive circuit, and no disconnection of injector bank 2 has occurred.	• Coupler • Wire-harness • ECU • Injector

● Actions when an error occurs

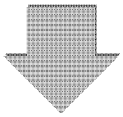
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • The injection by the failed cylinder stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

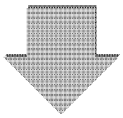
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Disconnection of the injector (No. 3 cylinder) drive circuit (TWV2)
3. Disconnection of the injector internal circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P764* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the injector resistance value. *See Chapter 3 *P764* for details on the diagnosis method and procedure.

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

P code	P0204	Name	Injector (No. 4 cylinder) disconnection (injector-specific)
SPN/FMI	654/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Injection other than post-injection exists • CPU is normal • Driver IC is normal 2. Disconnection of No. 4 cylinder injector has been detected in the drive circuit, and no disconnection of injector bank 1 has occurred.	• Coupler • Wire-harness • ECU • Injector

● Actions when an error occurs

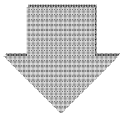
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • The injection by the failed cylinder stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

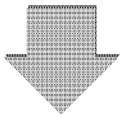
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Disconnection of the Injector (No. 4 cylinder) drive circuit (TWV3)
3. Disconnection of the injector internal circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P764* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the injector resistance value. *See Chapter 3 *P764* for details on the diagnosis method and procedure.

■ Injectors (general)

P2148: Injector bank 1 + B short circuit

P code	P2148	Name	Injector bank 1 + B short circuit
SPN/FMI	2797/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. +B short circuit of injector bank 1 detected in the drive circuit.	• Coupler • Wire-harness • ECU

● Actions when an error occurs

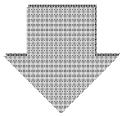
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

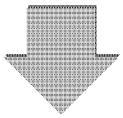
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of injector drive circuit common 1 system
   - Power short circuit of No. 1 cylinder injector drive circuit (TWV1) or No. 4 cylinder injector drive circuit (TWV3)
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P767* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. *See Chapter 3 *P767* for details on the diagnosis method and procedure.

P2147: Injector bank 1 GND short circuit

P code	P2147	Name	Injector bank 1 GND short circuit
SPN/FMI	2797/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. GND short circuit of injector bank 1 detected in the drive circuit.	• Coupler • Wire-harness • ECU

● Actions when an error occurs

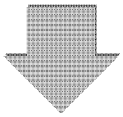
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

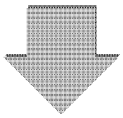
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of injector drive circuit common 1 system
   - GND short circuit of No. 1 cylinder injector drive circuit (TWV1) or No. 4 cylinder injector drive circuit (TWV3)
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P767* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. *See Chapter 3 *P767* for details on the diagnosis method and procedure.

P2146: Injector bank 1 disconnection

P code	P2146	Name	Injector bank 1 disconnection
SPN/FMI	2797/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Injection other than post-injection exists • CPU is normal • Driver IC is normal 2. Disconnection of injector banks 1 and 3 has been detected in the drive circuit.	• Coupler • Wire-harness • ECU • Injector

● Actions when an error occurs

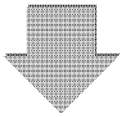
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

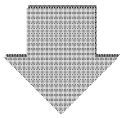
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the injector drive circuit common 1 system
   - Disconnection of No. 1 cylinder injector drive circuit (TWV1) and No. 4 cylinder injector drive circuit (TWV3) at the same time
3. Disconnection of the injector internal circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P764* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the injector resistance value. *See Chapter 3 *P764* for details on the diagnosis method and procedure.

P2151: Injector bank 2 + B short circuit

P code	P2151	Name	Injector bank 2 + B short circuit
SPN/FMI	2798/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. +B short circuit of injector bank 2 detected in the drive circuit.	• Coupler • Wire-harness • ECU

● Actions when an error occurs

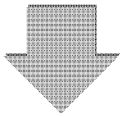
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

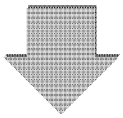
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of injector drive circuit common 2 system
   - Power short circuit of No. 2 cylinder injector drive circuit (TWV4) or No. 3 cylinder injector drive circuit (TWV2)
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P767* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. *See Chapter 3 *P767* for details on the diagnosis method and procedure.

P2150: Injector bank 2 GND short circuit

P code	P2150	Name	Injector bank 2 GND short circuit
SPN/FMI	2798/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. GND short circuit of injector bank 2 detected in the drive circuit.	• Coupler • Wire-harness • ECU

● Actions when an error occurs

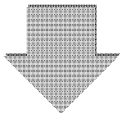
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

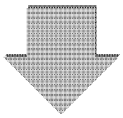
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of injector drive circuit common 2 system
   - GND short circuit of No. 2 cylinder injector drive circuit (TWV4) or No. 3 cylinder injector drive circuit (TWV2)
3. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P767* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. *See Chapter 3 *P767* for details on the diagnosis method and procedure.

P2149: Injector bank 2 disconnection

P code	P2149	Name	Injector bank 2 disconnection
SPN/FMI	2798/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Injection other than post-injection exists • CPU is normal • Driver IC is normal 2. Disconnection of injector banks 2 and 4 has been detected in the drive circuit.	• Coupler • Wire-harness • ECU • Injector

● Actions when an error occurs

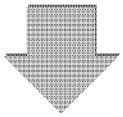
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

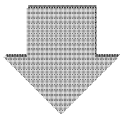
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of the injector drive circuit common 2 system
   - Disconnection of No. 2 cylinder injector drive circuit (TWV4) and No. 3 cylinder injector drive circuit (TWV2) at the same time
3. Disconnection of the injector internal circuit
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P764* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the injector resistance value. *See Chapter 3 *P764* for details on the diagnosis method and procedure.

■ Injector drive circuit

P0611: Low charge error

P code	P0611	Name	Low charge error
SPN/FMI	522996/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. Detection of a low charge error in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine. *See Chapter 3 *P789* for details on the diagnosis method and procedure.

P0200: Overcharge error

P code	P0200	Name	Overcharge error
SPN/FMI	522997/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. Detection of an overcharge error in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	• The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine. *See Chapter 3 *P791* for details on the diagnosis method and procedure.

P1710: Injector drive circuit (No. 1 cylinder) coil short circuit between COM/TWV terminals

P code	P1710	Name	Injector drive circuit (No. 1 cylinder) coil short circuit between COM/TWV terminals
SPN/FMI	651/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • Injection other than post-injection exists 2. There is no +B or GND short in injector bank 1, and an injector coil short has been detected in the circuit.	• ECU

● Actions when an error occurs

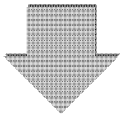
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

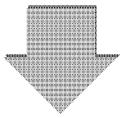
1. Wiring failure of the wire-harness
   • Short circuit of the injector drive circuit common harness, or of injector drive harness of each cylinder
2. ECU internal circuit failure
3. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness.

P1711: Injector drive circuit (No. 1 cylinder) discharge MOS open failure

P code	P1711	Name	Injector drive circuit (No. 1 cylinder) discharge MOS open failure
SPN/FMI	651/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • Injection has stopped, or a certain amount of time has elapsed since the last injection 2. Discharge MOS open failure has been detected in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine.

P1712: Injector drive circuit (No. 3 cylinder) coil short circuit between COM/TWV terminals

P code	P1712	Name	Injector drive circuit (No. 3 cylinder) coil short circuit between COM/TWV terminals
SPN/FMI	653/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • Injection other than post-injection exists 2. All of the followings are satisfied. • There is no +B or GND short in injector bank 2 • An injector coil short has been detected in the circuit	• ECU

● Actions when an error occurs

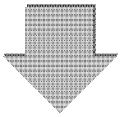
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

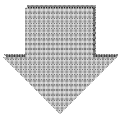
1. Wiring failure of the wire-harness
   • Short circuit of the injector drive circuit common harness, or of injector drive harness of each cylinder
2. ECU internal circuit failure
3. Short circuit of the injector internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness.

P1713: Injector drive circuit (No. 3 cylinder) discharge MOS open failure

P code	P1713	Name	Injector drive circuit (No. 3 cylinder) discharge MOS open failure
SPN/FMI	653/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • Injection has stopped, or a certain amount of time has elapsed since the last injection 2. Discharge MOS open failure has been detected in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine.

P1714: Injector drive circuit (No. 4 cylinder) coil short circuit between COM/TWV terminals

P code	P1714	Name	Injector drive circuit (No. 4 cylinder) coil short circuit between COM/TWV terminals
SPN/FMI	654/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • Injection other than post-injection exists 2. All of the followings are satisfied. • There is no +B or GND short in injector bank 1 • An injector coil short has been detected in the circuit	• ECU

● Actions when an error occurs

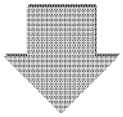
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

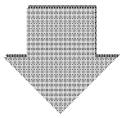
1. Wiring failure of the wire-harness
   • Short circuit of the injector drive circuit common harness, or of injector drive harness of each cylinder
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness.

P1715: Injector drive circuit (No. 4 cylinder) discharge MOS open failure

P code	P1715	Name	Injector drive circuit (No. 4 cylinder) discharge MOS open failure
SPN/FMI	654/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • Injection has stopped, or a certain amount of time has elapsed since the last injection 2. Discharge MOS open failure has been detected in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine.

P1716: Injector drive circuit (No. 2 cylinder) coil short circuit between COM/TWV terminals

P code	P1716	Name	Injector drive circuit (No. 2 cylinder) coil short circuit between COM/TWV terminals
SPN/FMI	652/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • Injection other than post-injection exists 2. All of the followings are satisfied. • There is no +B or GND short in injector bank 2 • An injector coil short has been detected in the circuit	• ECU

● Actions when an error occurs

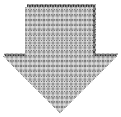
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

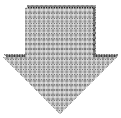
1. Wiring failure of the wire-harness
   • Short circuit of the injector drive circuit common harness, or of injector drive harness of each cylinder
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the injector for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the injector wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness.

P1717: Injector drive circuit (No. 2 cylinder) discharge MOS open failure

P code	P1717	Name	Injector drive circuit (No. 2 cylinder) discharge MOS open failure
SPN/FMI	652/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • Injection has stopped, or a certain amount of time has elapsed since the last injection 2. Discharge MOS open failure has been detected in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine.

P1718: Injector driver IC-1 VDIC 3 internal clock error

P code	P1718	Name	Injector driver IC-1 VDIC 3 internal clock error
SPN/FMI	2797/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal 2. A clock error has been detected in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine.

P1719: Injector driver IC-1 VDIC 3- communication error between micro computers

P code	P1719	Name	Injector driver IC-1 VDIC 3- communication error between micro computers
SPN/FMI	2797/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal 2. A communication error has been detected in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine.

P1720: Injector driver IC-2 VDIC 3 internal clock error

P code	P1720	Name	Injector driver IC-2 VDIC 3 internal clock error
SPN/FMI	2798/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal 2. A clock error has been detected in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine.

P1721: Injector driver IC-2 VDIC 3- communication error between micro computers

P code	P1721	Name	Injector driver IC-2 VDIC 3- communication error between micro computers
SPN/FMI	2798/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal 2. A communication error has been detected in the circuit.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Injection by the bank suffering the failure stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary failure caused by external factors such as radio waves
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine.

■ SCV (Suction control valve)

P0629: SCV (Suction control valve) H/L side VB short circuit

P code	P0629	Name	SCV (Suction control valve) H/L side VB short circuit
SPN/FMI	633/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal 2. The SCV drive current value is at or above 1300 mA, and a +B short circuit has been detected for 2 continuous seconds in the ECU internal circuit.	• Coupler • Wire-harness • SCV • ECU

● Actions when an error occurs

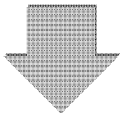
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

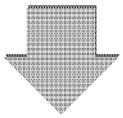
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of SCV (+) output
   - Power short circuit of SVC (–) output
3. SCV failure caused by a coil short circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P770* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the SCV for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the SCV wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the SCV resistance value. • Check the conduction of the wire-harness. *See Chapter 3 *P770* for details on the diagnosis method and procedure.

P0627: SCV (Suction control valve) H side GND short circuit/disconnection

P code	P0627	Name	SCV (Suction control valve) H side GND short circuit/disconnection
SPN/FMI	633/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal 2. SCV drive current value is 500 mA or below and disconnection or GND short circuit is detected in the ECU internal circuit for 2 seconds.	• Coupler • Wire-harness • SCV • ECU

● Actions when an error occurs

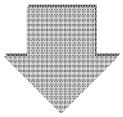
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

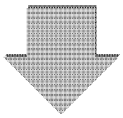
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of SCV (+) output
   - Disconnection of SCV (–) output
   - GND short circuit of SCV (+) output
   - GND short circuit of SCV (–) output
   - Power short circuit of SCV (+) output
   - Power short circuit of SVC (–) output
3. SCV failure caused by coil short

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P770* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the SCV for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the SCV wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the SCV resistance value. • Check the conduction of the wire-harness. *See Chapter 3 *P770* for details on the diagnosis method and procedure.

P2635: Drive circuit error (SCV sticking)

P code	P2635	Name	Drive circuit error (SCV sticking)
SPN/FMI	633/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisite should be satisfied. 1- The key switch is turned ON for a given length of time. 2- Battery voltage is within normal range. 3- Engine is running. 2. The demand discharge quantity is below 0 mm^3/st, and the actual rail pressure is 20 MPa above the specified value for the target rail pressure for 23 seconds or longer.	• Supply pump • Rail pressure sensor

● Actions when an error occurs

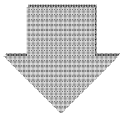
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

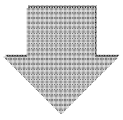
1. SCV drive circuit system failure
2. SCV open sticking
3. SCV intermittent failure
4. Rail pressure sensor system failure
5. Wiring failure of the wire-harness

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P773* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the SCV and rail pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the SCV and rail pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Perform the failure diagnosis on the rail pressure sensor. • Perform the failure diagnosis on the SCV. *See Chapter 3 *P773* for details on the diagnosis method and procedure.

P009B: PRV (Pressure reducing valve) disconnection

P code	P009B	Name	PRV (Pressure reducing valve) disconnection
SPN/FMI	5571/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • During PRV drive indication 2. Disconnection has been detected in the circuit.	• Coupler • Wire-harness • PRV • ECU

● Actions when an error occurs

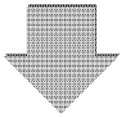
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

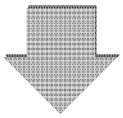
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - PRV + output disconnection
   - PRV - output disconnection
3. PRV failure due to coil disconnection

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the PRV coupler pin for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check whether the PRV wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis	• Check the PRV resistance value. • Check the conduction of the wire-harness. • Inspect the PRV (pressure reducing valve) and replace the rail if any abnormality is found.

P1722: PRV (Pressure reducing valve) coil short circuit

P code	P1722	Name	PRV (Pressure reducing valve) coil short circuit
SPN/FMI	5571/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. Coil short circuit has been detected in the circuit.	• Coupler • Wire-harness • PRV • ECU

● Actions when an error occurs

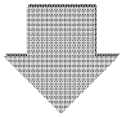
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

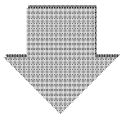
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - PRV + output and - output disconnection
3. PRV failure due to coil short circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the PRV coupler pin for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check whether the PRV wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis	• Check the PRV resistance value. • Check the conduction of the wire-harness.

P1723: PRV (Pressure reducing valve) ECU internal failure

P code	P1723	Name	PRV (Pressure reducing valve) ECU internal failure
SPN/FMI	5571/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal • During PRV drive indication 2. Detects faults in ECU internal circuits.	• Wire-harness • ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

1. Wiring failure of the wire-harness
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again.

P009F: PRV (Pressure reducing valve) sticking error (closed position)

P code	P009F	Name	PRV (Pressure reducing valve) sticking error (closed position)
SPN/FMI	5571/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • No abnormalities in related sensors • The fuel temperature sensor is 1.5 °C or higher • Power supply voltage is within the normal range • Injection amount ≤ 0 mm^3/st • Pump discharge amount ≤ 0 mm^3/st is kept for 4 times • Pressure reducing valve energizing time > Diagnosis threshold value (Depends on rail pressure and power supply voltage) 2. Pressure reduction valve flow rate (estimated value) is larger than the prescribed value.	• PRV • ECU

● Actions when an error occurs

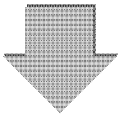
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

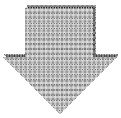
1. PRV (Pressure reducing valve) stuck closed due to rust
2. PRV sticking

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the PRV coupler pin for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check whether the PRV wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis	• Check the PRV resistance value. • Check the conduction of the wire-harness.

P009D: PRV (Pressure reducing valve) +B short circuit

P code	P009D	Name	PRV (Pressure reducing valve) +B short circuit
SPN/FMI	518287/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. PRV +B short has been detected.	• Coupler • Wire-harness • PRV • ECU

● Actions when an error occurs

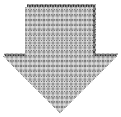
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

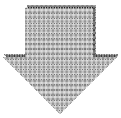
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • PRV +B short circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the PRV coupler pin for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check whether the PRV wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis	• Check the PRV resistance value. • Check the conduction of the wire-harness.

P009C: PRV (Pressure reducing valve) coil disconnection / GND short circuit

P code	P009C	Name	PRV (Pressure reducing valve) coil disconnection / GND short circuit
SPN/FMI	518287/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal • Driver IC is normal 2. Detects PRV GND short circuit and disconnection of ECU internal circuit.	• Coupler • Wire-harness • PRV • ECU

● Actions when an error occurs

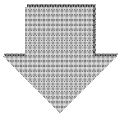
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the detection conditions are not established, after either of the following states occurs, it is canceled if all prerequisites are established. • Key switch turned from OFF to ON, and engine speed is 0 • ECU power is OFF
Remarks	

● Presumed cause of the failure or the error condition

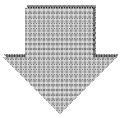
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - PRV + output GND short circuit
   - PRV - output GND short circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the PRV coupler pin for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check whether the PRV wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis	• Check the PRV resistance value. • Check the conduction of the wire-harness.

■ High pressure pump

P1235: Pump protection failure

P code	P1235	Name	Pump protection failure
SPN/FMI	1347/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Common rail pressure sensor is normal • Battery voltage is within normal range • Not during engine stall • Not during engine cranking 2. Common rail pressure continues for 1 second at high risk of valve seizure.	• Fuel system • Supply pump • Rail pressure sensor

● Actions when an error occurs

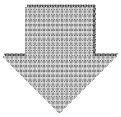
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

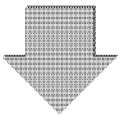
1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV intermittent failure
5. Blocked fuel return hose

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P775* for details on the diagnosis method and procedure.



2. Coupler, wiring and engine check	• Before beginning your work, be sure to turn OFF the key switch. • Check the level of fuel in the tank. • If there is a possibility of air intrusion, perform sufficient air-bleeding. • Make sure that the coupler of the SCV and rail pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Perform the failure diagnosis on the rail pressure sensor. • Perform the failure diagnosis on the SCV. *See Chapter 3 *P775* for details on the diagnosis method and procedure.

P1236: Pump replacement failure

P code	P1236	Name	Pump replacement failure
SPN/FMI	1347/15		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Common rail pressure sensor is normal • Battery voltage is within normal range • Not during engine stall 2. During one engine operation, the common rail pressure exceeds the specified cumulative operating time in the area where there is a risk of valve seizure.	• Fuel system • Supply pump • Rail pressure sensor

● Actions when an error occurs

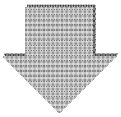
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

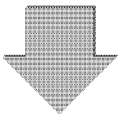
1. SCV drive circuit system failure
2. SCV open sticking
3. SCV intermittent failure
4. Rail pressure sensor system failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P775* for details on the diagnosis method and procedure.



2. Coupler, wiring and engine check	• Before beginning your work, be sure to turn OFF the key switch. • Check the level of fuel in the tank. • If there is a possibility of air intrusion, perform sufficient air-bleeding. • Make sure that the coupler of the SCV and rail pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Perform the failure diagnosis on the rail pressure sensor. • Perform the failure diagnosis on the SCV. *See Chapter 3 *P775* for details on the diagnosis method and procedure.

P1237: Pump learning not performed alarm

P code	P1237	Name	Pump learning not performed alarm
SPN/FMI	522803/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned ON. 2. When the pump learning condition is not completed.	• ECU

● Actions when an error occurs

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

● Presumed cause of the failure or the error condition

1. Pump learning value is not written
2. ECU internal EEPROM failure

■ Rail pressure error

P0088: Rail pressure too high

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The following prerequisites should be satisfied. 1- Battery voltage is within normal range. 2- The key switch is turned ON for a given length of time. 3- Not during engine cranking. 4- The sensor 5 V circuit 1 error (voltage high) is not occurring. 5- The sensor 5 V circuit 1 error (voltage low) is not occurring. 2. Common rail pressure is threshold value (4TNV94FHT: 191 MPa, 4TN101 • 107: 232 MPa) or above.	• Fuel system • Supply pump • Rail pressure sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Rail pressure sensor system failure
2. SCV drive circuit system failure
3. SCV open sticking
4. SCV closed sticking
5. SCV intermittent failure
6. Blocked fuel return hose

P0094: Rail pressure deviation error (rail pressure too low)

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During engine operation. 2. The state whereby common rail pressure - target common rail pressure ≤ rail pressure calculated with the map from the engine speed, continues for 17 seconds.	• Fuel system • Supply pump • Rail pressure sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Rail pressure sensor system failure
2. Fuel system failure
   - Air intrusion
   - No diesel fuel
3. Injector failure (rail pressure drop due to increase in actual injection volume)
4. Feed pump failure (reversed assembly, path blockage due to sticking)
5. Blockage on fuel inlet side
6. Failure of the supply pump (performance deterioration due to rust or wear)
7. Failure of the rail pressure sensor / PRV (Pressure reducing valve)
8. SCV sticking

Others

■ Overspeed

P1219: Overspeed 1

P code	P1219	Name	Overspeed 1
SPN/FMI	– / –		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Key switch is ON. 2. Engine speed is +300 min^{-1} or more above the high idle speed.	• Crankshaft speed sensor • Camshaft speed sensor • Injector • ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Injector failure
2. Crankshaft speed sensor failure
   • Temporary failure caused by external factors such as radio waves
3. Camshaft speed sensor failure
   • Temporary failure caused by external factors such as radio waves

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P678* for details on the diagnosis method and procedure.

P0219: Overspeed 2

P code	P0219	Name	Overspeed 2
SPN/FMI	190/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned ON. 2. Engine speed is +600 min^{-1} or more of the high idle engine speed threshold value.	• Crankshaft speed sensor • Camshaft speed sensor • Injector • ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	• Fuel injection stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Injector failure
2. Crankshaft speed sensor failure
   • Temporary failure caused by external factors such as radio waves
3. Camshaft speed sensor failure
   • Temporary failure caused by external factors such as radio waves

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P678* for details on the diagnosis method and procedure.

■ QR data

P1631: QR data not written

P code	P1631	Name	QR data not written
SPN/FMI	523221/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned ON (when the QR code of EEPROM is valid). 2. QR data has never been written since shipment of the ECU.	• ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	• Fuel injection stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal EEPROM failure
2. QR data not written

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Re-write the ECU QR data. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P795* for details on the diagnosis method and procedure.

P1632: QR data error

P code	P1632	Name	QR data error
SPN/FMI	523221/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned ON (when the QR code of EEPROM is valid). 2. QR data for at least one injector has been flagged as abnormal.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal EEPROM failure
2. Wrong entry of QR data

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Re-write the ECU QR data. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P797* for details on the diagnosis method and procedure.

P1630: QR data correction input error

P code	P1630	Name	QR data correction input error
SPN/FMI	522995/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned ON. 2. QR correction information input has been flagged as abnormal.	• ECU

● Actions when an error occurs

Fault mode	Limited operation: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal Flash ROM failure
2. Wrong entry of QR data

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Re-write the ECU software. • Check the fault indication again after switching the key switch from ON to OFF and starting the engine. *See Chapter 3 *P797* for details on the diagnosis method and procedure.

Actuator

■ Intake throttle drive circuit

P0660: Intake throttle drive circuit disconnection

P code	P0660	Name	Intake throttle drive circuit disconnection
SPN/FMI	2950/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal 2. No-load (disconnection) of drive circuit is detected.	• Coupler • Wire-harness • ECU • Intake throttle drive circuit

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Intake throttle internal circuit failure

P1658: Intake throttle drive circuit VB/GND short circuit

P code	P1658	Name	Intake throttle drive circuit VB/GND short circuit
SPN/FMI	2950/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • CPU is normal 2. GND short or VB short is detected in the drive circuit.	• Coupler • Wire-harness • ECU • Intake throttle drive circuit

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Intake throttle internal circuit failure

P1655: Intake throttle drive circuit deviation error

P code	P1655	Name	Intake throttle drive circuit deviation error
SPN/FMI	2950/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Intake throttle drive circuit is normal • Intake throttle opening sensor is normal 2. The difference between the actual degree of intake throttle opening and the target degree of opening is larger than a certain value.	• Coupler • Wire-harness • Intake throttle • ECU

● Actions when an error occurs

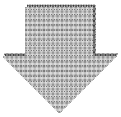
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

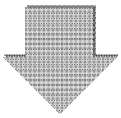
1. Intake throttle sticking
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. Intake throttle internal circuit failure

● Diagnosis

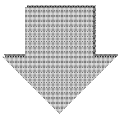
1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P780* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the intake throttle condition.



3. Coupler/wiring check	• Check the coupler pin of the intake throttle for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake throttle wiring is not disconnected or the wiring coating is not peeled.



4. Failure diagnosis	• Check the intake throttle (motor) resistance value. • Check the ECU output voltage. • Check the intake throttle valve position sensor output voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P780* for details on the diagnosis method and procedure.

P1656: Intake throttle drive circuit drive duty error

P code	P1656	Name	Intake throttle drive circuit drive duty error
SPN/FMI	2950/8		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Intake throttle drive circuit is normal • Intake throttle opening sensor is normal 2. Drive duty above a certain value continue for more than a certain period of time.	• Coupler • Wire-harness • Intake throttle • ECU

● Actions when an error occurs

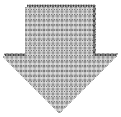
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

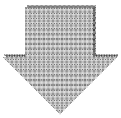
1. Intake throttle sticking
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. Intake throttle internal circuit failure

● Diagnosis

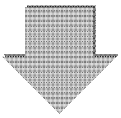
1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P780* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the intake throttle condition.



3. Coupler/wiring check	• Check the coupler pin of the intake throttle for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the intake throttle wiring is not disconnected or the wiring coating is not peeled.



4. Failure diagnosis	• Check the intake throttle (motor) resistance value. • Check the ECU output voltage. • Check the intake throttle valve position sensor output voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P780* for details on the diagnosis method and procedure.

Communication related

■ CAN

U0292: TSC1 (SA1) reception timeout

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. TSC1 (SA1) reception time out has been detected for a certain period of time.	• ECU • Coupler • Wire-harness • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No (Engine stop, speed limitations, and maximum injection amount limitations can be set using the application)
Reset criteria	The following operation can be selected by setting application. • When the ECU power is turned OFF, the fault mode is released. • Automatic reset when TSC1 message is received.
Remarks	

● Presumed cause of the failure or the error condition

1. CAN communication error from the controller on the driven machine
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. ECU internal circuit failure

U1301: TSC1 (SA2) reception timeout

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. TSC1 (SA2) reception timeout has been detected for a certain period of time.	• ECU • Coupler • Wire-harness • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. • When the ECU power is turned OFF, the fault mode is released. • The fault mode is automatically reset when TSC1 message is received.
Remarks	

● Presumed cause of the failure or the error condition

1. CAN communication error from the controller on the driven machine
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. ECU internal circuit failure

U1292: Y_ECR1 reception timeout

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Y_ECR1 reception timeout has been detected for a certain period of time.	• ECU • Coupler • Wire-harness • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. • When the ECU power is turned OFF, the fault mode is released. • The fault mode is automatically reset when Y_ECR1 message is received.
Remarks	

● Presumed cause of the failure or the error condition

1. CAN communication error from the controller on the driven machine
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. ECU internal circuit failure

U1293: Y_EC reception timeout

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Y_EC reception timeout has been detected for a certain period of time.	• ECU • Coupler • Wire-harness • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. • When the ECU power is turned OFF, the fault mode is released. • The fault mode is automatically reset when Y_EC message is received.
Remarks	

● Presumed cause of the failure or the error condition

1. CAN communication error from the controller on the driven machine
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. ECU internal circuit failure

U0168: VI reception timeout (some special specifications only)

P code	U0168	Name	VI reception timeout (some special specifications only)
SPN/FMI	237/31		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When there is no response three times to a VIN request.	• ECU • Coupler • Wire-harness • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	The high idle speed is limited to 1500 min^{-1}.
Reset criteria	• When the ECU power is turned OFF, the fault mode is released. • When there is no response to a VIN request, it is automatically reset.
Remarks	

● Presumed cause of the failure or the error condition

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

U3002: VI received data error (some special specifications only)

P code	U3002	Name	VI received data error (some special specifications only)
SPN/FMI	237/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When the received VI did not match with VI saved in the ECU.	• ECU • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	The high idle speed is limited to 1500 min^{-1}.
Reset criteria	• When the ECU power is turned OFF, the fault mode is released. • The fault mode is automatically reset when the received VI message matches with VI saved in the ECU.
Remarks	

● Presumed cause of the failure or the error condition

1. CAN communication error from the controller on the driven machine
2. Mismatch between implement and ECU controller
3. ECU internal circuit failure

U1303: Y_DPFIF reception timeout

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Y_DPFIF reception timeout has been detected for a certain period of time.	• ECU • Coupler • Wire-harness • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. • When the ECU power is turned OFF, the fault mode is released. • The fault mode is automatically reset when Y_DPFIF message is received.
Remarks	

● Presumed cause of the failure or the error condition

1. CAN communication error from the controller on the driven machine
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. ECU internal circuit failure

U1302: EBC1 reception timeout

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. EBC1 reception timeout has been detected for a certain period of time.	• ECU • Coupler • Wire-harness • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	The following operation can be selected by setting application. • When the ECU power is turned OFF, the fault mode is released. • The fault mode is automatically reset when EBC1 message is received.
Remarks	

● Presumed cause of the failure or the error condition

1. CAN communication error from the controller on the driven machine
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. ECU internal circuit failure

U010B: CAN reception timeout from the EGR valve

P code	U010B	Name	CAN reception timeout from the EGR valve
SPN/FMI	522610/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. ECU detects reception timeout for a certain amount of time.	• ECU • Coupler • Wire-harness

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, and CAN massage is not received from EGR valve when prerequisite is satisfied for the first time, the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

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

U1294: Y_RSS reception timeout

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Key switch is ON • Battery voltage is within normal range 2. Y_RSS reception timeout has been detected for a certain period of time.	• ECU • Coupler • Wire-harness • Controller on the driven machine

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned OFF, the fault mode is released. The following operation can be selected by setting application. • Key switch turned from OFF to ON, and engine speed is 0 • Automatic reset when Y_RSS message is received
Remarks	

● Presumed cause of the failure or the error condition

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

U0167: Immobilizer error (CAN communication)

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

● DTC detection criteria

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

● Actions when an error occurs

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

● Presumed cause of the failure or the error condition

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

U0426: Immobilizer error (system)

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

● DTC detection criteria

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

● Actions when an error occurs

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

● Presumed cause of the failure or the error condition

1. Immobilizer authentication key inconsistency

● Diagnosis

1. Checking the authentication key	• Make sure that the immobilizer authentication key is correct.

U1501: CAN reception timeout from DCU

P code	U1501	Name	CAN reception timeout from DCU
SPN/FMI	523513/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Reception timeout from DCU detected for a certain amount of time.	• Coupler • Wire-harness • DCU • ECU

● Actions when an error occurs

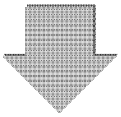
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%. • EGR fully closes. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When the ECU power is turned from OFF to ON, and a CAN message from the DCU is received, it is automatically canceled.
Remarks	

● Presumed cause of the failure or the error condition

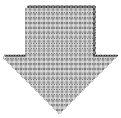
1. Poor connection of coupler
2. Wire-harness disconnection/short circuit
   - Disconnection, power short circuit or GND short circuit of CAN (engine side) communication wire (high/low)
   - Disconnection, power short circuit or GND short circuit of CAN (driven machine side) communication wire (high/low)
   - Disconnection of DCU power supply wire
3. DCU internal circuit failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage. *See Chapter 3 *P807* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the coupler pin of the CAN communication wiring for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the CAN communication wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the battery voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P807* for details on the diagnosis method and procedure.

U1503: DCU system error (FS action instruction 1 from DCU)

P code	U1503	Name	DCU system error (FS action instruction 1 from DCU)
SPN/FMI	–		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. When an engine derate request for urea water tank level Inducement 1 is received from the DCU.	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%.
Reset criteria	If an engine derate request for urea water tank level Inducement 1 is not received from the DCU, it is automatically canceled.
Remarks	

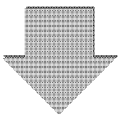
● Presumed cause of the failure or the error condition

1. Inspect the simultaneously alarmed failure parts

Note: The lamp does not come on when this error is detected during control. When this error is detected, the error that caused the FS action is detected at the same. Therefore, MIL/RSL always come on. This error is because of performing FS action in the ECU.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P820* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P820* for details on the diagnosis method and procedure.

U1504: DCU system error (FS action instruction 2 from DCU)

P code	U1504	Name	DCU system error (FS action instruction 2 from DCU)
SPN/FMI	–		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. When an engine derate request for urea water tank level Inducement2 is received from the DCU.	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%.
Reset criteria	If an engine derate request for urea water tank level Inducement 2 is not received from the DCU, it is automatically canceled.
Remarks	

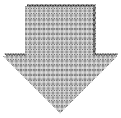
● Presumed cause of the failure or the error condition

1. Inspect the simultaneously alarmed failure parts

Note: The lamp does not come on when this error is detected during control. When this error is detected, the error that caused the FS action is detected at the same. Therefore, MIL/RSL always come on. This error is because of performing FS action in the ECU.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P820* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P820* for details on the diagnosis method and procedure.

U1505: DCU system error (FS action instruction 3 from DCU)

P code	U1505	Name	DCU system error (FS action instruction 3 from DCU)
SPN/FMI	–		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. When an engine derate request for aqueous SCR system abnormal Inducement 1 is received from the DCU.	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the engine speed at the maximum torque + 200 min^{-1}. • The maximum fuel injection quantity is limited to 75%.
Reset criteria	If an engine derate request for SCR system abnormal Inducement 1 is not received from the DCU, it is automatically canceled.
Remarks	

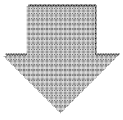
● Presumed cause of the failure or the error condition

1. Inspect the simultaneously alarmed failure parts

Note: The lamp does not come on when this error is detected during control. When this error is detected, the error that caused the FS action is detected at the same. Therefore, MIL/RSL always come on. This error is because of performing FS action in the ECU.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P820* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P820* for details on the diagnosis method and procedure.

U1506: DCU system error (FS action instruction 4 from DCU)

P code	U1506	Name	DCU system error (FS action instruction 4 from DCU)
SPN/FMI	–		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. When an engine derate request for Inducement 2 is received from the DCU.	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%.
Reset criteria	If an engine derate request for Inducement 2 is not received from the DCU, it is automatically canceled.
Remarks	

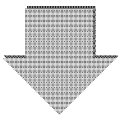
● Presumed cause of the failure or the error condition

1. Inspect the simultaneously alarmed failure parts

Note: The lamp does not come on when this error is detected during control. When this error is detected, the error that caused the FS action is detected at the same. Therefore, MIL/RSL always come on. This error is because of performing FS action in the ECU.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P820* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P820* for details on the diagnosis method and procedure.

U1507: DCU system error (FS action instruction 5 from DCU)

P code	U1507	Name	DCU system error (FS action instruction 5 from DCU)
SPN/FMI	–		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. When an engine derate request for fail-safe action LV2 is received from the DCU.	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}.
Reset criteria	If an engine derate request for fail-safe LV2 is not received from the DCU, it is automatically canceled.
Remarks	

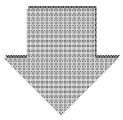
● Presumed cause of the failure or the error condition

1. Inspect the simultaneously alarmed failure parts

Note: The lamp does not come on when this error is detected during control. When this error is detected, the error that caused the FS action is detected at the same. Therefore, MIL/RSL always come on. This error is because of performing FS action in the ECU.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P820* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P820* for details on the diagnosis method and procedure.

U1508: DCU system error (FS action instruction 6 from DCU)

P code	U1508	Name	DCU system error (FS action instruction 6 from DCU)
SPN/FMI	–		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. When an engine derate request for fail-safe action LV3, 4, or 5 is received from the DCU.	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%.
Reset criteria	If an engine derate request for fail-safe LV3, 4, or 5 is not received from the DCU, it is automatically canceled.
Remarks	

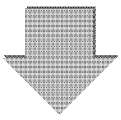
● Presumed cause of the failure or the error condition

1. Inspect the simultaneously alarmed failure parts

Note: The lamp does not come on when this error is detected during control. When this error is detected, the error that caused the FS action is detected at the same. Therefore, MIL/RSL always come on. This error is because of performing FS action in the ECU.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P820* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P820* for details on the diagnosis method and procedure.

U1509: DCU system error (FS action instruction 7 from DCU)

P code	U1509	Name	DCU system error (FS action instruction 7 from DCU)
SPN/FMI	–		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. When an EGR fully closed request is received from the DCU.	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	EGR fully closes.
Reset criteria	If an EGR fully closed request is not received from the DCU, it is automatically canceled.
Remarks	

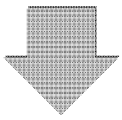
● Presumed cause of the failure or the error condition

1. Inspect the simultaneously alarmed failure parts

Note: The lamp does not come on when this error is detected during control. When this error is detected, the error that caused the FS action is detected at the same. Therefore, MIL/RSL always come on. This error is because of performing FS action in the ECU.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P820* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P820* for details on the diagnosis method and procedure.

U1510: DCU system error (FS action instruction 8 from DCU)

P code	U1510	Name	DCU system error (FS action instruction 8 from DCU)
SPN/FMI	–		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. When a DPF regeneration stop / SCR heating stop request is received from the DCU.	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• DPF regeneration stops. • SCR heating stops.
Reset criteria	If a DPF regeneration stop / SCR heating stop request is not received from the DCU, it is automatically canceled.
Remarks	

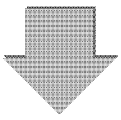
● Presumed cause of the failure or the error condition

1. Inspect the simultaneously alarmed failure parts

Note: The lamp does not come on when this error is detected during control. When this error is detected, the error that caused the FS action is detected at the same. Therefore, MIL/RSL always come on. This error is because of performing FS action in the ECU.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P820* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P820* for details on the diagnosis method and procedure.

P1672: Data verification error between ECU and DCU (engine model unmatched)

P code	P1672	Name	Data verification error between ECU and DCU (engine model unmatched)
SPN/FMI	587/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. The engine model received from the DCU is different from the engine model of the ECU.	• ECU • DCU

● Actions when an error occurs

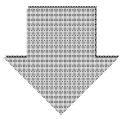
Fault mode	[Engine stop]: The engine stops.
Limited operation	Fuel injection stops.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

1. Incorrect installation of ECU or DCU
2. ECU internal EEPROM data error
3. DCU internal EEPROM data error
4. ECU or DCU failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P821* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Check for other errors. • Check the recent replacement history of ECU or DCU. *See Chapter 3 *P821* for details on the diagnosis method and procedure.

P264F: Data verification error between ECU and DCU (serial No. unmatched)

P code	P264F	Name	Data verification error between ECU and DCU (serial No. unmatched)
SPN/FMI	588/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. The serial number received from the DCU is different from the serial number of the ECU.	• ECU • DCU

● Actions when an error occurs

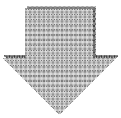
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

1. Incorrect installation of ECU or DCU
2. ECU internal EEPROM data error
3. DCU internal EEPROM data error
4. ECU or DCU failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the ECU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P821* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Check for other errors. • Check the recent replacement history of ECU or DCU. *See Chapter 3 *P821* for details on the diagnosis method and procedure.

U1502: Data verification error between ECU and DCU (verification timeout)

P code	U1502	Name	Data verification error between ECU and DCU (verification timeout)
SPN/FMI	523643/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. The engine model and serial number are not received from the DCU.	• Coupler • Wire-harness • DCU • ECU

● Actions when an error occurs

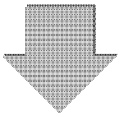
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

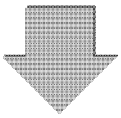
1. Poor connection of coupler
2. Wire-harness disconnection/short circuit
3. DCU internal circuit failure
4. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage. *See Chapter 3 *P807* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the ECU power. • Check the coupler pin of the CAN communication wiring for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the CAN communication wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the battery voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P807* for details on the diagnosis method and procedure.

■ EGR valve

P0403: Disconnection in EGR valve motor coils

P code	P0403	Name	Disconnection in EGR valve motor coils
SPN/FMI	2971/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve failure

P1405: EGR valve short circuit in motor coils

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve failure

P0488: EGR valve position sensor error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve failure

P1409: EGR valve feedback error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve failure

P148A: EGR valve sticking error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary malfunction of the EGR valve due to foreign matter, excessive carbon deposits, rust, etc.
2. EGR valve sticking
3. Wire-harness disconnection/short circuit
4. EGR valve internal circuit failure

P049D: EGR valve initialization error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Temporary malfunction of the EGR valve due to foreign matter, excessive carbon deposits, rust, etc.
2. EGR valve sticking
3. Wire-harness disconnection/short circuit
4. EGR valve internal circuit failure

U0401: EGR valve ECM data error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve internal circuit failure
2. ECU internal circuit failure

U1401: EGR valve target value out of range

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve • ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve internal circuit failure

P0404: EGR valve overvoltage error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• Battery • EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Battery overcharging
2. EGR valve internal circuit failure

P1404: EGR valve low voltage error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• Wire-harness • Battery • EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. Battery degradation
2. Power wiring short circuit of EGR valve
3. EGR valve internal circuit failure

P1410: EGR valve high temperature thermistor error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve internal circuit failure

P1411: EGR valve low temperature thermistor error

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

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is ON • 2 seconds have elapsed since turning the key switch ON (differs depending on application menu settings) • Battery voltage is within normal range 2. Receives a value indicating this abnormality from the EGR valve side.	• EGR valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. EGR valve internal circuit failure

ECU related

■ EEPROM

P1601: EEPROM error

P code	P1601	Name	EEPROM error
SPN/FMI	630/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When ECU is started consecutively twice during EEPROM error is occurring.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited. • EGR valve fully opens.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal circuit failure

■ ECU internal error

P0652: Sensor 5 V circuit 1 error (voltage low)

P code	P0652	Name	Sensor 5 V circuit 1 error (voltage low)
SPN/FMI	523074/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. The sensor voltage is below the 3.5 V threshold.	• Wire-harness • ECU

● Actions when an error occurs

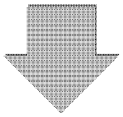
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

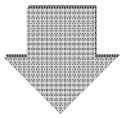
1. Wiring failure of the wire-harness
   • GND short circuit of the ECU sensor 5 V wire
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the ECU sensor 5 V voltage. *See Chapter 3 *P674* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Make sure that the ECU sensor 5 V wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the ECU power voltage (sensor 5 V wire voltage value). *See Chapter 3 *P674* for details on the diagnosis method and procedure.

P0653: Sensor 5 V circuit 1 error (voltage high)

P code	P0653	Name	Sensor 5 V circuit 1 error (voltage high)
SPN/FMI	523074/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. The sensor voltage is above the 4.5 V threshold.	• Wire-harness • ECU

● Actions when an error occurs

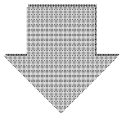
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

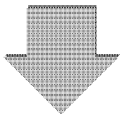
1. Wiring failure of the wire-harness
   • Power supply short circuit of ECU sensor 5 V wire
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the ECU sensor 5 V voltage. *See Chapter 3 *P674* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Make sure that the wiring of the ECU sensor 5 V wire and sensor GND wire coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the ECU power voltage (sensor 5 V wire voltage value). *See Chapter 3 *P674* for details on the diagnosis method and procedure.

P0698: Sensor 5 V circuit 2 error (voltage low)

P code	P0698	Name	Sensor 5 V circuit 2 error (voltage low)
SPN/FMI	523075/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. The sensor voltage is below the 3.5 V threshold.	• Wire-harness • ECU

● Actions when an error occurs

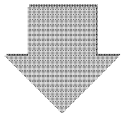
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

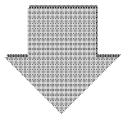
1. Wiring failure of the wire-harness
   • GND short circuit of the ECU sensor 5 V wire
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the ECU sensor 5 V voltage. *See Chapter 3 *P676* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Make sure that the ECU sensor 5 V wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the ECU power voltage (sensor 5 V wire voltage value). *See Chapter 3 *P676* for details on the diagnosis method and procedure.

P0699: Sensor 5 V circuit 2 error (voltage high)

P code	P0699	Name	Sensor 5 V circuit 2 error (voltage high)
SPN/FMI	523075/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. The sensor voltage is above the 4.5 V threshold.	• Wire-harness • ECU

● Actions when an error occurs

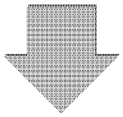
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • Intake throttle fully opens. • DPF regeneration stops. • The accumulated PM amount calculation by DPF differential pressure stops. • SCR heating stops. • Ash amount reset is prohibited. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	After switching the ECU power from OFF to ON, when prerequisite is satisfied for the first time, but detection criteria is not satisfied, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

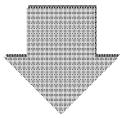
1. Wiring failure of the wire-harness
   • Power supply short circuit of ECU sensor 5 V wire
2. ECU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the ECU sensor 5 V voltage. *See Chapter 3 *P676* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Make sure that the wiring of the ECU sensor 5 V wire and sensor GND wire coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the ECU power voltage (sensor 5 V wire voltage value). *See Chapter 3 *P676* for details on the diagnosis method and procedure.

P0607: CPU monitoring IC error

P code	P0607	Name	CPU monitoring IC error
SPN/FMI	522993/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisites. 2. IC for monitoring ECU internal CPU is abnormal.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal IC error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P793* for details on the diagnosis method and procedure.

P0606: CPU error

P code	P0606	Name	CPU error
SPN/FMI	522994/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisites. 2. ECU internal CPU is abnormal.	• ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%.
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal IC error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P793* for details on the diagnosis method and procedure.

P1602: Flash ROM error (checksum error)

P code	P1602	Name	Flash ROM error (checksum error)
SPN/FMI	522998/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The check sum did not match for 3 times or more in each range subject to inspection.	• ECU

● Actions when an error occurs

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

● Presumed cause of the failure or the error condition

1. ECU internal IC error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again. *See Chapter 3 *P793* for details on the diagnosis method and procedure.

P1724: Communication error between micro computers (MSC communication error)

P code	P1724	Name	Communication error between micro computers (MSC communication error)
SPN/FMI	518267/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON 2. ECU internal IC abnormality is detected (communication error between main micro computer and monitoring micro computer).	• ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	Fuel injection stops.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal IC error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again.

P1725: Communication error between micro computers, SPI communication error (diagnosis: atmospheric pressure sensor abnormal)

P code	P1725	Name	Communication error between micro computers, SPI communication error (diagnosis: atmospheric pressure sensor abnormal)
SPN/FMI	518268/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON 2. ECU internal IC abnormality is detected (main micro computer cannot acquire information from the atmospheric pressure sensor IC).	• ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	Fuel injection stops.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal IC error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again.

P1726: Communication error between micro computers, SPI communication error (diagnosis: monitoring micro computer abnormal)

P code	P1726	Name	Communication error between micro computers, SPI communication error (diagnosis: monitoring micro computer abnormal)
SPN/FMI	518269/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON 2. ECU internal IC abnormality is detected (main micro computer cannot acquire information from the monitoring micro computer).	• ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	Fuel injection stops.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal IC error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again.

P060B: Micro computer internal A/D converter abnormal

P code	P060B	Name	Micro computer internal A/D converter abnormal
SPN/FMI	518270/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Key switch is ON. 2. ECU internal IC abnormality is detected.	• ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	Fuel injection stops.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal IC error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again.

P1727: Injection stop circuit error during micro computer abnormality

P code	P1727	Name	Injection stop circuit error during micro computer abnormality
SPN/FMI	518271/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisites. 2. ECU internal IC abnormality is detected.	• ECU

● Actions when an error occurs

Fault mode	[Engine stop]: The engine stops.
Limited operation	Fuel injection stops.
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

1. ECU internal IC error

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the key switch from ON to OFF to check the fault indication again.

Contact input related

■ Air cleaner switch

P1101: Air cleaner clogged alarm

P code	P1101	Name	Air cleaner clogged alarm
SPN/FMI	522323/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned ON and the battery voltage is 9 V or higher. 2. The air cleaner switch is turned ON for 10 seconds.	• Air cleaner • Wire-harness • Air cleaner switch • ECU

● Actions when an error occurs

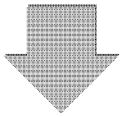
	Settings of the actions during a air cleaner error	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The engine is stopped, and the high idle speed or the maximum injection amount is limited. (Set using application)
Reset criteria	When the ECU power is turned OFF, the fault mode is released.	When the ECU power is turned OFF, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

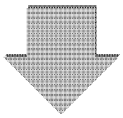
1. Clogged air cleaner
2. Wiring failure of the wire-harness
   - Power short circuit of the air cleaner switch wiring
3. Air cleaner switch failure
   - Power short circuit of the air cleaner switch internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Make sure that the input signal of the air cleaner switch is correctly recognized. *See Chapter 3 *P743* for details on the diagnosis method and procedure.



2. Engine check	• Turn OFF the key switch and stop the engine. • Check the air cleaner. • After a few moments, turn ON the key switch and make sure that DTC is detected.



3. Failure diagnosis	• Check the air cleaner switch system. *See Chapter 3 *P743* for details on the diagnosis method and procedure.

■ Level sensor

P1151: Water separator alarm

P code	P1151	Name	Water separator alarm
SPN/FMI	522329/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned ON and the battery voltage is 9 V or higher. 2. The level sensor is turned ON for 10 seconds.	• Water separator • Coupler • Wire-harness • Level sensor • ECU

● Actions when an error occurs

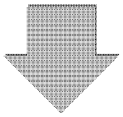
	Settings of the actions during a water separator error	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The engine is stopped, and the high idle speed or the maximum injection amount is limited. (Set using application)
Reset criteria	When the ECU power is turned OFF, the fault mode is released.	When the ECU power is turned OFF, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

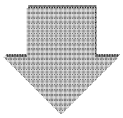
1. Increased water content in the water separator
2. Float sticking in water separator
3. Wiring failure of the wire-harness
   - Power short circuit of the level sensor wiring
4. Level sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Make sure that the input signal of the water separator switch is correctly recognized. *See Chapter 3 *P747* for details on the diagnosis method and procedure.



2. Engine check	• Turn OFF the key switch and stop the engine. • Check the water separator. • After a few moments, turn ON the key switch and make sure that DTC is detected.



3. Failure diagnosis	• Check the water separator switch system. *See Chapter 3 *P747* for details on the diagnosis method and procedure.

■ Charge switch

P1562: Charge switch disconnection

P code	P1562	Name	Charge switch disconnection
SPN/FMI	167/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Key switch is ON, and the end of detection is not established. Detection end conditions (detection ends when one of the following conditions is established. Thereafter, detection is not performed until the ECU power is turned OFF.) • The key switch is turned ON • Engine speed > 45 min^{-1} 2. Judge when the charge switch is turned OFF for 1 second.	• Coupler • Wire-harness • Charge switch • ECU

● Actions when an error occurs

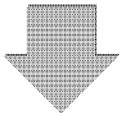
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the charge switch on or the ECU power off is detected the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

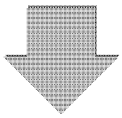
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Disconnection of the charge switch wiring
3. Charge switch failure
   • Disconnection of the charge switch internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Make sure that the input signal of the charge switch is correctly recognized. *See Chapter 3 *P731* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the charge switch for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the charge switch wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the charge switch. • Check the conduction of the wire-harness. • Check the operation of the charge switch. *See Chapter 3 *P731* for details on the diagnosis method and procedure.

P1568: Charge alarm

P code	P1568	Name	Charge alarm
SPN/FMI	167/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. The key switch is turned ON. 2. After engine starting is complete, and the charge switch has been ON for 10 continuous seconds.	• Alternator • Coupler • Wire-harness • Charge switch • ECU

● Actions when an error occurs

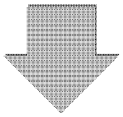
	Setting of the charge alarm operation	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The engine is stopped, and the high idle speed or the maximum injection amount is limited. (Set using application)
Reset criteria	When the ECU power is turned OFF, the fault mode is released.	When the ECU power is turned OFF, the fault mode is released.
Remarks		

● Presumed cause of the failure or the error condition

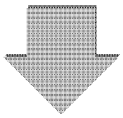
1. Belt slip due to poor fan belt tension
2. Alternator failure
3. Wiring failure of the wire-harness
   - GND short circuit of the charge switch wiring
4. Charge switch failure
   - GND short circuit of the charge switch internal wiring
5. Battery is not normal

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Make sure that the input signal of the charge switch is correctly recognized. *See Chapter 3 *P739* for details on the diagnosis method and procedure.



2. Engine check	• Turn OFF the key switch and stop the engine. • Check the engine charging equipment. • After checking, turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the charge switch system. *See Chapter 3 *P739* for details on the diagnosis method and procedure.

■ Oil pressure sensor • Oil pressure switch

P1193: Oil pressure sensor error (voltage high)

P code	P1193	Name	Oil pressure sensor error (voltage high)
SPN/FMI	100/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. Sensor output is higher than the 2.5 V threshold.	• Coupler • Wire-harness • Oil pressure sensor • ECU

● Actions when an error occurs

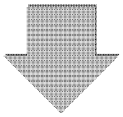
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Canceled when the key switch is turned from OFF to ON, and the engine speed is 0 or powering off of the ECU is detected.
Remarks	

● Presumed cause of the failure or the error condition

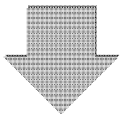
1. Wiring failure of the wire-harness
   • Power short circuit or short circuit of the oil pressure sensor wiring 5 V wire
2. Oil pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the oil pressure sensor input signal is correctly recognized. *See Chapter 3 *P731* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the oil pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check whether the oil pressure sensor wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis	• Check the oil pressure sensor conduction. • Check the conduction of the wire-harness. • Check the oil pressure sensor operation. *See Chapter 3 *P731* for details on the diagnosis method and procedure.

P1192: Oil pressure switch disconnection (Applicable to 4TNV94FHT)

P code	P1192	Name	Oil pressure switch disconnection
SPN/FMI	100/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not started since the key switch was turned ON 2. Oil pressure switch is OFF.	• Coupler • Wire-harness • Oil pressure switch • ECU

● Actions when an error occurs

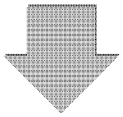
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Canceled when the key switch is turned from OFF to ON, and the engine speed is 0, or powering off of the ECU is detected.
Remarks	

● Presumed cause of the failure or the error condition

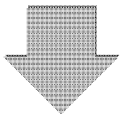
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Disconnection of the oil pressure switch wiring
3. Oil pressure switch failure
   • Disconnection of the oil pressure switch internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the oil pressure switch input signal is correctly recognized. *See Chapter 3 *P731* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the oil pressure switch for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check whether the oil pressure switch wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis	• Check the conduction of the oil pressure switch. • Check the conduction of the wire-harness. • Check the operation of the oil pressure switch. *See Chapter 3 *P731* for details on the diagnosis method and procedure.

P1192: Oil pressure sensor error (voltage low) (Only not applicable to 4TNV94FHT)

P code	P1192	Name	Oil pressure sensor error (voltage low)
SPN/FMI	100/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking 2. Sensor output is lower than the 0.15 V threshold.	• Coupler • Wire-harness • Oil pressure sensor • ECU

● Actions when an error occurs

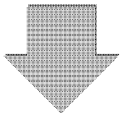
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Canceled when the key switch is turned from OFF to ON, and the engine speed is 0 or powering off of the ECU is detected.
Remarks	

● Presumed cause of the failure or the error condition

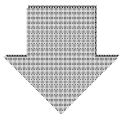
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Disconnection or GND short circuit of the oil pressure sensor wiring
3. Oil pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the oil pressure sensor input signal is correctly recognized. *See Chapter 3 *P731* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the oil pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Check whether the oil pressure sensor wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis	• Check the conduction of the oil pressure sensor. • Check the conduction of the wire-harness. • Check the operation of the oil pressure sensor. *See Chapter 3 *P731* for details on the diagnosis method and procedure.

P1198: Low oil pressure alarm (Applicable to 4TNV94FHT)

P code	P1198	Name	Low oil pressure alarm
SPN/FMI	100/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Engine speed > 600 min^{-1} 2. Oil pressure switch is ON.	• Engine oil quantity • Hydraulic system • Wire-harness • Oil pressure switch • ECU

● Actions when an error occurs

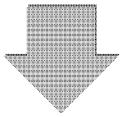
	Settings of the actions during a low oil pressure alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The engine is stopped, and the high idle speed or the maximum injection amount is limited. (Set using application)
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks		

● Presumed cause of the failure or the error condition

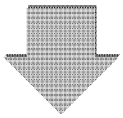
1. Engine oil level low
2. Air is mixed in due to excessive engine tilt
3. Hydraulic system failure
4. Wiring failure of the wire-harness
   - Power short circuit of the oil pressure switch wiring
5. Oil pressure switch failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the oil pressure switch input signal is correctly recognized. *See Chapter 3 *P734* for details on the diagnosis method and procedure.



2. Engine check	• Turn OFF the key switch and stop the engine. • Check the lubrication system. • After checking, turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the oil pressure switch system. *See Chapter 3 *P734* for details on the diagnosis method and procedure.

P1198: Low oil pressure alarm (Only not applicable to 4TNV94FHT)

P code	P1198	Name	Low oil pressure alarm
SPN/FMI	100/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Engine speed > 600 min^{-1} • No abnormalities in sensor voltage maximum and minimum 2. Oil pressure is lower than the threshold (calculated using a map with the engine speed and atmospheric pressure as inputs).	• Engine oil quantity • Hydraulic system • Wire-harness • Oil pressure sensor • ECU

● Actions when an error occurs

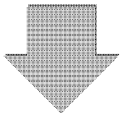
	Settings of the actions during a low oil pressure alarm	
	No	Yes
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.	[Limited operation]: The engine operation is limited.
Limited operation	No	The engine is stopped, and the high idle speed or the maximum injection amount is limited. (Set using application)
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks		

● Presumed cause of the failure or the error condition

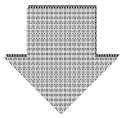
1. Engine oil level low
2. Air is mixed in due to excessive engine tilt
3. Hydraulic system failure
4. Wiring failure of the wire-harness
   • GND short circuit of the oil pressure sensor output wire
5. Oil pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the oil pressure sensor input signal is correctly recognized. *See Chapter 3 *P734* for details on the diagnosis method and procedure.



2. Engine check	• Turn OFF the key switch and stop the engine. • Check the lubrication system. • After checking, turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the oil pressure sensor system. *See Chapter 3 *P734* for details on the diagnosis method and procedure.

After treatment control

■ DPF

P2463: Excessive PM accumulation (method C)

P code	P2463	Name	Excessive PM accumulation (method C)
SPN/FMI	522573/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When transitioning to backup mode due to PM deposition amount (C method) ≥ 12 (g/L) continuing for 600 seconds.	• Various sensor systems

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}.
Reset criteria	Automatically canceled when the operation is reset from backup mode (when recovery regeneration is completed).
Remarks	Then this error occurs, “Backup mode” error is also defected at the same time.

● Presumed cause of the failure or the error condition

1. Various sensor systems failure
2. Regeneration for the stationary regeneration request is not performed

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

P1463: Excessive PM accumulation (method P)

P code	P1463	Name	Excessive PM accumulation (method P)
SPN/FMI	522574/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When transitioning to backup mode due to PM deposition amount (P method) ≥ 12 (g/L) continuing for 600 seconds.	• DPF differential pressure sensor • DPF differential pressure sensor system wire-harness • Injector • Turbocharger • Engine oil quantity • Air cleaner • Charge air cooler

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}.
Reset criteria	Automatically canceled when the operation is reset from backup mode (when recovery regeneration is completed).
Remarks	Then this error occurs, “Backup mode” error is also defected at the same time.

● Presumed cause of the failure or the error condition

1. Injector failure
2. Engine oil overfill
3. Turbocharger failure
4. Clogging of air cleaner (Indicator failure)
5. Clogging of charge air cooler
6. Abnormality in DPF system wire-harness
7. DPF differential pressure sensor failure
8. DPF differential pressure sensor downstream hose is removed or damaged
9. Regeneration for the stationary regeneration request is not performed

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

P2459: Regeneration failure (stationary regeneration not performed)

P code	P2459	Name	Regeneration failure (stationary regeneration not performed)
SPN/FMI	522577/11		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. If the transition to backup mode occurs after the stationary regeneration request is issued and before the stationary regeneration is performed.	• Regeneration request lamp • Regeneration request switch • ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}.
Reset criteria	Automatically canceled when the operation is reset from backup mode.
Remarks	Then this error occurs, “Backup mode” error is also defected at the same time.

● Presumed cause of the failure or the error condition

1. Regeneration inhibit switch: Under the inhibited state
2. Check the details of errors in C method excess, P method excess, and backup mode
3. When the engine speed is dropped to low idling during regeneration and abandoned

Note: The ON/OFF can either be switched with contact points or CAN communication depending on the specifications.

* During control, the lamp does not come on due to this error detection. However, when this error is detected, the backup mode is detected at the same time, so MIL / RSL always comes on. This error indicates the reasons for entering backup mode, and does not execute fail-safe action.

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

P2458: Regeneration failure (stationary regeneration failure)

P code	P2458	Name	Regeneration failure (stationary regeneration failure)
SPN/FMI	522575/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When the transition is made to backup mode due to stationary regeneration not being completed within the specified time.	• DPF intermediate temperature sensor • DPF differential pressure sensor • DPF inlet temperature sensor • Accelerator sensor • Injector • Intake throttle • Regeneration inhibit switch • Interlock • Wire-harness • DOC • Parts related to errors that occurred during regeneration

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}.
Reset criteria	Automatically canceled when the operation is reset from backup mode.
Remarks	Then this error occurs, “Backup mode” error is also defected at the same time.

● Presumed cause of the failure or the error condition

1. Removed or damage of piping, pressure hose, or pressure pipe
2. DPF intermediate temperature sensor system failure (*)
3. DPF inlet temperature sensor failure
4. Regeneration inhibit switch failure
5. Interlock failure
6. Accelerator sensor failure
7. Intake throttle failure
8. DOC deterioration or DOC breakage due to the external factor such as sulfur poisoning
9. Injector failure
   - Decrease in injection quantity
   - Injection timing error

* During control, the lamp does not come on due to this error detection. However, when this error is detected, the backup mode is detected at the same time, so MIL / RSL always comes on. This error indicates the reasons for entering backup mode, and does not execute fail-safe action.

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

P1445: Regeneration failure (recovery regeneration failure)

P code	P1445	Name	Regeneration failure (recovery regeneration failure)
SPN/FMI	3719/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Recovery regeneration failed.	• DPF intermediate temperature sensor • DPF differential pressure sensor • DPF inlet temperature sensor • Accelerator sensor • Injector • Intake throttle • Regeneration inhibit switch • Interlock • Wire-harness • DOC • Parts related to errors that occurred during regeneration

● Actions when an error occurs

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

● Presumed cause of the failure or the error condition

1. Removed or damage of piping, pressure hose, or pressure pipe
2. DPF intermediate temperature sensor system failure (*)
3. DPF inlet temperature sensor failure
4. Regeneration inhibit switch failure
5. Interlock failure
6. Accelerator sensor failure
7. Intake throttle failure
8. DOC deterioration or DOC breakage due to the external factor such as sulfur poisoning
9. Injector failure
   - Decrease in injection quantity
   - Injection timing error

* If this error is detected, the engine stop fail-safe action is performed. After the engine stops, recovery regeneration is canceled, the system transitions to backup mode, and RSL flashes.

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

■ 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. Accumulated density of ash is 50 g/L or more, and less than 60 g/L.	• DPF • ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	The fuel injection quantity is limited to 75% of the rated operation.
Reset criteria	The error is canceled by SA-D, and the condition of ash accumulation density of ≥ 50 g/L, < 60 g/L is not established.
Remarks	

● Presumed cause of the failure or the error condition

1. 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.

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

P1420: Ash cleaning request 2

P code	P1420	Name	Ash cleaning request 2
SPN/FMI	3720/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Ash accumulation density is 60 g/L or more.	• DPF • ECU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%.
Reset criteria	The error is canceled by SA-D, and the condition of ash accumulation density of ≥ 60 g/L is not established.
Remarks	

● Presumed cause of the failure or the error condition

1. 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.

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

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.	

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the fuel injection quantity is limited to a maximum of 85%. • Main operation After 2 hours, the fuel injection quantity is limited to a maximum of 50%.
Reset criteria	Automatically canceled when the key switch is turned from OFF to ON, either the engine speed is 0 or powering off of the ECU is detected, and detection conditions are not established.
Remarks	

● Presumed cause of the failure or the error condition

1. The amount of PM accumulated in the DPF exceeds the threshold

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

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. Transition to backup regeneration mode.	• Simultaneous DTC locations that cause backup mode

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Forecast operation If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • EGR fully closes. • SCR heating stops. • Control of the urea water injection amount enters alternative mode, and the injection amount is limited.
Reset criteria	When backup mode is released, the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of parts related to DTCs that are triggered at the same time

When this error is detected, one of the followings is detected at the same time: “P2463: Excessive PM accumulation (method C)”, “P1463: Excessive PM accumulation (method P)”, “P2458: Regeneration failure (stationary regeneration failure)”, and “P2459: Regeneration failure (stationary regeneration not performed)”. When recovery regeneration failed, “P1445: Regeneration failure (recovery regeneration failure)” may be detected. Be sure to perform the failure diagnosis for the respective part first.

P1446: Recovery regeneration is inhibited

P code	P1446	Name	Recovery regeneration is inhibited
SPN/FMI	3719/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Any of the following is established. • DPF accumulated PM density (method C) ≥ 16 g/L for 10 seconds. • Cumulative time is more than 60 seconds when DPF accumulated PM density (method P) ≥ 16 g/L is satisfied. 2. Recovery regeneration starts.	• Soot filter (SF) • DPF differential pressure sensor • DPF sensor system wire-harness • Injector • Turbocharger • Engine oil quantity • Air cleaner • Charge air cooler

● Actions when an error occurs

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

● Presumed cause of the failure or the error condition

There is a large amount of PM deposits, and recovery regeneration cannot be performed for safety reasons.
Check the following.

1. DPF system wire-harness failure
2. Injector failure
3. Engine oil overfill
4. Turbocharger failure
5. Clogging of air cleaner (Indicator failure)
6. Clogging of charge air cooler

* If this error is detected, the engine stop fail-safe action is performed. After the engine stops, recovery regeneration is canceled, the system transitions to backup mode, and RSL flashes.

● See Chapter 3 “After treatment related” for diagnosis method and corrective action.

P1728: Preheating lamp +B short circuit

P code	P1728	Name	Preheating lamp +B short circuit
SPN/FMI	518272/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Preheating lamp • ECU

● Actions when an error occurs

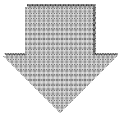
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

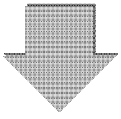
1. Wiring failure of the wire-harness
   - Power short circuit of the preheating lamp wire
2. Preheating lamp failure
   - Power short circuit of the preheating lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the preheating lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the preheating lamp system.

P1729: Failure lamp +B short circuit

P code	P1729	Name	Failure lamp +B short circuit
SPN/FMI	518273/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Failure lamp • ECU

● Actions when an error occurs

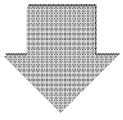
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

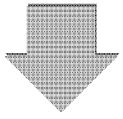
1. Wiring failure of the wire-harness
   - Power short circuit of the failure lamp wire
2. Failure lamp failure
   - Power short circuit of the failure lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the failure lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the failure lamp system.

P0617: Starter relay +B short circuit

P code	P0617	Name	Starter relay +B short circuit
SPN/FMI	518274/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Starter relay is ON 2. +B short of starter relay is detected.	• Coupler • Wire-harness • Starter relay • ECU

● Actions when an error occurs

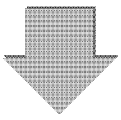
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

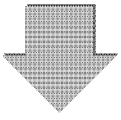
1. Wiring failure of the wire-harness
   - Power short circuit of the starter relay wire
2. Starter relay failure
   - Power short circuit of the starter relay internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the starter relay input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the starting relay system.

P1730: Low oil pressure alarm lamp +B short circuit

P code	P1730	Name	Low oil pressure alarm lamp +B short circuit
SPN/FMI	518275/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Low oil pressure alarm lamp • ECU

● Actions when an error occurs

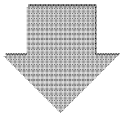
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

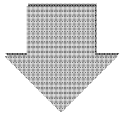
1. Wiring failure of the wire-harness
   - Power short circuit of the low oil pressure alarm lamp wire
2. Low oil pressure alarm lamp failure
   - Power short circuit of the low oil pressure alarm lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the low oil pressure alarm lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the low oil pressure alarm lamp system.

P1731: Amber warning lamp +B short circuit

P code	P1731	Name	Amber warning lamp +B short circuit
SPN/FMI	518276/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Amber warning lamp • ECU

● Actions when an error occurs

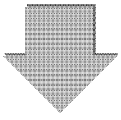
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

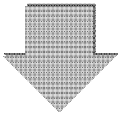
1. Wiring failure of the wire-harness
   • Power short circuit of the amber warning lamp wire
2. Amber warning lamp failure
   • Power short circuit of the amber warning lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the amber warning lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the amber warning lamp system.

P1732: Speed change display lamp +B short circuit

P code	P1732	Name	Speed change display lamp +B short circuit
SPN/FMI	518277/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Speed change display lamp • ECU

● Actions when an error occurs

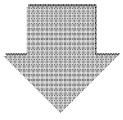
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

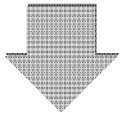
1. Wiring failure of the wire-harness
   • Power short circuit of the speed change display lamp wire
2. Speed change display lamp failure
   • Power short circuit of the speed change display lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the speed change display lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the speed change display lamp system.

P1733: Exhaust temperature alarm lamp +B short circuit

P code	P1733	Name	Exhaust temperature alarm lamp +B short circuit
SPN/FMI	518278/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Exhaust temperature alarm lamp • ECU

● Actions when an error occurs

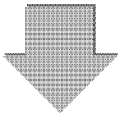
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

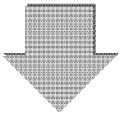
1. Wiring failure of the wire-harness
   - Power short circuit of the exhaust temperature alarm lamp wire
2. Exhaust temperature alarm lamp failure
   - Power short circuit of the exhaust temperature alarm lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the exhaust temperature alarm lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the exhaust temperature alarm lamp system.

P1734: Cooling water temperature alarm lamp +B short circuit

P code	P1734	Name	Cooling water temperature alarm lamp +B short circuit
SPN/FMI	518279/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Cooling water temperature alarm lamp • ECU

● Actions when an error occurs

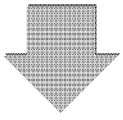
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

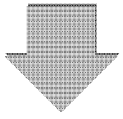
1. Wiring failure of the wire-harness
   • Power short circuit of the cooling water temperature alarm lamp wire
2. Cooling water temperature alarm lamp failure
   • Power short circuit of the cooling water temperature alarm lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the cooling water temperature alarm lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the cooling water temperature alarm lamp system.

P1735: Buzzer +B short circuit

P code	P1735	Name	Buzzer +B short circuit
SPN/FMI	518280/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Buzzer is on 2. +B short of buzzer is detected.	• Coupler • Wire-harness • Buzzer • ECU

● Actions when an error occurs

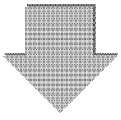
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

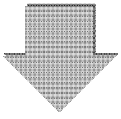
1. Wiring failure of the wire-harness
   - Power short circuit of the buzzer wire
2. Buzzer failure
   - Power short circuit of the buzzer internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the buzzer input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the buzzer system.

P1736: Red engine stop lamp +B short circuit

P code	P1736	Name	Red engine stop lamp +B short circuit
SPN/FMI	518281/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Red engine stop lamp • ECU

● Actions when an error occurs

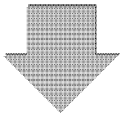
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

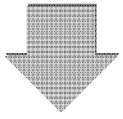
1. Wiring failure of the wire-harness
   - Power short circuit of the red engine stop lamp wire
2. Red engine stop lamp failure
   - Power short circuit of the red engine stop lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the red engine stop lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the red engine stop lamp system.

P1737: Isochronous lamp +B short circuit

P code	P1737	Name	Isochronous lamp +B short circuit
SPN/FMI	518282/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • Isochronous lamp • ECU

● Actions when an error occurs

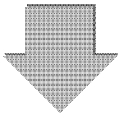
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

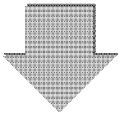
1. Wiring failure of the wire-harness
   - Power short circuit of the isochronous lamp wire
2. Isochronous lamp failure
   - Power short circuit of the isochronous lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the isochronous lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the isochronous lamp system.

P1738: DPF regeneration acknowledgement lamp +B short circuit

P code	P1738	Name	DPF regeneration acknowledgement lamp +B short circuit
SPN/FMI	518283/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • DPF regeneration acknowledgement lamp • ECU

● Actions when an error occurs

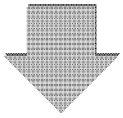
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

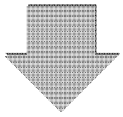
1. Wiring failure of the wire-harness
   - Power short circuit of the DPF regeneration acknowledgement lamp wire
2. DPF regeneration acknowledgement lamp failure
   - Power short circuit of the DPF regeneration acknowledgement lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the DPF regeneration acknowledgement lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the DPF regeneration acknowledgement lamp system.

P1739: DPF regeneration inhibit lamp +B short circuit

P code	P1739	Name	DPF regeneration inhibit lamp +B short circuit
SPN/FMI	518284/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • DPF regeneration inhibit lamp • ECU

● Actions when an error occurs

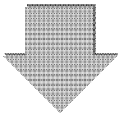
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

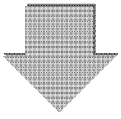
1. Wiring failure of the wire-harness
   • Power short circuit of the DPF regeneration inhibit lamp wire
2. DPF regeneration inhibit lamp failure
   • Power short circuit of the DPF regeneration inhibit lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the DPF regeneration inhibit lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the DPF regeneration inhibit lamp system.

P1740: DPF regeneration request lamp +B short circuit

P code	P1740	Name	DPF regeneration request lamp +B short circuit
SPN/FMI	518285/6		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Key switch is ON • Not during engine cranking • Lamp is on 2. +B short of lamp terminal is detected.	• Coupler • Wire-harness • DPF regeneration request lamp • ECU

● Actions when an error occurs

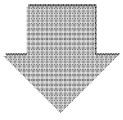
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Cleared when: Key switch OFF → ON and engine speed = 0 is detected Otherwise cleared when: ECU power OFF is detected.
Remarks	

● Presumed cause of the failure or the error condition

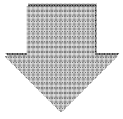
1. Wiring failure of the wire-harness
   • Power short circuit of the DPF regeneration request lamp wire
2. DPF regeneration request lamp failure
   • Power short circuit of the DPF regeneration request lamp internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check whether the DPF regeneration request lamp input signal is correctly recognized.



2. Engine check	• Turn OFF the key switch and stop the engine. • Turn ON the key switch and check for the DTC detection.



3. Failure diagnosis	• Check the DPF regeneration request lamp system.

■ Breather heater

P053A: Breather heater disconnection

P code	P053A	Name	Breather heater disconnection
SPN/FMI	3059/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • The key switch is turned ON for a given length of time • The engine start recognition is turned OFF • Heater energization OFF (10 seconds after starting the ECU) • No errors in the cooling water temperature sensor • Cooling water temperature is 40 °C or below 2. Breather heater disconnection is detected.	• Coupler • Wire-harness • Breather heater

● Actions when an error occurs

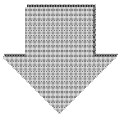
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

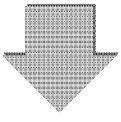
1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Breather heater failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the breather heater for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the breather heater wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the breather heater resistance value. • Check the conduction of the wire-harness.

P053B: Breather heater GND short circuit

P code	P053B	Name	Breather heater GND short circuit
SPN/FMI	3059/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • The key switch is turned ON for a given length of time • The engine start recognition is turned OFF • Heater energization OFF (10 seconds after starting the ECU) • No errors in the cooling water temperature sensor • Cooling water temperature is 40 °C or below 2. Breather heater GND short circuit is detected.	• Coupler • Wire-harness • Breather heater

● Actions when an error occurs

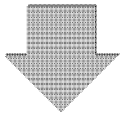
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

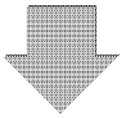
1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Breather heater failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the breather heater for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the breather heater wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the breather heater resistance value. • Check the conduction of the wire-harness.

P053C: Breather heater VB short circuit

P code	P053C	Name	Breather heater VB short circuit
SPN/FMI	3059/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • The key switch is turned ON for a given length of time • The engine start recognition is turned OFF • Heater energization ON 2. Breather heater VB short circuit (Overcurrent) is detected.	• Coupler • Wire-harness • Breather heater

● Actions when an error occurs

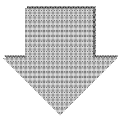
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When the ECU power is turned OFF, the fault mode is released.
Remarks	

● Presumed cause of the failure or the error condition

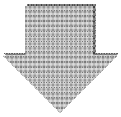
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - VB short circuit of wire-harness between breather heater and ECU
3. Breather heater failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch. • Check the coupler pin of the breather heater for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the breather heater wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the breather heater resistance value. • Check the conduction of the wire-harness.

DCU Judgment Item
(Applicable only to models with urea SCR system)

Sensor related

■ SCR upstream NOx sensor

P1545: SCR upstream NOx value rise error

P code	P1545	Name	SCR upstream NOx value rise error
SPN/FMI	523595/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Not during the engine cranking • SCR upstream NOx sensor is valid (Receives the NOx sensor heater release order from the DCU, and the warm-up of the SCR upstream NOx sensor is completed) (*1) 2. SCR upstream NOx concentration measured with the SCR upstream sensor is 2500 ppm or above for 2 seconds. (*1) The warm-up normally completes after approximately 2 minutes from receiving the order from DCU.	• EGR valve • Intake air pressure sensor • Exhaust gas pressure sensor • Injector • SCR upstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR upstream NOx value to model value. The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the engine speed at the maximum torque + 200 min^{-1}. • The maximum fuel injection quantity is limited to 50%. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. SCR upstream NOx sensor failure
2. EGR valve failure
3. Intake air pressure sensor failure, or leakage
4. Exhaust gas pressure sensor failure
5. Injector failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P2209: SCR upstream NOx sensor incomplete heating error

P code	P2209	Name	SCR upstream NOx sensor incomplete heating error
SPN/FMI	523597/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Not during the engine cranking • NOx sensor heater release order from DCU is completed • 0 °C ≤ SCR catalyst temperature ≤ 500 °C • CAN reception timeout from SCR upstream NOx sensor is not occurring • SCR upstream NOx value rise error is not occurring 2. When it is 240 seconds after the prerequisite is satisfied, and the warm-up of the SCR upstream NOx sensor is incomplete.	• SCR upstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR upstream NOx value to model value. The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. SCR upstream NOx sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above “DTC detection criteria 1. Prerequisite”, and then re-check the fault indication. • If DTC is detected again, replace SCR upstream NOx sensor. *See the engine Service Manual for details on the replacement method and procedure.

P2203: SCR upstream NOx sensor internal circuit short circuit

P code	P2203	Name	SCR upstream NOx sensor internal circuit short circuit
SPN/FMI	523595/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Not during the engine cranking • Elapse of 2 seconds after all of the following criteria are satisfied a. CAN reception timeout from ECU is not occurring b. Battery voltage is within normal range c. 0 °C ≤ SCR catalyst temperature ≤ 500 °C d. Elapse of 5 seconds after engine start is completed 2. SCR upstream NOx sensor detects internal circuit short circuit.	• SCR upstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR upstream NOx value to model value. The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. SCR upstream NOx sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace SCR upstream NOx sensor. *See the engine Service Manual for details on the replacement method and procedure.

P151C: SCR upstream NOx sensor internal circuit disconnection

P code	P151C	Name	SCR upstream NOx sensor internal circuit disconnection
SPN/FMI	523595/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Not during the engine cranking • Elapse of 2 seconds after all of the following criteria are satisfied a. CAN reception timeout from ECU is not occurring b. Battery voltage is within normal range c. 0 °C ≤ SCR catalyst temperature ≤ 500 °C d. Elapse of 5 seconds after engine start is completed 2. SCR upstream NOx sensor internal circuit disconnection is detected.	• SCR upstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR upstream NOx value to model value. The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. SCR upstream NOx sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above “DTC detection criteria 1. Prerequisite”, and then re-check the fault indication. • If DTC is detected again, replace SCR upstream NOx sensor. *See the engine Service Manual for details on the replacement method and procedure.

P1525: SCR upstream NOx sensor detected value error (upper limit error)

P code	P1525	Name	SCR upstream NOx sensor detected value error (upper limit error)
SPN/FMI	3216/15		

● Purpose of DTC detection

When the deviation between the SCR upstream NOx concentration measured with the SCR upstream NOx sensor and the SCR upstream NOx concentration calculated with a model is large, this error is detected. This detects errors such as the SCR upstream NOx sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • SCR upstream NOx sensor is valid (Receives the NOx sensor heater release order from the DCU, and the warm-up of the SCR upstream NOx sensor is completed) (*1) • 80 kPa ≤ atmospheric pressure ≤ 110 kPa • -40 °C ≤ fresh air temperature ≤ 40 °C • 70 °C ≤ cooling water temperature ≤ 110 °C • 17 STEP ≤ EGR valve actual position ≤ 80 STEP • Elapse of 5 minutes after engine start is completed • Engine is not at low speed nor in high load • Not during DPF regeneration • 30 ppm ≤ SCR upstream NOx model value ≤ 1500 ppm • The SCR upstream NOx model value satisfies the judgment criteria • Detected a dynamic behavior of SCR upstream NOx model value • Battery voltage is within normal range 2. When comparing the SCR upstream NOx concentration calculated with a model, the SCR upstream NOx concentration measured with the SCR upstream NOx sensor is too high for 1 second. (*1) The warm-up normally completes after approximately 2 minutes from receiving the order from DCU.	• SCR upstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR upstream NOx value to model value. The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of SCR upstream NOx sensor
2. SCR upstream NOx sensor failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P1526: SCR upstream NOx sensor detected value error (lower limit error)

P code	P1526	Name	SCR upstream NOx sensor detected value error (lower limit error)
SPN/FMI	3216/17		

● Purpose of DTC detection

When the deviation between the SCR upstream NOx concentration measured with the SCR upstream NOx sensor and the SCR upstream NOx concentration calculated with a model is large, this error is detected. This detects errors such as the SCR upstream NOx sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • SCR upstream NOx sensor is valid (Receives the NOx sensor heater release order from the DCU, and the warm-up of the SCR upstream NOx sensor is completed) (*1) • 80 kPa ≤ atmospheric pressure ≤ 110 kPa • -40 °C ≤ fresh air temperature ≤ 40 °C • 70 °C ≤ cooling water temperature ≤ 110 °C • 17 STEP ≤ EGR valve actual position ≤ 80 STEP • Elapse of 5 minutes after engine start is completed • Engine is not at low speed nor in high load • Not during DPF regeneration • 30 ppm ≤ SCR upstream NOx model value ≤ 1500 ppm • The SCR upstream NOx model value satisfies the judgment criteria • Detected a dynamic behavior of SCR upstream NOx model value • Battery voltage is within normal range 2. When comparing the SCR upstream NOx concentration calculated with a model, the SCR upstream NOx concentration measured with the SCR upstream NOx sensor is too low for 1 second. (*1) The warm-up normally completes after approximately 2 minutes from receiving the order from DCU.	• SCR upstream NOx sensor

Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR upstream NOx value to model value. The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of SCR upstream NOx sensor
2. SCR upstream NOx sensor failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

■ SCR downstream NOx sensor

P1546: SCR downstream NOx value rise error

P code	P1546	Name	SCR downstream NOx value rise error
SPN/FMI	523595/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Not during the engine cranking • SCR downstream NOx sensor is valid (Receives the NOx sensor heater release order from the DCU, and the warm-up of the SCR downstream NOx sensor is completed) (*1) 2. SCR downstream NOx concentration is 2500 ppm or above for 2 seconds. (*1) The warm-up normally completes after approximately 2 minutes from receiving the order from DCU.	• Urea water injection system (dosing module, supply module, and urea water hose) • EGR valve • Intake air pressure sensor • SCR downstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: SCR downstream NOx value is 0 ppm (default value). The engine operation is limited.
Limited operation	• Forecast operation: If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation: After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. SCR downstream NOx sensor failure
2. Urea water injection system failure (dosing module, supply module, and urea water hose)
3. EGR valve failure
4. Intake air pressure sensor failure, or leakage
5. Exhaust gas pressure sensor failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P2222: SCR downstream NOx sensor incomplete heating error

P code	P2222	Name	SCR downstream NOx sensor incomplete heating error
SPN/FMI	523598/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Not during the engine cranking • NOx sensor heater release order from DCU is completed • 0 °C ≤ SCR catalyst downstream temperature ≤ 500 °C • CAN reception timeout from SCR downstream NOx sensor is not occurring • SCR downstream NOx value rise error is not occurring 2. When it is 240 seconds after the prerequisite is satisfied, and the warm-up of the SCR downstream NOx sensor is incomplete.	• SCR downstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: SCR downstream NOx value is 0 ppm (default value). The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. SCR downstream NOx sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace SCR downstream NOx sensor. *See the engine Service Manual for details on the replacement method and procedure.

P2216: SCR downstream NOx sensor internal circuit short circuit

P code	P2216	Name	SCR downstream NOx sensor internal circuit short circuit
SPN/FMI	523596/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Not during the engine cranking • Elapse of 2 seconds after all of the following criteria are satisfied a. CAN reception timeout from ECU is not occurring b. Battery voltage is within normal range c. 0 °C ≤ SCR catalyst downstream temperature ≤ 500 °C d. Elapse of 5 seconds after engine start is completed 2. SCR downstream NOx sensor internal circuit short circuit is detected.	• SCR downstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: SCR downstream NOx value is 0 ppm (default value). The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. SCR downstream NOx sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above “DTC detection criteria 1. Prerequisite”, and then re-check the fault indication. • If DTC is detected again, replace SCR downstream NOx sensor. *See the engine Service Manual for details on the replacement method and procedure.

P151D: SCR downstream NOx sensor internal circuit disconnection

P code	P151D	Name	SCR downstream NOx sensor internal circuit disconnection
SPN/FMI	523596/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Not during the engine cranking • Elapse of 2 seconds after all of the following criteria are satisfied a. CAN reception timeout from ECU is not occurring b. Battery voltage is within normal range c. 0 °C ≤ SCR catalyst downstream temperature ≤ 500 °C d. Elapse of 5 seconds after engine start is completed 2. SCR downstream NOx sensor internal circuit disconnection is detected.	• SCR downstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: SCR downstream NOx value is 0 ppm (default value). The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. SCR downstream NOx sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace SCR downstream NOx sensor. *See the engine Service Manual for details on the replacement method and procedure.

P1524: SCR downstream NOx sensor detected value error

P code	P1524	Name	SCR downstream NOx sensor detected value error
SPN/FMI	523606/10		

● Purpose of DTC detection

Compare the SCR upstream NOx concentration measured with the SCR upstream NOx sensor and SCR downstream NOx concentration measured with SCR downstream NOx sensor. If the concentration difference is too small, this error is detected. This detects errors such as the SCR downstream NOx sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Elapse of 10 seconds after engine start is completed • SCR upstream NOx sensor is valid (Receives the NOx sensor heater release order from the DCU, and the warm-up of the SCR upstream NOx sensor is completed) (*1) • SCR downstream NOx sensor is valid (Receives the NOx sensor heater release order from the DCU, and the warm-up of the SCR downstream NOx sensor is completed) (*1) • During the urea water injection • Urea water injection is not alternative mode • Not during DPF regeneration • Exhaust gas flow rate is equal to or above the threshold value • SCR catalytic efficiency is equal to or below the threshold value • Urea water injection flow rate is 400 mg/s or below • The peak of SCR upstream NOx concentration exceeds the threshold value • Battery voltage is within normal range 2. The SCR downstream NOx concentration measured with the SCR down-stream NOx sensor is lower than the threshold value. (*1) The warm-up normally completes after approximately 2 minutes from receiving the order from DCU.	• SCR downstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: SCR downstream NOx value is 0 ppm (default value). The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of SCR downstream NOx sensor
2. SCR downstream NOx sensor failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P1778: SCR downstream NOx sensor detected value error (O_2 concentration)

P code	1778	Name	SCR downstream NOx sensor detected value error (O_2 concentration)
SPN/FMI	518343/10		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Engine speed is more than the specified value (600 min^{-1}) • Fuel injection value is more than specified value (20 mg/st) • No abnormalities in related sensors 2. SCR downstream NOx sensor O_2 concentration is higher than the threshold (0.190).	• SCR downstream NOx sensor

● Actions when an error occurs

Fault mode	[Limited operation]: SCR downstream NOx value is 0 ppm (default value). The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of SCR downstream NOx sensor
2. SCR downstream NOx sensor failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

■ SCR catalyst temperature sensor

P0428: SCR catalyst temperature sensor error (voltage high)

P code	P0428	Name	SCR catalyst temperature sensor error (voltage high)
SPN/FMI	4360/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during the engine cranking. 2. Sensor output is above 4.6 V (threshold value).	• Coupler • Wire-harness • SCR catalyst temperature sensor • DCU

● Actions when an error occurs

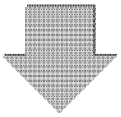
Fault mode	[Limited operation]: Switch from SCR catalyst temperature to model value. The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

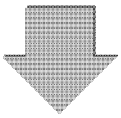
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or power short circuit of the sensor signal wire
   - Disconnection of the sensor GND wire
3. SCR catalyst temperature sensor failure
   - Sensor output failure caused by disconnection of the SCR catalyst temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P845* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the SCR catalyst temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the SCR catalyst temperature sensor is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of SCR catalyst temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of SCR catalyst temperature sensor. *See Chapter 3 *P845* for details on the diagnosis method and procedure.

P0427: SCR catalyst temperature sensor error (voltage low)

P code	P0427	Name	SCR catalyst temperature sensor error (voltage low)
SPN/FMI	4360/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during the engine cranking. 2. Sensor output is below 0.5 V (threshold value).	• Coupler • Wire-harness • SCR catalyst temperature sensor • DCU

● Actions when an error occurs

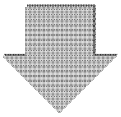
Fault mode	[Limited operation]: Switch from SCR catalyst temperature to model value. The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

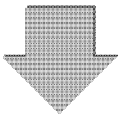
1. Wiring failure of the wire-harness
   - GND short circuit of the sensor signal wire
2. SCR catalyst temperature sensor failure
   - Sensor output failure caused by GND short circuit of the SCR catalyst temperature sensor internal wiring

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P845* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the SCR catalyst temperature sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of the SCR catalyst temperature sensor is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of SCR catalyst temperature sensor. • Check the conduction of the wire-harness. • Check the output voltage of SCR catalyst temperature sensor. *See Chapter 3 *P845* for details on the diagnosis method and procedure.

P0426: SCR catalyst temperature sensor error (temperature rise error)

P code	P0426	Name	SCR catalyst temperature sensor error (temperature rise error)
SPN/FMI	4360/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. SCR catalyst temperature sensor is normal. 2. SCR catalyst temperature is above 700 °C for one second.	• Coupler • Wire-harness • SCR catalyst temperature sensor • DPF intermediate temperature sensor • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: Set the SCR catalyst temperature to 200 °C as default value. The engine operation is limited.
Limited operation	• Forecast operation: If a sensor abnormality occurs, the high idle speed is limited to a maximum torque rpm of +200 min^{-1}, and the fuel injection quantity is limited to a maximum of 85%. • Main operation: After 15 minutes, the fuel injection quantity is limited to a maximum of 50%, and the high idle speed is maintained at a maximum torque rpm of +200 min^{-1}. • Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • EGR valve fully closes. • DPF regeneration stops. • SCR heating stops. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. SCR catalyst temperature sensor failure
4. DPF inlet temperature sensor failure
5. DPF intermediate temperature sensor failure
6. Regeneration operation failure (Soot filter (SF) erosion and abnormal combustion)

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P153B: SCR catalyst temperature sensor detected value error (upper limit error)

P code	P153B	Name	SCR catalyst temperature sensor detected value error (upper limit error)
SPN/FMI	4360/15		

● Purpose of DTC detection

When the deviation between the SCR catalyst temperature measured with the SCR upstream temperature sensor and the SCR catalyst temperature calculated with a model is large, this error is detected.
This detects errors such as the SCR catalyst temperature sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • 150 seconds after all of the following criteria ECU are satisfied a. The engine start is completed b. Not during DPF regeneration c. SCR catalyst temperature measured with a model is 200 °C or higher d. No errors in the SCR catalyst temperature sensor 2. SCR catalyst temperature measured with the SCR catalyst temperature sensor is lower than 80 °C.	• Coupler • Wire-harness • SCR catalyst temperature sensor • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR catalyst temperature to model value. The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of SCR catalyst temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. SCR catalyst temperature sensor failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P1541: SCR catalyst temperature sensor detected value error (lower limit error)

P code	P1541	Name	SCR catalyst temperature sensor detected value error (lower limit error)
SPN/FMI	4360/17		

● Purpose of DTC detection

When the deviation between the SCR catalyst temperature measured with the SCR upstream temperature sensor and the SCR catalyst temperature calculated with a model is large, this error is detected.
This detects errors such as the SCR catalyst temperature sensor falling off from the engine.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Elapse of 90 seconds after all of the following criteria ECU are satisfied a. The engine start is completed b. Not during DPF regeneration c. SCR catalyst temperature measured with a model is 190 °C or lower d. No errors in the SCR catalyst temperature sensor 2. SCR catalyst temperature measured with the SCR catalyst temperature sensor is higher than 670 °C.	• Coupler • Wire-harness • SCR catalyst temperature sensor • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR catalyst temperature to model value. The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of SCR catalyst temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. SCR catalyst temperature sensor failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P1542: SCR catalyst temperature sensor detected value error (at cold start check)

P code	P1542	Name	SCR catalyst temperature sensor detected value error (at cold start check)
SPN/FMI	4360/10		

● Purpose of DTC detection

When the difference between the SCR catalyst temperature and the fresh air temperature at engine stop (cold state) is large, this error is detected. This checks the SCR catalyst temperature sensor state.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Previous engine operation was in a complete warming-up state • Cooling water temperature is below 40 °C when the key switch is turned ON • Temperature difference between cooling water temperature and fresh air temperature is within ± 8 °C when key switch is turned ON • No errors in the SCR catalyst temperature sensor • No errors in the cooling water temperature sensor • No errors in the fresh air temperature sensor 2. The absolute value of the difference between the SCR catalyst temperature when the key switch is ON and the fresh air temperature when the key switch is ON is 50 °C or more.	• Coupler • Wire-harness • SCR catalyst temperature sensor • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: Switch from SCR catalyst temperature to model value. The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of SCR catalyst temperature sensor
2. Poor connection of coupler
3. Wiring failure of the wire-harness
4. SCR catalyst temperature sensor failure

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

■ Supply module pressure sensor

P204D: Supply module pressure sensor error (voltage high)

P code	P204D	Name	Supply module pressure sensor error (voltage high)
SPN/FMI	4334/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during the engine cranking. 2. Sensor output is above 4.75 V (threshold value).	• Coupler • Wire-harness • Supply module pressure sensor • DCU

● Actions when an error occurs

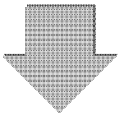
Fault mode	[Limited operation]: Supply module pressure is 0 kPa (default value). The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

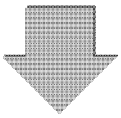
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or power short circuit of the sensor signal wire
   - Disconnection of the sensor GND wire
   - Disconnection of the sensor 5 V wire
3. Supply module pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P858* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module pressure sensor. *See Chapter 3 *P858* for details on the diagnosis method and procedure.

P204C: Supply module pressure sensor error (voltage low)

P code	P204C	Name	Supply module pressure sensor error (voltage low)
SPN/FMI	4334/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during the engine cranking. 2. Sensor output is below 0.25 V (threshold value).	• Coupler • Wire-harness • Supply module pressure sensor • DCU

● Actions when an error occurs

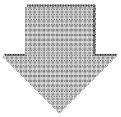
Fault mode	[Limited operation]: Supply module pressure is 0 kPa (default value). The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

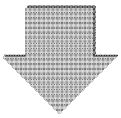
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • GND short circuit of the sensor signal wire
3. Supply module pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P858* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module pressure sensor. *See Chapter 3 *P858* for details on the diagnosis method and procedure.

P153C: Supply module pressure sensor detected value error (upper limit error)

P code	P153C	Name	Supply module pressure sensor detected value error (upper limit error)
SPN/FMI	4334/15		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Supply module is not filled with urea water • Defrosting of supply module is completed • Before starting the urea water injection (Dosing system sub-state is NOPRESSURECTL) • No errors in the supply module pressure sensor • Supply module (pump motor) pressure rise error 1 is not occurring • Supply module (pump motor) pressure rise error 2 is not occurring • Supply module pressure drop error is not occurring • Not starting to measure temperature of supply module (pump motor) is not occurring 2. Supply module pressure is more than 50 kPa for 1 seconds.	• Coupler • Wire-harness • Supply module pressure sensor • DCU

● Actions when an error occurs

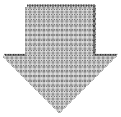
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

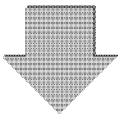
1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Supply module pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P861* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module pressure sensor. *See Chapter 3 *P861* for details on the diagnosis method and procedure.

P153D: Supply module pressure sensor detected value error (lower limit error)

P code	P153D	Name	Supply module pressure sensor detected value error (lower limit error)
SPN/FMI	4334/17		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Supply module is not filled with urea water • Defrosting of supply module is completed • Before starting the urea water injection (Dosing system main-state is NOPRESSURECTL) • No errors in the supply module pressure sensor • Supply module (pump motor) pressure rise error 1 is not occurring • Supply module (pump motor) pressure rise error 2 is not occurring • Supply module pressure drop error is not occurring • Not starting to measure temperature of supply module (pump motor) is not occurring 2. Supply module pressure is lower than -50 kPa for 1 second.	• Coupler • Wire-harness • Supply module pressure sensor • DCU

● Actions when an error occurs

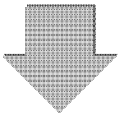
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

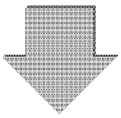
1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Supply module pressure sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the sensor voltage. *See Chapter 3 *P861* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module pressure sensor. *See Chapter 3 *P861* for details on the diagnosis method and procedure.

P1516: Sensor supply voltage error

P code	P1516	Name	Sensor supply voltage error
SPN/FMI	523576/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The voltage supplied to the sensor exceeds the range of the threshold value.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

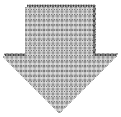
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

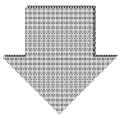
1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P864* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module pressure sensor for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module pressure sensor wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. *See Chapter 3 *P864* for details on the diagnosis method and procedure.

■ Urea water quality sensor/Urea water tank temperature sensor (A1DEFI)

P1559: Urea water quality sensor/Urea water tank temperature sensor (A1DEFI) controller temperature rise error

P code	P1559	Name	Urea water quality sensor/Urea water tank temperature sensor (A1DEFI) controller temperature rise error
SPN/FMI	3515/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • A1DEFI reception timeout is not occurring 2. Urea water tank temperature sensor detects temperature rise of the controller. (Error information of urea water quality sensor received in A1DEFI message is 2, and the condition is continued for 5 seconds.)	• Urea water quality sensor • Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

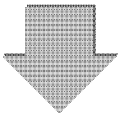
● Presumed cause of the failure or the error condition

1. Ambient temperature rise of urea water quality sensor/urea water tank temperature sensor controller
2. Failure of urea water quality sensor/urea water tank temperature sensor internal circuit

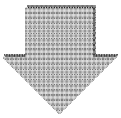
Note: Installation location and specifications of the urea water quality sensor, urea water tank temperature sensor, and controllers thereof vary depending on the driven machine.
See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P867* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Make sure that there is no factors causing the temperature around the urea water quality sensor and urea water tank temperature sensor controller to rise. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above “DTC detection criteria 1. Prerequisite”, and then re-check the fault indication. • If DTC is detected again, replace the urea water quality sensor or urea water tank temperature sensor. *See Chapter 3 *P867* for details on the diagnosis method and procedure.

P206D: Urea water quality sensor (A1DEFI) internal circuit disconnection

P code	P206D	Name	Urea water quality sensor (A1DEFI) internal circuit disconnection
SPN/FMI	3516/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • A1DEFI reception timeout is not occurring 2. Urea water quality sensor detects the internal circuit disconnection. (Error information of urea water quality sensor received in A1DEFI message is 3 or 5, and the condition is continued for 5 seconds.)	• Urea water quality sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water quality sensor internal circuit failure

Note: The specifications of urea water quality sensor vary according to the driven machine.
See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water quality sensor. *See Chapter 3 *P869* for details on the diagnosis method and procedure.

P206C: Urea water quality sensor (A1DEFI) internal circuit short circuit

P code	P206C	Name	Urea water quality sensor (A1DEFI) internal circuit short circuit
SPN/FMI	3516/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • A1DEFI reception timeout is not occurring 2. Urea water quality sensor detects internal circuit short circuit. (Error information of urea water quality sensor received in A1DEFI message is 4 or 6, and the condition is continued for 5 seconds.)	• Urea water quality sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water quality sensor internal circuit failure

Note: The specifications of urea water quality sensor vary according to the driven machine.
See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water quality sensor. *See Chapter 3 *P869* for details on the diagnosis method and procedure.

P154F: Urea water quality sensor (A1DEFI) controller internal failure

P code	P154F	Name	Urea water quality sensor (A1DEFI) controller internal failure
SPN/FMI	3516/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • A1DEFI reception timeout is not occurring 2. Urea water quality sensor detects the internal controller error. (Error information of urea water quality sensor received in A1DEFI message is 11 or 12, and the condition is continued for 5 seconds.)	• Urea water quality sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water quality sensor internal circuit failure

Note: The specifications of urea water quality sensor and controller vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water quality sensor. *See Chapter 3 *P869* for details on the diagnosis method and procedure.

P1551: Urea water tank temperature sensor (A1DEFI) internal circuit disconnection

P code	P1551	Name	Urea water tank temperature sensor (A1DEFI) internal circuit disconnection
SPN/FMI	3515/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • A1DEFI reception timeout is not occurring 2. Urea water tank temperature sensor detects the internal circuit disconnection. (Error information of urea water quality sensor received in A1DEFI message is 3 or 5, and the condition is continued for 5 seconds.)	• Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank temperature sensor internal circuit

Note: The specifications of urea water tank temperature sensor vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank temperature sensor. *See Chapter 3 *P870* for details on the diagnosis method and procedure.

P1552: Urea water tank temperature sensor (A1DEFI) internal circuit short circuit

P code	P1552	Name	Urea water tank temperature sensor (A1DEFI) internal circuit short circuit
SPN/FMI	3515/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • A1DEFI reception timeout is not occurring 2. Urea water tank temperature sensor detects the internal circuit short circuit. (Error information of urea water quality sensor received in A1DEFI message is 4 or 6, and the condition is continued for 5 seconds.)	• Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank temperature sensor internal circuit

Note: The specifications of urea water tank temperature sensor vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank temperature sensor. *See Chapter 3 *P870* for details on the diagnosis method and procedure.

P1550: Urea water tank temperature sensor (A1DEFI) controller internal failure

P code	P1550	Name	Urea water tank temperature sensor (A1DEFI) controller internal failure
SPN/FMI	3515/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • A1DEFI reception timeout is not occurring 2. Urea water tank temperature sensor detects the internal controller error. (Error information of urea water tank temperature sensor received in A1DEFI message is 11 or 12, and the condition is continued for 5 seconds.)	• Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank temperature sensor internal circuit

Note: The specifications of urea water tank temperature sensor and controller vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank temperature sensor. *See Chapter 3 *P870* for details on the diagnosis method and procedure.

■ Urea water tank temperature sensor/urea water tank level sensor (AT1T1I)

P1557: Urea water tank temperature sensor/urea water tank level sensor (AT1T1I) controller temperature rise error

P code	P1557	Name	Urea water tank temperature sensor/urea water tank level sensor (AT1T1I) controller temperature rise error
SPN/FMI	3031/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range 2. Urea water tank temperature sensor detects temperature rise of the controller. (Error information of urea water quality sensor received in AT1T1I message is 2, and the condition is continued for 5 seconds.)	• Urea water tank temperature sensor • Urea water tank level sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

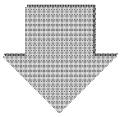
● Presumed cause of the failure or the error condition

1. Ambient temperature rise of urea water tank temperature sensor/Urea water tank level sensor controller
2. Failure of urea water quality sensor/Urea water tank temperature sensor internal circuit

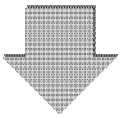
Note: Installation location and specifications of the urea water quality sensor, urea water tank temperature sensor, and controllers thereof vary depending on the driven machine.
See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P871* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Make sure that there is no factors causing the temperature around the urea water tank temperature sensor and urea water tank level sensor controller to rise. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above “DTC detection criteria 1. Prerequisite”, and then re-check the fault indication. • If DTC is detected again, replace the urea water quality sensor or urea water tank temperature sensor. *See Chapter 3 *P871* for details on the diagnosis method and procedure.

P203D: Urea water tank level sensor (AT1T1I) internal circuit disconnection

P code	P203D	Name	Urea water tank level sensor (AT1T1I) internal circuit disconnection
SPN/FMI	1761/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range 2. Urea water tank level sensor detects the internal circuit disconnection. (Error information of urea water tank level sensor received in AT1T1I message is 3 or 5, and the condition is continued for 5 seconds.)	• Urea water tank level sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank level sensor internal circuit

Note: The specifications of urea water tank level sensor vary depending on the driven machine.
See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank level sensor. *See Chapter 3 *P873* for details on the diagnosis method and procedure.

P203C: Urea water tank level sensor (AT1T1I) internal circuit short circuit

P code	P203C	Name	Urea water tank level sensor (AT1T1I) internal circuit short circuit
SPN/FMI	1761/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range 2. Urea water tank level sensor detects the internal circuit short circuit. (Error information of urea water tank level sensor received in AT1T1I message is 4 or 6, and the condition is continued for 5 seconds.)	• Urea water tank level sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank level sensor internal circuit

Note: The specifications of urea water tank level sensor vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank level sensor. *See Chapter 3 *P873* for details on the diagnosis method and procedure.

P155A: Urea water tank level sensor (AT1T1I) controller internal failure

P code	P155A	Name	Urea water tank level sensor (AT1T1I) controller internal failure
SPN/FMI	1761/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range 2. Urea water tank level sensor detects the internal controller error. (Error information of urea water tank level sensor received in AT1T1I message is 11 or 12, and the condition is continued for 5 seconds.)	• Urea water tank level sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank level sensor internal circuit

Note: The specifications of urea water tank level sensor and controller vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank level sensor. *See Chapter 3 *P873* for details on the diagnosis method and procedure.

P205D: Urea water tank temperature sensor (AT1T1I) internal circuit disconnection

P code	P205D	Name	Urea water tank temperature sensor (AT1T1I) internal circuit disconnection
SPN/FMI	3031/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range 2. Urea water tank temperature sensor detects the internal circuit disconnection. (Error information of urea water quality sensor received in AT1T1I message is 3 or 5, and the condition is continued for 5 seconds.)	• Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank temperature sensor internal circuit

Note: The specifications of urea water tank temperature sensor vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank temperature sensor. *See Chapter 3 *P874* for details on the diagnosis method and procedure.

P205C: Urea water tank temperature sensor (AT1T1I) internal circuit short circuit

P code	P205C	Name	Urea water tank temperature sensor (AT1T1I) internal circuit short circuit
SPN/FMI	3031/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range 2. Urea water tank temperature sensor detects the internal circuit short circuit. (Error information of urea water quality sensor received in AT1T1I message is 4 or 6, and the condition is continued for 5 seconds.)	• Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank temperature sensor internal circuit

Note: The specifications of urea water tank temperature sensor vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank temperature sensor. *See Chapter 3 *P874* for details on the diagnosis method and procedure.

P1556: Urea water tank temperature sensor (AT1T1I) controller internal failure

P code	P1556	Name	Urea water tank temperature sensor (AT1T1I) controller internal failure
SPN/FMI	3031/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range 2. Urea water tank temperature sensor detects the internal controller error. (Error information of urea water tank temperature sensor received in AT1T1I message is 11 or 12, and the condition is continued for 5 seconds.)	• Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Failure of urea water tank temperature sensor internal circuit

Note: The specifications of urea water tank temperature sensor and controller vary depending on the driven machine. See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and run the engine operation that satisfies the above "DTC detection criteria 1. Prerequisite", and then re-check the fault indication. • If DTC is detected again, replace the urea water tank temperature sensor. *See Chapter 3 *P874* for details on the diagnosis method and procedure.

P155B: Urea water tank level sensor detected value error

P code	P155B	Name	Urea water tank level sensor detected value error
SPN/FMI	1761/15		

● Purpose of DTC detection

When the difference between the deviation of urea water tank level and the consumption of urea water injected from dosing module is large, this error is detected. This enables to check the urea water tank level sensor state.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Urea water tank level sensor is valid (Defrosting of urea water tank is completed. Elapse of 12 seconds after the key switch is turned ON) • During the urea water injection (Dosing system sub-state is METERINGCONTROL) • Integrated value of quantity of urea water after the refill or the last diagnosis is threshold or higher • Urea water is not refilled into urea water tank yet • No errors in the urea water tank level sensor 2. Deviation in urea water tank level is too small.	• Urea water tank level sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of urea water tank level sensor (sliding failure in the float of the sensor)
2. Failure of urea water tank level sensor internal circuit

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P205B: Urea water tank temperature rise error

P code	P205B	Name	Urea water tank temperature rise error
SPN/FMI	3031/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • No errors in the urea water tank temperature sensor 2. Urea water tank temperature is higher than 70 °C for one second.	• Urea water tank heating valve • Urea water tank • Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water tank heating valve failure
2. Temperature rise around the urea water tank
3. Failure of urea water tank temperature sensor internal circuit

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P1539: Urea water tank temperature sensor detected value error (upper limit error)

P code	P1539	Name	Urea water tank temperature sensor detected value error (upper limit error)
SPN/FMI	3031/15		

● Purpose of DTC detection

When the difference between the urea water tank temperature and the fresh air temperature at engine stop (cold state) is large, this error is detected. This checks the urea water tank temperature sensor state.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Elapse of 3 seconds after urea water tank level sensor is valid (Defrosting of urea water tank is completed. Elapse of 12 seconds after the key switch is turned ON) • Urea water is not refilled into urea water tank yet • Before starting the urea water injection (Dosing system main-state is NOPRESSURECTL) • Intake manifold temperature, exhaust manifold temperature, coolant temperature, and intake air temperature are all 40 °C or lower • Difference from the intake manifold temperature, exhaust manifold temperature, coolant temperature, and intake air temperature are all within ± 5 °C • 12 seconds have elapsed after key switch ON • Previous operating state was completely warmed up • No errors in the urea water tank temperature sensor • No errors in the SCR catalyst temperature sensor • No errors in the cooling water temperature sensor • No errors in the fresh air temperature sensor 2. The urea water tank temperature is more than 35 °C higher than the fresh air temperature.	• Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of urea water tank temperature sensor
2. Temperature rise around the urea water tank
3. Failure of urea water tank temperature sensor

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P153A: Urea water tank temperature sensor detected value error (lower limit error)

P code	P153A	Name	Urea water tank temperature sensor detected value error (lower limit error)
SPN/FMI	3031/17		

● Purpose of DTC detection

When the difference between the urea water tank temperature and the fresh air temperature at engine stop (cold state) is large, this error is detected. This checks the urea water tank temperature sensor state.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Elapse of 3 seconds after urea water tank level sensor is valid (Defrosting of urea water tank is completed. Elapse of 12 seconds after the key switch is turned ON) • Urea water is not refilled into urea water tank yet • Before starting the urea water injection (Dosing system main-state is NOPRESSURECTL) • Intake manifold temperature, exhaust manifold temperature, coolant temperature, and intake air temperature are all 40 °C or lower • Difference from the intake manifold temperature, exhaust manifold temperature, coolant temperature, and intake air temperature are all within ± 5 °C • 12 seconds have elapsed after key switch ON • Previous operating state was completely warmed up (Operates for 900 seconds at water temperature 60 °C or higher) • No errors in the urea water tank temperature sensor • No errors in the SCR catalyst temperature sensor • No errors in the cooling water temperature sensor • No errors in the fresh air temperature sensor 2. The urea water tank temperature is more than 35 °C lower than the fresh air temperature.	• Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Installation condition failure of urea water tank temperature sensor
2. Temperature rise around the urea water tank
3. Failure of urea water tank temperature sensor internal circuit

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

P154B: Urea water tank temperature rise error

P code	P154B	Name	Urea water tank temperature rise error
SPN/FMI	523630/2		

● Purpose of DTC detection

When the tank temperature does not rise even during the defrosting of urea water tank, this error is detected.
This detects the sticking to urea water tank heating valve, or the error of the cooling system circulating in urea water tank.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Elapse of 30 minutes after all of the following criteria from (a to e) are satisfied a. Elapse of 60 seconds after key switch is turned ON b. Energization ON to urea water tank heating valve c. Urea water tank level is 20% or above d. Cooling water temperature is higher than 50 °C e. Urea water tank temperature is between -8 °C and -5 °C, or lower than -14 °C 2. The difference between the urea water tank temperature when the prerequisite is satisfied and the urea water tank temperature when it is 60 seconds after the key switch is turned ON is 1.5 °C or smaller.	• Urea water tank heating valve • Cooling water hose • Urea water tank temperature sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water tank heating valve failure
2. Cooling water hose circulating in the urea water tank is clogged.
3. Failure of urea water tank temperature sensor internal circuit

● See Chapter 3 “Sensor related” for diagnosis method and corrective action.

■ DCU internal temperature sensor

P1504: DCU internal temperature rise error

P code	P1504	Name	DCU internal temperature rise error
SPN/FMI	523581/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • DCU internal temperature sensor voltage normal 2. DCU temperature is higher than 114 °C of the threshold.	• DCU

● Actions when an error occurs

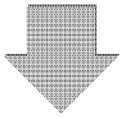
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

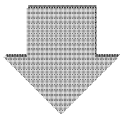
1. Temperature around the DCU is high.
2. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the DCU temperature. *See Chapter 3 *P889* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Make sure that there is no factors causing the temperature around the DCU to rise. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Check the DCU temperature sensor system. *See Chapter 3 *P889* for details on the diagnosis method and procedure.

Contact output related

■ Heater relay

P21C4: Heater relay L side VB short circuit

P code	P21C4	Name	Heater relay L side VB short circuit
SPN/FMI	523592/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. VB short circuit on the low side is detected in heater relay drive circuit inside the DCU.	• Coupler • Wire-harness • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

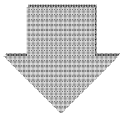
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Power short circuit of heater relay low side output (*1)
3. Heater relay failure
   • Coil short circuit of heater relay internal circuit

(*1) When this error is caused by power short circuit of low side output, “P2686: Heater relay/Urea water tank heating valve H side VB short circuit” may be detected at the same time.

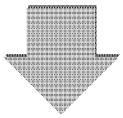
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, “P1506: SCR system forced termination” is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P891* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P891* for details on the diagnosis method and procedure.

P21C3: Heater relay L side GND short circuit

P code	P21C3	Name	Heater relay L side GND short circuit
SPN/FMI	523592/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Energization OFF to heater relay. 2. GND short circuit on the low side is detected in heater relay drive circuit inside the DCU.	• Coupler • Wire-harness • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

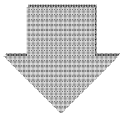
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of heater relay low side output
3. Heater relay failure

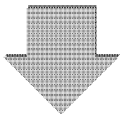
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P891* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P891* for details on the diagnosis method and procedure.

P21C2: Heater relay disconnection

P code	P21C2	Name	Heater relay disconnection
SPN/FMI	523592/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Energization OFF to heater relay 2. High side or low side disconnection is detected in heater relay drive circuit inside the DCU.	• Coupler • Wire-harness • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

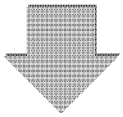
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of heater relay high side output
   - Disconnection of heater relay low side output
3. Heater relay failure
   - Heater relay internal circuit disconnection

Note • Be sure to perform the failure diagnosis for this error first, when the followings are also detected: "P20B9: Urea water hose heater (back flow) disconnection" / "P20BD: Urea water hose heater (pressure) disconnection" / "P20C1: Urea water hose heater (suction) disconnection"

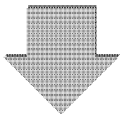
• If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P891* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P891* for details on the diagnosis method and procedure.

P1509: Heater relay power stage temperature rise error

P code	P1509	Name	Heater relay power stage temperature rise error
SPN/FMI	523592/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

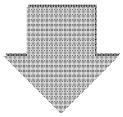
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Heater relay failure
4. DCU internal circuit failure

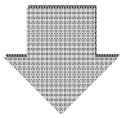
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P896* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P896* for details on the diagnosis method and procedure.

Actuator

■ Dosing module

P2049: Dosing module H side VB short circuit/disconnection

P code	P2049	Name	Dosing module H side VB short circuit/disconnection
SPN/FMI	523586/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. VB short circuit or disconnection of high side or low side is detected in dosing module drive circuit inside the DCU.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

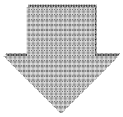
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water does not suck back. (urea water sucking back is stopped during after-run) • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

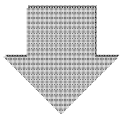
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or power short circuit of dosing module high side output
   - Disconnection or power short circuit of dosing module low side output
3. Dosing module failure
   - Dosing module internal circuit disconnection

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P2047: Dosing module H side GND short circuit

P code	P2047	Name	Dosing module H side GND short circuit
SPN/FMI	523586/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to dosing module. 2. GND short circuit on the high side is detected in dosing module drive circuit inside the DCU.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

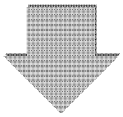
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water does not suck back. (urea water sucking back is stopped during after-run) • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

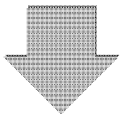
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Dosing module high side output GND short circuit
3. Dosing module failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P151B: Dosing module H side - L side short circuit (Applicable to 4TNV94FHT, 4TN101 Stage V)

P code	P151B	Name	Dosing module H side - L side short circuit
SPN/FMI	523585/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to dosing module. 2. Short circuit on the high side and low side is detected in dosing module drive circuit inside the DCU.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

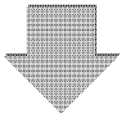
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water does not suck back. (urea water sucking back is stopped during after-run) • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

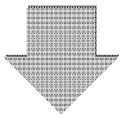
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of dosing module low side output
3. Dosing module failure
   - Coil short circuit of dosing module internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P151B: Dosing module L side VB short circuit (Applicable to 4TN107FHT, 4TN107FTT)

P code	P151B	Name	Dosing module L side VB short circuit
SPN/FMI	523585/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to dosing module. 2. VB short circuit on the low side is detected in dosing module drive circuit inside the DCU.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

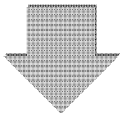
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water does not suck back. (urea water sucking back is stopped during after-run) • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

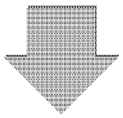
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of dosing module low side output
3. Dosing module failure
   - Coil short circuit of dosing module internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P2048: Dosing module L side GND short circuit

P code	P2048	Name	Dosing module L side GND short circuit
SPN/FMI	523586/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to dosing module. 2. VB short circuit on the low side is detected in dosing module drive circuit inside the DCU.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

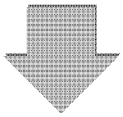
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water does not suck back. (urea water sucking back is stopped during after-run) • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

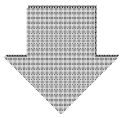
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of dosing module low side output
3. Dosing module failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P1771: Dosing module disconnection

P code	P1771	Name	Dosing module disconnection
SPN/FMI	523586/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to dosing module. 2. Disconnection of high side or low side is detected in dosing module drive circuit inside the DCU.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

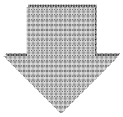
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water does not suck back. (urea water sucking back is stopped during after-run) • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

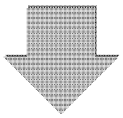
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of dosing module high side output or low side output
3. Dosing module failure
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P1770: Dosing module VB short circuit

P code	P1770	Name	Dosing module VB short circuit
SPN/FMI	523586/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to dosing module. 2. VB short circuit on the high side or low side is detected in dosing module drive circuit inside the DCU.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

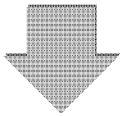
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water does not suck back. (urea water sucking back is stopped during after-run) • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

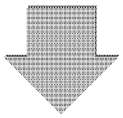
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of dosing module high side or low side output
3. Dosing module failure
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P1772: Dosing module GND short circuit

P code	P1772	Name	Dosing module GND short circuit
SPN/FMI	523586/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to dosing module. 2. GND short circuit is detected in dosing module drive circuit inside the DCU.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

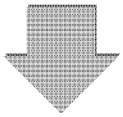
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water does not suck back. (urea water sucking back is stopped during after-run) • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

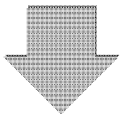
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of dosing module
3. Dosing module failure
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P1505: Dosing module power stage temperature rise error

P code	P1505	Name	Dosing module power stage temperature rise error
SPN/FMI	523584/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Dosing module • DCU

● Actions when an error occurs

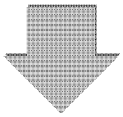
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

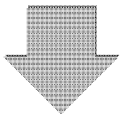
1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Dosing module failure
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P901* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of dosing module. • Check the conduction of the wire-harness. *See Chapter 3 *P901* for details on the diagnosis method and procedure.

P208E: Dosing module valve sticking

P code	P208E	Name	Dosing module valve sticking
SPN/FMI	523588/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • During the urea water injection (Dosing system sub-state is METERINGCONTROL) • 350 kPa ≤ Supply module pressure ≤ 1500 kPa 2. Dosing module sticking is detected for 50 seconds.	• Dosing module • DCU

● Actions when an error occurs

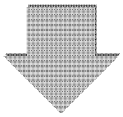
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

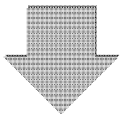
1. Dosing module sticking

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P905* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the dosing module for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the dosing module wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Perform the failure diagnosis on the dosing module. *See Chapter 3 *P905* for details on the diagnosis method and procedure.

■ Supply module

P208D: Supply module (pump motor) PWM signal wire VB short circuit

P code	P208D	Name	Supply module (pump motor) PWM signal wire VB short circuit
SPN/FMI	4375/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When supply module (pump motor) shows the drive instruction. 2. PWM signal wire VB short circuit is detected in supply module (pump motor) drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

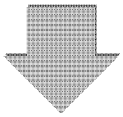
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

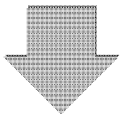
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of supply module (pump motor) PWM signal wire
3. Supply module failure
   - Power short circuit of supply module internal circuit
   - Urea water leakage inside supply module

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P909* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P909* for details on the diagnosis method and procedure.

P208C: Supply module (pump motor) PWM signal wire GND short circuit

P code	P208C	Name	Supply module (pump motor) PWM signal wire GND short circuit
SPN/FMI	4375/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Not during the temperature measurement of supply module. 2. PWM signal wire GND short circuit is detected for 8 seconds in supply module (pump motor) drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

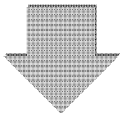
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

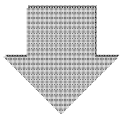
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Supply module (pump motor) PWM signal wire GND short circuit
3. Supply module failure
   - Supply module internal circuit GND short circuit
   - Urea water leakage inside supply module

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P909* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P909* for details on the diagnosis method and procedure.

P208A: Supply module (pump motor) PWM signal wire disconnection

P code	P208A	Name	Supply module (pump motor) PWM signal wire disconnection
SPN/FMI	4375/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Not during the temperature measurement of supply module 2. PWM signal wire, high side or low side disconnection is detected in supply module (pump motor) drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

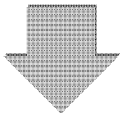
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

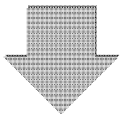
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Supply module (pump motor) PWM signal wire disconnection
   - Disconnection in supply module (pump motor) power supply wire
   - Supply module (pump motor) GND wire disconnection
3. Supply module failure
   - Supply module internal circuit disconnection

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P909* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P909* for details on the diagnosis method and procedure.

P150D: Supply module (pump motor) power stage temperature rise error

P code	P150D	Name	Supply module (pump motor) power stage temperature rise error
SPN/FMI	4375/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When supply module (pump motor) shows the drive instruction. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

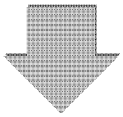
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

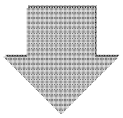
1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Supply module failure
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P913* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P913* for details on the diagnosis method and procedure.

P151F: Supply module (pump motor) pump motor drive error 1

P code	P151F	Name	Supply module (pump motor) pump motor drive error 1
SPN/FMI	4375/10		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When supply module (pump motor) shows the drive instruction. 2. When pump motor re-drive fails consecutively 5 times after pump motor speed biasing error is detected.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

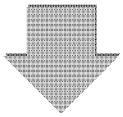
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

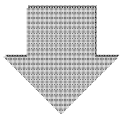
1. Supply module failure
   - Deviation of motor speed due to supply module (pump motor) failure
   - Supply module internal circuit failure
2. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P913* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P913* for details on the diagnosis method and procedure.

P208B: Supply module (pump motor) pump motor drive error 2

P code	P208B	Name	Supply module (pump motor) pump motor drive error 2
SPN/FMI	4375/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When temperature measurement of supply module is completed. 2. When completion signal of temperature measurement is not received from supply module.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

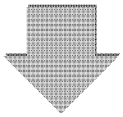
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection or GND short circuit of supply module (pump motor) PWM signal wire (*1)
   - Disconnection or GND short circuit of supply module (pump motor) power supply wire (*1) (*2)
   - Supply module (pump motor) GND wire disconnection (*1)
3. Supply module failure
   - Disconnection or GND short circuit of supply module internal circuit
   - Urea water leakage inside supply module

(*1) When this error is caused by PWM signal wire disconnection or GND short circuit, power supply wire disconnection, or GND wire disconnection, the followings may be detected at the same time: “P20AD: Not starting to measure temperature of supply module (pump motor)”, or “P152F: Supply module temperature information PWM cycle error”.

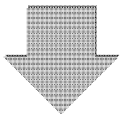
(*2) When this error is caused by power supply wire GND short circuit, “P2670: Supply module (reverting valve) H side GND short circuit” may be detected at the same time.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P913* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P913* for details on the diagnosis method and procedure.

P20AD: Not starting to measure temperature of supply module (pump motor)

P code	P20AD	Name	Not starting to measure temperature of supply module (pump motor)
SPN/FMI	523618/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • When temperature measurement of supply module is started • Battery voltage is within normal range 2. When supply module does not respond to the start signal of temperature measurement.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

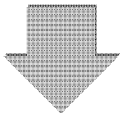
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection, power short circuit, or GND short circuit of supply module (pump motor) PWM signal wire (*1) (*2)
   - Supply module (pump motor) power supply wire disconnection (*1)
   - Supply module (pump motor) GND wire disconnection (*1)
3. Supply module failure
   - Disconnection, power short circuit, or GND short circuit of supply module internal circuit
   - Urea water leakage inside supply module

(*1) When this error is caused by PWM signal wire disconnection or GND disconnection, power supply wire disconnection, or GND wire disconnection, the followings may be detected at the same time: “P208B: Supply module (pump motor) pump motor drive error 2”, or “P152F: Supply module temperature information PWM cycle error”.

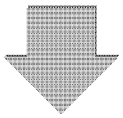
(*2) When this error is caused by power short circuit of PWM signal wire, “P152F: Supply module temperature information PWM cycle error” may be detected at the same time.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P909* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P909* for details on the diagnosis method and procedure.

P152F: Supply module temperature information PWM cycle error

P code	P152F	Name	Supply module temperature information PWM cycle error
SPN/FMI	523614/8		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • While measuring the temperature of supply module • Battery voltage is within normal range 2. When PWM signal cycle of temperature signal received from supply module exceeds a specified range.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

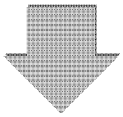
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection, power short circuit, or GND short circuit of supply module (pump motor) PWM signal wire (*1) (*2)
   - Supply module (pump motor) power supply wire disconnection (*1)
   - Supply module (pump motor) GND wire disconnection (*1)
3. Supply module failure
   - Disconnection, power short circuit, or GND short circuit of supply module internal circuit
   - Supply module internal circuit failure
   - Urea water leakage inside supply module

(*1) When this error is caused by PWM signal wire disconnection or GND disconnection, power supply wire disconnection, or GND wire disconnection, the followings may be detected at the same time: “P208B: Supply module (pump motor) pump motor drive error 2”, or “P20AD: Not starting to measure temperature of supply module (pump motor)”.

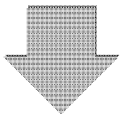
(*2) When this error is caused by PWM signal wire power short circuit, “P20AD: Not starting to measure temperature of supply module (pump motor)” may be detected at the same time.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P918* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P918* for details on the diagnosis method and procedure.

P152E: Supply module temperature information PWM signal error

P code	P152E	Name	Supply module temperature information PWM signal error
SPN/FMI	523615/8		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • While measuring the temperature of supply module • Battery voltage is within normal range 2. When the PWM communication of the temperature signal received from the supply module becomes abnormal.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

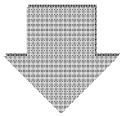
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

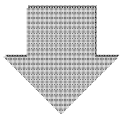
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Intermittent disconnection of supply module PWM signal wire
3. Supply module failure
   • Supply module internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P918* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P918* for details on the diagnosis method and procedure.

P1530: Supply module (supply module temperature sensor) fault value for temperature information duty value received

P code	P1530	Name	Supply module (supply module temperature sensor) fault value for temperature information duty value received
SPN/FMI	523616/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • While measuring the temperature of supply module • Battery voltage is within normal range 2. When supply module temperature received from supply module becomes an invalid value.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

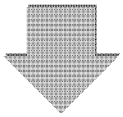
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

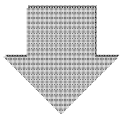
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Intermittent disconnection of supply module PWM signal wire
3. Supply module failure
   • Supply module internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P922* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P922* for details on the diagnosis method and procedure.

P1531: Supply module (supply module temperature sensor) invalid value for temperature information duty value received

P code	P1531	Name	Supply module (supply module temperature sensor) invalid value for temperature information duty value received
SPN/FMI	523617/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • While measuring the temperature of supply module • Battery voltage is within normal range 2. When supply module temperature received from supply module becomes an invalid value.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

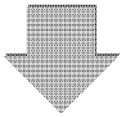
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

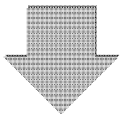
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Intermittent disconnection of supply module PWM signal wire
3. Supply module failure
   • Supply module internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P922* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P922* for details on the diagnosis method and procedure.

P152B: Supply module (supply module temperature sensor) detected value error

P code	P152B	Name	Supply module (supply module temperature sensor) detected value error
SPN/FMI	523611/1		

● Purpose of DTC detection

Two temperature sensors are built-in to the supply module (supply module temperature sensor and supply module heater temperature sensor). Although the supply module heater is energized, when the supply module temperature does not rise, this error is detected. This detects the error from the supply module temperature sensor.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Energization ON to the supply module heater (Defrosting supply module or checking heater) • Cooling water temperature is 55 °C or higher • Supply module temperature is lower than 60 °C when the key switch is turned ON • Supply module heater temperature is lower than 60 °C when the key switch is turned ON • No errors in the supply module heater • No errors in the supply module temperature sensor • No errors in the supply module heater temperature sensor • Not starting to measure temperature of supply module (pump motor) is not occurring • Supply module temperature information PWM cycle error is not occurring • Supply module temperature information PWM signal error is not occurring • No errors in the cooling water temperature sensor 2. Supply module temperature rises not more than 3 °C in 500 seconds, and supply module heater temperature rises 3 °C or more in 500 seconds.	• Supply module • DCU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Supply module (supply module temperature sensor) failure
2. Supply module (supply module heater) failure

● See Chapter 3 “Actuator related” for diagnosis method and corrective action.

P1544: Supply module (supply module temperature sensor) detected value error (at cold start check)

P code	P1544	Name	Supply module (supply module temperature sensor) detected value error (at cold start check)
SPN/FMI	523611/10		

● Purpose of DTC detection

Two temperature sensors are built-in to the supply module (supply module temperature sensor and supply module heater temperature sensor). When the difference between the supply module temperature and the fresh air temperature at engine stop (cold state) is large, this error is detected. This detects the error from the supply module temperature sensor.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Enegization OFF to supply module heater • Intake manifold temperature, exhaust manifold temperature, coolant temperature, and intake air temperature are all 40 °C or lower • Difference from the intake manifold temperature, exhaust manifold temperature, coolant temperature, and intake air temperature are all within ± 5 °C • 12 seconds have elapsed after key switch ON • Previous operating state was completely warmed up (Operates for 900 seconds at water temperature 60 °C or higher) • No errors in the supply module temperature sensor • No errors in the supply module heater temperature sensor • Supply module (supply module heater) H side GND short circuit is not occurring • Not starting to measure temperature of supply module (pump motor) is not occurring • Supply module temperature information PWM cycle error is not occurring • Supply module temperature information PWM signal error is not occurring • No errors in the SCR catalyst temperature sensor • No errors in the cooling water temperature sensor • No errors in the fresh air temperature sensor 2. The difference between the supply module heater temperature when the key switch is turned ON and the fresh air temperature is out of ± 15 °C.	• Supply module • DCU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Supply module (supply module temperature sensor) failure
2. Supply module (supply module heater) failure

● See Chapter 3 “Actuator related” for diagnosis method and corrective action.

P20A3: Supply module (reverting valve) L side VB short circuit

P code	P20A3	Name	Supply module (reverting valve) L side VB short circuit
SPN/FMI	523600/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to reverting valve. 2. Low side VB short circuit is detected in the reverting valve drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

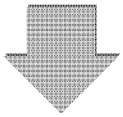
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

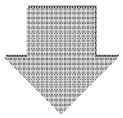
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of reverting valve low side output
3. Supply module failure
   - Power short circuit of supply module internal circuit
   - Urea water leakage inside supply module

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P934* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (reverting valve) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (reverting valve) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (reverting valve). • Check the conduction of the wire-harness. *See Chapter 3 *P934* for details on the diagnosis method and procedure.

P20A2: Supply module (reverting valve) L side GND short circuit

P code	P20A2	Name	Supply module (reverting valve) L side GND short circuit
SPN/FMI	523600/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization OFF to reverting valve. 2. GND short circuit on the low side is detected in the reverting valve drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

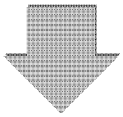
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

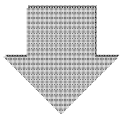
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of reverting valve low side output
3. Supply module failure
   - Supply module internal circuit GND short circuit
   - Urea water leakage inside supply module

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P934* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (reverting valve) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (reverting valve) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (reverting valve). • Check the conduction of the wire-harness. *See Chapter 3 *P934* for details on the diagnosis method and procedure.

P20A0: Supply module (reverting valve) disconnection

P code	P20A0	Name	Supply module (reverting valve) disconnection
SPN/FMI	523600/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Enegization OFF to reverting valve 2. Disconnection on the high side or low side is detected in the reverting valve drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

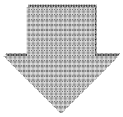
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • The suck-back of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

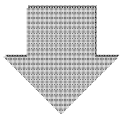
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of reverting valve high side output
   - Disconnection of reverting valve low side output
3. Supply module failure
   - Supply module internal circuit disconnection

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P938* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (reverting valve) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (reverting valve) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (reverting valve). • Check the conduction of the wire-harness. *See Chapter 3 *P938* for details on the diagnosis method and procedure.

P150E: Supply module (reverting valve) power stage temperature rise error

P code	P150E	Name	Supply module (reverting valve) power stage temperature rise error
SPN/FMI	523599/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

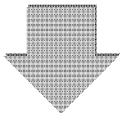
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • The suck-back of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

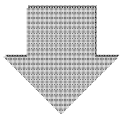
1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Supply module failure
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P938* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (reverting valve) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (reverting valve) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (reverting valve). • Check the conduction of the wire-harness. *See Chapter 3 *P938* for details on the diagnosis method and procedure.

P26E9: Supply module (supply module heater) H side VB short circuit

P code	P26E9	Name	Supply module (supply module heater) H side VB short circuit
SPN/FMI	523556/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During the DCU after-run. 2. VB short circuit on the high side is detected in supply module heater drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

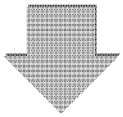
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

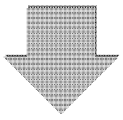
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of supply module heater high side output
   - Power short circuit of supply module heater low side output
3. Supply module failure
   - Power short circuit of supply module internal circuit
   - Urea water leakage inside supply module

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P943* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (supply module heater) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (supply module heater) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (supply module heater). • Check the conduction of the wire-harness. *See Chapter 3 *P943* for details on the diagnosis method and procedure.

P26E8: Supply module (supply module heater) H side GND short circuit

P code	P26E8	Name	Supply module (supply module heater) H side GND short circuit
SPN/FMI	523556/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. GND short circuit on the high side is detected in supply module heater drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

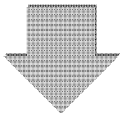
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of supply module heater high side output (*1)
3. Supply module failure
   - Supply module internal circuit GND short circuit
   - Heater short circuit of supply module internal circuit
   - Urea water leakage inside supply module

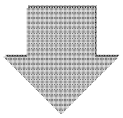
(*1) When this error occurs by GND short circuit of high side output during the defrosting control of supply module, there is a case that “P208B: Supply module (pump motor) pump motor drive error 2” may be detected.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P948* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (supply module heater) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (supply module heater) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (supply module heater). • Check the conduction of the wire-harness. *See Chapter 3 *P948* for details on the diagnosis method and procedure.

P20C8: Supply module (supply module heater) L side VB short circuit

P code	P20C8	Name	Supply module (supply module heater) L side VB short circuit
SPN/FMI	523593/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to supply module heater. 2. VB short circuit of the low side is detected in supply module heater drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

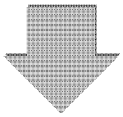
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of supply module heater low side output (*1)
3. Supply module failure
   - Power short circuit of supply module internal circuit
   - Urea water leakage inside supply module

(*1) When this error occurs by power short circuit of low side output during the defrosting control of supply module, there is a case that “P208B: Supply module (pump motor) pump motor drive error 2” may be detected.

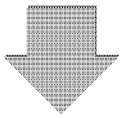
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, “P1506: SCR system forced termination” is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P948* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (supply module heater) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (supply module heater) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (supply module heater). • Check the conduction of the wire-harness. *See Chapter 3 *P948* for details on the diagnosis method and procedure.

P1773: Supply module (supply module heater) L side GND short circuit

P code	P1773	Name	Supply module (supply module heater) L side GND short circuit
SPN/FMI	523556/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Enegization ON to supply module heater. 2. GND short circuit on the low side is detected in supply module heater drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

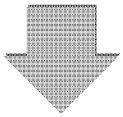
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

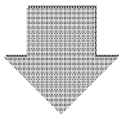
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of supply module heater low side output
3. Supply module failure
   - Supply module internal circuit GND short circuit
   - Heater short circuit of supply module internal circuit
   - Urea water leakage inside supply module
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P948* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (supply module heater) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (supply module heater) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (supply module heater). • Check the conduction of the wire-harness. *See Chapter 3 *P948* for details on the diagnosis method and procedure.

P20C5: Supply module (supply module heater) disconnection

P code	P20C5	Name	Supply module (supply module heater) disconnection
SPN/FMI	523556/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Disconnection of the high side or low side is detected in supply module heater drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

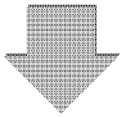
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of supply module heater high side output (*1)
   - Disconnection or GND short circuit of supply module heater low side output (*1)
3. Supply module failure
   - Disconnection or GND short circuit of supply module internal circuit
   - Urea water leakage inside supply module

(*1) When this error occurs by high side output disconnection, low side output disconnection or GND short circuit during the defrosting control of supply module, there is a case that “P208B: Supply module (pump motor) pump motor drive error 2” may be detected.

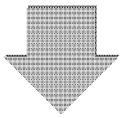
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, “P1506: SCR system forced termination” is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P948* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (supply module heater) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (supply module heater) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (supply module heater). • Check the conduction of the wire-harness. *See Chapter 3 *P948* for details on the diagnosis method and procedure.

P150B: Supply module (supply module heater) power stage temperature rise error

P code	P150B	Name	Supply module (supply module heater) power stage temperature rise error
SPN/FMI	523610/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

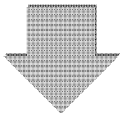
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Supply module failure
4. DCU internal circuit failure

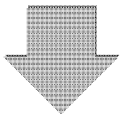
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P943* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (supply module heater) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (supply module heater) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (supply module heater). • Check the conduction of the wire-harness. *See Chapter 3 *P943* for details on the diagnosis method and procedure.

P20B6: Supply module (supply module heater) detected value error

P code	P20B6	Name	Supply module (supply module heater) detected value error
SPN/FMI	523556/10		

● Purpose of DTC detection

Two temperature sensors are built-in to the supply module (supply module temperature sensor and supply module heater temperature sensor). Although the supply module heater is energized, when both the supply module temperature and the supply module heater temperature do not rise, this error is detected. This detects the error from the supply module heater.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Energization ON to the supply module heater (Defrosting supply module or checking heater) • Cooling water temperature is 55 °C or higher • Supply module temperature is lower than 60 °C when the key switch is turned ON • Supply module heater temperature is lower than 60 °C when the key switch is turned ON • No error related to the supply module has occurred • No errors in the cooling water temperature sensor 2. Supply module temperature rises not more than 3 °C in 500 seconds, and supply module heater temperature rises not more than 3 °C in 500 seconds.	• Supply module • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Supply module failure

● See Chapter 3 “Actuator related” for diagnosis method and corrective action.

P152C: Supply module (supply module heater temperature sensor) fault value for temperature information duty value received

P code	P152C	Name	Supply module (supply module heater temperature sensor) fault value for temperature information duty value received
SPN/FMI	523612/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • While measuring the temperature of supply module • Battery voltage is within normal range 2. When supply module heater temperature received from supply module becomes an invalid value.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

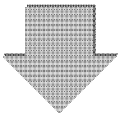
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

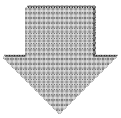
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Intermittent disconnection of supply module PWM signal wire
3. Supply module failure
   • Supply module internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P922* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P922* for details on the diagnosis method and procedure.

P152D: Supply module (supply module heater temperature sensor) invalid value for temperature information duty value received

P code	P152D	Name	Supply module (supply module heater temperature sensor) invalid value for temperature information duty value received
SPN/FMI	523613/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • While measuring the temperature of supply module • Battery voltage is within normal range 2. When supply module heater temperature received from supply module becomes an invalid value.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

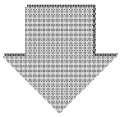
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

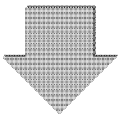
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Intermittent disconnection of supply module PWM signal wire
3. Supply module failure
   • Supply module internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P922* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the supply module (pump motor) wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P922* for details on the diagnosis method and procedure.

P152A: Supply module (supply module heater temperature sensor) detected value error

P code	P152A	Name	Supply module (supply module heater temperature sensor) detected value error
SPN/FMI	523610/1		

● Purpose of DTC detection

Two temperature sensors are built-in to the supply module (supply module temperature sensor and supply module heater temperature sensor). Although the supply module heater is energized, when the supply module temperature does not rise, this error is detected. This detects the error from the supply module heater temperature sensor.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Energization ON to the supply module heater (Defrosting supply module or checking heater) • Cooling water temperature is 55 °C or higher • Supply module temperature is lower than 60 °C when the key switch is turned ON • Supply module heater temperature is lower than 60 °C when the key switch is turned ON • No error related to the supply module has occurred • No errors in the cooling water temperature sensor 2. Supply module temperature rises 3 °C or more in 500 seconds, and supply module heater temperature rises not more than 3 °C in 500 seconds	• Supply module • DCU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Supply module (supply module heater temperature sensor) failure
2. Supply module (supply module heater) failure

● See Chapter 3 “Actuator related” for diagnosis method and corrective action.

P1543: Supply module (supply module heater temperature sensor) detected value error (at cold start check)

P code	P1543	Name	Supply module (supply module heater temperature sensor) detected value error (at cold start check)
SPN/FMI	523610/10		

● Purpose of DTC detection

Two temperature sensors are built-in to the supply module (supply module temperature sensor and supply module heater temperature sensor). When the difference between the supply module heater temperature and the fresh air temperature at engine stop (cold state) is large, this error is detected. This detects the error from the supply module heater temperature sensor.

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Enegization OFF to supply module heater • Intake manifold temperature, exhaust manifold temperature, coolant temperature, and intake air temperature are all 40 °C or lower • Difference from the intake manifold temperature, exhaust manifold temperature, coolant temperature, and intake air temperature are all within ± 5 °C • 12 seconds have elapsed after key switch ON • Previous operating state was completely warmed up (Operates for 900 seconds at water temperature 60 °C or higher) • No errors in the supply module temperature sensor • No errors in the supply module heater temperature sensor • Supply module (supply module heater) H side GND short circuit is not occurring • Not starting to measure temperature of supply module (pump motor) is not occurring • Supply module temperature information PWM cycle error is not occurring • Supply module temperature information PWM signal error is not occurring • No errors in the SCR catalyst temperature sensor • No errors in the cooling water temperature sensor • No errors in the fresh air temperature sensor 2. The difference between the supply module heater temperature and the fresh air temperature when the key switch is turned ON is out of 15 °C.	• Supply module • DCU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Supply module (supply module heater temperature sensor) failure
2. Supply module (supply module heater) failure

● See Chapter 3 “Actuator related” for diagnosis method and corrective action.

P2671: Supply module (reverting valve) H side VB short circuit

P code	P2671	Name	Supply module (reverting valve) H side VB short circuit
SPN/FMI	523554/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During the DCU after-run. 2. VB short circuit of high side is detected in the pump motor drive circuit and reverting valve drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

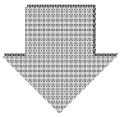
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of pump motor and reverting valve high side output
3. Supply module failure
   - Power short circuit of supply module internal circuit
   - Urea water leakage inside supply module

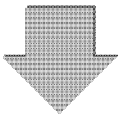
Note: Supply module high side and reverting valve high side are connected inside the DCU. When this error occurs, check both supply module and reverting valve.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P953* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) or supply module (reverting valve) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of supply module (pump motor) or supply module (reverting valve) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (reverting valve). • Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P953* for details on the diagnosis method and procedure.

P2670: Supply module (reverting valve) H side GND short circuit

P code	P2670	Name	Supply module (reverting valve) H side GND short circuit
SPN/FMI	523554/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. GND short circuit of high side is detected in the pump motor drive circuit and reverting valve drive circuit inside the DCU.	• Coupler • Wire-harness • Supply module • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

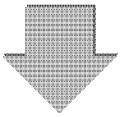
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of reverting valve high side output (*1)
3. Supply module failure
   - Supply module internal circuit GND short circuit
   - Urea water leakage inside supply module

(*1) When this error is caused by GND short circuit of high side output during supply module temperature measurement, there is a case that “P208B: Supply module (pump motor) pump motor drive error 2” may be detected.

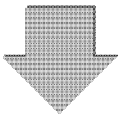
Note: Supply module high side and reverting valve high side are connected inside the DCU. When this error occurs, check both supply module and reverting valve.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P953* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the supply module (pump motor) or supply module (reverting valve) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of supply module (pump motor) or supply module (reverting valve) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of supply module (reverting valve). • Check the conduction of the wire-harness. • Check the DCU output voltage. • Check the output voltage of supply module (pump motor) PWM signal wire. *See Chapter 3 *P953* for details on the diagnosis method and procedure.

■ Heater relay/Urea water tank heating valve

P2686: Heater relay/Urea water tank heating valve H side VB short circuit

P code	P2686	Name	Heater relay/Urea water tank heating valve H side VB short circuit
SPN/FMI	523555/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During the DCU after-run. 2. VB short circuit is detected on the high side is detected in the heater relay drive circuit or urea water tank heating valve drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water tank heating valve • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

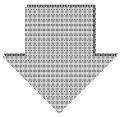
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of heater relay high side output
   - Power short circuit of heater relay low side output (*1)
   - Power short circuit of urea water tank heating valve high side output
   - Power short circuit of urea water tank heating valve low side output
3. Supply module failure

(*1) When this error is caused by power short circuit of low side output, “P21C4: Heater relay L side VB short circuit” may be detected at the same time.

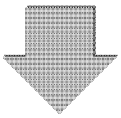
Note: Heater relay high side and urea water tank heating valve high side are connected inside the DCU. When this error occurs, check both heater relay and urea water tank heating valve.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P960* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water tank heating valve or heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of urea water tank heating valve or heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water tank heating valve. • Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P960* for details on the diagnosis method and procedure.

P2685: Heater relay/Urea water tank heating valve H side GND short circuit

P code	P2685	Name	Heater relay/Urea water tank heating valve H side GND short circuit
SPN/FMI	523555/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. GND short circuit is detected on the high side is detected in the heater relay drive circuit or urea water tank heating valve drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water tank heating valve • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

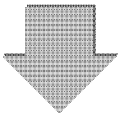
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - GND short circuit of heater relay high side output
   - GND short circuit of urea water tank heating valve high side output
3. Supply module failure

Note • If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

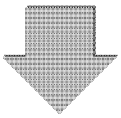
• Heater relay high side and urea water tank heating valve high side are connected inside the DCU. When this error occurs, check both heater relay and urea water tank heating valve.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P960* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water tank heating valve or heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of urea water tank heating valve or heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water tank heating valve. • Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P960* for details on the diagnosis method and procedure.

■ Urea water hose heater (back flow, pressure, suction)

P1510: Urea water hose heater (back flow, pressure, suction) H side VB short circuit/L side VB short circuit

P code	P1510	Name	Urea water hose heater (back flow, pressure, suction) H side VB short circuit/L side VB short circuit
SPN/FMI	523557/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. During the DCU after-run. 2. VB short circuit on the high side or low side is detected in the urea water hose heater (back flow, pressure, suction) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (back flow) • Urea water hose heater (pressure) • Urea water hose heater (suction) • Heater relay • Urea water tank heating valve • DCU

● Actions when an error occurs

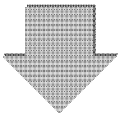
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

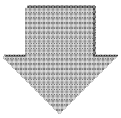
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Power short circuit of urea water hose heater (back flow, pressure, suction) high side output
   - Power short circuit of urea water hose heater (back flow, pressure, suction) low side output
   - Power short circuit of heater relay high side output
   - Power short circuit of urea water tank heating valve high side output
   - Power short circuit of urea water tank heating valve low side output
3. Supply module failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P966* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (back flow, pressure, suction) or heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (back flow, pressure, suction) or heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (back flow). • Check the resistance value of urea water hose heater (pressure). • Check the resistance value of urea water hose heater (suction). • Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P966* for details on the diagnosis method and procedure.

■ Urea water hose heater (back flow)

P20BC: Urea water hose heater (back flow) L side VB short circuit

P code	P20BC	Name	Urea water hose heater (back flow) L side VB short circuit
SPN/FMI	4343/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization ON to urea water hose heater (back flow) 2. VB short circuit on the low side is detected in urea water hoes heater (back flow) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (back flow) • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

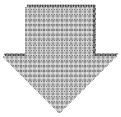
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Power short circuit of urea water hose heater (back flow) low side output (*1)
3. Urea water hose heater (back flow) failure
   • Coil short circuit of urea water hose heater (back flow) internal circuit

(*1) When this error is caused by power short circuit of low side output, “P1510: Urea water hose heater (back flow, pressure, suction) H side VB short circuit/L side VB short circuit” may be detected at the same time.

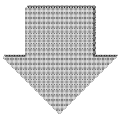
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, “P1506: SCR system forced termination” is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P971* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (back flow) for deformation or cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (back flow) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (back flow). • Check the conduction of the wire-harness. *See Chapter 3 *P971* for details on the diagnosis method and procedure.

P1775: Urea water hose heater (back flow) L side GND short circuit

P code	P1775	Name	Urea water hose heater (back flow) L side GND short circuit
SPN/FMI	4343/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization ON to urea water hose heater (back flow) 2. GND short circuit on the low side is detected in urea water hoes heater (back flow) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (back flow) • DCU

● Actions when an error occurs

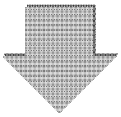
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

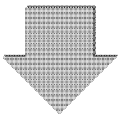
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • GND short circuit of urea water hose heater (back flow) low side output
3. Urea water hose heater (back flow) failure
   • Disconnection of coil
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P971* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (back flow) for deformation or cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (back flow) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (back flow). • Check the conduction of the wire-harness. *See Chapter 3 *P971* for details on the diagnosis method and procedure.

P20B9: Urea water hose heater (back flow) disconnection

P code	P20B9	Name	Urea water hose heater (back flow) disconnection
SPN/FMI	4343/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization OFF to urea water hose heater (back flow) 2. Disconnection on the high side or low side is detected in urea water hose heater (back flow) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (back flow) • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

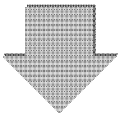
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of urea water hose heater (back flow) high side output
   - Disconnection or GND short circuit of urea water hose heater (back flow) low side output
   - Disconnection of heater relay high side output
   - Disconnection of heater relay low side output
3. Urea water hose heater (back flow) failure
   - Disconnection of urea water hose heater (back flow) internal circuit
4. Heater relay failure
   - Heater relay internal circuit disconnection

Note • Be sure to perform the failure diagnosis for "P21C2: Heater relay disconnection" first when this error is detected at the same time because the error may be caused due to heater relay open circuit caused by "P21C2: Heater relay disconnection".

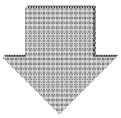
• If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P971* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (back flow) or heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (back flow) or heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (back flow). • Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P971* for details on the diagnosis method and procedure.

P1507: Urea water hose heater (back flow) power stage temperature rise error

P code	P1507	Name	Urea water hose heater (back flow) power stage temperature rise error
SPN/FMI	4343/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Urea water hose heater (back flow) • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

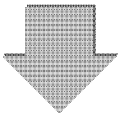
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Urea water hose heater (back flow) failure
4. DCU internal circuit failure

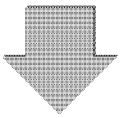
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P971* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (back flow) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (back flow) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (back flow). • Check the conduction of the wire-harness. *See Chapter 3 *P971* for details on the diagnosis method and procedure.

■ Urea water hose heater (pressure)

P20C0: Urea water hose heater (pressure) L side VB short circuit

P code	P20C0	Name	Urea water hose heater (pressure) L side VB short circuit
SPN/FMI	4341/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization ON to urea water hose heater (pressure) 2. VB short circuit on the low side is detected in urea water hoes heater (pressure) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (pressure) • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

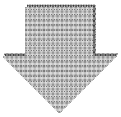
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Power short circuit of urea water hose heater (pressure) low side output (*1)
3. Urea water hose heater (pressure) failure
   • Coil short circuit of urea water hose heater (pressure) internal circuit

(*1) When this error is caused by power short circuit of low side output, “P1510: Urea water hose heater (back flow, pressure, suction) H side VB short circuit/L side VB short circuit” may be detected at the same time.

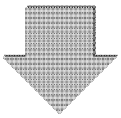
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, “P1506: SCR system forced termination” is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P977* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (pressure) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (pressure) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (pressure). • Check the conduction of the wire-harness. *See Chapter 3 *P977* for details on the diagnosis method and procedure.

P1774: Urea water hose heater (pressure) L side GND short circuit

P code	P1774	Name	Urea water hose heater (pressure) L side GND short circuit
SPN/FMI	4341/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization ON to urea water hose heater (pressure) 2. GND short circuit on the low side is detected in urea water hoes heater (pressure) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (pressure) • DCU

● Actions when an error occurs

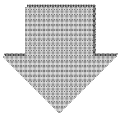
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

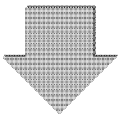
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • GND short circuit of urea water hose heater (pressure) low side output
3. Urea water hose heater (pressure) failure
   • Coil short circuit of urea water hose heater (pressure) internal circuit
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P977* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (pressure) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (pressure) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (pressure). • Check the conduction of the wire-harness. *See Chapter 3 *P977* for details on the diagnosis method and procedure.

P20BD: Urea water hose heater (pressure) disconnection

P code	P20BD	Name	Urea water hose heater (pressure) disconnection
SPN/FMI	4341/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization OFF to urea water hose heater (pressure) 2. Disconnection on the high side or low side is detected in urea water hose heater (pressure) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (pressure) • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

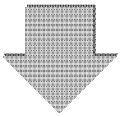
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of urea water hose heater (pressure) high side output
   - Disconnection or GND short circuit of urea water hose heater (pressure) low side output
   - Disconnection of heater relay high side output
   - Disconnection of heater relay low side output
3. Urea water hose heater (pressure) failure
   - Disconnection of urea water hose heater (pressure) internal circuit
4. Heater relay failure
   - Heater relay internal circuit disconnection

Note • Be sure to perform the failure diagnosis for "P21C2: Heater relay disconnection" first when this error is detected at the same time because the error may be caused due to heater relay open circuit caused by "P21C2: Heater relay disconnection".

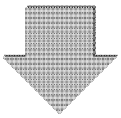
• If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P977* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (pressure) or heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (pressure) or heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (pressure). • Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P977* for details on the diagnosis method and procedure.

P1508: Urea water hose heater (pressure) power stage temperature rise error

P code	P1508	Name	Urea water hose heater (pressure) power stage temperature rise error
SPN/FMI	4341/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Urea water hose heater (pressure) • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

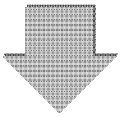
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Urea water hose heater (pressure) failure
4. DCU internal circuit failure

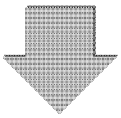
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P977* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (pressure) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (pressure) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (pressure). • Check the conduction of the wire-harness. *See Chapter 3 *P977* for details on the diagnosis method and procedure.

■ Urea water hose heater (suction)

P20C4: Urea water hose heater (suction) L side VB short circuit

P code	P20C4	Name	Urea water hose heater (suction) L side VB short circuit
SPN/FMI	4345/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization ON to urea water hose heater (suction) 2. VB short circuit on the low side is detected in urea water hoes heater (suction) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (suction) • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

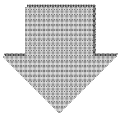
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Power short circuit of urea water hose heater (suction) low side output (*1)
3. Urea water hose heater (suction) failure
   • Coil short circuit of urea water hose heater (suction) internal circuit

(*1) When this error is caused by power short circuit of low side output, “P1510: Urea water hose heater (back flow, pressure, suction) H side VB short circuit/L side VB short circuit” may be detected at the same time.

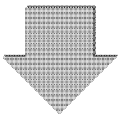
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, “P1506: SCR system forced termination” is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P983* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (suction) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (suction) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (suction). • Check the conduction of the wire-harness. *See Chapter 3 *P983* for details on the diagnosis method and procedure.

P1776: Urea water hose heater (suction) L side GND short circuit

P code	P1776	Name	Urea water hose heater (suction) L side GND short circuit
SPN/FMI	4345/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization ON to urea water hose heater (suction) 2. GND short circuit on the low side is detected in urea water hoes heater (suction) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (suction) • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

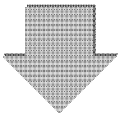
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • GND short circuit of urea water hose heater (suction) low side output
3. Urea water hose heater (suction) failure
   • Coil short circuit of urea water hose heater (suction) internal circuit
4. DCU internal circuit failure

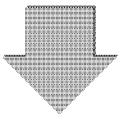
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P983* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (suction) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (suction) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (suction). • Check the conduction of the wire-harness. *See Chapter 3 *P983* for details on the diagnosis method and procedure.

P20C1: Urea water hose heater (suction) disconnection

P code	P20C1	Name	Urea water hose heater (suction) disconnection
SPN/FMI	4345/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization OFF to urea water hose heater (suction) 2. Disconnection on the high side or low side is detected in urea water hose heater (suction) drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water hose heater (suction) • Heater relay • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

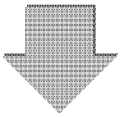
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of urea water hose heater (suction) high side output
   - Disconnection or GND short circuit of urea water hose heater (suction) low side output
   - Disconnection of heater relay high side output
   - Disconnection of heater relay low side output
3. Urea water hose heater (suction) failure
   - Disconnection of urea water hose heater (suction) internal circuit
4. Heater relay failure
   - Heater relay internal circuit disconnection

Note • *Be sure to perform the failure diagnosis for "P21C2: Heater relay disconnection" first when this error is detected at the same time because the error may be caused due to heater relay open circuit caused by "P21C2: Heater relay disconnection".*

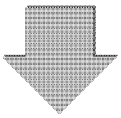
• *If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.*

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P983* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (suction) or heater relay for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (suction) or heater relay is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (suction). • Check the resistance value of heater relay. • Check the conduction of the wire-harness. *See Chapter 3 *P983* for details on the diagnosis method and procedure.

P150A: Urea water hose heater (suction) power stage temperature rise error

P code	P150A	Name	Urea water hose heater (suction) power stage temperature rise error
SPN/FMI	4345/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Urea water hose heater (suction) • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

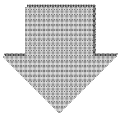
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Urea water hose heater (suction) failure
4. DCU internal circuit failure

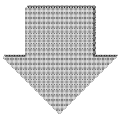
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P983* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water hose heater (suction) for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the urea water hose heater (suction) is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water hose heater (suction). • Check the conduction of the wire-harness. *See Chapter 3 *P983* for details on the diagnosis method and procedure.

■ Urea water tank heating valve

P202C: Urea water tank heating valve L side VB short circuit

P code	P202C	Name	Urea water tank heating valve L side VB short circuit
SPN/FMI	523594/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Energization ON to urea water tank heating valve 2. Low side VB short circuit is detected in the urea water tank heating valve drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water tank heating valve • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

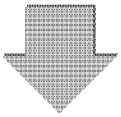
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Power short circuit of urea water tank heating valve low side output
3. Urea water tank heating valve failure
   • Coil short circuit of urea water tank heating valve internal circuit

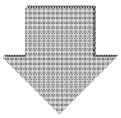
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P989* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water tank heating valve for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of urea water tank heating valve is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water tank heating valve. • Check the conduction of the wire-harness. *See Chapter 3 *P989* for details on the diagnosis method and procedure.

P202B: Urea water tank heating valve L side GND short circuit

P code	P202B	Name	Urea water tank heating valve L side GND short circuit
SPN/FMI	5137/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Enegization OFF to urea water tank heating valve 2. Low side GND short circuit is detected in the urea water tank heating valve drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water tank heating valve • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

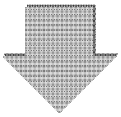
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • GND short circuit of urea water tank heating valve low side output
3. Urea water tank heating valve failure

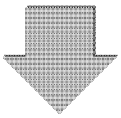
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P989* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water tank heating valve for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of urea water tank heating valve is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water tank heating valve. • Check the conduction of the wire-harness. *See Chapter 3 *P989* for details on the diagnosis method and procedure.

P202A: Urea water tank heating valve disconnection

P code	P202A	Name	Urea water tank heating valve disconnection
SPN/FMI	5137/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Energization ON to heater relay • Enegization OFF to urea water tank heating valve 2. Disconnection on the high side or low side is detected in heater relay drive circuit inside the DCU.	• Coupler • Wire-harness • Urea water tank heating valve • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

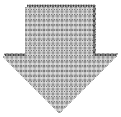
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection of urea water tank heating valve high side output
   - Disconnection of urea water tank heating valve low side output
3. Urea water tank heating valve failure
   - Disconnection of urea water tank heating valve internal circuit

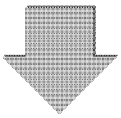
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P989* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water tank heating valve for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of urea water tank heating valve is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water tank heating valve. • Check the conduction of the wire-harness. *See Chapter 3 *P989* for details on the diagnosis method and procedure.

P150C: Urea water tank heating valve power stage temperature rise error

P code	P150C	Name	Urea water tank heating valve power stage temperature rise error
SPN/FMI	5137/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Energization ON to heater relay. 2. The element temperature of drive circuit inside the DCU is above the threshold value.	• Coupler • Wire-harness • Urea water tank heating valve • DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

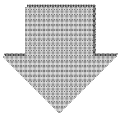
● Presumed cause of the failure or the error condition

1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. Urea water tank heating valve failure
4. DCU internal circuit failure

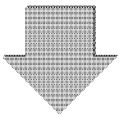
Note: If this error occurs when defrosting or heat insulating control is required at low temperature, "P1506: SCR system forced termination" is also detected. Be sure to perform the failure diagnosis for this error first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P989* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the urea water tank heating valve for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the wiring of urea water tank heating valve is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the resistance value of urea water tank heating valve. • Check the conduction of the wire-harness. *See Chapter 3 *P989* for details on the diagnosis method and procedure.

Communication related

■ CAN (engine side)

U029D: CAN reception timeout from SCR upstream NOx sensor

P code	U029D	Name	CAN reception timeout from SCR upstream NOx sensor
SPN/FMI	523562/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Battery voltage is within normal range 2. The CAN message from SCR upstream NOx sensor is not received for a given length of time.	• Coupler • Wire-harness • SCR upstream NOx sensor • NOx sensor relay • DCU

● Actions when an error occurs

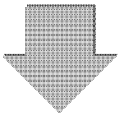
Fault mode	[Limited operation]: Switch from SCR upstream NOx value to model value. The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

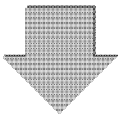
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection, power short circuit or GND short circuit of CAN (engine side) communication wire (high/low)
   - Disconnection of SCR upstream NOx sensor power supply wire
   - Disconnection or power short circuit of SCR upstream NOx sensor switching wire (upstream/downstream)
   - NOx sensor relay disconnection
3. SCR upstream temperature sensor failure
4. NOx sensor relay failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage. *See Chapter 3 *P994* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the CAN communication wiring for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the CAN communication wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the battery voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P994* for details on the diagnosis method and procedure.

U029E: CAN reception timeout from SCR downstream NOx sensor

P code	U029E	Name	CAN reception timeout from SCR downstream NOx sensor
SPN/FMI	523563/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Battery voltage is within normal range 2. The CAN message from SCR downstream NOx sensor is not received for a given length of time.	• Coupler • Wire-harness • SCR downstream NOx sensor • NOx sensor relay • DCU

● Actions when an error occurs

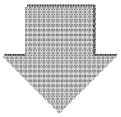
Fault mode	[Limited operation]: SCR downstream NOx value is 0 ppm (default value). The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

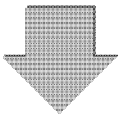
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   - Disconnection, power short circuit or GND short circuit of CAN (engine side) communication wire (high/low)
   - Disconnection of SCR downstream NOx sensor power supply wire
   - NOx sensor relay disconnection
3. SCR downstream temperature sensor failure
4. NOx sensor relay failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage. *See Chapter 3 *P997* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the CAN communication wiring for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the CAN communication wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the battery voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P997* for details on the diagnosis method and procedure.

U1607: CAN reception timeout from ECU

P code	U1607	Name	CAN reception timeout from ECU
SPN/FMI	523570/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • The key switch is turned ON • Battery voltage is within normal range 2. The CAN message for ECU is not received for a given length of time.	• Coupler • Wire-harness • ECU • DCU

● Actions when an error occurs

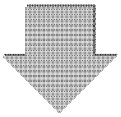
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%. • While continuing with the limited operation, the SCR system error Inducement level changes from Warning to Inducement 1 to Inducement 2, sequentially, according to the time of the engine operation. • EGR fully closes. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

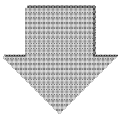
1. Poor connection of coupler
2. Wire-harness disconnection/short circuit
   - Disconnection, power short circuit or GND short circuit of CAN (engine side) communication wire (high/low)
   - Disconnection of ECU power supply wire

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage. *See Chapter 3 *P1000* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the CAN communication wiring for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the CAN communication wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the battery voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P1000* for details on the diagnosis method and procedure.

P1555: ECU system error (invalid fresh air temperature value is received)

P code	P1555	Name	ECU system error (invalid fresh air temperature value is received)
SPN/FMI	172/19		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. CAN reception timeout from ECU is not occurring. 2. When fresh air temperature sensor error is detected in ECU, and the invalid value for fresh air temperature is received from ECU.	• Fresh air temperature sensor

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

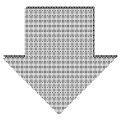
● Presumed cause of the failure or the error condition

1. Fresh air temperature sensor failure

Note: When this error is detected, error for fresh air temperature is also detected in ECU at the same time.
Be sure to perform the failure diagnosis for the respective part first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P1003* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P1003* for details on the diagnosis method and procedure.

P155C: ECU system error (FS action instruction 1 from ECU)

P code	P155C	Name	ECU system error (FS action instruction 1 from ECU)
SPN/FMI	523637/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON • Engine status is READY/CRANKING, and speed is not 0 (Dosing system state is neither INIT nor STANDBY) • Battery voltage is within normal range • CAN reception timeout from ECU is not occurring 2. When "FS action instruction 1" is received from ECU. (When the error that causes the Inducement of SCR system error is detected in ECU.)	• Engine system

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

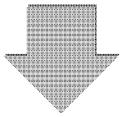
● Presumed cause of the failure or the error condition

1. Check the error item that caused the Inducement

Note: When this error is detected, error that causes the Inducement of SCR system error in ECU is also detected at the same time. Be sure to perform the failure diagnosis for the respective part first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P1004* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P1004* for details on the diagnosis method and procedure.

P1565: ECU system error (FS action instruction 2 from ECU)

P code	P1565	Name	ECU system error (FS action instruction 2 from ECU)
SPN/FMI	518339/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON • Engine status is READY/CRANKING, and speed is not 0 (Dosing system state is neither INIT nor STANDBY) • Battery voltage is within normal range • CAN reception timeout from ECU is not occurring 2. When “FS action instruction 2” is received from ECU. (When the error that causes the Inducement of EGR system error is detected in ECU.)	• Engine system

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced according to EGR system error Inducement level. a. When Inducement level is “Warning”, • The high idle speed and fuel injection quantity are not limited. b. When Inducement level is “Inducement 1”, • The maximum fuel injection quantity is limited to 75%. c. When Inducement level is “Inducement 2”, • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

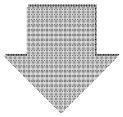
● Presumed cause of the failure or the error condition

1. Check the error item that caused the Inducement

Note: When this error is detected, error that causes the Inducement of EGR system error in ECU is also detected at the same time. Be sure to perform the failure diagnosis for the respective part first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P1004* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P1004* for details on the diagnosis method and procedure.

■ CAN (driven machine side)

U1610: Urea water quality sensor/Urea water tank temperature sensor (A1DEFI) reception timeout

P code	U1610	Name	Urea water quality sensor/Urea water tank temperature sensor (A1DEFI) reception timeout
SPN/FMI	523634/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Battery voltage is within normal range 2. The CAN message for A1DEFI from urea water quality sensor and urea water tank temperature sensor is not received for a given length of time.	• Coupler • Wire-harness • Urea water quality sensor • Urea water tank temperature sensor • DCU

● Actions when an error occurs

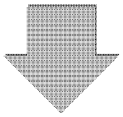
Fault mode	[Limited operation]: Urea water concentration is set to 32.5% (default value) and urea water tank temperature retains the previous value. The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

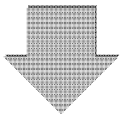
1. Poor connection of coupler
2. Wire-harness disconnection/short circuit
   - Disconnection, power short circuit or GND short circuit of CAN (driven machine side) communication wire (high/low)
   - Disconnection of controller power supply wire of urea water quality sensor/urea water tank temperature sensor
3. Failure of controller internal circuit of urea water quality sensor/urea water tank temperature sensor

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage. *See Chapter 3 *P1005* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the CAN communication wiring for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the CAN communication wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the battery voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P1005* for details on the diagnosis method and procedure.

U1611: Urea water tank temperature sensor/Urea water tank level sensor (AT1T1I) reception timeout

P code	U1611	Name	Urea water tank temperature sensor/Urea water tank level sensor (AT1T1I) reception timeout
SPN/FMI	523635/9		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Battery voltage is within normal range 2. The CAN message for AT1T1I from urea water tank temperature sensor and urea water tank level sensor is not received for a given length of time.	• Coupler • Wire-harness • Urea water tank temperature sensor • Urea water tank level sensor • DCU

● Actions when an error occurs

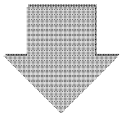
Fault mode	[Limited operation]: Urea water tank level is set to 50% (default value) and urea water tank temperature retains the previous value. The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

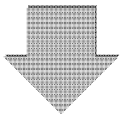
1. Poor connection of coupler
2. Wire-harness disconnection/short circuit
   - Disconnection, power short circuit or GND short circuit of CAN (driven machine side) communication wire (high/low)
   - Disconnection of controller power supply wire of urea water tank temperature sensor/urea water tank level sensor
3. Failure of controller internal circuit of urea water tank temperature sensor/urea water tank level sensor
4. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage. *See Chapter 3 *P1008* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the CAN communication wiring for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the CAN communication wiring is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the battery voltage. • Check the conduction of the wire-harness. *See Chapter 3 *P1008* for details on the diagnosis method and procedure.

Battery related

■ DCU supply voltage

P1512: DCU supply voltage error (voltage high 1)

P code	P1512	Name	DCU supply voltage error (voltage high 1)
SPN/FMI	523558/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Not during engine cranking • 2 seconds have elapsed after engine starting is complete 2. DCU supply voltage is higher than the threshold below for 10 seconds. • For 12 V specification: 16 V • For 24 V specification: 32 V	• Battery • Alternator • Wire-harness

● Actions when an error occurs

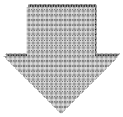
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

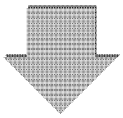
1. A battery of the wrong specification is used
2. Incorrect wiring of the battery
3. Alternator failure
4. Wiring failure of the wire-harness

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Using a circuit tester, check the battery voltage. • Check the engine charging equipment. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Make sure that the battery wiring is not disconnected or the wiring coating is not peeled.

P1514: DCU supply voltage error (voltage high 2)

P code	P1514	Name	DCU supply voltage error (voltage high 2)
SPN/FMI	523559/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Not during engine cranking • 2 seconds have elapsed after engine starting is complete 2. DCU supply voltage is higher than the threshold below. • For 12 V specification: 17 V • For 24 V specification: 33 V	• Battery • Alternator • Wire-harness

● Actions when an error occurs

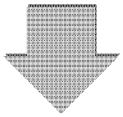
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

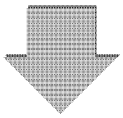
1. A battery of the wrong specification is used
2. Incorrect wiring of the battery
3. Alternator failure
4. Wiring failure of the wire-harness

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Using a circuit tester, check the battery voltage. • Check the engine charging equipment. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Make sure that the battery wiring is not disconnected or the wiring coating is not peeled.

