

DM

DIAGNOSIS MANUAL **REFORMER SYSTEM**

V1505-T-E4 (FOR ZERO TURN MOWER)

Kubota

I INFORMATION

INFORMATION

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1. SAFETY FIRST	I-1
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1. SAFETY FIRST

SAFETY FIRST

- This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.
- It is essential that you read the instructions and safety regulations before you attempt to repair or use this unit.



DANGER

- Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

- Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

- Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



IMPORTANT

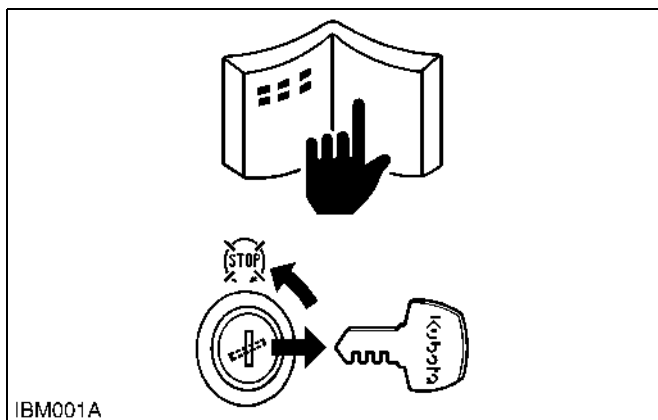
- Indicates that equipment or property damage could result if instructions are not followed.



NOTE

- Gives helpful information.

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BEFORE SERVICING AND REPAIRING

- Read all instructions and safety instructions in this manual and on your machine safety decals.
- Clean the work area and machine.
- Park the machine on a firm and level ground.
- Allow the engine to cool before proceeding.
- Stop the engine, and remove the key.
- Disconnect the battery negative cable.
- Hang a "DO NOT OPERATE" tag in operator station.

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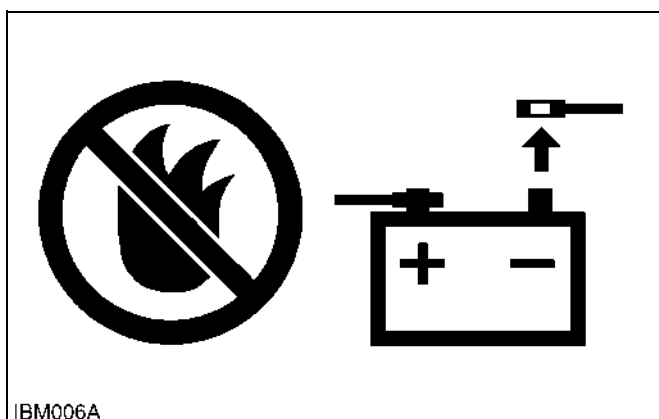
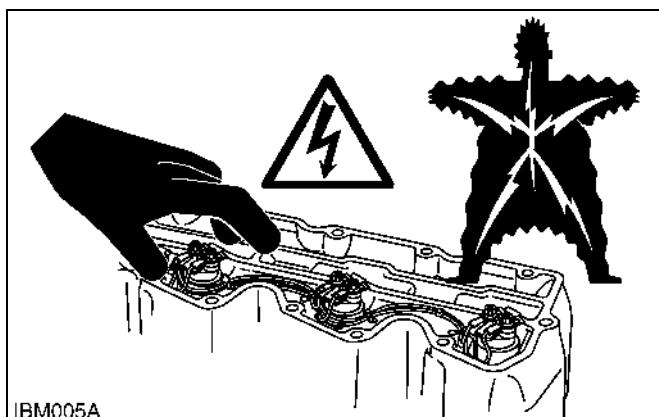
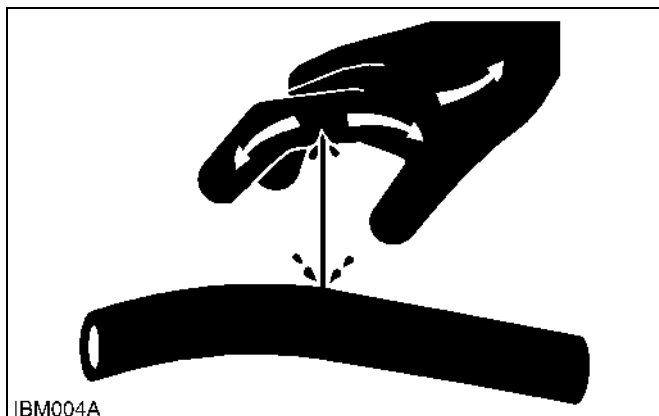
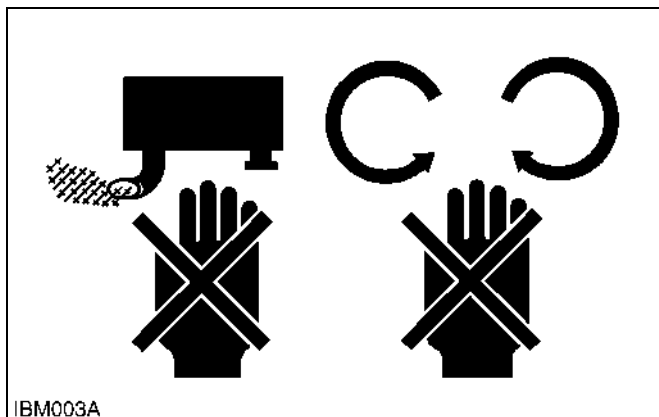
SAFETY STARTING

- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Unauthorized modifications to the engine may impair the function and / or safety and affect engine life.

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SAFETY WORKING

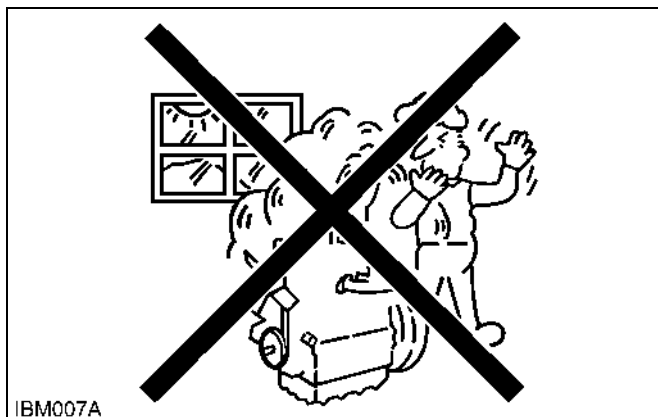
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.
- Do not open high-pressure fuel system. High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt to repair fuel lines, sensors, or any other components between the high-pressure fuel pump and injectors on engines with high pressure common rail fuel system.
- High voltage exceeding 100 V is generated in the ECU and injector. Pay sufficient caution to electric shock when performing work activities.

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AVOID FIRES

- Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
- Make sure that no fuel has been spilled on the engine.

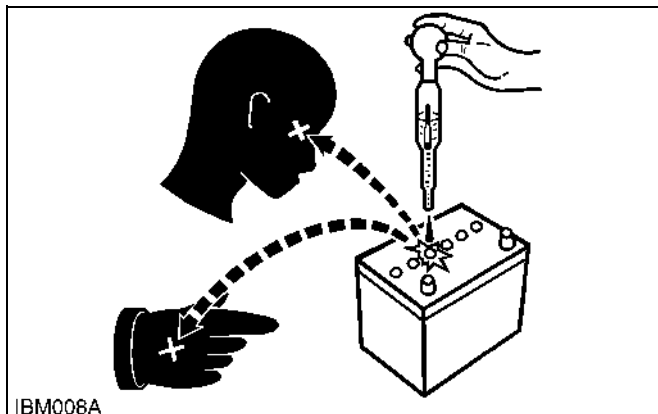
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VENTILATE WORK AREA

- If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.

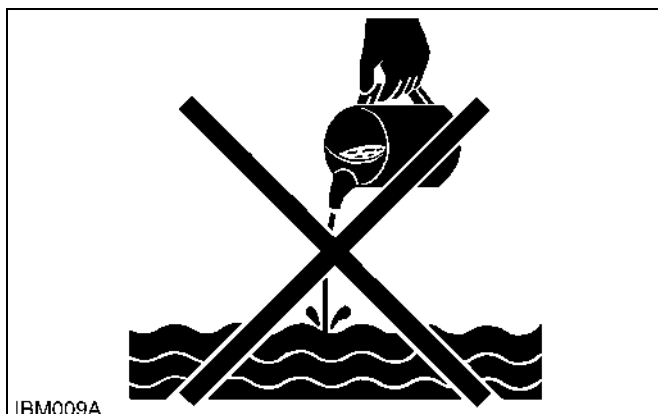
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PREVENT ACID BURNS

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, clothing and cause blindness if splashed into eyes. Keep electrolyte away from eyes, hands and clothing. If you spill electrolyte on yourself, flush with water, and get medical attention immediately.

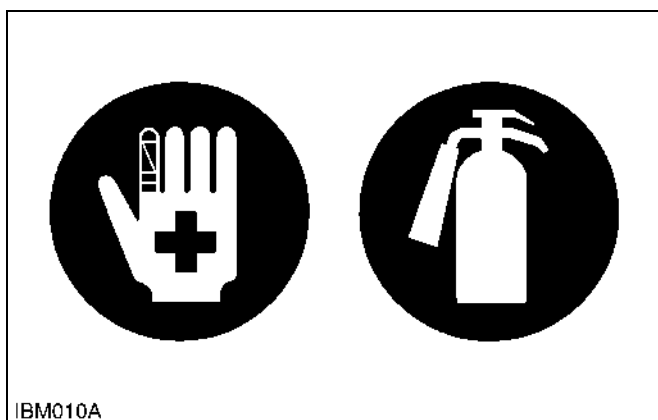
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DISPOSE OF FLUIDS PROPERLY

- Do not pour fluids into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, electrolyte and other harmful waste.

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PREPARE FOR EMERGENCIES

- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

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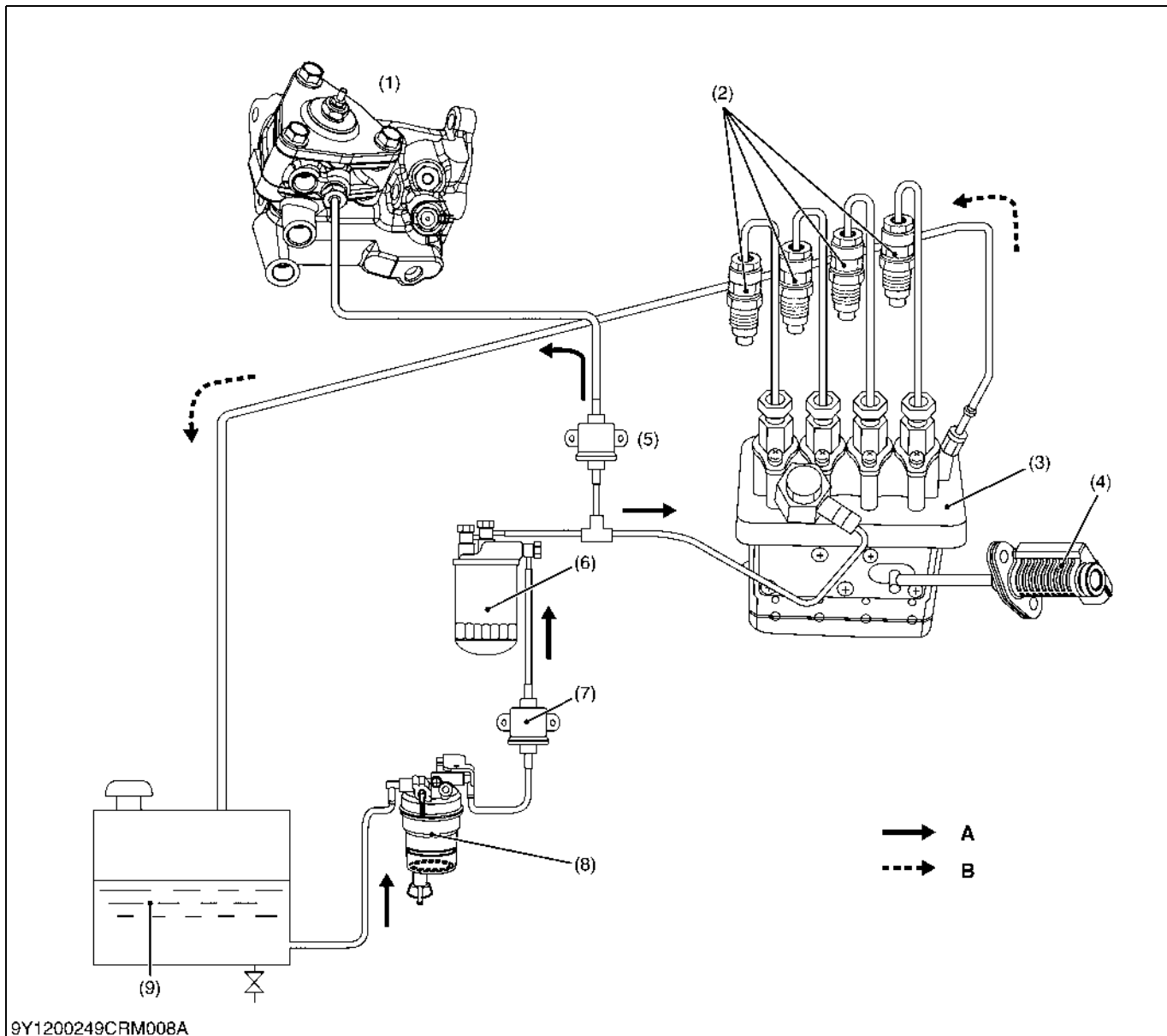
1 REFORMER SYSTEM

MECHANISM

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[2] FUEL SYSTEM



- (1) Fuel Reformer
- (2) Injection Nozzle
- (3) Injection Pump

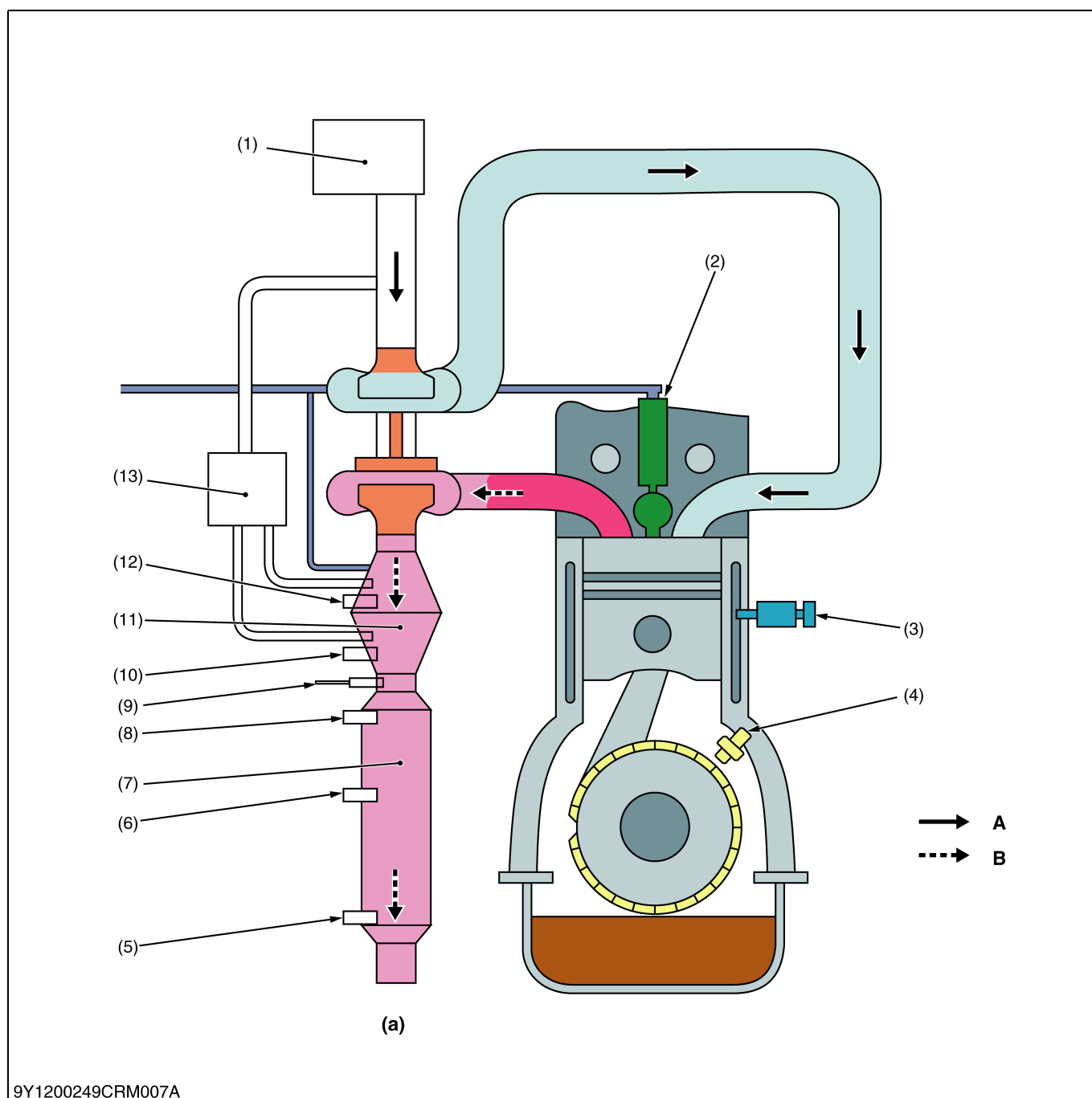
- (4) Rack Position Sensor
- (5) Fuel Feed Pump For Fuel Reformer
- (6) Fuel Filter

- (7) Fuel Feed Pump
- (8) Water Separator
- (9) Fuel Tank

A: Injected Fuel Flow
B: Returned Fuel Flow

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[3] INTAKE AND EXHAUST SYSTEM



- | | | | |
|---|---|---------------------------------------|----------------------------|
| (1) Air Cleaner | (6) Exhaust Gas Temperature Sensor 1 (T1) | (10) Burner Temperature Sensor (T4) | A: Intake Air Flow |
| (2) Injection Nozzle | (7) Diesel Particulate Filter | (11) Reformer | B: Exhaust Gas Flow |
| (3) Coolant Temperature Sensor | (8) Exhaust Gas Temperature Sensor (T0) | (12) Reformer Temperature Sensor (T3) | (a) To Muffler |
| (4) Engine Speed Sensor | (9) Differential Pressure Sensor | (13) Blower | |
| (5) Exhaust Gas Temperature Sensor 2 (T2) | | | |

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[4] AVAILABLE DATA MONITOR SIGNALS (LEVEL 1)

(1) Monitor Items

Classification		Signal Name	Unit	Terminal No.
Input	Rotary signal	Engine speed	/min (rpm)	—
	Analog signal	Accel Pedal Position	%	—
		Coolant Temperature	°C	—
		Coolant Temperature Sensor Output Voltage	V	—
		Atmospheric Pressure	kPa	—
		Atmospheric Pressure Sensor Output Voltage	V	—
		Battery Voltage	V	—
		Rack Position Sensor	—	—
		Rack Position Sensor Voltage	—	—
		Blower Pressure	—	—
		Blower Pressure Voltage	—	—
	Digital signal	Key switch	—	—
		Starter switch	—	—
		Neutral switch	—	—
		Alternator SW	—	—
		Glow SW	—	—

■ NOTE

- The signals marked with * are inputs from ECU for machine through CAN. Terminal names and terminal numbers have become invalid.

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Classification		Signal Name	Unit	Terminal No.
Output	Basic control signal	Engine Stop Flag	—	—
		Low Temperature Start Mode Flag	—	—
	Actuator	Glow Relay	—	—
		Fuel Feed Pump Relay	—	—
		Starter Relay	—	—
	DPF Data	Differential Pressure 1 Output Voltage	V	—
		Exhaust Gas Temperature 0 Output Voltage	V	—
		Exhaust Gas Temperature 1 Output Voltage	V	—
		Exhaust Gas Temperature 2 Output Voltage	V	—
		Differential Pressure 1	kPa	—
		Exhaust Gas Temperature 0	°C	—
		Exhaust Gas Temperature 1	°C	—
		Exhaust Gas Temperature 2	°C	—
		PM Sedimentation Quantity 1	mg	—
		Fuel Quantity after Regeneration	L	—
		DPF Regeneration Control Detailed Status	—	—
		Hour meter	h	—
		DPF Auto Regeneration Inhibit Time	sec	—
		DPF Regeneration Last Active Time	sec	—
		Regeneration Progress	%	—
		Parking SW	—	—
		DPF Auto Regeneration Inhibit SW	—	—
		DPF Manual Regeneration Force SW	—	—
		Oil Pressure SW	—	—
		Target speed of Isochronous control	/min (rpm)	—
		DPF Regeneration Control Level	—	—
		DPF Regeneration Control Status	—	—
	EGV Data	Electric Governor Solenoid Current	mA	—
		Target Rack Position	AD	—
		Actual Rack Position	AD	—
		Governor Characteristic	—	—

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(2) Normal Value

Classification		Signal Name	Unit	Engine Stops	During Start-Up	Idling	During Acceleration	During No-load Maximum Speed
In-put	Pulse / Rotary signal	Engine speed	min ⁻¹ (rpm)	0	0 → 1050 (Ordinary temperature)	Approx. 1050 (After warm-up)	Approx. 1050 → 2500	Approx. 2500 (After warm-up)
		Engine speed active flag	–	OFF	ON	ON	ON	ON
		Cam speed active flag	–	OFF	ON	ON	ON	ON
		Machine speed	km/h	When the machine stopped: 0				
	Analog signal	Final accelerator pedal position opening	%	0	0	0	0 → 100	100
		Coolant temperature	°C	Representative value: Approx. 20 °C (68 °F) → Approx. 2.4 V				
		Coolant temperature sensor voltage output	V	Representative value: Approx. 80 °C (176 °F) → Approx. 0.5 V				
		Atmospheric pressure	kPa	Representative value: Approx. 100 kPa → 3.7 V (Depending on the atmospheric pressure)				
		Atmospheric pressure sensor output voltage	V					
		Battery voltage	V	When stopped: Approx. 12.5 V When operating: Approx. 14 V (Depends on the battery charging condition, whether or not there is a load voltage, rotation speed)				
		Rack position sensor	V	Full scale voltage: 4.111 V (= 18 mm)				
	Digital signal	Key Switch	–	ON	ON	ON	ON	ON
		Start switch	–	OFF	ON	OFF	OFF	OFF
		Neutral switch	–	During neutral: ON				

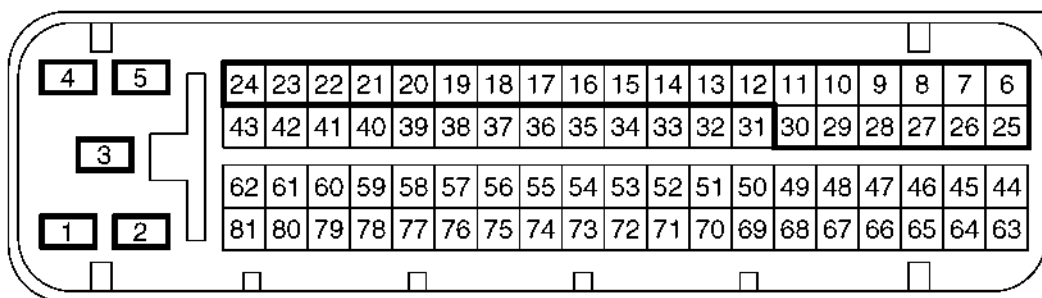
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Classification		Signal Name	Unit	Engine Stops	During Start-Up	Idling	During Acceleration	During No-load Maximum Speed
Out-put	Basic control signal	Engine stop flag	–	ON	OFF	OFF	OFF	OFF
		Actuator	A	When Engine stops: Approx. 0 A When Full stroke: Approx. 2.5 A				

Classification		Signal Name	Unit	Engine Stops	During Start-Up	Idling	During Acceleration	During No-load Maximum Speed
Out-put	Actuator	Glow relay	–	Only during cold start-up (before-and-after): ON				
	DPF data	Differential pressure 1	kPa	Input range: –1.7 to 34.5 kPa Output range: 0.5 to 4.5 V				
		Differential pressure 1 sensor output voltage	V					
		Exhaust gas temperature 0	°C	Representative value: Approx. 100 °C (212 °F) → Approx. 4.4 V Representative value: Approx. 250 °C (482 °F) → Approx. 2.3 V				
		Exhaust gas temperature 0 sensor output voltage	V					
		Exhaust gas temperature 1	°C	Representative value: Approx. 100 °C (212 °F) → Approx. 4.4 V Representative value: Approx. 250 °C (482 °F) → Approx. 2.3 V				
		Exhaust gas temperature 1 sensor output voltage	V					
		Exhaust gas temperature 2	°C	Representative value: Approx. 100 °C (212 °F) → Approx. 4.4 V Representative value: Approx. 250 °C (482 °F) → Approx. 2.3 V				
		Exhaust gas temperature 2 sensor output voltage	V					
		Reformer temperature	°C	Representative value: Approx. 100 °C (212 °F) → Approx. 4.4 V Representative value: Approx. 250 °C (482 °F) → Approx. 2.3 V				
		Reformer temperature sensor output voltage	V					
		Burner temperature	°C	Representative value: Approx. 100 °C (212 °F) → Approx. 4.4 V Representative value: Approx. 250 °C (482 °F) → Approx. 2.3 V				
		Burner temperature sensor output voltage	V					

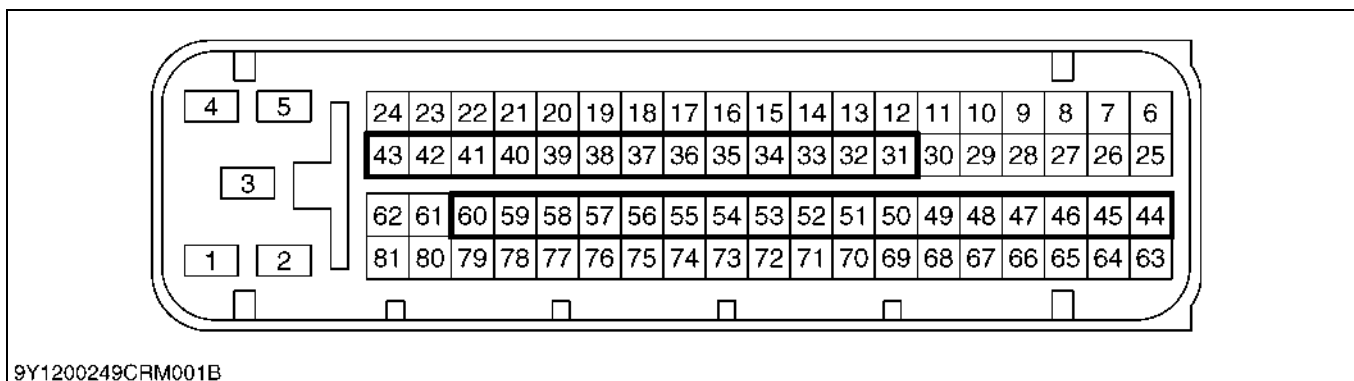
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[5] ECU TERMINAL LAYOUT

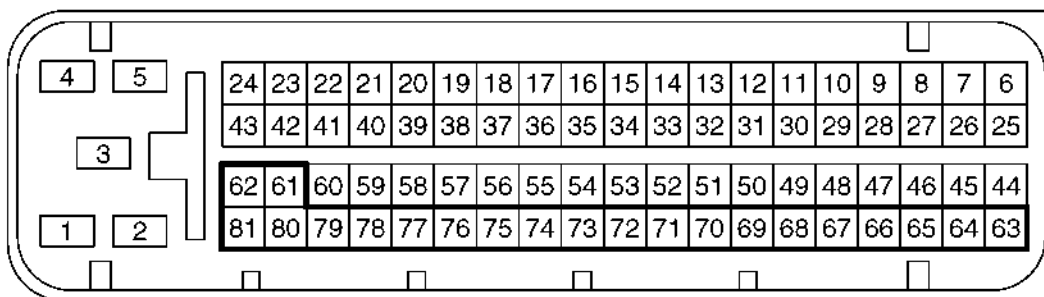


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No.	Signal Name
1	Battery (+B)
2	Battery (+B)
3	Blower motor [Reformer]
4	Blower motor [Reformer]
5	Glow plug [BURNER]
6	Pressure Sensor Signal [Blower]
7	Blank
8	Rack position sensor Signal
9	GND (A) [Rack position sensor]
10	GND (A) [Accel position sensor]
11	5 V (A) [Rack position sensor]
12	Solenoid (-) [Elc. Gov]
13	Blank
14	GND [12 V Output]
15	Engine Error Output
16	12 V Output [Engine speed sensor]
17	Fuel Feed Pump [Reformer]
18	Blank
19	GND
20	Solenoid valve 1 [Reformer]
21	Solenoid valve 2 [Reformer]
22	Starter relay
23	Blank
24	Fuel feed pump (engine) output
25	Pressure Sensor Signal [DPF]
26	Accel Position 2
27	Accel Position 1
28	GND (A) [Pressure Sensor]
29	5 V (A) [Pressure Sensor]
30	5 V (A) [Accel position sensor]



No.	Signal Name
31	GND [INJ-Shield]
32	Blank
33	GND
34	Auto DPF Regeneration Lamp
35	Parked Regeneration Lamp
36	Blank
37	Blank
38	GND [for Service Tool]
39	Motion Control Lever Switch
40	Starter-Switch [Terminal 50]
41	Blank
42	Blank
43	IG-Switch [Terminal Acc]
44	Blank
45	CAN2-H (for Vehicle)
46	Blank
47	CAN2-L (for Vehicle)
48	GND (A) [Water Temp. Sensor]
49	Blank
50	Blank
51	Blank
52	Blank
53	GND (A) [Gas Temp. Sensor]
54	Engine speed sensor Signal
55	DPF IN Temp. Sensor (T1)
56	DOC IN Temp. Sensor (T0)
57	Water temp. sensor [signal]
58	Reformer Temp. Sensor (T3)
59	PTO Switch
60	Blank



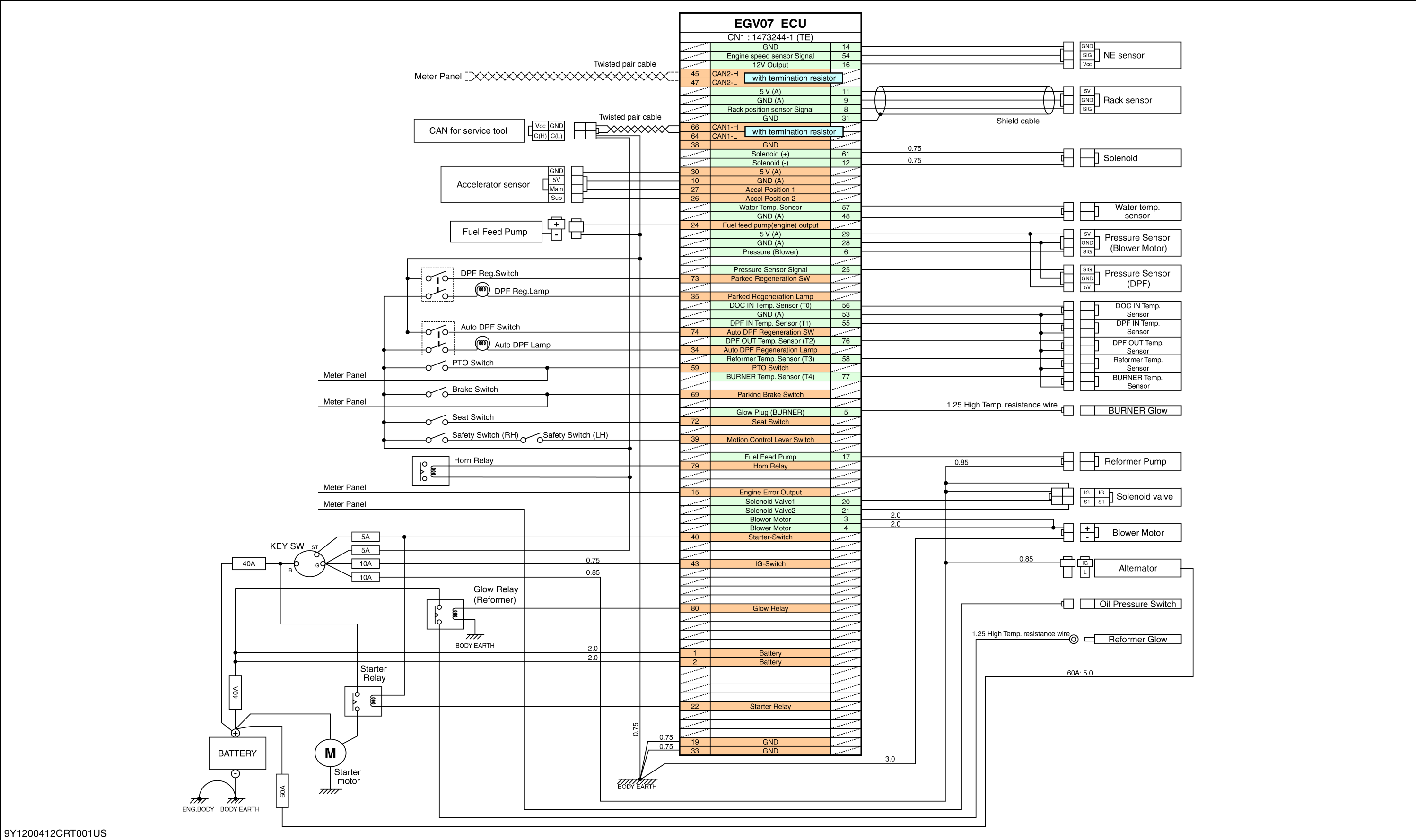
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No.	Signal Name
61	Solenoid (+) [Elc. Gov]
62	Blank
63	Blank
64	CAN1-L (for Service Tool)
65	Blank
66	CAN1-H (for Service Tool)
67	Blank
68	Blank
69	Parking Brake Switch
70	Blank
71	Blank
72	Seat Switch
73	Parked Regeneration Switch
74	Auto DPF Regeneration Switch
75	Blank
76	DPF OUT Temp. Sensor (T2)
77	BURNER Temp. Sensor (T4)
78	Blank
79	Horn Relay
80	Glow relay [Reformer]
81	Blank

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2. WIRING DIAGRAM

[1] ZD1511



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SERVICING

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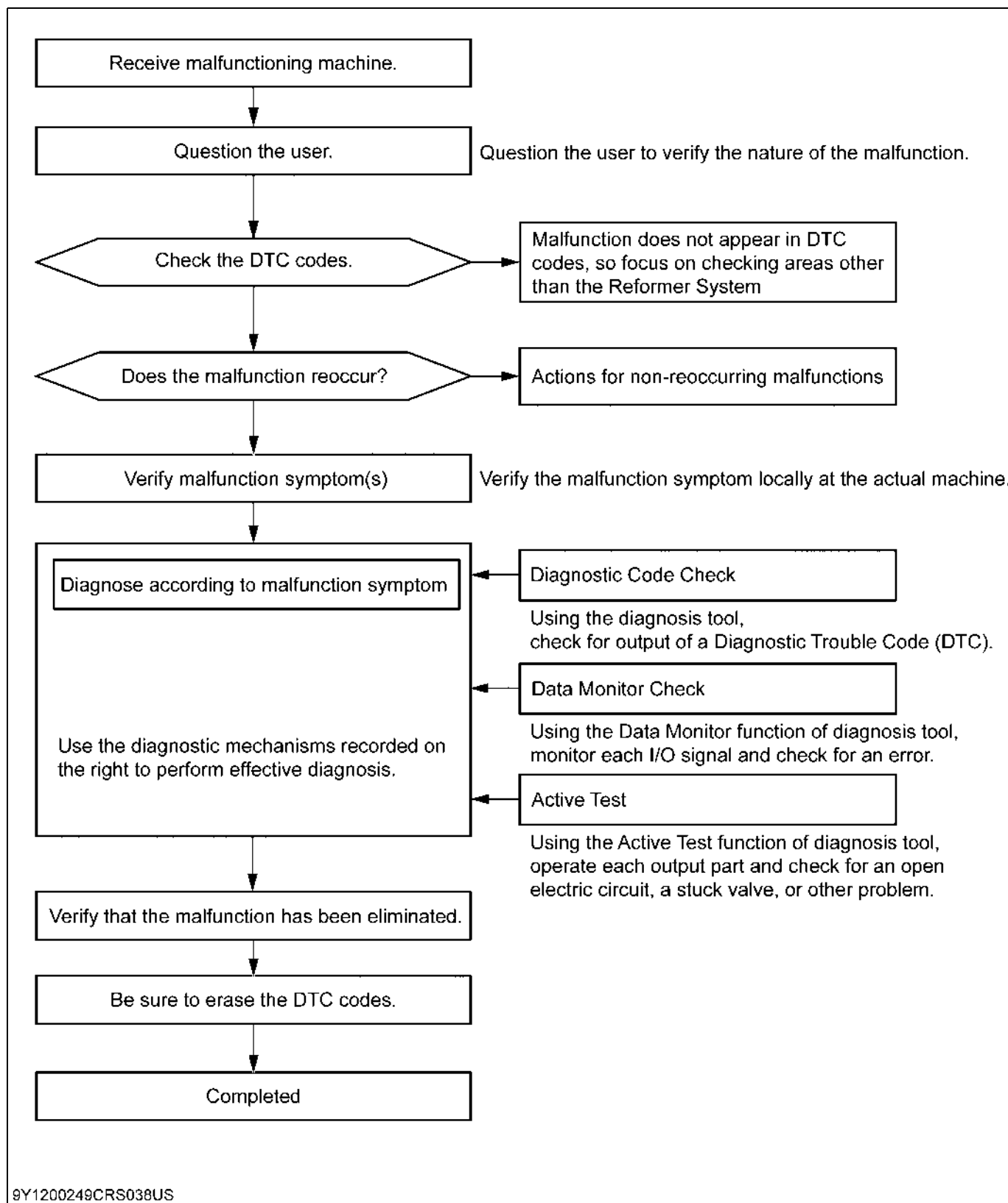
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(46)All Exhaust Gas Temperature Sensor Failure (DTC P3018 / 523599-0)	1-S200
(47)High Exhaust Gas Temperature After Emergency High Temperature DTC (DTC P3023 / 523601-0)	1-S201
(48)High Frequency of Regeneration (DTC P3024 / 523602-0)	1-S202
7. INSPECTION PROCEDURE FOR EACH SYSTEM.....	1-S203
[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE	1-S203
[2] FUEL SYSTEM INSPECTION PROCEDURE	1-S204
[3] ELECTRIC SYSTEM INSPECTION PROCEDURE	1-S208

(1) Basics Of Checking Electrical / Electronic Circuit Systems.....	1-S208
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1. GENERAL

[1] OVERALL DIAGNOSTIC PROCEDURE



9Y1200412RSS0001US0

[2] QUESTIONING

- Use the trouble check sheet to ensure that the customer's explanation is fully understood.
- Accurately judge information concerning the malfunction.
Grasp the situation firmly, using five 5W1H (Who, What, When, Where, Why, How) as a basis.
Ex: Low ambient temperature, starting, normal conditions, proximity to engine, metallic noise, etc.