P1511: DCU supply voltage error (voltage low 1)

P code	P1511	Name	DCU supply voltage error (voltage low 1)
SPN/FMI	523559/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Not during engine cranking • 2 seconds have elapsed after engine starting is complete 2. DCU supply voltage is lower than the threshold below. • For 12 V specification: 9 V • For 24 V specification: 18 V	• Battery • Alternator • Wire-harness

● Actions when an error occurs

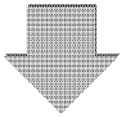
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

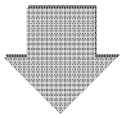
1. Battery with wrong specification uses
2. Incorrect wiring of the battery
3. Alternator failure
4. Wiring failure of the wire-harness

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Using a circuit tester, check the battery voltage. • Check the engine charging equipment. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Make sure that the battery wiring is not disconnected or the wiring coating is not peeled.

P1513: DCU supply voltage error (voltage low 2)

P code	P1513	Name	DCU supply voltage error (voltage low 2)
SPN/FMI	523558/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Not during engine cranking • 2 seconds have elapsed after engine starting is complete 2. DCU supply voltage is lower than the threshold below for 10 seconds. • For 12 V specification: 10 V • For 24 V specification: 20 V	• Battery • Alternator • Wire-harness

● Actions when an error occurs

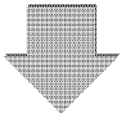
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

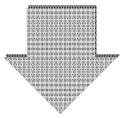
1. Battery with wrong specification uses
2. Incorrect wiring of the battery
3. Alternator failure
4. Wiring failure of the wire-harness

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the battery voltage.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Using a circuit tester, check the battery voltage. • Check the engine charging equipment. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Make sure that the battery wiring is not disconnected or the wiring coating is not peeled.

■ Main relay

P20EA: Main relay opens early

P code	P20EA	Name	Main relay opens early
SPN/FMI	523560/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Immediately after DCU power is turned ON. 2. Detects DCU power OFF twice in a row before after-run is completed.	• Coupler • Wire-harness • DCU

● Actions when an error occurs

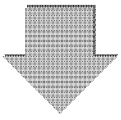
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

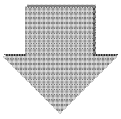
1. Poor connection of coupler
2. Wiring failure of the wire-harness
3. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Make sure that you can log in SMARTASSIST-DIRECT (SA-D) after the key switch is turned ON, and a specified time has passed. *See Chapter 3 *P1011* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Check the battery terminal for looseness. • Using a circuit tester, check the battery voltage. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Make sure that the battery wiring is not disconnected or the wiring coating is not peeled.

DCU internal related

P1600: EEPROM memory deletion error

P code	P1600	Name	EEPROM memory deletion error
SPN/FMI	523589/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When the page (sector) is switched. 2. EEPROM deletion error There are two pages in EEPROM and data is stored alternately to each page. When the first page is fully occupied with data, the data on the second page is deleted to write in. Alternatively, when the second page is fully occupied with data, then the data on the first page is deleted to secure space to write in. Error is detected when the data cannot be deleted when switching between the pages.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P160E: EEPROM memory reading error

P code	P160E	Name	EEPROM memory reading error
SPN/FMI	523590/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When accessing to read. 2. EEPROM reading error Judge errors by check sum for all EEPROM.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P160F: EEPROM memory writing error

P code	P160F	Name	EEPROM memory writing error
SPN/FMI	523591/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. When accessing to write. 2. EEPROM writing error This error occurs when wiring to single data is failed three times.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P1500: SPI communication error 1

P code	P1500	Name	SPI communication error 1
SPN/FMI	523577/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Key switch is turned ON for 5 seconds • Not during the engine cranking • 2 seconds have elapsed after engine starting is complete 2. When SPI communication error frequency between FC and MM inside the DCU exceeds the threshold value.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P1501: SPI communication error 2

P code	P1501	Name	SPI communication error 2
SPN/FMI	523578/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. When SPI communication error inside the DCU is detected.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P21CC: Supply 1 overvoltage error

P code	P21CC	Name	Supply 1 overvoltage error
SPN/FMI	523574/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The voltage supplied to the micro-controller is above the threshold value.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P21CB: Supply 1 low voltage error

P code	P21CB	Name	Supply 1 low voltage error
SPN/FMI	523574/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. The voltage supplied to the micro-controller is below the threshold value.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P1502: AD converter error 1

P code	P1502	Name	AD converter error 1
SPN/FMI	523579/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Immediately after DCU power is turned ON. 2. When initialization of AD converter is not completed within the specified time.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P1503: AD converter error 2

P code	P1503	Name	AD converter error 2
SPN/FMI	523580/12		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Immediately after DCU power is turned ON. 2. A/D conversion in all of AD converters is not completed within the specified time.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

■ DCU internal temperature sensor

P1517: DCU internal temperature sensor error (voltage high)

P code	P1517	Name	DCU internal temperature sensor error (voltage high)
SPN/FMI	523582/3		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Temperature sensor output inside the DCU is higher than threshold value.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

P1519: DCU internal temperature sensor error (voltage low)

P code	P1519	Name	DCU internal temperature sensor error (voltage low)
SPN/FMI	523582/4		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Temperature sensor output inside the DCU is lower than threshold value.	• DCU

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1015* for details on the diagnosis method and procedure.

■ Main relay

P20EB: Main relay sticking

P code	P20EB	Name	Main relay sticking
SPN/FMI	523560/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Immediately after DCU power is turned ON. 2. Even after DCU after-run is completed, and 70 ms have passed, main relay inside the DCU does not open.	• DCU

● Actions when an error occurs

Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

1. DCU internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Make sure that you can log in SMARTASSIST-DIRECT (SA-D) after the key switch is turned ON, and a specified time has passed. • Switch the DCU power from OFF to ON, and check the fault indication again. • If DTC is detected again, replace DCU. *See Chapter 3 *P1011* for details on the diagnosis method and procedure.

Contact input related

■ Key switch

P1561: Key switch disconnection

P code	P1561	Name	Key switch disconnection
SPN/FMI	523640/5		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. After turning the key switch OFF, engine speed is above 240 min^{-1} for 30 seconds.	• Coupler • Wire-harness • Key switch • DCU

● Actions when an error occurs

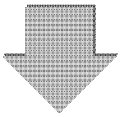
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	When ECU power OFF is detected, automatic reset occurs.
Remarks	

● Presumed cause of the failure or the error condition

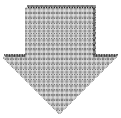
1. Poor connection of coupler
2. Wiring failure of the wire-harness
   • Disconnection or GND short circuit of the key switch wiring
3. Key switch failure
   • Disconnection or GND short circuit of the key switch internal circuit

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. *See Chapter 3 *P1017* for details on the diagnosis method and procedure.



2. Coupler/wiring check	• Before beginning your work, be sure to turn OFF the key switch, and turn OFF the DCU power. • Check the pin of the key switch for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed. • Make sure that the key switch is not disconnected or the wiring coating is not peeled.



3. Failure diagnosis	• Check the conduction of the key switch. • Check the conduction of the wire-harness. • Check the operation of the key switch. *See Chapter 3 *P1017* for details on the diagnosis method and procedure.

SCR control related

■ Urea water hose (back flow side)

P1533: Urea water hose (back flow side) pressure rise error

P code	P1533	Name	Urea water hose (back flow side) pressure rise error
SPN/FMI	523621/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Under clogging test when urea water pressure starts to rise (Dosing system sub-state is DETECTIONMODE) 2. Supply module pressure of 1070 kPa or above for 5 seconds is detected consecutively three times.	• Urea water hose system (back flow) • Supply module

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water hose (back flow) clogging
2. Urea water hose coupler (back flow) clogging
3. Supply module failure

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

■ Urea water hose (pressure side)

P1534: Urea water hose (pressure side) pressure rise error

P code	P1534	Name	Urea water hose (pressure side) pressure rise error
SPN/FMI	523622/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Under clogging test when urea water pressure starts to rise (Dosing system sub-state is DETECTIONMODE) 2. Supply module pressure not dropping to 850 kPa or below within 5 seconds is detected consecutively three times after dosing module valve opens.	• Urea water hose system (pressure) • Supply module • Dosing module

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water hose (pressure) clogging
2. Urea water hose coupler (pressure) clogging
3. Supply module failure
4. Dosing module clogging

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

■ Supply module

P20E9: Supply module (pump motor) pressure rise error 1

P code	P20E9	Name	Supply module (pump motor) pressure rise error 1
SPN/FMI	523619/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Defrosting of supply module is completed 2. Supply module pressure is more than 1250 kPa for 5 seconds.	• Urea water hose system (back flow) • Supply module

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water hose (back flow) clogging
2. Urea water hose coupler (back flow) clogging
3. Supply module failure

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

P1536: Supply module (pump motor) pressure rise error 2

P code	P1536	Name	Supply module (pump motor) pressure rise error 2
SPN/FMI	523626/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • During the urea water injection (Dosing system sub-state is METERINGCONTROL) 2. Supply module pressure is 1050 kPa or above for 20 seconds.	• Urea water hose system (back flow) • Supply module

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water hose (back flow) clogging
2. Urea water hose coupler (back flow) clogging
3. Supply module failure

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

P1532: Supply module (pump motor) pressure reduction failure

P code	P1532	Name	Supply module (pump motor) pressure reduction failure
SPN/FMI	523620/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • When sucking back the urea water (Dosing system state is PRESSUREREDUCTION) 2. Supply module pressure does not drop to 25 kPa or below within 25 seconds after starting to suck back the urea water.	• Urea water hose system (suction) • Supply module main filter • Supply module

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	The suck-back of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water hose (suction) clogging
2. Urea water hose coupler (suction) clogging
3. Supply module main filter clogging
4. Supply module failure

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

P1535: Supply module (reverting valve) failure

P code	P1535	Name	Supply module (reverting valve) failure
SPN/FMI	523624/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Under clogging test when urea water pressure starts to rise (Dosing system sub-state is DETECTIONMODE) 2. Supply module pressure does not drop to below 90 kPa within 30 seconds after energization ON to the reverting valve.	• Supply module

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops and the urea water suck back stops. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Supply module failure

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

P150F: Supply module (pump motor) pressure stability error

P code	P150F	Name	Supply module (pump motor) pressure stability error
SPN/FMI	523623/2		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Under clogging test when urea water pressure starts to rise (Dosing system sub-state is DETECTIONMODE) 2. Within the supply module pump pressure range between 850 kPa and 950 kPa, NODEFROST: detects a state where it does not continue for 327 seconds, once DFEFROST: detects a state where it does not continue for 327 seconds, 21 times in a row	• Urea water hose system (suction) • Urea water hose system (back flow) • Supply module main filter • Supply module

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water hose (suction) clogging
2. Urea water hose (back flow) clogging
3. Urea water hose coupler (suction) clogging
4. Urea water hose coupler (back flow) clogging
5. Supply module main filter clogging
6. Supply module failure

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

P1537: Supply module pressure drop error

P code	P1537	Name	Supply module pressure drop error
SPN/FMI	523627/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • Urea water tank level is above 2.5% • During the urea water injection (Dosing system sub-state is METERINGCONTROL) 2. Supply module pressure is below 750 kPa for 180 seconds.	• Urea water hose system (suction) • Urea water hose system (pressure) • Supply module main filter • Urea water tank • Supply module • Dosing module

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Urea water leakage from urea water hose (suction), clogging
2. Urea water leakage from urea water hose (pressure)
3. Urea water leakage from urea water hose coupler (suction), clogging
4. Urea water leakage from urea water hose coupler (pressure)
5. Supply module main filter clogging
6. Clogging of urea inlet in the urea water tank
7. Supply module failure
8. Urea water leakage from supply module
9. Urea water leakage from dosing module

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

P1538: Supply module urea water pressure rise failure

P code	P1538	Name	Supply module urea water pressure rise failure
SPN/FMI	523628/10		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • Battery voltage is within normal range • When the urea water pressure starts to rise (Dosing system sub-state is PRESSUREBUILDUP) 2. The condition where the supply module pressure does not rise to 800 kPa or above within 40 seconds after the urea water pressure starts to rise is detected consecutively 7 times.	• Urea water tank • Urea water hose (suction) • Urea water hose (pressure) • Supply module main filter • Supply module • Dosing module • Backflow line

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

1. Low urea water tank level
2. Urea water leakage from urea water hose (suction), clogging
3. Urea water leakage from urea water hose (pressure)
4. Urea water hose (back flow) clogging
5. Urea water hose coupler (back flow) clogging
6. Urea water leakage from urea water hose coupler (suction), clogging
7. Urea water leakage from urea water hose coupler (pressure)
8. Supply module main filter clogging
9. Clogging of urea inlet in the urea water tank
10. Supply module failure
11. Urea water leakage from supply module
12. Urea water leakage from dosing module

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

P204F: Supply module urea water suck-back failure

P code	P204F	Name	Supply module urea water sucking back failure
SPN/FMI	523625/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. Battery voltage is within normal range 2. This detects if urea water remains in the supply module.	• Presence or absence of power supply cut-off during after-run after key OFF • Simultaneously alarmed failure parts

● Actions when an error occurs

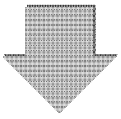
Fault mode	[Continuous operation]: The engine continues to operate without limitations after the error is detected.
Limited operation	No
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

● Presumed cause of the failure or the error condition

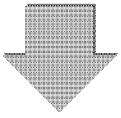
1. After stopping the engine last time, the DCU power was turned OFF before the urea water was sucked back.
2. Last time, an error which stops the suck-back of urea water occurred.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Make sure an error which stops the suck-back of urea water is not detected. *See Chapter 3 *P1052* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Check the battery terminal for looseness. • Using a circuit tester, check the battery voltage. • After a few moments, turn ON the key switch and check the fault indication again.



3. Wiring check	• Make sure that the battery wiring is not disconnected or the wiring coating is not peeled.

■ SCR system

P1520: Inefficient NOx cleaning

P code	P1520	Name	Inefficient NOx cleaning
SPN/FMI	523601/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • SCR upstream NOx sensor is valid (Receives the NOx sensor heater release order from the DCU, and the warm-up of the SCR upstream NOx sensor is completed) (*1) • SCR downstream NOx sensor is valid (Receives the NOx sensor heater release order from the DCU, and the warm-up of the SCR downstream NOx sensor is completed) (*1) • During the urea water injection • Urea water injection is not alternative mode • Not during DPF regeneration • 80 kPa ≤ atmospheric pressure • Integrated value of SCR upstream NOx flow exceeds the threshold value • Battery voltage is within normal range • No errors in the SCR upstream NOx sensor • No errors in the SCR downstream NOx sensor 2. NOx cleaning rate is below the threshold value. (*1) The warm-up normally completes after approximately 2 minutes from receiving the order from DCU.	• Urea water tank • Urea water hose system (suction) • Urea water hose system (pressure) • Urea water quality • Remaining amount of urea water • Supply module main filter • Supply module • Dosing module • SCR catalyst

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

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

1. SCR catalyst damage (pulling out)
2. Deterioration of SCR catalyst
3. Low urea water tank level
4. Urea water leakage from urea water hose (suction), clogging
5. Urea water leakage from urea water hose (pressure)
6. Urea water leakage from urea water hose coupler (suction), clogging
7. Urea water leakage from urea water hose coupler (pressure)
8. Supply module main filter clogging
9. Clogging of urea inlet in the urea water tank
10. Supply module failure
11. Urea water leakage from supply module
12. Urea water leakage from dosing module

● See Chapter 3 “SCR control related” for diagnosis method and corrective action.

P1506: SCR system forced termination

P code	P1506	Name	SCR system forced termination
SPN/FMI	523557/7		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Any of the following conditions is detected. • All of the following (a to c) are satisfied. a. When this error is detected, the error in any of the followings is also detected at the same time: supply module heater, urea water hose heater (back flow, pressure, and suction), heater relay, or urea water tank heating valve. b. Energization ON to urea water hose heater (pressure). c. SCR catalyst temperature is lower than 400 °C. • All of the following (d to f) are satisfied. d. When the transition in defrosting of urea water tank is made from completed defrosting to refreezing. e. During the urea water injection. (Dosing system sub-state is METERINGCONTROL.) f. SCR catalyst temperature is lower than 400 °C.	• Supply module • Heater relay • Urea water hose heater • Urea water tank heating valve

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Turn OFF the ECU once (wait until the after-run is completed) → turn it ON. Then the system automatically recovers if the preconditions are met and the detection conditions are not met.
Remarks	

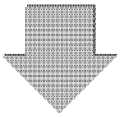
● Presumed cause of the failure or the error condition

1. Supply module (supply module heater) failure
2. Urea water hose heater (back flow, pressure, suction) failure
3. Urea water tank heating valve failure
4. Heater relay failure

Note: When this error is detected, the error in any of the followings is also detected at the same time: supply module (supply module heater), heater relay, urea water hose heater (back flow, pressure, and suction), or urea water tank heating valve. Be sure to perform the failure diagnosis for the respective part first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P1059* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P1059* for details on the diagnosis method and procedure.

P1553: SCR system error (Inducement 1)

P code	P1553	Name	SCR system error (Inducement 1)
SPN/FMI	523636/16		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Conditions for establishing Inducement1 when SCR system error occurs and becomes Inducement1 is explained in P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	The maximum fuel injection quantity is limited to 75%.
Reset criteria	When all errors that cause the Inducement of SCR system error are released, the fault mode is automatically released.
Remarks	

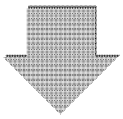
● Presumed cause of the failure or the error condition

1. Failure occurs in engine system or SCR system

Note: When this error is detected, error that causes the Inducement of SCR system error in ECU or DCU is also detected at the same time. Be sure to perform the failure diagnosis for the respective part first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P1059* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P1059* for details on the diagnosis method and procedure.

P1554: SCR system error (Inducement 2)

P code	P1554	Name	SCR system error (Inducement 2)
SPN/FMI	523636/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Conditions for establishing Inducement2 when SCR system error occurs and becomes Inducement2 is explained in P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%.
Reset criteria	When all errors that cause the Inducement of SCR system error are released, the fault mode is automatically released.
Remarks	

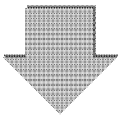
● Presumed cause of the failure or the error condition

1. Failure occurs in engine system or SCR system

Note: When this error is detected, other errors that cause the Inducement of SCR system error in ECU or DCU are also detected at the same time. Be sure to perform the failure diagnosis for the respective part first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P1059* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P1059* for details on the diagnosis method and procedure.

P1563: EGR system error (Inducement 1)

P code	P1563	Name	EGR system error (Inducement 1)
SPN/FMI	518289/16		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Conditions for establishing Inducement1 when EGR system error occurs and becomes Inducement1 is explained in P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	The maximum fuel injection quantity is limited to 75%.
Reset criteria	When all errors that cause the Inducement of EGR system error are released, the fault mode is automatically released.
Remarks	

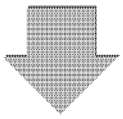
● Presumed cause of the failure or the error condition

1. Failure occurs in engine system or EGR system

Note: When this error is detected, error that causes the Inducement of EGR system error in ECU or DCU is also detected at the same time. Be sure to perform the failure diagnosis for the respective part first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P1060* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P1060* for details on the diagnosis method and procedure.

P1564: EGR system error (Inducement 2)

P code	P1564	Name	EGR system error (Inducement 2)
SPN/FMI	518289/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. Conditions for establishing Inducement2 when EGR system error occurs and becomes Inducement2 is explained in P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements].	• Simultaneously alarmed failure parts

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%.
Reset criteria	When all errors that cause the Inducement of EGR system error are released, the fault mode is automatically released.
Remarks	

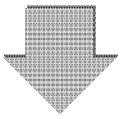
● Presumed cause of the failure or the error condition

1. Failure occurs in engine system or EGR system

Note: When this error is detected, other errors that cause the Inducement of EGR system error in ECU or DCU are also detected at the same time. Be sure to perform the failure diagnosis for the respective part first.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Switch the DCU power from OFF to ON, and check the fault indication again. *See Chapter 3 *P1060* for details on the diagnosis method and procedure.



2. Failure diagnosis	• Deal with failure that is occurring at the same time. *See Chapter 3 *P1060* for details on the diagnosis method and procedure.

Urea water related

■ Urea water tank level

P1549: Low urea water tank level (Inducement 1)

P code	P1549	Name	Low urea water tank level (Inducement 1)
SPN/FMI	1761/18		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. *1 Depends on the DCU application menu setting. [Standard] *1 • The urea water tank level is kept [*1]% or lower for 30 seconds [Option] *1 All of the followings are satisfied. • Urea water tank level is 0% or less for 30 seconds • Supply module pressure is more than 750 kPa	• Urea water tank • Urea water hose • Urea water tank level sensor • Remaining amount of urea water

● Actions when an error occurs

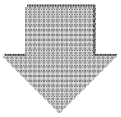
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The maximum fuel injection quantity is limited to 75%.
Reset criteria	When urea water tank level becomes 2.5% or more, the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

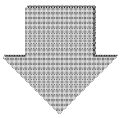
1. Decrease of the remaining in urea water tank
2. Contact error of urea water hose
3. Urea water tank level sensor system failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the urea water tank level. *See Chapter 3 *P1061* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Make sure that urea water is still in urea water tank. • Make sure that urea water tank is not damaged. • After a few moments, turn ON the key switch and check the fault indication again.



3. Urea water hose check	• Make sure that urea water hose is not removed or damaged.

P154A: Low urea water tank level (Inducement 2)

P code	P154A	Name	Low urea water tank level (Inducement 2)
SPN/FMI	1761/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. No prerequisite. 2. *1 Depends on the DCU application menu setting. [Option 1 (standard)] *1 • Urea water tank level is 0% or less for 30 seconds. [Option 2] *1 All of the followings are satisfied. • Urea water tank level is 0% or less for 30 seconds • Supply module pressure is less than 750 kPa	• Urea water tank • Urea water hose • Urea water tank level sensor • Remaining amount of urea water

● Actions when an error occurs

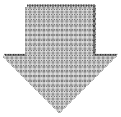
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• When sensor error occurs, engine power is reduced immediately. • The high idle speed is limited to the low idle speed. • The maximum fuel injection quantity is limited to 50%. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	When urea water tank level becomes 2.5% or more, the fault mode is automatically released.
Remarks	

● Presumed cause of the failure or the error condition

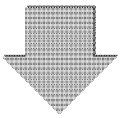
1. Decrease of the remaining in urea water tank
2. Contact error of urea water hose
3. Urea water tank level sensor failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the urea water tank level. *See Chapter 3 *P1061* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Make sure that urea water is still in urea water tank. • Make sure that urea water tank is not damaged. • After a few moments, turn ON the key switch and check the fault indication again.



3. Urea water hose check	• Make sure that urea water hose is not removed or damaged.

■ Urea water quality sensor

P154E: Urea water quality sensor concentration error (small deviation)

P code	P154E	Name	Urea water quality sensor concentration error (small deviation)
SPN/FMI	3516/1		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • Little fluctuation of urea water tank level • Urea water tank level is above the threshold value • Defrosting is completed • 180 seconds or more have passed since urea water refilling was detected • -5 °C ≤ urea water tank temperature ≤ 55 °C • A1DEFI reception timeout is not occurring • Urea water quality sensor is normal 2. Urea water quality sensor keeps on detecting urea water concentration error for 655 seconds.	• Urea water • Urea water tank • Urea water quality sensor

● Actions when an error occurs

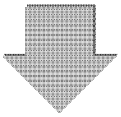
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection is limited to alternative mode.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

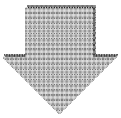
1. Deterioration of urea water
2. Use of substandard urea water
3. Contamination in urea water tank
4. Urea water quality sensor internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the urea water concentration. *See Chapter 3 *P1064* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Make sure liquid other than urea water is not in urea water tank. • After a few moments, turn ON the key switch and check the fault indication again.



3. Urea water exchange	• Drain the urea water in urea water tank, and refill this tank with new urea water. After a few moments, turn ON the key switch and check the fault indication again.

P154D: Urea water quality sensor concentration error (large deviation)

P code	P154D	Name	Urea water quality sensor concentration error (large deviation)
SPN/FMI	3516/0		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • Little fluctuation of urea water tank level • Urea water tank level is above the threshold value • Defrosting is completed • 180 seconds or more have passed since urea water refilling was detected • -5 °C ≤ urea water tank temperature ≤ 55 °C • A1DEFI reception timeout is not occurring • Urea water quality sensor is normal 2. Urea water concentration is kept under 25.8% for 655 seconds.	• Urea water • Urea water tank • Urea water quality sensor

● Actions when an error occurs

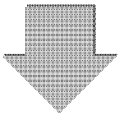
Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

● Presumed cause of the failure or the error condition

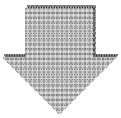
1. Deterioration of urea water
2. Use of substandard urea water
3. Contamination in urea tank
4. Urea water quality sensor internal circuit failure

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the urea water concentration. *See Chapter 3 *P1064* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Make sure liquid other than urea water is not in urea water tank. • After a few moments, turn ON the key switch and check the fault indication again.



3. Urea water exchange	• Drain the urea water in urea water tank, and refill this tank with new urea water. After a few moments, turn ON the key switch and check the fault indication again.

P1558: Urea water quality sensor contamination error in urea water tank

P code	P1558	Name	Urea water quality sensor contamination error in urea water tank
SPN/FMI	3521/13		

● DTC detection criteria

1. Prerequisite, 2. Judgment criteria	Check points
1. All of the followings are satisfied. • The key switch is turned ON • Elapse of 12 seconds after the key switch is turned ON (Dosing system state is neither INIT nor STANDBY) • Not during the engine cranking • Battery voltage is within normal range • A1DEFI reception timeout is not occurring 2. Urea water quality sensor detects liquid other than urea water (e.g. diesel fuel or oil). *Note: The detected varies according to the specification of urea water quality sensor.* (All of the followings are satisfied for 5 seconds. • Error information of urea water quality sensor received in A1DEFI message is 14 or 31 • Liquid type information received in A1DEFI message is 2 or 13)	• Urea water tank • Urea water quality sensor

● Actions when an error occurs

Fault mode	[Limited operation]: The engine operation is limited.
Limited operation	• Inducement is activated. For Inducement1 and Inducement2, refer to P21 [Failure Diagnosis Functions, Warning Indications, and Output Limitation Based on Legal Requirements]. • The urea water injection stops, and the urea water is sucked back immediately. • Defrosting/heat insulating control of urea water stops.
Reset criteria	Automatically released when the precondition is met and the detection condition is not met.
Remarks	

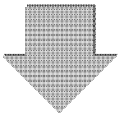
● Presumed cause of the failure or the error condition

1. Contamination in urea tank
2. Urea water quality sensor internal circuit failure

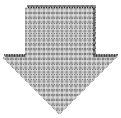
Note: The specifications of urea water quality sensor vary according to the driven machine.
See the driven machine manual, too.

● Diagnosis

1. Initial diagnosis using SA-D	• Check the fault indication. • Check the urea water concentration. *See Chapter 3 *P1064* for details on the diagnosis method and procedure.



2. Engine check	• Before beginning your work, be sure to turn OFF the key switch, and stop the engine. • Make sure liquid other than urea water is not in urea water tank. • After a few moments, turn ON the key switch and check the fault indication again.



3. Urea water exchange	• Drain the urea water in urea water tank, and refill this tank with new urea water. After a few moments, turn ON the key switch and check the fault indication again.

METHOD AND PROCEDURE OF FAILURE DIAGNOSIS

Description

● Related DTC

The related DTCs are listed.

P code	POOOO	Error name
	P△△△△	Error name

● Workflow

The workflow for failure diagnosis is listed.

● Wire diagram

The wire diagram for the parts related to errors is listed.

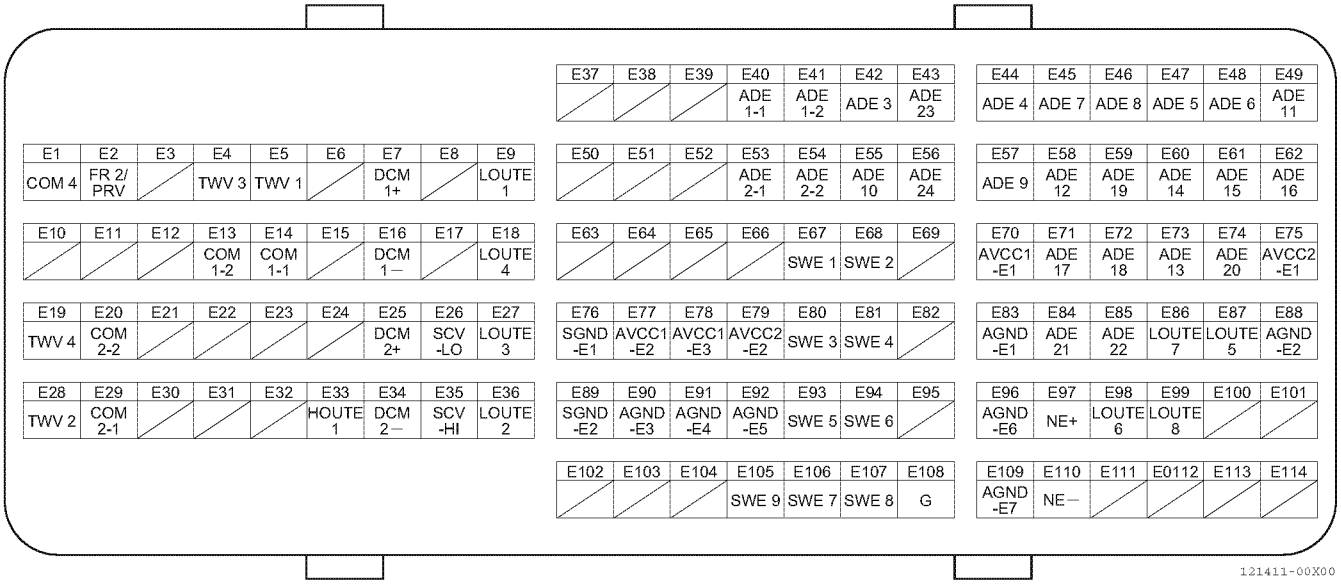
● Work description

The corrective action and procedure for failure diagnosis are listed.

Engine ECU Judgment Item

■ ECU pin layout drawing

Engine side (ECU side)



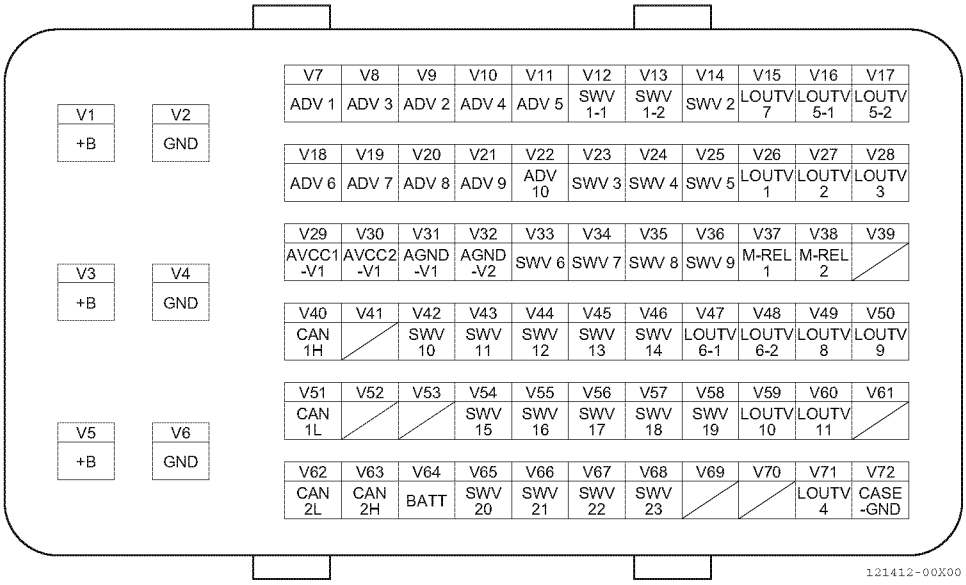
Pin code	Pin symbol	Terminal name
E1	COM 4	PRV
E2	FP 2/PRV	PRV
E4	TWV 3	Injector L
E5	TWV 1	Injector L
E7	DCM 1+	Intake valve motor
E9	LOUTE 1	Breather heater
E13	COM 1-2	Injector H
E14	COM 1-1	Injector H
E16	DCM 1–	Intake valve motor
E18	LOUTE 4	Speed selection lamp
E19	TWV 4	Injector L
E20	COM 2-2	Injector H
E25	DCM 2+	Exhaust valve motor
E26	SCV-LO	SCV L
E27	LOUTE 3	Starter relay
E28	TWV 2	Injector L
E29	COM 2-1	Injector H

Pin code	Pin symbol	Terminal name
E33	HOUTE 1	Starting aid relay
E34	DCM 2–	Exhaust valve motor
E35	SCV-Hi	SCV-H
E36	LOUTE 2	DPF regeneration acknowledge lamp
E40	ADE 1-1	Rail pressure sensor
E41	ADE 1-2	Rail pressure sensor
E42	ADE 3	Fuel temperature sensor
E43	ADE 23	Reserve analog
E44	ADE 4	CW temperature sensor
E45	ADE 7	Reserve analog
E46	ADE 8	Intake valve sensor
E47	ADE 5	Reserve analog
E48	ADE 6	Accelerator sensor 1
E49	ADE 11	Reserve analog
E53	ADE 2-1	Reserve analog
E54	ADE 2-2	Reserve analog
E55	ADE 10	Reserve analog

Pin code	Pin symbol	Terminal name
E56	ADE 24	Reserve analog
E57	ADE 9	Fuel temperature sensor
E58	ADE 12	Exhaust manifold temperature sensor
E59	ADE 19	DPF high pressure sensor
E60	ADE 14	DPF inlet temperature sensor
E61	ADE 15	Intake air pressure sensor
E62	ADE 16	DPF differential pressure sensor
E67	SWE 1	Speed 2
E68	SWE 2	Reserve digital
E70	AVCC1-E1	Sensor 5V
E71	ADE 17	Exhaust gas pressure sensor
E72	ADE 18	Reserve analog
E73	ADE 13	EGR temperature sensor
E74	ADE 20	Reserve analog
E75	AVCC2-E1	Sensor 5V
E76	SGND-E1	Shield GND
E77	AVCC1-E2	Sensor 5V
E78	AVCC1-E3	Sensor 5V
E79	AVCC2-E2	Sensor 5V
E80	SWE 3	Engine oil level switch
E81	SWE 4	Starter permission 1
E83	AGND-E1	Analog GND

Pin code	Pin symbol	Terminal name
E84	ADE 21	Reserve analog
E85	ADE 22	Exhaust valve sensor
E86	LOUTE 7	CWT warning lamp
E87	LOUTE 5	Iso·chronous lamp
E88	AGND-E2	Analog GND
E89	SGND-E2	Shield GND
E90	AGND-E3	Analog GND
E91	AGND-E4	Analog GND
E92	AGND-E5	Analog GND
E93	SWE 5	Speed selection enable
E94	SWE 6	Reserve digital
E96	AGND-E6	Analog GND
E97	NE+	Crankshaft speed sensor
E98	LOUTE 6	Red engine stop lamp
E99	LOUTE 8	Buzzer
E105	SWE 9	Reserve digital
E106	SWE 7	Reserve digital
E107	SWE 8	Reserve digital
E108	G	CAN speed sensor
E109	AGND-E7	Analog GND
E110	NE–	Crankshaft speed sensor

Driven machine side (ECU side)



Pin code	Pin symbol	Terminal name
V1	+B	VB
V2	GND	ECU GND
V3	+B	VB
V4	GND	ECU GND
V5	+B	VB
V6	GND	ECU GND
V7	ADV 1	Reserve analog
V8	ADV 3	Oil pressure sensor
V9	ADV 2	Accelerator sensor 2
V10	ADV 4	DPF intermediate temperature sensor
V11	ADV 5	Fresh air temperature sensor
V12	SWV 1-1	Key switch on
V13	SWV 1-2	Key switch on
V14	SWV 2	Key switch start
V15	LOUTV 7	DPF regeneration inhibit lamp
V16	LOUTV 5-1	Reserve digital
V17	LOUTV 5-2	Reserve digital
V18	ADV 6	DOC outlet temperature sensor
V19	ADV 7	Reserve analog
V20	ADV 8	Reserve analog
V21	ADV 9	Accelerator sensor 3

Pin code	Pin symbol	Terminal name
V22	ADV 10	Reserve analog
V23	SWV 3	Engine stop 1
V24	SWV 4	Speed 1
V25	SWV 5	DPF regeneration request
V26	LOUTV 1	LO pressure lamp
V27	LOUTV 2	Speed monitor
V28	LOUTV 3	Load ratio monitor
V29	AVCC1-V1	Sensor 5V
V30	AVCC2-V1	Sensor 5V
V31	AGND-V1	Analog GND
V32	AGND-V2	Analog GND
V33	SWV 6	Engine stop 2
V34	SWV 7	Starter permission 2
V35	SWV 8	Water separator sensor
V36	SWV 9	Droop
V37	M-REL 1	Main relay
V38	M-REL 2	Main relay
V40	CAN 1H	CAN-H1
V42	SWV 10	HI-IDLE limit enable
V43	SWV 11	Accel. Pedal
V44	SWV 12	CAN time out

Pin code	Pin symbol	Terminal name
V45	SWV 13	Air cleaner sensor
V46	SWV 14	Alternator L terminal
V47	LOUTV 6-1	Dummy load
V48	LOUTV 6-2	Dummy load
V49	LOUTV 8	Pre-heat lamp
V50	LOUTV 9	DPF regeneration request
V51	CAN 1L	CAN-L1
V54	SWV 15	DPF regeneration inhibit
V55	SWV 16	HI-IDLE speed select
V56	SWV 17	Regeneration interlock
V57	SWV 18	Reserve digital
V58	SWV 19	Reserve digital

Pin code	Pin symbol	Terminal name
V59	LOUTV 10	Amber warning lamp
V60	LOUTV 11	EGT lamp
V62	CAN 2L	CAN-L2
V63	CAN 2H	CAN-H2
V64	BATT	VB (Back up)
V65	SWV 20	Reserve digital
V66	SWV 21	Reserve digital
V67	SWV 22	LO pressure switch
V68	SWV 20	Reserve digital
V71	LOUTV 4	Failure lamp
V72	CASE-GND	Case GND

■ How to use the checker harness

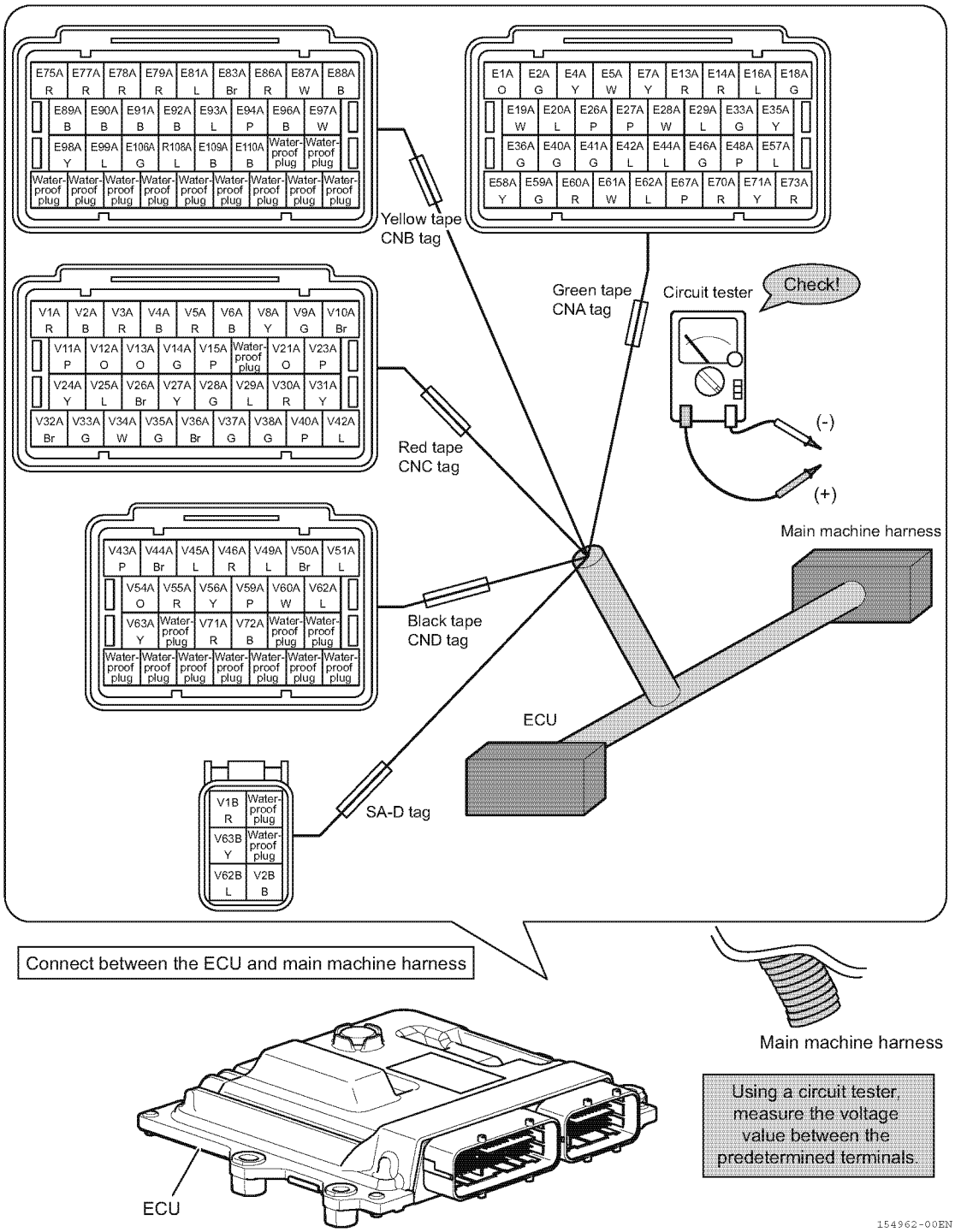
When you perform the ECU or DCU related failure diagnosis, use the checker harness to measure the voltage value. Therefore, prior to the failure diagnosis, remove the ECU and the machine harness or the DCU and the SCR harness, and connect the checker harness between the ECU and the machine harness or the DCU and the SCR harness.

Note • Details on failure diagnosis of each part are mentioned later.

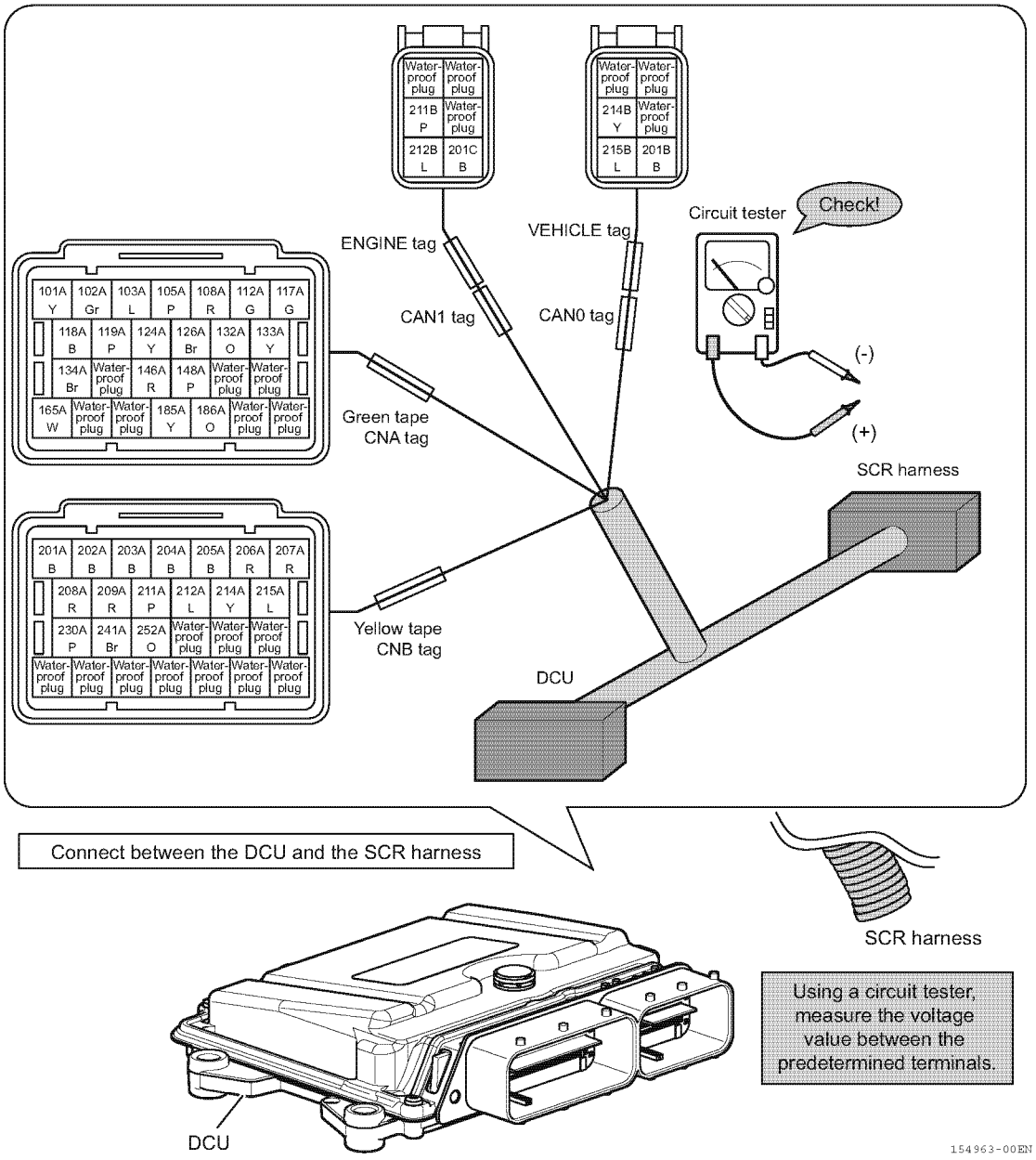
• Using a circuit tester, measure the resistance value between the terminals checked in the figure below.

• DCU and SCR harnesses apply to models with urea SCR system.

ECU checker harness



DCU checker harness



Analog input related

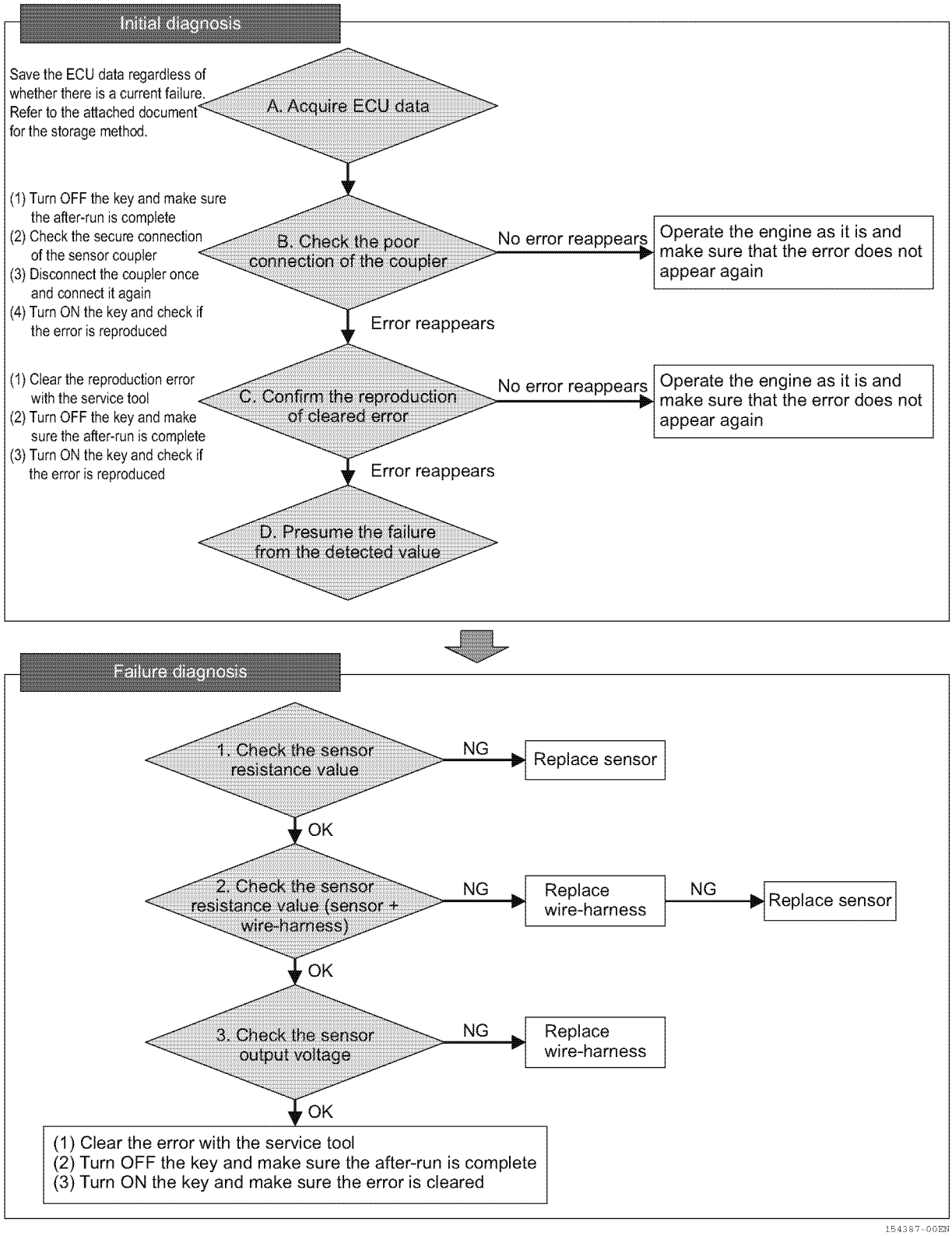
■ Accelerator sensor

● Related DTC

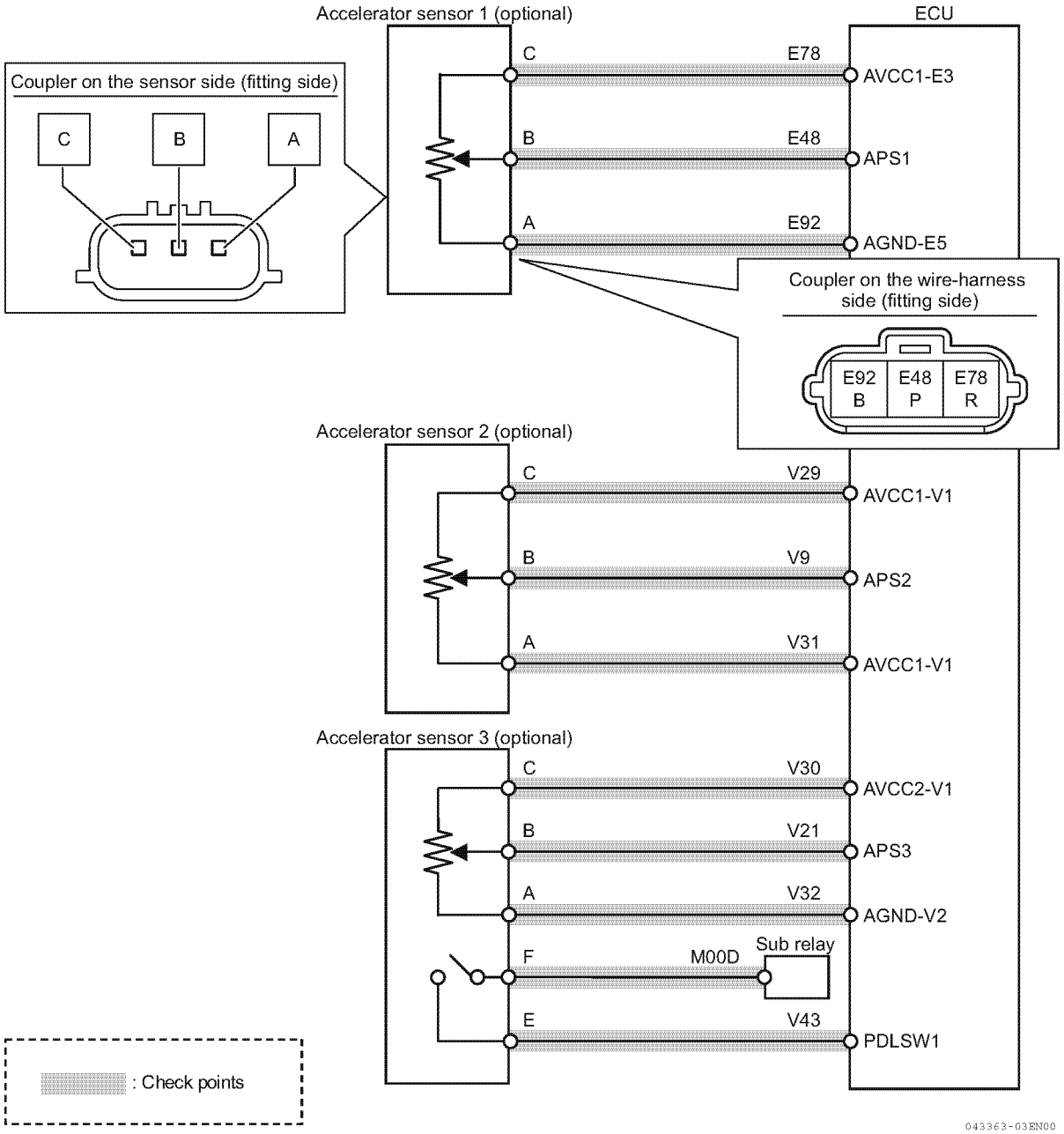
P code	P0123	Accelerator sensor 1 error (voltage high)
	P0122	Accelerator sensor 1 error (voltage low)
	P0223	Accelerator sensor 2 error (voltage high)
	P0222	Accelerator sensor 2 error (voltage low)
	P1646	Accelerator sensor 1/2 Dual accelerator sensor error (closed position error)
	P1647	Accelerator sensor 1/2 Dual accelerator sensor error (open position error)
	P0228	Accelerator sensor 3 error (voltage high)
	P0227	Accelerator sensor 3 error (voltage low)
	P1126	Accelerator sensor 3 foot pedal error (open position error)
	P1125	Accelerator sensor 3 foot pedal error (closed position error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   - ● Between terminal A and C of the accelerator sensor (overall resistance value)
     1- Remove the accelerator sensor from the wire-harness.
     2- Using a circuit tester, measure the resistance value between sensor terminals A and C (overall resistance value).

Reference: YANMAR standard accelerator sensor overall resistance value

Terminal	Specifications
Sensor A to C	5 ± 1.5 kΩ *1

**1: The accelerator sensor is to be prepared by the customer. The above values are default values. Please check the specifications of your order for the actual resistance values.*

NG	Replace the accelerator sensor.
OK	Go to “Between accelerator sensor terminals A and B”.

- ● Between accelerator sensor terminals A and B
  1- Using a circuit tester, measure the resistance value between accelerator sensor terminals A and B.
  2- Move the accelerator throttle, and check if the resistance value between accelerator sensor terminals A and B fluctuates.

NG	Replace the accelerator sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   - ● Between wire-harnesses E78 and E92 (V29 and V31, V30 and V32) (overall resistance value)
     1- Connect the accelerator sensor and wire-harness then remove the ECU from the wire-harness.
     2- Using a circuit tester, measure the resistance value (overall resistance value) between ECU couplers E78 and E92 (V29 and V31, V30 and V32) on the wire-harness side.
     Note: See above “Reference: YANMAR standard accelerator sensor overall resistance value”.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Between wire-harnesses E48 and E92 (V9 and V31, V21 and V32) “.

- ● Between wire-harnesses E48 and E92 (V9 and V31, V21 and V32)
  1- Using a circuit tester, measure the resistance value between ECU couplers E48 and E92 (V9 and V31, V21 and V32).
  2- Move the accelerator throttle, and check if the resistance value between ECU couplers E48 and E92 (V9 and V31, V21 and V32) fluctuates.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the accelerator sensor output voltage”.

3. Checking the accelerator sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage of the sensor signal between E48 and E92 (V9 and V31, V21 and V32).

Voltage	State	Corrective action
E48 (V9, V21) ≤ 0.25 V	NG	Replace the wire-harness.
0.25 V < E48 (V9, V21) < 4.75 V	OK (normal range)	Wire-harness is normal.
4.75 V ≤ E48 (V9, V21)	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

4. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

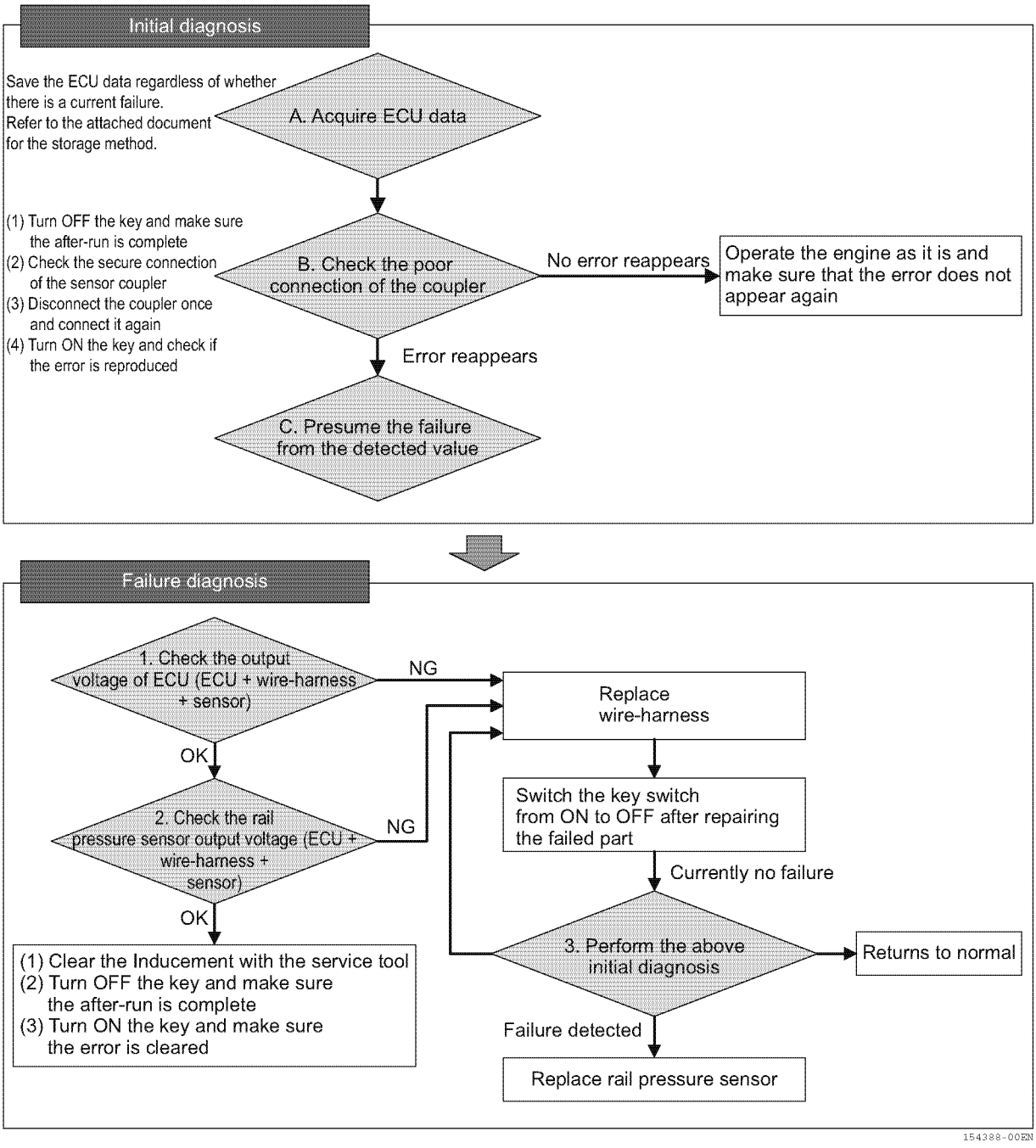
■ Rail pressure sensor

● Related DTC

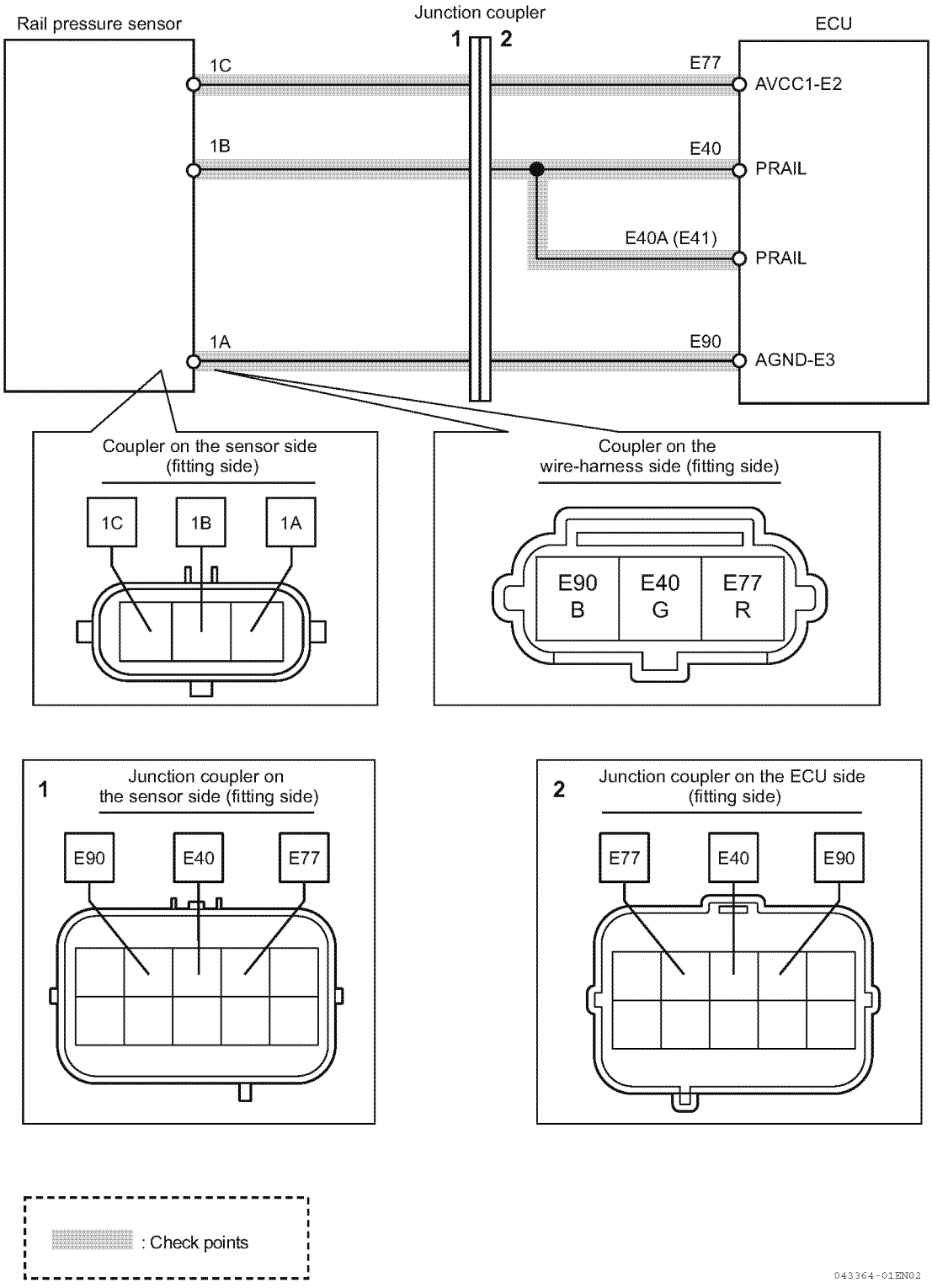
P code	P0192	Rail pressure sensor error (voltage low)
	P0193	Rail pressure sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the ECU output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between E77 and E90 of the rail pressure sensor 5 V.

Voltage	State	Corrective action
E77 < 4.375 V	NG	Replace the wire-harness.
4.375 V ≤ E77 ≤ 5.625 V	OK (normal range)	Check the rail pressure sensor output voltage.
5.625 V < E77	NG	Replace the wire-harness.

NG	Replace the wire-harness, and turn OFF and on the key switch for failure diagnosis.
OK	Go to “Checking the rail pressure sensor output voltage”.

2. Checking the rail pressure sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage of the sensor signal between E40 (E40A) and E90.

Voltage	State	Corrective action
E40 (E40A) < 0.65 V	NG	Replace the wire-harness.
0.65 V ≤ E40 (E40A) ≤ 4.84 V	OK (normal range)	After turning the key OFF/ON, perform a diagnosis using SA-D.
4.84 V < E40 (E40A)	NG	Replace the wire-harness.

NG	Replace the wire-harness or ECU, and turn OFF and on the key switch for failure diagnosis using SA-D.
OK	Confirm that the error does not reappear on SA-D after clearing the Inducement and turning the key OFF/ON.

3. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the rail pressure sensor.

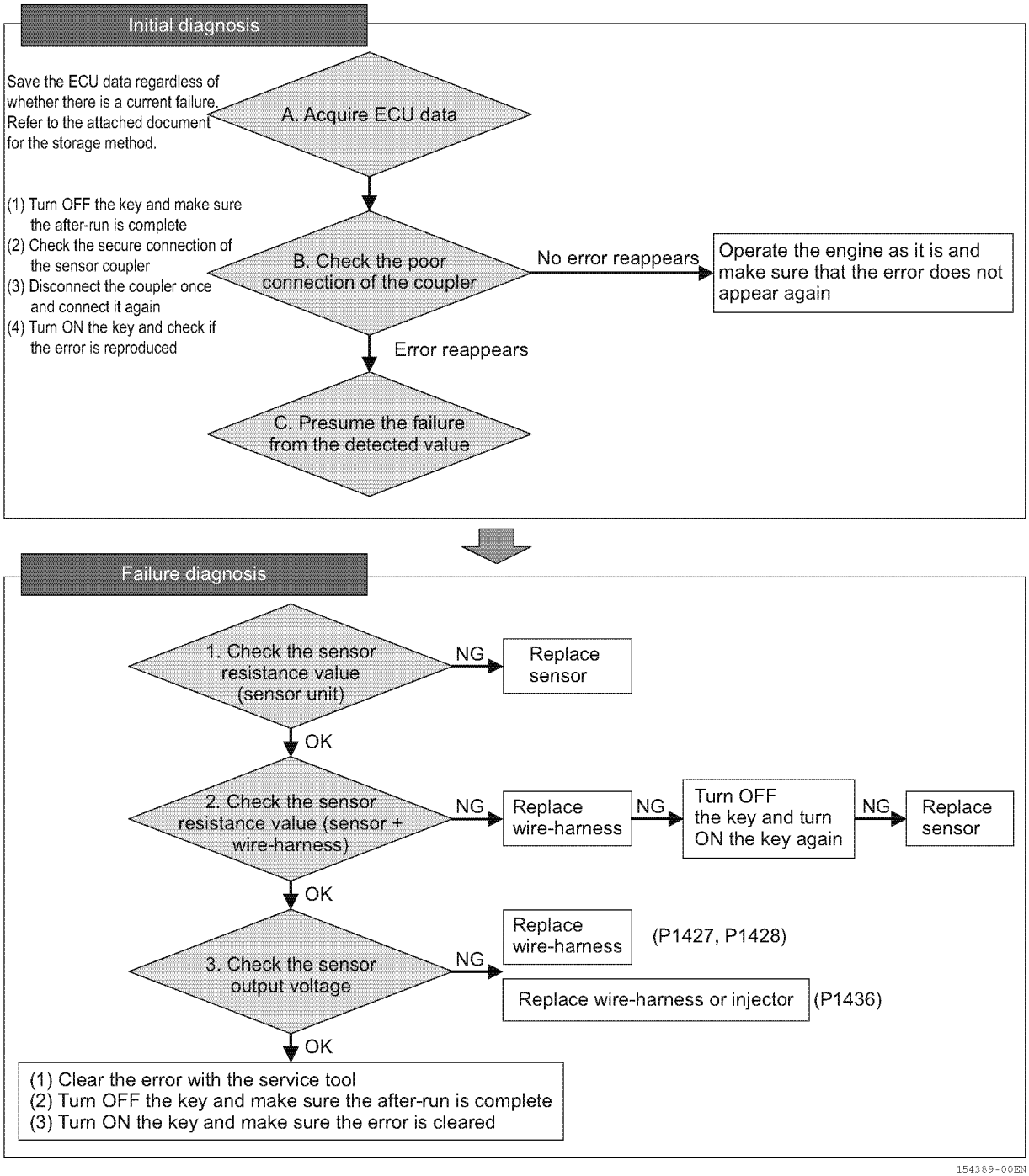
■ DPF inlet temperature sensor 1

● Related DTC

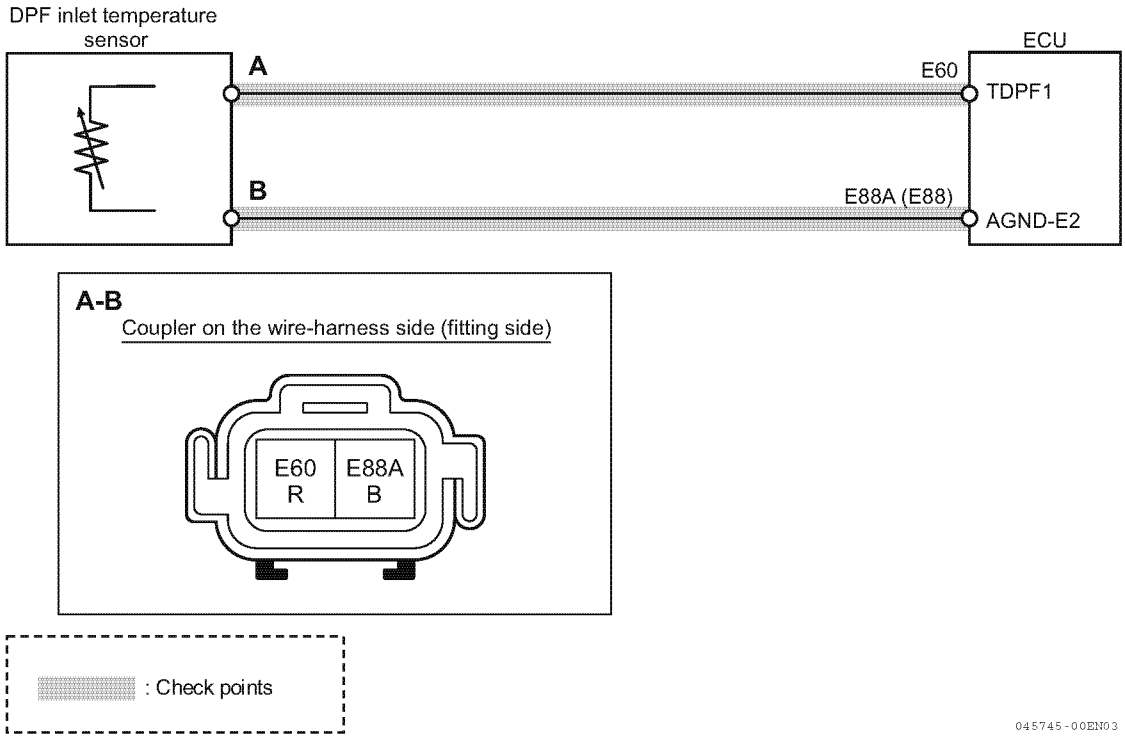
P code	P1427	DPF inlet temperature sensor error (voltage low)
	P1428	DPF inlet temperature sensor error (voltage high)
	P1436	DPF inlet temperature sensor abnormal temperature (abnormally high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

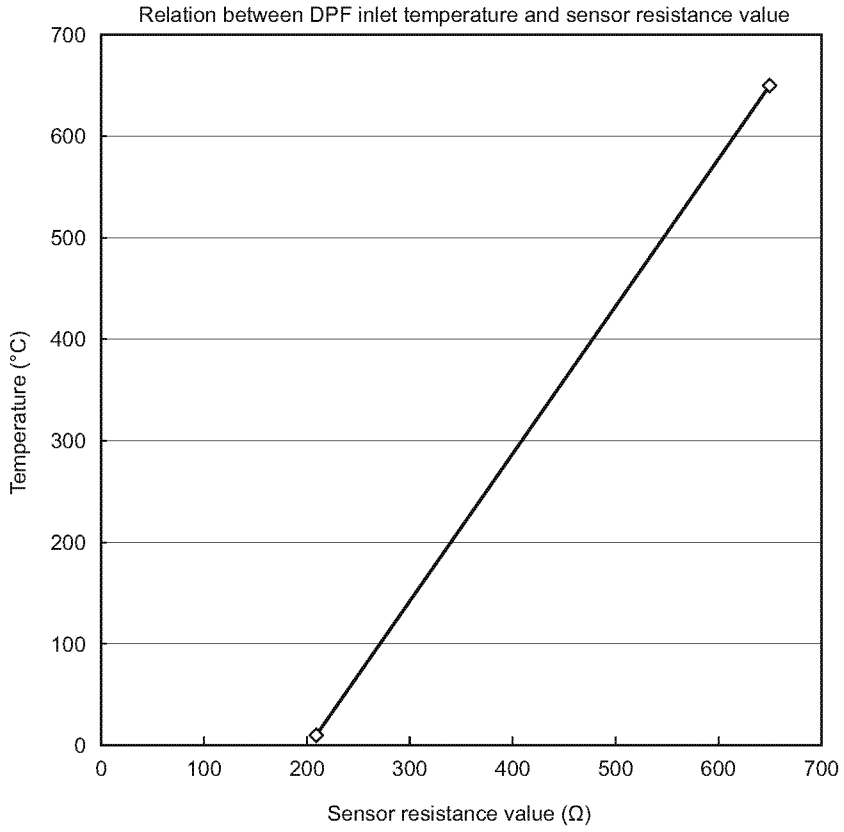


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the DPF inlet temperature sensor.
   2- Using a circuit tester, measure the resistance value between DPF inlet temperature sensor terminals A and B.
   3- Using “DPF inlet temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

DPF inlet temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

NG	Replace the DPF inlet temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness)”.

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the DPF inlet temperature sensor and wire-harness then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E60 and E88A on the wire-harness side.
   3- Using “DPF inlet temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the DPF inlet temperature sensor output voltage”.

3. Checking the DPF inlet temperature sensor output voltage

1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).

2- Using a circuit tester, measure the voltage between DPF inlet temperature sensor signals E60 and E88A.

Voltage	State	Corrective action
E60 < 0.2 V	NG	• Replace the wire-harness. • Replace the injector. (P1436 only)
0.2 V ≤ E60 ≤ 4.8 V	OK (normal range)	• Returns to normal. • Replace the injector. (P1436 only)
4.8 V < E60	NG	• Replace the wire-harness. • Replace the injector. (P1436 only)

NG	• The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the injector. (P1436 only)
OK	Replace the injector. (P1436 only)

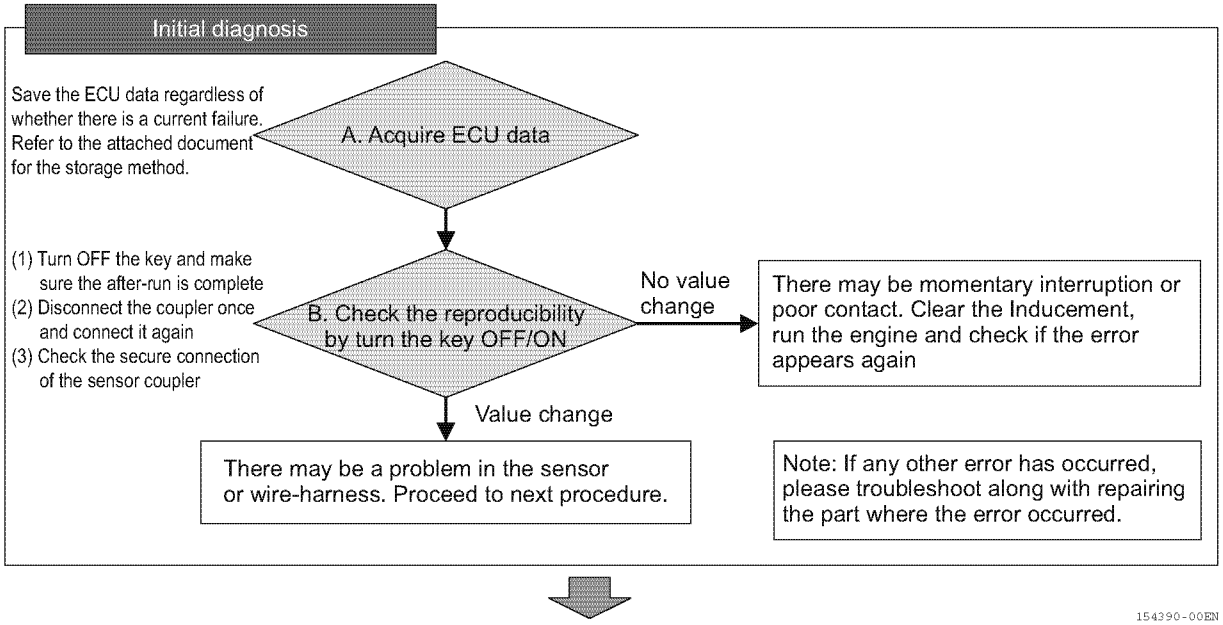
■ DPF inlet temperature sensor 2

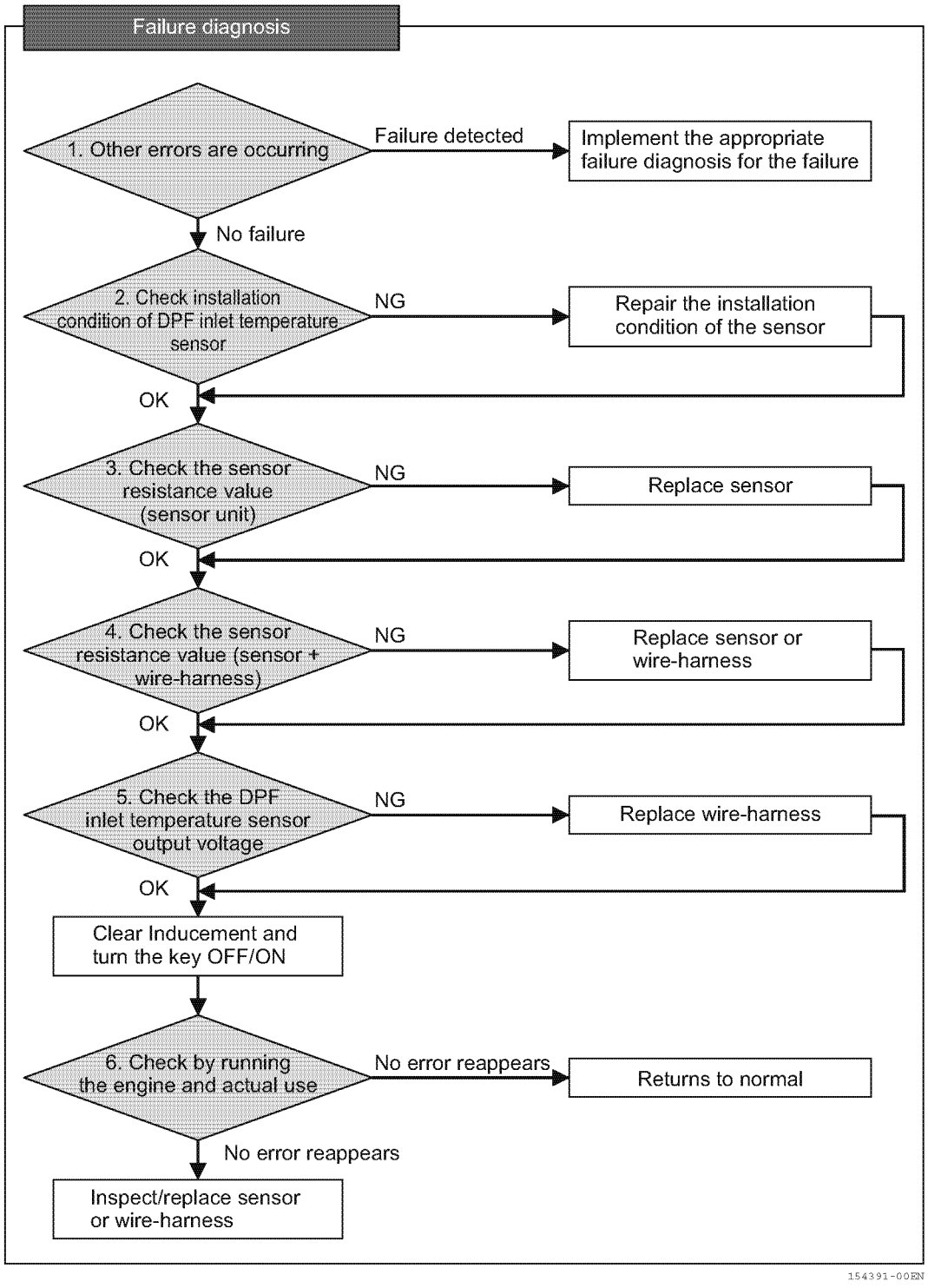
● Related DTC

P code	P167E	DPF inlet temperature sensor error (detected value error)

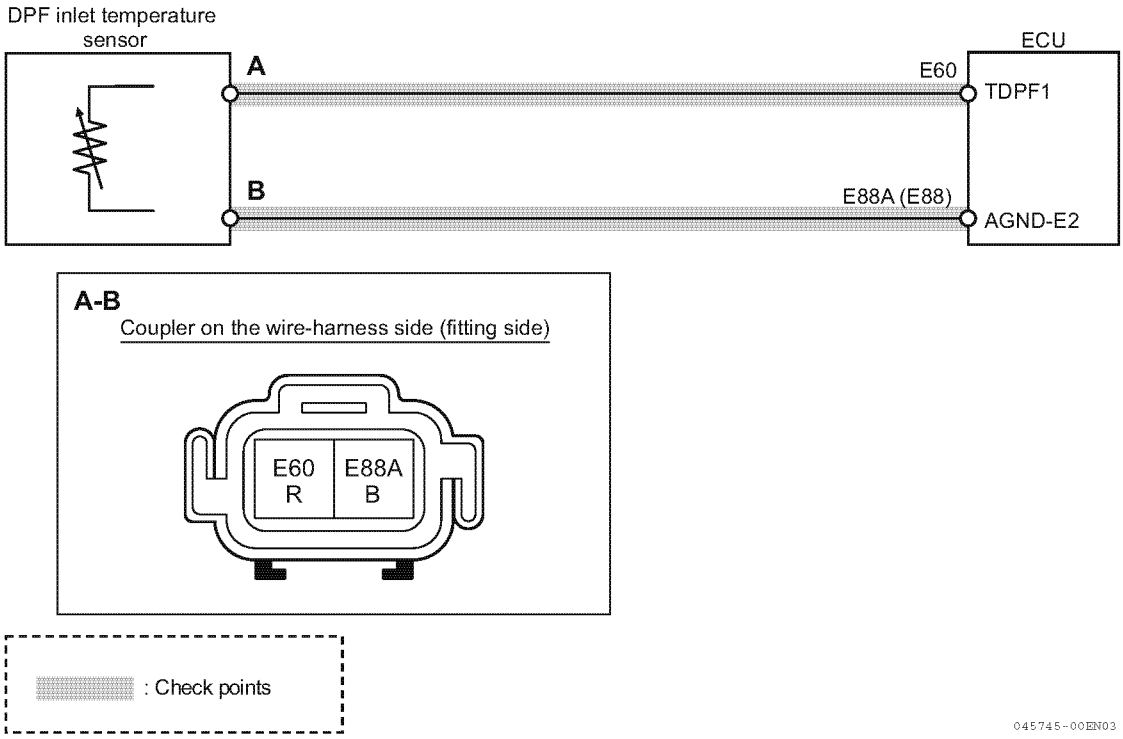
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of DPF inlet temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the sensor resistance value (sensor unit)
NG
Replace sensor
OK
4. Check the sensor resistance value (sensor + wire-harness)
NG
Replace sensor or wire-harness
OK
5. Check the DPF inlet temperature sensor output voltage
NG
Replace wire-harness
OK
Clear Inducement and turn the key OFF/ON
6. Check by running the engine and actual use
No error reappears
Returns to normal
No error reappears
Inspect/replace sensor or wire-harness
154391-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for EGR gas temperature sensor, cooling water temperature sensor, DPF inlet temperature sensor, EGR valve, or inside the ECU.

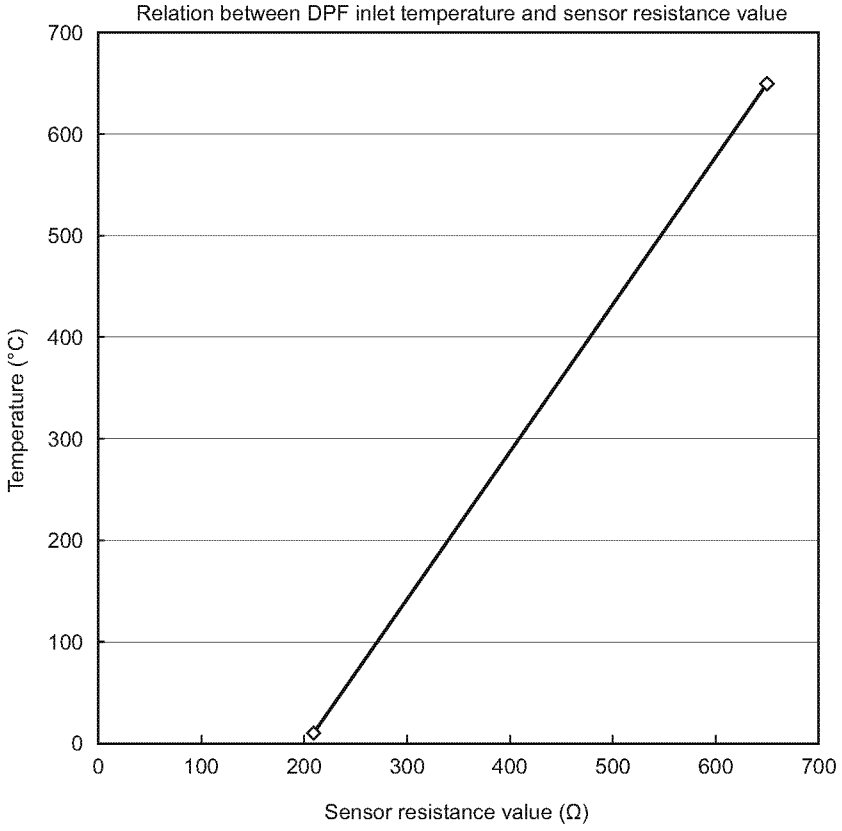
Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to “Checking installation condition of DPF inlet temperature sensor”.

2. Checking installation condition of DPF inlet temperature sensor
   1- Turn OFF the key switch.
   2- Check the installation condition of DPF inlet temperature sensor.
   3- Check the DPF and exhaust piping for damage or failure.

NG	Reinstall the sensor, and turn OFF/ON the ECU power for failure diagnosis using SA-D.
OK	Go to “Checking the sensor resistance value (sensor unit)”

3. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the DPF inlet temperature sensor.
   2- Using a circuit tester, measure the resistance value between DPF inlet temperature sensor terminals A and B.
   3- Using “DPF inlet temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

DPF inlet temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

NG	Replace the DPF inlet temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness)”.

4. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the DPF inlet temperature sensor and wire-harness then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E60 and E88A on the wire-harness side.
   3- Using “DPF inlet temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the DPF inlet temperature sensor output voltage”.

5. Checking the DPF inlet temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between DPF inlet temperature sensor signals E60 and E88A.

Voltage	State	Corrective action
E60 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ E60 ≤ 4.8 V	OK (normal range)	Returns to normal.
4.8 V < E60	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After clearing the Inducement and turning the key OFF/ON, start the engine, and perform normal operation to check if the error reappears.

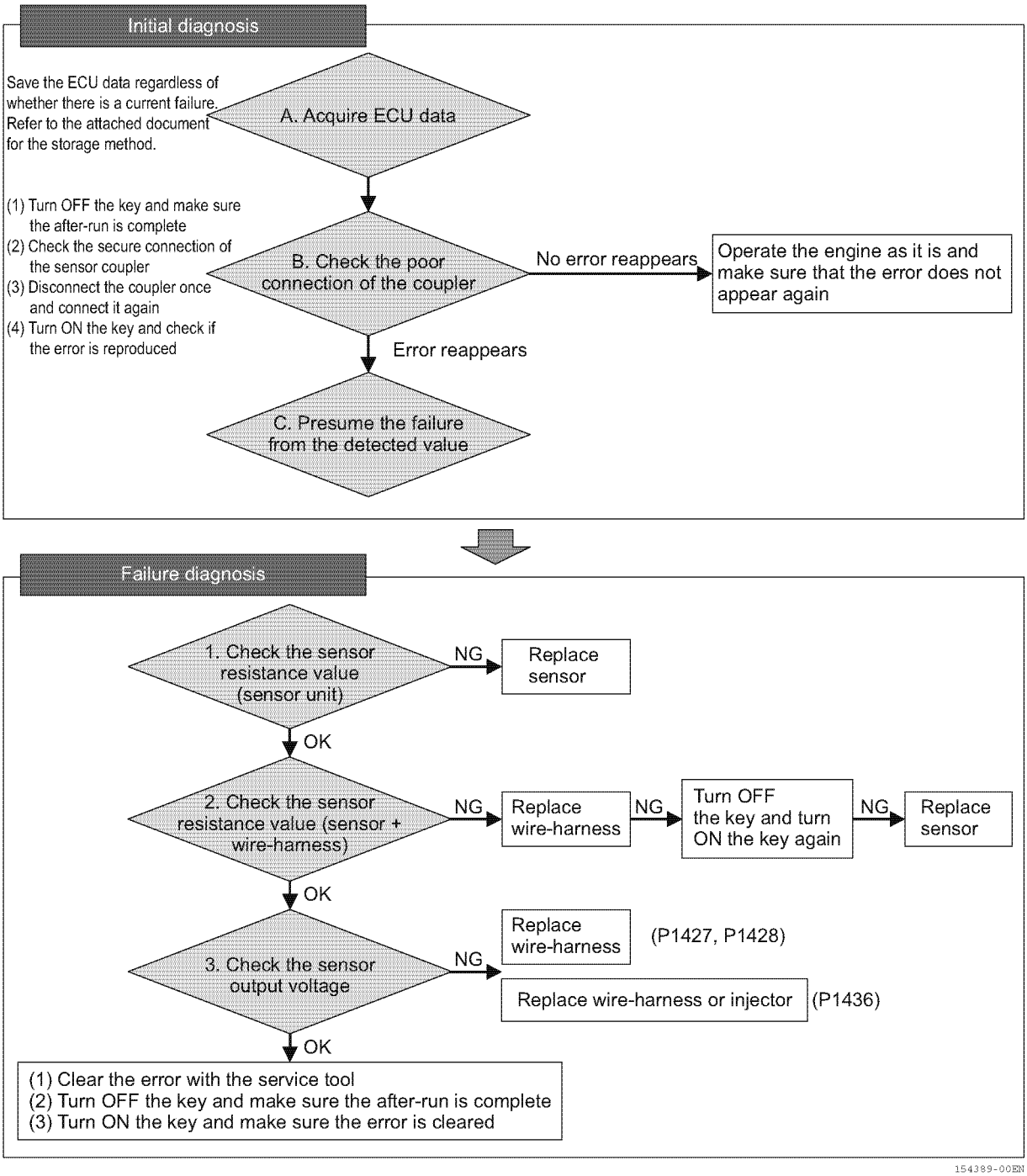
■ DPF intermediate temperature sensor 1

● Related DTC

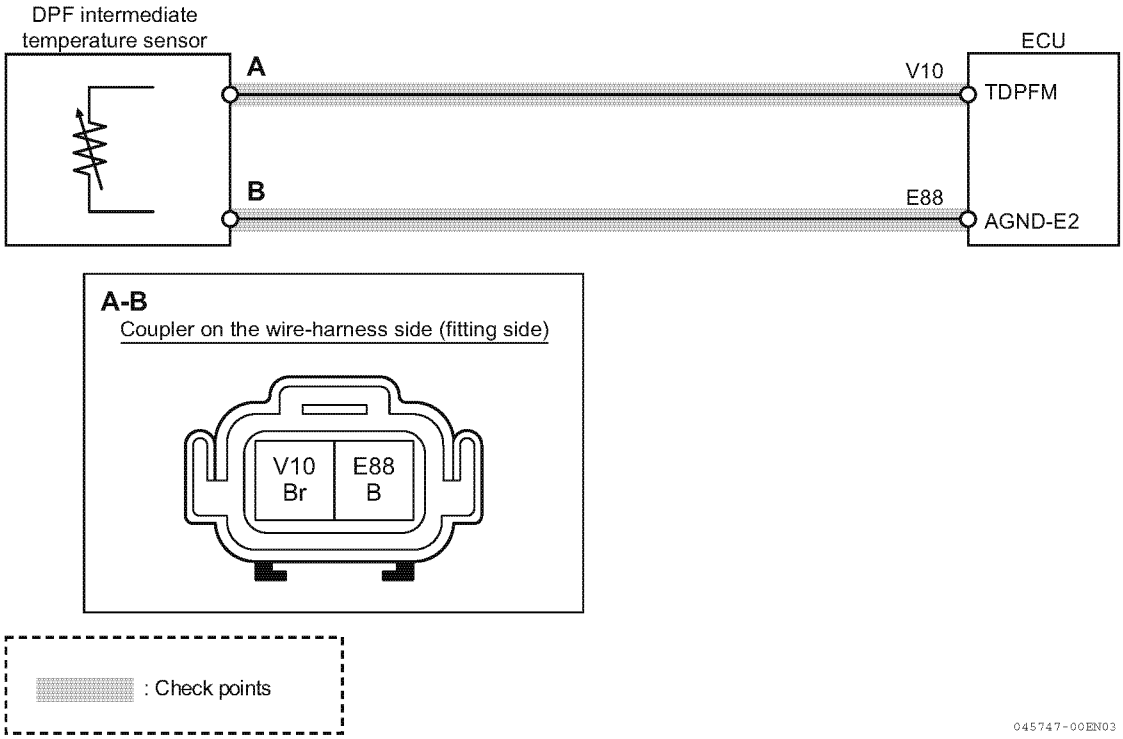
P code	P1435	DPF intermediate temperature sensor error (voltage low)
	P1434	DPF intermediate temperature sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

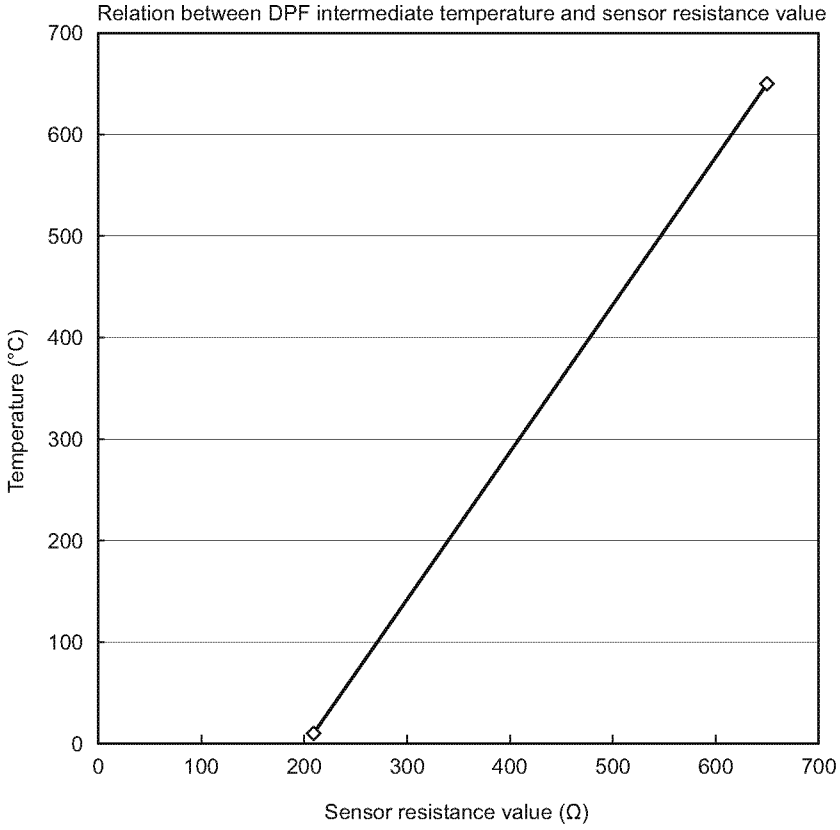


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the DPF intermediate temperature sensor.
   2- Using a circuit tester, measure the resistance value between DPF intermediate temperature sensor terminals A and B.
   3- Using “DPF intermediate temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

DPF intermediate temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

NG	Replace the DPF intermediate temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the DPF intermediate temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals V10 and E88 on the wire-harness side.
   3- Using “DPF intermediate temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the DPF intermediate temperature sensor output voltage”.

3. Checking the DPF intermediate temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between DPF intermediate temperature sensor signals V10 and E88.

Voltage	State	Corrective action
V10 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ V10 ≤ 4.8 V	OK (normal range)	Wire-harness is normal.
4.8 V < V10	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

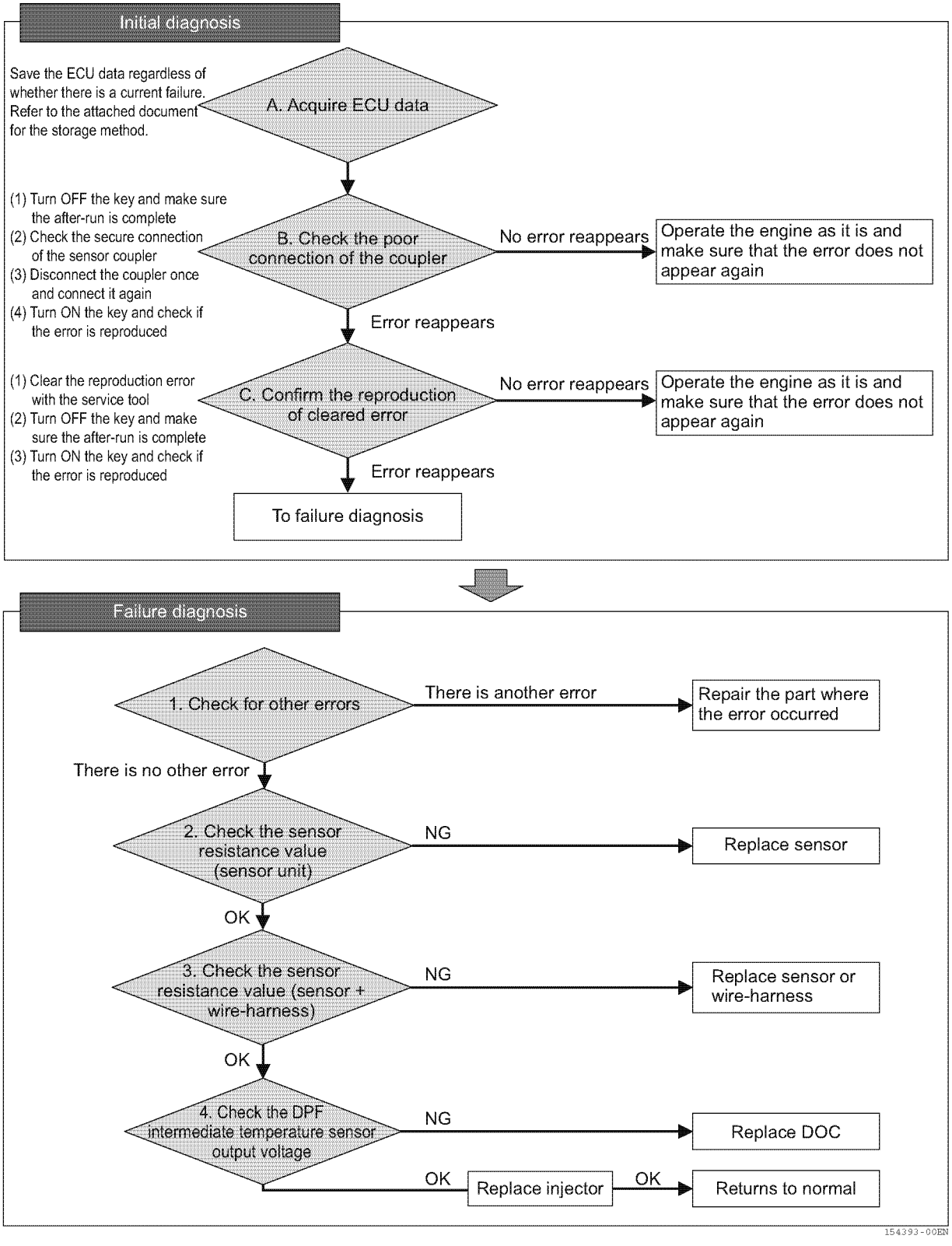
■ DPF intermediate temperature sensor 2

● Related DTC

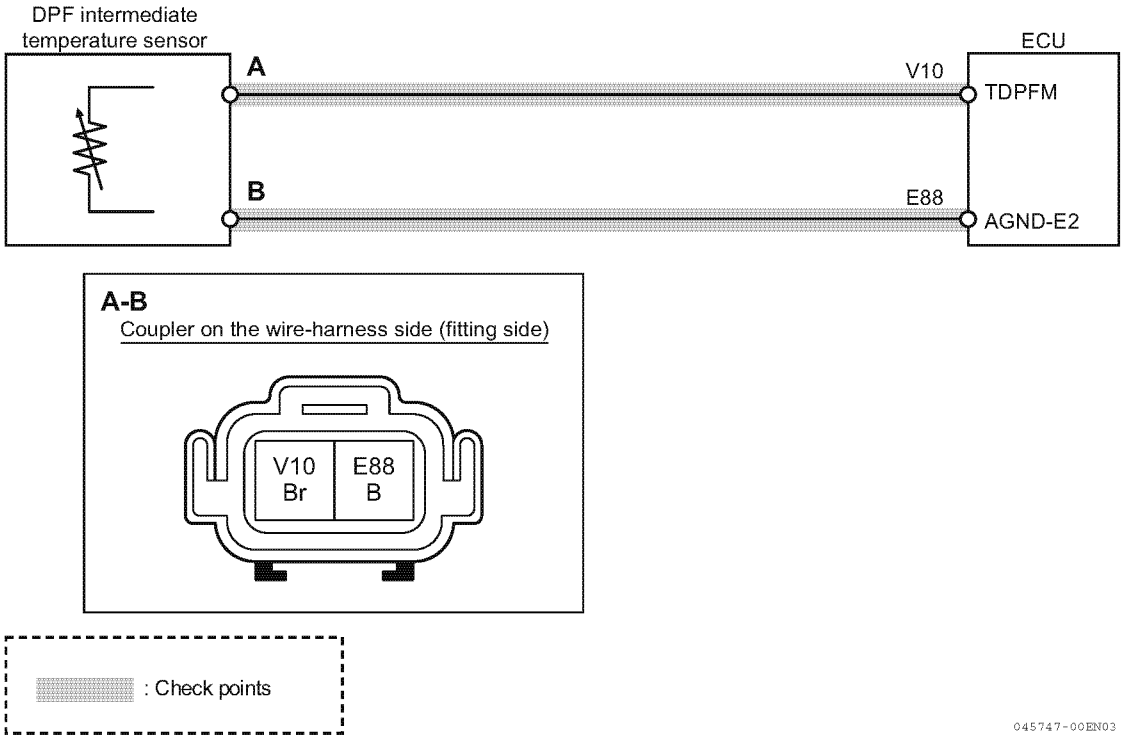
P code	P0420	DPF intermediate temperature abnormal (abnormally low)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Check for other errors

1- Connect the SA-D and check for current failures.

NG	Correct that part.
OK	Go to “Checking the sensor resistance value (sensor unit)”.

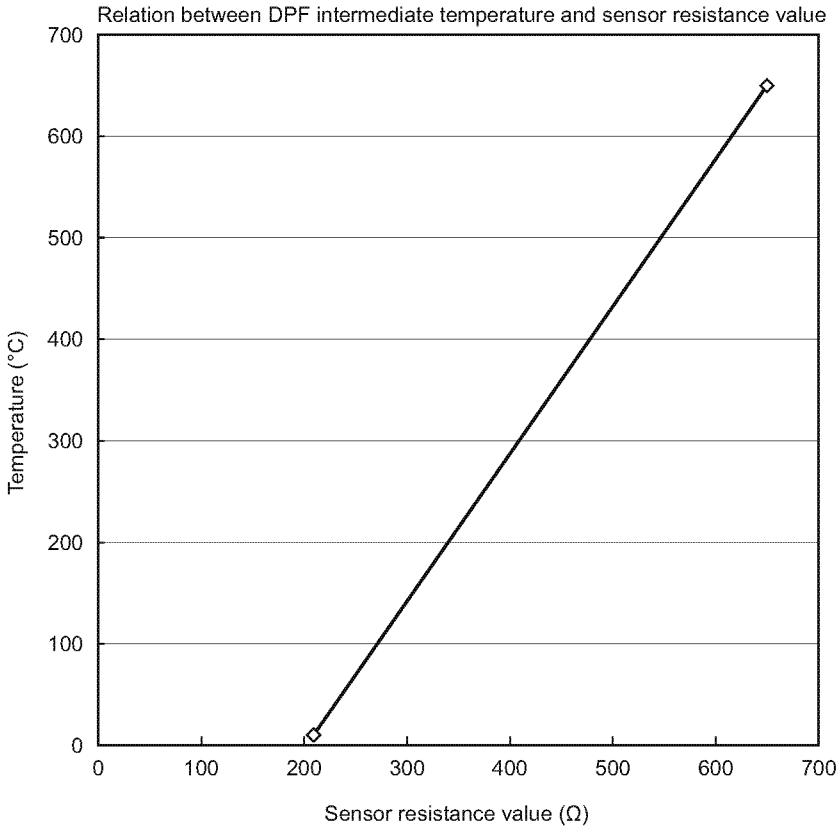
2. Checking the sensor resistance value (sensor unit)

1- Remove the wire-harness from the DPF intermediate temperature sensor.

2- Using a circuit tester, measure the resistance value between DPF intermediate temperature sensor terminals A and B.

3- Using “DPF intermediate temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

DPF intermediate temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

NG	Replace the DPF intermediate temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

3. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the DPF intermediate temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals V10 and E88 on the wire-harness side.
   3- Using “DPF intermediate temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the DPF intermediate temperature sensor output voltage”.

4. Checking the DPF intermediate temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between DPF intermediate temperature sensor signals V10 and E88.

Voltage	State	Corrective action
V10 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ V10 ≤ 4.8 V	OK (normal range)	Replace the injector.
4.8 V < V10	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Replace the injector.

5. Replacing the injector
   After replacing the injector, run the engine after the engine has warmed up, then perform stationary regeneration or recovery regeneration to make sure that the error does not occur again.

NG	Replace the DOC.
OK	Returns to normal.

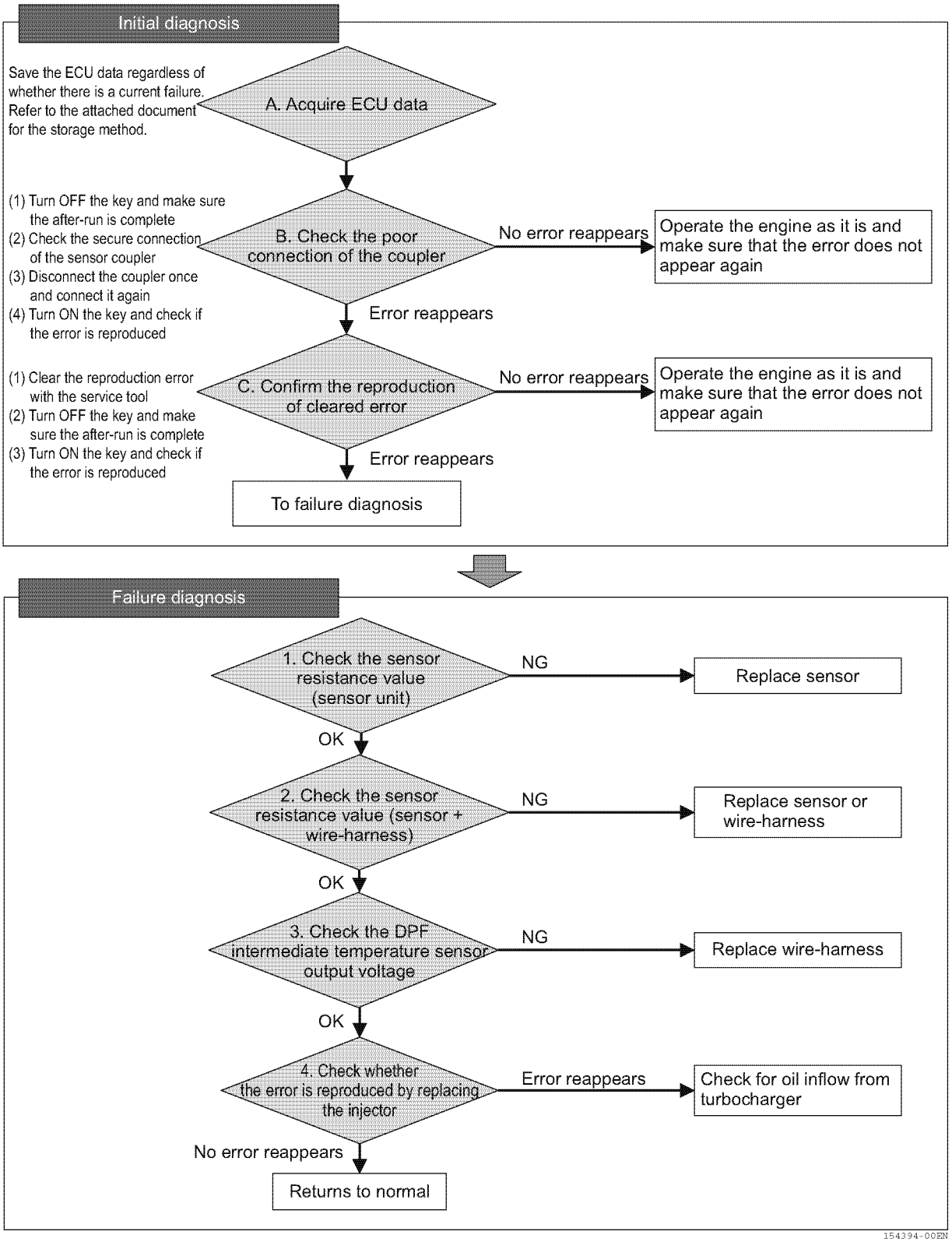
■ DPF intermediate temperature sensor 3

● Related DTC

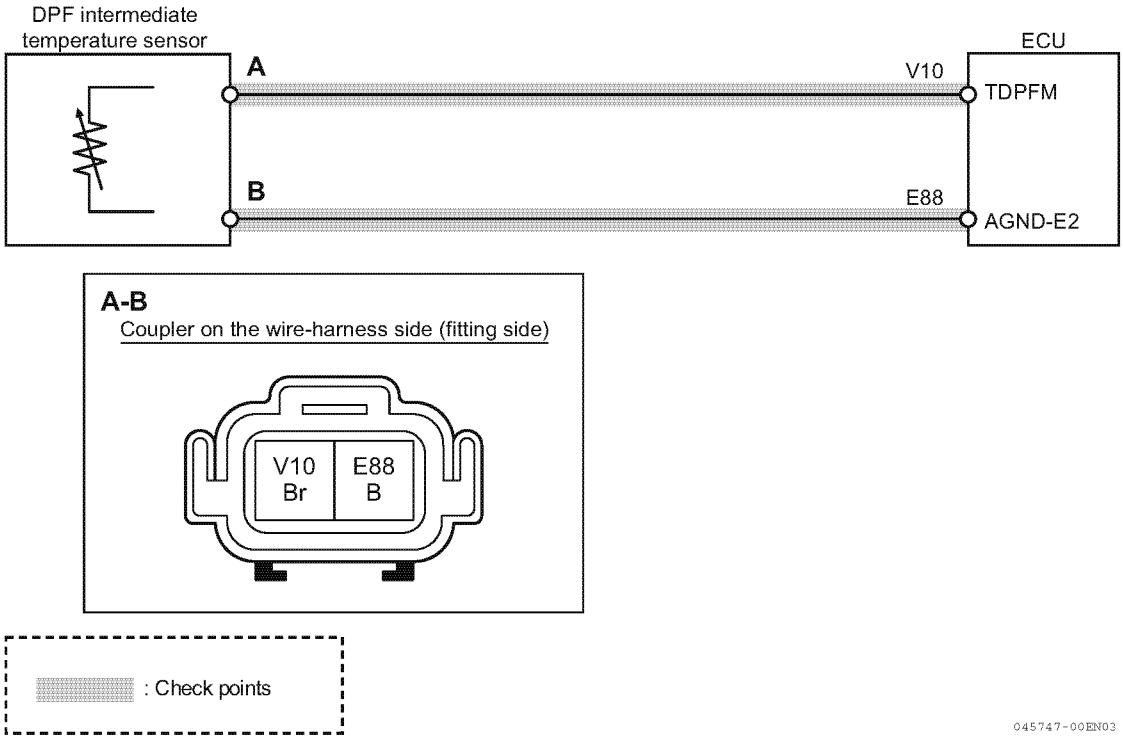
P code	P1426	DPF intermediate temperature abnormal (abnormal rise in temperature)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

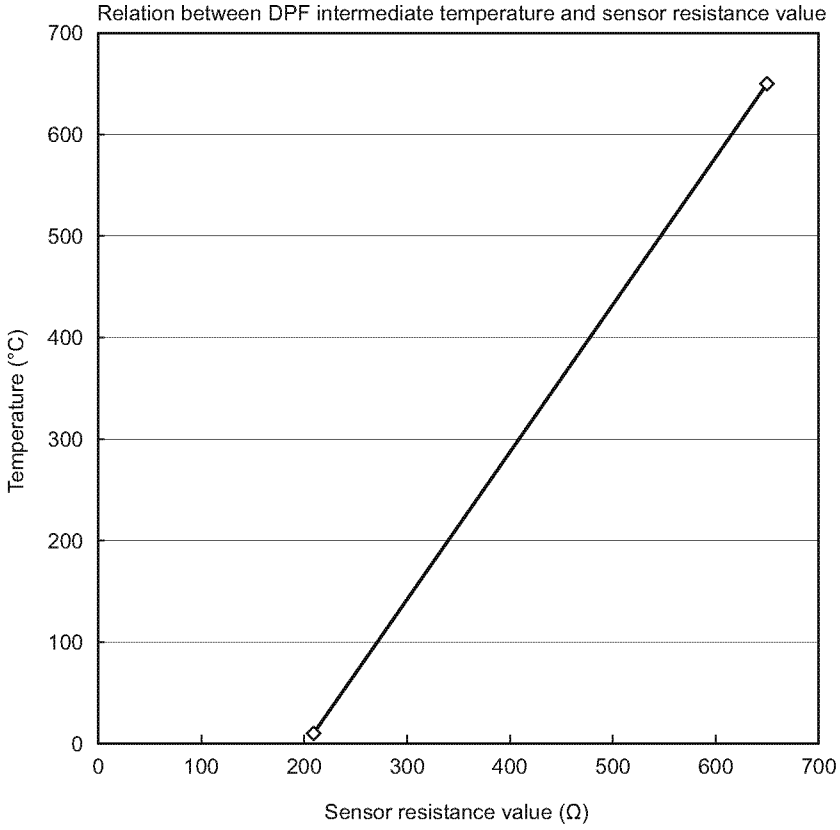


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the DPF intermediate temperature sensor.
   2- Using a circuit tester, measure the resistance value between DPF intermediate temperature sensor terminals A and B.
   3- Using “DPF intermediate temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

DPF intermediate temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

NG	Replace the DPF intermediate temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the DPF intermediate temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals V10 and E88 on the wire-harness side.
   3- Using “DPF intermediate temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the DPF intermediate temperature sensor output voltage”.

3. Checking the DPF intermediate temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between DPF intermediate temperature sensor signals V10 and E88.

Voltage	State	Corrective action
V10 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ V10 ≤ 4.8 V	OK (normal range)	Replace the injector.
4.8 V < V10	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Replace the injector.

4. Checking whether the error reappears by replacing the injector
   Replace the injector, start the engine, and perform normal operation to check if the error reappears.

NG	There is a possibility of oil inflow from the turbocharger. Remove the pipes and check the turbocharger and pipes for oil adhesion.
OK	Returns to normal.

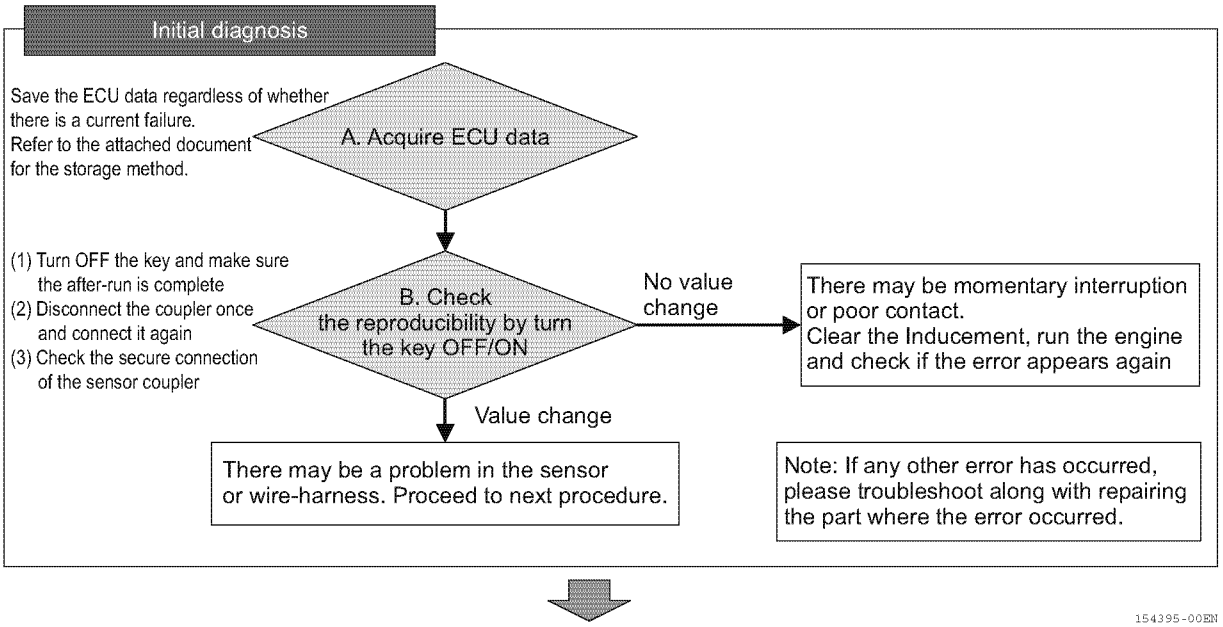
■ DPF intermediate temperature sensor 4

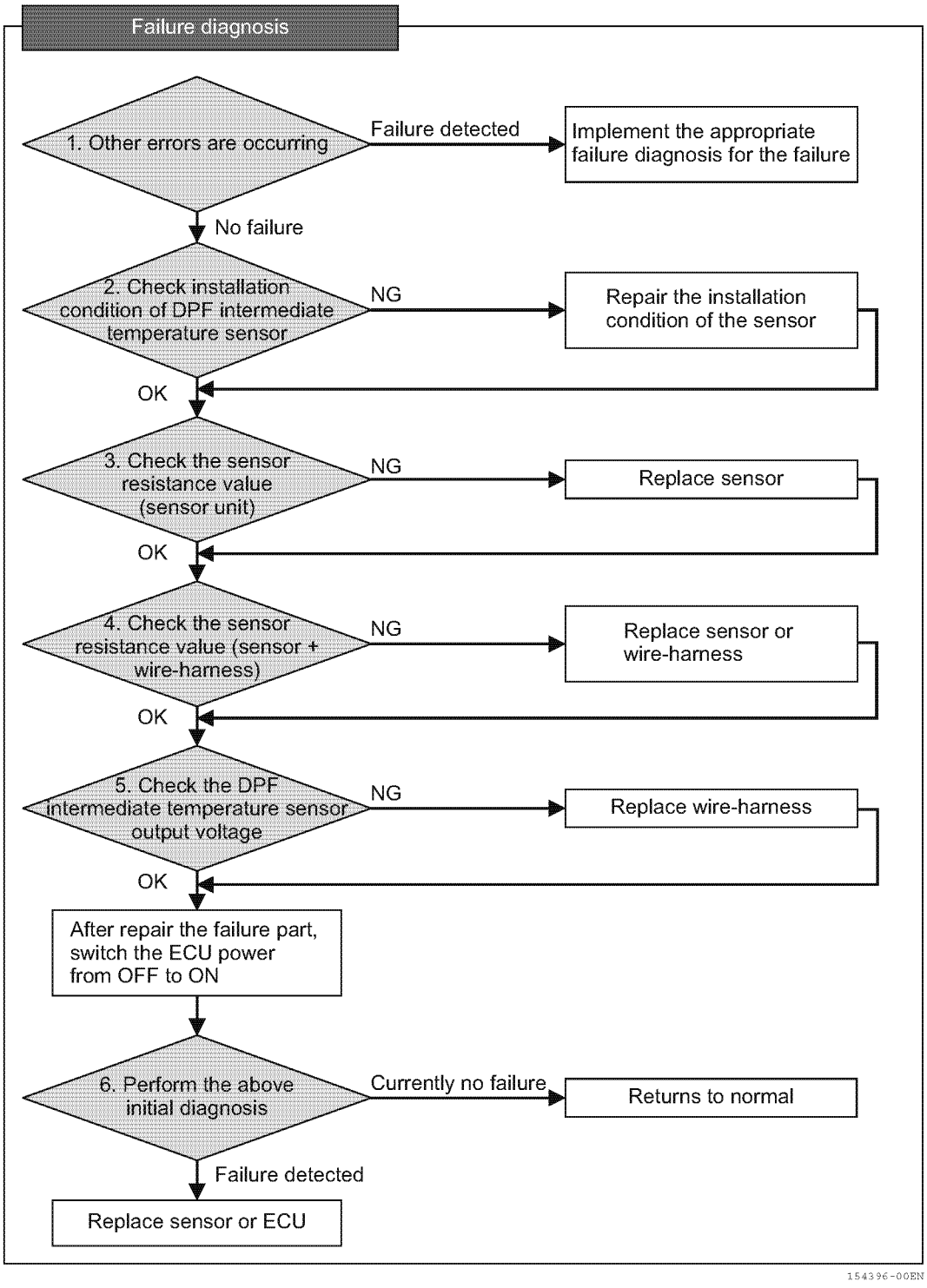
● Related DTC

P code	P167A	DPF intermediate temperature sensor error (detected value error)

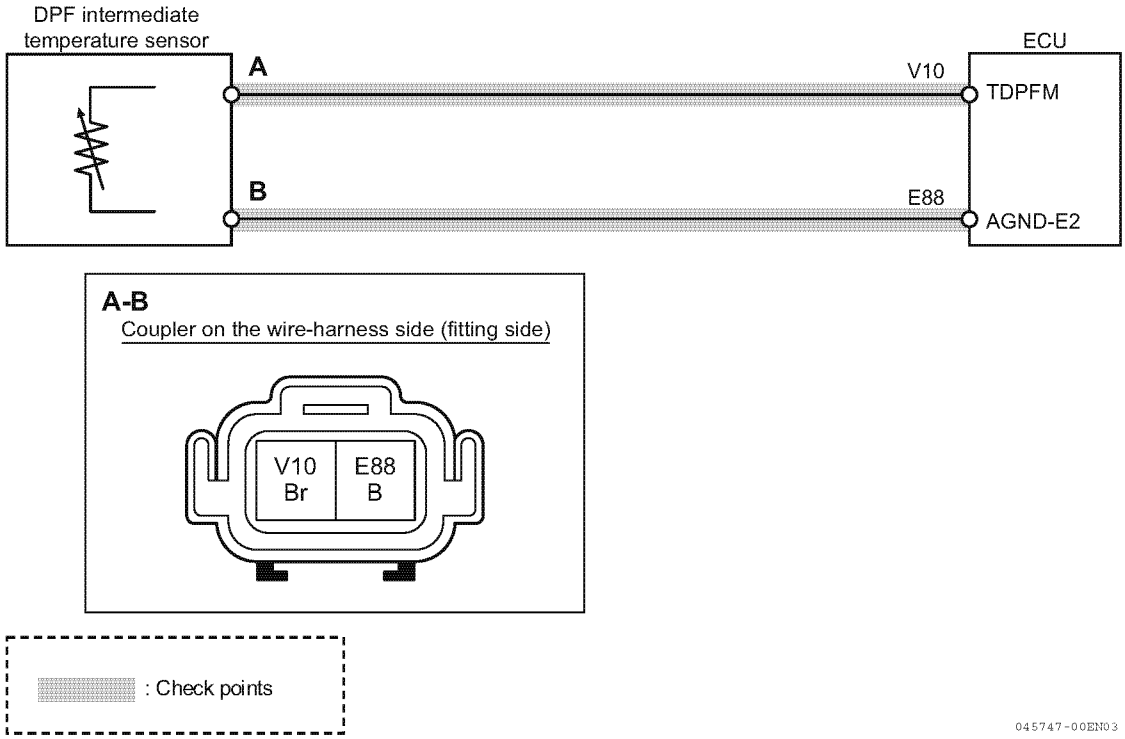
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of DPF intermediate temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the sensor resistance value (sensor unit)
NG
Replace sensor
OK
4. Check the sensor resistance value (sensor + wire-harness)
NG
Replace sensor or wire-harness
OK
5. Check the DPF intermediate temperature sensor output voltage
NG
Replace wire-harness
OK
After repair the failure part, switch the ECU power from OFF to ON
6. Perform the above initial diagnosis
Currently no failure
Returns to normal
Failure detected
Replace sensor or ECU
154396-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for EGR gas temperature sensor, cooling water temperature sensor, DPF inlet temperature sensor, EGR valve, or inside the ECU.

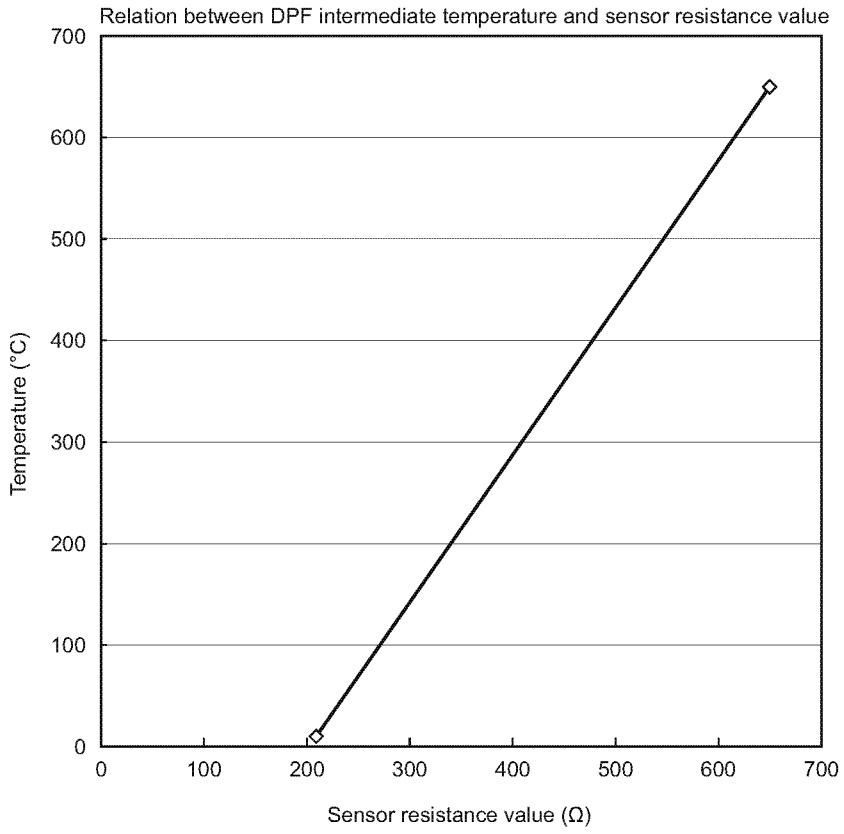
Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to “Checking installation condition of DPF intermediate temperature sensor”.

2. Checking installation condition of DPF intermediate temperature sensor
   1- Turn OFF the key switch.
   2- Check the installation condition of DPF intermediate temperature sensor.
   3- Check the DPF and exhaust piping for damage or failure.

NG	Reinstall the sensor, and turn OFF/ON the ECU power for failure diagnosis using SA-D.
OK	Go to “Checking the sensor resistance value (sensor unit)”

3. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the DPF intermediate temperature sensor.
   2- Using a circuit tester, measure the resistance value between DPF intermediate temperature sensor terminals A and B.
   3- Using “DPF intermediate temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

DPF intermediate temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

NG	Replace the DPF intermediate temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

4. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the DPF intermediate temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals V10 and E88 on the wire-harness side.
   3- Using “DPF intermediate temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the DPF intermediate temperature sensor output voltage”.

5. Checking the DPF intermediate temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between DPF intermediate temperature sensor signals V10 and E88.

Voltage	State	Corrective action
V10 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ V10 ≤ 4.8 V	OK (normal range)	Wire-harness is normal.
4.8 V < V10	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

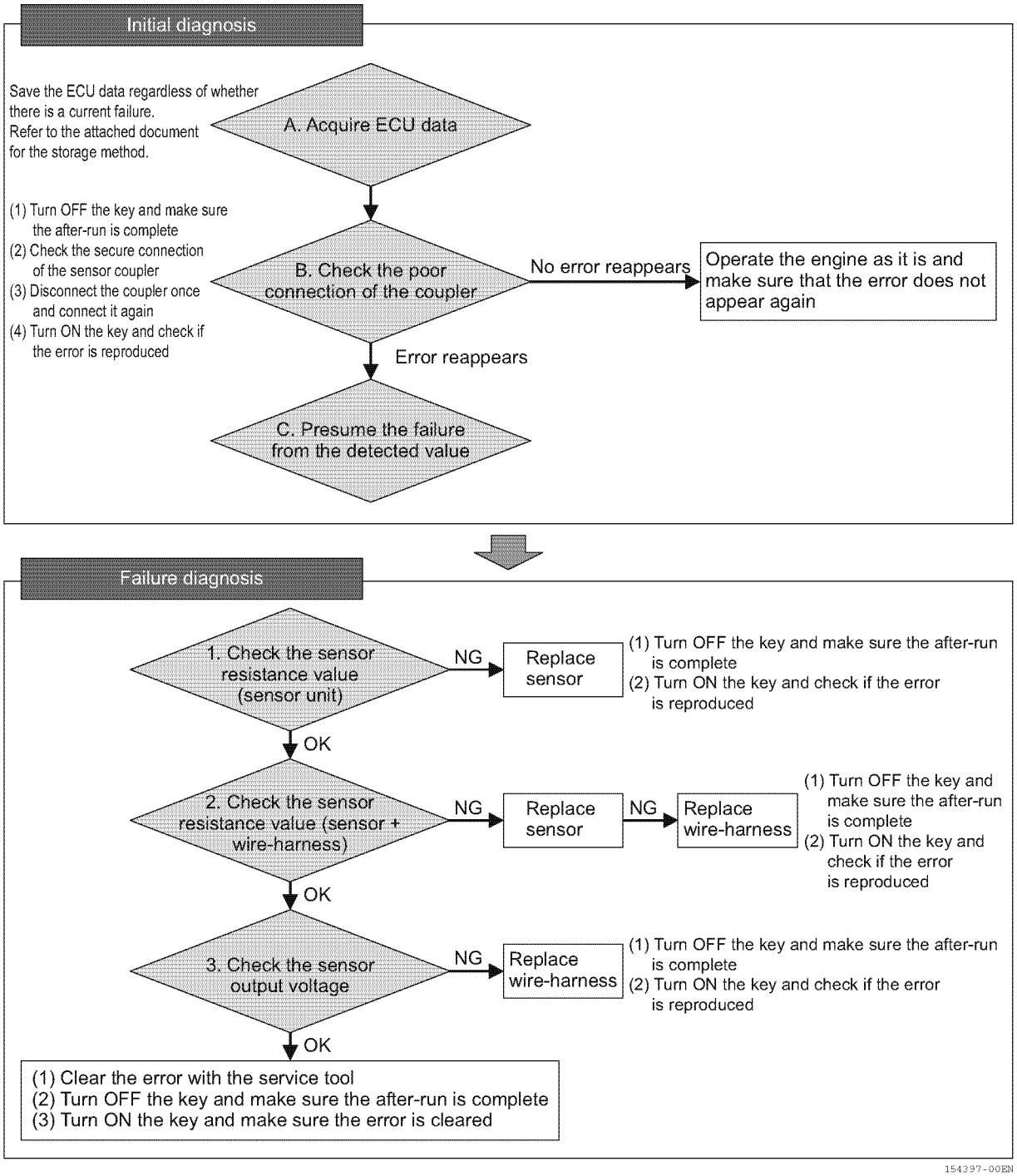
■ Cooling water temperature sensor 1

● Related DTC

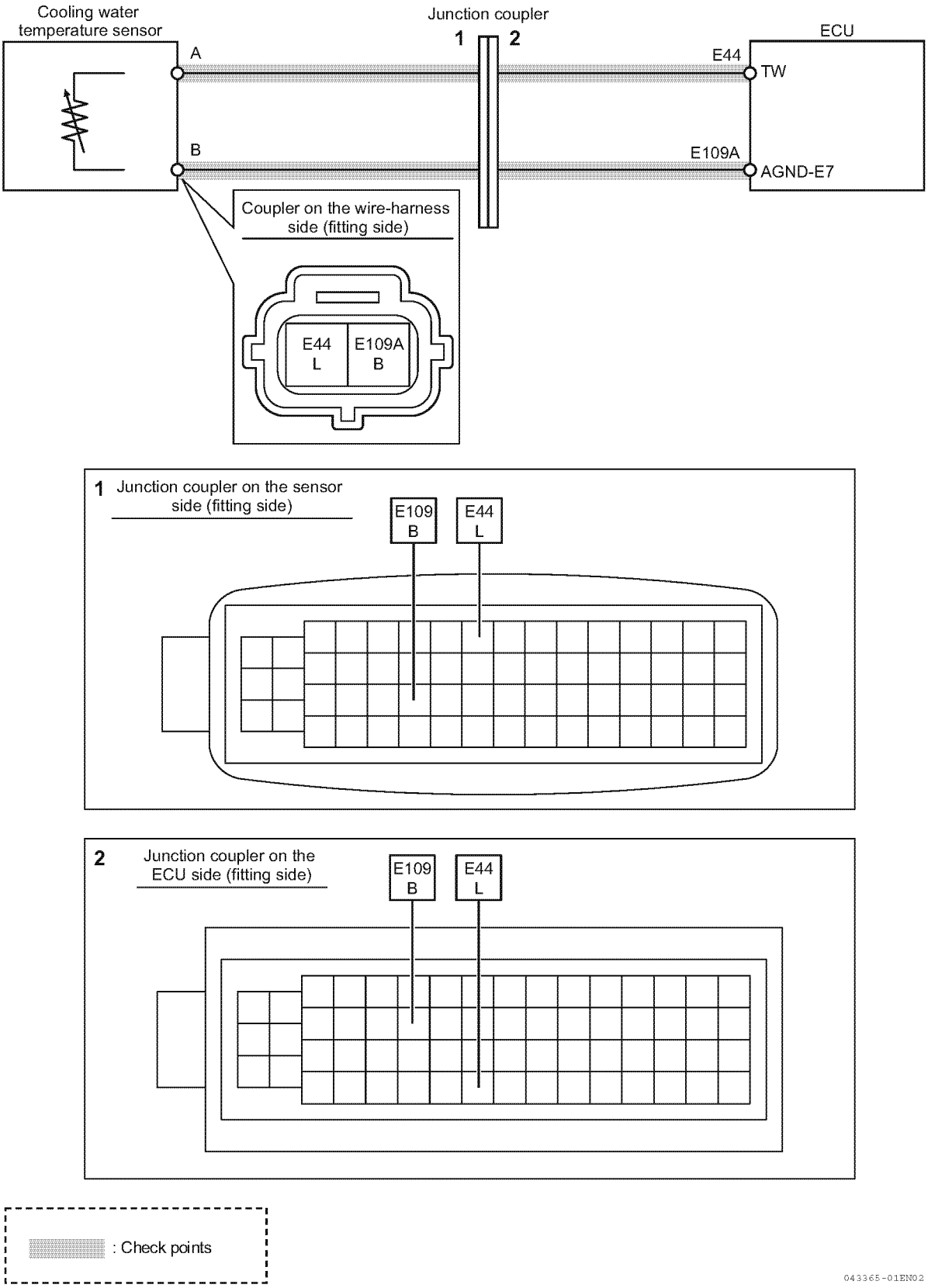
P code	P0117	Cooling water temperature sensor error (voltage low)
	P0118	Cooling water temperature sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

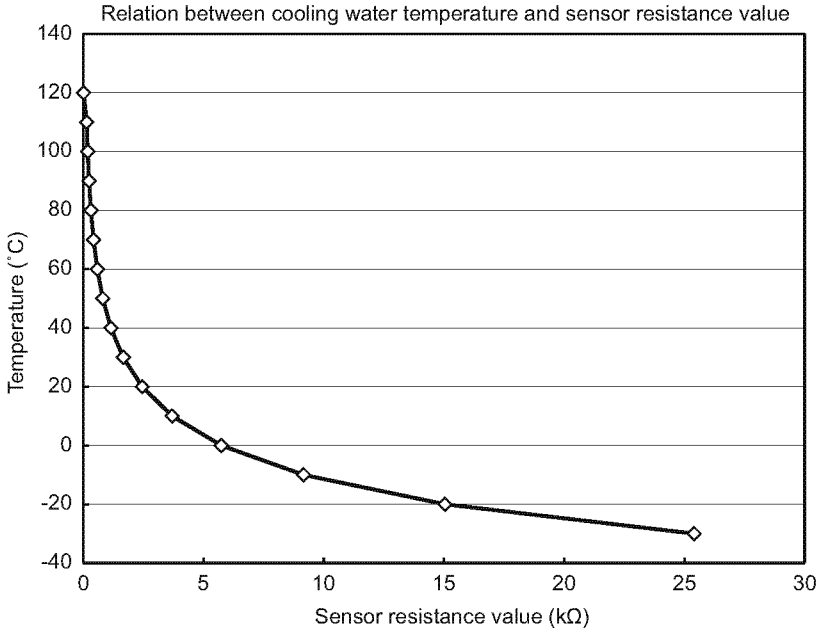


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the cooling water temperature sensor.
   2- Using a circuit tester, measure the resistance value between cooling water temperature sensor terminals A and B.
   3- Using “Cooling water temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Cooling water temperature sensor characteristics



Temperature (˚C)	Sensor resistance value (kΩ)
-30	25.40
-20	15.04
-10	9.16
0	5.74
10	3.70
20	2.45
30	1.66
40	1.15
50	0.811
60	0.584
70	0.428
80	0.318
90	0.240
100	0.184
110	0.142
120	0.111

NG	Replace the cooling water temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the cooling water temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E44 and E109A on the wire-harness side.
   3- Using “Cooling water temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the cooling water temperature sensor output voltage”.

3. Checking the cooling water temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage of the cooling water temperature sensor signals between E44 and E109A.

Voltage	State	Corrective action
E44 < 0.1 V	NG	Replace the wire-harness.
0.1 V ≤ E44 ≤ 4.8 V	OK (normal range)	Wire-harness is normal.
4.8 V < E44	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

4. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

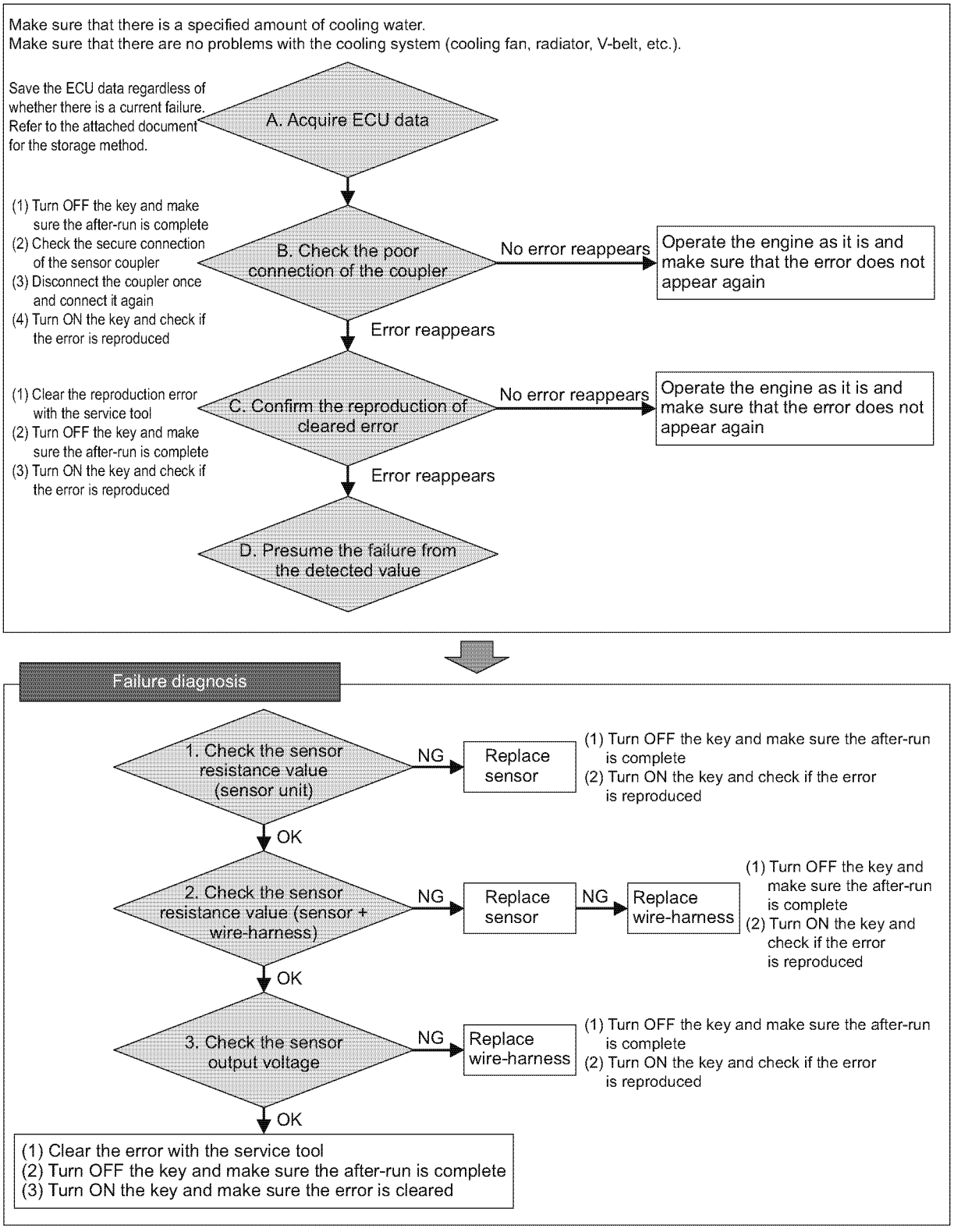
■ Cooling water temperature sensor 2

● Related DTC

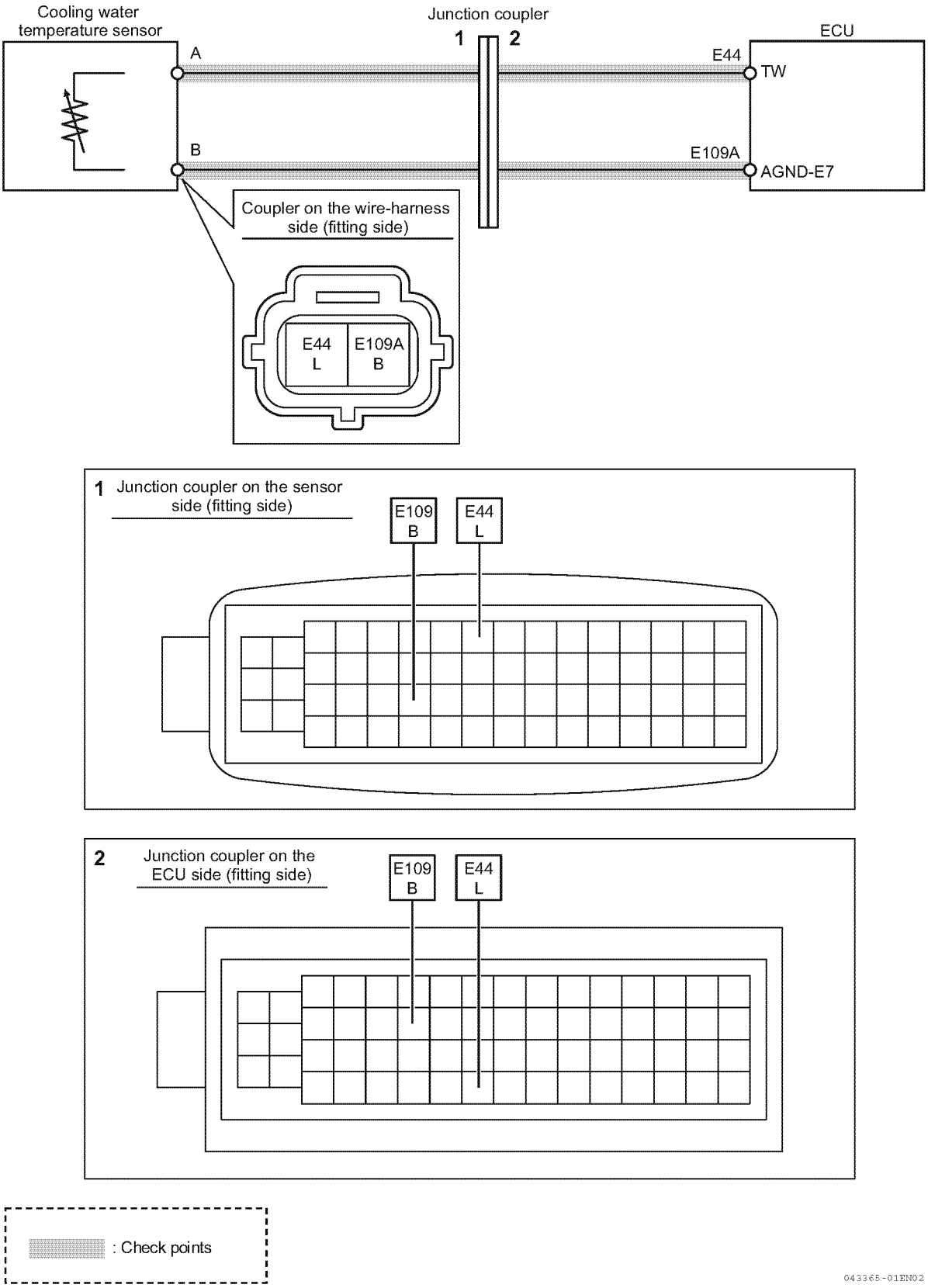
P code	P0217	Cooling water temperature high (overheat)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

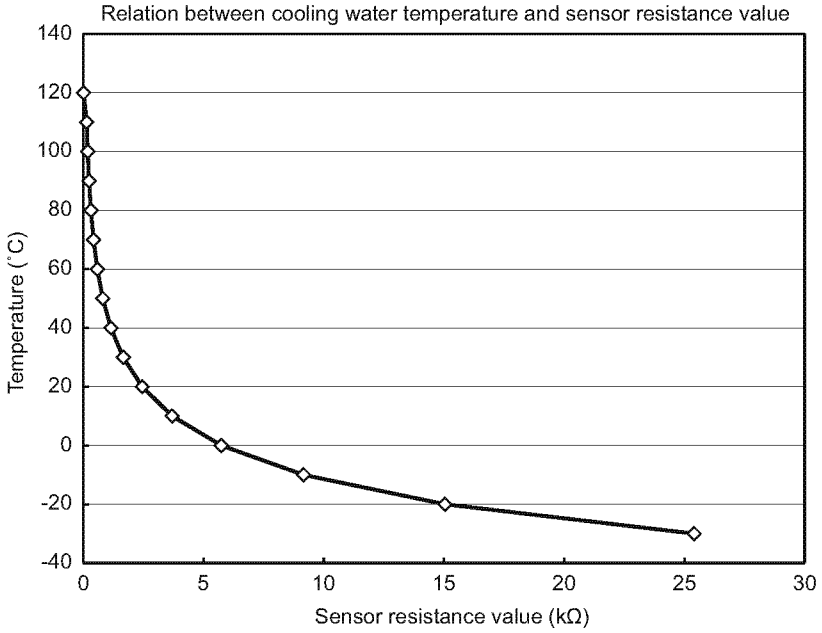


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the cooling water temperature sensor.
   2- Using a circuit tester, measure the resistance value between cooling water temperature sensor terminals A and B.
   3- Using “Cooling water temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Cooling water temperature sensor characteristics



Temperature (˚C)	Sensor resistance value (kΩ)
-30	25.40
-20	15.04
-10	9.16
0	5.74
10	3.70
20	2.45
30	1.66
40	1.15
50	0.811
60	0.584
70	0.428
80	0.318
90	0.240
100	0.184
110	0.142
120	0.111

NG	Replace the cooling water temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the cooling water temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E44 and E109A on the wire-harness side.
   3- Using “Cooling water temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the cooling water temperature sensor output voltage”.

3. Checking the cooling water temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage of the cooling water temperature sensor signals between E44 and E109A.

Voltage	State	Corrective action
E44 < 0.1 V	NG	Replace the wire-harness.
0.1 V ≤ E44 ≤ 4.8 V	OK (normal range)	Wire-harness is normal.
4.8 V < E44	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

4. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

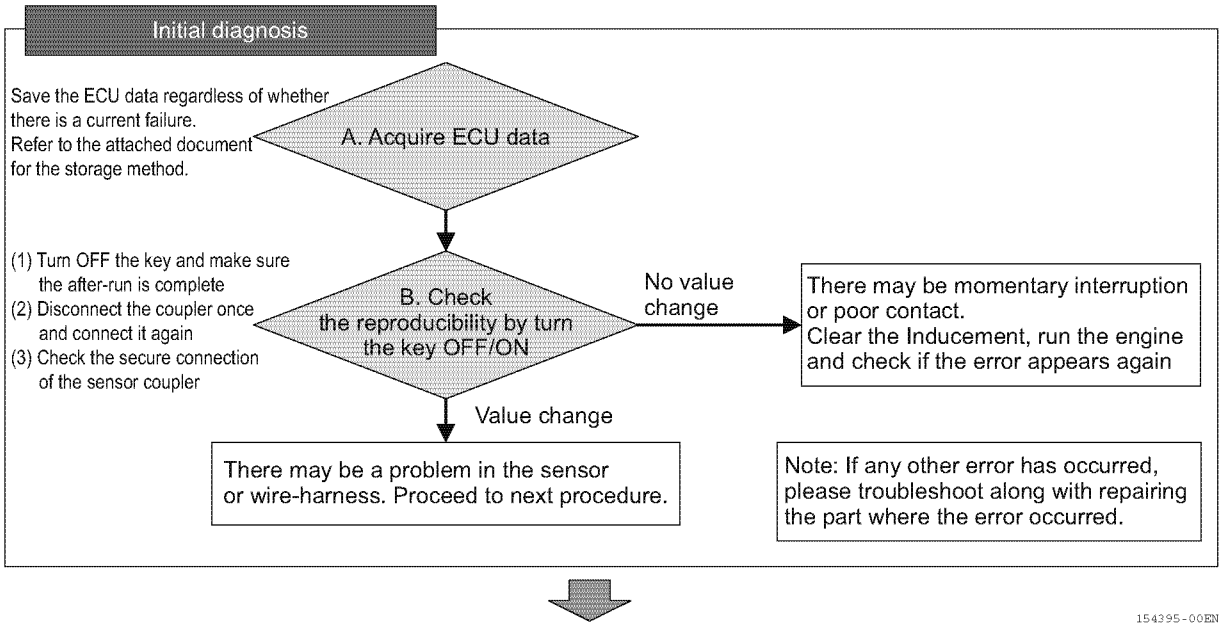
■ Cooling water temperature sensor 3

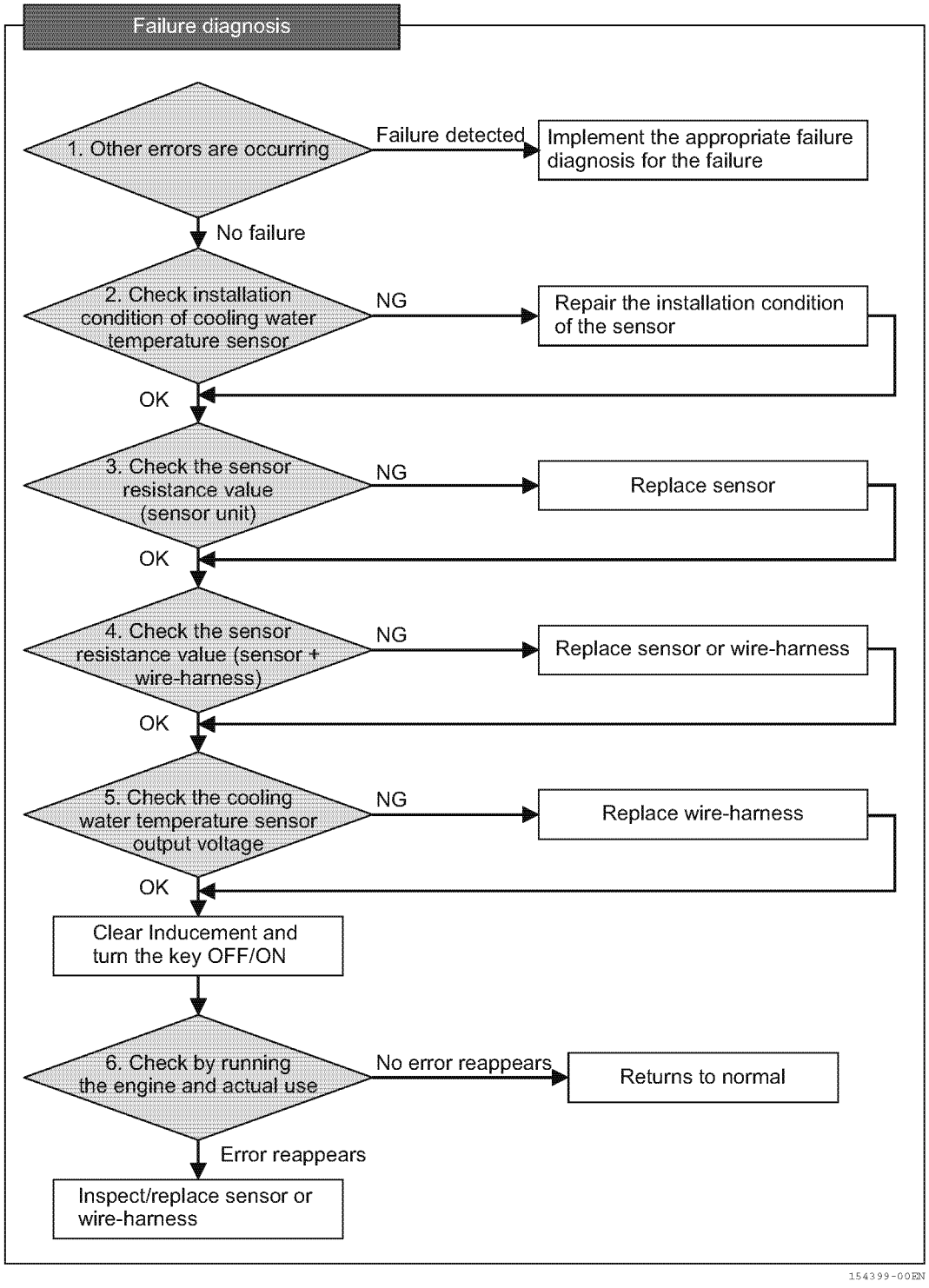
● Related DTC

P code	P1674	Cooling water temperature sensor error (detected value error)

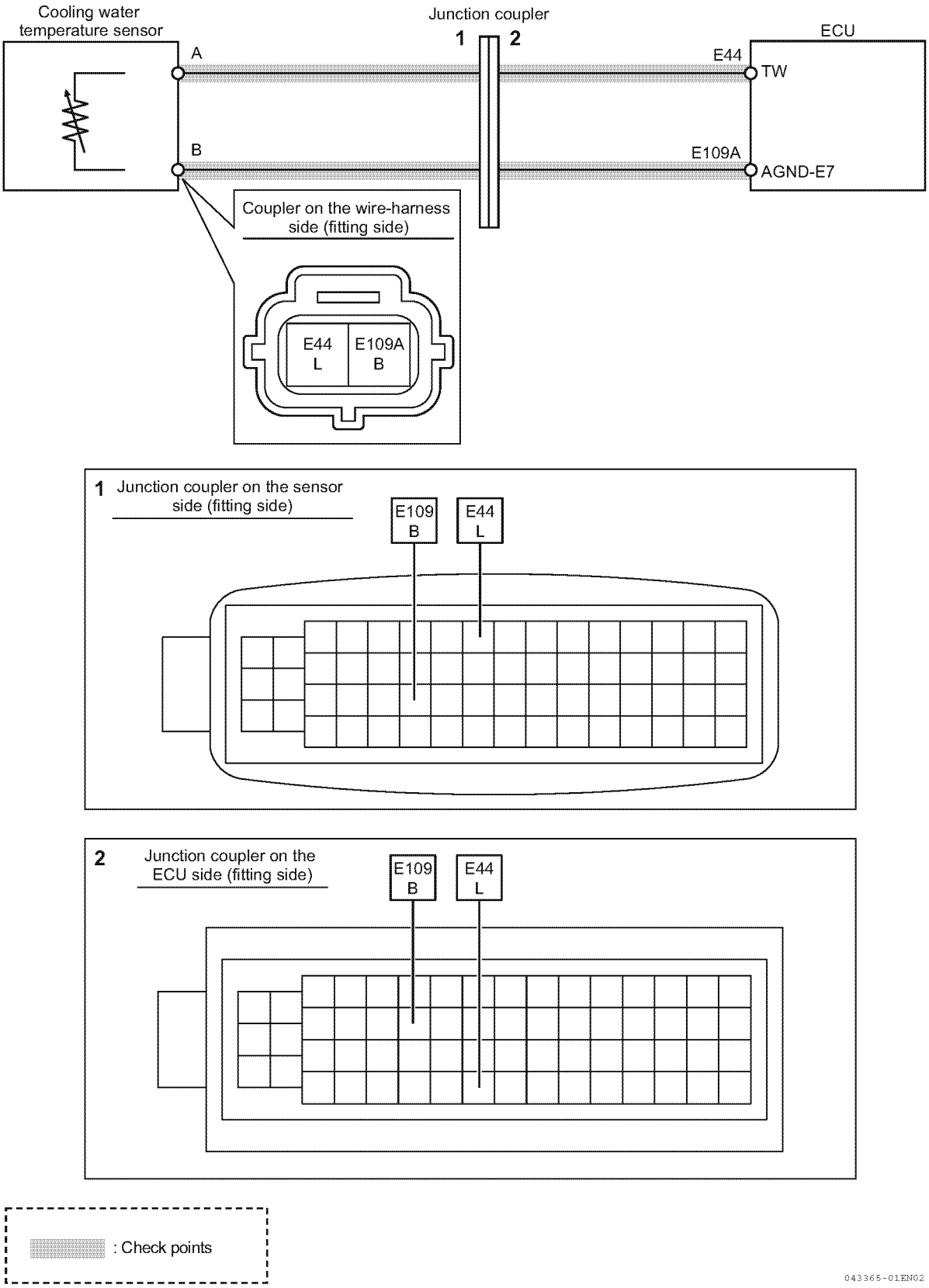
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of cooling water temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the sensor resistance value (sensor unit)
NG
Replace sensor
OK
4. Check the sensor resistance value (sensor + wire-harness)
NG
Replace sensor or wire-harness
OK
5. Check the cooling water temperature sensor output voltage
NG
Replace wire-harness
OK
Clear Inducement and turn the key OFF/ON
6. Check by running the engine and actual use
No error reappears
Returns to normal
Error reappears
Inspect/replace sensor or wire-harness
154399-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for cooling water temperature sensor or inside the ECU.

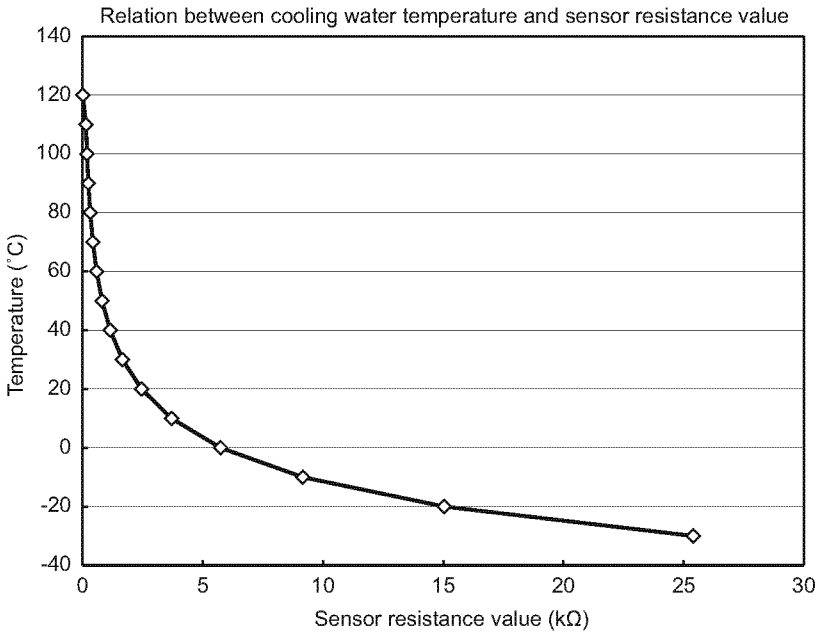
Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to “Checking installation condition of cooling water temperature sensor”.

2. Checking installation condition of cooling water temperature sensor
   1- Turn OFF the key switch.
   2- Check the installation condition of cooling water temperature sensor.
   3- Make sure that there is nothing wrong (disconnections and damages) with the cooling water piping or cooling system.

NG	Correct the sensor mounting state and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor unit)”

3. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the cooling water temperature sensor.
   2- Using a circuit tester, measure the resistance value between cooling water temperature sensor terminals A and B.
   3- Using “Cooling water temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Cooling water temperature sensor characteristics



Temperature (°C)	Sensor resistance value (kΩ)
-30	25.40
-20	15.04
-10	9.16
0	5.74
10	3.70
20	2.45
30	1.66
40	1.15
50	0.811
60	0.584
70	0.428
80	0.318
90	0.240
100	0.184
110	0.142
120	0.111

NG	Replace the cooling water temperature sensor, and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

4. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the cooling water temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E44 and E109A on the wire-harness side.
   3- Using “Cooling water temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. After replacement, perform the following procedures.
OK	Go to “Checking the cooling water temperature sensor output voltage”.

5. Checking the cooling water temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage of the cooling water temperature sensor signals between E44 and E109A.

Voltage	State	Corrective action
E44 < 0.1 V	NG	Replace the wire-harness.
0.1 V ≤ E44 ≤ 4.8 V	OK (normal range)	Wire-harness is normal.
4.8 V < E44	NG	Replace the wire-harness.

NG	• The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU. After replacement, switch the ECU power from OFF to ON, and then clear the Inducement by SA-D.
OK	Switch the ECU power from OFF to ON, and then clear the Inducement by SA-D.

6. Operation using SA-D
   1- Turn OFF the key switch and turn ON the key switch again to start the engine. Operate the engine that satisfies the reset criteria for cooling water temperature sensor error (detected value error) (*P97*).
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the cooling water temperature sensor or wire-harness.

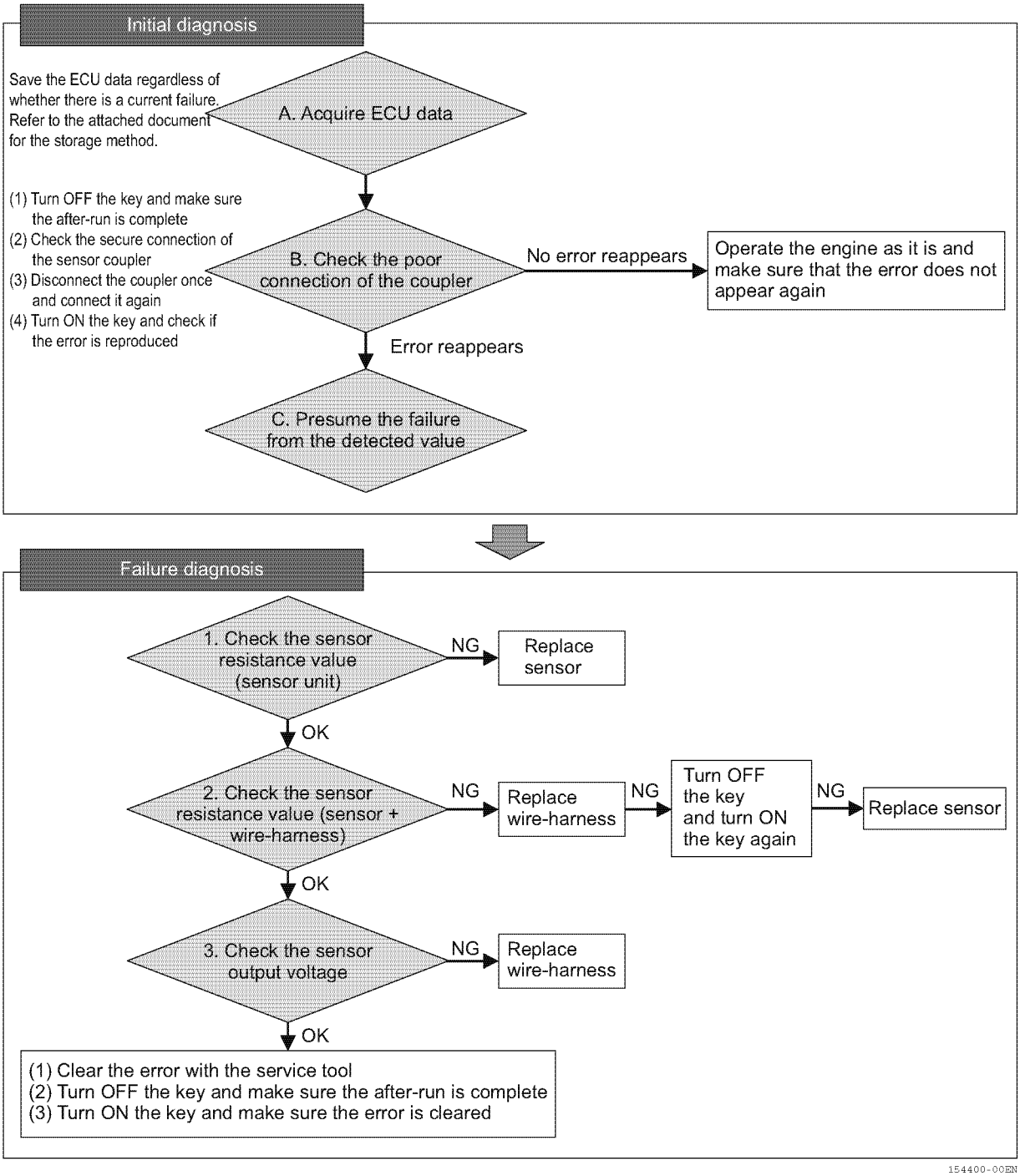
■ Fresh air temperature sensor 1

● Related DTC

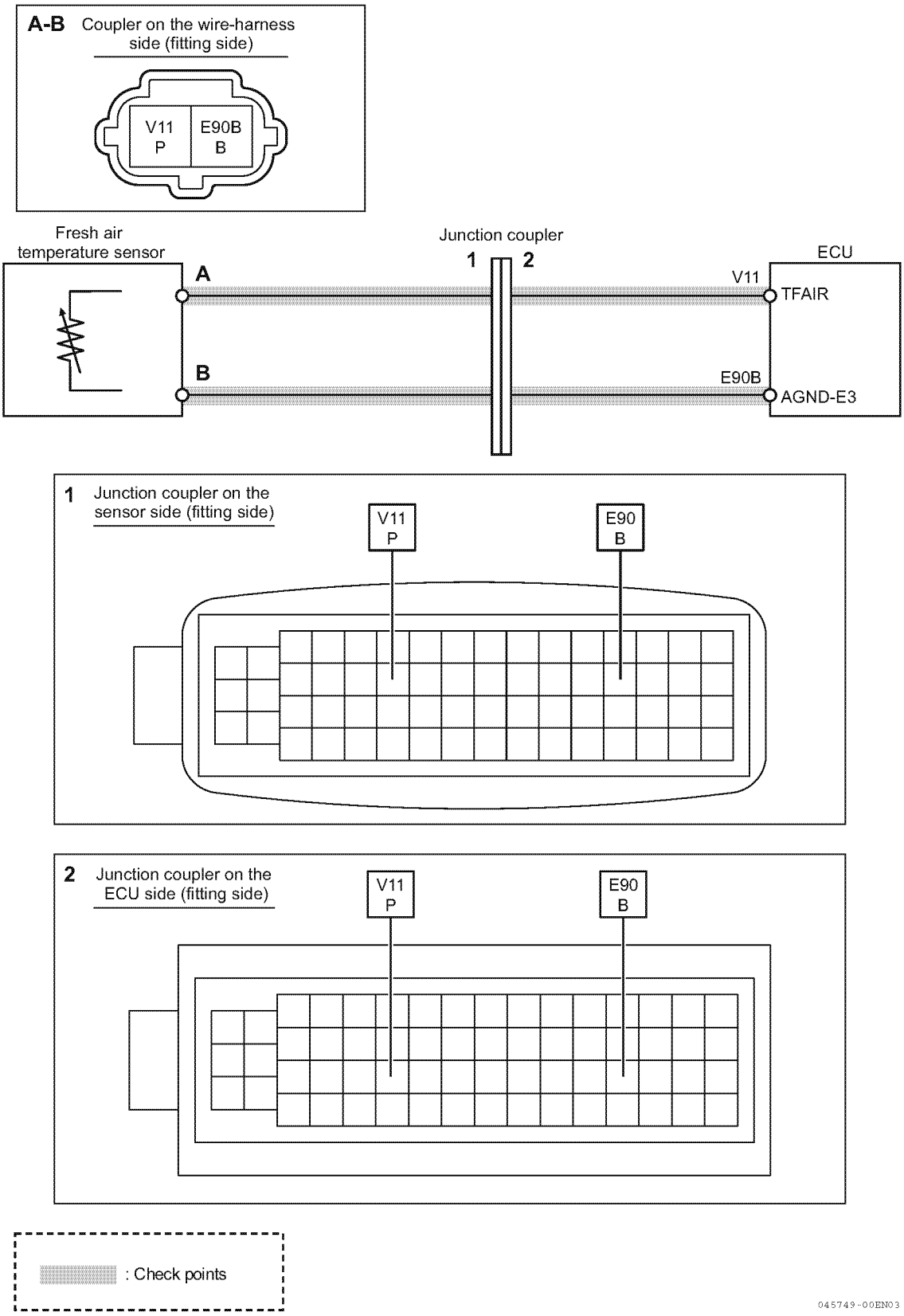
P code	P0113	Fresh air temperature sensor error (voltage high)
	P0112	Fresh air temperature sensor error (voltage low)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

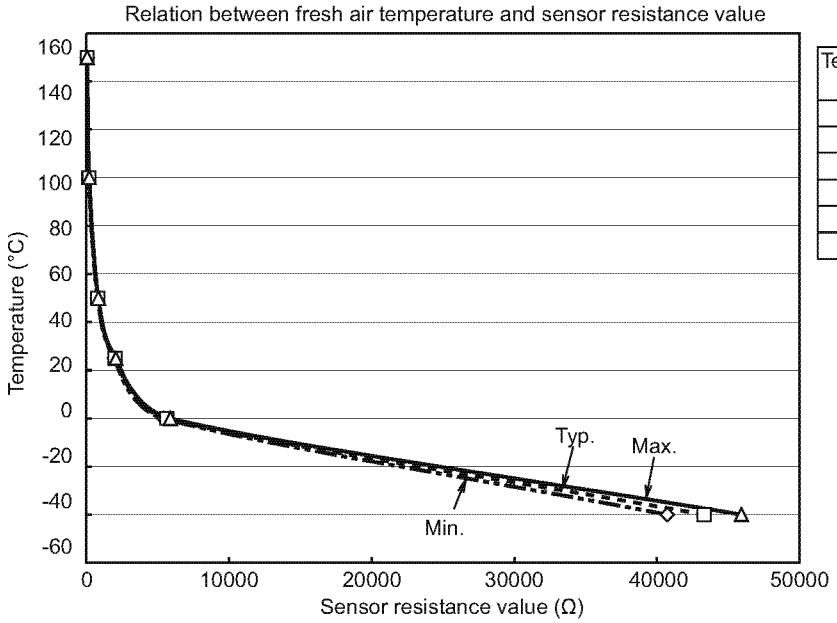


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the fresh air temperature sensor.
   2- Using a circuit tester, measure the resistance value between fresh air temperature sensor terminals A and B.
   3- Using “Fresh air temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Fresh air temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Typ.	Max.
-40	40720	43318	45918
0	5417	5652	5886
25	1940	2000	2060
50	783.6	812.8	842.1
100	177.1	186	194.4
150	54.48	57.96	61.44

NG	Replace the fresh air temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the fresh air temperature sensor and wire-harness then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals V11 and E90B on the wire-harness side.
   3- Using “Fresh air temperature sensor characteristics”, make sure that not the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the fresh air temperature sensor output voltage”.

3. Checking the fresh air temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between fresh air temperature sensor signals V11 and E90B.

Voltage	State	Corrective action
V11 < 0.15 V	NG	Replace the wire-harness.
0.15 V ≤ V11 ≤ 4.85 V	OK (normal range)	Wire-harness is normal.
4.85 V < V11	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

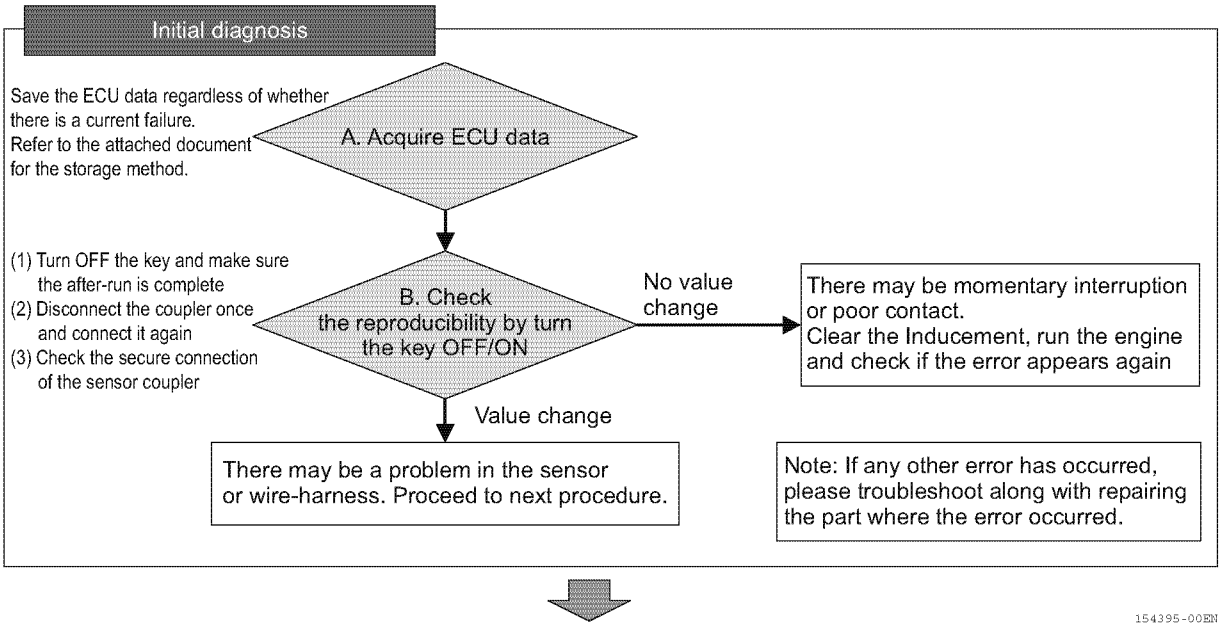
■ Fresh air temperature sensor 2

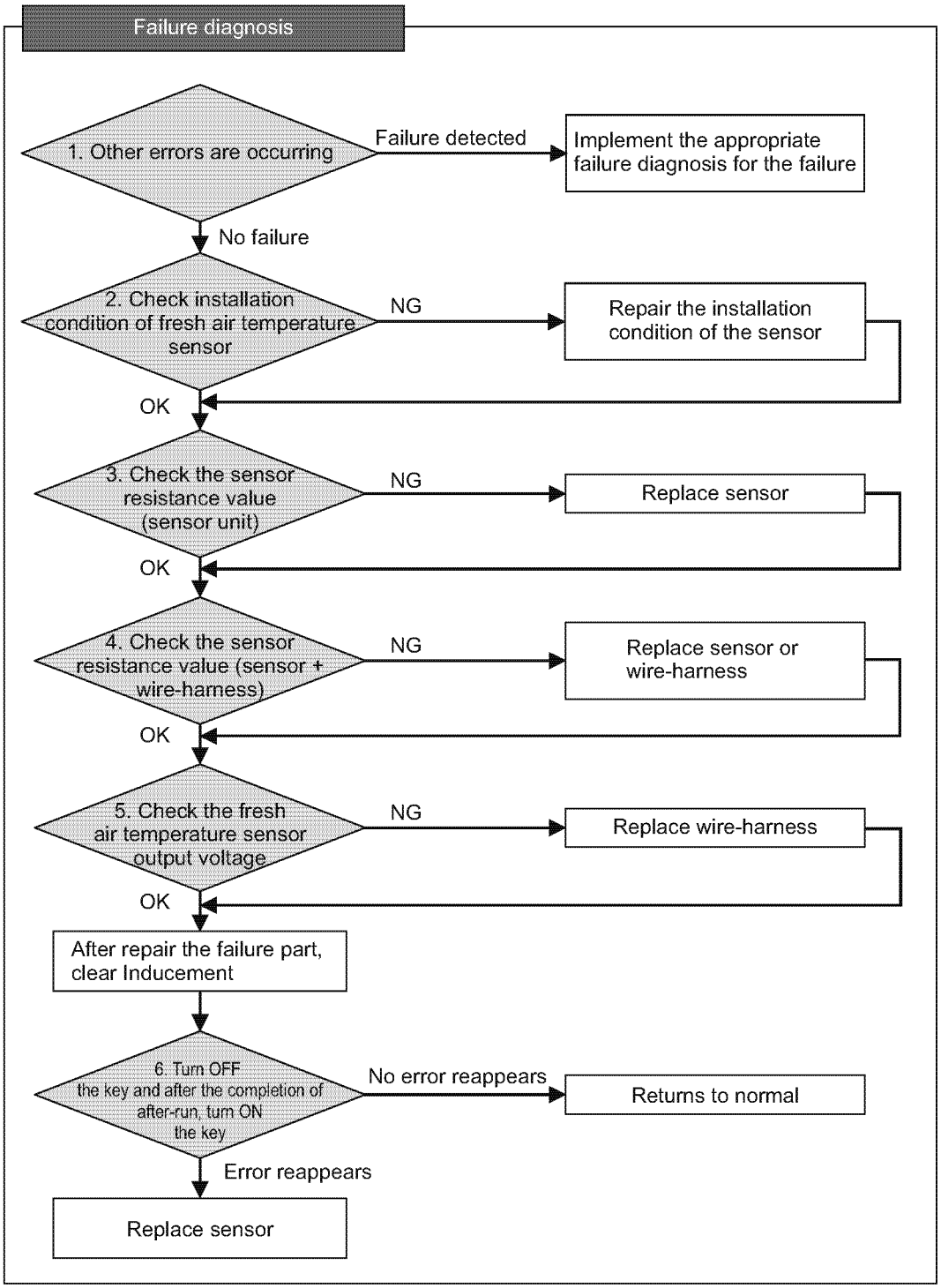
● Related DTC

P code	P1678	Fresh air temperature sensor error (detected value error)

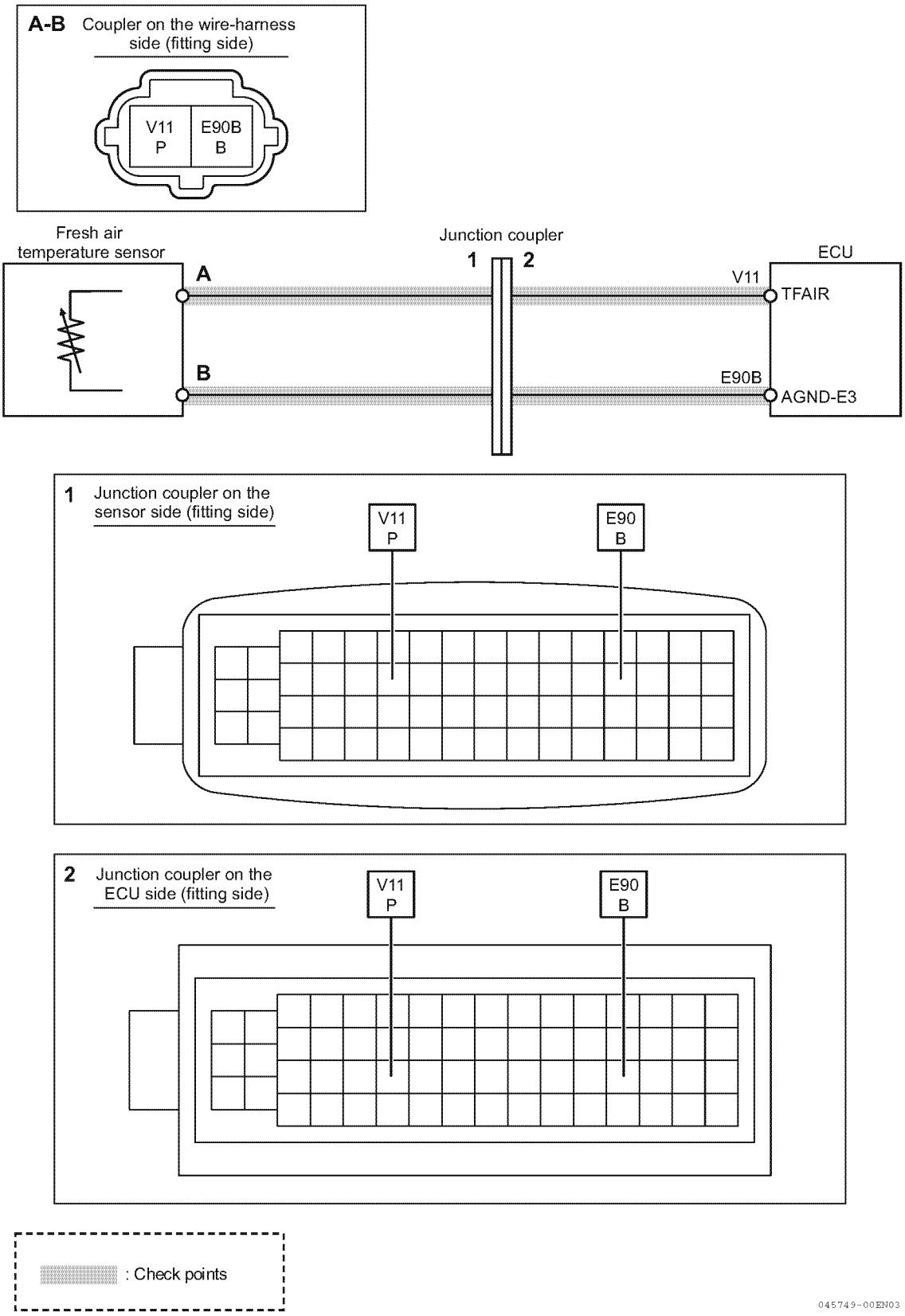
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of fresh air temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the sensor resistance value (sensor unit)
NG
Replace sensor
OK
4. Check the sensor resistance value (sensor + wire-harness)
NG
Replace sensor or wire-harness
OK
5. Check the fresh air temperature sensor output voltage
NG
Replace wire-harness
OK
After repair the failure part, clear Inducement
6. Turn OFF the key and after the completion of after-run, turn ON the key
No error reappears
Returns to normal
Error reappears
Replace sensor
154401-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for fresh air temperature sensor, cooling water temperature sensor, exhaust manifold temperature sensor, or inside the ECU.

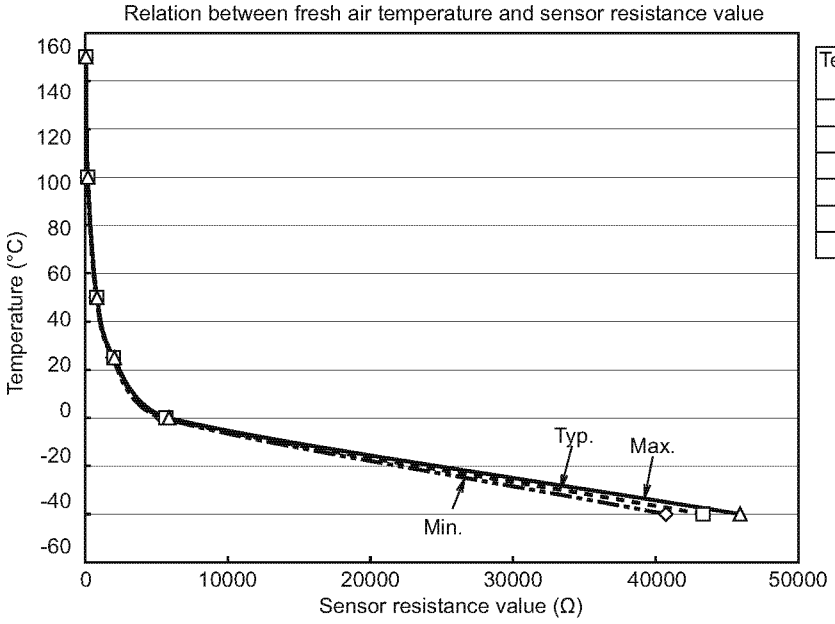
Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to “Checking installation condition of fresh air temperature sensor”.

2. Checking installation condition of fresh air temperature sensor
   1- Turn OFF the key switch.
   2- Check the installation condition of fresh air temperature sensor.

NG	Correct the sensor mounting state and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor unit)”

3. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the fresh air temperature sensor.
   2- Using a circuit tester, measure the resistance value between fresh air temperature sensor terminals A and B.
   3- Using “Fresh air temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Fresh air temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Typ.	Max.
-40	40720	43318	45918
0	5417	5652	5886
25	1940	2000	2060
50	783.6	812.8	842.1
100	177.1	186	194.4
150	54.48	57.96	61.44

NG	Replace the fresh air temperature sensor, and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

4. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the fresh air temperature sensor and wire-harness then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals V11 and E90B on the wire-harness side.
   3- Using “Fresh air temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. After replacement, perform the following procedures.
OK	Go to “Checking the fresh air temperature sensor output voltage”.

5. Checking the fresh air temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between fresh air temperature sensor signals V11 and E90B.

Voltage	State	Corrective action
V11 < 0.15 V	NG	Replace the wire-harness.
0.15 V ≤ V11 ≤ 4.85 V	OK (normal range)	Wire-harness is normal.
4.85 V < V11	NG	Replace the wire-harness.

NG	• The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the ECU. After replacement, switch the ECU power from OFF to ON, and then perform the following procedure.
OK	Switch the ECU power from OFF to ON, and then clear the Inducement, make a diagnosis using SA-D and make sure that the error does not reappear.

6. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and check if the error reappears.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the fresh air temperature sensor or wire-harness.

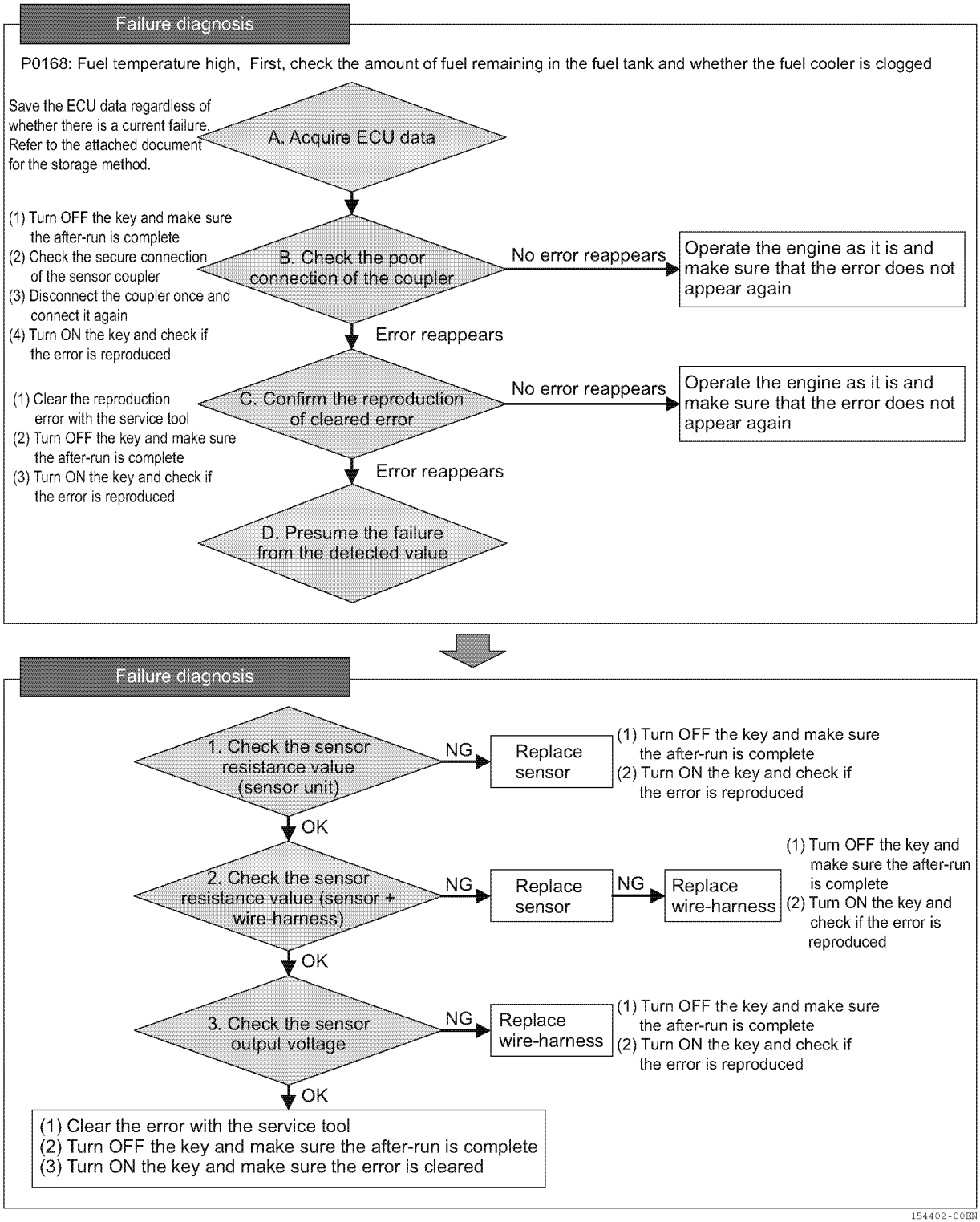
■ Fuel temperature sensor

● Related DTC

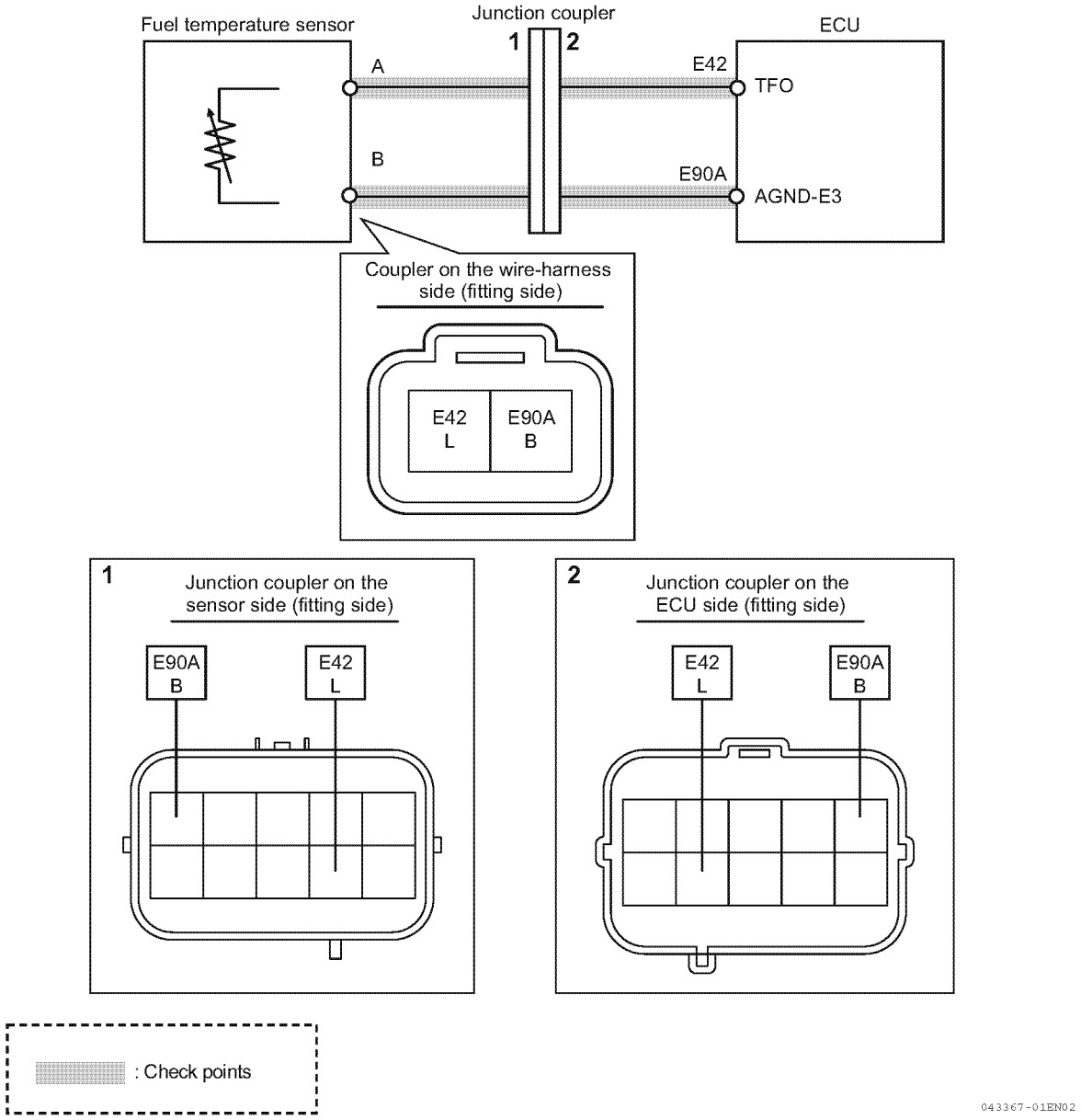
P code	P0182	Fuel temperature sensor error (voltage low)
	P0183	Fuel temperature sensor error (voltage high)
	P0168	Fuel temperature high

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

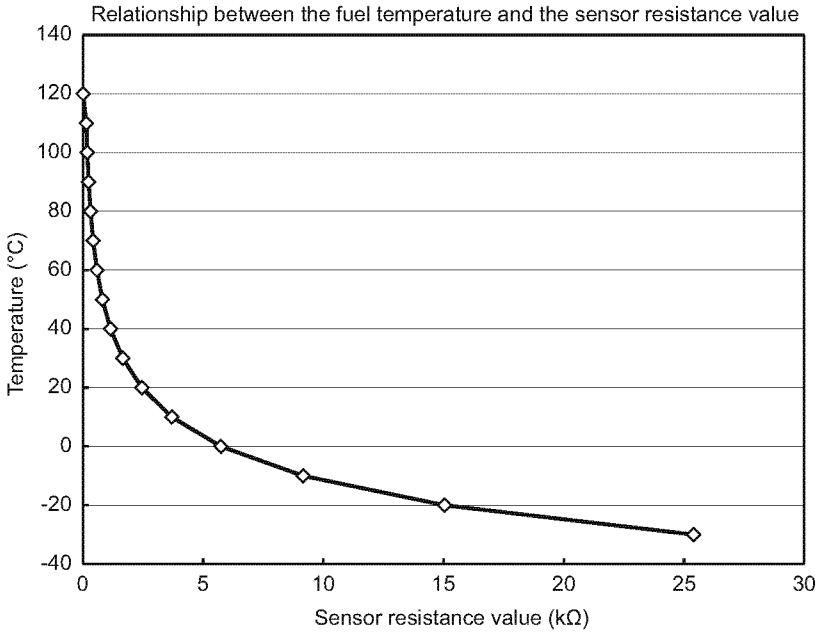


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the fuel temperature sensor.
   2- Using a circuit tester, measure the resistance value between fuel temperature sensor terminals A and B.
   3- Using “Fuel temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Fuel temperature sensor characteristics



Temperature (°C)	Sensor resistance value (kΩ)
-30	25.40
-20	15.04
-10	9.16
0	5.74
10	3.70
20	2.45
30	1.66
40	1.15
50	0.811
60	0.584
70	0.428
80	0.318
90	0.240
100	0.184
110	0.142
120	0.111

05915700EN00

NG	Replace the fuel temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the fuel temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E42 and E90A on the wire-harness side.
   3- Using “Fuel temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the fuel temperature sensor output voltage”.

3. Checking the fuel temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between the sensor signals E42 and E90A.

Voltage	State	Corrective action
E42 < 0.1 V	NG	Replace the wire-harness.
0.1 V ≤ E42 ≤ 4.8 V	OK (normal range)	Wire-harness is normal.
4.8 V < E42	NG	Replace the wire-harness.

NG	The coupler between the fuel temperature sensor and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

4. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

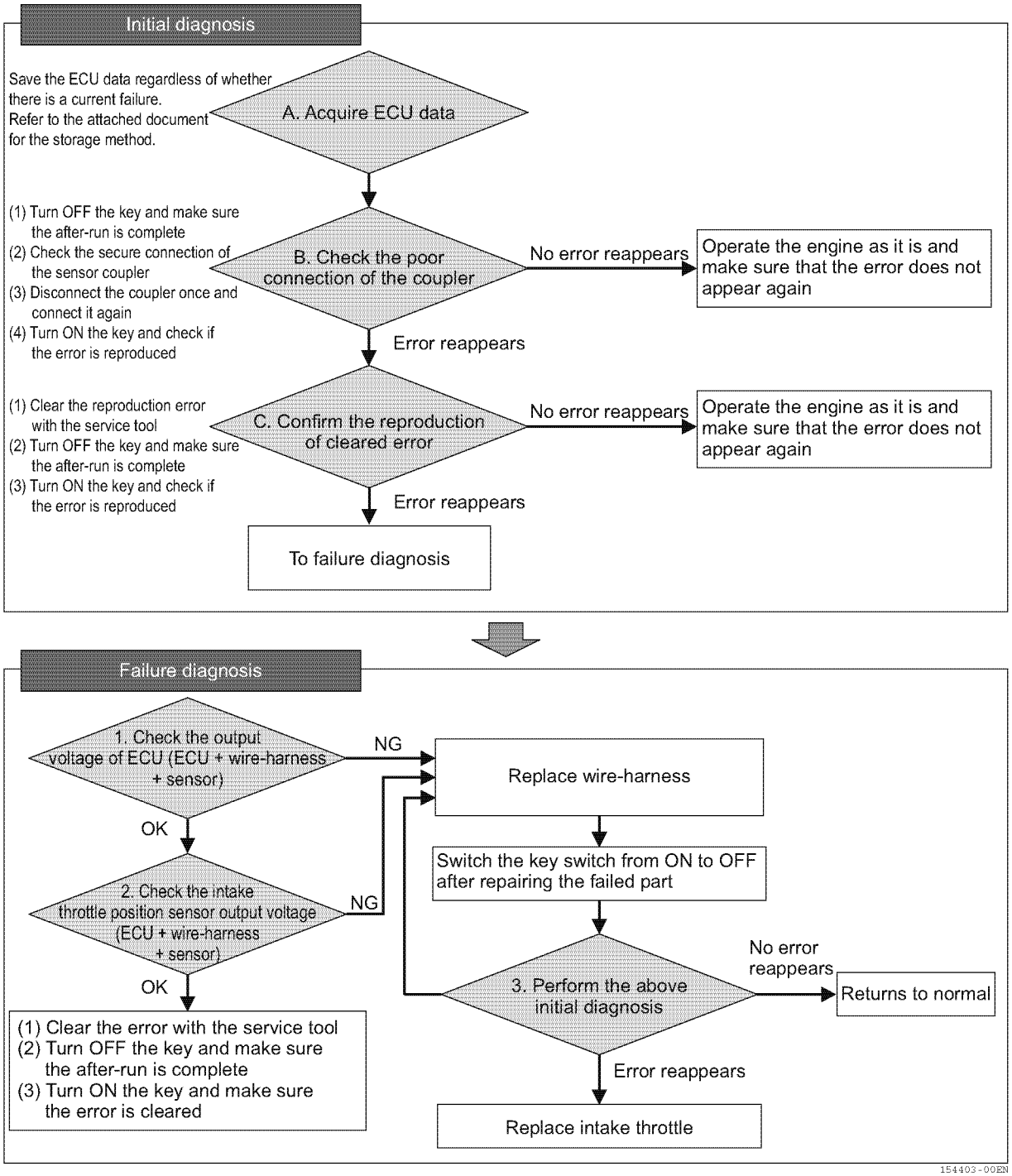
■ Intake throttle valve position sensor

● Related DTC

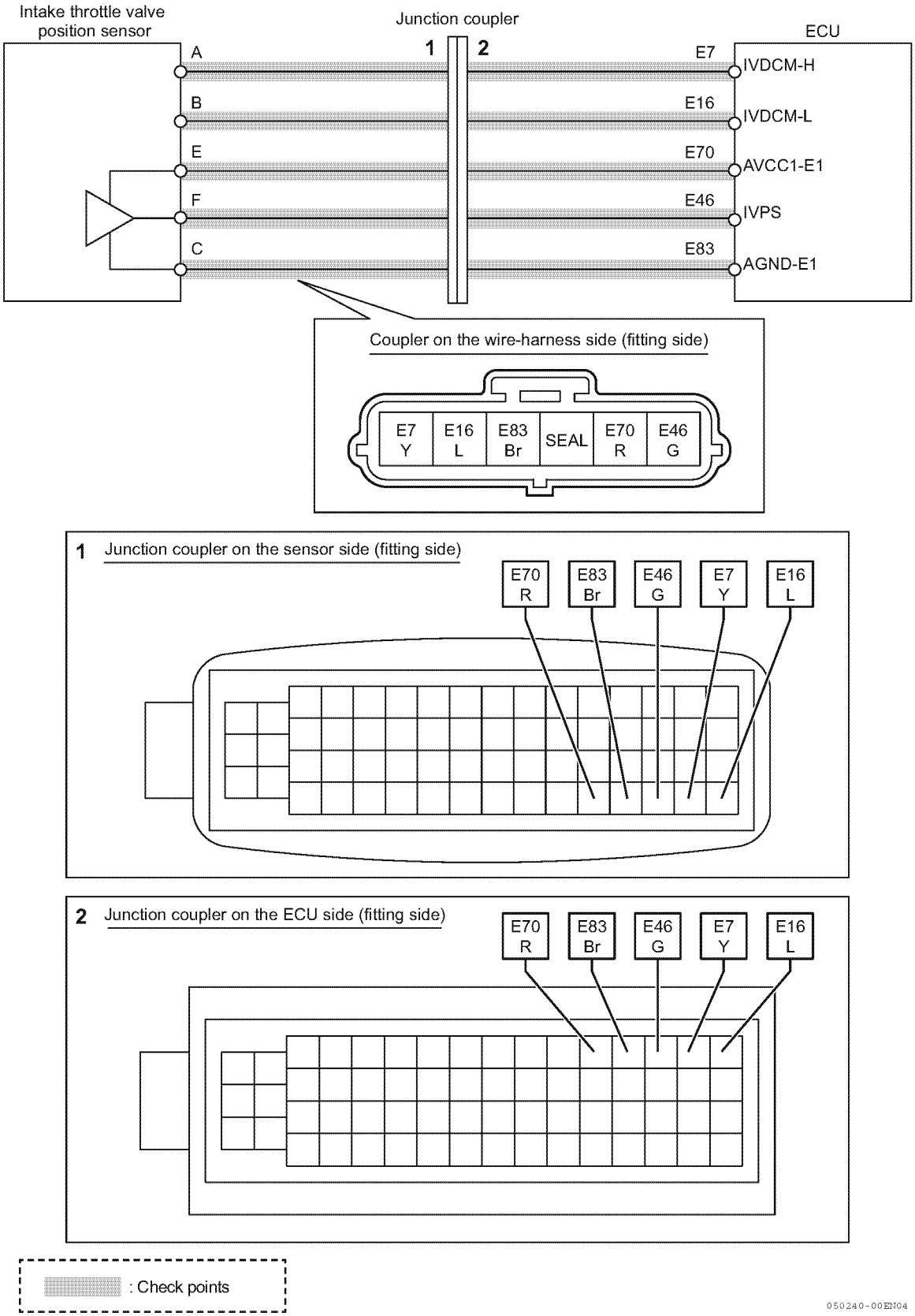
P code	P02E8	Intake throttle valve position sensor error (voltage low)
	P02E9	Intake throttle valve position sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the ECU output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between the intake throttle valve position sensors 5 V E70 and E83.

Voltage	State	Corrective action
E70 < 4.375 V	NG	Replace the wire-harness.
4.375 V ≤ E70 ≤ 5.625 V	OK (normal range)	Check the intake throttle valve position sensor output voltage.
5.625 V < E70	NG	Replace the wire-harness.

NG	Replace the wire-harness, and turn OFF and on the key switch for failure diagnosis.
OK	Go to “Checking the intake throttle valve position sensor output voltage”.

2. Checking the intake throttle valve position sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between the sensor signals E46 and E83.

Voltage	State	Corrective action
E46 < 0.6 V	NG	Replace the wire-harness.
0.6 V ≤ E46 ≤ 4.4 V	OK (normal range)	Wire-harness is normal.
4.4 V < E46	NG	Replace the wire-harness.

NG	Replace the wire-harness, and turn OFF and on the key switch for failure diagnosis using SA-D.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

3. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the intake throttle

4. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

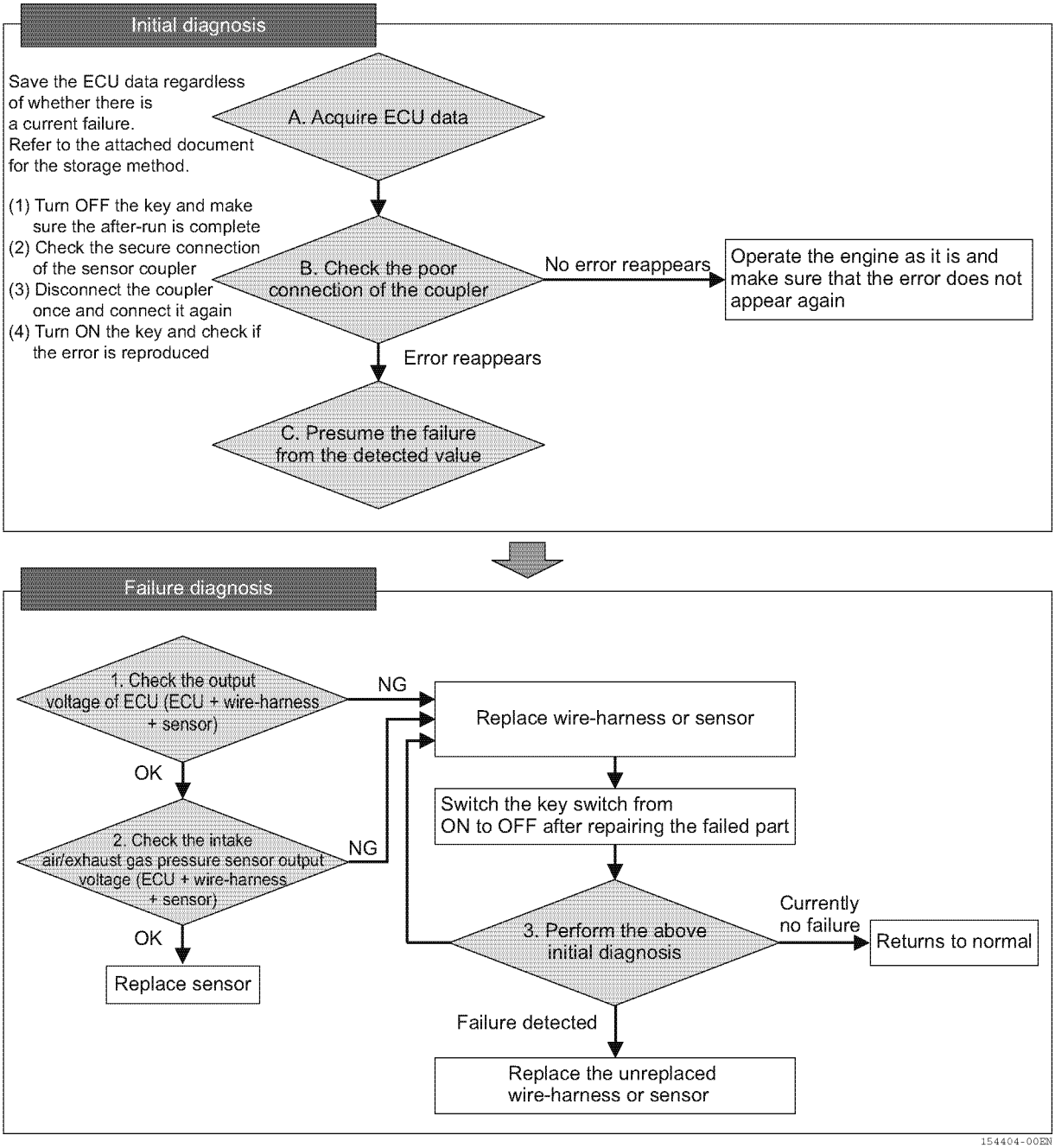
■ Intake air/exhaust gas pressure sensor 1

● Related DTC

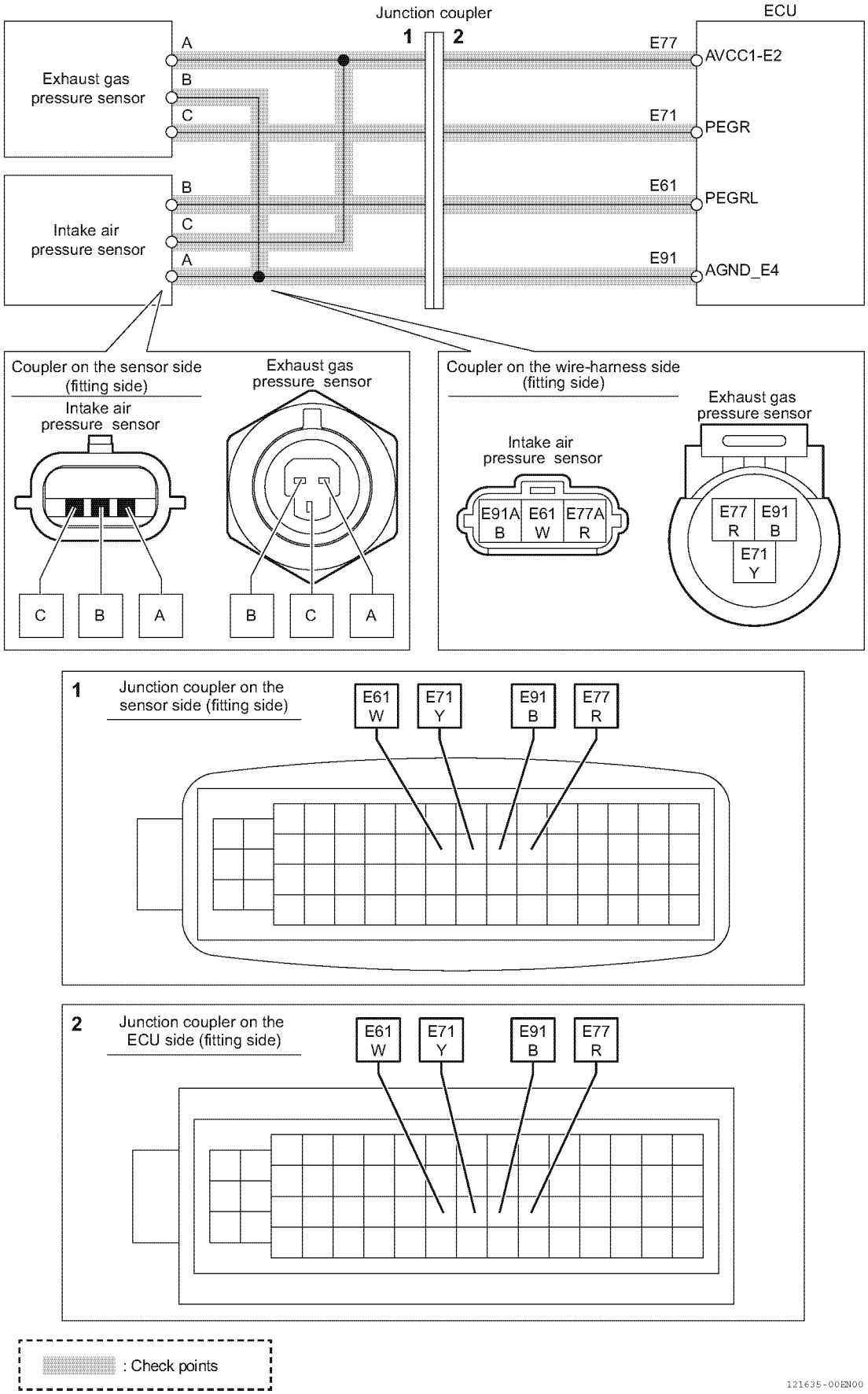
P code	P0237	Intake air pressure sensor error (voltage low)
	P0238	Intake air pressure sensor error (voltage high)
	P0472	Exhaust gas pressure sensor error (voltage low)
	P0473	Exhaust gas pressure sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the ECU output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between the intake air/exhaust gas pressure sensor 5 V E77 and E91.

Voltage	State	Corrective action
E77 < 4.375 V	NG	• Replace the wire-harness. • Replace the battery.
4.375 V ≤ E77 ≤ 5.625 V	OK (normal range)	Check the pressure sensor output voltage.
5.625 V < E77	NG	• Replace the wire-harness. • Replace the battery.

NG	Replace the wire-harness or battery, and turn OFF and on the key switch for failure diagnosis.
OK	Go to “Checking the intake air/exhaust gas pressure sensor output voltage”.

2. Checking the wire-harness
   Check the wire-harness of the 5 V - GND wire between the relay coupler and the terminal.

NG	Replace the wire-harness.
OK	Go to “Checking the sensor coupler”.

3. Checking the sensor coupler
   Check the coupler of the 5 V - GND line between the sensor coupler and terminals.

NG	Replace engine wire-harness.
OK	Replace the sensor.

4. Checking the intake air/exhaust gas pressure sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage of the intake air pressure sensor signal between E61 and E91, exhaust gas pressure sensor signal between E71 and E91.

Voltage	State	Corrective action
E61, E71 < 0.5 V	NG	Replace the wire-harness.
0.5 V ≤ E61, E71 ≤ 4.5 V	OK (normal range)	Replace the sensor.
4.5 V < E61, E71	NG	Replace the wire-harness.

NG	Replace the wire-harness or sensor, and turn OFF and on the key switch for failure diagnosis using SA-D.
OK	Replace the sensor.

5. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the unreplaced wire-harness or pressure sensor.

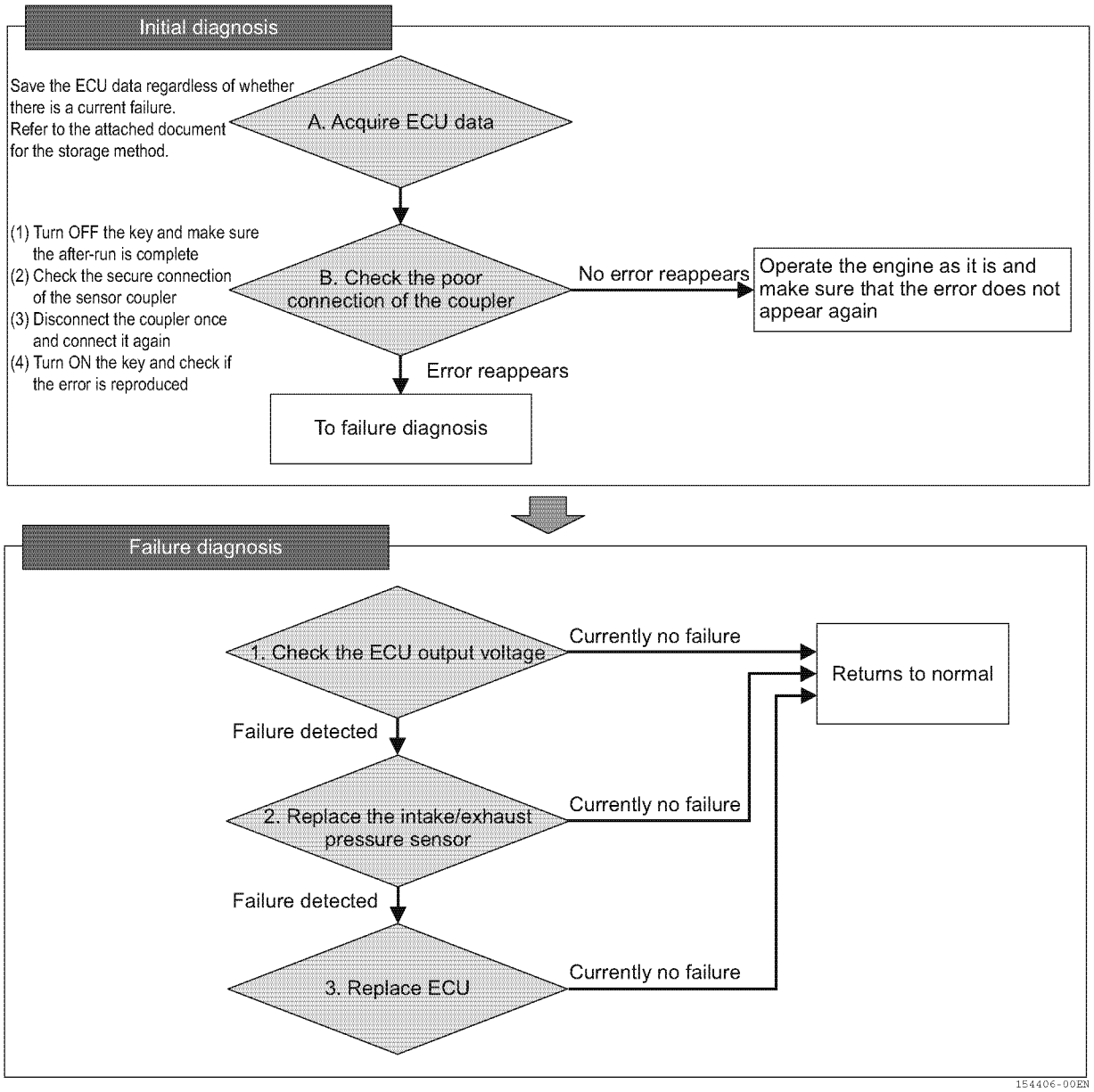
■ Intake air/exhaust gas pressure sensor 2

● Related DTC

P code	P0236	Intake air pressure sensor error (abnormal learning value)
	P0471	Exhaust gas pressure sensor error (abnormal learning value)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Replacing the intake air/exhaust gas pressure sensor
   1- When this error occurs, replace the intake air/exhaust gas pressure sensor.

2. Operation using SA-D
   1- turn ON the key switch, and then start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the ECU.

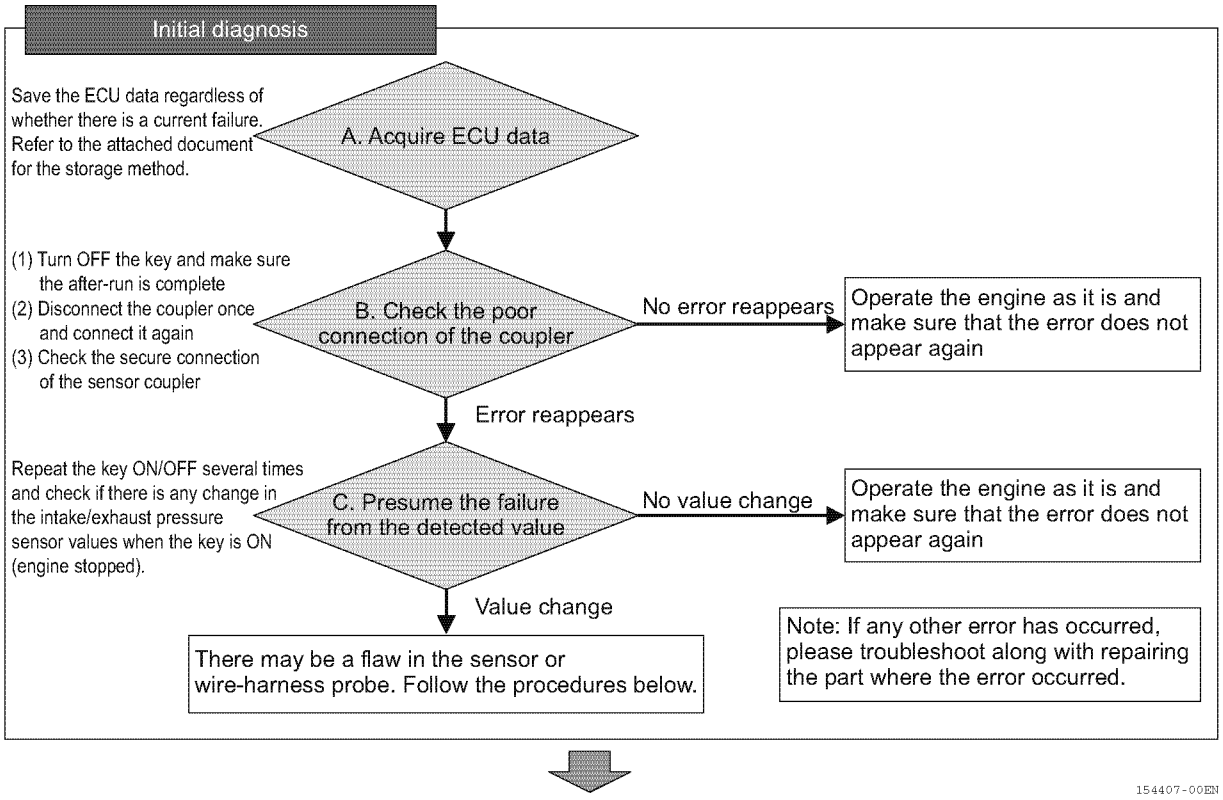
■ Intake air/exhaust gas pressure sensor 3

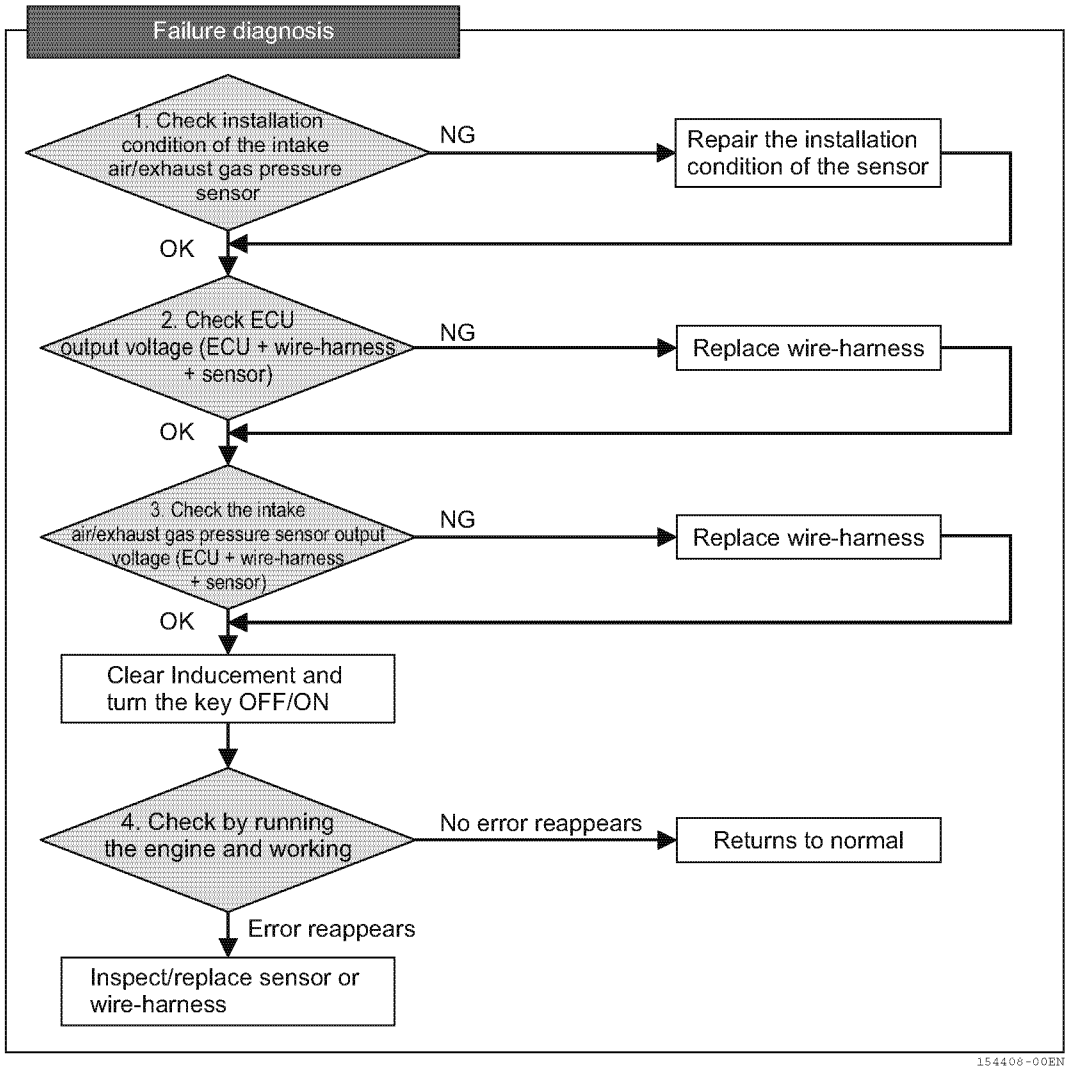
● Related DTC

P code	P1673	Intake air pressure sensor error (detected value error)
	P1679	Exhaust gas pressure sensor error (detected value error)

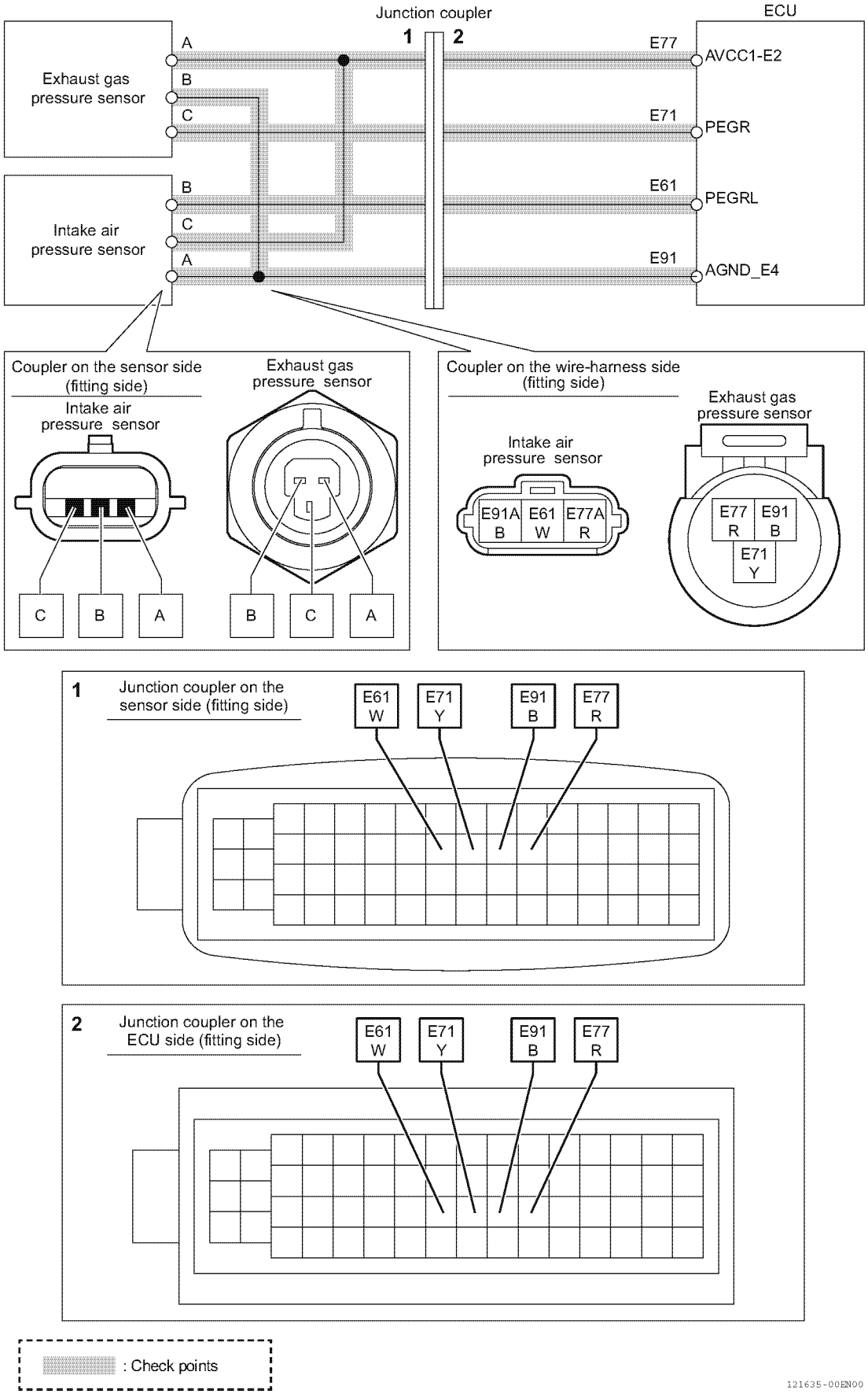
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check installation condition of the intake air/exhaust gas pressure sensor
NG
Repair the installation condition of the sensor
OK
2. Check ECU output voltage (ECU + wire-harness + sensor)
NG
Replace wire-harness
OK
3. Check the intake air/exhaust gas pressure sensor output voltage (ECU + wire-harness + sensor)
NG
Replace wire-harness
OK
Clear Inducement and turn the key OFF/ON
4. Check by running the engine and working
No error reappears
Returns to normal
Error reappears
Inspect/replace sensor or wire-harness
154408-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for other errors
   1- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for intake air/exhaust gas pressure sensor, atmospheric pressure sensor, cooling water temperature sensor, fresh air temperature sensor, sensor 5 V circuit 2, or inside the ECU.

Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to “Checking the installation condition of intake air/exhaust gas pressure sensor”.

2. Checking the installation condition of intake air/exhaust gas pressure sensor
   1- Turn OFF the key switch.
   2- Check the installation condition of intake air/exhaust gas pressure sensor.
   3- Check the intake air/exhaust gas piping, pressure hose, and pressure pipe for disconnection, damage, or signs of leaks.

NG	Correct the sensor mounting condition and perform diagnosis according to the following countermeasures.
OK	Go to “Checking the ECU output voltage”.

3. Checking the ECU output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between intake air/exhaust gas pressure sensor 5 V E77 and E91.

Voltage	State	Corrective action
E77 < 4.375 V	NG	Replace the wire-harness.
4.375 V ≤ E77 ≤ 5.625 V	OK (normal range)	Check the intake air/exhaust gas pressure sensor output voltage.
5.625 V < E77	NG	Replace the wire-harness.

NG	Replace the wire-harness and clear the Inducement according to the following actions.
OK	Go to “Checking the intake air/exhaust gas pressure sensor output voltage”.

4. Checking the intake air/exhaust gas pressure sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage of the intake air pressure sensor signal between E61 and E91, exhaust gas pressure sensor signal between E71 and E91.

Voltage	State	Corrective action
E61, E71 < 0.5 V	NG	Replace the wire-harness.
0.5 V ≤ E61, E71 ≤ 4.5 V	OK (normal range)	Perform failure diagnosis using SA-D.
4.5 V < E61, E71	NG	Replace the wire-harness.

NG	Replace the wire-harness, switch the ECU power from OFF to ON, and then clear the Inducement by SA-D.
OK	Switch the ECU power from OFF to ON, and then clear the Inducement by SA-D.

5. Operation using SA-D
   1- Run the engine and perform normal work, etc., and check if the error does not reappear.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Check for malfunction of the intake air/exhaust gas pressure sensor or poor contact of the wire-harness. If there is any malfunction, replace it

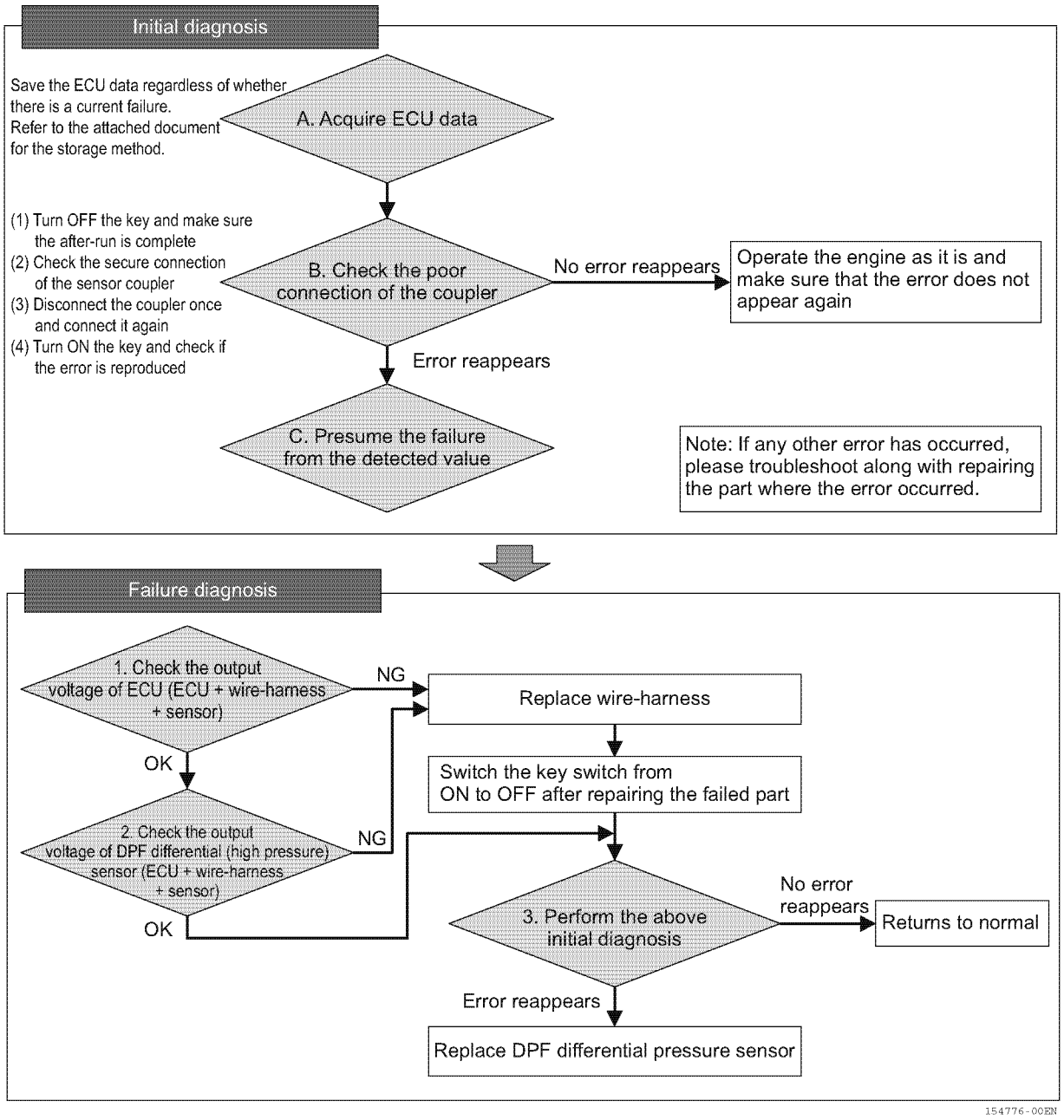
■ DPF differential pressure sensor 1

● Related DTC

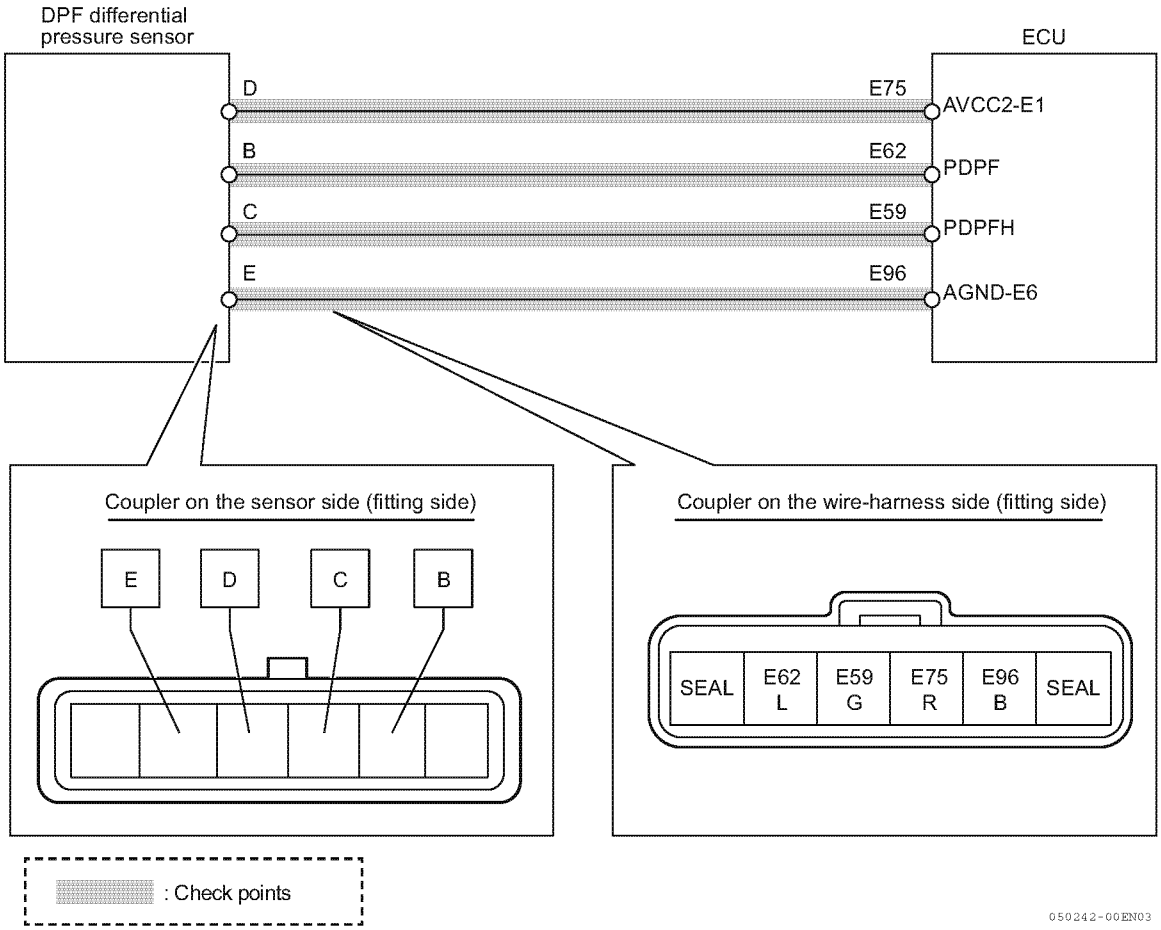
P code	P2454	DPF differential pressure sensor error (voltage low)
	P2455	DPF differential pressure sensor error (voltage high)
	P1454	DPF high pressure sensor error (voltage low)
	P1455	DPF high pressure sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the ECU output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between DPF differential pressure sensors 5 V E75 and E96.

Voltage	State	Corrective action
E75 < 4.375 V	NG	Replace the wire-harness.
4.375 V ≤ E75 ≤ 5.625 V	OK (normal range)	Check the DPF differential pressure sensor output voltage.
5.625 V < E75	NG	Replace the wire-harness.

NG	Replace the wire-harness, and turn OFF and on the key switch for failure diagnosis.
OK	Go to “Checking the DPF differential pressure sensor output voltage” and “Checking the DPF high pressure sensor output voltage”.

2. Checking the DPF differential pressure sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between the sensor signals E62 and E96.

Voltage	State	Corrective action
E62 < 0.5 V	NG	Replace the wire-harness.
0.5 V ≤ E62 ≤ 4.5 V	OK (normal range)	Go to “Execute the initial diagnosis again”.
4.5 V < E62	NG	Replace the wire-harness.

NG	Replace the wire-harness or ECU, and turn OFF and on the key switch for failure diagnosis using SA-D.
OK	Go to “Execute the initial diagnosis again”.

3. Checking the DPF high pressure sensor output
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between the sensor signals E59 and E96.

Voltage	State	Corrective action
E59 < 0.5 V	NG	Replace the wire-harness.
0.5 V ≤ E59 ≤ 4.5 V	OK (normal range)	Go to “Execute the initial diagnosis again”.
4.5 V < E59	NG	Replace the wire-harness.

NG	Replace the wire-harness or ECU, and turn OFF and on the key switch for failure diagnosis using SA-D.
OK	Go to “Execute the initial diagnosis again”.

4. Execute the initial diagnosis again
   Turn the key OFF and make sure the after-run is complete, then turn the key ON again and check if the error reappears.

Error reappears	Replace DPF differential pressure sensor.
No error reappears	Return to normal state.

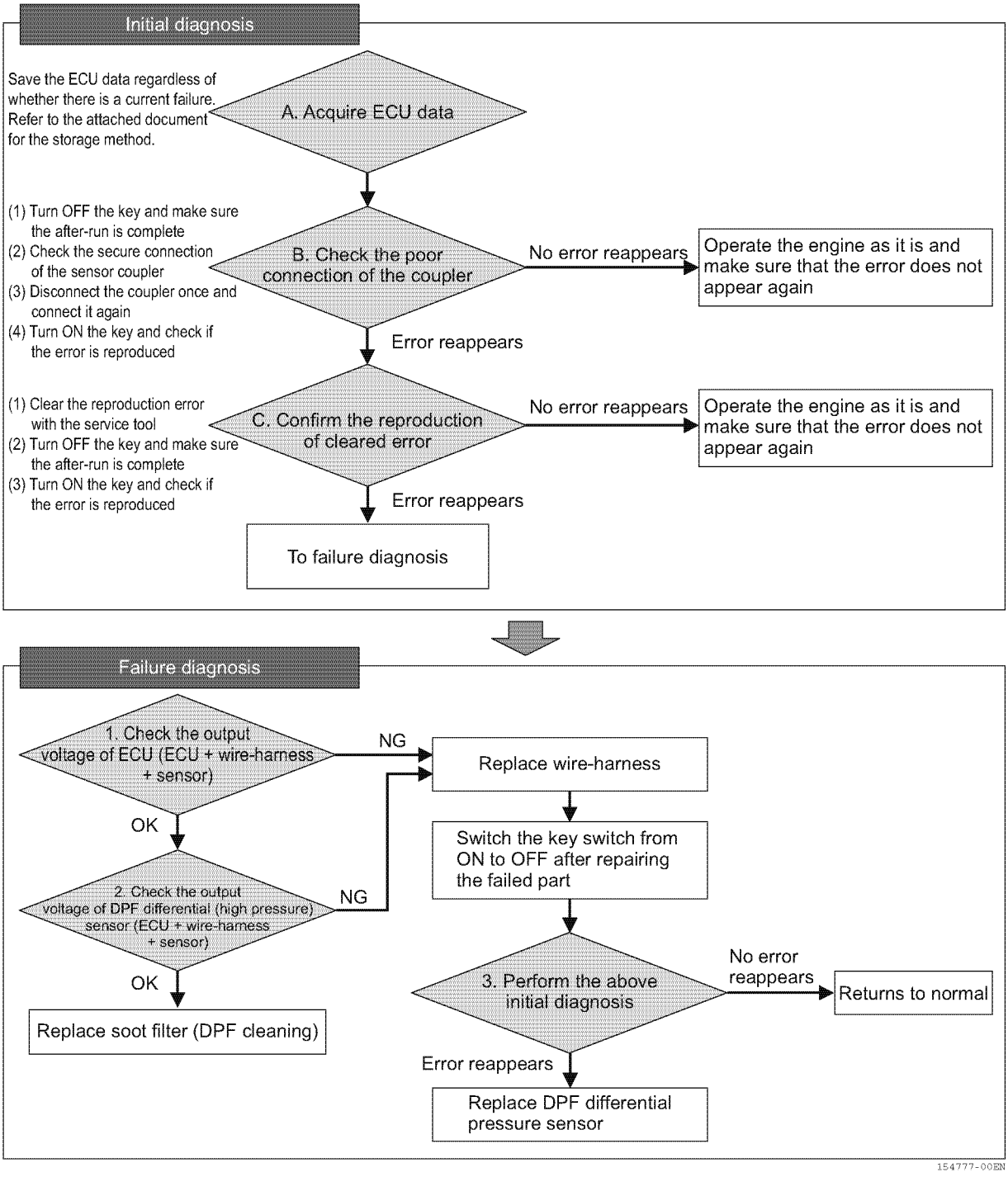
■ DPF differential pressure sensor 2

● Related DTC

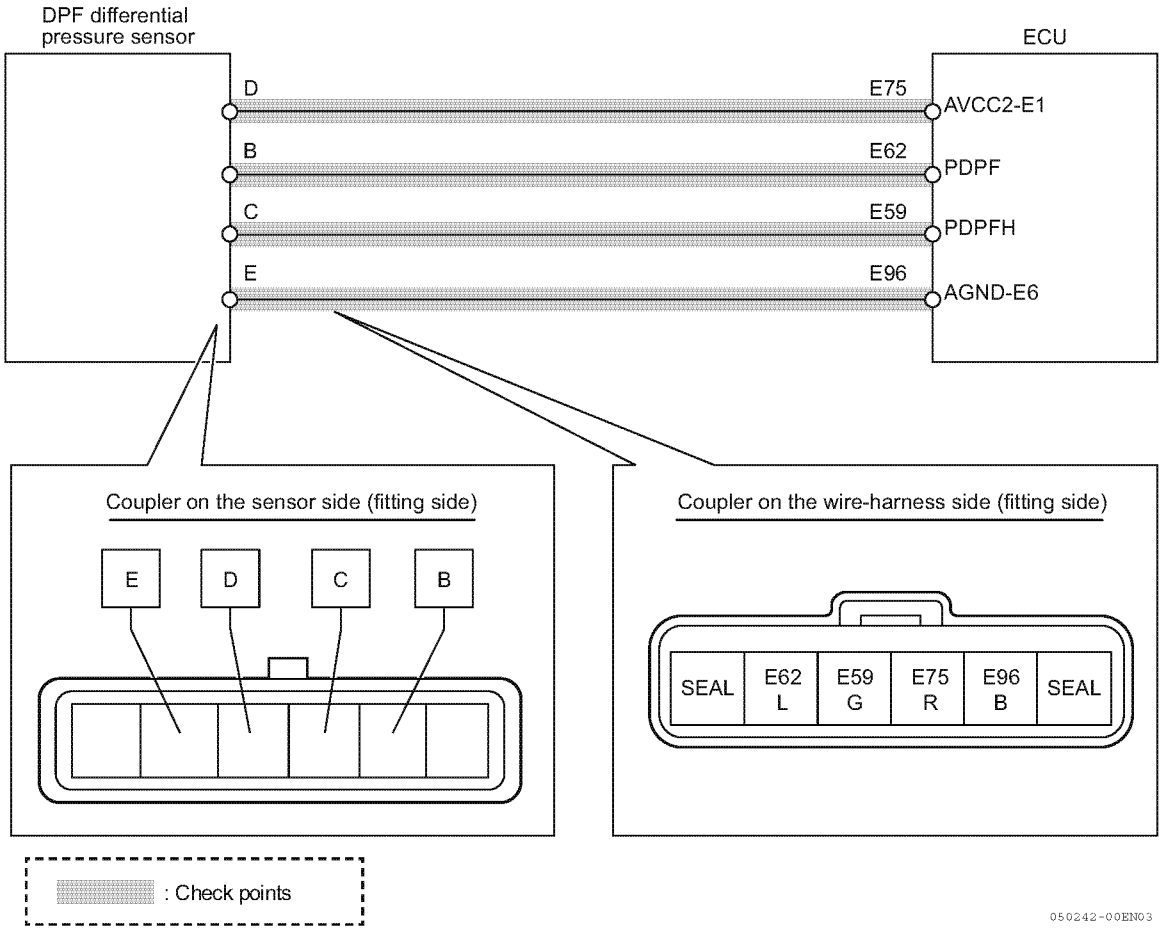
P code	P2452	DPF differential pressure sensor abnormal rise in differential pressure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the ECU output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between DPF differential pressure sensors 5 V E75 and E96.

Voltage	State	Corrective action
E75 < 4.375 V	NG	Replace the wire-harness.
4.375 V ≤ E75 ≤ 5.625 V	OK (normal range)	Check the DPF differential pressure sensor output voltage.
5.625 V < E75	NG	Replace the wire-harness.

NG	Replace the wire-harness, and turn OFF and on the key switch for failure diagnosis.
OK	Go to “Checking the DPF differential pressure sensor output voltage” and “Checking the DPF high pressure sensor output voltage”.

2. Checking the DPF differential pressure sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between the sensor signals E62 and E96.

Voltage	State	Corrective action
E62 < 0.5 V	NG	• Replace the wire-harness. • Replace the ECU.
0.5 V ≤ E62 ≤ 4.5 V	OK (normal range)	Replace (DPF cleaning) the soot filter (SF).
4.5 V < E62	NG	• Replace the wire-harness. • Replace (DPF cleaning) the soot filter (SF).

NG	Replace the wire-harness or replace (DPF cleaning) the soot filter (SF), and turn OFF and on the key switch for failure diagnosis using SA-D.
OK	Replace (DPF cleaning) the soot filter (SF).

Note: If you see white deposits on the surface of the soot filter (SF) to be replaced, it may be due to the use of incompatible oil or oil inflow due to the liner, piston, valve stem seal, turbocharger, etc. Also, if the surface of the soot filter (SF) is covered with black deposits, there is a risk of injector failure or blockage of the intake passage.

3. Execute the initial diagnosis again
   Turn the key OFF and make sure the after-run is complete, then turn the key ON again and check if the error reappears.

Error reappears	Replace DPF differential pressure sensor.
No error reappears	Return to normal state.

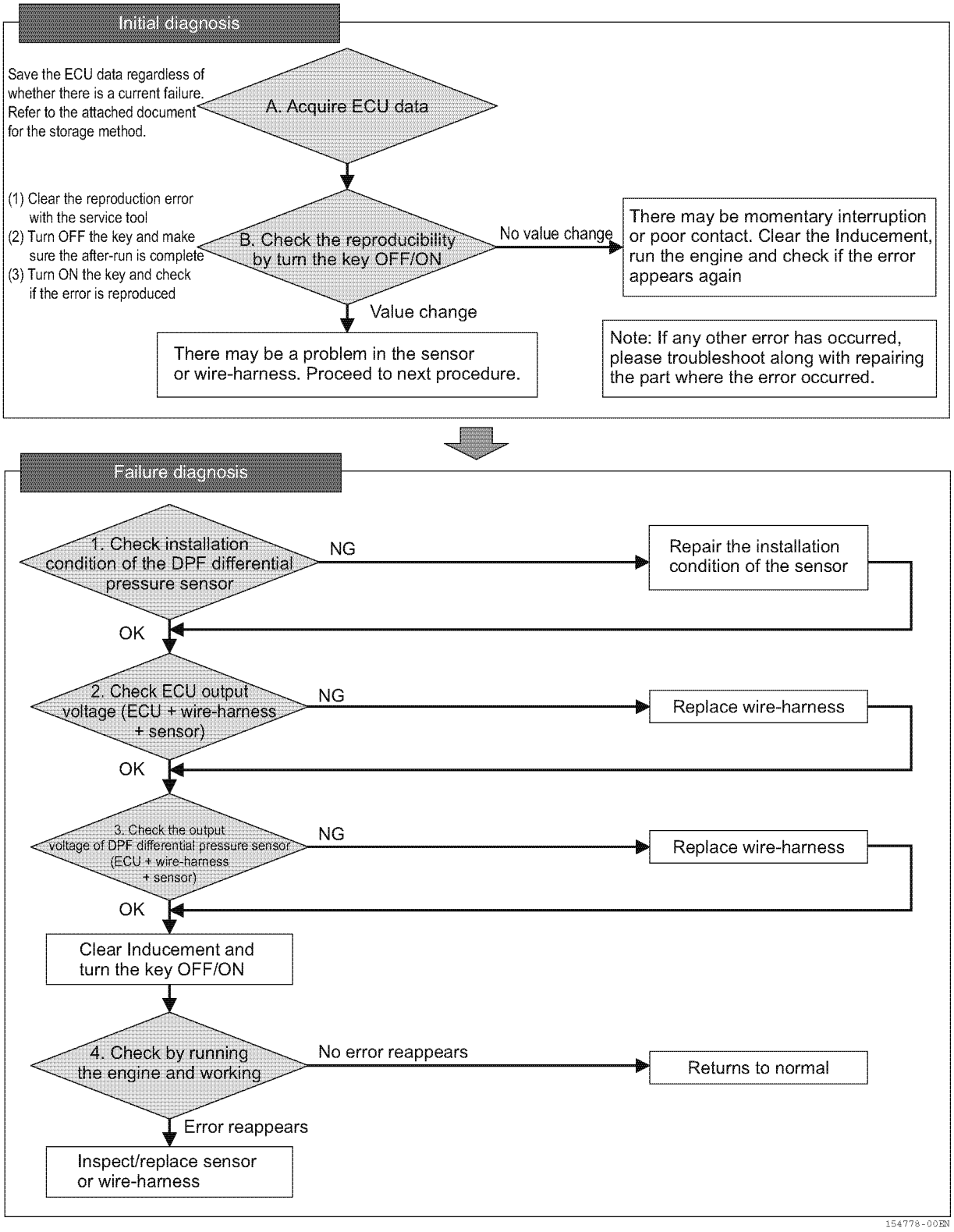
■ DPF differential pressure sensor 3

● Related DTC

P code	P2453	DPF differential pressure sensor error (abnormal learning value)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Replacing the DPF differential pressure sensor

   1- When this error occurs, replace the DPF differential pressure sensor.

2. Operation using SA-D

   1- turn ON the key switch, and then start the engine.

   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the DPF differential pressure sensor.

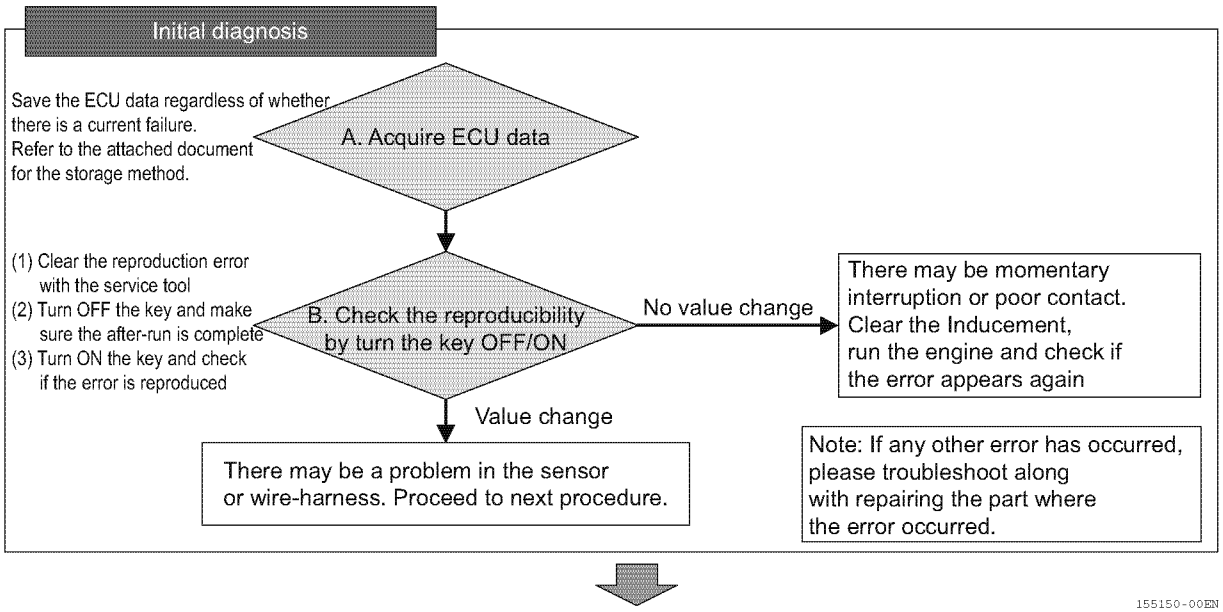
■ DPF differential pressure sensor 4

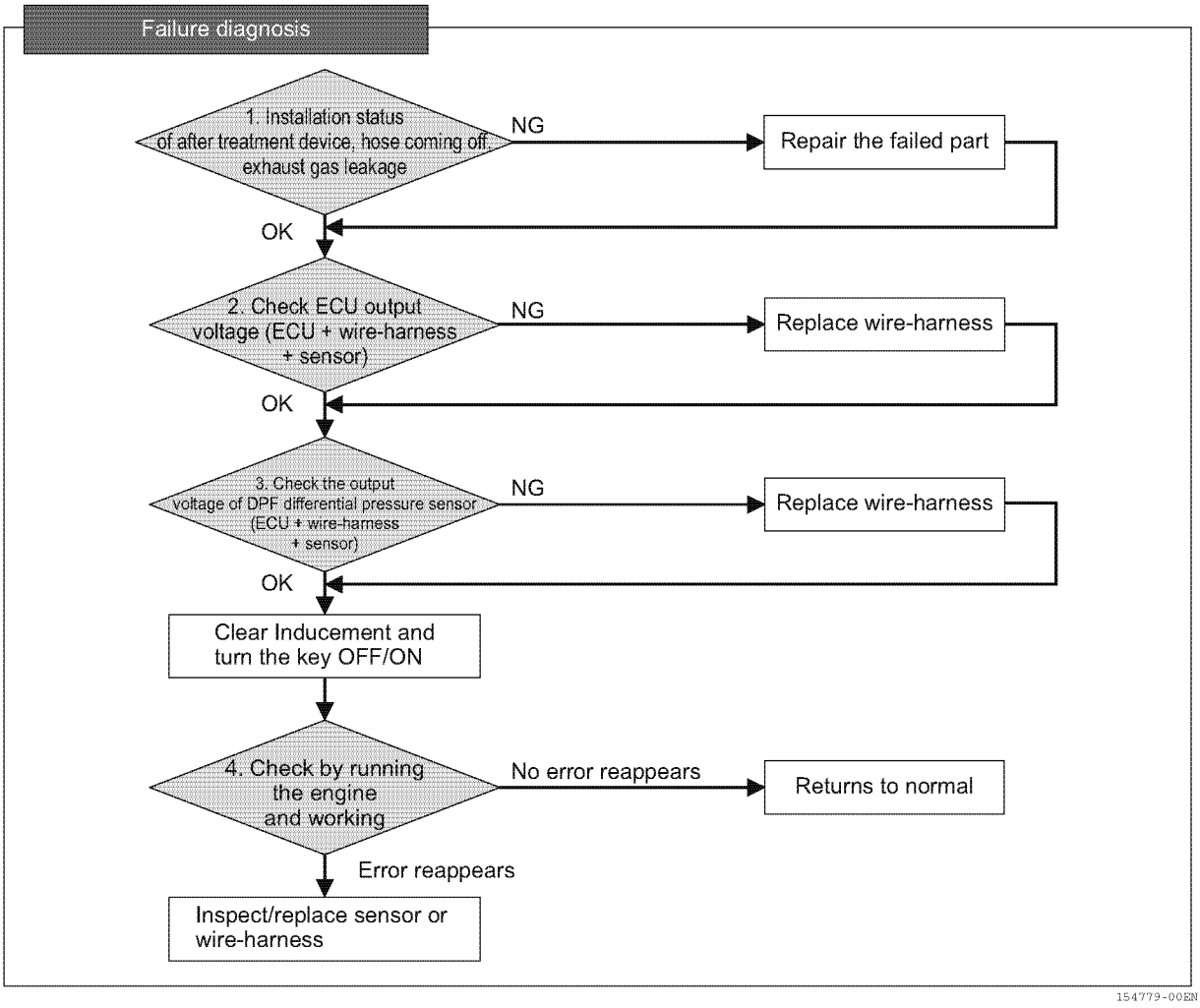
● Related DTC

P code	P167C	DPF high pressure sensor error (detected value error)
	P226D	DPF substrate/DPF differential pressure sensor error (DPF substrate removal/DPF differential pressure sensor detected value error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





● Work description

1. Replacing the DPF differential pressure sensor
   1- When this error occurs, replace the DPF differential pressure sensor.

2. Operation using SA-D
   1- turn ON the key switch, and then start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the DPF differential pressure sensor.

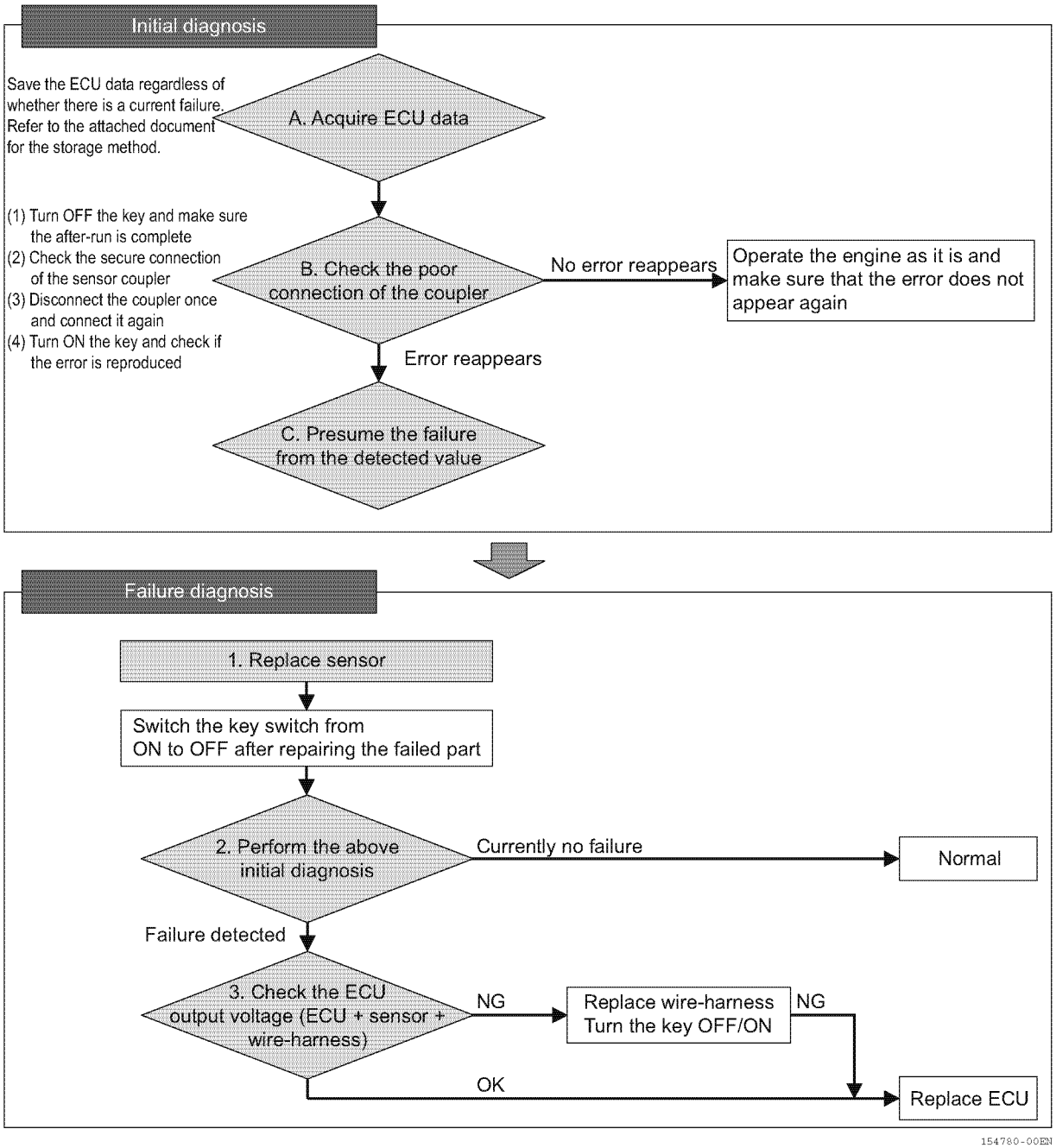
■ ECU sensor 5 V circuit 1

● Related DTC

P code	P0652	ECU sensor 5 V circuit 1 error (voltage low)
	P0653	ECU sensor 5 V circuit 1 error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

See “Rail pressure sensor” and “Camshaft speed sensor” for details.

● Work description

1. Replacing the sensor

   1- Remove the rail pressure sensor and the camshaft speed sensor from the wire-harness, and replace them.

2. Operation using SA-D

   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.

   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Go to “Checking the ECU output voltage (when connected to the sensor)”.

3. Checking the ECU output voltage (when connected to the sensor)

   1- Connect the checker harness between the ECU and engine wire-harness.

   2- Using a circuit tester, measure the voltage between sensor 5 V and GND.

Voltage	State	Corrective action
E77 (E79) < 4.375 V	NG	• Replace the wire-harness. • Replace the ECU.
4.375 V ≤ E77 (E79) ≤ 5.625 V	OK (normal range)	Replace the ECU.
5.625 V < E77 (E79)	NG	• Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the ECU.

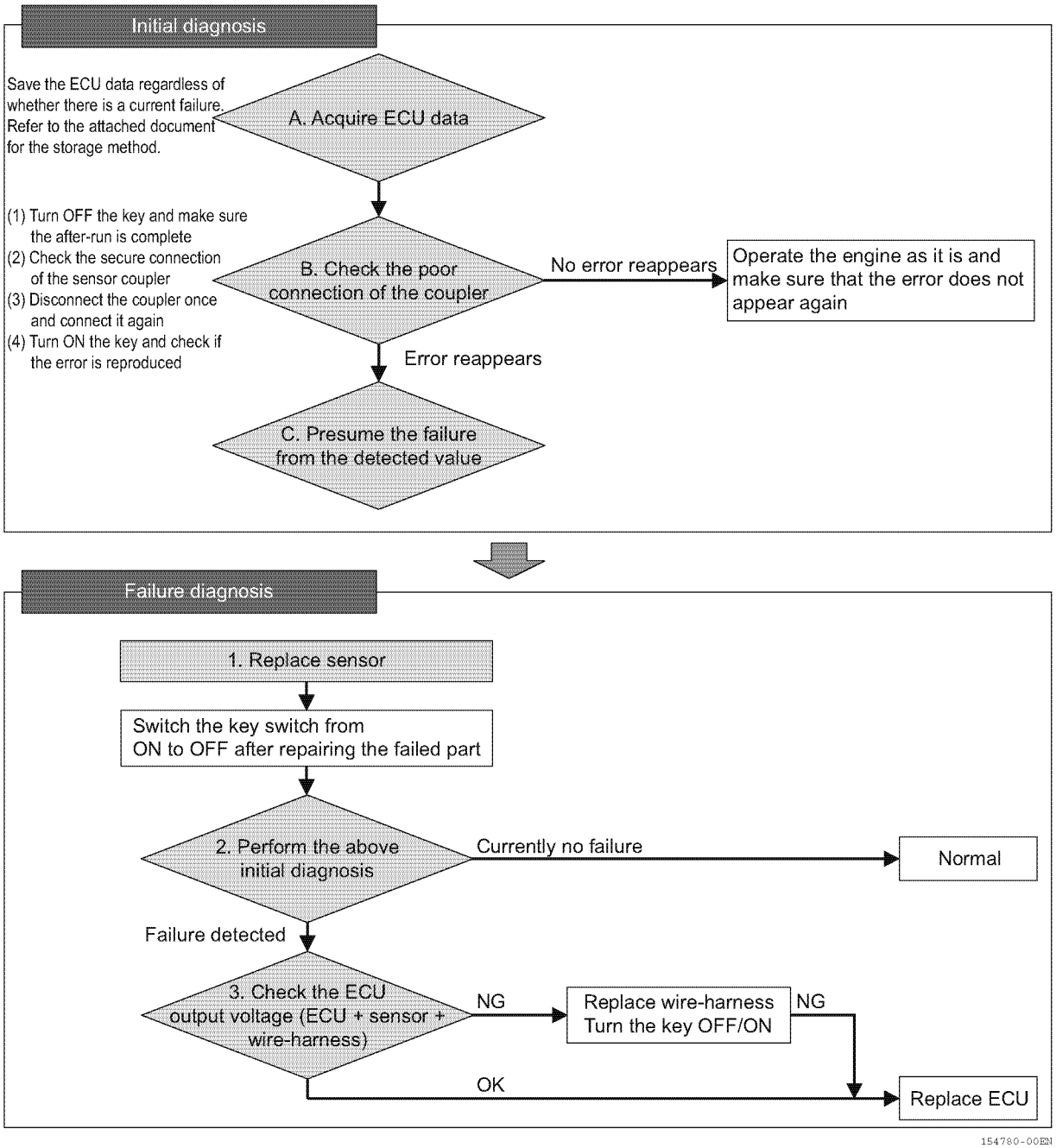
■ ECU sensor 5 V circuit 2

● Related DTC

P code	P0698	ECU sensor 5 V circuit 2 error (voltage low)
	P0699	ECU sensor 5 V circuit 2 error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

See “Intake air pressure sensor” for details.

● Work description

1. Replacing the sensor

   1- Remove the intake air pressure sensor from the wire-harness, and replace it.

2. Operation using SA-D

   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.

   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Go to “Checking the ECU output voltage (when connected to the sensor)”.

3. Checking the ECU output voltage (when connected to the sensor)

   1- Connect the checker harness between the ECU and engine wire-harness.

   2- Using a circuit tester, measure the voltage between intake air pressure sensor 5 V E77 and E91.

Voltage	State	Corrective action
E77 < 4.375 V	NG	• Replace the wire-harness. • Replace the ECU.
4.375 V ≤ E77 ≤ 5.625 V	OK (normal range)	Replace the ECU.
5.625 V < E77	NG	• Replace the wire-harness. • Replace the ECU.

NG	Replace the wire-harness, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the ECU.

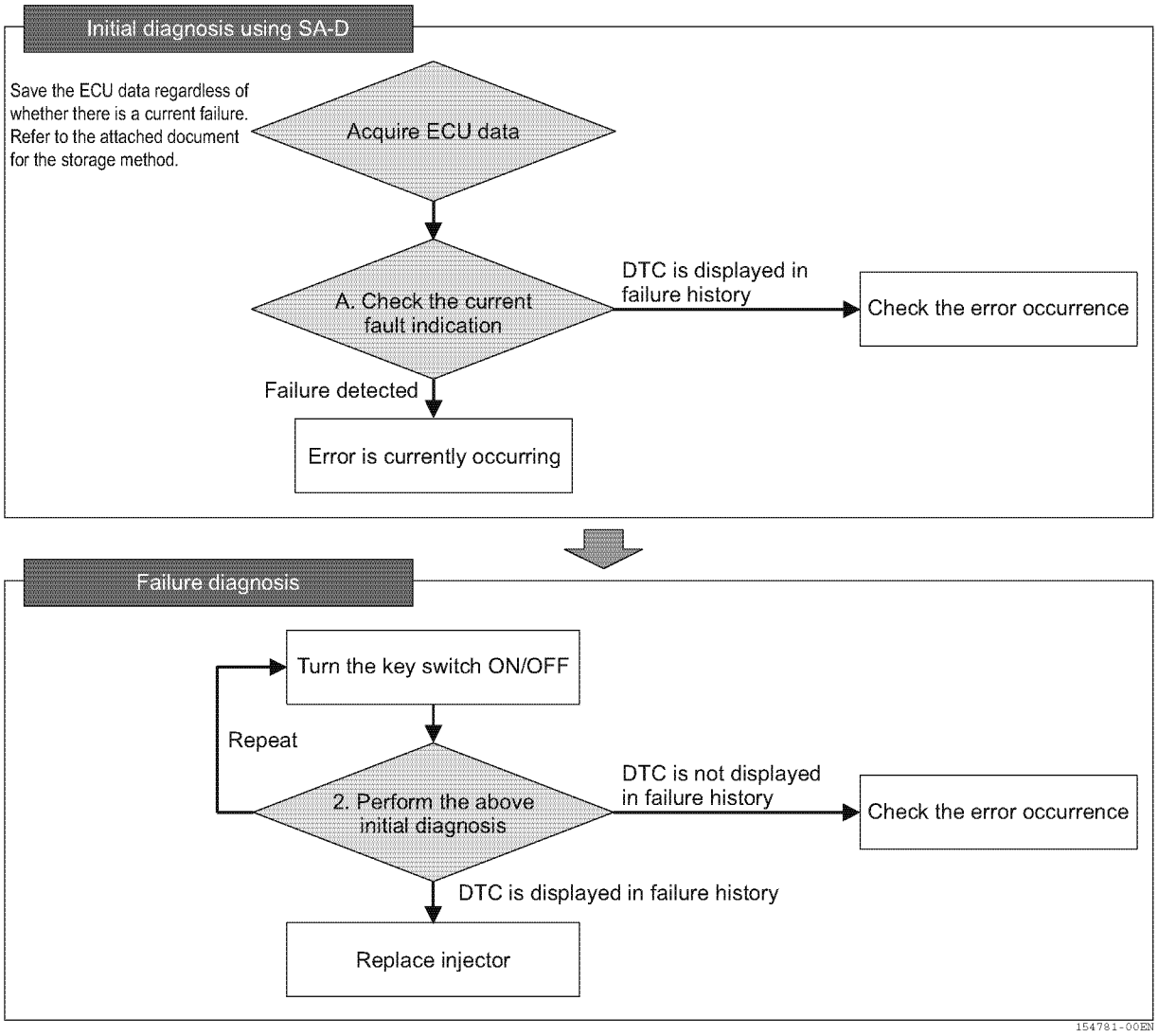
■ Engine overspeed

● Related DTC

P code	P1219	Overspeed 1
	P0219	Overspeed 2

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Operation using SA-D

1- Turn OFF the key switch, turn ON the key switch again, and start the engine.

2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the injector.

Pulse sensor related

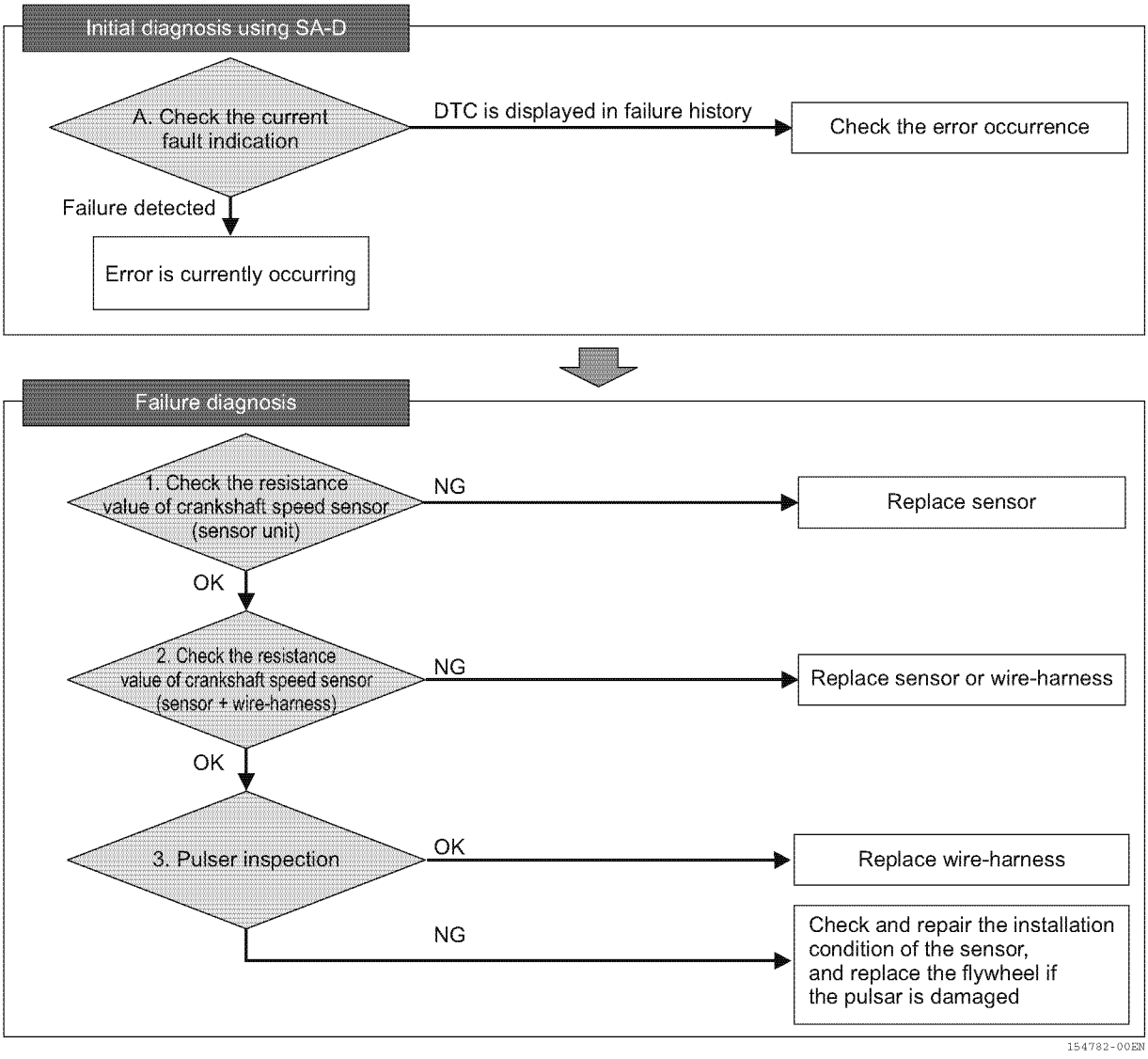
■ Crankshaft speed sensor 1

● Related DTC

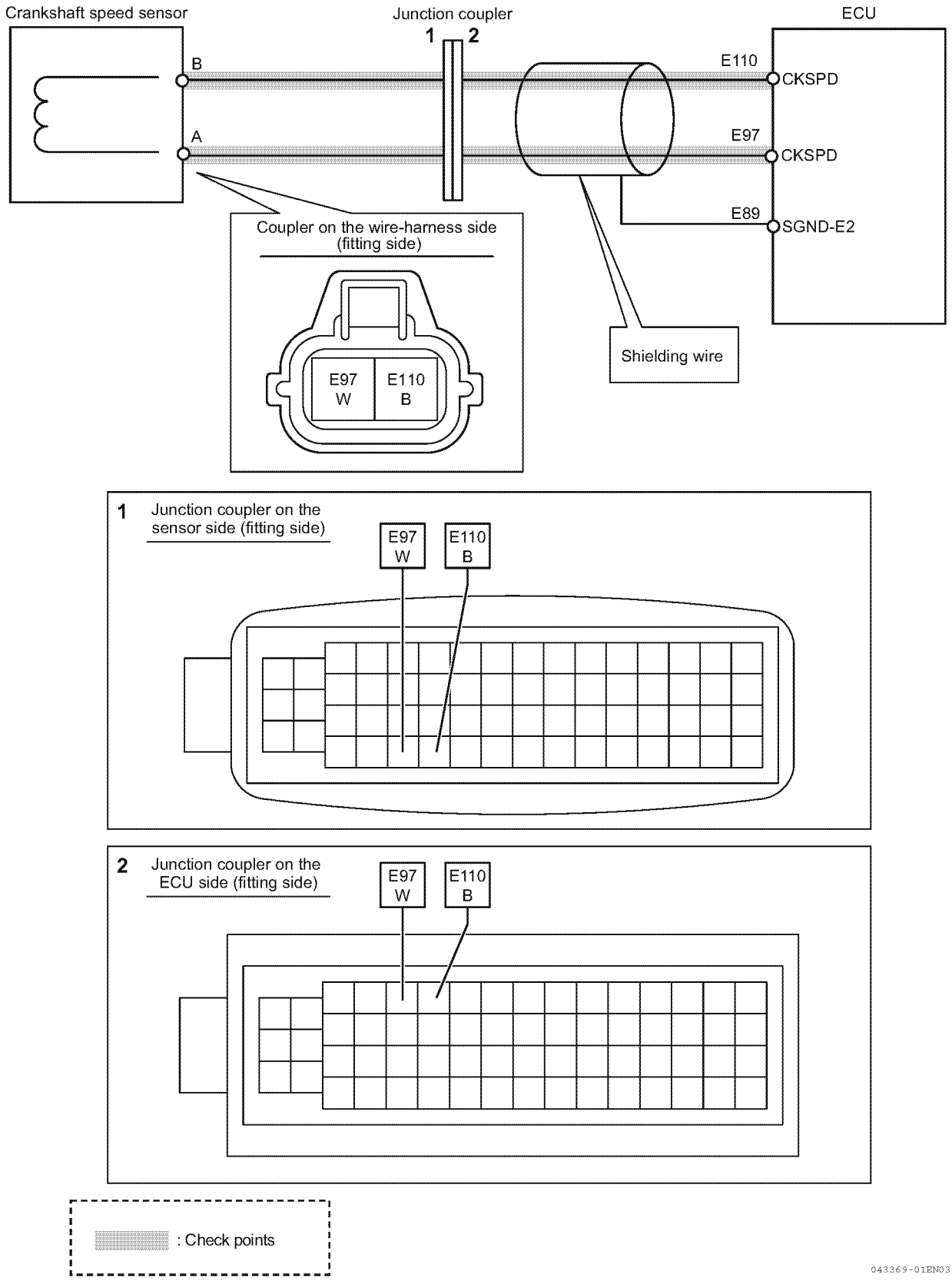
P code	P0336	Crankshaft signal error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the resistance values of the crankshaft speed sensor
   1- Remove the crankshaft speed sensor from the wire-harness.
   2- Using a circuit tester, measure the resistance value between crankshaft speed sensors A and B.

Reference: Resistance value between crankshaft speed sensor terminals

Terminal	Specifications
Sensor A to B	125.5 ± 17 Ω

NG	Replace the crankshaft speed sensor.
OK	Go to "Checking the resistance values of the crankshaft speed sensor (sensor and wire-harness)".

2. Checking the resistance values of the crankshaft speed sensor (sensor and wire-harness)
   1- Remove the ECU from the wire-harness while the crankshaft speed sensor and the wire-harness are connected.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E97 and E110 on the wire-harness side.
   Note: See the above "Reference: Resistance value between crankshaft speed sensor terminals".

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to "Pulser inspection".

3. Pulser inspection
   1- Check the pulser for cracks, pieces of metal, distortion, etc.

NG	Check and repair the installation condition of the sensor, and replace the flywheel if the pulsar is damaged.
OK	The coupler between the ECU and the wire-harness may be defective. Replace the wire-harness.

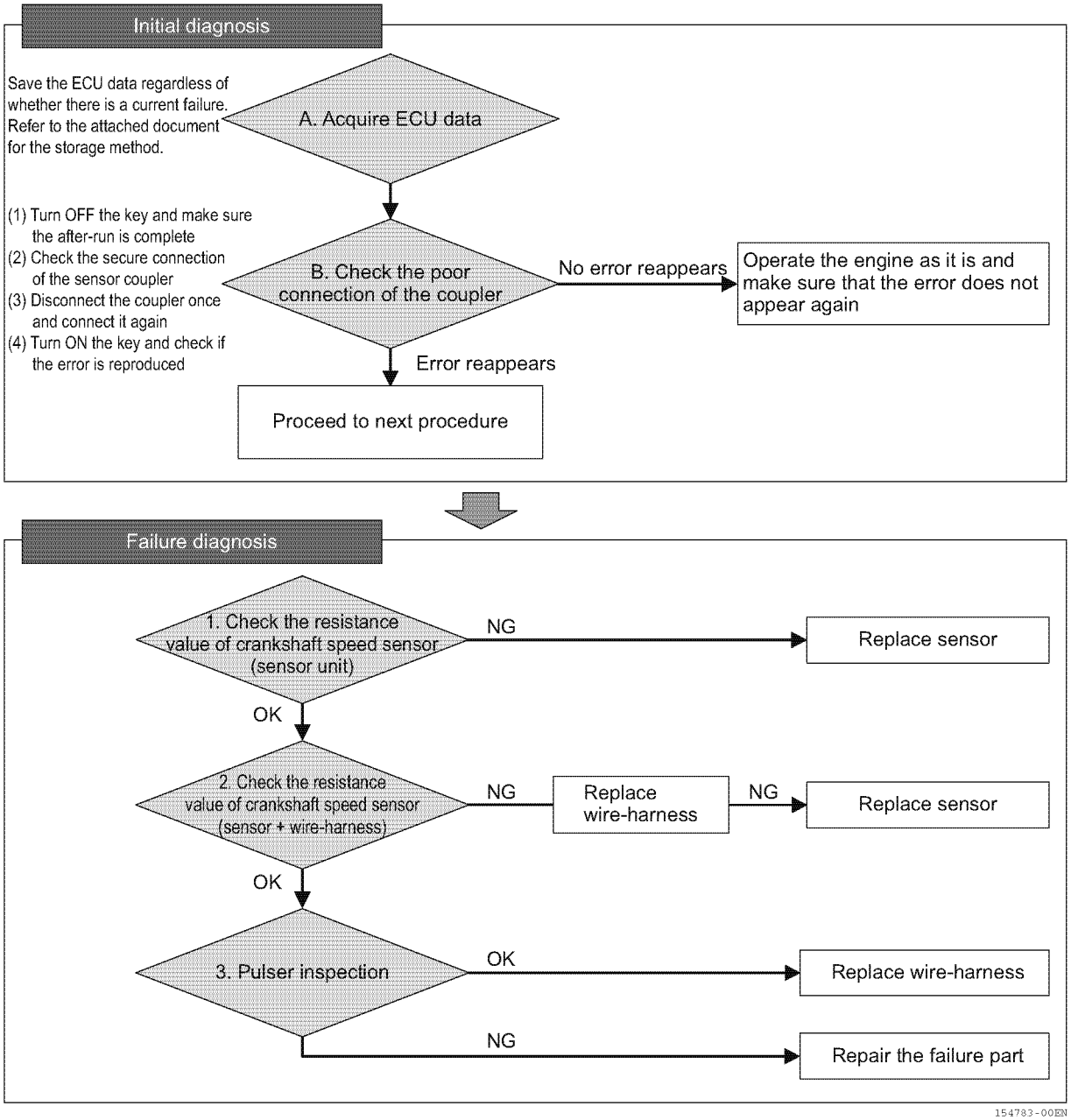
■ Crankshaft speed sensor 2

● Related DTC

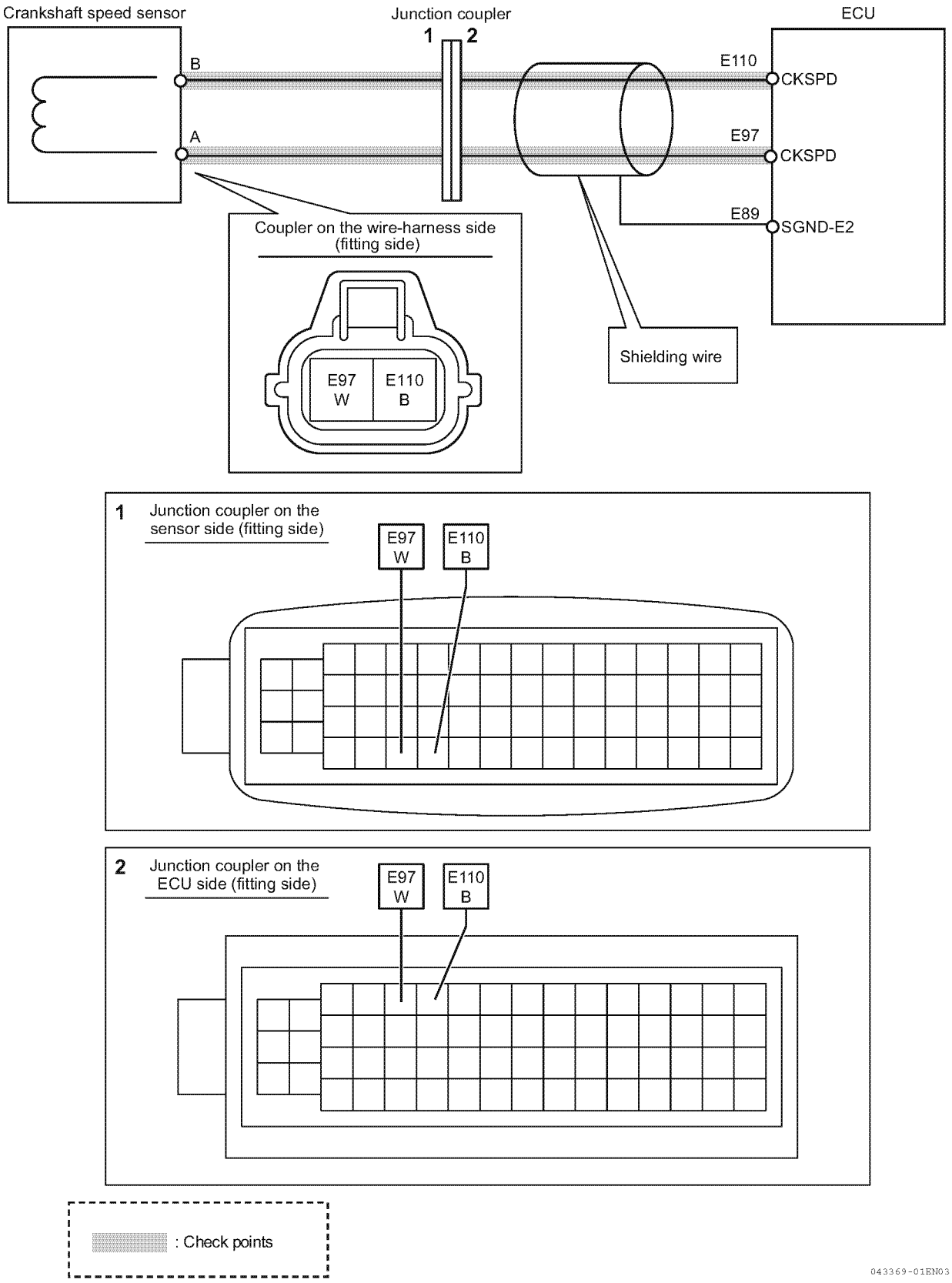
P code	P0337	No signal from crankshaft

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the resistance values of the crankshaft speed sensor
   1- Remove the crankshaft speed sensor from the wire-harness.
   2- Using a circuit tester, measure the resistance value between crankshaft speed sensors A and B.

Reference: Resistance value between crankshaft speed sensor terminals

Terminal	Specifications
Sensor A to B	125.5 ± 17 Ω

NG	Replace the crankshaft speed sensor.
OK	Go to “Checking the resistance values of the crankshaft speed sensor (sensor and wire-harness)”.

2. Checking the resistance values of the crankshaft speed sensor (sensor and wire-harness)
   1- Remove the ECU from the wire-harness while the crankshaft speed sensor and the wire-harness are connected.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E97 and E110 on the wire-harness side.
   Note: See the above “Reference: Resistance value between crankshaft speed sensor terminals“.

NG	The coupler between the sensor and the wire-harness may be defective. Replace the wire-harness and drive to make sure the error is cleared. If the error recurs, replace the sensor and run again to make sure the error disappears.
OK	Go to “Pulser inspection”.

3. Pulser inspection
   1- Check the pulser for cracks, pieces of metal, distortion, etc.

NG	Repair the failure part.
OK	The coupler between the ECU and the wire-harness may be defective. Replace the wire-harness.

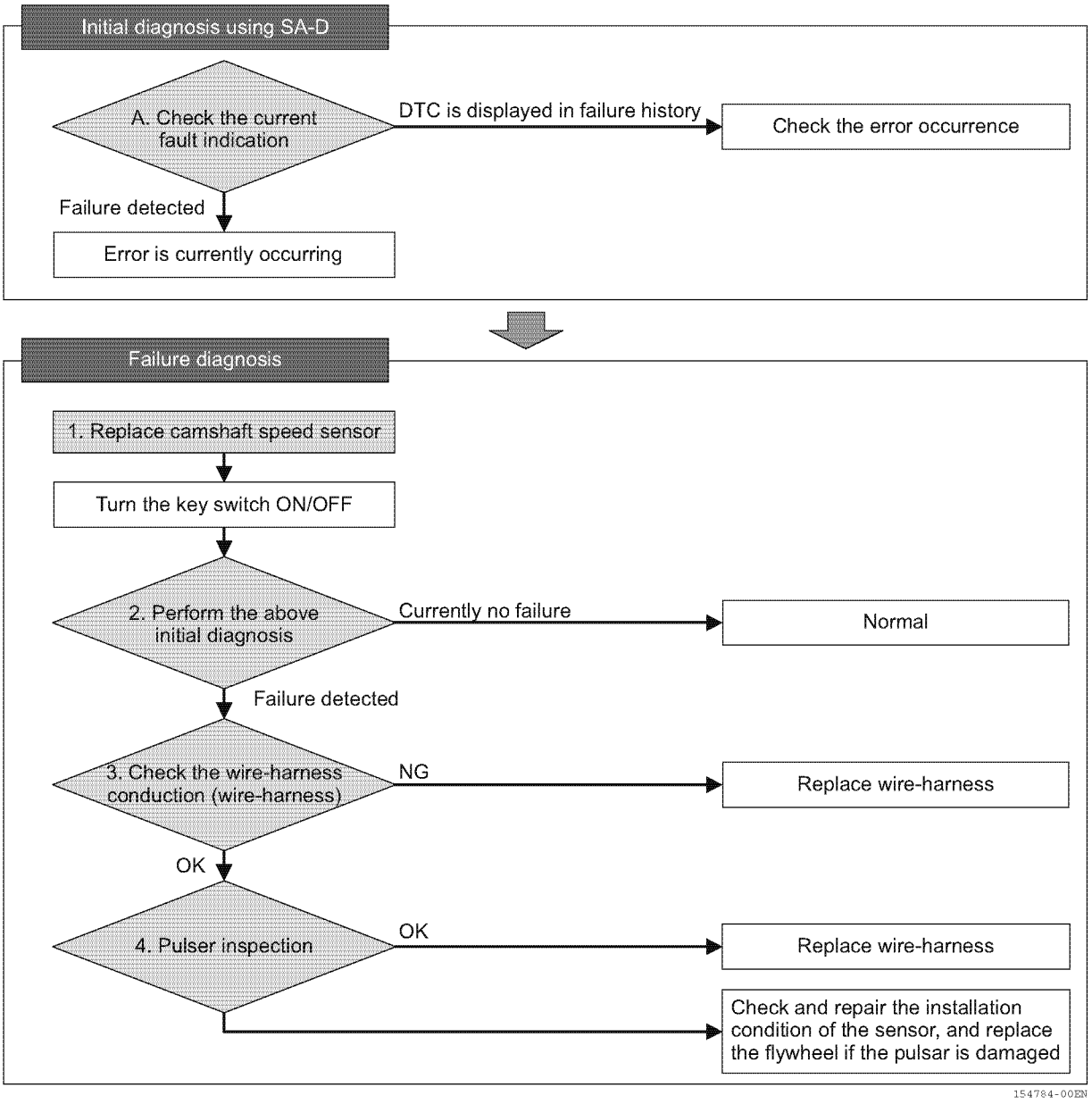
■ Camshaft speed sensor 1

● Related DTC

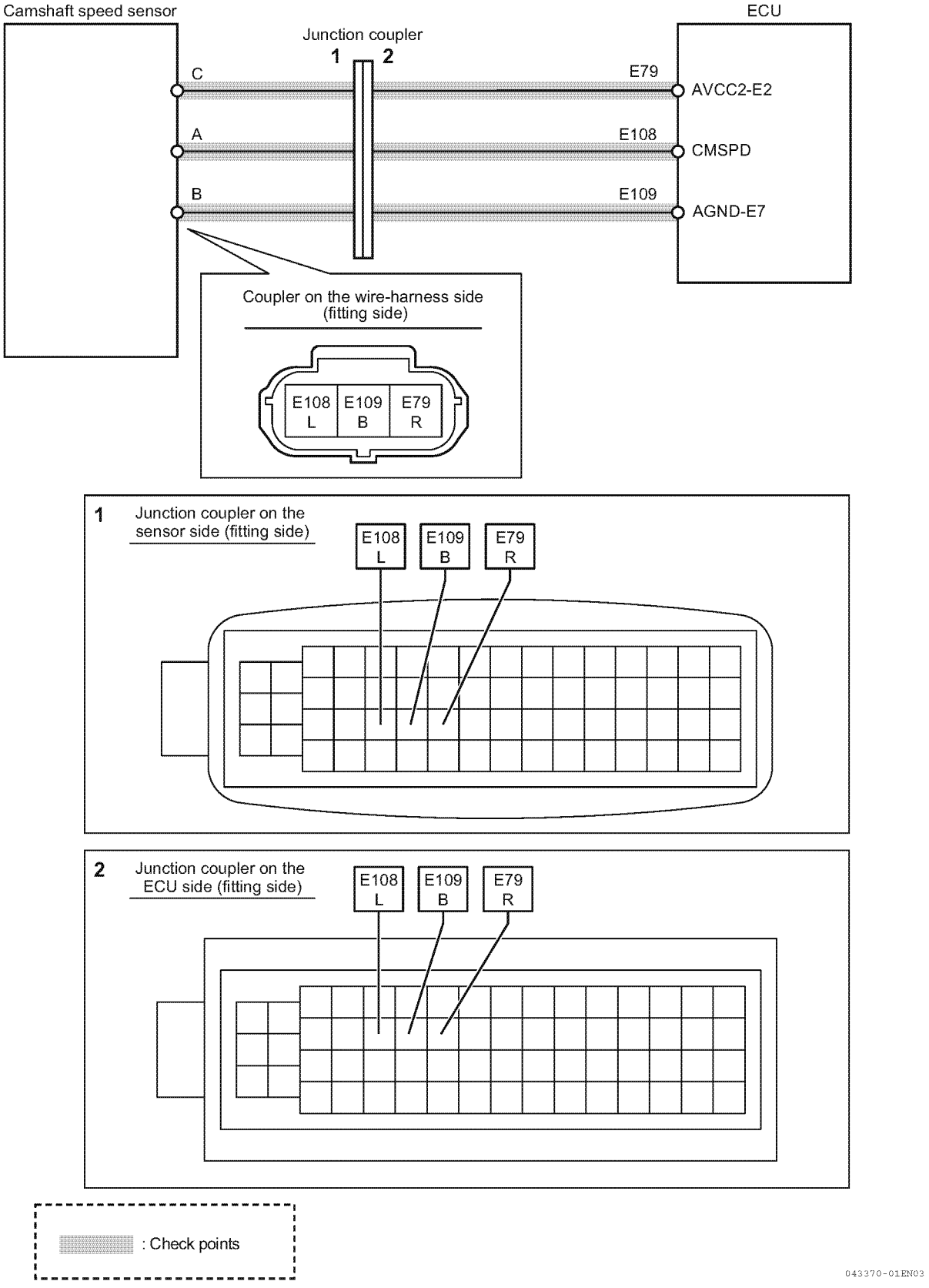
P code	P0341	Camshaft signal error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Replacing the camshaft speed sensor
   1- Remove the camshaft speed sensor from the wire-harness and replace it.

2. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Check the conduction of the wire-harness between the ECU side harness coupler and the camshaft speed sensor side harness coupler for each of E79, E108, and E109.
   2- While referring to the P586 "ECU pin layout drawing", perform a wire-harness conduction check between measurement point 1 and measurement point 2 in the table below.

Phenomenon	Measurement point 1	Measurement point 2	Result of conduction check	State
Disconnection	ECU side coupler (E79, E108, E109)	Camshaft speed sensor side coupler (E79, E108, E109)	Yes	OK: Normal
			No	NG: Error
Short-circuit	ECU side coupler (E79, E108, E109)	ECU side coupler (Other terminals)	Yes	NG: Error
			No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Pulser inspection”.

4. Pulser inspection
   1- Check the pulser for cracks, pieces of metal, distortion, etc.

NG	Check and correct the sensor installation state, and replace the flywheel if the pulsar is damaged.
OK	Replace the wire-harness.

5. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

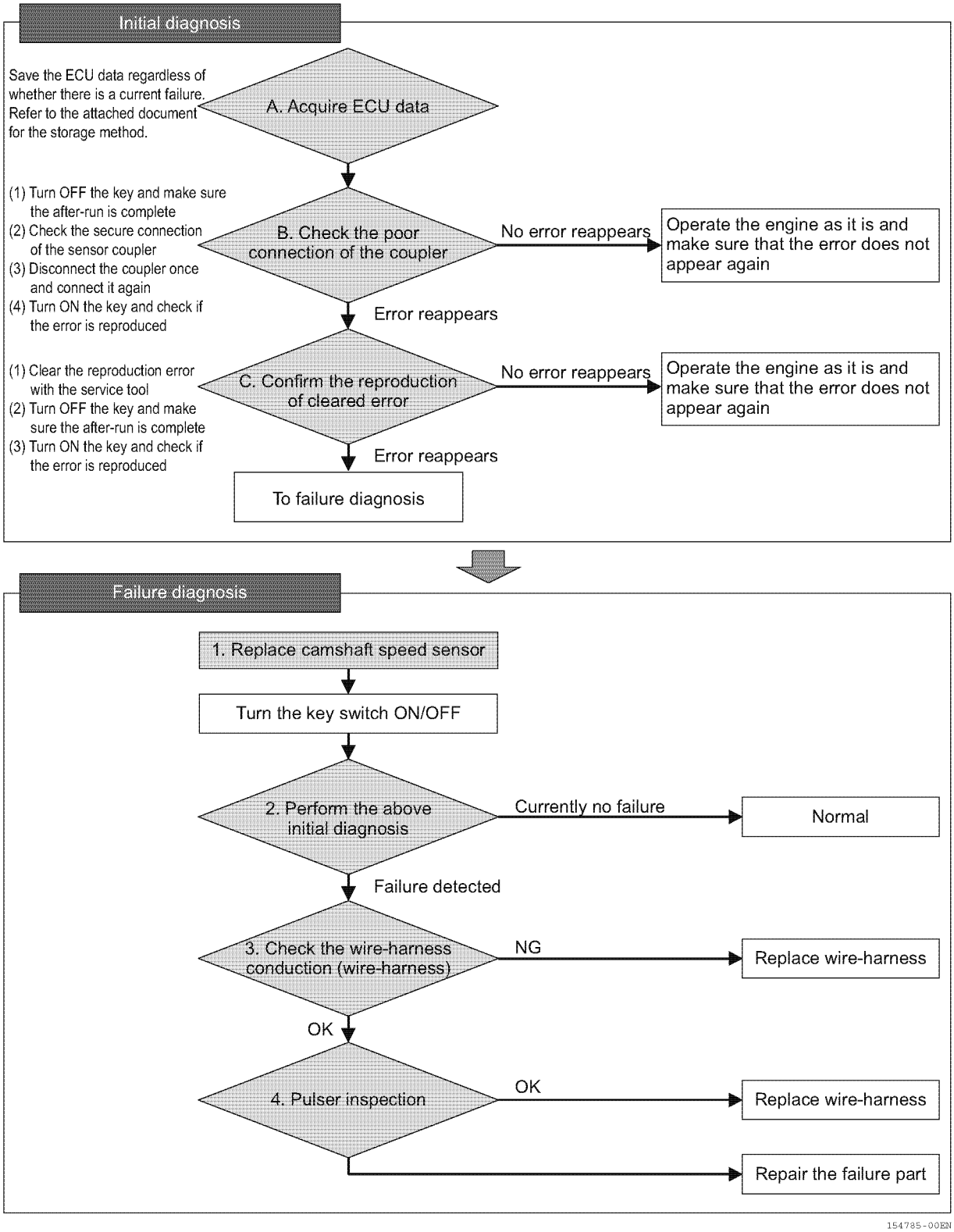
■ Camshaft speed sensor 2

● Related DTC

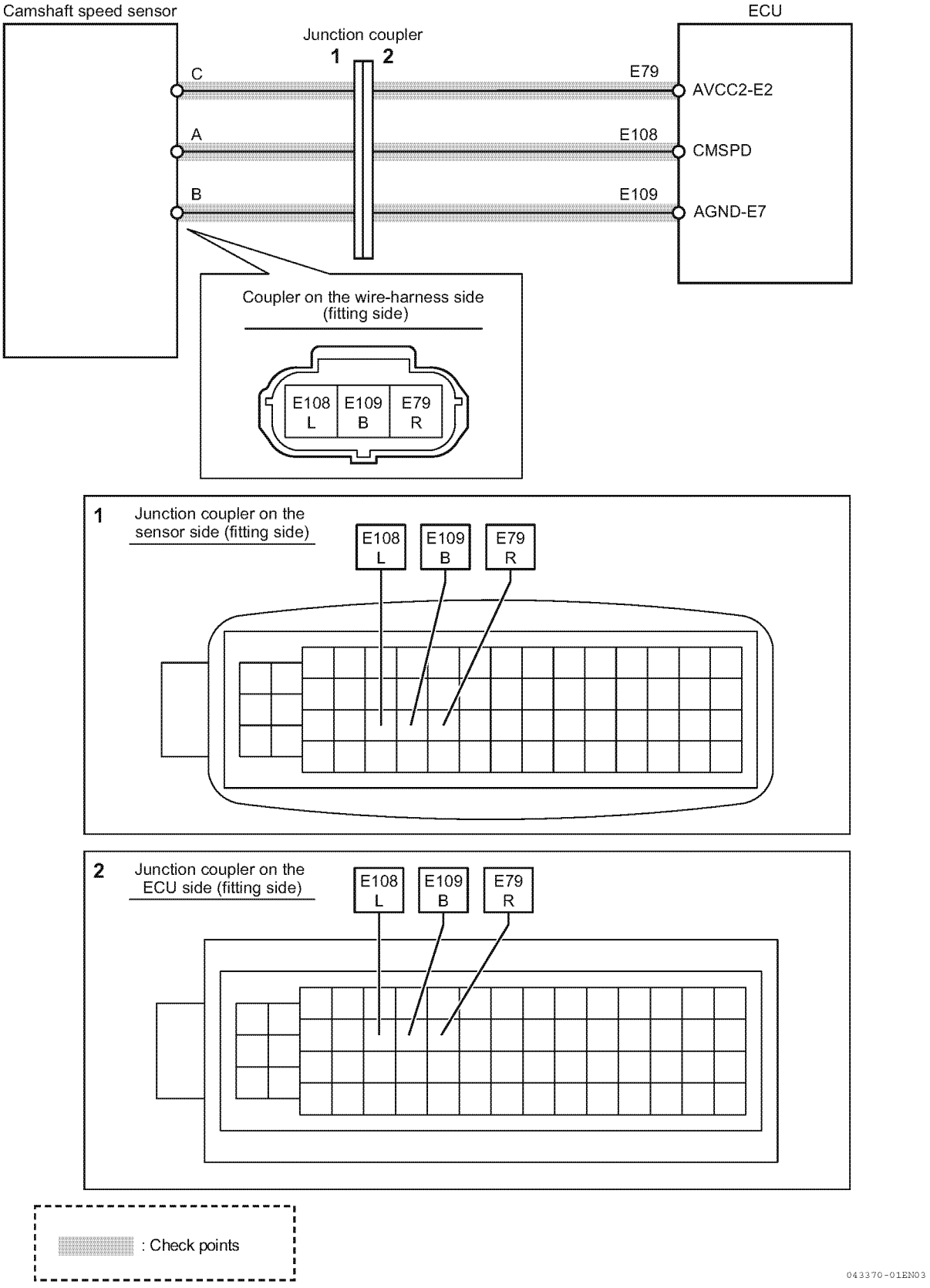
P code	P0342	No signal from camshaft

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Replacing the camshaft speed sensor
   1- Remove the camshaft speed sensor from the wire-harness and replace it.

2. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Check the conduction of the wire-harness between the ECU side harness coupler and the camshaft speed sensor side harness coupler for each of E79, E108, and E109.
   2- While referring to the P586 "ECU pin layout drawing", perform a wire-harness conduction check between measurement point 1 and measurement point 2 in the table below.

Phenomenon	Measurement point 1	Measurement point 2	Result of conduction check	State
Disconnection	ECU side coupler (E79, E108, E109)	Camshaft speed sensor side coupler (E79, E108, E109)	Yes	OK: Normal
			No	NG: Error
Short-circuit	ECU side coupler (E79, E108, E109)	ECU side coupler (Other terminals)	Yes	NG: Error
			No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Pulser inspection”.

4. Pulser inspection
   1- Check the pulser for cracks, pieces of metal, distortion, etc.

NG	Repair the failure part.
OK	Replace the wire-harness.

5. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

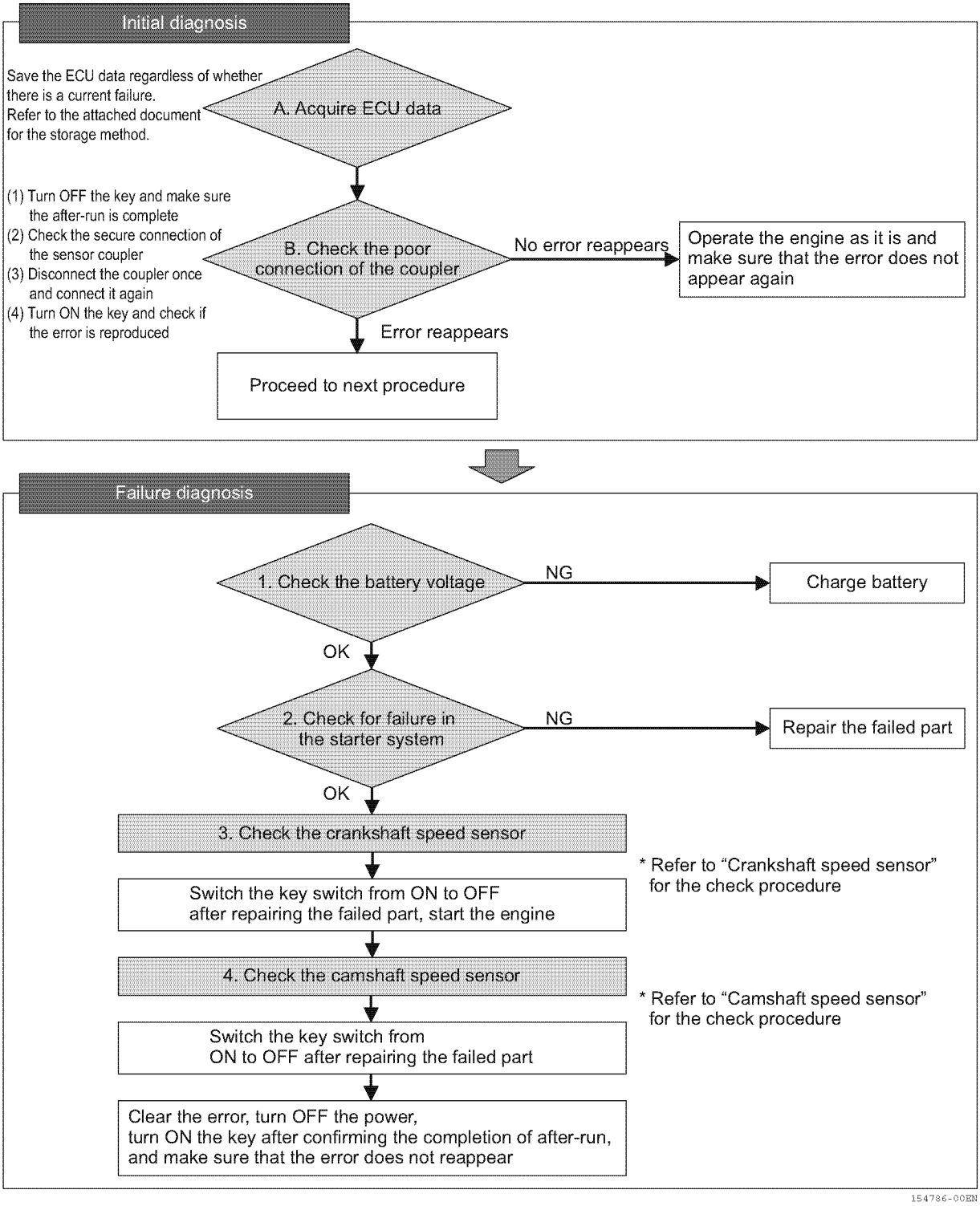
■ Crankshaft speed sensor/Camshaft speed sensor

● Related DTC

P code	P0008	Crank/Camshaft speed sensor non-input (simultaneous)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the battery voltage

   Make sure the battery voltage is within the range below.

For 12V specification	10 V to 16 V
For 24V specification	18 V to 33 V

2. Checking the starter system

   1- Make sure the starter wiring is correct. Correct if it is not correct.

   2- Check the starter terminal and wiring for rust and looseness.

NG	Correct or replace the starter.
OK	Replace the starter.

3. Checking the crankshaft speed sensor

   1- See the failure diagnosis for crankshaft speed sensor error for work.

   2- After repairing the failed part, switch the key switch from ON to OFF to start the engine.

4. Checking the camshaft speed sensor

   1- See the failure diagnosis for camshaft speed sensor failure for work.

   2- After repairing the failed part, switch the key switch from ON to OFF to start the engine.

5. Operation using SA-D

   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.

   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Recheck the crankshaft speed sensor and the camshaft speed sensor.

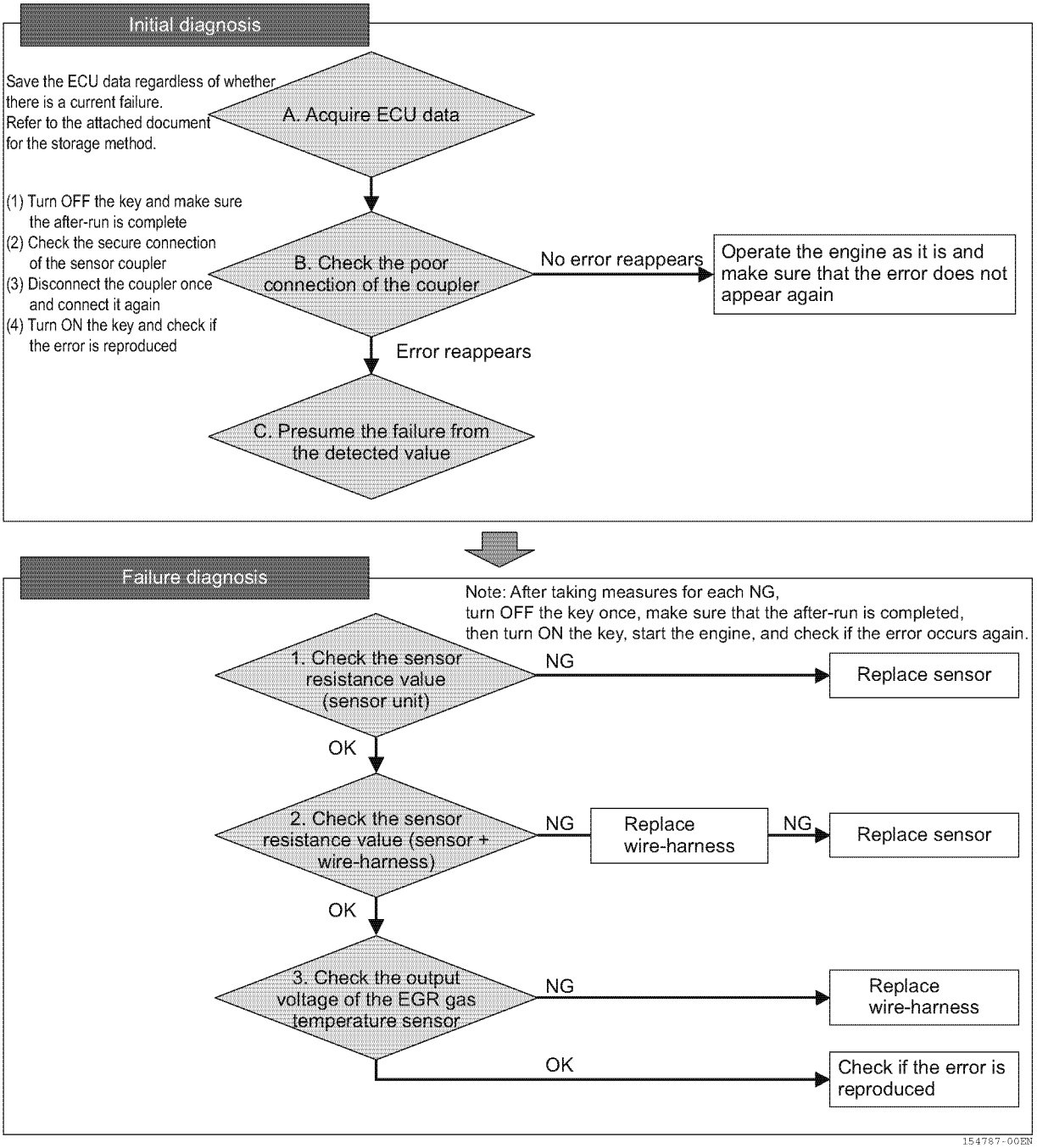
■ EGR gas temperature sensor

● Related DTC

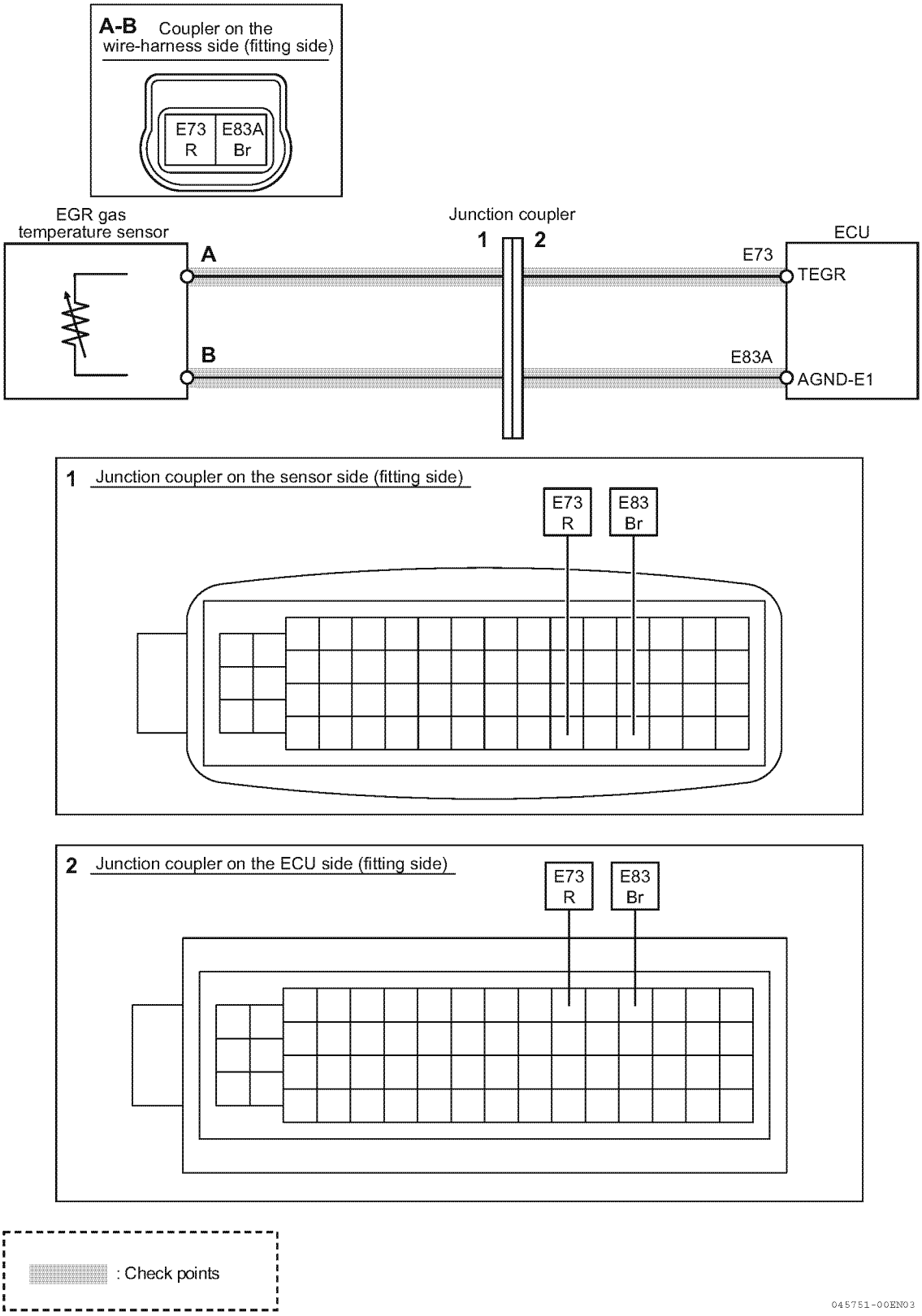
P code	P041C	EGR gas temperature sensor error (voltage low)
	P041D	EGR gas temperature sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

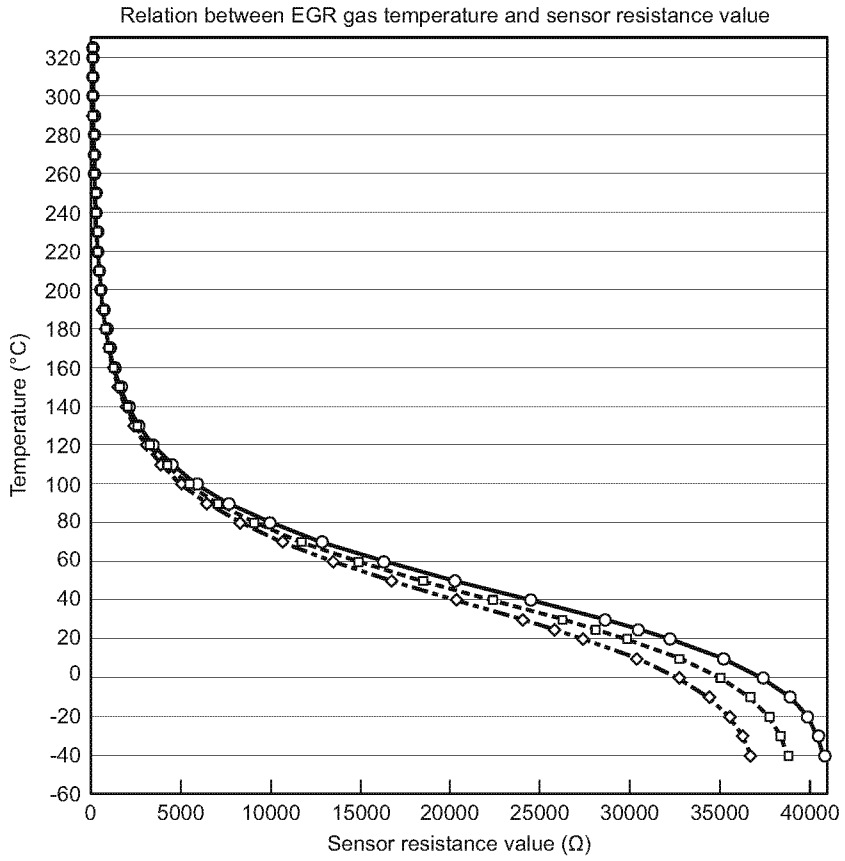


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the EGR gas temperature sensor.
   2- Using a circuit tester, measure the resistance value between EGR gas temperature sensor terminals A and B.
   3- Using “EGR gas temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

EGR gas temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Nom.	Max.
-40	36702	38753	40791
-30	36252	38359	40448
-20	35513	37693	39853
-10	34364	36630	38879
0	32683	35031	37373
10	30349	32746	35160
20	27393	29773	32194
25	25726	28051	30442
30	23965	26214	28543
40	20309	22327	24449
50	16722	18432	20255
60	13444	14820	16301
70	10622	11681	12830
80	8300	9088	9943
90	6449	7023	7642
100	5004	5414	5854
110	3891	4180	4489
120	3038	3240	3455
130	2386	2526	2673
140	1886	1982	2083
150	1502	1567	1635
160	1205	1248	1294
170	973.5	1002	1031
180	792.5	810.7	829.2
190	649.9	660.7	671.7
200	536.7	542.4	548.1
210	441.2	448.4	455.6
220	365.3	373.2	381.2
230	304.4	312.6	321
240	255.3	263.5	271.9
250	215.4	223.4	231.6
260	182.9	190.5	198.4
270	156.1	163.3	170.9
280	133.9	140.8	147.9
290	115.5	121.9	128.6
300	100.1	106.1	112.3
310	81.2	90.2	99.2
320	71.2	79.1	87
325	65.5	74.4	83.3

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NG	Replace the EGR gas temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the EGR gas temperature sensor and the wire-harness, and then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E73 and E83A on the wire-harness side.
   3- Using “EGR gas temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	The coupler between the sensor and the wire-harness may be defective. Replace the wire-harness, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the sensor.
OK	Go to “Checking the output voltage of the EGR gas temperature sensor”.

3. Checking the output voltage of the EGR gas temperature sensor
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between EGR gas temperature sensor signals E73 and E83A.

Voltage	State	Corrective action
E73 < 0.07 V	NG	• Replace the wire-harness. • Replace the ECU.
0.07 V ≤ E73 ≤ 4.8 V	OK (normal range)	Wire-harness is normal.
4.8 V < E73	NG	• Replace the wire-harness. • Replace the ECU.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

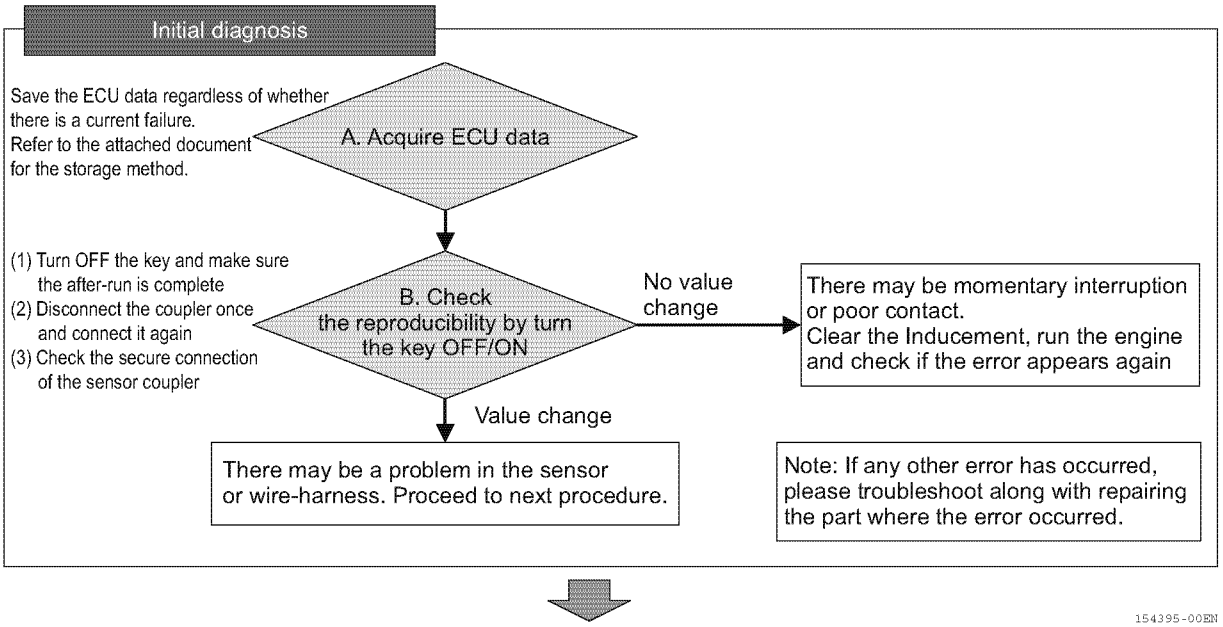
■ EGR gas temperature sensor 2

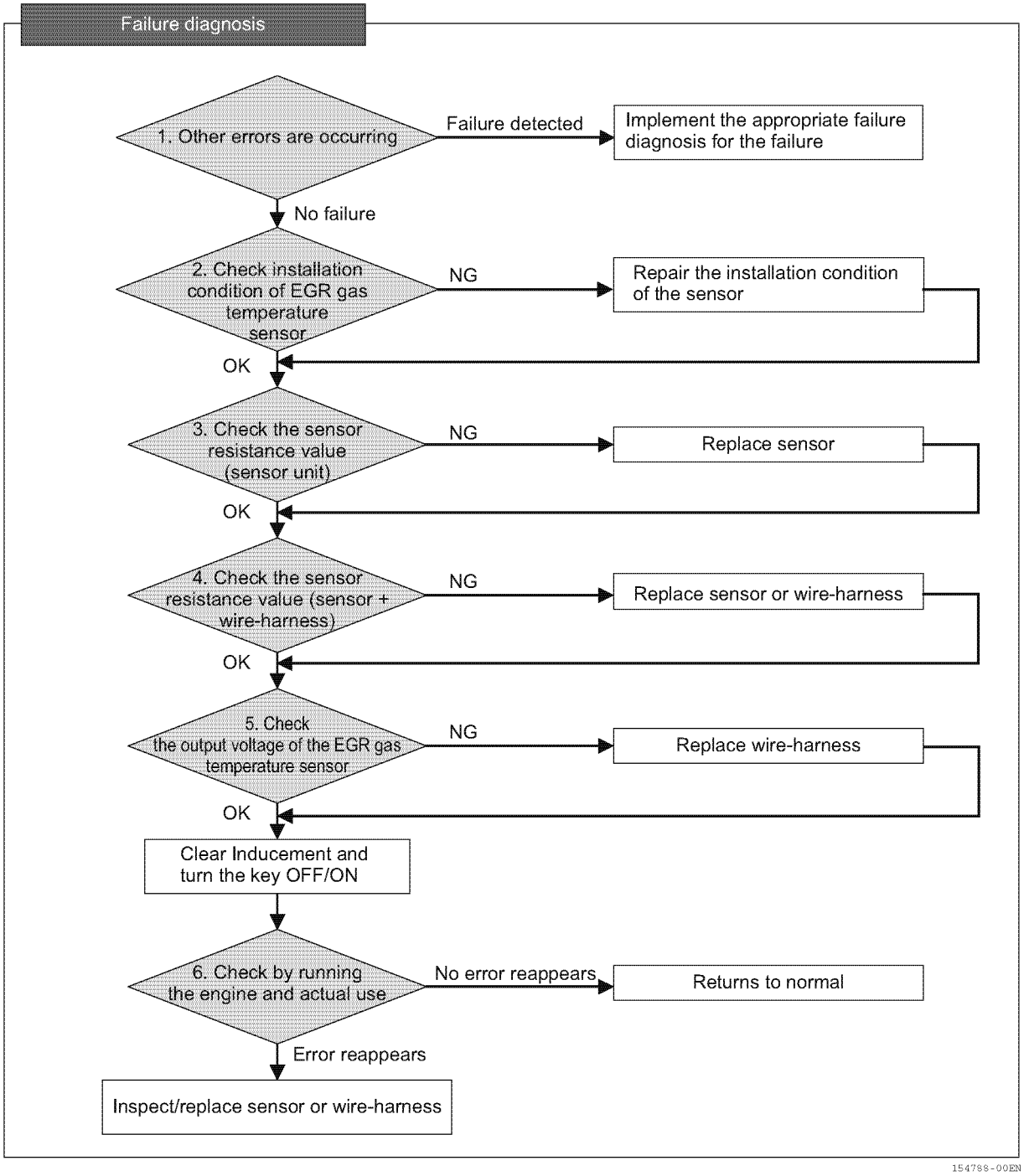
● Related DTC

P code	P1675	EGR gas temperature sensor error (detected value error)

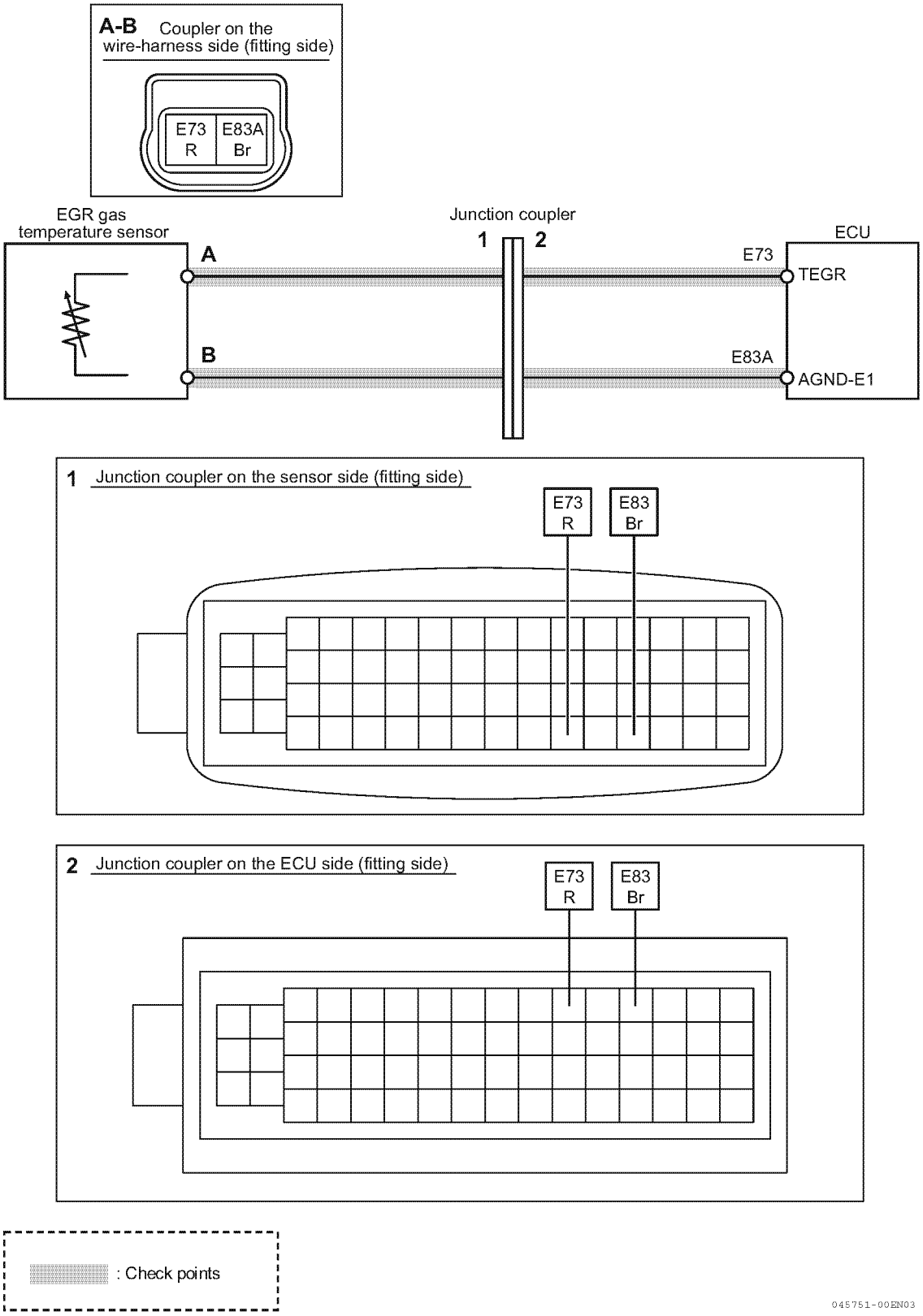
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of EGR gas temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the sensor resistance value (sensor unit)
NG
Replace sensor
OK
4. Check the sensor resistance value (sensor + wire-harness)
NG
Replace sensor or wire-harness
OK
5. Check the output voltage of the EGR gas temperature sensor
NG
Replace wire-harness
OK
Clear Inducement and turn the key OFF/ON
6. Check by running the engine and actual use
No error reappears
Returns to normal
Error reappears
Inspect/replace sensor or wire-harness
154788-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for EGR gas temperature sensor, cooling water temperature sensor, DPF inlet temperature sensor, EGR valve, or inside the ECU.

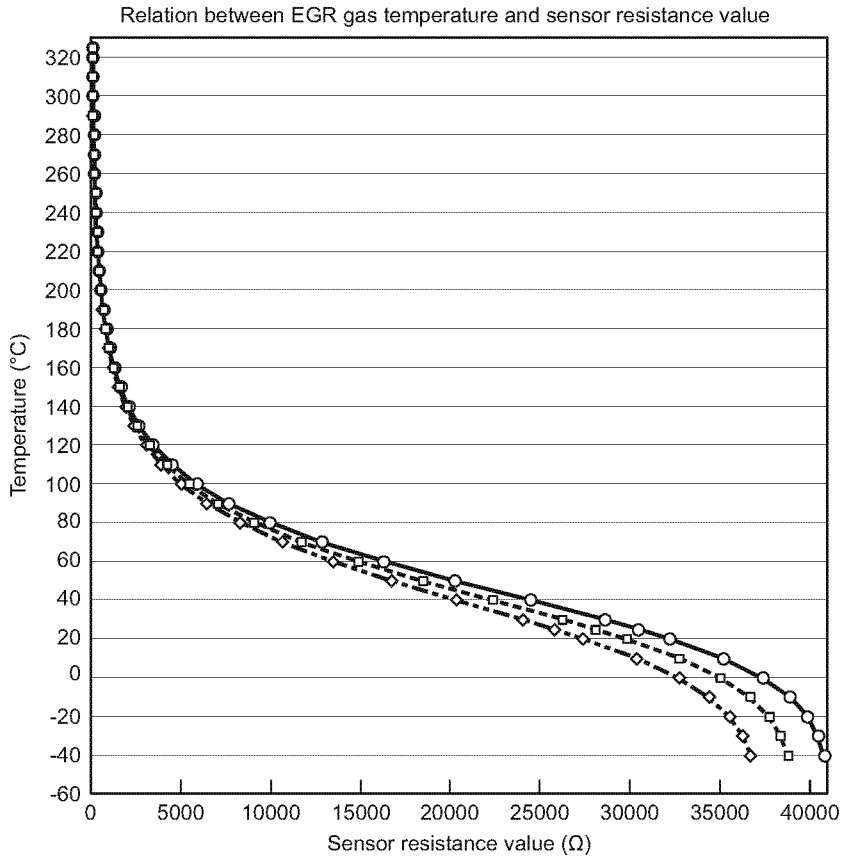
Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to “Checking installation condition of EGR gas temperature sensor”.

2. Checking installation condition of EGR gas temperature sensor
   1- Turn OFF the key switch.
   2- Check the installation condition of EGR gas temperature sensor.
   3- Check the EGR pipe and EGR cooler for damage or failure.

NG	Correct the sensor mounting state and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor unit)”.

3. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the EGR gas temperature sensor.
   2- Using a circuit tester, measure the resistance value between EGR gas temperature sensor terminals A and B.
   3- Using “EGR gas temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

EGR gas temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Nom.	Max.
-40	36702	38753	40791
-30	36252	38359	40448
-20	35513	37693	39853
-10	34364	36630	38879
0	32683	35031	37373
10	30349	32746	35160
20	27393	29773	32194
25	25726	28051	30442
30	23965	26214	28543
40	20309	22327	24449
50	16722	18432	20255
60	13444	14820	16301
70	10622	11681	12830
80	8300	9088	9943
90	6449	7023	7642
100	5004	5414	5854
110	3891	4180	4489
120	3038	3240	3455
130	2386	2526	2673
140	1886	1982	2083
150	1502	1567	1635
160	1205	1248	1294
170	973.5	1002	1031
180	792.5	810.7	829.2
190	649.9	660.7	671.7
200	536.7	542.4	548.1
210	441.2	448.4	455.6
220	365.3	373.2	381.2
230	304.4	312.6	321
240	255.3	263.5	271.9
250	215.4	223.4	231.6
260	182.9	190.5	198.4
270	156.1	163.3	170.9
280	133.9	140.8	147.9
290	115.5	121.9	128.6
300	100.1	106.1	112.3
310	81.2	90.2	99.2
320	71.2	79.1	87
325	65.5	74.4	83.3

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NG	Replace the EGR gas temperature sensor, and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

4. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the EGR gas temperature sensor and the wire-harness, and then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E73 and E83A on the wire-harness side.
   3- Using “EGR gas temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. After replacement, switch the ECU power from OFF to ON, and then perform the following procedure.
OK	Go to “Checking the output voltage of the EGR gas temperature sensor”.

5. Checking the output voltage of the EGR gas temperature sensor
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between EGR gas temperature sensor signals E73 and E83A.

Voltage	State	Corrective action
E73 < 0.07 V	NG	Replace the wire-harness.
0.07 V ≤ E73 ≤ 4.8 V	OK (normal range)	Perform failure diagnosis using SA-D.
4.8 V < E73	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. After replacement, switch the ECU power from OFF to ON, clear the Inducement, turn the key OFF and ON, and then run the engine to check again.
OK	Clear the Inducement, turn the key OFF and ON, and then run the engine to check again.

6. Operation using SA-D
   1- Turn OFF the key switch and turn ON the key switch again to start the engine. Operate the engine that satisfies the reset criteria for EGR gas temperature sensor error (detected value error) (*P153*).
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the EGR gas temperature sensor or wire-harness.

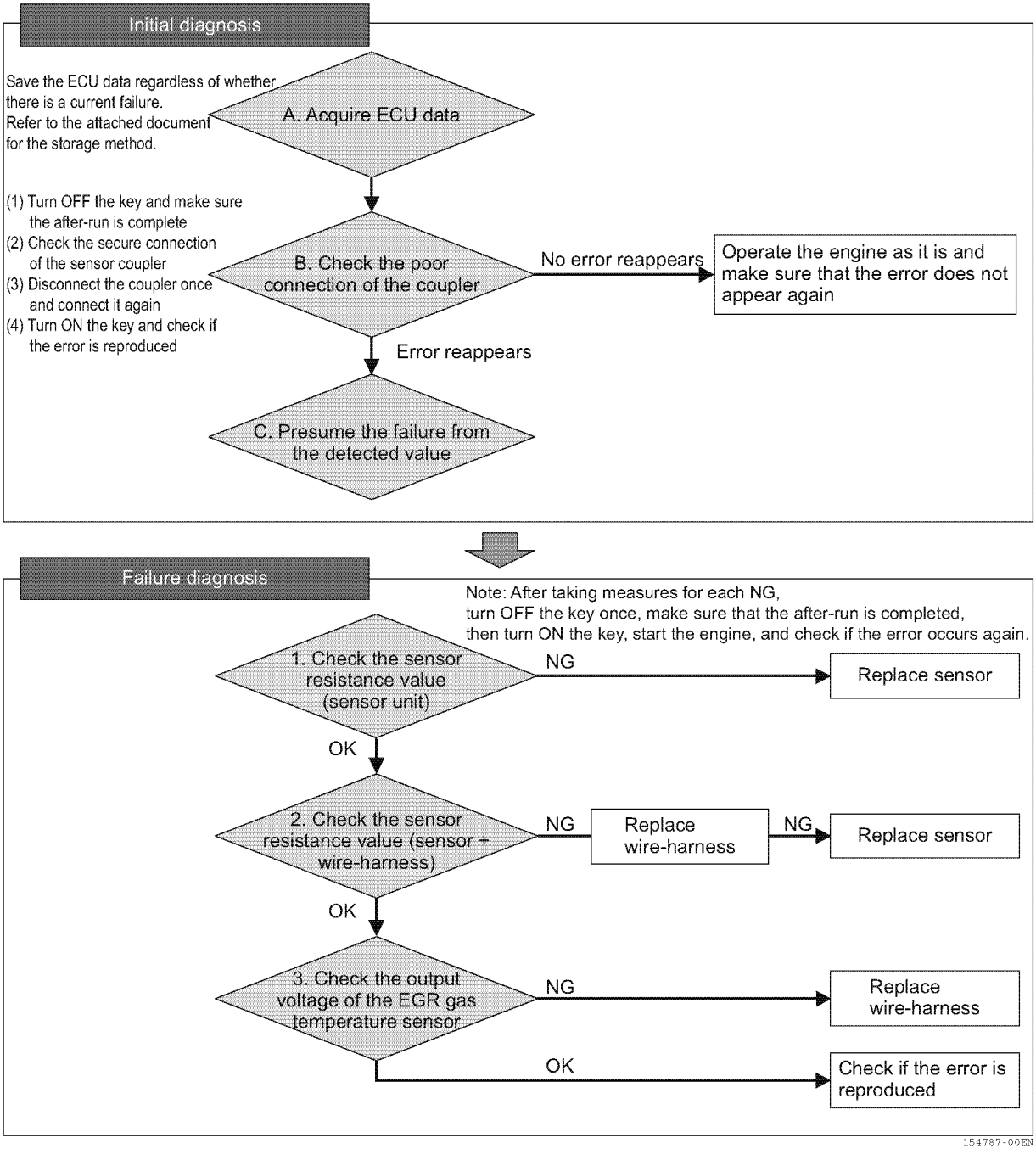
■ Intake manifold temperature sensor

● Related DTC

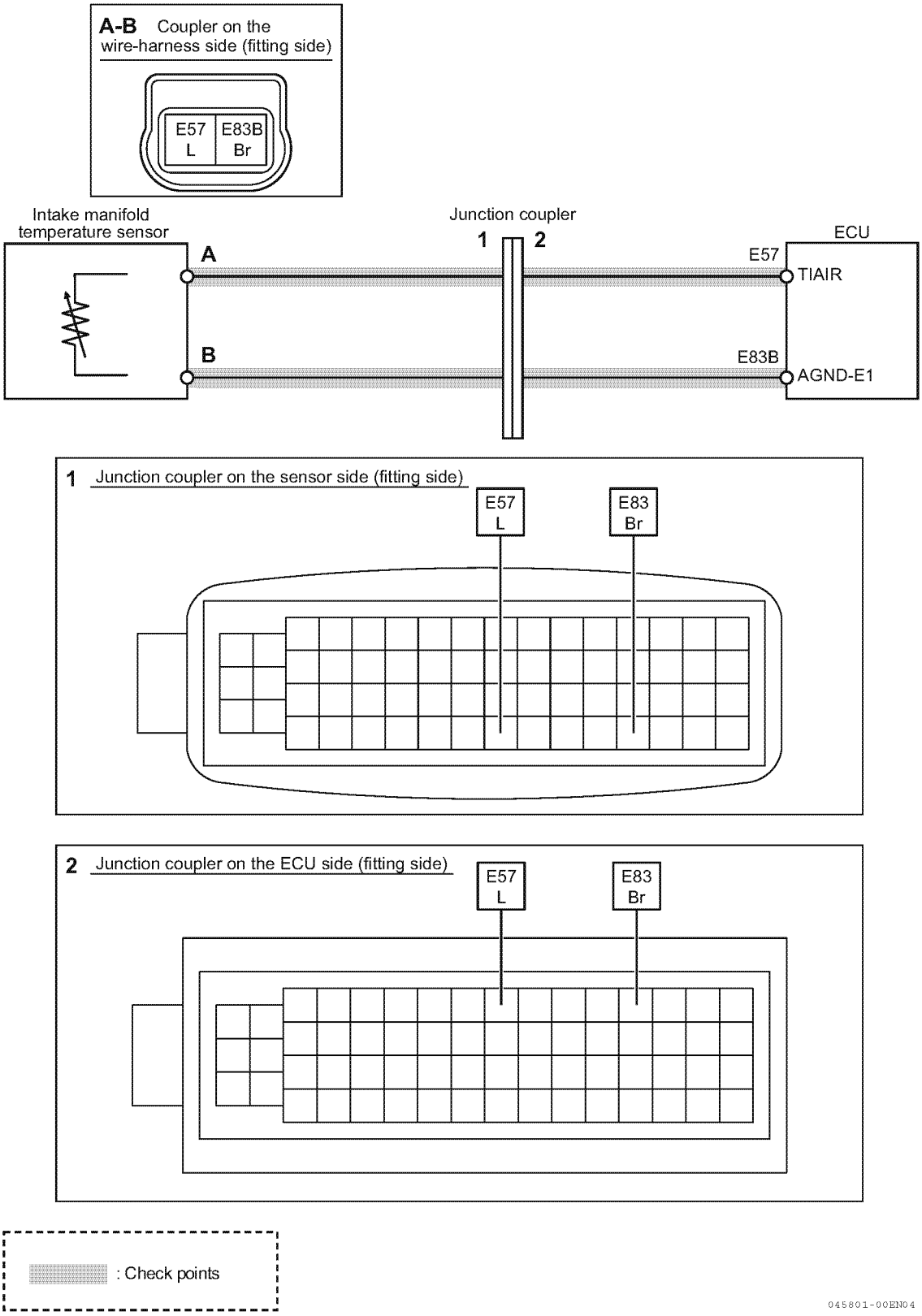
P code	P040C	Intake manifold temperature sensor error (voltage low)
	P040D	Intake manifold temperature sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

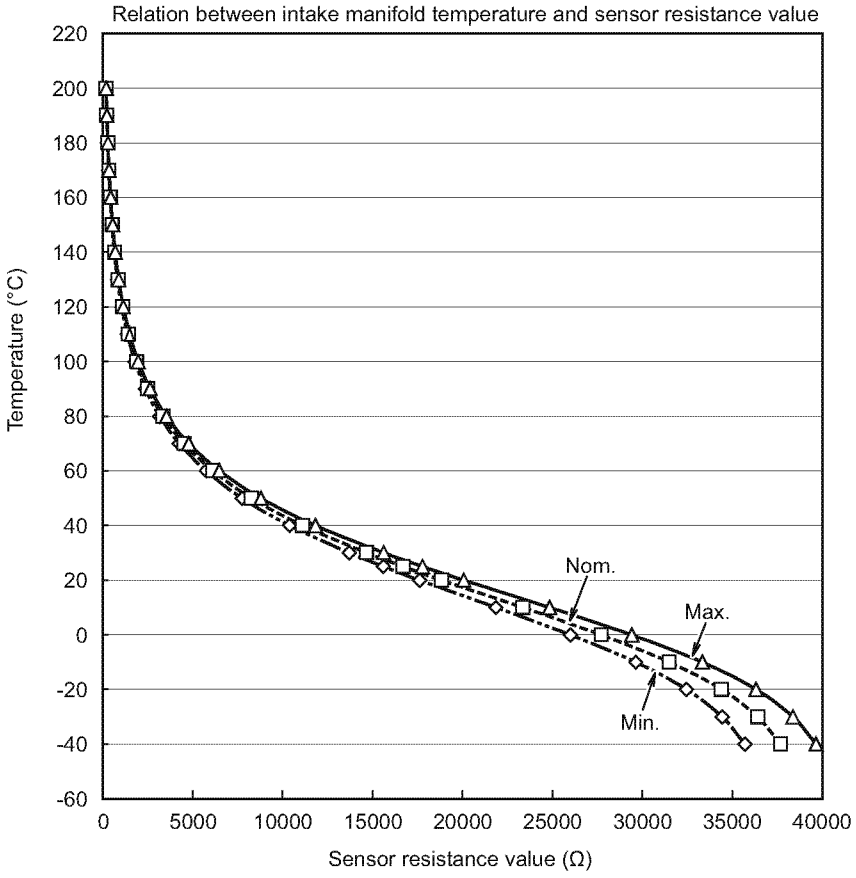


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the intake manifold temperature sensor.
   2- Using a circuit tester, measure the resistance value between intake manifold temperature sensor terminals A and B.
   3- Using “Intake manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Intake manifold temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Nom.	Max.
-40	35699	37683	39656
-30	34434	36412	38374
-20	32455	34400	36325
-10	29633	31496	33339
0	26009	27723	29420
10	21858	23354	24838
20	17614	18847	20073
25	15595	16691	17782
30	13701	14664	15623
40	10386	11106	11825
50	7750	8273	8795
60	5742	6116	6488
70	4252	4516	4780
80	3162	3347	3534
90	2366	2499	2631
100	1787	1881	1975
110	1362	1431	1498
120	1050	1098	1148
130	816.2	852.3	888.3
140	641.2	667.8	694.6
150	508.9	528.5	548.1
160	405.3	422.1	438.9
170	325.9	340.2	354.4
180	264.4	276.5	288.7
190	216.2	226.6	236.9
200	178.2	187.1	196.1

044402-01EN00

NG	Replace the intake manifold temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the intake manifold temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E57 and E83B on the wire-harness side.
   3- Using “Intake manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	The coupler between the sensor and the wire-harness may be defective. Replace the wire-harness, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the sensor.
OK	Go to “Checking the intake manifold temperature sensor output voltage”.