(Reference)

Do not ask random questions. Ask questions that will aid in narrowing down the possible malfunctioning system while making educated guesses based on the malfunction symptoms.

9Y1200412RSS0002US0

Questioning Points

What?	Malfunction symptom
When?	Date, time, frequency of occurrence.
Where?	Field conditions
What were conditions like at the time of malfunction?	Driving conditions, operating conditions, weather.
What happened?	Type of malfunction.

9Y1200412RSS0003US0

3EEABAH1P002A

Trouble Check Sheet for KUBOTA Reformer System

When the machine is received from the customer, it is necessary to verify the "malfunction symptoms" and the "generated malfunction data" with the customer. This is performed based on the trouble check sheet.

(1) Trouble Check Sheet

Because:

- The malfunction symptom may not be reproduced at the workshop.
- The customer's complaint does not always match the malfunction.
- If the person performing repairs is not working from the correct malfunction symptoms, man-hours will be wasted.

The question chart can aid the service person in diagnosing, repairing and verifying repair work.

9Y1200412RSS0004US0

Trouble Check Sheet			
Machine details			
Customer name			
Customer address			
Machine model		Machine serial number	
Engine serial number		Purchase date	
Repair date		Hourmeter indicator	hours
Warranty			
Warranty Judgment	☐ Yes		☐ No
Defective parts	☐ Injection Nozzle		☐ Fuel Pump
	☐ Fuel Filter		☐ Others ()
Replace parts details			
Injection Nozzle	Defective Injection Nozzle	☐ Injection Nozzle 1	☐ Injection Nozzle 2
		☐ Injection Nozzle 3	☐ Injection Nozzle 4
Actual part replacement	☐ Injection Nozzle		☐ Fuel Pump
	☐ ECU		☐ Fuel Filter
	☐ Others ()		
Customer complaint			
☐ 1. Engine no start	☐ a. No initial combustion		☐ b. No complete combustion
	☐ c. No cranking		
☐ 2. Difficult to start	☐ a. Engine crank slowly		
	☐ b. Others ()		
☐ 3. Poor idling	☐ a. Incorrect first idle		☐ b. Noise
	☐ c. Hunting idle from () to () min ⁻¹ (rpm)		
	☐ d. High idling () min ⁻¹ (rpm)		
	☐ e. Low idling () min ⁻¹ (rpm)		
	☐ f. Rough		
	☐ g. Others ()		
☐ 4. Poor driveability	☐ a. Hesitation		☐ b. Surging
	☐ c. Knocking		☐ d. Lack of power
	☐ e. Others ()		
☐ 5. Abnormal smoke	☐ a. Black		☐ b. White
	☐ c. Others ()		
☐ 6. Fuel leakage	☐ a. Large quantity		☐ b. Blurred
	Leaking from:	☐ Injection Nozzle	☐ Fuel Pump
		☐ Others ()	
☐ 7. Engine not stop			
☐ 8. Engine stall			
☐ 9. Others			

9Y1200412RSS0005US0

Condition when problem occurs (Duplicated answers can be possible)		
1. Weather	☐ a. Fine	☐ b. Cloudy
	☐ c. Rainy	☐ d. Snow
	☐ e. Flood	
	☐ f. Others ()	
2. Outdoor temperature	Approx. °C (°F)	
3. Altitude	Approx. m	
4. Engine coolant	☐ a. Cold	Write the position of the indicator on coolant temperature gauge.  9Y1200058ENI031A
	☐ b. Warming up	
	☐ c. After warming up	
	☐ d. Any temperature	
	☐ e. Others ()	
5. Engine operation	☐ a. Starting	☐ b. Just after starting
	☐ c. Idling	☐ d. Racing
	☐ e. Acceleration	☐ f. Deceleration
	☐ g. While at work	
	☐ h. Others ()	
6. Problem frequency	☐ a. Constant	☐ b. Once only
	☐ c. Sometime (Time per day/month)	
7. Engine warning light	☐ Turn on a light	☐ Turn off a light
8. Optional parts	Fill the parts in if you use optional parts or non-genuine parts for electrical, intake/exhaust and fuel system. ()	
Dealer check		
1. Duplicate the problem	☐ a. Yes (Duplicate)	☐ b. No (Not occur)
2. Diagnosis trouble code	☐ a. Abnormal (What is code)	
	☐ b. Normal (No code)	
3. Appearance	☐ a. Normal	☐ b. Cracked
	☐ c. Discolored	
	☐ d. Others ()	
4. Fuel condition	☐ a. Normal	
	☐ b. Abnormal ()	

9Y1200412RSS0006US0

[3] LIST OF MALFUNCTION SYMPTOM

Malfunctions and corresponding symptoms resulting from the fuel reformer may also be generated from other sources, such as the engine (mechanical parts), the fuel system, etc. When performing fuel reformer troubleshooting, the aim is not to quickly determine that the fuel reformer is the cause of a malfunction. Rather, the cause should be exhaustively considered while verifying the causes listed below.

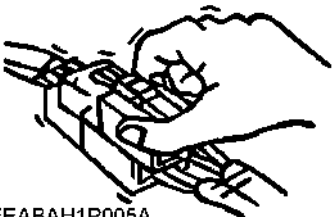
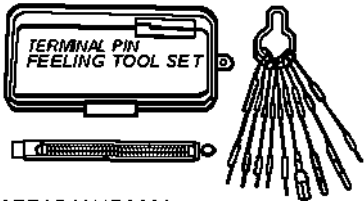
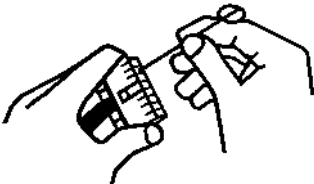
Malfunction symptom	Area of Fault	Cause	Action
Engine overheat	Fuel system	Poor fuel	Switch to the correct fuel (No.2-D diesel fuel).
	Lubrication system	Engine oil deterioration.	Change engine oil.
		Inappropriate engine oil.	Replace with the appropriate engine oil (API Service Classification CJ-4 grade or higher).
		Faulty oil pump.	Replace oil pump.
		Insufficient engine oil level	Add engine oil.
Insufficient output	Intake system	Clogged air cleaner element.	Clean or replace air cleaner element.
	Fuel system	Air mixed with the fuel system.	Perform fuel system air bleeding.
		Faulty fuel filter.	Replace fuel filter.
		Poor or inappropriate fuel.	Switch to the correct fuel (No.2-D diesel fuel).
	Engine	Worn cylinder liner and the piston ring of the piston. (Low compression pressure)	Overhaul engine.
	Other	Overheat	Refer to "Engine Overheat" items.
Faulty starting	Intake system	Clogged air cleaner element.	Clean or replace air cleaner element.
	Fuel system	Insufficient fuel.	Add fuel and perform fuel system air bleeding.
		Fuel system clogged.	Clean the fuel system.
		Large amount of intermixing water to the water separator, element clogging and deformation.	Clean or replace.
		Air being introduced through fuel system connection points.	Tighten connections.
		Clogged fuel filter	Replace fuel filter.
		Fuel feed pump operation fault.	Replace fuel feed pump.
		Injection pipe connection loose.	Tighten connecting nut.
	Electrical system	Battery fault	Inspect battery.
		Faulty starter wiring.	Replace starter wiring.
		Loose battery cable.	Tighten battery terminal connections, or replace cables.
		Faulty starter operation.	Replace starter assembly.
		Starting assist device (glow plug) fault.	Replace starting assist device (glow plug).
	Lubrication system	Excessive engine oil viscosity.	Replace with oil of appropriate viscosity.
	Engine	Burnt pistons.	Replace piston, piston ring and cylinder block.
		Burnt main bearing.	Replace main bearing and crankshaft.
		Low compression pressure.	Overhaul engine.
	Other	Ring gear damage.	Flywheel / starter replacement.
Idle fault	Engine	Poor valve clearance	Adjust valve clearance.
		Poor valve seat contact.	Break in valve and valve seat, or replace.
		Low coolant temperature.	Perform warm-up operation.
		Large difference in cylinder-to cylinder compression pressure.	Overhaul engine.

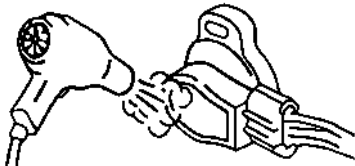
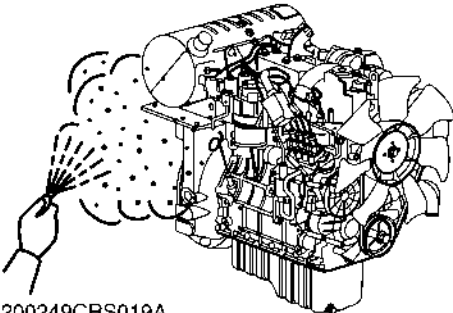
9Y1200412RSS0007US0

[4] ACTIONS FOR NON-REOCCURRING MALFUNCTIONS

- In cases where the malfunction does not reoccur, perform the actions below to determine the cause of the malfunction.
- In cases where the malfunction does not reoccur at the dealer, sales company or workshop, perform the work that actually caused the malfunction.
- Check the fuel pipe system [including the fuel feed pump (electromagnetic pump) and tank], intake system and exhaust system.
- If the malfunction does not reoccur, there may be an ECU malfunction. For diagnostic purposes only, temporarily replace the ECU with a unit that functions normally to perform the check procedure. At the same time, be sure to perform difference learning for the supply pump and input QR Code for injectors. If there would be no change, ECU should not be replaced.

9Y1200412RSS0008US0

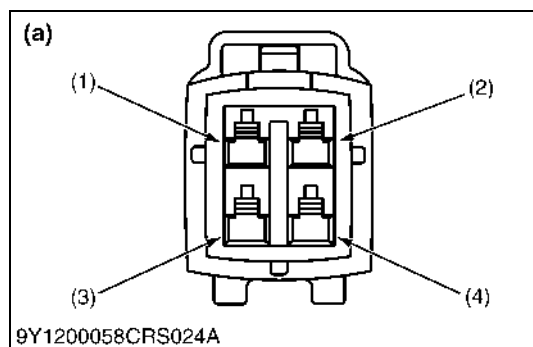
Action	Malfunction symptom		
	Dead battery	Engine will not start	Idle speed abnormal engine stall sluggish poor acceleration
Verify that there is no Diagnostic Trouble Code (DTC) stored in the memory.	—	○	○
Using the trouble check sheet as a base, perform a reoccurrence test in "Reoccurrence" mode. Use this data (engine ECU (PCM) voltage value, etc.) to determine the cause of the malfunction.	○	○	○
Assume that an electrical system wiring harness or connector is the cause of the malfunction and vibrate these components by hand to verify whether or not a malfunction occurs and a DTC is generated.  3EEABAH1P005A	—	○	○
Assume that an electrical system female connector terminal is the cause of the malfunction and verify that the connection points are not defective. Recommended Tools: KOWA Precision Handling Feeling Tool Set (KLM-10- 20) Depending on the terminal, a matching size may not be available.  3EEABAH1P006A Insert the male terminal that matches the shape of the female terminal and check for looseness.  3EEABAH1P007A	—	○	○

Action	Malfunction symptom		
	Dead battery	Engine will not start	Idle speed abnormal engine stall sluggish poor acceleration
Heat the accelerator sensor and other electrical components with a hair dryer. Verify whether or not the voltage value (resistance value) changes. ■ NOTE - Do not exceed 60 °C (140 °F) (still touchable by hand) when heating. - Do not remove the component case and add heat directly to electronic parts.  3EEABAH1P008A	—	—	○
Verify whether or not malfunction symptoms occur under heavy engine loads (headlights, A/C, wiper, etc. switches ON).	○	—	○
If any commercial electrical products have been installed, remove them and verify whether or not the malfunction symptoms occur.	○	○	○
If it is thought that the malfunction occurs in rainy or high temperature weather, spray the machine with water and verify whether or not the malfunction occurs. ■ NOTE - Do not spray water directly onto the engine. Spray water mist on the entire surface of the radiator to indirectly change the temperature and humidity of the engine compartment. - Do not spray water directly on electrical parts.  9Y1200249CRS019A	○	○	○

9Y1200412RSS0009US0

2. DIAGNOSTIC TOOL CONNECTION PROCEDURE

[1] DIAGNOSTIC CONNECTOR POSITIONS



1. Refer to the operator's manual for this machine to check the position for connecting the diagnosis tool.

- (1) Terminal IG-SW (No.43)
- (2) Terminal CAN1-H (No.66)
- (3) Terminal S-GND (No.48)
- (4) Terminal CAN1-L (No.64)

(a) CAN1 Connector

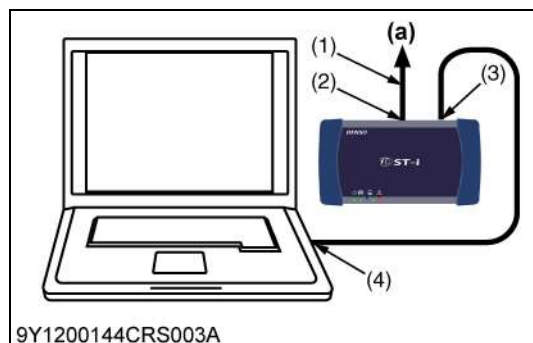
9Y1200412RSS0010US0

[2] DIAGNOSTIC TOOL CONNECTION PROCEDURE

■ IMPORTANT

- At first time usage, it is necessary to do "Communication Setting" with administrator user account.
- Prepare a PC on which the diagnostic software has already been installed.
- When connecting the diagnosis cable, ensure that the key switch on the machine side is OFF.

9Y1200412RSS0011US0



1. Start up a PC on which the diagnostic software has been installed with administrator user account.
2. Connect the machine-side CAN1 connector (a) to the interface connector (To Machine) (2) with the cable (To Machine) (1).
3. Connect the cable (USB) (4) to the USB connector (To PC) (3) and then connect the USB cable to the USB port on PC.
4. Start the diagnostic software.
5. Select "Communication Setting" from "System Setting" in the menu and execute. (Only when performing the initial settings.)

■ NOTE

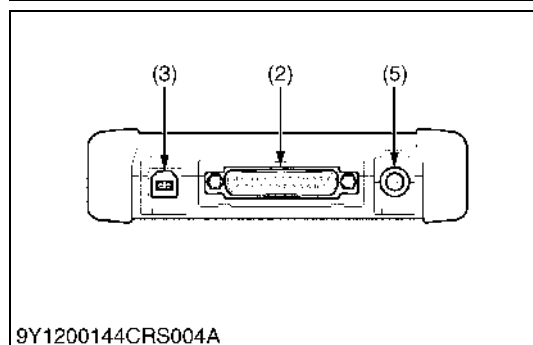
- The USB port used while the "Communication Setting" process, should always be used.

- (1) Cable (To Machine)
- (2) Interface Connector (To Machine)
- (3) USB Connector (To PC)*
- (4) Cable (USB)
- (5) DC Jack (Reserved)*

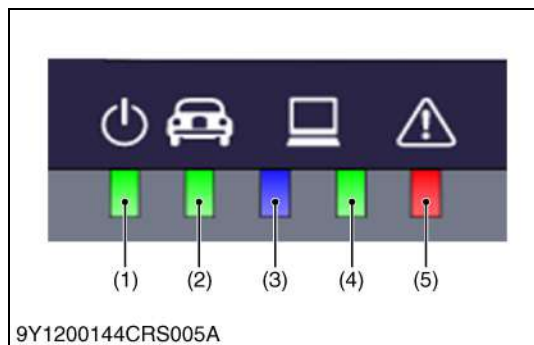
(a) CAN1 Connector

* Rubber cap is attached to USB connector and DC jack each

9Y1200412RSS0012US0



[3] CHECKING THE COMMUNICATION OPERATION OF THE INTERFACE (DST-i)



The communication operation can be checked with the illuminating condition of the five indicators on the DST-i unit.

If a communication error occurs, check the illuminating condition of each indicator and repair or replace the malfunction (including cable open circuits).

- (1) Power Indicator
- (2) Machine Communication Indicator
- (3) PC Communication (Bluetooth) Indicator
- (4) PC Communication (USB) Indicator
- (5) Error Detection Indicator

No.	Type of LED	Color	LED Status	Details
(1)	Power Indicator	Green	Light OFF	Power OFF
			Light ON	Power is supplied from machine cable or USB cable
(2)	Machine Communication Indicator	Green	Light OFF	Stand-by for communication
			Light Flashing (synchronized with communication)	Communication in progress
(3)	PC Communication (Bluetooth) Indicator	Blue	Reserved	Bluetooth communication status (Bluetooth is option)
(4)	PC Communication (USB) Indicator	Green	Light OFF	USB cable has not connected to PC or USB driver has not installed to PC
			Light ON	Stand-by for communication
			Light Flashing	Stand-by for establishment of communication
			Light Flashing (synchronized with communication)	Communication in progress
(5)	Error Detection Indicator	Red	Light OFF	Normal conditions
			Light Flashing	Error occurs

9Y1200412RSS0013US0

DST-i operation Status and Display Specification

■ Light Operation During Normal Conditions

DST-i Status	LED Status			
	Power	Machine	USB	Error
Power OFF	□	□	□	□
Power ON	■	□	□	□
USB stand-by status	■	□	●	□
USB cable has not connected to PC or USB driver has not installed to PC	■	□	□	□
Machine stand-by for communication	■	□	■	□
Machine / USB communication in progress	■	★	★	□

■ Light Operation During Abnormal Operation

DST-i Status	LED Status			
	Power	Machine	USB	Error
System Error	■	●	●	●
	■	■	■	●

□: Light OFF

■: Light ON

●: Light Flashing

★: Light Flashing (Synchronized with communication)

9Y1200412RSS0014US0

[4] CHECKING THE OPERATION OF THE ECU

(1) Starting Diagmaster

1. Double-click the Diagmaster icon on your computer desktop

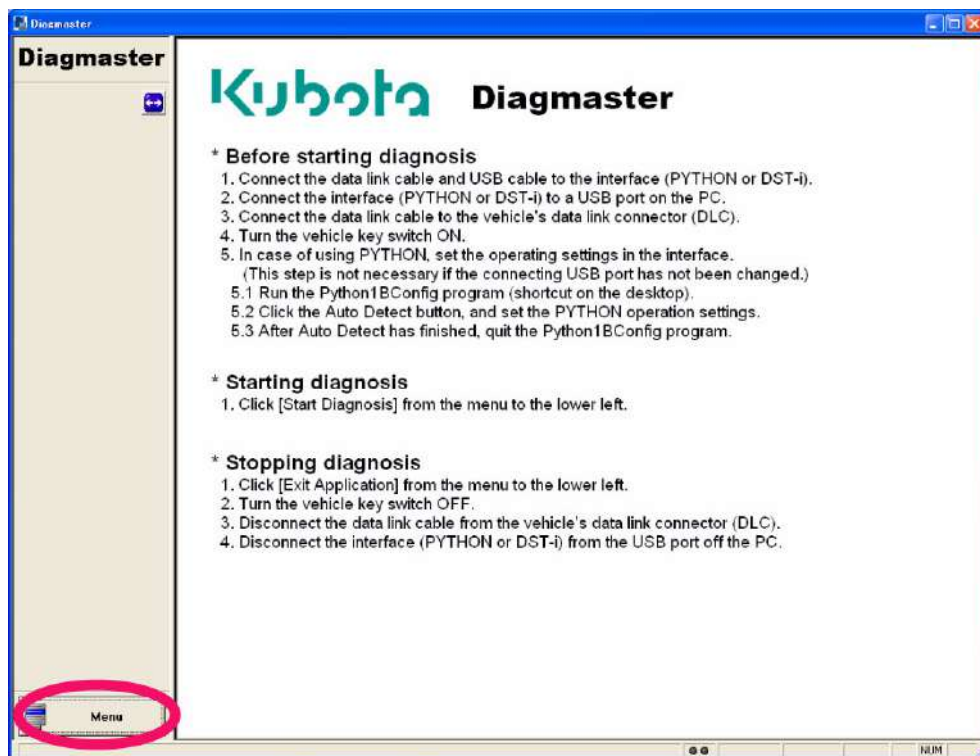


If you connected Diagmaster to ECU already, below screen appears.

2. Enter your "User ID" and "Password", and then click the  button.



3. The Diagmaster initial screen appears.



4. If you do not connected the Diagmaster to ECU, below screen appears.

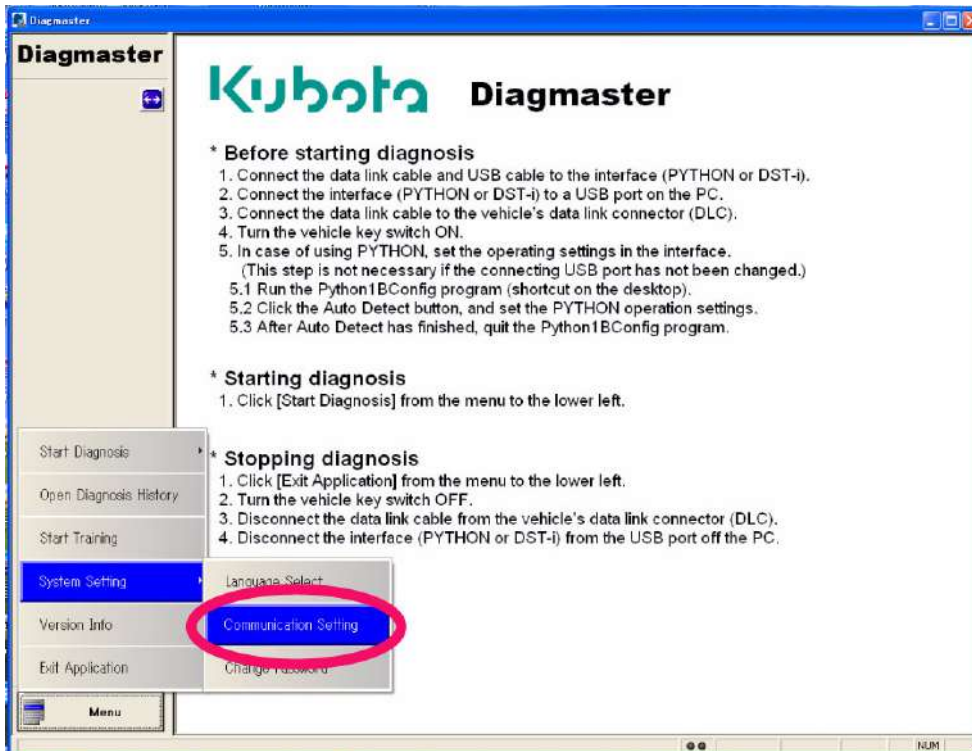


Select the Diagmaster 05, and then click the  button.

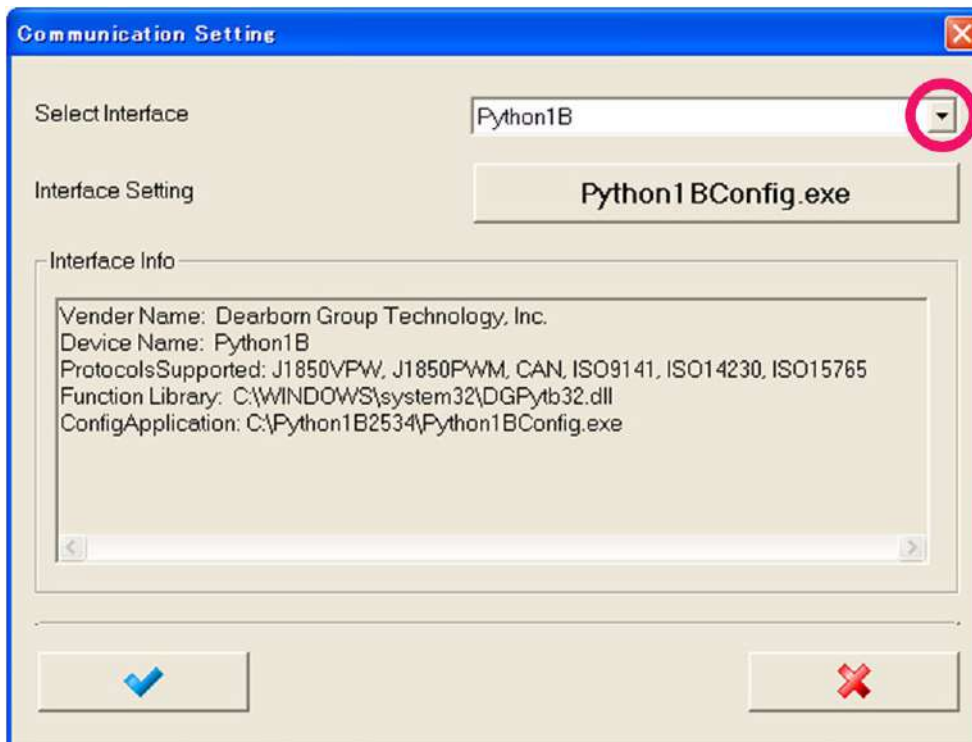
9Y1200412RSS0015US0

(2) DST-i Communication Settings

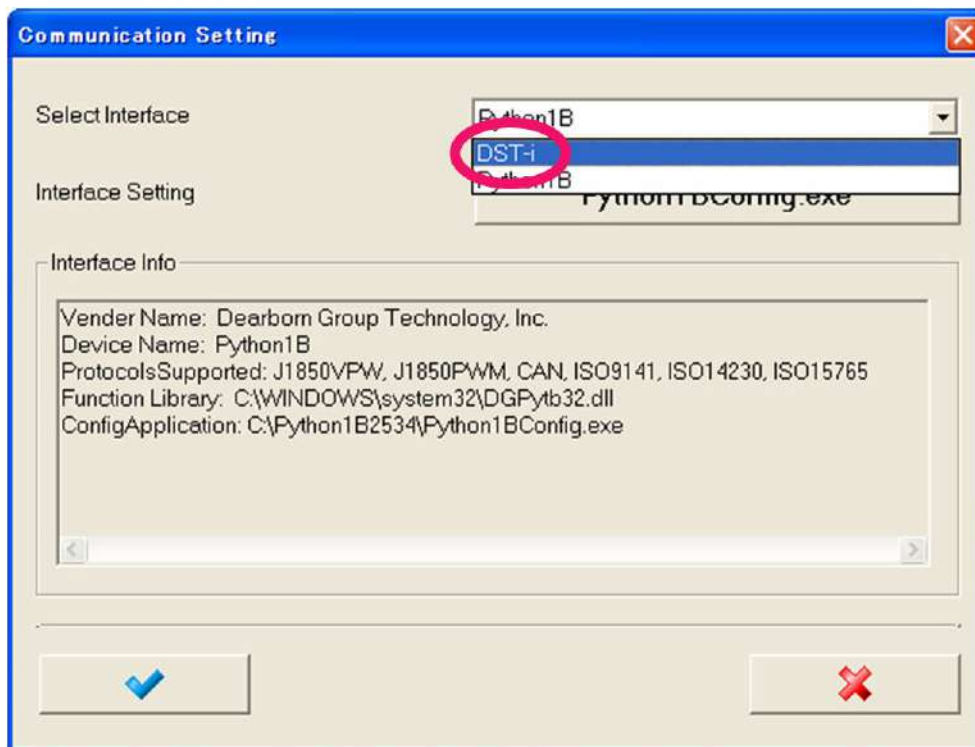
1. From the "Menu", select "System Setting", and then "Communication Setting"



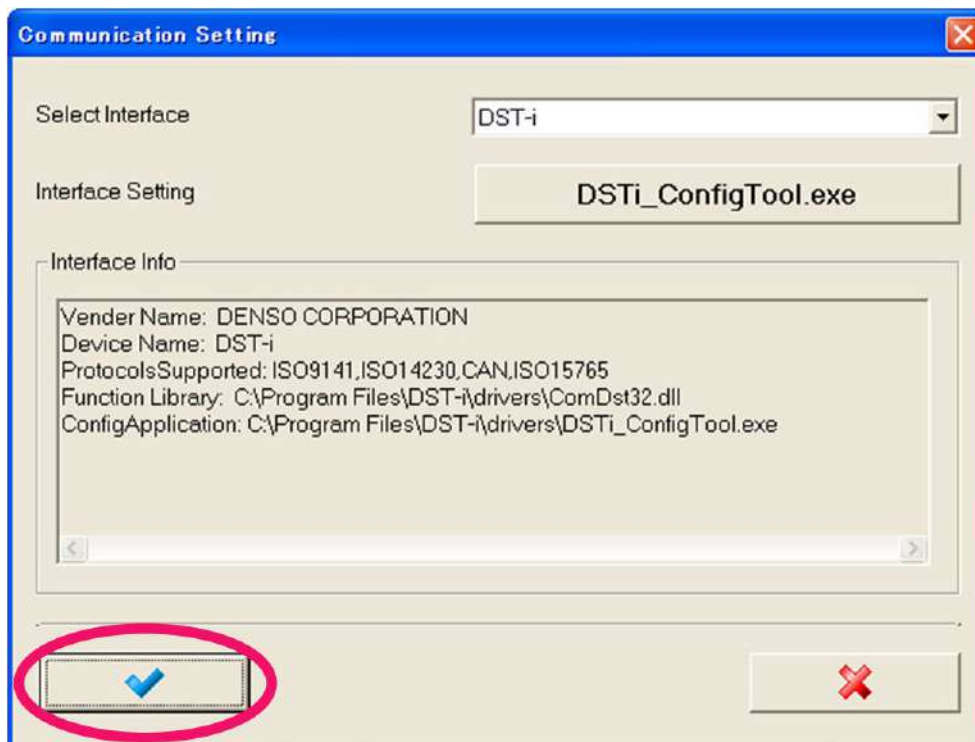
2. Click the interface select button.



3. Select "DST-i", and then click the mouse button.



4. Click the  button.

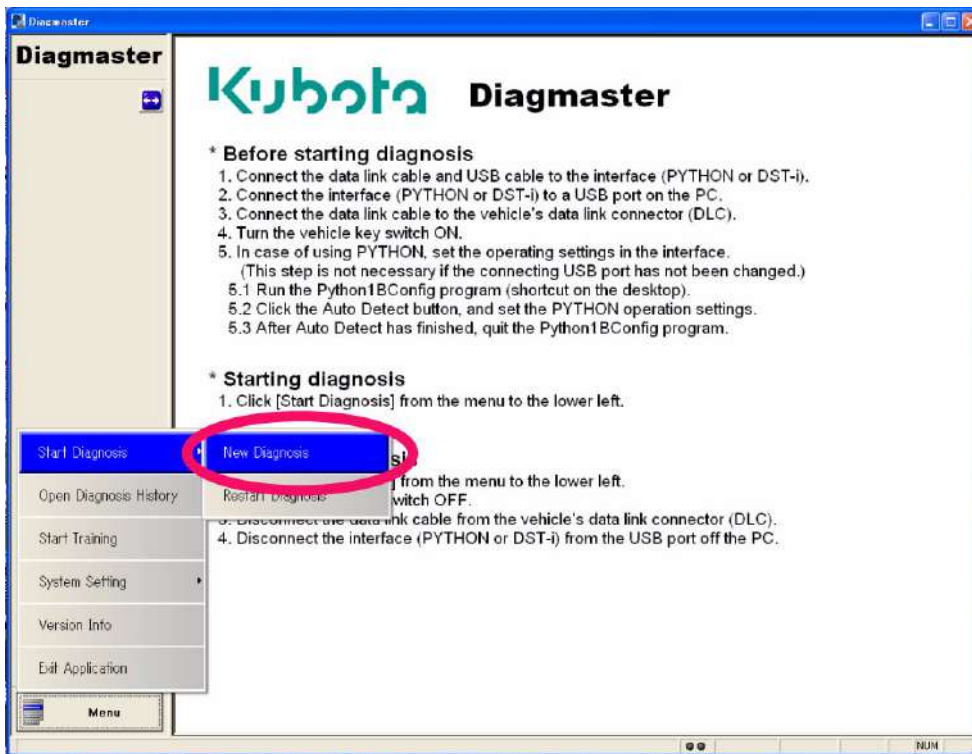


■ **NOTE**

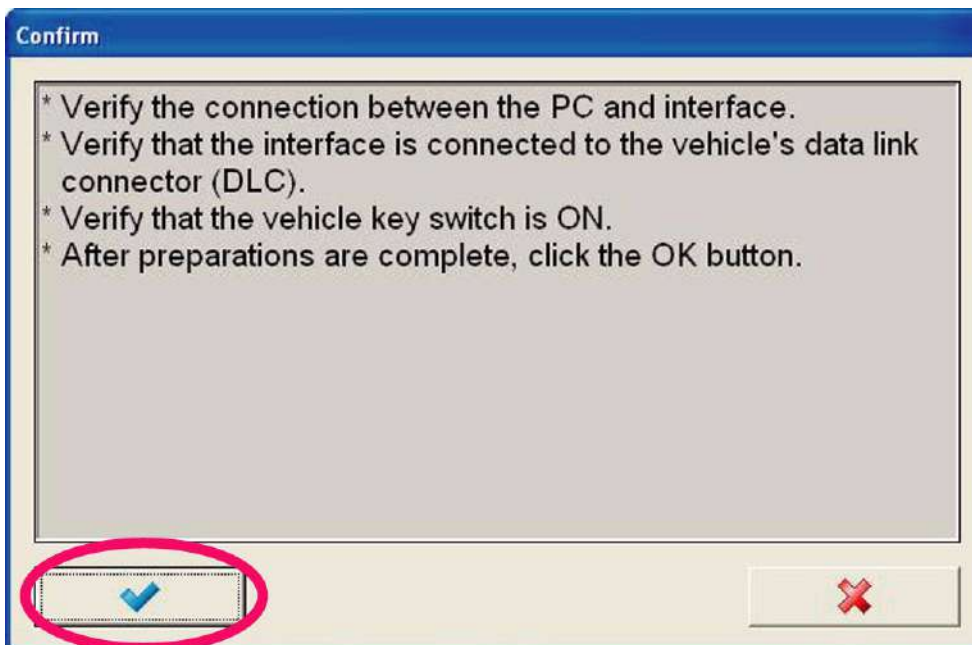
- If you failed in the setting, confirm the connection and start again from procedure 1. to 4..

9Y1200412RSS0016US0

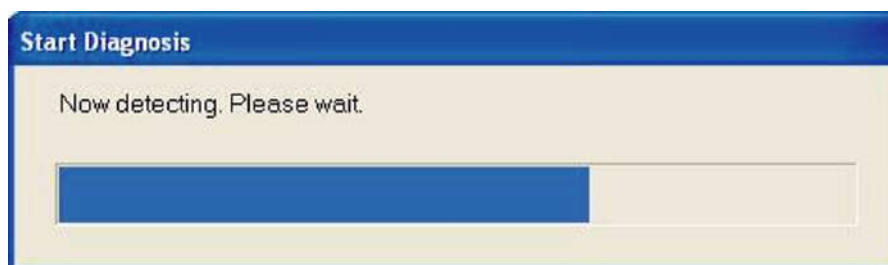
5. From "Menu", select "Start Diagnosis", and then "New Diagnosis".