3. Checking the intake manifold temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between intake manifold temperature sensor signals E57 and E83B.

Voltage	State	Corrective action
E57 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ E57 ≤ 4.8 V	OK (normal range)	Wire-harness is normal.
4.8 V < E57	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	After turning the key OFF and ON, make a diagnosis using SA-D and make sure that the error does not reappear.

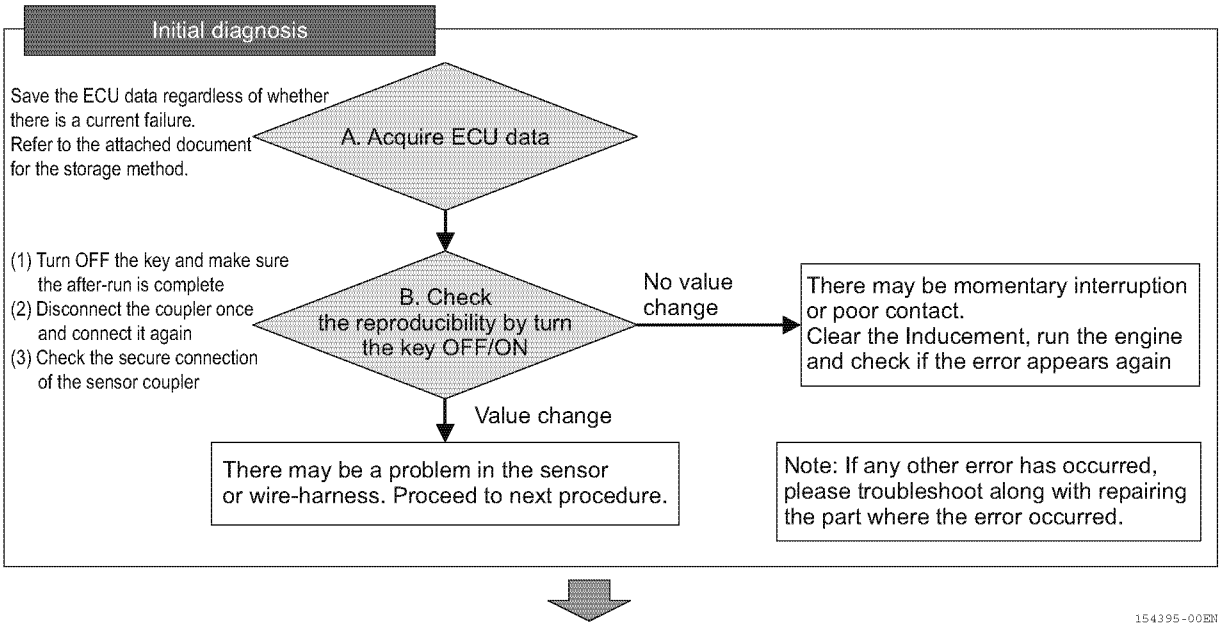
■ Intake manifold temperature sensor 2

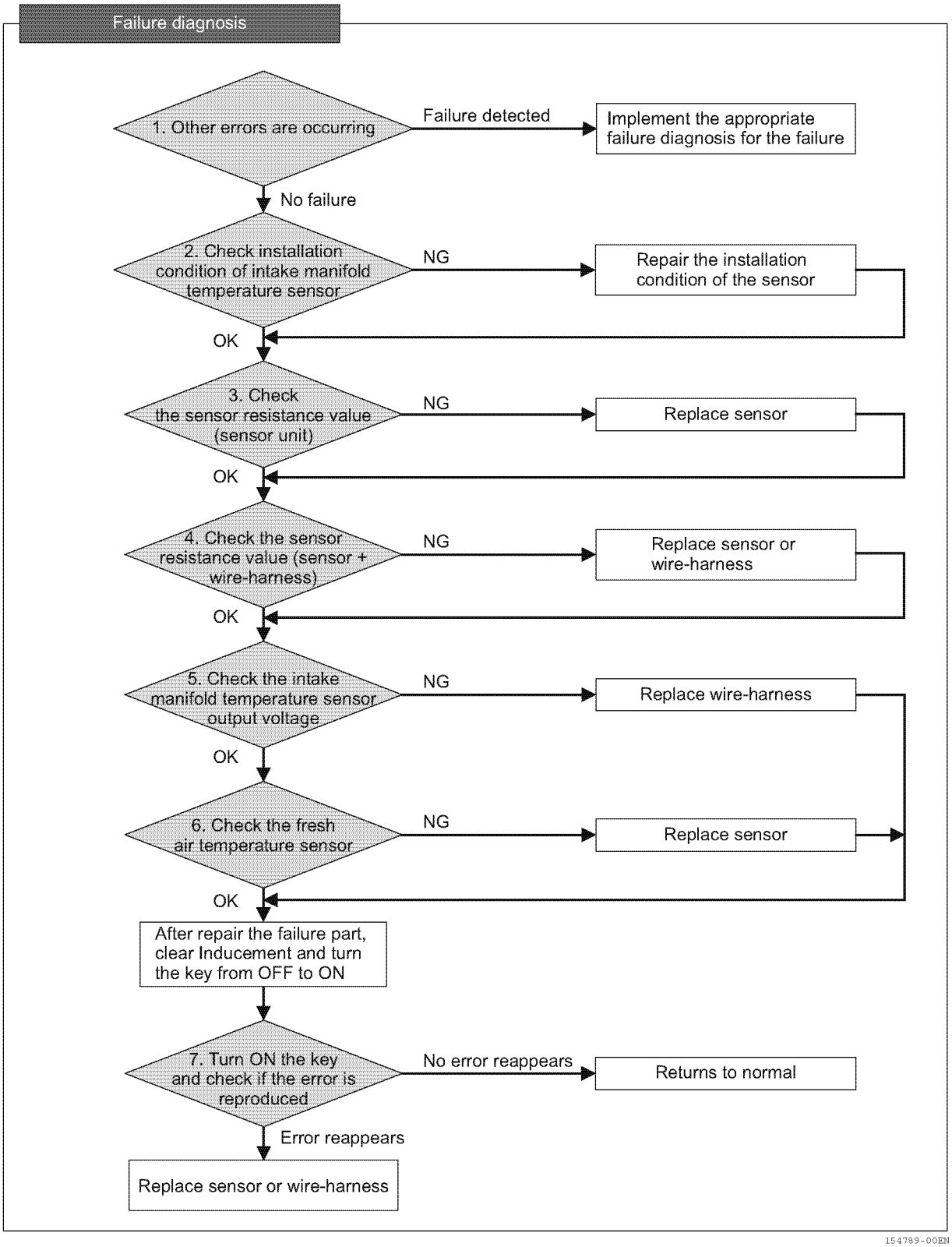
● Related DTC

P code	P1676	Intake manifold temperature sensor error (detected value error)

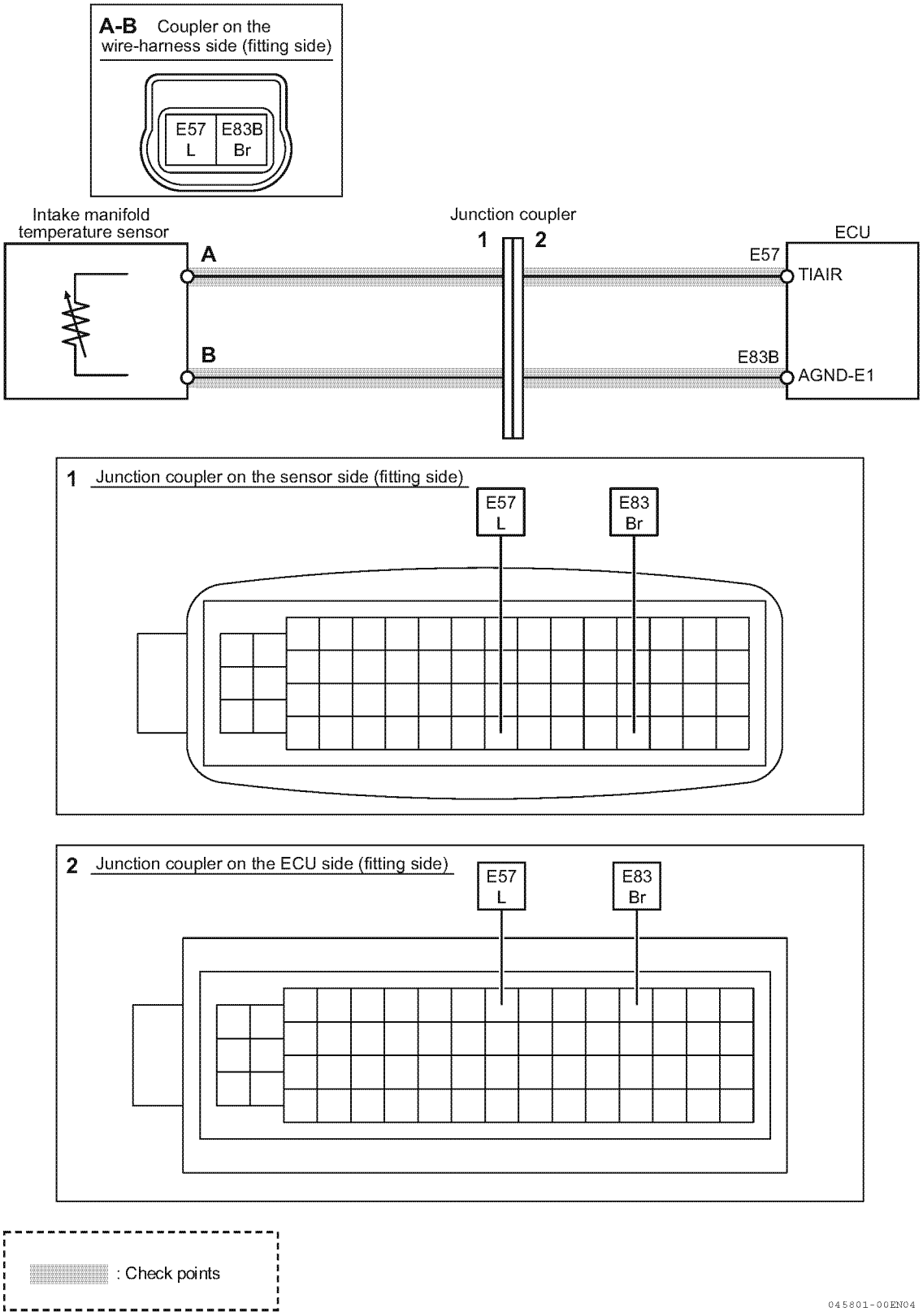
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of intake manifold temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the sensor resistance value (sensor unit)
NG
Replace sensor
OK
4. Check the sensor resistance value (sensor + wire-harness)
NG
Replace sensor or wire-harness
OK
5. Check the intake manifold temperature sensor output voltage
NG
Replace wire-harness
OK
6. Check the fresh air temperature sensor
NG
Replace sensor
OK
After repair the failure part, clear Inducement and turn the key from OFF to ON
7. Turn ON the key and check if the error is reproduced
No error reappears
Returns to normal
Error reappears
Replace sensor or wire-harness
154789-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for intake manifold temperature sensor, cooling water temperature sensor, fresh air temperature sensor, or inside the ECU.

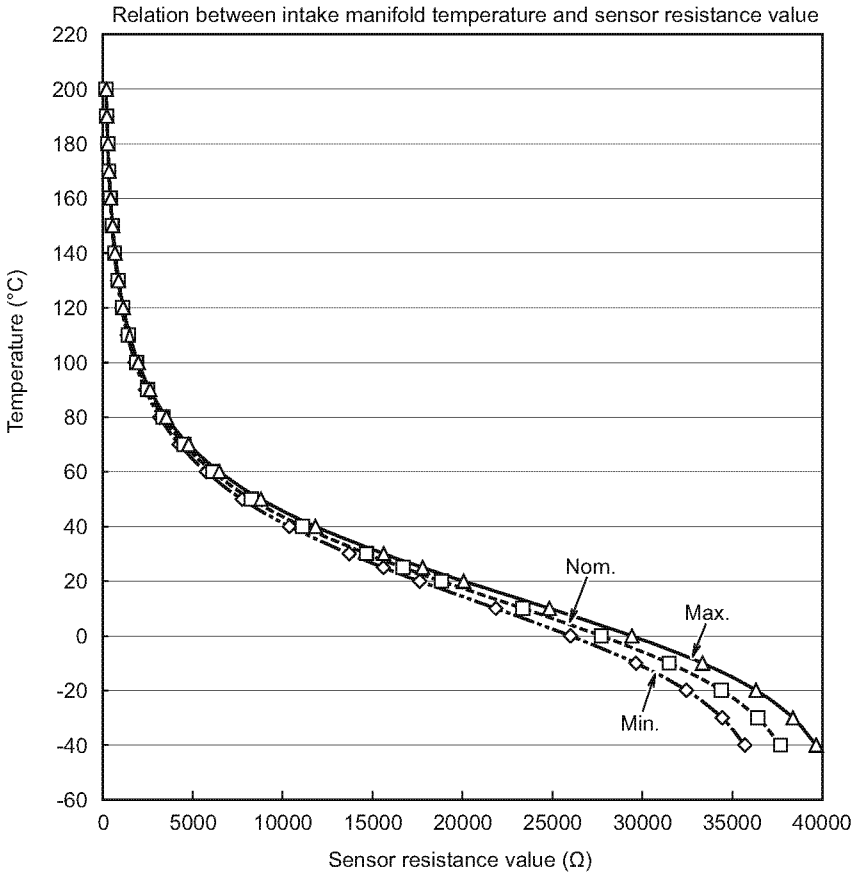
Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to “Checking installation condition of intake manifold temperature sensor”.

2. Checking installation condition of intake manifold temperature sensor
   1- Turn OFF the key switch.
   2- Check the installation condition of intake manifold temperature sensor.

NG	Correct the sensor mounting state and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor unit)”

3. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the intake manifold temperature sensor.
   2- Using a circuit tester, measure the resistance value between intake manifold temperature sensor terminals A and B.
   3- Using “Intake manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Intake manifold temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Nom.	Max.
-40	35699	37683	39656
-30	34434	36412	38374
-20	32455	34400	36325
-10	29633	31496	33339
0	26009	27723	29420
10	21858	23354	24838
20	17614	18847	20073
25	15595	16691	17782
30	13701	14664	15623
40	10386	11106	11825
50	7750	8273	8795
60	5742	6116	6488
70	4252	4516	4780
80	3162	3347	3534
90	2366	2499	2631
100	1787	1881	1975
110	1362	1431	1498
120	1050	1098	1148
130	816.2	852.3	888.3
140	641.2	667.8	694.6
150	508.9	528.5	548.1
160	405.3	422.1	438.9
170	325.9	340.2	354.4
180	264.4	276.5	288.7
190	216.2	226.6	236.9
200	178.2	187.1	196.1

044402-01EN00

NG	Replace the intake manifold temperature sensor, and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

4. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the intake manifold temperature sensor and wire-harness, then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E57 and E83B on the wire-harness side.
   3- Using “Intake manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. After replacement, switch the ECU power from OFF to ON, and then perform the following procedure.
OK	Go to “Checking the intake manifold temperature sensor output voltage”.

5. Checking the intake manifold temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between intake manifold temperature sensor signals E57 and E83B.

Voltage	State	Corrective action
E57 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ E57 ≤ 4.8 V	OK (normal range)	Perform failure diagnosis using SA-D.
4.8 V < E57	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. After replacement, switch the ECU power from OFF to ON, and then perform the following procedure.
OK	Switch the ECU power from OFF to ON for failure diagnosis using SA-D.

6. Checking the fresh air temperature sensor
   1- Refer to P0113, P0112 and P1678 for checking procedure of fresh air temperature sensor.
   2- After checking the sensor, clear the Inducement, turn the key OFF/ON, and then run the engine to check again.

7. Operation using SA-D
   1- Turn OFF the key switch and then turn ON the key switch again. No need to run the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the intake manifold temperature sensor or wire-harness.

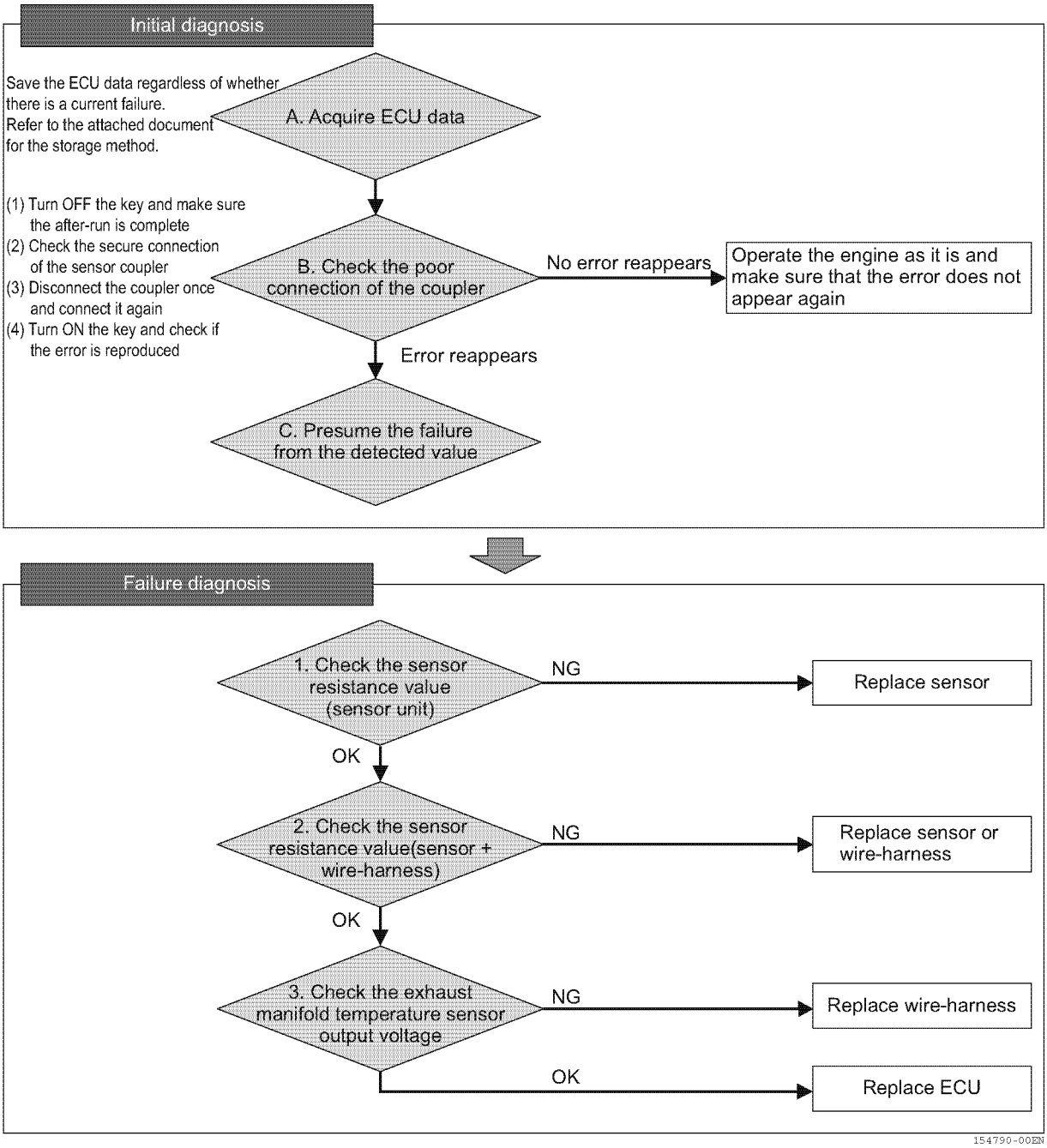
■ Exhaust manifold temperature sensor 1

● Related DTC

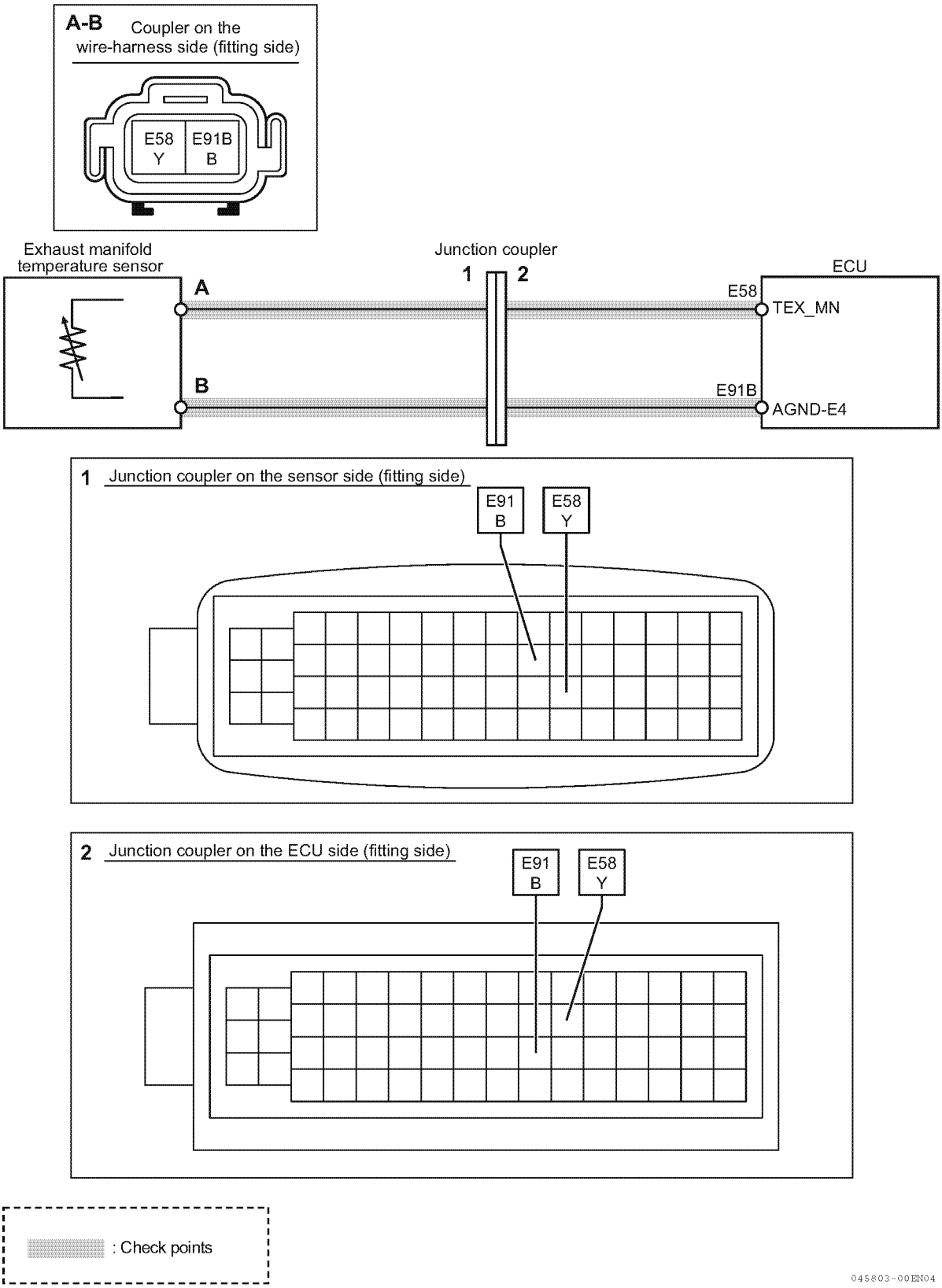
P code	P0545	Exhaust manifold temperature sensor error (voltage low)
	P0546	Exhaust manifold temperature sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

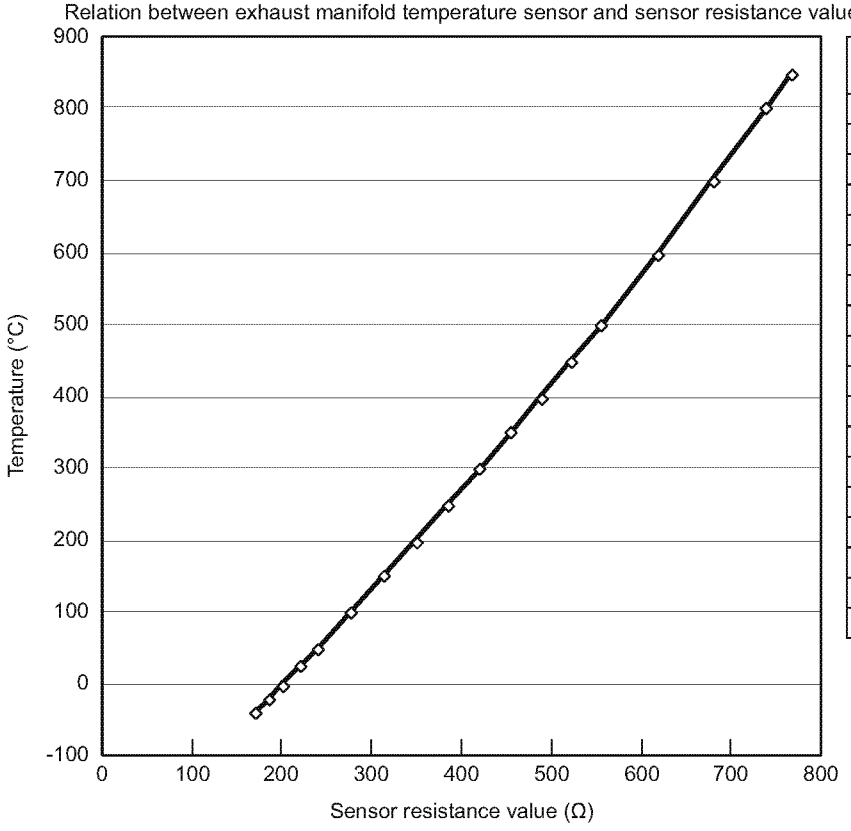


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the exhaust manifold temperature sensor.
   2- Using a circuit tester, measure the resistance value between exhaust manifold temperature sensor terminals A and B.
   3- Using “Exhaust manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Exhaust manifold temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
-40	170.2
-20	185.6
0	201.0
25	220.1
50	239.0
100	276.4
150	313.2
200	349.5
250	385.1
300	420.2
350	454.7
400	488.6
450	521.9
500	554.6
600	618.3
700	679.7
800	738.7
850	767.3

NG	Replace the exhaust manifold temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the exhaust manifold temperature sensor and wire-harness, and then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E58 and E91B on the wire-harness side.
   3- Using “Exhaust manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the exhaust manifold temperature sensor output voltage”.

3. Checking the exhaust manifold temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between exhaust manifold temperature sensor signals E58 and E91B.

Voltage	State	Corrective action
E58 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ E58 ≤ 4.8 V	OK (normal range)	Replace the ECU.
4.8 V < E58	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Replace the exhaust manifold temperature sensor or wire-harness.

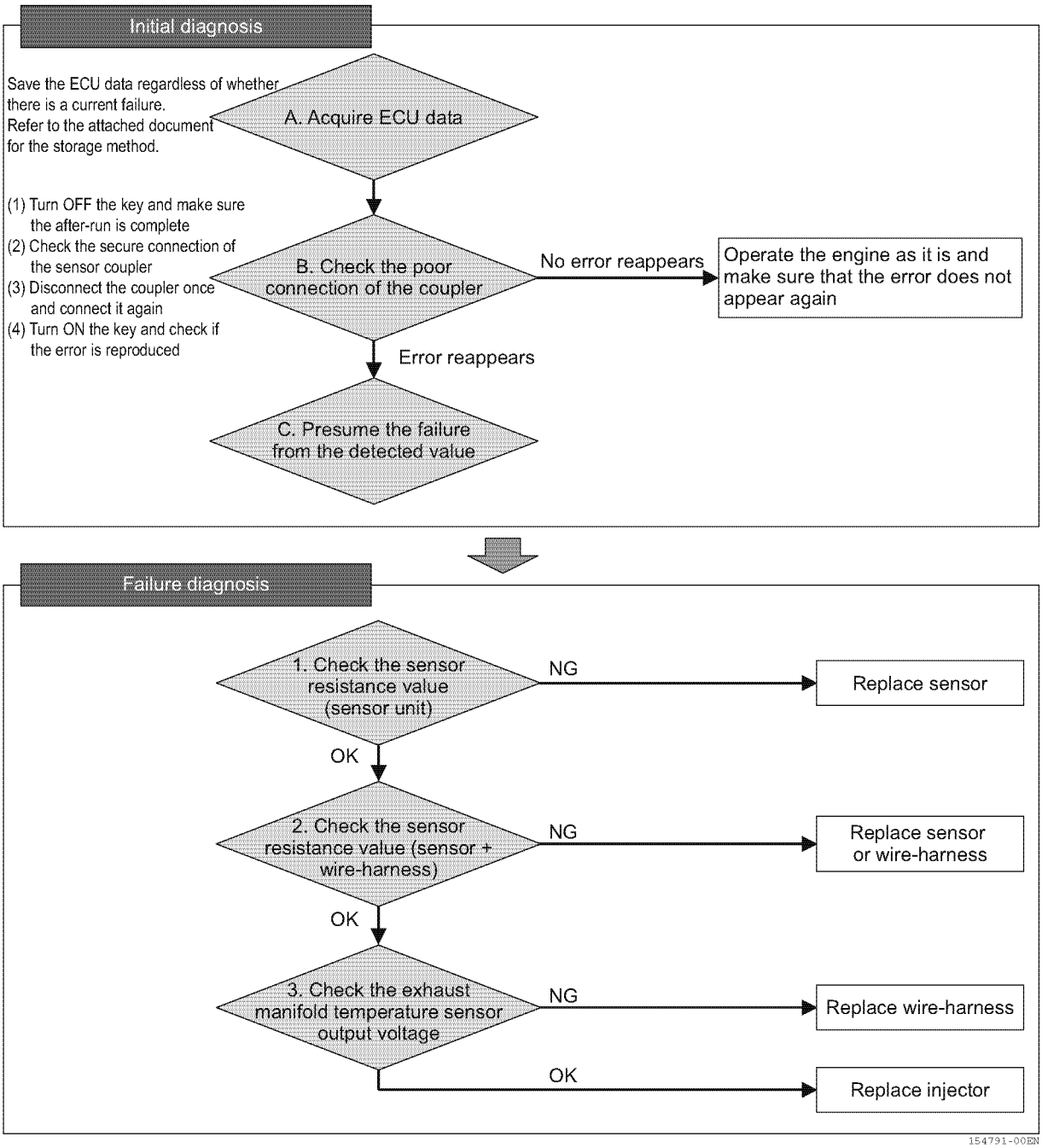
■ Exhaust manifold temperature sensor 2

● Related DTC

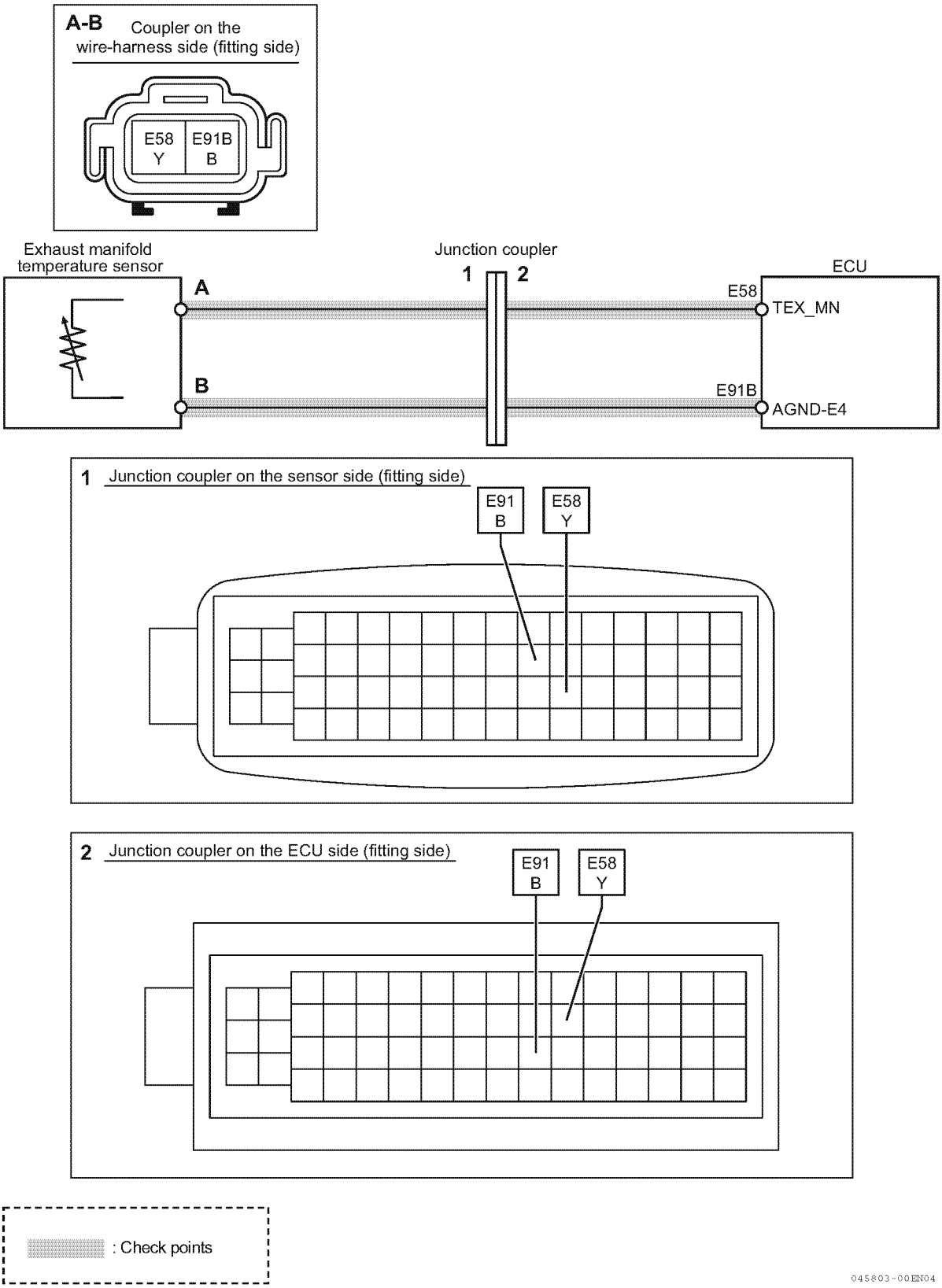
P code	P2428	Exhaust manifold temperature sensor error (detected value error) (temperature high) (Applicable only to EU Stage IIIA equivalent certified model)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

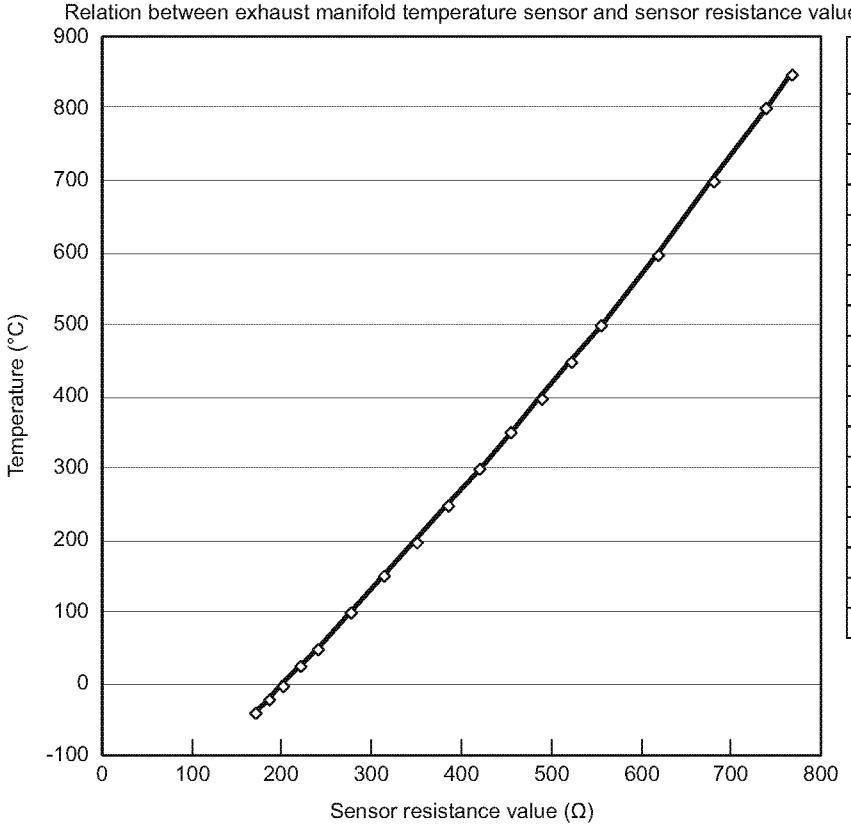


Note: See P586 for the ECU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the exhaust manifold temperature sensor.
   2- Using a circuit tester, measure the resistance value between exhaust manifold temperature sensor terminals A and B.
   3- Using “Exhaust manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Exhaust manifold temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
-40	170.2
-20	185.6
0	201.0
25	220.1
50	239.0
100	276.4
150	313.2
200	349.5
250	385.1
300	420.2
350	454.7
400	488.6
450	521.9
500	554.6
600	618.3
700	679.7
800	738.7
850	767.3

NG	Replace the exhaust manifold temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the exhaust manifold temperature sensor and wire-harness, and then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E58 and E91B on the wire-harness side.
   3- Using “Exhaust manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the exhaust manifold temperature sensor output voltage”.

3. Checking the exhaust manifold temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between exhaust manifold temperature sensor signals E58 and E91B.

Voltage	State	Corrective action
E58 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ E58 ≤ 4.8 V	OK (normal range)	Replace the injector.
4.8 V < E58	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Replace the injector.

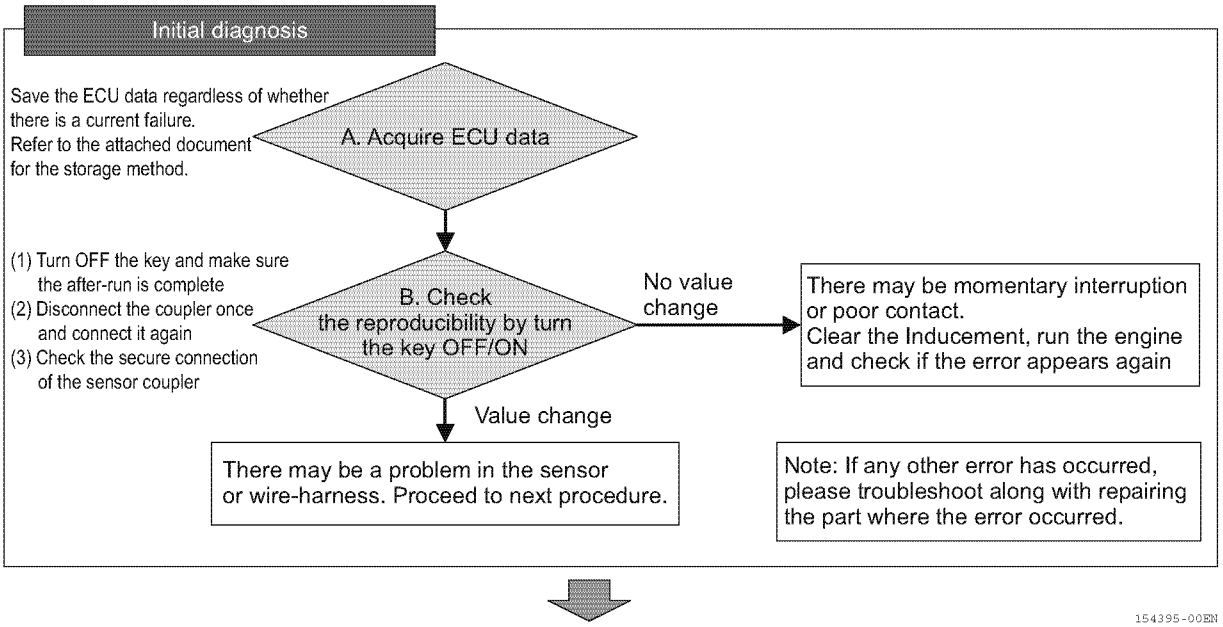
■ Exhaust manifold temperature sensor 3

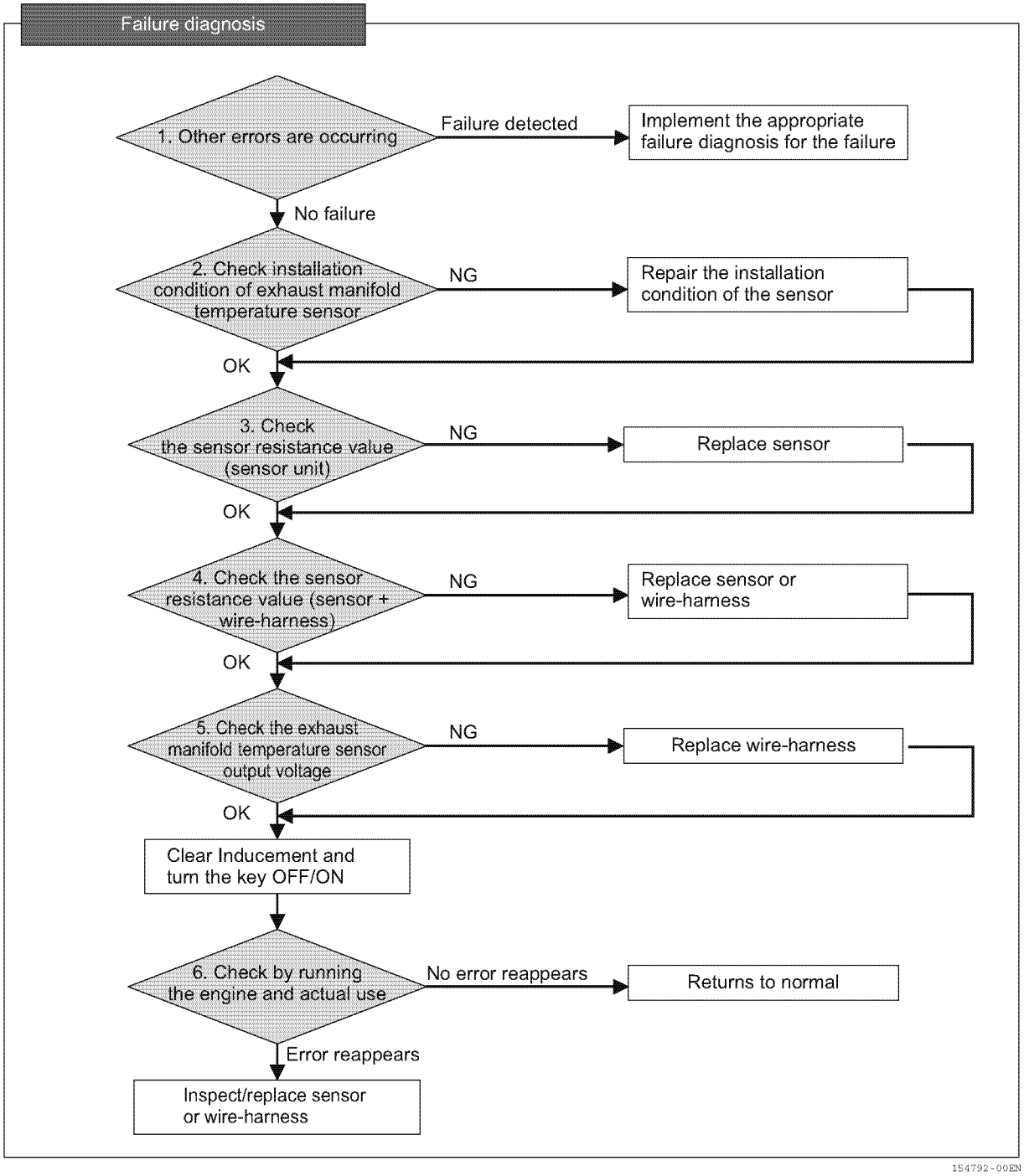
● Related DTC

P code	P1677	Exhaust manifold temperature sensor error (detected value error)

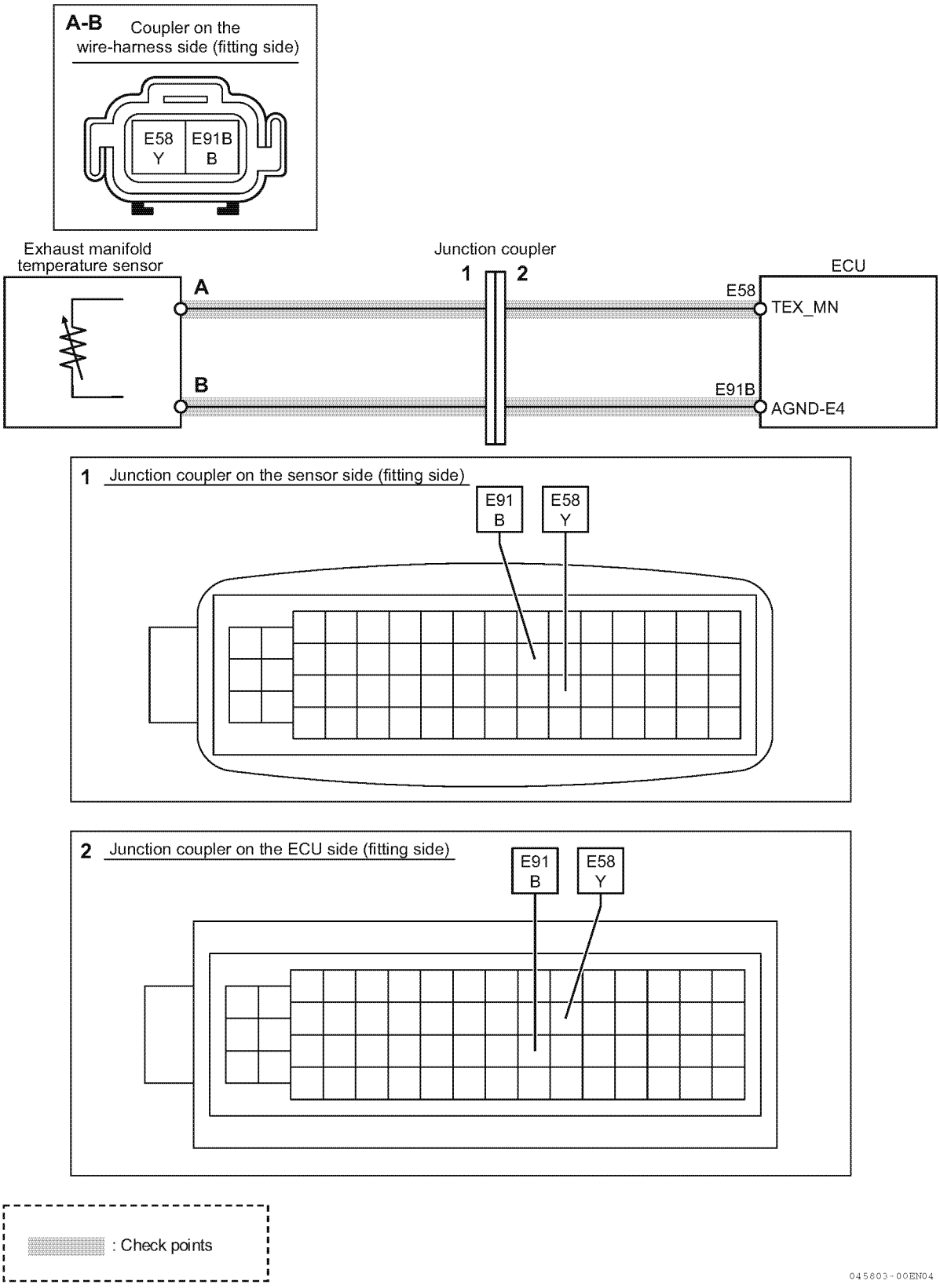
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of exhaust manifold temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the sensor resistance value (sensor unit)
NG
Replace sensor
OK
4. Check the sensor resistance value (sensor + wire-harness)
NG
Replace sensor or wire-harness
OK
5. Check the exhaust manifold temperature sensor output voltage
NG
Replace wire-harness
OK
Clear Inducement and turn the key OFF/ON
6. Check by running the engine and actual use
No error reappears
Returns to normal
Error reappears
Inspect/replace sensor or wire-harness
154792-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Particularly, check to see whether any errors are detected for exhaust manifold temperature sensor, cooling water temperature sensor, DPF inlet temperature sensor, or inside the ECU.

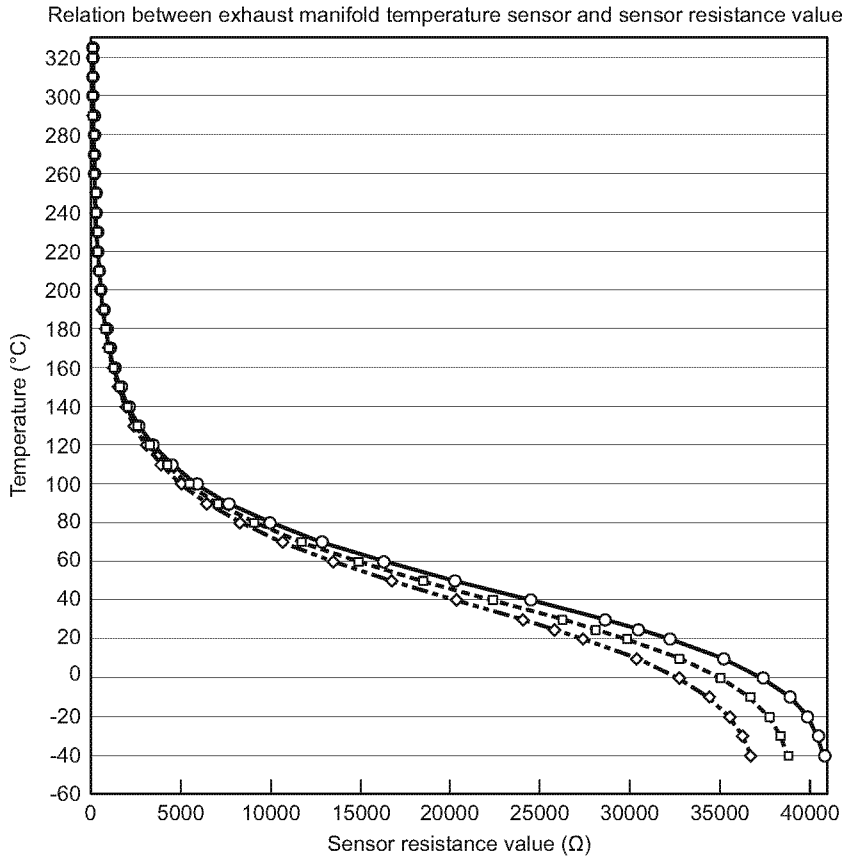
Error detected	Implement the appropriate failure diagnosis for the failure.
No error detected	Go to “Checking installation condition of exhaust manifold temperature sensor”.

2. Checking installation condition of exhaust manifold temperature sensor
   1- Turn OFF the key switch.
   2- Check the installation condition of exhaust manifold temperature sensor.
   3- Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

NG	Correct the sensor mounting state and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor unit)”

3. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the exhaust manifold temperature sensor.
   2- Using a circuit tester, measure the resistance value between exhaust manifold temperature sensor terminals A and B.
   3- Using “Exhaust manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

Exhaust manifold temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)		
	Min.	Nom.	Max.
-40	36702	38753	40791
-30	36252	38359	40448
-20	35513	37693	39853
-10	34364	36630	38879
0	32683	35031	37373
10	30349	32746	35160
20	27393	29773	32194
25	25726	28051	30442
30	23965	26214	28543
40	20309	22327	24449
50	16722	18432	20255
60	13444	14820	16301
70	10622	11681	12830
80	8300	9088	9943
90	6449	7023	7642
100	5004	5414	5854
110	3891	4180	4489
120	3038	3240	3455
130	2386	2526	2673
140	1886	1982	2083
150	1502	1567	1635
160	1205	1248	1294
170	973.5	1002	1031
180	792.5	810.7	829.2
190	649.9	660.7	671.7
200	536.7	542.4	548.1
210	441.2	448.4	455.6
220	365.3	373.2	381.2
230	304.4	312.6	321
240	255.3	263.5	271.9
250	215.4	223.4	231.6
260	182.9	190.5	198.4
270	156.1	163.3	170.9
280	133.9	140.8	147.9
290	115.5	121.9	128.6
300	100.1	106.1	112.3
310	81.2	90.2	99.2
320	71.2	79.1	87
325	65.5	74.4	83.3

121636-00EN00

NG	Replace the exhaust manifold temperature sensor, and perform the following procedure.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness).

4. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the exhaust manifold temperature sensor and wire-harness, and then remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU coupler terminals E58 and E91B on the wire-harness side.
   3- Using “Exhaust manifold temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness. After replacement, switch the ECU power from OFF to ON, and then perform the following procedure.
OK	Go to “Checking the exhaust manifold temperature sensor output voltage”.

5. Checking the exhaust manifold temperature sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also connect all couplers (sensor, ECU).
   2- Using a circuit tester, measure the voltage between exhaust manifold temperature sensor signals E58 and E91B.

Voltage	State	Corrective action
E58 < 0.07 V	NG	Replace the wire-harness.
0.07 V ≤ E58 ≤ 4.8 V	OK (normal range)	Perform failure diagnosis using SA-D.
4.8 V < E58	NG	Replace the wire-harness.

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. After replacement, switch the ECU power from OFF to ON, clear the Inducement, turn the key OFF and ON, and then run the engine to check again.
OK	Clear the Inducement, turn the key OFF and ON, and then run the engine to check again.

6. Operation using SA-D
   1- Turn OFF the key switch and turn ON the key switch again to start the engine. Operate the engine that satisfies the reset criteria for exhaust manifold temperature sensor error (detected value error) (*P165*).
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the exhaust manifold temperature sensor or wire-harness.

Contact output related

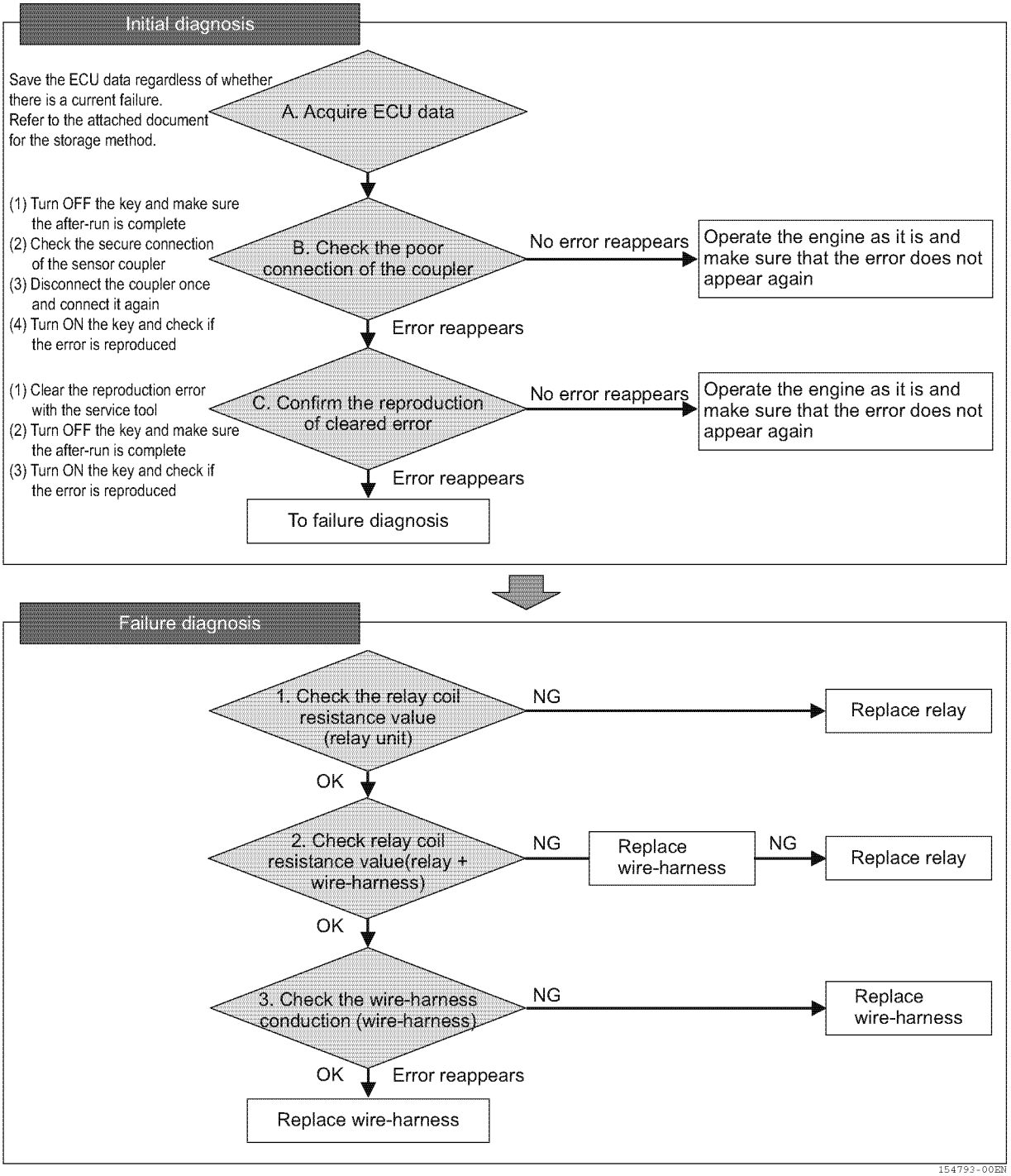
■ Starting aid relay

● Related DTC

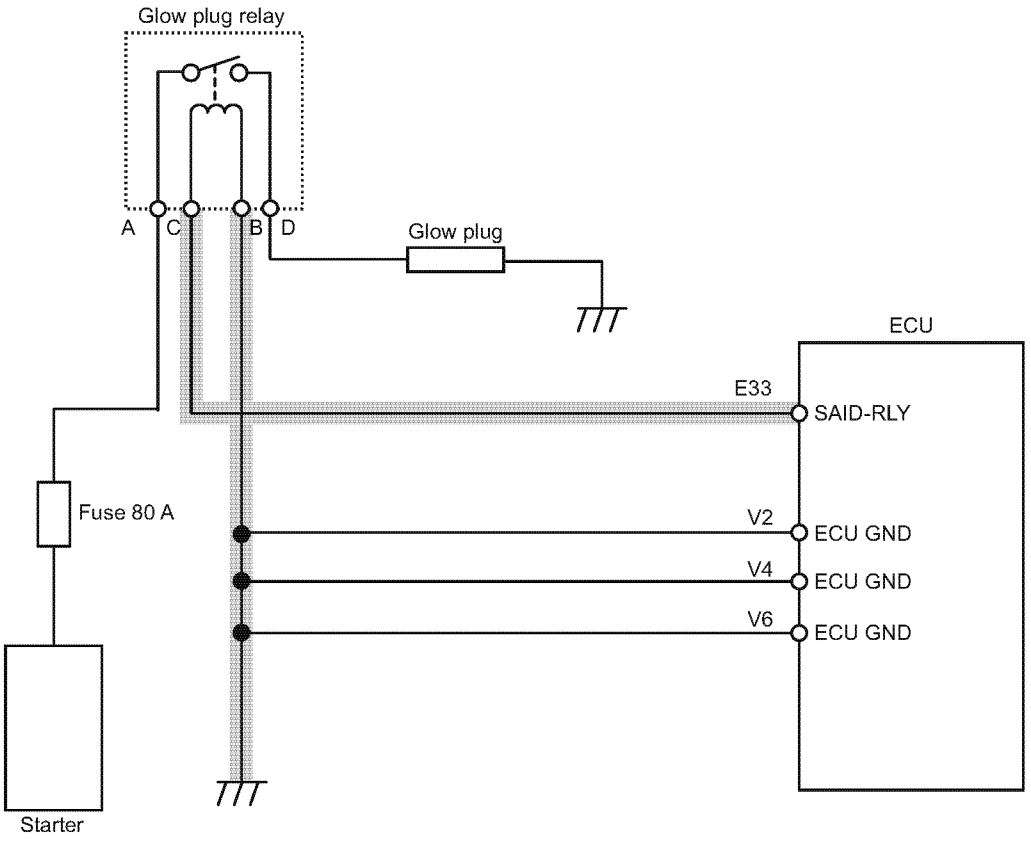
P code	P0541	Starting aid relay GND short circuit
	P0543	Starting aid relay disconnection/VB short circuit

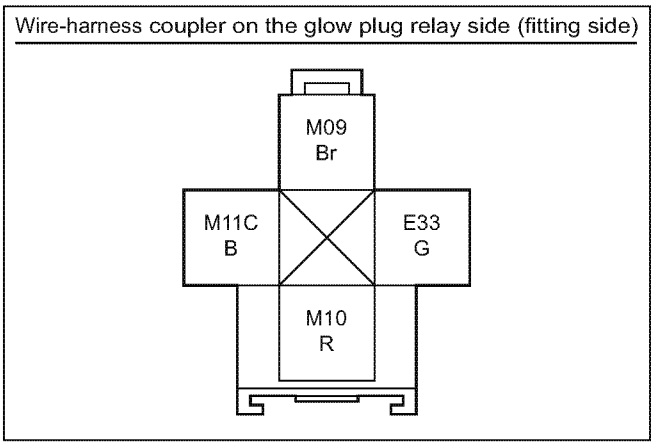
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram





: Check points

155099-00EN

Note: See P586 for the ECU pin layout.

● Work description

1. Checking the relay coil resistance value (relay unit)
   1- Remove the glow plug relay from the wire-harness.
   2- Using a circuit tester, measure the resistance value between terminals B and C on the relay side.

Reference: Resistance value of YANMAR standard glow plug relay

Terminal	Specifications
Terminals B to C on the relay coil side	320 Ω ± 10% (at 20 °C)

NG	Replace the glow plug relay.
OK	Go to “Checking the relay coil resistance value (relay and wire-harness side)”.

2. Checking the relay coil resistance value (relay and wire-harness side)
   1- Attach the glow plug relay to the wire-harness.
   2- Remove the ECU from the wire-harness.
   3- Using a circuit tester, measure the resistance value between ECU coupler E33 and battery negative terminal.
   Note: See the above “Reference: Resistance value of YANMAR standard glow plug relay”.

NG	• The coupler between the glow relay and the wire-harness may be defective. Replace the glow relay. • Replace the wire-harness.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the glow plug relay and ECU.
   2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below. When “Starting aid relay GND short circuit” is detected, perform “Glow plug relay conduction check pattern 1”. When “Starting aid relay disconnection/VB short circuit” is detected, perform “Glow plug relay conduction check pattern 2 and 3”.

Reference: Glow plug relay conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
E33	GND terminal	Yes	NG: Error
		No	OK: Normal
V2	GND terminals other than V2, V4, V6, V72	Yes	NG: Error
		No	OK: Normal

Reference: Glow plug relay conduction check pattern 2

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
E33	VB terminal	Yes	NG: Error
		No	OK: Normal
V2		Yes	NG: Error
		No	OK: Normal

Reference: Glow plug relay conduction check pattern 3

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
E33	Glow plug relay terminal C	Yes	OK: Normal
		No	NG: Error
V2	Glow plug relay terminal B	Yes	OK: Normal
		No	NG: Error

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	The coupler between the ECU and the wire-harness may be defective. Replace the wire-harness.

4. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

Contact input related

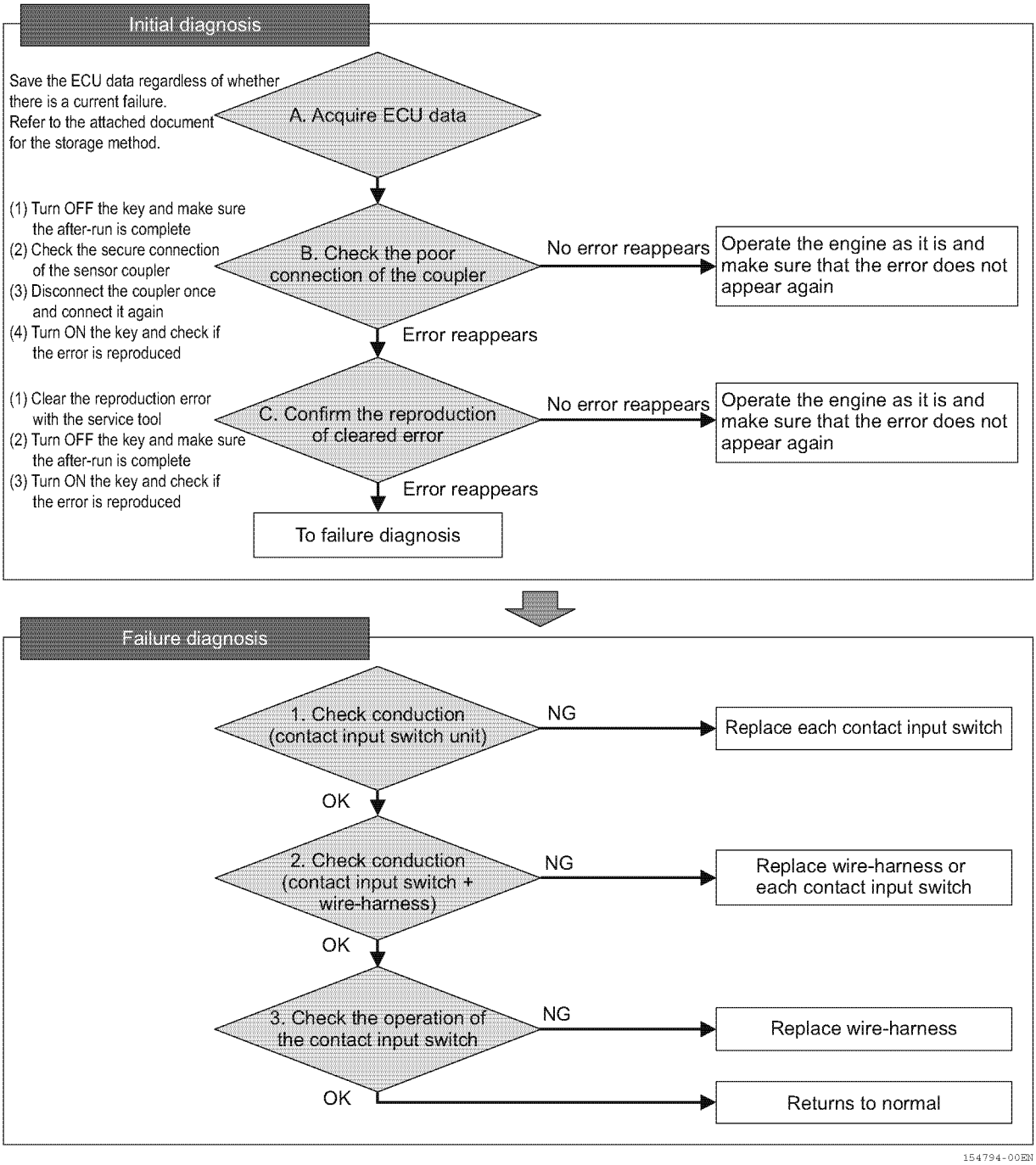
■ Contact input related 1

● Related DTC

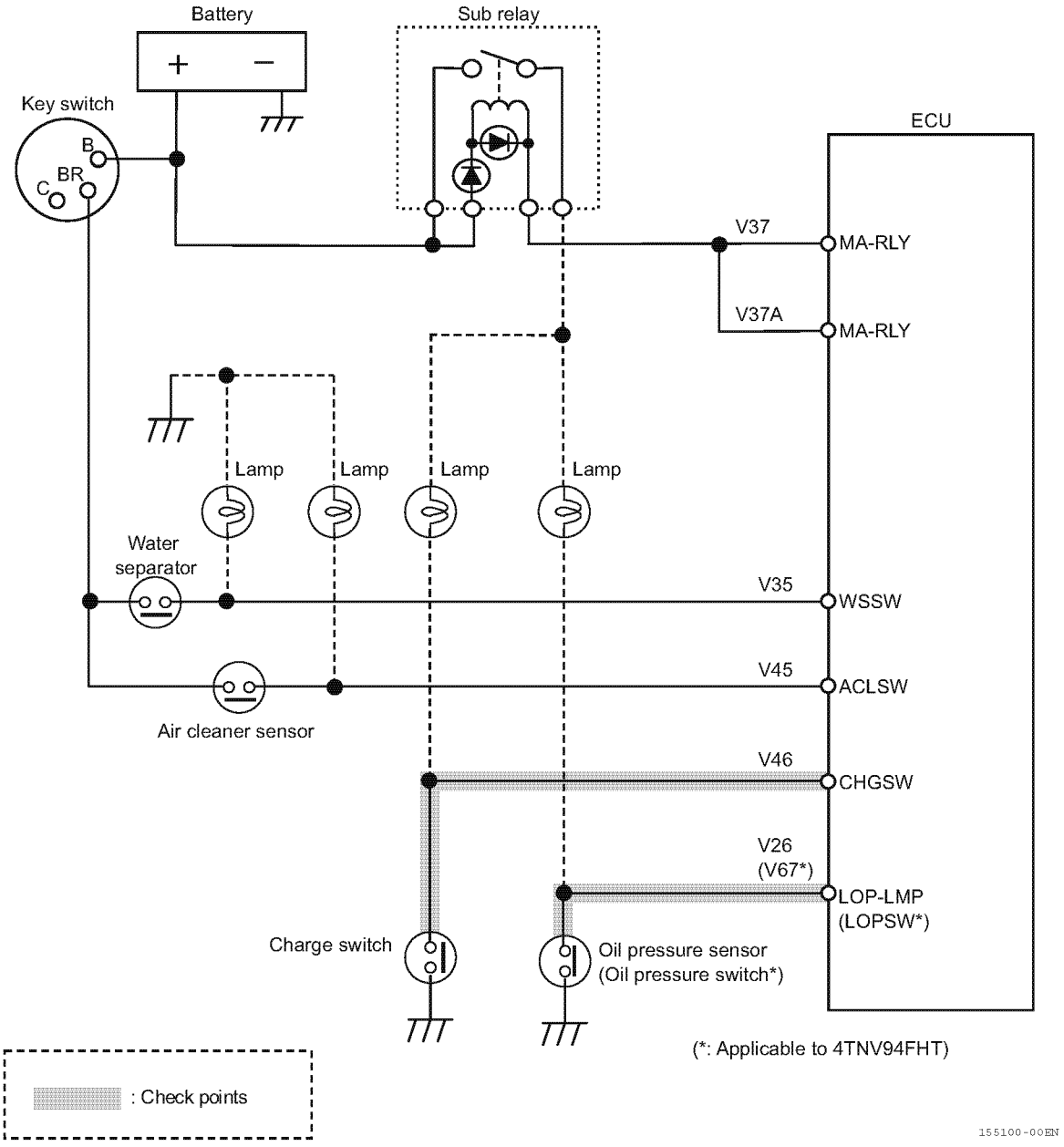
P code	P1192 (4TNV94FHT)	Oil pressure switch disconnection
	P1192 (except 4TNV94FHT)	Oil pressure sensor error (voltage low)
	P1193	Oil pressure sensor error (voltage high)
	P1562	Charge switch disconnection

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the conduction (contact input switch unit)
   1- Turn OFF the key switch.
   2- Remove the wire-harness from each contact input switch.
   3- Using a circuit tester, check the conduction between the contact input terminal and the body frame while referring to the following table.

Item	Terminal name (Terminal No.)	Conduction (between terminal and body frame)	State
Oil pressure switch*1	LOPSW (V67)*1	Yes	OK: Normal
Oil pressure sensor	LOP-LMP (V26)	No	NG: Error
Charge switch	CHGSW (V46)	No	OK: Normal
		Yes	NG: Error

*1: Applicable to 4TNV94FHT

NG	Replace the contact input switch.
OK	Go to “Checking the conduction (contact input switch and wire-harness)”.

2. Checking the conduction (contact input switch and wire-harness)
   1- Connect the contact input switch to the wire-harness. Remove the ECU from the wire-harness.
   2- Using the circuit tester, measure the conduction between the ECU coupler terminal and the body frame of the wire-harness. See 1. for the name of the terminals to check.

NG	• A coupler failure between the contact input switch and the wire-harness may be caused. Replace the contact input switch. • Replace the wire-harness.
OK	Go to “Checking the operation of the contact input switch”.

3. Checking the operation of the contact input switch
   1- Connect all couplers (contact input switch, ECU, junction coupler).
   2- Connect SA-D, turn ON the key switch, and then log in to SA-D.
   3- Using SA-D’s “Diagnosis Test: Digital input”, monitor each indicated item, and check the ON/OFF display of the contact input switch under specific conditions.

Item	Check condition	ON/OFF indication	State
Oil pressure sensor	Before engine startup	ON	OK: Normal
		OFF	NG: Error
	During engine operation	OFF	OK: Normal
		ON	NG: Error
Charge switch	Before engine startup	ON	OK: Normal
		OFF	NG: Error
	During engine operation	OFF	OK: Normal
		ON	NG: Error

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Turn OFF the power after clearing the error, and turn ON the power after the after-run is completed.

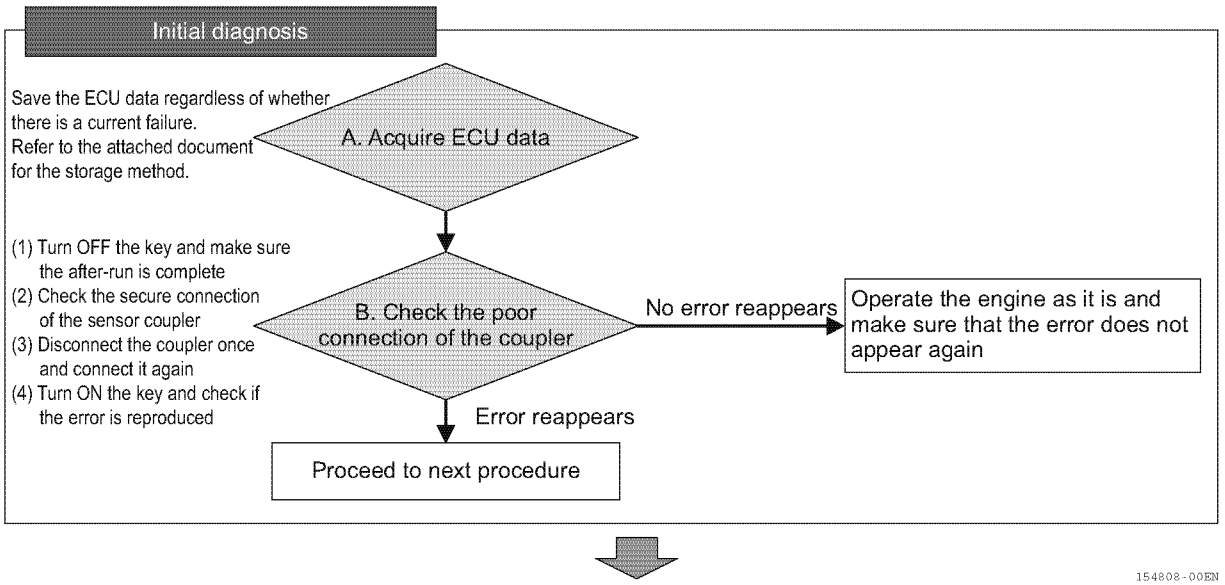
■ Contact input related 2

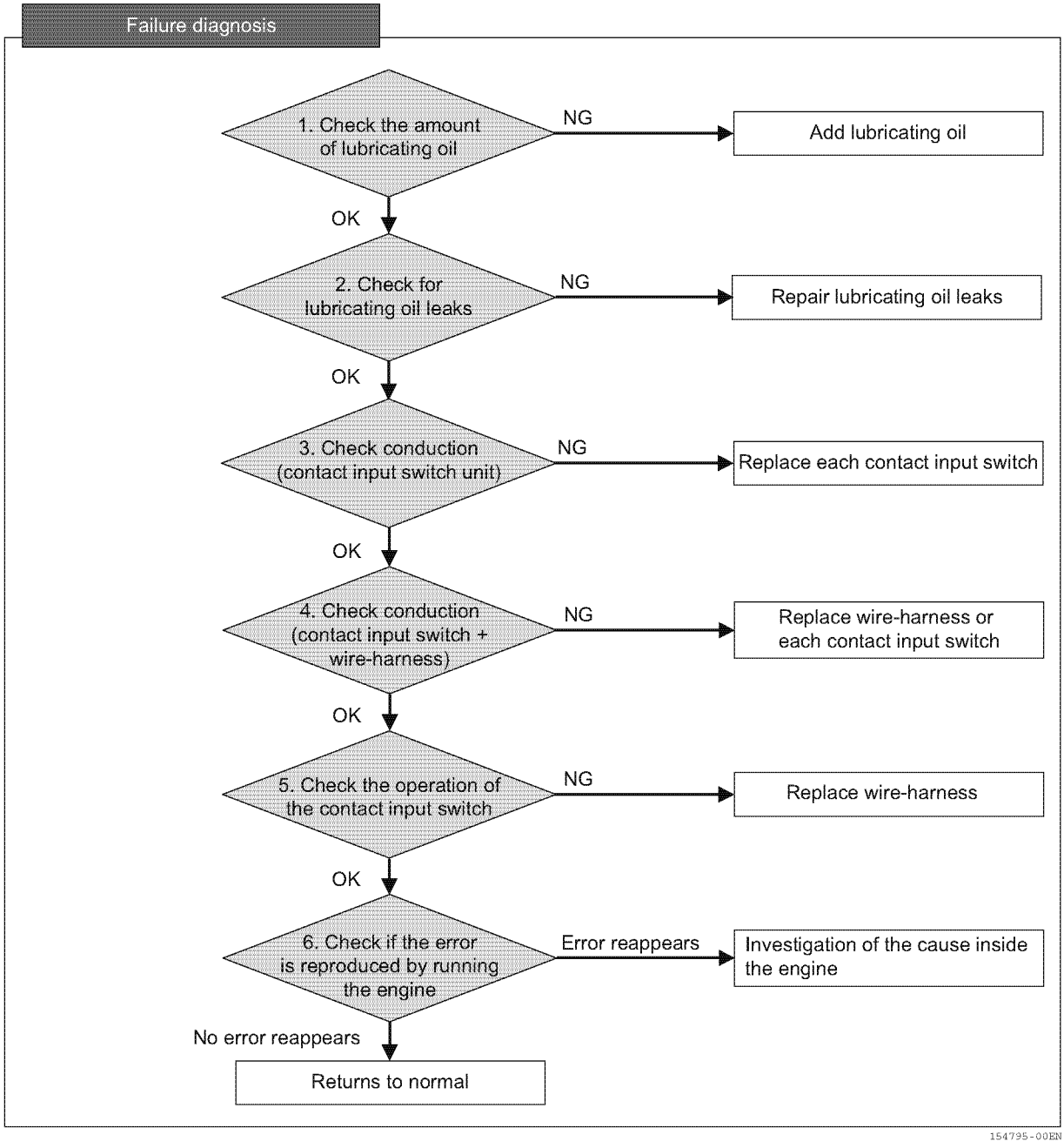
● Related DTC

P code	P1198 (4TNV94FHT)	Low oil pressure alarm
	P1198 (except 4TNV94FHT)	Low oil pressure alarm

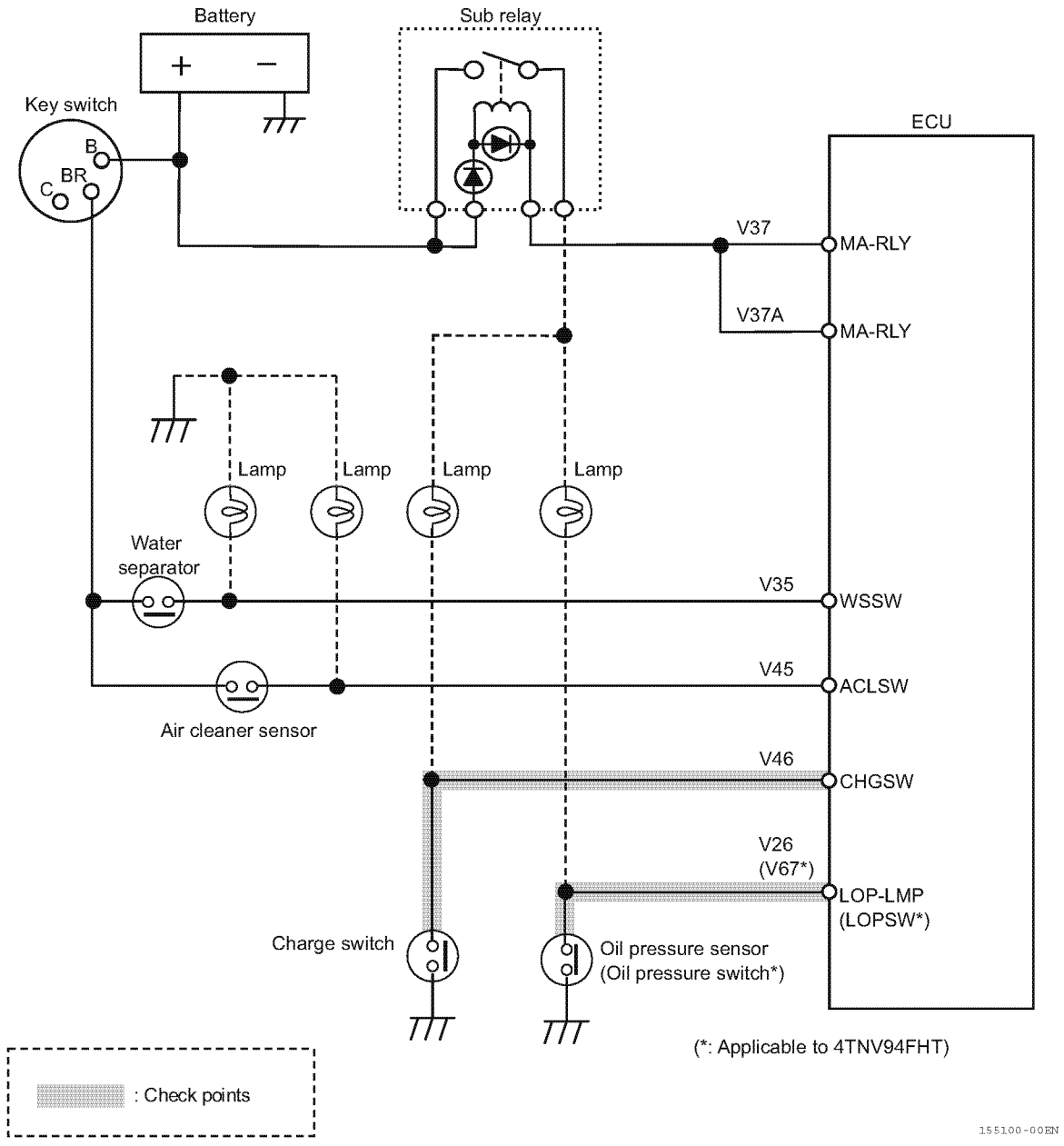
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the amount of lubricating oil
NG
Add lubricating oil
OK
2. Check for lubricating oil leaks
NG
Repair lubricating oil leaks
OK
3. Check conduction (contact input switch unit)
NG
Replace each contact input switch
OK
4. Check conduction (contact input switch + wire-harness)
NG
Replace wire-harness or each contact input switch
OK
5. Check the operation of the contact input switch
NG
Replace wire-harness
OK
6. Check if the error is reproduced by running the engine
Error reappears
Investigation of the cause inside the engine
No error reappears
Returns to normal
154795-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the amount of lubricating oil
   1- Make sure that the oil level is appropriate with the dipstick.
   2- If the amount of oil is low, add lubricating oil.

2. Checking for lubricating oil leaks
   1- Make sure there are no lubricating oil leaks from the engine.
   2- If there is a leak, the engine may be damaged and the leak needs repairment.

3. Checking the conduction (contact input switch unit)
   1- Turn OFF the key switch.
   2- Remove the wire-harness from each contact input switch.
   3- Using a circuit tester, check the conduction between the contact input terminal and the body frame while referring to the following table.

Item	Terminal name (Terminal No.)	Conduction (between terminal and body frame)	State
Oil pressure switch*1 Oil pressure sensor	LOPSW (V67)*1 LOP-LMP (V26)	Yes	OK: Normal
		No	NG: Error
Charge switch	CHGSW (V46)	No	OK: Normal
		Yes	NG: Error

**1: Applicable to 4TNV94FHT*

NG	Replace the contact input switch.
OK	Go to “Checking the conduction (contact input switch and wire-harness)”.

4. Checking the conduction (contact input switch and wire-harness)
   1- Connect the contact input switch to the wire-harness. Remove the ECU from the wire-harness.
   2- Using the circuit tester, measure the conduction between the ECU coupler terminal and the body frame of the wire-harness. See 1. for the name of the terminals to check.

NG	• A coupler failure between the contact input switch and the wire-harness may be caused. Replace the contact input switch. • Replace the wire-harness.
OK	Go to “Checking the operation of the contact input switch”.

5. Checking the operation of the contact input switch
   1- Connect all couplers (contact input switch, ECU, junction coupler).
   2- Connect SA-D, turn ON the key switch, and then log in to SA-D.
   3- Using SA-D's "Diagnosis Test: Digital input", monitor each indicated item, and check the ON/OFF display of the contact input switch under specific conditions.

Item	Check condition	ON/OFF indication	State
Oil pressure sensor	Before engine startup	ON	OK: Normal
		OFF	NG: Error
	During engine operation	OFF	OK: Normal
		ON	NG: Error
Charge switch	Before engine startup	ON	OK: Normal
		OFF	NG: Error
	During engine operation	OFF	OK: Normal
		ON	NG: Error

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Turn OFF the power after clearing the error, and turn ON the power after the after-run is completed.

6. Checking if the error is reproduced by running the engine
   Run the engine and make sure that the low oil pressure error has not recurred.

Error reappears	There is a possibility of damage to internal engine components. Inspect inside the engine. Especially when the oil pan is removed, if the intake pipe is damaged or impurities are found in the oil, the engine must be replaced.
No error reappears	Normal state. There is a possibility that the hydraulic pressure drops because of the air trapped temporarily due to the inclination of the operation location. Check the operating environment.

■ Contact input related 3

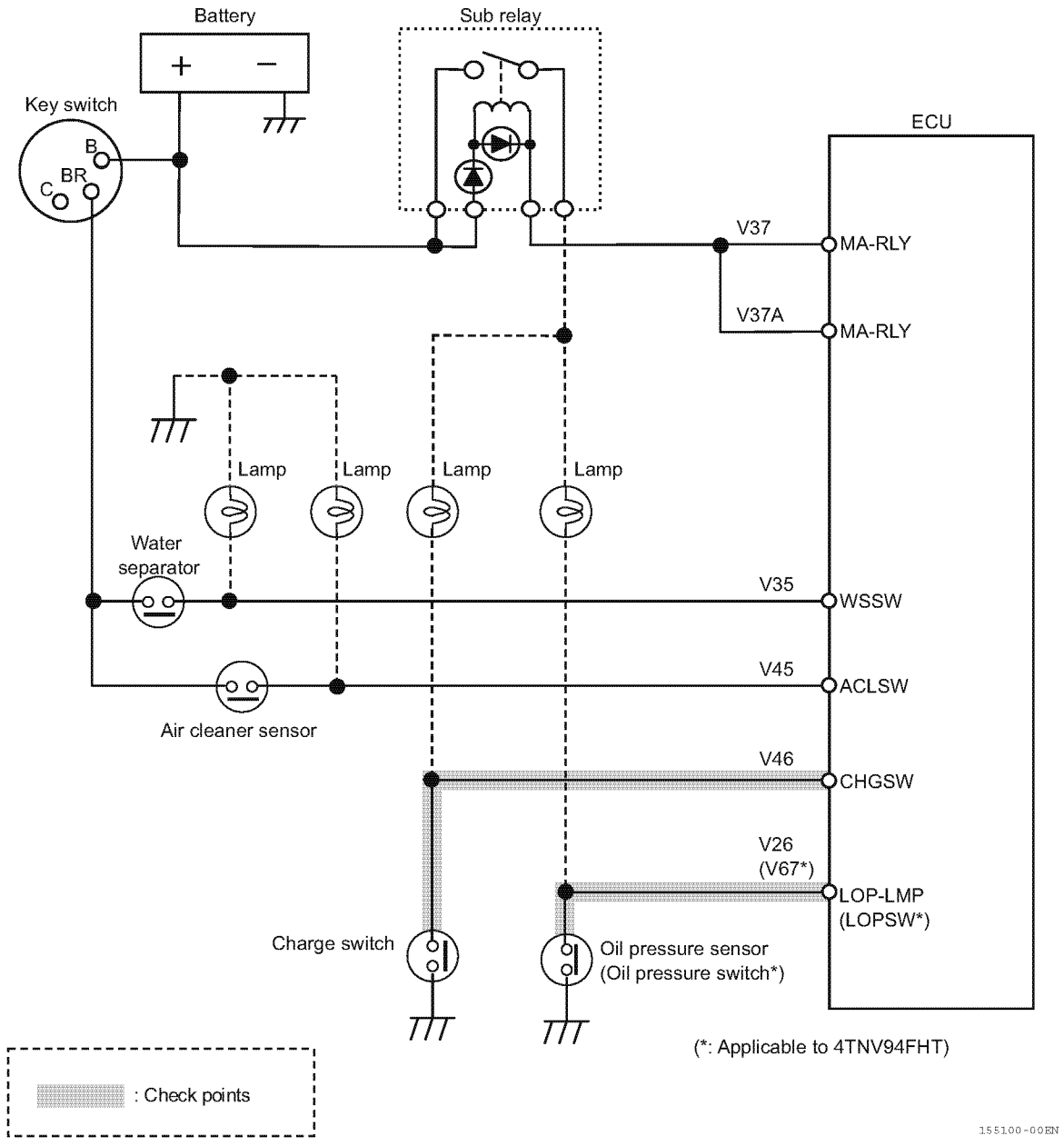
● Related DTC

P code	P1568	Charge alarm

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for fan belt slip

NG	Replace the fan belt.
OK	Go to “Checking the alternator”.

2. Checking the alternator

NG	Replace the alternator.
OK	Go to “Checking the conduction (contact input switch unit)”.

3. Checking the conduction (contact input switch unit)

1- Turn OFF the key switch.

2- Remove the wire-harness from each contact input switch.

3- Using a circuit tester, check the conduction between the contact input terminal and the body frame while referring to the following table.

Item	Terminal name (Terminal No.)	Conduction (between terminal and body frame)	State
Oil pressure switch	LOPSW (V67)	Yes	OK: Normal
Oil pressure sensor	LOP-LMP (V26)	No	NG: Error
Charge switch	CHGSW (V46)	No	OK: Normal
		Yes	NG: Error

NG	Replace the contact input switch.
OK	Go to “Checking the conduction (contact input switch and wire-harness)”.

4. Checking the conduction (contact input switch and wire-harness)

1- Connect the contact input switch to the wire-harness. Remove the ECU from the wire-harness.

2- Using the circuit tester, measure the conduction between the ECU coupler terminal and the body frame of the wire-harness. See 1. for the name of the terminals to check.

NG	• A coupler failure between the contact input switch and the wire-harness may be caused. Replace the contact input switch. • Replace the wire-harness.
OK	Go to “Check the operation of the contact input switch”.

5. Check the operation of the contact input switch
   1- Connect all couplers (contact input switch, ECU, junction coupler).
   2- Connect SA-D, turn ON the key switch, and then log in to SA-D.
   3- Using SA-D's "Diagnosis Test: Digital input", monitor each indicated item, and check the ON/OFF display of the contact input switch under specific conditions.

Item	Check condition	ON/OFF indication	State
Oil pressure sensor	Before engine startup	ON	OK: Normal
		OFF	NG: Error
	During engine operation	OFF	OK: Normal
		ON	NG: Error
Charge switch	Before engine startup	ON	OK: Normal
		OFF	NG: Error
	During engine operation	OFF	OK: Normal
		ON	NG: Error

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Turn OFF the power after clearing the error, and turn ON the power after the after-run is completed.

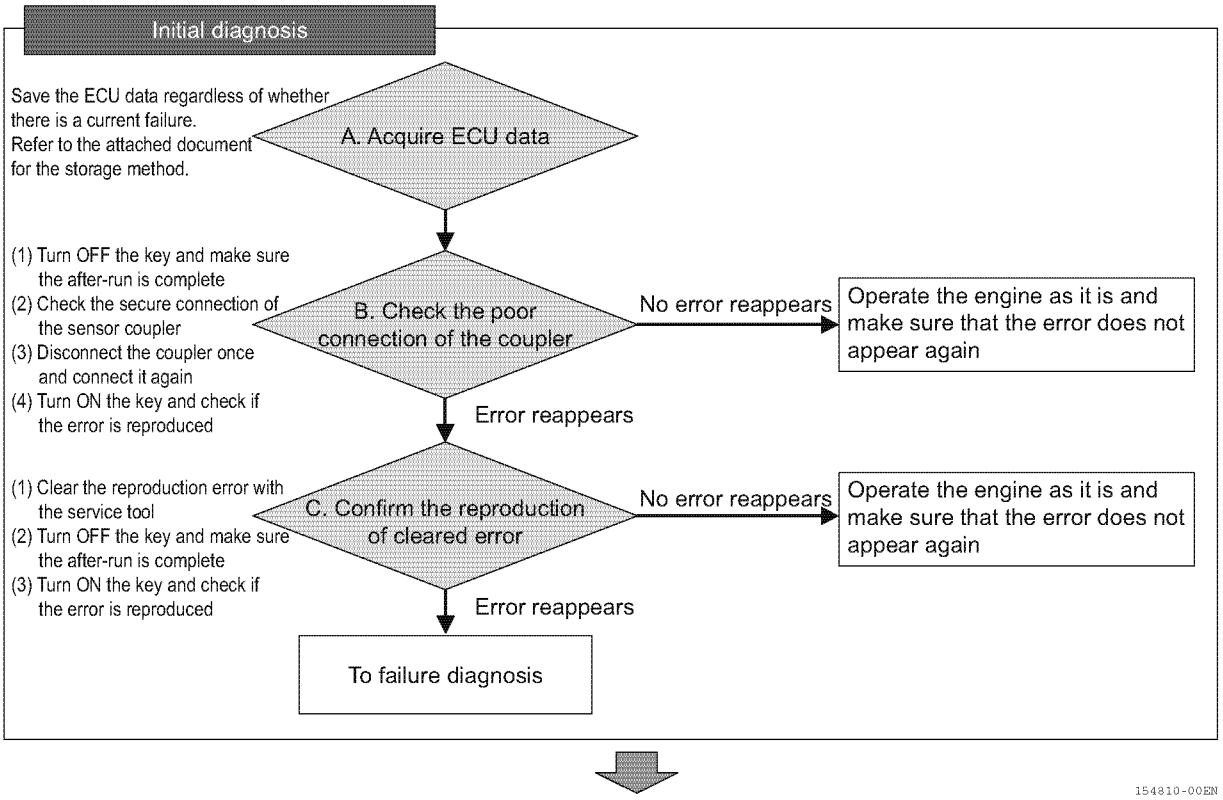
■ Contact input related 4

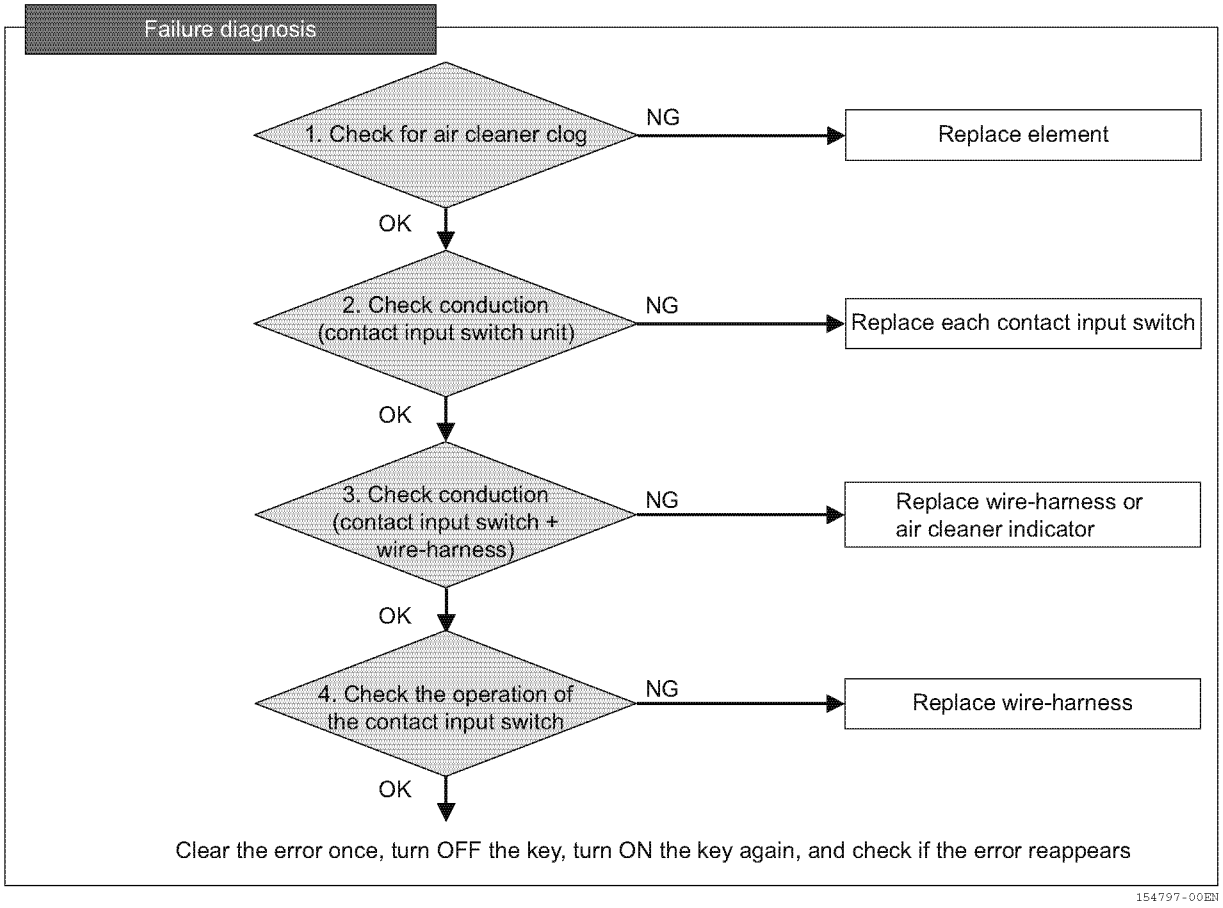
● Related DTC

P code	P1101	Air cleaner clogged alarm

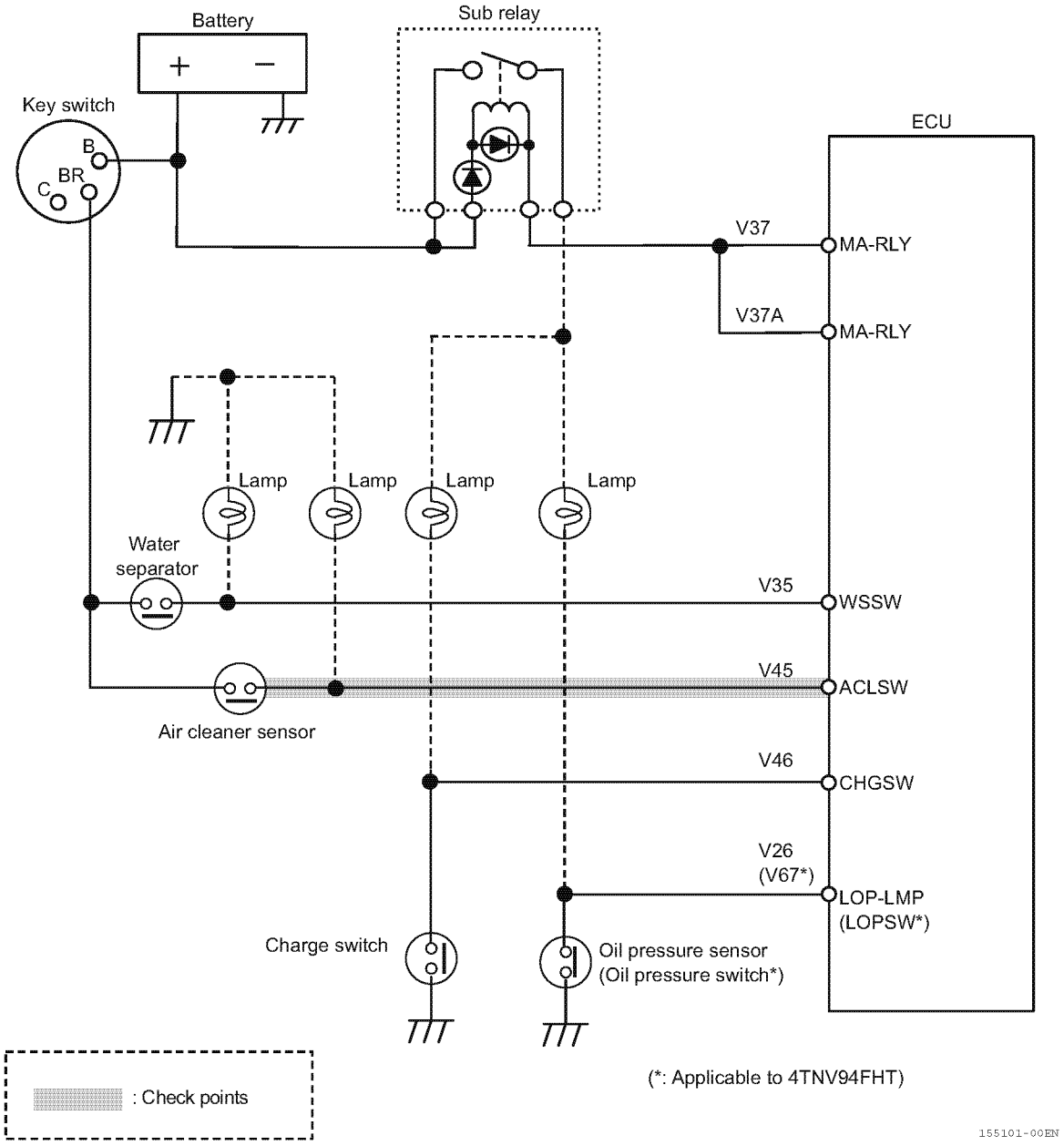
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check for air cleaner clog
NG
Replace element
OK
2. Check conduction (contact input switch unit)
NG
Replace each contact input switch
OK
3. Check conduction (contact input switch + wire-harness)
NG
Replace wire-harness or air cleaner indicator
OK
4. Check the operation of the contact input switch
NG
Replace wire-harness
OK
Clear the error once, turn OFF the key, turn ON the key again, and check if the error reappears
154797-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking for air cleaner clog

NG	Replace the element.
OK	Go to “Checking the conduction (air cleaner indicator unit)”.

2. Checking the conduction (air cleaner indicator unit)
   1- Turn OFF the key switch.
   2- Remove the wire-harness from air cleaner indicator.
   3- Using a circuit tester, check the conduction between the contact input terminals of air cleaner indicator while referring to the following table.

Item	Terminal name (Terminal No.)	Conduction (between each switch terminal)	State
Air cleaner indicator	ACLSW (V45)	No	OK: Normal
		Yes	NG: Error

NG	Replace the air cleaner indicator.
OK	Go to “Checking the conduction (air cleaner indicator and wire-harness)”.

3. Checking the conduction (air cleaner indicator and wire-harness)
   1- Connect the air cleaner indicator to the wire-harness. Remove the ECU and the sub relay from the wire-harness.
   2- Use the circuit tester to check the conduction between the ECU coupler terminal and the sub relay terminal of the wire-harness. See above 1. for the name of the terminals to check.

NG	• A coupler failure between the air cleaner indicator and the wire-harness may be caused. Replace the air cleaner indicator. • Replace the wire-harness.
OK	Go to “Checking the operation of the air cleaner indicator”.

4. Checking the operation of the air cleaner indicator
   1- Connect all couplers (air cleaner indicator, ECU, and sub relay).
   2- Connect SA-D, turn ON the key switch, and then log in to SA-D.
   3- Using SA-D’s “Diagnosis Test: Digital input”, monitor each indicated item, and check the ON/OFF display of the contact input switch under specific conditions.

Item	ON/OFF indication	State
Air cleaner indicator	OFF	OK: Normal
	ON	NG: Error

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Turn OFF the power after clearing the error once, and turn ON the power after the after-run is completed.

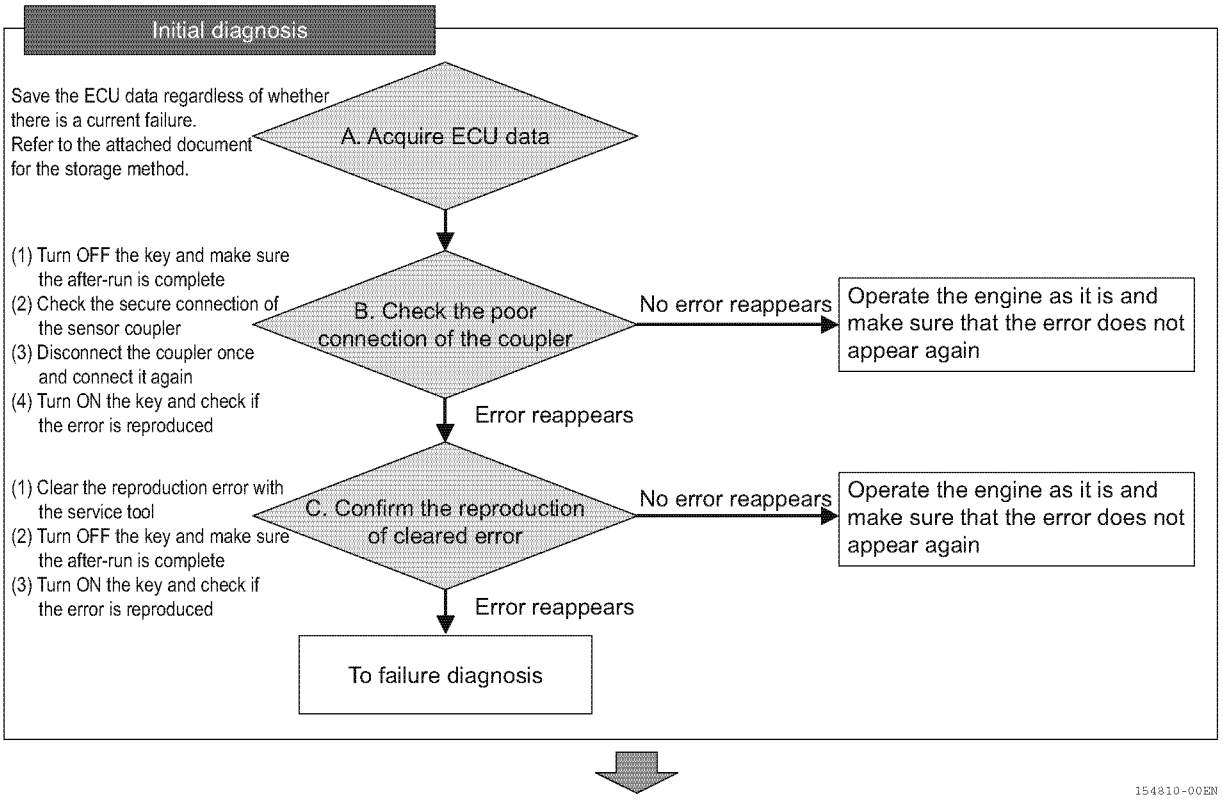
■ Contact input related 5

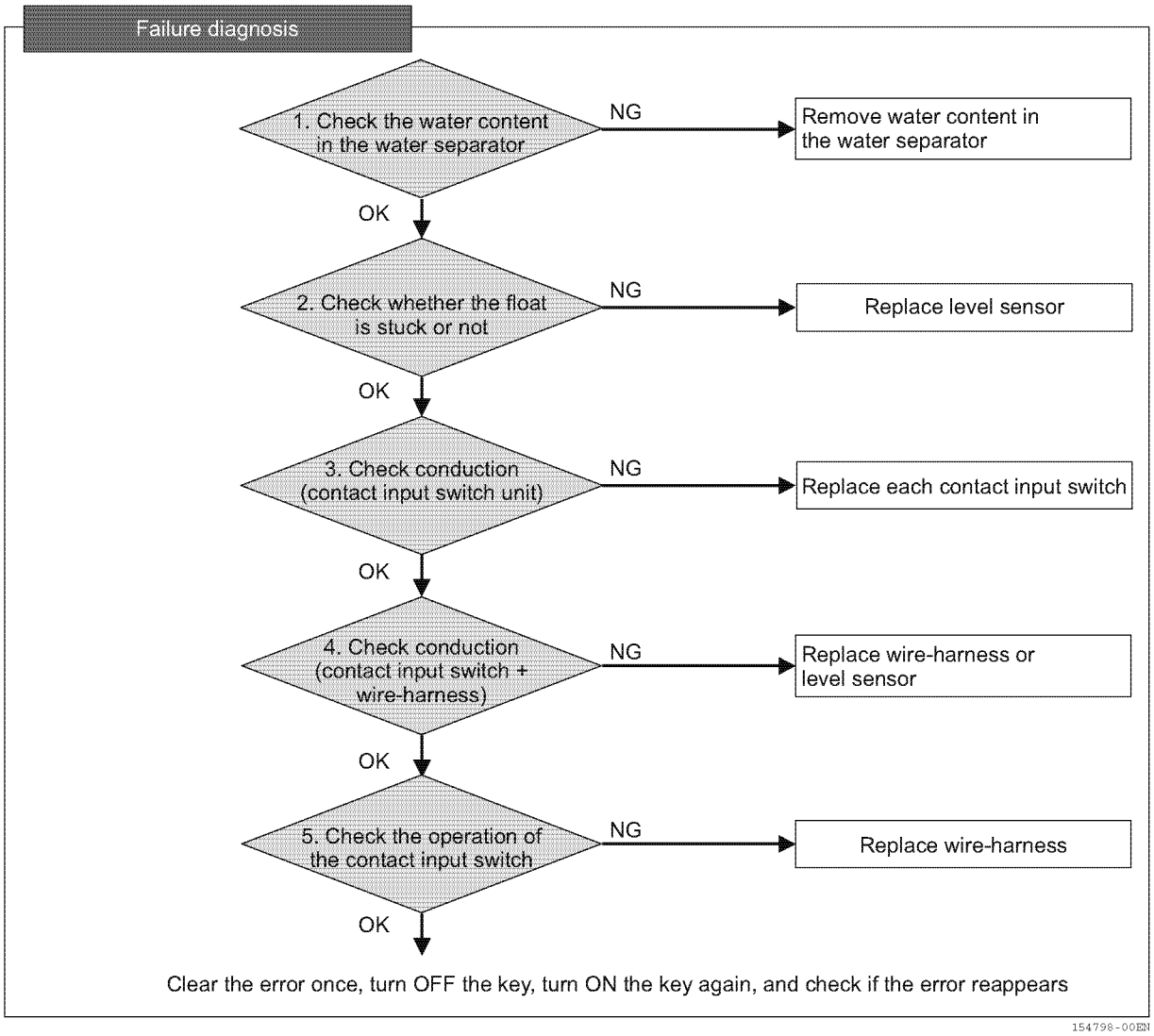
● Related DTC

P code	P1151	Water separator alarm

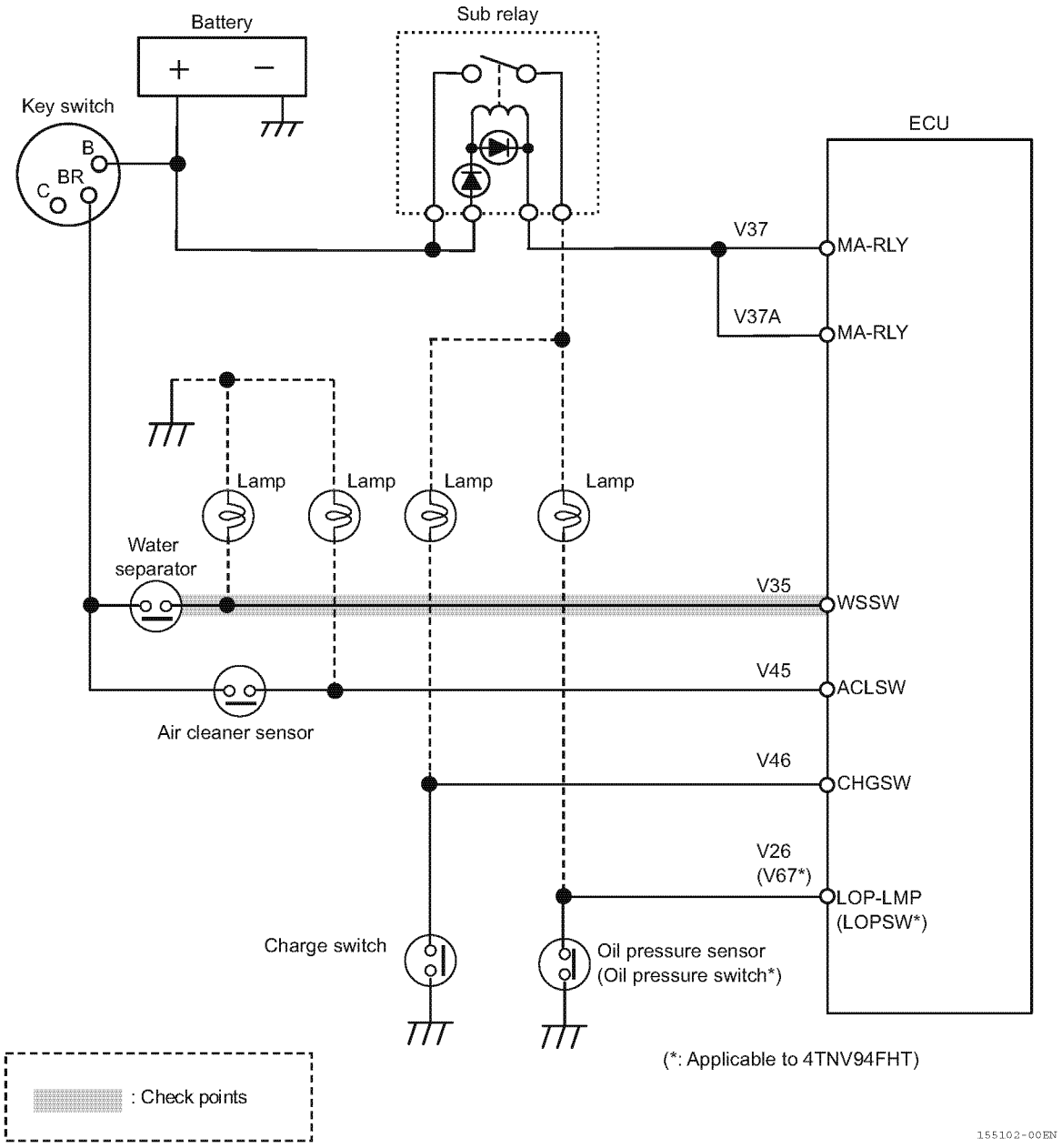
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the water content in the water separator
NG
Remove water content in the water separator
OK
2. Check whether the float is stuck or not
NG
Replace level sensor
OK
3. Check conduction (contact input switch unit)
NG
Replace each contact input switch
OK
4. Check conduction (contact input switch + wire-harness)
NG
Replace wire-harness or level sensor
OK
5. Check the operation of the contact input switch
NG
Replace wire-harness
OK
Clear the error once, turn OFF the key, turn ON the key again, and check if the error reappears
154798-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the water content in the water separator

NG	Remove the water in the water separator.
OK	Go to “Checking the conduction (level sensor unit)”.

2. Checking whether the float is stuck or not
   1- Remove the level sensor.
   2- Move the float by hand to check if the float does not stick or slide.

NG	Replace the level sensor.
OK	Go to “Checking the conduction (level sensor unit)”.

3. Checking the conduction (level sensor unit)
   1- Turn OFF the key switch.
   2- Remove the wire-harness from level sensor.
   3- Using a circuit tester, check the conduction between the contact input terminals of level sensor while referring to the following table.

Item	Terminal name (Terminal No.)	Conduction (between each switch terminal)	State
Water separator switch	WSSW (V35)	No	OK: Normal
		Yes	NG: Error

NG	Replace the level sensor.
OK	Go to “Checking the conduction (level sensor and wire-harness)”.

4. Checking the conduction (level sensor and wire-harness)
   1- Connect the level sensor to the wire-harness. Remove the ECU and the sub relay from the wire-harness.
   2- Use the circuit tester to check the conduction between the ECU coupler terminal and the sub relay terminal of the wire-harness. See above 1. for the name of the terminals to check.

NG	• A coupler failure between the level sensor and the wire-harness may be caused. Replace the level sensor. • Replace the wire-harness.
OK	Go to “Checking the operation of the level sensor”.

5. Checking the operation of the level sensor
   1- Connect all couplers (level sensor, ECU, and sub relay).
   2- Connect SA-D, turn ON the key switch, and then log in to SA-D.
   3- Using SA-D’s “Diagnosis Test: Digital input”, monitor each indicated item, and check the ON/OFF display of the level sensor under specific conditions.

Item	ON/OFF indication	State
Level sensor	OFF	OK: Normal
	ON	NG: Error

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Turn OFF the power after clearing the error once, and turn ON the power after the after-run is completed.

After treatment related

■ DPF

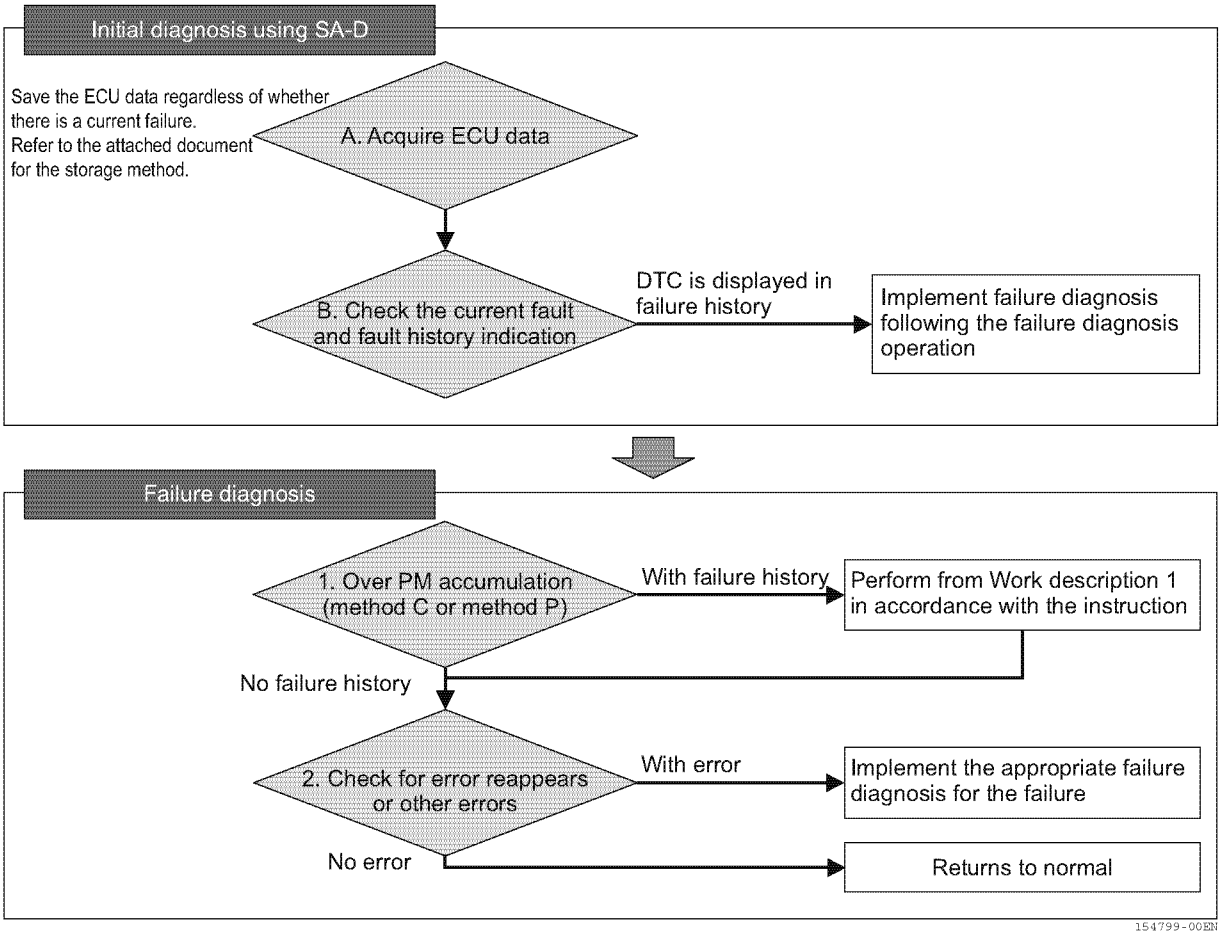
Excessive PM accumulation

● Related DTC

P code	P2463	Excessive PM accumulation (method C)
	P1463	Excessive PM accumulation (method P)

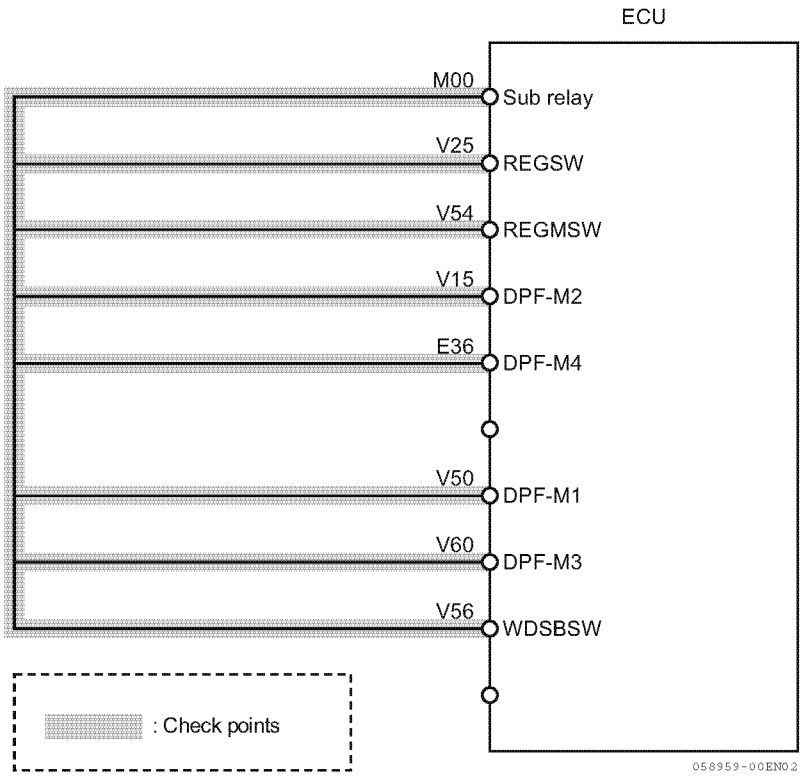
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

Follow the work procedure described later in “Work description”.



Note: See P586 for the ECU pin layout.

● Work description

1. Exhaust piping, pressure hose, and pressure pipe error
   1- Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

If there is something wrong with the exhaust pipe system	Fix the problem and proceed to procedure 2 of Work description.
If the exhaust pipe system is fine	Proceed to procedure 2 of Work description.

2. DPF differential pressure sensor system error
   1- If “P2452: DPF differential pressure sensor abnormal rise in differential pressure” is occurring at the same time, refer to the procedure for “P2452: DPF differential pressure sensor abnormal rise in differential pressure”.

When DPF differential pressure sensor error is occurring	Fix the DPF differential pressure sensor system error, and then proceed to procedure 4 of Work description.
When DPF differential pressure sensor error is not occurring	Proceed to procedure 4 of Work description.

3. DPF intermediate temperature sensor system error

1- Make sure that “P0420: DPF intermediate temperature abnormal (abnormally low)” is not occurring at the same time.

When DPF intermediate temperature sensor system error is occurring	Fix the DPF intermediate temperature sensor, and then proceed to procedure 4 of Work description.
When DPF intermediate temperature sensor system error is not occurring	Proceed to procedure 4 of Work description.

4. Ask the operator if he/she has been doing the stationary regeneration

If the stationary regeneration has been done	Proceed to procedure 5 of Work description.
If the stationary regeneration has not been done	Explain the operator how to use the stationary regeneration, and then proceed to procedure 5 of Work description.

5. Checking the DPF regeneration request lamp, DPF regeneration inhibit lamp, regeneration inhibit switch, and interlock switch

● Make sure if the connection of the lamp related to the DPF regeneration is the same as the above wiring diagram

1- Turn OFF the ECU power.

2- Remove the wire-harness from each contact input.

3- Using a circuit tester, check the conduction between the contact input terminals of each lamp while referring to the following table.

Item	Terminal No.		Conduction	State
DPF Regeneration request lamp	M00	V50	Yes	OK: Normal
			No	NG: Error
DPF Regeneration Inhibit lamp	M00	V15	Yes	OK: Normal
			No	NG: Error

● Checking the regeneration request switch, the regeneration inhibit switch, and the interlock switch

1- Connect the SA-D, operate the regeneration request switch, the regeneration inhibit switch, and the interlock switch to make sure that the contact ON/OFF switches properly.
See “SA-D Operation Manual” for details on SA-D operation.
Note: The ON/OFF can either be switched with contact points or CAN communication depending on the specifications.

2- DPF regeneration inhibit switch: Inhibited When the inhibited state is continued
Turn OFF the DPF regeneration inhibit switch.

If there is something wrong with the lamp or switch	Replace the wire-harness, and then proceed to procedure 6 of Work description.
If the lamp and switch are fine	Proceed to procedure 6 of Work description.

6. Perform the recovery regeneration. See “SA-D Operation Manual” for details on recovery regeneration.
After the recovery regeneration, check that the failure has been solved.

7. Checking for current failure
If there is currently a failure, please take action for the part where the error occurred.

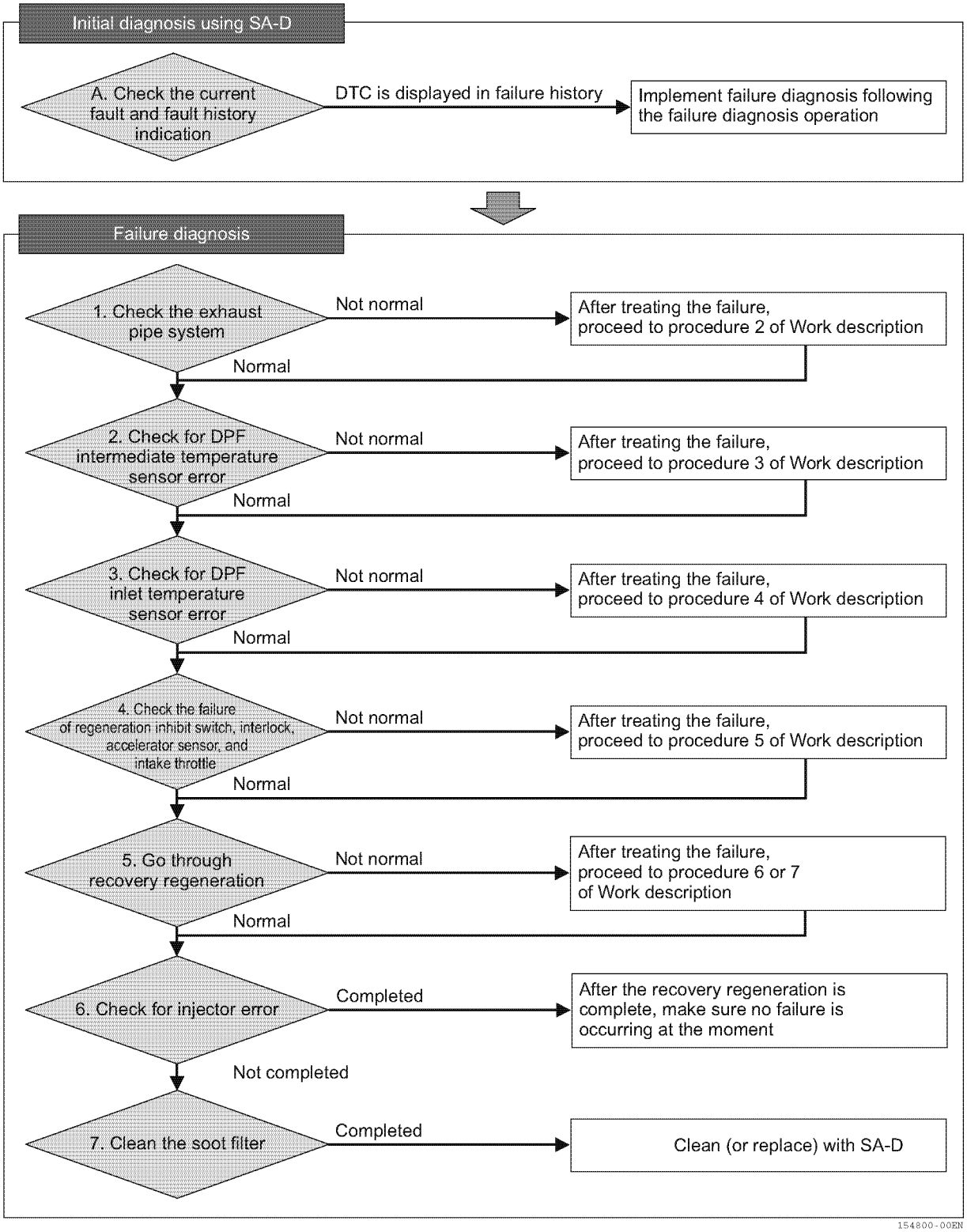
■ Regeneration failure 1

● Related DTC

P code	P2458	Regeneration failure (stationary regeneration failure)
	P1445	Regeneration failure (recovery regeneration failure)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Exhaust piping, pressure hose, and pressure pipe error

   1- Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

If there is something wrong with the exhaust pipe system	Fix the problem and proceed to procedure 2 of Work description.
If the exhaust pipe system is fine	Proceed to procedure 2 of Work description.

2. DPF intermediate temperature sensor system error

   1- Make sure that “P0420: DPF intermediate temperature abnormal (abnormally low)” is not occurring at the same time.

When DPF intermediate temperature sensor system error is occurring	Fix the DPF intermediate temperature sensor, and then proceed to procedure 3 of Work description.
When DPF intermediate temperature sensor system error is not occurring	Proceed to procedure 3 of Work description.

3. DPF inlet temperature sensor error

   1- Check the resistance value of the DPF inlet temperature sensor with reference to the failure diagnosis items in “P1427: DPF inlet temperature sensor error (voltage low)”, etc.

If the resistance value of the DPF inlet temperature sensor is out of the range	Fix the DPF inlet temperature sensor failure, and then proceed to procedure 4 of Work description.
If the resistance value of the DPF inlet temperature sensor is within the range	Proceed to procedure 4 of Work description.

4. Checking the failure of regeneration inhibit switch, interlock, accelerator sensor, and intake throttle

   For each of them, refer to the troubleshooting items of the relevant parts.

5. Perform the recovery regeneration. There are two ways to perform the recovery regeneration.

   ● SA-D Changing Operation Manual

   ● See the long press of switch

   The long press time varies according to models. Consult your authorized YANMAR industrial engine dealer or distributor for details.

If the recovery regeneration is completed	After the recovery regeneration, check that the failure has been solved.
If the recovery regeneration is not completed	After recovery regeneration is completed, and if the recovery regeneration is failed, proceed to procedure 6 of Work description.

6. Injector failure

   1- Remove the injector, and replace the nozzle.

If there is something wrong such deposits	Fix the injector failure in accordance with the Service Manual. If the recovery regeneration (optional) function is equipped, proceed to procedure 5 of Work description. If the recovery regeneration (optional) function is not equipped, proceed to procedure 6 of Work description.
If the injector works properly	Install the injector again. If the recovery regeneration (optional) function is equipped, proceed to procedure 5 of Work description. If the recovery regeneration (optional) function is not equipped, proceed to procedure 6 of Work description.

7. Clean the soot filter (SF)

   Using SA-D, clean (replace) the soot filter (SF). See “SA-D Operation Manual” for details.

   Remarks: Replace the DPF (DOC + SF), when “P1445: Regeneration failure (recovery regeneration failure)” occurs again.

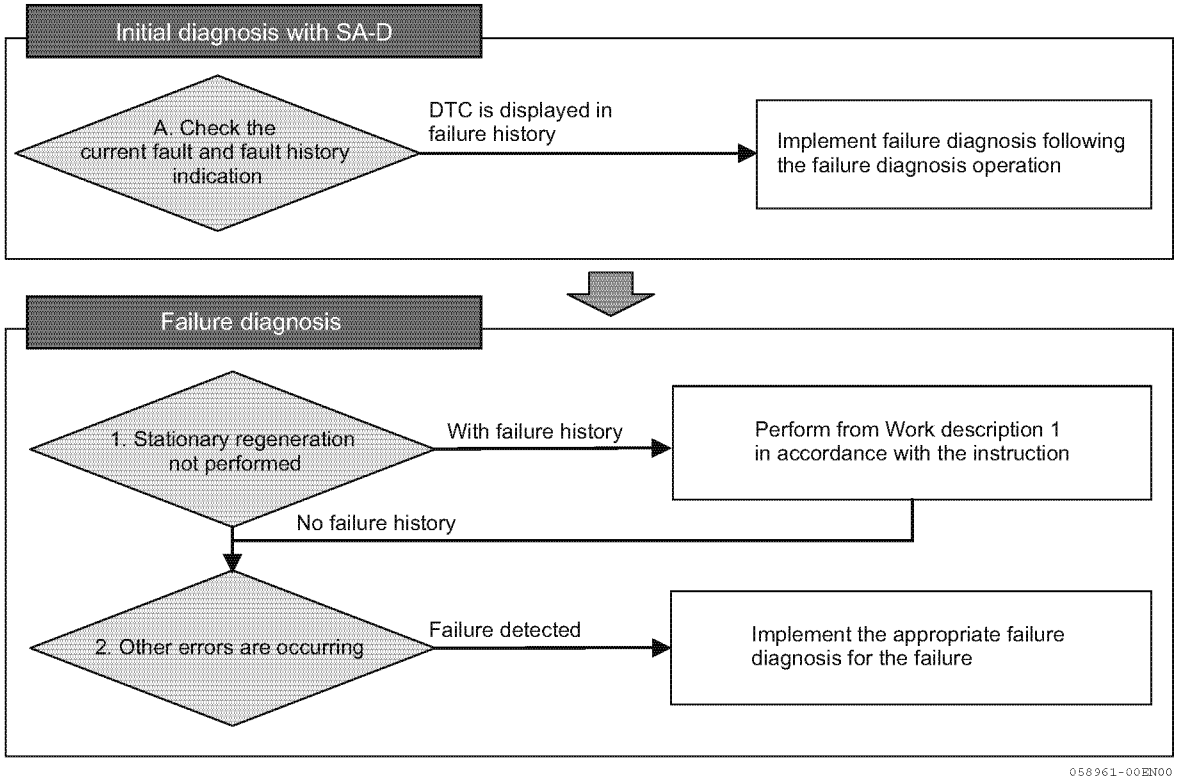
■ Regeneration failure 2

● Related DTC

P code	P2459*	Regeneration failure (stationary regeneration not performed)

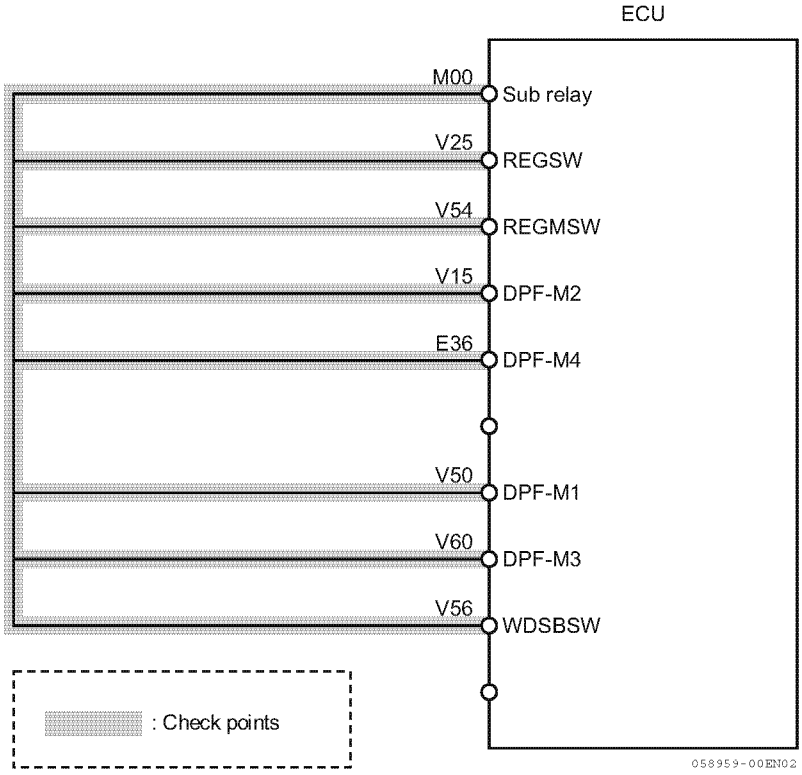
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

Follow the work procedure described later in “Work description”.



Note: See P586 for the ECU pin layout.

● Work description

1. Regeneration for the stationary regeneration request is not performed
   - Make sure if the connection of the switch and lamp related to the DPF regeneration is the same as the above wiring diagram.
     Note: The ON/OFF can either be switched with contact points or CAN communication depending on the specifications.
   - Checking the conduction (contact input switch unit)
     1- Turn OFF the ECU power.
     2- Remove the wire-harness from each contact input.
     3- Using a circuit tester, check the conduction between the contact input terminals of each lamp while referring to the following table.

Item	Terminal No.		Conduction	State
DPF regeneration request lamp	M00	V50	Yes	OK: Normal
			No	NG: Error
DPF regeneration inhibit lamp	M00	V15	Yes	OK: Normal
			No	NG: Error

   - Checking the regeneration request switch, the regeneration inhibit switch, and the interlock switch
     1- Connect the SA-D, operate the regeneration request switch, the regeneration inhibit switch, and the interlock switch to make sure that the contact ON/OFF switches properly.
     See “SA-D Operation Manual” for details on SA-D operation.
     2- DPF regeneration inhibit switch: Inhibited When the inhibited state is continued
     Turn OFF the DPF regeneration inhibit switch.

If the conduction in switch or lamp is failed	Replace the wire-harness, and then proceed to procedure 2 of Work description.
When DPF differential pressure sensor error is not occurring	Proceed to procedure 2 of Work description.

2. Perform the recovery regeneration. There are two ways to perform the recovery regeneration.
   - SA-D Changing Operation Manual
   - See the long press of switch

   The long press time varies according to models. Consult your authorized YANMAR industrial engine dealer or distributor for details.

■ DPF OP interface

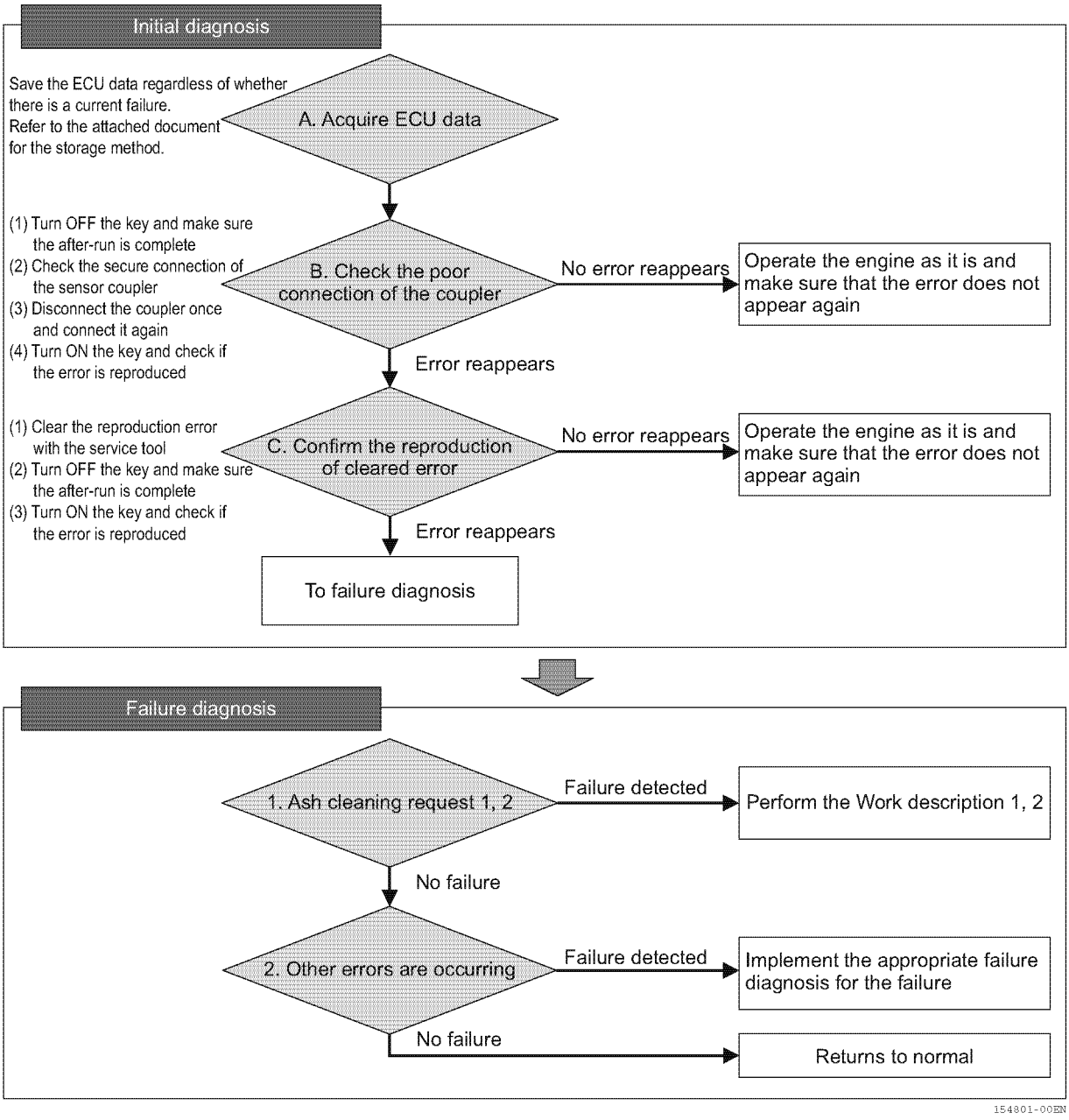
Ash cleaning request

● Related DTC

P code	P242F	Ash cleaning request 1
	P1420	Ash cleaning request 2

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Clean (replace) the soot filter (SF).
   Connect to SA-D, and clean (replace) the soot filter (SF) according to the soot filter (SF) replacement procedure.
   See “SA-D Operation Manual” for details on soot filter (SF) replacement.
   Consult your authorized YANMAR dealer or distributor for soot filter (SF) cleaning.

2. Make sure that Ash cleaning request 1 and 2 are not shown now.

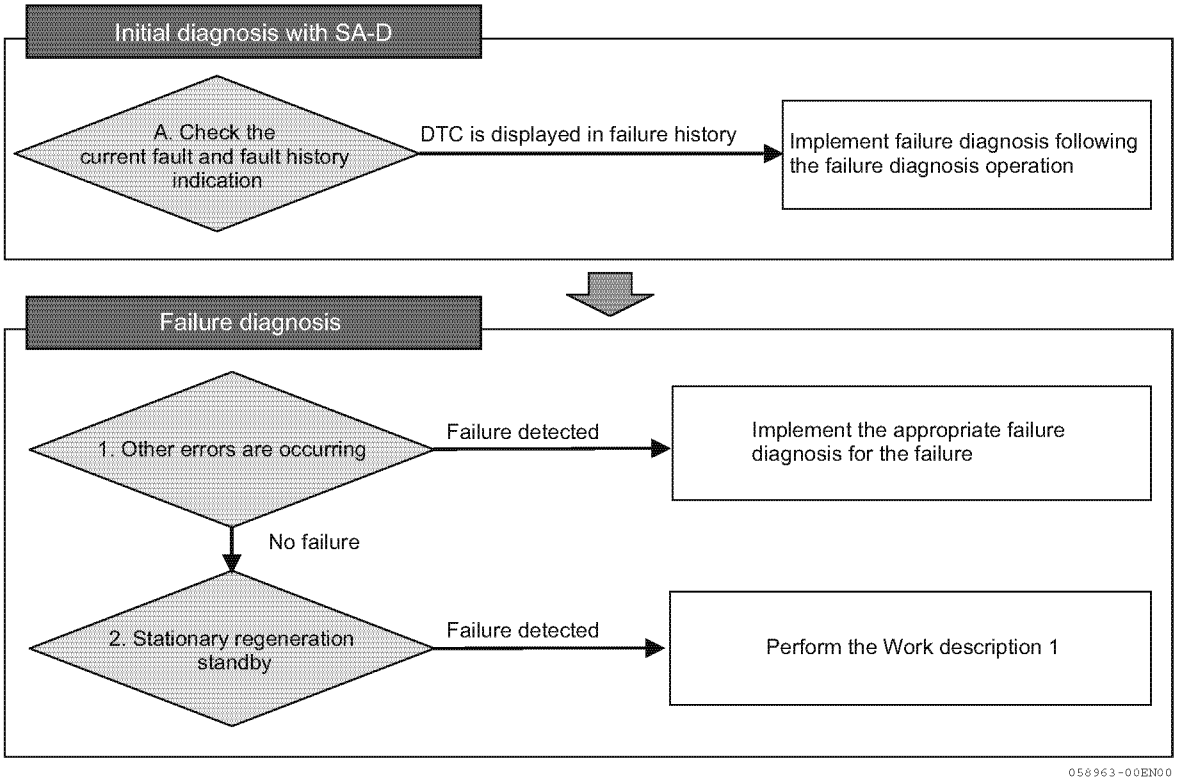
Stationary regeneration standby

● Related DTC

P code	P1421	Stationary regeneration standby

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. PM may be accumulated, which required stationary regeneration.
   Perform the stationary regeneration.

   Note: If the stationary regeneration request is repeated immediately after executing the stationary regeneration, there is a possibility of injector failure or intake system abnormality. In that case, check the malfunction such as blockage of the intake system, or check the injector.

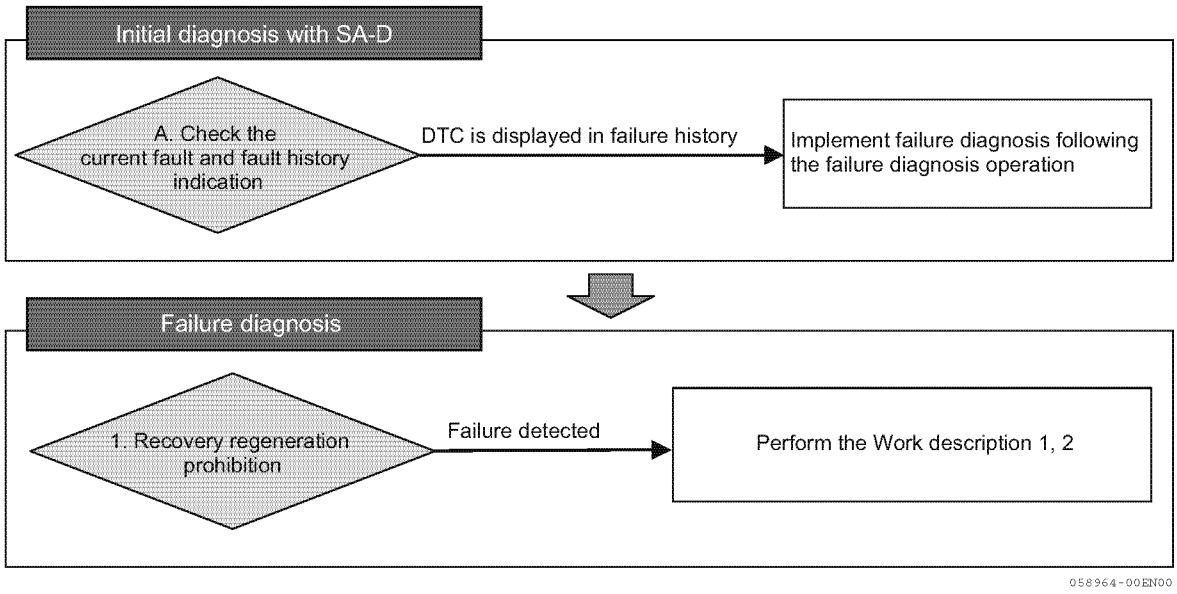
Recovery regeneration is inhibited

● Related DTC

P code	P1446	Recovery regeneration is inhibited

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Too much PM is accumulated in soot filter (SF). Replace the soot filter (SF).
   Connect to SA-D, and clean (replace) the soot filter (SF) according to the soot filter (SF) replacement procedure.
   See "SA-D Operation Manual" for details on soot filter (SF) replacement.

2. Make sure that "recovery regeneration is inhibited" is not shown now.
   If the failure is currently reproduced, troubleshoot the differential pressure sensor.

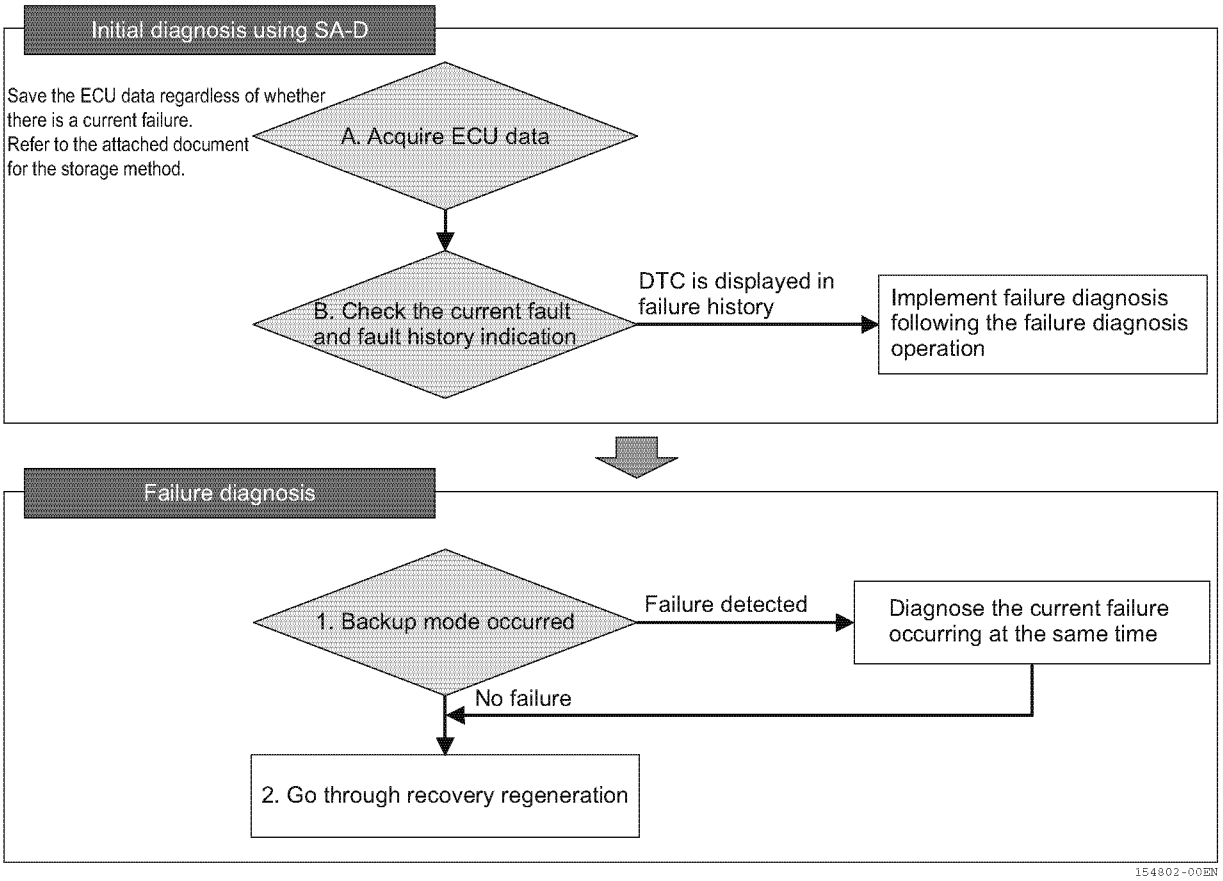
Backup mode

● Related DTC

P code	P1424	Backup mode

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. When this error is detected, one of the followings is detected at the same time: "P2463: Excessive PM accumulation (method C)", "P1463: Excessive PM accumulation (method P)", "P2458: Regeneration failure (stationary regeneration failure)", and "P2459: Regeneration failure (stationary regeneration not performed)". When recovery regeneration failed, "P1445: Regeneration failure (recovery regeneration failure)" may be detected. Be sure to perform the failure diagnosis for the respective part first.

2. Perform the recovery regeneration.
   See "SA-D Operation Manual" for details on recovery regeneration.
   After the recovery regeneration, check that the failure has been solved.

Actuator, etc.

■ Injector

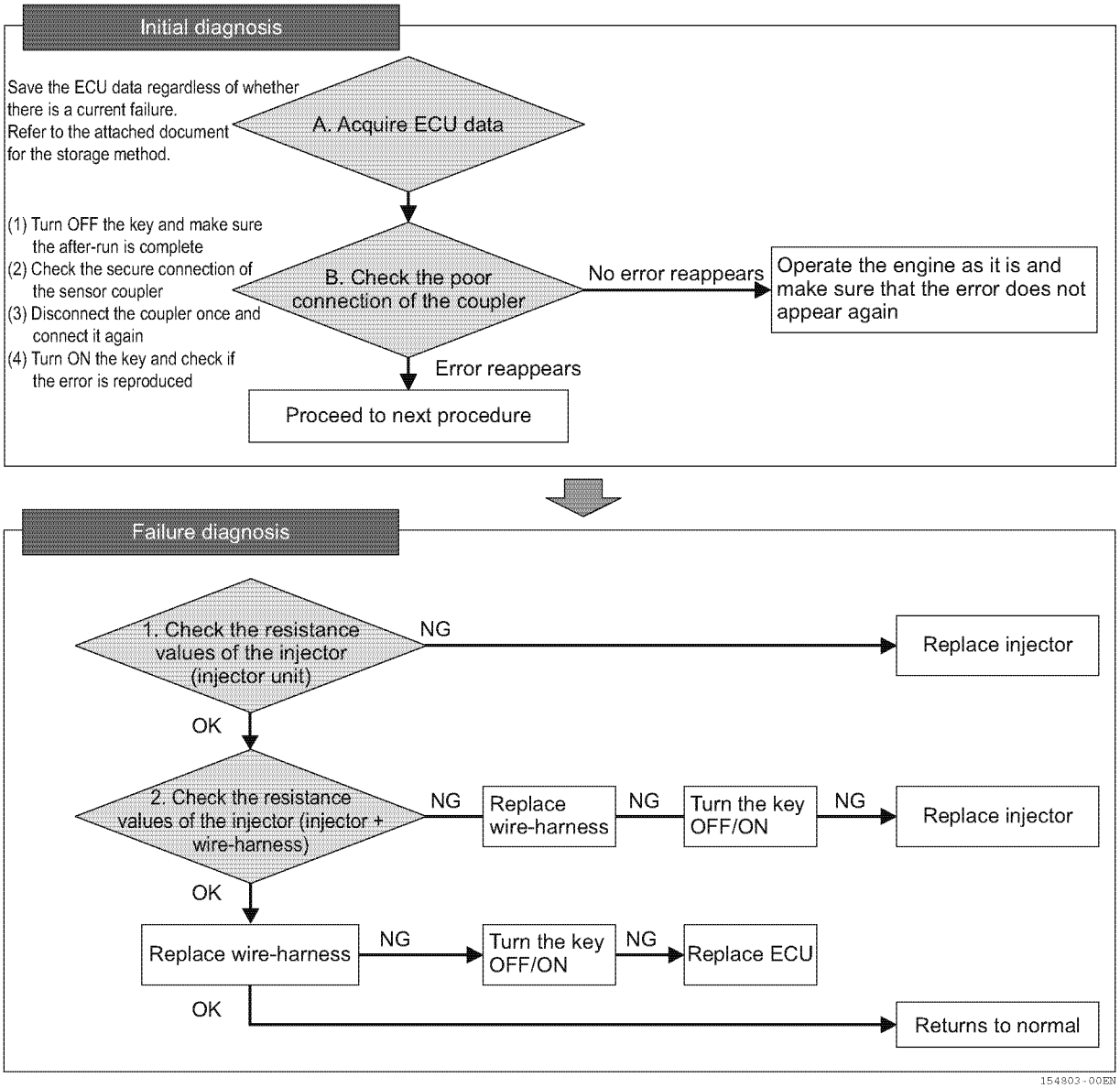
Disconnection of the injector

● Related DTC

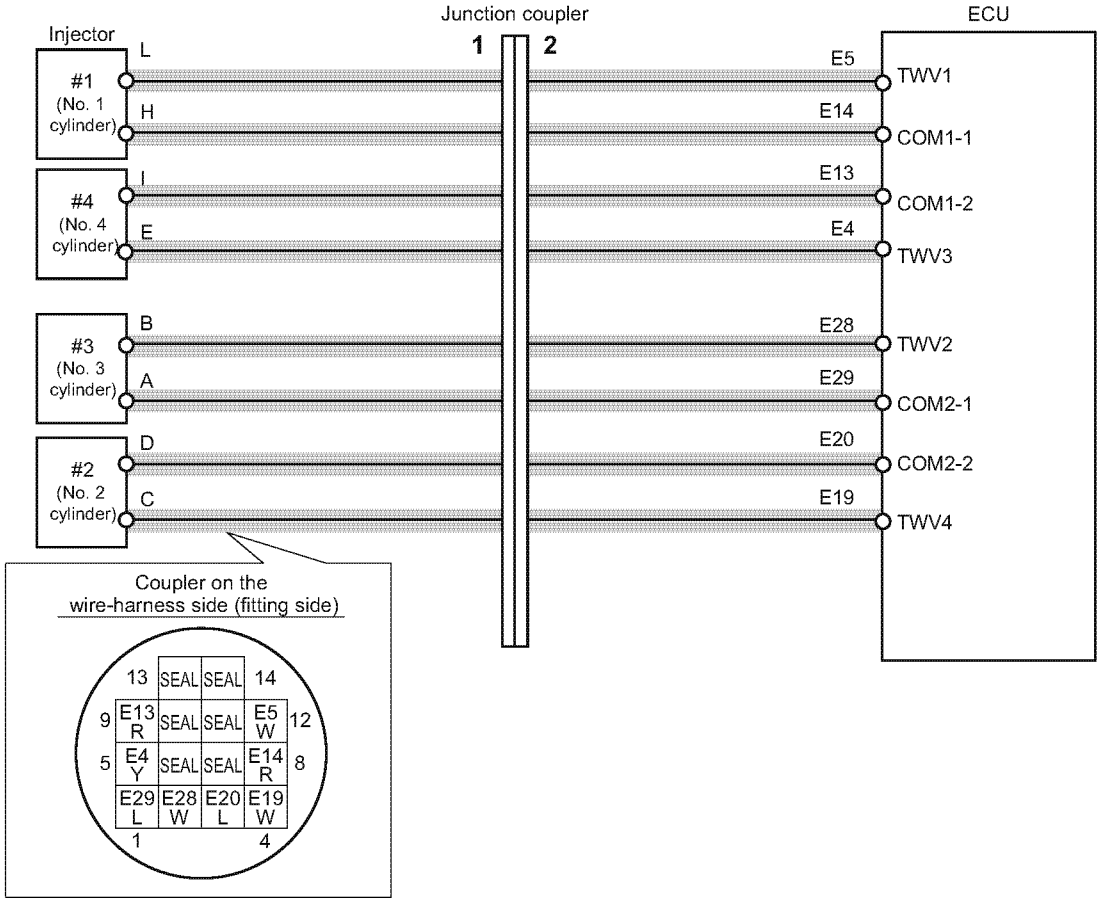
P code	P0201	Injector (No. 1 cylinder) disconnection (injector-specific)
	P0202	Injector (No. 2 cylinder) disconnection (injector-specific)
	P0203	Injector (No. 3 cylinder) disconnection (injector-specific)
	P0204	Injector (No. 4 cylinder) disconnection (injector-specific)
	P2146	Injector bank 1 disconnection
	P2149	Injector bank 2 disconnection

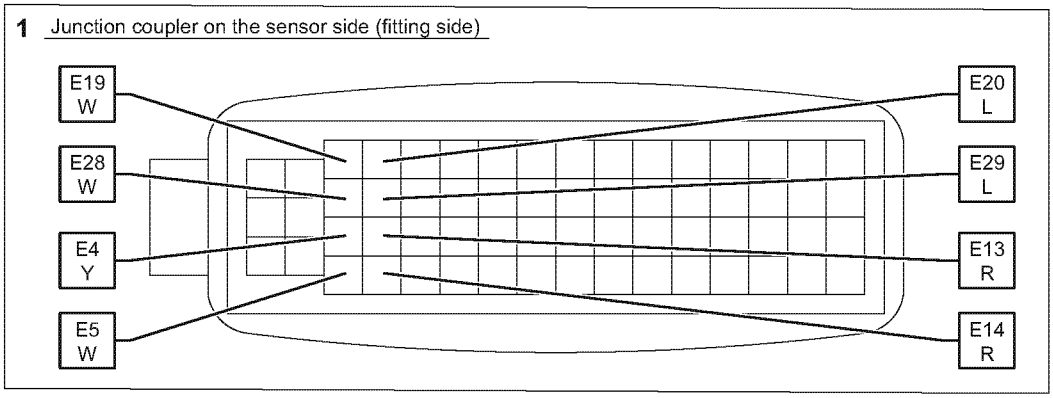
● Workflow

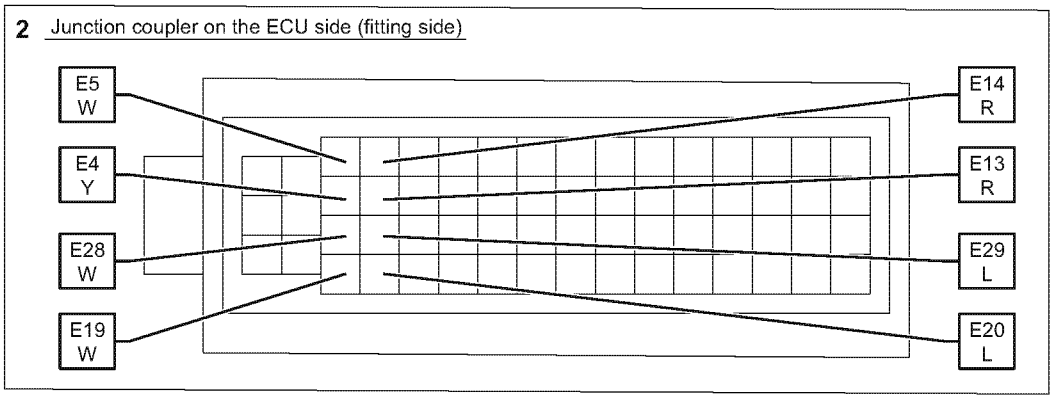
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram







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Note: See P586 for the ECU pin layout.

● Work description

1. Checking the injector resistance value (injector unit)
   1- Remove the injector from the wire-harness.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between injector terminals L and H, I and E, B and A, and D and C.

Reference: Injector's overall resistance value

Terminal	Specifications
Between injector terminals	0.59 Ω (at 20 °C)

NG	Replace the injector.
OK	Go to "Checking the resistance values of the injector (injector and wire-harness)".

2. Checking the resistance values of the injector (injector and wire-harness)
   ● Junction coupler not connected
   1- Connect the injector and the wire-harness, and remove the ECU from the wire-harness. However, see the above wiring diagram to remove the wire-harness of junction coupler (2) from the wire-harness of junction coupler (1).
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the junction coupler (1) side wire-harness couplers E5 and E14, E4 and E13, E28 and E29, and E19 and E20.
   Note: See "Reference: Injector's overall resistance value".

NG	• The coupler between the injector and the wire-harness may be defective. Replace the wire-harness. • Replace the wire-harness, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the injector.
OK	Go to "While junction coupler is connected"

   ● While junction coupler is connected
   1- Connect the injector and the wire-harness, and remove the ECU from the wire-harness. However, see the above wiring diagram to connect the wire-harness of junction coupler (2) to the wire-harness of junction coupler (1).
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the ECU side wire-harness couplers E5 and E14, E4 and E13, E28 and E29, and E19 and E20.
   Note: See "Reference: Injector's overall resistance value".

NG	The junction coupler may be defective. Replace the wire-harness.
OK	• The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness. • Replace the wire-harness, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the injector.

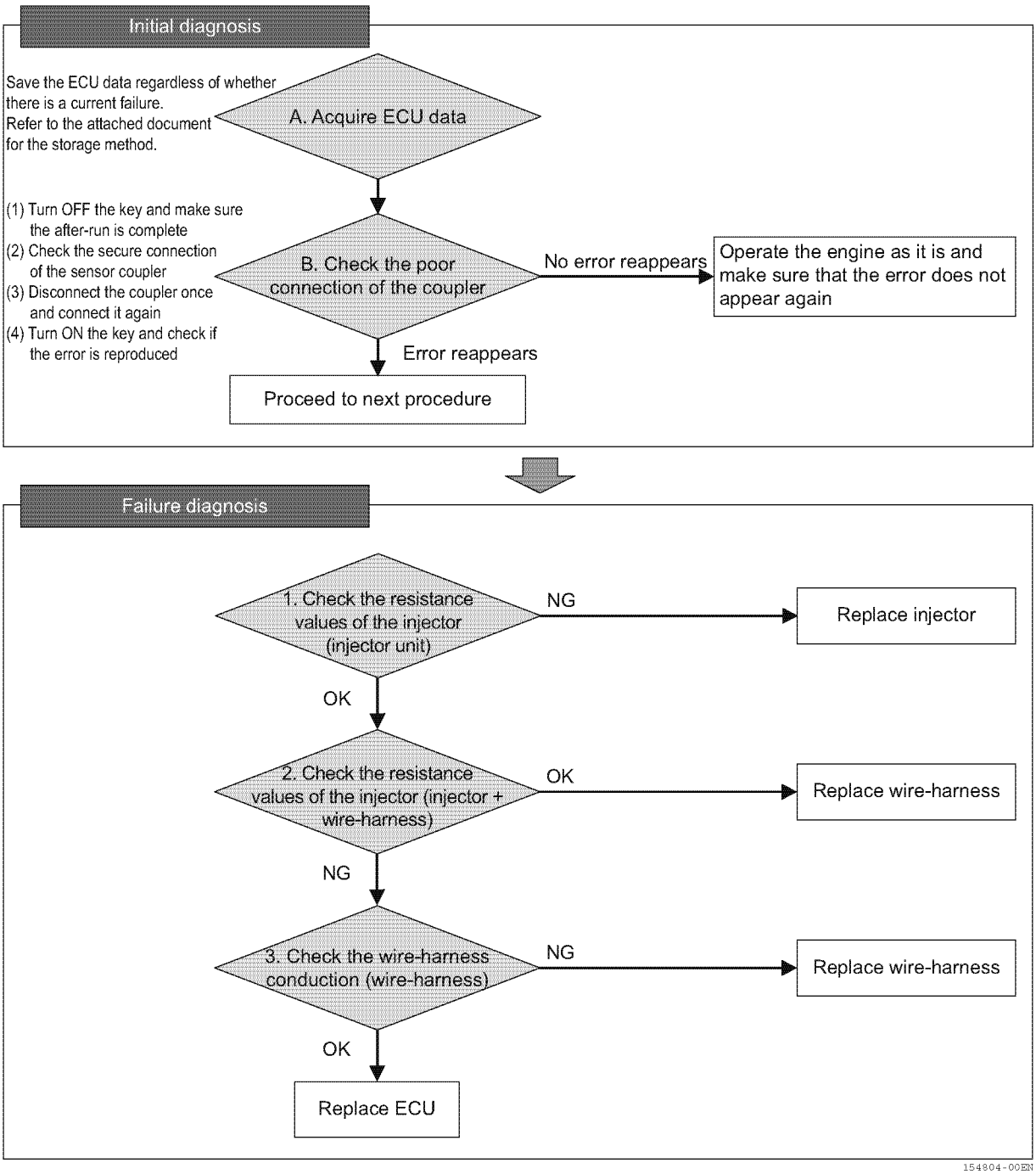
Short circuit of the injector

● Related DTC

P code	P2148	Injector bank 1 + B short circuit
	P2147	Injector bank 1 GND short circuit
	P2151	Injector bank 2 + B short circuit
	P2150	Injector bank 2 GND short circuit

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the injector resistance value (injector unit)
   1- Remove the wire-harness from the injector.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between injector terminals L and H, I and E, B and A, and D and C.

Reference: Injector's overall resistance value

Terminal	Specifications
Between injector terminals	0.59 Ω (at 20 °C)

NG	Replace the injector.
OK	Go to "Checking the resistance values of the injector (injector and wire-harness)".

2. Checking the resistance values of the injector (injector and wire-harness)
   ● Junction coupler not connected
   1- Connect the injector and the wire-harness, and remove the ECU from the wire-harness. However, see the above wiring diagram to remove the wire-harness of junction coupler (2) from the wire-harness of junction coupler (1).
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the junction coupler (1) side wire-harness couplers E5 and E14, E4 and E13, E28 and E29, and E19 and E20.
   Note: See "Reference: Injector's overall resistance value".

NG	Replace the wire-harness.
OK	Go to "While junction coupler is connected"

   ● While junction coupler is connected
   1- Connect the injector and the wire-harness, and remove the ECU from the wire-harness. However, see the above wiring diagram to connect the wire-harness of junction coupler (2) to the wire-harness of junction coupler (1).
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the ECU side wire-harness couplers E5 and E14, E4 and E13, E28 and E29, and E19 and E20.
   Note: See "Reference: Injector's overall resistance value".

NG	Replace the wire-harness.
OK	Go to "Checking the wire-harness conduction".

3. Checking the wire-harness conduction

1- Remove the wire-harness from the injector and the ECU. However, connect the junction coupler.

2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Injector conduction check pattern

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
E5	VB/GND terminal	Yes	NG: Error
		No	OK: Normal
E14		Yes	NG: Error
		No	OK: Normal
E4		Yes	NG: Error
		No	OK: Normal
E13		Yes	NG: Error
		No	OK: Normal
E28		Yes	NG: Error
		No	OK: Normal
E29		Yes	NG: Error
		No	OK: Normal
E19		Yes	NG: Error
		No	OK: Normal
E20		Yes	NG: Error
		No	OK: Normal

NG	Short circuited between the wire-harnesses. Replace the wire-harness.
OK	Replace the ECU.

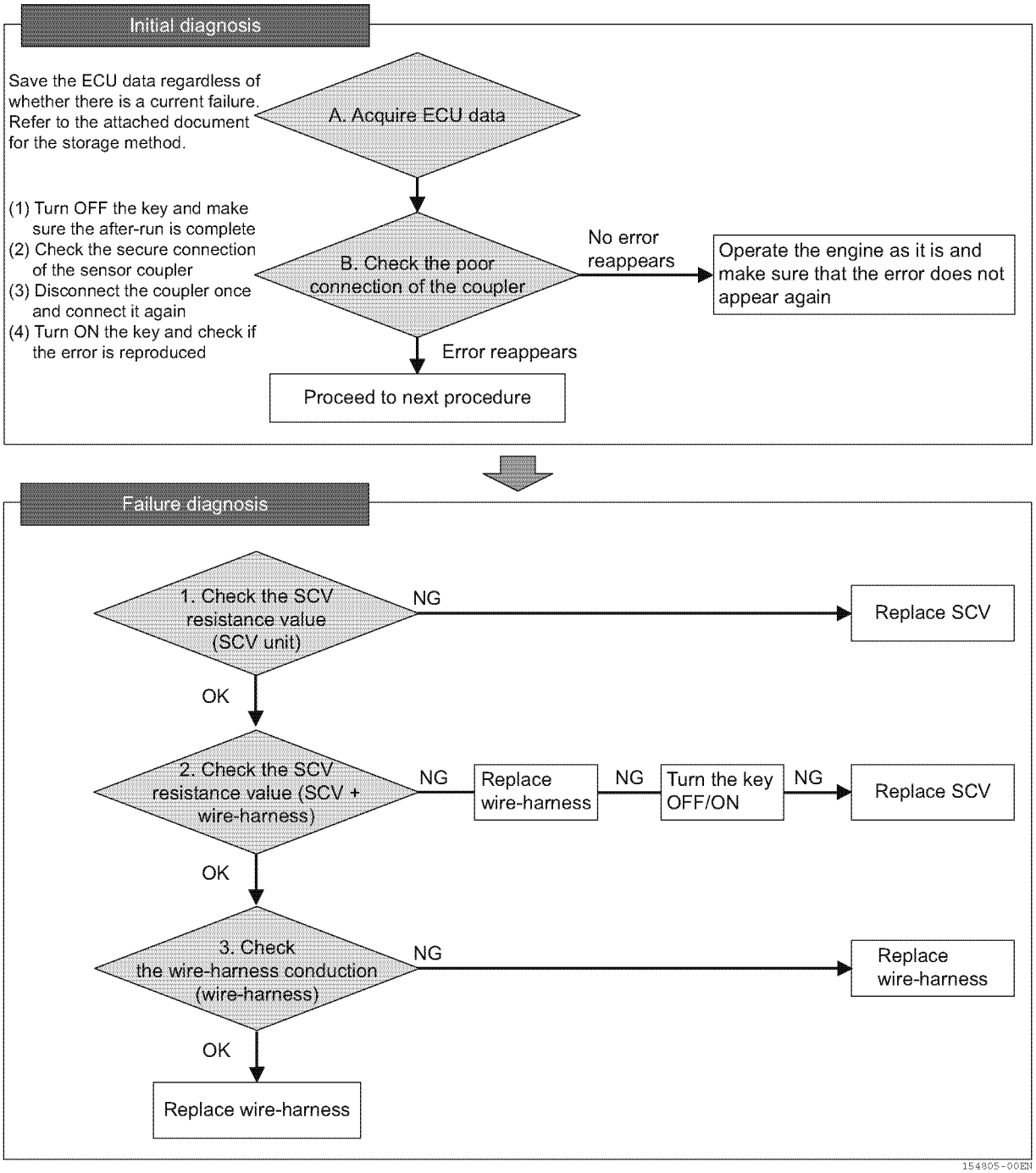
■ SCV drive circuit

● Related DTC

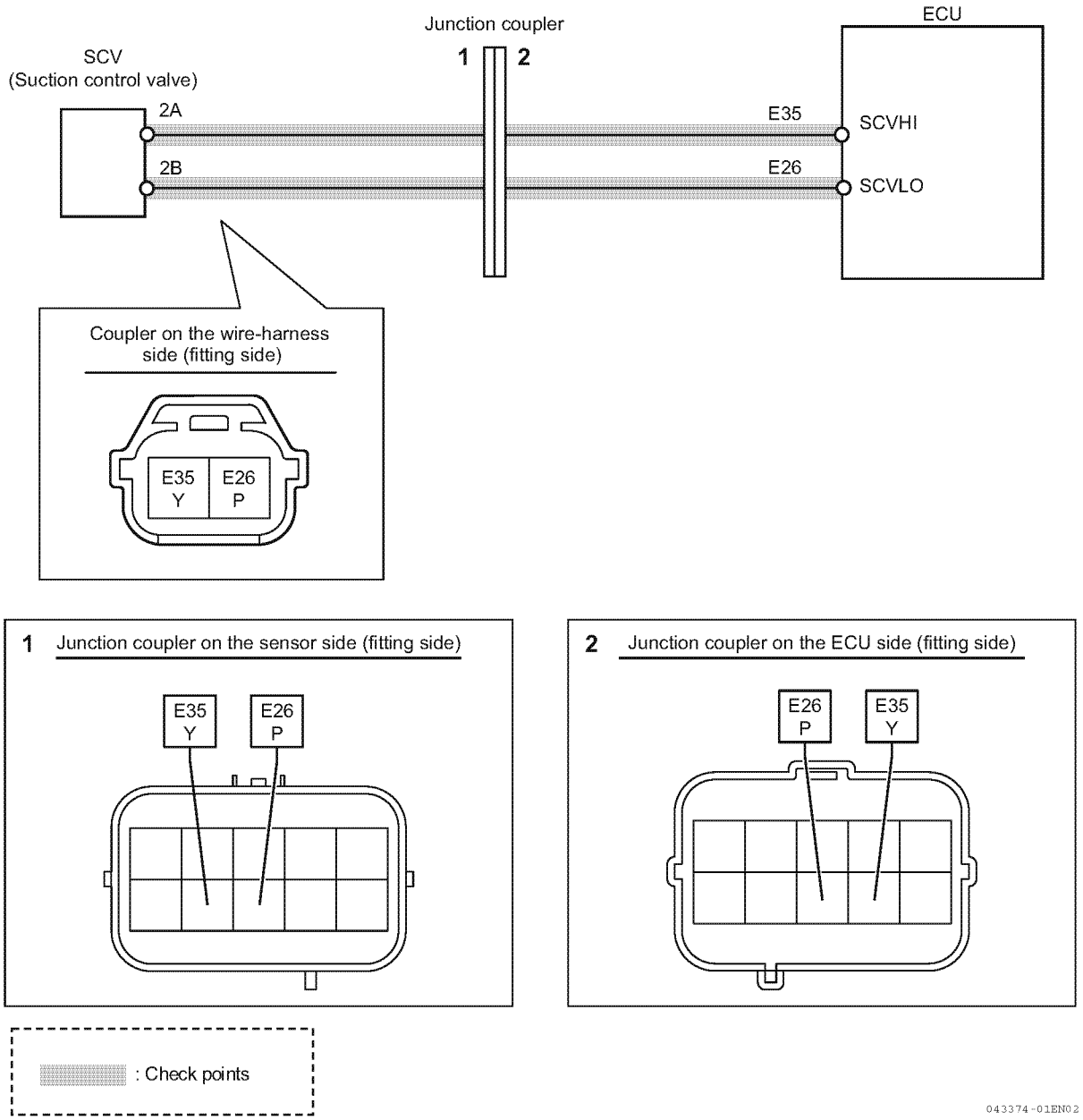
P code	P0629	SCV (Suction control valve) H/L side VB short circuit
	P0627	SCV (Suction control valve) H side GND short circuit/disconnection

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the SCV resistance value (SCV unit)
   1- Remove the SCV from the wire-harness.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between SCV terminals 2A and 2B.

Reference: SCV's overall resistance value

Terminal	Specifications
Between SCV terminals	2.1 Ω (at 20 °C)

NG	Replace the SCV.
OK	Go to "Checking the SCV resistance value (SCV + wire-harness)"

2. Checking the SCV resistance value (SCV + wire-harness)
   1- Connect the SCV and the wire-harness. Remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU wire-harness couplers E35 and E26.
   Note: See the above "Reference: SCV's overall resistance value".

NG	• A coupler between the SCV and the wire-harness may be defective. Replace the wire-harness • Replace the wire-harness, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the SCV.
OK	Go to "Checking the wire-harness conduction".

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the SCV and ECU. However, connect the junction coupler.
   2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: SCV conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
E35	VB/GND terminal	Yes	NG: Error
		No	OK: Normal
E26		Yes	NG: Error
		No	OK: Normal

Perform the followings when every items is normal, and "SCV (Suction control valve) H side GND short circuit/disconnection" is detected in the above SCV conduction check pattern 1.

Reference: SCV conduction check pattern 2

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (SCV side wire-harness coupler)	Conduction	State
E35	SCV terminal B	Yes	OK: Normal
		No	NG: Error
E26	SCV terminal A	Yes	OK: Normal
		No	NG: Error

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	The coupler between the ECU and the wire-harness may be defective. After clearing the error, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the wire-harness.

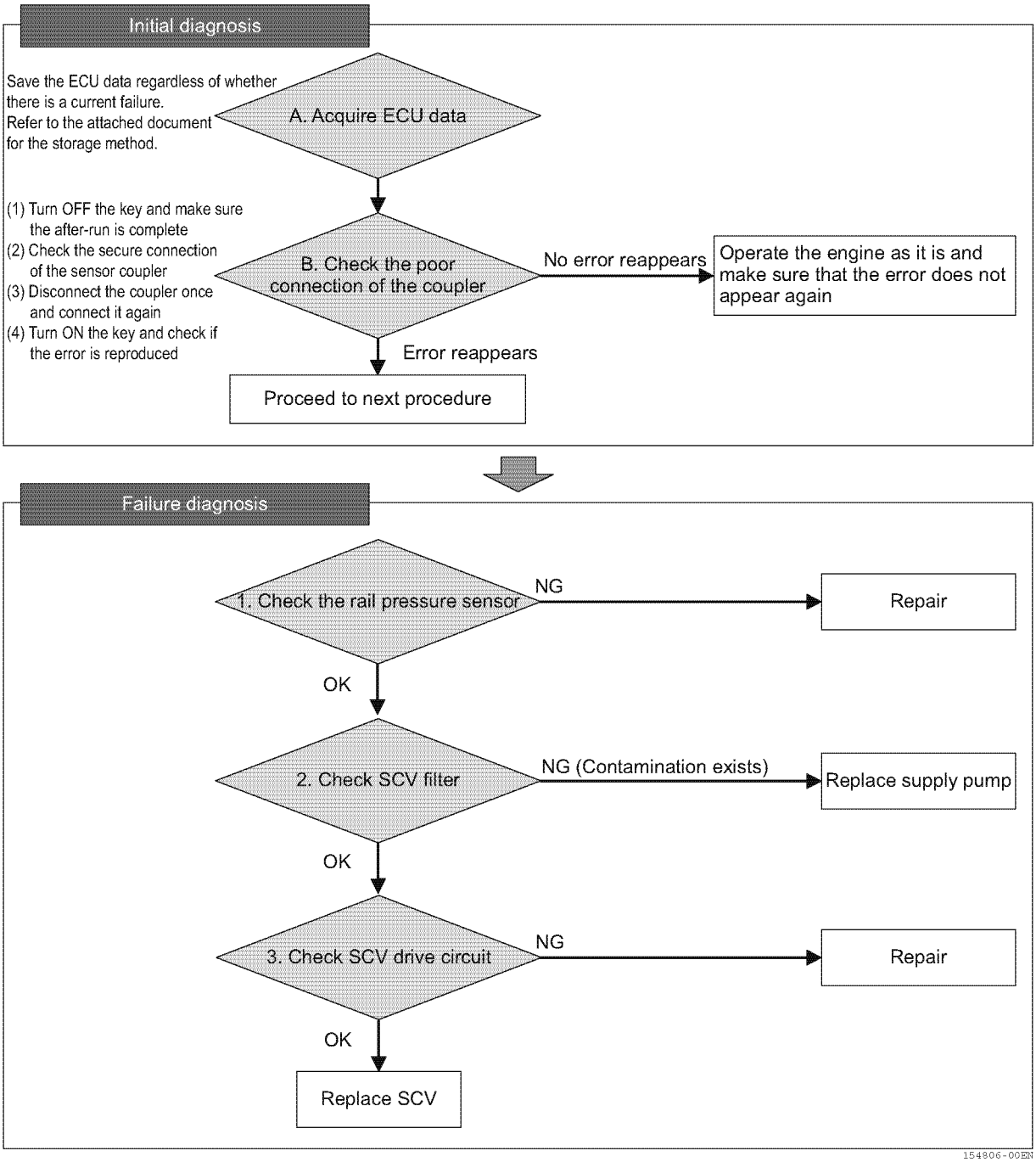
■ SCV 1

● Related DTC

P code	P2635	SCV sticking

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the rail pressure sensor

1- Perform the failure diagnosis for “Rail pressure sensor”.

Results of “Rail pressure sensor”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Go to “Checking the SCV filter”.

2. Checking the SCV filter

1- Check the clogging status of the SCV filter.

2- If contamination such as foreign matter is found, replace the supply pump.

3. Checking the SCV drive circuit

1- Perform the failure diagnosis for “SCV drive circuit”.

Results of “SCV drive circuit”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Replace the SCV.

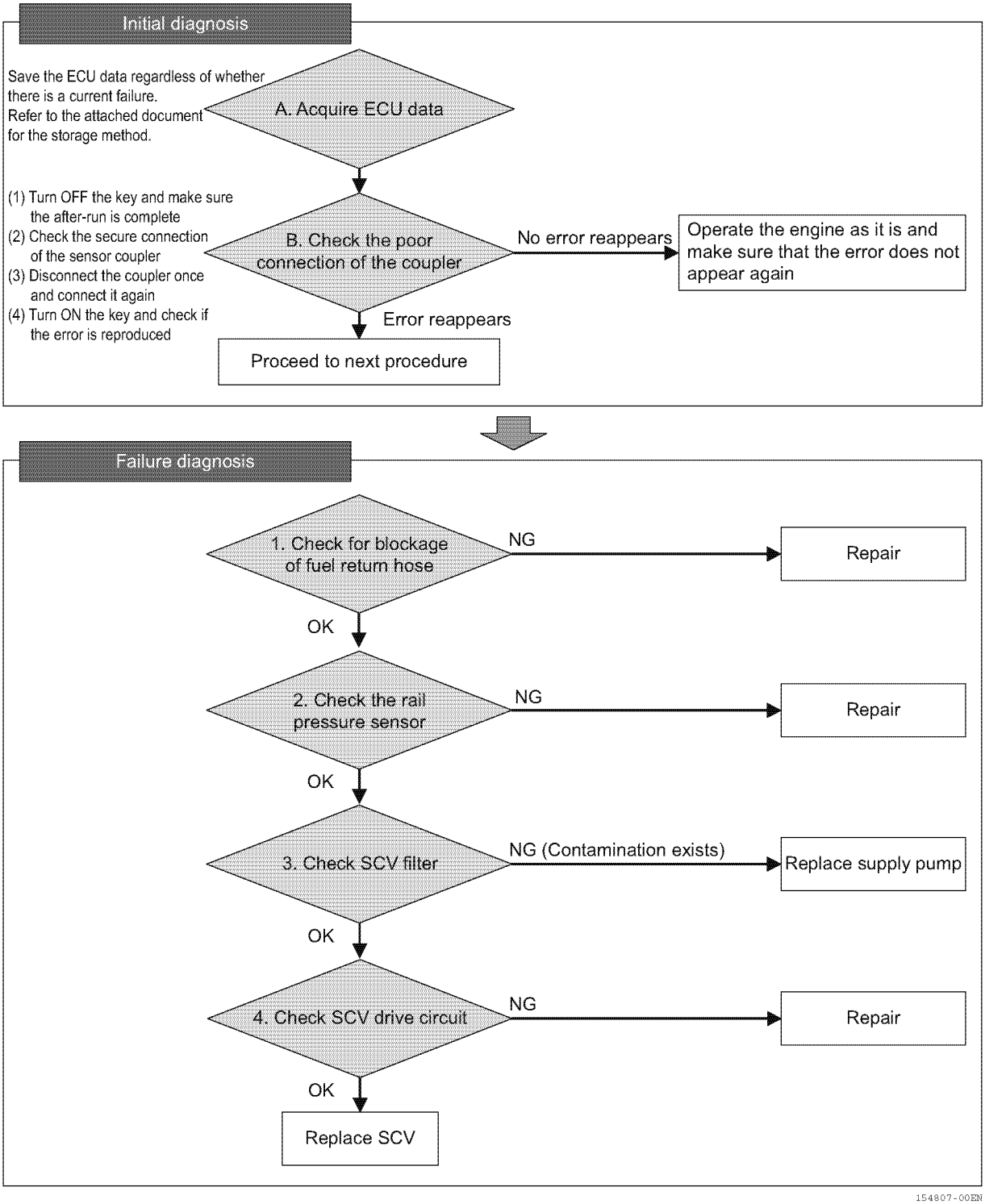
■ SCV 2

● Related DTC

P code	P1235	Pump protection failure
	P1236	Pump replacement failure
	P0088	Common rail pressure abnormally high

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking for blockage of fuel return hose
   1- Check the fuel return hose for blockage.
   2- Correct any blockages.

2. Checking the rail pressure sensor
   1- Perform the failure diagnosis for “Rail pressure sensor”.

Results of “Rail pressure sensor”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Go to “Checking the SCV filter”.

3. Checking the SCV filter
   1- Check the clogging status of the SCV filter.
   2- If contamination such as foreign matter is found, replace the supply pump.

4. Checking the SCV drive circuit
   1- Perform the failure diagnosis for “SCV drive circuit”.

Results of “SCV drive circuit”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Replace the SCV.

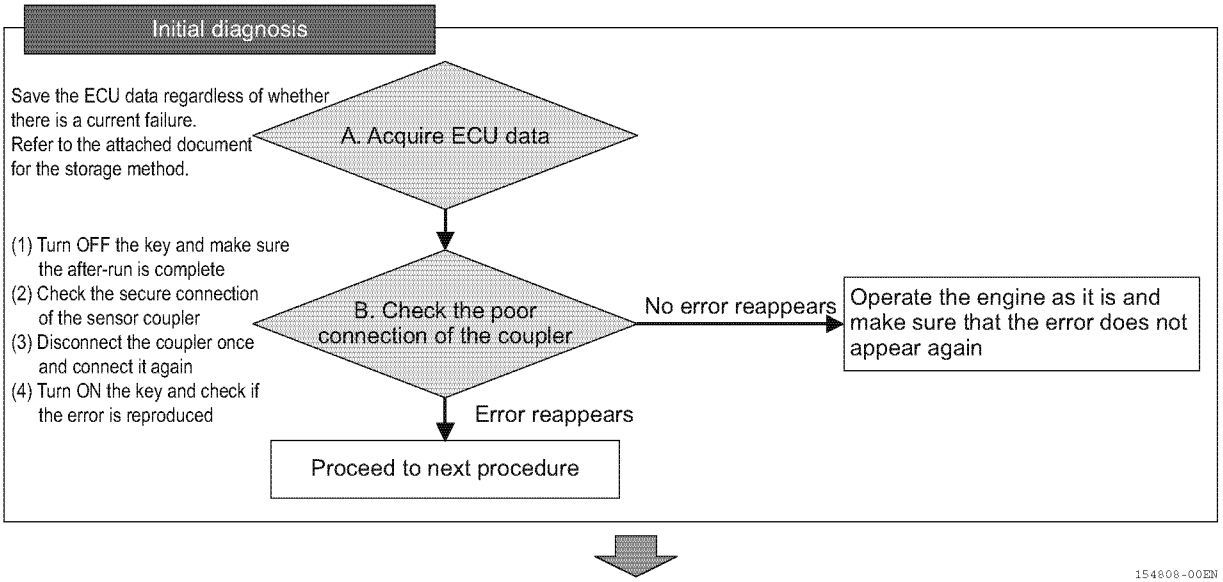
■ SCV 3

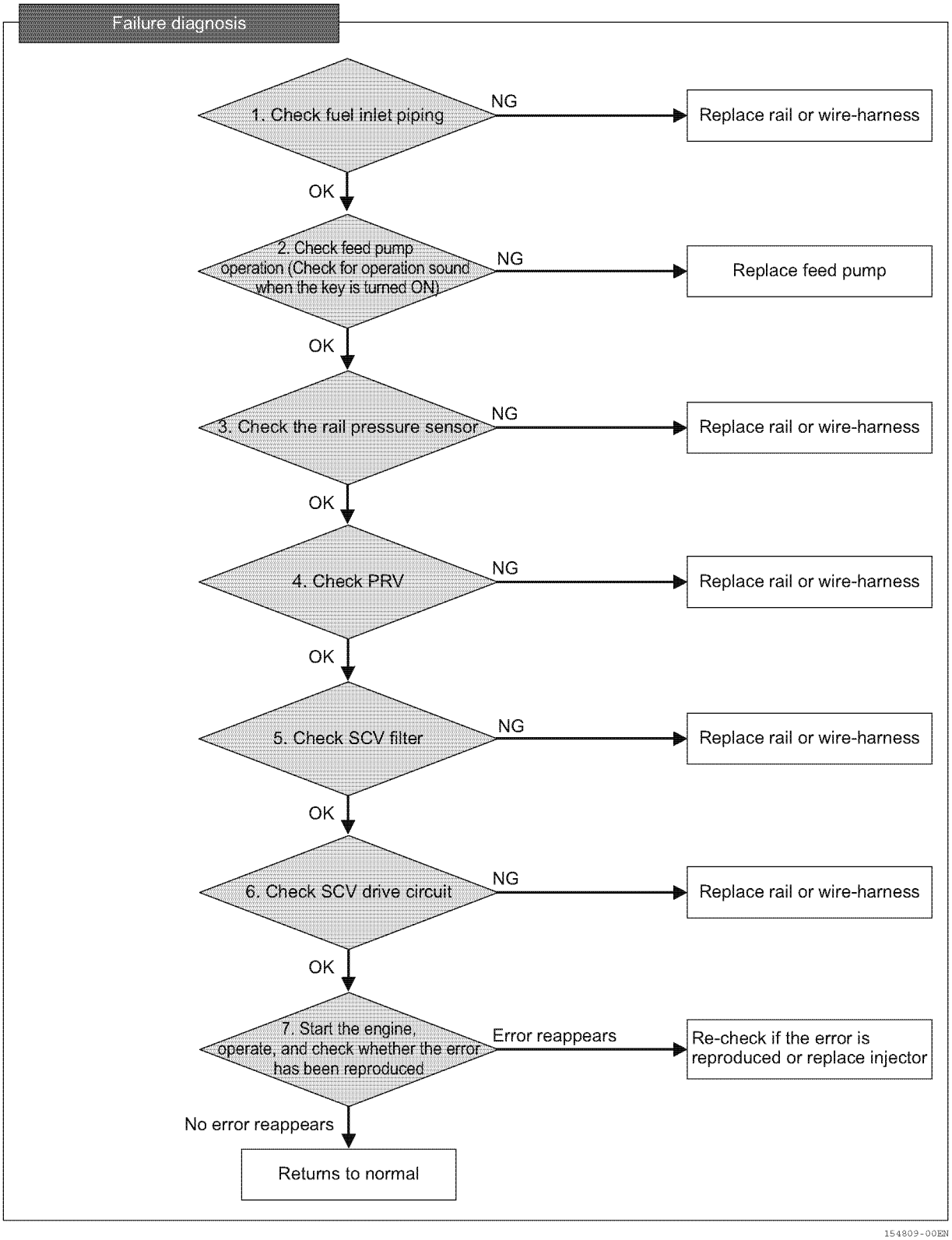
● Related DTC

P code	P0094	Rail pressure deviation error (rail pressure too low)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check fuel inlet piping
NG
Replace rail or wire-harness
OK
2. Check feed pump operation (Check for operation sound when the key is turned ON)
NG
Replace feed pump
OK
3. Check the rail pressure sensor
NG
Replace rail or wire-harness
OK
4. Check PRV
NG
Replace rail or wire-harness
OK
5. Check SCV filter
NG
Replace rail or wire-harness
OK
6. Check SCV drive circuit
NG
Replace rail or wire-harness
OK
7. Start the engine, operate, and check whether the error has been reproduced
Error reappears
Re-check if the error is reproduced or replace injector
No error reappears
Returns to normal
154809-00EN

● Work description

1. Checking fuel inlet piping
   1- Check for defective fuel supply due to bent or leaking hoses.
   2- Correct any defects.

2. Checking feed pump operation
   1- Check for operation sound when the key is turned ON.
   2- Replace the feed pump if any abnormality is found.

3. Checking the rail pressure sensor
   1- Perform the failure diagnosis for “Rail pressure sensor”.

Results of “Rail pressure sensor”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Go to “Checking the PRV”.

4. Checking the PRV
   1- Check the pin of the PRV couplers for deformation and cracks, the condition of the connection, and whether the retainer is loose or removed.
   2- Check whether the PRV wiring is disconnected or the wiring coating is peeled.
   3- Measure the resistance value of the PRV, and check the conduction of the wire-harness.

NG	Replace the rail or wire-harness.
OK	Go to “Checking the SCV filter”.

5. Checking the SCV filter
   1- Check the clogging status of the SCV filter.
   2- If contamination such as foreign matter is found, replace the supply pump.

6. Checking the SCV drive circuit
   1- Perform the failure diagnosis for “SCV drive circuit”.

Results of “SCV drive circuit”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Replace the SCV.

7. Checking the error reproduction

Error reappears	After bleeding the air again, run the engine to check whether the error reappears or replace the injector.
No error reappears	Return to normal state.

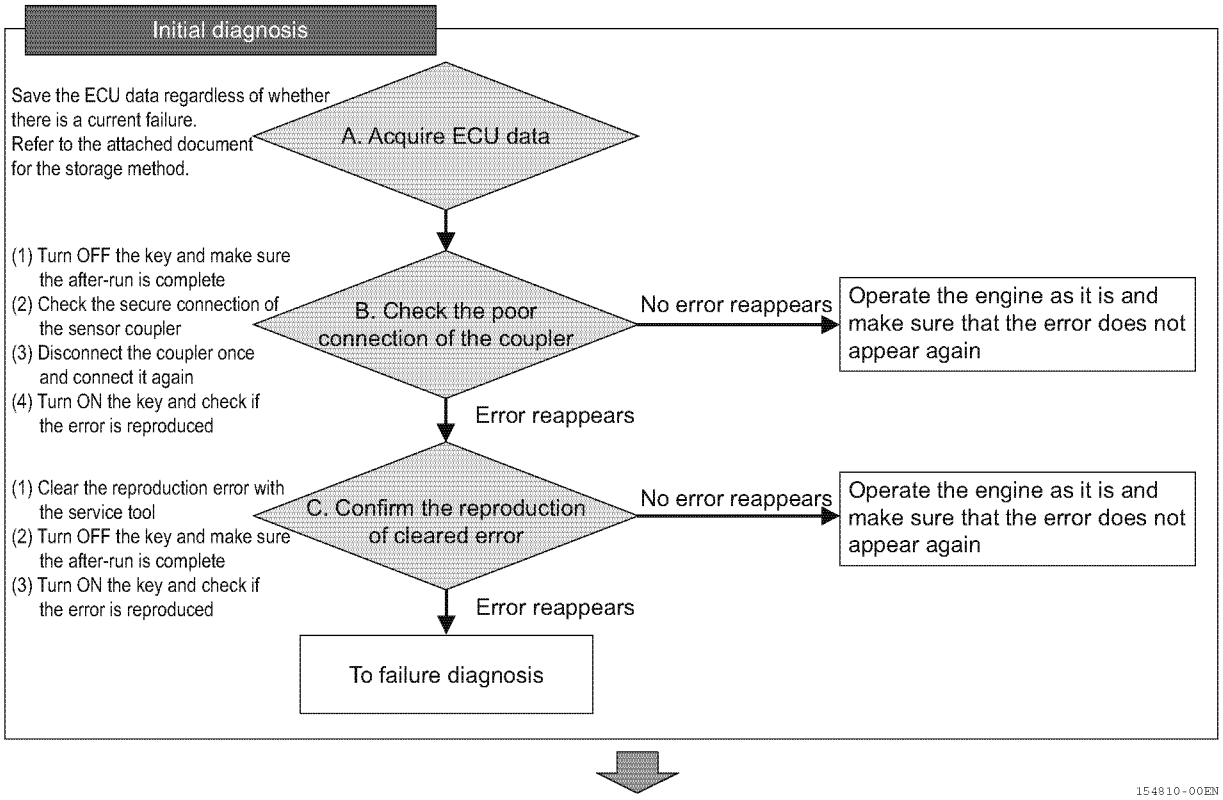
■ Intake throttle

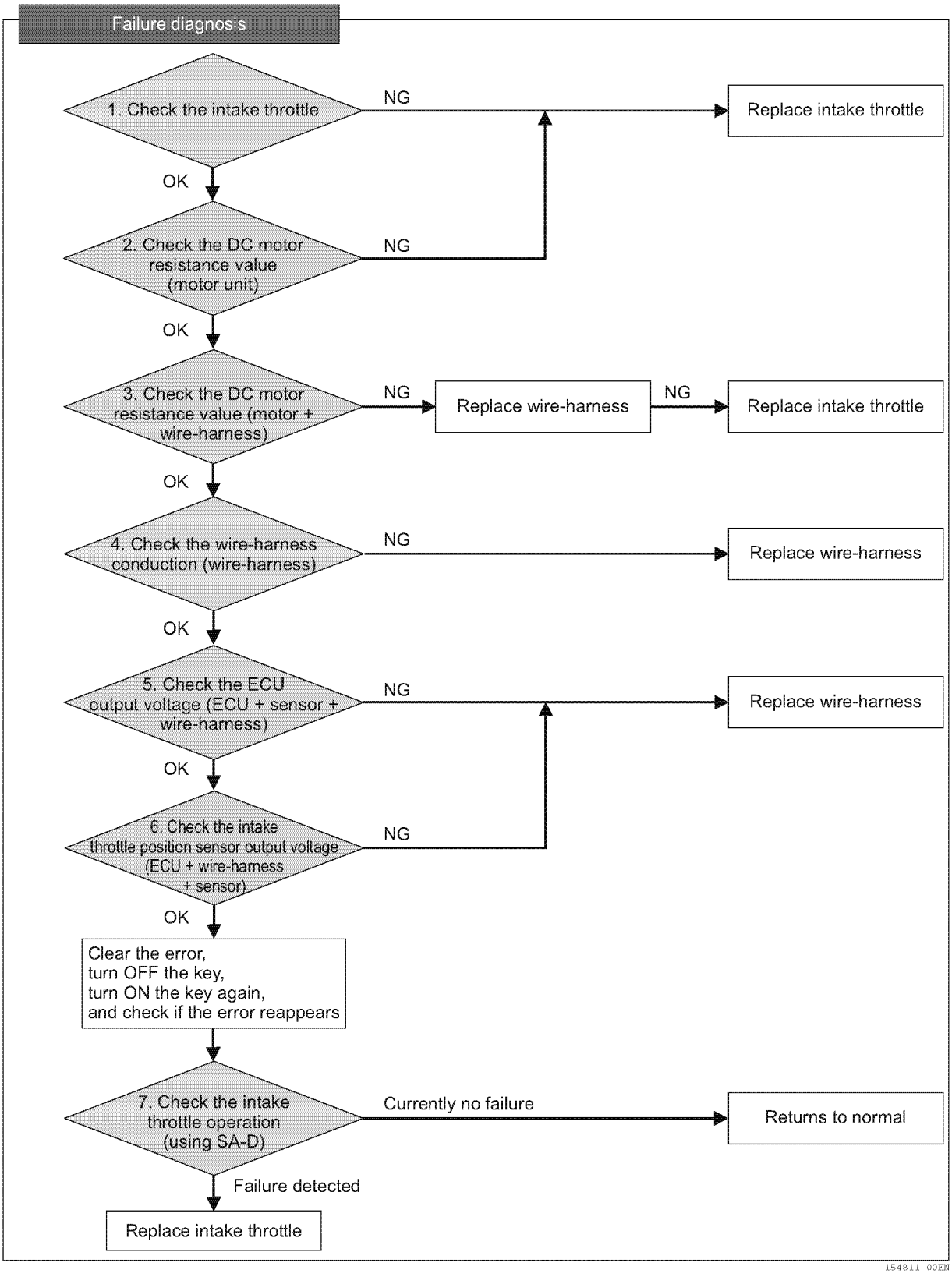
● Related DTC

P code	P1655	Intake throttle drive circuit deviation error
	P1656	Intake throttle drive circuit drive duty error

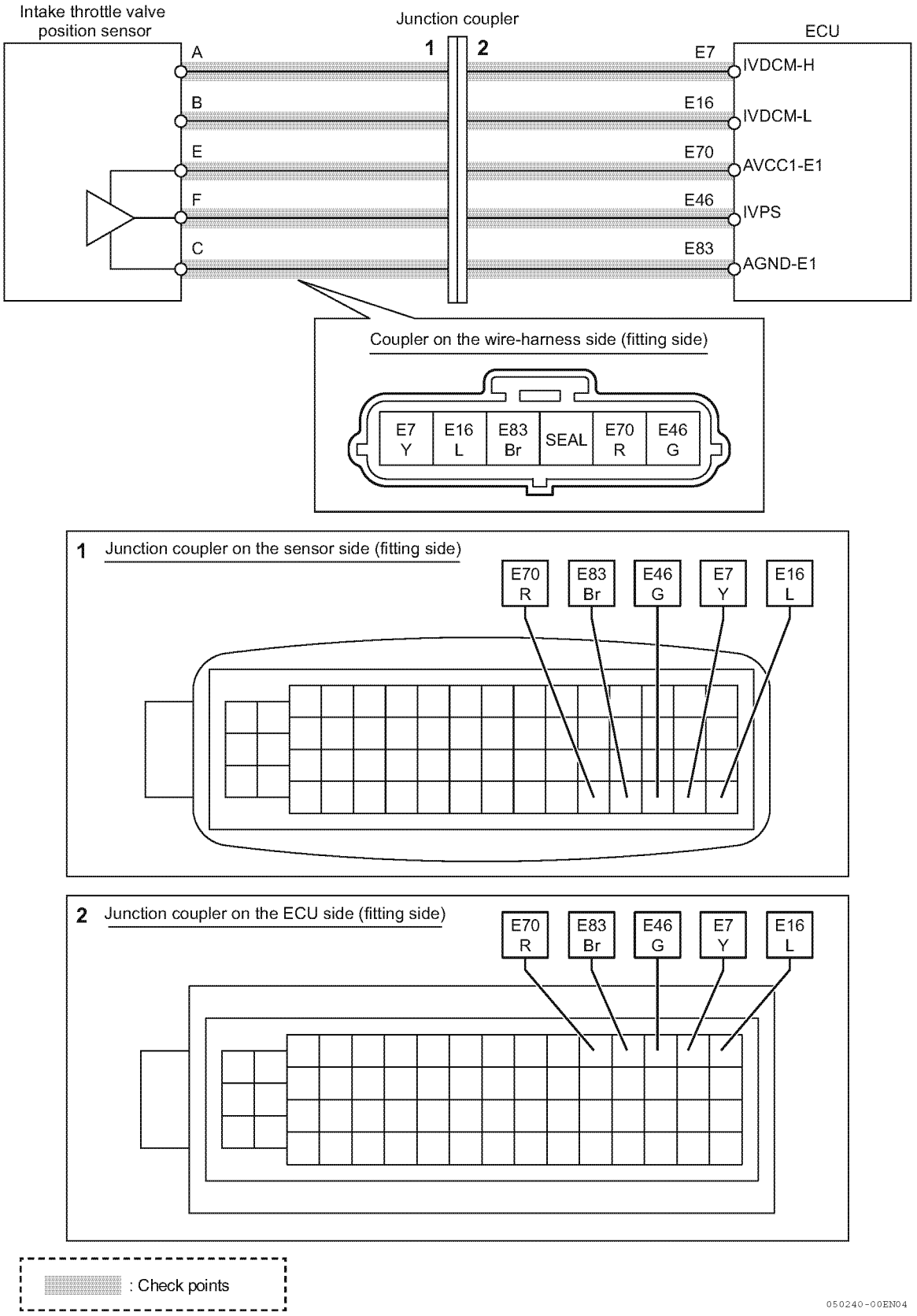
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the intake throttle
NG
Replace intake throttle
OK
2. Check the DC motor resistance value (motor unit)
NG
OK
3. Check the DC motor resistance value (motor + wire-harness)
NG
Replace wire-harness
NG
Replace intake throttle
OK
4. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
5. Check the ECU output voltage (ECU + sensor + wire-harness)
NG
Replace wire-harness
OK
6. Check the intake throttle position sensor output voltage (ECU + wire-harness + sensor)
NG
OK
Clear the error, turn OFF the key, turn ON the key again, and check if the error reappears
7. Check the intake throttle operation (using SA-D)
Currently no failure
Returns to normal
Failure detected
Replace intake throttle
154811-00EN

● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the intake throttle
   1- Remove the intake throttle from the engine.
   2- Make sure that the throttle valve is not bent or stuck.

NG	Replace the intake throttle
OK	Go to “Checking the DC motor resistance value (motor unit)”

2. Checking the DC motor resistance value (motor unit)
   1- Remove the intake throttle from the wire-harness.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between intake throttle DC motor terminals A and B.

Reference: Overall resistance value of DC motor
1.38 Ω (at 20 °C)

NG	Replace the intake throttle
OK	Go to “Checking the resistance value (motor + wire-harness)”

3. Checking the resistance value (motor + wire-harness)
   1- Connect the intake throttle and the wire-harness. Remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between ECU wire-harness couplers E7 and E16.
   Note: See the above “Reference: Overall resistance value of DC motor”.

NG	A coupler between the motor and the wire-harness may be defective. Replace the wire-harness, clear the error, turn the power OFF → ON, and check if the error reappears. If error reappears again even after clearing the error, replace the intake throttle.
OK	Go to “Checking the wire-harness conduction”.

4. Checking the wire-harness conduction
   1- Remove the wire-harness from the intake throttle and ECU. However, connect the junction coupler.
   2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Intake throttle drive circuit conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
E7	VB/GND terminal	Yes	NG: Error
		No	OK: Normal
E16		Yes	NG: Error
		No	OK: Normal

Reference: Intake throttle drive circuit conduction check pattern 2

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on intake throttle side)	Conduction	State
E7	Motor terminal A	Yes	OK: Normal
		No	NG: Error
E16	Motor terminal B	Yes	OK: Normal
		No	NG: Error

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Checking the ECU output voltage”.

5. Checking the ECU output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between the intake throttle valve position sensors 5 V E70 and E7.

Voltage	State	Corrective action
E70 < 4.375 V	NG	Replace the wire-harness.
4.375 V ≤ E70 ≤ 5.625 V	OK (normal range)	Check the intake throttle valve position sensor output voltage.
5.625 V < E70	NG	Replace the wire-harness.

NG	Replace the wire-harness.
OK	Go to “Checking the intake throttle valve position sensor output voltage”.

6. Checking the intake throttle valve position sensor output voltage
   1- Connect the checker harness between the ECU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, ECU).
   2- Using a circuit tester, measure the voltage between the sensor signals E46 and E83.

Voltage	State	Corrective action
E46 < 0.2 V	NG	Replace the wire-harness.
0.2 V ≤ E46 ≤ 4.9 V	OK (normal range)	Check the intake throttle operation using SA-D.
4.9 V < E46	NG	Replace the wire-harness.

NG	Replace the wire-harness.
OK	Go to “Checking the intake throttle operation (using SA-D)”

7. Checking the intake throttle operation (using SA-D)
   1- After clearing the error, turn OFF the key switch and turn ON the key switch again.
   2- Activate the intake throttle using “Active control of Diagnosis Test” of SMARTASSIST-Direct (SA-D), and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the intake throttle

ECU internal and communication related

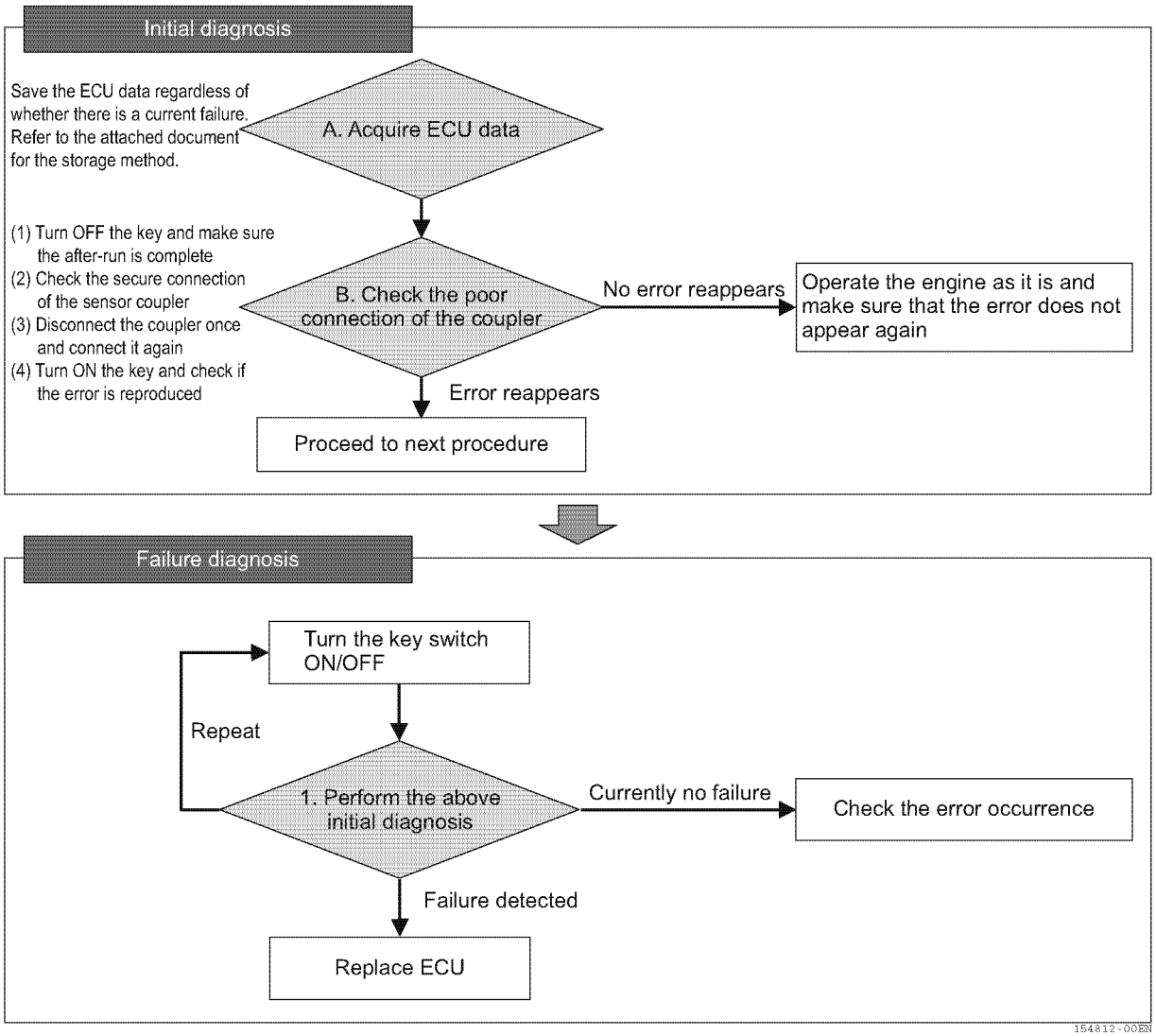
■ ECU internal related 1

● Related DTC

P code	P2228	Atmospheric pressure sensor error (voltage low)
	P2229	Atmospheric pressure sensor error (voltage high)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Operation using SA-D

1- Turn OFF the key switch and turn ON the key switch again.

2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

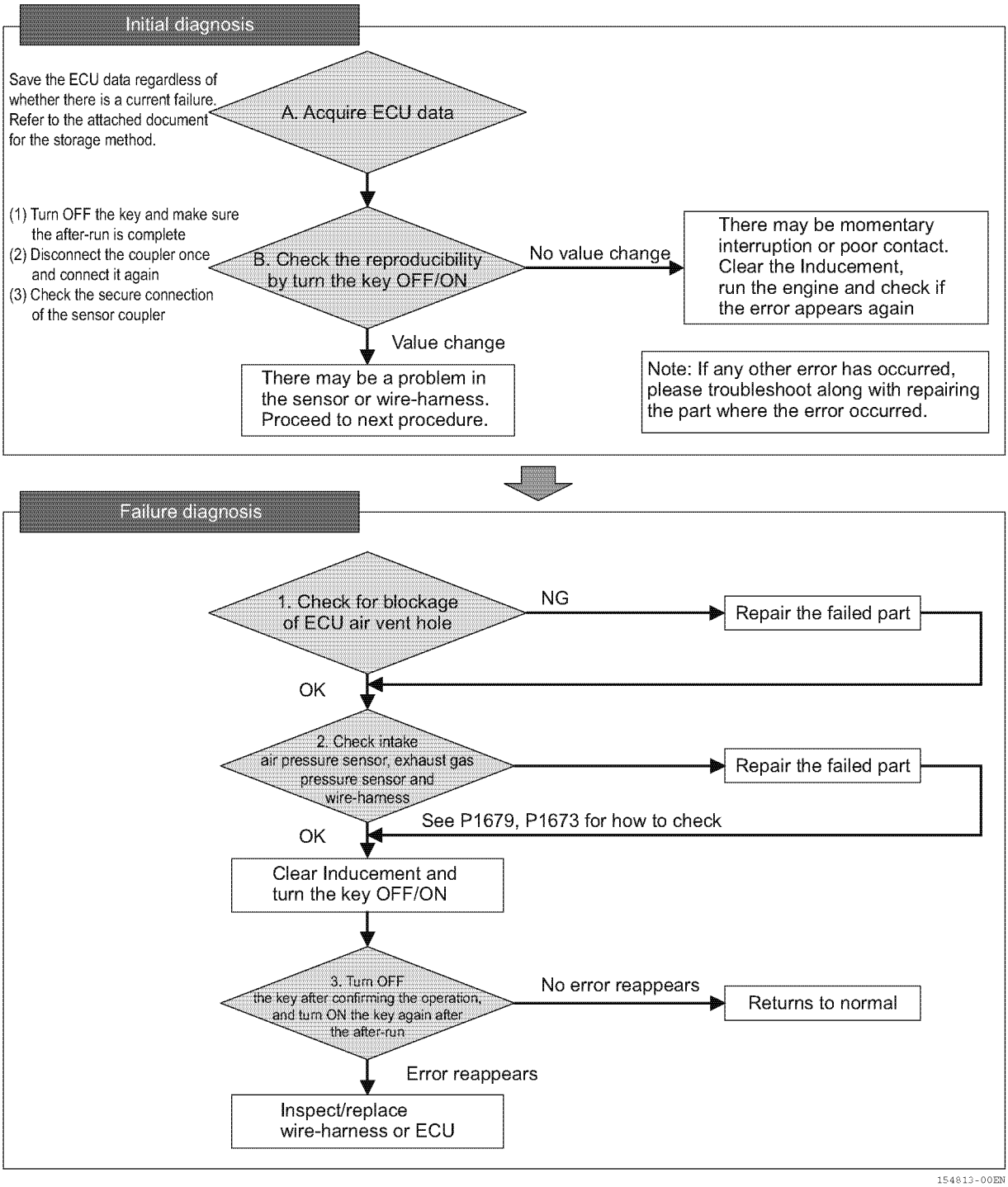
■ ECU internal related 2

● Related DTC

P code	P1231	Atmospheric pressure sensor error (characteristic error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Operation using SA-D

   1- Turn OFF the key switch and turn ON the key switch again.

   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

2. Check operation

   Run the engine and carry out normal operation, etc., then turn OFF the key to complete the after-run once.
   After that, turn the key ON again and make sure that the error does not occur again.

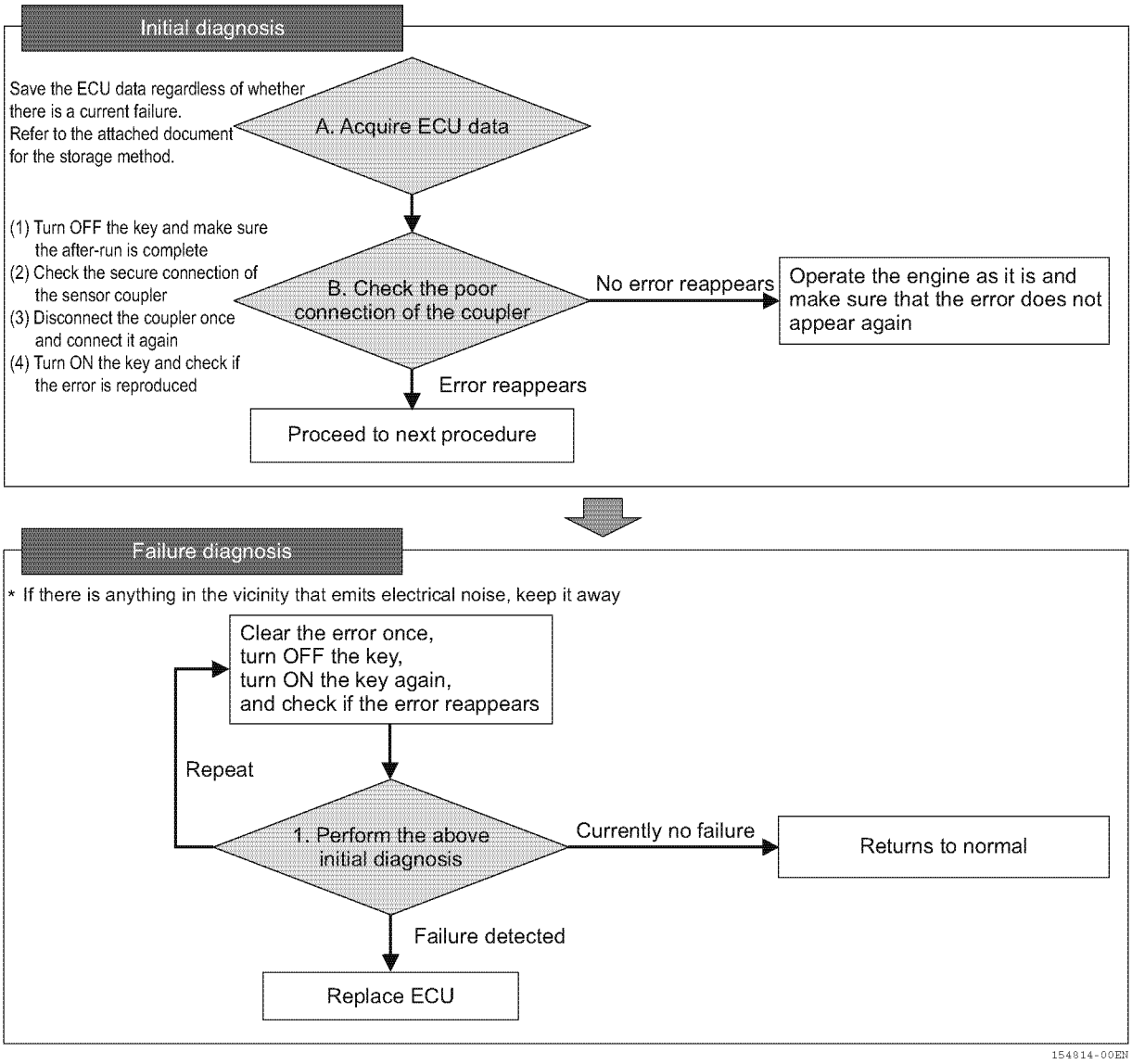
■ ECU internal related 3

● Related DTC

P code	P0611	Low charge error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. If there is anything in the vicinity that emits electrical noise, keep it away.
   1- Clear the error, turn the key switch OFF, and turn the key ON after the after-run is completed.
   2- Connect SA-D and check if an error is currently detected in the failure display.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

2. Operation using SA-D
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

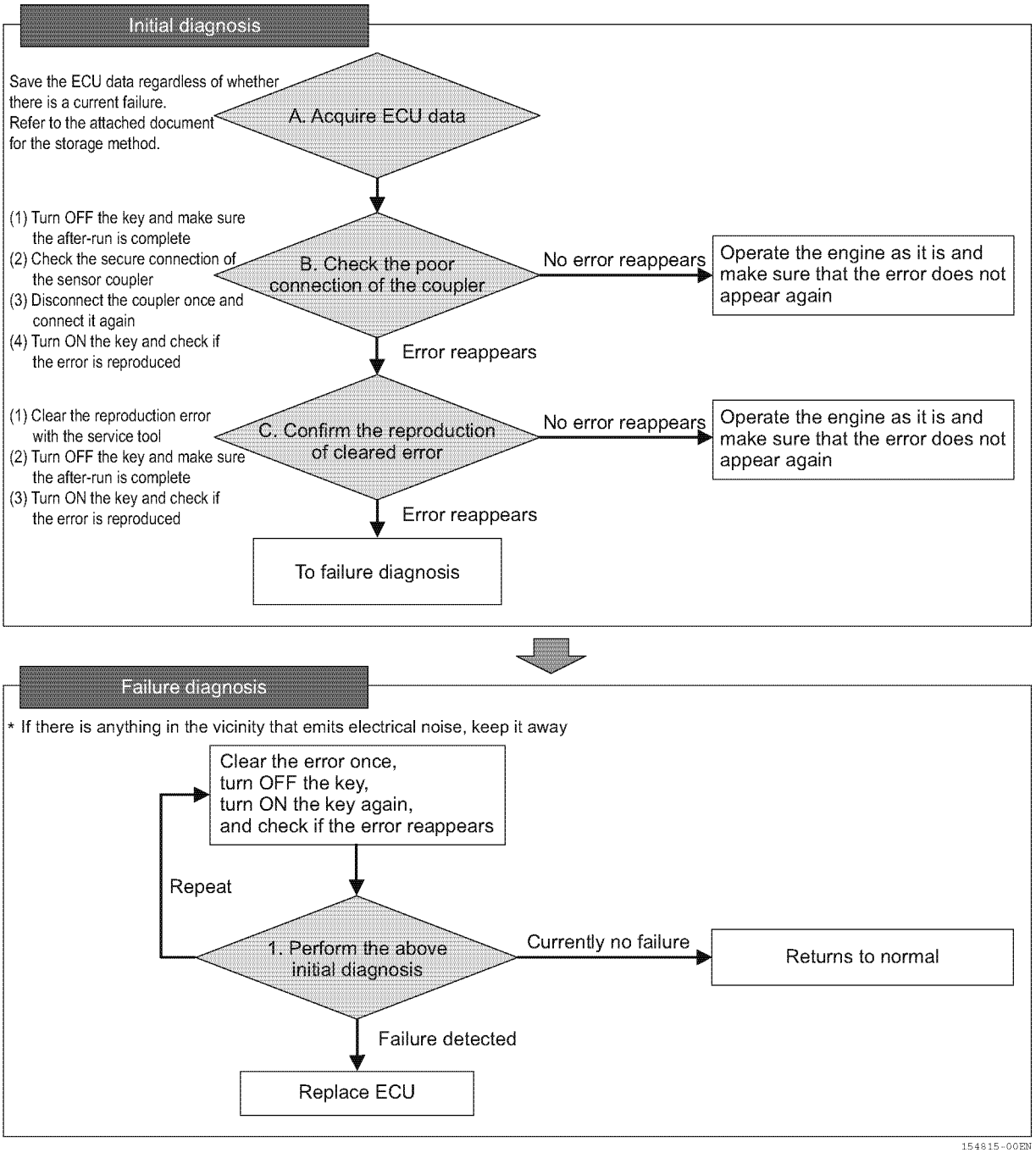
■ ECU internal related 4

● Related DTC

P code	P0200	Overcharge error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. If there is anything in the vicinity that emits electrical noise, keep it away.
   1- Clear the error, turn the key switch OFF, and turn the key ON after the after-run is completed.
   2- Connect SA-D and check if an error is currently detected in the failure display.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

2. Operation using SA-D
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

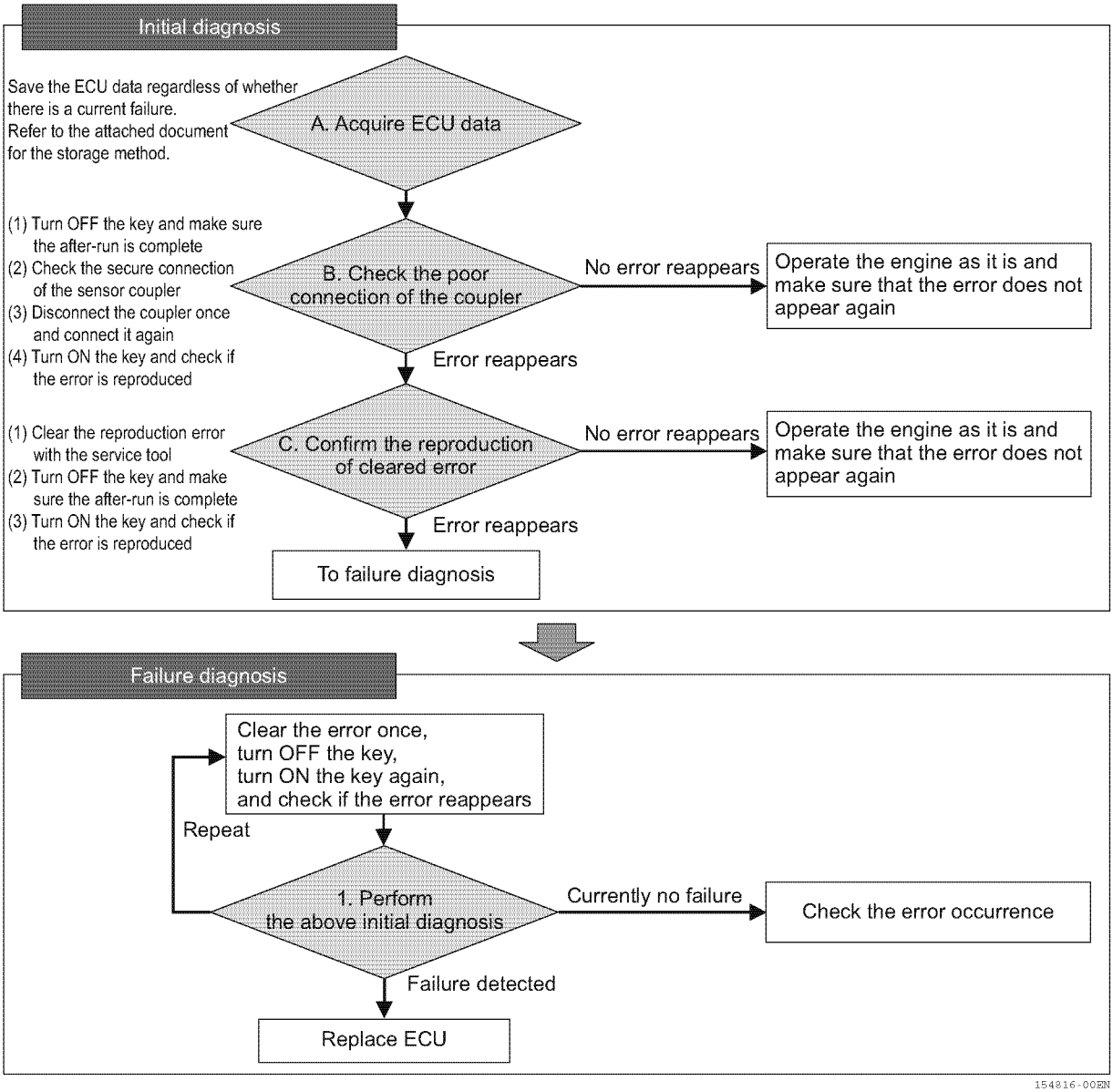
■ ECU internal related 5

● Related DTC

P code	P0607	CPU monitoring IC error
	P0606	CPU error
	P1601	EEPROM error
	P1602	Flash ROM error (checksum error)
	P1724	Communication error between micro computers (MSC communication error)
	P1725	Communication error between micro computers, SPI communication error (diagnosis: atmospheric pressure sensor abnormal)
	P1726	Communication error between micro computers, SPI communication error (diagnosis: monitoring micro computer abnormal)
	P060B	Micro computer internal A/D converter abnormal
	P1727	Injection stop circuit error during micro computer abnormality

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. If there is anything in the vicinity that emits electrical noise, keep it away.
   1- Clear the error, turn the key switch OFF, and turn the key ON after the after-run is completed.
   2- Connect SA-D and check if an error is currently detected in the failure display.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

2. Operation using SA-D
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the ECU.

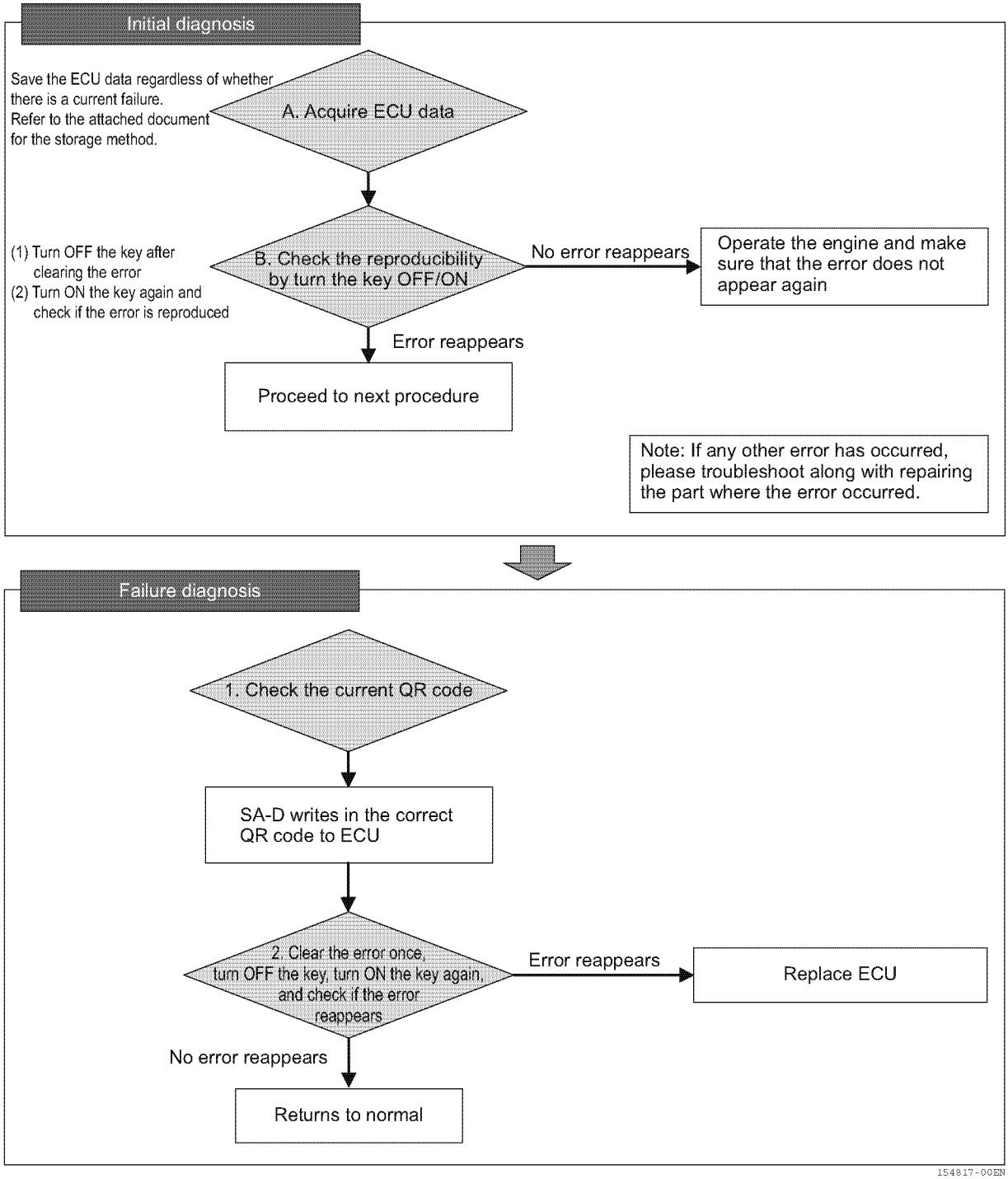
■ QR data 1

● Related DTC

P code	P1631	QR data not written

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the current QR code
   1- Press the injector replacing button in SA-D and check the current QR code written in the ECU. After that, perform the QR code writing.

2. Check the QR code after writing
   1- Check the current QR code corresponding to each cylinder by using the SA-D. Make sure that an abnormal code (QR correction value are all zeros, etc.) is not written. After the error is cleared, switch the key switch from ON to OFF, then make sure that there are no errors displayed.

Error indication	State
No	OK: Normal
Yes	NG: Error

NG	Replace the ECU.
OK	Normal

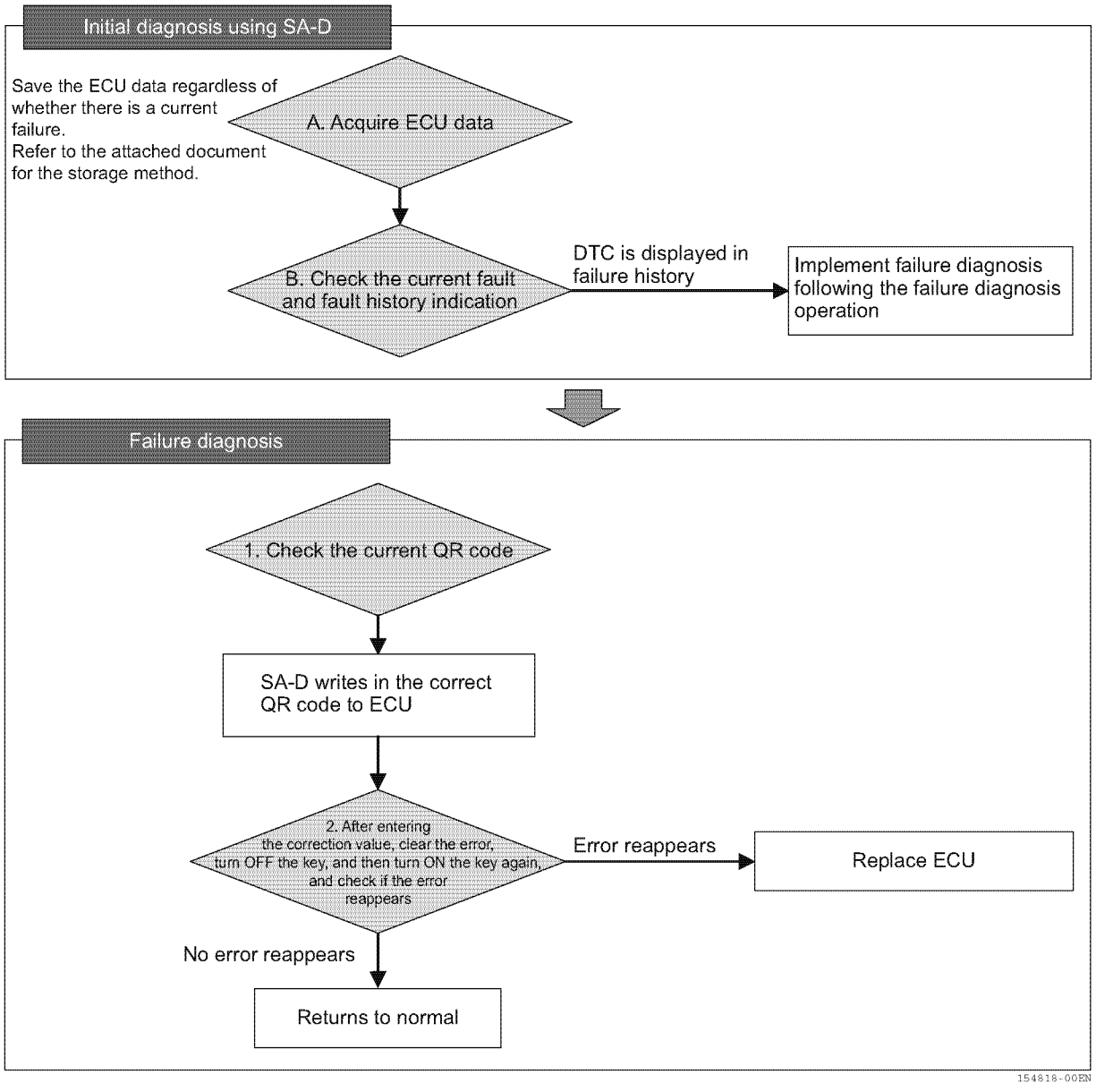
■ QR data 2

● Related DTC

P code	P1632	QR data error
	P1630	QR data correction input error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the current QR code
   1- Press the injector replacing button in SA-D and check the current QR code written in the ECU. After that, perform the QR code writing.

2. Check the QR code after writing
   1- Check the current QR code corresponding to each cylinder by using the SA-D. Make sure that an abnormal code (QR correction value are all zeros, etc.) is not written. Switch the key switch from ON to OFF, then make sure that there are no errors displayed.

Error indication	State
No	OK: Normal
Yes	NG: Error

NG	Replace the ECU.
OK	Normal

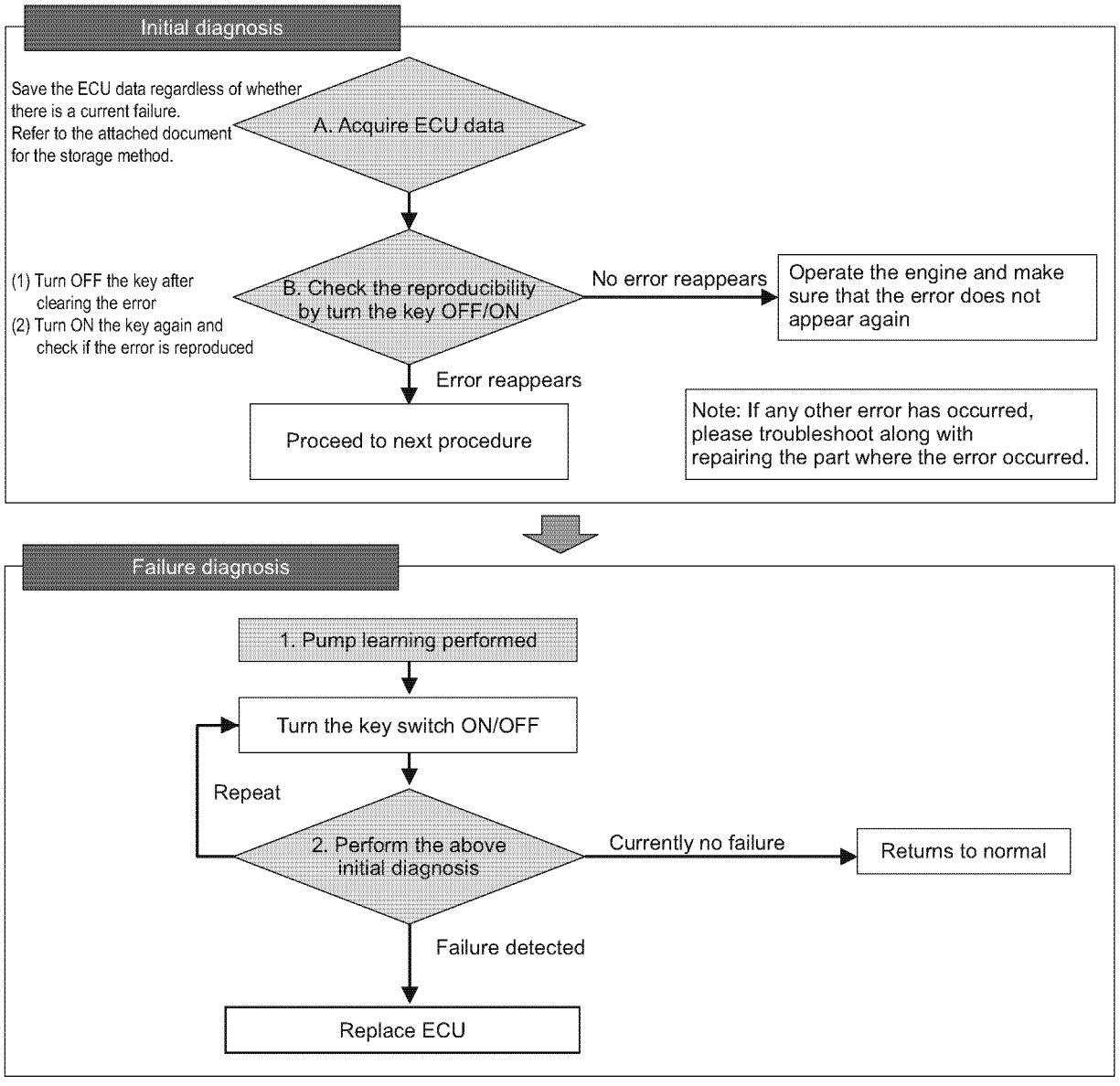
■ Pump learning not performed alarm

● Related DTC

P code	P1237	Pump learning not performed alarm

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Pump learning implementation
   1- Pump learning may not be implemented. Connect SA-D, and perform the pump learning by “Active control of Diagnosis Test”.

2. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Replace the ECU.

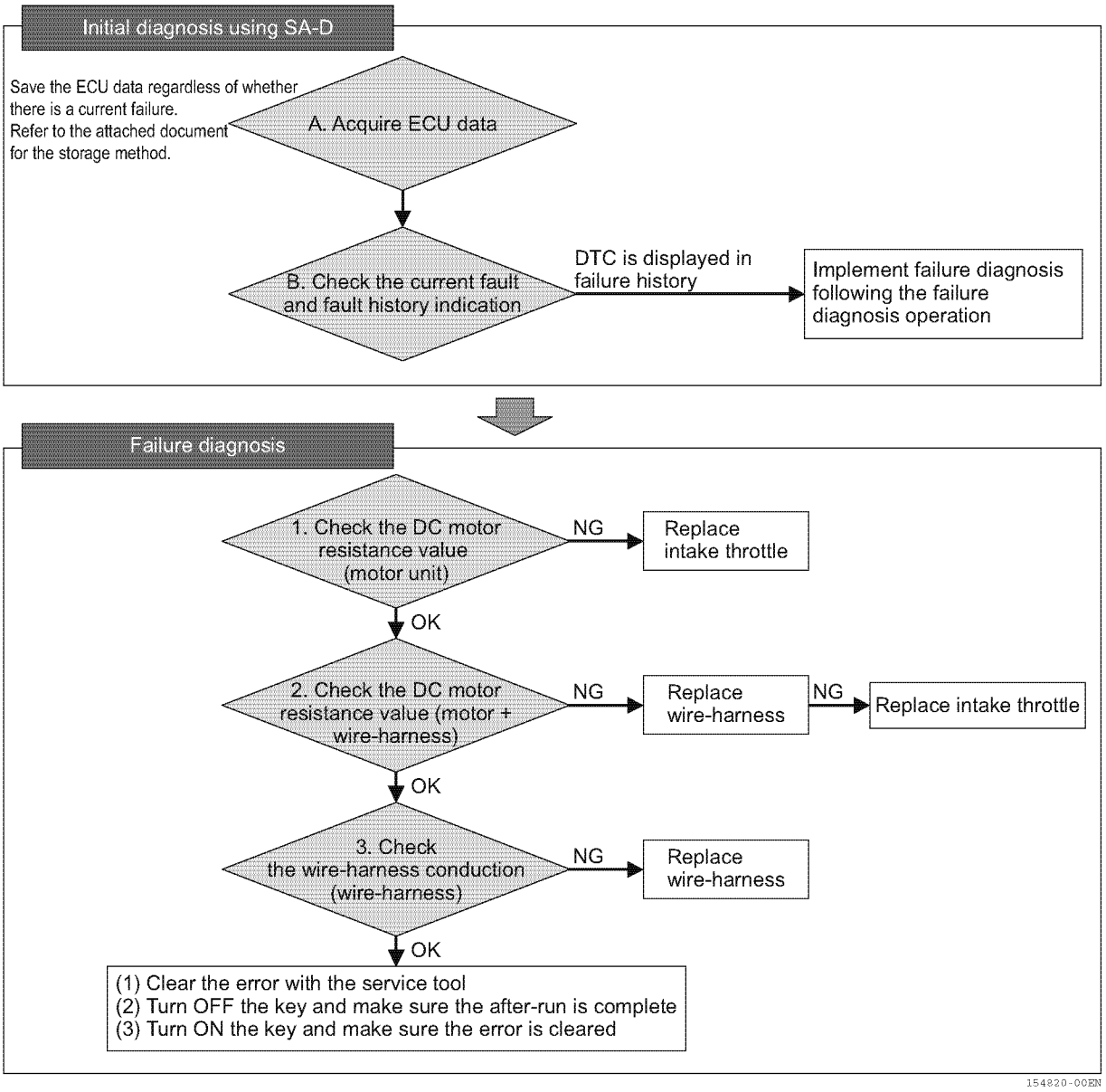
■ Intake throttle drive circuit

● Related DTC

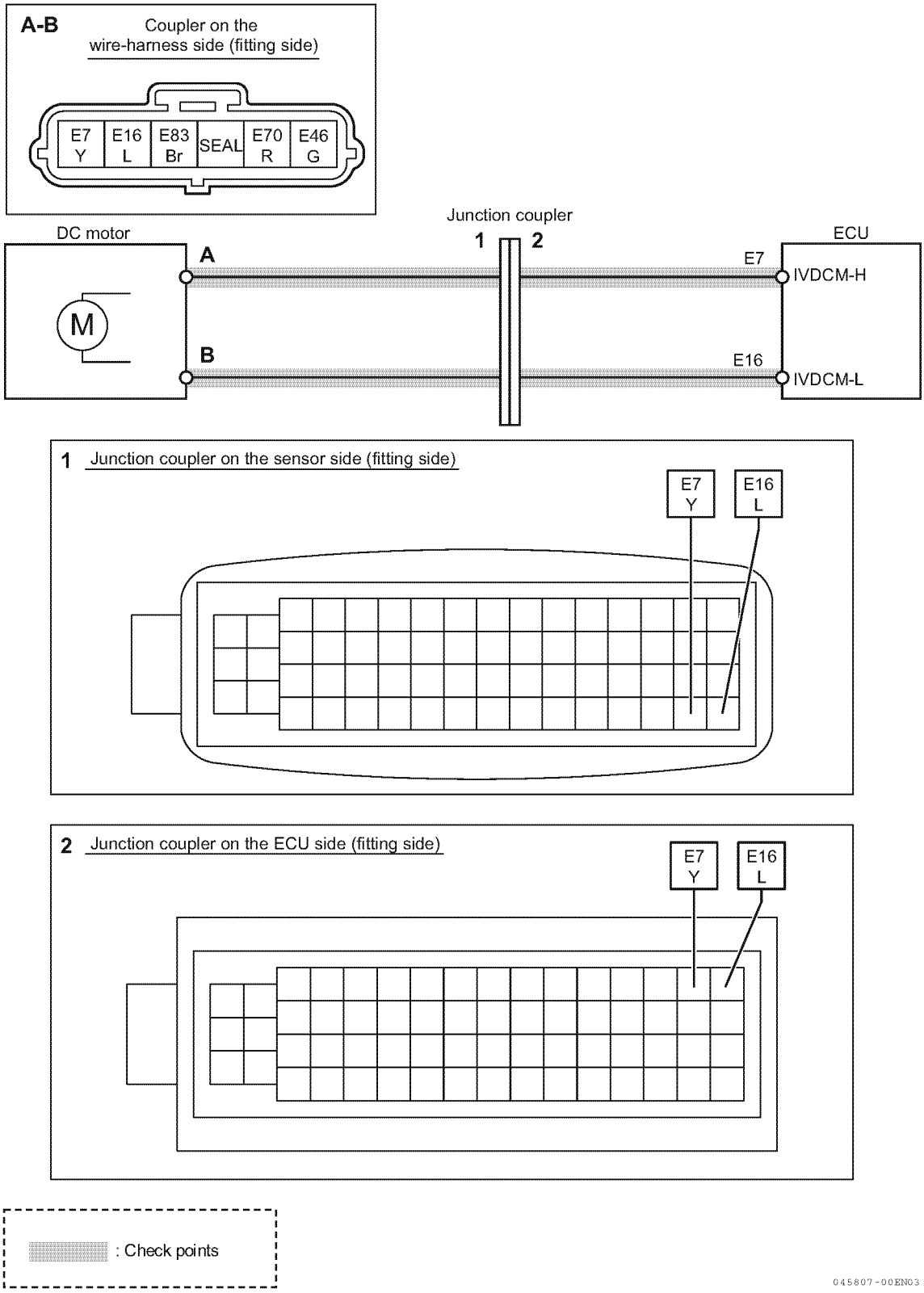
P code	P0660	Intake throttle drive circuit disconnection
	P1658	Intake throttle drive circuit VB/GND short circuit

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the DC motor resistance value (motor unit)
   1- Remove the DC motor from the wire-harness.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between DC motor terminals A and B.

Reference: Overall resistance value of DC motor
The resistance value of DC motor is under investigation.

NG	Replace the intake throttle.
OK	Go to “Checking the resistance value (motor + wire-harness)”

2. Checking the resistance value (motor + wire-harness)
   1- Connect the motor and the wire-harness. Remove the ECU from the wire-harness.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between ECU wire-harness couplers E7 and E16.

Note: See the above “Reference: Overall resistance value of DC motor”.

NG	• A coupler between the motor and the wire-harness may be defective. Replace the intake throttle. • Replace the wire-harness.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the DC motor and ECU. However, connect the junction coupler.
   2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below. However, when the intake throttle drive circuit VB/GND short-circuit is detected, perform the check pattern 1. When the intake throttle drive circuit disconnection is detected, perform the check pattern 2.

Reference: Intake throttle drive circuit conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
E7	VB/GND terminal	Yes	NG: Error
		No	OK: Normal
E16		Yes	NG: Error
		No	OK: Normal

Reference: Intake throttle drive circuit conduction check pattern 2

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (DC motor side wire-harness coupler)	Conduction	State
E7	Motor terminal A	Yes	OK: Normal
		No	NG: Error
E16	Motor terminal B	Yes	OK: Normal
		No	NG: Error

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	The coupler between the ECU and the wire-harness may be defective. Replace the wire-harness.

4. Check when an error (failure) is resolved by replacing parts
   In order to identify the part that caused the error (failure), when the part is replaced and the error is resolved, put back the original part and confirm that the error (failure) is reproduced.

Communication related

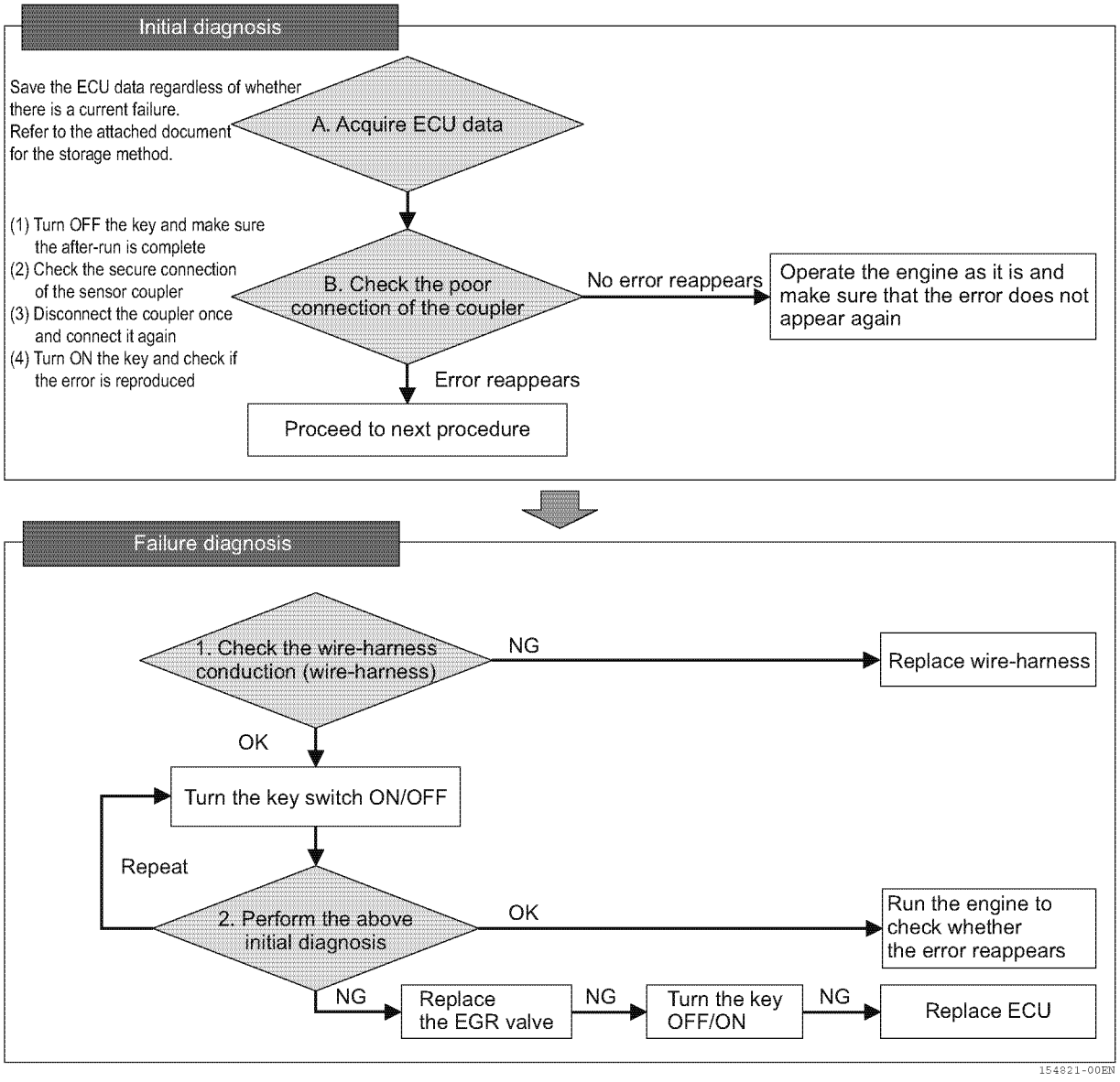
■ CAN (engine side) 1

● Related DTC

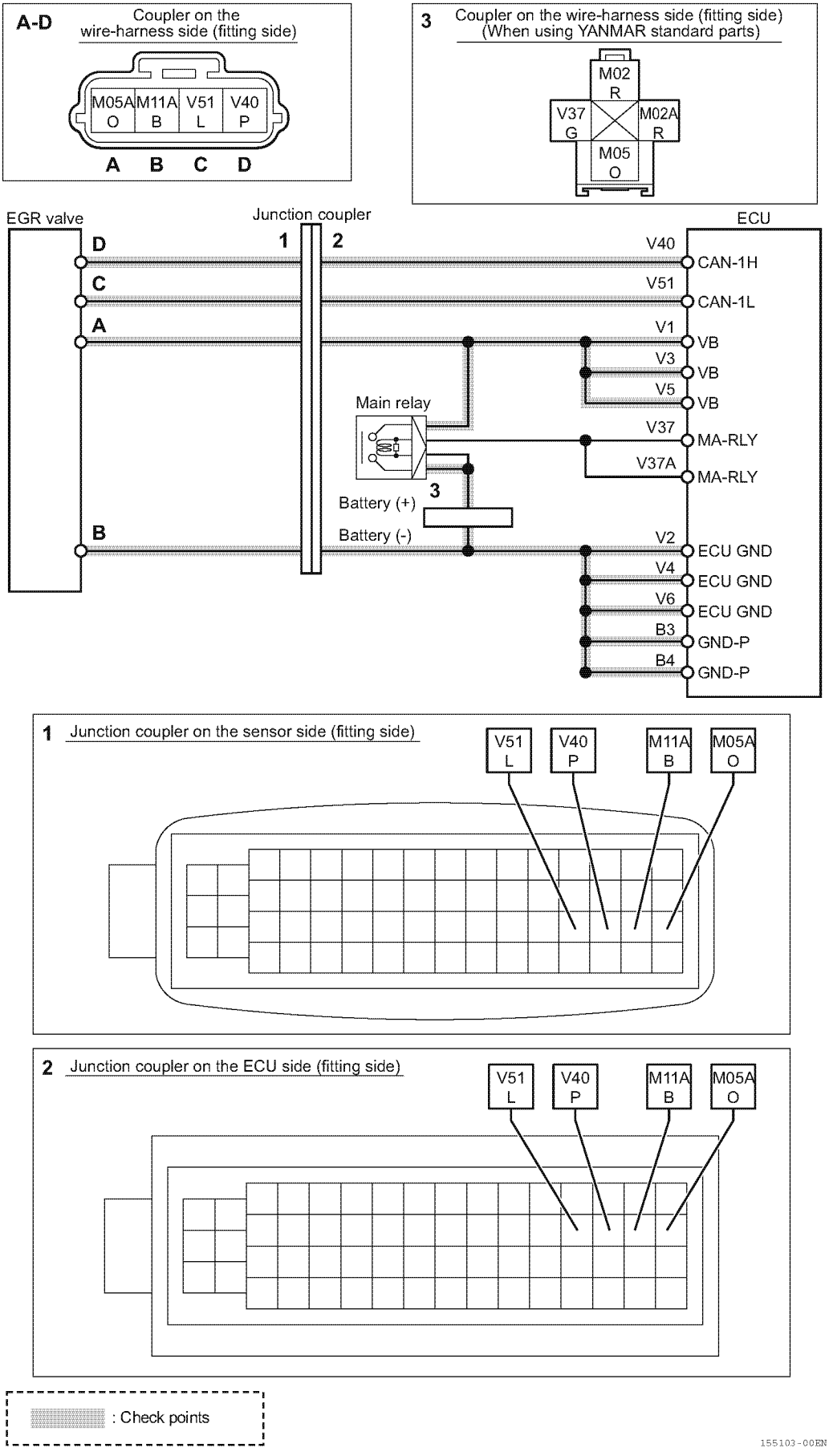
P code	U010B	CAN reception timeout from the EGR valve

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the wire-harness conduction
   1- Remove the wire-harness from the ECU and ECU of driven machine side.
   2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: CAN 1 line conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (EGR valve side wire-harness coupler)	Conduction	State
V40	V40	Yes	OK: Normal
		No	NG: Error
V51	V51	Yes	OK: Normal
		No	NG: Error

Reference: CAN 1 line conduction check pattern 2

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
V40	All terminals other than V40	Yes	NG: Error
		No	OK: Normal
V51	All terminals other than V51	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Operation using SA-D”

2. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	• Check the EGR valve operation. 1- Check the power supply to the EGR valve. 2- If there is no power supply to the EGR valve, check the conduction of the main relay, fuse, and power line. 3- If the power system is fine, replace the EGR valve. • Replace the EGR valve, turn the key OFF and after the after-run is completed, turn the key ON again, and when the error reappears, replace the ECU.

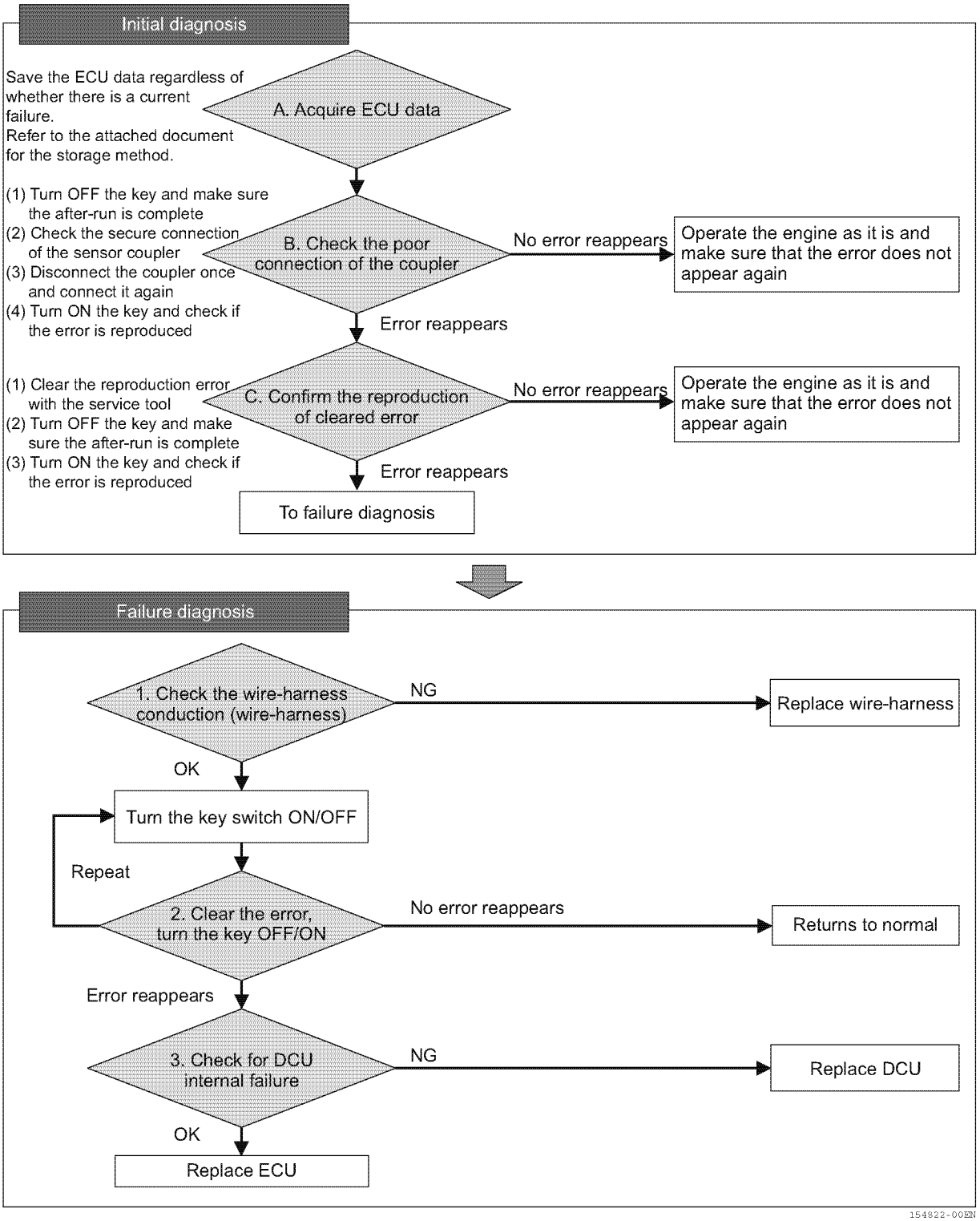
■ CAN (engine side) 2

● Related DTC

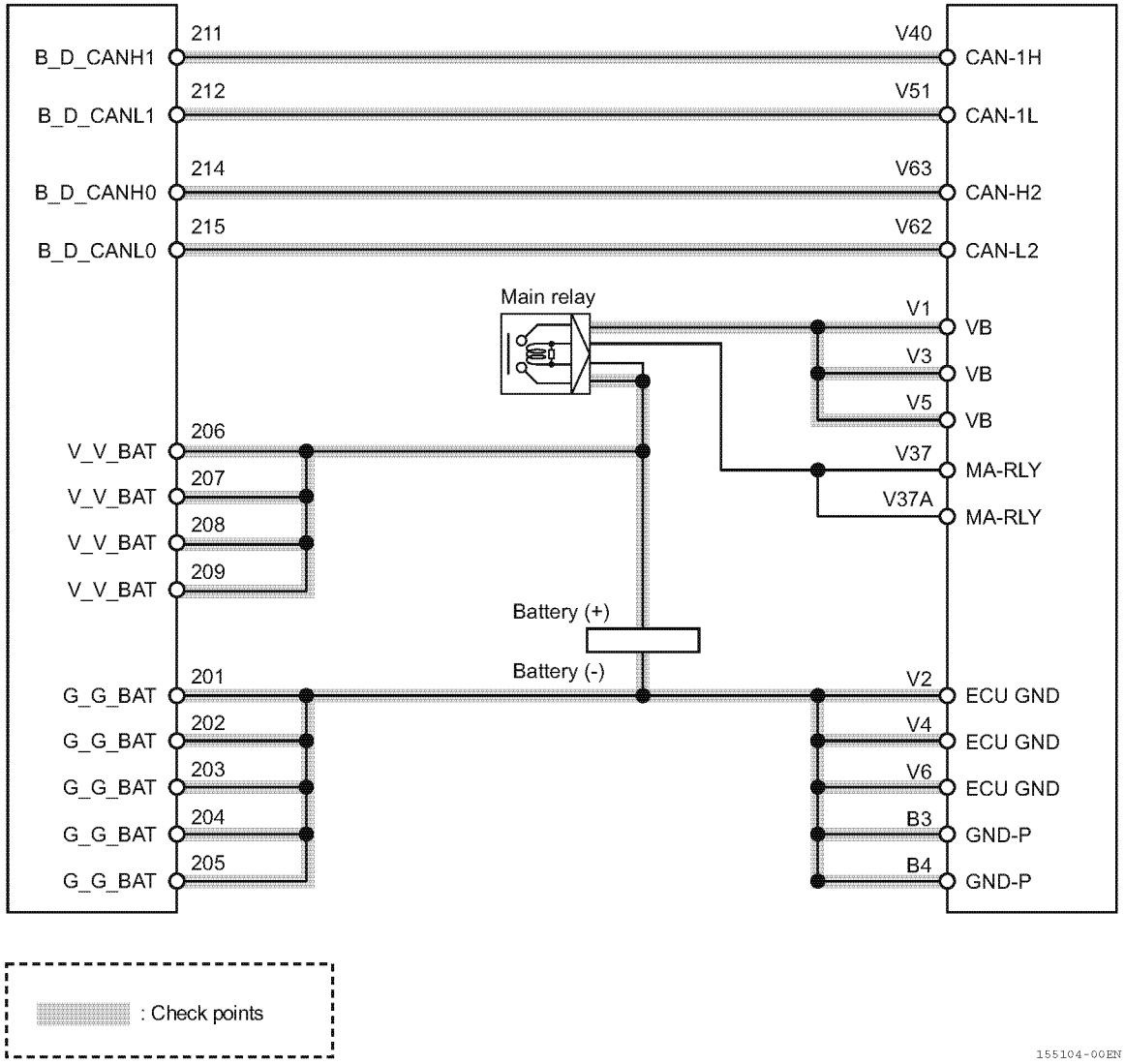
P code	U1501	CAN reception timeout from DCU
	U1502	Data verification error between ECU and DCU (verification timeout)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the wire-harness conduction
   1- Remove the wire-harness from the DCU and ECU.
   2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: CAN (engine side) line conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
V40	211	Yes	OK: Normal
		No	NG: Error
V51	212	Yes	OK: Normal
		No	NG: Error

Reference: CAN (driven machine side) line conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
V63	214	Yes	OK: Normal
		No	NG: Error
V62	215	Yes	OK: Normal
		No	NG: Error

Reference: CAN (engine side) line conduction check pattern 2

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
V40	All terminals other than V40	Yes	NG: Error
		No	OK: Normal
V51	All terminals other than V51	Yes	NG: Error
		No	OK: Normal

Reference: CAN (driven machine side) line conduction check pattern 2

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
V63	All terminals other than V63	Yes	NG: Error
		No	OK: Normal
V62	All terminals other than V62	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Operation using SA-D”

2. Operation using SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	• Check the DCU operation. 1- Check the power supply to the DCU. 2- If there is no power supply, check the conduction of the fuse and power line. 3- If the power system is fine, replace the DCU. • If an error related to a DCU internal fault has occurred, correct the error content. (see 3.3 DCU judgment item) • If there is no problem with the DCU, replace the ECU.

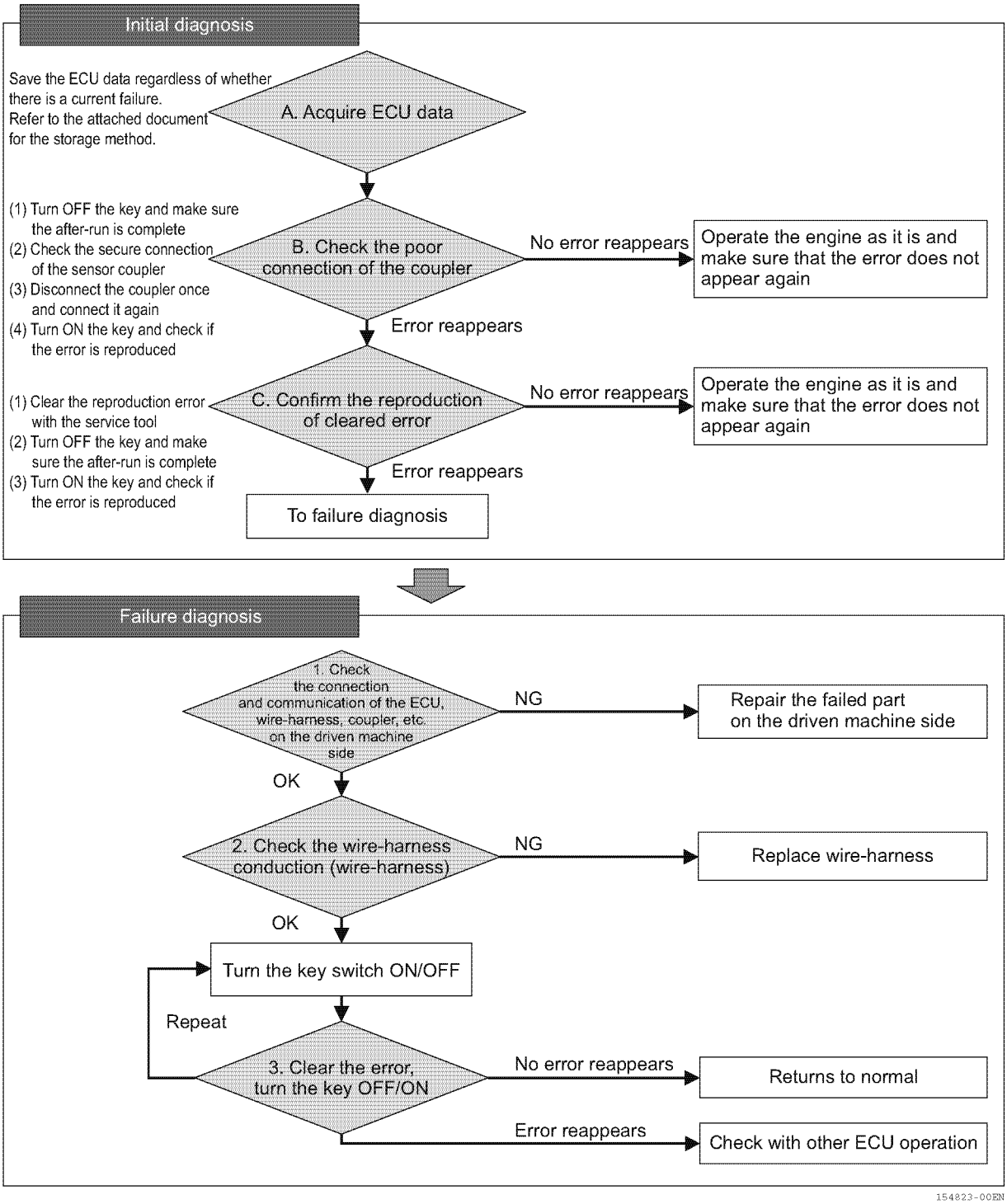
■ CAN (driven machine side)

● Related DTC

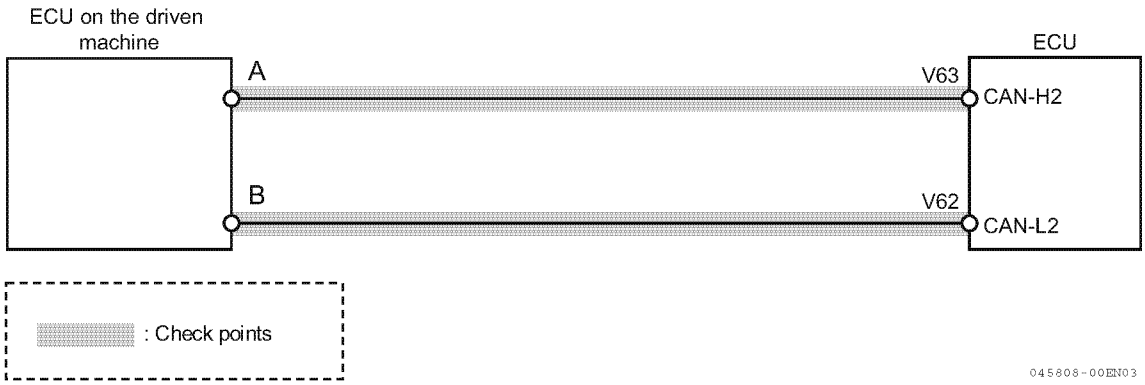
P code	U0292	TSC1 (SA1) reception timeout
	U1301	TSC1 (SA2) reception timeout
	U1292	Y_ECR1 reception timeout
	U1293	Y_EC reception timeout
	U1294	Y_RSS reception timeout
	U0168	VI reception timeout
	U3002	VI reception data error
	U1303	Y_DPFIF reception timeout
	U1302	EBC1 reception timeout
	U0167	Immobilizer error (CAN communication)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the connection and communication of the ECU, wire-harness, coupler, etc. on the implement side
   Carry out troubleshooting according to the implement's manual.

NG	Correct the defective part of the implement.
OK	Go to "Checking the wire-harness conduction".

2. Checking the wire-harness conduction
   1- Remove the wire-harness from the ECU and ECU of driven machine side.
   2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: CAN 2 conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on driven machine ECU)	Conduction	State
V63	Driven machine ECU terminal A	Yes	OK: Normal
		No	NG: Error
V62	Driven machine ECU terminal B	Yes	OK: Normal
		No	NG: Error

Reference: CAN 2 conduction check pattern 2

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
V63	All terminals other than V37	Yes	NG: Error
		No	OK: Normal
V62	All terminals other than V17	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	• The coupler between the ECU and the wire-harness may be defective. Replace the wire-harness. • Go to "Operation using SA-D" after wire-harness replacement.

3. Operation using SA-D
   1- After clearing the error, turn OFF the key switch and after the after-run is completed, turn ON the key switch again to start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	Normal
Yes	Check the operation of other ECUs.

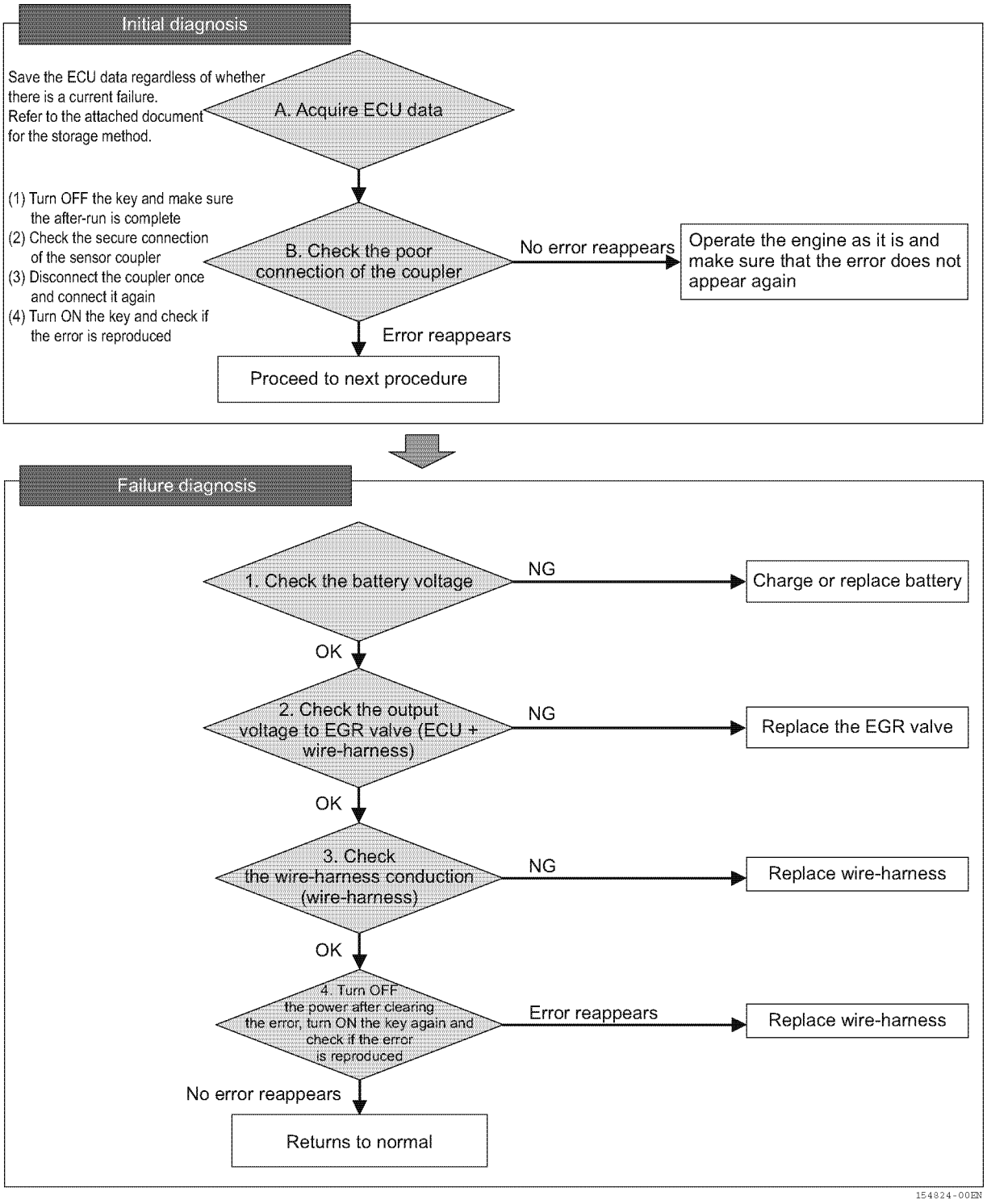
■ EGR valve 1

● Related DTC

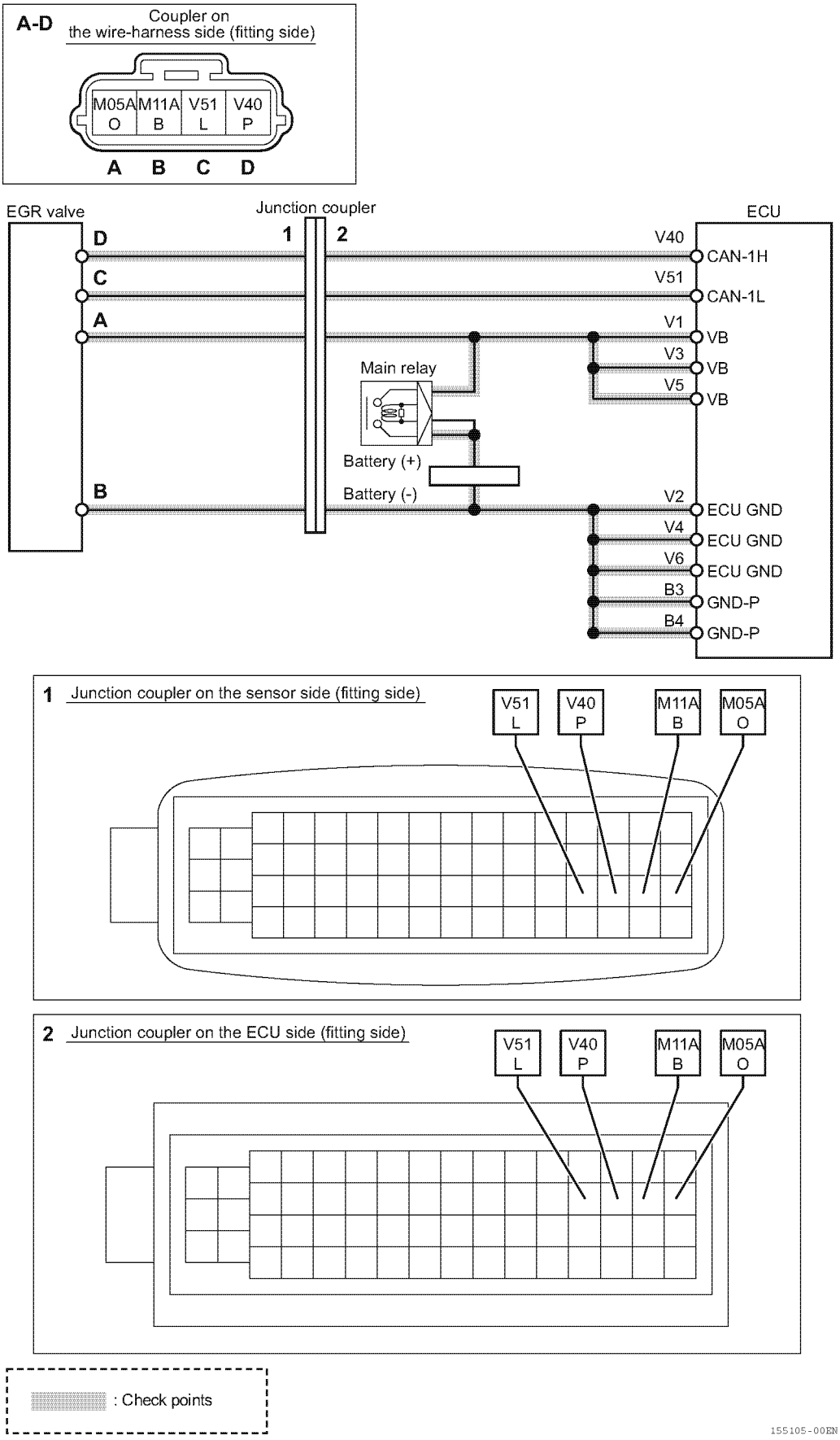
P code	P0404	EGR overvoltage error
	P1404	EGR low voltage error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P586 for the ECU pin layout.

● Work description

1. Checking the battery voltage

Turn ON the key switch and check the battery voltage.

1- Make sure that the battery voltage is not reduced due to the battery life.

2- Make sure that the battery output is not too high.

Reference: Battery voltage check pattern 1

Terminal 1 (Battery)	Terminal 2 (Battery)	Voltage (12 V specification)	Voltage (24 V specification)	State
Battery (+)	Battery (–)	8 V or lower	16 V or lower	NG: Error
		8 to 16 V	16 to 32 V	OK: Normal
		16 V or higher	32 V or higher	NG: Error

NG	Charge or replace the battery.
OK	Go to “Checking the output voltage to the EGR valve”.

2. Checking the output voltage to the EGR valve

1- Remove the EGR valve from the wire-harness.

2- Turn ON the key switch and check the battery voltage. Measure the wire-harness between A and B with reference to “Wire diagram”.

Reference: Battery voltage check pattern 2

Terminal 1 (EGR valve side wire-harness coupler)	Terminal 2 (EGR valve side wire-harness coupler)	Voltage (12 V specification)	Voltage (24 V specification)	State
A (M05A)	B (M11A)	8 V or lower	13 V or lower	NG: Error
		8 to 18 V	13 to 35 V	OK: Normal
		18 V or higher	35 V or higher	NG: Error

NG	Replace the EGR valve.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the EGR valve and the ECU.
   2- While referring to the P586 "ECU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: EGR valve conduction check pattern 1

Terminal 1 (Wire-harness coupler on ECU side)	Terminal 2 (EGR valve side wire-harness coupler)	Conduction	State
V1/V3	EGR valve terminal A	Yes	OK: Normal
		No	NG: Error
V2/V4/V6/V72	EGR valve terminal B	Yes	OK: Normal
		No	NG: Error
V40*1	EGR valve terminal D	Yes	OK: Normal
		No	NG: Error
V51*1	EGR valve terminal C	Yes	OK: Normal
		No	NG: Error

**1: Although it is not a battery line, the abnormal signal may be transmitted due to disconnection/short circuit. Check the condition.*

Reference: EGR valve conduction check pattern 2

Terminal 1 (EGR valve side wire-harness coupler)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
EGR valve terminal A	All terminals other than V1 and V3	Yes	NG: Error
		No	OK: Normal
EGR valve terminal B	All terminals other than GND	Yes	NG: Error
		No	OK: Normal
EGR valve terminal D*1	All terminals other than V40	Yes	NG: Error
		No	OK: Normal
EGR valve terminal C*1	All terminals other than V51	Yes	NG: Error
		No	OK: Normal

**1: Although it is not a battery line, the abnormal signal may be transmitted due to disconnection/short circuit. Check the condition.*

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	• The coupler between the ECU and the wire-harness may be defective. Replace the wire-harness. • Turn the key OFF and after the after-run is completed, turn the key ON again, and check if the error reappears.

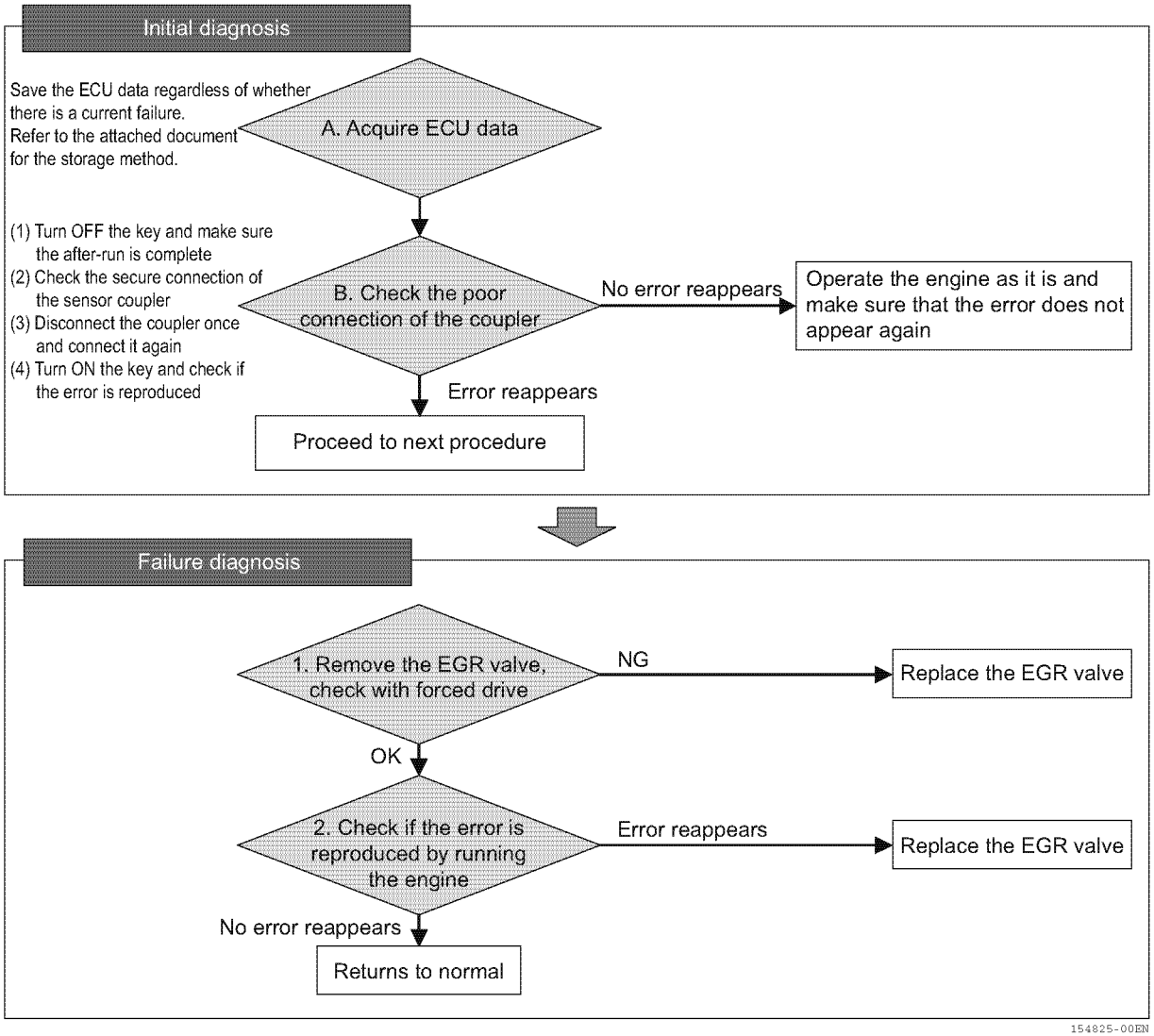
■ EGR valve 2

● Related DTC

P code	P0403	Disconnection in EGR motor coils
	P1405	EGR valve short circuit in motor coils
	P0488	EGR position sensor error
	P1409	EGR feedback error
	P148A	EGR valve sticking error
	P049D	EGR initialization error
	U0401	EGR ECM data error
	U1401	EGR target value out of range
	P1410	EGR high temperature thermistor error
	P1411	EGR low temperature thermistor error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Removing the EGR valve, check with forced drive

   Check if the EGR valve operates with forced drive by SA-D.

NG	Replace the EGR valve.
OK	Go to “Checking if the error is reproduced by running the engine”.

2. Checking if the error is reproduced by running the engine

Error reappears	Replace the EGR valve.
No error reappears	Returns to normal.

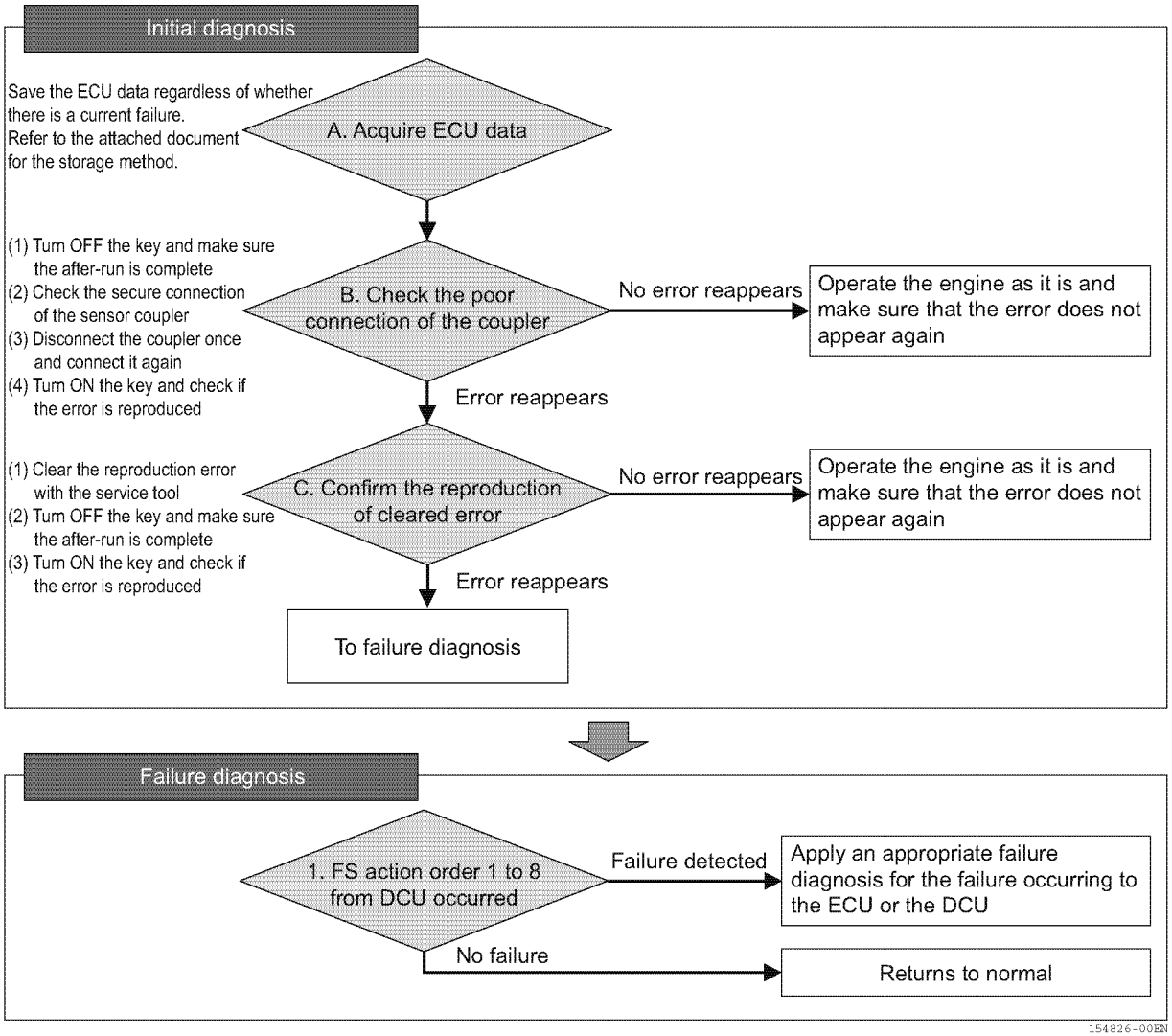
■ DCU system error

● Related DTC

P code	U1503	DCU system error (FS action instruction 1 from DCU)
	U1504	DCU system error (FS action instruction 2 from DCU)
	U1505	DCU system error (FS action instruction 3 from DCU)
	U1506	DCU system error (FS action instruction 4 from DCU)
	U1507	DCU system error (FS action instruction 5 from DCU)
	U1508	DCU system error (FS action instruction 6 from DCU)
	U1509	DCU system error (FS action instruction 7 from DCU)
	U1510	DCU system error (FS action instruction 8 from DCU)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. When this error is detected, other errors that cause the FS action instruction in ECU or DCU are also detected at the same time. Be sure to perform the failure diagnosis for the respective part first.

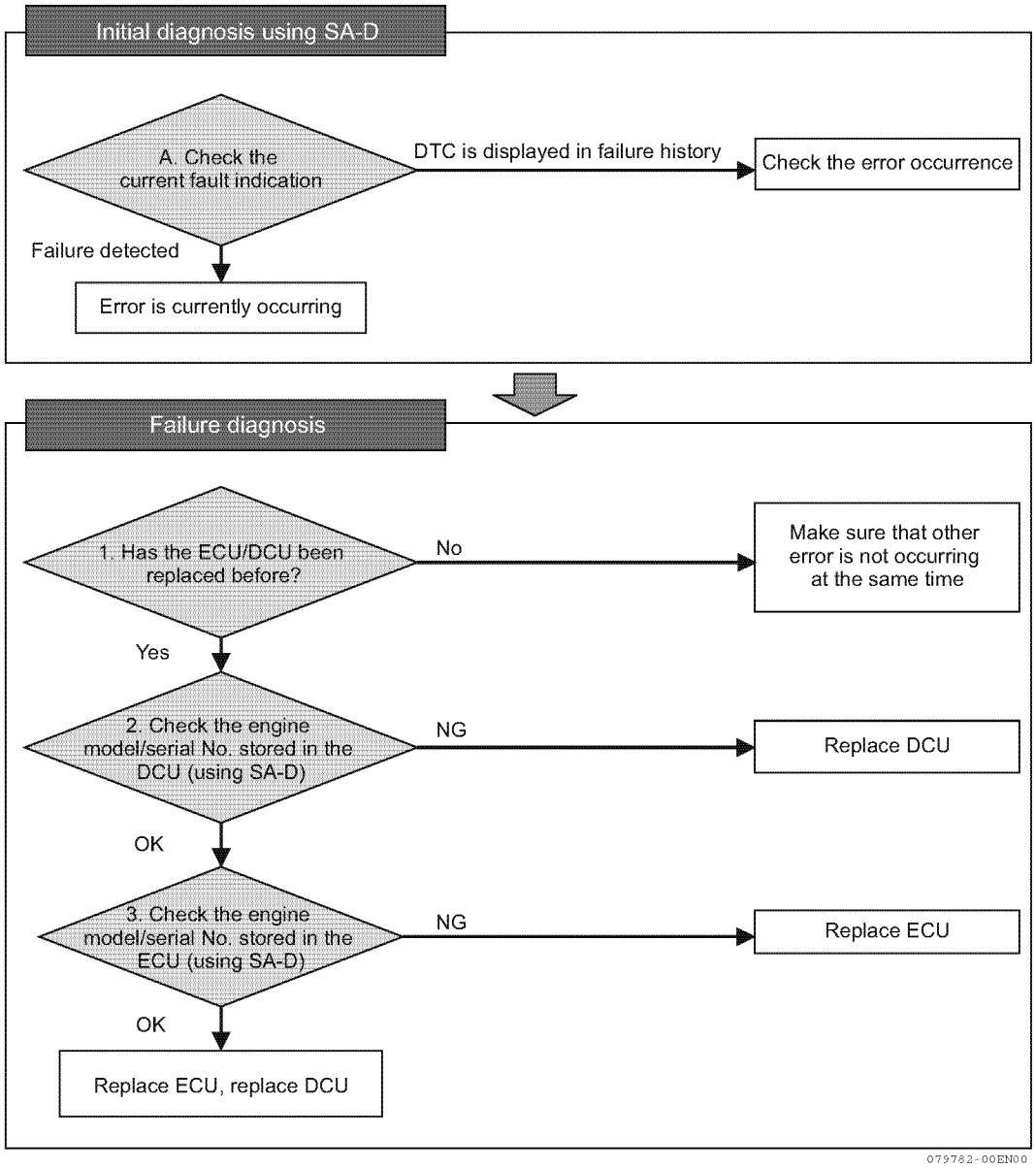
■ Data verification between ECU and DCU

● Related DTC

P code	P1672	Data verification error between ECU and DCU (engine model unmatched)
	P264F	Data verification error between ECU and DCU (serial No. unmatched)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the replacement history of ECU or DCU
   1- Check if a customer has replaced the ECU or DCU.

No replacement	Check to see whether any errors related to inside the ECU or DCU are detected.
With replacement	Go to “Checking the engine model/serial No. stored in the DCU (using SA-D)”.

2. Checking the engine model/serial No. stored in the DCU (using SA-D)
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Check the engine model and engine serial No. (on nameplate) of DCU indicated in “ECU Specification/Structure: ECU ID Data” of SMARTASSIST-DIRECT (SA-D) are same as the engine model and engine serial No. indicated on engine nameplate.

NG	Replace the DCU.
OK	Go to “Checking the engine model/serial No. stored in the ECU (using SA-D)”.

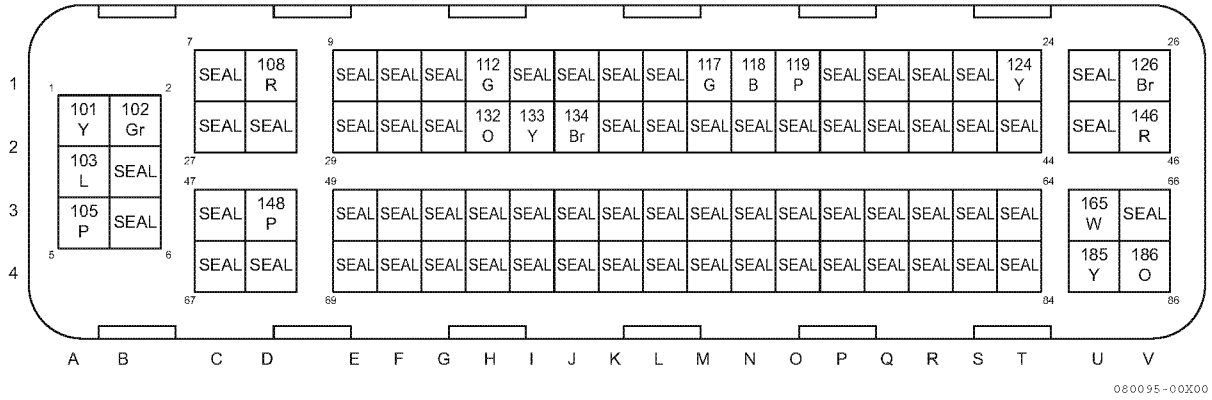
3. Checking the engine model/serial No. stored in the ECU (using SA-D)
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Check the engine model and engine serial No. (on nameplate) of ECU indicated in “ECU Specification/Structure: ECU ID Data” of SMARTASSIST-DIRECT (SA-D) are same as the engine model and engine serial No. indicated on engine nameplate.

NG	Replace the ECU.
OK	• Replace the ECU. • Replace the DCU.

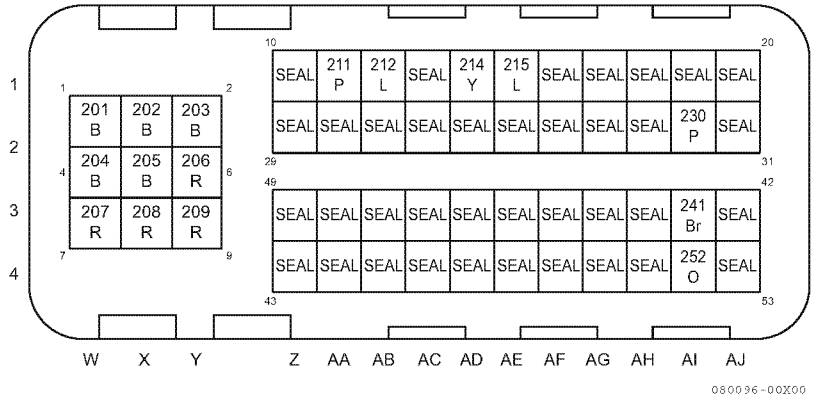
DCU Judgment Item

■ DCU pin layout drawing

DCU engine side (wire-harness side)



DCU body side (wire-harness side)



No.	Terminal name	Code
101	Pressure line heater	O_S_HH1
102	Back flow line heater	O_S_HH2
103	Supply module heater	O_S_SMH
105	External 12V	O_V_SMH
108	External 12V	O_V_RATH
112	Dosing module (Low-side)	O_T_RAMVL
117	Reduction agent pressure sensor	I_A_PRAS
118	Analog GND	G_R_PRAS
119	Sensor 5V	V_V_5VPRAS
124	Reduction agent pump motor	O_T_RAPMP
126	Motor GND	G_G_RAPMP
132	Dosing module (High-side)	O_T_RAMVH
133	SCR catalyst temperature sensor	I_A_CATTS1
134	Analog GND	G_R_CATTS1
146	External 12V	O_V_RAPMP
148	Suction line heater	O_S_HH3
165	Reduction agent reverting valve	O_S_RARV
185	Urea water tank heating valve	O_S_RATH
186	External 12V	O_V_RARV
201	DCU GND	G_G_BAT
202	DCU GND	G_G_BAT
203	DCU GND	G_G_BAT
204	DCU GND	G_G_BAT
205	DCU GND	G_G_BAT
206	VB	V_V_BAT
207	VB	V_V_BAT
208	VB	V_V_BAT
209	VB	V_V_BAT
211	CAN-H1	B_D_CANH1
212	CAN-L1	B_D_CANL1
214	CAN-H0	B_D_CANH0
215	CAN-L0	B_D_CANL0
230	External 12V	O_V_HHRLY
241	Heater relay	O_S_HHRLY
252	Key switch on	I_S_T15

Sensor related

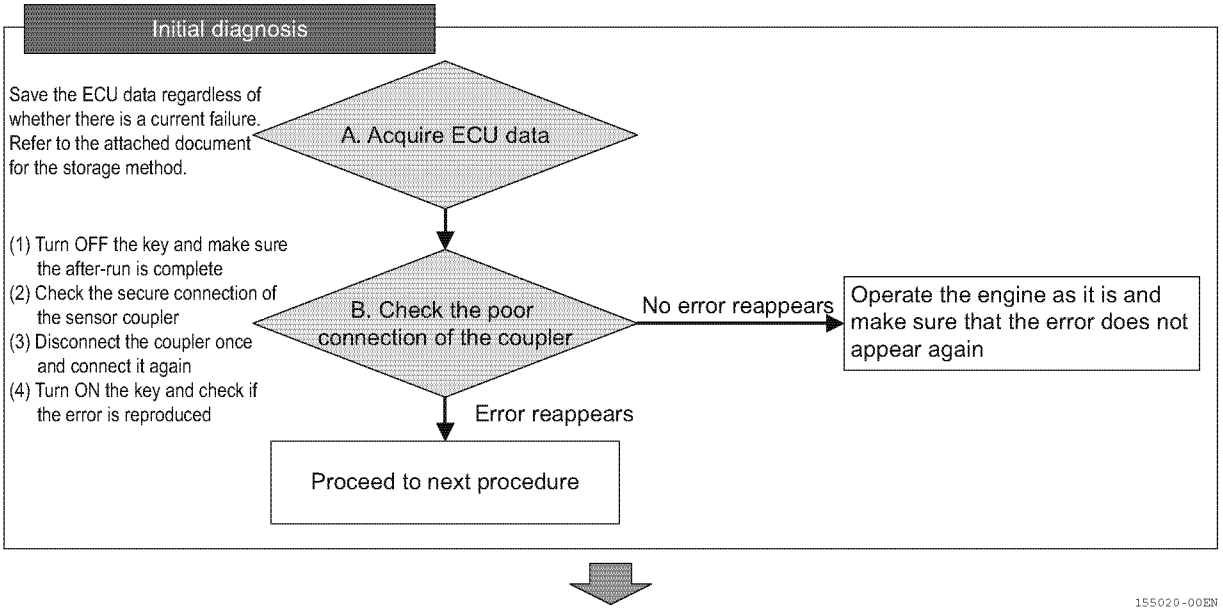
■ SCR upstream NOx sensor 1

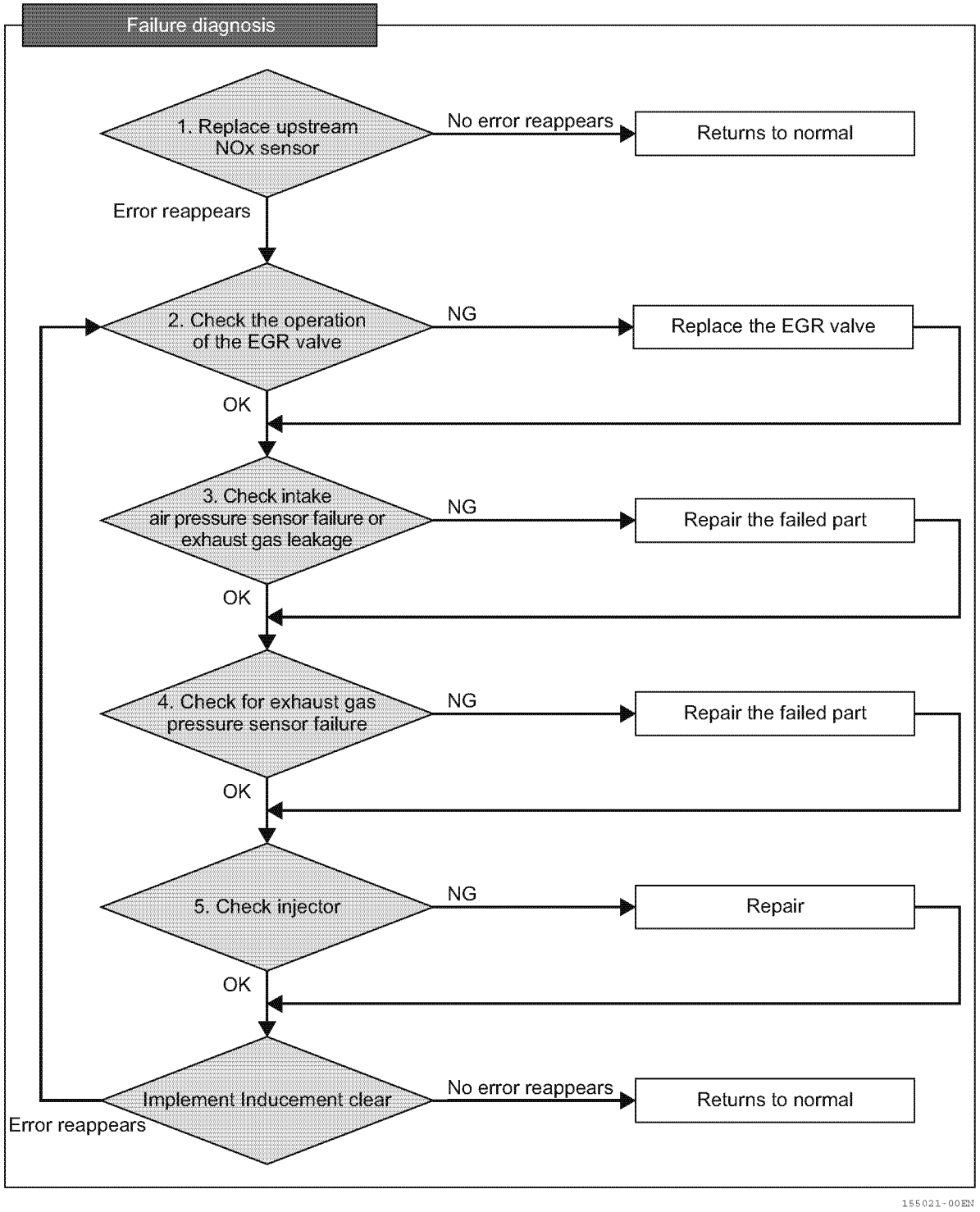
● Related DTC

P code	P1545	SCR upstream NOx value rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Replace upstream NOx sensor
No error reappears
Returns to normal
Error reappears
2. Check the operation of the EGR valve
NG
Replace the EGR valve
OK
3. Check intake air pressure sensor failure or exhaust gas leakage
NG
Repair the failed part
OK
4. Check for exhaust gas pressure sensor failure
NG
Repair the failed part
OK
5. Check injector
NG
Repair
OK
Implement Inducement clear
No error reappears
Returns to normal
Error reappears
155021-00EN

● Work description

1. Replacing the upstream NOx sensor
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Replace the NOx sensor.
   3- Turn the key switch ON to clear Inducement.
   4- Turn OFF the key switch again and make sure the after-run is complete.
   5- Turn ON the key switch and run the engine, and check if the error reappears.

Error reappears	Go to “Checking the operation of the EGR valve”.
No error reappears	Returns to normal.

2. Checking the operation of the EGR valve
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the EGR valve from the engine.
   3- Turn ON the key switch.
   4- Activate the EGR valve using “Active control of Diagnosis Test” of SMARTASSIST-Direct (SA-D), and make sure that the EGR valve position changes from opening to all closed.

NG	• Replace the EGR valve. • After replacement, turn the key switch ON to clear Inducement. • Turn OFF the key switch again and make sure the after-run is complete. • Turn ON the key switch and run the engine. Error reappears: Go to “Checking the intake air pressure sensor failure or exhaust gas leakage”. No error reappears: Returns to normal.
OK	Go to “Checking the intake air pressure sensor failure or exhaust gas leakage”.

3. Checking the intake air pressure sensor failure or exhaust gas leakage
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check for leaks from the intake air pressure sensor hose.
   3- Perform troubleshooting for “intake air pressure sensor 1”.

NG	• Repair the installation condition of sensor. • After repairing, turn the key switch ON to clear Inducement. • Turn OFF the key switch again and make sure the after-run is complete. • Turn ON the key switch and run the engine. Error reappears: Go to “Checking for exhaust gas pressure sensor failure”. No error reappears: Returns to normal.
OK	Go to “Checking for exhaust gas pressure sensor failure”.

4. Checking for exhaust gas pressure sensor failure

1- Perform the failure diagnosis for “Exhaust gas pressure sensor 1”.

Results of “Exhaust gas pressure sensor 1”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • After repairing, turn the key switch ON to clear Inducement. • Turn OFF the key switch again and make sure the after-run is complete. • Turn ON the key switch and run the engine. Error reappears: Go to “Checking the injector”. No error reappears: Returns to normal.
OK	Go to “Checking the injector”.

5. Checking the injector

1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

2- Remove the injector, and make sure that there is nothing wrong (e.g. deposition) with the nozzle.

3- The engine operation after correction is performed by activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	260 °C or higher
NOx sensor heater release	“1” (NOx sensor heater release is completed.)

4- Keep on operating the engine under conditions meeting the reference value for 10 minutes or more, and make sure no error is detected in the current fault indication.

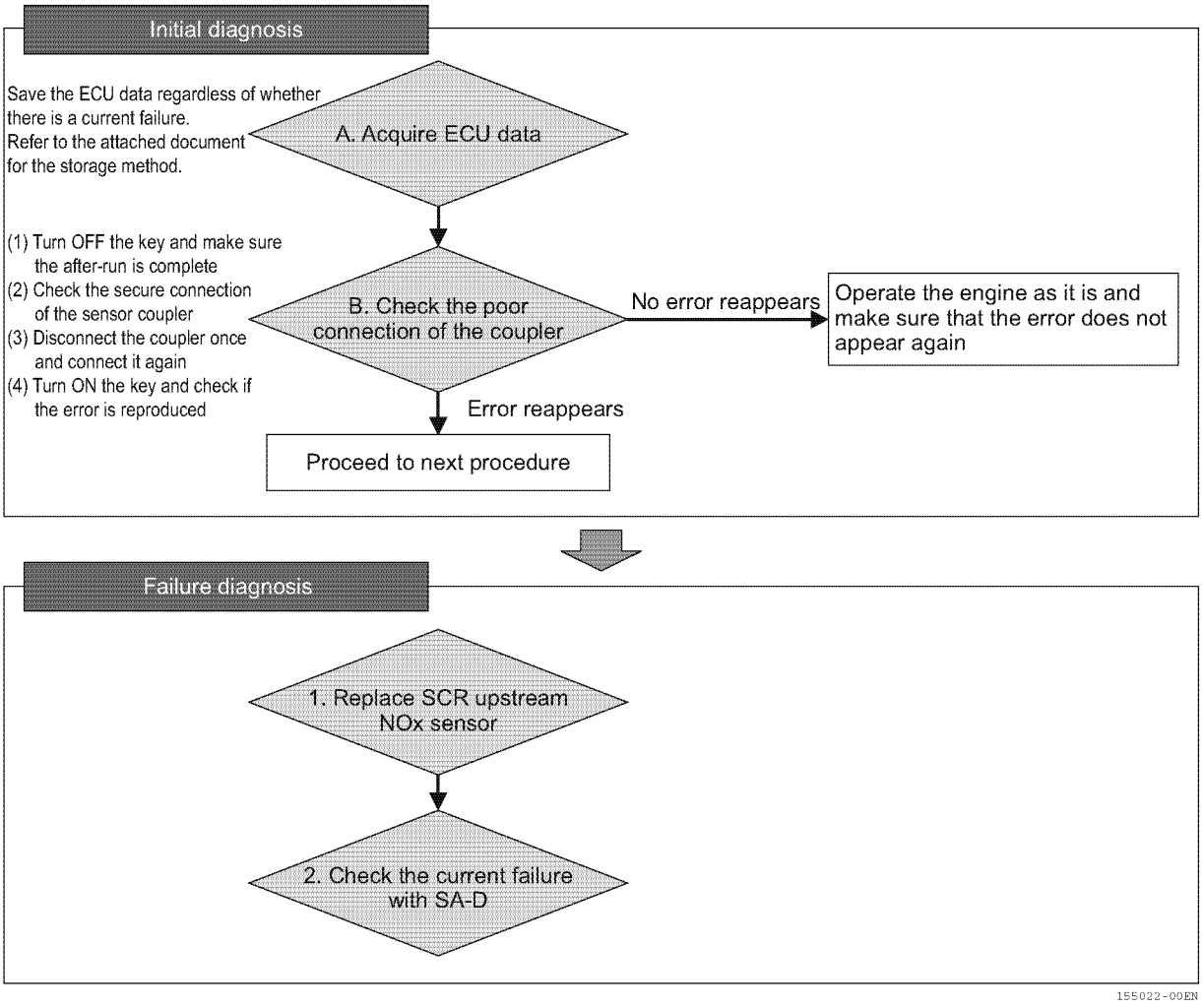
■ SCR upstream NOx sensor 2

● Related DTC

P code	P2209	SCR upstream NOx sensor incomplete heating error
	P2203	SCR upstream NOx sensor internal circuit short circuit
	P151C	SCR upstream NOx sensor internal circuit disconnection

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Replacing the SCR upstream NOx sensor
   Internal circuit of SCR upstream NOx sensor may be defective.
   Replace the SCR upstream NOx sensor.

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	260 to 500 °C
NOx sensor heater release	“1” (NOx sensor heater release is completed.)

   5- Keep on operating the engine under conditions meeting the reference value for 10 minutes or more, and make sure no error is detected in the current fault indication.

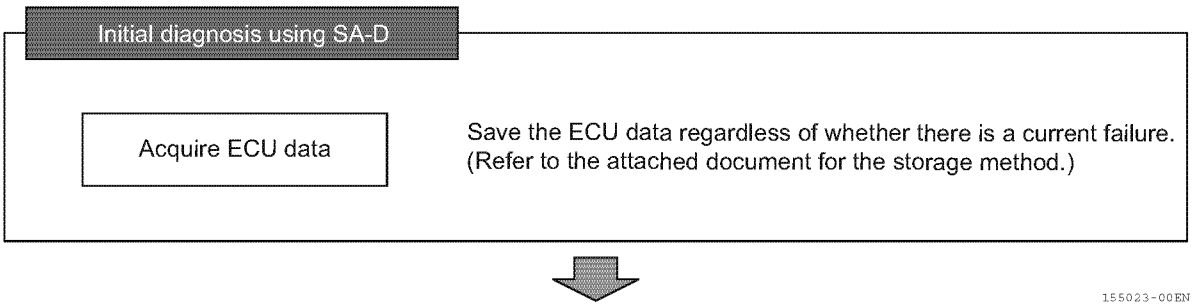
■ SCR upstream NOx sensor 3

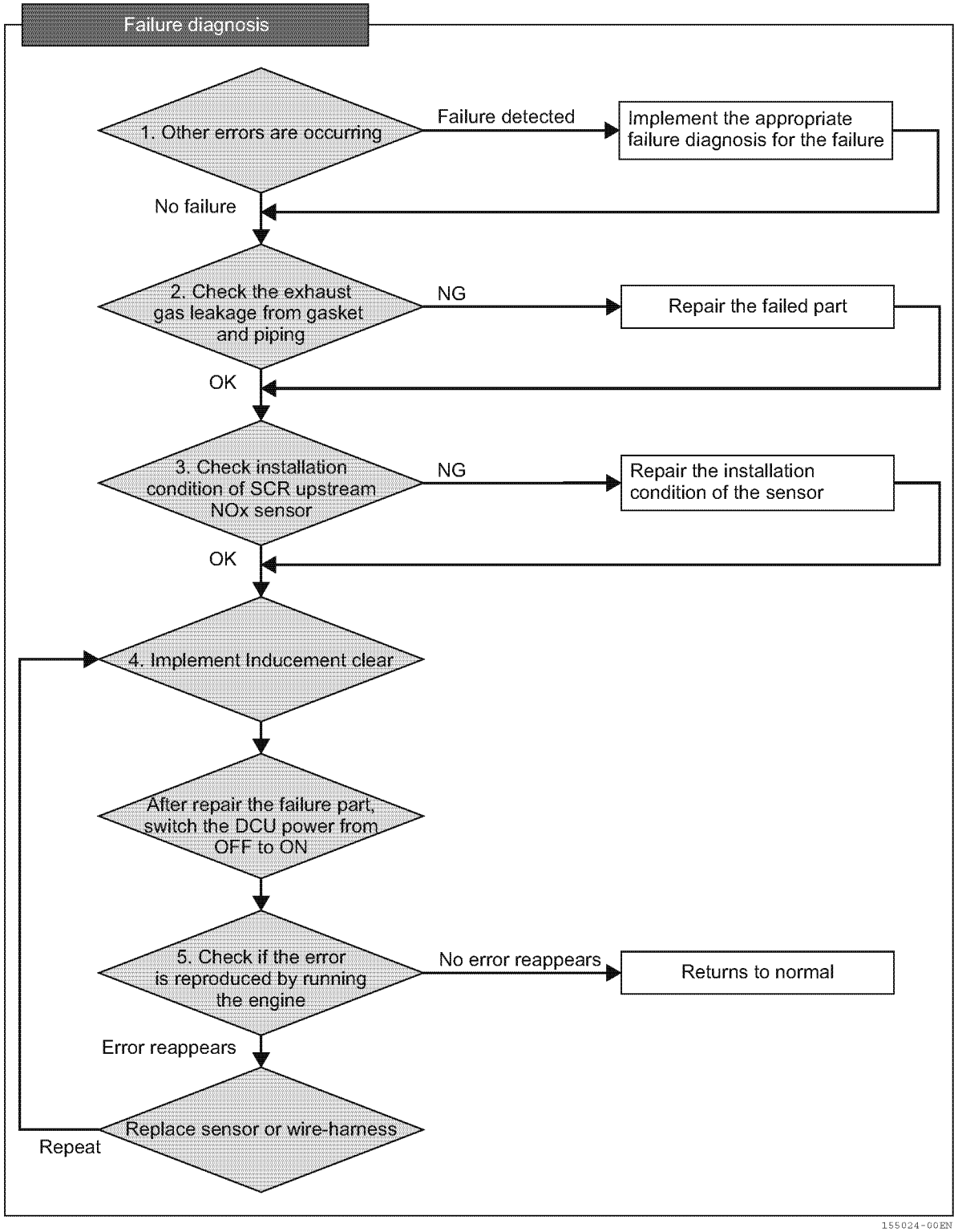
● Related DTC

P code	P1525	SCR upstream NOx sensor detected value error (upper limit error)
	P1526	SCR upstream NOx sensor detected value error (lower limit error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the exhaust gas leakage from gasket and piping
NG
Repair the failed part
OK
3. Check installation condition of SCR upstream NOx sensor
NG
Repair the installation condition of the sensor
OK
4. Implement Inducement clear
After repair the failure part, switch the DCU power from OFF to ON
5. Check if the error is reproduced by running the engine
No error reappears
Returns to normal
Error reappears
Replace sensor or wire-harness
Repeat
155024-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the exhaust pipe system" after treatment.
No error detected	Go to "Checking the exhaust pipe system".

2. Checking the exhaust pipe system
   1- Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

NG	• Repair the defective parts. • Go to "Checking installation condition of SCR upstream NOx sensor" after repair.
OK	Go to "Checking installation condition of SCR upstream NOx sensor".

3. Checking installation condition of SCR upstream NOx sensor
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the installation condition of SCR upstream NOx sensor (whether SCR upstream NOx sensor is not disconnected from piping, damaged, and deformed).

NG	• Repair the installation condition of sensor. If sensor is damaged, replace it. • Go to "Implementation of Inducement clear" after repair or replacement.
OK	Go to "Implementation of Inducement clear".

4. Implementation of Inducement clear
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU).
   3- Turn ON the key switch again.
   4- Activate "Configuration of settings" of SA-D, and implement the Inducement clear. (Write "1" in data.)
   5- Go to "Checking the current failure with SA-D".

   Note: When Inducement clear is implemented, the current malfunction is temporarily released. To check that no error is detected, make sure to perform "Checking the current failure with SA-D".

5. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	260 °C or higher
NOx sensor heater release	“1” (NOx sensor heater release is completed.)
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Battery voltage	10 to 16 V

   5- Keep on operating the engine under conditions meeting the above reference value for 10 minutes or more, and make sure that the reference value is met.

Item	Reference value
SCR catalyst upstream NOx concentration	SCR catalyst upstream NOx concentration > SCR catalyst downstream NOx concentration (after NOx sensor correction)
SCR catalyst downstream NOx concentration (after NOx sensor correction)	

NG	• Replace the SCR upstream NOx sensor. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Current fault indication check”.

   6- Make sure no error is detected in the current fault indication.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Replace the SCR upstream NOx sensor. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

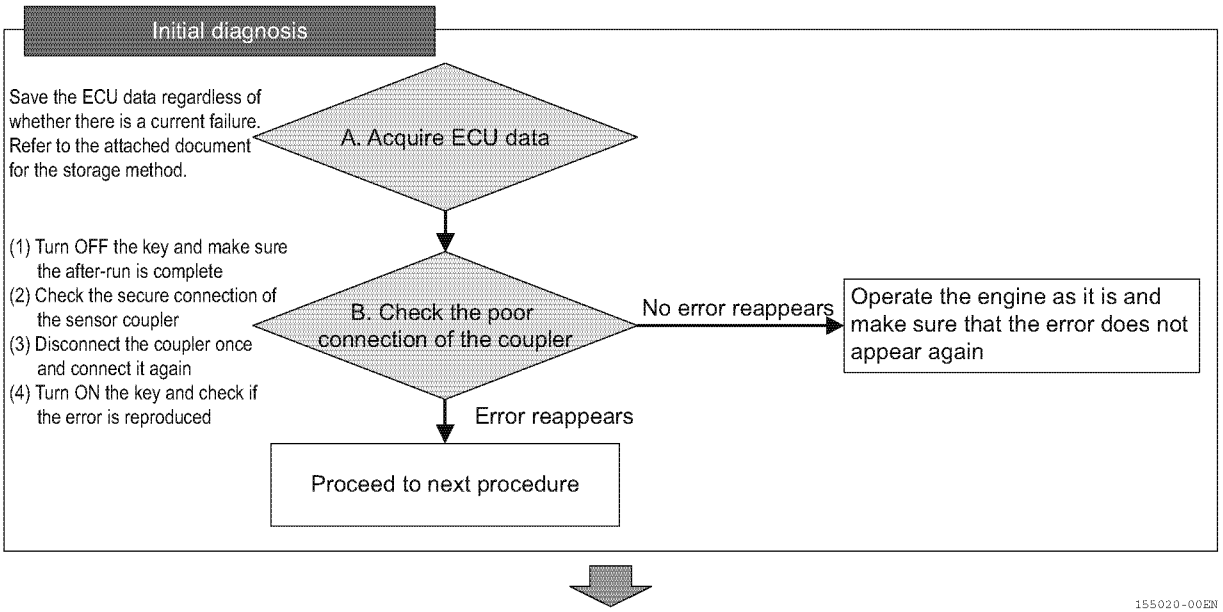
■ SCR downstream NOx sensor 1

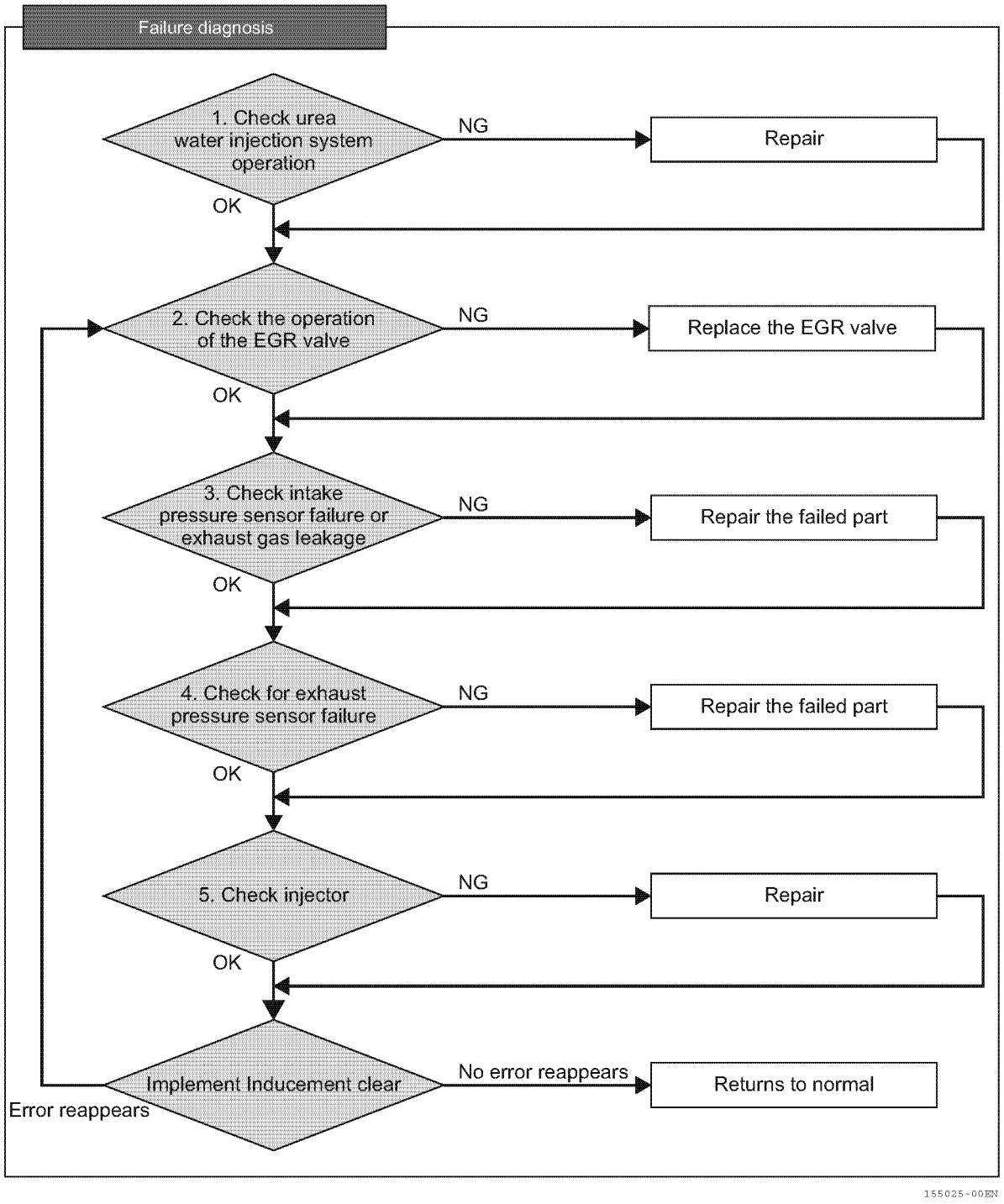
● Related DTC

P code	P1546	SCR downstream NOx value rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check urea water injection system operation
NG
Repair
OK
2. Check the operation of the EGR valve
NG
Replace the EGR valve
OK
3. Check intake pressure sensor failure or exhaust gas leakage
NG
Repair the failed part
OK
4. Check for exhaust pressure sensor failure
NG
Repair the failed part
OK
5. Check injector
NG
Repair
OK
Implement Inducement clear
No error reappears
Returns to normal
Error reappears
155025-00EN

● Work description

1. Checking the operation of urea water injection system

   Make sure that dosing module injects the proper quantity of urea water (whether the dosing module does not inject too much quantity).

   1- Perform the failure diagnosis for “Supply module 5”. However, do not replace the supply module, when the result of “Checking the operation of supply module” is OK.

Results of “Supply module 5”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • After repairing, turn the key switch ON to clear Inducement. • Turn OFF the key switch again and make sure the after-run is complete. • Turn ON the key switch and run the engine. Error reappears: Go to “Checking the operation of the EGR valve”. No error reappears: Returns to normal.
OK	Go to “Checking the operation of the EGR valve”.

2. Checking the operation of the EGR valve

   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

   2- Remove the EGR valve from the engine.

   3- Turn ON the key switch.

   4- Activate the EGR valve using “Active control of Diagnosis Test” of SMARTASSIST-Direct (SA-D), and make sure that the EGR valve position changes from opening to all closed.

NG	• Replace the EGR valve. • After replacement, turn the key switch ON to clear Inducement. • Turn OFF the key switch again and make sure the after-run is complete. • Turn ON the key switch and run the engine. Error reappears: Go to “Checking the intake air pressure sensor failure or exhaust gas leakage”. No error reappears: Returns to normal.
OK	Go to “Checking the intake air pressure sensor failure or exhaust gas leakage”.

3. Checking the intake air pressure sensor failure or exhaust gas leakage

   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

   2- Check for leaks from the intake air pressure sensor hose.

   3- Perform troubleshooting for “intake air pressure sensor 1”.

NG	• Repair the installation condition of sensor. • After repairing, turn the key switch ON to clear Inducement. • Turn OFF the key switch again and make sure the after-run is complete. • Turn ON the key switch and run the engine. Error reappears: Go to “Checking for exhaust gas pressure sensor failure”. No error reappears: Returns to normal.
OK	Go to “Checking for exhaust gas pressure sensor failure”.

4. Checking for exhaust gas pressure sensor failure

1- Perform the failure diagnosis for “Exhaust gas pressure sensor 1”.

Results of “Exhaust gas pressure sensor 1”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • After repairing, turn the key switch ON to clear Inducement. • Turn OFF the key switch again and make sure the after-run is complete. • Turn ON the key switch and run the engine. Error reappears: Go to “Checking the injector”. No error reappears: Returns to normal.
OK	Go to “Checking the injector”.

5. Checking the injector

1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

2- Remove the injector, and make sure that there is nothing wrong (e.g. deposition) with the nozzle.

3- The engine operation after correction is performed by activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	260 °C or higher
NOx sensor heater release	“1” (NOx sensor heater release is completed.)

4- Keep on operating the engine under conditions meeting the reference value for 10 minutes or more, and make sure no error is detected in the current fault indication.

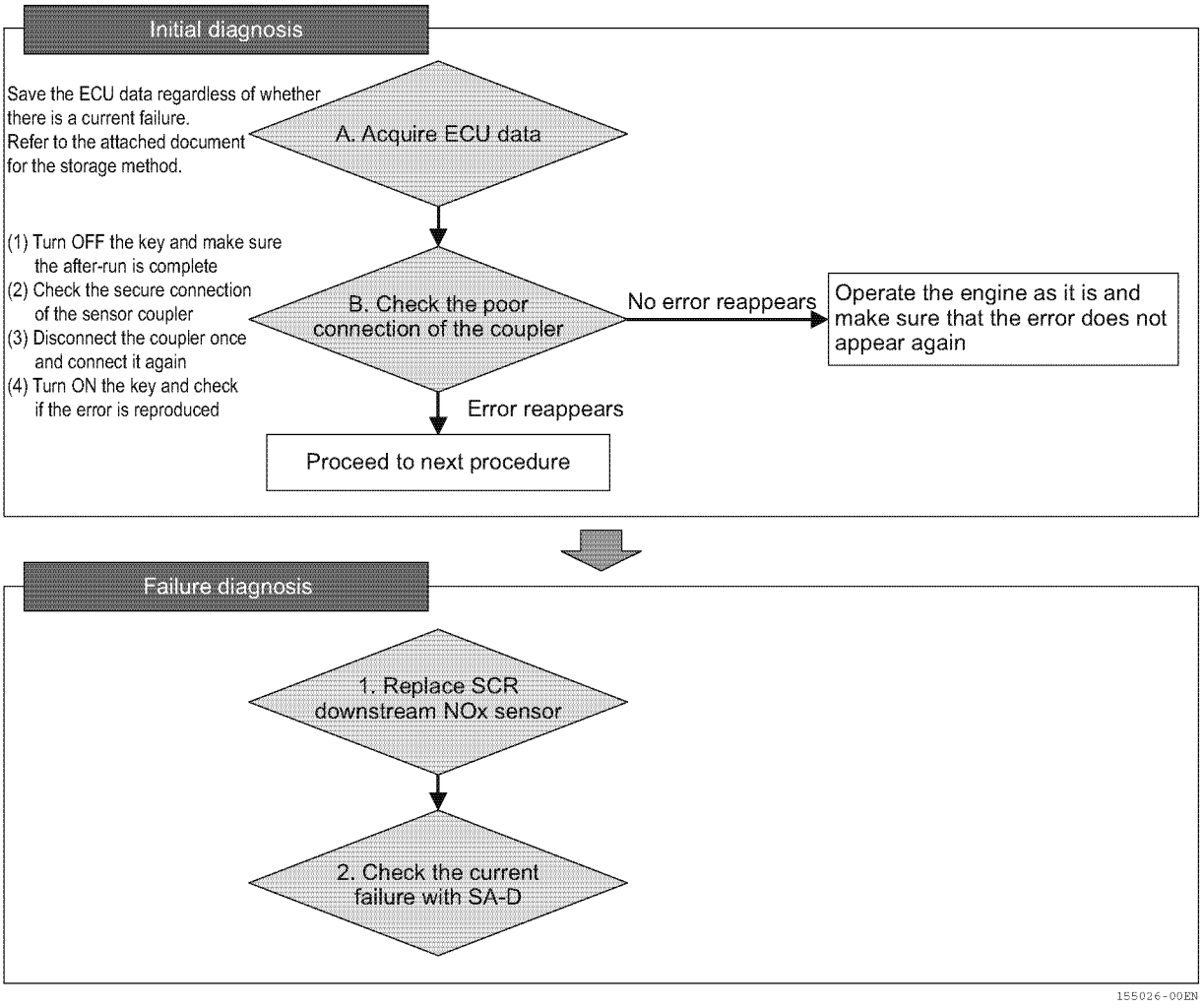
■ SCR downstream NOx sensor 2

● Related DTC

P code	P2222	SCR downstream NOx sensor incomplete heating error
	P2216	SCR downstream NOx sensor internal circuit short circuit
	P151D	SCR downstream NOx sensor internal circuit disconnection

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Replacing SCR downstream NOx sensor
   Internal circuit of SCR downstream NOx sensor may be defective.
   Replace the SCR downstream NOx sensor.

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	260 to 500 °C
NOx sensor heater release	“1” (NOx sensor heater release is completed.)

   5- Keep on operating the engine under conditions meeting the reference value for 10 minutes or more, and make sure no error is detected in the current fault indication.

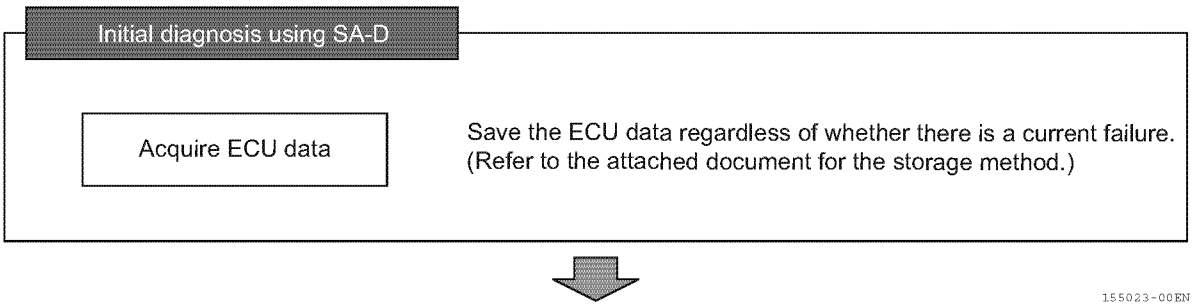
■ SCR downstream NOx sensor 3

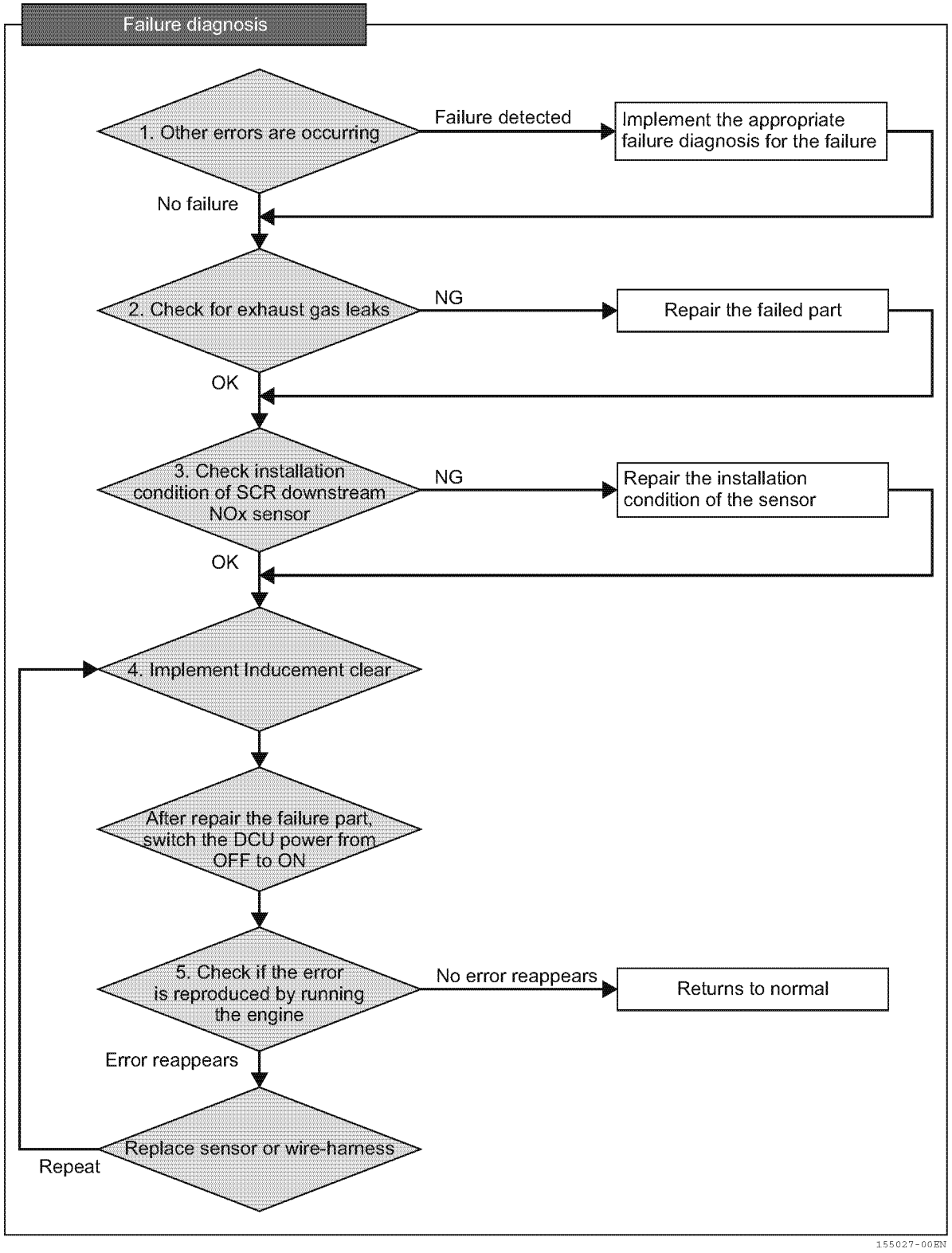
● Related DTC

P code	P1524	SCR downstream NOx sensor detected value error
	P1778	SCR downstream NOx sensor detected value error (O_2 concentration)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check for exhaust gas leaks
NG
Repair the failed part
OK
3. Check installation condition of SCR downstream NOx sensor
NG
Repair the installation condition of the sensor
OK
4. Implement Inducement clear
After repair the failure part, switch the DCU power from OFF to ON
5. Check if the error is reproduced by running the engine
No error reappears
Returns to normal
Error reappears
Replace sensor or wire-harness
Repeat
155027-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the exhaust pipe system" after treatment.
No error detected	Go to "Checking the exhaust pipe system".

2. Checking the exhaust pipe system
   1- Make sure that there is nothing wrong (disconnections and damages) with the exhaust piping, pressure hose, or pressure pipe.

NG	• Repair the defective parts. • Go to "Checking the installation condition of SCR downstream NOx sensor" after repair.
OK	Go to "Checking the installation condition of SCR downstream NOx sensor".

3. Checking the installation condition of SCR downstream NOx sensor
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Make sure that SCR downstream NOx sensor is not disconnected from piping, damaged and deformed.

NG	• Repair the installation condition of sensor. If sensor is damaged, replace it. • Go to "Implementation of Inducement clear" after repair or replacement.
OK	Go to "Implementation of Inducement clear".

4. Implementation of Inducement clear
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU).
   3- Turn ON the key switch again.
   4- Activate "Configuration of settings" of SA-D, and implement the Inducement clear. (Write "1" in data.)
   5- Go to "Checking the current failure with SA-D".

   Note: When Inducement clear is implemented, the current malfunction is temporarily released. To check that no error is detected, make sure to perform "Checking the current failure with SA-D".

5. Checking the current failure with SA-D

1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.

3- Turn ON the key switch again to start the engine.

4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	260 °C or higher
NOx sensor heater release	“1” (NOx sensor heater release is completed.)
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Battery voltage	12 V specification:10 to 16 V 24 V specification:18 to 33 V

5- Keep on operating the engine under conditions meeting the above reference value for 10 minutes or more, and make sure that the reference value is met.

Item	Reference value
SCR catalyst upstream NOx concentration	SCR catalyst upstream NOx concentration > SCR catalyst downstream NOx concentration (after NOx sensor correction)
SCR catalyst downstream NOx concentration (after NOx sensor correction)	

NG	• Replace the SCR downstream NOx sensor. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Current fault indication check”.

6- Make sure no error is detected in the current fault indication.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Replace the SCR downstream NOx sensor. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

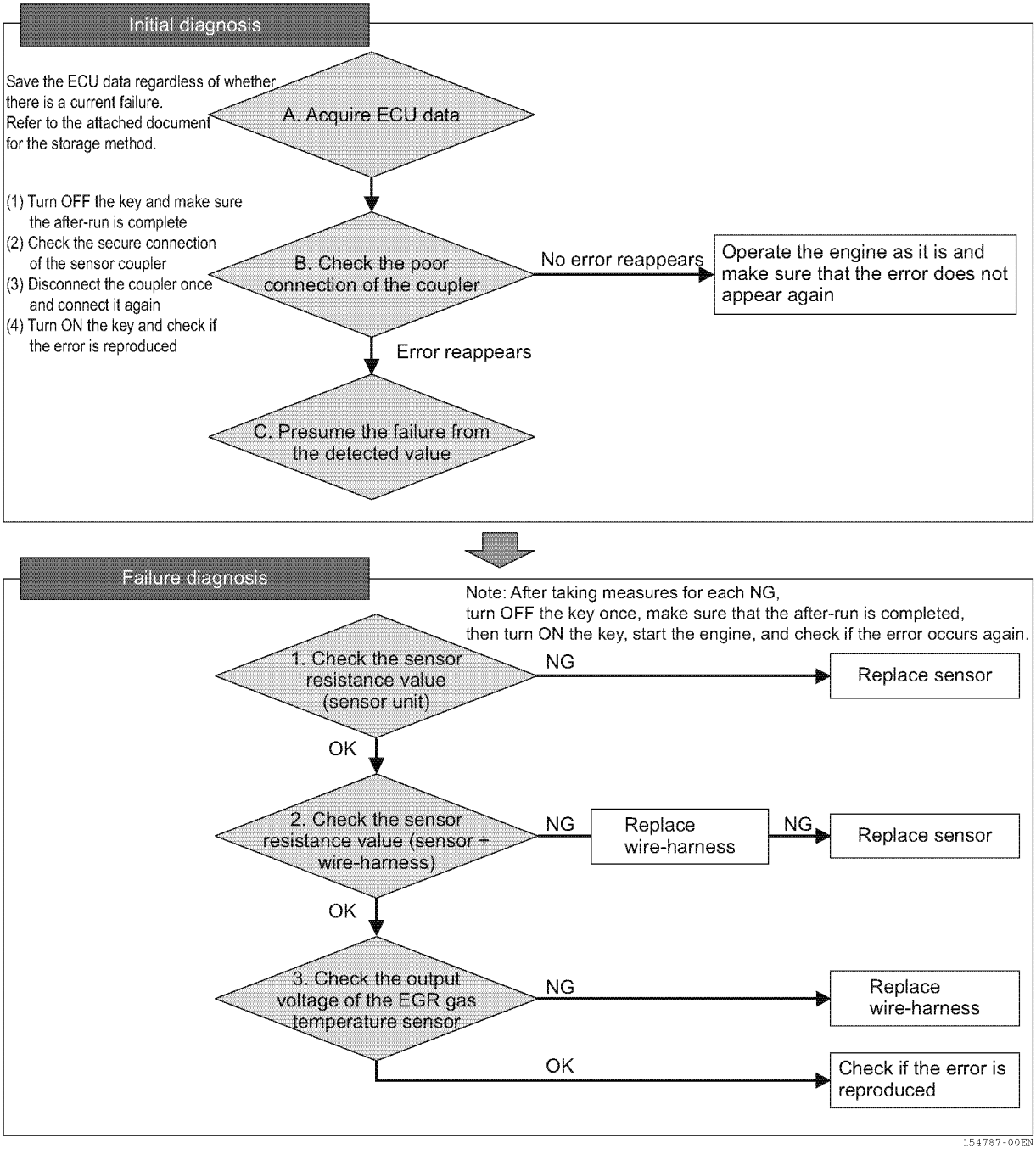
■ SCR catalyst temperature sensor 1

● Related DTC

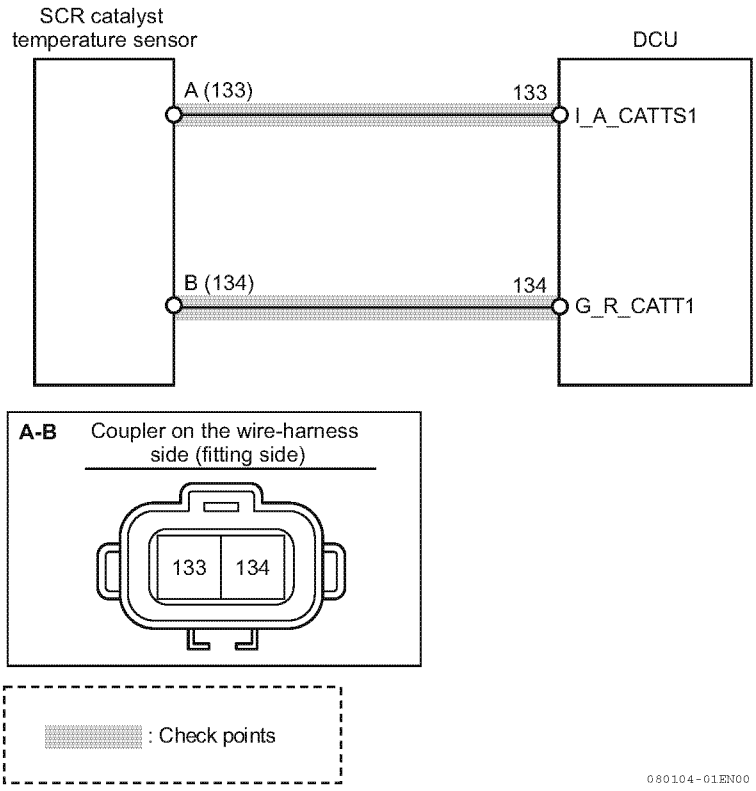
P code	P0428	SCR catalyst temperature sensor error (voltage high)
	P0427	SCR catalyst temperature sensor error (voltage low)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram

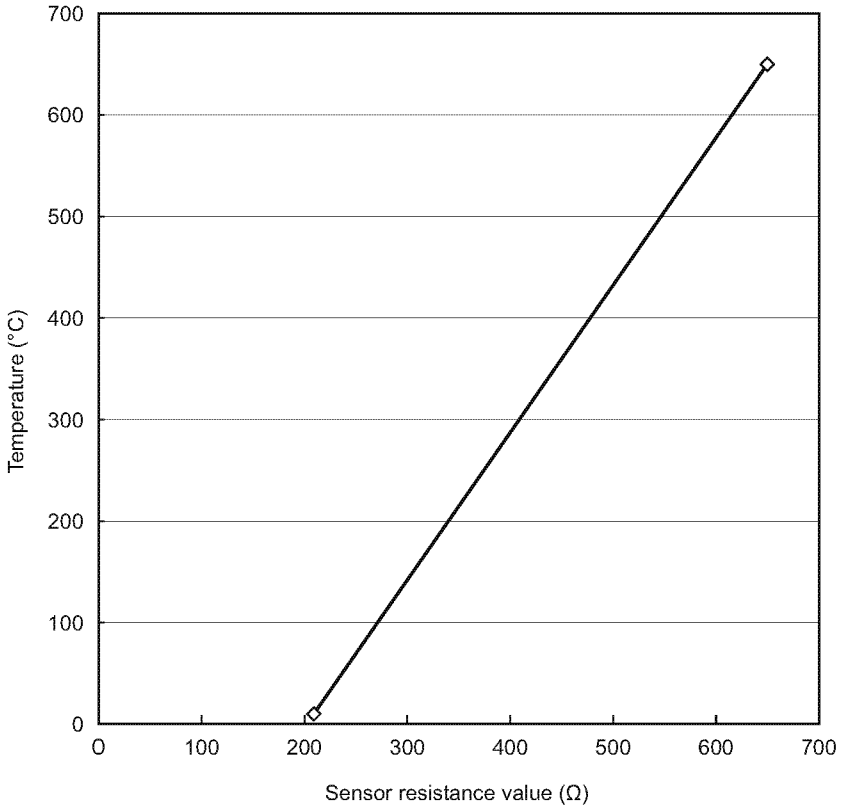


Note: See P823 for the DCU pin layout.