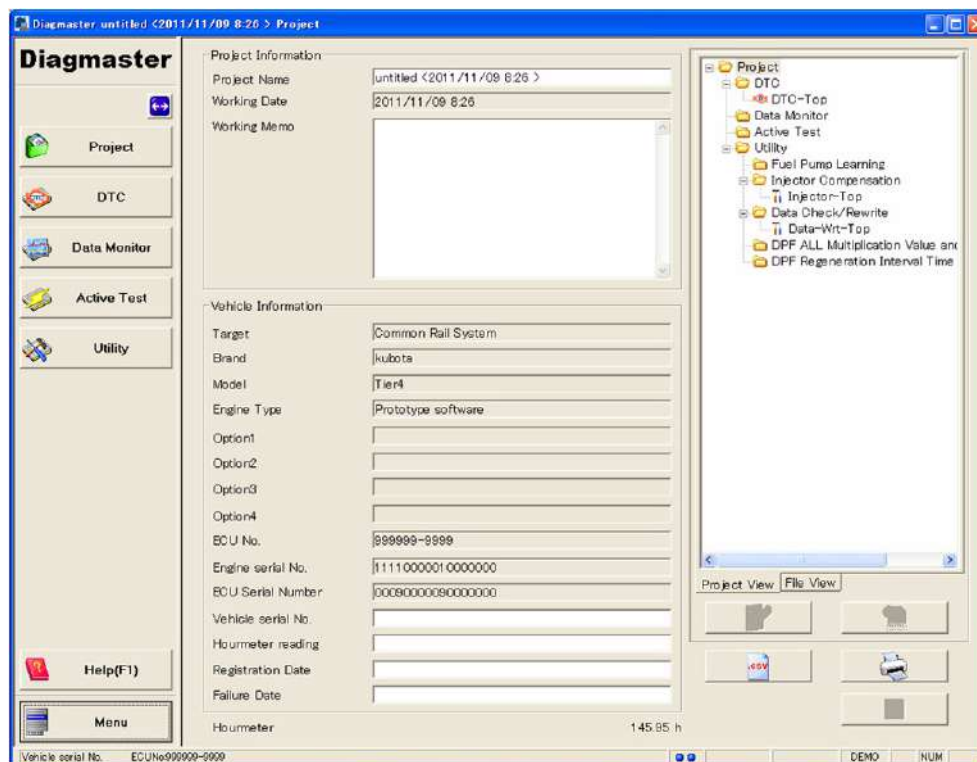
6. Click the  button.



7. The transmitting to ECU progress indicator appears.



8. The "Project" screen appears.



■ NOTE

- If you failed in the setting, confirm the content of procedure 6. and start again from procedure 5. to 8..

9Y1200412RSS0017US0

3. ACTIVE TEST AND UTILITY

[1] ACTIVE TEST

Active tests are useful for checking the trouble shooting with DTC.

All active tests are accepted the request command 20 seconds from the first request command.

All active tests are stopped automatically.

Active tests are below

9Y1200412RSS0018US0

(1) Glow Relay ON/OFF Function

- This test cannot use for this engine.

9Y1200412RSS0019US0

(2) EGV Fuel Feed Pump ON/OFF Function

- This test is used when engine does not start.
 - Start the active test and check the fuel feed pump operation with monitor signal "Fuel Feed Pump Relay" and sound.

Monitor signal	Command signal	Duration time	Number of times
Fuel Feed Pump Relay	ON/OFF	ON 3 sec., OFF 3 sec.	2

9Y1200412RSS0020US0

(3) Air Valve 1 for Fuel Reformer Operate Function

- This test is used when "Reformer abnormal" (P1844) has occurred.
 - Start the active test and check the air valve 1 operation with monitor signal "Solenoid Air Valve 1 Duty" and sound.

Monitor signal	Command signal	Duration time	Number of times
Solenoid Air Valve 1 Duty	60 %	5 sec.	1

9Y1200412RSS0021US0

(4) Air Valve 2 for Fuel Reformer Operate Function

- This test is used when "Fail to ignite burner" (P1848) has occurred.
 - Start the active test and check the air valve 2 operation with monitor signal "Solenoid Air Valve 2 Duty" and sound.

Monitor signal	Command signal	Duration time	Number of times
Solenoid Air Valve 2 Duty	60 %	5 sec.	1

9Y1200412RSS0022US0

(5) Air Blower for Fuel Reformer ON/OFF Function

- This test is used when "Reformer abnormal" (P1844) and "Fail to ignite burner" (P1848) have occurred.
 - Start the active test and check the air blower operation with monitor signal "Air Blower Current" and sound.

Monitor signal	Command signal	Duration time	Number of times
Air Blower Current	10 to 12 A	5 sec.	2

9Y1200412RSS0023US0

(6) Fuel Pump for Fuel Reformer Operate Function

- This test is used when "Reformer abnormal" (P1844) has occurred.
 - Start the active test and check the fuel pump for fuel reformer operation with monitor signal "Fuel Pump Frequency" and sound/touched at the fuel pump.

Monitor signal	Command signal	Duration time	Number of times
Fuel Pump Frequency	2 Hz	5 sec.	1



CAUTION

- If use this function, pump supply the fuel to fuel reformer for real, so do not do this function many times. This may cause a malfunction.

9Y1200412RSS0024US0

(7) Catalyst Heater for Fuel Reformer ON/OFF Function

- This test is used when "Reformer abnormal" (P1844) has occurred.
 - Start the active test and check the line of catalyst heater for fuel reformer operation with monitor signal "Catalyst Heater Active Flag".
 - Check the current value of line of catalyst heater for fuel reformer.

Factory specification	2.8 to 4.0 A
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9Y1200412RSS0025US0

(8) Regen. Gas Glow for Fuel Reformer ON/OFF Function

- This test is used when "Fail to ignite burner" (P1848) has occurred.
 - Start the active test and check the regen. gas glow for fuel reformer operation with monitor signal "Regen. Gas Glow Active Flag".
 - Check the current value of line of regen. gas glow for fuel reformer with ammeter.

Factory specification	3.5 to 10 A
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9Y1200412RSS0026US0

(9) Purge Function for Catalyst of Fuel Reformer

- This test is used when "Reformer abnormal" (P1844) has occurred.
 - Start the active test and check the purge function operation with monitor signal "Solenoid Air Valve 1 Duty".

Monitor signal	Factory specification
Solenoid Air Valve 1 Duty	minimum 5 % (over 5 % is normal)

9Y1200412RSS0027US0

[2] UTILITY

Utility are below

9Y1200412RSS0028US0

(1) Gear Case or Gear Case Gasket or Rack Position Sensor Exchange

You must do this utility when you replace the new rack position sensor or you replace gear case or gear case gasket.

Description

After getting the value of Actual Rack Position, finally the engine ECU will write the Rack Offset calculated from the difference between the value before and after the exchange of them.
Please press the button of "Register".
*Please fetch the data at room temperature. If the temperature between before and after exchange is

Actual Rack Position(AD) *Engine stopped

Before Exchange
560
15 degC
Fetch (1)

After Exchange
553
15 degC
Fetch (2)

Previous data or Input
Previous data

Compensation History

Compensat...	Rack Position Offset	Remarks
Compensation history not found.		

Rack Position Offset Correction
43
-7
Register (3)

Output CSV file button (4)

RePlay
< Current Data >

(1) Data fetch button
(Before Exchange)

(2) Data fetch button
(After Exchange)

(3) Register button

(4) Output CSV file button

Procedure of Gear Case or Gear Case Gasket Exchange

1. Before disassembling the engine, get the data (1) (Before Exchange).
2. Exchange the rack position sensor/gear case/gear case gasket.
3. After reassembling the engine, get the data (2) (After Exchange)
4. Rack Position Offset Correction is calculated automatically.
5. Register the offset data to ECU. (3)
6. When you click the (3) button, below window is displayed.

(To be continued)

(Continued)

Gear Case or Gear Case Gasket or Rack Position Sensor Exchange

Notes
The value of Rack Position Offset Data corrected by exchanging the gear case is saved in this project. Please input Reason before Saving. Memo can be added to information to be saved. Click [Cancel] button to stop registration.

Reason

Memo

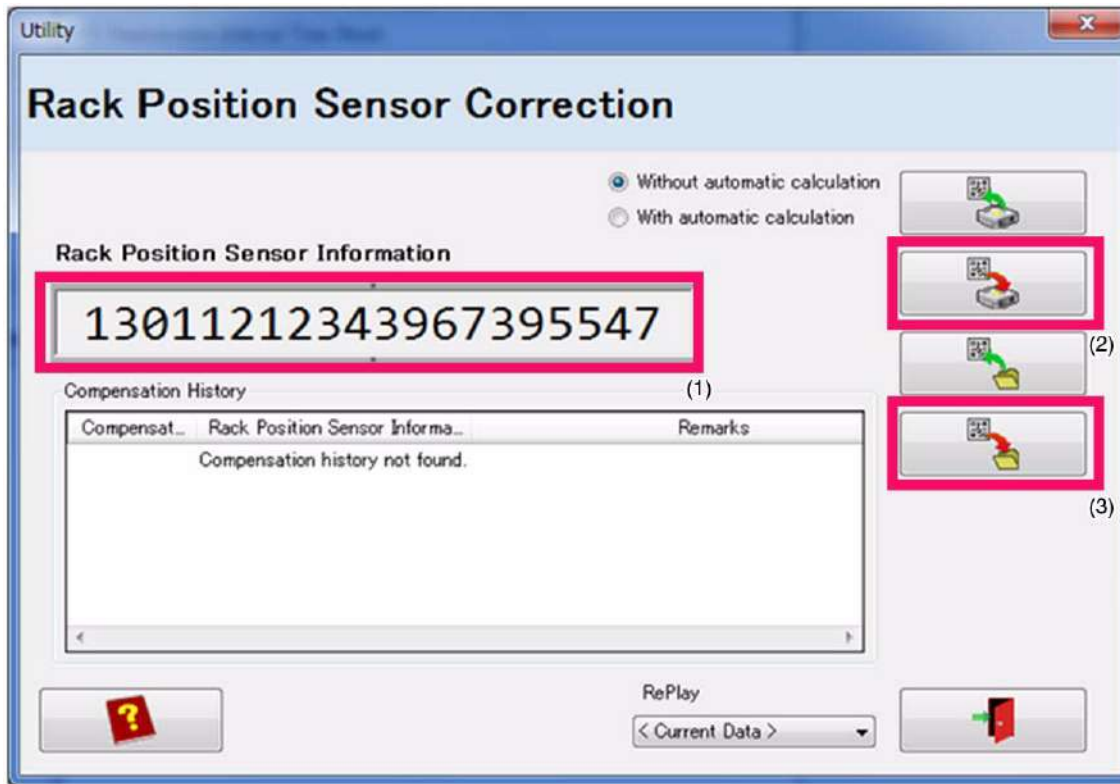
 

7. Write reason and click enter button.
8. Update the ECU data to website with using CSV file. (4)

9Y1200412RSS0029US0

(2) Rack Position Sensor Correction

You must do this utility when you replace the new rack position sensor.



- (1) Rack Position Sensor Serial Number (2) Save button (3) Output CSV file button

Procedure of Rack Position Sensor Correction

1. First, you should have to finish "Gear Case or Gear Case Gasket or Rack Position Sensor Exchange".
2. Next, select the Rack Position Sensor Correction.
3. Select "Without automatic calculation".
4. Enter the new serial number of new rack position sensor. (1)
5. Save the data. (2)
6. Update the ECU data to website with using CSV file. (3)

9Y1200412RSS0030US0

4. REPLACE ECU



You must do the following procedure after you replace the ECU.

1. Rewrite all data which you got from the website in new ECU.(Included Rack position Sensor Correction and Rack position offset Correction)
2. Do DPF Manual Regeneration Request Function.

■ IMPORTANT

- ECU estimate PM accumulation from calculating fuel quantity, so if you do not do this procedure, unexpected DTC will be occurred

9Y1200412RSS0031US0

5. DIAGNOSIS BY MALFUNCTION SYMPTOM

[1] LIST OF MALFUNCTION CAUSES BY SYMPTOM

- Verify the malfunction symptom, and perform diagnosis according to the appropriate number.
- Many diagnostic procedures include check and verification of malfunction symptom while it occurs. Be sure to perform work while verifying the malfunction symptom.

No.	Malfunction Symptom	Detail
1	Engine Warning Light Comes On.	—
2	Engine Does Not Start.	Engine does not crank (starter motor does not rotate).
		Engine stops when the key switch returns to the ON position from the ST position (engine does not rotate under its own power).
3	Takes A Long Time Before Engine Starts.	Takes a long time before engine starts.
		May accompany idle failure.
4	Idle Failure	Idle speed is lower than the standard value or unstable.
		Engine may stall.
5	Engine Noise	Abnormal noises come from inside the engine.
		Engine sound is loud.
6	High Fuel Consumption	Fuel consumption has increased significantly.
7	Poor Acceleration (Insufficient Output)	Acceleration is slower than before when depressing the accelerator pedal.
		Power feels insufficient compared with previously. Large amount of rotation drop.
8	Black Smoke Emitted.	The amount of black smoke in the exhaust gas has increased abnormally compared with previously.
9	White Smoke Emitted.	The amount of white smoke in the exhaust gas has increased abnormally compared with previously.
10	Engine Stalls On Deceleration.	Engine speed drops when releasing the accelerator pedal.
		Engine stalls on deceleration with the accelerator pedal fully closed.
		Engine stalls immediately after the machine stops when decelerating with the accelerator pedal fully closed.

9Y1200412RSS0032US0

Malfunction Cause		Malfunction Cause														
		Control System								Engine						Control System
		Engine Speed Sensor			Accelerator position sensor			Coolant temperature sensor	Low compression pressure	Engine internal fault	Valve clearance fault	Valve timing fault	Low engine oil viscosity	Insufficient engine oil level	Main relay malfunction	
No signal output	Damaged sensor pulsar gear	Air gap size is too large	No signal output	False signal output	Misadjustment	No signal output	False signal output									
1	Engine Warning Light Comes On	○	○	○	○	○		○		○ *1	○ *1		○ *2			○
2	Engine Does Not Start	○	○	○					○	○	○		○			○
3	Takes A Long Time Before Engine Starts		○	○				○	○	○	○		○			
4	Idle Failure		○	○	○	○	○		○	○	○		○			
5	Engine Noise		○	○					○	○	○	○	○			
6	High Fuel Consumption		○	○					○	○	○	○	○	○		
7	Poor Acceleration (Insufficient Output)		○	○	○	○	○	○	○	○	○	○	○	○		
8	Black Smoke Emitted		○	○						○	○	○	○	○		
9	White Smoke Emitted		○	○						○	○	○	○			
10	Engine Stalls On Deceleration		○	○						○	○		○			

*1: When the engine rotation change is large, it lights.

*2: It lights for a timing positional wrong gear.

9Y1200412RSS0033US0

Malfunction Cause		Malfunction Cause																									
		Engine Electrical System					Intake System			Fuel System				Cooling System			Others										
		Does not charge		Does not discharge		Charging system malfunction		Air cleaner clogging		Starter relay malfunction		Intake system components		Turbocharge malfunction	Fuel quality	Injectors		Supply pump malfunction	Clogged fuel filter	Faulty fuel pressure limiter	Cooling system failure (radiator, hoses, thermostat, cooling fan, etc.)	Damaged fan belt or misadjusted belt tension	Improper concentration of antifreeze	Power transmission malfunction (including clutch slipping) *2	Large dragging (including brake) *2	Loose fit parts	Defective CAN communication
												Leak	Intake air heater fault			Blockage, leakage, malfunction											
1	Engine Warning Light Comes On	☐		☐			☐ *1					☐	☐	☐	☐	☐	☐	☐	☐								
2	Engine Does Not Start	☐	☐	☐		☐		☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				☐				
3	Takes A Long Time Before Engine Starts		☐			☐		☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				☐				
4	Idle Failure									☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				☐				
5	Engine Noise						☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐			☐	☐		
6	High Fuel Consumption				☐		☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			☐	☐				
7	Poor Acceleration (Insufficient Output)				☐		☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐			☐	☐			☐	
8	Black Smoke Emitted				☐		☐		☐	☐	☐			☐	☐	☐	☐	☐	☐								
9	White Smoke Emitted				☐		☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐								
10	Engine Stalls On Deceleration				☐					☐	☐	☐	☐	☐	☐	☐	☐	☐	☐								

*1: When pressure doesn't hang to the boost pressure sensor, it is likely to light.

*2: It emphatically searches for the machine side.

9Y1200412RSS0034US0

[2] DIAGNOSIS BY MALFUNCTION SYMPTOM

(1) Engine Warning Light Comes On

1. Turn the key switch ON and check that the fuel feed pump is operating. If it is not operating, check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)
2. Connect diagnosis tool and read DTC. Refer to pertinent DTC diagnosis guidelines and implement diagnosis.

9Y1200412RSS0035US0

(2) Engine Does Not Start

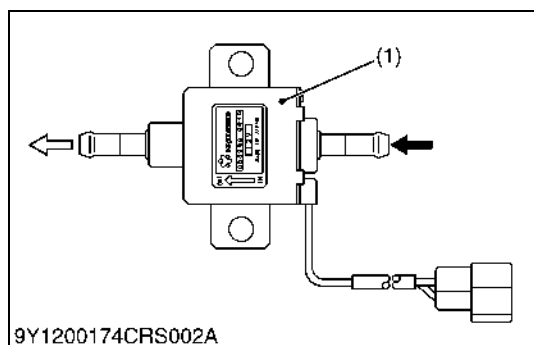
Possible causes:

1. Fuel feed pump operation fault.
2. Starting assist device (glow plug)
 - Applicable only when the temperature is low: -10°C (14°F) or less
 - Refer to the workshop manual for the machine and check the glow plug and related wiring harness.

***Refer to the previous "List of malfunction causes by symptom" for the subsequent details.**

3. Engine fault
 - Low compression pressure.
 - Engine internal fault
 - Valve timing fault
4. Control system
 - Damage to the pulsar gear of the engine speed sensor
 - Air gap of the engine speed sensor is large
 - Main relay malfunction
5. Engine electrical system
 - Battery fault
 - Charging system malfunction
 - Starter relay malfunction
6. Intake system
 - Glow relay fault
 - Intake air heater fault
7. Fuel system
 - Fuel quality
 - Fuel filter clogging
 - Fuel line clogging, leak
8. ECU and wiring harness
 - Power supply system
 - Output system (Fuel feed pump and starter relay)
 - Input system (sensors and switches)
9. Others
 - Large amount of drag (including the brakes, etc.)

9Y1200412RSS0036US0



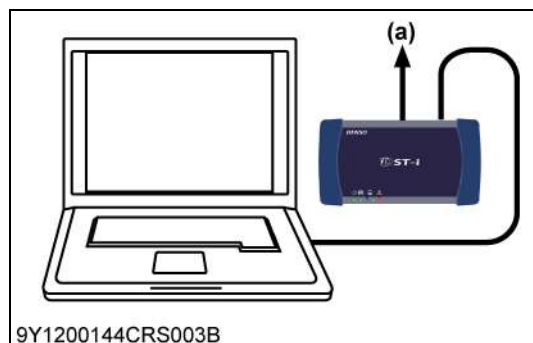
1. Check the Fuel Feed Pump Operation

1. Turn the key switch ON and check that the fuel feed pump is operating.

Factory specification	Operates when the key switch is turned ON.
OK	Go to "2. Check the DTC".
NG	Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)

(1) Fuel Feed Pump

9Y1200412RSS0037US0



2. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
-----------------------	-------------------

Communication error

OK	Go to "3. Check the Starting Assist Device".
NG	Go to "6. Check the ECU Power Supply and Grounding".

DTC presently existing

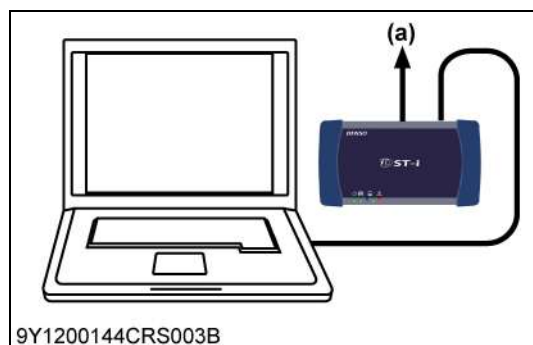
OK	Go to "3. Check the Starting Assist Device".
NG	Check in accordance with the troubleshooting procedures for each DTC.

Past DTC only

OK	Go to "3. Check the Starting Assist Device".
NG	Reproduce defect by referring to the freeze frame data, etc.

(a) CAN1 Connector

9Y1200412RSS0038US0



3. Check the Starting Assist Device

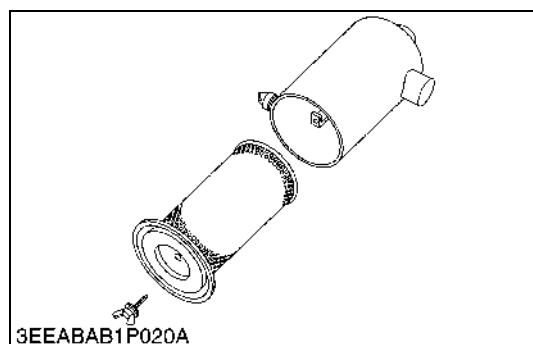
1. Refer to the workshop manual for the machine and check the glow plug and related wiring harness.
2. In case the engine can not start when it is new or after the maintenance, make sure to connect the injector harness connector of the head cover position.
3. If the starter relay is used, neutral condition is required depending on the model. Use the monitor function to check whether the neutral switch (signal) is ON.
4. Perform an active test for models that have relay control in the ECU on the engine side.

Factory specification	Operates repeatedly between ON and OFF in accordance with the specified cycle.
-----------------------	--

OK	Go to "4. Check the Intake System".
NG	Checking and repair of starting assist device (glow plug).

(a) CAN1 Connector

9Y1200412RSS0039US0

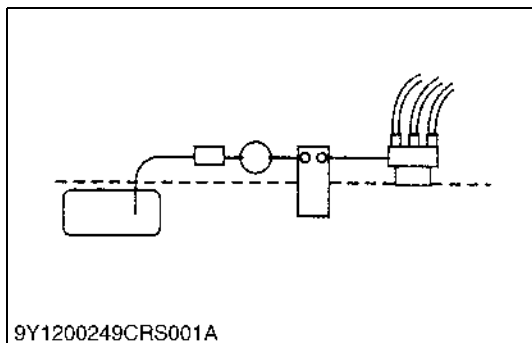


4. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

OK	Go to "5. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

9Y1200412RSS0040US0



5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

OK	Go to "6. Check the ECU Power Supply and Grounding".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

(1) Rail

(2) Supply Pump

9Y1200412RSS0041US0

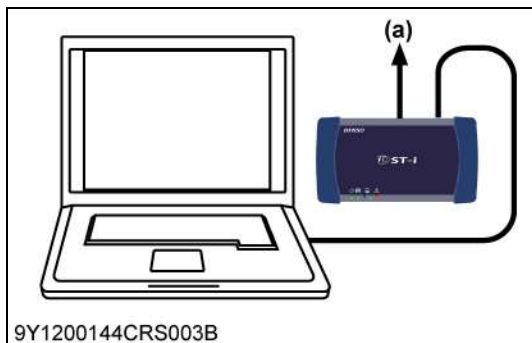
6. Check the ECU Power Supply and Grounding

1. Turn the key switch ON and measure the voltage between the ECU +BP terminals (No.1,2) and ground (body / battery terminal) and ECU S-GND terminal (No.19,32,33) and ground (body / battery terminal).

Factory specification	BATT terminal - ground: 10 V or higher Power Gnd terminal - ground: 0.5 V or lower
-----------------------	---

OK	Go to "7. Check the Engine Speed Sensor Signal".
NG	Check the battery / wiring harness or replace ECU

9Y1200412RSS0042US0



7. Check the Engine Speed Sensor Signals

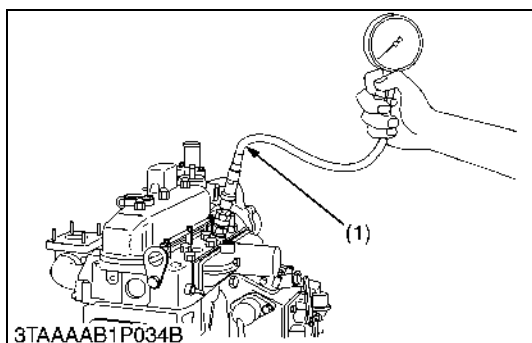
1. Set the key switch to START position and crank the engine. Check the "Engine speed active flag" using the diagnosis tool data monitor function.

Factory specification	ON and constant
-----------------------	-----------------

OK	Normal
NG	Go to "8. Check the Engine".

(a) CAN1 Connector

9Y1200412RSS0043US0



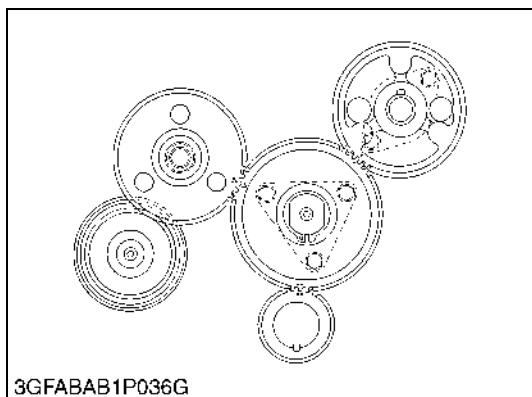
8. Check the Engine

1. Check the compression pressure, valve timing and the inside of the engine.

OK	Normal.
NG	Repair the malfunction.

(1) Compression Tester

9Y1200412RSS0044US0

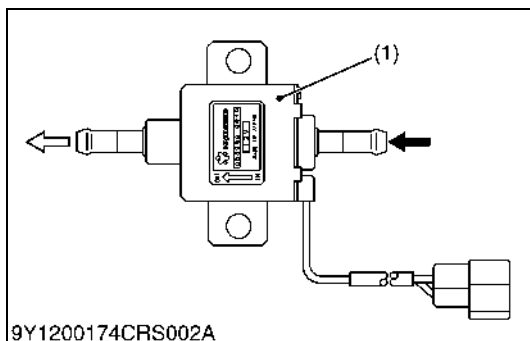


(3) Takes A Long Time Before Engine Starts

Possible causes:

1. Fuel feed pump operation fault.
- *Refer to the previous "List of malfunction causes by symptom" for the subsequent details.
2. Engine fault
 - Low compression pressure.
 - Engine internal fault
 - Valve timing fault
3. Control system
 - Damage to the pulsar gear of the engine speed sensor
 - Air gap of the engine speed sensor is large
4. Engine electrical system
 - Battery fault
5. Intake system
 - Glow (intake air heater) relay fault
 - Intake air heater fault
6. Fuel system
 - Fuel quality
 - Fuel filter clogging
 - Fuel line clogging, leak
7. ECU and the wiring harness
 - Output system (Fuel feed pump and starter relay)
 - Input system (Sensors and switches)
8. Others
 - Large amount of drag (Including the brakes, etc.)

9Y1200412RSS0045US0



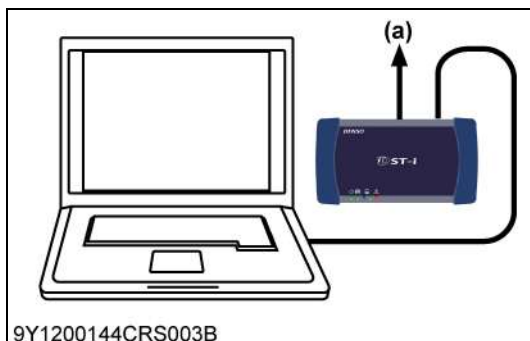
1. Check the Fuel Feed Pump Operation

1. Turn the key switch ON and check that the fuel feed pump is operating.

Factory specification	Operates when the key switch is turned ON.
OK	Go to "2. Check the DTC".
NG	Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)

(1) Fuel Feed Pump

9Y1200412RSS0046US0



2. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
-----------------------	-------------------

DTC presently existing

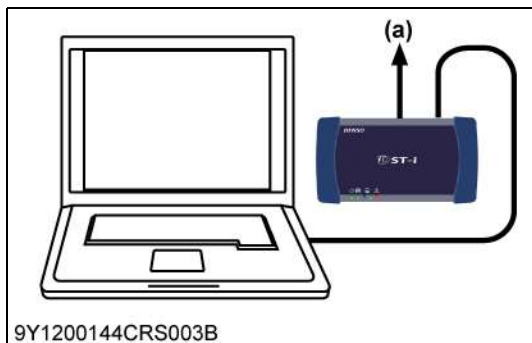
OK	Go to "3. Check the Starting Assist Device".
NG	Check in accordance with the troubleshooting procedures for each DTC.

Past DTC only

OK	Go to "3. Check the Starting Assist Device".
NG	Reproduce defect by referring to the freeze frame data, etc.

(a) CAN1 Connector

9Y1200412RSS0047US0



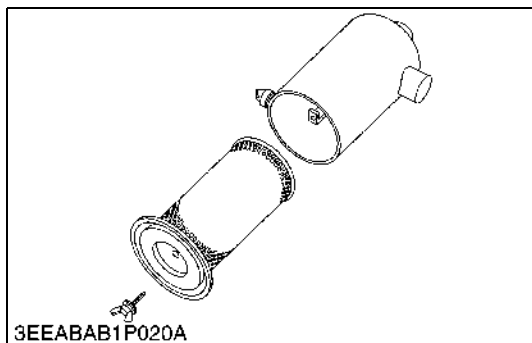
3. Check the Starting Assist Device

1. Refer to the workshop manual for the machine and check the air heater, relay and related wiring harness.
2. In case the engine can not start when it is new or after the maintenance, make sure to connect the injector harness connector of the head cover position.
3. If the starter relay is used, neutral condition is required depending on the model. Use the monitor function to check whether the neutral switch (signal) is ON.
4. Perform an active test for models that have relay control in the ECU on the engine side.

Factory specification	Operates repeatedly between ON and OFF in accordance with the specified cycle.
OK	Go to "4. Check the Intake System".
NG	Checking and repair of starting assist device (glow plug).

(a) CAN1 Connector

9Y1200412RSS0048US0

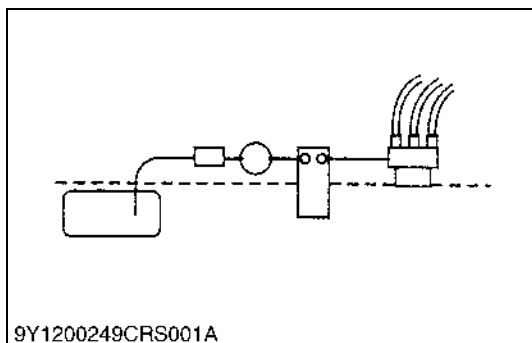


4. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

OK	Go to "5. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

9Y1200412RSS0049US0

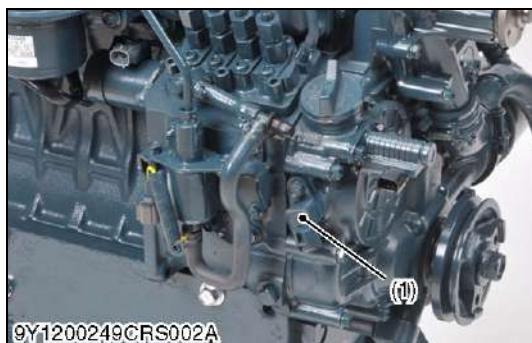


5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

OK	Go to "6. Check the Engine Speed Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

9Y1200412RSS0050US0



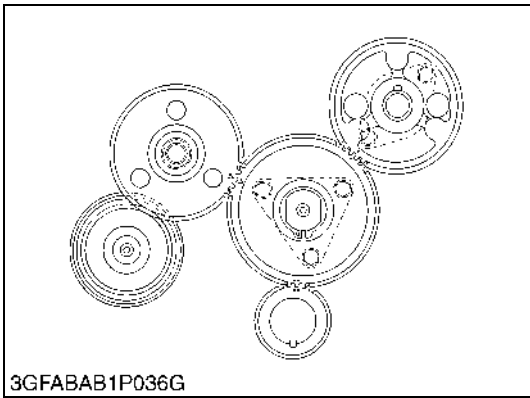
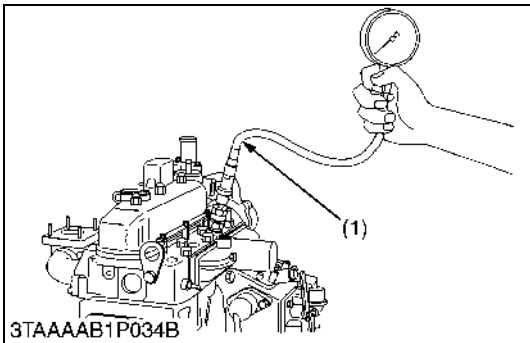
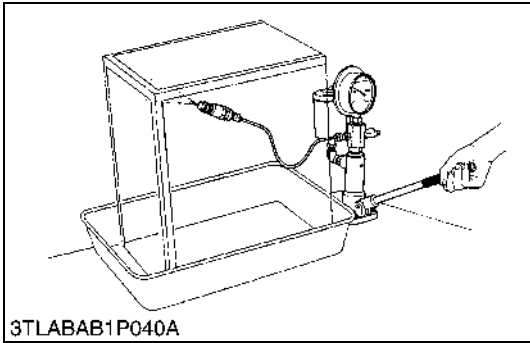
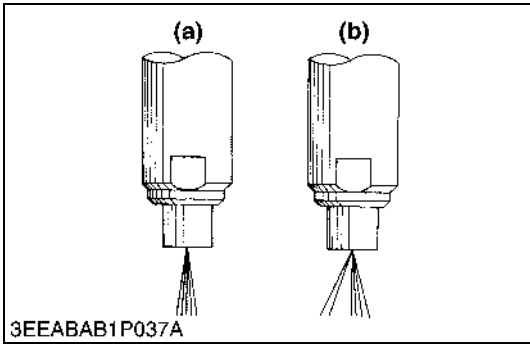
6. Check the Engine Speed Sensor

1. Refer to DTC P0335, and implement checking of the engine speed sensor.

OK	Go to "7. Check the Injection Nozzle and Fuel Pipes".
NG	Repair and replacement of the engine speed sensor-related parts.

(1) Engine Speed Sensor

9Y1200412RSS0051US0



7. Check the Injection Nozzle and Fuel Pipes

1. Check the nozzle spraying condition and fuel injection pressure dealing with a nozzle tester.
Refer to the workshop manual for more information.

Factory specification	Engine vibration and noise are increased and the rotation rate is reduced when the injection for the corresponding cylinder is stopped. The same results must be attained from all the cylinders.
OK	Go to "8. Check the Engine".
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(a) Good (b) Bad

9Y1200412RSS0052US0

8. Check the Engine

1. Check the compression pressure, valve timing and the inside of the engine.

OK	Normal.
NG	Repair the malfunction.

(1) Compression Tester

9Y1200412RSS0053US0

(4) Idle Failure

Possible causes:

1. Fuel feed pump operation fault.

***Refer to the previous "List of malfunction causes by symptom" for the subsequent details.**

2. Engine fault

- Low compression pressure.
- Engine internal fault
- Valve timing fault

3. Control system

- Damage to the pulsar gear of the engine speed sensor
- Air gap of the engine speed sensor is large

4. Fuel system

- Fuel quality
- Fuel filter clogging
- Fuel line clogging, leak

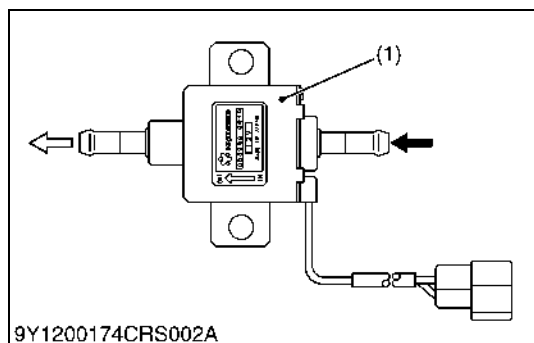
5. ECU and wiring harness

- Output system (Fuel feed pump and starter relay)
- Input system (sensors and switches)

6. Others

- Large amount of drag (including the brakes, etc.)