● Work description

1. Checking the sensor resistance value (sensor unit)
   1- Remove the wire-harness from the SCR catalyst temperature sensor.
   2- Using a circuit tester, measure the resistance value between SCR catalyst temperature sensor terminals A and B.
   3- Using “SCR catalyst temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

SCR catalyst temperature sensor characteristics



Temperature (°C)	Sensor resistance value (Ω)
10	209.15
650	649.77

NG	Replace the SCR catalyst temperature sensor.
OK	Go to “Checking the sensor resistance value (sensor and wire-harness)”.

2. Checking the sensor resistance value (sensor and wire-harness)
   1- Connect the SCR catalyst temperature sensor to wire-harness, and remove the DCU from the wire-harness.
   2- Using a circuit tester, measure the resistance value between DCU coupler terminals 133 and 134 on the wire-harness side.
   3- Using “SCR catalyst temperature sensor characteristics”, make sure that the measured resistance value is within the normal range.

NG	• The coupler between the sensor and the wire-harness may be defective. Replace the sensor. • Replace the wire-harness.
OK	Go to “Checking the output voltage of SCR catalyst temperature sensor”.

3. Checking the output voltage of SCR catalyst temperature sensor

1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).

2- Using a circuit tester, measure the voltage between SCR catalyst temperature sensor signals 133 and 134.

Voltage	State	Corrective action
133 < 0.5 V	NG	• Replace the wire-harness. • Replace the DCU.
0.5 V ≤ 133 ≤ 4.6 V	OK (normal range)	Replace the DCU.
4.6 V < 133	NG	• Replace the wire-harness. • Replace the DCU.

NG	• The coupler between the wire-harness and the DCU may be defective. Replace the wire-harness. • Replace the DCU.
OK	Replace the DCU.

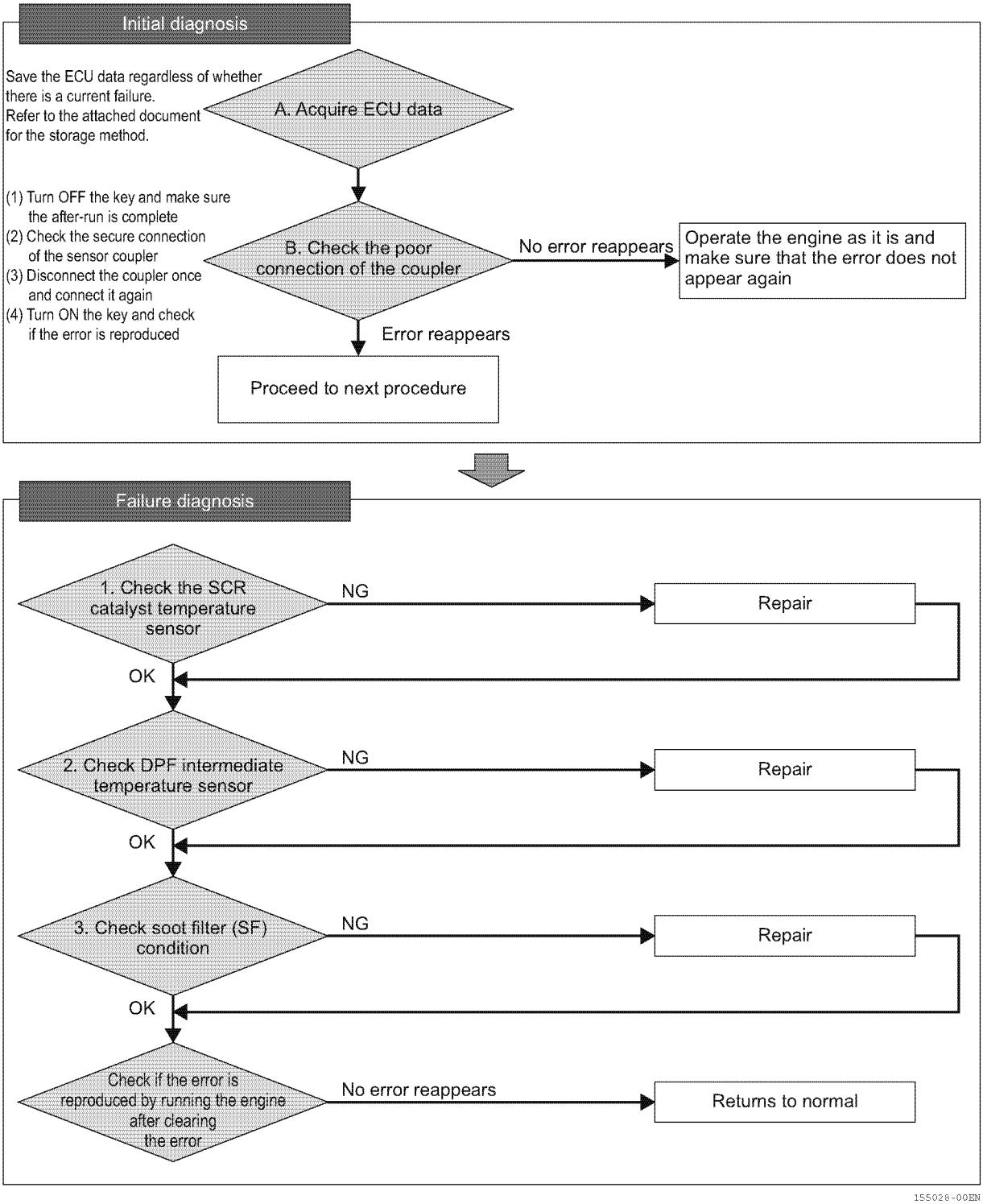
■ SCR catalyst temperature sensor 2

● Related DTC

P code	P0426	SCR catalyst temperature sensor error (temperature rise error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the SCR catalyst temperature sensor

1- Perform the failure diagnosis for “SCR catalyst temperature sensor 1”. However, do not replace the DCU, when the result of “Checking the output voltage of SCR catalyst temperature sensor” is OK.

Results of “SCR catalyst temperature sensor 1”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • After repairing, activate DPF active regeneration of “Diagnosis Test: Active control” of SA-D, perform the stationery regeneration (regeneration mode = “3”), and make sure that the SCR catalyst temperature during stationary regeneration is 700 °C or less in “Data logging”. If NG, go to “Checking the DPF intermediate temperature sensor”.
OK	Go to “Checking the DPF intermediate temperature sensor”.

2. Checking the DPF intermediate temperature sensor

1- Perform the failure diagnosis for “DPF intermediate temperature sensor”. However, do not replace the ECU, when the result of “Checking the DPF intermediate temperature sensor output voltage” is OK.

Results of “DPF intermediate temperature sensor”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the injector” after repair.
OK	Go to “Checking the injector”.

3. Checking soot filter (SF) condition

1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

2- Remove the DPF and make sure that the soot filter (SF) is not melted or damaged.

NG	Replace the soot filter (SF).

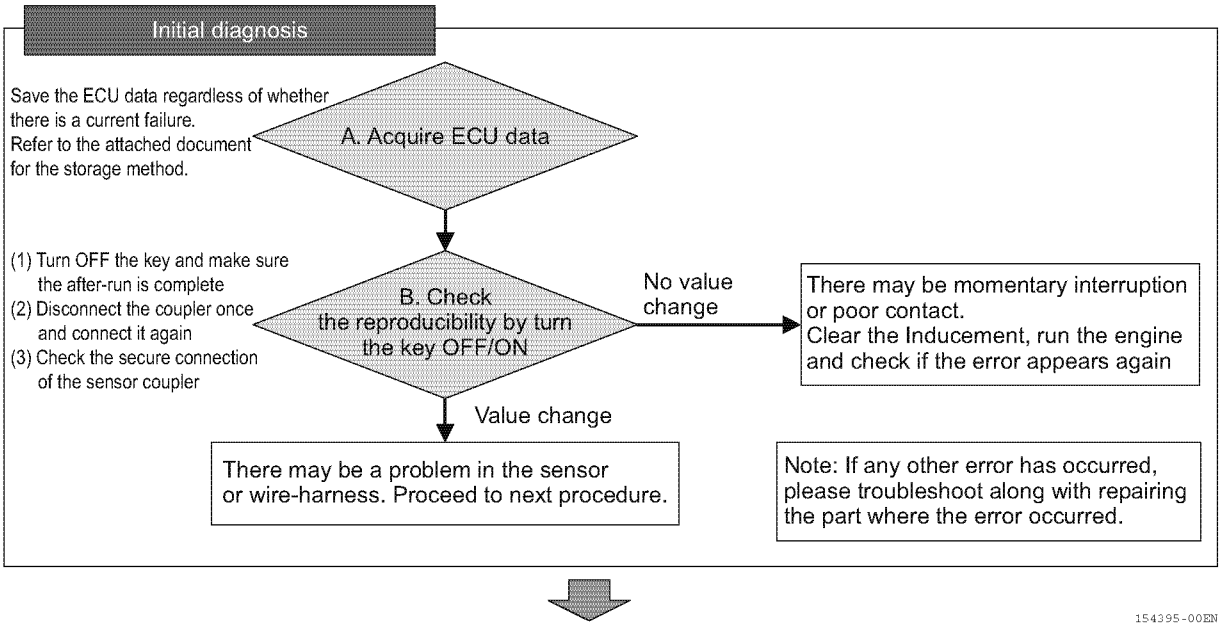
■ SCR catalyst temperature sensor 3

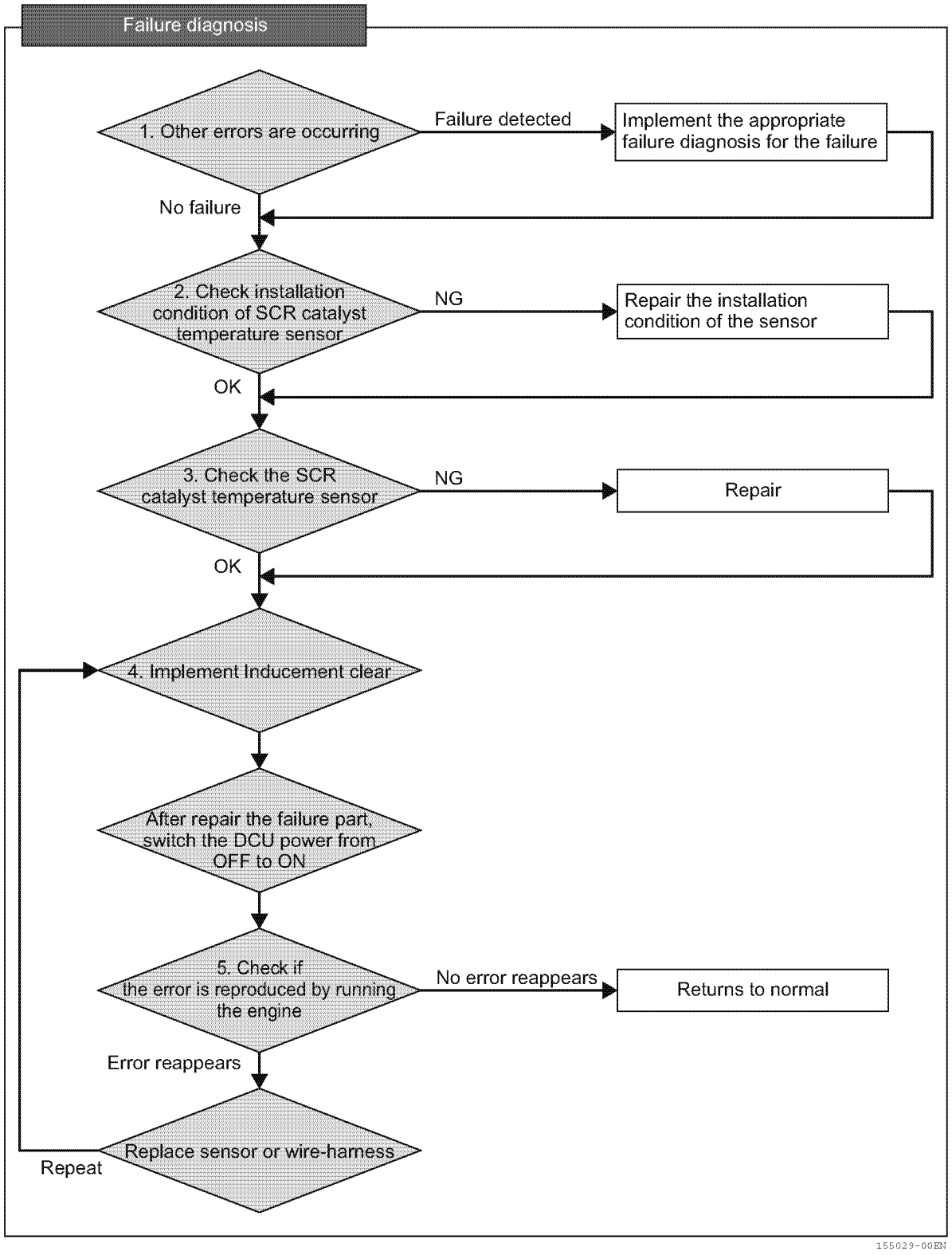
● Related DTC

P code	P153B	SCR catalyst temperature sensor detected value error (upper limit error)
	P1541	SCR catalyst temperature sensor detected value error (lower limit error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of SCR catalyst temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the SCR catalyst temperature sensor
NG
Repair
OK
4. Implement Inducement clear
After repair the failure part, switch the DCU power from OFF to ON
5. Check if the error is reproduced by running the engine
No error reappears
Returns to normal
Error reappears
Replace sensor or wire-harness
Repeat
155029-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the installation condition of SCR catalyst temperature sensor" after treatment.
No error detected	Go to "Checking the installation condition of SCR catalyst temperature sensor".

2. Checking the installation condition of SCR catalyst temperature sensor
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the installation condition of SCR catalyst temperature sensor (whether SCR catalyst temperature sensor is not disconnected from piping, and is not damaged and deformed.).
   3- Make sure that there is nothing wrong (e.g. disconnections and damages) with the exhaust piping.

NG	• Repair the installation condition of sensor. If sensor is damaged, replace it. • Go to "Checking the SCR catalyst temperature sensor" after repair or replacement.
OK	Go to "Checking the SCR catalyst temperature sensor".

3. Checking the SCR catalyst temperature sensor
   1- Perform the failure diagnosis for "SCR catalyst temperature sensor 1". However, do not replace the DCU, when the result of "Checking the output voltage of SCR catalyst temperature sensor" is OK.

Results of "SCR catalyst temperature sensor 1"	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to "Implementation of Inducement clear" after repair.
OK	Go to "Implementation of Inducement clear".

4. Implementation of Inducement clear
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU).
   3- Turn ON the key switch again.
   4- Log in to SA-D by function, select the "SCR" tab, and clear Inducement. (Write "1" to the data.)
   5- Go to "Checking the current failure with SA-D".

   Note: When Inducement clear is implemented, the current malfunction is temporarily released. To check that no error is detected, make sure to perform "Checking the current failure with SA-D".

5. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	200 °C or higher
Switching flag of DPF regeneration control mode	“0” (Not during DPF regeneration)
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- Keep on operating the engine under conditions meeting the above reference value for 10 minutes or more, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or lower
Switching flag of DPF regeneration control mode	“0” (Not during DPF regeneration)
Battery voltage	10 to 16 V

   6- Keep on operating the engine under conditions meeting the reference value for 10 minutes or more, and make sure no error is detected in the current fault indication.

No	Returns to normal.
Yes	• Replace the SCR catalyst temperature sensor, or wire-harness. • After replacement, switch the DCU power from OFF to ON, and then return to Inducement clear.

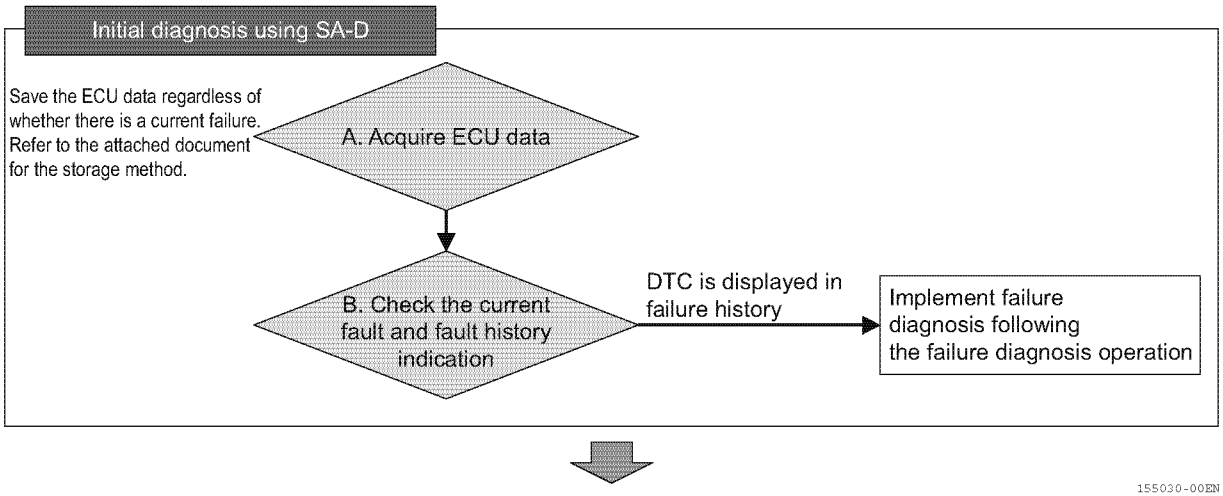
■ SCR catalyst temperature sensor 4

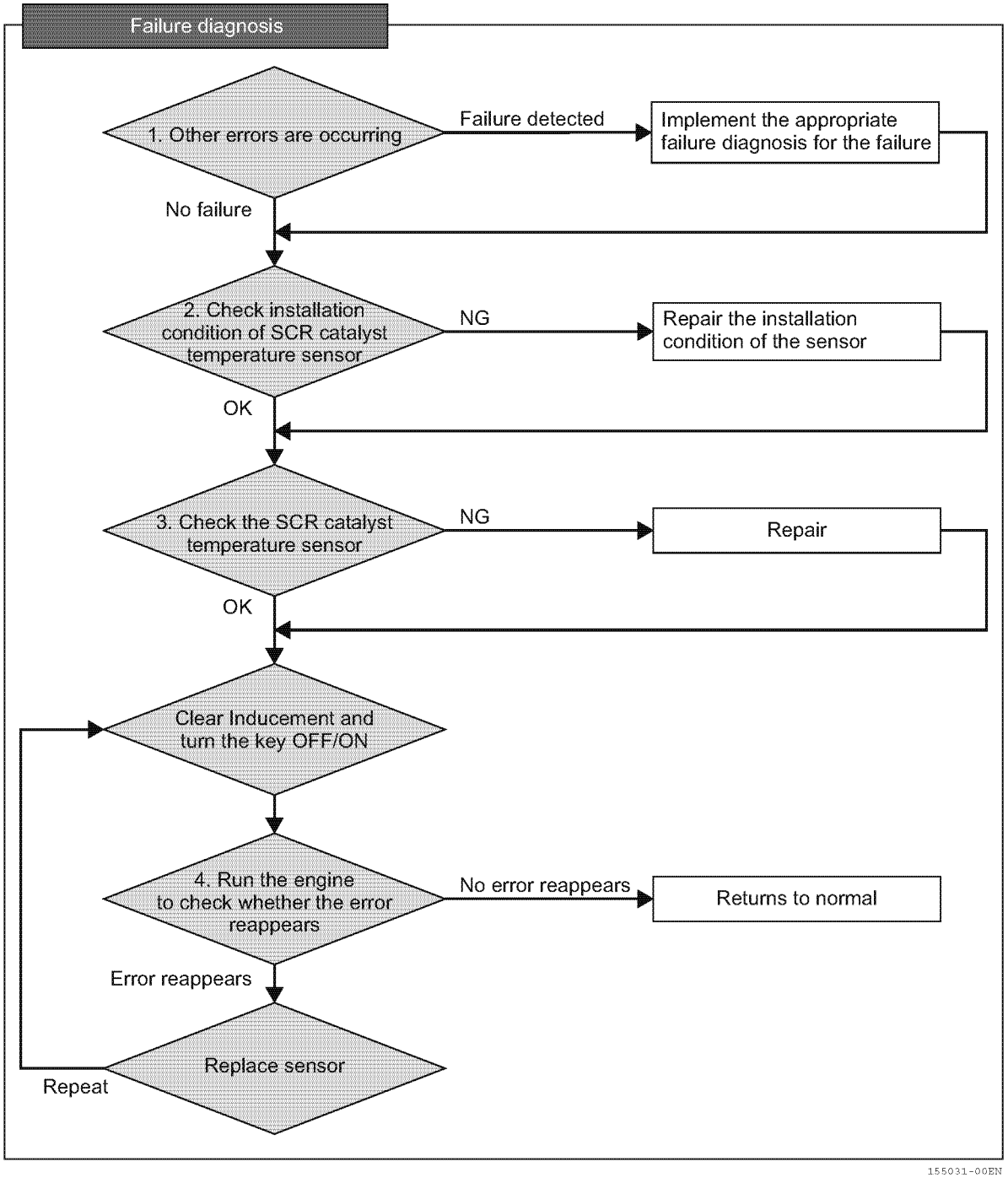
● Related DTC

P code	P1542	SCR catalyst temperature sensor detected value error (at cold start check)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of SCR catalyst temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the SCR catalyst temperature sensor
NG
Repair
OK
Clear Inducement and turn the key OFF/ON
4. Run the engine to check whether the error reappears
No error reappears
Returns to normal
Error reappears
Replace sensor
Repeat
155031-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to cooling water temperature sensor or fresh air temperature sensor are detected on ECU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the installation condition of SCR catalyst temperature sensor" after treatment.
No error detected	Go to "Checking the installation condition of SCR catalyst temperature sensor".

2. Checking the installation condition of SCR catalyst temperature sensor
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the installation condition of SCR catalyst temperature sensor (whether SCR catalyst temperature sensor is not disconnected from piping, and is not damaged and deformed.).
   3- Make sure that there is nothing wrong (e.g. disconnections and damages) with the exhaust piping.

NG	• Repair the installation condition of sensor. If sensor is damaged, replace it. • Go to "Checking the SCR catalyst temperature sensor" after repair or replacement.
OK	Go to "Checking the SCR catalyst temperature sensor".

3. Checking the SCR catalyst temperature sensor
   1- Perform the failure diagnosis for "SCR catalyst temperature sensor 1". However, do not replace the DCU, when the result of "Checking the output voltage of SCR catalyst temperature sensor" is OK.

Results of "SCR catalyst temperature sensor 1"	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to "Checking the current failure with SA-D" after repair.
OK	Go to "Checking the current failure with SA-D".

4. Checking the current failure with SA-D
   1- Implement the Inducement clear.
   2- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   3- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   4- Turn ON the key switch again. In this case, do not start the engine. Make sure no error is detected in the current fault indication.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Replace the SCR catalyst temperature sensor, or DCU. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

Note: When the reference value in 7. above cannot be met due to the ambient environmental factors, activate "Configuration of settings" of SA-D, and implement the Inducement clear. (Write "1" in data.)

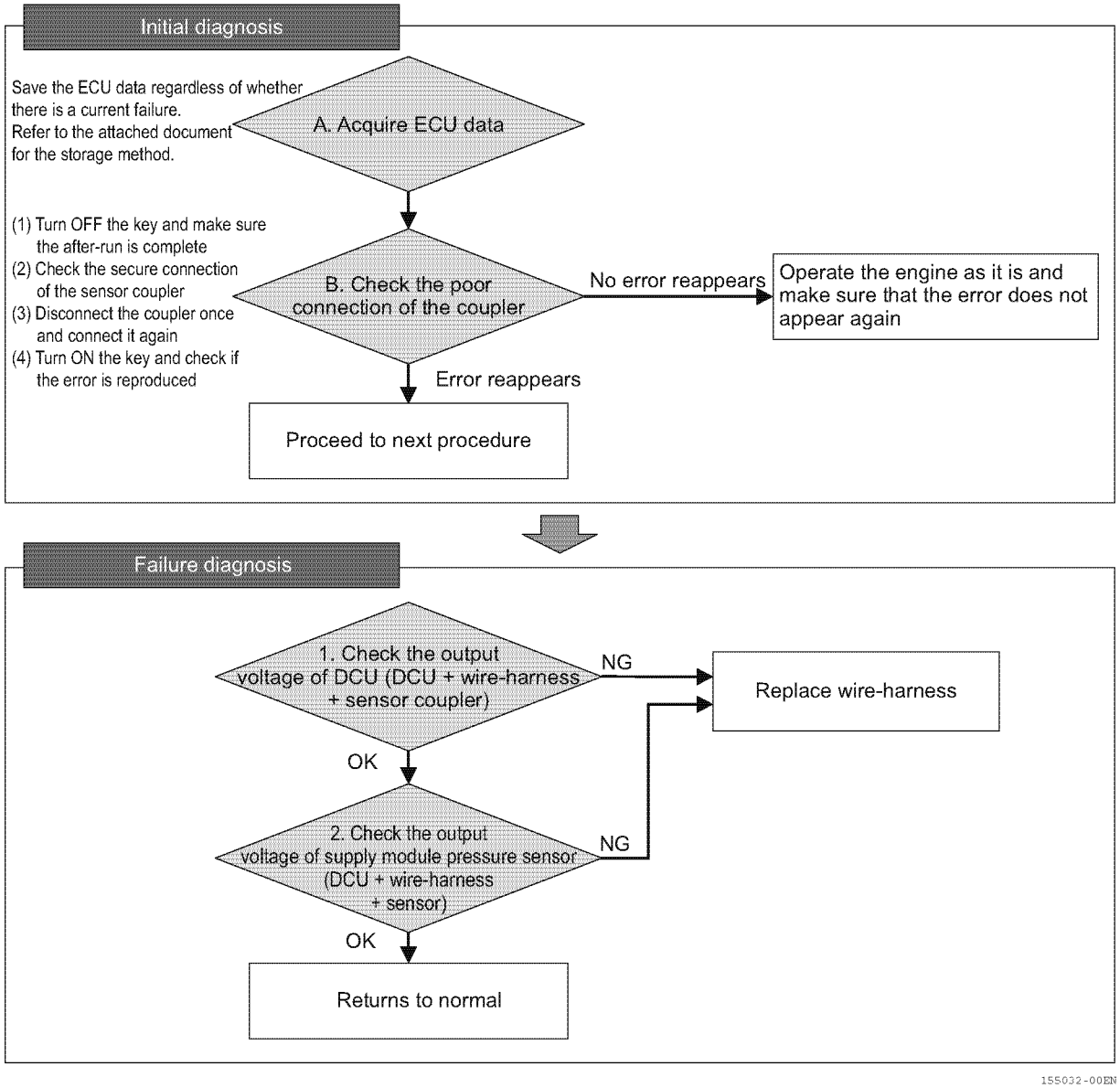
■ Supply module pressure sensor 1

● Related DTC

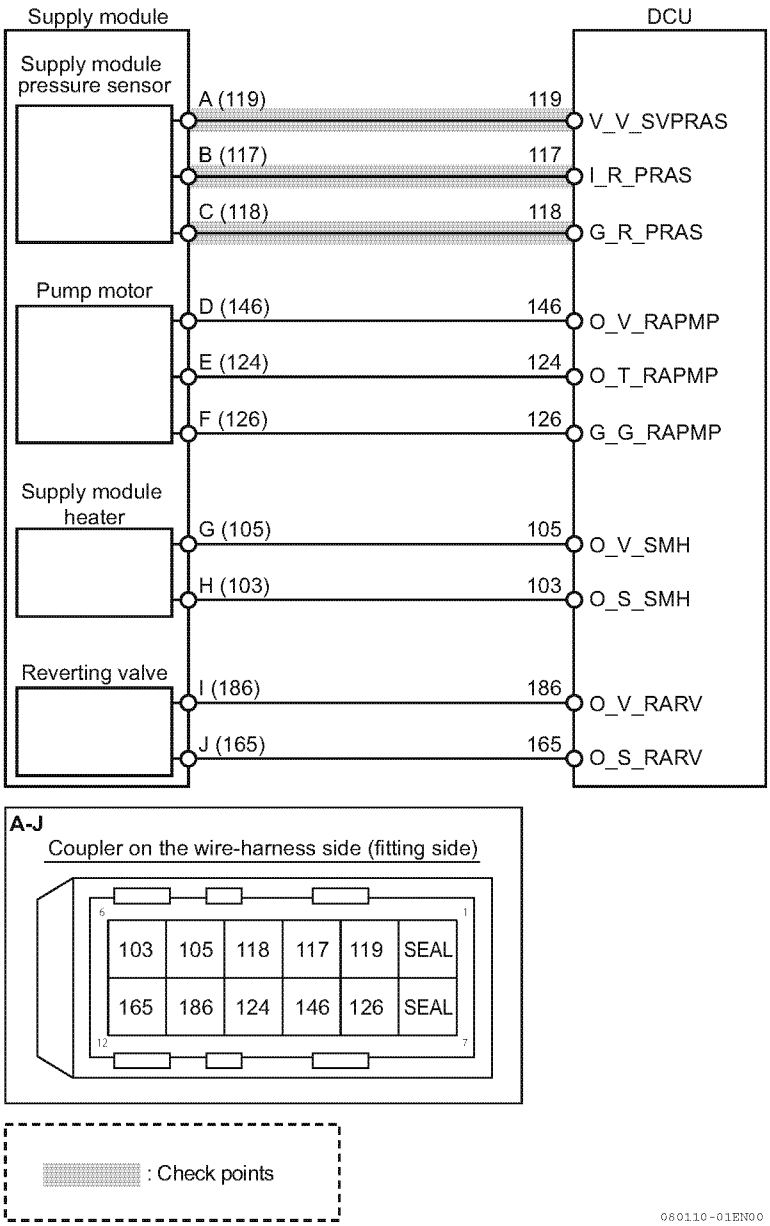
P code	P204D	Supply module pressure sensor error (voltage high)
	P204C	Supply module pressure sensor error (voltage low)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the output voltage of DCU
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between Supply module pressure sensor 5 V 119 and 118.

Voltage	State	Corrective action
119 < 4.75 V	NG	• Replace the wire-harness. • Replace the DCU.
4.75 V ≤ 119 ≤ 5.25 V	OK (normal range)	Check the output voltage of supply module pressure sensor
5.25 V < 119	NG	• Replace the wire-harness. • Replace the DCU.

NG	Replace the wire-harness or DCU, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the output voltage of Supply module pressure sensor”.

2. Checking the output voltage of Supply module pressure sensor
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between the sensor signals 117 and 118.

Voltage	State	Corrective action
117 < 0.25 V	NG	Replace the wire-harness.
0.25 V ≤ 117 ≤ 4.75 V	OK (normal range)	Wire-harness is normal.
4.75 V < 117	NG	Replace the wire-harness.

NG	Replace the wire-harness, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Replace the supply module.

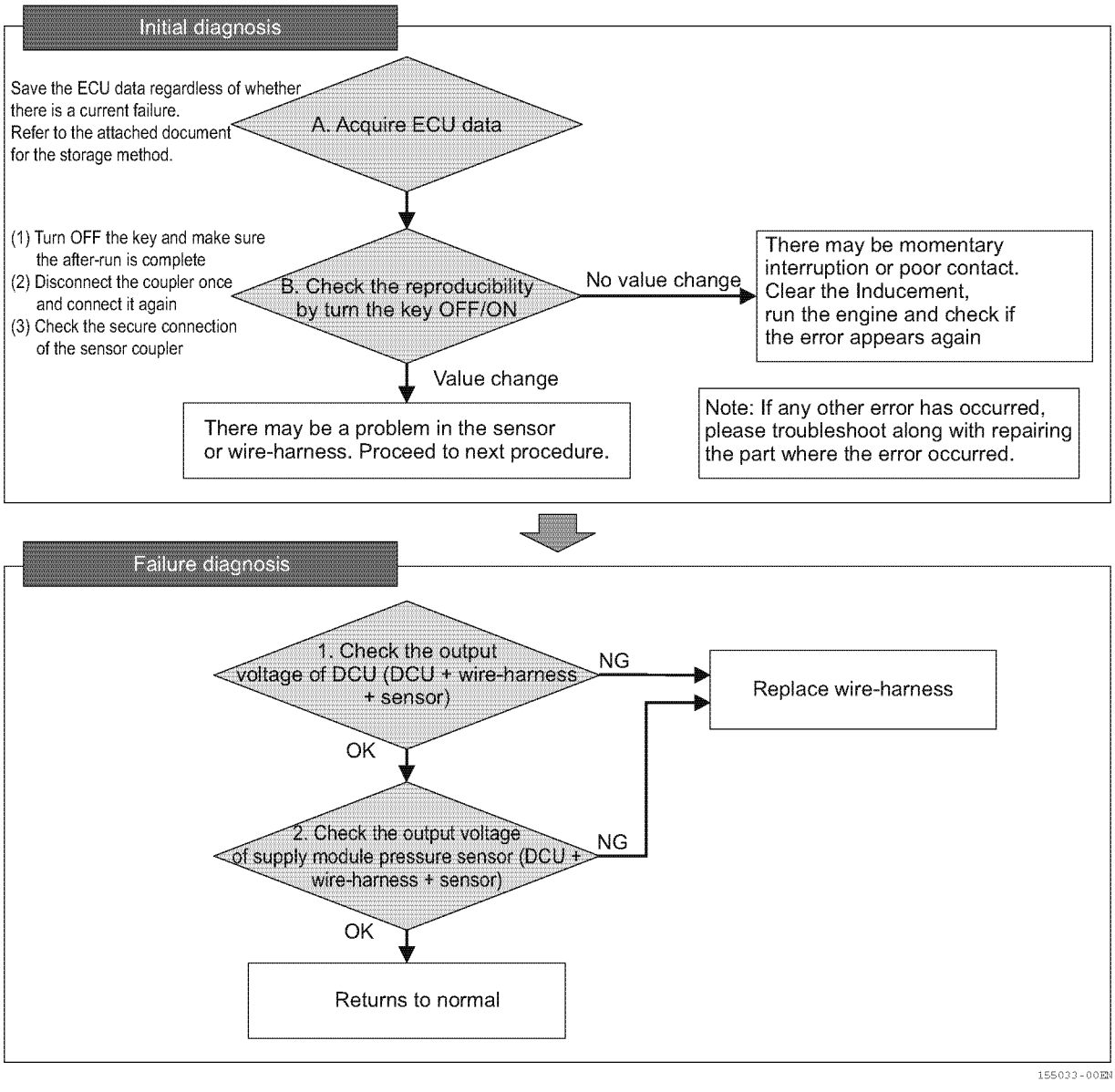
■ Supply module pressure sensor 2

● Related DTC

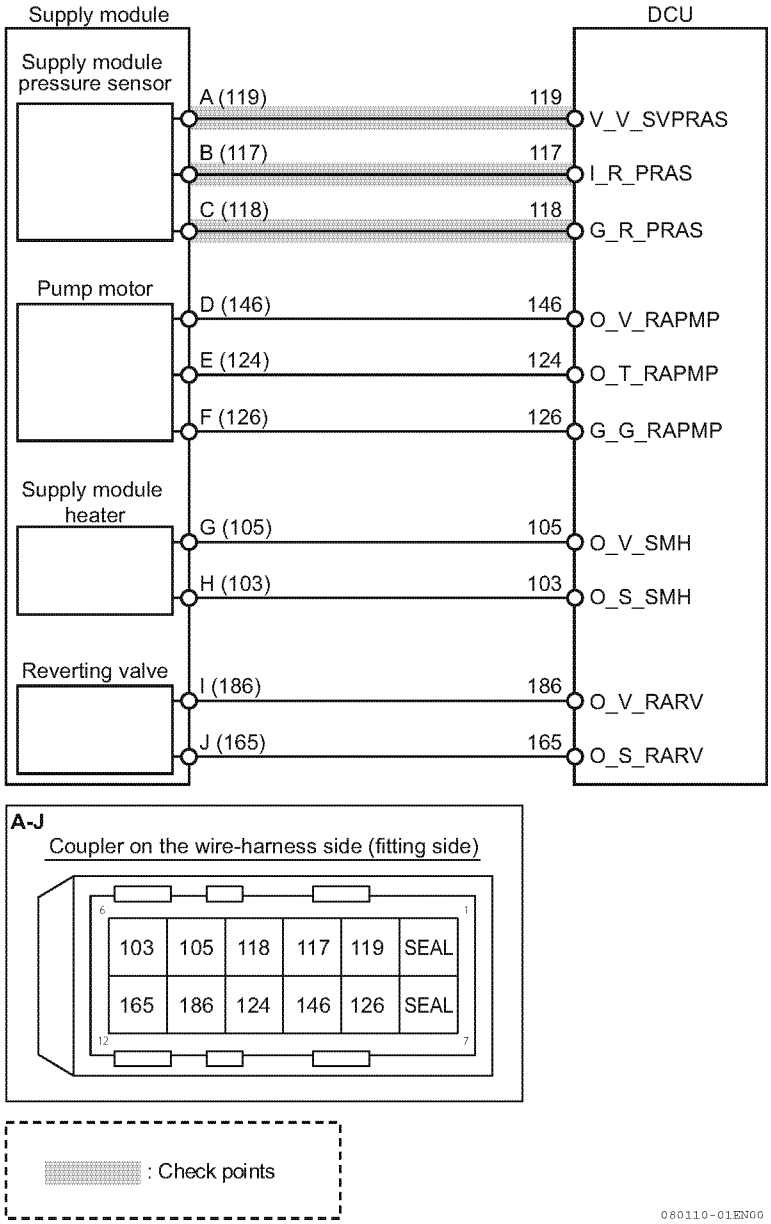
P code	P153C	Supply module pressure sensor detected value error (upper limit error)
	P153D	Supply module pressure sensor detected value error (lower limit error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the output voltage of DCU

1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).

2- Using a circuit tester, measure the voltage between Supply module pressure sensor 5 V 119 and 118.

Voltage	State	Corrective action
119 < 4.75 V	NG	• Replace the wire-harness. • Replace the DCU.
4.75 V ≤ 119 ≤ 5.25 V	OK (normal range)	Check the output voltage of Supply module pressure sensor
5.25 V < 119	NG	• Replace the wire-harness. • Replace the DCU.

NG	Replace the wire-harness or DCU, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the output voltage of Supply module pressure sensor”.

2. Checking the output voltage of Supply module pressure sensor

1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).

2- Using a circuit tester, measure the voltage between the sensor signals 117 and 118.

Voltage	State	Corrective action
117 < 0.25 V	NG	Replace the wire-harness.
0.25 V ≤ 117 ≤ 4.75 V	OK (normal range)	Wire-harness is normal.
4.75 V < 117	NG	Replace the wire-harness.

NG	Replace the wire-harness or DCU, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Replace the supply module.

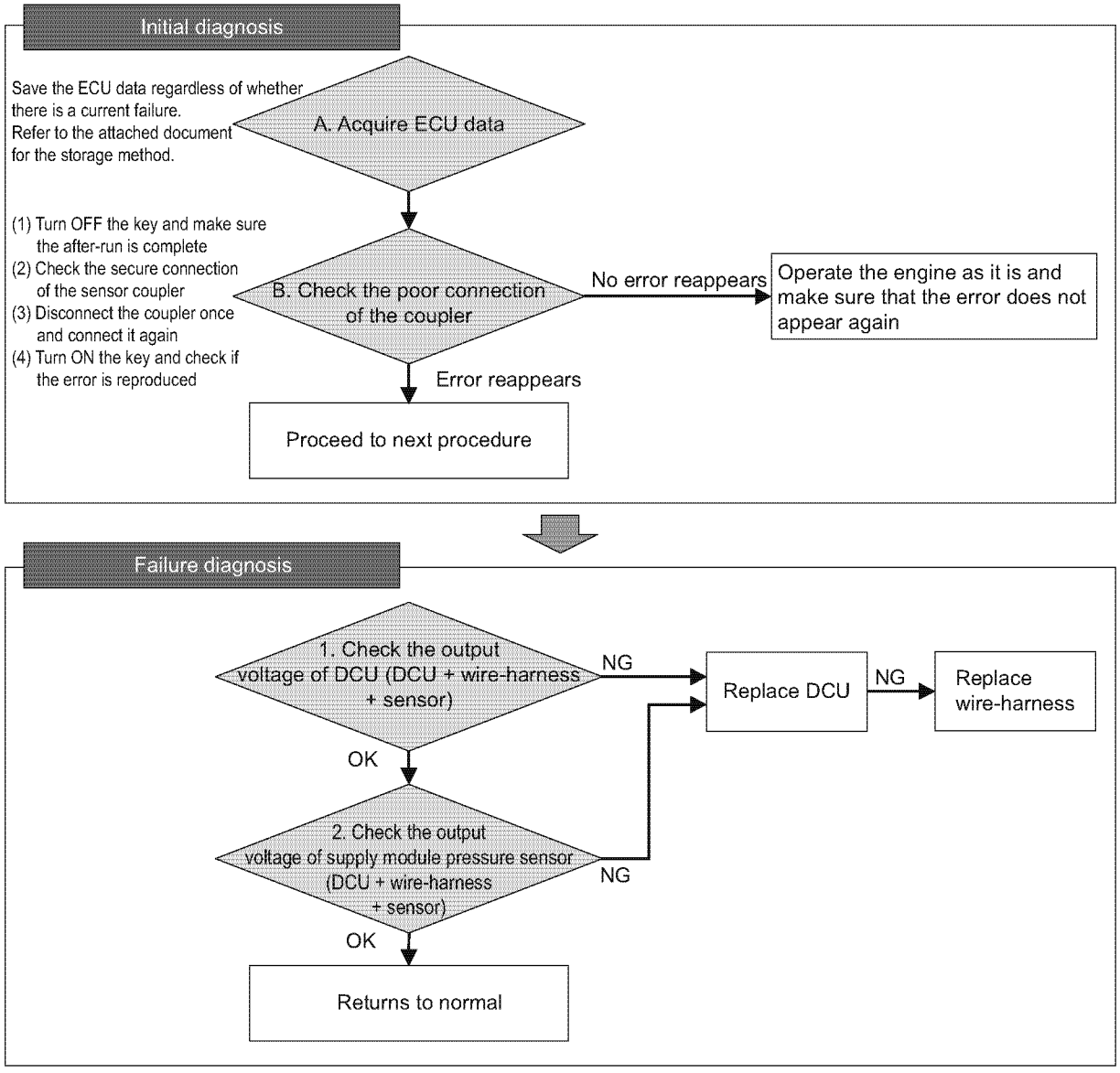
■ Supply module pressure sensor 3

● Related DTC

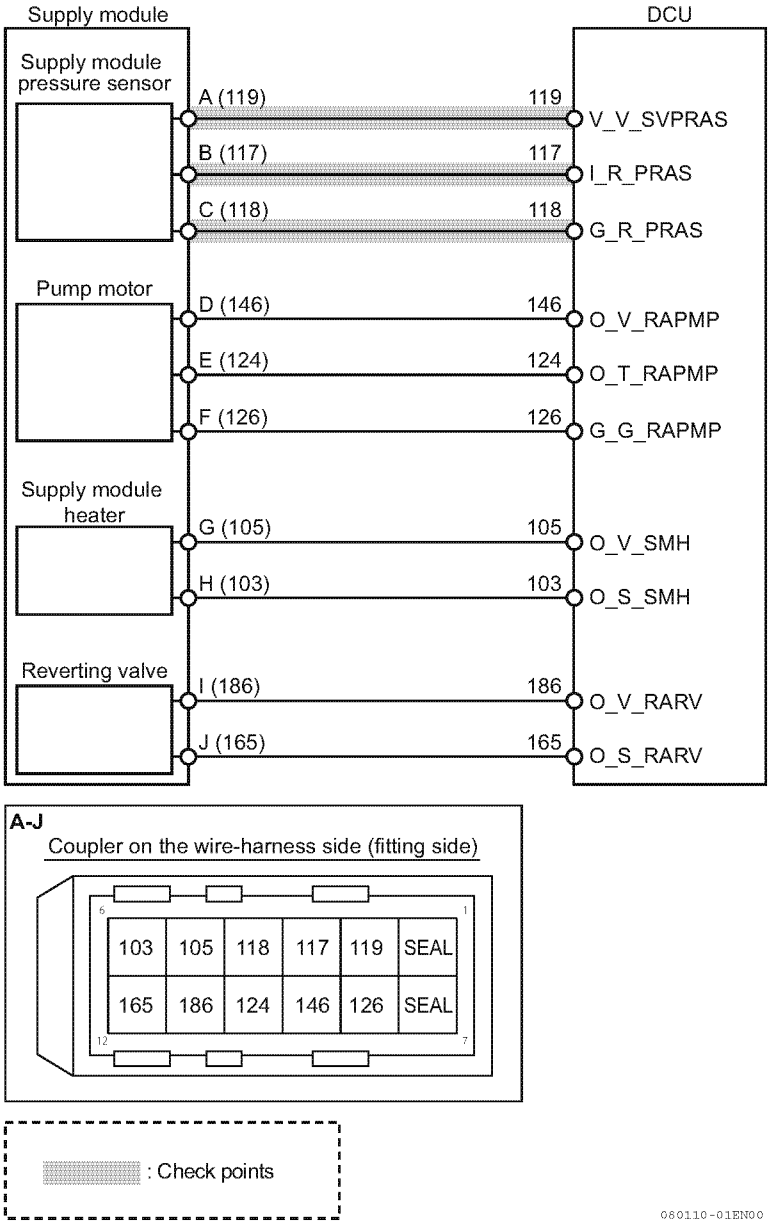
P code	P1516	Sensor supply voltage error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the output voltage of DCU
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between Supply module pressure sensor 5 V 119 and 118.

Voltage	State	Corrective action
119 < 4.75 V	NG	• Replace the wire-harness. • Replace the DCU.
4.75 V ≤ 119 ≤ 5.25 V	OK (normal range)	Check the output voltage of Supply module pressure sensor
5.25 V < 119	NG	• Replace the wire-harness. • Replace the DCU.

NG	Replace the wire-harness or DCU, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the output voltage of Supply module pressure sensor”.

2. Checking the output voltage of Supply module pressure sensor
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between the sensor signals 117 and 118.

Voltage	State	Corrective action
117 < 0.25 V	NG	• Replace the wire-harness. • Replace the DCU.
0.25 V ≤ 117 ≤ 4.75 V	OK (normal range)	Wire-harness is normal.
4.75 V < 117	NG	• Replace the wire-harness. • Replace the DCU.

NG	Replace the wire-harness, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Replace the supply module.

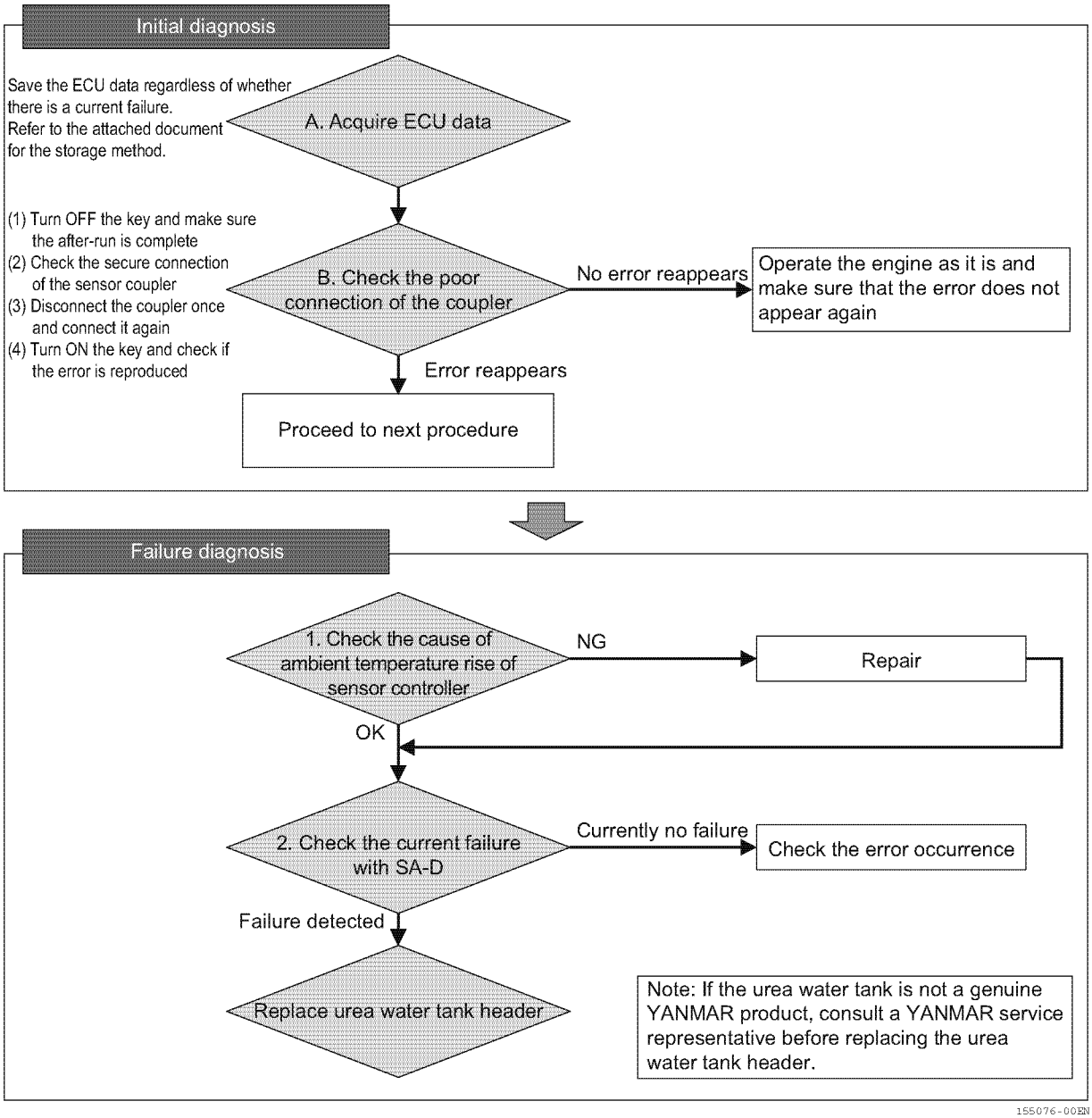
■ Urea water quality sensor/Urea water tank temperature sensor (A1DEFI)

● Related DTC

P code	P1559	Urea water quality sensor/Urea water tank temperature sensor (A1DEFI) controller temperature rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the cause of ambient temperature rise of sensor controller

   1- Make sure that there is no factors causing the temperature around the urea water quality sensor and urea water tank temperature sensor controller to rise.

NG	• Take measures against the temperature rise. • Perform failure diagnosis using SA-D after treatment.
OK	Go to “Checking the current failure with SA-D”.

2. Checking the current failure with SA-D

   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.

   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	Replace the urea water tank header.

Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.

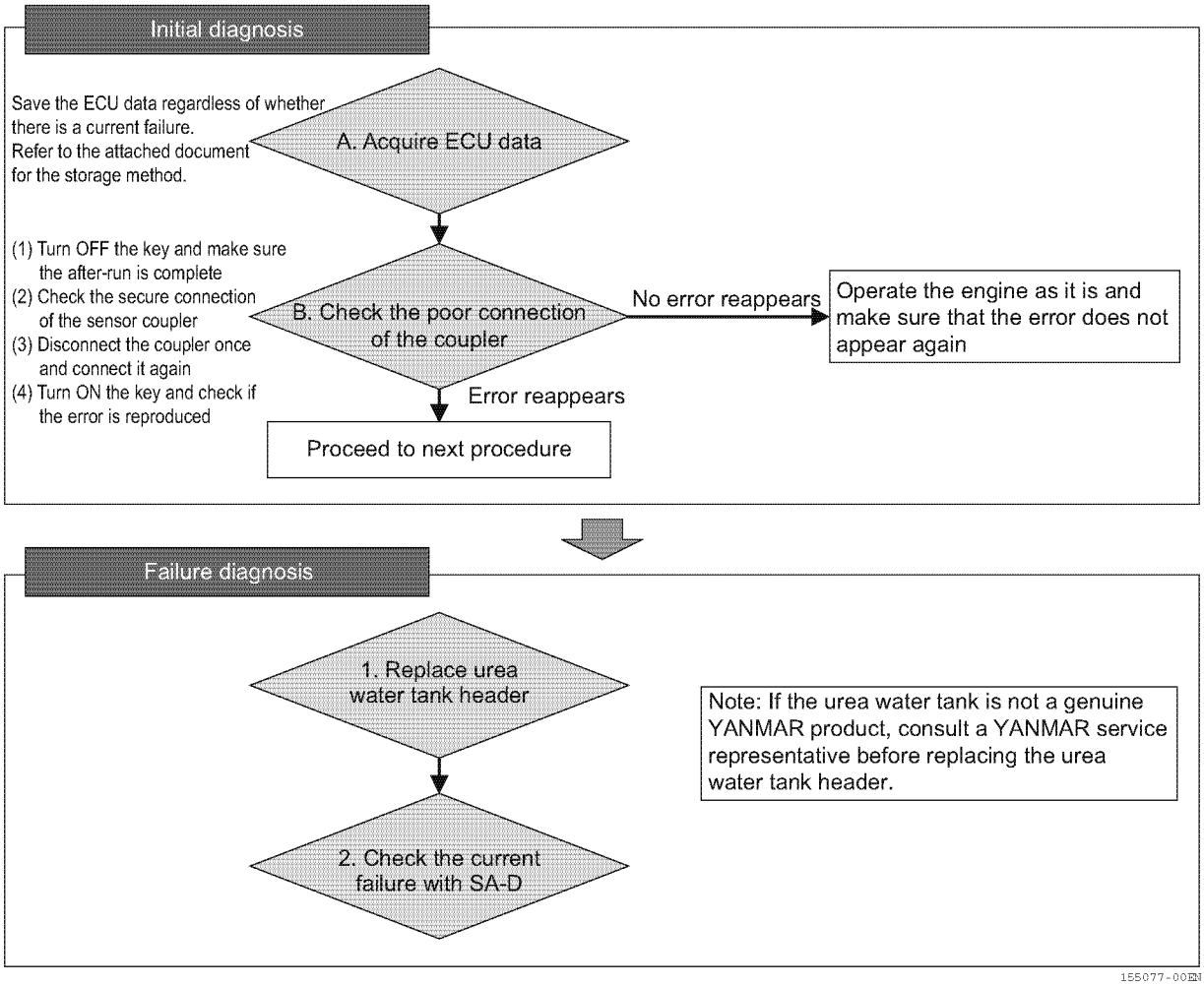
■ Urea water quality sensor (A1DEFI)

● Related DTC

P code	P206D	Urea water quality sensor (A1DEFI) internal circuit disconnection
	P206C	Urea water quality sensor (A1DEFI) internal circuit short circuit
	P154F	Urea water quality sensor (A1DEFI) controller internal failure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Replacing the urea water tank header.
   Internal of urea water tank header may be defective.
   Replace the urea water tank header.
   Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Make sure no error is detected in the current fault indication.

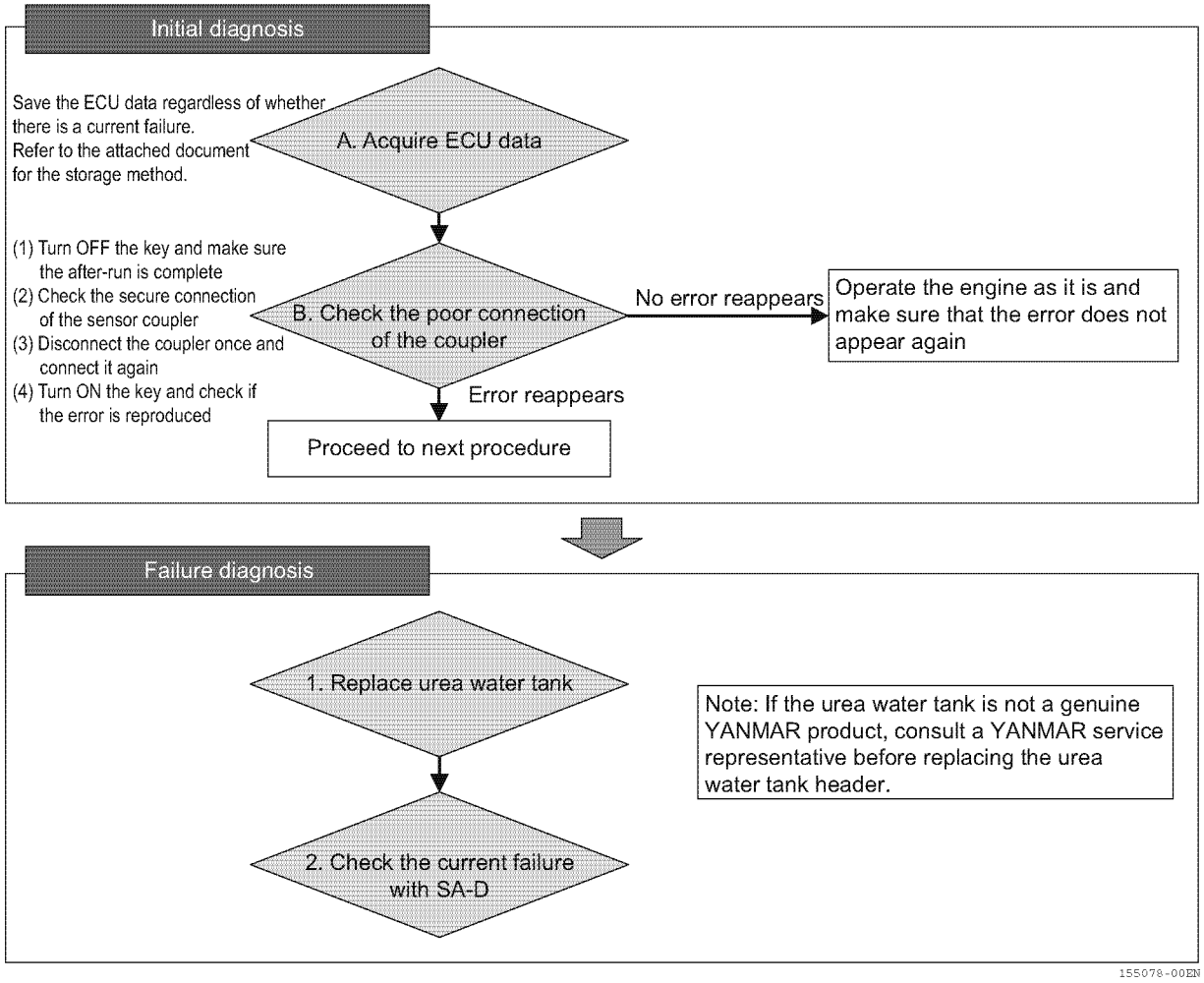
■ Urea water tank temperature sensor (A1DEFI)

● Related DTC

P code	P1551	Urea water tank temperature sensor (A1DEFI) internal circuit disconnection
	P1552	Urea water tank temperature sensor (A1DEFI) internal circuit short circuit
	P1550	Urea water tank temperature sensor (A1DEFI) controller internal failure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Replacing the urea water tank header.
   Internal of urea water tank header may be defective.
   Replace the urea water tank header.
   Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Make sure no error is detected in the current fault indication.

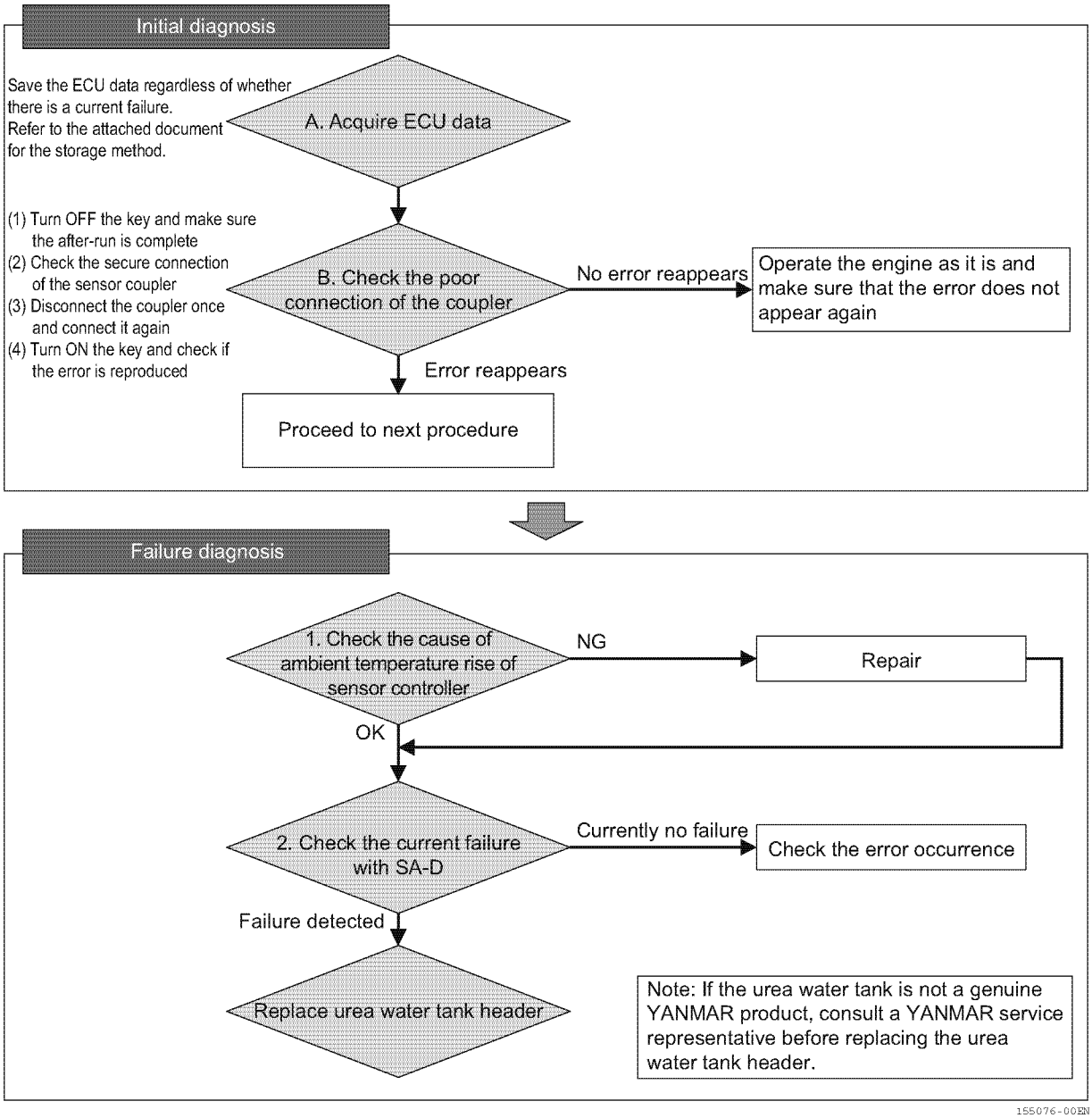
■ Urea water tank temperature sensor/urea water tank level sensor (AT1T1I)

● Related DTC

P code	P1557	Urea water tank temperature sensor/urea water tank level sensor (AT1T1I) controller temperature rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the cause of ambient temperature rise of sensor controller
   1- Make sure that there is no factors causing the temperature around the urea water tank temperature sensor and urea water tank level sensor controller to rise.

NG	• Take measures against the temperature rise. • Perform failure diagnosis using SA-D after treatment.
OK	Go to “Checking the current failure with SA-D”

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	Replace the urea water tank header.

Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.

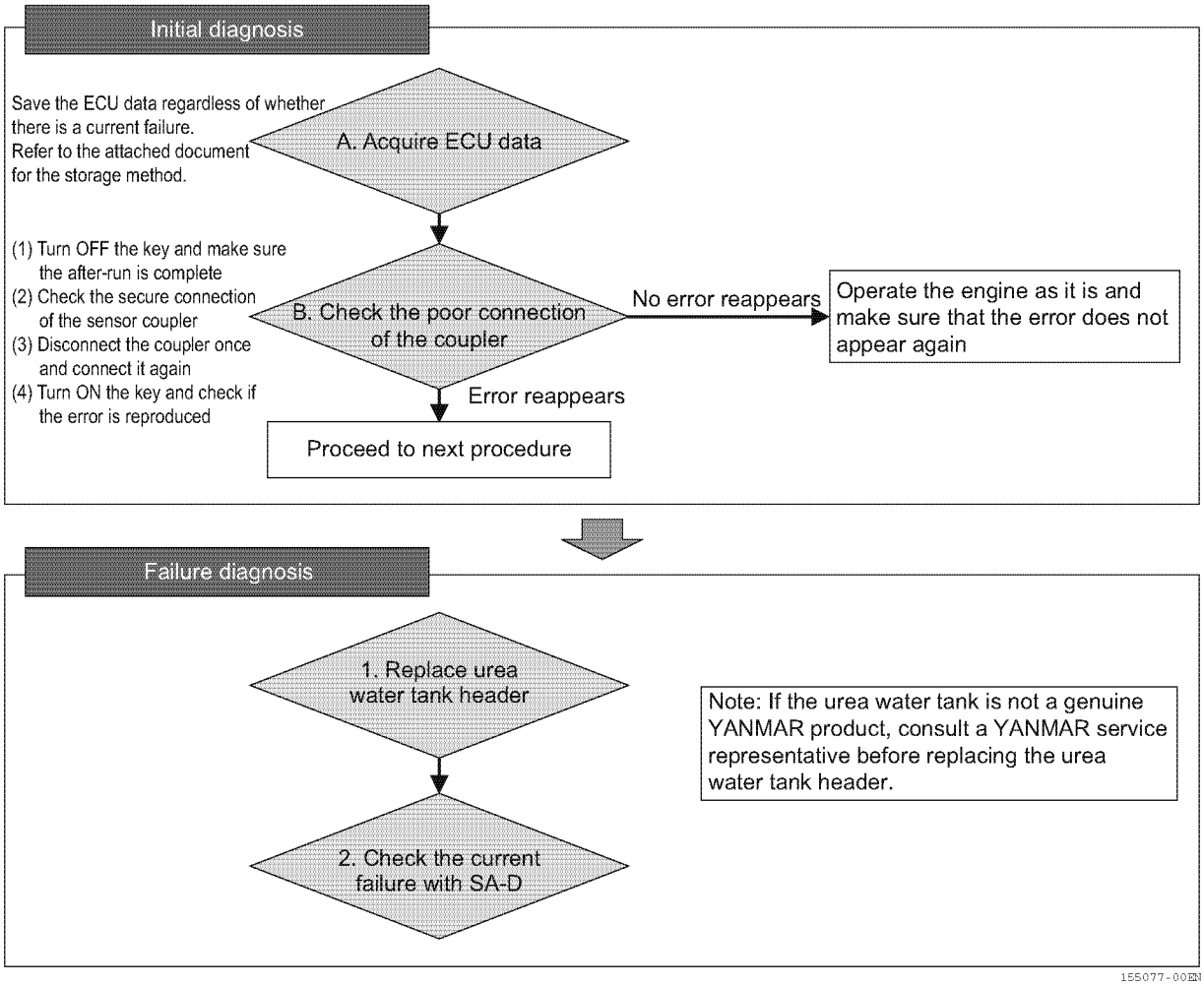
■ Urea water tank level sensor (AT1T1I)

● Related DTC

P code	P203D	Urea water tank level sensor (AT1T1I) internal circuit disconnection
	P203C	Urea water tank level sensor (AT1T1I) internal circuit short circuit
	P155A	Urea water tank level sensor (AT1T1I) controller internal failure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Replacing the urea water tank header.
   Internal of urea water tank header may be defective.
   Replace the urea water tank header.
   Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Make sure no error is detected in the current fault indication.

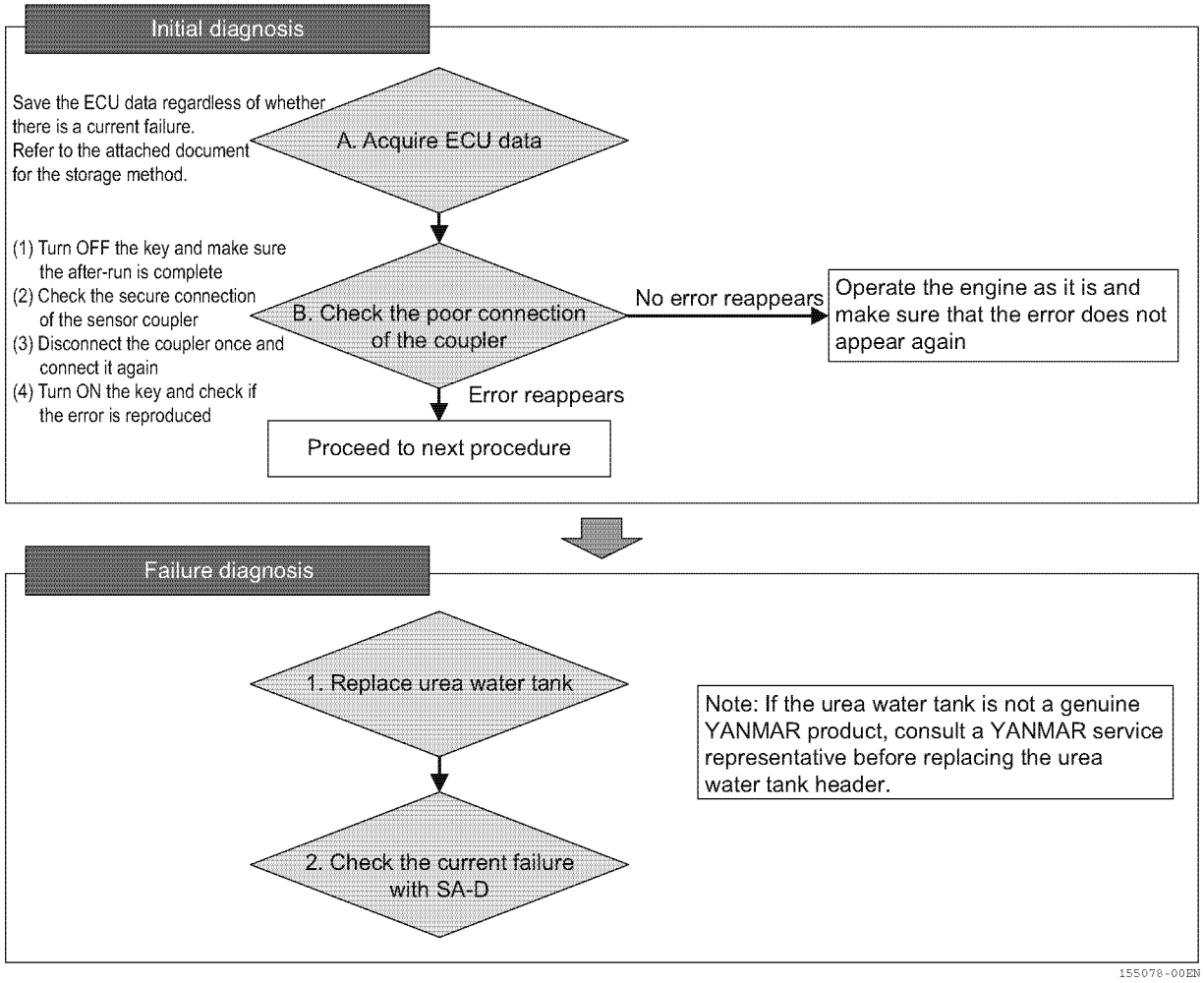
■ Urea water tank temperature sensor (AT1T1I)

● Related DTC

P code	P205D	Urea water tank temperature sensor (AT1T1I) internal circuit disconnection
	P205C	Urea water tank temperature sensor (AT1T1I) internal circuit short circuit
	P1556	Urea water tank temperature sensor (AT1T1I) controller internal failure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Replacing the urea water tank header.
   Internal of urea water tank header may be defective.
   Replace the urea water tank header.
   Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Make sure no error is detected in the current fault indication.

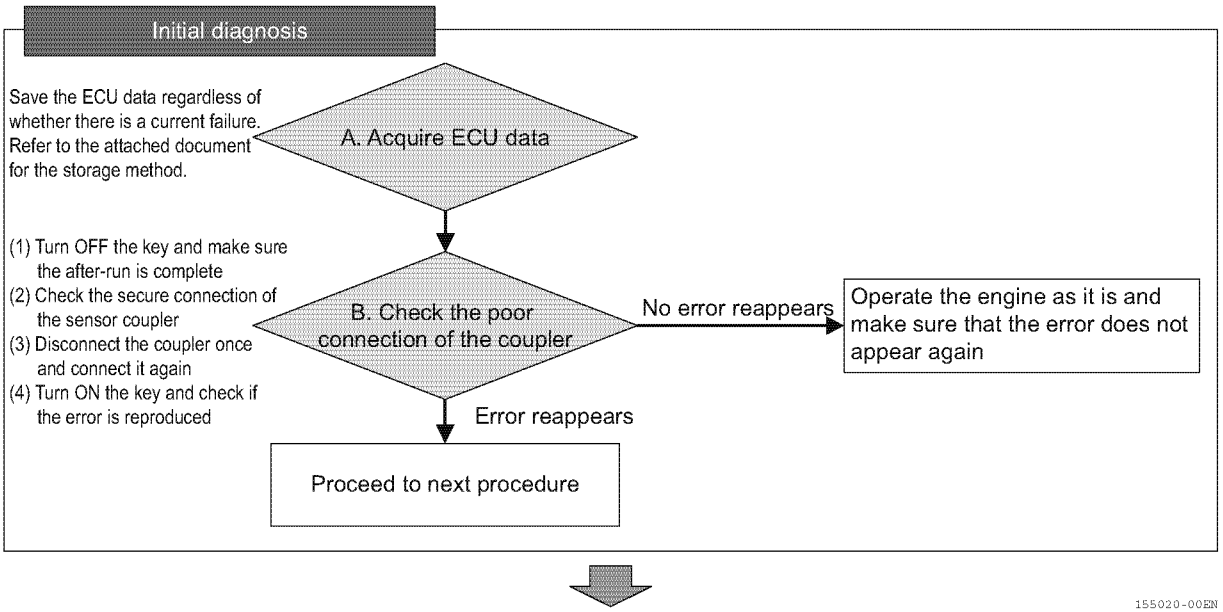
■ Urea water tank level sensor

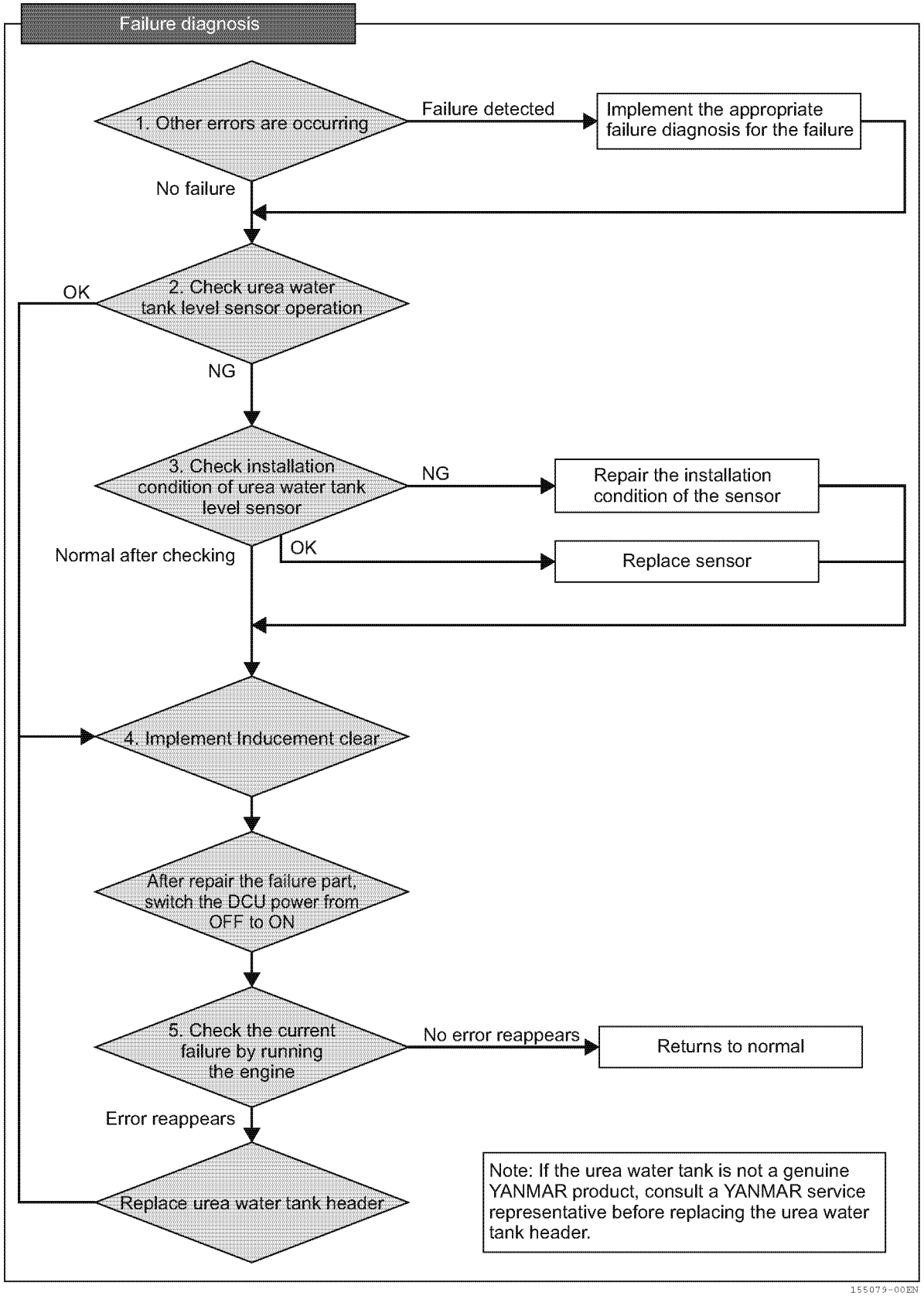
● Related DTC

P code	P155B	Urea water tank level sensor detected value error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
OK
2. Check urea water tank level sensor operation
NG
3. Check installation condition of urea water tank level sensor
NG
Repair the installation condition of the sensor
Normal after checking
OK
Replace sensor
4. Implement Inducement clear
After repair the failure part, switch the DCU power from OFF to ON
5. Check the current failure by running the engine
No error reappears
Returns to normal
Error reappears
Replace urea water tank header
Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.
155079-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the urea water tank level sensor operation" after treatment.
No error detected	Go to "Checking the urea water tank level sensor operation".

2. Checking the urea water tank level sensor operation
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Refill the urea water tank with urea water.
   3- Turn ON the key switch.
   4- Activate "Diagnosis Test: Input/output of pulse/analog" of SA-D, and monitor each indicated item. Then make sure that the urea water tank level is changing slowly between the reference values, while draining the urea water from urea water tank (e.g. by opening the drain of the tank)

Item	Reference value
Urea water tank level	Fluctuates between 0 to 100%

NG	Go to "Checking installation condition of urea water tank level sensor".
OK	Go to "Implementation of Inducement clear".

3. Checking installation condition of urea water tank level sensor
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the installation condition of urea water tank level sensor.
   3- Make sure that there is no sliding malfunction in the float of the urea water tank level sensor.

NG	• Repair the failure part. • After repairing, clear Inducement.
OK	• Replace the urea water tank level sensor. • After repairing, clear Inducement.

4. Implementation of Inducement clear
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU).
   3- Turn ON the key switch again.
   4- Activate "Configuration of settings" of SA-D, and implement the Inducement clear. (Write "1" in data.)
   5- Go to "Checking the current failure with SA-D".

   Note: When Inducement clear is implemented, the current malfunction is temporarily released. To check that no error is detected, make sure to perform "Checking the current failure with SA-D".

5. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   3- Turn ON the key switch again, start the engine, and check if the error reappears.
   4- Make sure no error is detected in the current fault indication.

No	• When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences. • No error reappears: Returns to normal
Yes	• Replace the urea water tank header. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.

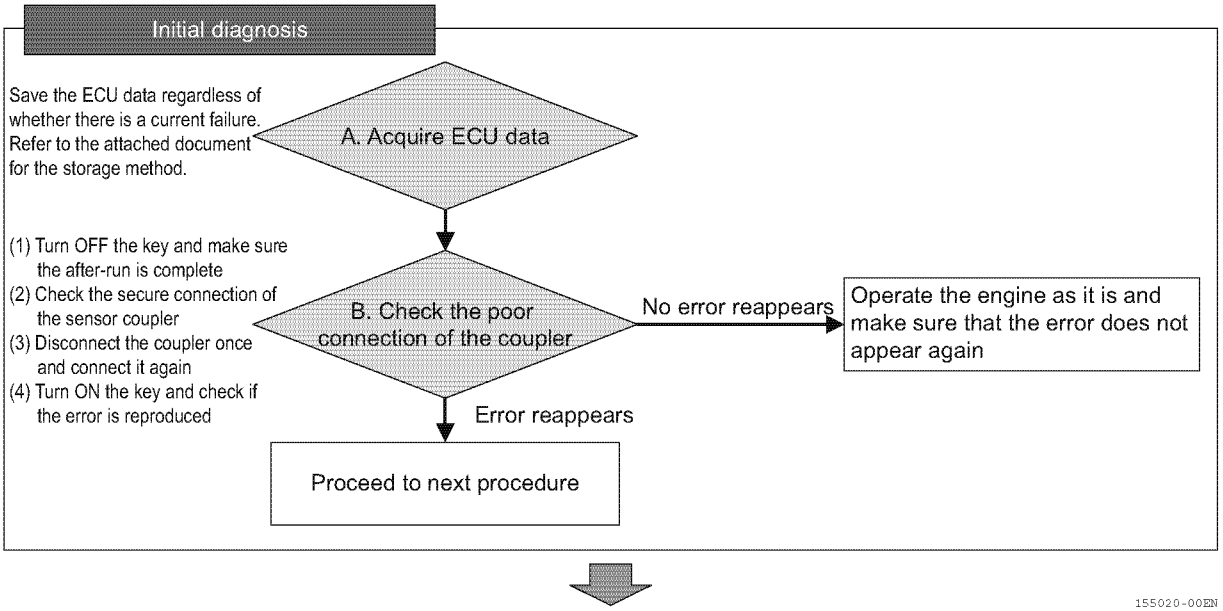
■ Urea water tank temperature sensor 1

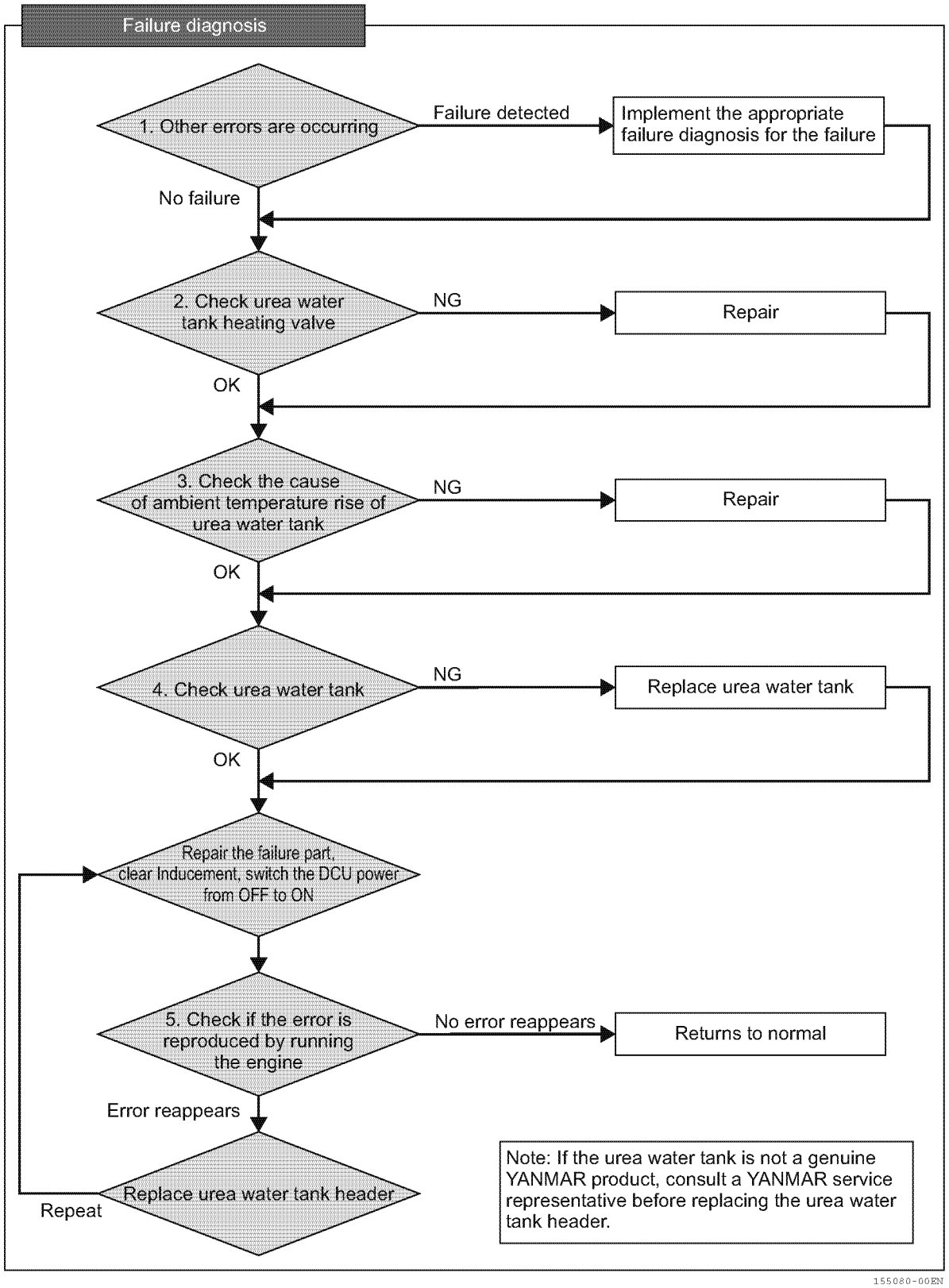
● Related DTC

P code	P205B	Urea water tank temperature rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check urea water tank heating valve
NG
Repair
OK
3. Check the cause of ambient temperature rise of urea water tank
NG
Repair
OK
4. Check urea water tank
NG
Replace urea water tank
OK
Repair the failure part, clear Inducement, switch the DCU power from OFF to ON
5. Check if the error is reproduced by running the engine
No error reappears
Returns to normal
Error reappears
Replace urea water tank header
Repeat
Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.
155080-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to urea water tank heating valve are detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the urea water tank heating valve" after treatment.
No error detected	Go to "Checking the urea water tank heating valve".

2. Checking the urea water tank heating valve
   1- Perform the failure diagnosis for "Urea water tank heating valve". However, do not replace the wire-harness or DCU, when the result of "Checking the wire-harness conduction" is OK.

Results of "Urea water tank heating valve"	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to "Checking the cause of ambient temperature rise of urea water tank" after repair.
OK	Go to "Checking the cause of ambient temperature rise of urea water tank".

3. Checking the cause of ambient temperature rise of urea water tank
   1- Make sure that there is no factors causing the temperature around the urea water tank to rise.

NG	• Take measures against the temperature rise. • Go to "Checking the urea water tank" after treatment.
OK	Go to "Checking the urea water tank".

4. Checking the urea water tank
   1- Make sure that the cooling water does not flow into the urea water tank, which is caused by cracks or damages of cooling water piping circulating in the tank.

NG	• Replace the urea water tank. • Go to "Checking the current failure with SA-D" after replacement.
OK	Go to "Checking the current failure with SA-D".

5. Checking the current failure with SA-D
   1- Clear the Inducement, turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   3- Turn ON the key switch again to start the engine.
   4- Make sure no error is detected in the current fault indication.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Replace the urea water header. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

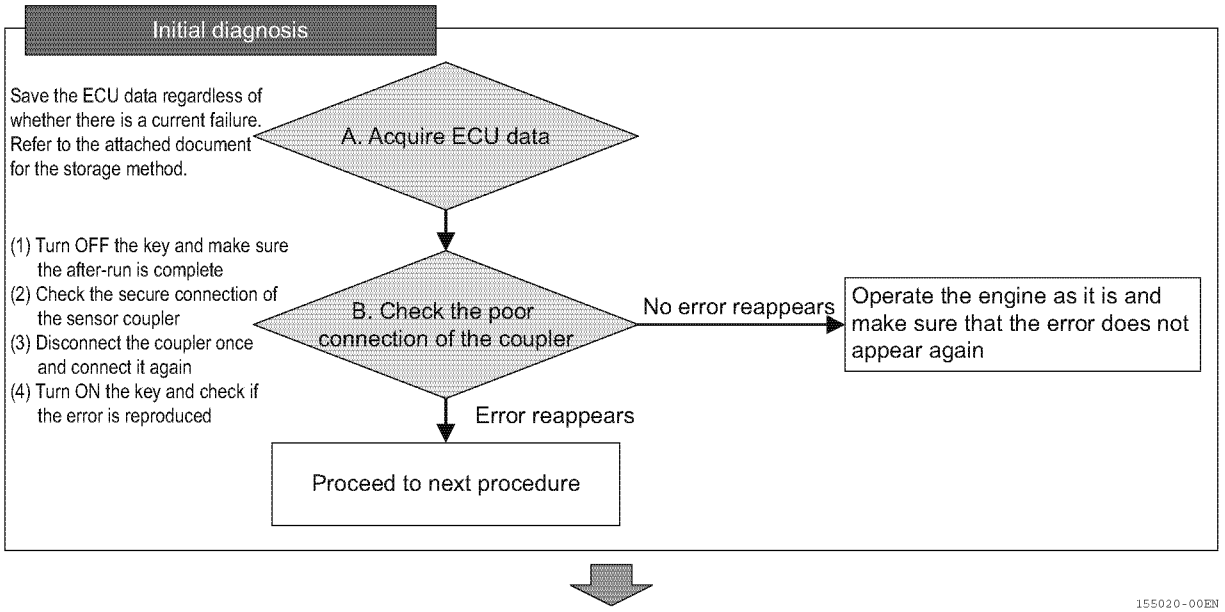
■ Urea water tank temperature sensor 2

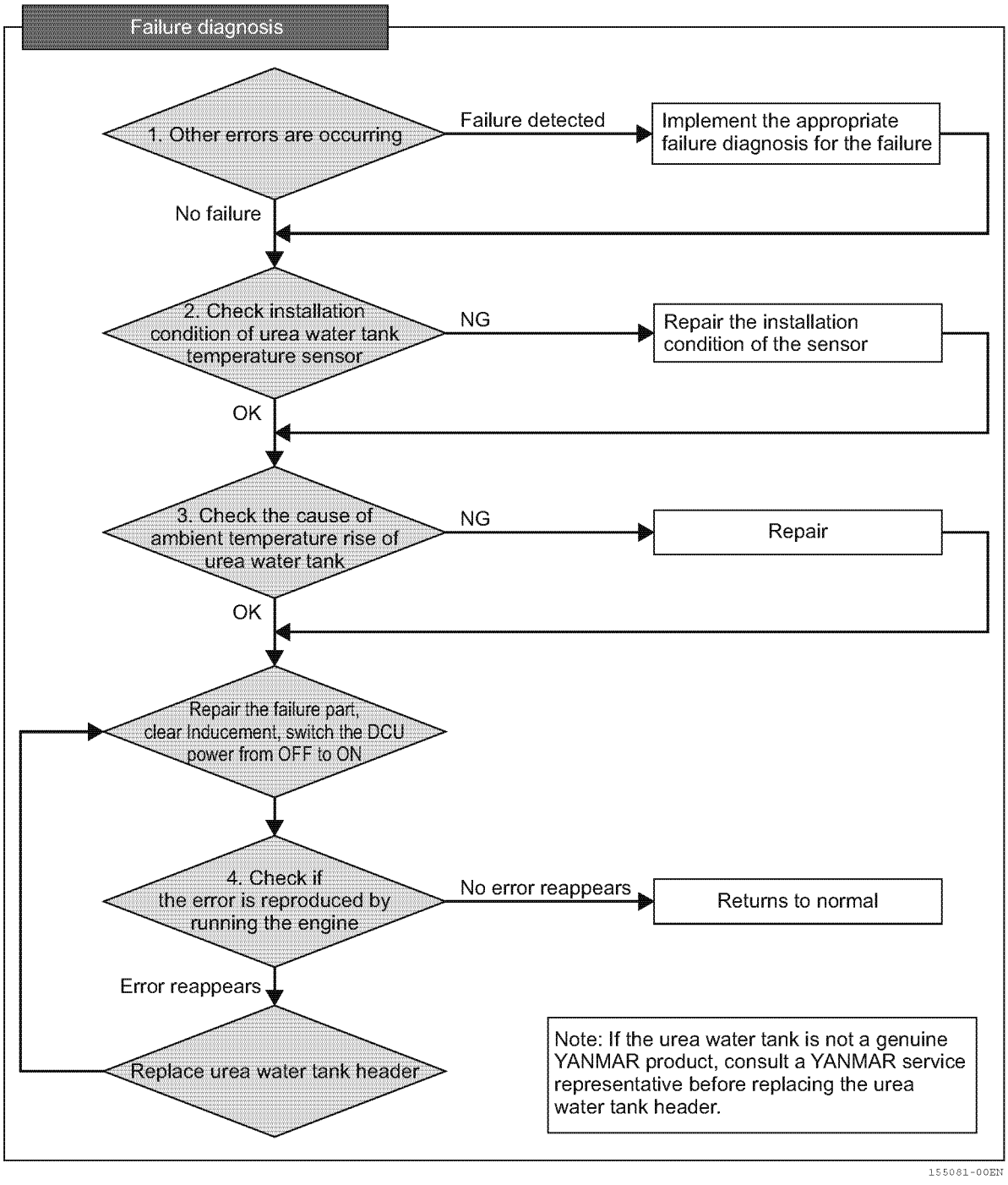
● Related DTC

P code	P1539	Urea water tank temperature sensor detected value error (upper limit error)
	P153A	Urea water tank temperature sensor detected value error (lower limit error)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check installation condition of urea water tank temperature sensor
NG
Repair the installation condition of the sensor
OK
3. Check the cause of ambient temperature rise of urea water tank
NG
Repair
OK
Repair the failure part, clear Inducement, switch the DCU power from OFF to ON
4. Check if the error is reproduced by running the engine
No error reappears
Returns to normal
Error reappears
Replace urea water tank header
Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.
155081-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to the followings are not detected: cooling water temperature sensor, fresh air temperature sensor on ECU side, and SCR catalyst temperature sensor on DCU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the installation condition of urea water tank temperature sensor” after treatment.
No error detected	Go to “Checking the installation condition of urea water tank temperature sensor”.

2. Checking the installation condition of urea water tank temperature sensor
   1- Turn OFF the key switch, and wait until power supplies of DCU is turned OFF.
   2- Check the installation condition of urea water tank temperature sensor.

NG	• Repair the installation condition of sensor. • Go to “Checking the cause of ambient temperature rise of urea water tank” after repair.
OK	Go to “Checking the cause of ambient temperature rise of urea water tank”.

3. Checking the cause of ambient temperature rise of urea water tank
   1- Make sure that there is no factors causing the temperature around the urea water tank to rise.

NG	• Take measures against the temperature rise. • After correcting the problem, clear Inducement, turn OFF the DCU power, and check the completion of after-run.
OK	Go to “Checking if the error is reproduced by running the engine”.

4. Checking if the error is reproduced by running the engine
   1- Turn OFF the key switch, and wait until power supplies of DCU is turned OFF.
   2- Connect all couplers (sensor, wire-harness, DCU).
   3- Turn ON the key switch again, check if the error is reproduced by running the engine.

No error reappears	Returns to normal.
Error reappears	• Replace the urea water tank header. • After replacement, switch the DCU power from OFF to ON for failure diagnosis using SA-D.

Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.

Note: When the reference value in 4. above cannot be met due to the ambient environmental factors, activate “Configuration of settings” of SA-D, and implement the Inducement clear. (Write “1” in data.)

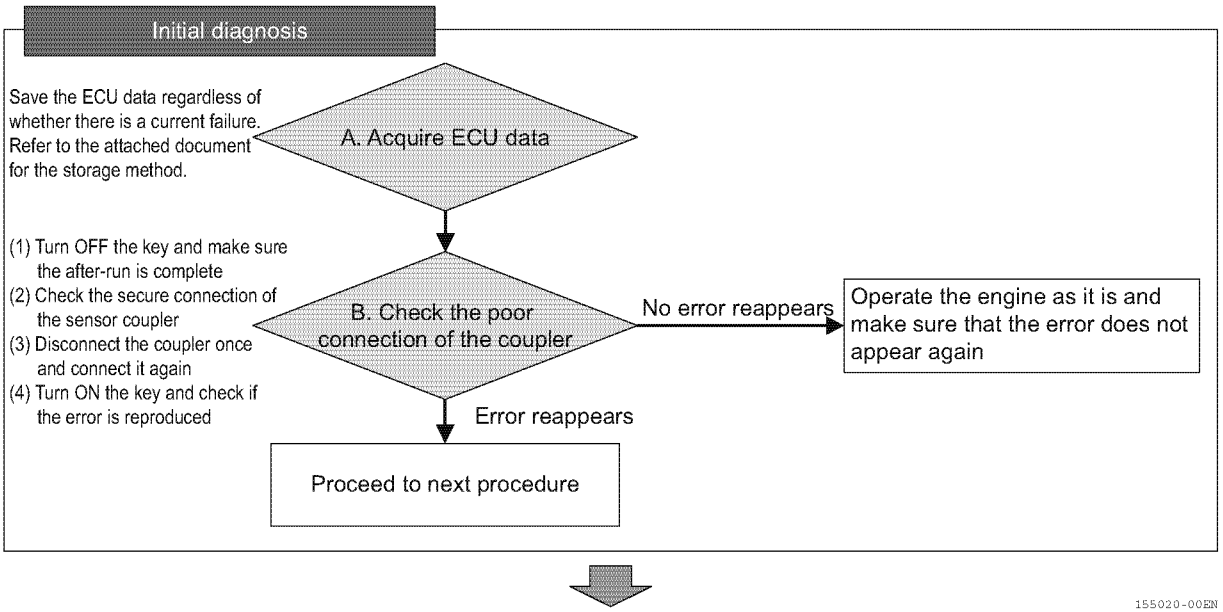
■ Urea water tank temperature sensor 3

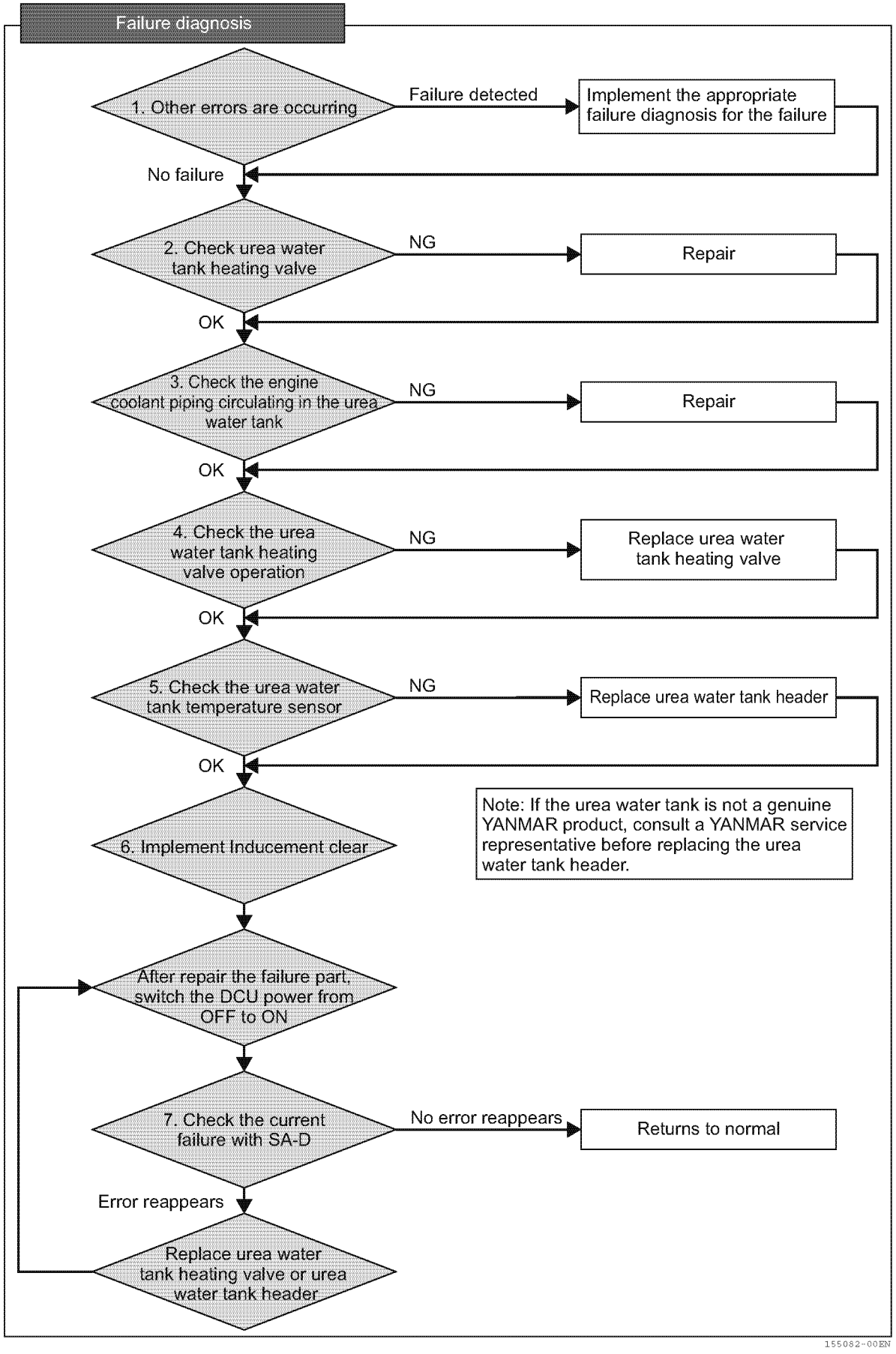
● Related DTC

P code	P154B	Urea water tank temperature rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check urea water tank heating valve
NG
Repair
OK
3. Check the engine coolant piping circulating in the urea water tank
NG
Repair
OK
4. Check the urea water tank heating valve operation
NG
Replace urea water tank heating valve
OK
5. Check the urea water tank temperature sensor
NG
Replace urea water tank header
OK
6. Implement Inducement clear
Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.
After repair the failure part, switch the DCU power from OFF to ON
7. Check the current failure with SA-D
No error reappears
Returns to normal
Error reappears
Replace urea water tank heating valve or urea water tank header
155082-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to urea water tank heating valve are detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the urea water tank heating valve” after treatment.
No error detected	Go to “Checking the urea water tank heating valve”.

2. Checking the urea water tank heating valve
   1- Perform the failure diagnosis for “Urea water tank heating valve”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Urea water tank heating valve”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • After repairing, clear Inducement, turn the key OFF and make sure the after-run is completed, then turn the key ON again and run the engine to check whether the error has reappeared. No error reappears: Returns to normal Error reappears: Go to “Checking the cooling water piping circulating in the urea water tank”
OK	Go to “Checking the cooling water piping circulating in the urea water tank”.

3. Checking the cooling water piping circulating in the urea water tank
   1- Check the coolant piping between the engine and the urea water tank to make sure that the coolant piping is not clogged by being twisted and bent, or contamination.
   2- Check the cooling water piping circulating in the urea water tank to make sure that the coolant piping is not clogged by contamination.

NG	• Repair the defective parts. • After repairing, clear Inducement, turn the key OFF and make sure the after-run is completed, then turn the key ON again and run the engine to check whether the error has reappeared. No error reappears: Returns to normal Error reappears: Go to “Checking the cooling water piping circulating in the urea water tank”
OK	Go to “Checking the urea water tank heating valve operation”.

4. Checking the urea water tank heating valve operation
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine. Connect all coolant pipings.
   3- Turn ON the key switch, and start the engine.
   4- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water tank heating valve, and check if the coolant circulates in the urea water tank.

NG	• Replace the urea water tank heating valve. • After replacement, clear Inducement, turn the key OFF and make sure the after-run is completed, then turn the key ON again and run the engine to check whether the error has reappeared. No error reappears: Returns to normal Error reappears: Go to “Checking the urea water tank temperature sensor”
OK	Go to “Checking the urea water tank temperature sensor”.

5. Checking the urea water tank temperature sensor
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine. Connect all coolant pipings.
   3- Turn ON the key switch.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, and check if the urea water tank temperature indicates a correct temperature.

NG	• Replace the urea water tank header. • Go to “Implementation of Inducement clear” after replacement.
OK	Go to “Implementation of Inducement clear”.

6. Implementation of Inducement clear
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU).
   3- Turn ON the key switch again.
   4- Activate “Configuration of settings” of SA-D, and implement the Inducement clear. (Write “1” in data.)
   5- Go to “Checking the current failure with SA-D”.

   Note: When Inducement clear is implemented, the current malfunction is temporarily released. To check that no error is detected, make sure to perform “Checking the current failure with SA-D”.

7. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   3- Turn ON the key switch again to start the engine.
   4- Make sure no error is detected in the current fault indication.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Replace the urea water tank heating valve, or the urea water tank header. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

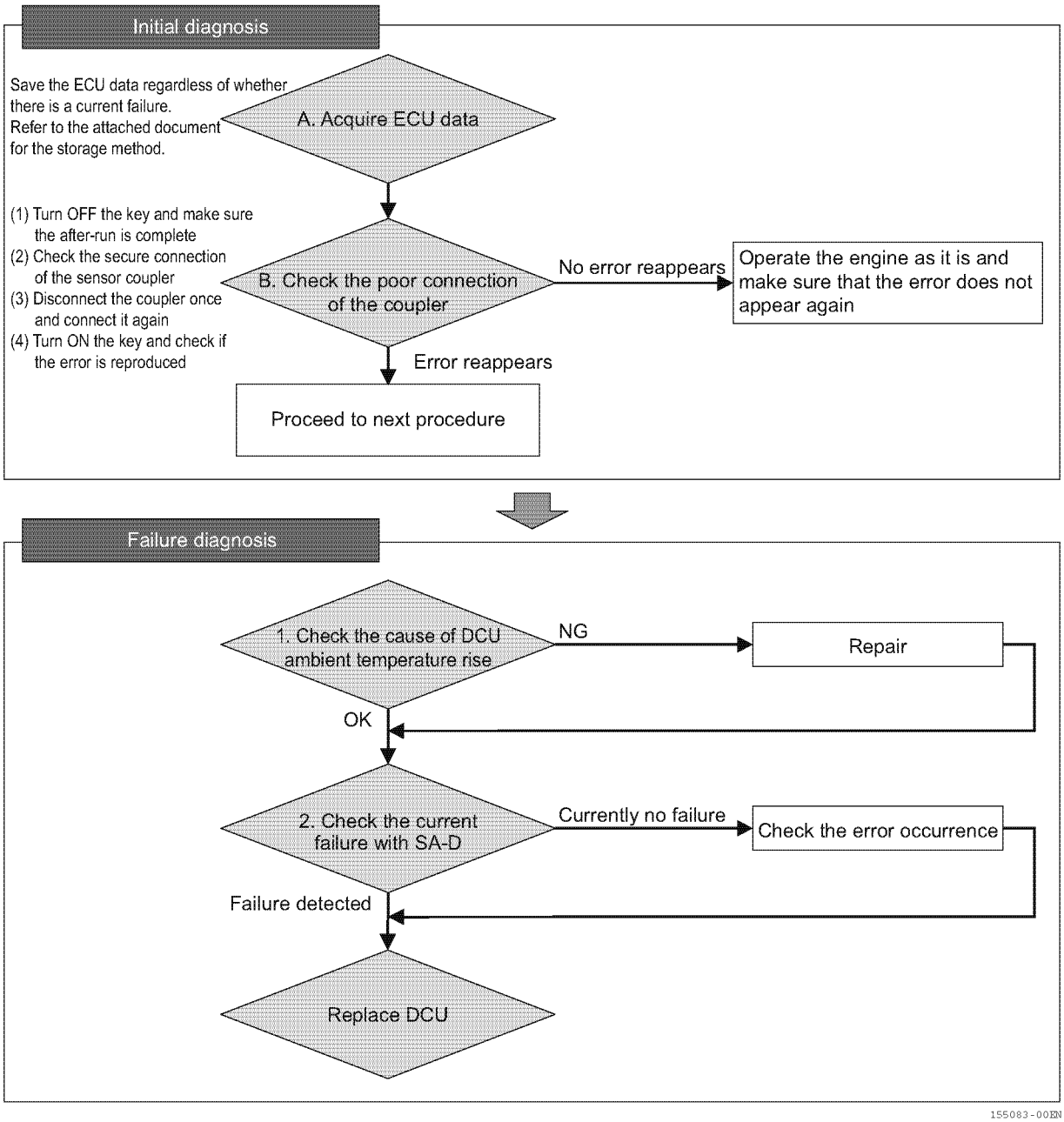
■ DCU internal temperature sensor

● Related DTC

P code	P1504	DCU internal temperature rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the cause of DCU ambient temperature rise

1- Make sure that there is no factors causing the temperature around the DCU to rise.

NG	• Take measures against the temperature rise. • Go to “Checking the current failure with SA-D” after treatment.
OK	Go to “Checking the current failure with SA-D”.

2. Checking the current failure with SA-D

1- Turn OFF the key switch, turn ON the key switch again, and start the engine.

2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	Replace the DCU.

Contact output related

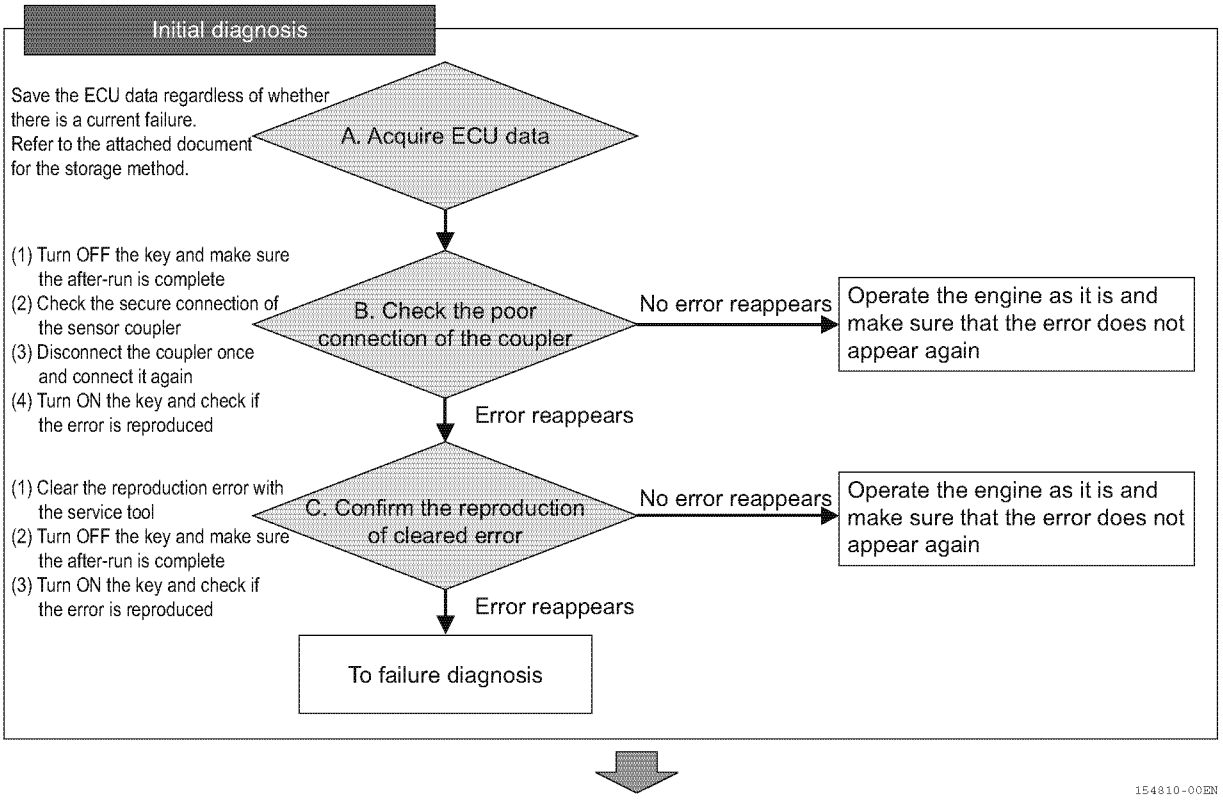
■ Heater relay 1

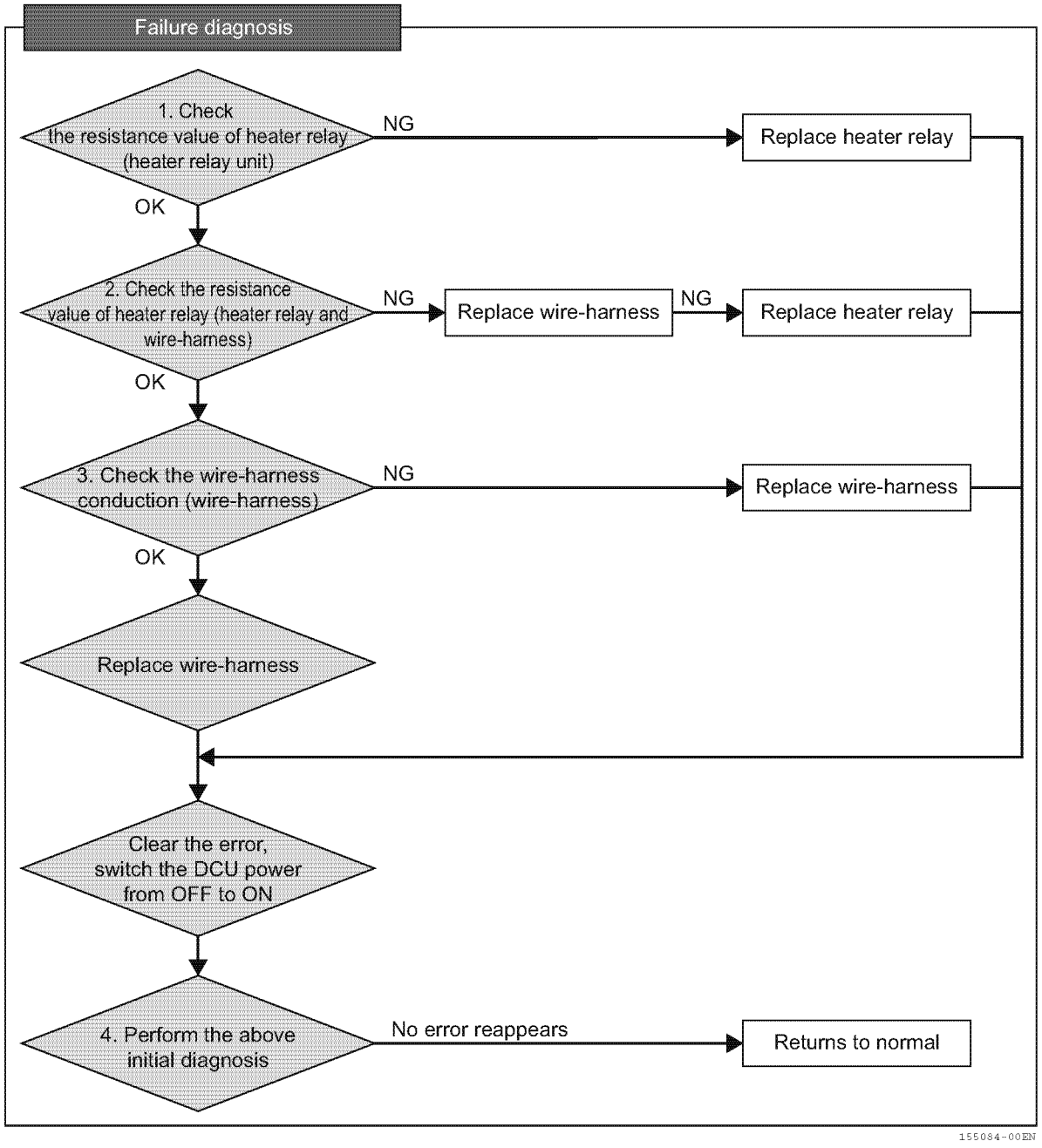
● Related DTC

P code	P21C4	Heater relay L side VB short circuit
	P21C3	Heater relay L side GND short circuit
	P21C2	Heater relay disconnection

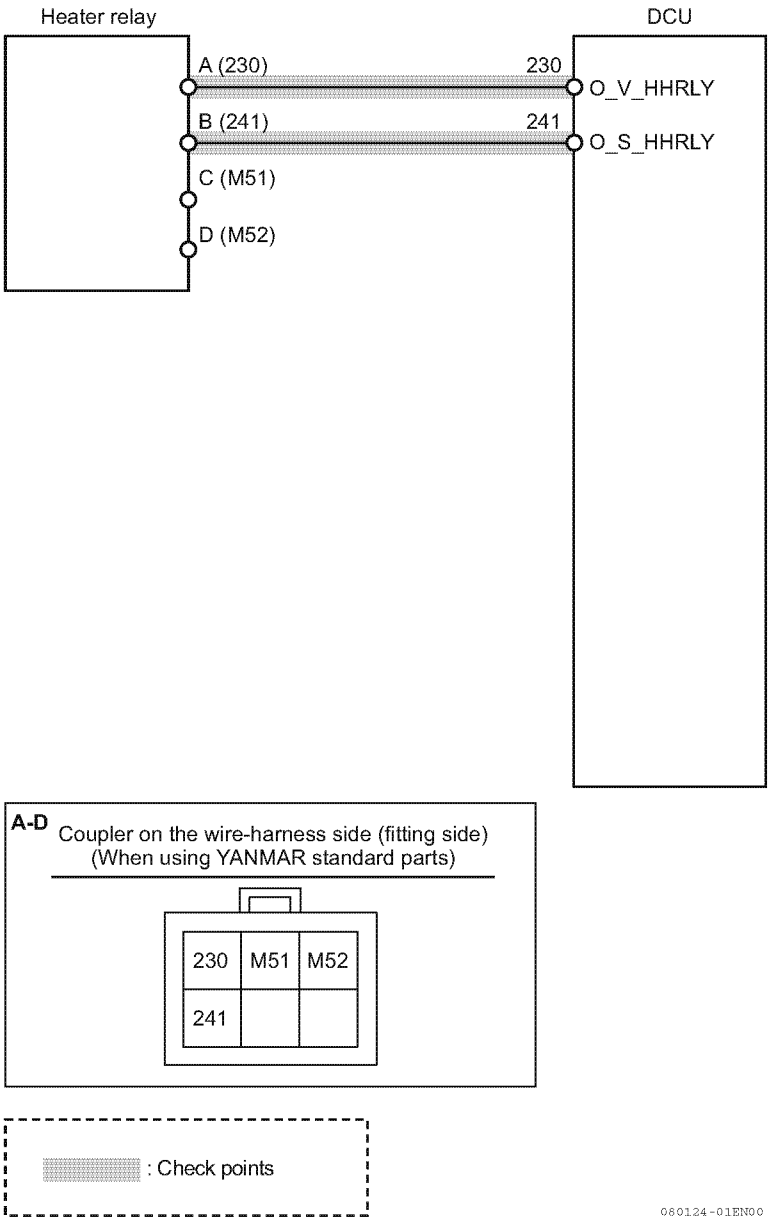
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of heater relay (heater relay unit)
NG
Replace heater relay
OK
2. Check the resistance value of heater relay (heater relay and wire-harness)
NG
Replace wire-harness
NG
Replace heater relay
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace wire-harness
Clear the error, switch the DCU power from OFF to ON
4. Perform the above initial diagnosis
No error reappears
Returns to normal
155084-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of heater relay (heater relay unit)
   1- Remove the wire-harness from the heater relay.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the heater relay terminals A and B.

Reference: Overall resistance value of heater relay

Terminal	Specifications
Between heater relay terminals	Specifications of heater relay vary depending on the driven machine. See the Operation Manual of the driven machine.

NG	Replace the heater relay, switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of heater relay (heater relay and wire-harness)”

2. Checking the resistance value of heater relay (heater relay and wire-harness)
   1- Connect the heater relay and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 230 and 241 on DCU side.
   Note: See the above “Reference: Overall resistance value of heater relay”.

NG	• The coupler between the heater relay and the wire-harness may be defective. Replace the wire-harness, clear the error, turn OFF the power, and turn the power back ON after the after-run is completed to check whether the error reappears. If the error repeats, replace the heater relay. • Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the heater relay and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Heater relay conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on heater relay side)	Conduction	State
230	Heater relay terminal A	Yes	OK: Normal
		No	NG: Error
241	Heater relay terminal B	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Heater relay conduction check pattern 1”, carry out the below, too.

Reference: Heater relay conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
230	All terminals other than 230 and 180	Yes	NG: Error
		No	OK: Normal
241	All terminals other than 241	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

4. Checking the current failure with SA-D
   1- Clear the error.
   2- Turn OFF the key switch and turn ON the key switch again.
   3- Make sure no error is detected in the current fault indication.

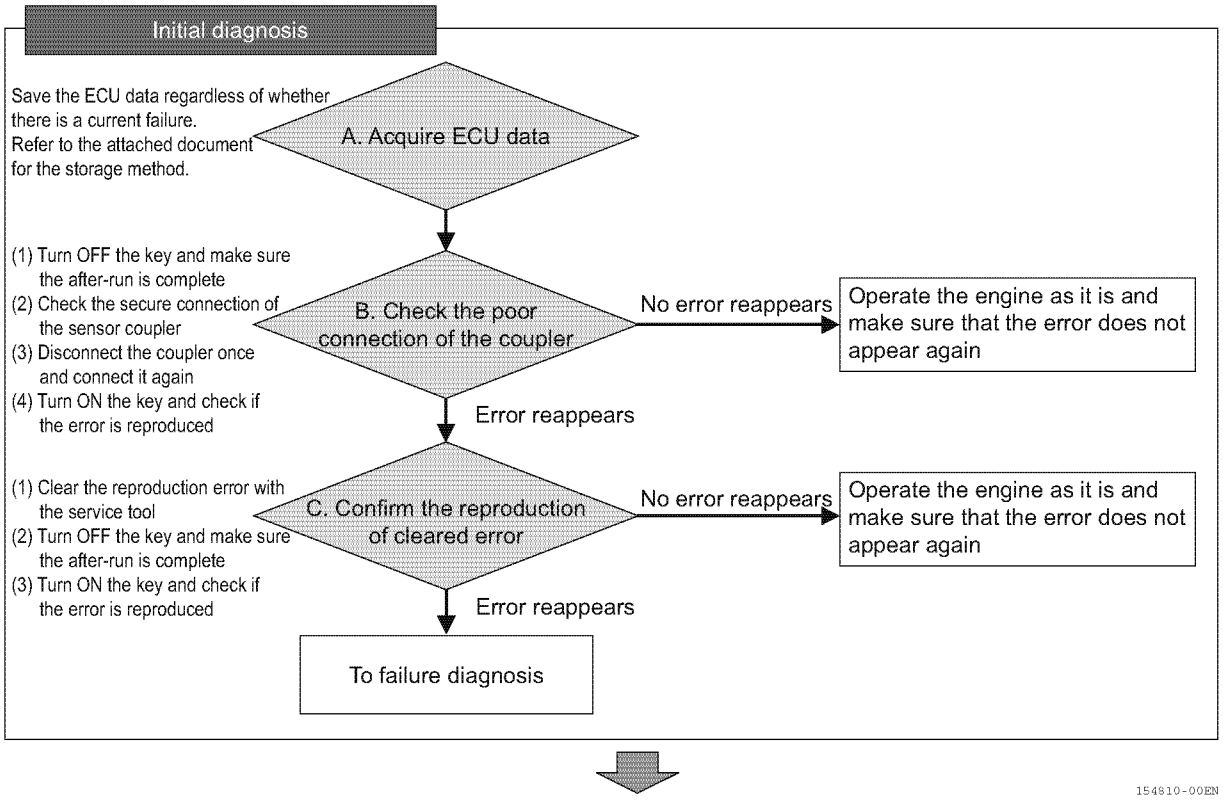
■ Heater relay 2

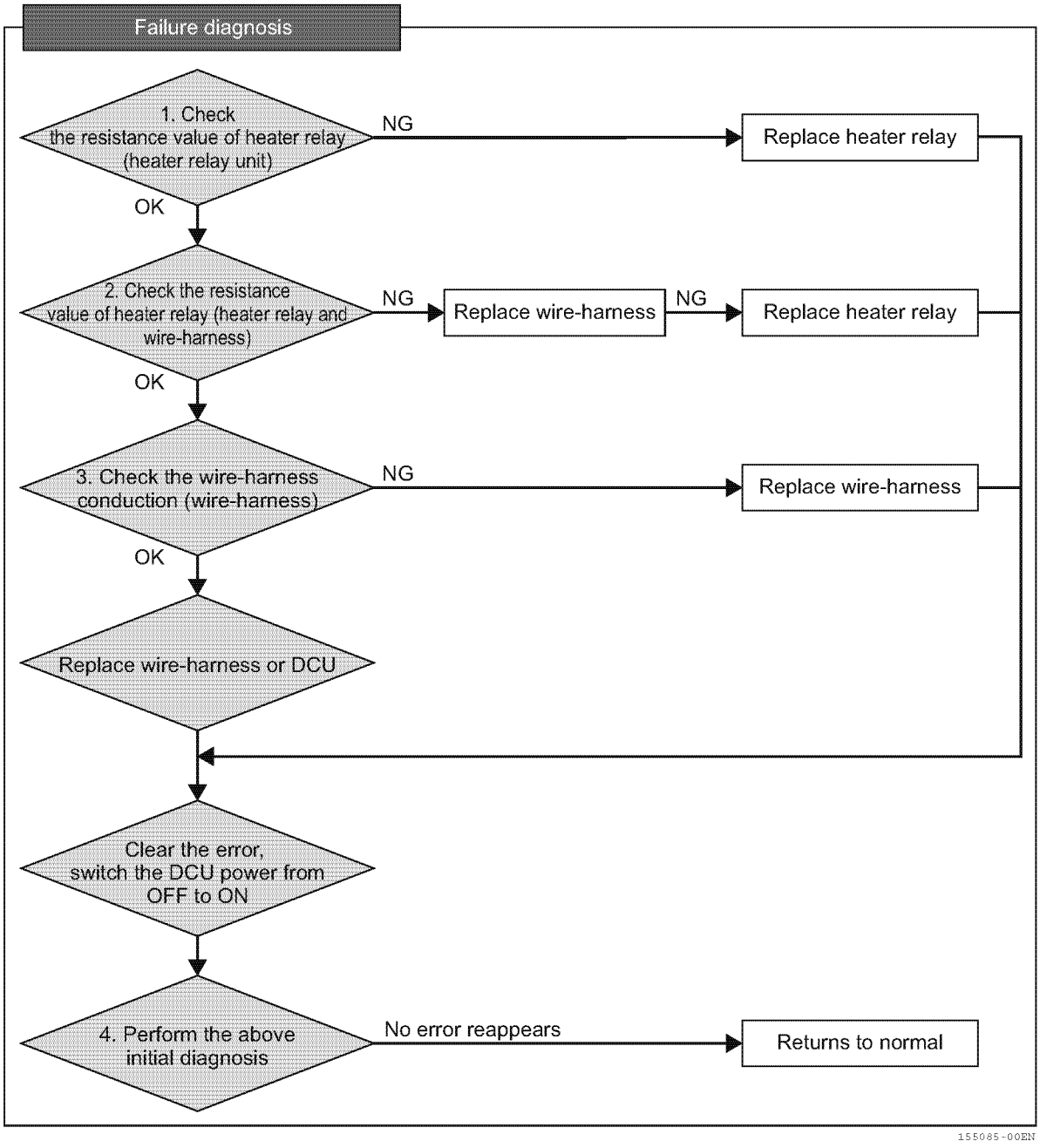
● Related DTC

P code	P1509	Heater relay power stage temperature rise error

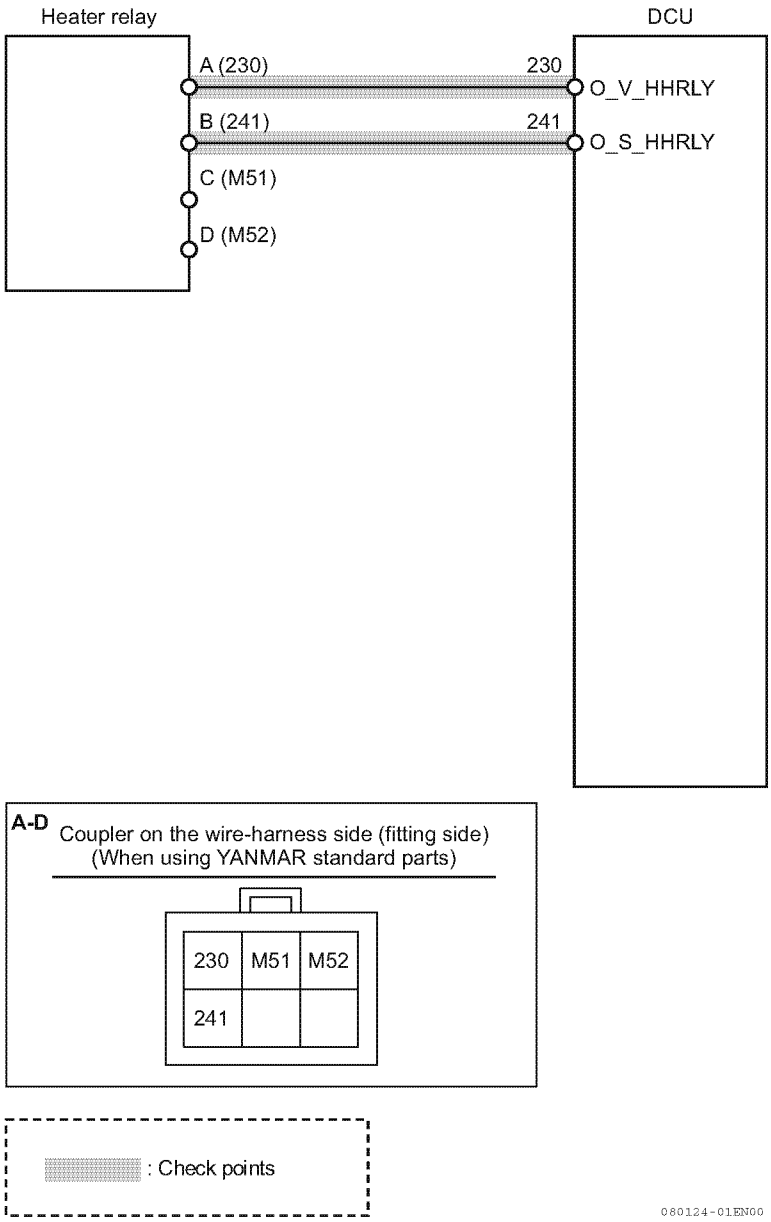
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of heater relay (heater relay unit)
NG
Replace heater relay
OK
2. Check the resistance value of heater relay (heater relay and wire-harness)
NG
Replace wire-harness
NG
Replace heater relay
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace wire-harness or DCU
Clear the error, switch the DCU power from OFF to ON
4. Perform the above initial diagnosis
No error reappears
Returns to normal
155085-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of heater relay (heater relay unit)
   1- Remove the wire-harness from the heater relay.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the heater relay terminals A and B.

Reference: Overall resistance value of heater relay

Terminal	Specifications
Between heater relay terminals	Specifications of heater relay vary depending on the driven machine. See the Operation Manual of the driven machine.

NG	Replace the heater relay, switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of heater relay (heater relay and wire-harness)”

2. Checking the resistance value of heater relay (heater relay and wire-harness)
   1- Connect the heater relay and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 230 and 241 on DCU side.
   Note: See the above “Reference: Overall resistance value of heater relay”.

NG	• The coupler between the heater relay and the wire-harness may be defective. Replace the wire-harness, clear the error, turn OFF the power, and turn the power back ON after the after-run is completed to check whether the error reappears. If the error repeats, replace the heater relay. • Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the heater relay and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Heater relay conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on heater relay side)	Conduction	State
230	Heater relay terminal A	Yes	OK: Normal
		No	NG: Error
241	Heater relay terminal B	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Heater relay conduction check pattern 1”, carry out the below, too.

Reference: Heater relay conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
230	All terminals other than 230 and 180	Yes	NG: Error
		No	OK: Normal
241	All terminals other than 241	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the DCU. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

4. Checking the current failure with SA-D
   1- Clear the error.
   2- Turn OFF the key switch and turn ON the key switch again.
   3- Make sure no error is detected in the current fault indication.

Actuator related

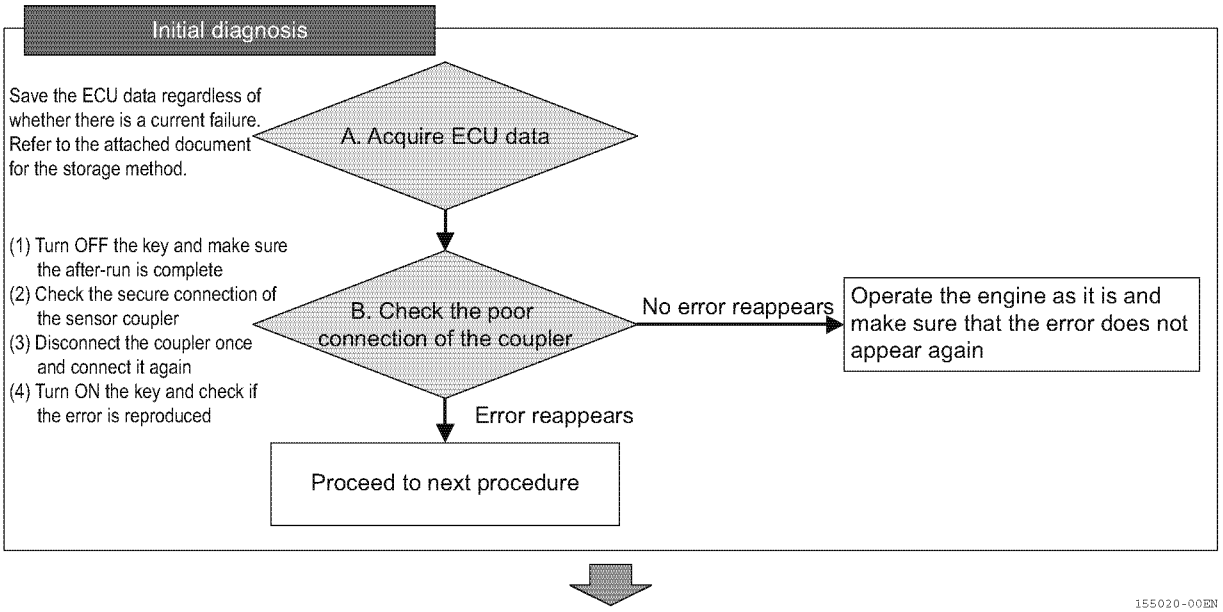
■ Dosing module 1

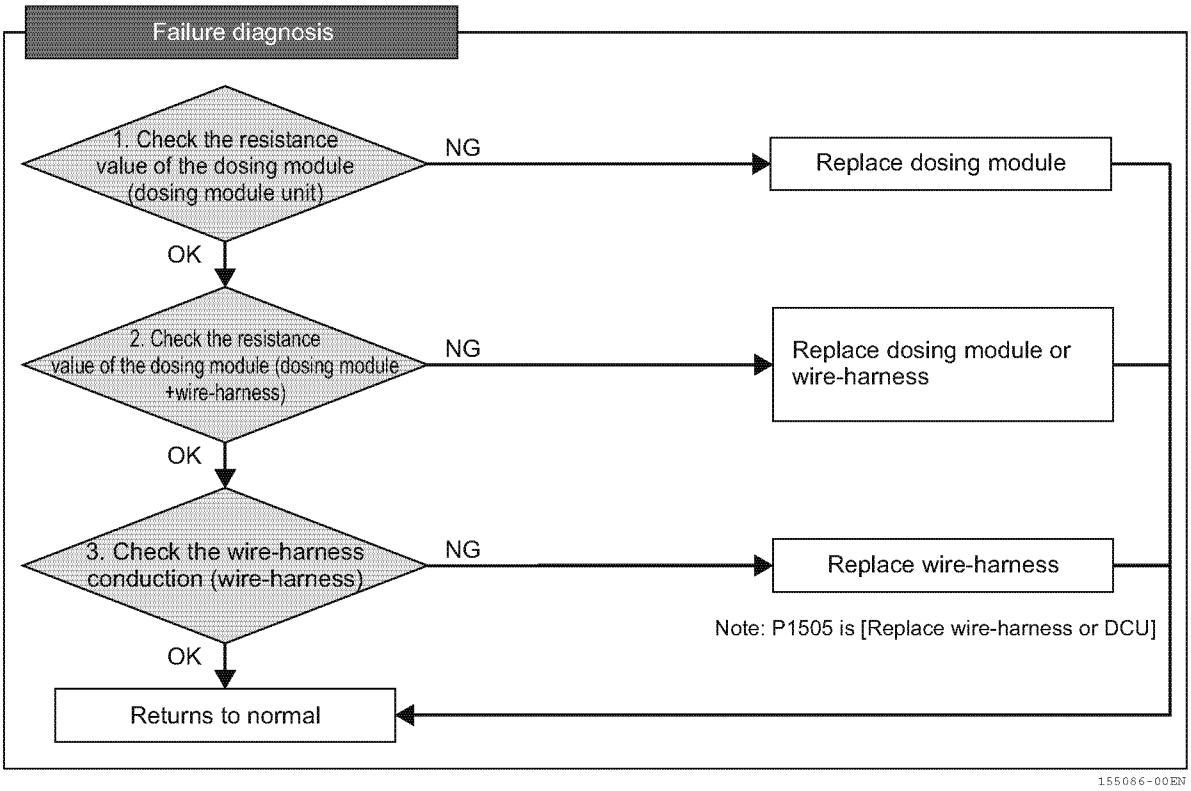
● Related DTC

P code	P2049	Dosing module H side VB short circuit/disconnection
	P2047	Dosing module H side GND short circuit
	P151B (4TNV94FHT, 4TN101FHT, FDT)	Dosing module H side - L side short circuit
	P151B (4TN107FHT, FTT)	Dosing module L side VB short circuit
	P2048	Dosing module L side GND short circuit
	P1771	Dosing module disconnection
	P1770	Dosing module VB short circuit
	P1772	Dosing module GND short circuit
	P1505	Dosing module power stage temperature rise error

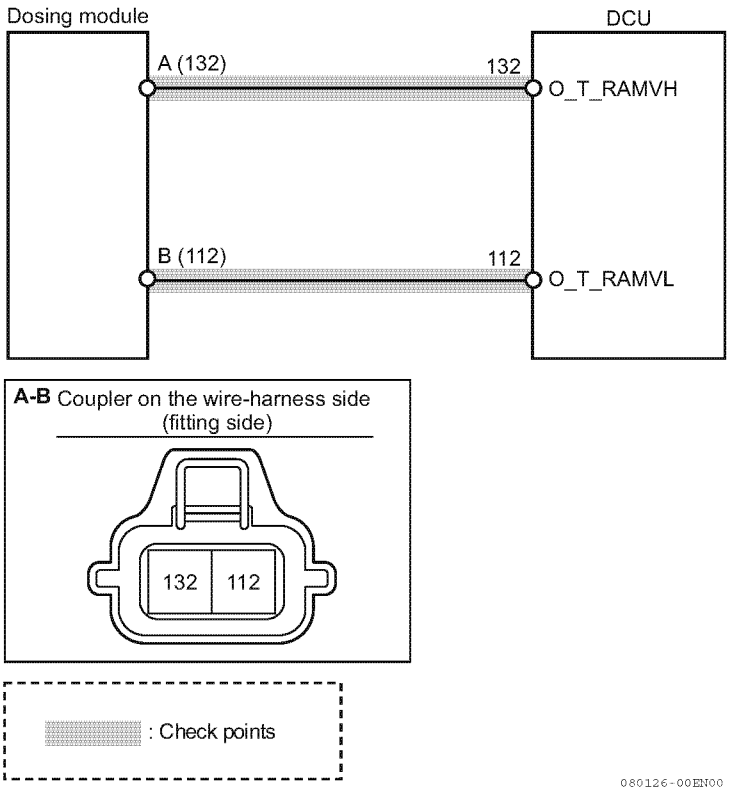
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of the dosing module (dosing module unit)
NG
Replace dosing module
OK
2. Check the resistance value of the dosing module (dosing module +wire-harness)
NG
Replace dosing module or wire-harness
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
Note: P1505 is [Replace wire-harness or DCU]
OK
Returns to normal
155086-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of dosing module (dosing module unit)
   1- Remove the wire-harness from the dosing module.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the dosing module terminals A and B.

Reference: Overall resistance value of dosing module

Terminal	Specifications
Between dosing module terminals	12 ± 0.6 Ω (at 20 °C)

NG	Replace the dosing module, switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to "Checking the resistance value of dosing module. (Dosing module and wire-harness)"

2. Checking the resistance value of dosing module (dosing module and wire-harness)
   1- Connect the dosing module and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 132 and 112 on DCU side.
   Note: See the above "Reference: Overall resistance value of dosing module".

NG	• The coupler between the dosing module and the wire-harness may be defective. After replacing the dosing module, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the wire-harness. • Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to "Checking the wire-harness conduction".

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the dosing module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Dosing module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on dosing module side)	Conduction	State
132	Dosing module terminal A	Yes	OK: Normal
		No	NG: Error
112	Dosing module terminal B	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Dosing module conduction check pattern 1”, carry out the below, too.

Reference: Dosing module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
132	All terminals other than 132	Yes	NG: Error
		No	OK: Normal
112	All terminals other than 112	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Replace the DCU. (P1505 only) • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

4. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- Operate the engine under conditions meeting the above reference value, and make sure no error is detected in the current fault indication.

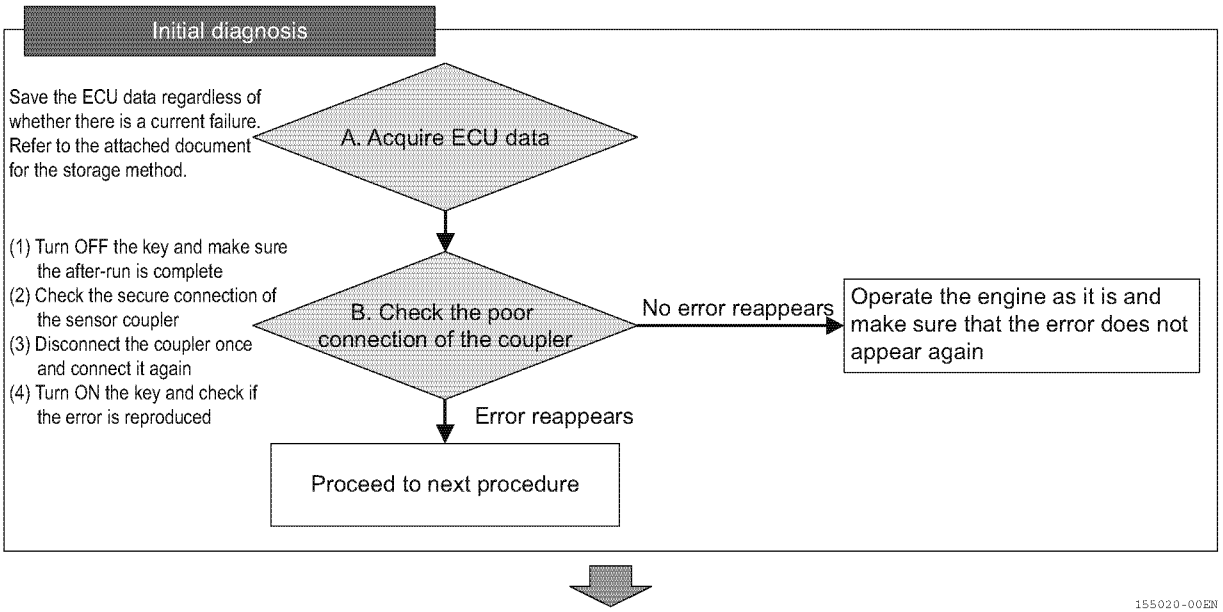
■ Dosing module 2

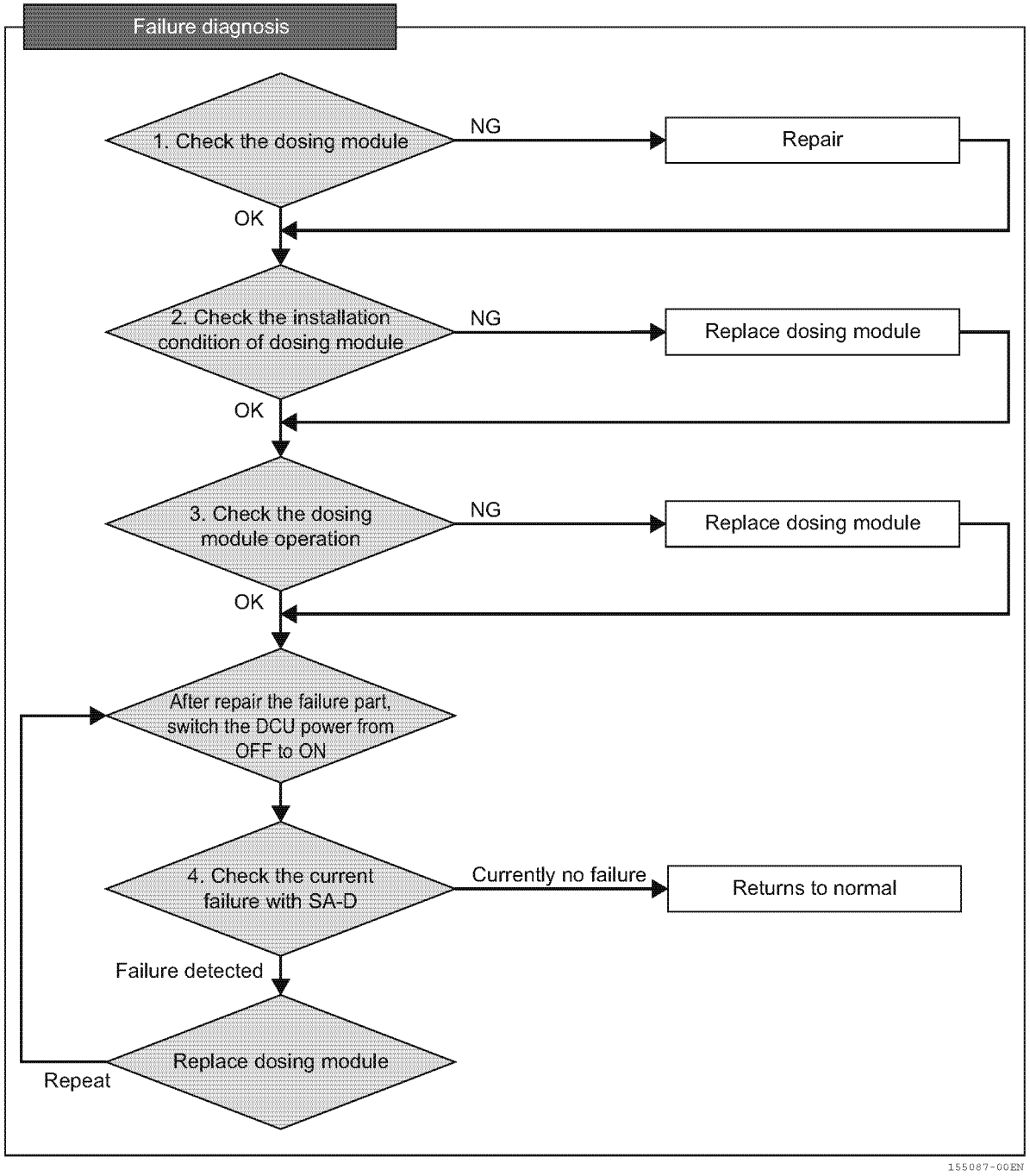
● Related DTC

P code	P208E	Dosing module valve sticking

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the dosing module
NG
Repair
OK
2. Check the installation condition of dosing module
NG
Replace dosing module
OK
3. Check the dosing module operation
NG
Replace dosing module
OK
After repair the failure part, switch the DCU power from OFF to ON
4. Check the current failure with SA-D
Currently no failure
Returns to normal
Failure detected
Replace dosing module
Repeat
155087-00EN

● Work description

1. Checking the dosing module

1- Perform the failure diagnosis for “Dosing module 1”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Dosing module 1”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the installation condition of dosing module” after repair.
OK	Go to “Checking the installation condition of dosing module”.

2. Checking the installation condition of dosing module

1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

2- Remove the dosing module from the engine.

3- Make sure that the dosing module is not damaged or deformed.

NG	• Replace the dosing module. • Go to “Checking the operation of dosing module” after replacement.
OK	Go to “Checking the operation of dosing module”.

3. Checking the operation of dosing module

1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)

3- Remove the dosing module from the engine.

4- Turn ON the key switch.

5- Activate the urea water injection test (injection pattern = “3”) of “Diagnosis Test: Active control” of SMARTAS-SIST-DIRECT (SA-D), operate the dosing module, and check if the dosing module injects the urea water.

NG	• Replace the dosing module. • Go to “Checking the current failure with SA-D” after replacement.
OK	Go to “Checking the current failure with SA-D”.

4. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Attach the dosing module to the engine.
   3- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine. Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   4- Turn ON the key switch again to start the engine.
   5- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Supply module pressure	350 to 1500 kPa
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   6- Keep on operating the engine under conditions meeting the reference value for 2 minutes or more, and make sure no error is detected in the current fault indication.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Replace the dosing module. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

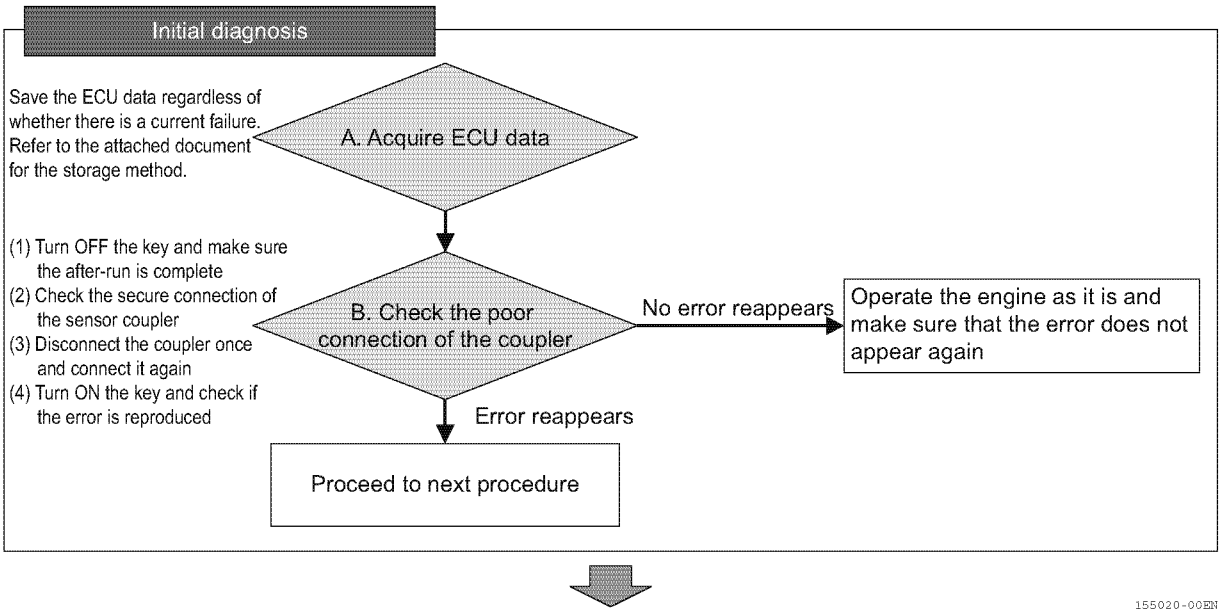
■ Supply module 1

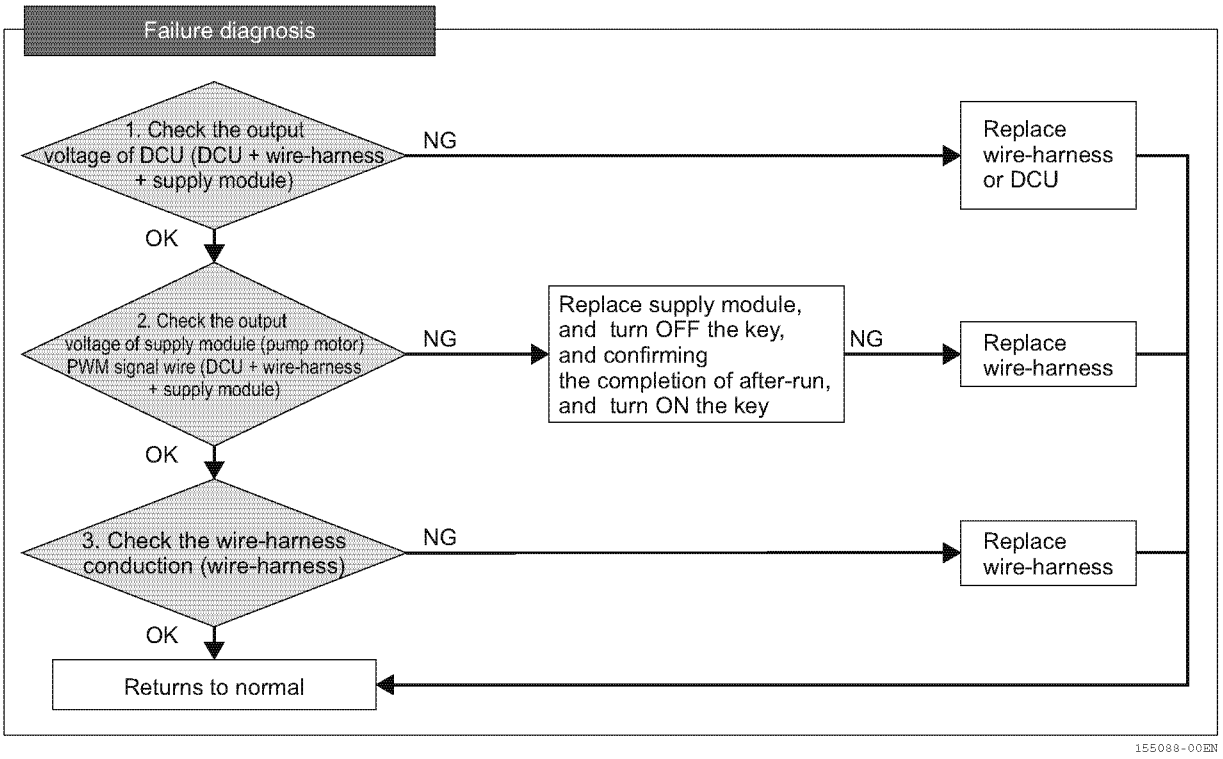
● Related DTC

P code	P208D	Supply module (pump motor) PWM signal wire VB short circuit
	P208C	Supply module (pump motor) PWM signal wire GND short circuit
	P208A	Supply module (pump motor) PWM signal wire disconnection
	P20AD	Not starting to measure temperature of supply module (pump motor)

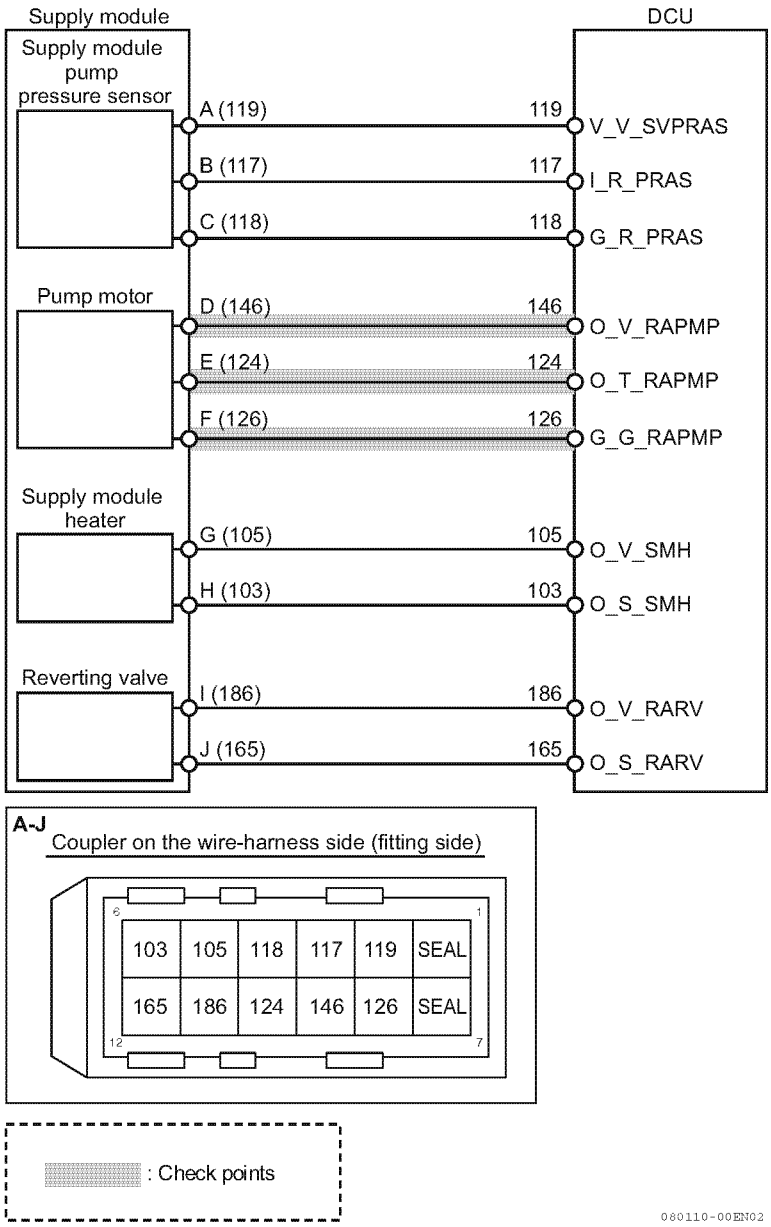
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the output voltage of DCU
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) power supply 146 to 126.

Voltage	State	Corrective action
146 ≈ Battery voltage	OK (normal range)	Check the output voltage of supply module (pump motor) PWM signal wire.
146 ≈ 0 V	NG	Replace the wire-harness.

NG	Replace the wire-harness, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the output voltage of supply module (pump motor) PWM signal wire”.

2. Checking the output voltage of supply module (pump motor) PWM signal wire
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) PWM signal wire 124 to 126.

Voltage	State	Corrective action
124 ≈ Battery voltage	OK (normal range)	Check the conduction of the wire-harness.
124 ≈ 0 V	NG	• Replace the supply module. • After replacing the supply module, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the wire-harness.

NG	Replace the supply module or the wire-harness, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on dosing module side)	Conduction	State
146	Supply module terminal D	Yes	OK: Normal
		No	NG: Error
124	Supply module terminal E	Yes	OK: Normal
		No	NG: Error
126	Supply module terminal F	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above "**Supply** module conduction check pattern 1", carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
146	All terminals other than 146 and 186	Yes	NG: Error
		No	OK: Normal
124	All terminals other than 124	Yes	NG: Error
		No	OK: Normal
126	All terminals other than GND	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Returns to normal.

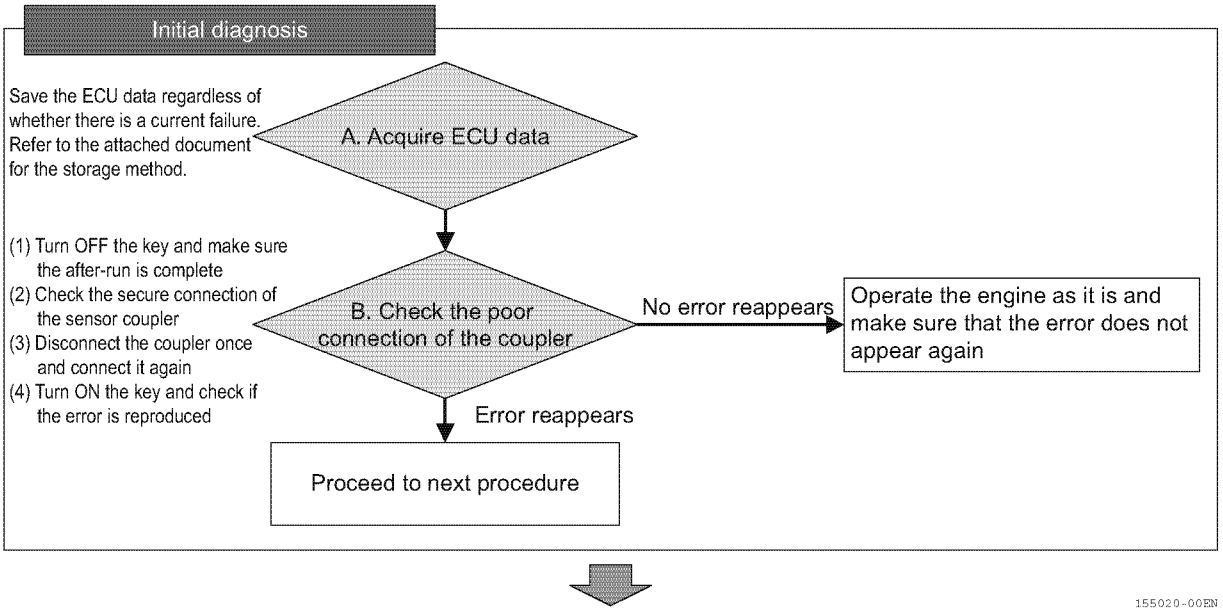
■ Supply module 2

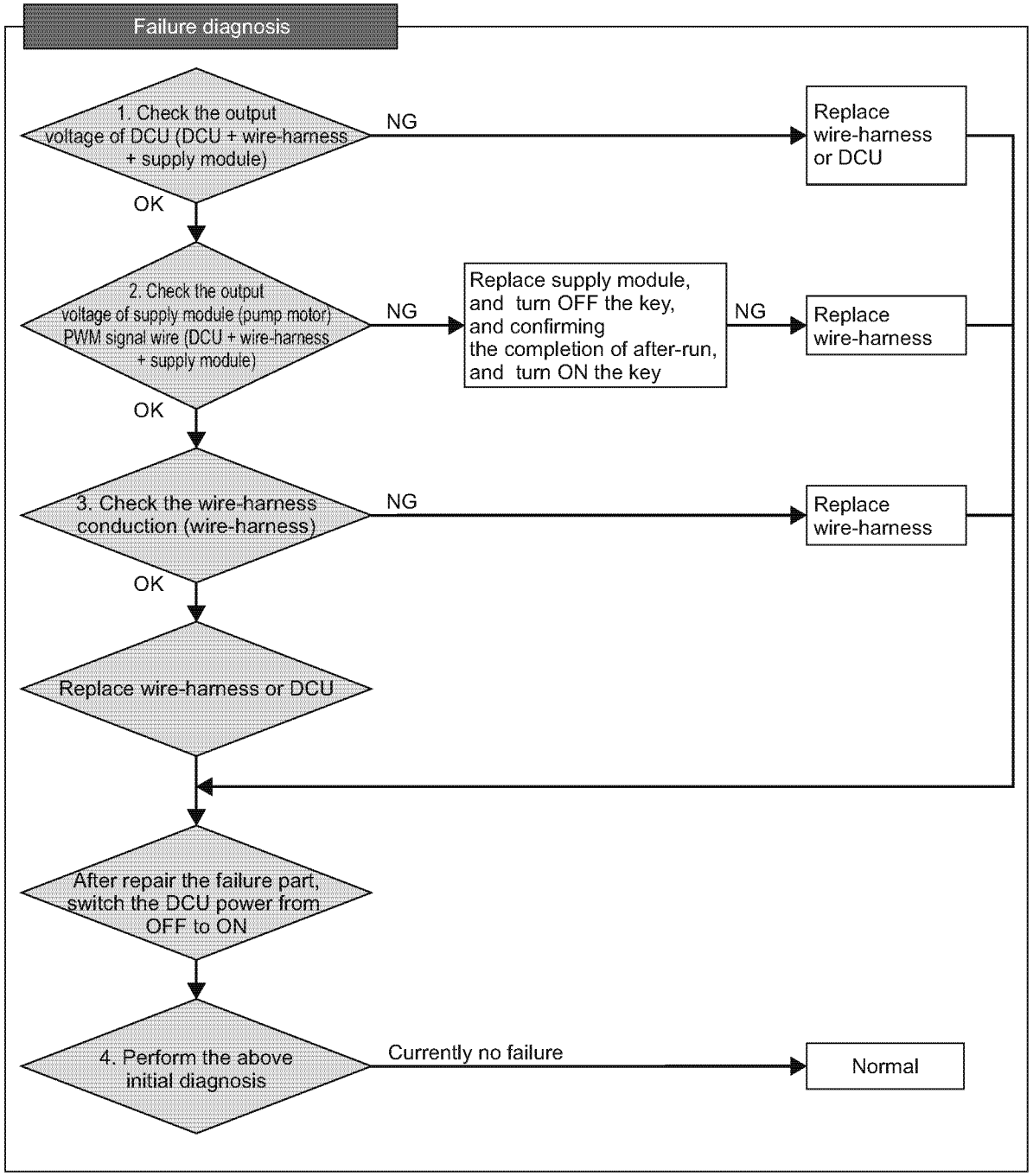
● Related DTC

P code	P150D	Supply module (pump motor) power stage temperature rise error
	P151F	Supply module (pump motor) pump motor drive error 1
	P208B	Supply module (pump motor) pump motor drive error 2

● Workflow

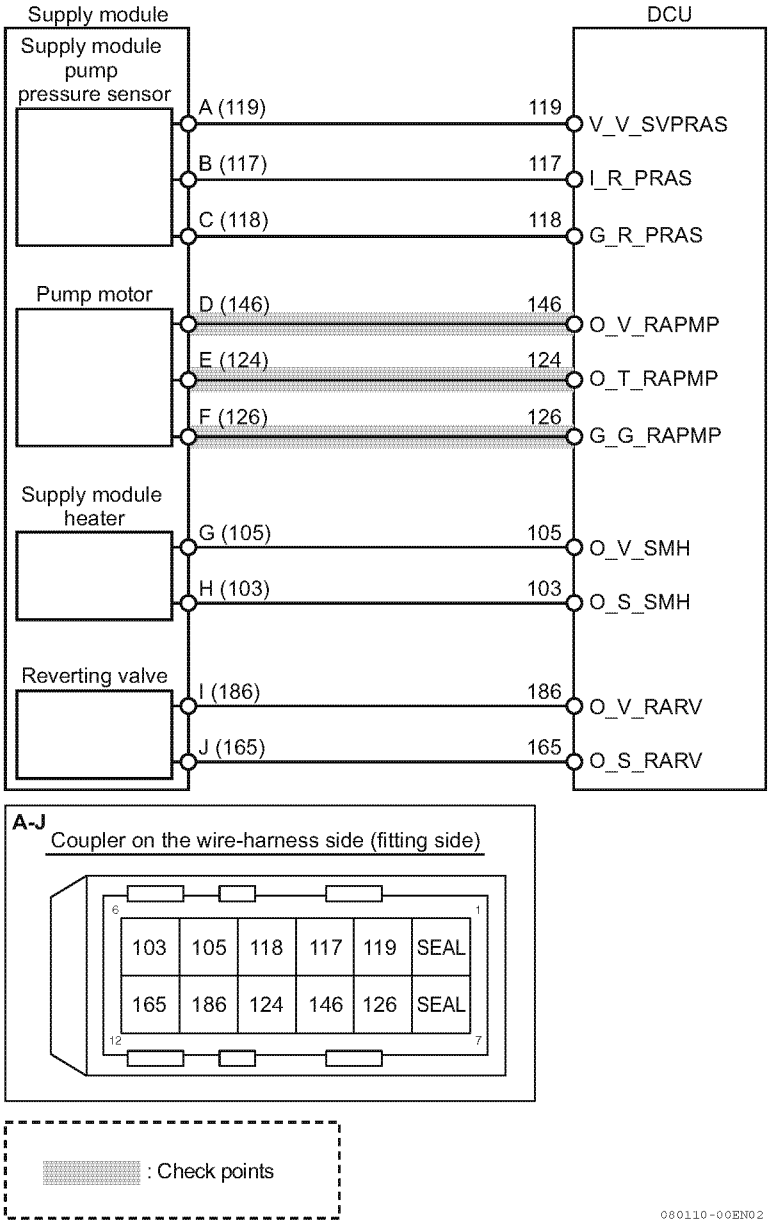
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the output voltage of DCU (DCU + wire-harness + supply module)
NG
Replace wire-harness or DCU
OK
2. Check the output voltage of supply module (pump motor) PWM signal wire (DCU + wire-harness + supply module)
NG
Replace supply module, and turn OFF the key, and confirming the completion of after-run, and turn ON the key
NG
Replace wire-harness
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace wire-harness or DCU
After repair the failure part, switch the DCU power from OFF to ON
4. Perform the above initial diagnosis
Currently no failure
Normal

155089-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the output voltage of DCU
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) power supply 146 to 126.

Voltage	State	Corrective action
146 ≈ Battery voltage	OK (normal range)	Check the output voltage of supply module (pump motor) PWM signal wire.
146 ≈ 0 V	NG	• Replace the wire-harness. • Replace the DCU.

NG	Replace the wire-harness or DCU, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the output voltage of supply module (pump motor) PWM signal wire”.

2. Checking the output voltage of supply module (pump motor) PWM signal wire
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) PWM signal wire 124 to 126.

Voltage	State	Corrective action
124 ≈ Battery voltage	OK (normal range)	Check the conduction of the wire-harness.
124 ≈ 0 V	NG	• Replace the supply module. • After replacing the supply module, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the wire-harness.

NG	Replace the supply module or the wire-harness, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on dosing module side)	Conduction	State
146	Supply module terminal D	Yes	OK: Normal
		No	NG: Error
124	Supply module terminal E	Yes	OK: Normal
		No	NG: Error
126	Supply module terminal F	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Supply module conduction check pattern 1”, carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
146	All terminals other than 146 and 186	Yes	NG: Error
		No	OK: Normal
124	All terminals other than 124	Yes	NG: Error
		No	OK: Normal
126	All terminals other than GND	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the DCU. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

4. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- Operate the engine under conditions meeting the above reference value, and make sure no error is detected in the current fault indication.

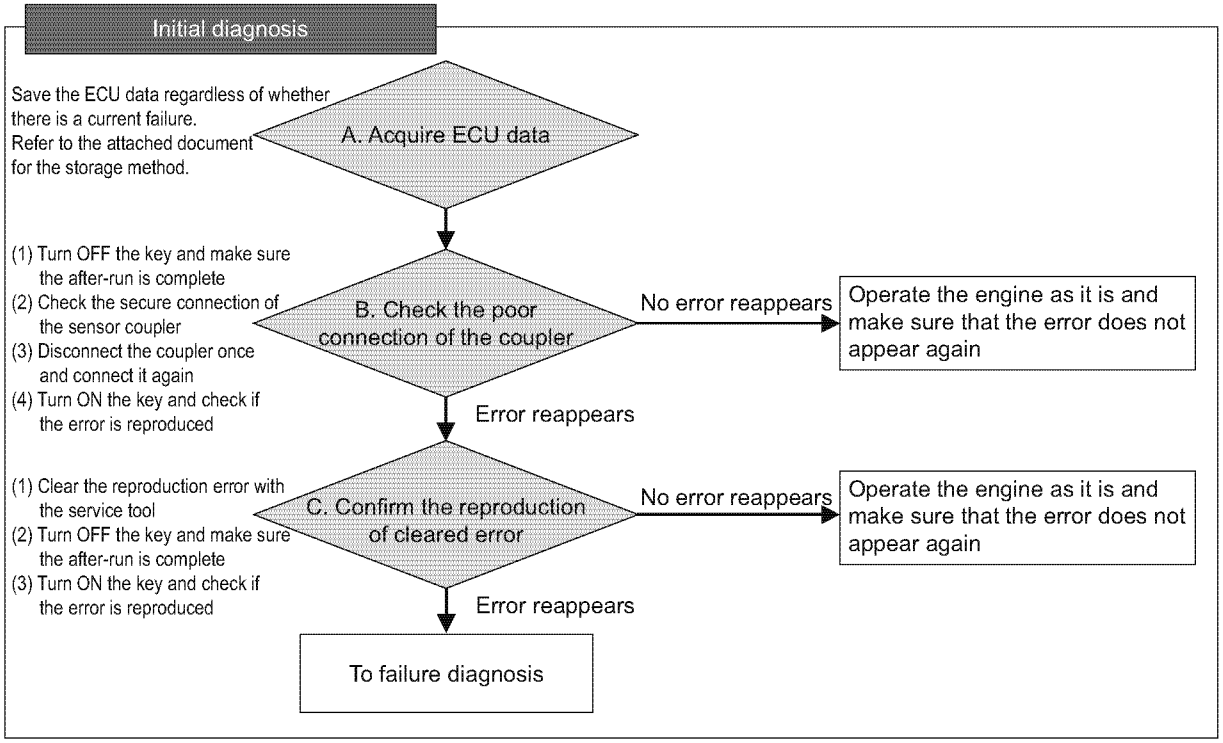
■ Supply module 3

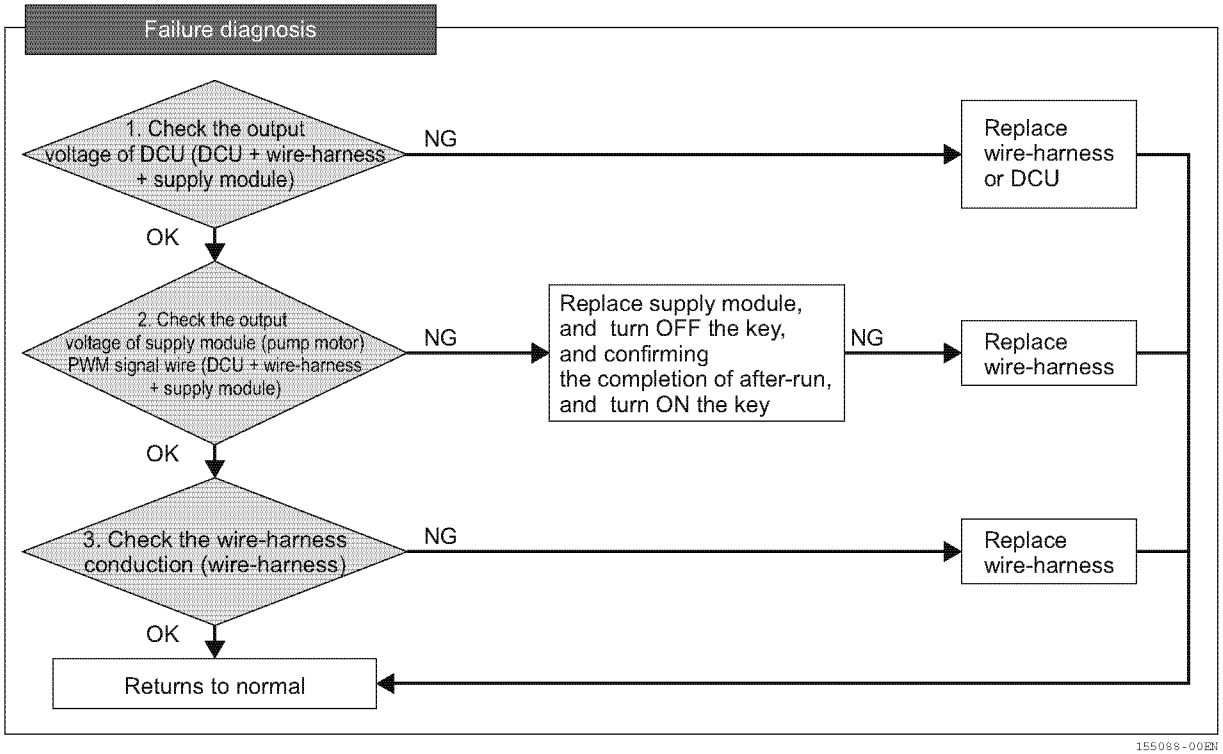
● Related DTC

P code	P152F	Supply module temperature information PWM cycle error
	P152E	Supply module temperature information PWM signal error

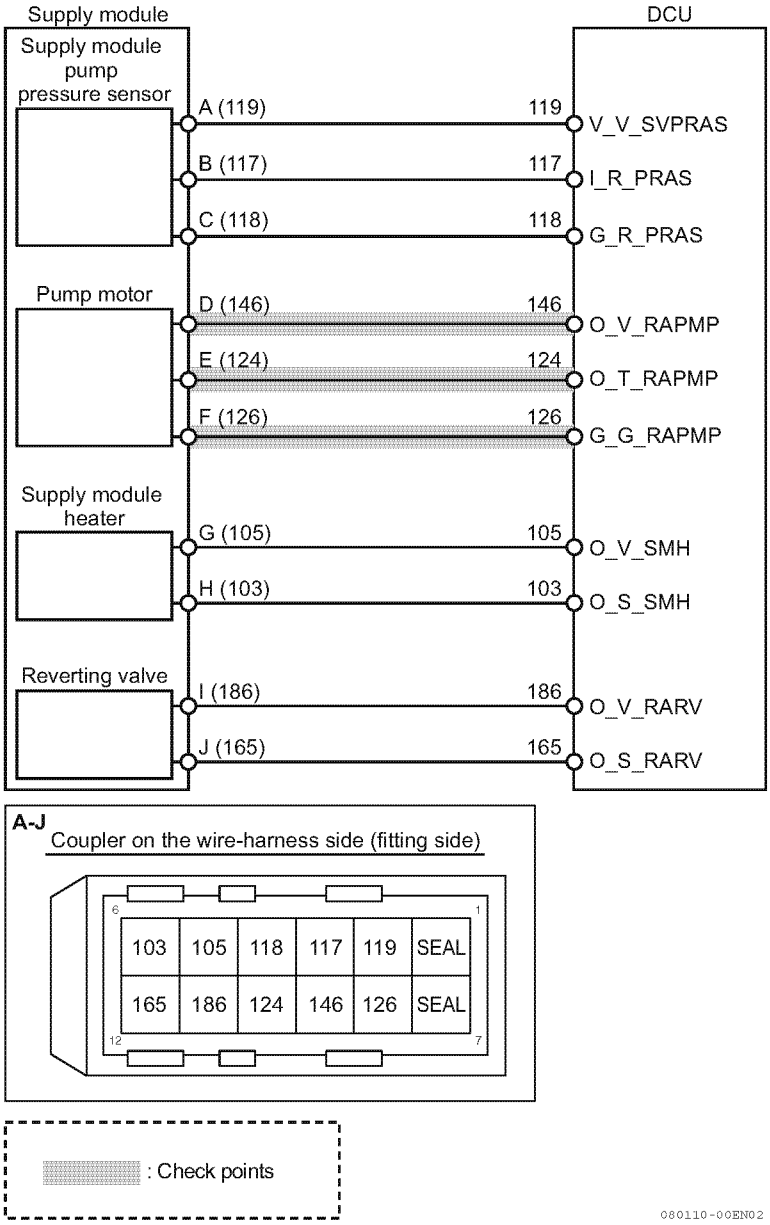
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the output voltage of DCU
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) power supply 146 to 126.

Voltage	State	Corrective action
146 ≈ Battery voltage	OK (normal range)	Check the output voltage of supply module (pump motor) PWM signal wire.
146 ≈ 0 V	NG	Replace the wire-harness.

NG	Replace the wire-harness or DCU, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the output voltage of supply module (pump motor) PWM signal wire”.

2. Checking the output voltage of supply module (pump motor) PWM signal wire
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) PWM signal wire 124 to 126.

Voltage	State	Corrective action
124 ≈ Battery voltage	OK (normal range)	Check the conduction of the wire-harness.
124 ≈ 0 V	NG	• Replace the supply module. • After replacing the supply module, turn the key OFF and after the after-run is completed, turn the key ON again, and if the error reappears, replace the wire-harness.

NG	Replace the supply module or the wire-harness, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on dosing module side)	Conduction	State
146	Supply module terminal D	Yes	OK: Normal
		No	NG: Error
124	Supply module terminal E	Yes	OK: Normal
		No	NG: Error
126	Supply module terminal F	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above "**Supply** module conduction check pattern 1", carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
146	All terminals other than 146 and 186	Yes	NG: Error
		No	OK: Normal
124	All terminals other than 124	Yes	NG: Error
		No	OK: Normal
126	All terminals other than GND	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Returns to normal.

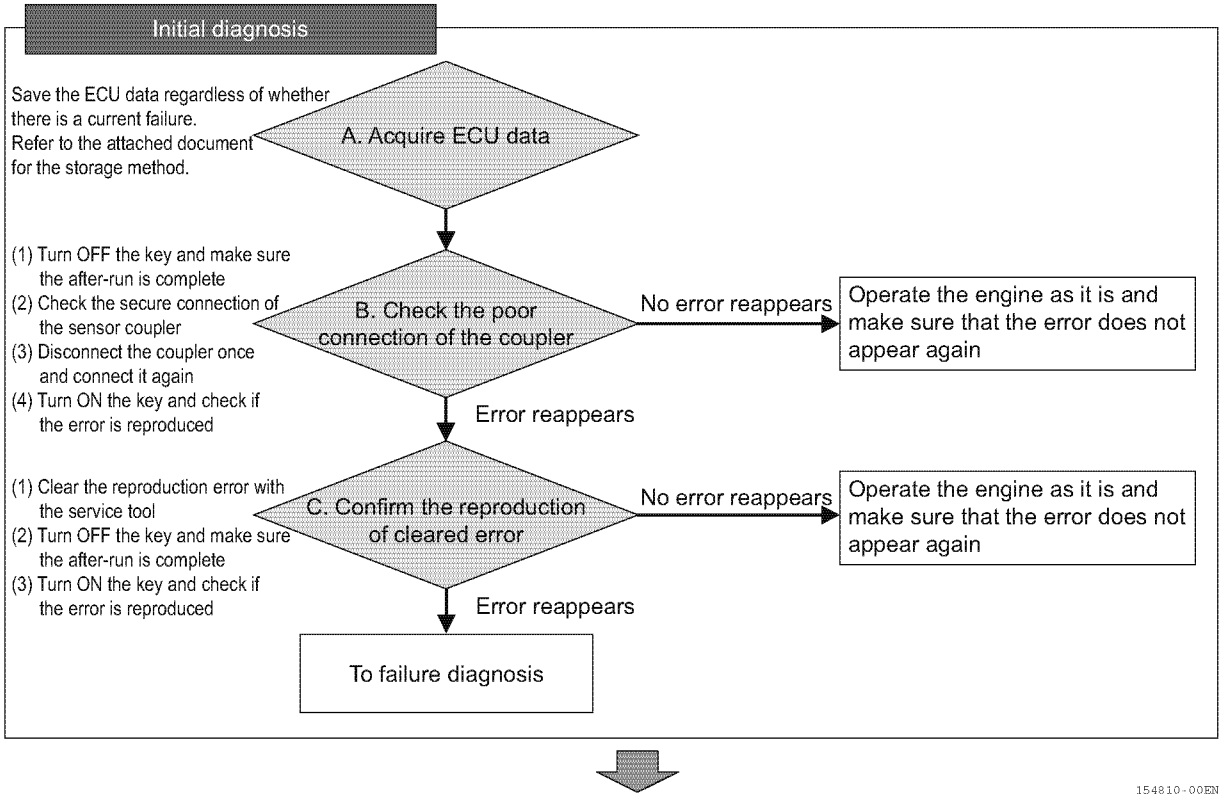
■ Supply module 4

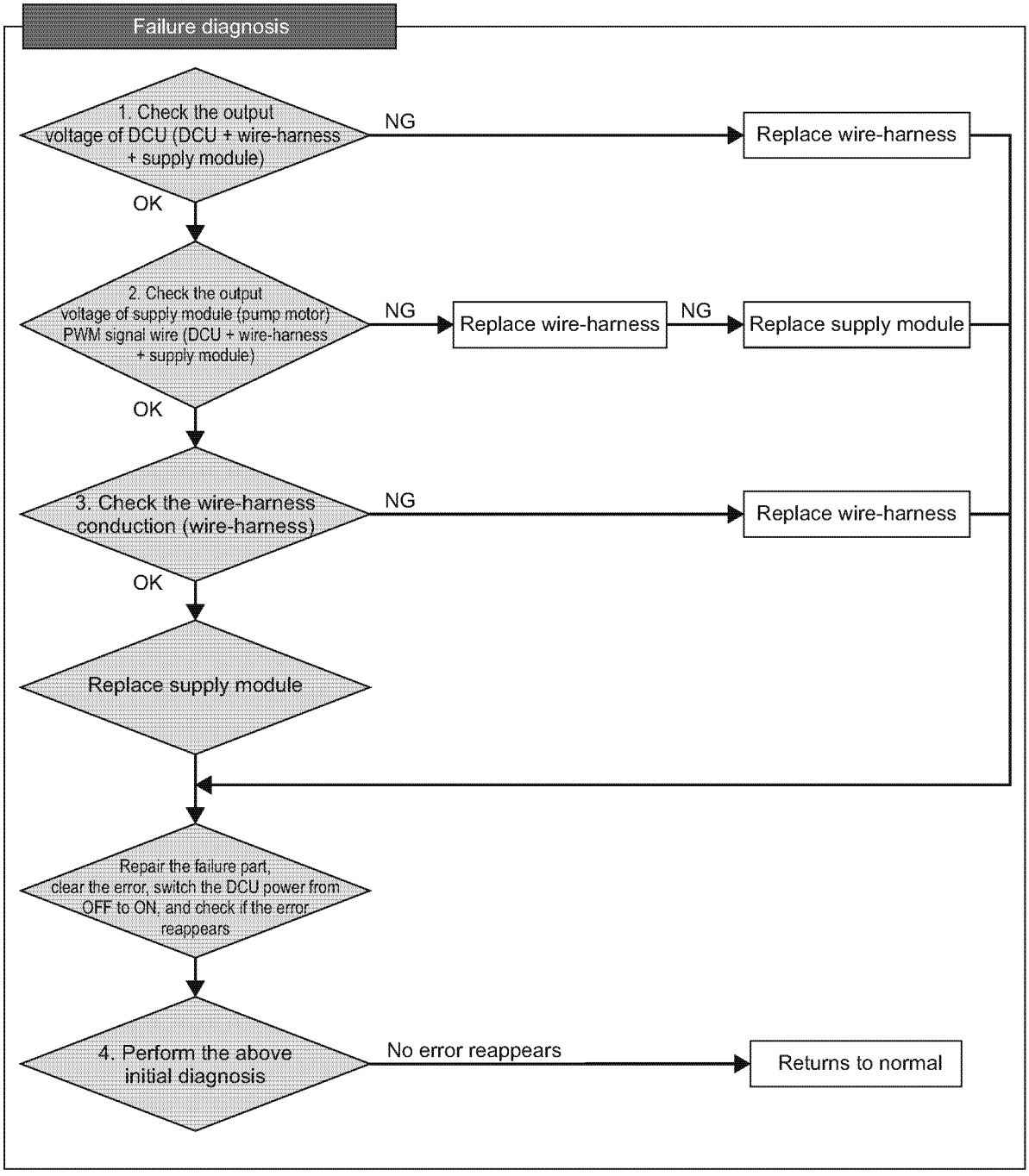
● Related DTC

P code	P1530	Supply module (supply module temperature sensor) fault value for temperature information duty value received
	P1531	Supply module (supply module temperature sensor) invalid value for temperature information duty value received
	P152C	Supply module (supply module heater temperature sensor) fault value for temperature information duty value received
	P152D	Supply module (supply module heater temperature sensor) invalid value for temperature information duty value received

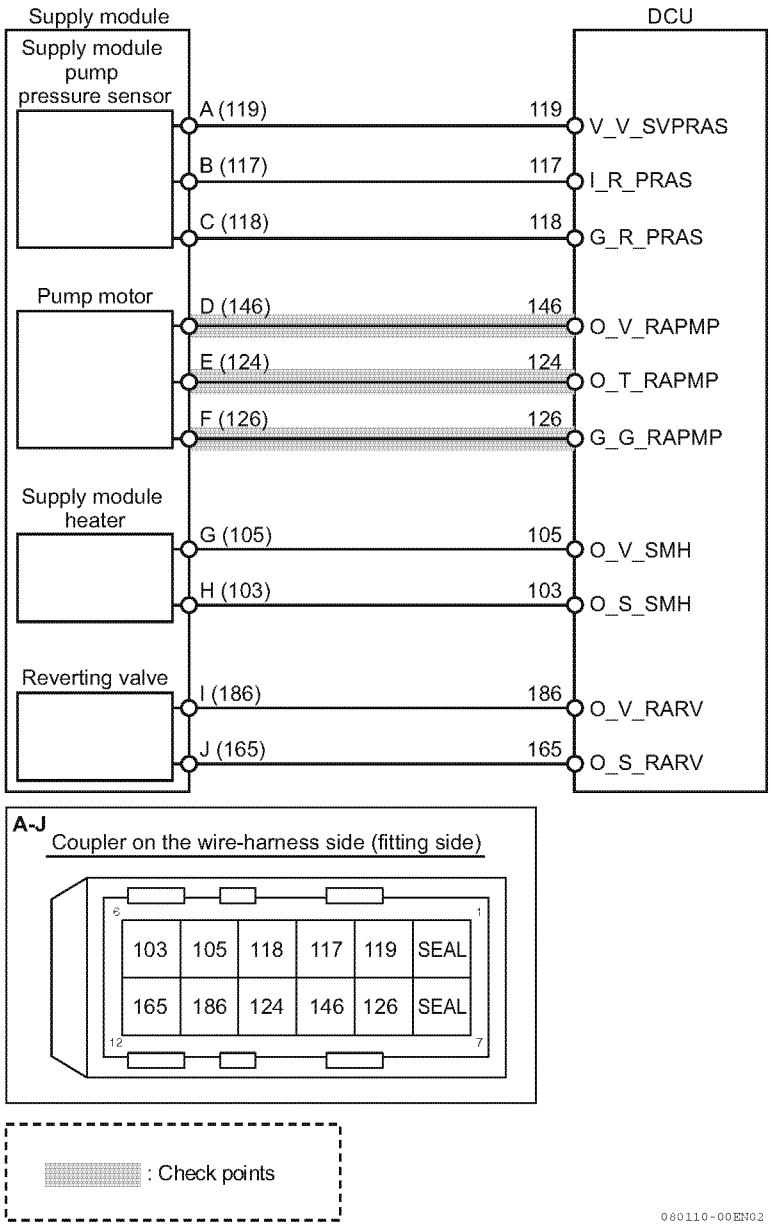
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the output voltage of DCU (DCU + wire-harness + supply module)
NG
Replace wire-harness
OK
2. Check the output voltage of supply module (pump motor) PWM signal wire (DCU + wire-harness + supply module)
NG
Replace wire-harness
NG
Replace supply module
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace supply module
Repair the failure part, clear the error, switch the DCU power from OFF to ON, and check if the error reappears
4. Perform the above initial diagnosis
No error reappears
Returns to normal
155090-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the output voltage of DCU
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) power supply 146 to 126.

Voltage	State	Corrective action
146 ≈ Battery voltage	OK (normal range)	Check the output voltage of supply module (pump motor) PWM signal wire.
146 ≈ 0 V	NG	• Replace the wire-harness. • Replace the DCU.

NG	Replace the wire-harness or DCU, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the output voltage of supply module (pump motor) PWM signal wire”.

2. Checking the output voltage of supply module (pump motor) PWM signal wire
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) PWM signal wire 124 to 126.

Voltage	State	Corrective action
124 ≈ Battery voltage	OK (normal range)	Check the conduction of the wire-harness.
124 ≈ 0 V	NG	• Replace the supply module. • Replace the wire-harness.

NG	Replace the supply module or the wire-harness, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on dosing module side)	Conduction	State
146	Supply module terminal D	Yes	OK: Normal
		No	NG: Error
124	Supply module terminal E	Yes	OK: Normal
		No	NG: Error
126	Supply module terminal F	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Supply module conduction check pattern 1”, carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
146	All terminals other than 146 and 186	Yes	NG: Error
		No	OK: Normal
124	All terminals other than 124	Yes	NG: Error
		No	OK: Normal
126	All terminals other than GND	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the supply module. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

4. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- Operate the engine under conditions meeting the above reference value, and make sure no error is detected in the current fault indication.

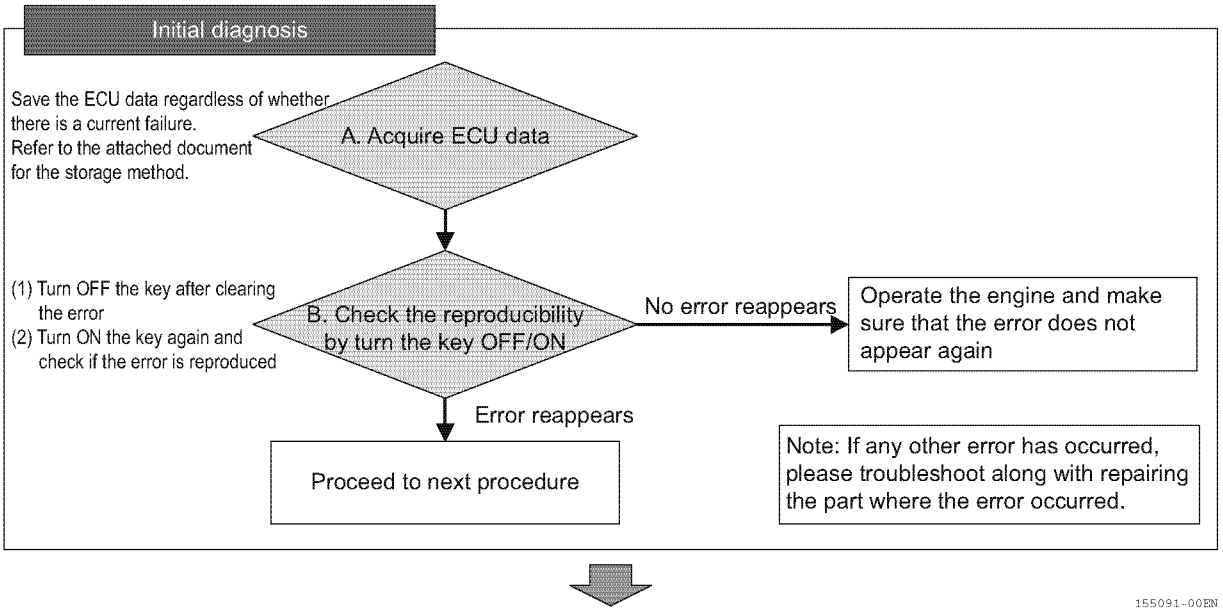
■ Supply module 5

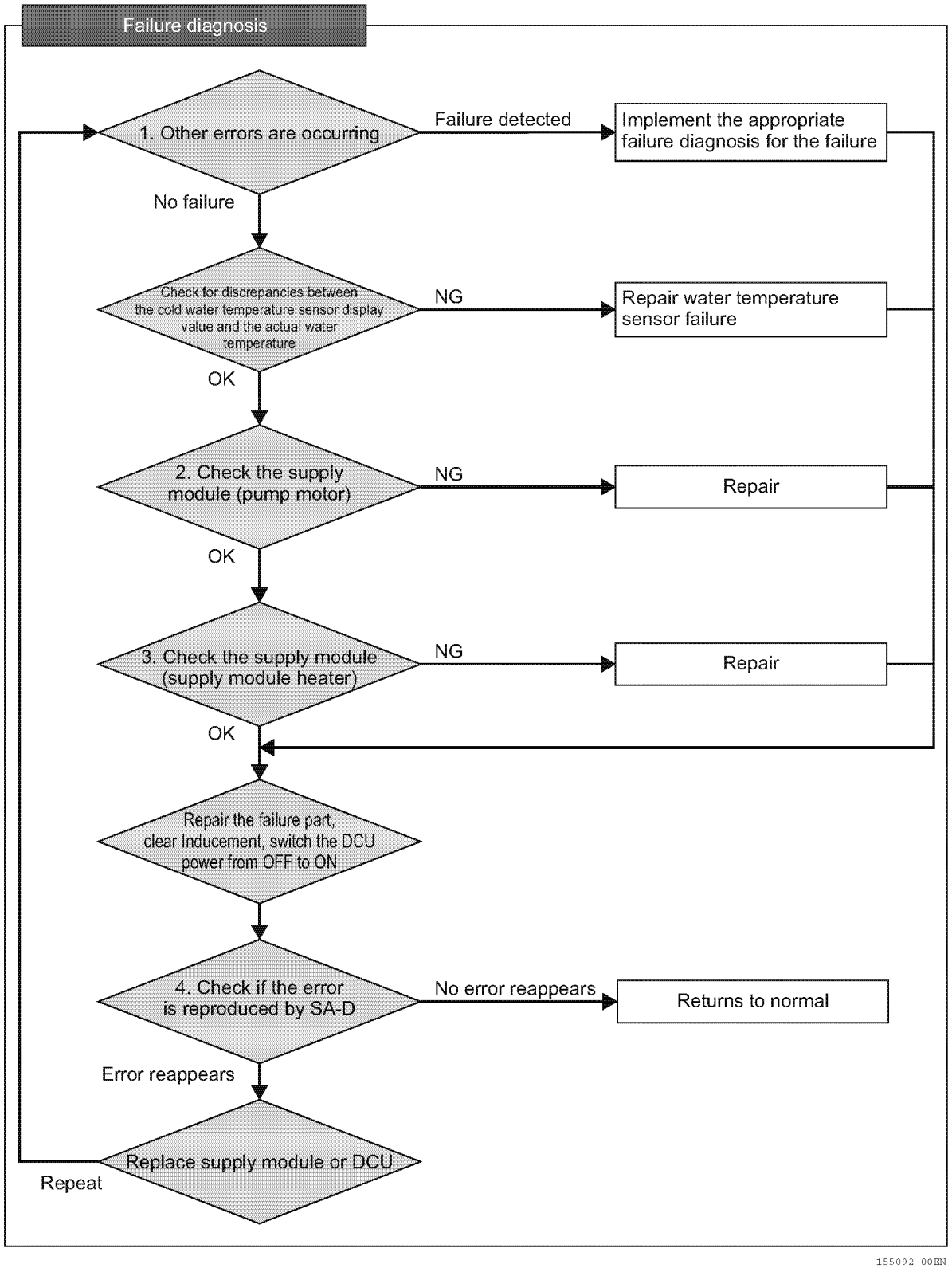
● Related DTC

P code	P20B6	Supply module (supply module heater) detected value error
	P152B	Supply module (supply module temperature sensor) detected value error
	P152A	Supply module (supply module heater temperature sensor) detected value error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
Check for discrepancies between the cold water temperature sensor display value and the actual water temperature
NG
Repair water temperature sensor failure
OK
2. Check the supply module (pump motor)
NG
Repair
OK
3. Check the supply module (supply module heater)
NG
Repair
OK
Repair the failure part, clear Inducement, switch the DCU power from OFF to ON
4. Check if the error is reproduced by SA-D
No error reappears
Returns to normal
Error reappears
Replace supply module or DCU
Repeat
155092-00EN

● Work description

1. Checking for other errors

1- Turn OFF the key switch and turn ON the key switch again.

2- Connect the SA-D and check the current fault indication to see whether any other errors are detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the supply module (pump motor)” after treatment.
No error detected	Go to “Checking the supply module (pump motor)”.

2. Checking the supply module (pump motor)

1- Perform the failure diagnosis for “Supply module 1”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Supply module 1”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the supply module (supply module heater)” after repair.
OK	Go to “Checking the supply module (supply module heater)”.

3. Checking the supply module (supply module heater)

1- Perform the failure diagnosis for “Supply module (supply module heater)”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Supply module (supply module heater)”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the current failure with SA-D” after repair.
OK	Go to “Checking the current failure with SA-D”.

4. Checking the current failure with SA-D
   1- Implement the Inducement clear.
   2- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   3- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   4- Turn ON the key switch again.
   5- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor each indicated item, and check the reference value is met. When the reference value is not met, turn OFF the key switch, wait until the supply module temperature and the supply module heater temperature drops, turn ON the key again.

Item	Reference value
Supply module temperature	60 °C or lower
Supply module heater temperature	60 °C or lower

   6- Start the engine.
   7- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor each indicated item, and operate the engine under conditions where the reference value is met.

Item	Reference value
Cooling water temperature	55 °C or higher
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   8- Keep on operating the engine under conditions meeting the reference value for 10 minutes or more, and make sure no error is detected in the current fault indication.

No	Returns to normal.
Yes	• Replace the supply module or DCU. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

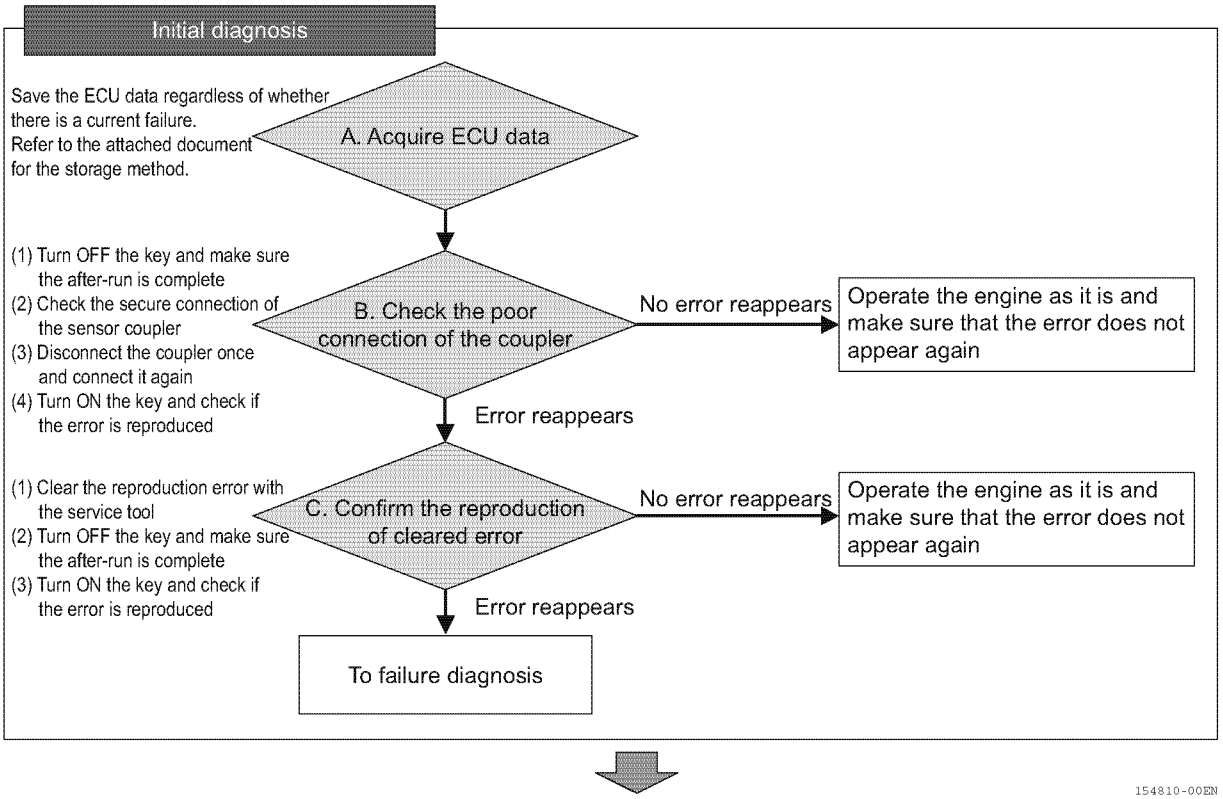
■ Supply module 6

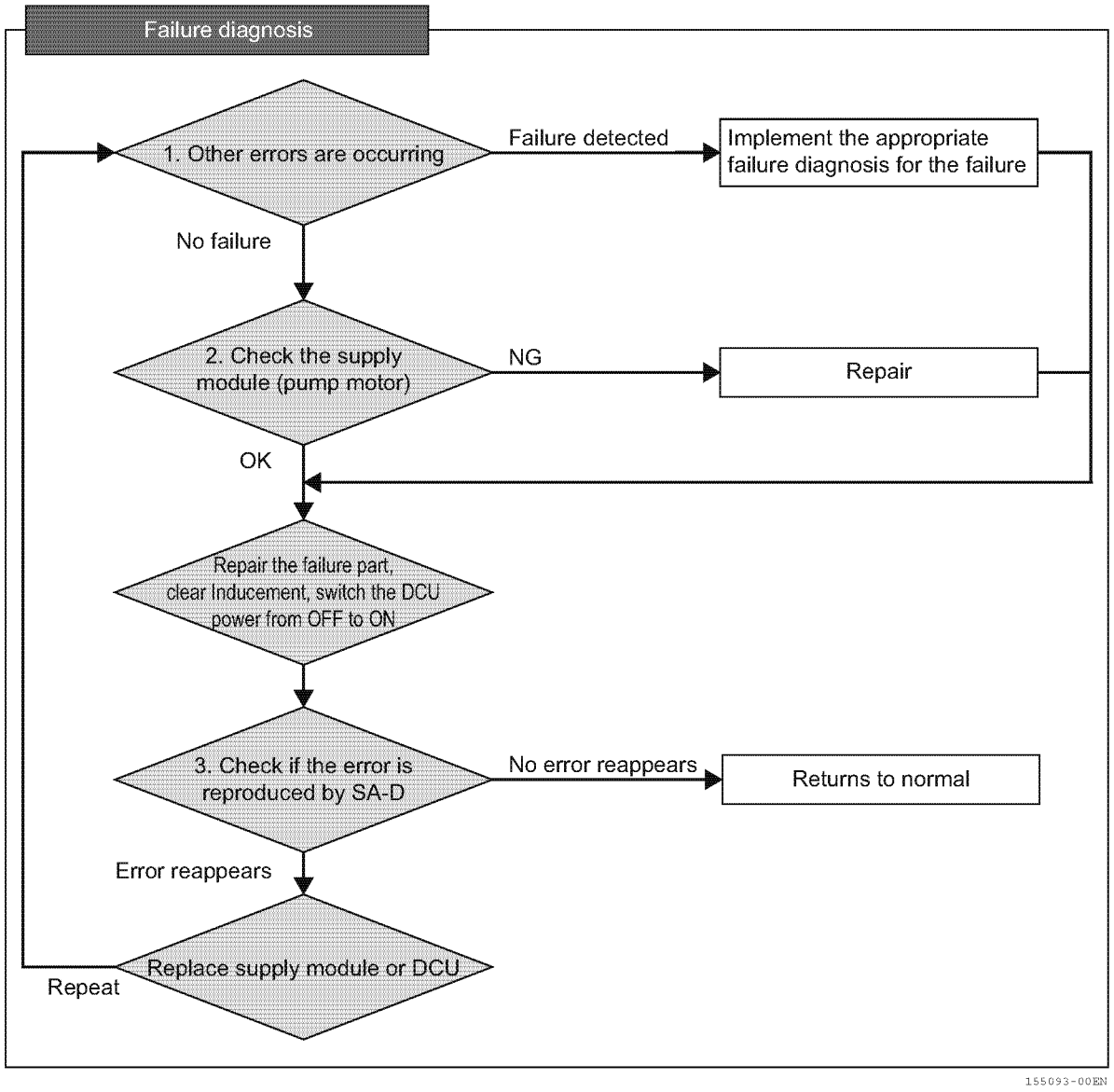
● Related DTC

P code	P1544	Supply module (supply module temperature sensor) detected value error (at cold start check)
	P1543	Supply module (supply module heater temperature sensor) detected value error (at cold start check)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the supply module (pump motor)
NG
Repair
OK
Repair the failure part, clear Inducement, switch the DCU power from OFF to ON
3. Check if the error is reproduced by SA-D
No error reappears
Returns to normal
Error reappears
Replace supply module or DCU
Repeat
155093-00EN

● Work description

1. Checking for other errors

1- Turn OFF the key switch and turn ON the key switch again.

2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to the followings are not detected: cooling water temperature sensor, fresh air temperature sensor on ECU side, and SCR catalyst temperature sensor on DCU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the supply module (pump motor)" after treatment.
No error detected	Go to "Checking the supply module (pump motor)".

2. Checking the supply module (pump motor)

1- Perform the failure diagnosis for "Supply module 1". However, do not replace the wire-harness or DCU, when the result of "Checking the wire-harness conduction" is OK.

Results of "Supply module 1"	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to "Checking the current failure with SA-D" after repair.
OK	Go to "Checking the current failure with SA-D".

3. Checking the current failure with SA-D

1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.

3- Turn ON the key switch again. In this case, do not start the engine.

4- Activate "Diagnosis Test: Input/output of pulse/analog" of SA-D, monitor each indicated item, and wait until the reference value is met.

Item	Reference value
Fresh air temperature	40 °C or lower
Cooling water temperature	Temperature difference among fresh air, cooling water and SCR catalyst upstream is within ± 8 °C.
SCR catalyst temperature	
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

5- Clear the Inducement, turn OFF the key switch, and wait until power supplies of DCU is turned OFF.

6- Turn ON the key switch again, and check if the error reappears.

No	Returns to normal.
Yes	• Replace the supply module or DCU. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

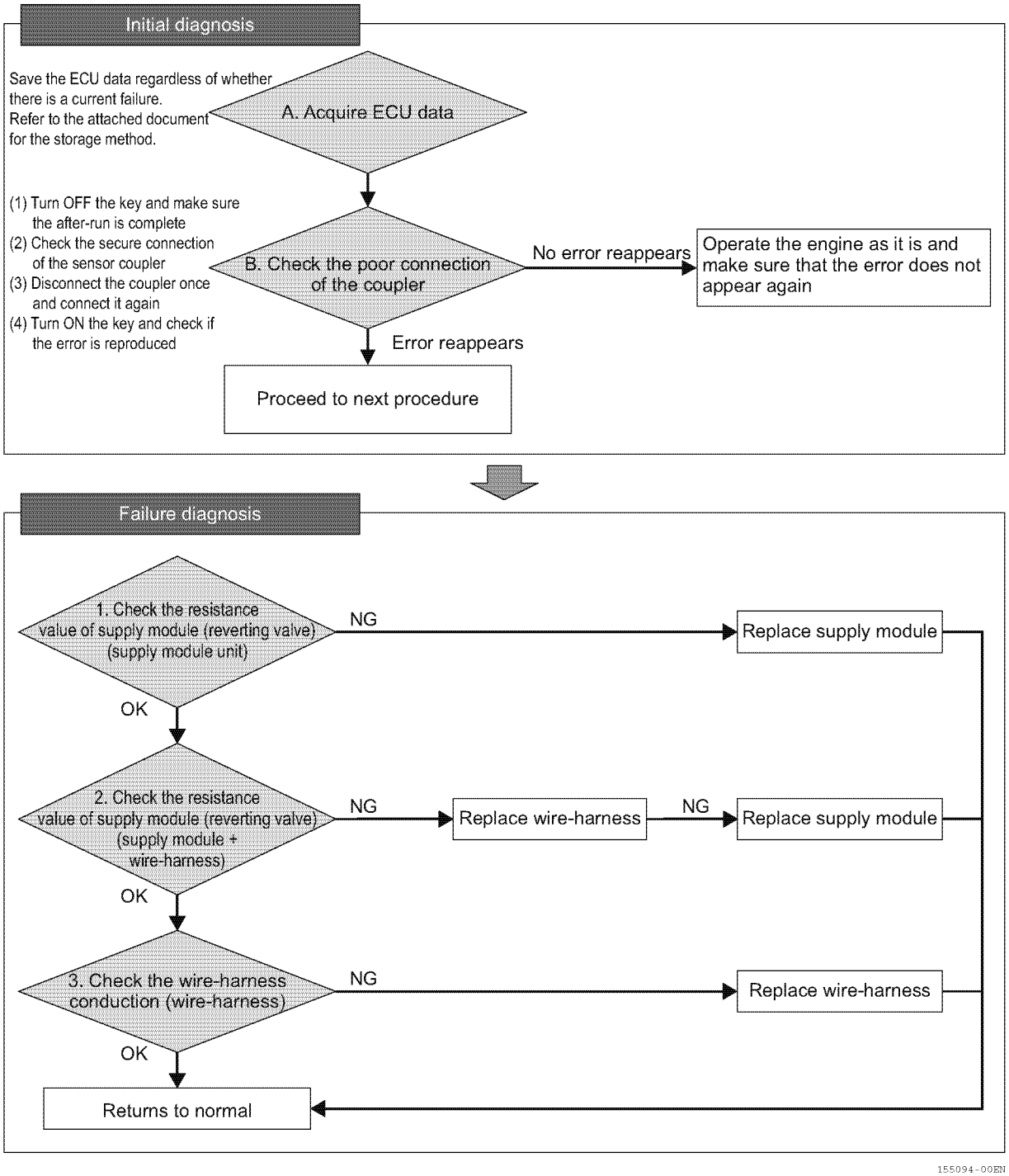
■ Supply module (reverting valve) 1

● Related DTC

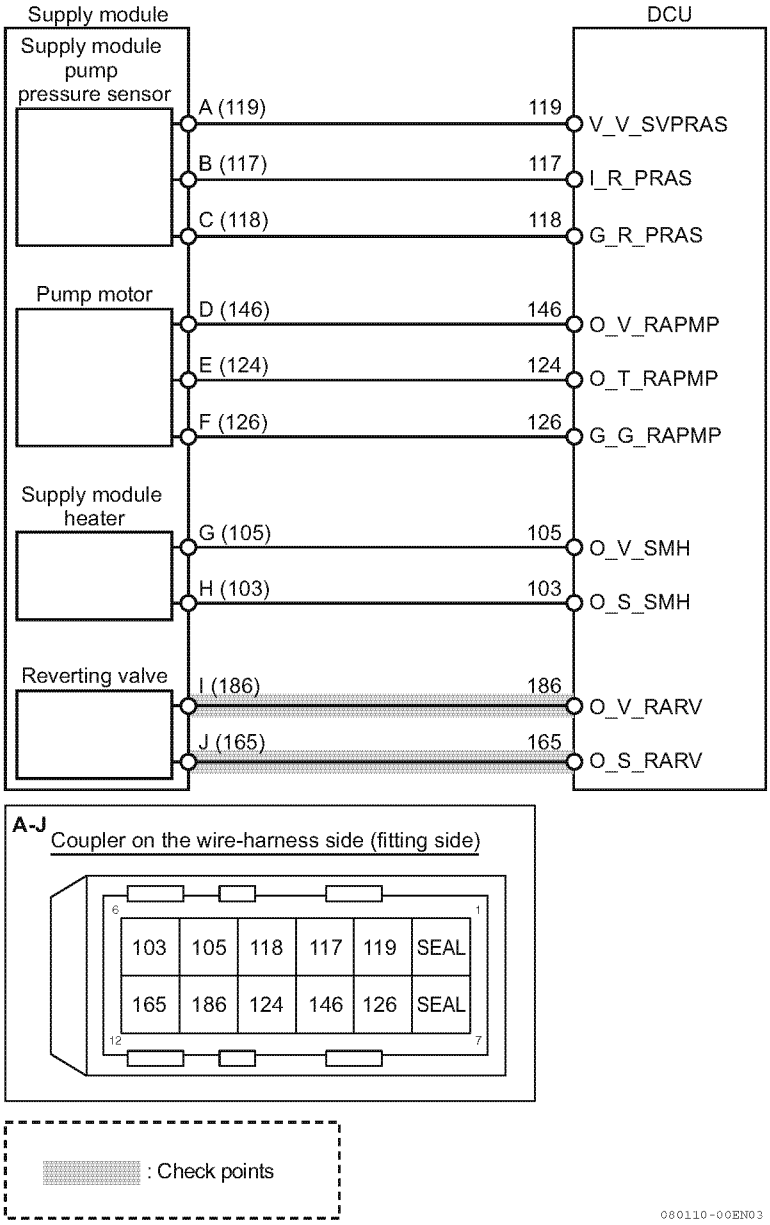
P code	P20A3	Supply module (reverting valve) L side VB short circuit
	P20A2	Supply module (reverting valve) L side GND short circuit

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of supply module (reverting valve) (supply module unit)
   1- Remove the wire-harness from the supply module.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the supply module terminals I and J.

Reference: Overall resistance value of supply module (reverting valve)

Terminal	Specifications
Between the supply module terminals	12 V specification: 6.6 ± 0.46 Ω (at 20 °C) 24 V specification: 20.6 ± 1.44 Ω (at 20 °C)

NG	Replace the supply module, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of supply module (reverting valve) (supply module and wire-harness)”.

2. Checking the resistance value of supply module (reverting valve) (supply module and wire-harness)
   1- Connect the supply module and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 186 and 165 on DCU side.
   Note: See the above “Reference: Overall resistance value of supply module (reverting valve)”

NG	• Replace the wire-harness. • After replacing the wire-harness and clear the error, ECU power OFF, turn ON the power after the after-run is completed, and if the error reappears, replace the supply module. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on supply module)	Conduction	State
186	Supply module terminal I	Yes	OK: Normal
		No	NG: Error
165	Supply module terminal J	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Supply module conduction check pattern 1”, carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
186	All terminals other than 146 and 186	Yes	NG: Error
		No	OK: Normal
165	All terminals other than 165	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Returns to normal.

4. Checking the current failure with SA-D
   1- After clearing the error, turn OFF the key switch and after the after-run is completed, turn ON the key switch again.
   2- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the supply module (reverting valve), and make sure no error is detected in the current fault indication.

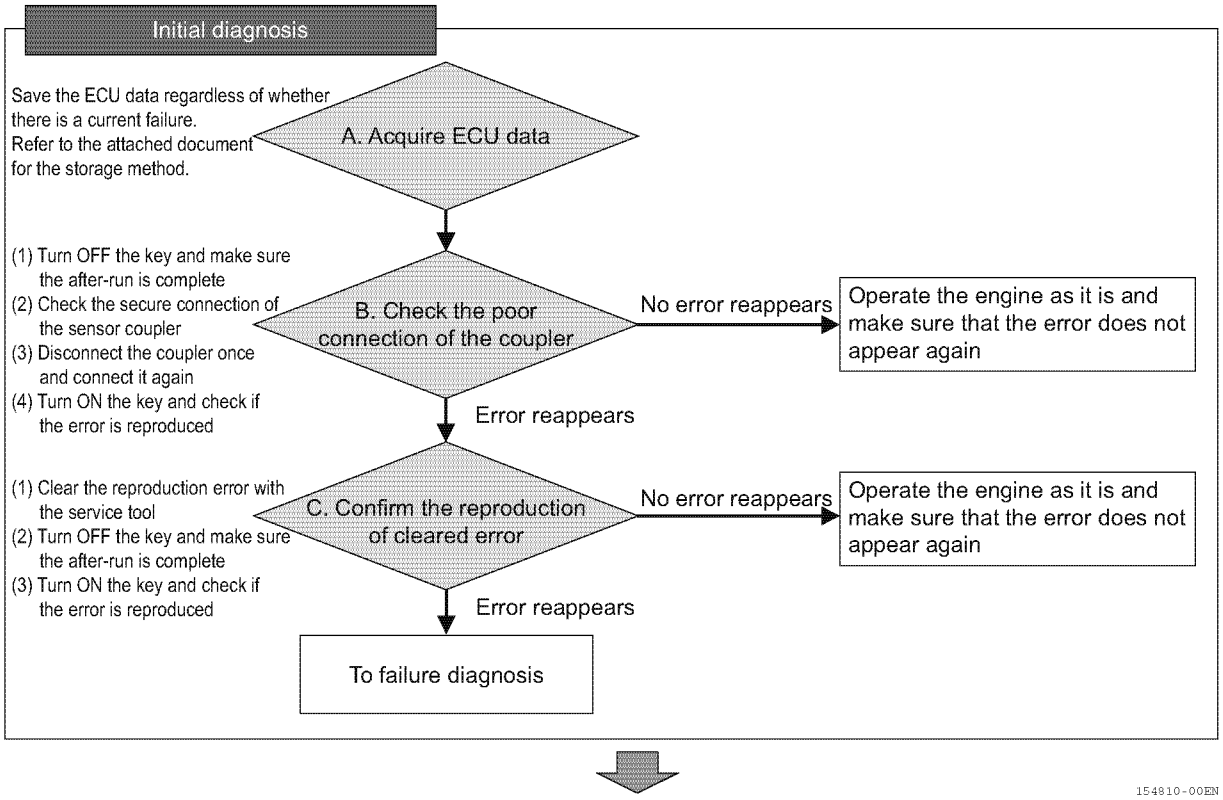
■ Supply module (reverting valve) 2

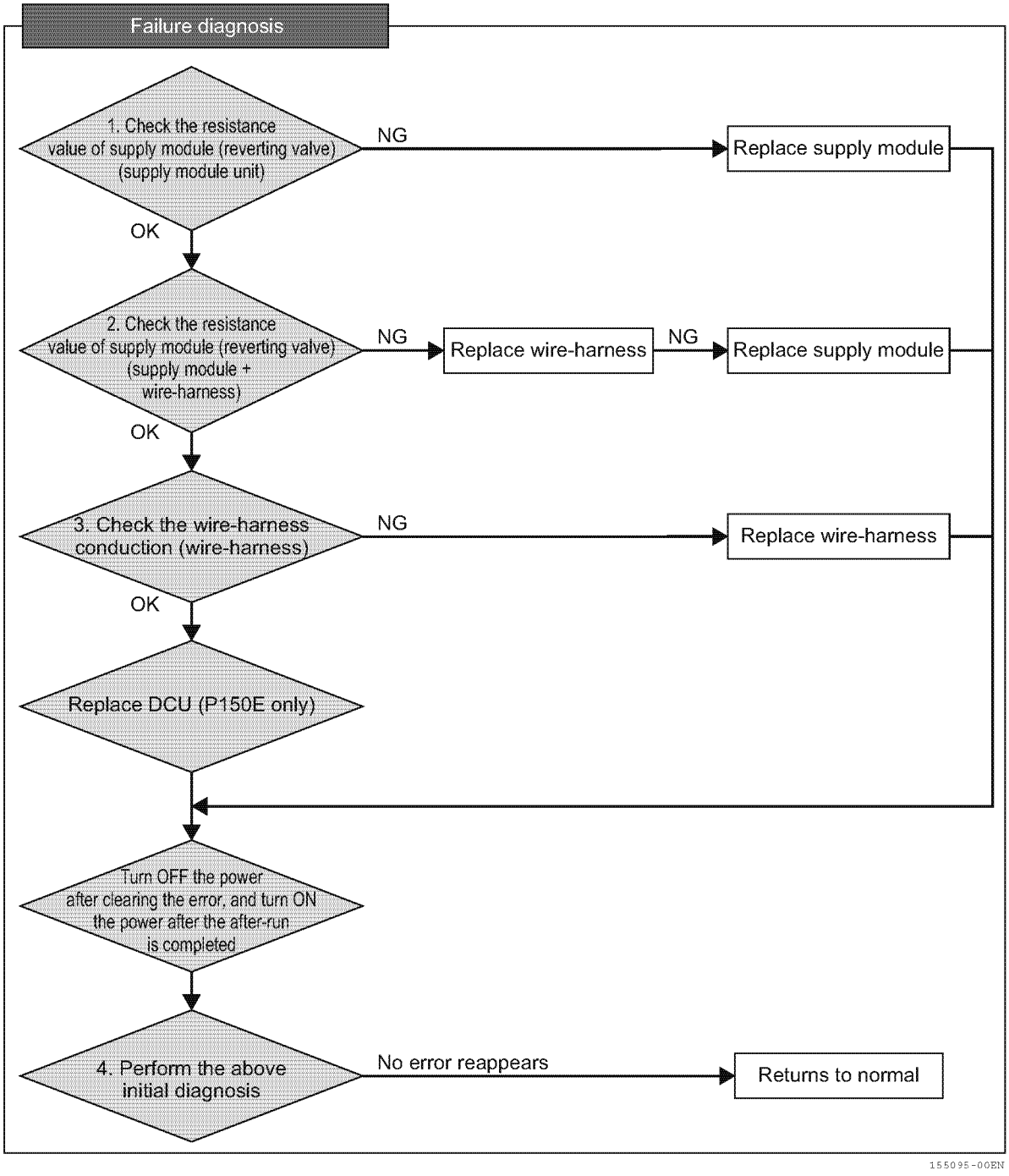
● Related DTC

P code	P20A0	Supply module (reverting valve) disconnection
	P150E	Supply module (reverting valve) power stage temperature rise error

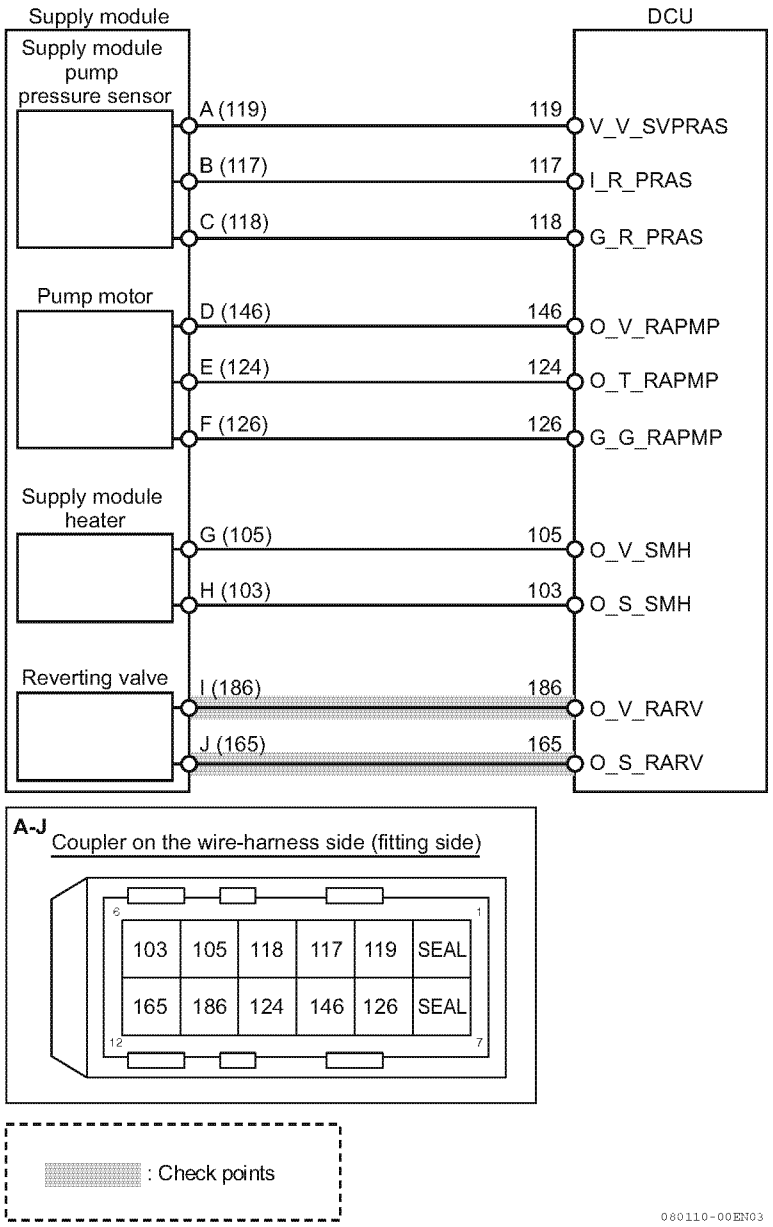
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of supply module (reverting valve) (supply module unit)
NG
Replace supply module
OK
2. Check the resistance value of supply module (reverting valve) (supply module + wire-harness)
NG
Replace wire-harness
NG
Replace supply module
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace DCU (P150E only)
Turn OFF the power after clearing the error, and turn ON the power after the after-run is completed
4. Perform the above initial diagnosis
No error reappears
Returns to normal
155095-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of supply module (reverting valve) (supply module unit)
   1- Remove the wire-harness from the supply module.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the supply module terminals I and J.

Reference: Overall resistance value of supply module (reverting valve)

Terminal	Specifications
Between the supply module terminals	12 V specification: 6.6 ± 0.46 Ω (at 20 °C) 24 V specification: 20.6 ± 1.44 Ω (at 20 °C)

NG	Replace the supply module, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of supply module (reverting valve) (supply module and wire-harness)”.

2. Checking the resistance value of supply module (reverting valve) (supply module and wire-harness)
   1- Connect the supply module and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 186 and 165 on DCU side.
   Note: See the above “Reference: Overall resistance value of supply module (reverting valve)”

NG	• Replace the wire-harness. • After replacing the wire-harness and clear the error, ECU power OFF, turn ON the power after the after-run is completed, and if the error reappears, replace the supply module.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on supply module)	Conduction	State
186	Supply module terminal I	Yes	OK: Normal
		No	NG: Error
165	Supply module terminal J	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Supply module conduction check pattern 1”, carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
186	All terminals other than 146 and 186	Yes	NG: Error
		No	OK: Normal
165	All terminals other than 165	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• Replace the DCU. (P150E only) • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

4. Checking the current failure with SA-D
   1- After clearing the error, turn OFF the key switch and after the after-run is completed, turn ON the key switch again.
   2- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the supply module (reverting valve), and make sure no error is detected in the current fault indication.

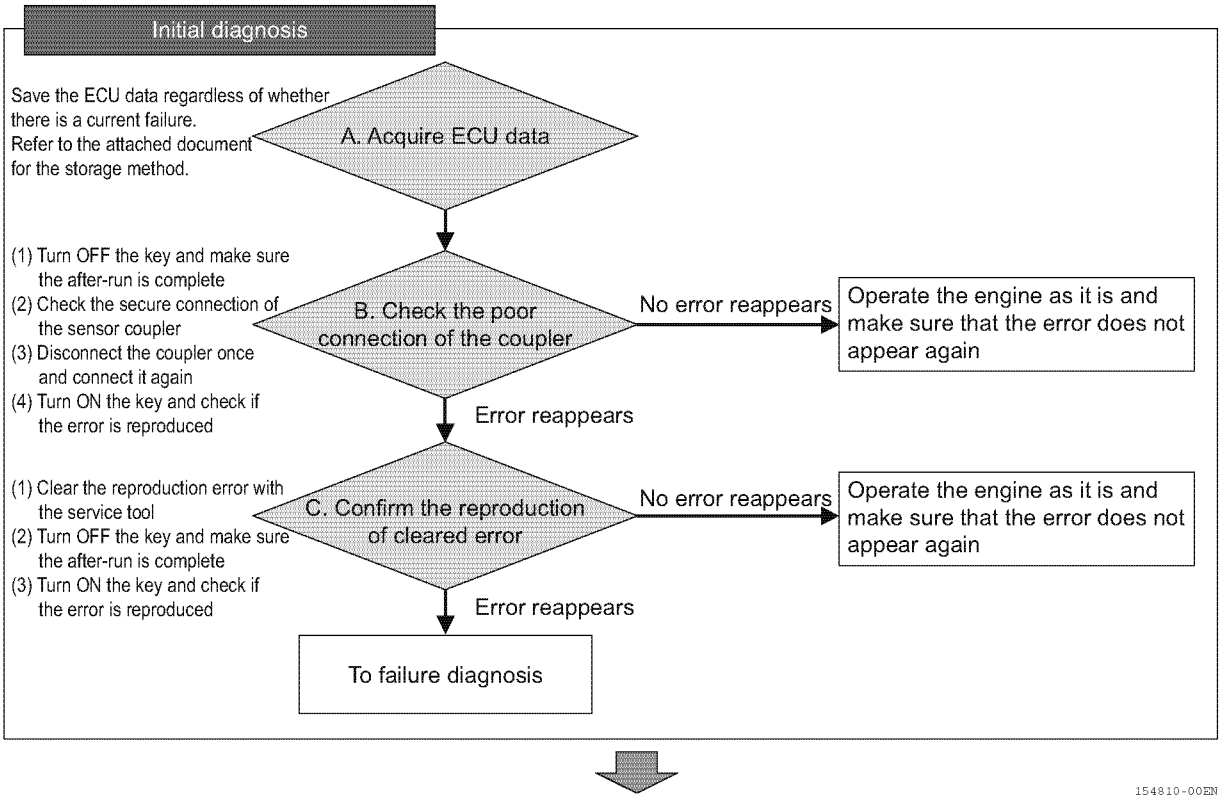
■ Supply module (supply module heater) 1

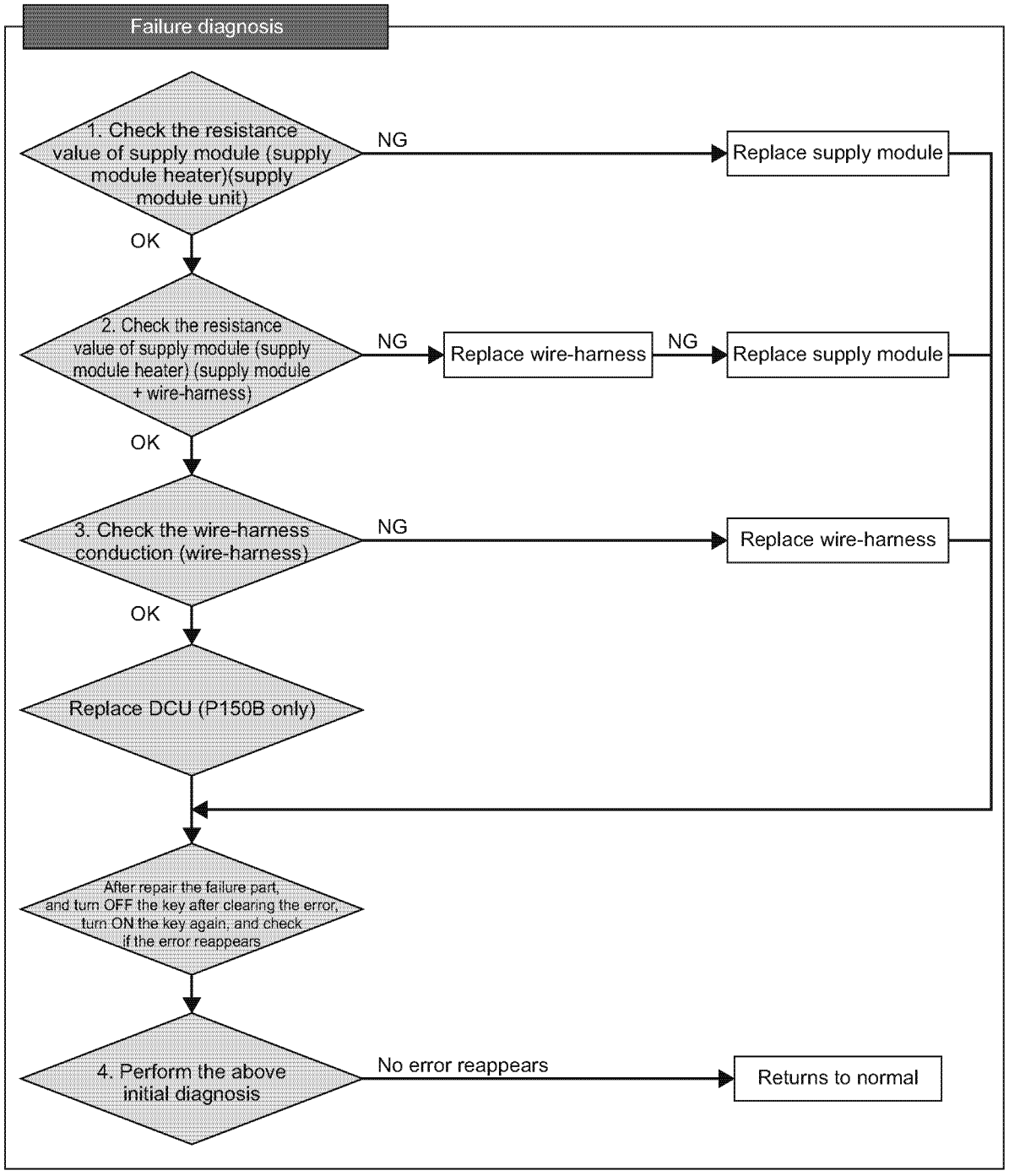
● Related DTC

P code	P26E9	Supply module (supply module heater) H side VB short circuit
	P150B	Supply module (supply module heater) power stage temperature rise error

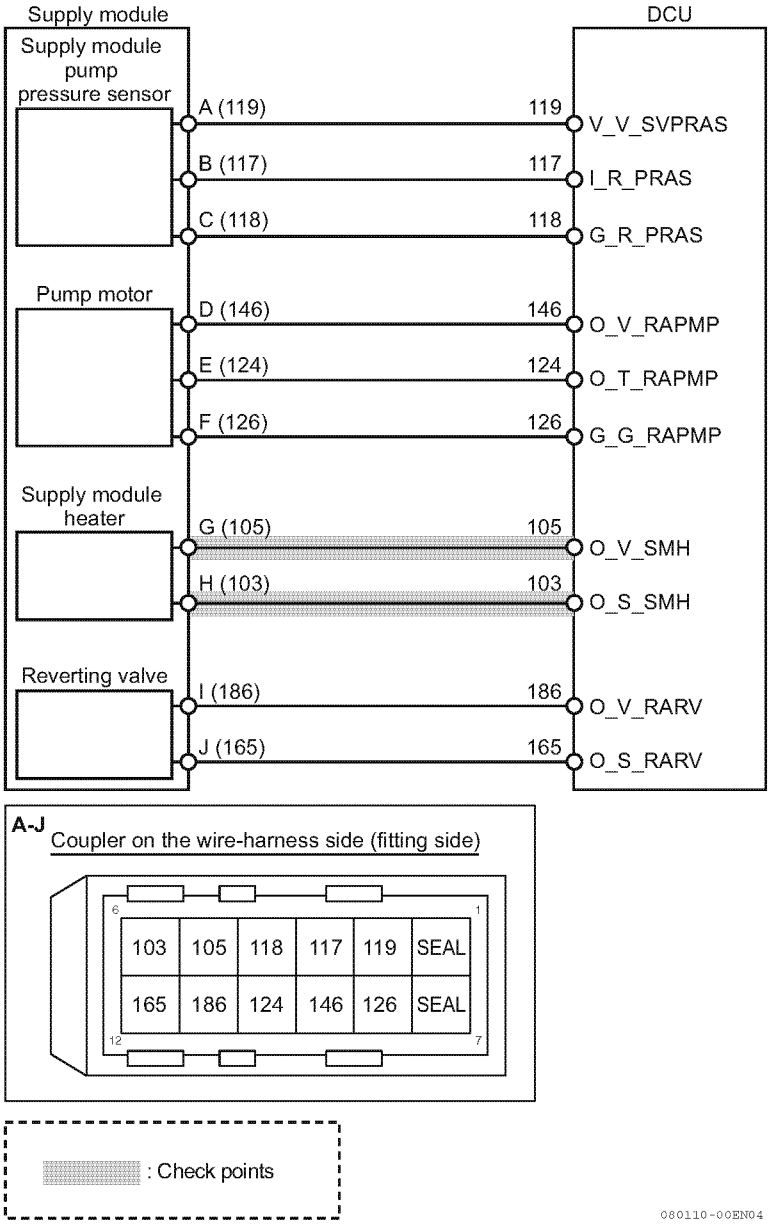
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of supply module (supply module heater)(supply module unit)
NG
Replace supply module
OK
2. Check the resistance value of supply module (supply module heater) (supply module + wire-harness)
NG
Replace wire-harness
NG
Replace supply module
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace DCU (P150B only)
After repair the failure part, and turn OFF the key after clearing the error, turn ON the key again, and check if the error reappears
4. Perform the above initial diagnosis
No error reappears
Returns to normal
155209-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of supply module (supply module heater) (supply module heater unit)
   1- Remove the wire-harness from the supply module.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the supply module terminals G and H.

Reference: Overall resistance value of supply module (supply module heater)

Terminal	Specifications
Between the supply module terminals	12 V specification: 1.51 ± 0.9 Ω (at 20 °C) 24 V specification: 6.0 ± 1.0 Ω (at 20 °C)

NG	Replace the supply module, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of supply module (supply module heater) (supply module and wire-harness).

2. Checking the resistance value of supply module (supply module heater) (supply module and wire-harness)
   1- Connect the supply module and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 105 and 103 on DCU side.
   Note: See the above “Reference: Overall resistance value of supply module (supply module heater)”.

NG	• The coupler between the supply module and the wire-harness may be defective. Replace the supply module. • Replace the wire-harness. • After replacing the wire-harness and clear the error, ECU power OFF, turn ON the power after the after-run is completed, and if the error reappears, replace the supply module.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on supply module)	Conduction	State
105	Supply module terminal G	Yes	OK: Normal
		No	NG: Error
103	Supply module terminal H	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Supply module conduction check pattern 1”, carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
105	All terminals other than 105	Yes	NG: Error
		No	OK: Normal
103	All terminals other than 103	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• Replace the DCU. (P150B only) • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

4. Checking the current failure with SA-D
   1- After clearing the error, turn OFF the key switch and after the after-run is completed, turn ON the key switch again.
   2- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the supply module (supply module heater), and make sure no error is detected in the current fault indication.

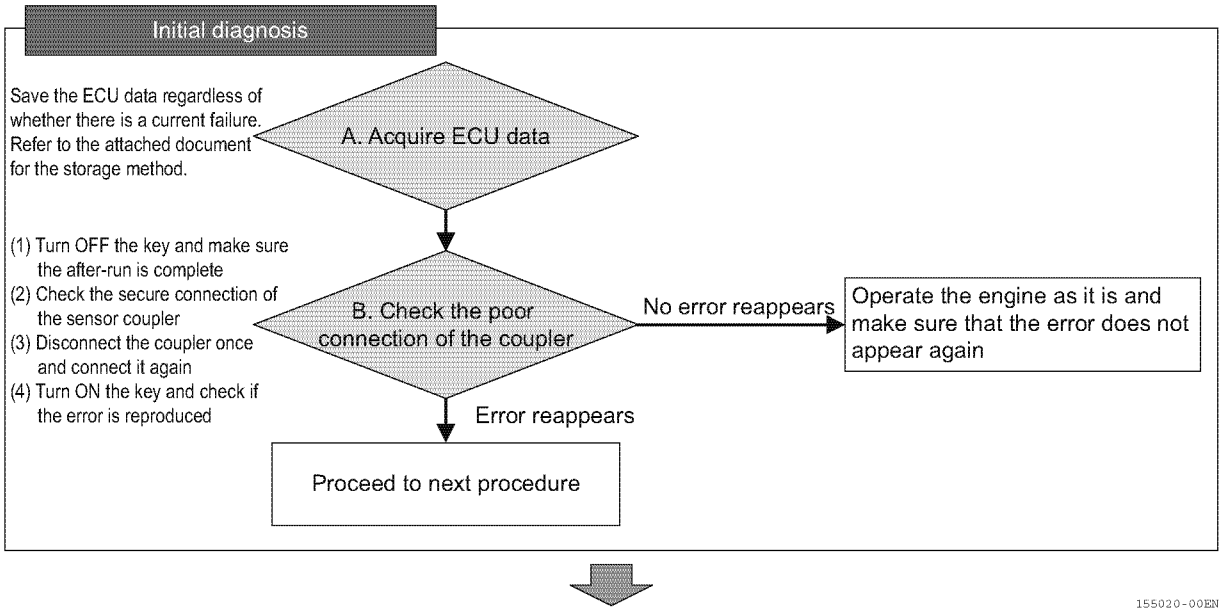
■ Supply module (supply module heater) 2

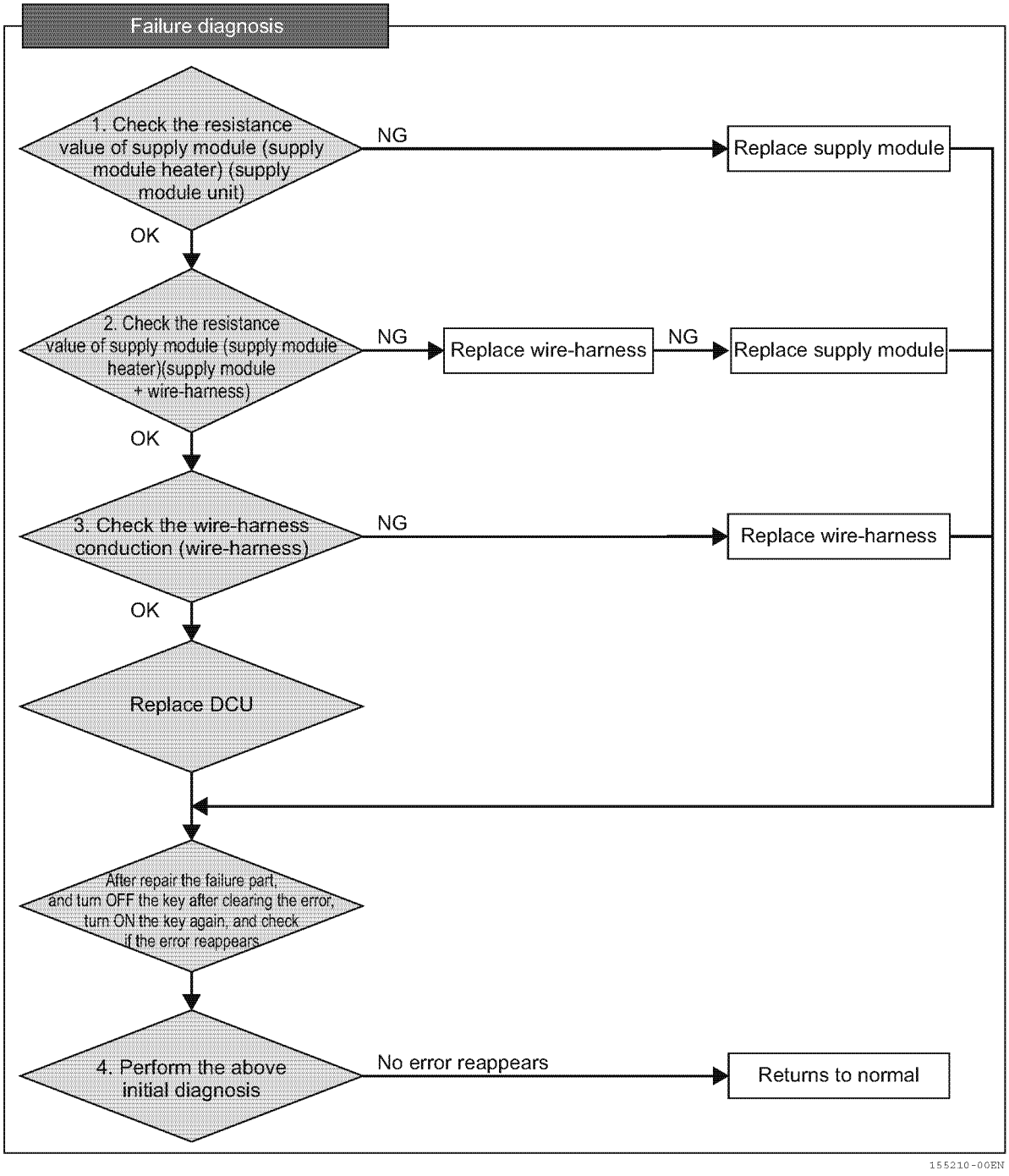
● Related DTC

P code	P26E8	Supply module (supply module heater) H side GND short circuit
	P20C8	Supply module (supply module heater) L side VB short circuit
	P1773	Supply module (supply module heater) L side GND short circuit
	P20C5	Supply module (supply module heater) disconnection

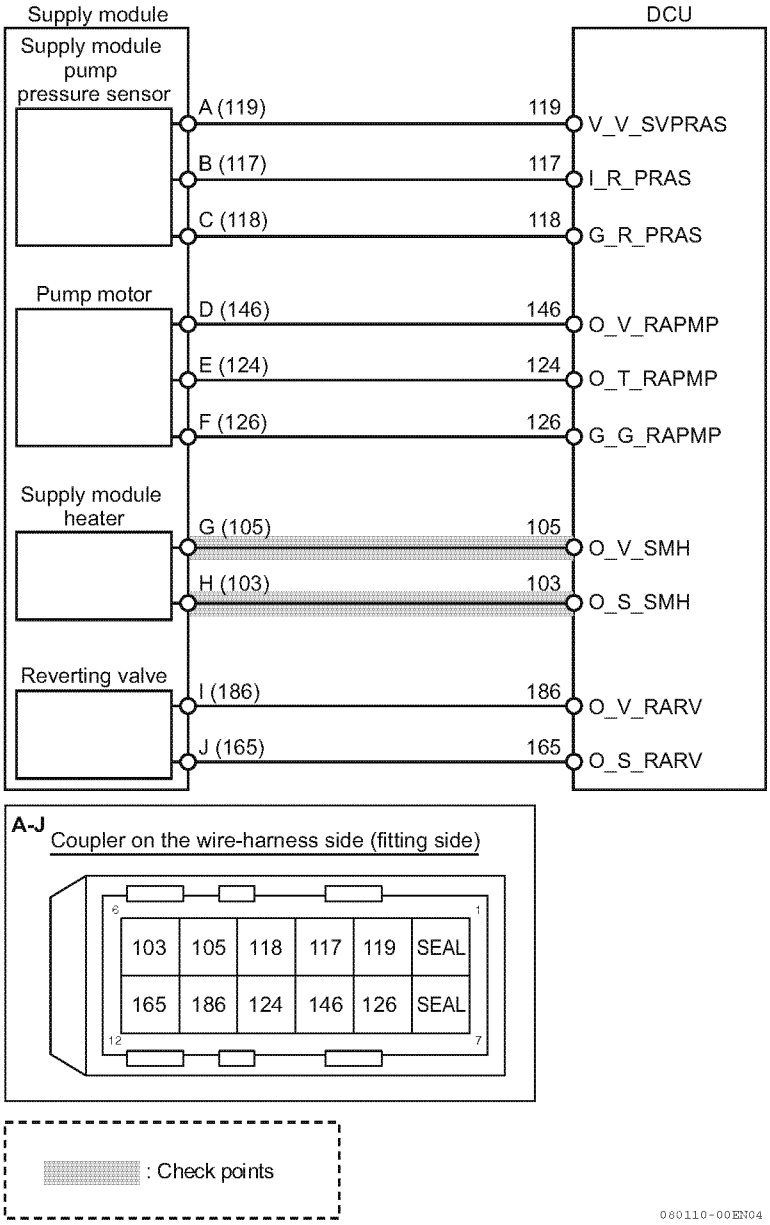
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of supply module (supply module heater) (supply module unit)
NG
Replace supply module
OK
2. Check the resistance value of supply module (supply module heater)(supply module + wire-harness)
NG
Replace wire-harness
NG
Replace supply module
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace DCU
After repair the failure part, and turn OFF the key after clearing the error, turn ON the key again, and check if the error reappears
4. Perform the above initial diagnosis
No error reappears
Returns to normal
155210-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of supply module (supply module heater) (supply module heater unit)
   1- Remove the wire-harness from the supply module.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the supply module terminals G and H.

Reference: Overall resistance value of supply module (supply module heater)

Terminal	Specifications
Between the supply module terminals	12 V specification: 1.51 ± 0.9 Ω (at 20 °C) 24 V specification: 6.0 ± 1.0 Ω (at 20 °C)

NG	Replace the supply module, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of supply module (supply module heater) (supply module and wire-harness).

2. Checking the resistance value of supply module (supply module heater) (supply module and wire-harness)
   1- Connect the supply module and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 105 and 103 on DCU side.
   Note: See the above “Reference: Overall resistance value of supply module (supply module heater)”.

NG	• The coupler between the supply module and the wire-harness may be defective. Replace the supply module. • Replace the wire-harness. • After replacing the wire-harness and clear the error, ECU power OFF, turn ON the power after the after-run is completed, and if the error reappears, replace the supply module.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on supply module)	Conduction	State
105	Supply module terminal G	Yes	OK: Normal
		No	NG: Error
103	Supply module terminal H	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Supply module conduction check pattern 1”, carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
105	All terminals other than 105	Yes	NG: Error
		No	OK: Normal
103	All terminals other than 103	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

4. Checking the current failure with SA-D
   1- After clearing the error, turn OFF the key switch and after the after-run is completed, turn ON the key switch again.
   2- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the supply module (supply module heater), and make sure no error is detected in the current fault indication.

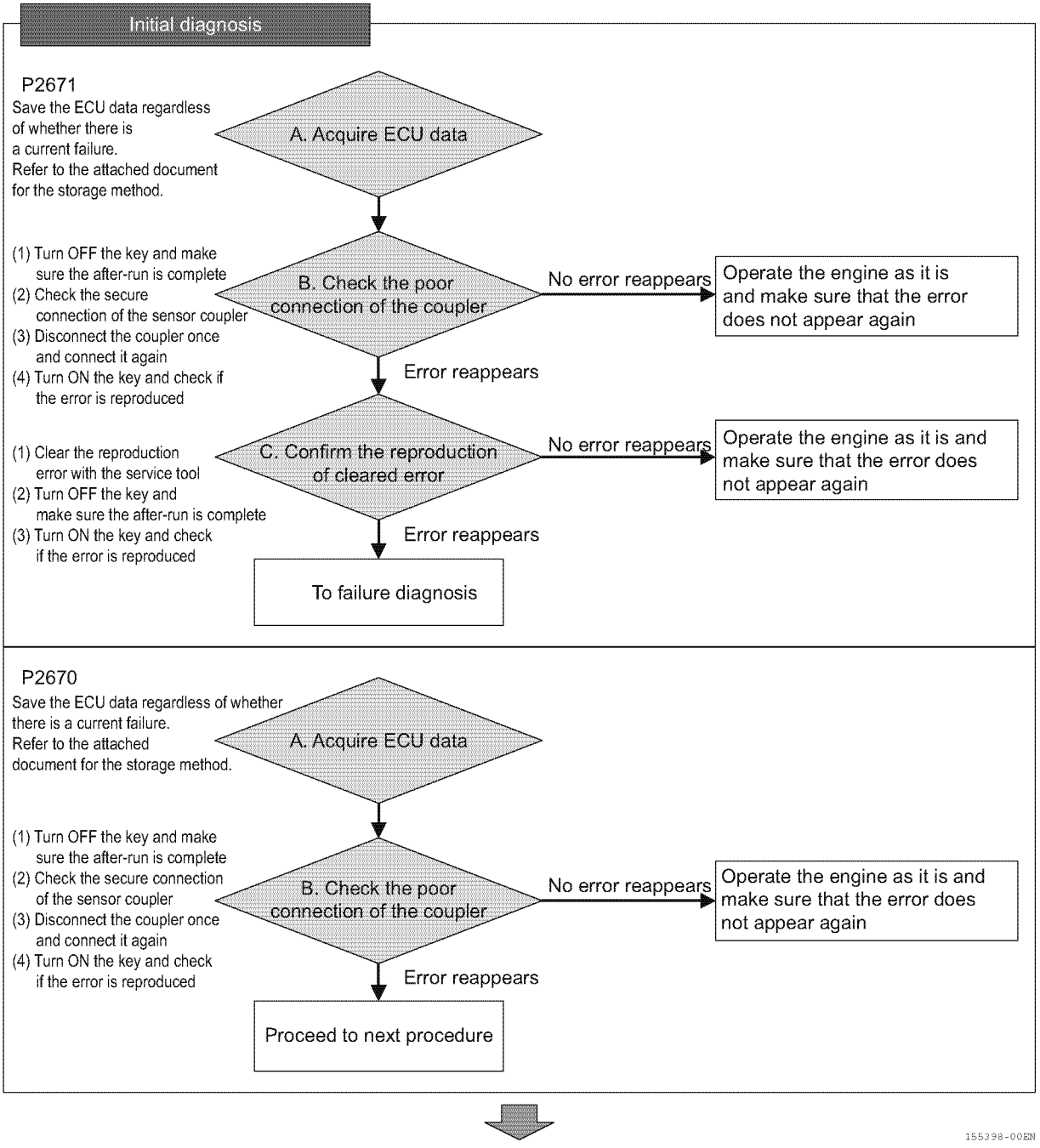
■ Supply module (reverting valve)

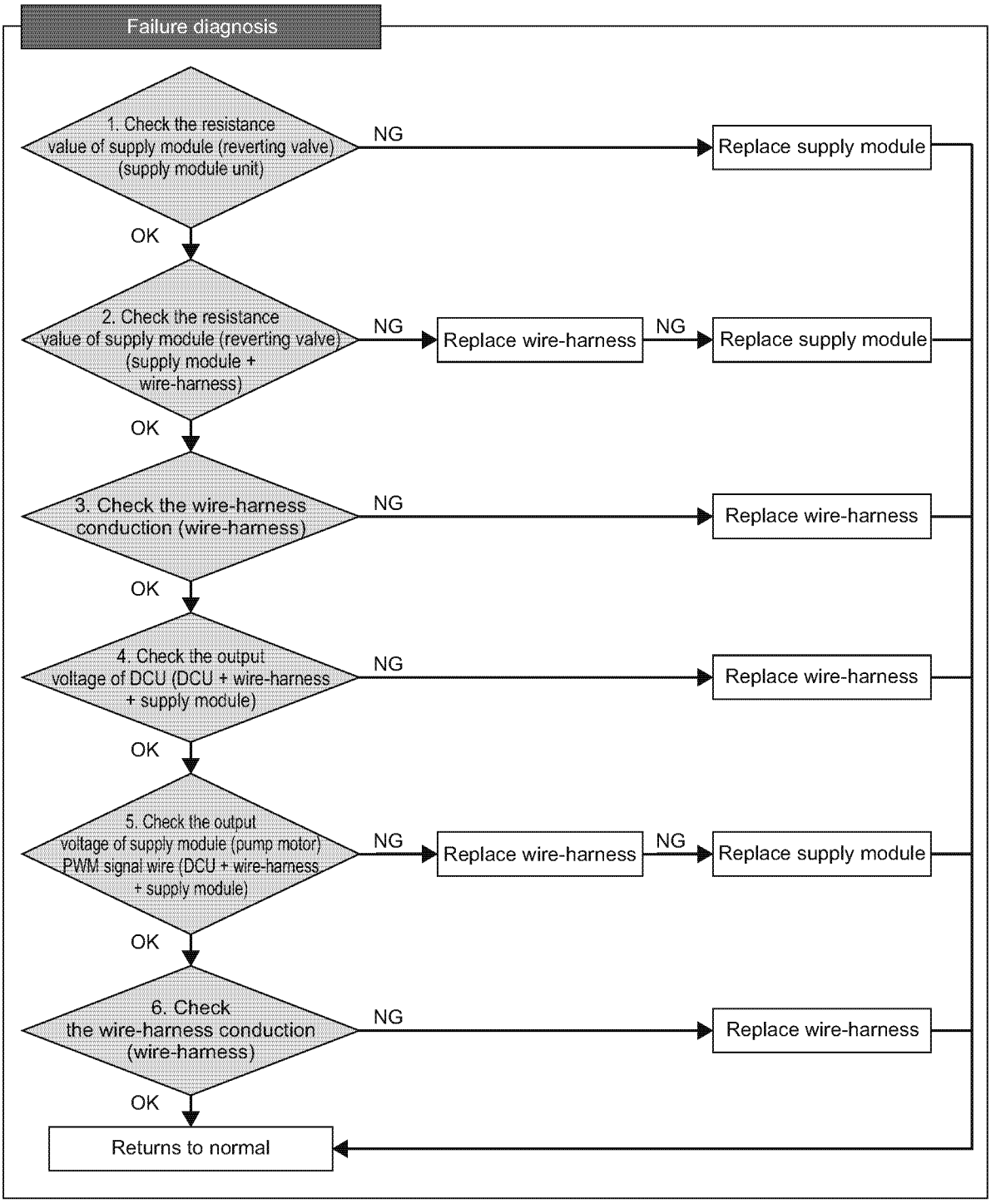
● Related DTC

P code	P2671	Supply module (reverting valve) H side VB short circuit
	P2670	Supply module (reverting valve) H side GND short circuit

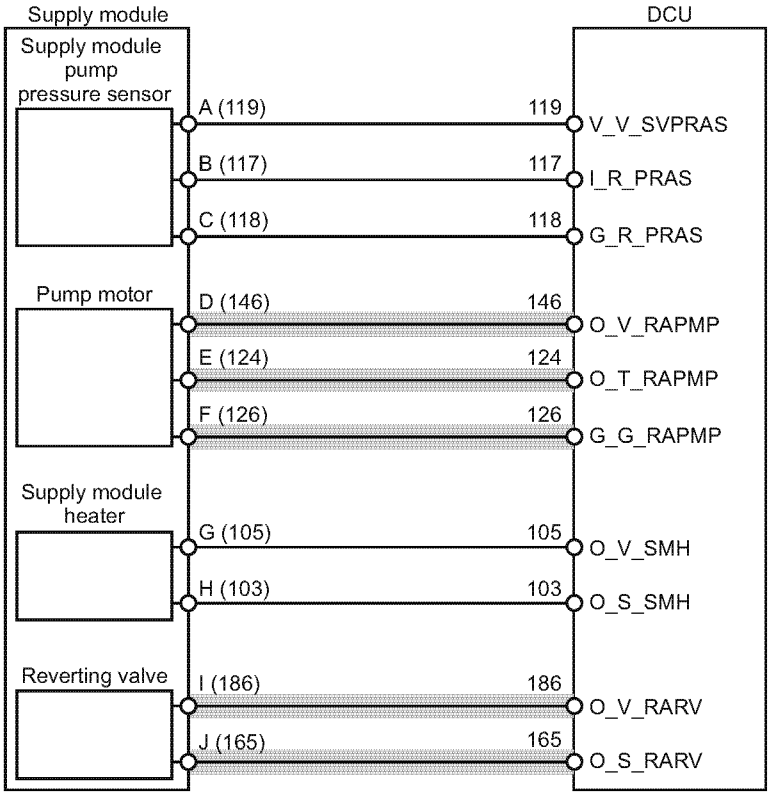
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

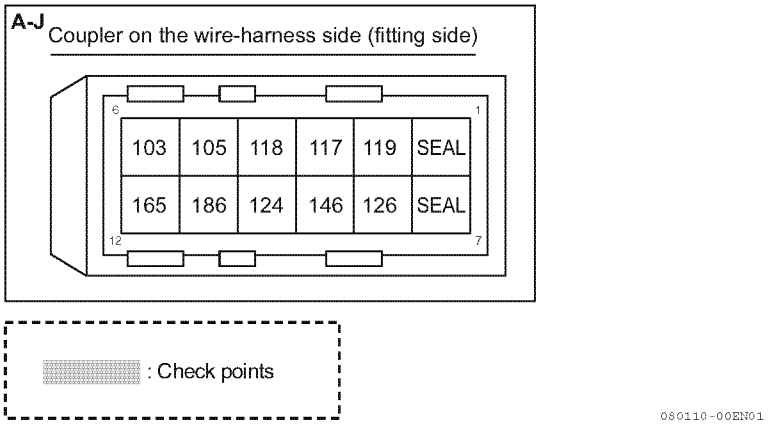



Failure diagnosis
1. Check the resistance value of supply module (reverting valve) (supply module unit)
NG
Replace supply module
OK
2. Check the resistance value of supply module (reverting valve) (supply module + wire-harness)
NG
Replace wire-harness
NG
Replace supply module
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
4. Check the output voltage of DCU (DCU + wire-harness + supply module)
NG
Replace wire-harness
OK
5. Check the output voltage of supply module (pump motor) PWM signal wire (DCU + wire-harness + supply module)
NG
Replace wire-harness
NG
Replace supply module
OK
6. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Returns to normal
155211-00EN

● Wire diagram



Note: The supply module high side (146) and the reverting valve high side (186) are connected inside the DCU. When this error occurs, check both supply module and reverting valve.



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of supply module (reverting valve) (supply module unit)
   1- Remove the wire-harness from the supply module.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the supply module terminals I and J.

Reference: Overall resistance value of supply module (reverting valve)

Terminal	Specifications
Between the supply module terminals	12 V specification: 6.6 ± 0.46 Ω (at 20 °C) 24 V specification: 20.6 ± 1.44 Ω (at 20 °C)

NG	Replace the supply module, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of supply module (reverting valve) (supply module and wire-harness)”.

2. Checking the resistance value of supply module (reverting valve) (supply module and wire-harness)
   1- Connect the supply module and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 186 and 165 on DCU side.
   Note: See the above “Reference: Overall resistance value of supply module (reverting valve)”

NG	• The coupler between the supply module and the wire-harness may be defective. Replace the supply module. • Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on supply module)	Conduction	State
186	Supply module terminal I	Yes	OK: Normal
		No	NG: Error
165	Supply module terminal J	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Supply module conduction check pattern 1”, carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
186	All terminals other than 146 and 186	Yes	NG: Error
		No	OK: Normal
165	All terminals other than 165	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the output voltage of DCU”.

4. Checking the output voltage of DCU
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) power supply 146 to 126.

Voltage	State	Corrective action
146 ≈ Battery voltage	OK (normal range)	Check the output voltage of supply module (pump motor) PWM signal wire.
146 ≈ 0 V	NG	• Replace the wire-harness. • Replace the DCU.

NG	Replace the wire-harness or DCU, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the output voltage of supply module (pump motor) PWM signal wire”.

5. Checking the output voltage of supply module (pump motor) PWM signal wire
   1- Connect the checker harness between the DCU and engine wire-harness. Also, connect all couplers (sensor, wire-harness, DCU).
   2- Using a circuit tester, measure the voltage between supply module (pump motor) PWM signal wire 124 to 126.

Voltage	State	Corrective action
124 ≈ Battery voltage	OK (normal range)	Check the conduction of the wire-harness.
124 ≈ 0 V	NG	• Replace the supply module. • Replace the wire-harness.

NG	Replace the supply module or the wire-harness, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the wire-harness conduction”.

6. Checking the wire-harness conduction
   1- Remove the wire-harness from the supply module and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Supply module conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on dosing module side)	Conduction	State
146	Supply module terminal D	Yes	OK: Normal
		No	NG: Error
124	Supply module terminal E	Yes	OK: Normal
		No	NG: Error
126	Supply module terminal F	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Supply module conduction check pattern 1”, carry out the below, too.

Reference: Supply module conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
146	All terminals other than 146 and 186	Yes	NG: Error
		No	OK: Normal
124	All terminals other than 124	Yes	NG: Error
		No	OK: Normal
126	All terminals other than GND	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Returns to normal.

7. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU).
   3- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   4- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   5- Turn ON the key switch again to start the engine.
   6- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   7- Operate the engine under conditions meeting the above reference value, and make sure no error is detected in the current fault indication.

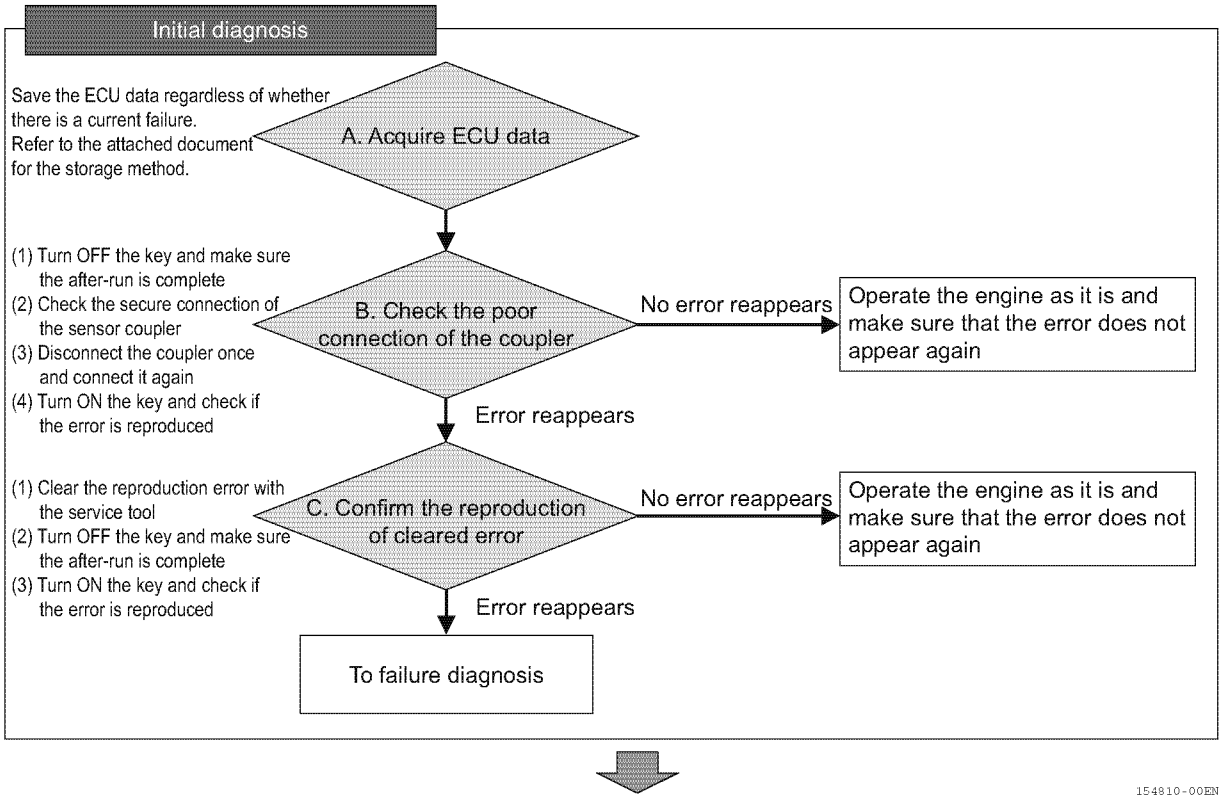
■ Heater relay/urea water tank heating valve

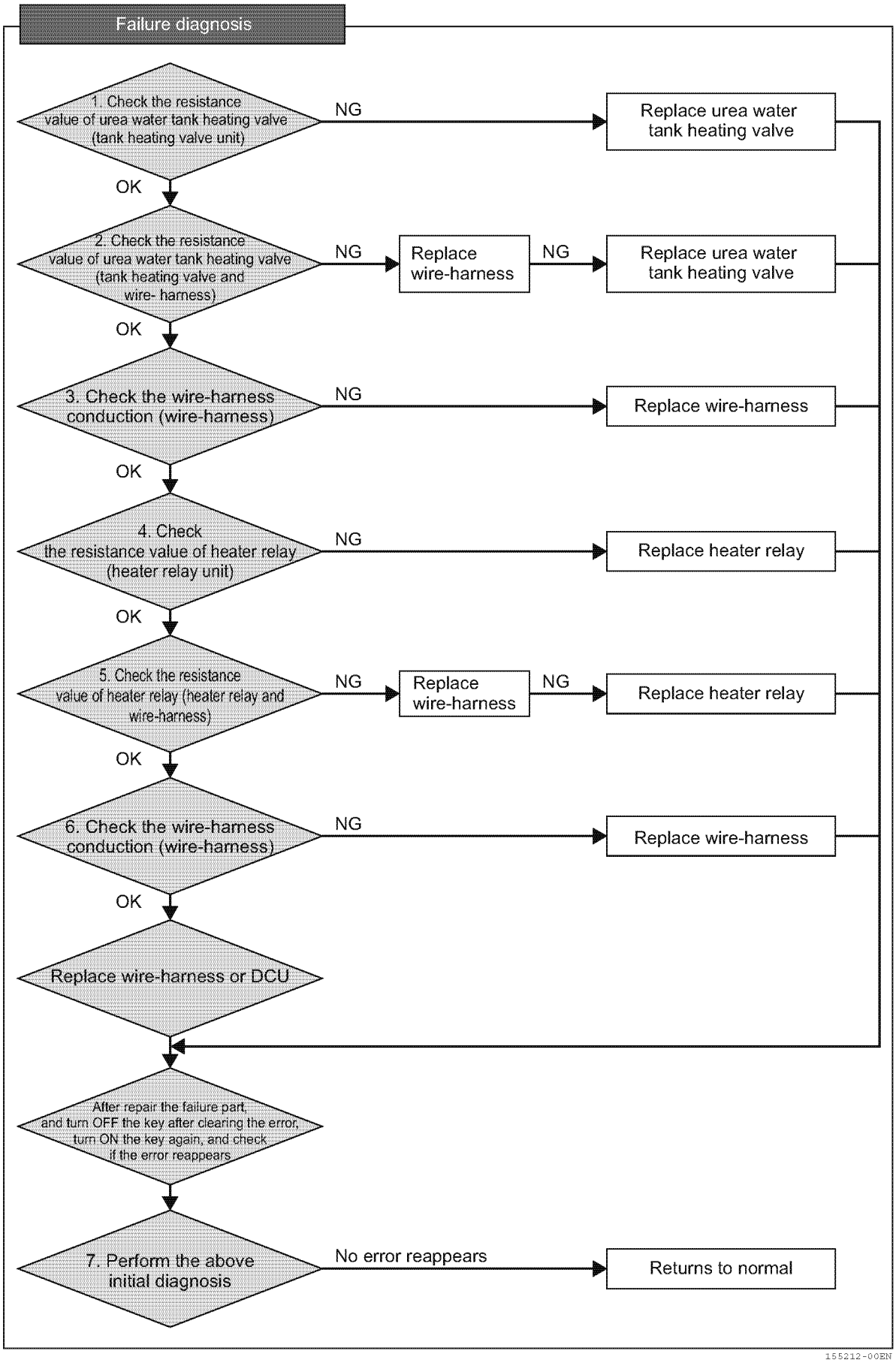
● Related DTC

P code	P2686	Heater relay/urea water tank heating valve H side VB short circuit
	P2685	Heater relay/urea water tank heating valve H side GND short circuit

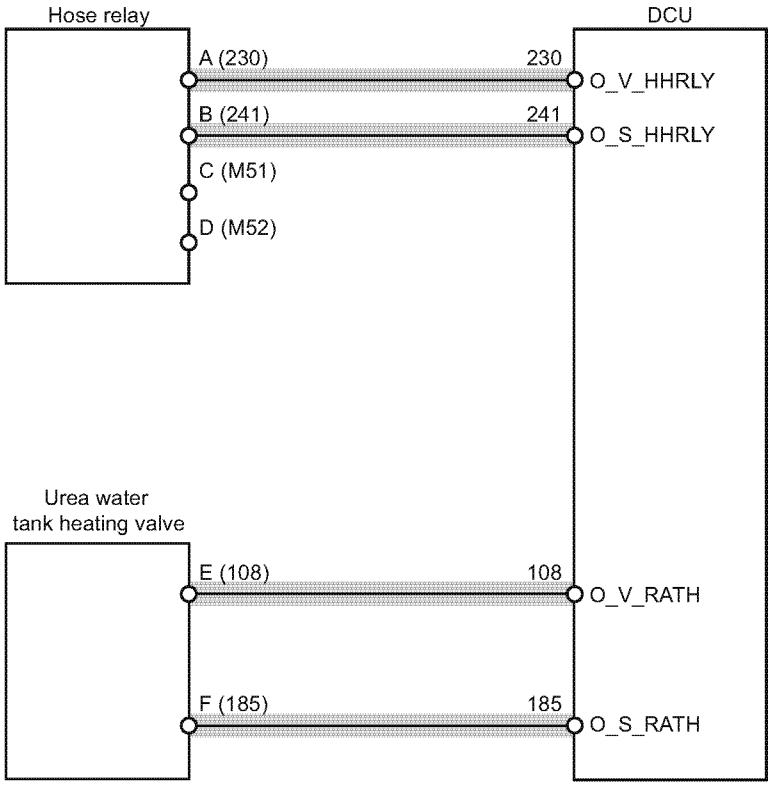
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

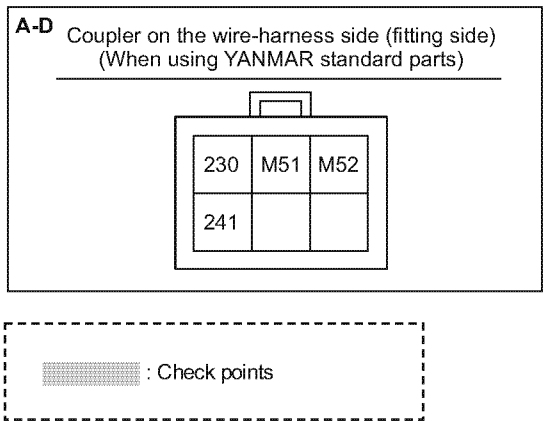



Failure diagnosis
1. Check the resistance value of urea water tank heating valve (tank heating valve unit)
NG
Replace urea water tank heating valve
OK
2. Check the resistance value of urea water tank heating valve (tank heating valve and wire- harness)
NG
Replace wire-harness
NG
Replace urea water tank heating valve
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
4. Check the resistance value of heater relay (heater relay unit)
NG
Replace heater relay
OK
5. Check the resistance value of heater relay (heater relay and wire-harness)
NG
Replace wire-harness
NG
Replace heater relay
OK
6. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace wire-harness or DCU
After repair the failure part, and turn OFF the key after clearing the error, turn ON the key again, and check if the error reappears
7. Perform the above initial diagnosis
No error reappears
Returns to normal
155212-00EN

● Wire diagram



Note: The heater relay high side (230) and the urea water tank heating valve high side (108) are connected inside the DCU. When this error occurs, check both heater relay and urea water tank heating valve.



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of urea water tank heating valve (urea water tank heating valve unit)
   1- Remove the wire-harness from the urea water tank heating valve.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between urea water tank heating valve terminals E and F.

Reference: Overall resistance value of urea water tank heating valve

Terminal	Specifications
Between urea water tank heating valve terminals	Specifications of urea water tank heating valve vary depending on the driven machine. See the Operation Manual of the driven machine.

NG	Replace the urea water tank heating valve, switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of urea water tank heating valve (urea water tank heating valve and wire-harness)”.

2. Checking the resistance value of urea water tank heating valve (urea water tank heating valve and wire-harness)
   1- Connect the urea water tank heating valve and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 108 and 185 on DCU side.
   Note: See the above “Reference: Overall resistance value of urea water tank heating valve”.

NG	• Replace the wire-harness. • Replace the wire-harness, turn OFF the power, and turn ON the power after the after-run is completed, and if the error reappears, replace the urea water tank heating valve.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the urea water tank heating valve and the DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Urea water tank heating valve conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on urea water tank heating valve)	Conduction	State
108	Urea water tank heating valve terminal A	Yes	OK: Normal
		No	NG: Error
185	Urea water tank heating valve terminal B	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Urea water tank heating valve conduction check pattern 1”, carry out the below, too.

Reference: Urea water tank heating valve conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
108	All terminals other than 230 and 180	Yes	NG: Error
		No	OK: Normal
185	All terminals other than 185	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the resistance value of heater relay (heater relay unit)”.

4. Checking the resistance value of heater relay (heater relay unit)
   1- Remove the wire-harness from the heater relay.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the heater relay terminals A and B.

Reference: Overall resistance value of heater relay

Terminal	Specifications
Between heater relay terminals	Specifications of heater relay vary depending on the driven machine. See the Operation Manual of the driven machine.

NG	Replace the heater relay, switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of heater relay (heater relay and wire-harness)”

5. Checking the resistance value of heater relay (heater relay and wire-harness)
   1- Connect the heater relay and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 230 and 241 on DCU side.
   Note: See the above "Reference: Overall resistance value of heater relay".

NG	• Replace the wire-harness. • Replace the wire-harness, turn OFF the power, and turn ON the power after the after-run is completed, and if the error reappears, replace the heater relay.
OK	Go to "Checking the wire-harness conduction".

6. Checking the wire-harness conduction
   1- Remove the wire-harness from the heater relay and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Heater relay conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on heater relay side)	Conduction	State
230	Heater relay terminal A	Yes	OK: Normal
		No	NG: Error
241	Heater relay terminal B	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above "Heater relay conduction check pattern 1", carry out the below, too.

Reference: Heater relay conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
230	All terminals other than 230 and 180	Yes	NG: Error
		No	OK: Normal
241	All terminals other than 241	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the DCU. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.

7. Checking the current failure with SA-D
   1- After clearing the error, turn OFF the key switch and turn ON the key switch again.
   2- Activate "Diagnosis Test: Active control" of SMARTASSIST-DIRECT (SA-D), operate the urea water tank heating valve, and make sure no error is detected in the current fault indication. Because heater relay is energized by turning on the key switch, operation check by active control is not required.

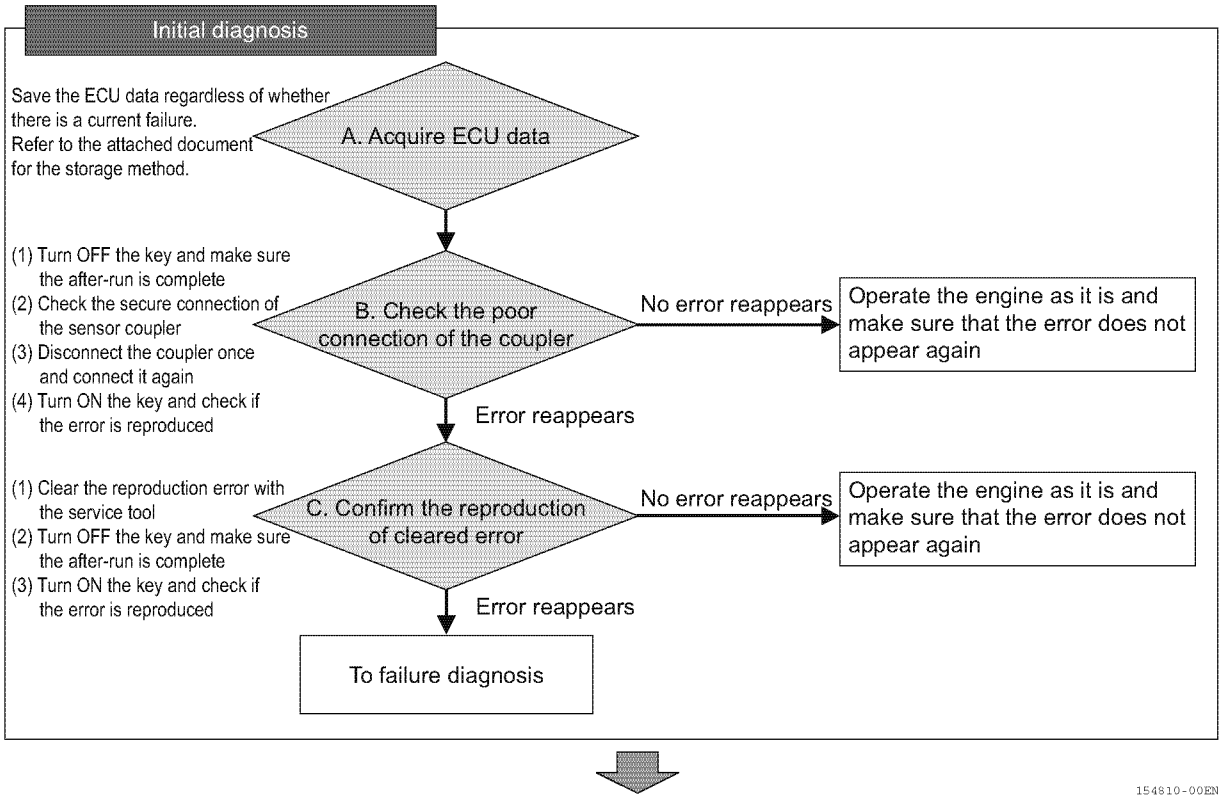
■ Urea water hose heater (back flow, pressure, suction)

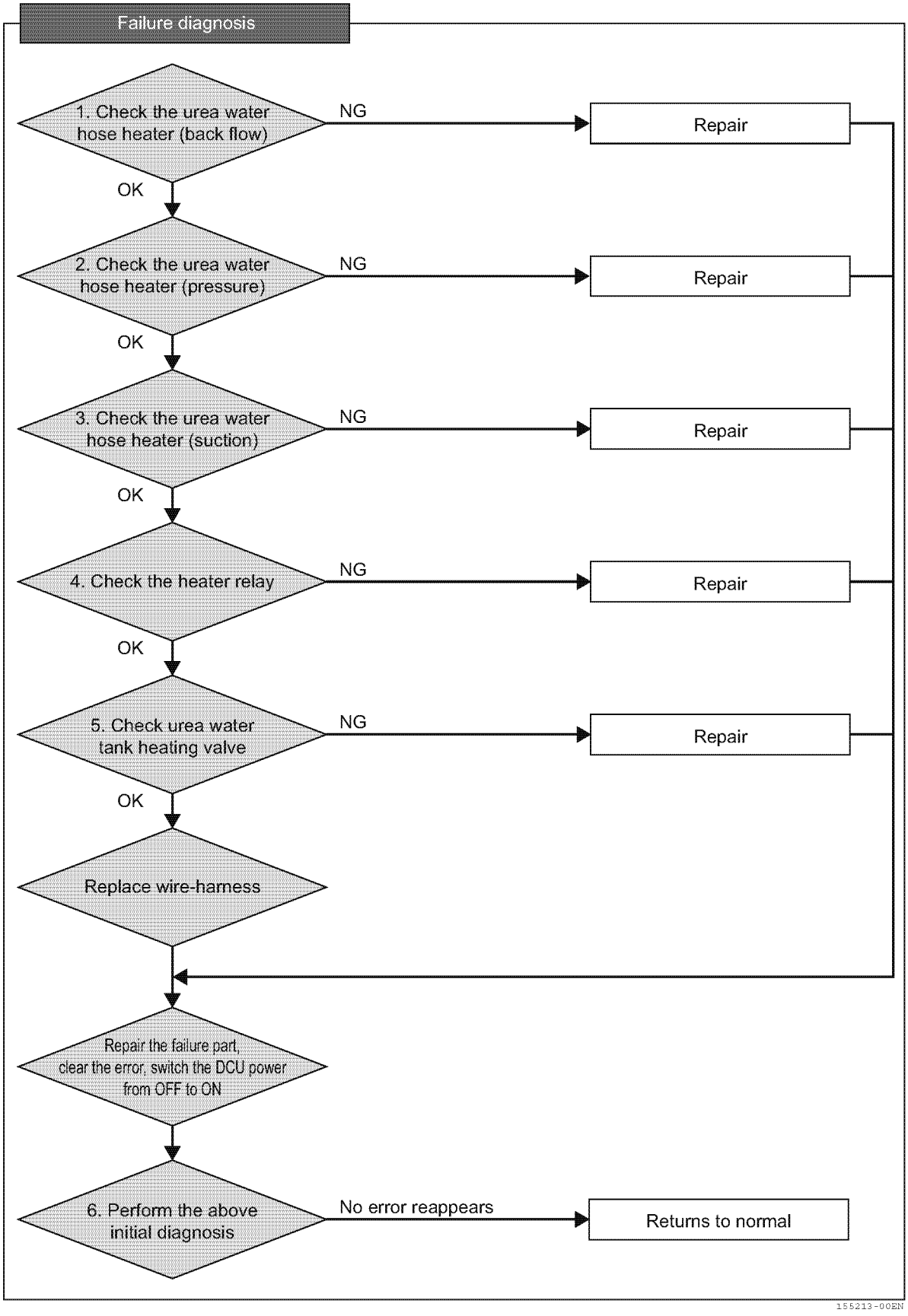
● Related DTC

P code	P1510	Urea water hose heater (back flow, pressure, suction) H side VB short circuit/L side VB short circuit

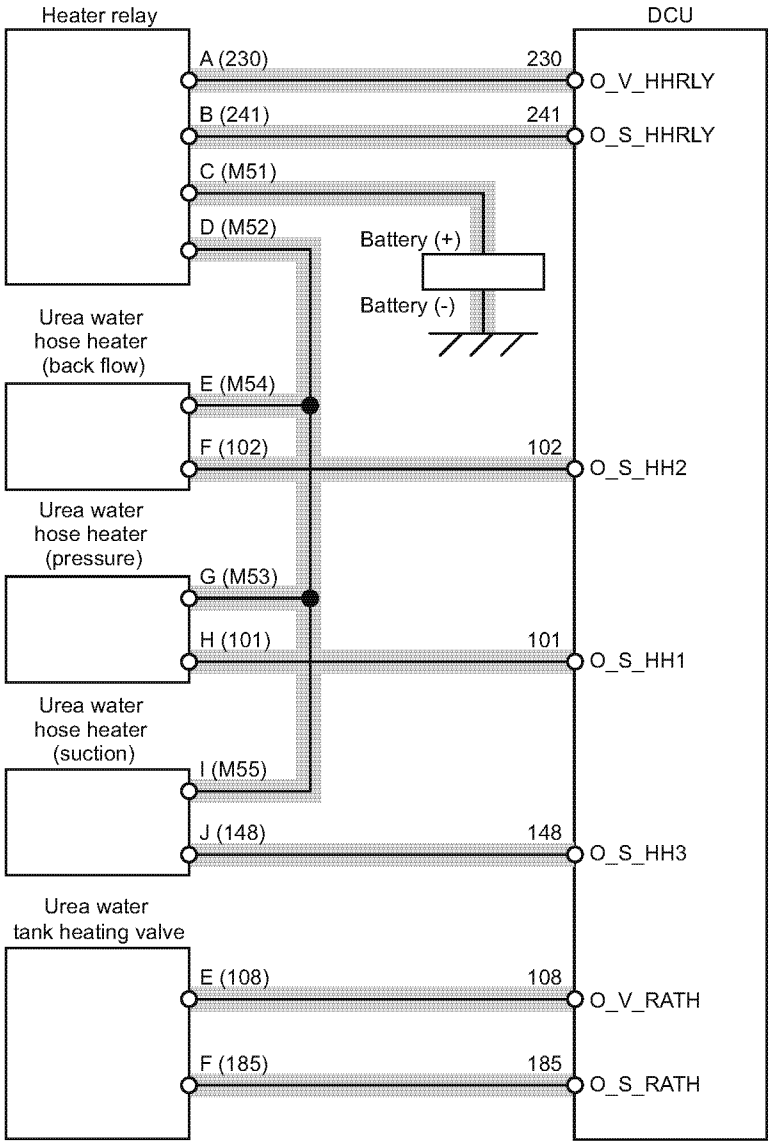
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.

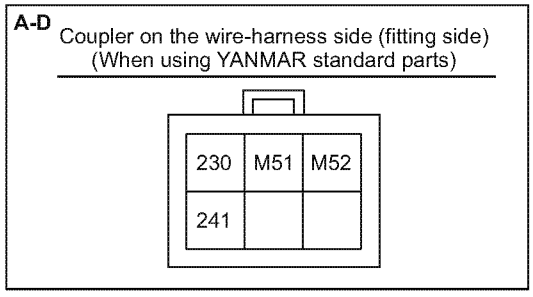



Failure diagnosis
1. Check the urea water hose heater (back flow)
NG
Repair
OK
2. Check the urea water hose heater (pressure)
NG
Repair
OK
3. Check the urea water hose heater (suction)
NG
Repair
OK
4. Check the heater relay
NG
Repair
OK
5. Check urea water tank heating valve
NG
Repair
OK
Replace wire-harness
Repair the failure part, clear the error, switch the DCU power from OFF to ON
6. Perform the above initial diagnosis
No error reappears
Returns to normal
155213-00EN

● Wire diagram



Note: The heater relay high side (230) and the urea water tank heating valve high side (108) are connected inside the DCU. When this error occurs, check both heater relay and urea water tank heating valve.



080145-00EN00

Note: See P823 for the DCU pin layout.

● Work description

1. Checking the urea water hose heater (back flow)

1- Perform the failure diagnosis for “Urea water hose heater (back flow)”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Urea water hose heater (back flow)”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Go to “Checking the urea water hose heater (pressure)”.

2. Checking the urea water hose heater (pressure)

1- Perform the failure diagnosis for “Urea water hose heater (pressure)”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Urea water hose heater (pressure)”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Go to “Checking the urea water hose heater (suction)”.

3. Checking the urea water hose heater (suction)

1- Perform the failure diagnosis for “Urea water hose heater (suction)”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Urea water hose heater (suction)”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Go to “Checking the heater relay”.

4. Checking the heater relay

1- Perform the failure diagnosis for “Heater relay”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Heater relay”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	Go to “Checking the urea water tank heating valve”.

5. Checking the urea water tank heating valve

1- Perform the failure diagnosis for “Urea water tank heating valve”.

Results of “Urea water tank heating valve”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	Repair the defective parts.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the wire-harness, clear the error, turn OFF the power, and turn ON the power after the after-run is completed, and check if the error reappears.

6. Checking the current failure with SA-D

1- Turn OFF the key switch and turn ON the key switch again.

2- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water hose heater (back flow), and make sure no error is detected in the current fault indication.

3- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water hose heater (pressure), and make sure no error is detected in the current fault indication.

4- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water hose heater (suction), and make sure no error is detected in the current fault indication.

5- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water tank heating valve, and make sure no error is detected in the current fault indication.
Because heater relay is energized by turning on the key switch, operation check by active control is not required.

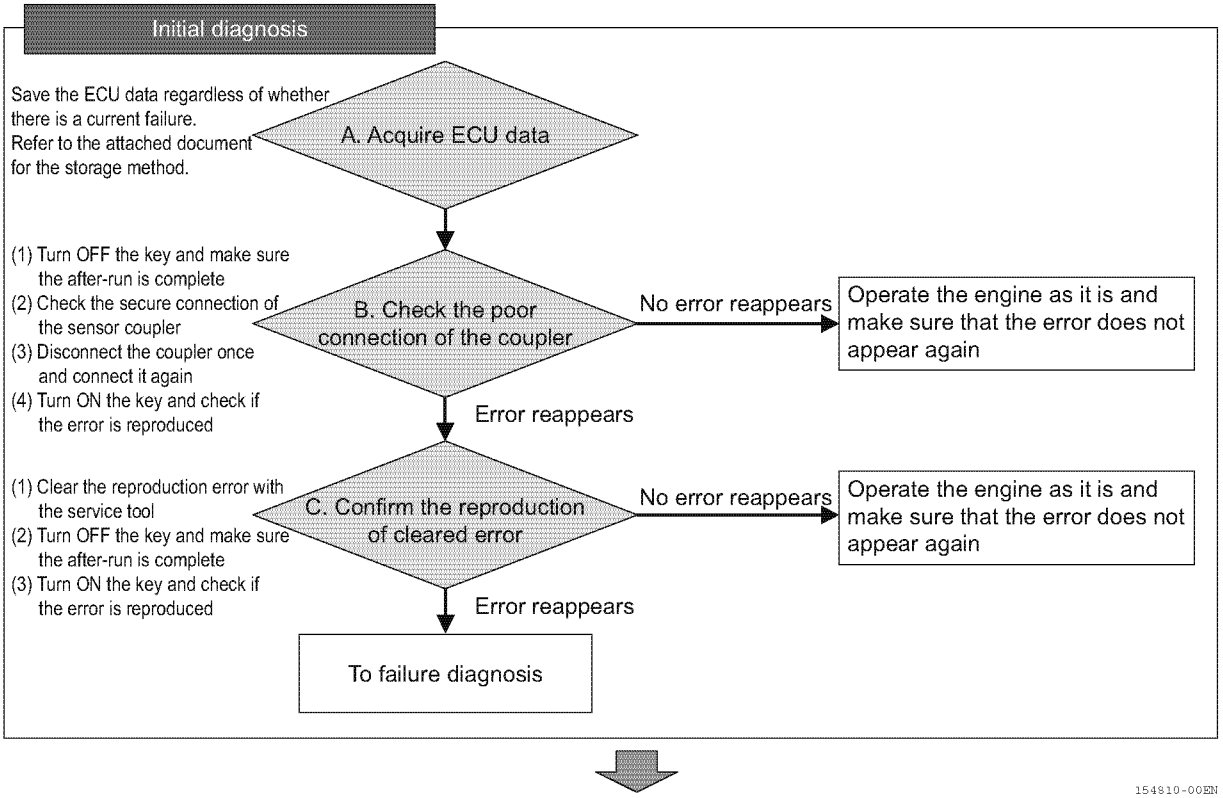
■ Urea water hose heater (back flow)

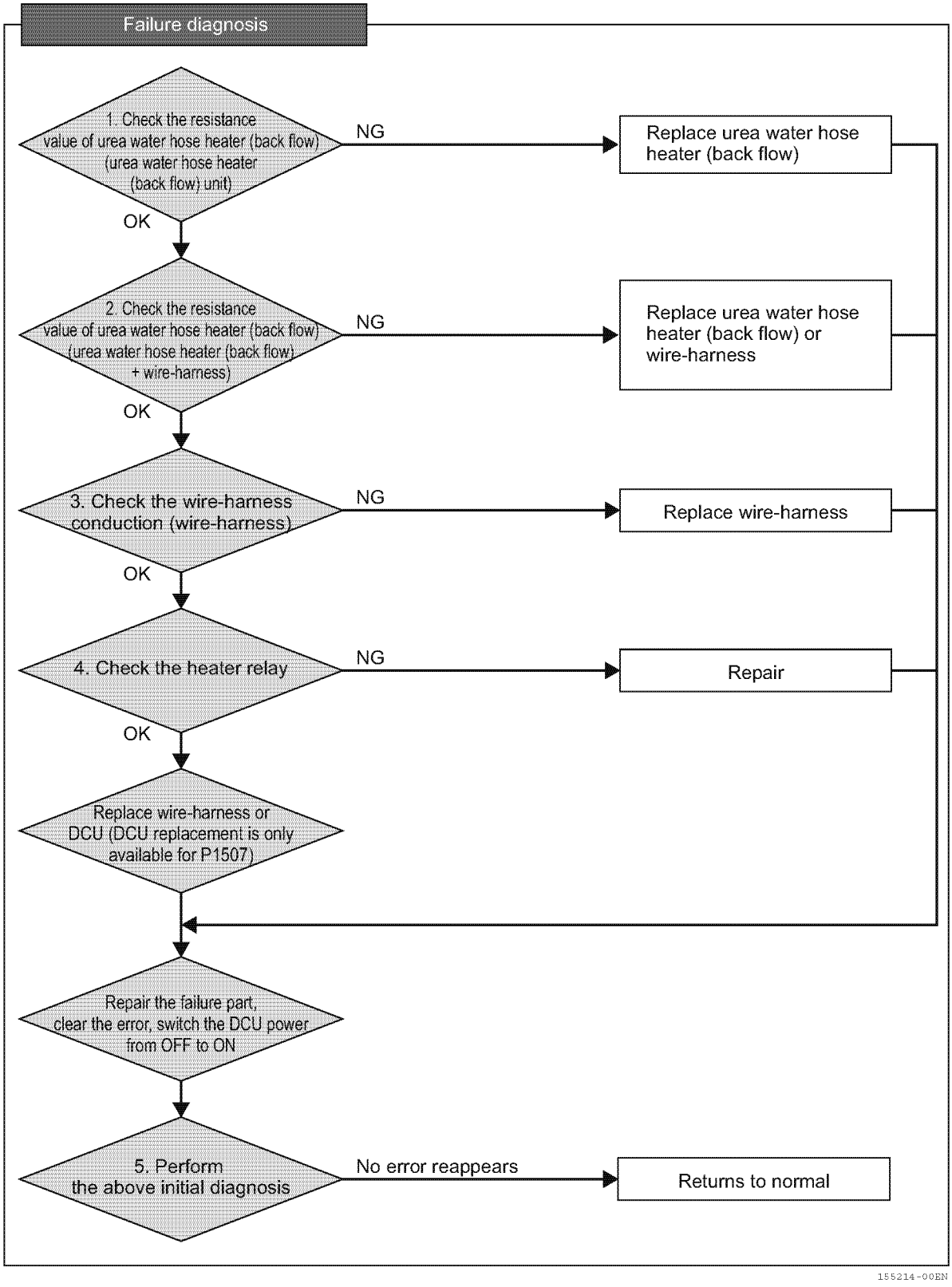
● Related DTC

P code	P20BC	Urea water hose heater (back flow) L side VB short circuit
	P1775	Urea water hose heater (back flow) L side GND short circuit
	P20B9	Urea water hose heater (back flow) disconnection
	P1507	Urea water hose heater (back flow) power stage temperature rise error

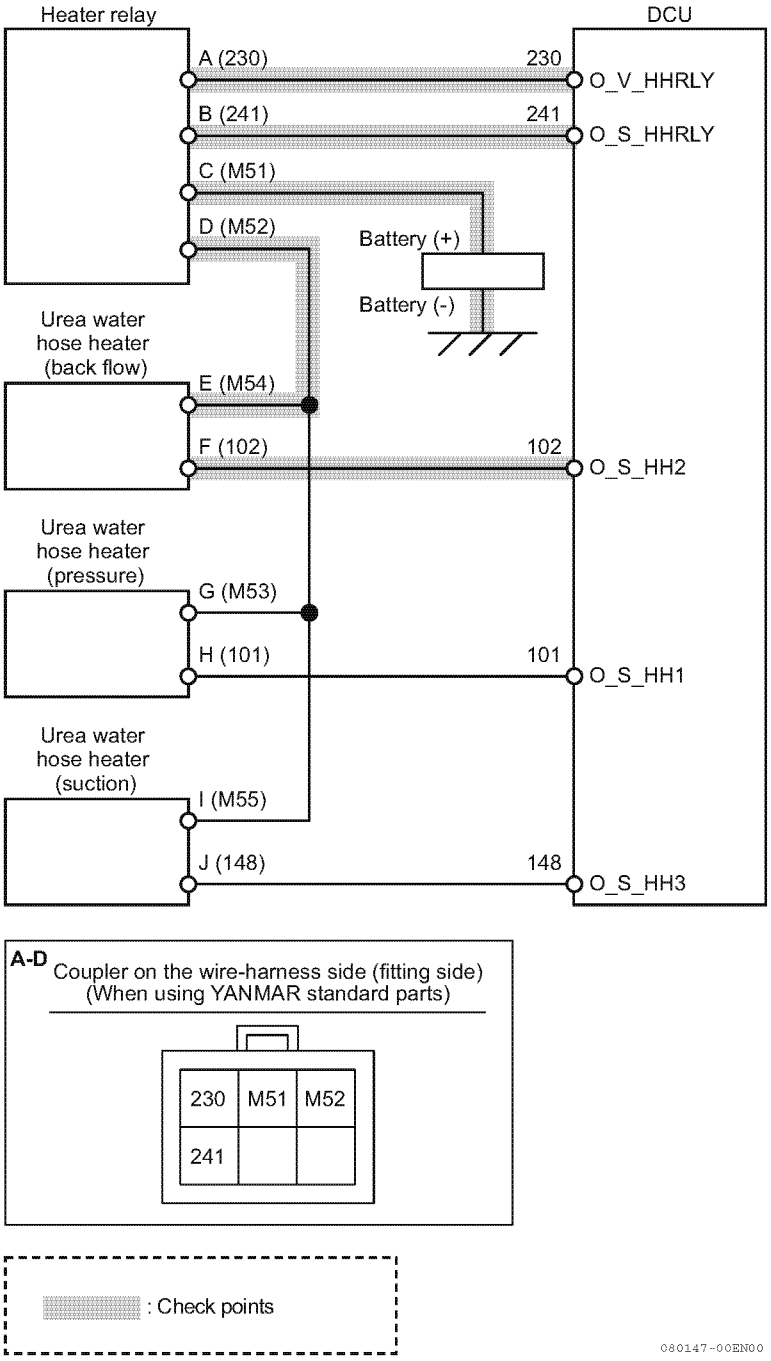
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of urea water hose heater (back flow) (urea water hose heater (back flow) unit)
NG
Replace urea water hose heater (back flow)
OK
2. Check the resistance value of urea water hose heater (back flow) (urea water hose heater (back flow) + wire-harness)
NG
Replace urea water hose heater (back flow) or wire-harness
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
4. Check the heater relay
NG
Repair
OK
Replace wire-harness or DCU (DCU replacement is only available for P1507)
Repair the failure part, clear the error, switch the DCU power from OFF to ON
5. Perform the above initial diagnosis
No error reappears
Returns to normal
155214-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of urea water hose heater (back flow) (urea water hose heater (back flow) unit)
   1- Remove the wire-harness from the urea water hose heater (back flow).
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the urea water hose heater (back flow) terminals E and F.

Reference: Overall resistance value of urea water hose heater (back flow)

Terminal	Specifications
Between the urea water hose heater (back flow) terminals	Specifications of urea water hose heater (back flow) vary depending on the driven machine. See the Operation Manual of the driven machine.

NG	Replace the urea water hose heater (back flow), switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of urea water hose heater (back flow) (urea water hose heater (back flow) and wire-harness)”.

2. Checking the resistance value of urea water hose heater (back flow) (urea water hose heater (back flow) and wire-harness)
   1- Connect the urea water hose heater (back flow), and remove the wire-harness from DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) from heater relay terminal C to heater relay terminal D to wire-harness coupler 102 on DCU side.
   Note: See the above “Reference: Overall resistance value of urea water hose heater (back flow)”.

NG	• The coupler between the urea water hose heater (back flow) and the wire-harness may be defective. Replace the urea water hose heater (back flow). • Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the urea water hose heater (back flow) and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Urea water hose heater (back flow) conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on urea water hose heater (back flow) side)	Conduction	State
102	The urea water hose heater (back flow) terminal F	Yes	OK: Normal
		No	NG: Error

Reference: Urea water hose heater (back flow) conduction check pattern 2

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on urea water hose heater (back flow) side)	Conduction	State
Heater relay terminal D	Urea water hose heater (back flow) terminal E	Yes	OK: Normal
		No	NG: Error

Reference: Urea water hose heater (back flow) conduction check pattern 3

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on battery side)	Conduction	State
Heater relay terminal C	Battery (+) terminal	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Urea water hose heater (back flow) conduction check pattern 1, 2 and 3”, carry out the below, too.

Reference: Urea water hose heater (back flow) conduction check pattern 4

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
102	All terminals other than 102	Yes	NG: Error
		No	OK: Normal

Reference: Urea water hose heater (back flow) conduction check pattern 5

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
Heater relay terminal D	All terminals	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the heater relay”.

4. Checking the heater relay

1- Perform the failure diagnosis for “Heater relay”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Heater relay”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after repair.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the DCU. (P1507 only) • Replace the wire-harness, clear the error, turn OFF the power, and turn ON the power after the after-run is completed, and check if the error reappears. (Except P1507)

5. Checking the current failure with SA-D

1- Turn OFF the key switch and turn ON the key switch again.

2- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water hose heater (back flow), and make sure no error is detected in the current fault indication.

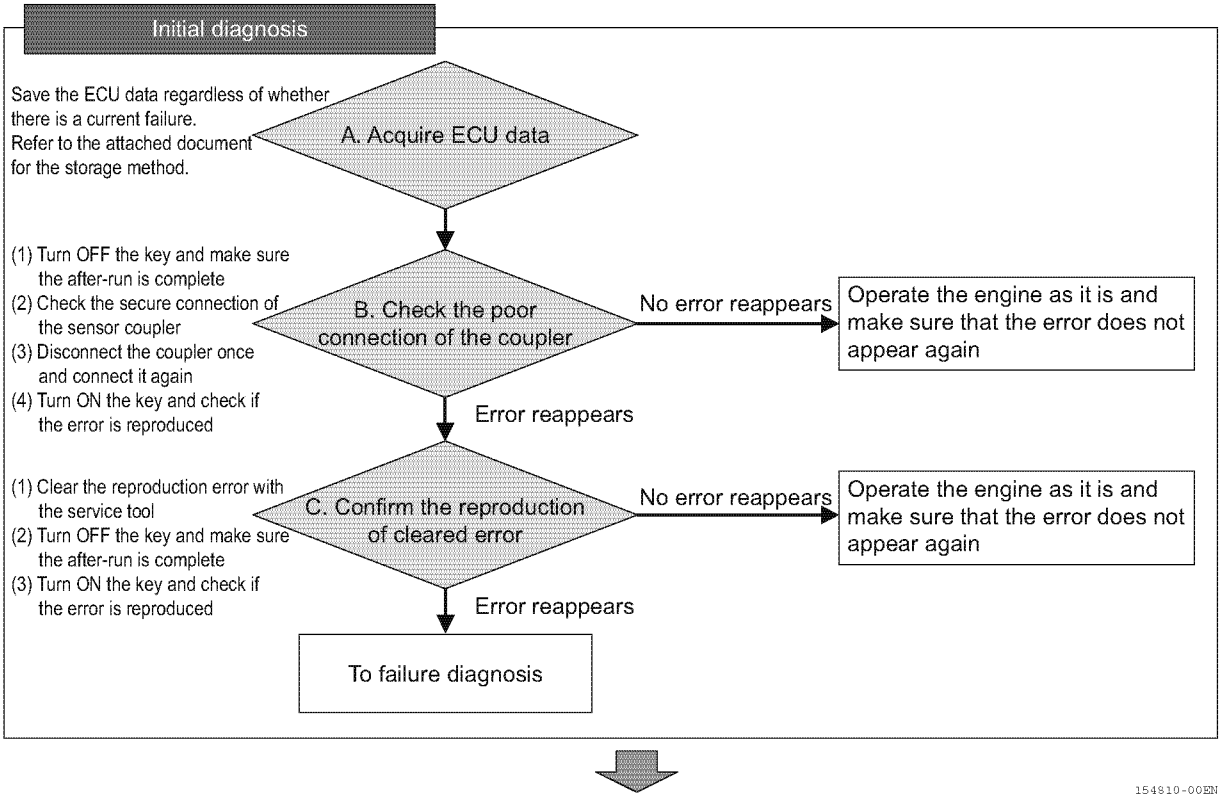
■ Urea water hose heater (pressure)

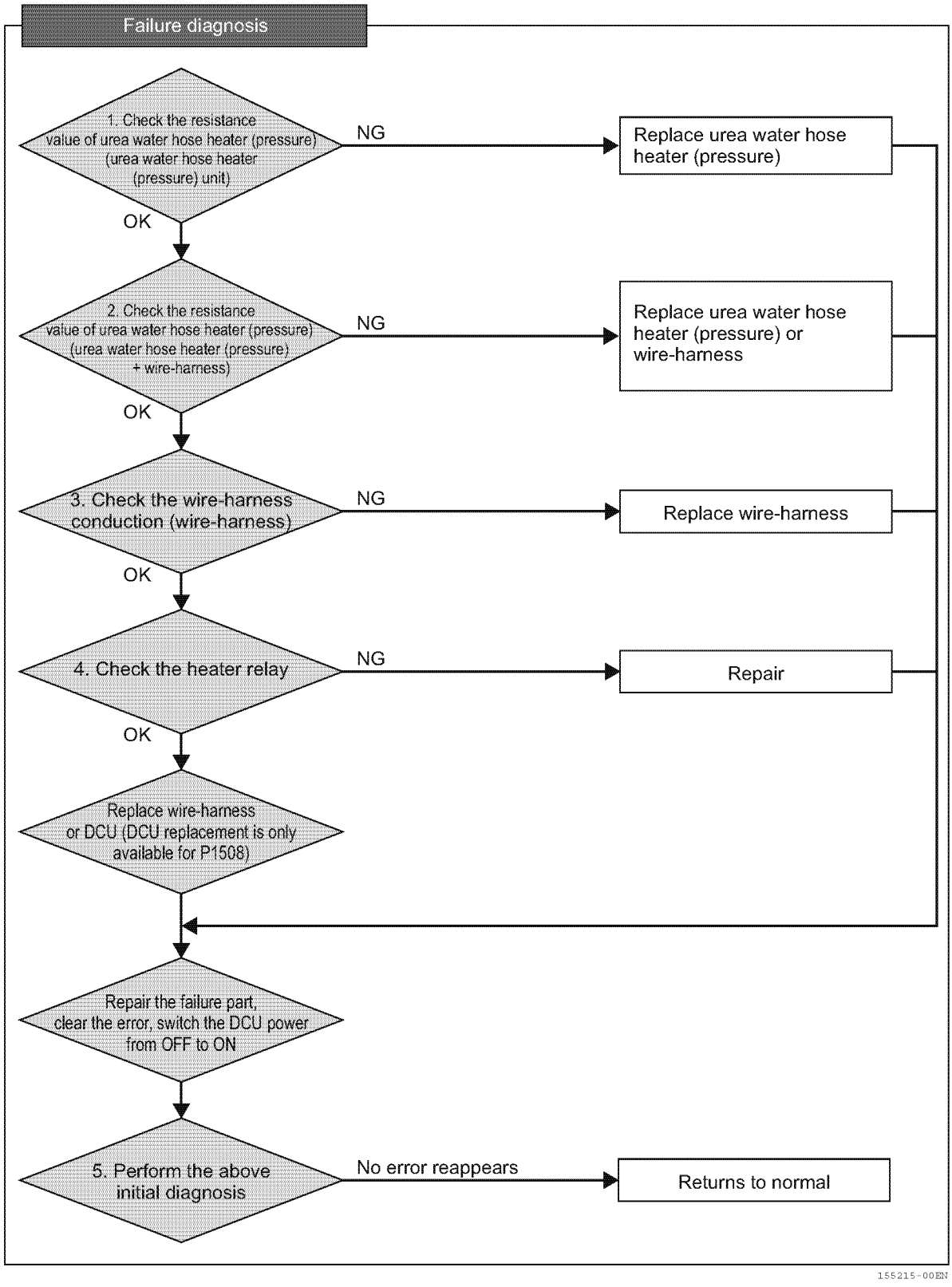
● Related DTC

P code	P20C0	Urea water hose heater (pressure) L side VB short circuit
	P1774	Urea water hose heater (pressure) L side GND short circuit
	P20BD	Urea water hose heater (pressure) disconnection
	P1508	Urea water hose heater (pressure) power stage temperature rise error

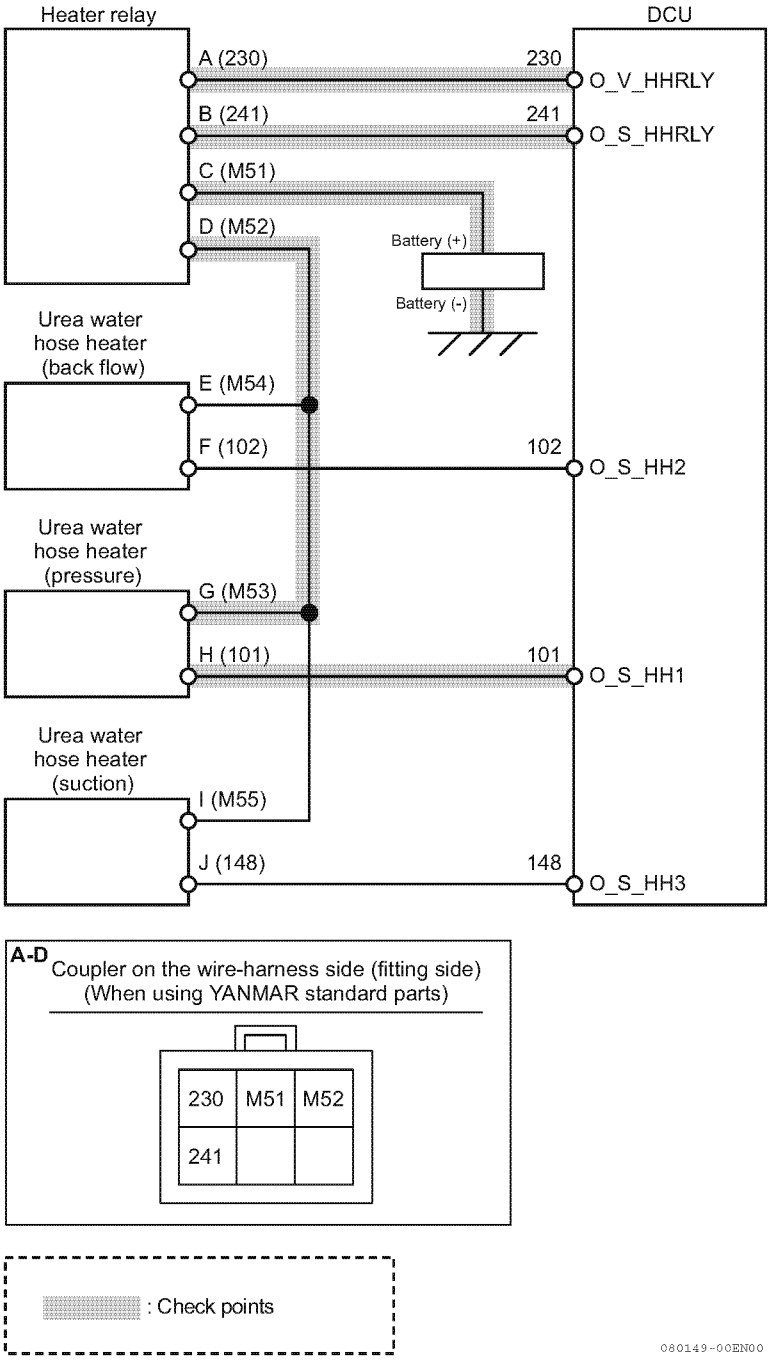
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of urea water hose heater (pressure) (urea water hose heater (pressure) unit)
NG
Replace urea water hose heater (pressure)
OK
2. Check the resistance value of urea water hose heater (pressure) (urea water hose heater (pressure) + wire-harness)
NG
Replace urea water hose heater (pressure) or wire-harness
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
4. Check the heater relay
NG
Repair
OK
Replace wire-harness or DCU (DCU replacement is only available for P1508)
Repair the failure part, clear the error, switch the DCU power from OFF to ON
5. Perform the above initial diagnosis
No error reappears
Returns to normal
155215-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of urea water hose heater (pressure) (urea water hose heater (pressure) unit)
   1- Remove the wire-harness from the urea water hose heater (pressure).
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the urea water hose heater (pressure) terminals G and H.

Reference: Overall resistance value of urea water hose heater (pressure)

Terminal	Specifications
Between urea water hose heater (pressure) terminals	Specifications of urea water hose heater (pressure) vary depending on the driven machine. See the Operation Manual of the driven machine.

NG	Replace the urea water hose heater (pressure), switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of urea water hose heater (pressure) (urea water hose heater (pressure) and wire-harness)”.

2. Checking the resistance value of urea water hose heater (pressure) (urea water hose heater (pressure) and wire-harness)
   1- Connect the urea water hose heater (pressure), and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) from heater relay terminal C to heater relay terminal D to wire-harness coupler 101 on DCU side.
   Note: See the above “Reference: Overall resistance value of urea water hose heater (pressure)”.

NG	• The coupler between the urea water hose heater (pressure) and the wire-harness may be defective. Replace the urea water hose heater (pressure). • Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the urea water hose heater (pressure) and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Urea water hose heater (pressure) conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on urea water hose heater (pressure))	Conduction	State
101	Urea water hose heater (pressure) terminal H	Yes	OK: Normal
		No	NG: Error

Reference: Urea water hose heater (pressure) conduction check pattern 2

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on urea water hose heater (pressure))	Conduction	State
Heater relay terminal D	Urea water hose heater (pressure) terminal G	Yes	OK: Normal
		No	NG: Error

Reference: Urea water hose heater (pressure) conduction check pattern 3

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on battery side)	Conduction	State
Heater relay terminal C	Battery (+) terminal	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Urea water hose heater (pressure) conduction check pattern 1, 2 and 3”, carry out the below, too.

Reference: Urea water hose heater (pressure) conduction check pattern 4

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
101	All terminals other than 101	Yes	NG: Error
		No	OK: Normal

Reference: Urea water hose heater (pressure) conduction check pattern 5

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
Heater relay terminal D	All terminals	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the heater relay”.

4. Checking the heater relay

1- Perform the failure diagnosis for “Heater relay”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Heater relay”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after repair.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the DCU. (P1508 only) • Replace the wire-harness, clear the error, turn OFF the power, and turn ON the power after the after-run is completed, and check if the error reappears. (Except P1508)

5. Checking the current failure with SA-D

1- Turn OFF the key switch and turn ON the key switch again.

2- Activate “Diagnosis Test: active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water hose heater (pressure), and make sure no error is detected in the current fault indication.

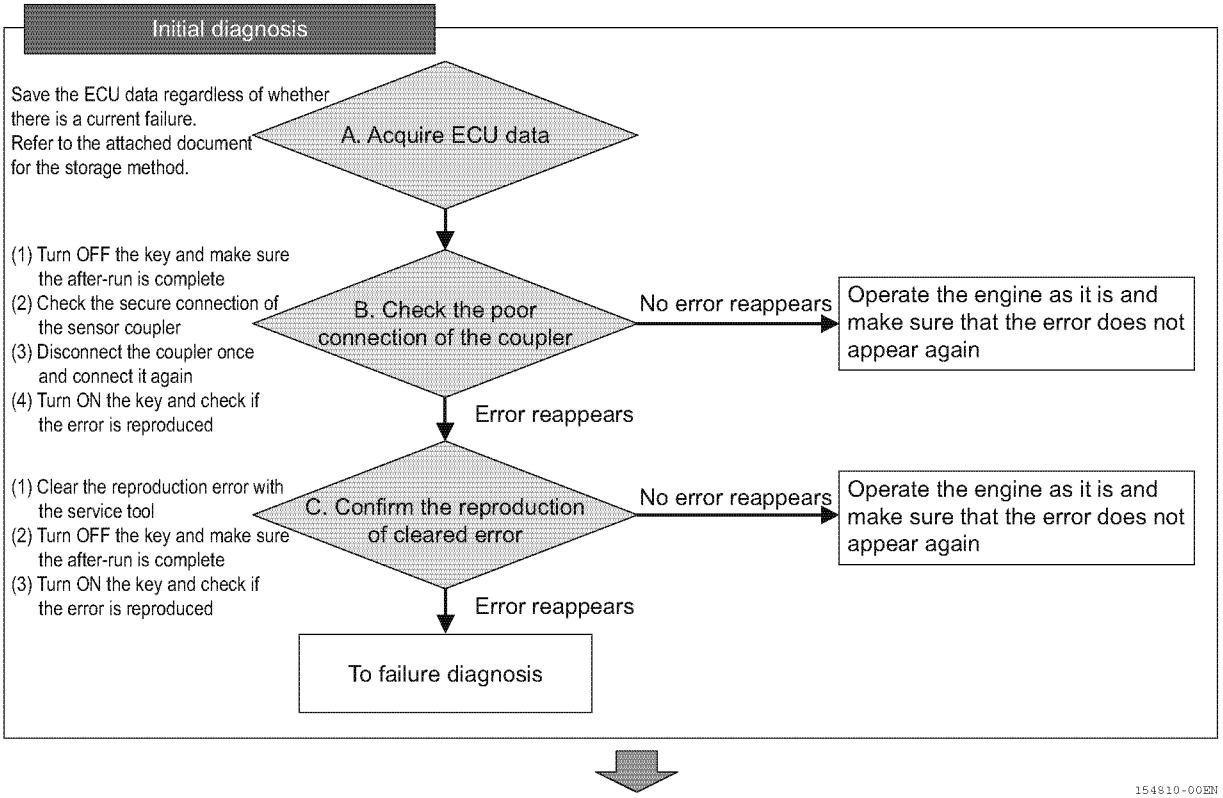
■ Urea water hose heater (suction)

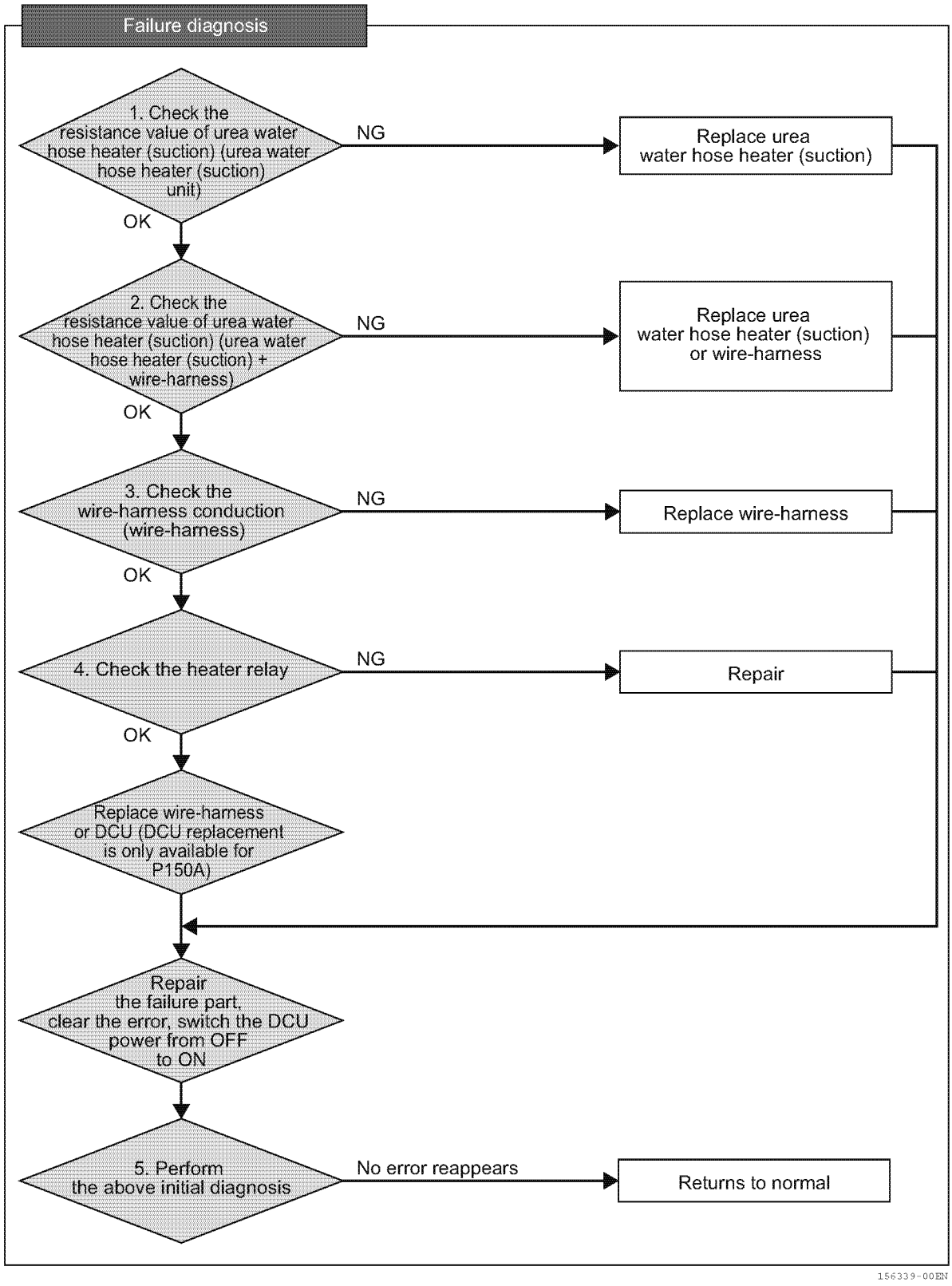
● Related DTC

P code	P20C4	Urea water hose heater (suction) L side VB short circuit
	P1776	Urea water hose heater (suction) L side GND short circuit
	P20C1	Urea water hose heater (suction) disconnection
	P150A	Urea water hose heater (suction) power stage temperature rise error

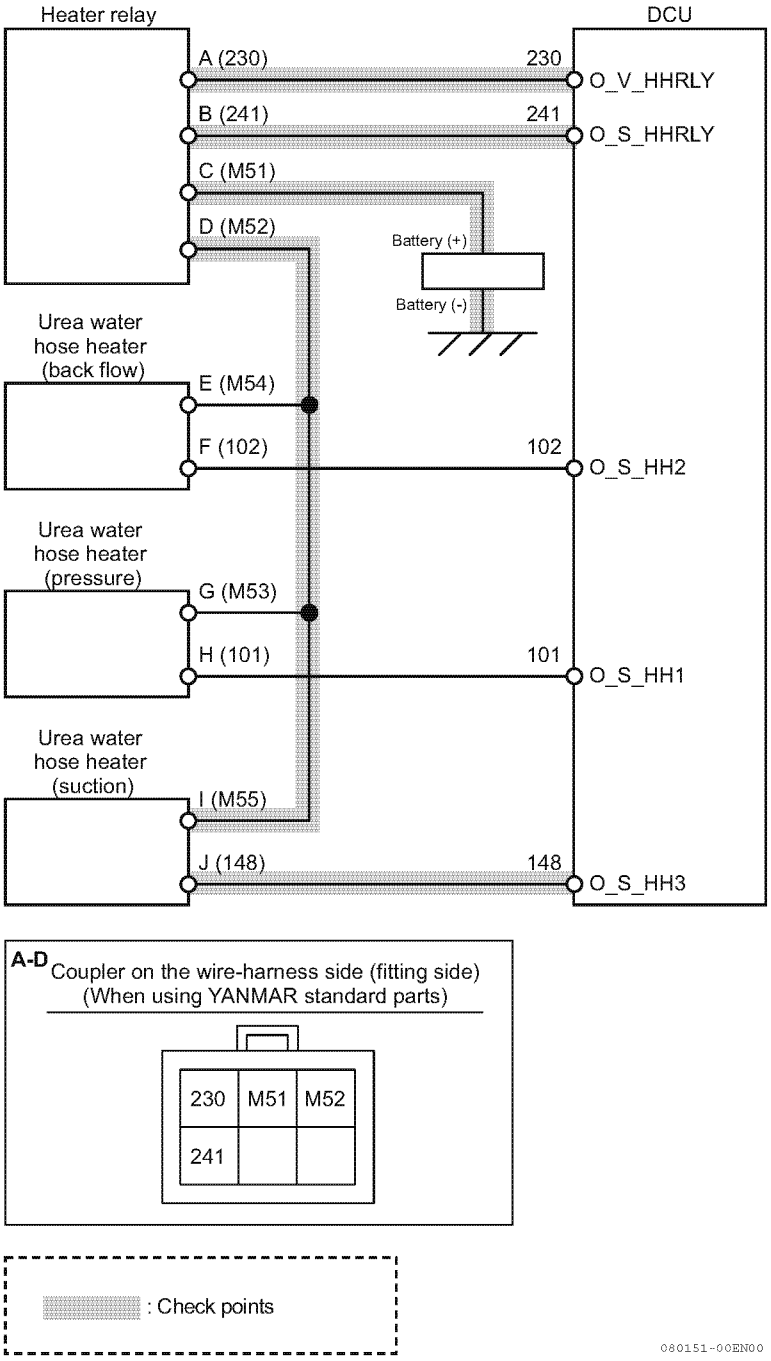
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of urea water hose heater (suction) (urea water hose heater (suction) unit)
NG
Replace urea water hose heater (suction)
OK
2. Check the resistance value of urea water hose heater (suction) (urea water hose heater (suction) + wire-harness)
NG
Replace urea water hose heater (suction) or wire-harness
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
4. Check the heater relay
NG
Repair
OK
Replace wire-harness or DCU (DCU replacement is only available for P150A)
Repair the failure part, clear the error, switch the DCU power from OFF to ON
5. Perform the above initial diagnosis
No error reappears
Returns to normal
156339-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of urea water hose heater (suction) (urea water hose heater (suction) unit)
   1- Remove the wire-harness from the urea water hose heater (suction).
   2- Using a circuit tester, measure the resistance value (overall resistance value) between the urea water hose heater (suction) terminals I and J.

Reference: Overall resistance value of urea water hose heater (suction)

Terminal	Specifications
Between the urea water hose heater (suction) terminals	Specifications of urea water hose heater (suction) vary depending on the driven machine. See the Operation Manual of the driven machine.

NG	Replace the urea water hose heater (suction), switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of urea water hose heater (suction) (urea water hose heater (suction) and the wire-harness)”.

2. Checking the resistance value of urea water hose heater (suction) (urea water hose heater (suction) and the wire-harness)
   1- Connect the urea water hose heater (suction), and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) from heater relay terminal C to heater relay terminal D to wire-harness coupler 148 on DCU side.
   Note: See the above “Reference: Overall resistance value of urea water hose heater (suction)”.

NG	• The coupler between the urea water hose heater (suction) and the wire-harness may be defective. Replace the urea water hose heater (suction). • Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the urea water hose heater (suction) and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Urea water hose heater (suction) conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on urea water hose heater (suction))	Conduction	State
148	Urea water hose heater (suction) terminal J	Yes	OK: Normal
		No	NG: Error

Reference: Urea water hose heater (suction) conduction check pattern 2

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on urea water hose heater (suction))	Conduction	State
Heater relay terminal D	Urea water hose heater (suction) terminal I	Yes	OK: Normal
		No	NG: Error

Reference: Urea water hose heater (suction) conduction check pattern 3

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on battery side)	Conduction	State
Heater relay terminal C	Battery (+) terminal	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Urea water hose heater (suction) conduction check pattern 1, 2 and 3”, carry out the below, too.

Reference: Urea water hose heater (suction) conduction check pattern 4

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
148	All terminals other than 148	Yes	NG: Error
		No	OK: Normal

Reference: Urea water hose heater (suction) conduction check pattern 5

Terminal 1 (Wire-harness coupler on heater relay side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
Heater relay terminal D	All terminals	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the heater relay”.

4. Checking the heater relay

1- Perform the failure diagnosis for “Heater relay”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Heater relay”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after repair.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the DCU. (P150A only) • Replace the wire-harness, clear the error, turn OFF the power, and turn ON the power after the after-run is completed, and check if the error reappears. (Except P150A)

5. Checking the current failure with SA-D

1- Turn OFF the key switch and turn ON the key switch again.

2- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water hose heater (suction), and make sure no error is detected in the current fault indication.

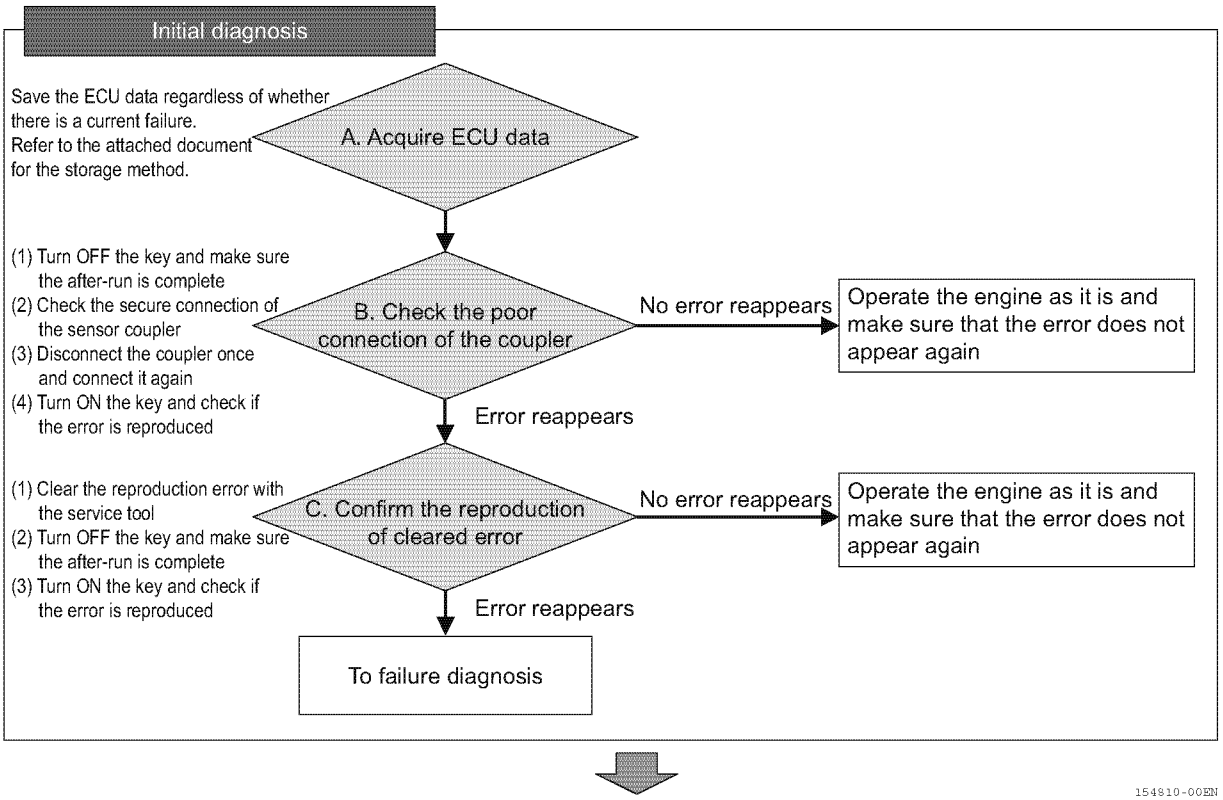
■ Urea water tank heating valve

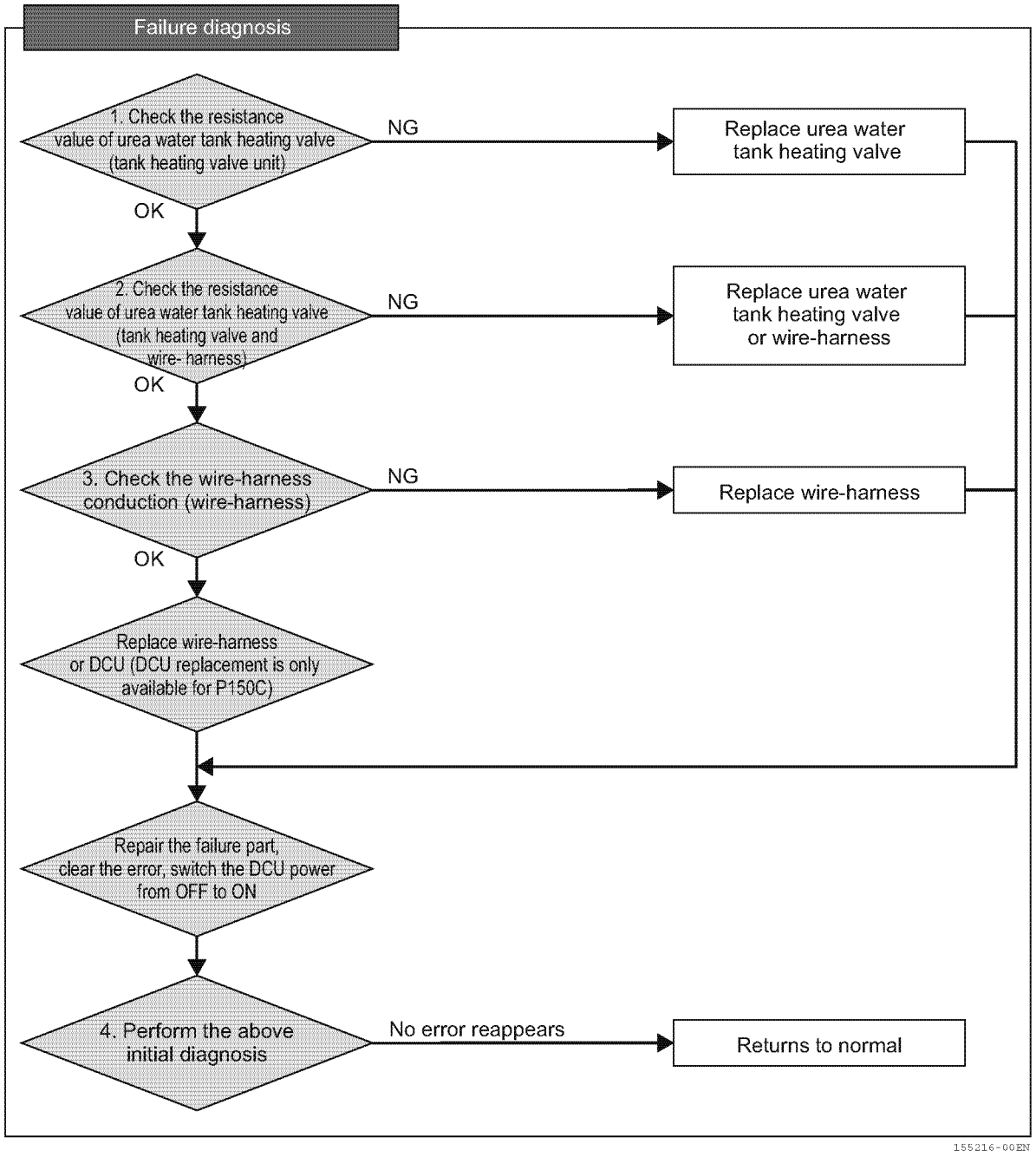
● Related DTC

P code	P202C	Urea water tank heating valve L side VB short circuit
	P202B	Urea water tank heating valve L side GND short circuit
	P202A	Urea water tank heating valve disconnection
	P150C	Urea water tank heating valve power stage temperature rise error

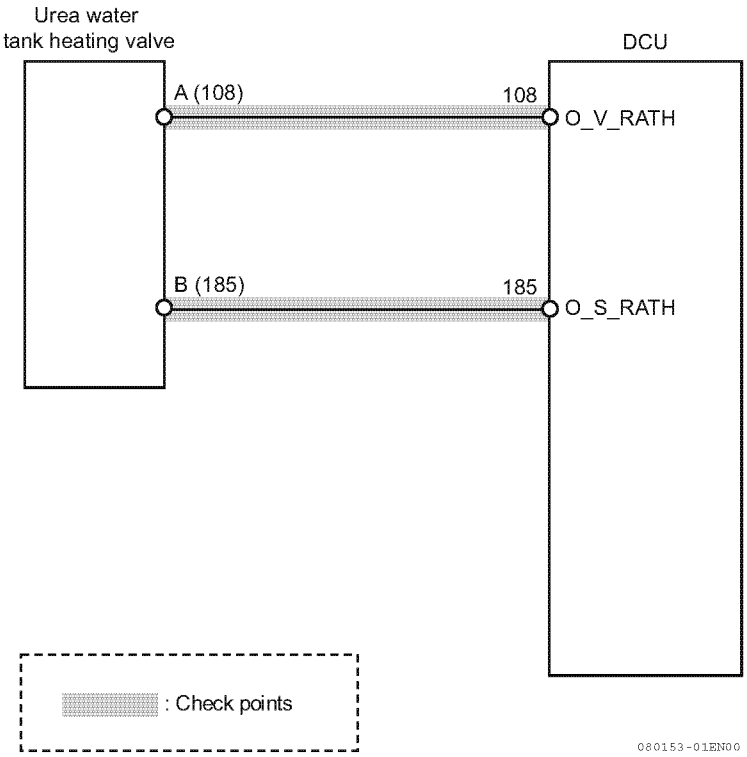
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the resistance value of urea water tank heating valve (tank heating valve unit)
NG
Replace urea water tank heating valve
OK
2. Check the resistance value of urea water tank heating valve (tank heating valve and wire- harness)
NG
Replace urea water tank heating valve or wire-harness
OK
3. Check the wire-harness conduction (wire-harness)
NG
Replace wire-harness
OK
Replace wire-harness or DCU (DCU replacement is only available for P150C)
Repair the failure part, clear the error, switch the DCU power from OFF to ON
4. Perform the above initial diagnosis
No error reappears
Returns to normal
155216-00EN

● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the resistance value of urea water tank heating valve (urea water tank heating valve unit)
   1- Remove the wire-harness from the urea water tank heating valve.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between urea water tank heating valve terminals A and B.

Reference: Overall resistance value of urea water tank heating valve

Terminal	Specifications
Between urea water tank heating valve terminals	Specifications of urea water tank heating valve vary depending on the driven machine. See the Operation Manual of the driven machine.

NG	Replace the urea water tank heating valve, switch the DCU power from OFF to ON for failure diagnosis using SA-D.
OK	Go to “Checking the resistance value of urea water tank heating valve (urea water tank heating valve and wire-harness)”.

2. Checking the resistance value of urea water tank heating valve (urea water tank heating valve and wire-harness)
   1- Connect the urea water tank heating valve and the wire-harness, and remove the wire-harness from the DCU.
   2- Using a circuit tester, measure the resistance value (overall resistance value) between wire-harness couplers 108 and 185 on DCU side.
   Note: See the above “Reference: Overall resistance value of urea water tank heating valve”.

NG	• The coupler between the urea water tank heating valve and the wire-harness may be defective. Replace the urea water tank heating valve. • Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	Go to “Checking the wire-harness conduction”.

3. Checking the wire-harness conduction
   1- Remove the wire-harness from the urea water tank heating valve and the DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Urea water tank heating valve conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on urea water tank heating valve)	Conduction	State
108	Urea water tank heating valve terminal A	Yes	OK: Normal
		No	NG: Error
185	Urea water tank heating valve terminal B	Yes	OK: Normal
		No	NG: Error

When every item is normal at the above “Urea water tank heating valve conduction check pattern 1”, carry out the below, too.

Reference: Urea water tank heating valve conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
108	All terminals other than 230 and 180	Yes	NG: Error
		No	OK: Normal
185	All terminals other than 185	Yes	NG: Error
		No	OK: Normal

NG	• Wire-harness disconnection or short circuit. Replace the wire-harness. • Switch the DCU power from OFF to ON for failure diagnosis using SA-D after replacement.
OK	• The coupler between the DCU and the wire-harness may be defective. Replace the wire-harness. • Replace the DCU. (P150C only) • Replace the wire-harness, clear the error, turn OFF the power, and turn ON the power after the after-run is completed, and check if the error reappears. (Except P150C)

4. Checking the current failure with SA-D
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), operate the urea water tank heating valve, and make sure no error is detected in the current fault indication.

Communication related

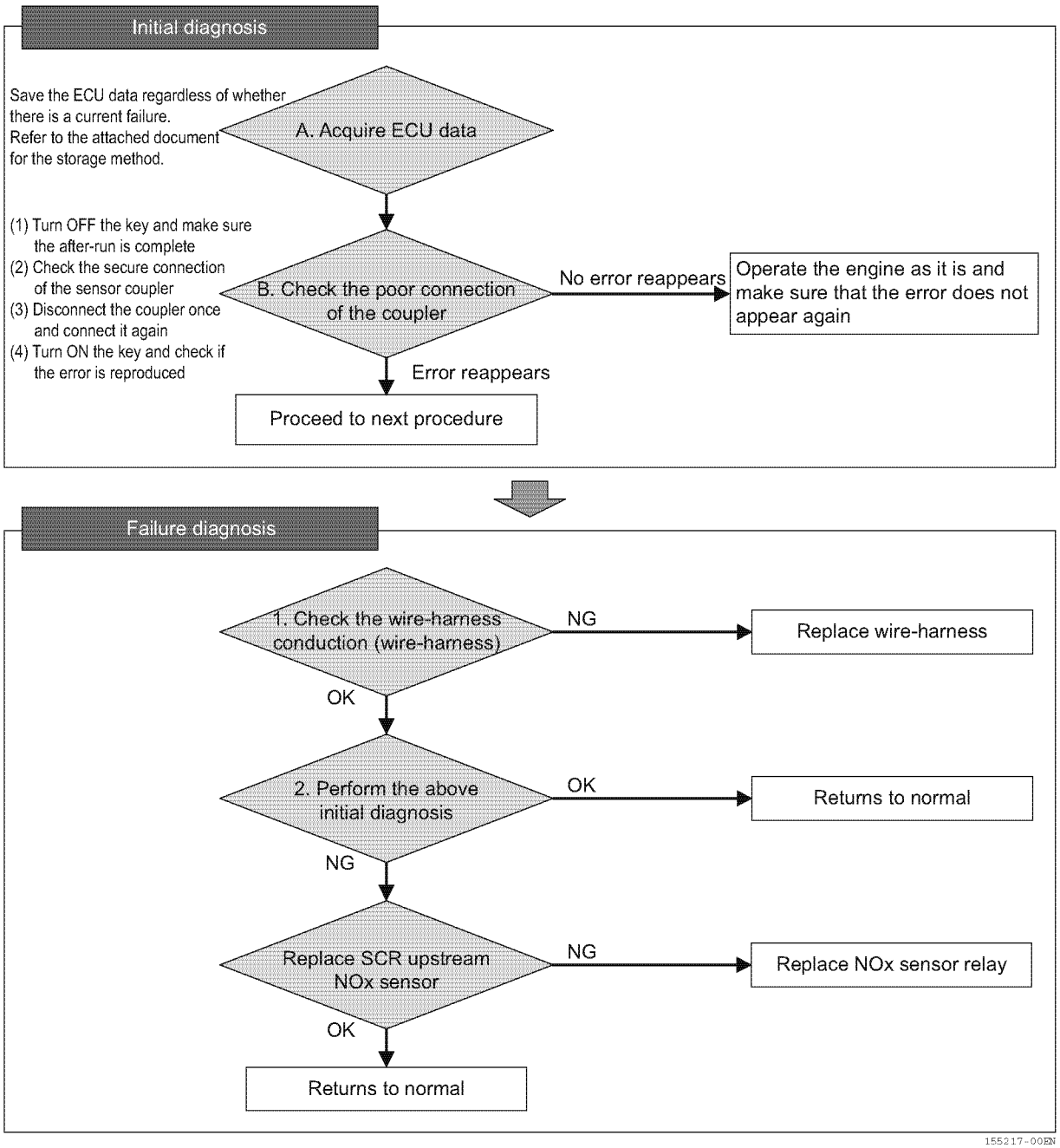
■ SCR upstream NOx sensor

● Related DTC

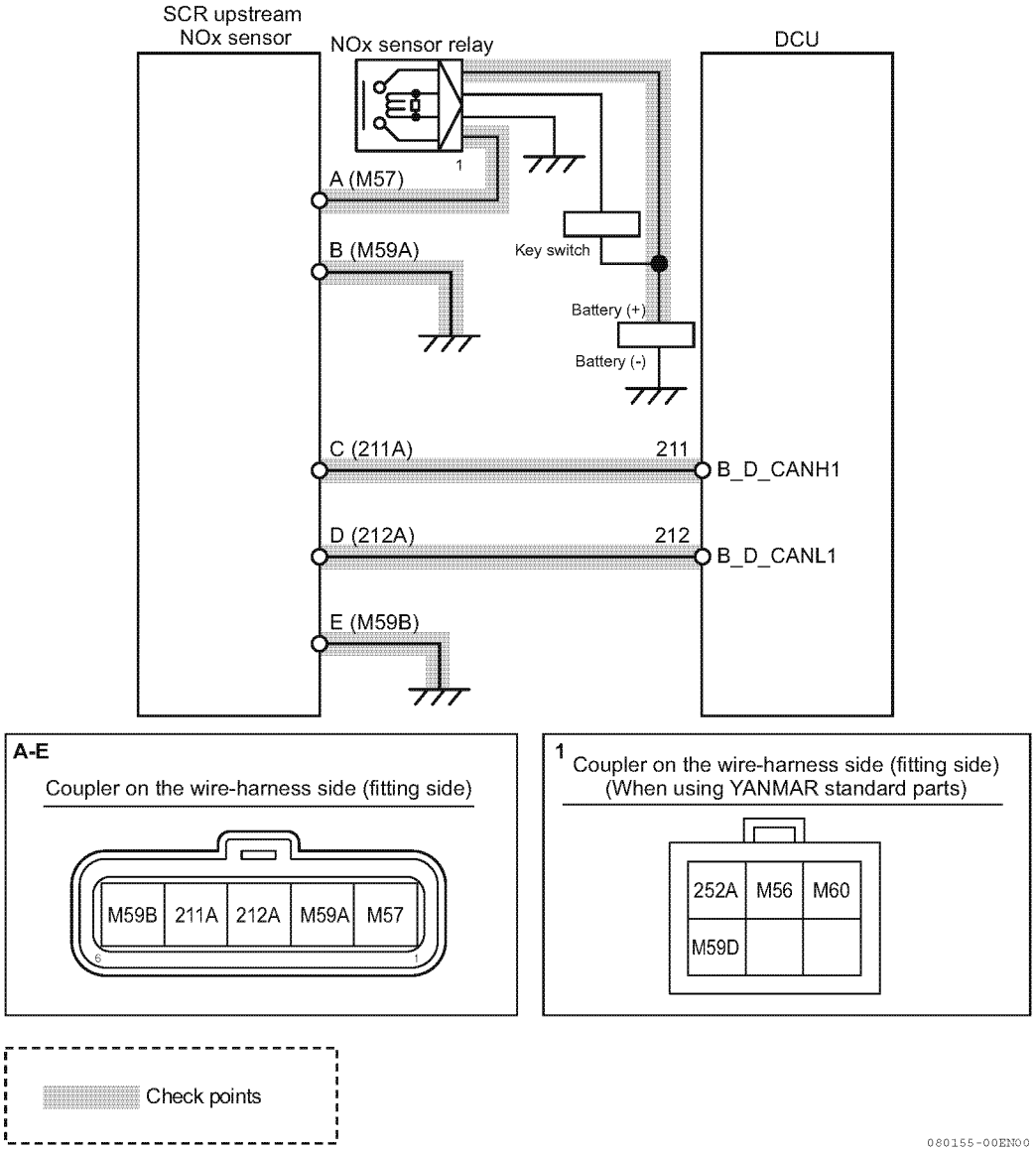
P code	U029D	CAN reception timeout from SCR upstream NOx sensor

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the wire-harness conduction
   1- Remove the wire-harness from the SCR upstream NOx sensor and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: SCR upstream NOx sensor conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on SCR upstream NOx sensor side)	Conduction	State
211	SCR upstream NOx sensor terminal C	Yes	OK: Normal
		No	NG: Error
212	SCR upstream NOx sensor terminal D	Yes	OK: Normal
		No	NG: Error
GND terminal	SCR upstream NOx sensor terminal E	Yes	OK: Normal
		No	NG: Error

Reference: SCR upstream NOx sensor conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
211	All terminals other than 211	Yes	NG: Error
		No	OK: Normal
212	All terminals other than 212	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Checking the current failure with SA-D”

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Check the operation of SCR upstream NOx sensor. 1. Check the power supply of SCR upstream NOx sensor. 2. If there is no power supply, check the conduction of the NOx sensor relay, fuse, and power line. 3. If the power system is fine, replace the SCR upstream NOx sensor. • If the error reappears after replacing the SCR upstream NOx sensor, replace the NOx sensor relay.