9Y1200412RSS0054US0



9Y1200174CRS002A

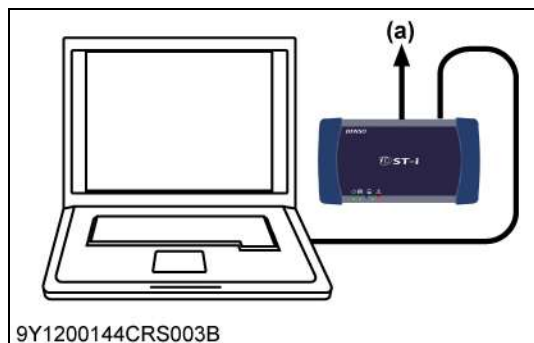
1. Check the Fuel Feed Pump Operation

1. Turn the key switch ON and check that the fuel feed pump is operating.

Factory specification	Operates when the key switch is turned ON.
OK	Go to "2. Check the DTC".
NG	Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)

(1) Fuel Feed Pump

9Y1200412RSS0055US0



9Y1200144CRS003B

2. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
-----------------------	-------------------

DTC presently existing

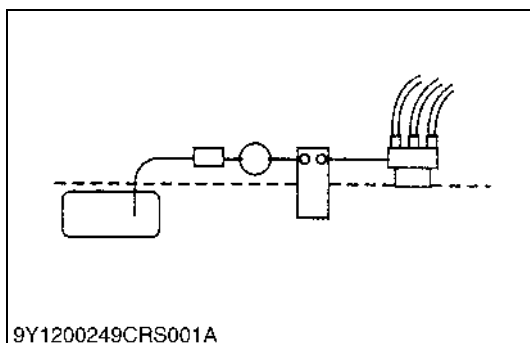
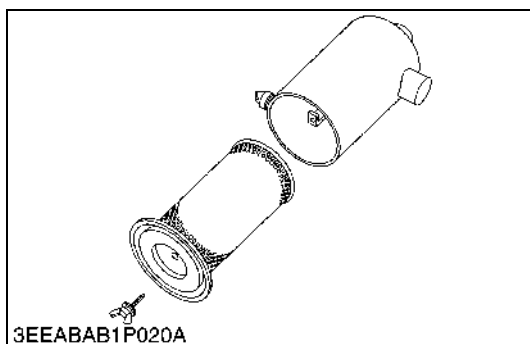
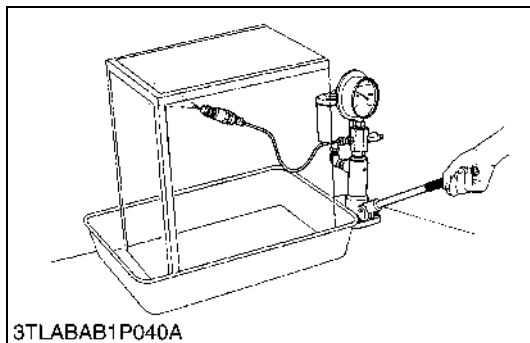
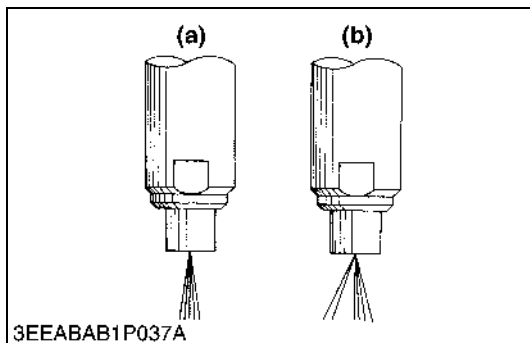
OK	Go to "3. Check the Injector (Including the Pipes, etc.)".
NG	Check in accordance with the troubleshooting procedures for each DTC.

Past DTC only

OK	Go to "3. Check the Injection Nozzle and Fuel Pipes".
NG	Reproduce defect by referring to the freeze frame data, etc.

(a) CAN1 Connector

9Y1200412RSS0056US0



3. Check the Injection Nozzle and Fuel Pipes

1. Check the nozzle spraying condition and fuel injection pressure dealing with a nozzle tester.

Refer to the workshop manual for more information.

Factory specification	Engine vibration and noise are increased and the rotation rate is reduced when the injection for the corresponding cylinder is stopped. The same results must be attained from all the cylinders.
OK	Go to "4. Check the Intake System".
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(a) Good

(b) Bad

9Y1200412RSS0057US0

4. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

OK	Go to "5. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

9Y1200412RSS0058US0

5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

OK	Go to "6. Check the Accelerator Position Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

9Y1200412RSS0059US0

6. Check the Accelerator Position Sensor



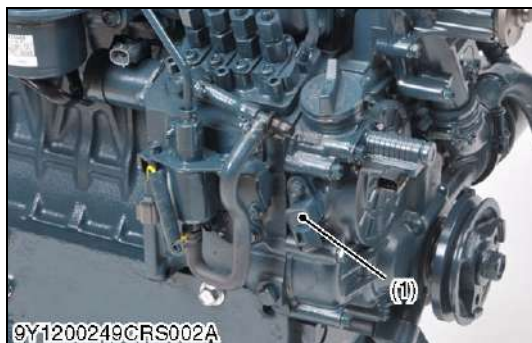
CAUTION

- When checking, pay attention to the angle of mounting instead of the output signal quality.

1. Inspect in accordance with the operator's manual.

OK	Go to "7. Check the Engine Speed Sensor".
NG	Replacement of accelerator position sensor.

9Y1200412RSS0060US0



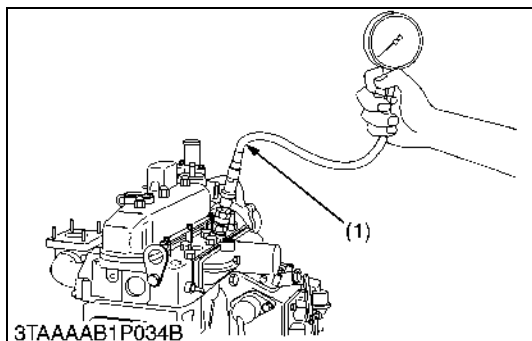
7. Check the Engine Speed Sensor

1. Refer to DTC P0335, and implement checking of the engine speed sensor.

OK	Go to "8. Check the Engine".
NG	Repair and replacement of the engine speed sensor-related parts.

- (1) Engine Speed Sensor

9Y1200412RSS0061US0



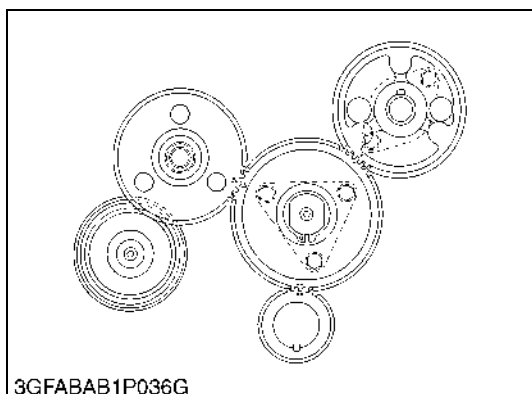
8. Check the Engine

1. Check the compression pressure, valve timing and the inside of the engine.

OK	Normal.
NG	Repair the malfunction.

- (1) Compression Tester

9Y1200412RSS0062US0



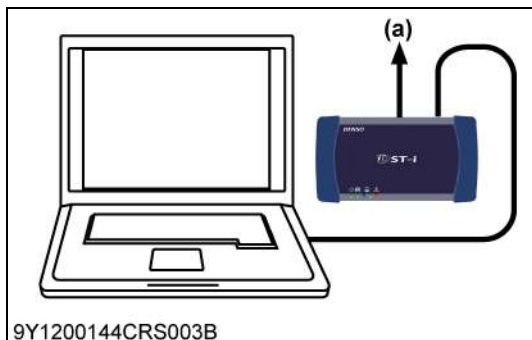
(5) Engine Noise

Possible causes:

***Refer to the previous "List of malfunction causes by symptom" for the subsequent details.**

1. Engine fault
 - Low compression pressure.
 - Engine internal fault
 - Valve clearance fault
 - Valve timing fault
2. Control system
 - Damage to the pulsar gear of the engine speed sensor
 - Air gap of the engine speed sensor is large
3. Intake system
 - Leak from the intake system parts
4. Fuel system
 - Fuel quality
5. Cooling system
 - Fan belt damage or tension misadjustment
6. ECU including related fuel line
 - Output system (Fuel feed pump and starter relay)
 - Input system (sensors)
7. Others
 - Large amount of drag (including the brakes, etc.)
 - Loose parts (including part interference sound)

9Y1200412RSS0063US0



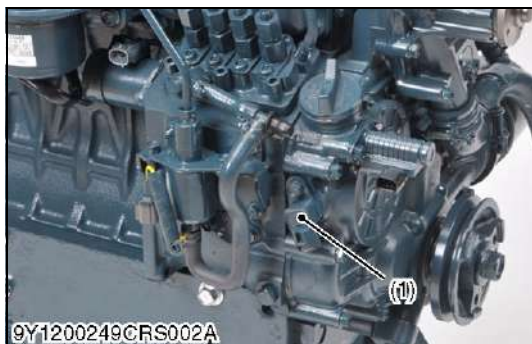
1. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
OK	Go to "2. Check the Engine Speed Sensor"
NG	Check in accordance with the troubleshooting procedures for each DTC.

(a) CAN1 Connector

9Y1200412RSS0064US0



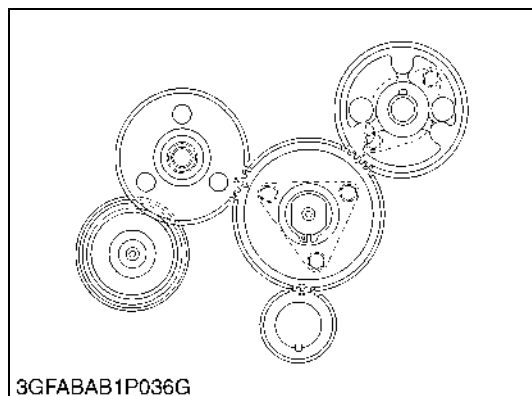
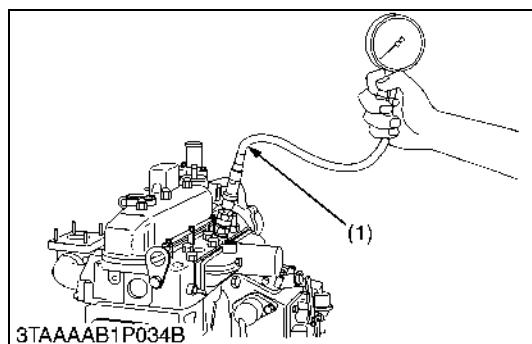
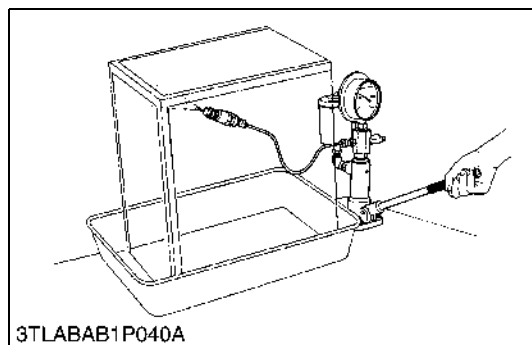
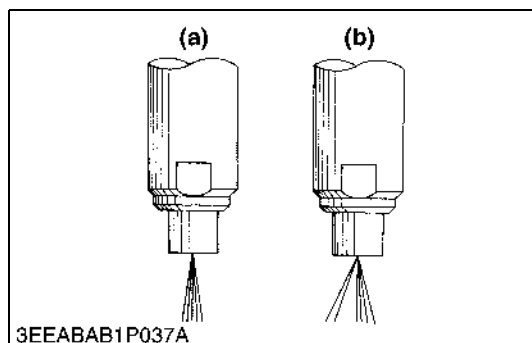
2. Check the Engine Speed Sensor

1. Refer to DTC P0335, and implement checking of the engine speed sensor.

OK	Go to "3. Check the Injection Nozzle and Fuel Pipes".
NG	Repair and replacement of the engine speed sensor-related parts.

(1) Engine Speed Sensor

9Y1200412RSS0065US0



3. Check the Injection Nozzle and Fuel Pipes

1. Check the nozzle spraying condition and fuel injection pressure dealing with a nozzle tester.

Refer to the workshop manual for more information.

Factory specification	1. Engine vibration and noise are increased and the rotation speed is reduced when the injection for the corresponding cylinder is stopped. 2. The same results must be attained from all the cylinders.
OK	Go to "4. Check the Engine and Machine Body".
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(a) Good

(b) Bad

9Y1200412RSS0066US0

4. Check the Engine and Machine Body

1. Check the compression pressure, valve clearance, valve timing and the inside of the engine.

OK	Normal.
NG	Repair the malfunction.
OK	Normal.
NG	Repair the malfunction.

2. Check for loose parts in the engine and on the machine body (including part interference sound).
3. Check for a large amount of drag (including the brakes, etc.).

(1) Compression Tester

9Y1200412RSS0067US0

(6) High fuel consumption

Possible causes:

Reduced engine performance is detected and the fuel consumption is higher for this reason.

1. The engine performance is reduced and the fuel consumption is higher for this reason

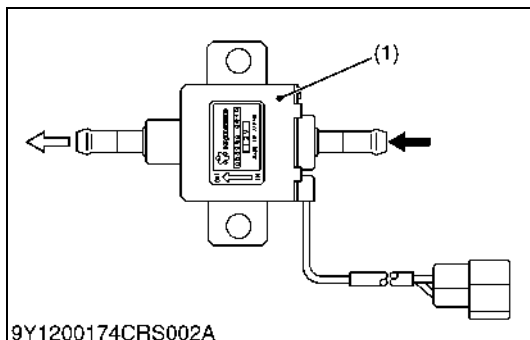
Reduced engine performance is not detected but the fuel consumption is higher.

1. Usage habits of the user or use of non-standard parts
 - Not the standard specification
 - Tires, wheels
 - Intake / exhaust system parts
 - Used for a long time under poor fuel consumption conditions
 - Engine used for a long time under a high load
 - Long idling time
 - Frequently used under driving conditions with a large injection quantity
 - Low mileage for each drive (frequently used before the engine has warmed up)
 - Faulty maintenance
 - Engine oil (dirt)
 - Air filter, fuel filter (dirt, clogging)
 - Radiator clogging
2. Powertrain malfunctions not involving the engine
 - Large driving resistance
 - Large resistance for actuation
 - Tire air pressure
 - Brake drag
 - Clutch slipping
3. Fuel feed pump operation fault.

***Refer to the previous "List of malfunction causes by symptom" for the subsequent details.**

4. Engine fault
 - Low compression pressure.
 - Engine internal fault
 - Valve clearance fault
 - Valve timing fault
 - Engine oil viscosity fault
5. Control system
 - Damage to the pulsar gear of the engine speed sensor
 - Air gap of the engine speed sensor is large
6. Intake system
 - Air cleaner clogging
 - Leak from the intake system parts
 - Turbocharger operation fault
7. Fuel system
 - Fuel quality
 - Fuel line clogging, leak
8. ECU and wiring harness
 - Output system (Fuel feed pump and starter relay)
 - Input system (sensors) *A cause for larger injection quantity

9Y1200412RSS0068US0



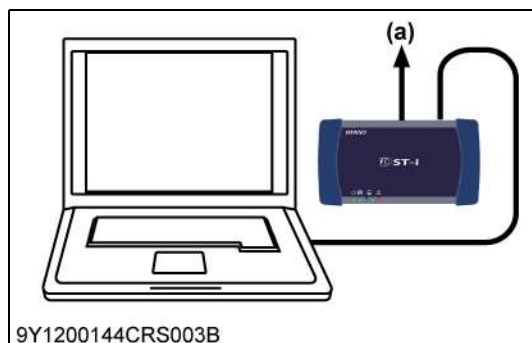
1. Check the Fuel Feed Pump Operation

1. Turn the key switch ON and check that the fuel feed pump is operating.

Factory specification	Operates when the key switch is turned ON.
OK	Go to "2. Check the DTC".
NG	Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)

(1) Fuel Feed Pump

9Y1200412RSS0069US0



2. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
-----------------------	-------------------

OK	Go to "3. Comparison of Fuel Economy".
NG	Check in accordance with the troubleshooting procedures for each DTC.

(a) **CAN1 Connector**

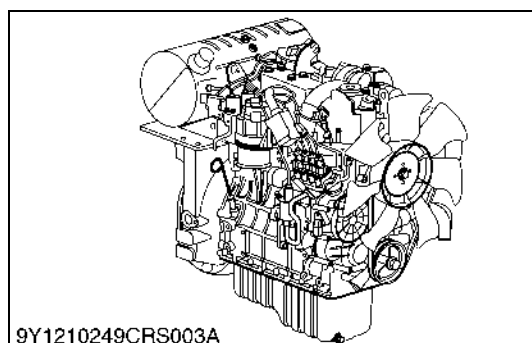
9Y1200412RSS0070US0

3. Comparison of Fuel Economy

1. Compare with a normal device working under the same operating conditions and measure the amount of consumed fuel (amount left in the tank).

OK	Use a specific example to explain and make the user understand that under some operating conditions the fuel consumption will increase and that the machine is not malfunctioning.
NG	Go to "4. Check the Engine and Machine Condition".

9Y1200412RSS0071US0



4. Check the Engine and Machine Condition

1. Check for the usage habits of the user or use of non-standard parts.
 - Use of non-standard parts such as tires, wheels and intake / exhaust system parts
 - Used under poor fuel consumption conditions
 - Engine used for a long time under a high load
 - Long idling time
 - Faulty maintenance
 - Engine oil level and dirt
 - Air filter, fuel filter dirt and clogging
 - Radiator clogging

OK	Go to "Check for malfunctions in the powertrain".
NG	Give guidance to the user.

2. Check for malfunctions in the powertrain.
 - Check the driving resistance
 - Is a large resistance required for actuation?
 - Is the tire air pressure correct?
 - Is there brake drag?

OK	Go to "5. Check the Fuel System".
NG	Adjust or repair the malfunction.

9Y1200412RSS0072US0

5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

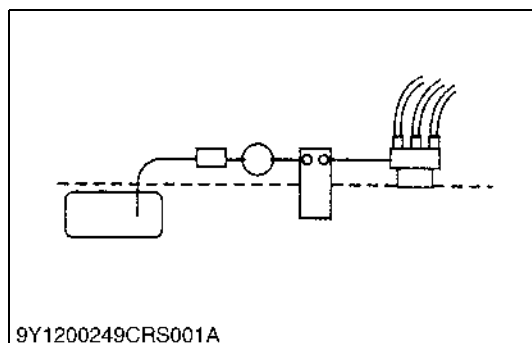
(Reference)

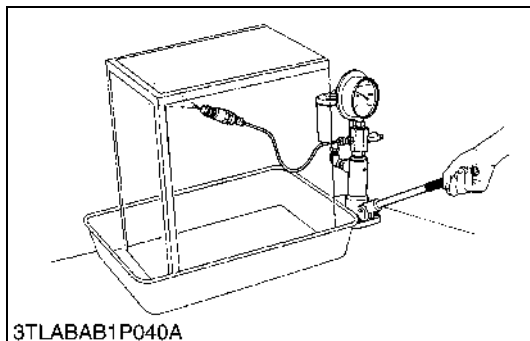
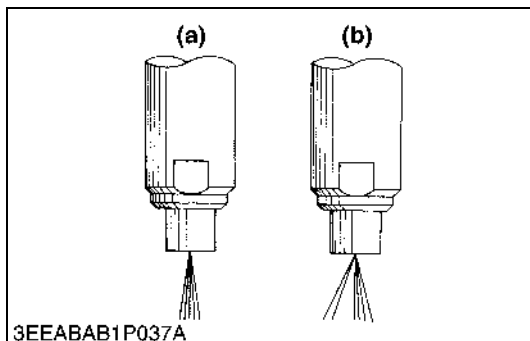
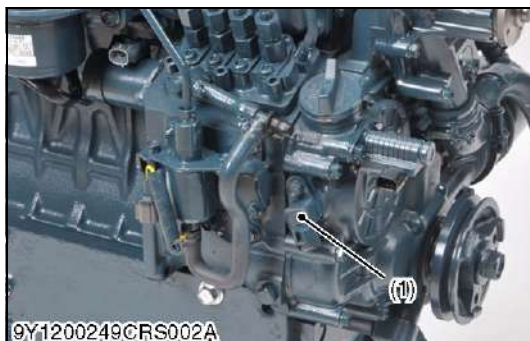
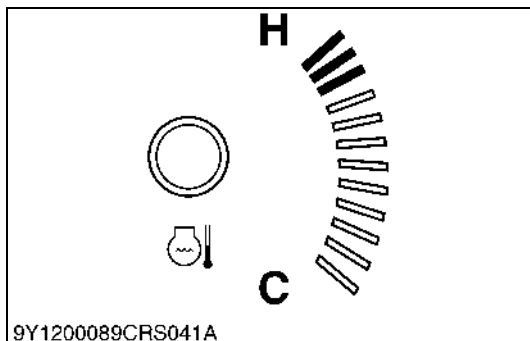
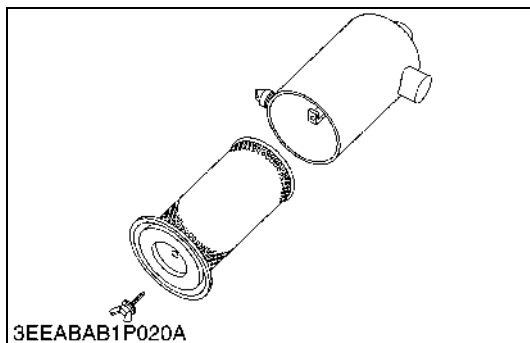
Pay attention particularly to the following two points:

- Service fuel (for summer / winter seasons, and cold region)
- Fuel leak from the fuel line

OK	Go to "6. Check the Intake System".
NG	Repair or replace the malfunctioning component.

9Y1200412RSS0073US0





6. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

(Reference)

Pay attention particularly to the following point:

- Intake air leak

OK	Go to "7. Check the Coolant Temperature Increase Rate".
NG	Repair or replace the malfunctioning component.

9Y1200412RSS0074US0

7. Check the Coolant Temperature Increase Rate

1. Check the speed of the coolant temperature increase on the coolant temperature gauge in the instrument panel (compared with a normal device).

OK	Go to "8. Check the Engine Speed Sensor".
NG	Check and repair the cooling system.

9Y1200412RSS0075US0

8. Check the Engine Speed Sensor

1. Refer to DTC P0335, and implement checking of the engine speed sensor.

OK	Go to "9. Check the Injection Nozzle and Fuel Pipes".
NG	Repair and replacement of the engine speed sensor-related parts.

- (1) Engine Speed Sensor

9Y1200412RSS0076US0

9. Check the Injection Nozzle and Fuel Pipes

1. Check the nozzle spraying condition and fuel injection pressure dealing with a nozzle tester.

Refer to the workshop manual for more information.

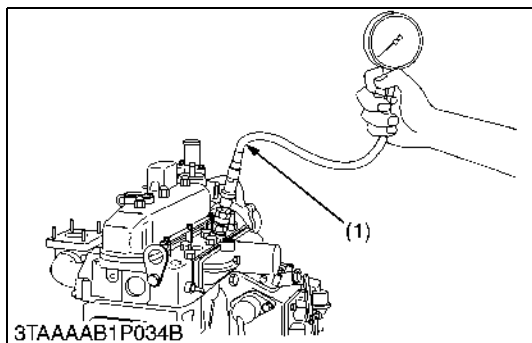
Factory specification	Engine vibration and noise are increased and the rotation speed is reduced when the injection for the corresponding cylinder is stopped. The same results must be attained from all the cylinders.
-----------------------	---

OK	Go to "10. Check the Engine".
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(a) Good

(b) Bad

9Y1200412RSS0077US0



10. Check the Engine

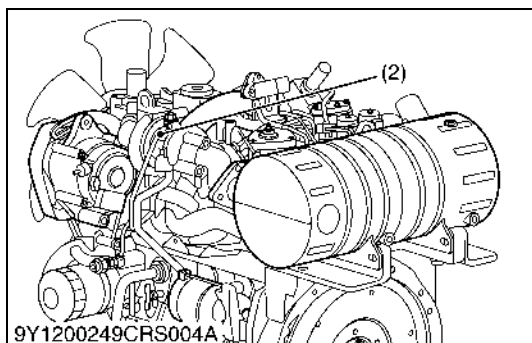
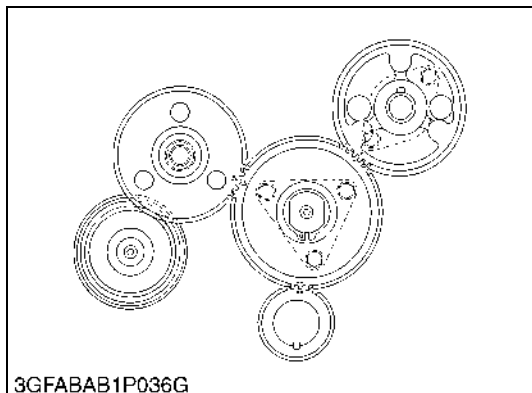
1. Check the compression pressure, valve clearance, valve timing, the inside of the engine and engine oil viscosity.
2. Check the timing gear.
3. Check the turbocharger.

OK	Normal.
NG	Repair or replace the related parts.

(1) Compression Tester

(2) Turbocharger

9Y1200412RSS0078US0



(7) Poor Acceleration (Insufficient Output)

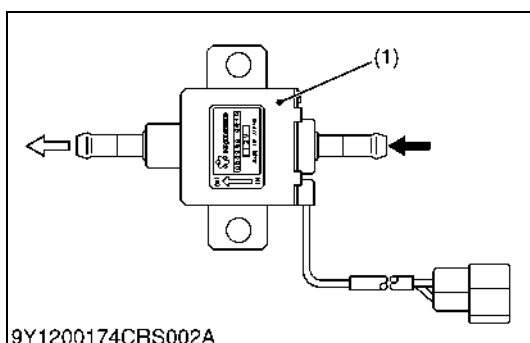
Possible causes:

1. Fuel feed pump operation fault.
2. Large driving resistance due to problems in the machine itself that do not involve the engine
 - Large resistance for actuation
 - Tire air pressure
 - Power transmission fault
 - Brake drag

***Refer to the previous "List of malfunction causes by symptom" for the subsequent details.**

3. Engine fault
 - Low compression pressure.
 - Engine internal fault
 - Valve clearance fault
 - Valve timing fault
 - Engine oil viscosity fault
4. Control system
 - Damage to the pulsar gear of the engine speed sensor
 - Air gap of the engine speed sensor is large
 - Accelerator position sensor misadjustment
5. Intake system
 - Air cleaner clogging
 - Leak from the intake system parts
 - Turbocharger operation fault
6. Fuel system
 - Fuel quality
 - Fuel line clogging, leak
7. ECU and wiring harness
 - Output system (Fuel feed pump and starter harness)
 - Input system (sensors) *A cause for larger injection quantity
8. Others
 - Power transmission fault
 - Large amount of drag (including the brakes, etc.)
 - Defective CAN communication

9Y1200412RSS0079US0



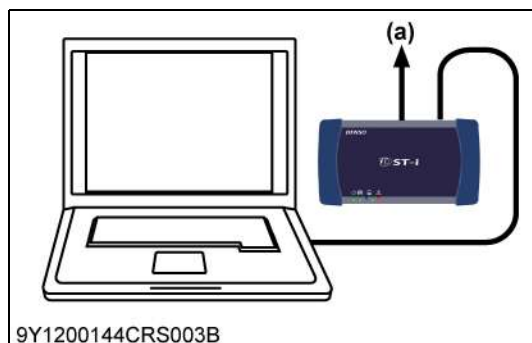
1. Check the Fuel Feed Pump Operation

1. Turn the key switch ON and check that the fuel feed pump is operating.

Factory specification	Operates when the key switch is turned ON.
OK	Go to "2. Check the DTC".
NG	Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)

(1) Fuel Feed Pump

9Y1200412RSS0080US0



2. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
-----------------------	-------------------

DTC presently existing

OK	Go to "3. Check the Accelerator Position Sensor.
NG	Check in accordance with the troubleshooting procedures for each DTC.

Past DTC only

OK	Go to "3. Check the Accelerator Position Sensor.
NG	Reproduce defect by referring to the freeze frame data, etc.

(a) CAN1 Connector

9Y1200412RSS0081US0

3. Check the Accelerator Position Sensor



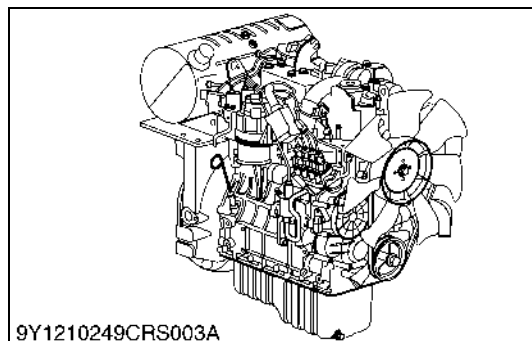
CAUTION

- When checking, pay attention to the angle of mounting instead of the output signal quality.

1. Inspect in accordance with the operator's manual.

OK	Go to "4. Check the Idle Condition".
NG	Replacement of accelerator position sensor.

9Y1200412RSS0082US0



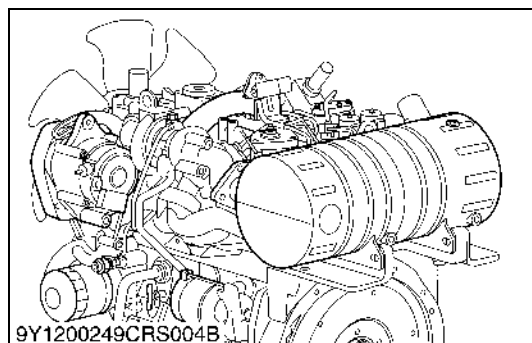
4. Check the Idle Condition

1. Check if idling is normal.

Factory specification	Stable at specified speed.
-----------------------	----------------------------

OK	Go to "5. Malfunction Verification - 1".
NG	Refer to "(4) Idle Failure", and implement checking and repair.(Refer to page 1-S31)

9Y1200412RSS0083US0



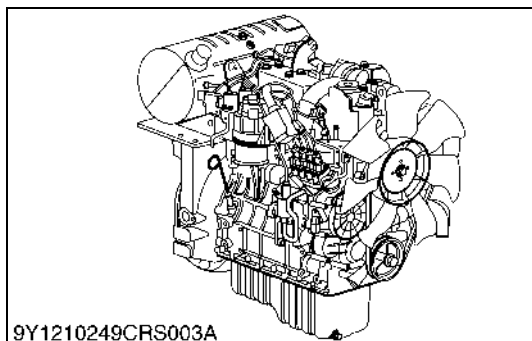
5. Malfunction Verification - 1

1. Reproduce running conditions (engine speed, machine speed, gear shift, etc.) as pointed out by the driver. Compare with another machine of the same model and check whether poor acceleration and power shortage can be sensed.

Factory specification	No malfunction should be detected.
-----------------------	------------------------------------

OK	Explain to the driver that the machine is in a normal condition. (Reference) • Give appropriate advice to the driver about matters concerning anything noticed that is related to his driving manner (such as selection of shift, etc.).
NG	Go to "6. Malfunction Verification - 2".

9Y1200412RSS0084US0

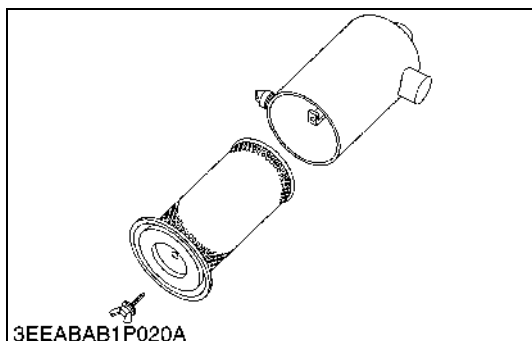


6. Malfunction Verification - 2

- Check for a large driving resistance due to problems in the machine itself that do not involve the engine.
 - Large resistance for actuation
 - Tire air pressure
 - Power transmission fault
 - Brake drag

OK	Go to "7. Check the Intake System".
NG	Repair or adjust the malfunction.

9Y1200412RSS0085US0

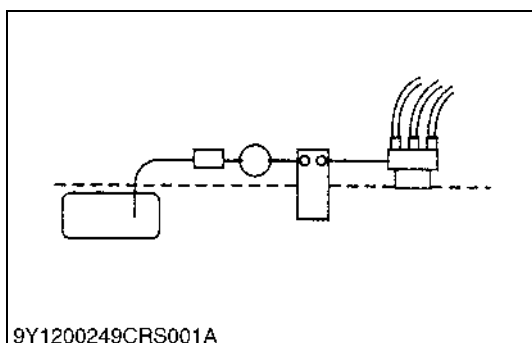


7. Check the Intake System

- Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

OK	Go to "8. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

9Y1200412RSS0086US0

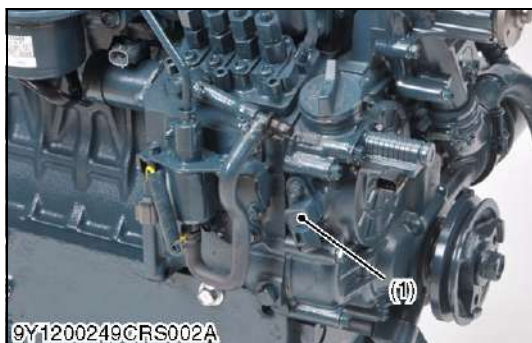


8. Check the Fuel System

- Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

OK	Go to "9. Check the Engine Speed Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

9Y1200412RSS0087US0



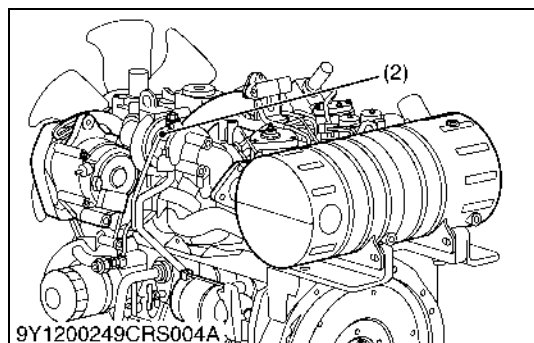
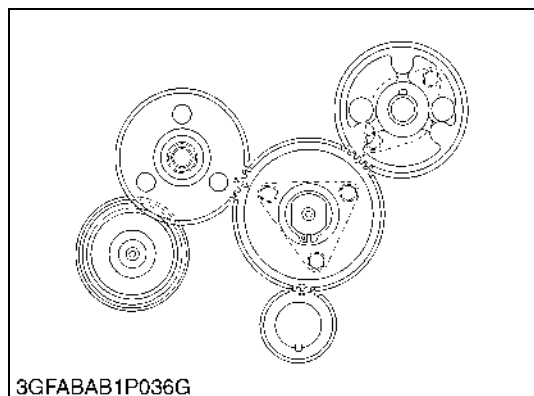
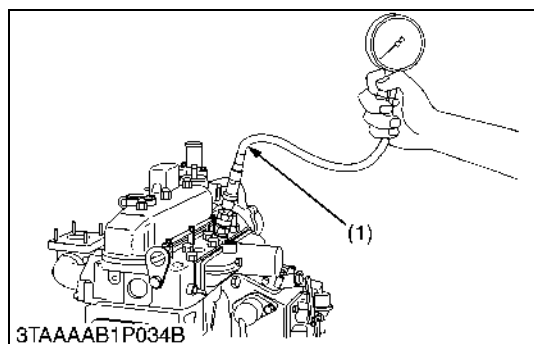
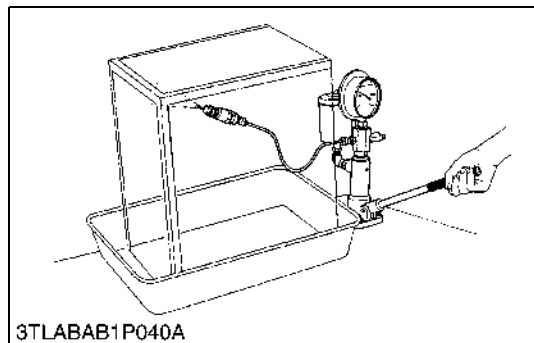
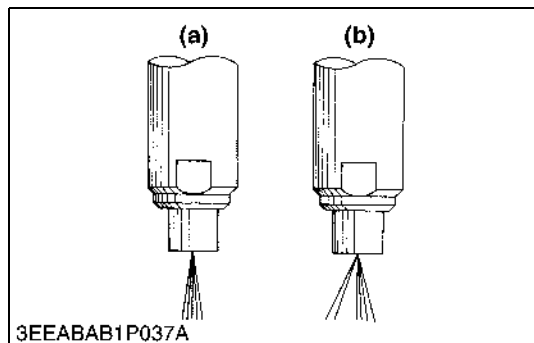
9. Check the Engine Speed Sensor

- Refer to DTC P0335, and implement checking of the engine speed sensor.

OK	Go to "10. Check the Injection Nozzle and Fuel Pipes".
NG	Repair and replacement of the engine speed sensor-related parts.

- (1) Engine Speed Sensor

9Y1200412RSS0088US0



10. Check the Injection Nozzle and Fuel Pipes

1. Check the nozzle spraying condition and fuel injection pressure dealing with a nozzle tester.

Refer to the workshop manual for more information.

Factory specification	1. Engine vibration and noise are increased and the rotation speed is reduced when the injection for the corresponding cylinder is stopped. 2. The same results must be attained from all the cylinders.
OK	Go to "11. Check the Engine"
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(a) Good

(b) Bad

9Y1200412RSS0089US0

11. Check the Engine

1. Check the compression pressure, valve clearance, valve timing, the inside of the engine and engine oil viscosity.
2. Check the timing gear.
3. Check the turbocharger.

OK	Normal.
NG	Repair or replace the related parts.