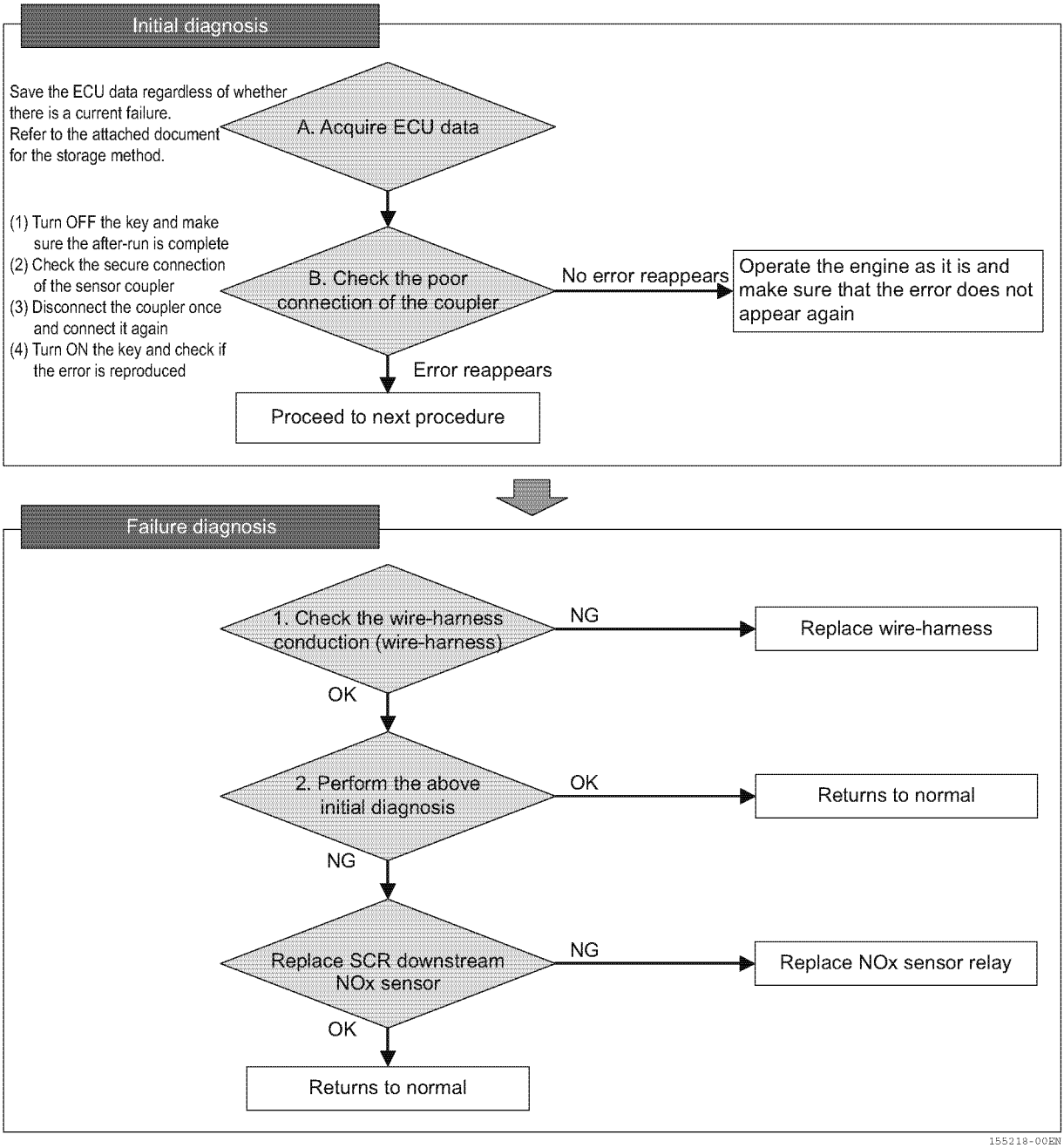
■ SCR downstream NOx sensor

● Related DTC

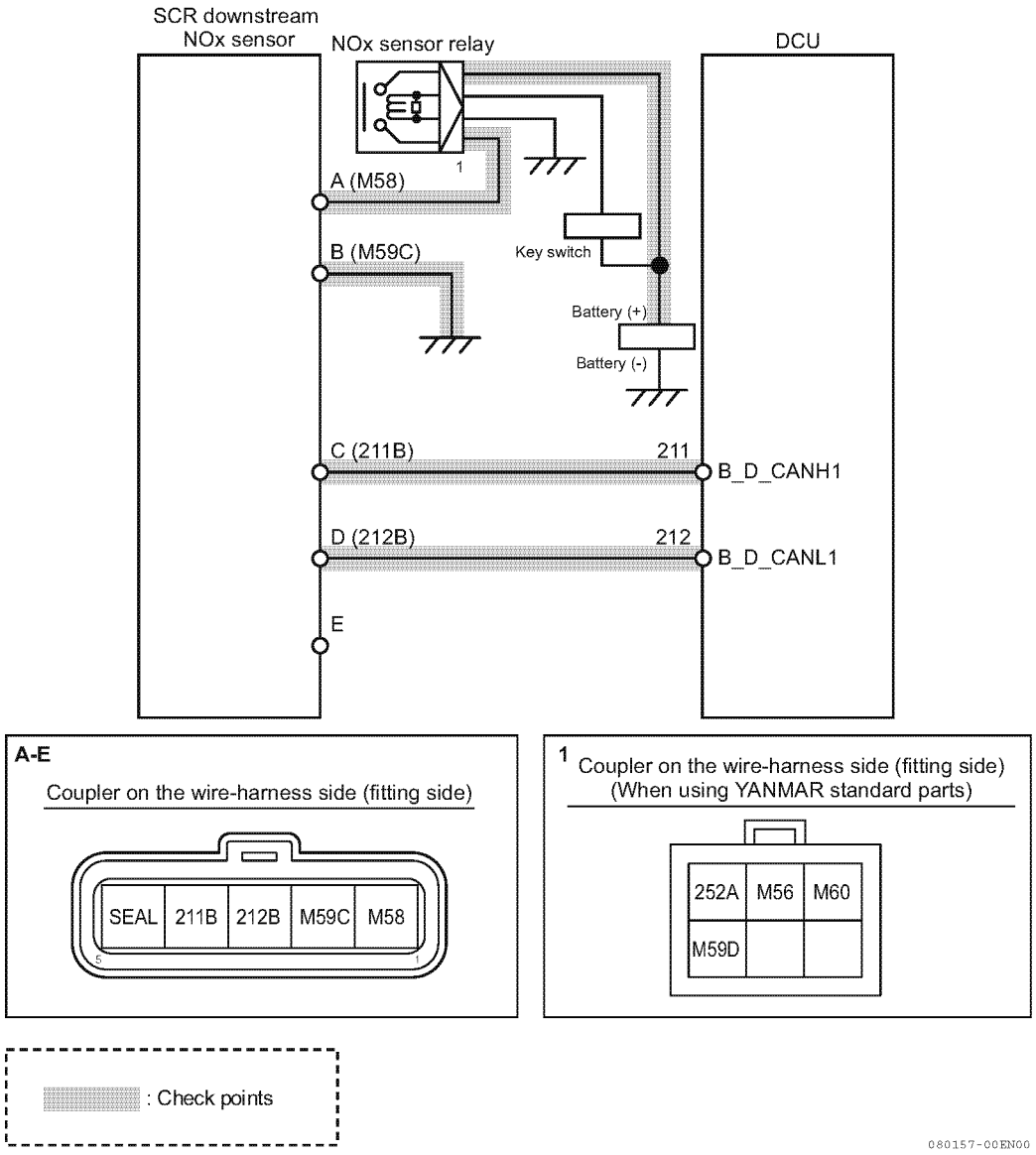
P code	U029E	CAN reception timeout from SCR downstream NOx sensor

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the wire-harness conduction
   1- Remove the wire-harness from the SCR downstream NOx sensor and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: SCR downstream NOx sensor conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on SCR downstream NOx sensor side)	Conduction	State
211	SCR downstream NOx sensor terminal C	Yes	OK: Normal
		No	NG: Error
212	SCR downstream NOx sensor terminal D	Yes	OK: Normal
		No	NG: Error
GND terminal	SCR downstream NOx sensor terminal E	Yes	NG: Error
		No	OK: Normal

Reference: SCR upstream NOx sensor conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
211	All terminals other than 211	Yes	NG: Error
		No	OK: Normal
212	All terminals other than 212	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Checking the current failure with SA-D”

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Check the operation of SCR downstream NOx sensor. 1. Check the power supply of SCR downstream NOx sensor. 2. If there is no power supply, check the conduction of the NOx sensor relay, fuse, and power line. 3. If the power system is fine, replace the SCR downstream NOx sensor. • If the error reappears after replacing the SCR downstream NOx sensor, replace the NOx sensor relay.

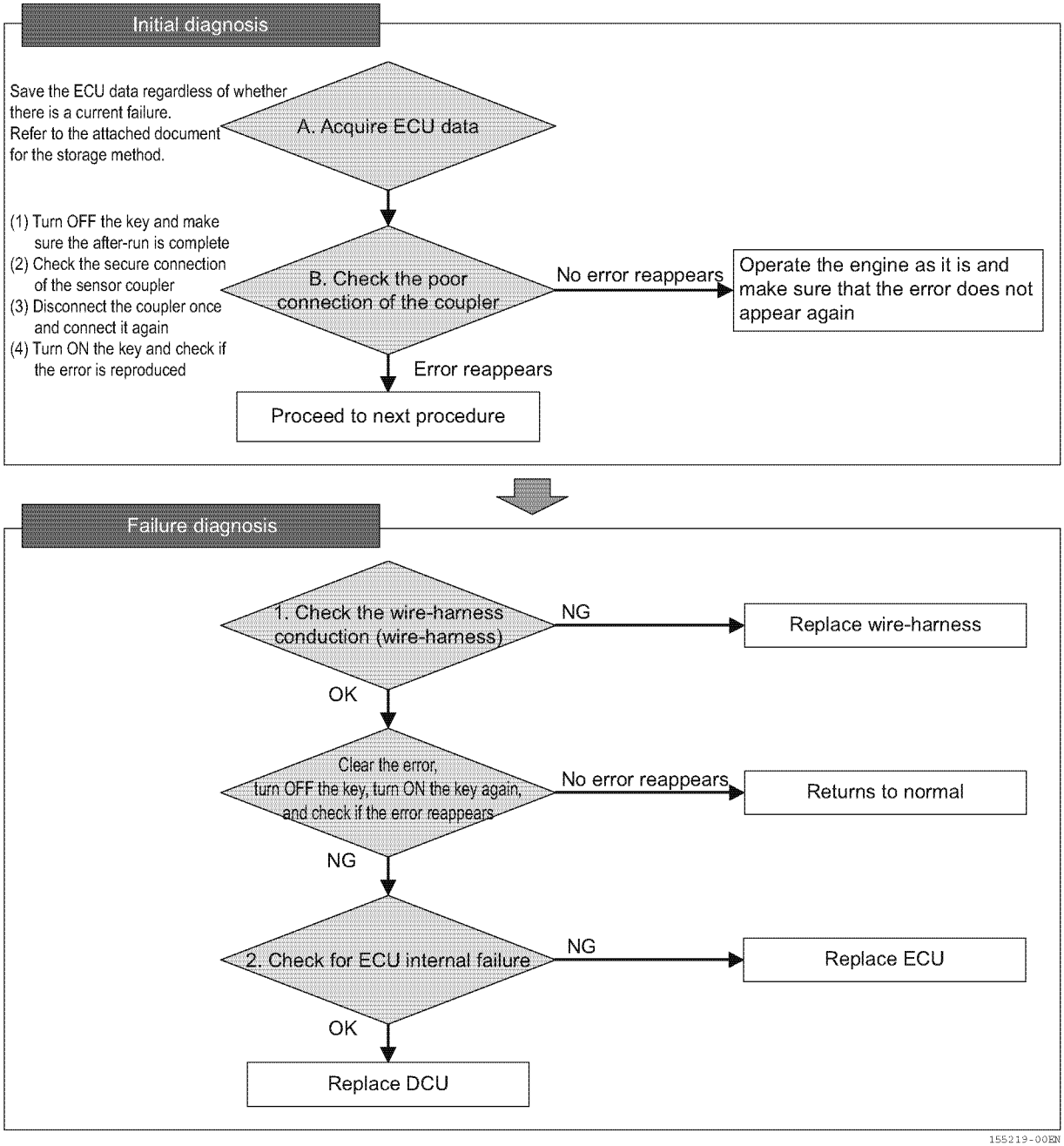
■ ECU

● Related DTC

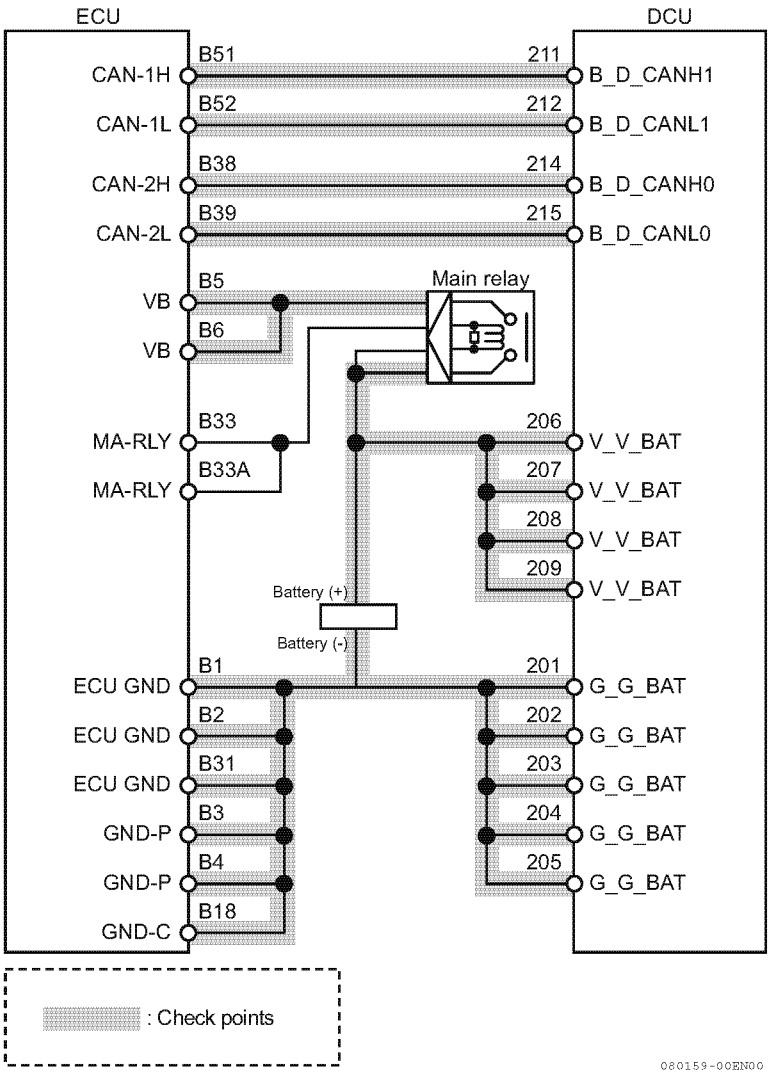
P code	U1607	CAN reception timeout from ECU

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the wire-harness conduction
   1- Remove the wire-harness from the ECU and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: ECU conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
211	B51	Yes	OK: Normal
		No	NG: Error
212	B52	Yes	OK: Normal
		No	NG: Error

Reference: ECU conduction check pattern 2

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on ECU side)	Conduction	State
214	B38	Yes	OK: Normal
		No	NG: Error
215	B39	Yes	OK: Normal
		No	NG: Error

Reference: ECU conduction check pattern 3

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
211	All terminals other than 211	Yes	NG: Error
		No	OK: Normal
212	All terminals other than 212	Yes	NG: Error
		No	OK: Normal

Reference: ECU conduction check pattern 4

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
214	All terminals other than 214	Yes	NG: Error
		No	OK: Normal
215	All terminals other than 215	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Checking the current failure with SA-D”

2. Checking for ECU internal failure
   1- After clearing the error, turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No error reappears	Returns to normal.
Error reappears	• Check the operation of the ECU. 1. Check the power supply to the ECU. 2. If there is no power supply, check the conduction of the main relay, fuse, and power line. 3. If there is no abnormality in the power system but the ECU malfunctions, replace the ECU. • If there is no problem with ECU operation, replace the DCU.

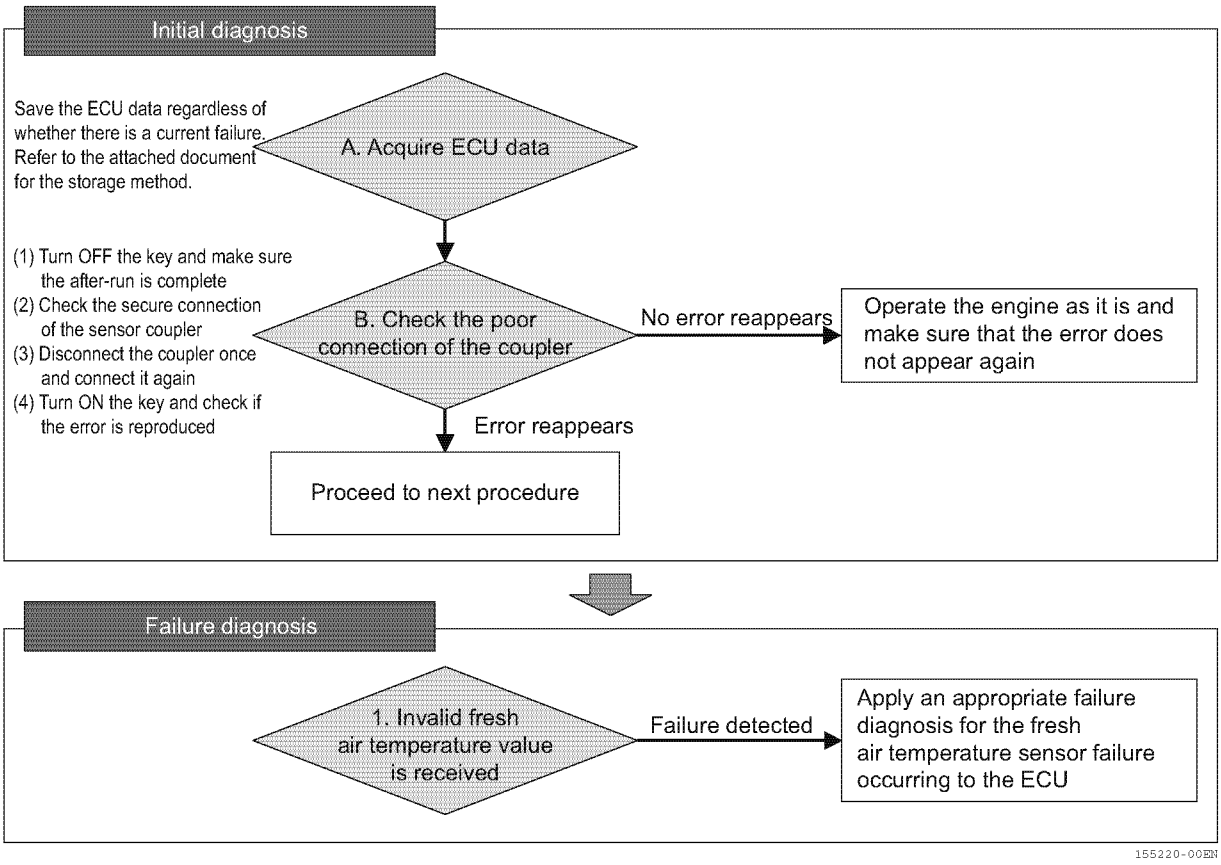
■ ECU (ECU system error) 1

● Related DTC

P code	P1555	ECU system error (invalid fresh air temperature value is received)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. When this error is detected, error for fresh air temperature sensor is also detected in ECU at the same time. Be sure to perform the failure diagnosis for the respective part first.

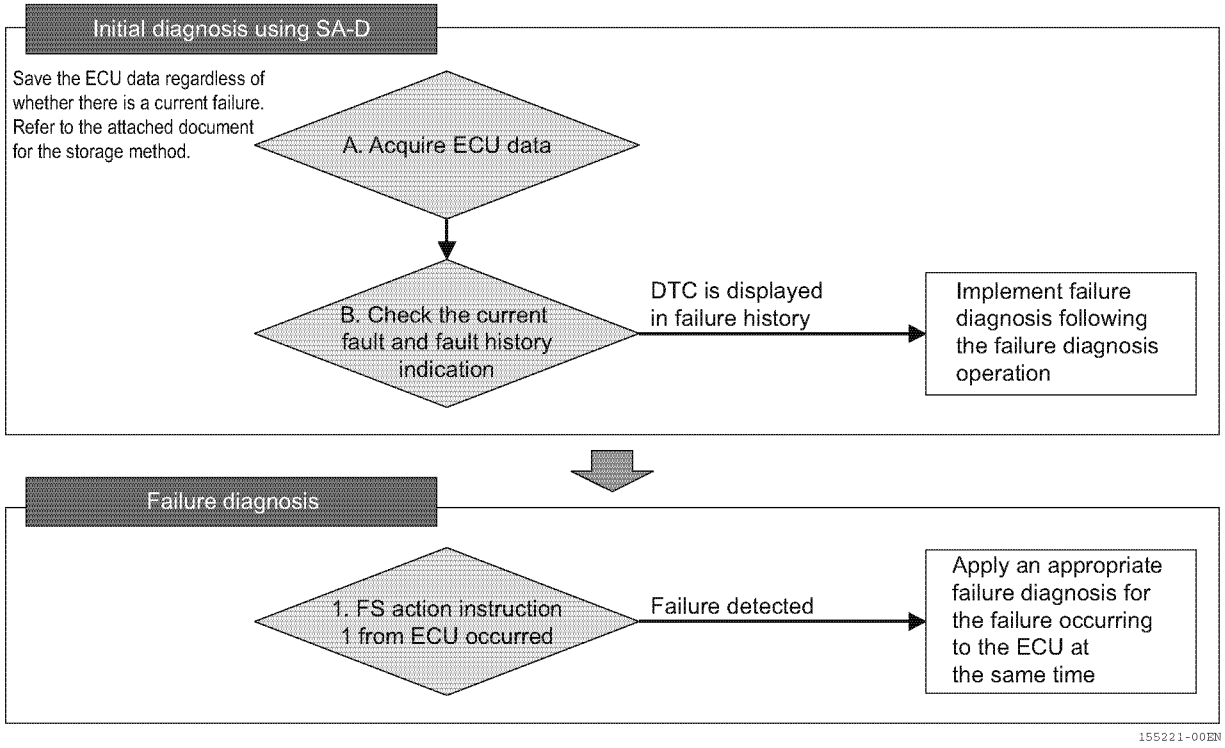
■ ECU (ECU system error) 2

● Related DTC

P code	P155C	ECU system error (FS action instruction 1 from ECU)
	P1565	ECU system error (FS action instruction 2 from ECU)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. When this error is detected, other errors that cause the FS action instruction in ECU are also detected at the same time. Be sure to perform the failure diagnosis for the respective part first.

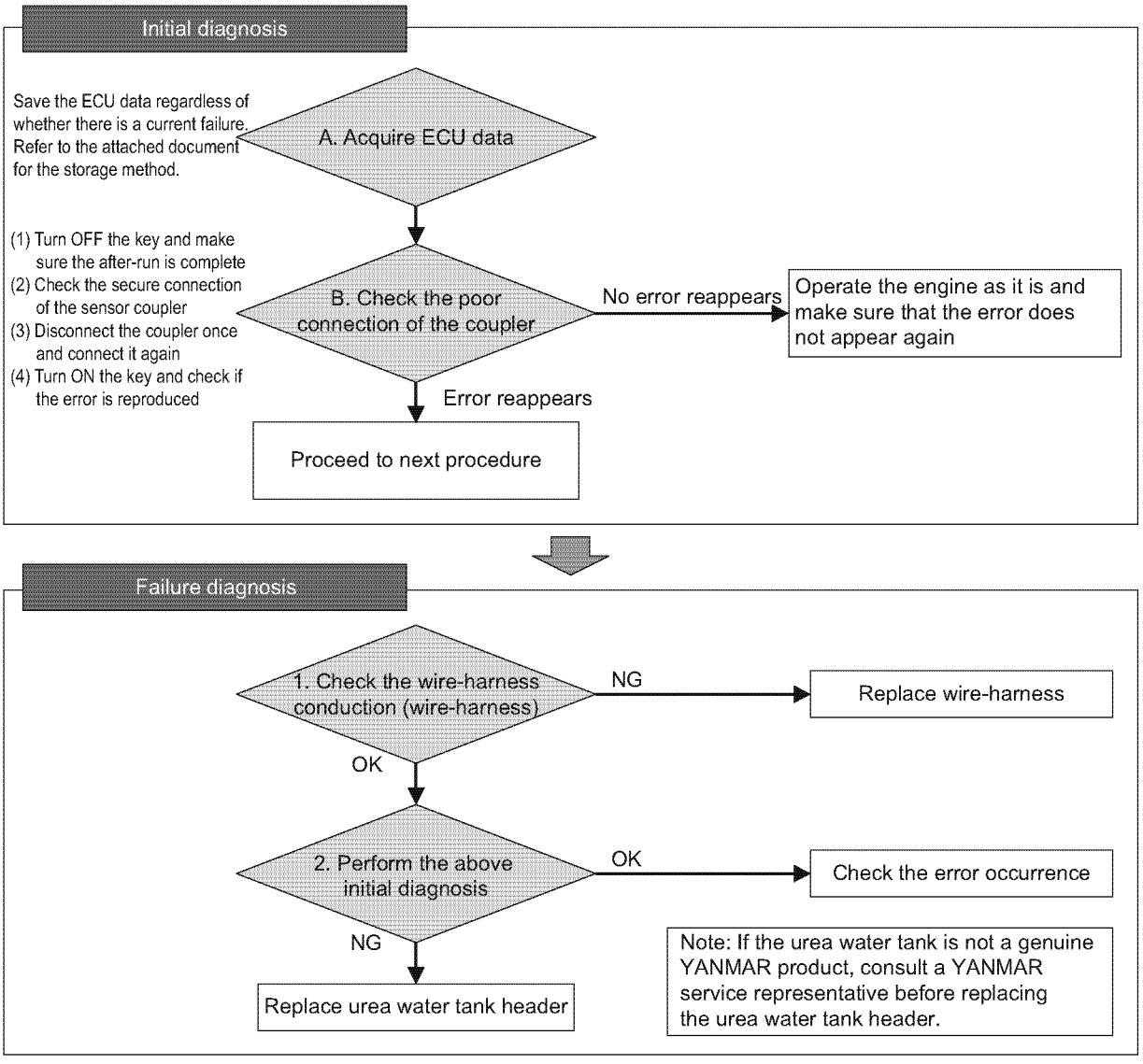
■ Urea water quality sensor/urea water tank temperature sensor (A1DEFI)

● Related DTC

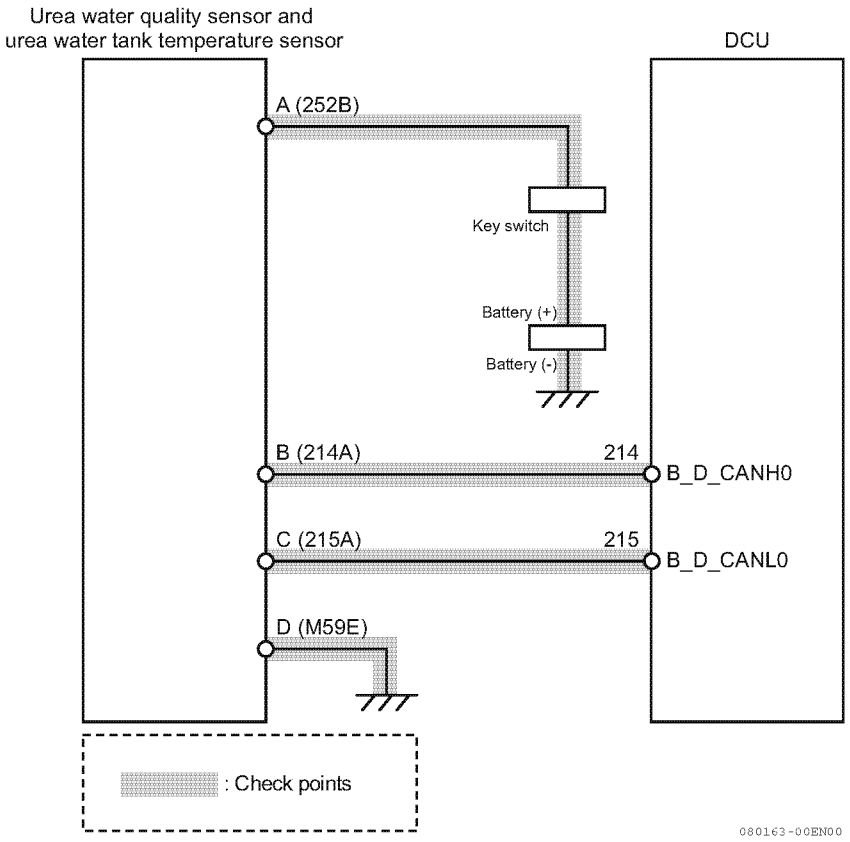
P code	U1610	Urea water quality sensor/Urea water tank temperature sensor (A1DEFI) reception timeout

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the wire-harness conduction
   1- Remove the wire-harness from urea water quality sensor/urea water tank temperature sensor, and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Conduction check pattern 1 (urea water quality sensor/urea water tank temperature sensor)

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on urea water quality sensor/urea water tank temperature sensor)	Conduction	State
214	Urea water quality sensor/ urea water tank temperature sensor terminal B	Yes	OK: Normal
		No	NG: Error
215	Urea water quality sensor/ urea water tank temperature sensor terminal C	Yes	OK: Normal
		No	NG: Error

Reference: Conduction check pattern 2 (urea water quality sensor/urea water tank temperature sensor)

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
214	All terminals other than 214	Yes	NG: Error
		No	OK: Normal
215	All terminals other than 215	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Checking the current failure with SA-D”

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Check the operation of urea water quality sensor/urea water tank temperature sensor. 1. Check the power supply to the urea water quality sensor/urea water tank temperature sensor. 2. If there is no power supply, check the conduction of the key switch, fuse and power line. 3. If the power system is fine, replace the urea water tank header. *Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.*

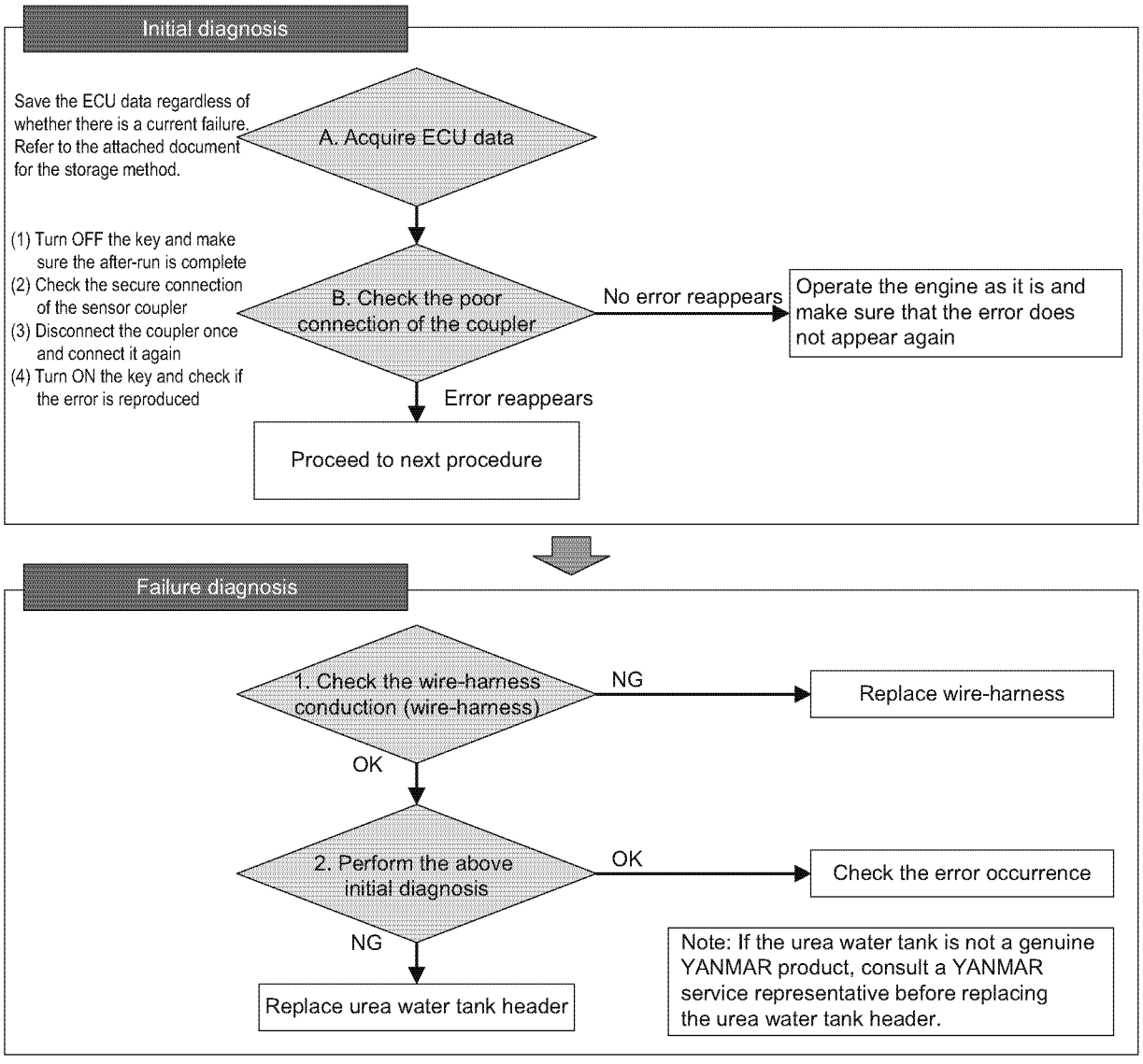
■ Urea water tank temperature sensor/urea water tank level sensor (AT1T1I)

● Related DTC

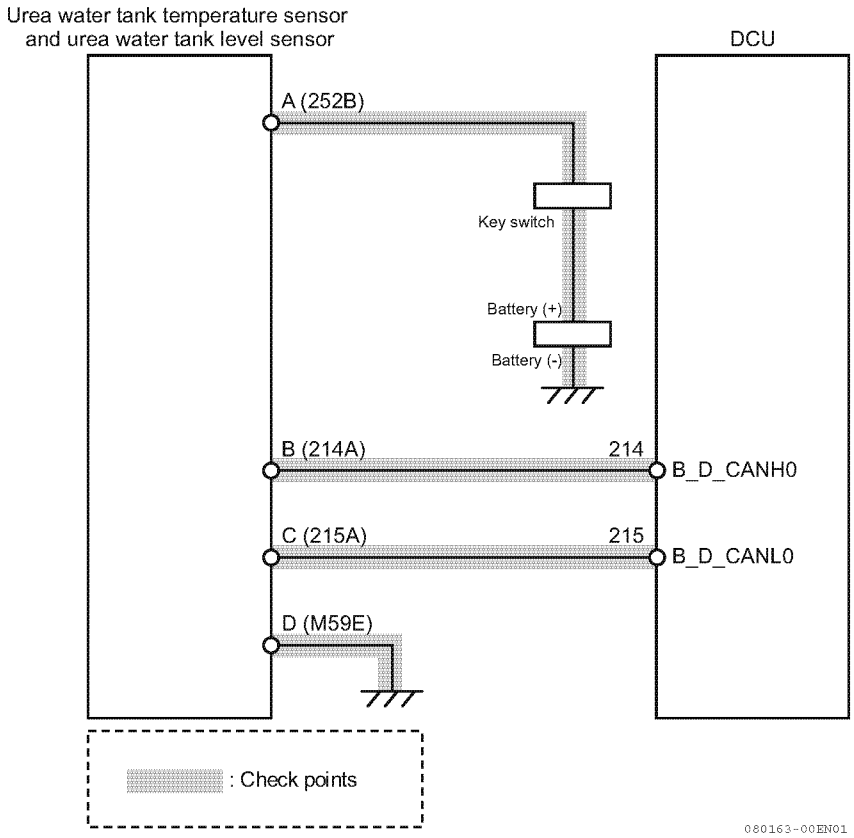
P code	U1611	Urea water tank temperature sensor/Urea water tank level sensor (AT1T1I) reception timeout

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the wire-harness conduction
   1- Remove the wire-harness from urea water tank temperature sensor/urea water tank level sensor, and DCU.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: Conduction check pattern 1 (urea water tank temperature sensor/urea water tank level sensor)

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on urea water tank temperature sensor/urea water tank level sensor)	Conduction	State
214	Urea water tank temperature sensor/urea water tank level sensor terminal B	Yes	OK: Normal
		No	NG: Error
215	Urea water tank temperature sensor/urea water tank level sensor terminal C	Yes	OK: Normal
		No	NG: Error

Reference: Conduction check pattern 2 (urea water tank temperature sensor/urea water tank level sensor)

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on DCU side)	Conduction	State
214	All terminals other than 214	Yes	NG: Error
		No	OK: Normal
215	All terminals other than 215	Yes	NG: Error
		No	OK: Normal

NG	Wire-harness disconnection or short circuit. Replace the wire-harness.
OK	Go to “Checking the current failure with SA-D”

2. Checking the current failure with SA-D
   1- Turn OFF the key switch, turn ON the key switch again, and start the engine.
   2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Check the operation of urea water quality sensor/urea water tank temperature sensor. 1. Check the power supply to the urea water quality sensor/urea water tank temperature sensor. 2. If there is no power supply, check the conduction of the key switch, fuse and power line. 3. If the power system is fine, replace the urea water tank header. *Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.*

Battery related

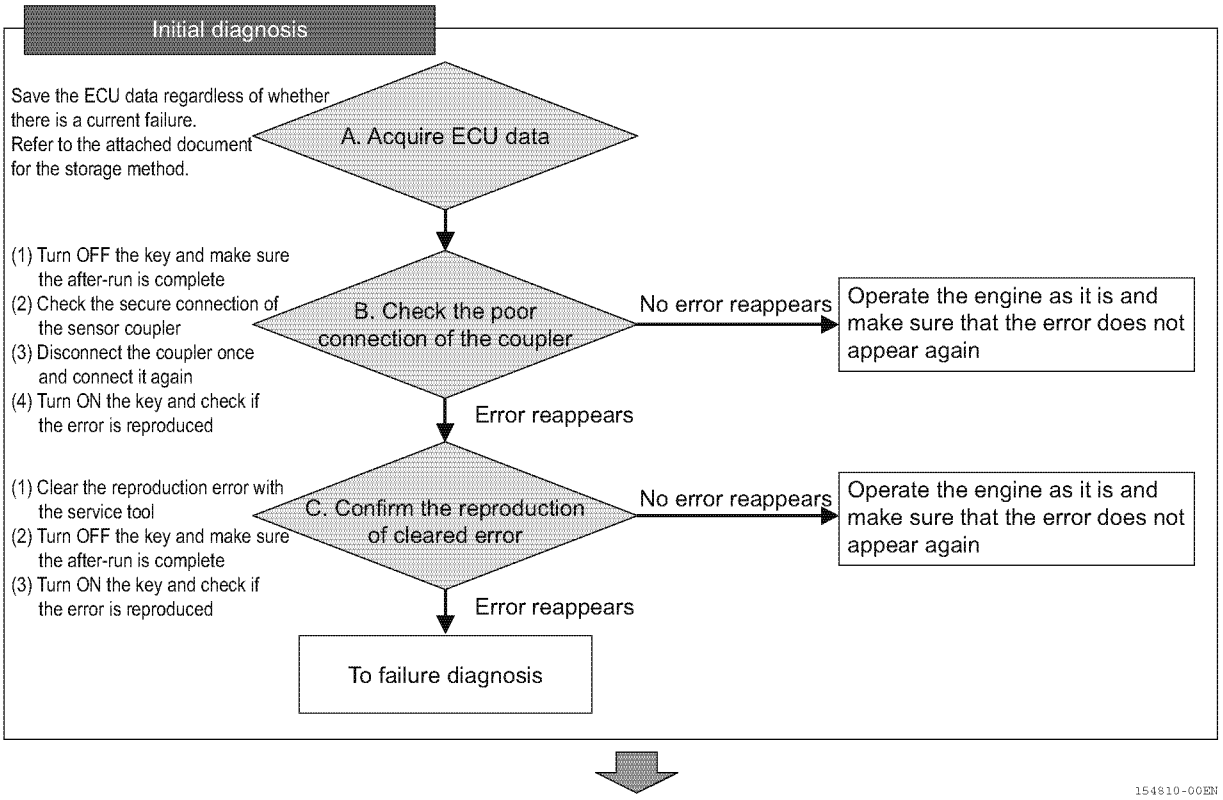
■ Main relay

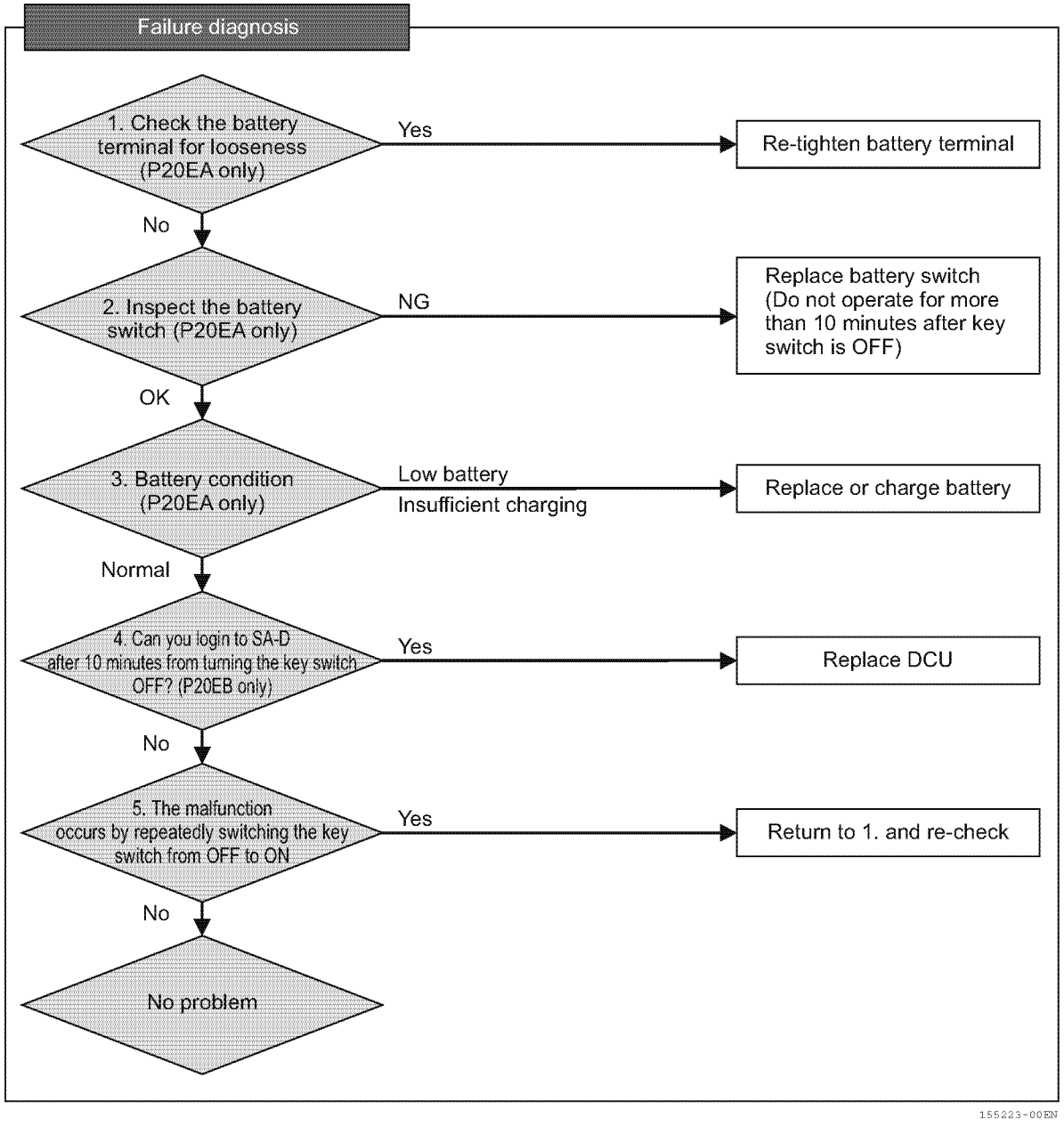
● Related DTC

P code	P20EA	Main relay opens early
	P20EB	Main relay sticking

● Workflow

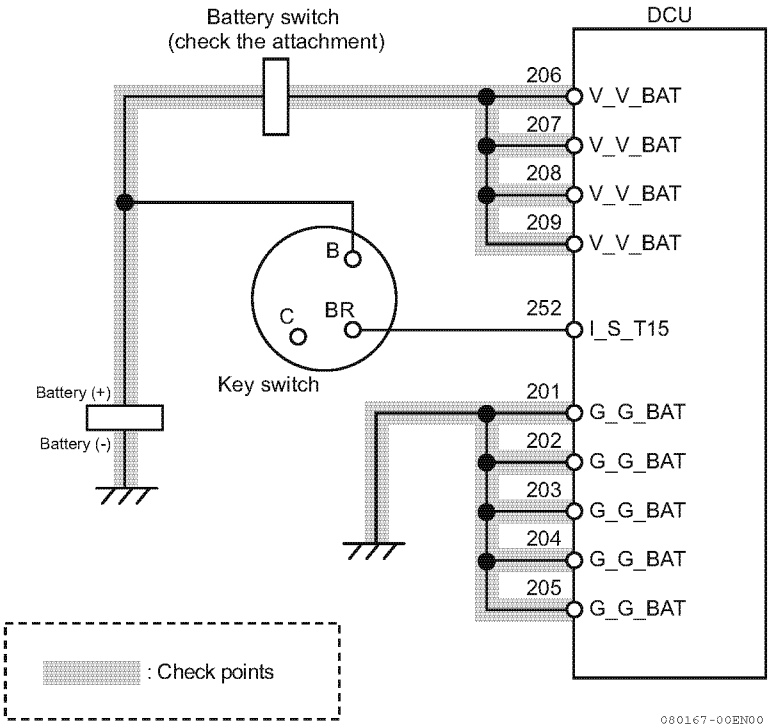
Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the battery terminal for looseness (P20EA only)
Yes
Re-tighten battery terminal
No
2. Inspect the battery switch (P20EA only)
NG
Replace battery switch (Do not operate for more than 10 minutes after key switch is OFF)
OK
3. Battery condition (P20EA only)
Low battery
Insufficient charging
Replace or charge battery
Normal
4. Can you login to SA-D after 10 minutes from turning the key switch OFF? (P20EB only)
Yes
Replace DCU
No
5. The malfunction occurs by repeatedly switching the key switch from OFF to ON
Yes
Return to 1. and re-check
No
No problem
155223-00EN

● Wire diagram

Note: Main relay has built-in DCU.



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the battery terminal for looseness (P20EA only)
   1- Make sure that there is no looseness and damages in wiring from the battery to VB terminal of DCU.
   2- Make sure that there is no looseness in fastening section between the GND terminal of the battery, and frame.
   3- Make sure that there is no looseness and damages in wiring from the GND terminal of DCU to the frame GND.
   4- Make sure that there is no looseness and damages in wiring from the key switch terminal of DCU to the key switch.

2. Inspecting the battery switch (P20EA only)
   Some driven machines are equipped with the battery switch other than the key switch for the long-term storage. Contact the driven machine manufacturer for details.
   1- Make sure that there is no looseness in wiring of the battery switch.
   2- Make sure that there is nothing wrong with the battery switch.
   3- Do not turn OFF the battery switch within 10 minutes after turning off the key switch. Instruct an operator how to operate.

3. Battery condition (P20EA only)
   When the battery is not charged enough or the battery capacity is decreased, it may decrease the supply voltage to DCU, and cause the malfunction to open main relay early. Inspect the battery.

4. Checking the log in status to SA-D (P20EB only)
   DCU operation completely stops in 10 minutes after turning off the key switch. Connect to SA-D in 10 minutes after turning off the key switch, make sure that you can log in. When you can log in after 10 minutes or more, main relay inside the DCU may be defective. Replace the DCU.

5. Does the error occur by repeatedly switching the key switch from OFF to ON.
   Repeatedly switching the key switch from OFF to ON to make sure this error does not occur again. When error occurs again, carry out the inspection again from procedure 1. When no malfunction occurs, the main relay is fine.

DCU related

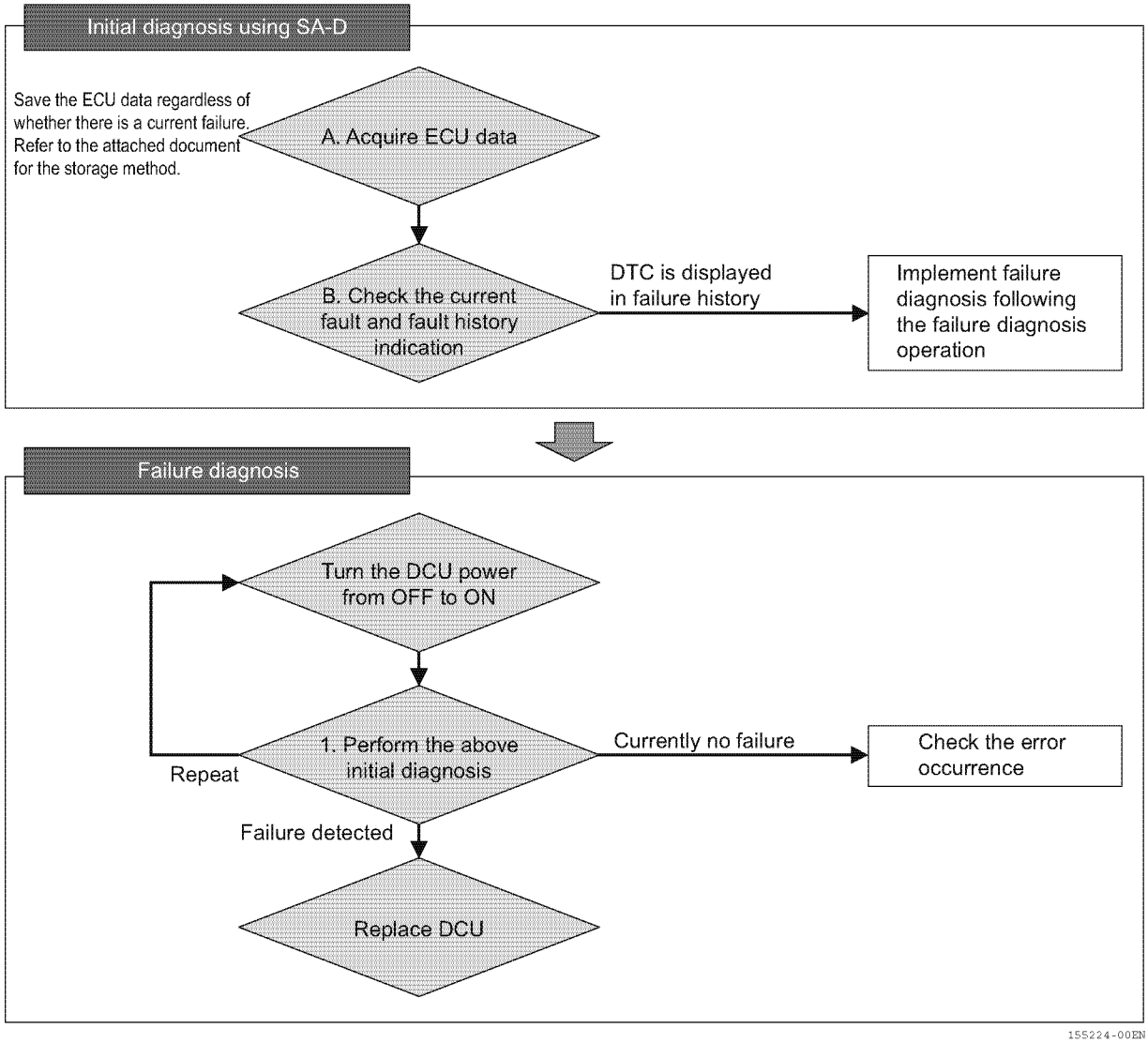
■ DCU internal error

● Related DTC

P code	P1600	EEPROM memory deletion error
	P160E	EEPROM memory reading error
	P160F	EEPROM memory writing error
	P1500	SPI communication error 1
	P1501	SPI communication error 2
	P21CC	Supply 1 overvoltage error
	P21CB	Supply 1 low voltage error
	P1502	AD converter error 1
	P1503	AD converter error 2
	P1517	DCU internal temperature sensor error (voltage high)
	P1519	DCU internal temperature sensor error (voltage low)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. Checking the current failure with SA-D

1- Turn OFF the key switch and turn ON the key switch again.

2- Connect the SA-D and check the current fault indication to see whether an error is detected.

No	When an error has been logged in the Logged Diagnostic Trouble Code, check for error occurrences.
Yes	• Switch the key switch from ON to OFF again and perform the work indicated above 1. • Replace the DCU.

Contact input related

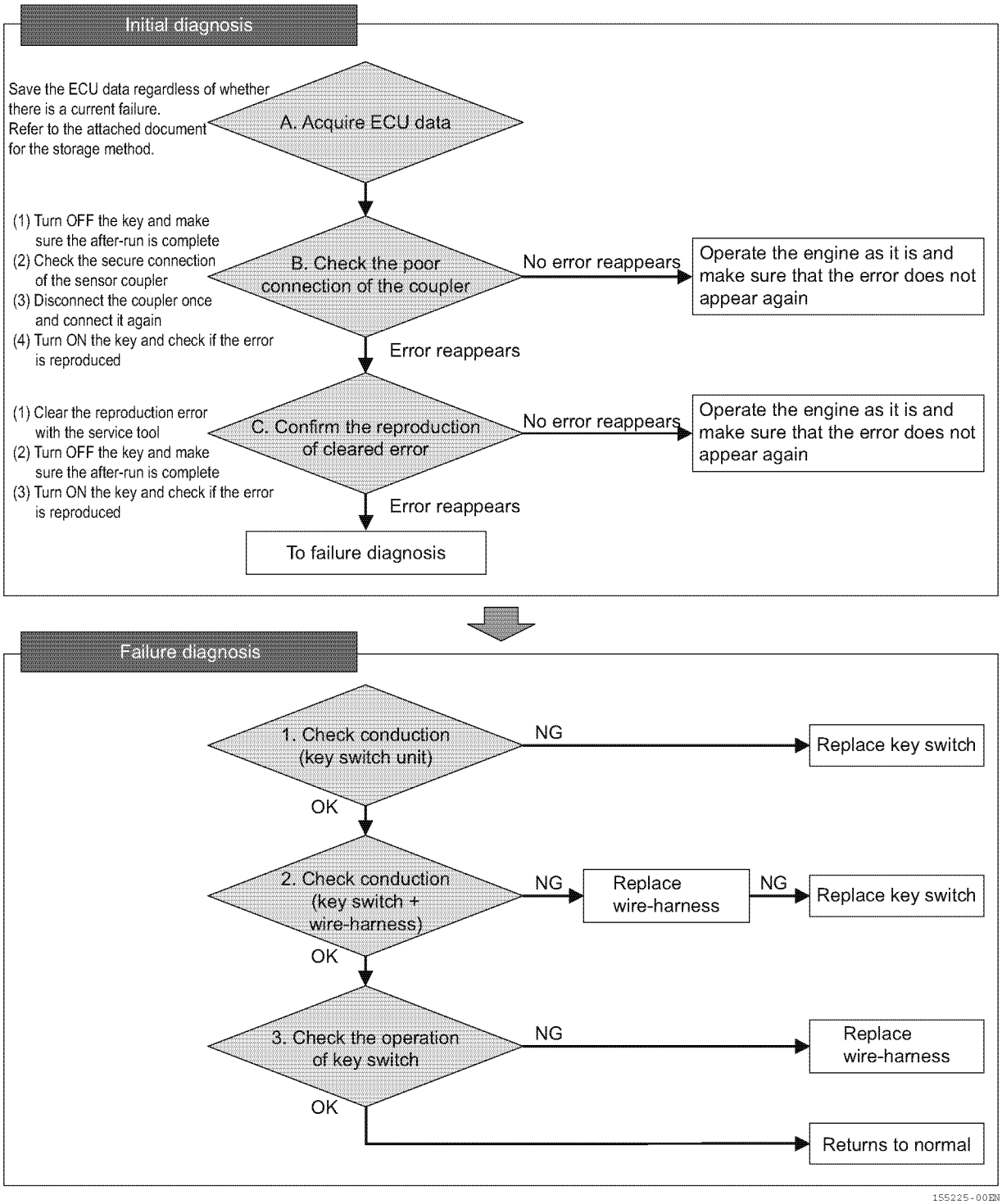
■ Key switch

● Related DTC

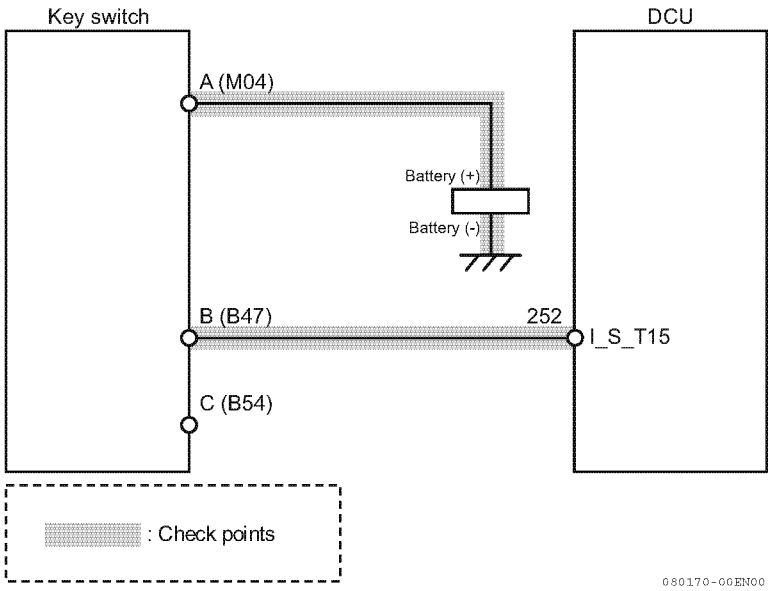
P code	P1561	Key switch disconnection

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Wire diagram



Note: See P823 for the DCU pin layout.

● Work description

1. Checking the conduction (key switch unit)
   1- Turn OFF the key switch.
   2- Remove the wire-harness from the key switch.
   3- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: key switch conduction check pattern 1

Terminal 1 (Wire-harness coupler on key switch side)	Terminal 2 (Wire-harness coupler on key switch side)	Key switch condition	Conduction	State
Key switch terminal A	Key switch terminal B	OFF	Yes	NG: Error
			No	OK: Normal
		ON	Yes	OK: Normal
			No	NG: Error

NG	Replace the key switch.
OK	Go to “Checking the conduction (key switch and wire-harness)”.

2. Checking the conduction (key switch and wire-harness)
   1- Connect the key switch and the wire-harness, and remove the wire-harness from the DCU and the battery.
   2- While referring to the P823 "DCU pin layout drawing", check the conduction of the wire-harness between terminals 1 and 2 in the chart below.

Reference: key switch conduction check pattern 1

Terminal 1 (Wire-harness coupler on DCU side)	Terminal 2 (Wire-harness coupler on battery side)	Key switch condition	Conduction	State
252	Battery (+) terminal	OFF	Yes	NG: Error
			No	OK: Normal
		ON	Yes	OK: Normal
			No	NG: Error

NG	• A coupler failure between the key switch and the wire-harness may be caused. Replace the key switch. • Replace the wire-harness.
OK	Go to “Checking the operation of key switch”.

3. Checking the operation of key switch
   1- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU).
   2- Connect SA-D, turn ON the key switch, and then log in to SA-D.
   3- Using “Diagnosis Test: Digital input” of SA-D, monitor each indicated item, and check the ON/OFF display of the key switch.

Item	Check condition	ON/OFF indication	State
Key switch	The key switch is turned ON	ON	OK: Normal
		OFF	NG: Error

NG	The coupler between the wire-harness and the ECU may be defective. Replace the wire-harness.
OK	Returns to normal.

SCR control related

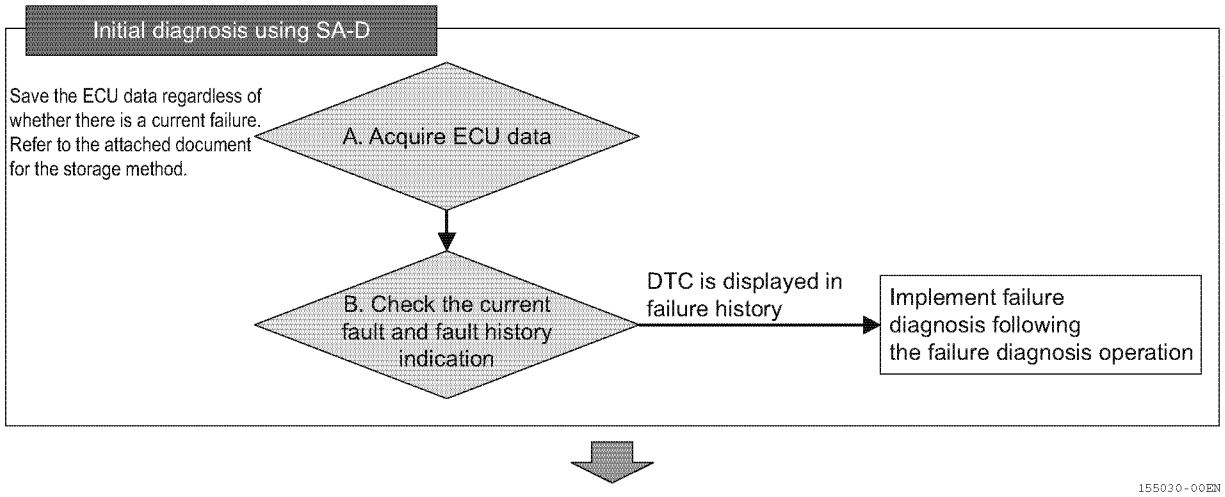
■ Urea water hose (back flow)

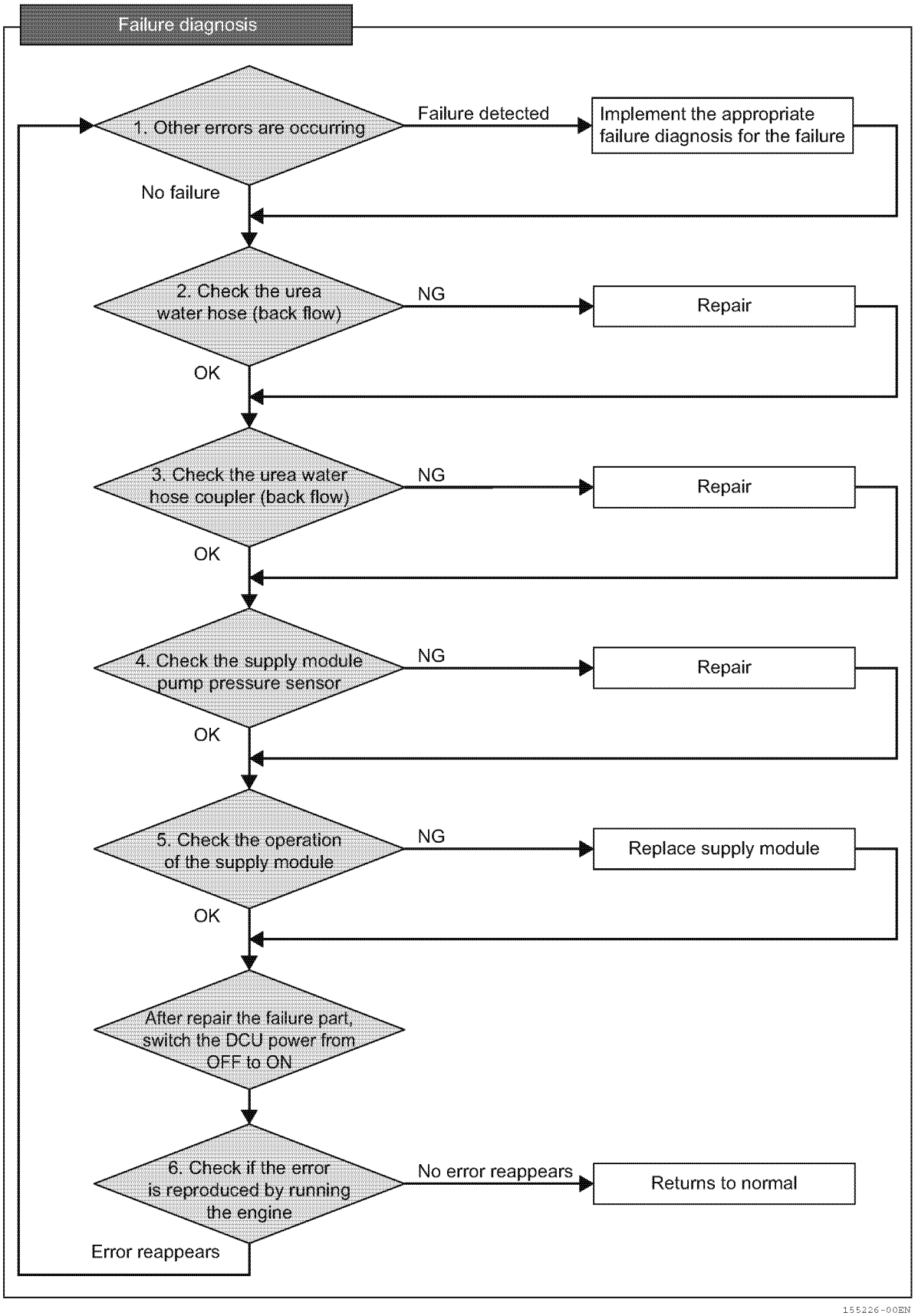
● Related DTC

P code	P1533	Urea water hose (back flow) pressure rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the urea water hose (back flow)
NG
Repair
OK
3. Check the urea water hose coupler (back flow)
NG
Repair
OK
4. Check the supply module pump pressure sensor
NG
Repair
OK
5. Check the operation of the supply module
NG
Replace supply module
OK
After repair the failure part, switch the DCU power from OFF to ON
6. Check if the error is reproduced by running the engine
No error reappears
Returns to normal
Error reappears
155226-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to fresh air temperature sensor are detected on ECU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the urea water hose (back flow)” after treatment.
No error detected	Go to “Checking the urea water hose (back flow)”.

2. Checking the urea water hose (back flow)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the urea water hose (back flow) between the supply module and the urea water tank from the engine.
   3- Check the urea water hose (back flow) to make sure its hose is not clogged by being twisted and bent, contamination or frozen urea water.
   4- Pour water into the urea water hose (back flow), and make sure that this water comes out from the other side.
   Note: Prevent the water from entering the supply module or the urea water tank. Prevent the water from remaining in the urea water hose (back flow).

NG	• Repair or replace the urea water hose (back flow). • Go to “Checking the urea water hose coupler (back flow)” after repair or replacement.
OK	Go to “Checking the urea water hose coupler (back flow)”.

3. Checking the urea water hose coupler (back flow)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the urea water hose coupler (back flow) of supply module to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.
   3- Check the urea water hose coupler (back flow) of urea water tank to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.

NG	• Repair or replace the defective urea water hose coupler (back flow). • Go to “Checking the Supply module pressure sensor” after repair or replacement.
OK	Go to “Checking the Supply module pressure sensor”.

4. Checking the Supply module pressure sensor
   1- Perform the failure diagnosis for “Supply module pressure sensor”.

Results of “Supply module pressure sensor”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the operation of supply module” after repair.
OK	Go to “Checking the operation of supply module”.

5. Checking the operation of supply module
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch.
   4- Activate the urea water injection test of "Diagnosis Test: Active control" of SMARTASSIST-DIRECT (SA-D), implement the leak check (injection pattern = "1"), and check with "Data logging" whether the supply module pressure meets the reference value under the leak check.
   Note:At the leak check (injection pattern = "1"), the dosing module does not inject the urea water. However, this is not an error.

Item	Reference value
Supply module pressure	1250 kPa or less

NG	• Replace the supply module. • Go to "Checking the current failure with SA-D" after replacement.
OK	Go to "Checking the current failure with SA-D".

6. Checking the current failure with SA-D
   1- Clear Inducement, turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate "Diagnosis Test: Input/output of pulse/analog" of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- After meeting the above reference value, when it is normal, value changes as in the below table. At No. 5, the urea water injection is started, errors disappear from the current fault indication.
   When the current fault indication detects an error, return to procedure 1, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
   Usually, it takes 2 minutes from No. 1 to No. 5.

No.	Dosing system state	Dosing system sub-state	Controlled condition of the urea water injection
1	"2"	"255"	Before urea water injection (NOPRESSURECTL)
2	"4"	"12"	Urea water pressure rise is started (REFILL)
3	"4"	"13"	Urea water pressure rise is started (PRESSUREBUILDUP)
4	"4"	"15"	Under the clogging check (DETECTIONMODE)
5	"4"	"16"	During the urea water injection (METERINGCONTROL)

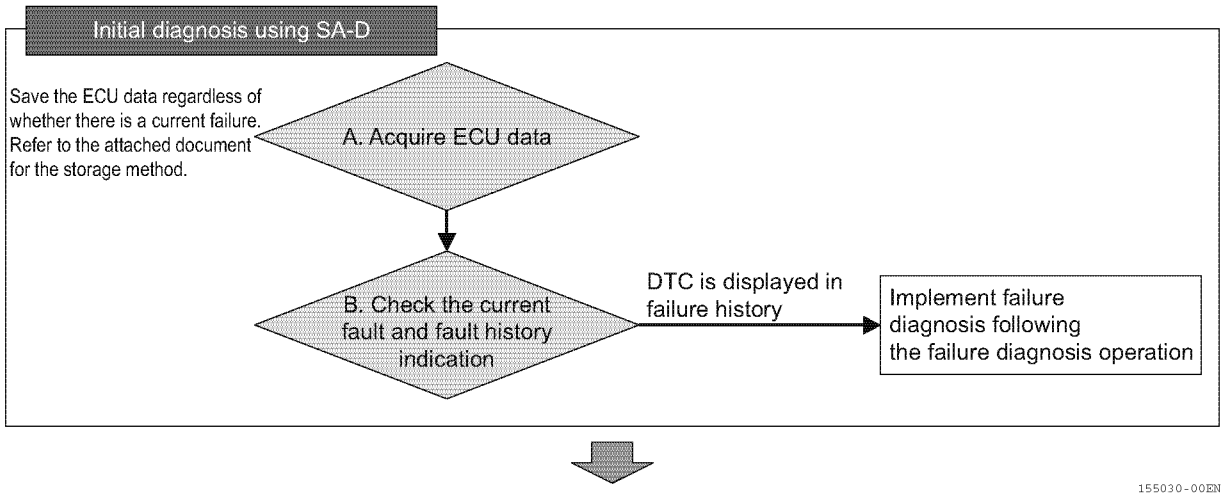
■ Urea water hose (pressure)

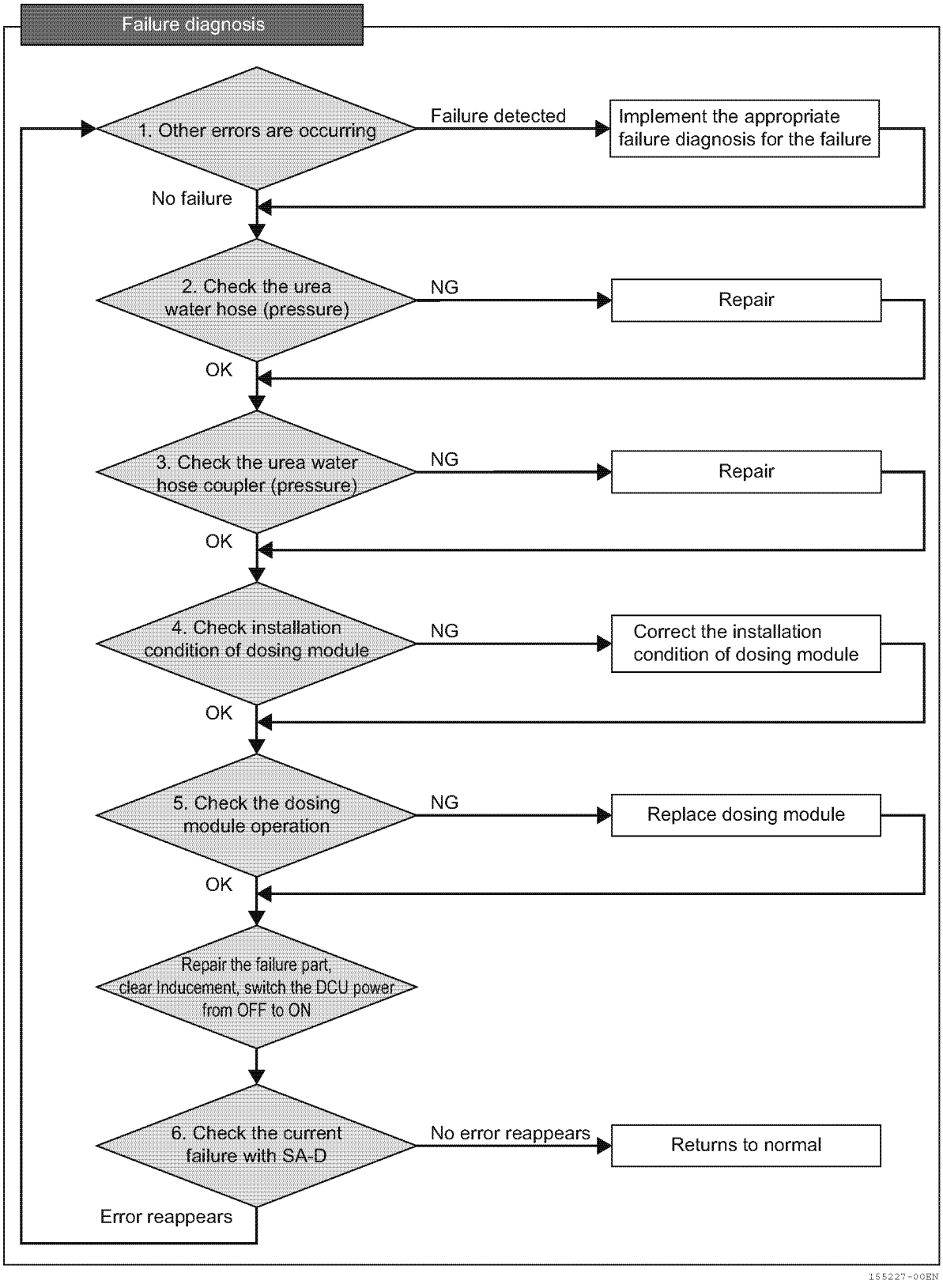
● Related DTC

P code	P1534	Urea water hose (pressure) pressure rise error

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the urea water hose (pressure)
NG
Repair
OK
3. Check the urea water hose coupler (pressure)
NG
Repair
OK
4. Check installation condition of dosing module
NG
Correct the installation condition of dosing module
OK
5. Check the dosing module operation
NG
Replace dosing module
OK
Repair the failure part, clear Inducement, switch the DCU power from OFF to ON
6. Check the current failure with SA-D
No error reappears
Returns to normal
Error reappears
155227-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to fresh air temperature sensor are detected on ECU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the urea water hose (pressure)” after treatment.
No error detected	Go to “Checking the urea water hose (pressure)”.

2. Checking the urea water hose (pressure)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the urea water hose (pressure) between the supply module and the dosing module from the engine.
   3- Check the urea water hose (pressure) to make sure its hose is not clogged by being twisted and bent, contamination or frozen urea water.
   4- Pour water into the urea water hose (pressure), and make sure that this water comes out from the other side.
   Note: Prevent the water from entering the supply module or the dosing module. Prevent the water from remaining in the urea water hose (pressure).

NG	• Repair or replace the urea water hose (pressure). • Go to “Checking the urea water hose coupler (pressure)” after repair or replacement.
OK	Go to “Checking the urea water hose coupler (pressure)”.

3. Checking the urea water hose coupler (pressure)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the urea water hose coupler (pressure) of supply module to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.
   3- Check the urea water hose coupler (pressure) of dosing module to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.

NG	• Repair or replace the defective urea water hose coupler (pressure). • Go to “Checking the supply module pressure sensor” after repair or replacement.
OK	Go to “Checking the supply module pressure sensor”.

4. Checking the installation condition of dosing module
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the dosing module from the engine.
   3- Check the dosing module to make sure that the urea crystal is not adhering to the top of dosing module, and the dosing module is not damaged or deformed.

NG	• Clean or replace the dosing module. • Go to “Checking the operation of dosing module” after cleaning or replacement.
OK	Go to “Checking the operation of dosing module”.

5. Checking the operation of dosing module
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Remove the dosing module from the engine.
   4- Turn ON the key switch.
   5- Activate the urea water injection test (injection pattern = “3”) of “Diagnosis Test: Active control” of SMARTAS-SIST-DIRECT (SA-D), operate the dosing module, and check if the dosing module injects the urea water.

NG	• Replace the dosing module. • Go to “Checking the current failure with SA-D” after replacement.
OK	Go to “Checking the current failure with SA-D”.

6. Checking the current failure with SA-D
   1- Clear Inducement, turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- After meeting the above reference value, when it is normal, value changes as in the below table. At No. 5, the urea water injection is started. Check if the error reappears.
   When the current fault indication detects an error, remove the supply module, and switch the DCU power from OFF to ON for failure diagnosis using SA-D. If the error is detected again, go back to procedure 1 and check again. Usually, it takes 2 minutes from No. 1 to No. 5.

No.	Dosing system state	Dosing system sub-state	Controlled condition of the urea water injection
1	“2”	“255”	Before urea water injection (NOPRESSURECTL)
2	“4”	“12”	Urea water pressure rise is started (REFILL)
3	“4”	“13”	Urea water pressure rise is started (PRESSUREBUILDUP)
4	“4”	“15”	Under the clogging check (DETECTIONMODE)
5	“4”	“16”	During the urea water injection (METERINGCONTROL)

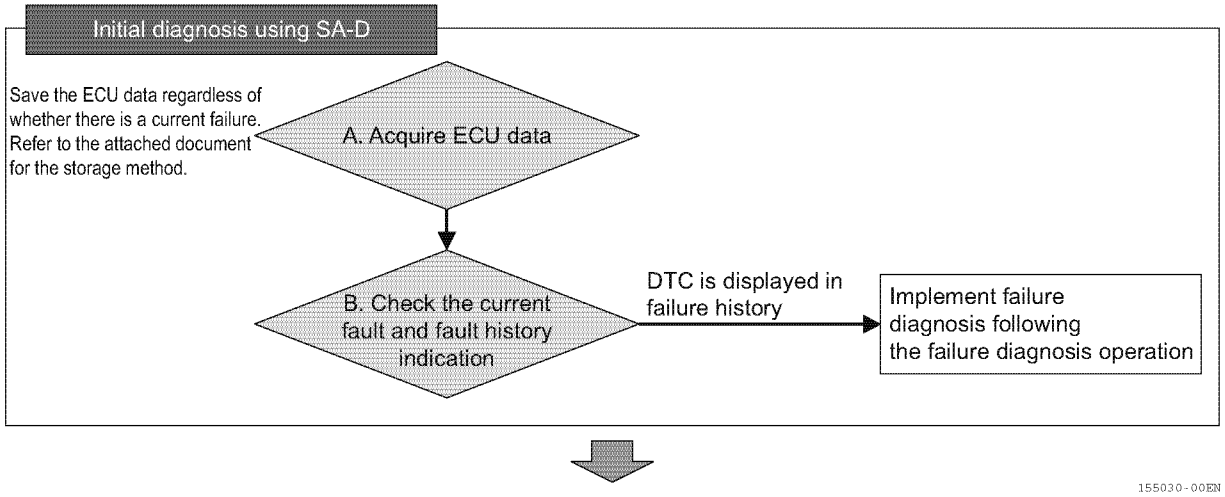
■ Supply module 1

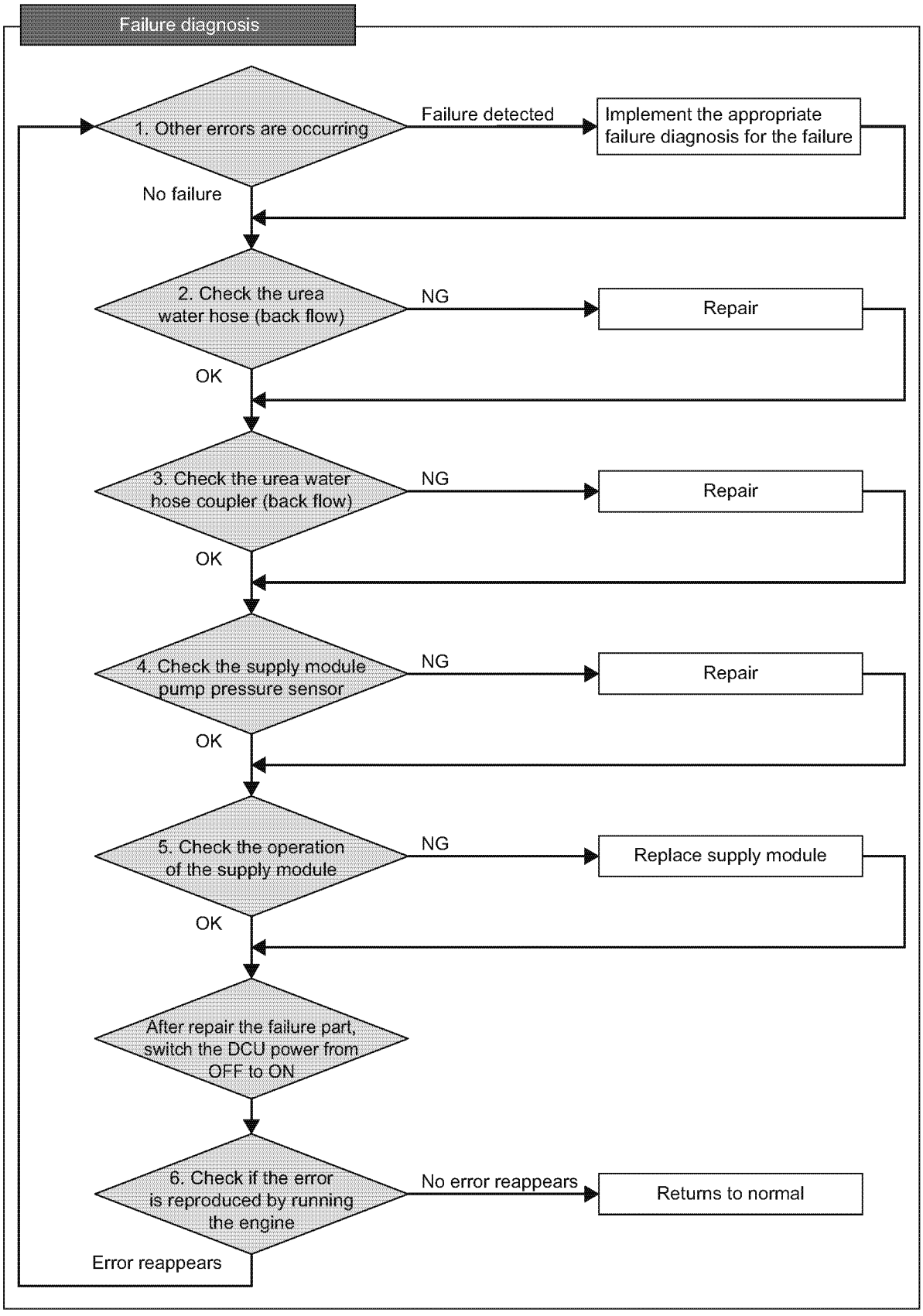
● Related DTC

P code	P20E9	Supply module (pump motor) pressure rise error 1
	P1536	Supply module (pump motor) pressure rise error 2

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the urea water hose (back flow)
NG
Repair
OK
3. Check the urea water hose coupler (back flow)
NG
Repair
OK
4. Check the supply module pump pressure sensor
NG
Repair
OK
5. Check the operation of the supply module
NG
Replace supply module
OK
After repair the failure part, switch the DCU power from OFF to ON
6. Check if the error is reproduced by running the engine
No error reappears
Returns to normal
Error reappears
155226-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to fresh air temperature sensor are detected on ECU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the urea water hose (back flow)” after treatment.
No error detected	Go to “Checking the urea water hose (back flow)”.

2. Checking the urea water hose (back flow)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the urea water hose (back flow) between the supply module and the urea water tank from the engine.
   3- Check the urea water hose (back flow) to make sure its hose is not clogged by being twisted and bent, contamination or frozen urea water.
   4- Pour water into the urea water hose (back flow), and make sure that this water comes out from the other side.
   Note: Prevent the water from entering the supply module or the urea water tank. Prevent the water from remaining in the urea water hose (back flow).

NG	• Repair or replace the urea water hose (back flow). • Go to “Checking the urea water hose coupler (back flow)” after repair or replacement.
OK	Go to “Checking the urea water hose coupler (back flow)”.

3. Checking the urea water hose coupler (back flow)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the urea water hose coupler (back flow) of supply module to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.
   3- Check the urea water hose coupler (back flow) of urea water tank to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.

NG	• Repair or replace the defective urea water hose coupler (back flow). • Go to “Checking the supply module pressure sensor” after repair or replacement.
OK	Go to “Checking the supply module pressure sensor”.

4. Checking the supply module pressure sensor
   1- Perform the failure diagnosis for “Supply module pressure sensor”.

Results of “Supply module pressure sensor”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the operation of supply module” after repair.
OK	Go to “Checking the operation of supply module”.

5. Checking the operation of supply module
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch.
   4- Activate the urea water injection test of "Diagnosis Test: Active control" of SMARTASSIST-DIRECT (SA-D), implement the leak check (injection pattern = "1"), and check with "Data logging" whether the supply module pressure meets the reference value under the leak check.
   Note: At the leak check (injection pattern = "1"), the dosing module does not inject the urea water. However, this is not an error.

Item	Reference value
Supply module pressure	1250 kPa or less

NG	• Replace the supply module. • Go to "Checking the current failure with SA-D" after replacement.
OK	Go to "Checking the current failure with SA-D".

6. Checking the current failure with SA-D
   1- Clear Inducement, turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate "Diagnosis Test: Input/output of pulse/analog" of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- After meeting the above reference value, when it is normal, value changes as in the below table. At No. 5, the urea water injection is started, errors disappear from the current fault indication.
   When the current fault indication detects an error, return to procedure 1, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
   Usually, it takes 2 minutes from No. 1 to No. 5.

No.	Dosing system state	Dosing system sub-state	Controlled condition of the urea water injection
1	"2"	"255"	Before urea water injection (NOPRESSURECTL)
2	"4"	"12"	Urea water pressure rise is started (REFILL)
3	"4"	"13"	Urea water pressure rise is started (PRESSUREBUILDUP)
4	"4"	"15"	Under the clogging check (DETECTIONMODE)
5	"4"	"16"	During the urea water injection (METERINGCONTROL)

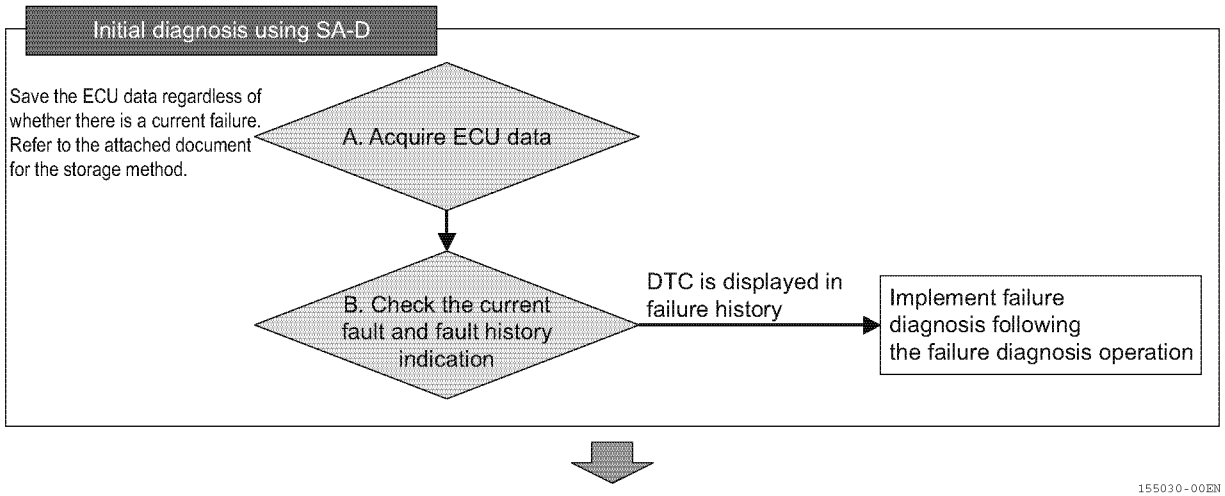
■ Supply module 2

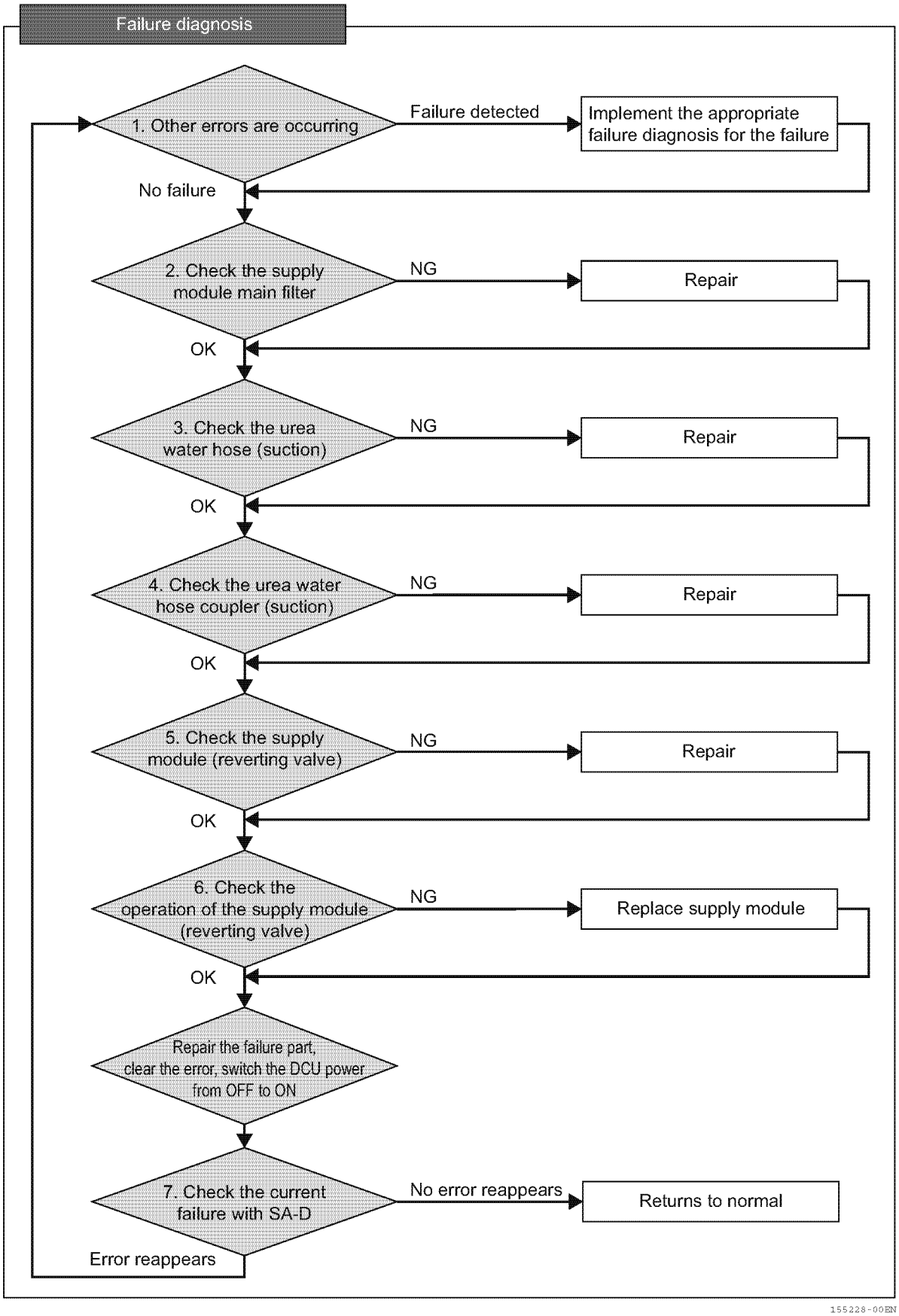
● Related DTC

P code	P1532	Supply module (pump motor) pressure reduction failure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the supply module main filter
NG
Repair
OK
3. Check the urea water hose (suction)
NG
Repair
OK
4. Check the urea water hose coupler (suction)
NG
Repair
OK
5. Check the supply module (reverting valve)
NG
Repair
OK
6. Check the operation of the supply module (reverting valve)
NG
Replace supply module
OK
Repair the failure part, clear the error, switch the DCU power from OFF to ON
7. Check the current failure with SA-D
No error reappears
Returns to normal
Error reappears
155228-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to fresh air temperature sensor are detected on ECU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the supply module main filter” after treatment.
No error detected	Go to “Checking the supply module main filter”.

2. Checking the supply module main filter
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the supply module main filter from the supply module.
   3- Make sure that the supply module main filter is not clogged by contamination.

NG	• Remove the supply module main filter. • Go to “Checking the urea water hose (suction)” after repair or replacement.
OK	Go to “Checking the urea water hose (suction)”.

3. Checking the urea water hose (suction)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the urea water hose (suction) between the supply module and the urea water tank from the engine.
   3- Check the urea water hose (suction) to make sure its hose is not clogged by being twisted and bent, contamination.
   4- Pour water into the urea water hose (suction), and make sure that this water comes out from the other side.
   Note: Prevent the water from entering the supply module or the urea water tank. Prevent the water from remaining in the urea water hose (suction).

NG	• Repair or replace the urea water hose (suction). • Go to “Checking the urea water hose coupler (suction)” after repair or replacement.
OK	Go to “Checking the urea water hose coupler (suction)”.

4. Checking the urea water hose coupler (suction)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the urea water hose coupler (suction) of supply module to make sure that its coupler is not deformed and its hose is not clogged by contamination.
   3- Check the urea water hose coupler (suction) of urea water tank to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.

NG	• Repair or replace the defective urea water hose coupler (suction). • Go to “Checking the supply module (reverting valve)” after repair or replacement.
OK	Go to “Checking the supply module (reverting valve)”.

5. Checking the supply module (reverting valve)
   1- Perform the failure diagnosis for “Supply module (reverting valve)”.

Results of “Supply module (reverting valve)”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the operation of supply module (reverting valve)” after repair.
OK	Go to “Checking the operation of supply module (reverting valve)”.

6. Checking the operation of supply module (reverting valve)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Remove the dosing module from the engine.
   4- Turn ON the key switch.
   5- Activate the urea water injection test (injection pattern = “3”) of “Diagnosis Test: Active control” of SMARTAS-SIST-DIRECT (SA-D), operate the dosing module, and wait until the urea water is injected from the dosing module.
   6- Turn OFF the power and check whether the supply module (reverting valve) operates (whether it makes an operating sound).

NG	• Replace the supply module. • Go to “Checking the current failure with SA-D” after replacement.
OK	Go to “Checking the current failure with SA-D”.

7. Checking the current failure with SA-D
   1- Clear the error and clear Inducement, turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, supply module main filter, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- Operate the engine under conditions meeting the above reference value, turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   6- Turn ON the key switch again, and check if the error reappears.

No	Returns to normal.
Yes	Go back to procedure 1 and check.

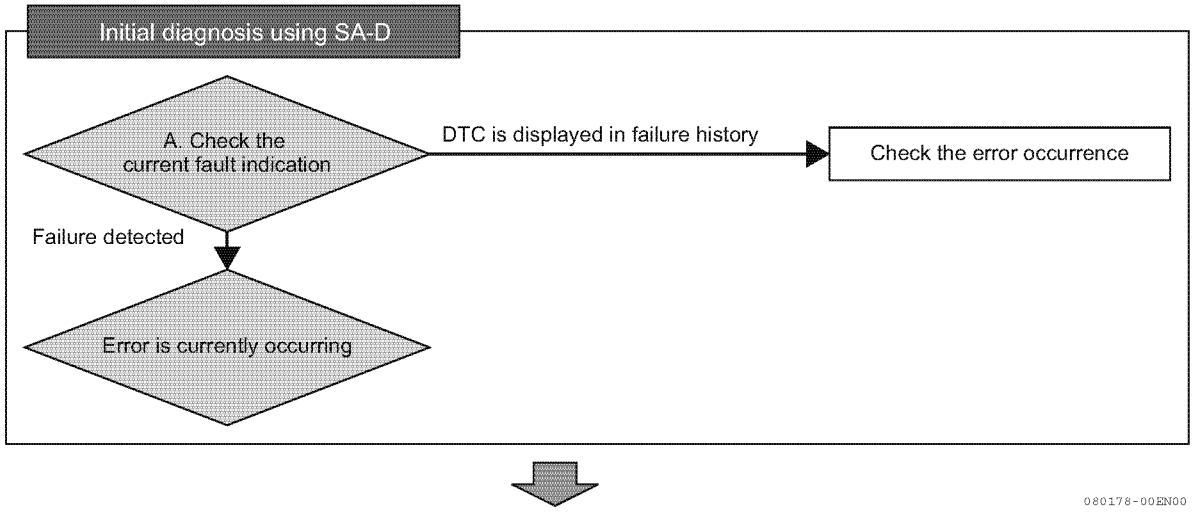
■ Supply module 3

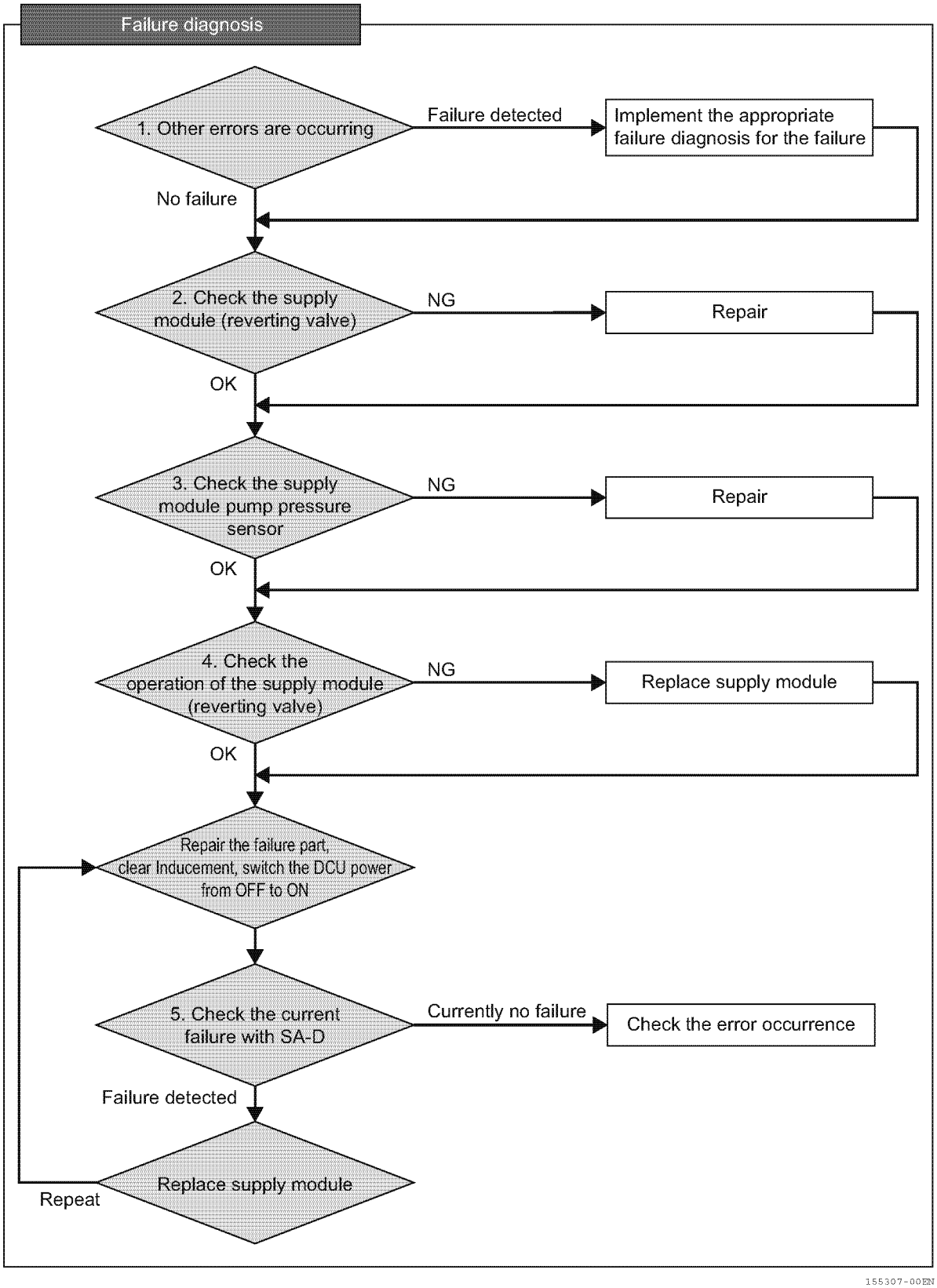
● Related DTC

P code	P1535	Supply module (reverting valve) failure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the supply module (reverting valve)
NG
Repair
OK
3. Check the supply module pump pressure sensor
NG
Repair
OK
4. Check the operation of the supply module (reverting valve)
NG
Replace supply module
OK
Repair the failure part, clear Inducement, switch the DCU power from OFF to ON
5. Check the current failure with SA-D
Currently no failure
Check the error occurrence
Failure detected
Replace supply module
Repeat
155307-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to fresh air temperature sensor are detected on ECU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the supply module (reverting valve)” after treatment.
No error detected	Go to “Checking the supply module (reverting valve)”.

2. Checking the supply module (reverting valve)
   1- Perform the failure diagnosis for “Supply module (reverting valve)”. However, do not replace the wire-harness or DCU, when the result of “Checking the wire-harness conduction” is OK.

Results of “Supply module (reverting valve)”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the supply module pressure sensor” after repair.
OK	Go to “Checking the supply module pressure sensor”.

3. Checking the supply module pressure sensor
   1- Perform the failure diagnosis for “Supply module pressure sensor”. However, do not replace the DCU, when the result of “Checking the output voltage of supply module pressure sensor” is OK.

Results of “Supply module pressure sensor”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the operation of supply module (reverting valve)” after repair.
OK	Go to “Checking the operation of supply module (reverting valve)”.

4. Checking the operation of supply module (reverting valve)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch.
   4- Activate “Diagnosis Test: Active control” of SMARTASSIST-DIRECT (SA-D), and make sure that the supply module (reverting valve) is operated or makes an operating sound.

NG	• Replace the supply module. • Go to “Checking the current failure with SA-D” after replacement.
OK	Go to “Checking the current failure with SA-D”.

5. Checking the current failure with SA-D

1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.

2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)

3- Turn ON the key switch again to start the engine.

4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

5- After meeting the above reference value, when it is normal, value changes as in the below table. At No. 5, the urea water injection is started, errors disappear from the current fault indication.
When the current fault indication detects an error, remove the supply module, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
Usually, it takes 2 minutes from No. 1 to No. 5.

No.	Dosing system state	Dosing system sub-state	Controlled condition of the urea water injection
1	“2”	“255”	Before urea water injection (NOPRESSURECTL)
2	“4”	“12”	Urea water pressure rise is started (REFILL)
3	“4”	“13”	Urea water pressure rise is started (PRESSUREBUILDUP)
4	“4”	“15”	Under the clogging check (DETECTIONMODE)
5	“4”	“16”	During the urea water injection (METERINGCONTROL)

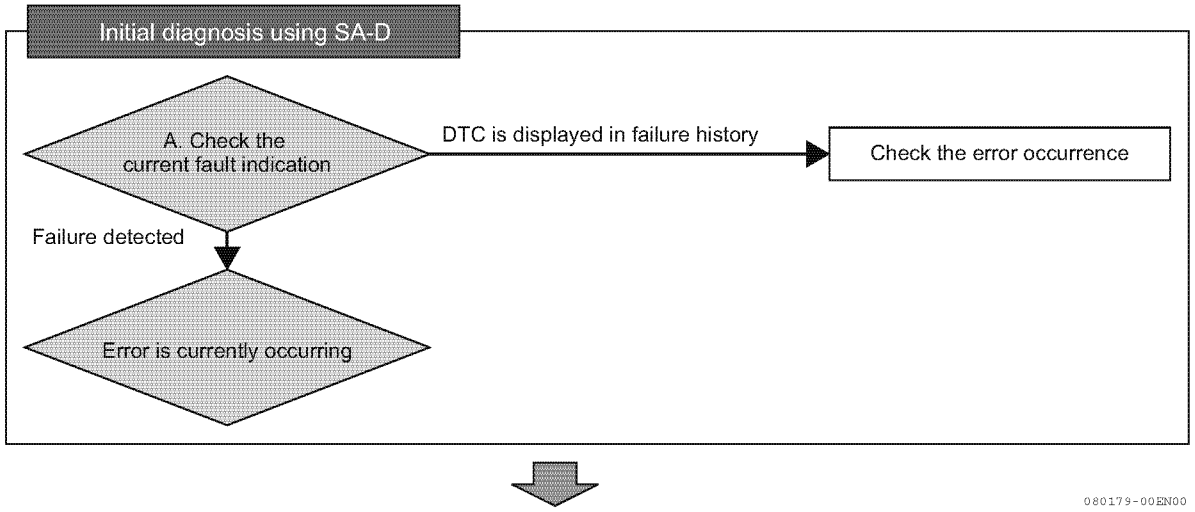
■ Supply module 4

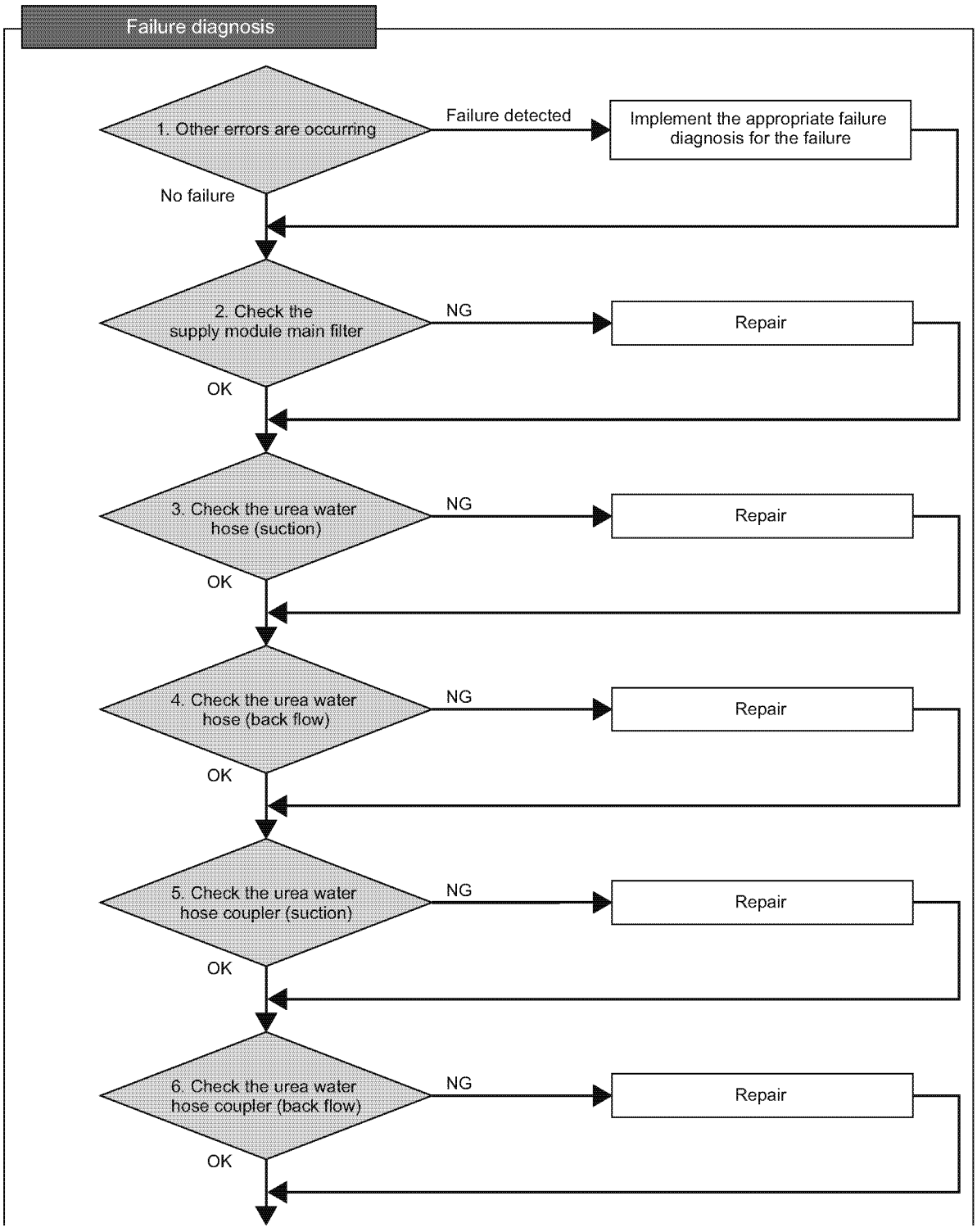
● Related DTC

P code	P150F	Supply module (pump motor) pressure stability error

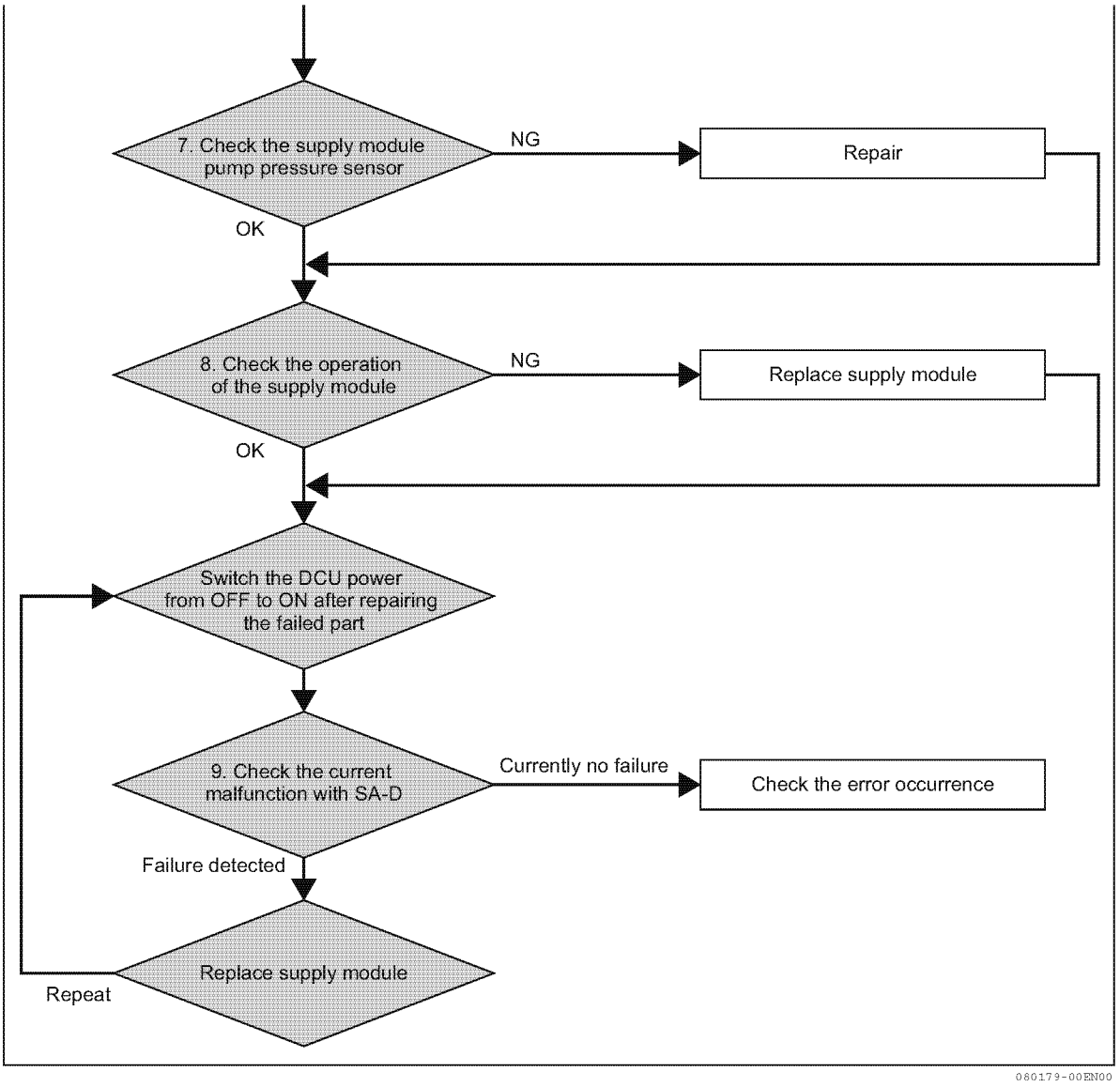
● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.





080179-00EN00


7. Check the supply module pump pressure sensor
NG
Repair
OK
8. Check the operation of the supply module
NG
Replace supply module
OK
Switch the DCU power from OFF to ON after repairing the failed part
9. Check the current malfunction with SA-D
Currently no failure
Check the error occurrence
Failure detected
Replace supply module
Repeat
080179-00EN00

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to fresh air temperature sensor are detected on ECU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the supply module main filter" after treatment.
No error detected	Go to "Checking the supply module main filter".

2. Checking the supply module main filter
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the supply module main filter from the supply module.
   3- Make sure that the supply module main filter is not clogged by contamination or frozen urea water.

NG	• Remove the supply module main filter. • Go to "Checking the urea water hose (suction)" after repair or replacement.
OK	Go to "Checking the urea water hose (suction)".

3. Checking the urea water hose (suction)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the urea water hose (suction) between the supply module and the urea water tank from the engine.
   3- Check the urea water hose (suction) to make sure its hose is not clogged by being twisted and bent, contamination or frozen urea water.
   4- Pour water into the urea water hose (suction), and make sure that this water comes out from the other side.
   Note: Prevent the water from entering the supply module or the urea water tank. Prevent the water from remaining in the urea water hose (suction).

NG	• Repair or replace the urea water hose (suction). • Go to "Checking the urea water hose (back flow)" after repair or replacement.
OK	Go to "Checking the urea water hose (back flow)".

4. Checking the urea water hose (back flow)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the urea water hose (back flow) between the supply module and the urea water tank from the engine.
   3- Check the urea water hose (back flow) to make sure its hose is not clogged by being twisted and bent, contamination or frozen urea water.
   4- Pour water into the urea water hose (back flow), and make sure that this water comes out from the other side.
   Note: Prevent the water from entering the supply module or the urea water tank. Prevent the water from remaining in the urea water hose (back flow).

NG	• Repair or replace the urea water hose (back flow). • Go to "Checking the urea water hose coupler (suction)" after repair or replacement.
OK	Go to "Checking the urea water hose coupler (suction)".

5. Checking the urea water hose coupler (suction)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the urea water hose coupler (suction) of supply module to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.
   3- Check the urea water hose coupler (suction) of urea water tank to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.

NG	• Repair or replace the defective urea water hose coupler (suction). • Go to "Checking the urea water hose coupler (back flow)" after repair or replacement.
OK	Go to "Checking the urea water hose coupler (back flow)".

6. Checking the urea water hose coupler (back flow)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Check the urea water hose coupler (back flow) of supply module to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.
   3- Check the urea water hose coupler (back flow) of urea water tank to make sure that its coupler is not deformed and its hose is not clogged by contamination or frozen urea water.

NG	• Repair or replace the defective urea water hose coupler (back flow). • Go to "Checking the supply module pressure sensor" after repair or replacement.
OK	Go to "Checking the supply module pressure sensor".

7. Checking the supply module pressure sensor
   1- Perform the failure diagnosis for "Supply module pressure sensor". However, do not replace the DCU, when the result of "Checking the output voltage of supply module pressure sensor" is OK.

Results of "Supply module pressure sensor"	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to "Checking the operation of supply module" after repair.
OK	Go to "Checking the operation of supply module".

8. Checking the operation of supply module
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Remove the dosing module from the engine.
   4- Turn ON the key switch.
   5- Activate the urea water injection test (injection pattern = “3”) of “Diagnosis Test: Active control” of SMARTAS-SIST-DIRECT (SA-D), operate the dosing module, and check if the dosing module injects the urea water, or if the urea water is not leaked from the urea water system.

NG	• When the urea water is not injected, replace the supply module. • When the urea water is leaked, repair it. • Go to “Checking the current failure with SA-D” after replacement or repair.
OK	Go to “Checking the current failure with SA-D”.

9. Checking the current failure with SA-D
   1- Clear Inducement, turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- After meeting the above reference value, when it is normal, value changes as in the below table. At No. 5, the urea water injection is started, errors disappear from the current fault indication.
   When the current fault indication detects an error, remove the supply module, and switch the DCU power from OFF to ON for failure diagnosis using SA-D.
   Usually, it takes 2 minutes from No. 1 to No. 5.

No.	Dosing system state	Dosing system sub-state	Controlled condition of the urea water injection
1	“2”	“255”	Before urea water injection (NOPRESSURECTL)
2	“4”	“12”	Urea water pressure rise is started (REFILL)
3	“4”	“13”	Urea water pressure rise is started (PRESSUREBUILDUP)
4	“4”	“15”	Under the clogging check (DETECTIONMODE)
5	“4”	“16”	During the urea water injection (METERINGCONTROL)

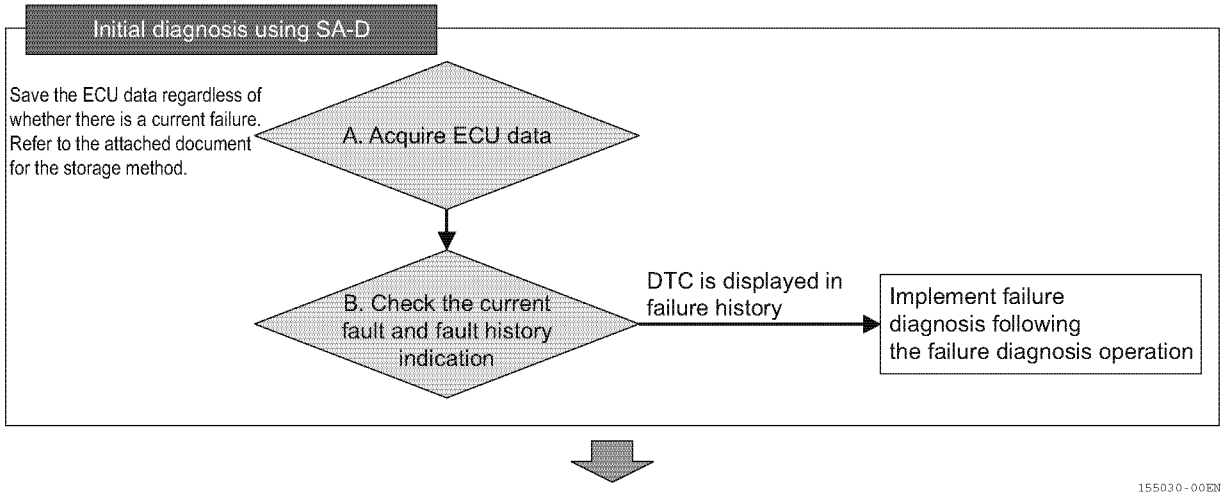
■ Supply module 5

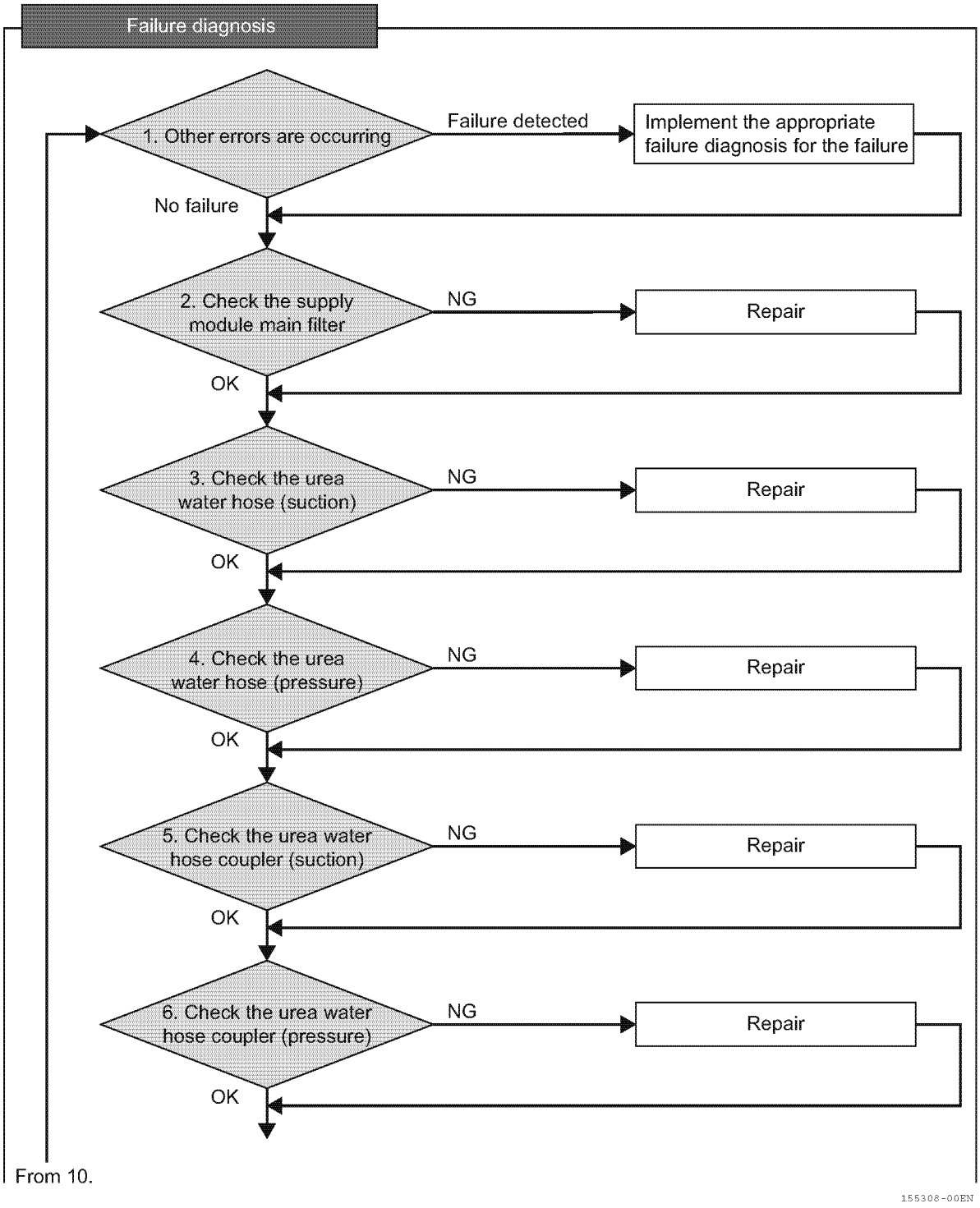
● Related DTC

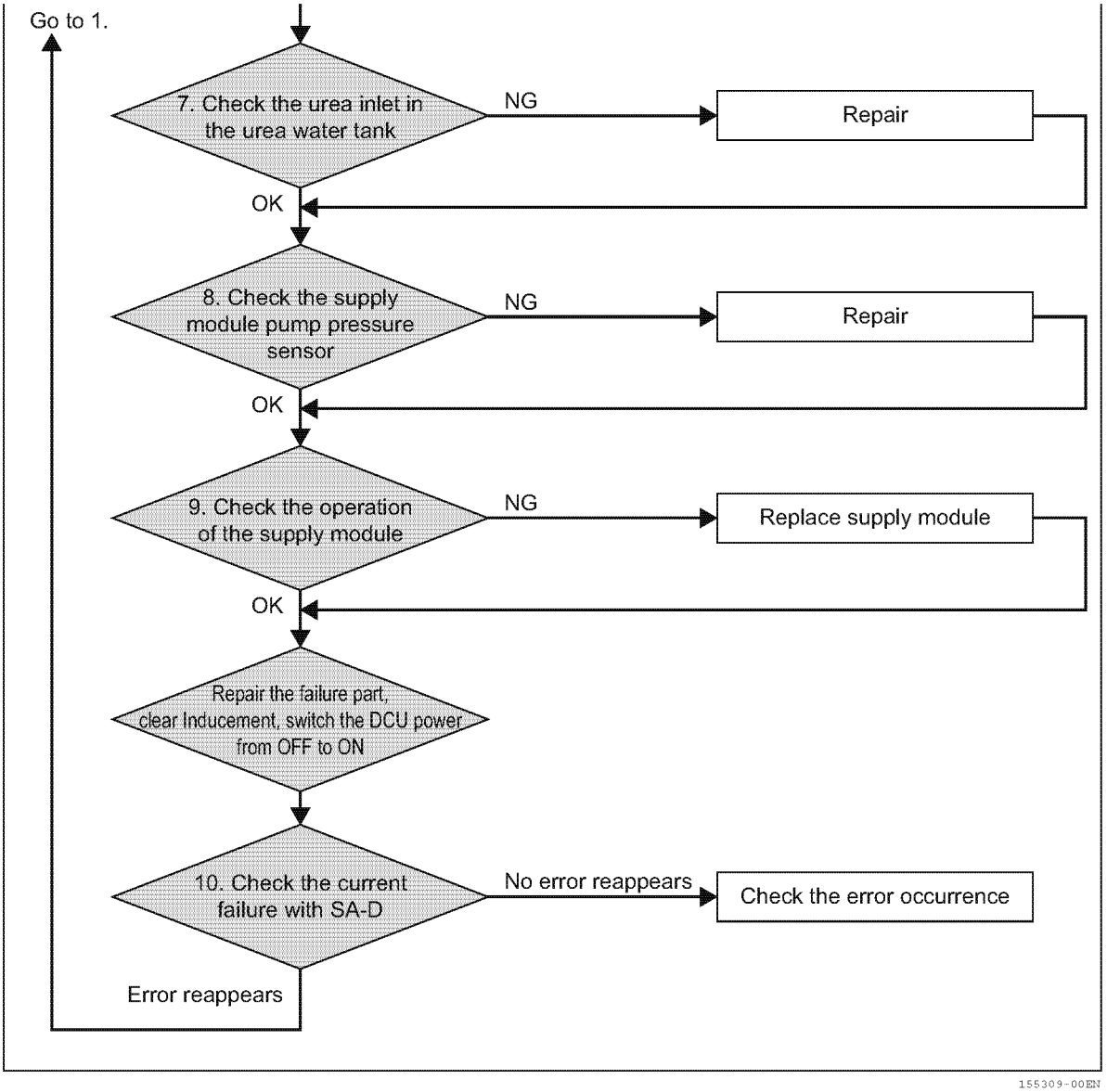
P code	P1537	Supply module pressure drop error
	P1538	Supply module urea water pressure rise failure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the supply module main filter
NG
Repair
OK
3. Check the urea water hose (suction)
NG
Repair
OK
4. Check the urea water hose (pressure)
NG
Repair
OK
5. Check the urea water hose coupler (suction)
NG
Repair
OK
6. Check the urea water hose coupler (pressure)
NG
Repair
OK
From 10.
155308-00EN


Go to 1.
7. Check the urea inlet in the urea water tank
NG
Repair
OK
8. Check the supply module pump pressure sensor
NG
Repair
OK
9. Check the operation of the supply module
NG
Replace supply module
OK
Repair the failure part, clear Inducement, switch the DCU power from OFF to ON
10. Check the current failure with SA-D
No error reappears
Check the error occurrence
Error reappears
155309-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure that no errors related to fresh air temperature sensor are detected on ECU side.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to "Checking the supply module main filter" after treatment.
No error detected	Go to "Checking the supply module main filter".

2. Checking the supply module main filter
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Remove the supply module main filter from the supply module.
   3- Make sure that the supply module main filter is not clogged by contamination or frozen urea water.

NG	• Repair or replace the supply module main filter. • Go to "Checking the urea water hose (suction)" after repair or replacement.
OK	Go to "Checking the urea water hose (suction)".

3. Checking the urea water hose (suction)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Make sure that the urea water hose (suction) is not removed from the supply module or the urea water tank.
   3- Make sure that the urea water hose (suction) is not cracked or damaged, and that there is no sign of leaking the urea water.
   4- Remove the urea water hose (suction).
   5- Check the urea water hose (suction) to make sure its hose is not clogged by being twisted and bent, contamination.
   6- Pour water into the urea water hose (suction), and make sure that this water comes out from the other side.
   Note: Prevent the water from entering the supply module or the urea water tank. Prevent the water from remaining in the urea water hose (suction).

NG	• Repair or replace the urea water hose (suction). • Go to "Checking the urea water hose (pressure)" after repair or replacement.
OK	Go to "Checking the urea water hose (pressure)".

4. Checking the urea water hose (pressure)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Make sure that the urea water hose (pressure) is not removed from the supply module or the dosing module.
   3- Make sure that the urea water hose (pressure) is not cracked or damaged, and that there is no sign of leaking the urea water.

NG	• Repair or replace the urea water hose (pressure). • Go to "Checking the urea water hose coupler (suction)" after repair or replacement.
OK	Go to "Checking the urea water hose coupler (suction)".

5. Checking the urea water hose coupler (suction)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Make sure that the urea water hose coupler (suction) of supply module is not cracked or damaged, and that there is no sign of leaking the urea water.
   3- Check the urea water hose coupler (suction) of supply module to make sure that its coupler is not deformed and its hose is not clogged by contamination.
   4- Check the urea water hose coupler (suction) of urea water tank to make sure that its coupler is not deformed and its hose is not clogged by contamination.

NG	• Repair or replace the defective urea water hose coupler (suction). • Go to “Checking the urea water hose coupler (pressure)” after repair or replacement.
OK	Go to “Checking the urea water hose coupler (pressure)”.

6. Checking the urea water hose coupler (pressure)
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Make sure that the urea water hose coupler (pressure) of supply module is not cracked or damaged, and that there is no sign of leaking the urea water.
   3- Make sure that the urea water hose coupler (pressure) of dosing module is not cracked or damaged, and that there is no sign of leaking the urea water.

NG	• Repair or replace the defective urea water hose coupler (pressure). • Go to “Checking the urea inlet in the urea water tank” after repair or replacement.
OK	Go to “Checking the urea inlet in the urea water tank”.

7. Checking the urea inlet in the urea water tank
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Make sure that the urea inlet filter of the urea water tank is not clogged.

NG	• Repair or replace the urea water tank. • Go to “Checking the supply module pressure sensor” after repair or replacement.
OK	Go to “Checking the supply module pressure sensor”.

8. Checking the supply module pressure sensor
   1- Perform the failure diagnosis for “Supply module pressure sensor”.

Results of “Supply module pressure sensor”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the operation of supply module” after repair.
OK	Go to “Checking the operation of supply module”.

9. Checking the operation of supply module
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Remove the dosing module from the engine.
   4- Turn ON the key switch.
   5- Activate the urea water injection test (injection pattern = “3”) of “Diagnosis Test: Active control” of SMARTAS-SIST-DIRECT (SA-D), operate the dosing module, and check if the dosing module injects the urea water, or if the urea water is not leaked from the urea water system.

NG	• When the urea water is not injected, replace the supply module. • When the urea water is leaked, repair it. • Go to “Checking the current failure with SA-D” after replacement or repair.
OK	Go to “Checking the current failure with SA-D”.

10. Checking the current failure with SA-D
   1- Clear Inducement, turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Connect all urea water system (urea water tank, urea water hose, supply module, and dosing module)
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	190 °C or higher
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- After meeting the above reference value, when it is normal, value changes as in the below table.
   At No. 5, the urea water injection is started, errors disappear from the current fault indication.
   If the error reappears in current fault indication, go back to procedure 1 and check again.
   Usually, it takes 2 minutes from No. 1 to No. 5.

No.	Dosing system state	Dosing system sub-state	Controlled condition of the urea water injection
1	“2”	“255”	Before urea water injection (NOPRESSURECTL)
2	“4”	“12”	Urea water pressure rise is started (REFILL)
3	“4”	“13”	Urea water pressure rise is started (PRESSUREBUILDUP)
4	“4”	“15”	Under the clogging check (DETECTIONMODE)
5	“4”	“16”	During the urea water injection (METERINGCONTROL)

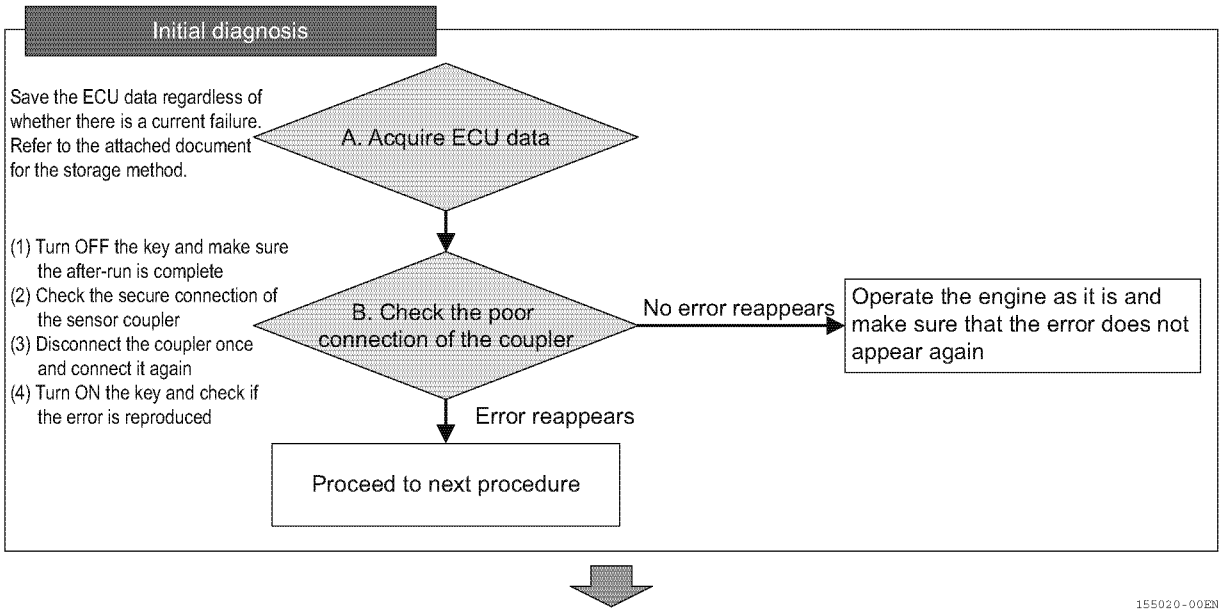
■ Supply module 6

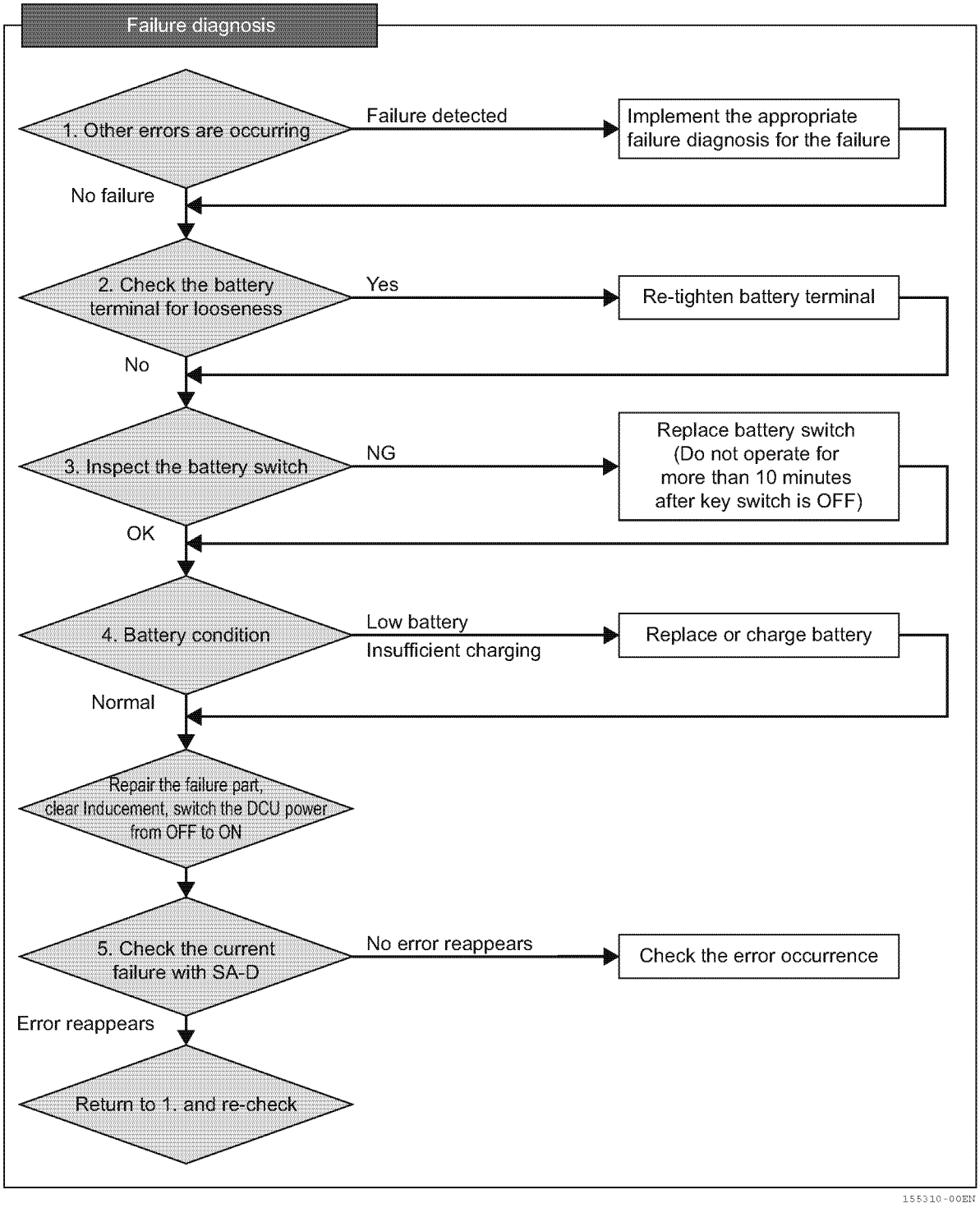
● Related DTC

P code	P204F	Supply module urea water sucking back failure

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the battery terminal for looseness
Yes
Re-tighten battery terminal
No
3. Inspect the battery switch
NG
Replace battery switch (Do not operate for more than 10 minutes after key switch is OFF)
OK
4. Battery condition
Low battery
Insufficient charging
Replace or charge battery
Normal
Repair the failure part, clear Inducement, switch the DCU power from OFF to ON
5. Check the current failure with SA-D
No error reappears
Check the error occurrence
Error reappears
Return to 1. and re-check
155310-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected. Especially, make sure an error which stops the suck-back of urea water is not detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the battery terminal for looseness” after treatment.
No error detected	Go to “Checking the battery terminal for looseness”.

2. Checking the battery terminal for looseness
   1- Make sure that there is no looseness and damages in wiring from the battery to VB terminal of DCU.
   2- Make sure that there is no looseness in fastening section between the GND terminal of the battery, and frame.
   3- Make sure that there is no looseness and damages in wiring from the GND terminal of DCU to the frame GND.
   4- Make sure that there is no looseness and damages in wiring from the key switch terminal of DCU to the key switch.

NG	• Repair the failure part. • Go to “Inspecting the battery switch” after treatment.
OK	Go to “Inspecting the battery switch”.

3. Inspecting the battery switch
   Some driven machines are equipped with the battery switch other than the key switch for the long-term storage. Contact the driven machine manufacturer for details.
   1- Make sure that there is no looseness in wiring of the battery switch.
   2- Make sure that there is nothing wrong with the battery switch.
   3- Do not turn OFF the battery switch within 10 minutes after turning off the key switch. Instruct an operator how to operate.

NG	• Repair the failure part. • Go to “Battery condition” after treatment.
OK	Go to “Battery condition”.

4. Battery condition
   When the battery is not charged enough or the battery capacity is decreased, it may decrease the supply voltage to DCU, and cause the malfunction to open main relay early. Inspect the battery.

NG	• Charge or replace the battery. • Go to “Checking the current failure with SA-D” after charging or replacement.
OK	Go to “Checking the current failure with SA-D”.

5. Checking the current failure with SA-D
   Clear Inducement, repeatedly switching the key switch from OFF to ON to make sure this malfunction does not occur again. When malfunction occurs again, carry out the inspection again from procedure 1.

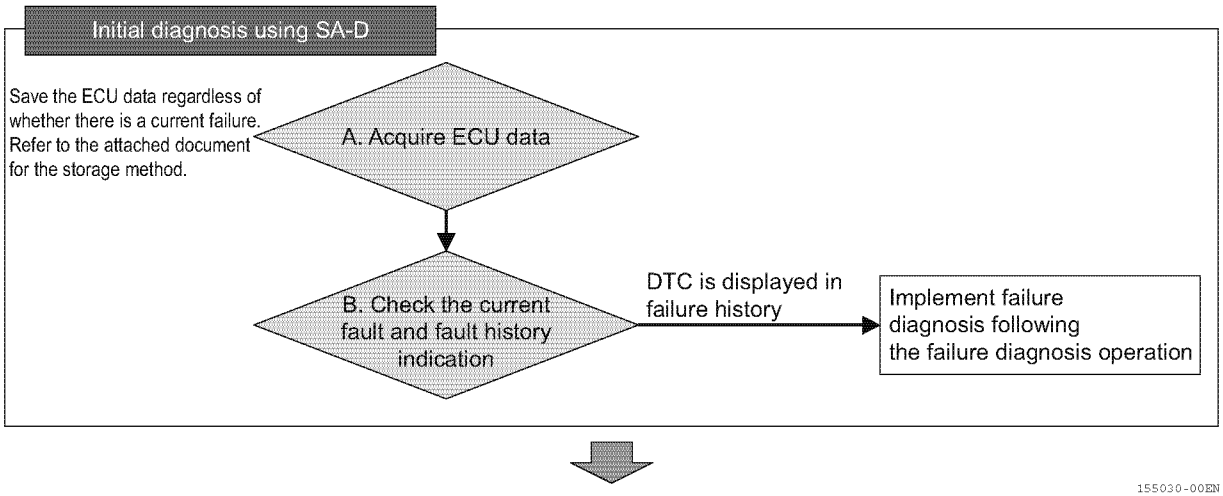
■ SCR system 1

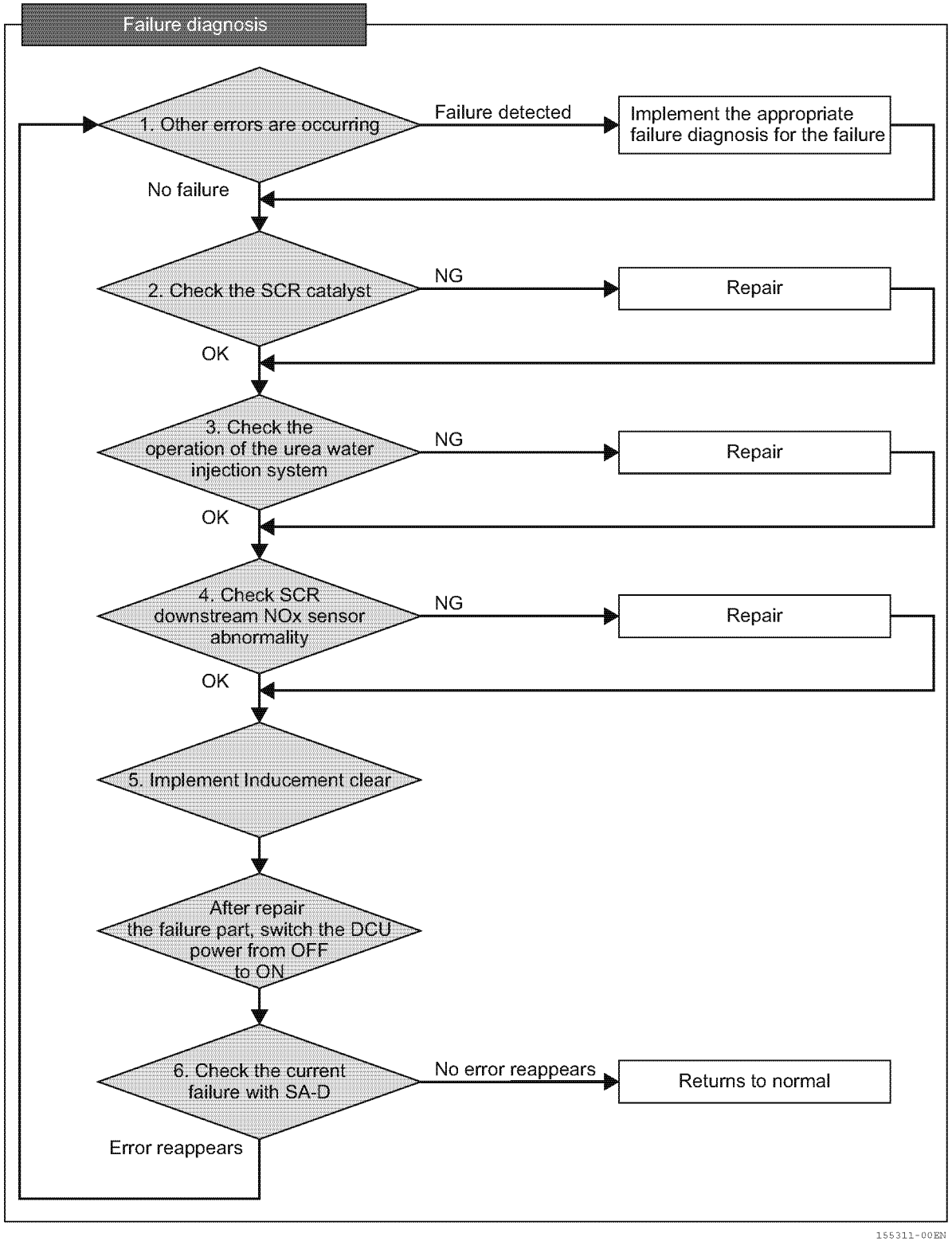
● Related DTC

P code	P1520	Inefficient NOx cleaning

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Other errors are occurring
Failure detected
Implement the appropriate failure diagnosis for the failure
No failure
2. Check the SCR catalyst
NG
Repair
OK
3. Check the operation of the urea water injection system
NG
Repair
OK
4. Check SCR downstream NOx sensor abnormality
NG
Repair
OK
5. Implement Inducement clear
After repair the failure part, switch the DCU power from OFF to ON
6. Check the current failure with SA-D
No error reappears
Returns to normal
Error reappears
155311-00EN

● Work description

1. Checking for other errors
   1- Turn OFF the key switch and turn ON the key switch again.
   2- Connect the SA-D and check the current fault indication to see whether any other errors are detected.

Error detected	• Implement the appropriate failure diagnosis for the failure. • Go to “Checking the SCR catalyst” after treatment.
No error detected	Go to “Checking the SCR catalyst”.

2. Checking the SCR catalyst
   1- Make sure that there is nothing wrong (disconnections and damages) with the SCR catalyst.

NG	• Repair the defective parts. • Go to “Checking the operation of urea water injection system” after repair.
OK	Go to “Checking the operation of urea water injection system”.

3. Checking the operation of urea water injection system
   1- Perform the failure diagnosis for “Supply module 5”. However, do not replace the supply module, when the result of “Checking the operation of supply module” is OK.

Results of “Supply module 5”	State
All OK	OK: Normal
There are NG items	NG: Error

NG	• Repair the defective parts. • Go to “Checking the SCR downstream NOx sensor abnormality” after repair.
OK	Go to “Checking the SCR downstream NOx sensor abnormality”.

4. Checking the SCR downstream NOx sensor abnormality
   1- Check the battery voltage (12 V spec: 9 V to 16 V, 24 V spec: 18 V to 33 V).
   2- Check the wire-harness conduction.
   3- Check the operation of the SCR downstream NOx sensor.

NG	• Repair the defective parts. • Go to “Implementation of Inducement clear” after repair.
OK	Go to “Implementation of Inducement clear”.

5. Implementation of Inducement clear
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU).
   3- Turn ON the key switch again.
   4- Activate “Configuration of settings” of SA-D, and implement the Inducement clear. (Write “1” in data.)
   5- Go to “Checking the current failure with SA-D”.

   Note: When Inducement clear is implemented, the current malfunction is temporarily released. To check that no error is detected, make sure to perform “Checking the current failure with SA-D”.

6. Checking the current failure with SA-D
   1- Turn OFF the key switch, and wait until power supplies of ECU and DCU is turned OFF.
   2- Connect all couplers (sensor, actuator, wire-harness, DCU, and ECU). Attach all the sensors, and actuator to the engine.
   3- Turn ON the key switch again to start the engine.
   4- Activate “Diagnosis Test: Input/output of pulse/analog” of SA-D, monitor items in the below table, and operate the engine under conditions where SCR catalyst temperature meets the reference value, and make sure that other reference value in the below table is met.

Item	Reference value
SCR catalyst temperature	260 °C or higher
NOx sensor heater release	“1” (NOx sensor heater release is completed.)
Dosing system state	“4” (During the urea water injection)
Dosing system sub-state	“16” (During the urea water injection)
Battery voltage	12 V specification: 10 to 16 V 24 V specification: 18 to 33 V

   5- Keep on operating the engine under conditions meeting the above reference value for 10 minutes or more, and make sure that the reference value is met.

Item	Reference value
SCR catalyst upstream NOx concentration	SCR catalyst upstream NOx concentration > SCR catalyst downstream NOx concentration (after NOx sensor correction) (SCR downstream NOx sensor value is about 80% or less of upstream NOx sensor value)
SCR catalyst downstream NOx concentration (after NOx sensor correction)	

NG	Go back to procedure 1 and check the faulty part again.
OK	Returns to normal.

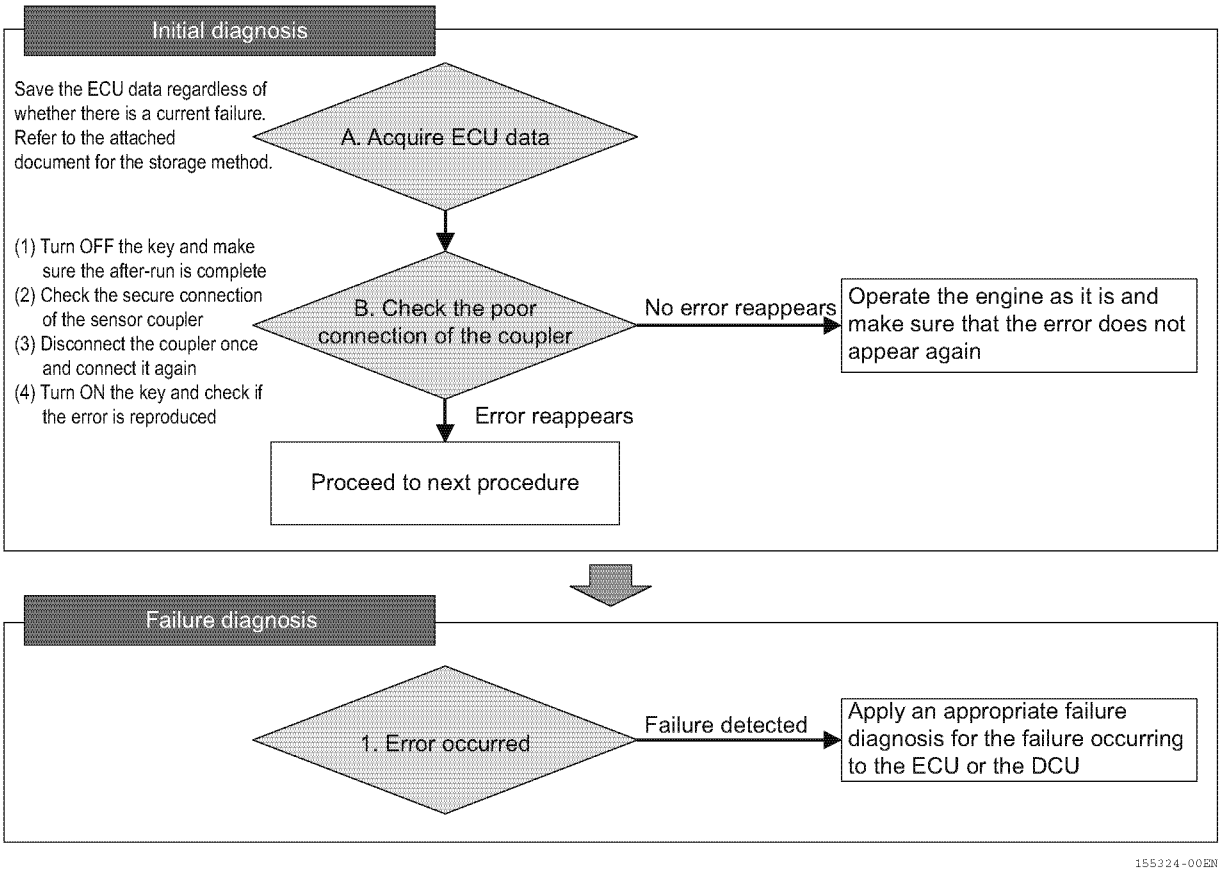
■ SCR system 2

● Related DTC

P code	P1506	SCR system forced termination
	P1553	SCR system error Inducement 1
	P1554	SCR system error Inducement 2

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. When this error is detected, other errors that cause this error are detected in ECU or DCU at the same time. Be sure to perform the failure diagnosis for the respective part first.

P1506:

Check for malfunctions in the supply module heater, urea water hose heater, urea water tank heating valve, and heater relay.

P1553, P1554:

After repairing the part where the error occurred, execute Inducement clear and check that the error does not reappear after running the engine.

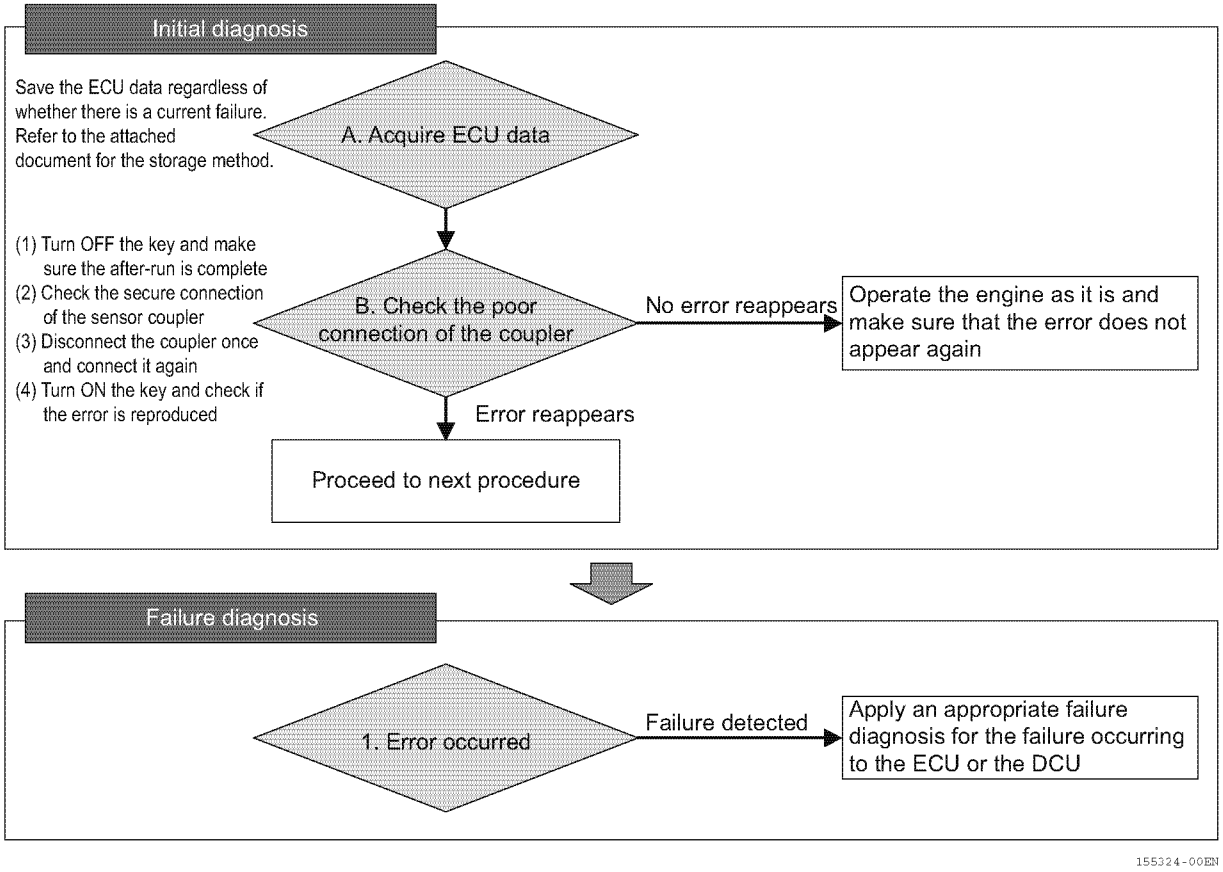
■ EGR system

● Related DTC

P code	P1563	EGR system error (Inducement 1)
	P1564	EGR system error (Inducement 2)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.



● Work description

1. When this error is detected, other errors that cause this error are detected in ECU or DCU at the same time. Be sure to perform the failure diagnosis for the respective part first.

2. After repairing the part where the error occurred, execute Inducement clear and check that the error does not reappear after running the engine.

Urea water related

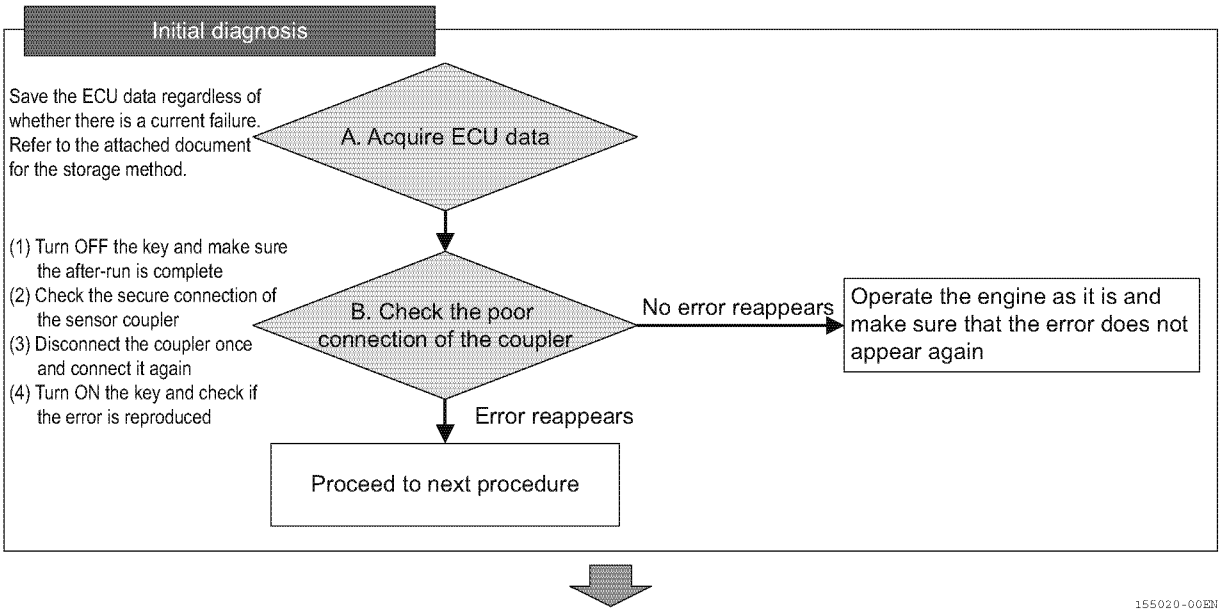
■ Urea water tank level

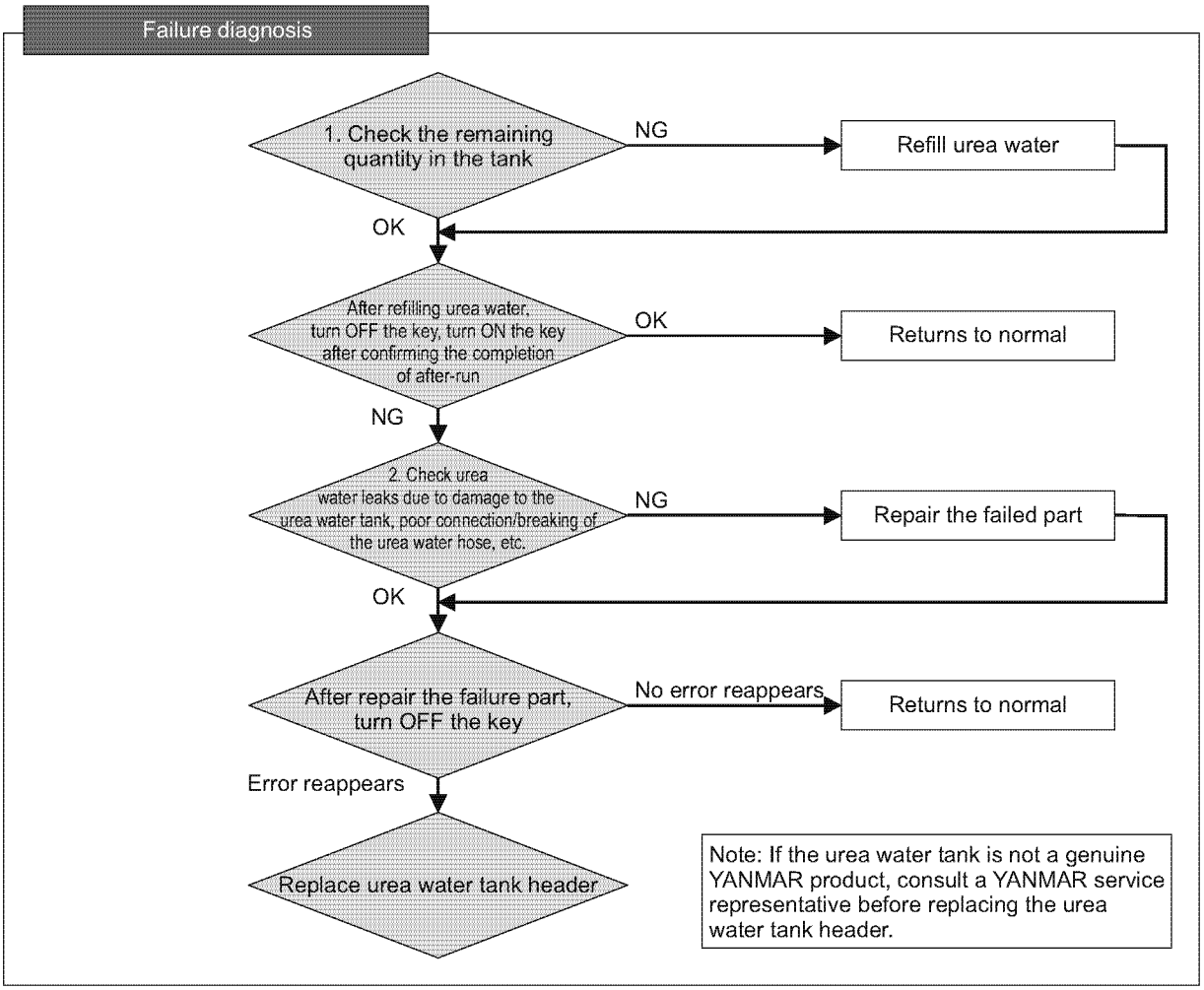
● Related DTC

P code	P1549	Low urea water tank level (Inducement 1)
	P154A	Low urea water tank level (Inducement 2)

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the remaining quantity in the tank
NG
Refill urea water
OK
After refilling urea water, turn OFF the key, turn ON the key after confirming the completion of after-run
OK
Returns to normal
NG
2. Check urea water leaks due to damage to the urea water tank, poor connection/breaking of the urea water hose, etc.
NG
Repair the failed part
OK
After repair the failure part, turn OFF the key
No error reappears
Returns to normal
Error reappears
Replace urea water tank header
Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.
155325-00EN

● Work description

1. Checking the remaining quantity in the tank

1- Make sure that the urea water which meets the reference value remains in the urea water tank.

Item	Reference value
Urea water tank level	20% or more

NG	• Refill it with urea water. • After refilling, if the key is turned ON and the error reappears, go to "Checking the urea water leaks due to damage to the urea water tank, poor connection/breaking of the urea water hose, etc.".
OK	Returns to normal.

2. Checking the urea water leaks due to damage to the urea water tank, poor connection/breaking of the urea water hose, etc.

1- Check for urea water leaks due to breakage in the urea water tank or poor connection or breakage of the urea water hose.

2- Make sure that the urea water tank (back flow, pressure, and suction) is not removed.

3- Make sure that the urea water tank (back flow, pressure, and suction) is not damaged or does not leak the urea water.

NG	• Repair or replace the failed part. • After repairing or replacement, if the error reappears after turning the key ON, replace the urea water tank header. *Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.*
OK	Returns to normal.

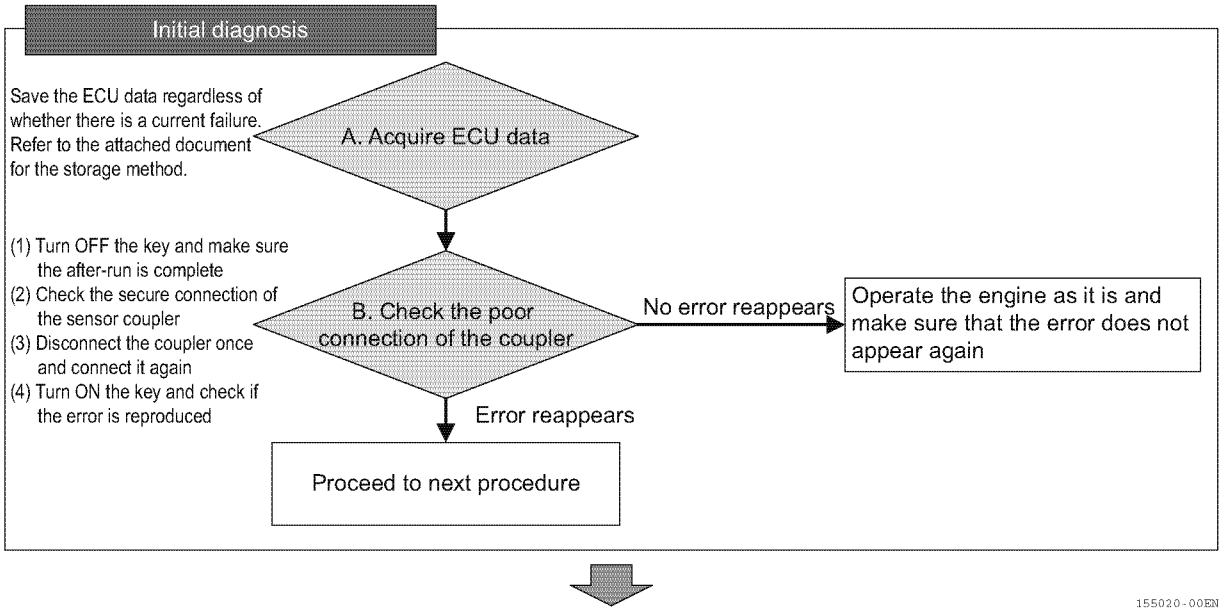
■ Urea water quality sensor

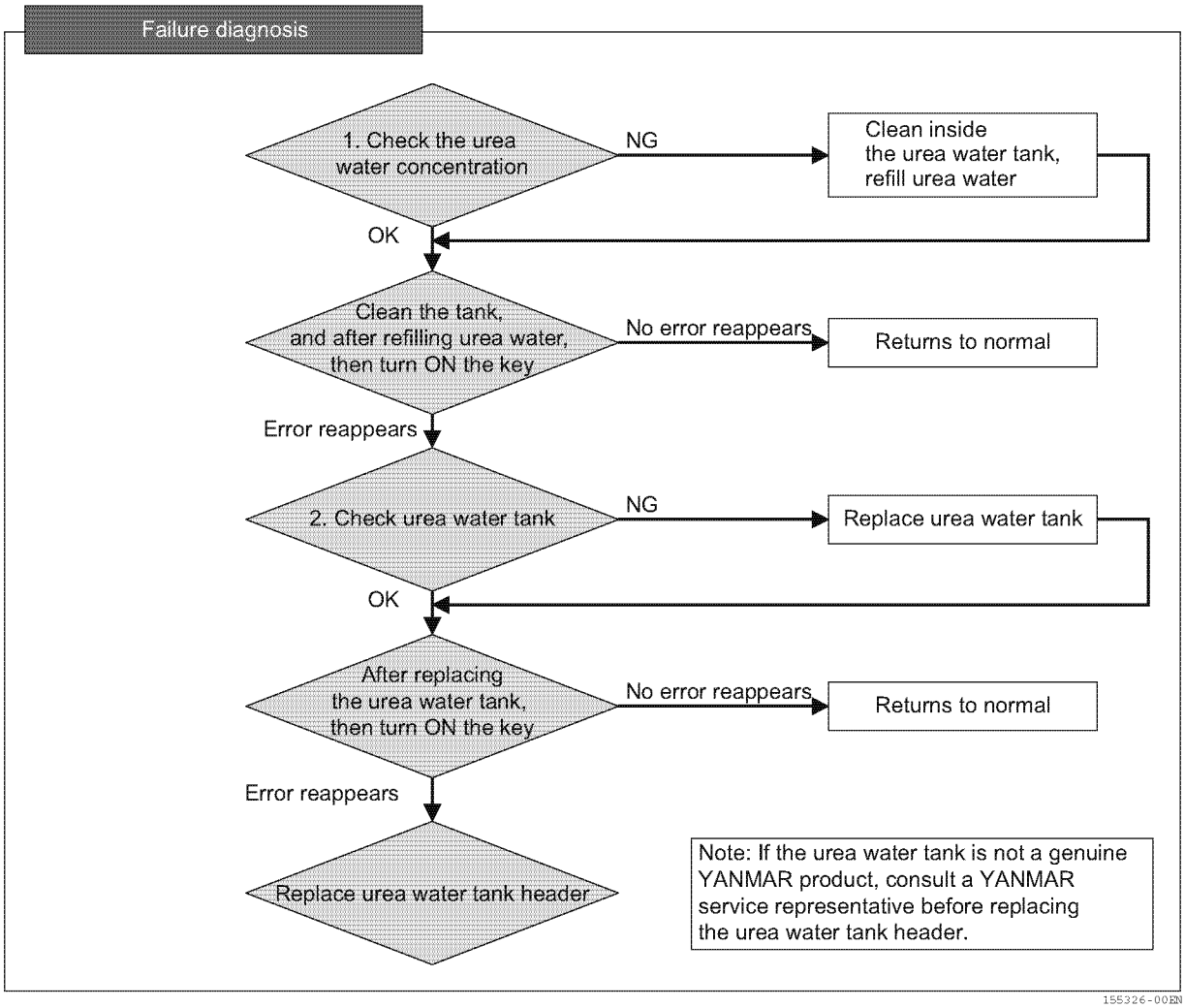
● Related DTC

P code	P154E	Urea water quality sensor concentration error (small deviation)
	P154D	Urea water quality sensor concentration error (large deviation)
	P1558	Urea water quality sensor contamination error in urea water tank

● Workflow

Note: See "Work description" for work details. Go to "SA-D Operation Manual" for the SA-D operation.




Failure diagnosis
1. Check the urea water concentration
NG
Clean inside the urea water tank, refill urea water
OK
Clean the tank, and after refilling urea water, then turn ON the key
No error reappears
Returns to normal
Error reappears
2. Check urea water tank
NG
Replace urea water tank
OK
After replacing the urea water tank, then turn ON the key
No error reappears
Returns to normal
Error reappears
Replace urea water tank header
Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.
155326-00EN

● Work description

1. Checking the urea water concentration
   1- Check the urea water concentration. (In standards of AdBlue®, the urea water concentration is 32.5 ± 0.7%.)
   2- Makes sure liquid other than urea water is not in urea water tank.

NG	• Clean the inside of the urea water tank. • Refill it with urea water. • After treatment, if the key is turned ON and the error reappears, go to “Checking the urea water tank”.
OK	Returns to normal.

2. Checking the urea water tank
   1- Make sure that the urea water tank is not damaged or does not leak the urea water.
   2- Make sure that the cooling water does not flow into the urea water tank, which is caused by cracks or damages of cooling water piping circulating in the tank.

NG	• Replace the urea water tank. • After replacement, if the error reappears after turning the key ON, replace the urea water tank header. *Note: If the urea water tank is not a genuine YANMAR product, consult a YANMAR service representative before replacing the urea water tank header.*
OK	Returns to normal.

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