(1) Compression Tester

(2) Turbocharger

9Y1200412RSS0090US0

(8) Abnormal Black Smoke Emitted

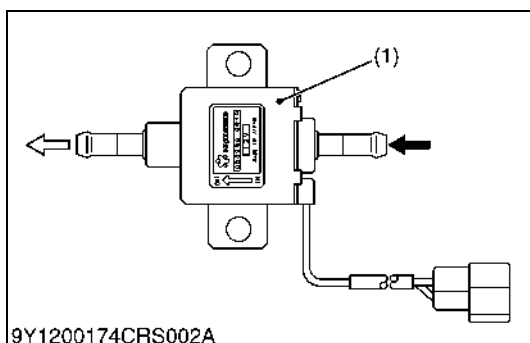
Possible causes:

1. Fuel feed pump operation fault.

***Refer to the previous "List of malfunction causes by symptom" for the subsequent details.**

2. Engine fault
 - Low compression pressure.
 - Engine internal fault
 - Valve clearance fault
 - Valve timing fault
 - Engine oil viscosity fault
3. Control system
 - Damage to the pulsar gear of the engine speed sensor
 - Air gap of the engine speed sensor is large
4. Intake system
 - Air cleaner clogging
 - Leak from the intake system parts
 - Turbocharger operation fault
5. Fuel system
 - Fuel quality
 - Fuel line clogging, leak
6. ECU and wiring harness
 - Output system (Fuel feed pump and starter relay)
 - Input system (sensors and switches)

9Y1200412RSS0091US0



9Y1200174CRS002A

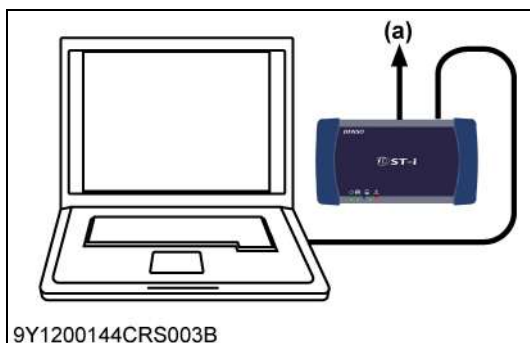
1. Check the Fuel Feed Pump Operation

1. Turn the key switch ON and check that the fuel feed pump is operating.

Factory specification	Operates when the key switch is turned ON.
OK	Go to "2. Check the DTC".
NG	Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)

(1) Fuel Feed Pump

9Y1200412RSS0092US0



9Y1200144CRS003B

2. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
-----------------------	-------------------

DTC presently existing

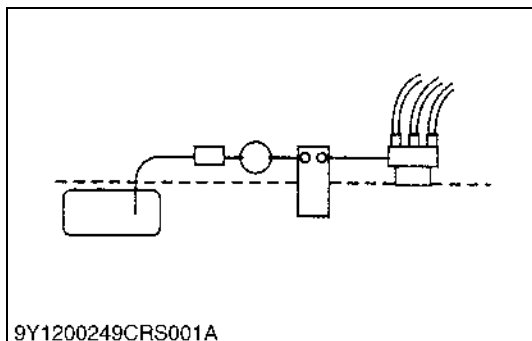
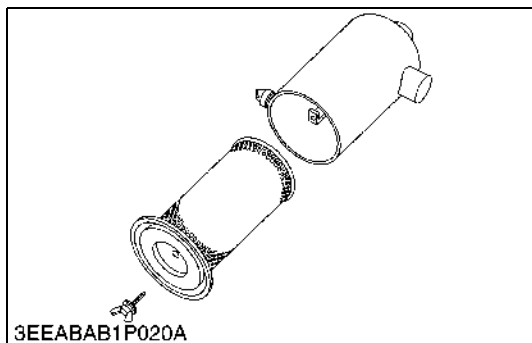
OK	Go to "3. Check the Intake System".
NG	Check in accordance with the troubleshooting procedures for each DTC.

Past DTC only

OK	Go to "3. Check the Intake System".
NG	Reproduce defect by referring to the freeze frame data, etc.

(a) CAN1 Connector

9Y1200412RSS0093US0



3. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

OK	Go to "4. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

9Y1200412RSS0094US0

4. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

OK	Go to "5. Check the Accelerator Position Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

9Y1200412RSS0095US0

5. Check the Accelerator Position Sensor



CAUTION

- When checking, pay attention to the angle of mounting instead of the output signal quality.
1. Inspect in accordance with the operator's manual.

OK	Go to "6. Check the Engine Speed Sensor".
NG	Replacement of accelerator position sensor.

9Y1200412RSS0096US0

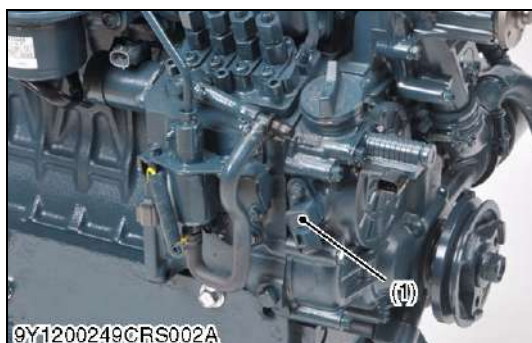
6. Check the Engine Speed Sensor

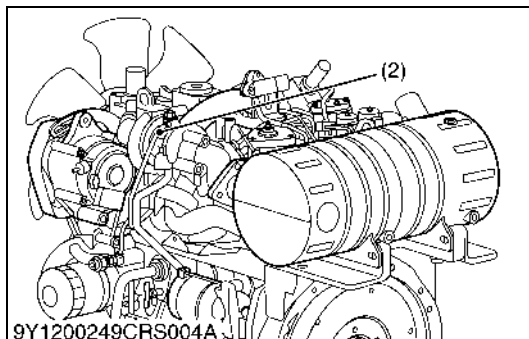
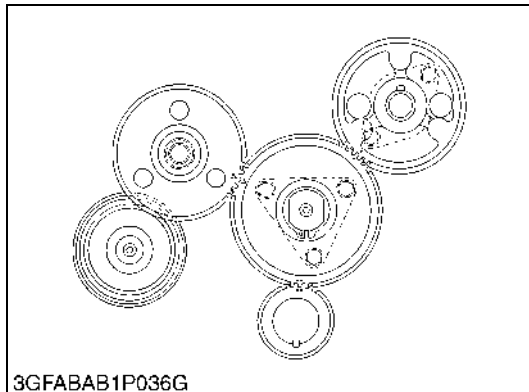
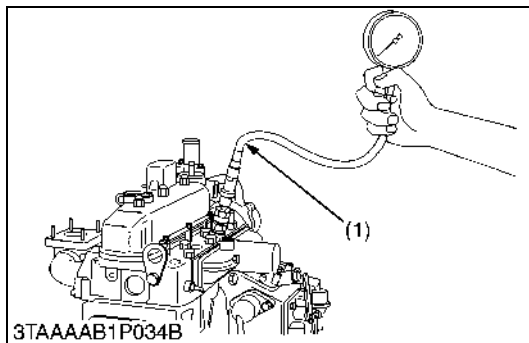
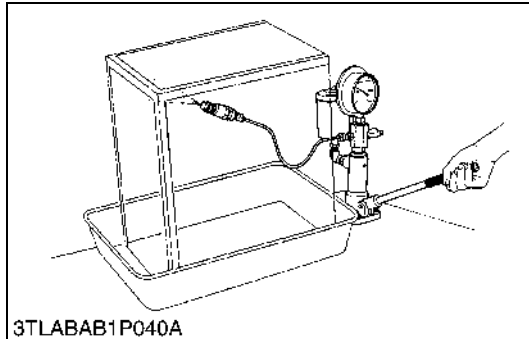
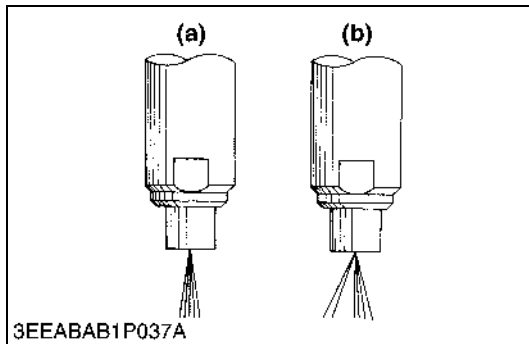
1. Refer to DTC P0335, and implement checking of the engine speed sensor.

OK	Go to "7. Check the Injection Nozzle and Fuel Pipes".
NG	Repair and replacement of the engine speed sensor-related parts.

- (1) Engine Speed Sensor

9Y1200412RSS0097US0





7. Check the Injection Nozzle and Fuel Pipes

1. Check the nozzle spraying condition and fuel injection pressure dealing with a nozzle tester.
Refer to the workshop manual for more information.

Factory specification	1. Engine vibration and noise are increased and the rotation speed is reduced when the injection for the corresponding cylinder is stopped. 2. The same results must be attained from all the cylinders.
-----------------------	---

OK	Go to "8. Check the Engine".
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(a) Good

(b) Bad

9Y1200412RSS0098US0

8. Check the Engine

1. Check the compression pressure, valve clearance, valve timing, the inside of the engine and engine oil viscosity.
2. Check the timing gear.
3. Check the turbocharger.

OK	Normal.
NG	Repair or replace the related parts.

(1) Compression Tester

(2) Turbocharger

9Y1200412RSS0099US0

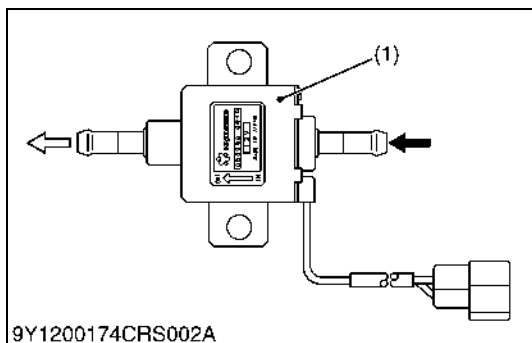
(9) Abnormal White Smoke Emitted

Possible causes:

1. Fuel feed pump operation fault.
2. Starting assist device fault (air heater and glow relay do not operate)

***Refer to the previous "List of malfunction causes by symptom" for the subsequent details.**

3. Engine fault
 - Low compression pressure.
 - Engine internal fault
 - Valve clearance fault
 - Valve timing fault
4. Control system
 - Damage to the pulsar gear of the engine speed sensor
 - Air gap of the engine speed sensor is large
5. Intake system
 - Air cleaner clogging
 - Leak from the intake system parts
 - Glow relay fault
 - Turbocharger operation fault
6. Fuel system
 - Fuel quality
 - Fuel filter clogging
 - Fuel line clogging, leak
7. ECU and wiring harness
 - Output system (Fuel feed pump and starter relay)
 - Input system (sensors and switches)

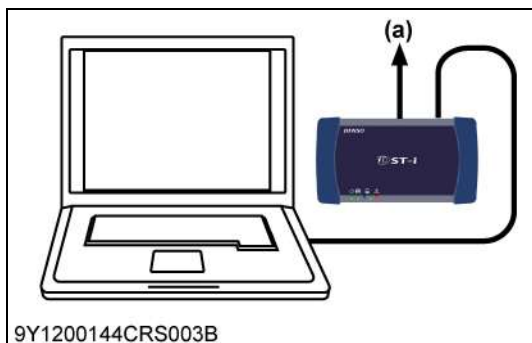


1. Check the Fuel Feed Pump Operation

1. Turn the key switch ON and check that the fuel feed pump is operating.

Factory specification	Operates when the key switch is turned ON.
OK	Go to "2. Check the DTC".
NG	Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)

(1) Fuel Feed Pump



2. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
-----------------------	-------------------

DTC presently existing

OK	Go to "3. Check the Starting Assist Device".
NG	Check in accordance with the troubleshooting procedures for each DTC.

Past DTC only

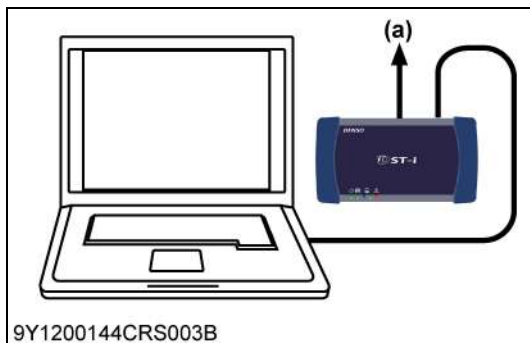
OK	Go to "3. Check the Starting Assist Device".
NG	Reproduce defect by referring to the freeze frame data, etc.

(a) CAN1 Connector

9Y1200412RSS0100US0

9Y1200412RSS0101US0

9Y1200412RSS0102US0



3. Check the Starting Assist Device

1. Refer to the workshop manual for the machine and check the air heater, relay and related wiring harness.
2. Perform an active test for models that have relay control in the ECU on the engine side.

Factory specification	Operates repeatedly between ON and OFF in accordance with the specified cycle.
-----------------------	--

OK	Go to "4. Check the Idle Condition".
NG	Checking and repair of starting assist device (intake air heater).

(a) CAN1 Connector

9Y1200412RSS0103US0

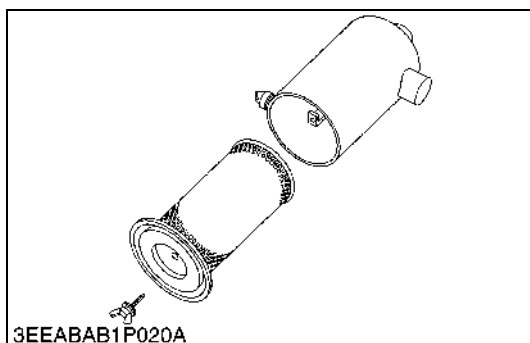
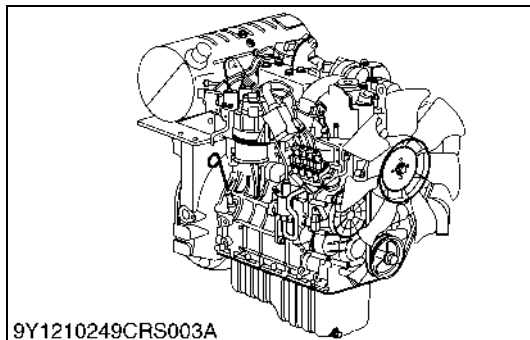
4. Check the Idle Condition

1. Check if idling is normal.

Factory specification	Stable at specified speed.
-----------------------	----------------------------

OK	Go to "5. Check the Intake System".
NG	Refer to "(4) Idle Failure", and implement checking and repair.(Refer to page 1-S31)

9Y1200412RSS0104US0

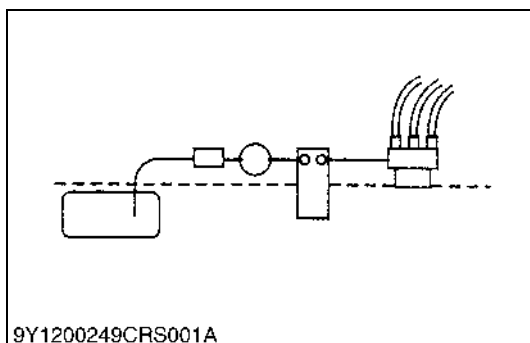


5. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

OK	Go to "6. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

9Y1200412RSS0105US0

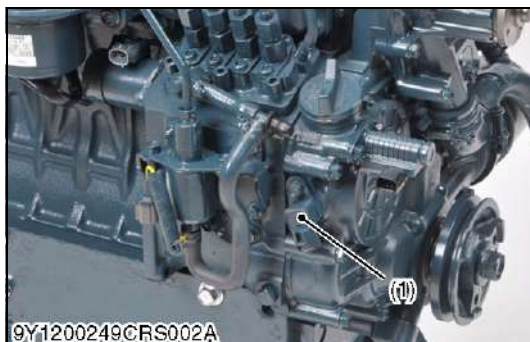


6. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

OK	Go to "7. Check the Engine Speed Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

9Y1200412RSS0106US0



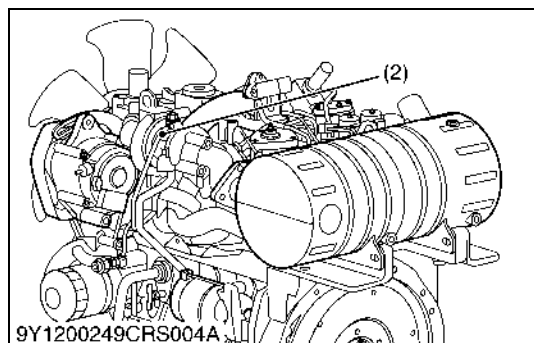
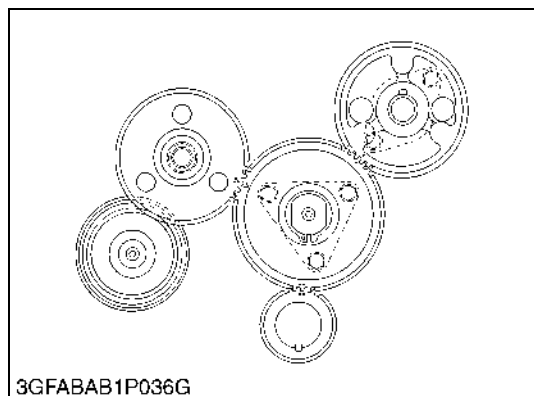
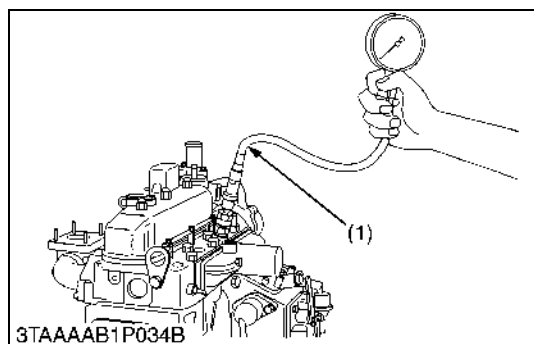
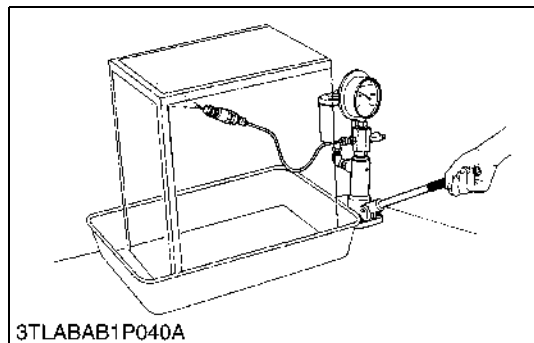
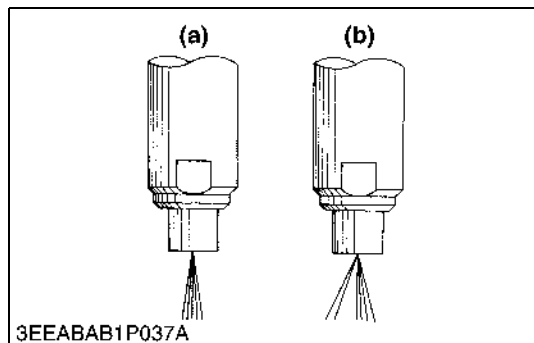
7. Check the Engine Speed Sensor

1. Refer to DTC P0335, and implement checking of the engine speed sensor.

OK	Go to "8. Check the Injection Nozzle and Fuel Pipes".
NG	Repair and replacement of the engine speed sensor-related parts.

(1) Engine Speed Sensor

9Y1200412RSS0107US0



8. Check the Injection Nozzle and Fuel Pipes

1. Check the nozzle spraying condition and fuel injection pressure dealing with a nozzle tester.

Refer to the workshop manual for more information.

Factory specification	Engine vibration and noise are increased and the rotation speed is reduced when the injection for the corresponding cylinder is stopped. The same results must be attained from all the cylinders.
OK	Go to "9. Check the Engine".
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(a) Good

(b) Bad

9Y1200412RSS0108US0

9. Check the Engine

1. Check the compression pressure, valve clearance, valve timing and the inside of the engine.
2. Check the timing gear.
3. Check the turbocharger.

OK	Normal.
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(1) Compression Tester

(2) Turbocharger

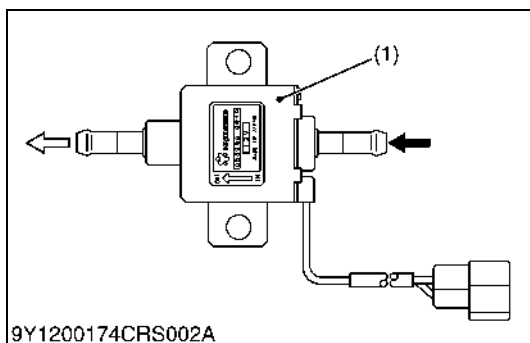
9Y1200412RSS0109US0

(10) Engine Stalls On Deceleration

Possible causes:

1. Fuel feed pump operation fault.
- *Refer to the previous "List of malfunction causes by symptom" for the subsequent details.
2. Engine fault
 - Low compression pressure.
 - Engine internal fault
 - Valve timing fault
3. Control system
 - Damage to the pulsar gear of the engine speed sensor
 - Air gap of the engine speed sensor is large
4. Intake system
 - Air cleaner clogging
5. Fuel system
 - Fuel quality
 - Fuel filter clogging
 - Fuel line clogging, leak
6. ECU and wiring harness
 - Output system (Fuel feed pump and starter relay)
 - Input system (sensors and switches)

9Y1200412RSS0110US0



9Y1200174CRS002A

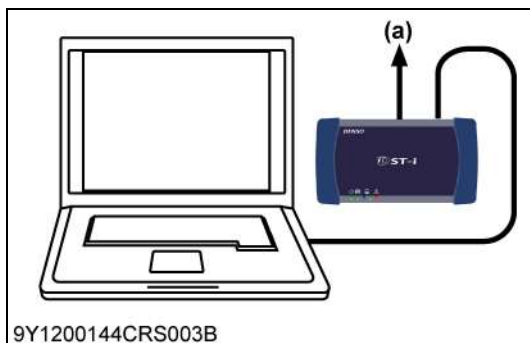
1. Check the Fuel Feed Pump Operation

1. Turn the key switch ON and check that the fuel feed pump is operating.

Factory specification	Operates when the key switch is turned ON.
OK	Go to "2. Check the DTC".
NG	Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE - 5. Check the Fuel Feed Pump". (Refer to page 1-S207)

(1) Fuel Feed Pump

9Y1200412RSS0111US0



9Y1200144CRS003B

2. Check the DTC

1. Turn the key switch ON and check the DTC.

Factory specification	No DTC is output.
-----------------------	-------------------

DTC presently existing

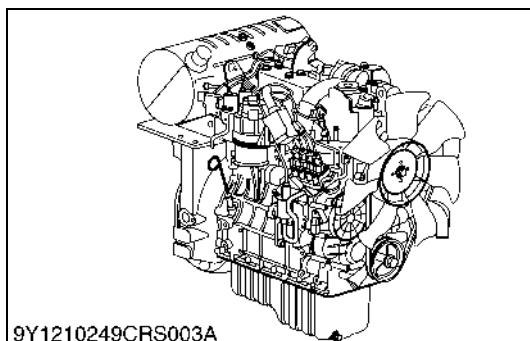
OK	Go to "3. Check the idle condition".
NG	Check in accordance with the troubleshooting procedures for each DTC.

Past DTC only

OK	Go to "3. Check the idle condition".
NG	Reproduce defect by referring to the freeze frame data, etc.

(a) CAN1 Connector

9Y1200412RSS0112US0



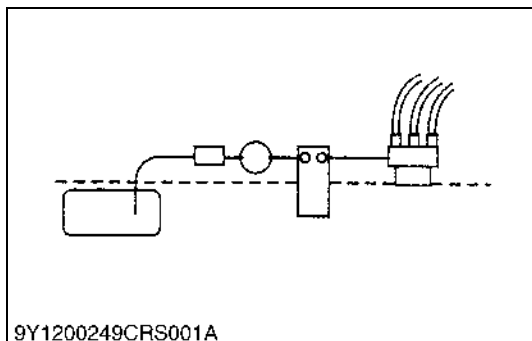
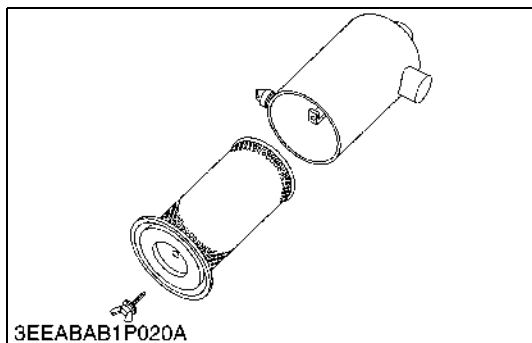
9Y1210249CRS003A

3. Check the Idle Condition

1. Check if idling is normal.

Factory specification	Stable at specified speed.
OK	Go to "4. Check the Intake System".
NG	Refer to "(4) Idle Failure", and implement checking and repair. (Refer to page 1-S31)

9Y1200412RSS0113US0



4. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

OK	Go to "5. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

9Y1200412RSS0114US0

5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

OK	Go to "6. Check the Accelerator Position Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S204)

9Y1200412RSS0115US0

6. Check the Accelerator Position Sensor



CAUTION

- When checking, pay attention to the angle of mounting instead of the output signal quality.
1. Inspect in accordance with the operator's manual.

OK	Go to "7. Check the Engine Speed Sensor".
NG	Replacement of accelerator position sensor.

9Y1200412RSS0116US0

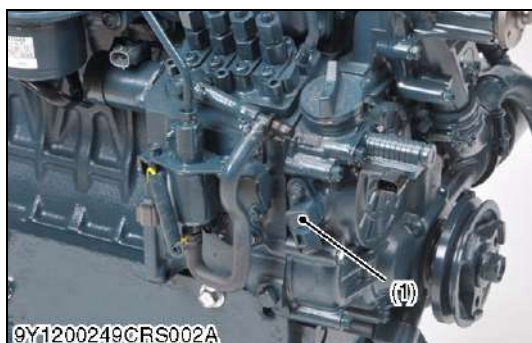
7. Check the Engine Speed Sensor

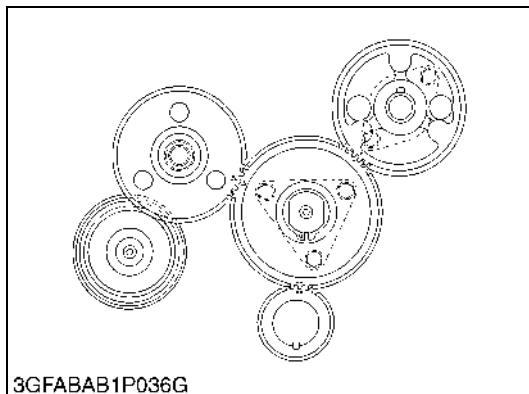
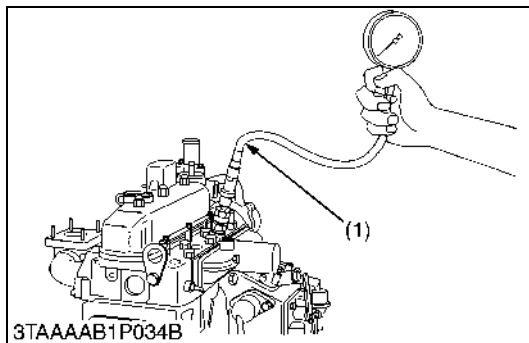
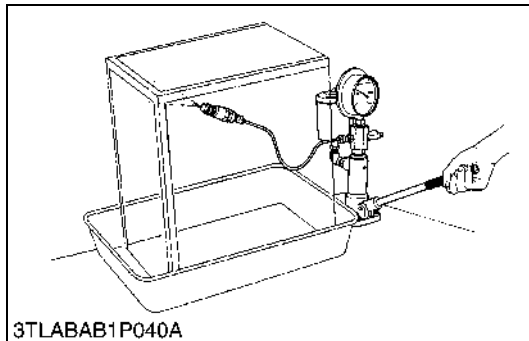
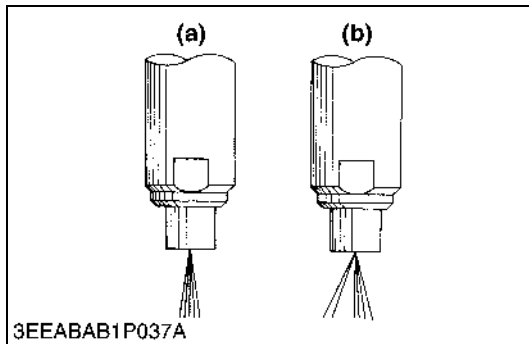
1. Refer to DTC P0335, and implement checking of the engine speed sensor.

OK	Go to "8. Check the Injection Nozzle and Fuel Pipes".
NG	Repair and replacement of the engine speed sensor-related parts.

- (1) Engine Speed Sensor

9Y1200412RSS0117US0





8. Check the Injection Nozzle and Fuel Pipes

1. Check the nozzle spraying condition and fuel injection pressure dealing with a nozzle tester.
Refer to the workshop manual for more information.

Factory specification	1. Engine vibration and noise are increased and the rotation speed is reduced when the injection for the corresponding cylinder is stopped. 2. The same results must be attained from all the cylinders.
OK	Go to "9. Check the Engine".
NG	Check and repair faulty parts including the high pressure line of the defective cylinder.

(a) Good

(b) Bad

9Y1200412RSS0118US0

9. Check the Engine

1. Check the compression pressure, valve clearance, valve timing and the inside of the engine.
2. Check the timing gear.

OK	Normal.
NG	Repair the malfunction.

(1) Compression Tester

9Y1200412RSS0119US0

6. DIAGNOSTIC PROCEDURE BY DTC

[1] DTC LIST

Name		Coolant temperature sensor abnormality	
ISO 14229 P-Code		P0117	P0118
J1939-73	SPN	110	110
	FMI	4	3
SPN Name SAE J1939 Table C1		Engine Coolant Temperature	Engine Coolant Temperature
DTC Name		Coolant temperature sensor: Low	Coolant temperature sensor: High
Detection item		GND short circuit of sensor / harness	Open circuit or +B short circuit of sensor / harness
DTC Set Preconditions		Sensor supply voltage VCC is normal	Sensor supply voltage VCC is normal
DTC set parameter		Voltage of coolant temperature sensor is 0.1 V or less	Voltage of coolant temperature sensor is 4.8 V or more
Time to action or number of error detection		2.8 sec. or more	2.8 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] During start-up = -20 °C (-4 °F) Under other conditions = 80 °C (176 °F) - Sending dummy message: water temp. is 125 °C (257 °F) - DPF active regeneration is inhibited	[Default value] During start-up = -20 °C (-4 °F) Under other conditions = 80 °C (176 °F) - Sending dummy message: water temp. is 125 °C (257 °F) - DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0120US0

Name		Engine overheat
ISO 14229 P-Code		P0217
J1939-73	SPN	110
	FMI	0
SPN Name SAE J1939 Table C1		Engine Coolant Temperature
DTC Name		Engine overheat
Detection item		Overheat of engine coolant temperature
DTC Set Preconditions		- Coolant temperature sensor is normal - Sensor supply voltage VCC is normal
DTC set parameter		Engine coolant temperature $\geq 123\text{ }^{\circ}\text{C}$ (253 $^{\circ}\text{F}$)
Time to action or number of error detection		5 sec. or more
Limp Home Action by engine ECU (system action)		Buzzer: on
Behaviour During Malfunction		Insufficient output Overheat
Engine Warning Light		OFF
Recovery from error		Diag counter = zero
Delay time for recovery		5 sec.
Remark		

9Y1200412RSS0121US0

Name		Engine overrun
ISO 14229 P-Code		P0219
J1939-73	SPN	190
	FMI	0
SPN Name SAE J1939 Table C1		Engine Speed
DTC Name		Engine overrun
Detection item		• Engine speed exceeds threshold speed
DTC Set Preconditions		• Key switch is ON
DTC set parameter		• Engine speed $\geq 4000 \text{ min}^{-1}$ (rpm)
Time to action or number of error detection		• transient
Limp Home Action by engine ECU (system action)		• Engine stop • DPF active regeneration is inhibited
Behaviour During Malfunction		• Overrun
Engine Warning Light		• ON
Recovery from error		• Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0122US0

Name		Engine speed sensor abnormality
ISO 14229 P-Code		P0335
J1939-73	SPN	636
	FMI	8
SPN Name SAE J1939 Table C1		Engine Position Sensor
DTC Name		No input of NE sensor pulse
Detection item		• Open circuit or short circuit of sensor / harness. • Failure of sensor.
DTC Set Preconditions		• Sensor supply voltage VCC is normal • Engine is running
DTC set parameter		• No recognition of Ne sensor pulse
Time to action or number of error detection		• 2 sec. or more
Limp Home Action by engine ECU (system action)		• Engine stop • DPF active regeneration is inhibited
Behaviour During Malfunction		• Engine stall
Engine Warning Light		• ON
Recovery from error		• Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0123US0

Name		Exhaust gas temperature sensor 1 (T1) abnormality	
ISO 14229 P-Code		P0543	P0544
J1939-73	SPN	3242	3242
	FMI	4	3
SPN Name SAE J1939 Table C1		Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature
DTC Name		Exhaust gas temperature sensor 1: Low	Exhaust gas temperature sensor 1: High
Detection item		GND short circuit of sensor / harness.	Open circuit or +B short circuit of sensor / harness.
DTC Set Preconditions		Sensor supply voltage VCC is normal	- Coolant temp. $\geq 65^{\circ}\text{C}$ (149°F) 100°C (212°F) $\leq T0 \leq 800^{\circ}\text{C}$ (1472°F): continues longer than 20 sec. or 100°C (212°F) $\leq T2 \leq 800^{\circ}\text{C}$ (1472°F): continues longer than 20 sec. or 100°C (212°F) $\leq T4 \leq 800^{\circ}\text{C}$ (1472°F): continues longer than 20 sec.
DTC set parameter		DPF inlet temp. sensor (T1) voltage: 0.08 V or less	DPF inlet temp. sensor (T1) voltage: 4.92 V or more
Time to action or number of error detection		5 sec. or more	120 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0°C (32°F) - Output limitation: Approximately 50 % of normal condition - DPF active regeneration is inhibited	[Default value] 0°C (32°F) - Output limitation: Approximately 50 % of normal condition - DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0124US0

Name		Exhaust gas temperature sensor 0 (T0) abnormality	
ISO 14229 P-Code		P0546	P0547
J1939-73	SPN	4765	4765
	FMI	4	3
SPN Name SAE J1939 Table C1		Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature
DTC Name		Exhaust gas temperature sensor 0: Low	Exhaust gas temperature sensor 0: High
Detection item		GND short circuit of sensor / harness.	Open circuit or +B short circuit of sensor / harness.
DTC Set Preconditions		Sensor supply voltage VCC is normal	- Coolant temp. $\geq 65\text{ }^{\circ}\text{C}$ (149 $^{\circ}\text{F}$) $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T1 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 20 sec. or $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T2 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 20 sec. or $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T4 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 20 sec.
DTC set parameter		DOC inlet temp. sensor (T0) voltage: 0.08 V or less	DOC inlet temp. sensor (T0) voltage: 4.92 V or more
Time to action or number of error detection		5 sec. or more	120 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] $0\text{ }^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) DPF active regeneration is inhibited	[Default value] $0\text{ }^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0125US0

Name		Battery voltage abnormality	
ISO 14229 P-Code		P0562	P0563
J1939-73	SPN	168	168
	FMI	4	3
SPN Name SAE J1939 Table C1		Battery Potential / Power Input 1	Battery Potential / Power Input 1
DTC Name		Battery voltage: Low	Battery voltage: High
Detection item		- Open circuit, short circuit or damage of harness. - Failure of battery.	- Open circuit, short circuit or damage of harness. - Failure of battery.
DTC Set Preconditions		- Key switch is ON - Starter switch is OFF - Sensor supply voltage VCC is normal 20 sec. elapsed after engine starts	- Key switch is ON - Starter switch is OFF - Sensor supply voltage VCC is normal
DTC set parameter		Battery voltage is lower than 8 V	Battery voltage: 16 V or more
Time to action or number of error detection		1 sec. or more	1 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited	- Output limitation: Approximately 50 % of normal condition - Accel limitation = 50 % - DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Diag counter = zero	Key switch turn OFF
Delay time for recovery		1 sec.	—
Remark			

9Y1200412RSS0126US0

Name		ECU FLASH ROM and CPU abnormality	
ISO 14229 P-Code		P0605	P0606
J1939-73	SPN	628	1077
	FMI	2	2
SPN Name SAE J1939 Table C1		Program Memory	Engine Fuel Injection Pump Controller
DTC Name		ECU FLASH ROM error	ECU CPU (Main IC) error
Detection item		• FLASH ROM check sum error	• Failure of CPU
DTC Set Preconditions		• Key switch is ON	• Key switch is ON
DTC set parameter		• FLASH ROM check sum error	• Error detection by Watch-Dog
Time to action or number of error detection		• transient	• transient
Limp Home Action by engine ECU (system action)		• Engine stop • DPF active regeneration is inhibited	• Engine stop • DPF active regeneration is inhibited
Behaviour During Malfunction		• Engine stall	• Engine stall
Engine Warning Light		• ON	• ON
Recovery from error		• Key switch turn OFF	• Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0127US0

Name		Sensor supply voltage low
ISO 14229 P-Code		P0642
J1939-73	SPN	3509
	FMI	4
SPN Name SAE J1939 Table C1		Sensor supply voltage 1
DTC Name		Sensor supply voltage: Low
Detection item		Sensor supply voltage 1 error or recognition error
DTC Set Preconditions		Key switch is ON
DTC set parameter		Voltage to sensor is below the threshold.
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		- Engine stop - DPF active regeneration is inhibited
Behaviour During Malfunction		Engine stall
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0128US0

Name		Circuit of burner glow abnormality	
ISO 14229 P-Code		P1801	P1802
J1939-73	SPN	523766	523766
	FMI	6	5
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Over current in circuit of burner glow	Circuit of burner glow open / short to B+
Detection item		Over current in circuit of glow	Open circuit or short circuit of harness
DTC Set Preconditions		- Battery voltage is normal - Sensor supply voltage VCC is normal - Glow is ON	- Battery voltage is normal - Glow is ON
DTC set parameter		Current at glow: 10 A or more	Current at glow is 0.5 A or less when glow is activated.
Time to action or number of error detection		3 sec. or more	3 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited	DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0129US0

Name		Circuit of fuel pump for fuel reformer abnormality		
ISO 14229 P-Code		P1803	P1804	P1805
J1939-73	SPN	523767	523767	523767
	FMI	5	4	3
SPN Name SAE J1939 Table C1		proprietary	proprietary	proprietary
DTC Name		Circuit of fuel pump for fuel reformer open	Circuit of fuel pump for fuel reformer short to GND	Circuit of fuel pump for fuel reformer short to B+
Detection item		Open circuit of fuel pump / harness.	GND short circuit of harness.	B+ short circuit of harness.
DTC Set Preconditions		Battery voltage is normal	Battery voltage is normal	Battery voltage is normal
DTC set parameter		Open circuit of harness	GND short circuit of harness	B+ short circuit of harness
Time to action or number of error detection		1 sec. or more	1 sec. or more	1 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited	DPF active regeneration is inhibited	DPF active regeneration is inhibited
Behaviour During Malfunction				
Engine Warning Light		ON	ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—	—
Remark				

9Y1200412RSS0130US0

Name		Blower motor malfunction	
ISO 14229 P-Code		P1806	P1807
J1939-73	SPN	523768	523768
	FMI	5	5
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Blower motor (Main circuit) malfunction	Blower motor (Sub circuit) malfunction
Detection item		- Open circuit or +B short circuit of harness. - Blower motor malfunction	- Open circuit or +B short circuit of harness. - Air-blow malfunction. - Sub blower motor circuit malfunction.
DTC Set Preconditions		- Battery voltage is normal - Sensor supply voltage VCC is normal - Blower is activated	- Battery voltage is normal - Sensor supply voltage VCC is normal - Blower motor is activated
DTC set parameter		- Open circuit of harness - Over current caused by short circuit	- Open circuit of harness - Over current caused by short circuit
Time to action or number of error detection		1 sec. or more	1 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited	DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0131US0

Name		Circuit of solenoid valve 1 for fuel reformer abnormality		
ISO 14229 P-Code		P1808	P1809	P1810
J1939-73	SPN	523770	523770	523770
	FMI	5	4	3
SPN Name SAE J1939 Table C1		proprietary	proprietary	proprietary
DTC Name		Circuit of solenoid valve 1 for fuel reformer open	Circuit of solenoid valve 1 for fuel reformer short to GND	Circuit of solenoid valve 1 for fuel reformer short to B+
Detection item		• Open circuit of solenoid valve 1 / harness.	• GND short circuit of harness.	• B+ short circuit of harness.
DTC Set Preconditions		• Battery voltage is normal	• Battery voltage is normal	• Battery voltage is normal
DTC set parameter		• Open circuit of harness	• GND short circuit of harness	• B+ short circuit of harness
Time to action or number of error detection		• 1 sec. or more	• 1 sec. or more	• 1 sec. or more
Limp Home Action by engine ECU (system action)		• DPF active regeneration is inhibited	• DPF active regeneration is inhibited	• DPF active regeneration is inhibited
Behaviour During Malfunction				
Engine Warning Light		• ON	• ON	• ON
Recovery from error		• Key switch turn OFF	• Key switch turn OFF	• Key switch turn OFF
Delay time for recovery		—	—	—
Remark				

9Y1200412RSS0132US0

Name		Circuit of solenoid valve 2 for fuel reformer abnormality		
ISO 14229 P-Code		P1811	P1812	P1813
J1939-73	SPN	523769	523769	523769
	FMI	5	4	3
SPN Name SAE J1939 Table C1		proprietary	proprietary	proprietary
DTC Name		Circuit of solenoid valve 2 for fuel reformer open	Circuit of solenoid valve 2 for fuel reformer short to GND	Circuit of solenoid valve 2 for fuel reformer short to B+
Detection item		Open circuit of solenoid valve 2 / harness.	GND short circuit of harness.	B+ short circuit of harness.
DTC Set Preconditions		Battery voltage is normal	Battery voltage is normal	Battery voltage is normal
DTC set parameter		Open circuit of harness	GND short circuit of harness	B+ short circuit of harness
Time to action or number of error detection		1 sec. or more	1 sec. or more	1 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited	DPF active regeneration is inhibited	DPF active regeneration is inhibited
Behaviour During Malfunction				
Engine Warning Light		ON	ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—	—
Remark				

9Y1200412RSS0133US0

Name		Burner temperature sensor abnormality	
ISO 14229 P-Code		P1815	P1816
J1939-73	SPN	523762	523762
	FMI	3	4
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Burner temperature sensor: High	Burner temperature sensor: Low
Detection item		Open circuit or +B short circuit of sensor / harness.	GND short circuit of sensor / harness.
DTC Set Preconditions		- Coolant temp. $\geq 65\text{ }^{\circ}\text{C}$ (149 $^{\circ}\text{F}$) $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T0 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 10 sec. or $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T1 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 10 sec. or $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T2 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 10 sec.	- DPF regeneration is not activated - Sensor supply voltage VCC is normal
DTC set parameter		Burner temp. sensor (T4) voltage: 4.92 V or more	Burner temp. sensor (T4) voltage: 0.08 V or less
Time to action or number of error detection		120 sec. or more	5 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) DPF active regeneration is inhibited	[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0134US0

Name		Blower pressure sensor abnormality	
ISO 14229 P-Code		P1818	P1819
J1939-73	SPN	523764	523764
	FMI	3	4
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Blower pressure sensor: High	Blower pressure sensor: Low
Detection item		Open circuit or +B short circuit of sensor / harness.	GND short circuit of sensor / harness.
DTC Set Preconditions		Sensor supply voltage VCC is normal	Sensor supply voltage VCC is normal
DTC set parameter		Blower pressure sensor voltage: 4.8 V or more	Blower pressure sensor voltage: 0.2 V or less
Time to action or number of error detection		2.8 sec. or more	2.8 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 kPa (0 psi) DPF active regeneration is inhibited	[Default value] 0 kPa (0 psi) DPF active regeneration is inhibited
Behaviour During Malfunction		—	—
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0135US0

Name		Rack position sensor abnormality	
ISO 14229 P-Code		P1827	P1828
J1939-73	SPN	523773	523773
	FMI	3	4
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Rack position sensor: High	Rack position sensor: Low
Detection item		Open circuit or B+ short circuit of sensor / harness	- GND short circuit of sensor / harness. - Mount condition of sensor is incorrect.
DTC Set Preconditions		Sensor supply voltage VCC is normal	Sensor supply voltage VCC is normal
DTC set parameter		Electric governor solenoid current: 1000 mA or less and rack position sensor voltage: 4.8 V or more	Rack position sensor voltage: 0.3 V or less
Time to action or number of error detection		0.5 sec. or more	transient
Limp Home Action by engine ECU (system action)		- Engine stop - DPF active regeneration is inhibited	- Engine stop - DPF active regeneration is inhibited
Behaviour During Malfunction		Engine stall	Engine stall
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0136US0

Name		Electric governor solenoid circuit abnormality	
ISO 14229 P-Code		P1830	P1831
J1939-73	SPN	523771	523771
	FMI	5	6
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Open circuit of electric governor solenoid	Electric governor solenoid circuit short to GND / B+
Detection item		Open circuit of solenoid / harness.	GND short circuit of solenoid / harness.
DTC Set Preconditions		- Sensor supply voltage VCC is normal - Key switch is ON - No starter-SW input	- Sensor supply voltage VCC is normal - Key switch is ON
DTC set parameter		Open circuit of solenoid / harness	GND short circuit of solenoid / harness
Time to action or number of error detection		3 sec. or more	3 sec. or more
Limp Home Action by engine ECU (system action)		- Engine stop - DPF active regeneration is inhibited	- Engine stop - DPF active regeneration is inhibited
Behaviour During Malfunction		Engine stall	Engine stall
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0137US0

Name		Reformer temperature sensor abnormality	
ISO 14229 P-Code		P1832	P1833
J1939-73	SPN	523763	523763
	FMI	3	4
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Reformer temperature sensor: High	Reformer temperature sensor: Low
Detection item		Open circuit or +B short circuit of sensor / harness.	GND short circuit of sensor / harness.
DTC Set Preconditions		- Coolant temp. $\geq 65^{\circ}\text{C}$ (149°F) - Fuel reforming control is active	- DPF regeneration is not active - Sensor supply voltage VCC is normal
DTC set parameter		Reformer temp. sensor (T3) voltage: 4.92 V or more	Reformer temp. sensor (T3) voltage: 0.08 V or less
Time to action or number of error detection		40 sec. or more	5 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0°C (32°F) DPF active regeneration is inhibited	[Default value] 0°C (32°F) DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0138US0

Name		Reformer temperature abnormality
ISO 14229 P-Code		P1834
J1939-73	SPN	523753
	FMI	0
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Reformer temperature high abnormally
Detection item		Abnormally high reformer temperature
DTC Set Preconditions		Sensor supply voltage VCC is normal
DTC set parameter		Reformer temp.: 1000 °C (1832 °F) or more
Time to action or number of error detection		210 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0139US0

Name		Blower pressure abnormal
ISO 14229 P-Code		P1835
J1939-73	SPN	523751
	FMI	0
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Blower pressure abnormal
Detection item		Abnormally high blower pressure
DTC Set Preconditions		Sensor supply voltage VCC is normal
DTC set parameter		Blower pressure: 55 kPa (8.0 psi) or more
Time to action or number of error detection		30 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0140US0

Name		Circuit of glow relay for fuel reforming abnormality	
ISO 14229 P-Code		P1836	P1837
J1939-73	SPN	523765	523765
	FMI	3	4
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Circuit of glow relay for fuel reforming open / short to B+	Circuit of glow relay for fuel reforming short to GND
Detection item		Open circuit or B+ short circuit of relay / harness	GND short circuit of relay / harness
DTC Set Preconditions		- Battery voltage is normal - Relay is OFF	- Battery voltage is normal - Relay is ON
DTC set parameter		Open circuit / B+ short circuit of harness	GND short circuit of harness
Time to action or number of error detection		1 sec. or more	1 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited	DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0141US0

Name		Buzzer circuit abnormality	
ISO 14229 P-Code		P1838	P1839
J1939-73	SPN	523759	523759
	FMI	4	3
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Buzzer circuit open / short to GND	Buzzer circuit short to B+
Detection item		Open circuit or GND short circuit of buzzer / harness.	B+ short circuit of buzzer / harness.
DTC Set Preconditions		- Battery voltage is normal - Buzzer is OFF	- Battery voltage is normal - Buzzer is ON
DTC set parameter		Open circuit / GND short circuit of harness	B+ short circuit of harness
Time to action or number of error detection		1 sec. or more	1 sec. or more
Limp Home Action by engine ECU (system action)			
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0142US0

Name		Feed pump circuit abnormality	
ISO 14229 P-Code		P1840	P1841
J1939-73	SPN	523761	523761
	FMI	3	4
SPN Name SAE J1939 Table C1		proprietary	proprietary
DTC Name		Feed pump circuit open / short to B+	Feed pump circuit short to GND
Detection item		Open circuit or B+ short circuit of pump / harness.	GND short circuit of pump / harness.
DTC Set Preconditions		- Battery voltage is normal - Feed pump is OFF	- Battery voltage is normal - Feed pump is ON
DTC set parameter		Open circuit / B+ short circuit of harness	GND short circuit of harness
Time to action or number of error detection		1 sec. or more	1 sec. or more
Limp Home Action by engine ECU (system action)			
Behaviour During Malfunction		Insufficient output or Engine stall	Insufficient output or Engine stall
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0143US0

Name		Reformer abnormal
ISO 14229 P-Code		P1844
J1939-73	SPN	523755
	FMI	2
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Reformer abnormal
Detection item		Reformer is not working when DPF regeneration is active.
DTC Set Preconditions		DPF regeneration is activated
DTC set parameter		Reformer temp. (T3) < 570 °C (1058 °F) three times while reforming catalyst startup sequence is activated
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0144US0

Name		Fail to rise DPF temperature
ISO 14229 P-Code		P1845
J1939-73	SPN	523756
	FMI	2
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Fail to rise DPF temperature
Detection item		DPF temperature rising control is incomplete when DPF regeneration is active.
DTC Set Preconditions		DPF regeneration is activated
DTC set parameter		60 sec. elapsed while following conditions were met a. DOC regeneration is activated b. DPF inlet temp. (T1) < 190 °C (374 °F)
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0145US0

Name		Over current in circuit of blower motor
ISO 14229 P-Code		P1846
J1939-73	SPN	523768
	FMI	6
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Over current in circuit of blower motor
Detection item		Over current in circuit of blower motor for fuel reforming
DTC Set Preconditions		Sensor supply voltage VCC is normal
DTC set parameter		Current in circuit of blower motor: 16 A or more
Time to action or number of error detection		5 sec. or more
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0146US0

Name		Fail to ignite burner
ISO 14229 P-Code		P1848
J1939-73	SPN	523757
	FMI	2
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Fail to ignite burner
Detection item		Fail to ignite burner (Solenoid valve 2 or ignition glow is not working.)
DTC Set Preconditions		- Sensor supply voltage VCC is normal - DPF regeneration is activated
DTC set parameter		- Fail to ignite reformed gas three times during DPF regeneration 120 sec. elapsed while following conditions were met a. DOC regeneration is activated b. Burner temp. (T4) $\leq 400\text{ }^{\circ}\text{C}$ (752 $^{\circ}\text{F}$)
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0147US0

Name		Low coolant temp. for DPF regeneration
ISO 14229 P-Code		P1849
J1939-73	SPN	523750
	FMI	2
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Low coolant temp. for DPF regeneration
Detection item		Fail to warm-up coolant temp. for DPF regeneration
DTC Set Preconditions		- Sensor supply voltage VCC is normal - Coolant temp. sensor is normal
DTC set parameter		Coolant temp. < 50 °C (122 °F) while reformer warm-up sequence is activated
Time to action or number of error detection		2700 sec.
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Diag counter = zero
Delay time for recovery		transient
Remark		

9Y1200412RSS0148US0

Name		EEP write error
ISO 14229 P-Code		P1850
J1939-73	SPN	523749
	FMI	2
SPN Name SAE J1939 Table C1		proprietary
DTC Name		EEP write error
Detection item		Write failure to EEPROM
DTC Set Preconditions		Key switch is ON
DTC set parameter		Write completion decision data to the EEPROM is invalid
Time to action or number of error detection		Transient
Limp Home Action by engine ECU (system action)		Forced Idle (Accelerator=0 %)
Behaviour During Malfunction		Insufficient output
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0149US0

Name		Excessive power consumption during regeneration
ISO 14229 P-Code		P1851
J1939-73	SPN	523748
	FMI	2
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Excessive power consumption during regeneration
Detection item		Excessive power consumption during DPF regeneration
DTC Set Preconditions		Key switch is ON
DTC set parameter		- Voltage drop below 12.5 V at the start of regeneration - Battery voltage during regeneration is 12.5 V or less
Time to action or number of error detection		Transient
Limp Home Action by engine ECU (system action)		Suspension of Regeneration
Behaviour During Malfunction		
Engine Warning Light		OFF
Recovery from error		DPF regeneration is successful completion
Delay time for recovery		—
Remark		

9Y1200412RSS0150US0

Name		High frequency of the interruption of automatic regeneration
ISO 14229 P-Code		P1856
J1939-73	SPN	523742
	FMI	2
SPN Name SAE J1939 Table C1		High frequency of the interruption of automatic regeneration
DTC Name		High frequency of the interruption of automatic regeneration
Detection item		"High frequency of the interruption of automatic regeneration during automatic regeneration (DPFst = 2 on and after) (The interruption by the following incidents, Key switch off, Occurrence of DTC, Engine Stop, Prohibit of regeneration by a switch)"
DTC Set Preconditions		Key switch is ON
DTC set parameter		The number of times of the interruption of regeneration during automatic regeneration (DPFst = 2 on and after)
Time to action or number of error detection		5 times or more
Limp Home Action by engine ECU (system action)		The issue of request of parked regeneration
Behaviour During Malfunction		
Engine Warning Light		OFF
Recovery from error		DPF regeneration is successful completion
Delay time for recovery		—
Remark		

9Y1200412RSS0151US0

Name		EEPROM check sum error
ISO 14229 P-Code		P1990
J1939-73	SPN	523700
	FMI	13
SPN Name SAE J1939 Table C1		proprietary
DTC Name		ECU EEPROM check sum error
Detection item		EEPROM check sum error
DTC Set Preconditions		- Battery voltage is normal - Key switch is ON
DTC set parameter		EEPROM check sum error
Time to action or number of error detection		0.5 sec. or more
Limp Home Action by engine ECU (system action)		- Engine stop - DPF active regeneration is inhibited
Behaviour During Malfunction		Engine stall
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0152US0

Name		Accelerator Pedal Position 1 abnormality	
ISO 14229 P-Code		P2122	P2123
J1939-73	SPN	91	91
	FMI	4	3
SPN Name SAE J1939 Table C1		Accelerator Pedal Position 1	Accelerator Pedal Position 1
DTC Name		Accelerator position sensor 1: Low	Accelerator position sensor 1: High
Detection item		GND short circuit or open circuit of sensor / harness	B+ short circuit of sensor / harness
DTC Set Preconditions		Sensor supply voltage VCC is normal	Sensor supply voltage VCC is normal
DTC set parameter		Voltage of accelerator position sensor 1: 0.2 V or less	Voltage of accelerator position sensor 1: 4.8 V or more
Time to action or number of error detection		transient	transient
Limp Home Action by engine ECU (system action)		Forced Idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)	Forced Idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)
Behaviour During Malfunction		Insufficient output	Insufficient output
Engine Warning Light		ON	ON
Recovery from error		Diag counter = zero	Diag counter = zero
Delay time for recovery		transient	transient
Remark			

9Y1200412RSS0153US0

Name		Accelerator Pedal Position 2 abnormality	
ISO 14229 P-Code		P2127	P2128
J1939-73	SPN	29	29
	FMI	4	3
SPN Name SAE J1939 Table C1		Accelerator Pedal Position 2	Accelerator Pedal Position 2
DTC Name		Accelerator position sensor 2: Low	Accelerator position sensor 2: High
Detection item		GND short circuit or open circuit of sensor / harness	B+ short circuit of sensor / harness
DTC Set Preconditions		Sensor supply voltage VCC is normal	Sensor supply voltage VCC is normal
DTC set parameter		Voltage of accelerator position sensor 2: 0.2 V or less	Voltage of accelerator position sensor 2: 4.8 V or more
Time to action or number of error detection		transient	transient
Limp Home Action by engine ECU (system action)		Forced Idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)	Forced Idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)
Behaviour During Malfunction		Insufficient output	Insufficient output
Engine Warning Light		ON	ON
Recovery from error		Diag counter = zero	Diag counter = zero
Delay time for recovery		transient	transient
Remark			

9Y1200412RSS0154US0

Name		Barometric pressure sensor error	
ISO 14229 P-Code		P2228	P2229
J1939-73	SPN	108	108
	FMI	4	3
SPN Name SAE J1939 Table C1		Barometric Pressure	Barometric Pressure
DTC Name		Barometric pressure sensor: Low	Barometric pressure sensor: High
Detection item		• GND short circuit of sensor	• B+ short circuit of sensor
DTC Set Preconditions		• Sensor supply voltage VCC is normal	• Sensor supply voltage VCC is normal
DTC set parameter		• Barometric pressure sensor voltage: 0.2 V or less	• Barometric pressure sensor voltage: 4.8 V or more
Time to action or number of error detection		• 2.8 sec. or more	• 2.8 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 65 kPa (9.4 psi) • Output limitation • Approximately 50 % of normal condition • DPF active regeneration is inhibited	[Default value] 65 kPa (9.4 psi) • Output limitation • Approximately 50 % of normal condition • DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		• ON	• ON
Recovery from error		• Diag counter = zero	• Diag counter = zero
Delay time for recovery		• 3 sec.	• 3 sec.
Remark		• Default value is lower than normal condition considering using at high altitude.	• Default value is lower than normal condition considering using at high altitude.

9Y1200412RSS0155US0

Name		Exhaust gas temperature sensor 2 (T2) abnormality	
ISO 14229 P-Code		P242C	P242D
J1939-73	SPN	3246	3246
	FMI	4	3
SPN Name SAE J1939 Table C1		Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature
DTC Name		Exhaust gas temperature sensor 2: Low	Exhaust gas temperature sensor 2: High
Detection item		GND short circuit of sensor / harness.	Open circuit or +B short circuit of sensor / harness.
DTC Set Preconditions		Sensor supply voltage VCC is normal	- Coolant temp. $\geq 65\text{ }^{\circ}\text{C}$ (149 $^{\circ}\text{F}$) $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T0 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 20 sec. or $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T1 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 20 sec. or $100\text{ }^{\circ}\text{C}$ (212 $^{\circ}\text{F}$) $\leq T4 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 20 sec.
DTC set parameter		DPF outlet temp. sensor (T2) voltage: 0.08 V or less	DPF outlet temp. sensor (T2) voltage: 4.92 V or more
Time to action or number of error detection		5 sec. or more	120 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) DPF active regeneration is inhibited	[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0156US0

Name		Differential pressure sensor 1 abnormality	
ISO 14229 P-Code		P2454	P2455
J1939-73	SPN	3251	3251
	FMI	4	3
SPN Name SAE J1939 Table C1		Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment 1 Diesel Particulate Filter Differential Pressure
DTC Name		Differential pressure sensor 1: Low	Differential pressure sensor 1: High
Detection item		GND short circuit of sensor / harness.	Open circuit or +B short circuit of sensor / harness.
DTC Set Preconditions		- Sensor supply voltage VCC is normal - No starter-SW input	- Sensor supply voltage VCC is normal - No starter-SW input
DTC set parameter		DPF differential pressure sensor voltage: 0.2 V or less	DPF differential pressure sensor voltage: 4.8 V or more
Time to action or number of error detection		2.8 sec. or more	2.8 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 kPa (0 psi) - Output limitation - Approximately 50 % of normal condition - DPF active regeneration is inhibited	[Default value] 0 kPa (0 psi) - Output limitation - Approximately 50 % of normal condition - DPF active regeneration is inhibited
Behaviour During Malfunction		Insufficient output	Insufficient output
Engine Warning Light		ON	ON
Recovery from error		Key switch turn OFF	Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200412RSS0157US0

Name		Exhaust gas temperature sensor 0: Emergency high
ISO 14229 P-Code		P3002
J1939-73	SPN	4765
	FMI	0
SPN Name SAE J1939 Table C1		Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature
DTC Name		Emergency Exhaust gas temperature sensor 0: High
Detection item		• DOC inlet temp. (T0) high
DTC Set Preconditions		• Exhaust gas temp. sensor T0, T1 and T2 are normal • Sensor supply voltage VCC is normal
DTC set parameter		• DOC inlet temp. (T0): 700 °C (1292 °F) or more
Time to action or number of error detection		• 2 sec. or more
Limp Home Action by engine ECU (system action)		• Engine stop • Inhibit starter relay activation until exhaust temp. reduces down to 300 °C (572 °F) • DPF active regeneration is inhibited
Behaviour During Malfunction		• Engine stall • Inhibits cranking until down to 300 °C (572 °F)
Engine Warning Light		• ON
Recovery from error		• Under 300 °C (572 °F) & key switch turn OFF
Delay time for recovery		
Remark		

9Y1200412RSS0158US0

Name		Exhaust gas temperature sensor 1: Emergency high
ISO 14229 P-Code		P3003
J1939-73	SPN	3242
	FMI	0
SPN Name SAE J1939 Table C1		Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature
DTC Name		Emergency Exhaust gas temperature sensor 1: High
Detection item		DPF inlet temp. (T1) high
DTC Set Preconditions		- Exhaust gas temp. sensor T0, T1 and T2 are normal - Sensor supply voltage VCC is normal
DTC set parameter		DPF inlet temp. (T1): 715 °C (1319 °F) or more
Time to action or number of error detection		9 min. or more
Limp Home Action by engine ECU (system action)		- Engine stop - Inhibit starter relay activation until exhaust temp. reduces down to 300 °C (572 °F) - DPF active regeneration is inhibited
Behaviour During Malfunction		- Engine stall - Inhibits cranking until down to 300 °C (572 °F)
Engine Warning Light		ON
Recovery from error		Under 300 °C (572 °F) & key switch turn OFF
Delay time for recovery		
Remark		

9Y1200412RSS0159US0

Name		Exhaust gas temperature sensor 2: Emergency high
ISO 14229 P-Code		P3004
J1939-73	SPN	3246
	FMI	0
SPN Name SAE J1939 Table C1		Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature
DTC Name		Emergency Exhaust gas temperature sensor 2: High
Detection item		DPF outlet temp. (T2) high
DTC Set Preconditions		- Exhaust gas temp. sensor T0, T1 and T2 are normal - Sensor supply voltage VCC is normal
DTC set parameter		DPF outlet temp. (T2): 820 °C (1508 °F) or more
Time to action or number of error detection		2 sec. or more
Limp Home Action by engine ECU (system action)		- Engine stop - Inhibit starter relay activation until exhaust temp. reduces down to 300 °C (572 °F) - DPF active regeneration is inhibited
Behaviour During Malfunction		- Engine stall - Inhibits cranking until down to 300 °C (572 °F)
Engine Warning Light		ON
Recovery from error		Under 300 °C (572 °F) & key switch turn OFF
Delay time for recovery		
Remark		

9Y1200412RSS0160US0

Name		Excessive PM3
ISO 14229 P-Code		P3006
J1939-73	SPN	3701
	FMI	15
SPN Name SAE J1939 Table C1		Diesel Particulate Filter Status
DTC Name		Excessive PM3
Detection item		PM accumulation level 3
DTC Set Preconditions		Key switch is ON
DTC set parameter		- PM accumulation more than trigger level - Regeneration level = 3
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		- Output limitation - Approximately 50 % of normal condition - DPF auto regeneration is inhibited - Buzzer: off and on
Behaviour During Malfunction		Insufficient output
Engine Warning Light		BLINK
Recovery from error		Diag counter = zero (DPF regeneration is finished normally)
Delay time for recovery		transient
Remark		To minimize PM out put

9Y1200412RSS0161US0

Name		Excessive PM4
ISO 14229 P-Code		P3007
J1939-73	SPN	3701
	FMI	16
SPN Name SAE J1939 Table C1		Diesel Particulate Filter Status
DTC Name		Excessive PM4
Detection item		PM accumulation level 4
DTC Set Preconditions		Key switch is ON
DTC set parameter		- PM accumulation more than trigger level - Regeneration level = 4
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		- Output limitation - Approximately 50 % of normal condition - DPF auto regeneration is inhibited - Buzzer: off and on
Behaviour During Malfunction		Insufficient output
Engine Warning Light		ON
Recovery from error		Diag counter = zero (DPF regeneration is finished normally)
Delay time for recovery		transient
Remark		To minimize PM out put

9Y1200412RSS0162US0

Name		Excessive PM5
ISO 14229 P-Code		P3008
J1939-73	SPN	3701
	FMI	0
SPN Name SAE J1939 Table C1		Diesel Particulate Filter Status
DTC Name		Excessive PM5
Detection item		PM accumulation level 5
DTC Set Preconditions		Key switch is ON
DTC set parameter		- PM accumulation more than trigger level - Regeneration level = 5
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		- Output limitation - Approximately 50 % of normal condition - DPF active regeneration is inhibited - Buzzer: off and on
Behaviour During Malfunction		Insufficient output
Engine Warning Light		ON
Recovery from error		Key switch turn OFF (Reset by Service tool)
Delay time for recovery		
Remark		- To minimize PM out put - Engine is not stopped forcibly by ECU. However KUBOTA strongly recommends operator to stop engine as soon as possible.

9Y1200412RSS0163US0

Name		Parked regeneration time out
ISO 14229 P-Code		P3013
J1939-73	SPN	523590
	FMI	16
SPN Name SAE J1939 Table C1		proprietary
DTC Name		Regeneration time out
Detection item		Time out error: regeneration incomplete due to low temperature of DPF
DTC Set Preconditions		DPF regeneration is active
DTC set parameter		- DPF regeneration process is not completed within 2700 sec. - DOC regeneration process is not completed within 3600 sec.
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200412RSS0164US0

Name		All exhaust temperature sensor failure
ISO 14229 P-Code		P3018
J1939-73	SPN	523599
	FMI	0
SPN Name SAE J1939 Table C1		proprietary
DTC Name		All exhaust temp. sensor failure
Detection item		All exhaust gas temp. sensor failure simultaneously
DTC Set Preconditions		- Sensor supply voltage VCC is normal - Engine speed is 1400 min⁻¹ (rpm) or more - Fuel quantity is 10 mm³/st or more - Coolant temperature is 65 °C (149 °F) or more 100 sec. elapsed after engine starts
DTC set parameter		T0 / T1 / T2 / T4 temp. sensor failure (sensor low) simultaneously
Time to action or number of error detection		100 sec. or more
Limp Home Action by engine ECU (system action)		- Output limitation - Approximately 75 % of normal condition - DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		ON
Recovery from error		Diag counter = zero
Delay time for recovery		transient
Remark		

9Y1200412RSS0165US0

Name		High exhaust gas temperature after emergency high temperature DTC
ISO 14229 P-Code		P3023
J1939-73	SPN	523601
	FMI	0
SPN Name SAE J1939 Table C1		proprietary
DTC Name		High exhaust gas temp. after emergency high temp. DTC.
Detection item		Exhaust gas temperature sensor 0,1,2 output
DTC Set Preconditions		Battery voltage is normal
DTC set parameter		All exhaust gas temp. (T0, T1, T2) reduces down to 300 °C (572 °F)
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		- Engine stop - Inhibit starter relay - activation until all exhaust gas temp. (T0, T1, T2) reduces down to 300 °C (572 °F)
Behaviour During Malfunction		–
Engine Warning Light		ON
Recovery from error		Diag counter = zero
Delay time for recovery		transient
Remark		

9Y1200412RSS0166US0

Name		High frequency of regeneration
ISO 14229 P-Code		P3024
J1939-73	SPN	523602
	FMI	0
SPN Name SAE J1939 Table C1		proprietary
DTC Name		High frequency of regeneration
Detection item		Time interval from the end time to the start time of the regeneration
DTC Set Preconditions		Key switch is ON
DTC set parameter		Regeneration time interval within 30 min. occurs three times continuously
Time to action or number of error detection		transient
Limp Home Action by engine ECU (system action)		- Output limitation - Approximately 50 % of normal condition - Auto DPF regeneration is inhibited
Behaviour During Malfunction		Worsening exhaust gas performance (NOx)
Engine Warning Light		ON
Recovery from error		Key switch turn OFF (Reset by Service tool)
Delay time for recovery		
Remark		

9Y1200412RSS0167US0

[2] DIAGNOSTIC PROCEDURE BY DTC

If a DTC output indicates a malfunction, locate the malfunction by following the diagnostic procedure in the following pages.

Follow the instructions of the diagnostic procedure when required to refer to other items.

In this manual, the diagnostic procedures are listed according to the Diagnostic Trouble Code (DTC) numbers as shown. (In exceptional cases, some procedures are given in different positions.)

ISO 14229 P-Code	J1939-73		Name	Reference Page
	SPN	FMI		
P0117	110	4	Coolant temperature sensor abnormality	1-S103
P0118	110	3		
P0217	110	0	Engine overheat	1-S106
P0219	190	0	Engine overrun	1-S108
P0335	636	8	Engine speed sensor abnormality	1-S109
P0543	3242	4	Exhaust gas temperature sensor 1 (T1) abnormality	1-S112
P0544	3242	3		
P0546	4765	4	Exhaust gas temperature sensor 0 (T0) abnormality	1-S115
P0547	4765	3		
P0562	168	4	Battery voltage abnormality	1-S118
P0563	168	3		
P0605	628	2	ECU FRASH ROM and CPU abnormality	1-S121
P0606	1077	2		
P0642	3509	4	Sensor supply voltage low	1-S122
P1801	523766	6	Circuit of burner glow abnormality	1-S124
P1802	523766	5		
P1803	523767	5	Circuit of fuel pump for fuel reformer abnormality	1-S127
P1804	523767	4		
P1805	523767	3		
P1806	523768	5	Blower motor malfunction	1-S129
P1807	523768	5		
P1808	523770	5	Circuit of solenoid valve 1 for fuel reformer abnormality	1-S131
P1809	523770	4		
P1810	523770	3		
P1811	523769	5	Circuit of solenoid valve 2 for fuel reformer abnormality	1-S133
P1812	523769	4		
P1813	523769	3		
P1815	523762	3	Burner temperature sensor abnormality	1-S135
P1816	523762	4		
P1818	523764	3	Blower pressure sensor abnormality	1-S138
P1819	523764	4		
P1827	523773	3	Rack position sensor abnormality	1-S142
P1828	523773	4		
P1830	523771	5	Electric governor solenoid circuit abnormality	1-S146
P1831	523771	6		

ISO 14229 P-Code	J1939-73		Name	Reference Page
	SPN	FMI		
P1832	523763	3	Reformer temperature sensor abnormality	1-S148
P1833	523763	4		
P1834	523753	0	Reformer temperature abnormally	1-S151
P1835	523751	0	Blower pressure abnormal	1-S152
P1836	523765	3	Circuit of glow relay for fuel reforming abnormality	1-S153
P1837	523765	4		
P1838	523759	4	Buzzer circuit abnormality	1-S156
P1839	523759	3		
P1840	523761	3	Feed pump circuit abnormality	1-S158
P1841	523761	4		
P1844	523755	2	Reformer abnormal	1-S160
P1845	523756	2	Fail to rise DPF temperature	1-S164
P1846	523768	6	Over current in circuit of blower motor	1-S165
P1848	523757	2	Fail to ignite burner	1-S166
P1849	523750	2	Low coolant temp. for DPF regeneration	1-S167
P1850	523749	2	EEP write error	1-S168
P1851	523748	2	Excessive power consumption during regeneration	1-S169
P1856	523742	2	High frequency of the interruption of automatic regeneration	1-S170
P1990	523700	13	EEPROM check sum error	1-S171
P2122	91	4	Accelerator position sensor 1 abnormality	1-S172
P2123	91	3		
P2127	29	4	Accelerator position sensor 2 abnormality	1-S176
P2128	29	3		
P2228	108	4	Barometric pressure sensor error	1-S180
P2229	108	3		
P242C	3246	4	Exhaust gas temperature sensor 2 (T2) abnormality	1-S182
P242D	3246	3		
P2454	3251	4	Differential pressure sensor 1 abnormality	1-S185
P2455	3251	3		
P3002	4765	0	Exhaust gas temperature sensor 0: Emergency high	1-S189
P3003	3242	0	Exhaust gas temperature sensor 1: Emergency high	1-S191
P3004	3246	0	Exhaust gas temperature sensor 2: Emergency high	1-S193
P3006	3701	15	Excessive PM3	1-S195
P3007	3701	16	Excessive PM4	1-S196
P3008	3701	0	Excessive PM5	1-S197
P3013	523590	16	Parked regeneration time out	1-S198
P3018	523599	0	All exhaust gas temperature sensor failure	1-S200
P3023	523601	0	High exhaust gas temperature after emergency high temperature DTC	1-S201
P3024	523602	0	High frequency of regeneration	1-S202

9Y1200412RSS0168US0

(1) Coolant Temperature Sensor Abnormality (DTC P0117 / 110-4, P0118 / 110-3)

P0117 / 110-4: Coolant temperature sensor abnormality (Low side)

Behaviour during malfunction:

- None

Detection item:

- Ground short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Voltage of coolant temperature sensor is 0.1 V or less

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- During start-up = -20 °C (-4 °F) [default value]
- Under other conditions = 80 °C (176 °F) [default value]
- Sending dummy message: Water temp. is 125 °C (257 °F)
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0169US0

P0118 / 110-3: Coolant temperature sensor abnormality (High side)

Behaviour during malfunction:

- None

Detection item:

- Open circuit or +B short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Voltage of coolant temperature sensor is 4.8 V or above

Engine warning light:

- ON

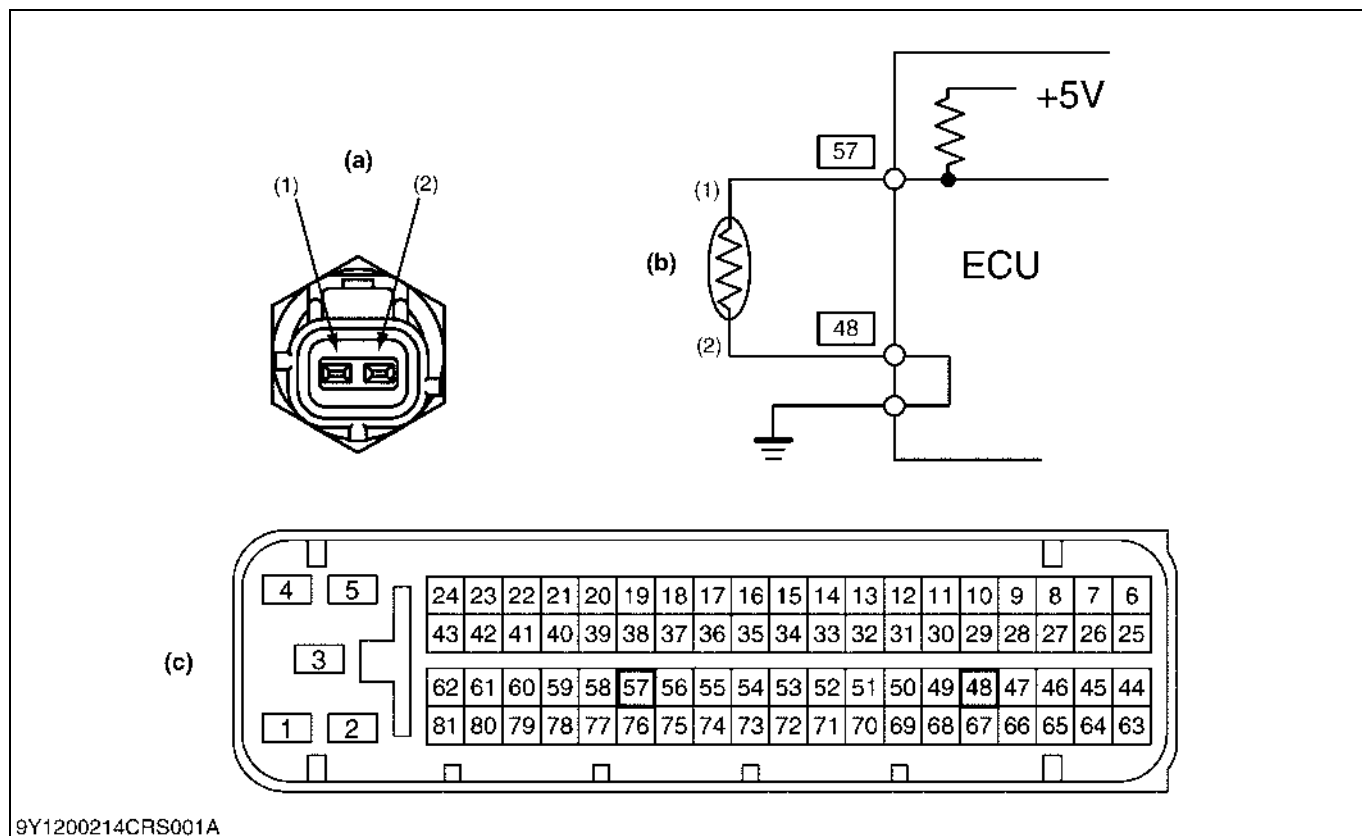
Limp home action by engine ECU (system action):

- During start-up = -20 °C (-4 °F) [default value]
- Under other conditions = 80 °C (176 °F) [default value]
- Sending dummy message: Water temp. is 125 °C (257 °F)
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0170US0



(1) Terminal 1 (No.57: Coolant Temperature Sensor)

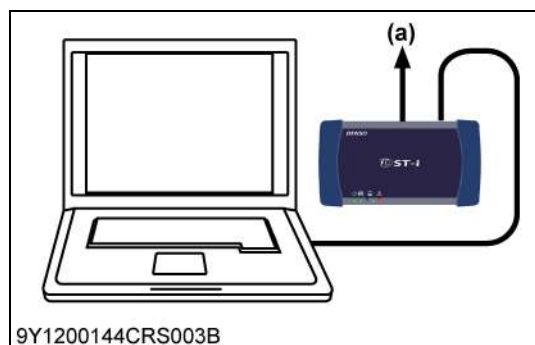
(2) Terminal 2 (No.48: GND)

(a) Coolant Temperature Sensor Terminal Layout

(b) Coolant Temperature Sensor

(c) ECU Connector

9Y1200412RSS0171US0



1. Check the Coolant Temperature Sensor Signals

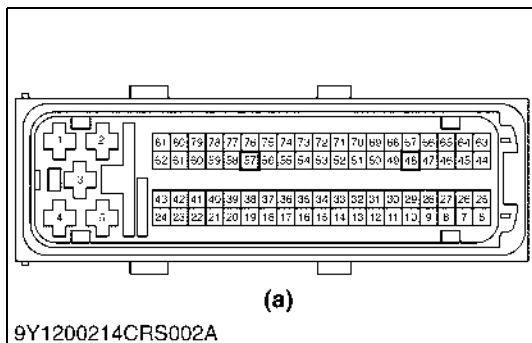
- Place the key switch in the ON position.
- Check the "Coolant temperature" and "Coolant temperature sensor output voltage" on the diagnosis tool data monitor.

Factory specification		
Actual coolant temperature	Coolant temperature	Output voltage
20 °C (68 °F)	20 °C (68 °F)	Approx. 2.7 V
40 °C (104 °F)	40 °C (104 °F)	Approx. 1.8 V
60 °C (140 °F)	60 °C (140 °F)	Approx. 1.1 V
80 °C (176 °F)	80 °C (176 °F)	Approx. 0.7 V

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Go to "2. Measure the Resistance Between Terminals".
NG	Go to "2. Measure the Resistance Between Terminals".	

(a) CAN1 Connector

9Y1200412RSS0172US0



2. Measure the Resistance Between Terminals

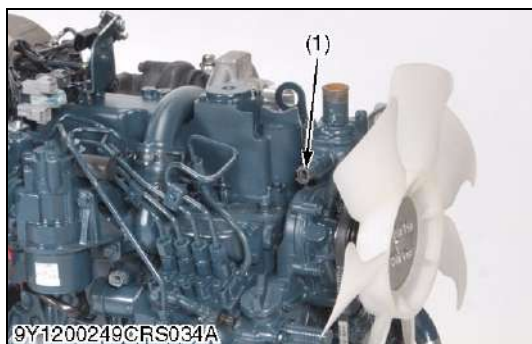
- Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
- Measure the resistance between terminals No.48 and No.57 of the connector.

Factory specification	
Temperature	Resistance
20 °C (68 °F)	Approx. 2.5 kΩ
40 °C (104 °F)	Approx. 1.2 kΩ
60 °C (140 °F)	Approx. 0.58 kΩ
80 °C (176 °F)	Approx. 0.32 kΩ
100 °C (212 °F)	Approx. 0.18 kΩ

OK	Go to "4. Measure the ECU Terminal Voltage".
NG	Go to "3. Check the sensor".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0173US0



3. Check the Sensor

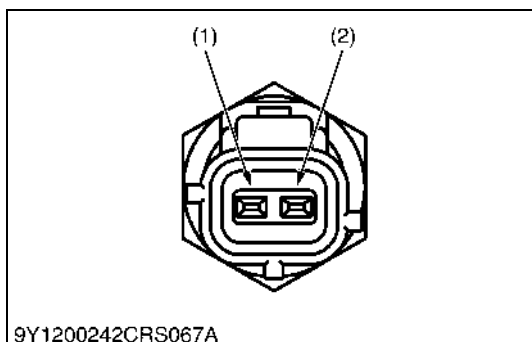
- Turn the key switch OFF, remove the connector from the sensor side.
- Measure the resistance between the terminals on the sensor side.

Factory specification	
Temperature	Resistance
20 °C (68 °F)	Approx. 2.5 kΩ
40 °C (104 °F)	Approx. 1.2 kΩ
60 °C (140 °F)	Approx. 0.58 kΩ
80 °C (176 °F)	Approx. 0.32 kΩ
100 °C (212 °F)	Approx. 0.18 kΩ

OK	Wiring harness open circuit or connector fault → Check and repair.
NG	Coolant temperature sensor fault → Replace the coolant temperature sensor.

(1) Coolant Temperature Sensor

9Y1200412RSS0174US0



4. Measure the ECU Terminal Voltage

- Plug the ECU wiring harness connector into socket again, and unplug the sensor connector.
- Place the key switch in the ON position, and measure the voltage between terminals of the sensor connector (at the wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

OK	The ECU connector is faulty.
NG	Confirm by using other sensors that there is no ground short malfunction before replacing the ECU.

(1) Terminal 1 (No.57:Coolant Temperature Sensor)

(2) Terminal 2 (No.48:GND)

9Y1200412RSS0175US0

(2) Engine Overheat (DTC P0217 / 110-0)

Behaviour during malfunction:

- Insufficient output
- Overheat

Detection item:

- Overheat of engine coolant temperature

DTC set preconditions:

- Coolant temperature sensor is normal
- Sensor supply voltage VCC is normal

DTC set parameter:

- Engine coolant temperature $\geq 123\text{ }^{\circ}\text{C}$ ($253\text{ }^{\circ}\text{F}$)

Engine warning light:

- ON

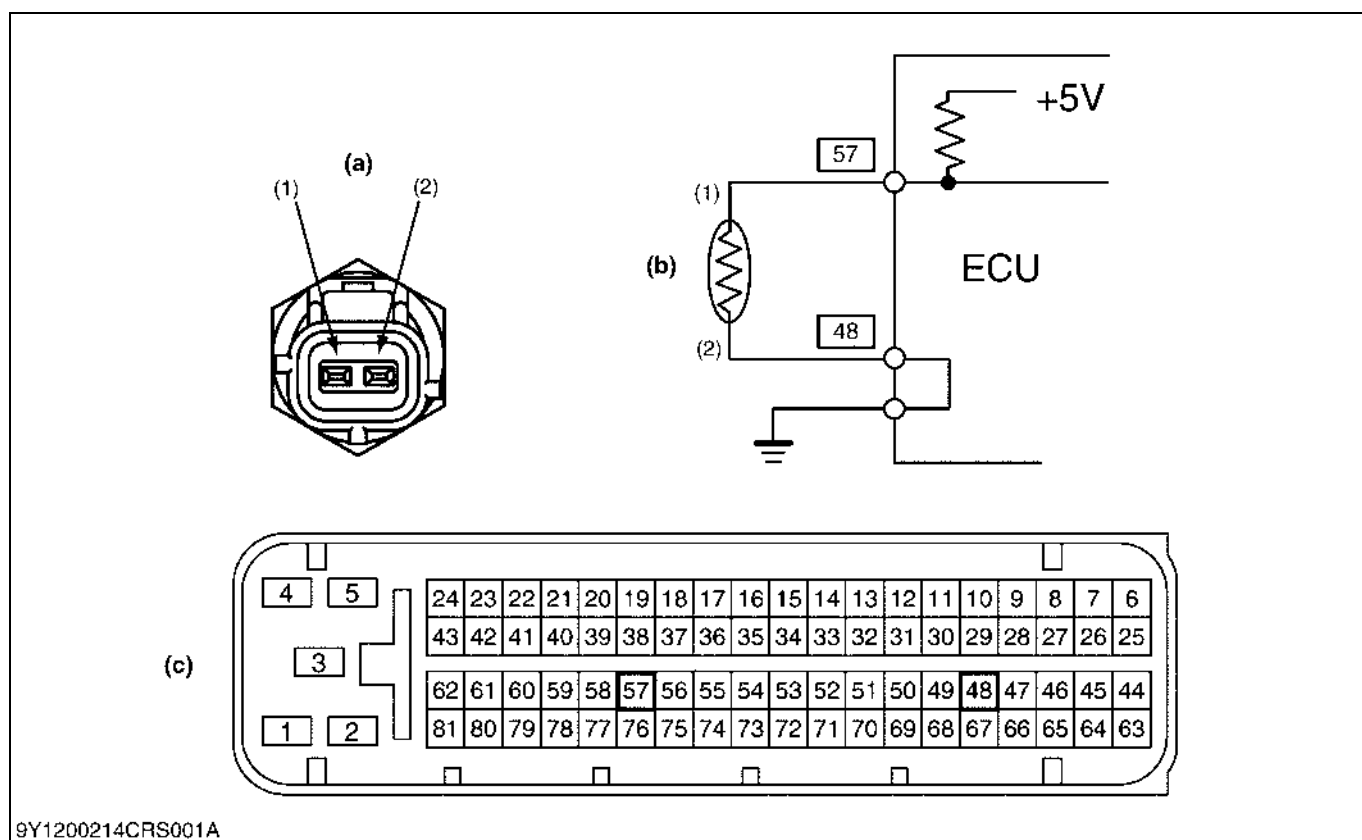
Limp home action by engine ECU (system action):

- Buzzer: On

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0176US0



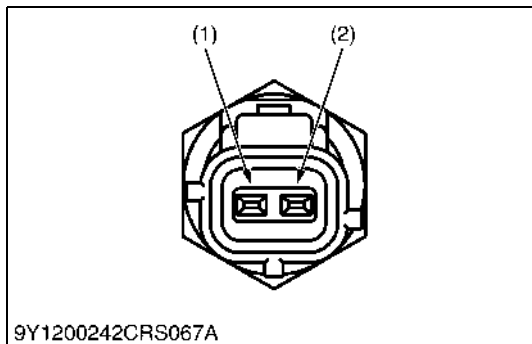
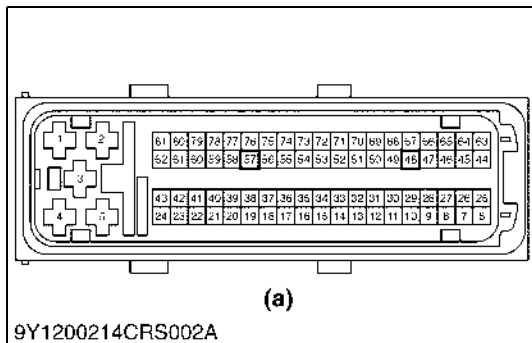
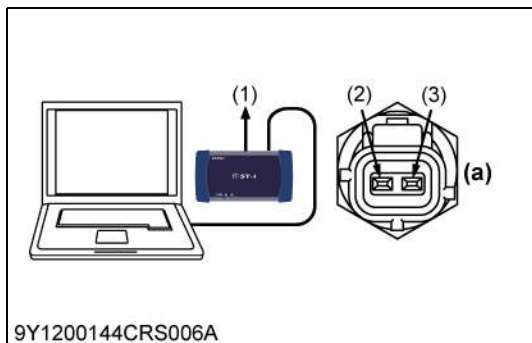
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(1) Terminal 1 (No.57: Coolant Temperature Sensor) (2) Terminal 2 (No.48: GND)

(a) Coolant Temperature Sensor Terminal Layout
(b) Coolant Temperature Sensor

(c) ECU Connector

9Y1200412RSS0177US0



1. Check the Coolant Temperature Sensor Characteristics for An Error

1. Refer to DTC P0117, P0118, and check the ECU, ECU wiring harness and sensor for an error.

OK	Check the cooling system. → Repair the faulty area. If the cooling system is operating normally, ask the user about malfunction occurrence based on the freeze-frame data to determine whether or not the system was used improperly.
NG	Check and repair or replace the faulty parts.

- (1) CAN1 Connector
(2) Terminal 1 (No.57: Coolant Temperature Sensor)
(3) Terminal 2 (No.48: GND)

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0178US0

(3) Engine Overrun (DTC P0219 / 190-0)

Behaviour during malfunction:

- Overrun

Detection item:

- Engine speed exceeds threshold speed

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- Engine speed $\geq 4000 \text{ min}^{-1}$ (rpm)

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn off

9Y1200412RSS0179US0



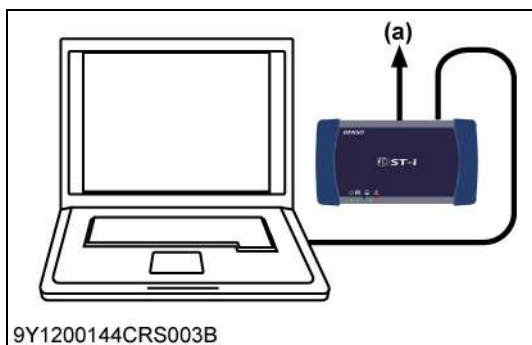
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1. Check the control rack of injection pump

1. Remove the actuator and cover.
2. Check the sliding resistance with moving the control rack.

OK	Go to "2. Checking Whether the DTC Is Detected Again"
NG	Replace the new injection pump.

9Y1200412RSS0180US0



9Y1200144CRS003B

2. Checking Whether the DTC Is Detected Again

1. Turn the key switch OFF and then ON again.
2. After clearing the DTC, turn the key switch OFF and then ON again, and start the engine.
3. Check whether or not the same DTC (P0219) is detected.

Factory specification	DTC is not detected.
-----------------------	----------------------

OK	Go to "3. Checking with the User".
NG	It could be a temporary malfunction caused by obstructions to the radio waves, so as long as it recovers to normal operation there is no problem.

(a) CAN1 Connector

9Y1200412RSS0181US0

3. Checking with the User

1. The following actions may have caused the overrun.
 - Towing heavy objects
 - Drag phenomenon when driving downhill
 - Mistaken operation when making a sudden shift change
 Question the user in detail about the items above and give guidance.

9Y1200412RSS0182US0

(4) Engine Speed Sensor Abnormality (DTC P0335 / 636-8)

Behaviour during malfunction:

- Engine stall

Detection item:

- Open circuit or short circuit of sensor / harness
- Failure of sensor

DTC set preconditions:

- Sensor supply voltage VCC is normal
- Engine is running

DTC set parameter:

- No recognition of Ne sensor pulse

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

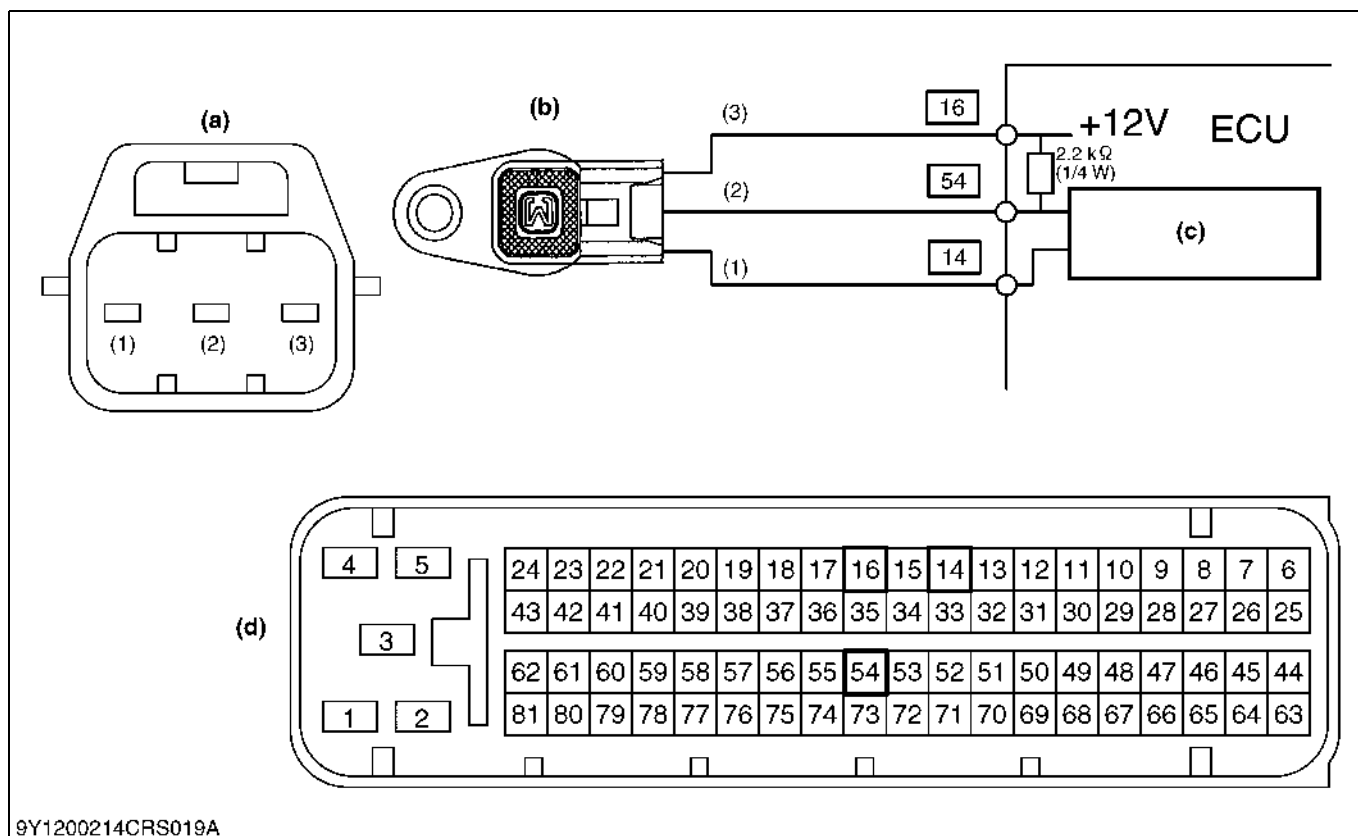
NOTE

- Engine will stop if NE fail

Recovery from error:

- Key switch turn off

9Y1200412RSS0183US0



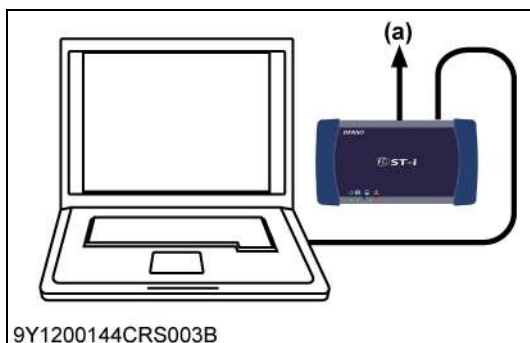
9Y1200214CRS019A

(1) Terminal 1 (No.14: GND)
 (2) Terminal 2 (No.54: Engine
 Speed Sensor)

(3) Terminal 3 (No.16: +12 V)

(a) Crankshaft Position Sensor (NE Sensor) Terminal Layout
 (b) NE Sensor
 (c) NE Sensor Input Circuit
 (d) ECU Connector

9Y1200412RSS0184US0



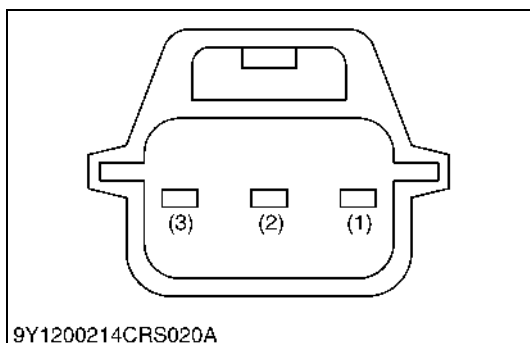
1. Check the Engine Speed Sensor Signals

1. Rotate the engine, and check the "Engine speed active flag" value on the diagnosis tool data monitor.

Factory specification	Always ON
OK	It should be confirmed two or more times while changing the accelerator.
	OK Normal.
	NG Go to "2. Check the Voltage Between Engine Speed Sensor Terminals".
NG	Go to "2. Check the Voltage Between Engine Speed Sensor Terminals".

(a) CAN1 Connector

9Y1200412RSS0185US0



2. Check the Voltage Between Engine Speed Sensor Terminals

1. Place the key switch in the OFF position, and unplug the engine speed sensor connector from the socket.
2. Place the key switch in the ON position, and measure the voltage between terminal 3 (3) and terminal 2 (2) at the wiring harness side.

Factory specification	Approx. 5 V
OK	Go to "4. Check the Connectors".
NG	Go to "3. Measure the ECU Terminal Voltage".

- (1) Terminal 1 (No.14: GND) (3) Terminal 3 (No.16: +12 V)
 (2) Terminal 2 (No.54: Engine Speed Sensor)

9Y1200412RSS0186US0



3. Measure the ECU Terminal Voltage

1. Place the key switch in the OFF position.
2. Remove the ECU wiring harness connector cover.
3. Place the key switch in the ON position, and measure the voltage between ECU terminals No.14 and No.16.

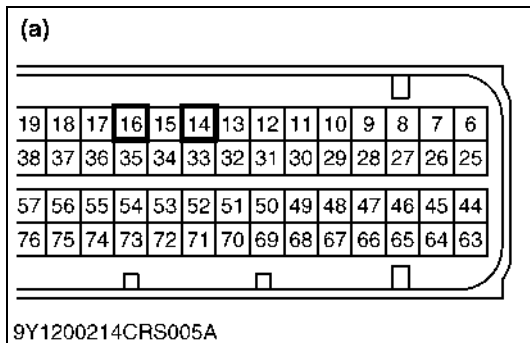
■ IMPORTANT

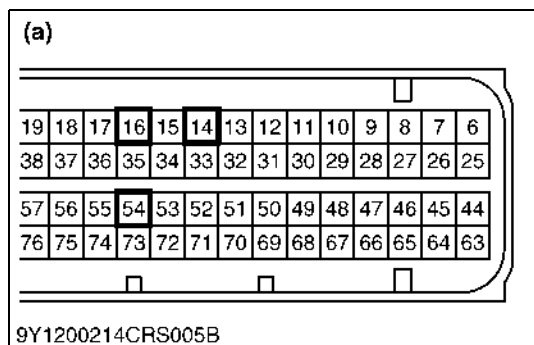
- Refer to "7. [3] ELECTRIC SYSTEM INSPECTION PROCEDURE-(1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Approx. 5 V
OK	Go to "4. Check the connectors".
NG	Replace the ECU.

(a) ECU Connector

9Y1200412RSS0187US0





4. Check the Connectors

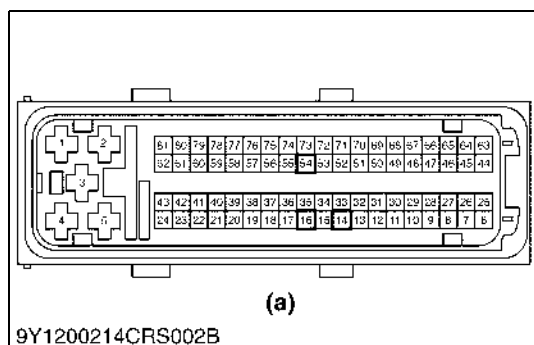
1. Check ECU connector terminal No.14, No.16 and No.54 and the ECU wiring harness connector for incorrect connection, inappropriate fitting, poor contact.

Factory specification	Must be free from incorrect connection, inappropriate fitting, poor contact.
-----------------------	--

OK	Go to "5. Check the wiring harness".
NG	Repair or replace.

(a) ECU Connector

9Y1200412RSS0188US0



5. Check the Wiring Harness

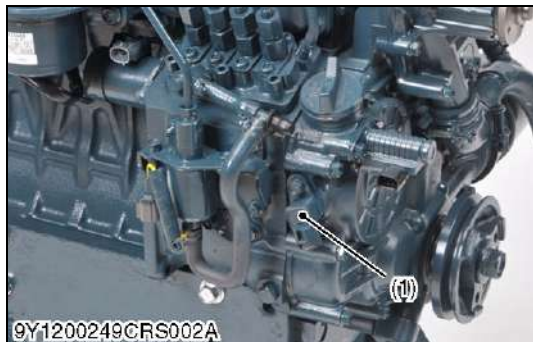
1. Check the ECU wiring harness connector terminals No.14, No.16 and No.54 for a short or an open circuit.

Factory specification	Must be free from shorts and open circuit.
-----------------------	--

OK	Go to "6. Check the Sensor".
NG	Repair.

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0189US0



6. Check the Sensor

1. Disconnect the sensor and check the following items.
 - Is there a large amount of magnetic foreign material adhering to the sensor surface?
 - Are there interference marks of the pulsar and the sensor?
 - Are there any pulsar gear abnormalities?

OK	Replace the ECU and test.
NG	Repair or replace the sensor.

(1) Engine Speed Sensor

9Y1200412RSS0190US0

(5) Exhaust Gas Temperature Sensor 1 (T1) Abnormality (DTC P0543 / 3242-4, P0544 / 3242-3)

P0543 / 3242-4: Exhaust gas temperature sensor 1 (T1) abnormality (Low side)

Behaviour during malfunction:

- None

Detection item:

- Ground short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Diesel Particulate Filter (hereinafter referred to as the "DPF") inlet temperature sensor (T1) voltage: 0.08 V or less

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- 0 °C (32 °F) [default value]
- Output limitation: Approximately 50 % of normal condition
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0191US0

P0544 / 3242-3: Exhaust gas temperature sensor 1 (T1) abnormality (High side)

Behaviour during malfunction:

- None

Detection item:

- Open circuit or +B short circuit of sensor / harness.

DTC set preconditions:

- Coolant temperature is 65 °C (149 °F) or more: continues longer than 10 min. after engine starting
- 100 °C (212 °F) ≤ T0 ≤ 800 °C (1472 °F): continues longer than 20 sec. or 100 °C (212 °F) ≤ T2 ≤ 800 °C (1472 °F): continues longer than 20 sec. or 100 °C (212 °F) ≤ T4 ≤ 800 °C (1472 °F): continues longer than 20 sec.

DTC set parameter:

- DPF inlet temperature sensor (T1) voltage: 4.92 V or more

Engine warning light:

- ON

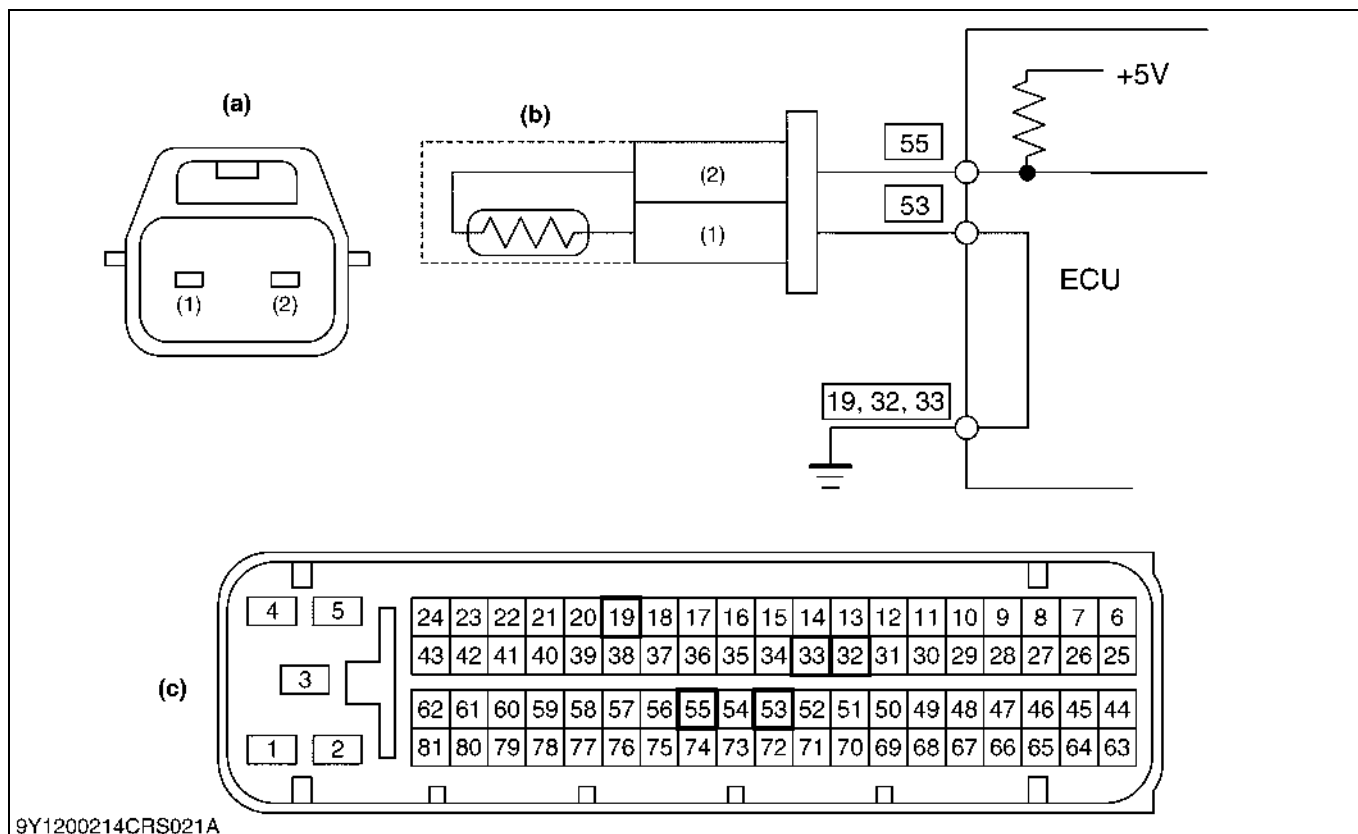
Limp home action by engine ECU (system action):

- 0 °C (32 °F) [default value]
- Output limitation: Approximately 50 % of normal condition
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0192US0



9Y1200214CRS021A

(1) Terminal 1 (No.53: GND)

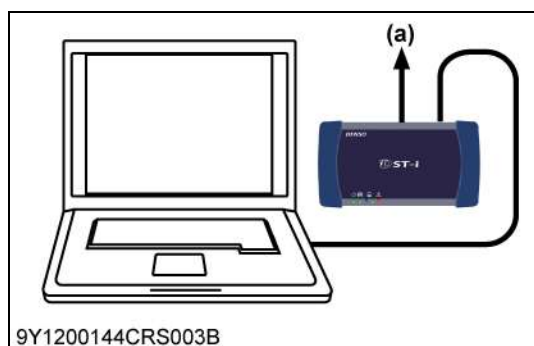
(2) Terminal 2 (No.55: DPF IN Temp. Sensor)

(a) Exhaust Gas Temperature Sensor Terminal Layout

(b) Exhaust Gas Temperature Sensor

(c) ECU Connector

9Y1200412RSS0193US0



9Y1200144CRS003B

1. Check the Exhaust Gas Temperature Sensor Signals

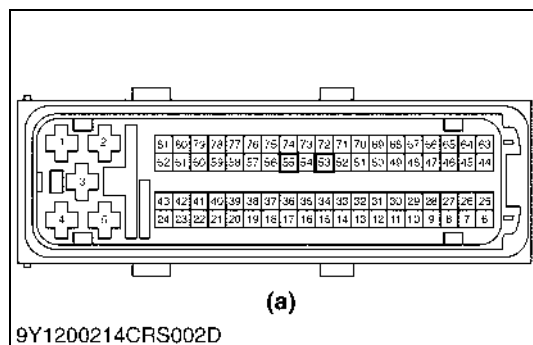
- Place the key switch in the ON position, and check the "Exhaust gas temperature" and "Exhaust gas temperature sensor output voltage" on the diagnosis tool data monitor.

Factory specification		
Actual exhaust gas temperature	Exhaust gas temperature	Output voltage
100 °C (212 °F)	100 °C (212 °F)	Approx. 4.7 V
150 °C (302 °F)	150 °C (302 °F)	Approx. 4.4 V
200 °C (392 °F)	200 °C (392 °F)	Approx. 4.0 V
250 °C (482 °F)	250 °C (482 °F)	Approx. 3.5 V

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Measure the Resistance Between Terminals".	

(a) CAN1 Connector

9Y1200412RSS0194US0



2. Measure the Resistance Between Terminals

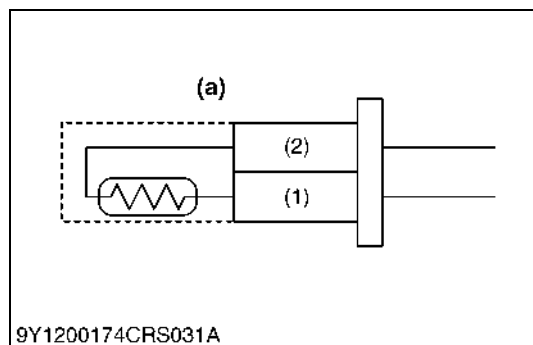
1. Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
2. Measure the resistance between terminals No.55 and No.53 of the connector.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Go to "4. Measure the ECU Terminal Voltage".
NG	Go to "3. Check the Sensor".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0195US0



3. Check the Sensor

1. Turn the key switch OFF, remove the connector from the sensor side.
2. Measure the resistance between the terminals on the sensor side.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

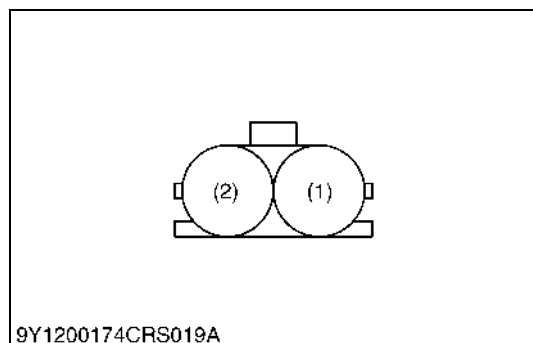
OK	Wiring harness open circuit or connector fault → Check and repair.
NG	Exhaust gas temperature sensor fault → Replace the exhaust gas temperature sensor 1 (T1).

(1) Terminal 1 (No.53: GND)

(2) Terminal 2 (No.55: DPF IN Temp. Sensor)

(a) Exhaust Gas Temperature Sensor

9Y1200412RSS0196US0



4. Measure the ECU Terminal Voltage

1. Plug the ECU wiring harness connector into socket again, and unplug the sensor connector.
2. Place the key switch in the ON position, and measure the voltage between terminals of the sensor connector (at the wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

OK	The ECU connector is faulty or its wiring harness is shorted.
NG	Confirm by using other sensors that there is no ground short malfunction before replacing the ECU.

(1) Terminal 1 (No.53: GND)

(2) Terminal 2 (No.55: DPF IN Temp. Sensor)

9Y1200412RSS0197US0

(6) Exhaust Gas Temperature Sensor 0 (T0) Abnormality (DTC P0546 / 4765-4, P0547 / 4765-3)

P0546 / 4765-4: Exhaust gas temperature sensor 0 (T0) abnormality (Low side)

Behaviour during malfunction:

- None

Detection item:

- Ground short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- DOC inlet temperature sensor (T0) voltage: 0.08 V or less

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- 0 °C (32 °F) [default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0198US0

P0547 / 4765-3: Exhaust gas temperature sensor 0 (T0) abnormality (Low side)

Behaviour during malfunction:

- None

Detection item:

- Open circuit or +B short circuit of sensor / harness.

DTC set preconditions:

- Coolant temperature is 65 °C (149 °F) or more
- 100 °C (212 °F) ≤ T1 ≤ 800 °C (1472 °F): continues longer than 20 sec. or 100 °C (212 °F) ≤ T2 ≤ 800 °C (1472 °F): continues longer than 20 sec. or 100 °C (212 °F) ≤ T4 ≤ 800 °C (1472 °F) continues longer than 20 sec.

DTC set parameter:

- DOC inlet temperature sensor (T0) voltage: 4.92 V or more

Engine warning light:

- ON

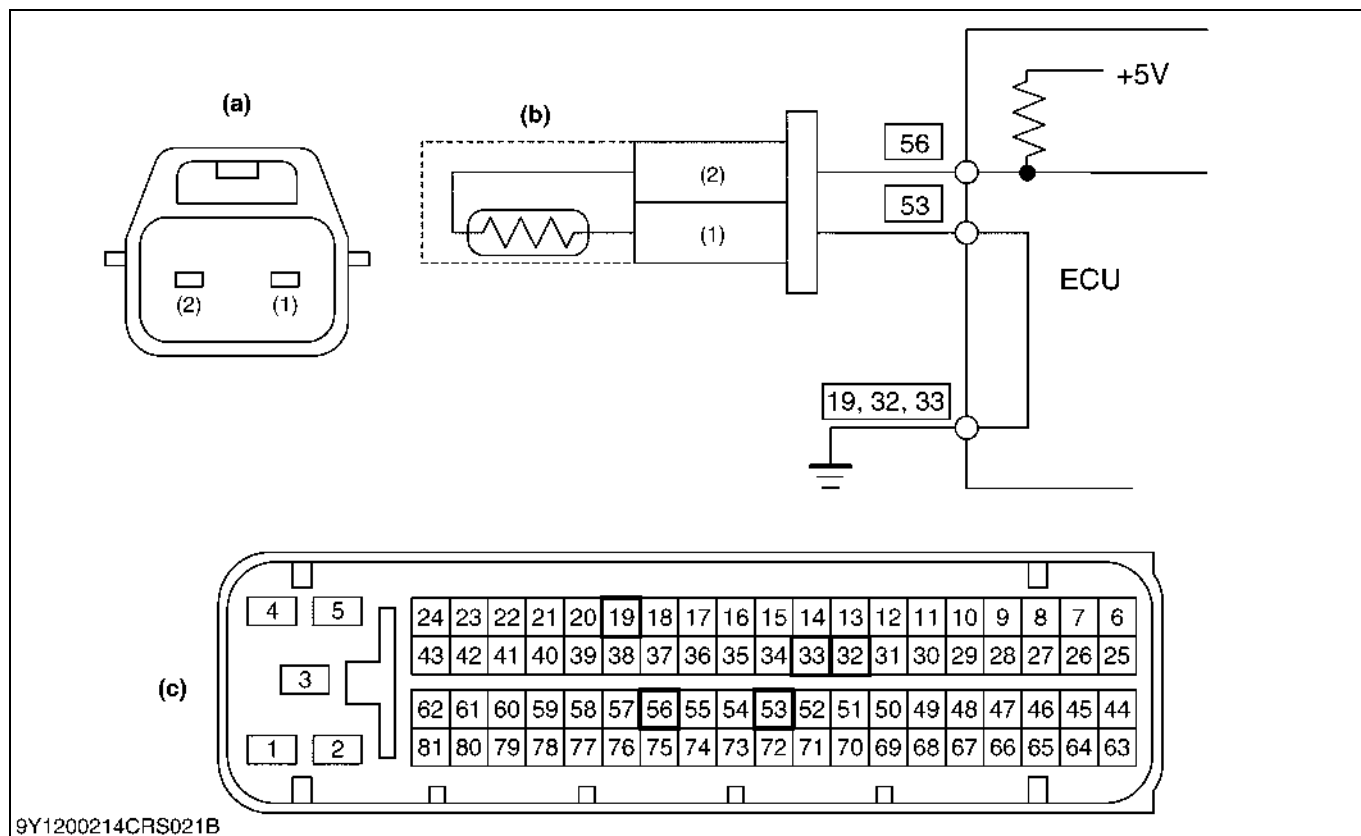
Limp home action by engine ECU (system action):

- 0 °C (32 °F) [default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0199US0



9Y1200214CRS021B

(1) Terminal 1 (No.53: GND)

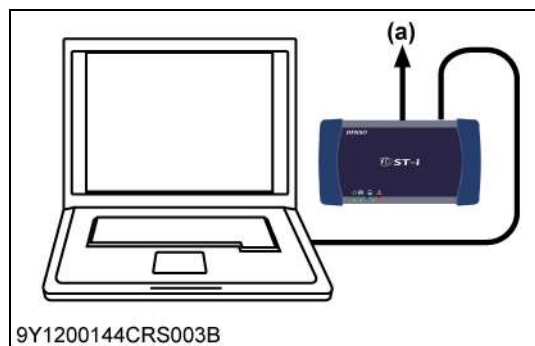
(2) Terminal 2 (No.56: DOC IN Temp. Sensor)

(a) Exhaust Gas Temperature Sensor Terminal Layout

(b) Exhaust Gas Temperature Sensor

(c) ECU Connector

9Y1200412RSS0200US0



9Y1200144CRS003B

1. Check the Exhaust Gas Temperature Sensor Signals

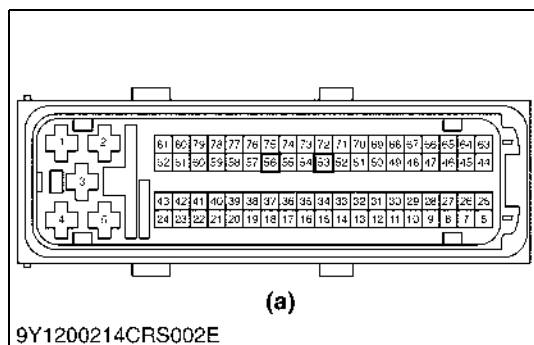
- Place the key switch in the ON position, and check the "Exhaust gas temperature" and "Exhaust gas temperature sensor output voltage" on the diagnosis tool data monitor.

Factory specification		
Actual exhaust gas temperature	Exhaust gas temperature	Output voltage
100 °C (212 °F)	100 °C (212 °F)	Approx. 4.4 V
150 °C (302 °F)	150 °C (302 °F)	Approx. 3.7 V
200 °C (392 °F)	200 °C (392 °F)	Approx. 3.0 V
250 °C (482 °F)	250 °C (482 °F)	Approx. 2.3 V

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Measure the Resistance Between Terminals".	

(a) CAN1 Connector

9Y1200412RSS0201US0



2. Measure the Resistance Between Terminals

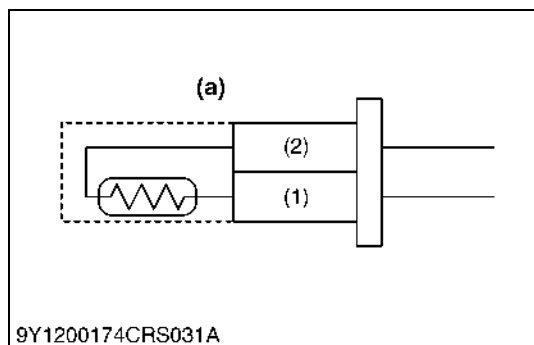
1. Place the key switch in the OFF position, unplug the ECU wiring harness connector (1) from the socket.
2. Measure the resistance between terminals No.56 and No.53 of the connector.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Go to "4. Measure the ECU Terminal Voltage".
NG	Go to "3. Check the Sensor".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0202US0



3. Check the Sensor

1. Turn the key switch OFF, remove the connector from the sensor side and measure the resistance between the terminals on the sensor side.

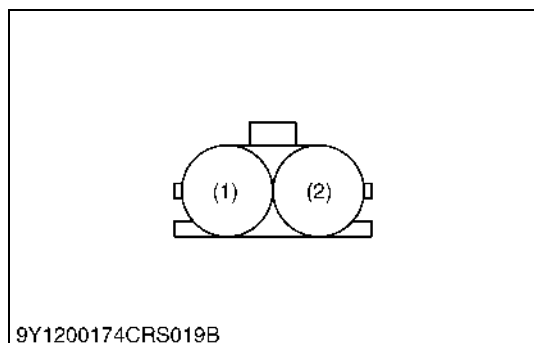
Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Wiring harness open circuit or connector fault → Check and repair.
NG	Exhaust gas temperature sensor fault → Replace the exhaust gas temperature sensor 0 (T0).

- (1) Terminal 1 (No.53: GND)
 (2) Terminal 2 (No.56: DOC IN Temp. Sensor)

(a) Exhaust Gas Temperature Sensor

9Y1200412RSS0203US0



4. Measure the ECU Terminal Voltage

1. Plug the ECU wiring harness connector into socket again, and unplug the sensor connector.
2. Place the key switch in the ON position, and measure the voltage between terminals of the sensor connector (at the wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

OK	The ECU connector is faulty or its wiring harness is shorted.
NG	Confirm by using other sensors that there is no ground short malfunction before replacing the ECU.

- (1) Terminal 1 (No.53: GND) (2) Terminal 2 (No.56: DOC IN Temp. Sensor)

9Y1200412RSS0204US0

(7) Battery Voltage Abnormality (DTC P0562 / 168-4, P0563 / 168-3)

P0562 / 168-4: Battery voltage abnormality (Low side)

Behaviour during malfunction:

- None

Detection item:

- Open circuit, short circuit or damage of harness
- Failure of battery

DTC set preconditions:

- Key switch is ON
- Starter switch is OFF
- Sensor supply voltage VCC is normal
- 20 sec. elapsed after engine starts

DTC set parameter:

- Battery voltage is lower than 8 V (Normal operation) or 12 V (DPF regeneration is requested)
- Not monitored during cranking

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0205US0

P0563 / 168-3: Battery voltage abnormality (High side)

Behaviour during malfunction:

- None

Detection item:

- Open circuit, short circuit or damage of harness
- Failure of battery

DTC set preconditions:

- Key switch is ON
- Starter switch is OFF
- Sensor supply voltage VCC is normal

DTC set parameter:

- Battery voltage; 16 V or more

Engine warning light:

- ON

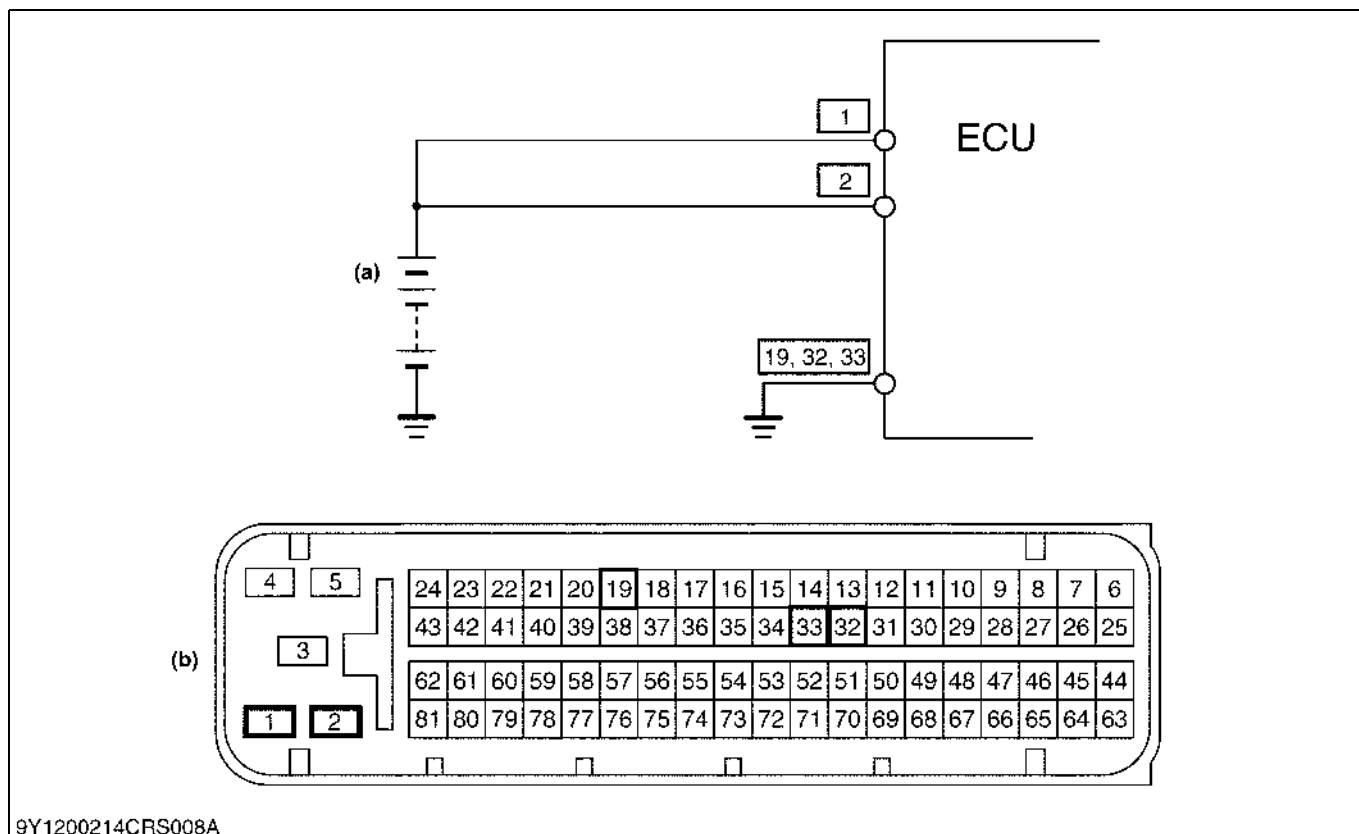
Limp home action by engine ECU (system action):

- Output limitation: Approximately 50 % of normal condition
- Accel limitation; 50 %
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

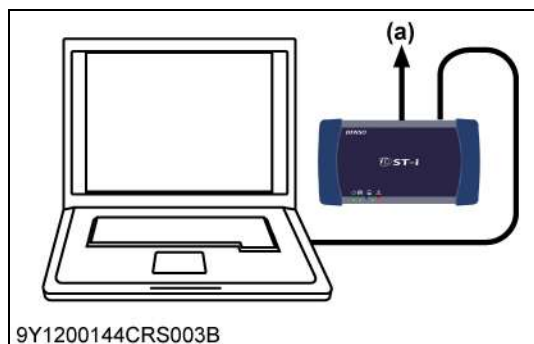
9Y1200412RSS0206US0



(a) Battery

(b) ECU Connector

9Y1200412RSS0207US0

**1. Check the ECU Data**

- Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again. Then, check the "Battery voltage" status on the data monitor.
- Change the engine operation status, and check the "Battery voltage".

Factory specification	8 V or higher, 15 V or lower (except intense cold temperature)
-----------------------	---

NOTE

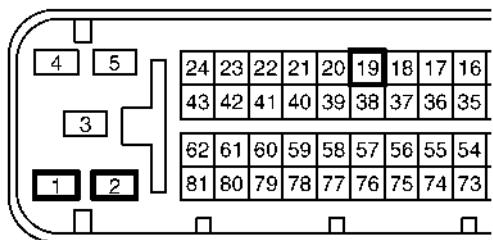
- Try to change the engine speed as the generated voltage changes accordingly.

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Check the ECU Terminal Voltage (Part 1)".	

(a) CAN1 Connector

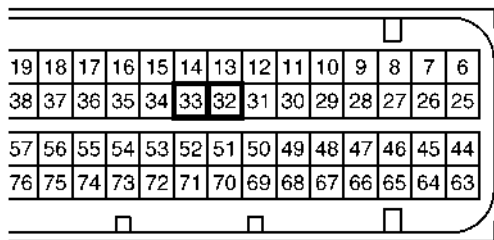
9Y1200412RSS0208US0

(a)



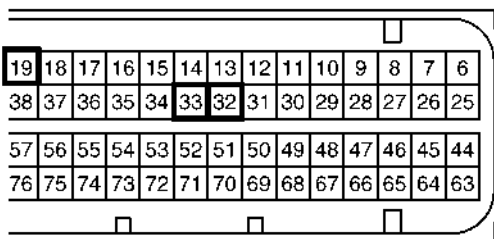
9Y1200214CRS009A

(a)



9Y1200214CRS005C

(a)



9Y1200214CRS005D

2. Check the ECU Terminal Voltage (Part 1)

1. Remove the ECU wiring harness connector cover.
2. Change the engine operation status, and measure the voltage between ECU terminals No.1 / No.2 and No.19 / No.32 / No.33.

■ IMPORTANT

- Refer to "7. [3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	8 V or higher, 15 V or lower (except intense cold temperature)
-----------------------	---

■ NOTE

- Try to change the engine speed as the generated voltage changes accordingly.

OK	Check the harness connectors and ECU pins.	
	OK	Faulty ECU → Replace.
	NG	Repair or replace the wiring harness, or replace the ECU.
NG	Go to "3. Check the ECU Terminal Voltage (Part 2)".	

(a) ECU Connector

9Y1200412RSS0209US0

3. Check the ECU Terminal Voltage (Part 2)

1. Change the engine operation status, and measure the voltage between ECU terminal No.19 / No.32 / No.33 and chassis ground terminal.

■ IMPORTANT

- Refer to "7. [3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Always 0.5 V or lower
-----------------------	-----------------------

■ NOTE

- Try to change the engine speed as the generated voltage changes accordingly.

OK	1. Check the charging system, the battery itself, wiring harness and cables. → Repair the faulty area. 2. Locate the cause of excessively high or low voltage.
NG	Check the wiring harness between ECU terminal and the body ground terminal. → Repair the defects.

(a) ECU Connector

9Y1200412RSS0210US0

(8) ECU Flash-ROM and CPU Abnormality (DTC P0605 / 628-2, P0606 / 1077-2, P0606/ 523527-2)

P0605 / 628-2: ECU Flash-ROM error

Behaviour during malfunction:

- Engine stall

Detection item:

- FLASH ROM check sum error

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- FLASH ROM check sum error

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0211US0

P0606 / 1077-2: ECU CPU (Main IC) error

Behaviour during malfunction:

- Engine stall

Detection item:

- Failure of CPU

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- Error detection by Watch-Dog

Engine warning light:

- ON

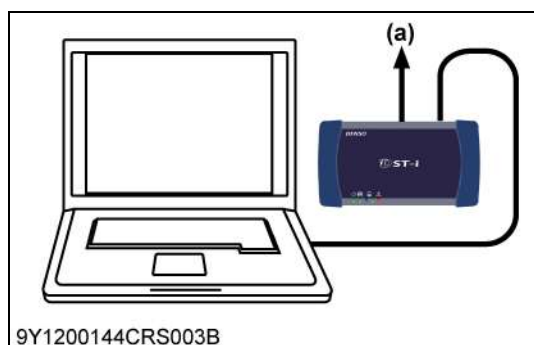
Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0212US0



1. Check the DTC

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC, and check whether the same DTC (P0605 or P0606) is output again or not.

Factory specification	No DTC is output.
OK	An electromagnetic interference (EMI) may have caused the temporary malfunction. There is no problem if the system has recovered.
NG	Faulty Engine ECU → Replace.

(a) CAN1 Connector

9Y1200412RSS0213US0

(9) Sensor Supply Voltage 1 Abnormality (DTC P0642 / 3509-4)

P0642 / 3509-4: Sensor supply voltage 1 abnormality (Low side)

Behaviour during malfunction:

- Engine stall

Detection item:

- Sensor supply voltage 1 error or recognition error

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- Voltage to sensor is below the threshold

Engine warning light:

- ON

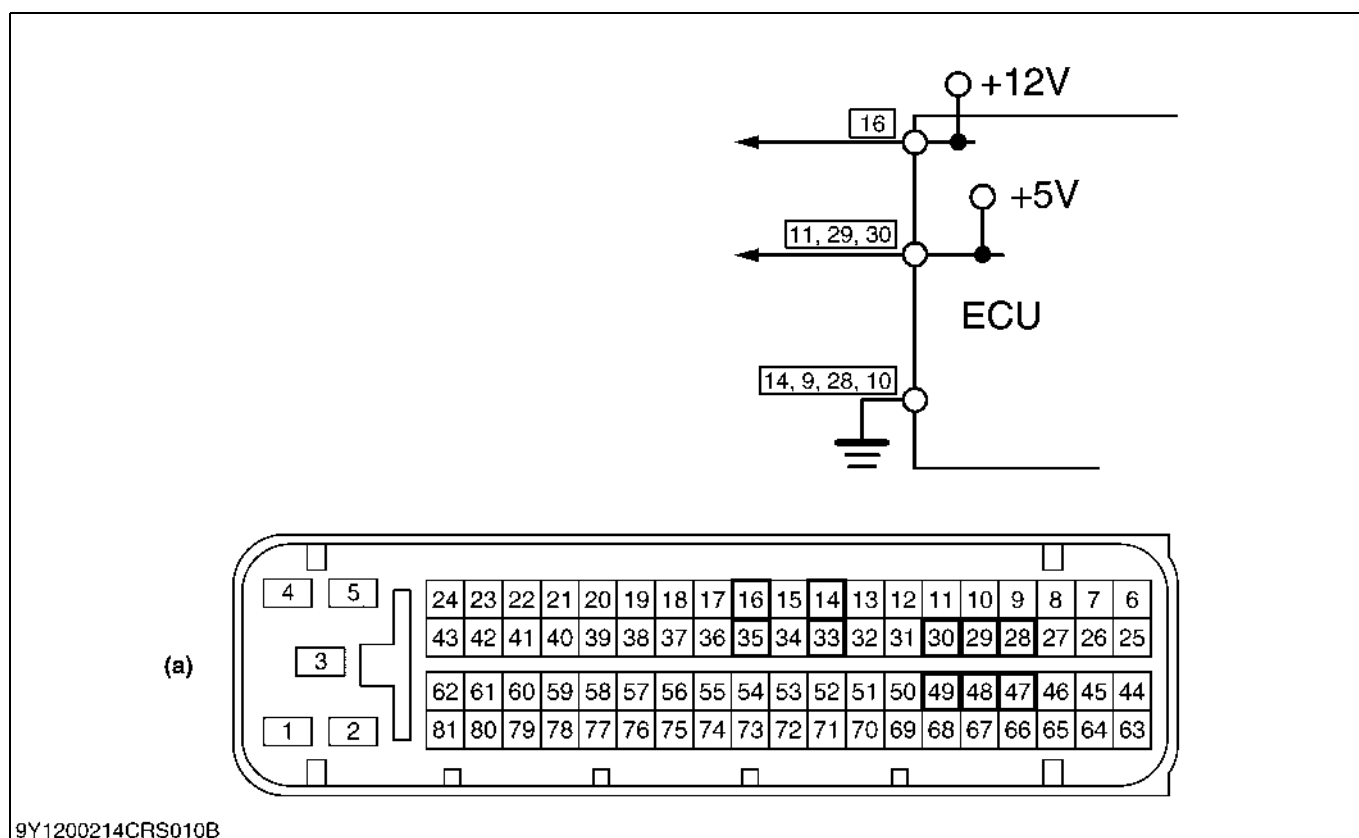
Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0214US0



9Y1200214CRS010B

(a) ECU Connector

9Y1200412RSS0215US0



(a)

19	18	17	16	15	14	13	12	11	10	9	8	7	6
38	37	36	35	34	33	32	31	30	29	28	27	26	25
57	56	55	54	53	52	51	50	49	48	47	46	45	44
76	75	74	73	72	71	70	69	68	67	66	65	64	63

9Y1200214CRS005E

1. Measure the ECU Terminal Voltage

1. Place the key switch in the OFF position, and remove the ECU wiring harness connector cover.
2. Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.11 / No.29 / No.30 / No.16 and No.9 / No.28 / No.10 / No.14.

■ IMPORTANT

- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Approx. 5 V (No.11 - No.9, No.29 - No.28, No.30 -No.10) Approx. 12 V (No.16 - No.14)
-----------------------	---

OK	Check the wiring harness for a short. → Repair the faulty area.				
NG	Check the harness connectors and ECU pins.				
	<table> <tr> <td>OK</td><td>Faulty ECU → Replace.</td></tr> <tr> <td>NG</td><td>Repair or replace the wiring harness, or replace the ECU.</td></tr> </table>	OK	Faulty ECU → Replace.	NG	Repair or replace the wiring harness, or replace the ECU.
OK	Faulty ECU → Replace.				
NG	Repair or replace the wiring harness, or replace the ECU.				

(a) ECU Connector

9Y1200412RSS0216US0

(10) Circuit of burner glow abnormality (DTC P1801 / 523766-6, P1802 / 523766-5)

P1801 / 523766-6: Circuit of burner glow abnormality (Over current)

Behavior during malfunction:

- None

Detection item:

- Over current in circuit of glow

DTC set preconditions:

- Battery voltage is normal
- Sensor supply voltage VCC is normal
- Glow is ON

DTC set parameter:

- Current at glow: 10 A or more

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0217US0

P1802 / 523766-5: Circuit of burner glow abnormality (Open / short to B+)

Behavior during malfunction:

- None

Detection item:

- Open circuit or short circuit of harness

DTC set preconditions:

- Battery voltage is normal
- Glow is ON

DTC set parameter:

- Current at glow is 0.5 A or less when glow is activated

Engine warning light:

- ON

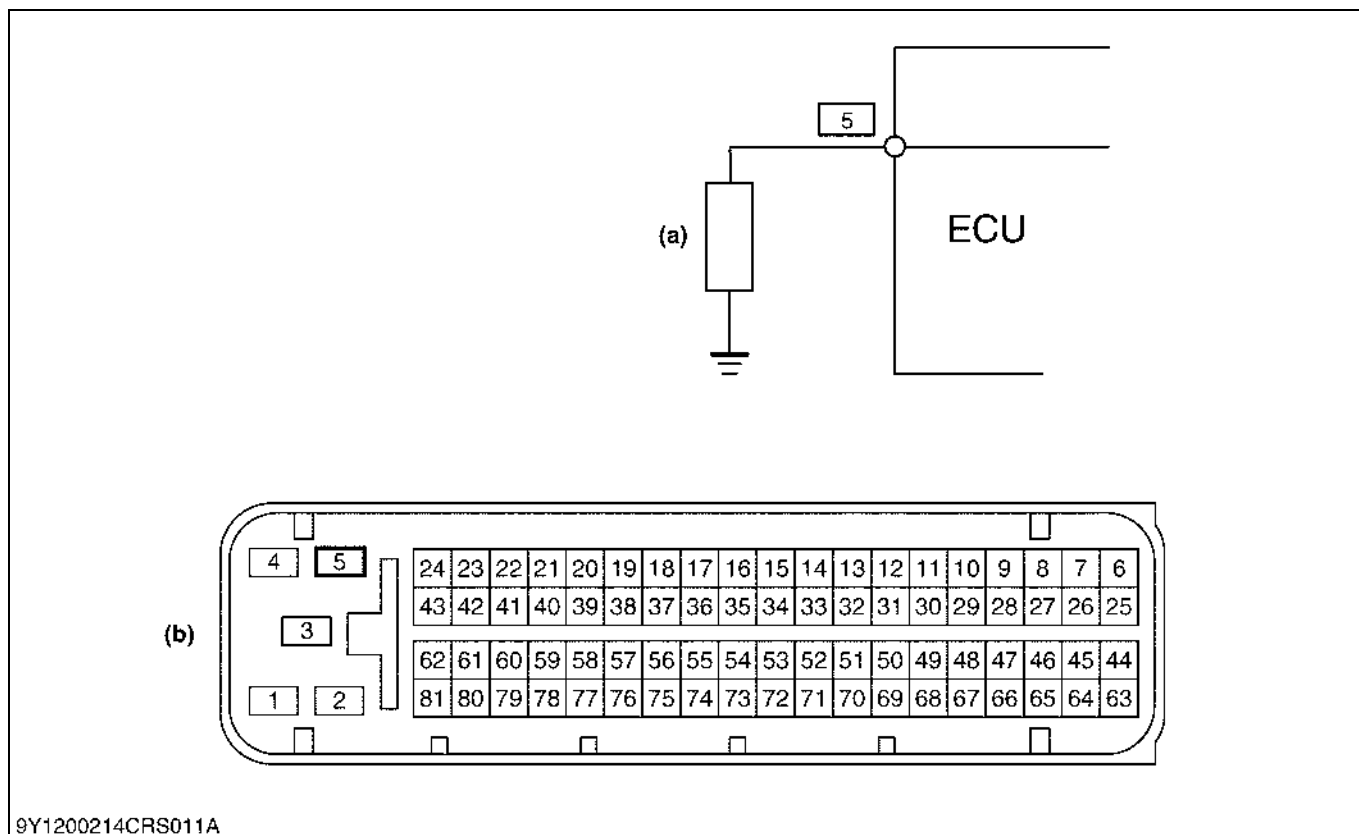
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

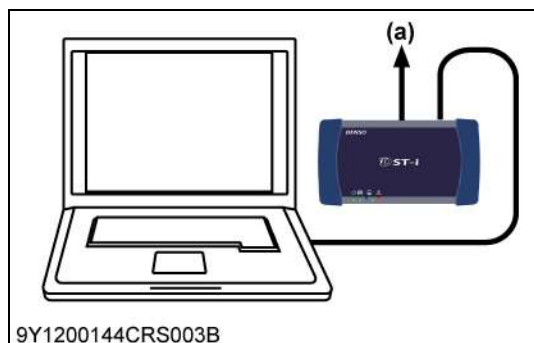
9Y1200412RSS0218US0



(a) Burner Glow Plug

(b) ECU Connector

9Y1200412RSS0219US0

**1. Check the DTC signals**

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Measure the resistance burner glow plug".

(a) CAN1 Connector

9Y1200412RSS0220US0

2. Measure the resistance of burner glow plug

1. Place the key switch in the OFF position, disconnect the burner glow plug from wiring harness.
2. Measure the resistance of burner glow plug.

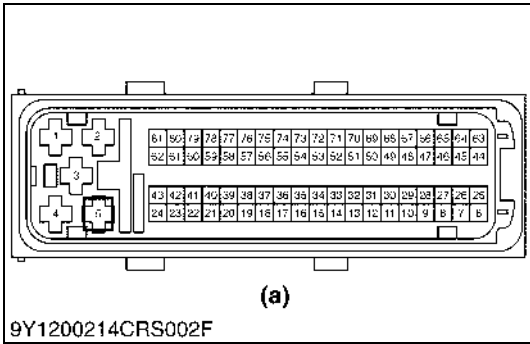
Factory specification	0.8 ~1.4 Ω
-----------------------	-------------------

OK	Go to "3. Check the wire harness".
NG	Replace the burner glow plug.

**CAUTION**

Reformer is checked for leaks the exhaust gas as assembly, so you cannot disassemble the burner plug.

9Y1200412RSS0221US0



3. Check the wire harness

1. Unplug the ECU wiring harness connector from socket, check conduction between the ECU wiring harness connector terminal No.5 and connecting point of glow plug.

Factory specification	Approx. 0Ω
OK	Replace the ECU.
NG	Replace the wiring harness.

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS022US0

(11) Circuit of fuel pump for fuel reformer abnormality (DTC P1803 / 523767-5, P1804 / 523767-4, P1805 / 523767-3)

P1803 / 523767-5: Circuit of fuel pump for fuel reformer abnormality (Open circuit)

Behavior during malfunction:

- None

Detection item:

- Open circuit of fuel-pump / harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- Open circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0223US0

P1804 / 523767-4: Circuit of fuel pump for fuel reformer abnormality (Short to GND)

Behavior during malfunction:

- None

Detection item:

- GND short circuit of harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- GND short circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0224US0

P1805 / 523767-3: Circuit of fuel pump for fuel reformer abnormality (Short to B+)

Behavior during malfunction:

- None

Detection item:

- B+ short circuit of harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- B+ short circuit of harness

Engine warning light:

- ON

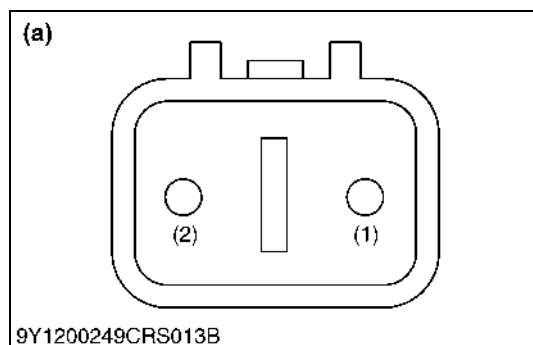
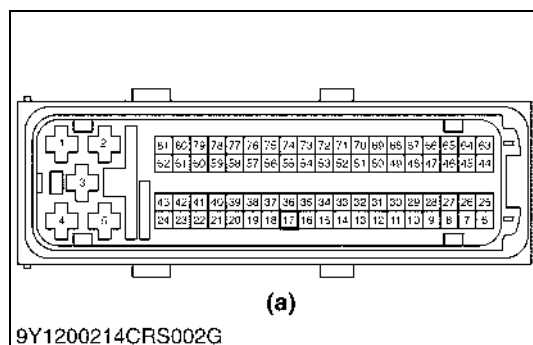
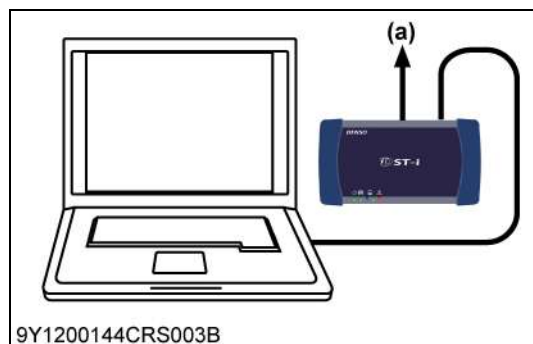
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0225US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the resistance between terminals".

(a) CAN1 Connector

9Y1200412RSS0226US0

2. Check the resistance between terminals

1. Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
2. Measure the resistance between connector terminal No.17 and key switch IG terminal.

Factory specification	2.5 ~3.5 Ω
-----------------------	------------

OK	Replace ECU.
NG	Go to "3. Measure the resistance of fuel pump for fuel reformer".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0227US0

3. Measure the resistance of fuel pump for fuel reformer

1. Remove the connector from the fuel pump.
2. Measure the resistance of fuel pump for fuel reformer.

Factory specification	2.5 ~ 3.5 Ω
-----------------------	-------------

OK	Wiring harness open circuit. Check and repair.
NG	Replace the fuel pump for fuel reformer.

- (1) Terminal 1 (No.17: Fuel Feed Pump (a) Fuel Pump Connector Reformer)
- (2) Terminal 2 (Key Switch: IG)

9Y1200412RSS0228US0

(12) Blower motor malfunction (DTC P1806 / 523768-5, P1807 / 523768-5)**P1806 / 523768-5: Blower motor malfunction (Main circuit)****Behavior during malfunction:**

- None

Detection item:

- Open circuit or +B short circuit of harness
- Blower motor malfunction

DTC set preconditions:

- Battery voltage is normal
- Sensor supply voltage VCC is normal
- Blower is activated

DTC set parameter:

- Open circuit of harness
- Over current caused by short circuit

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0229US0

P1807 / 523768-5: Blower motor malfunction (Sub circuit)**Behavior during malfunction:**

- None

Detection item:

- Open circuit or +B short circuit of harness
- Air-blow malfunction
- Sub blower motor circuit malfunction

DTC set preconditions:

- Battery voltage is normal
- Sensor supply voltage VCC is normal
- Blower is activated

DTC set parameter:

- Open circuit of harness
- Over current caused by short circuit

Engine warning light:

- ON

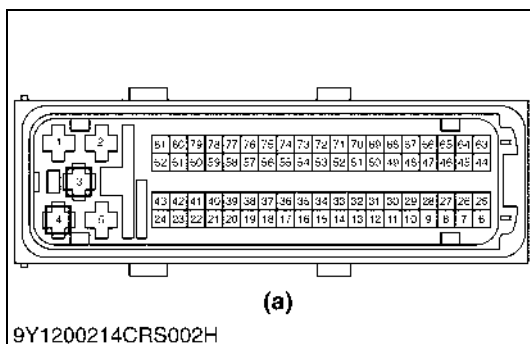
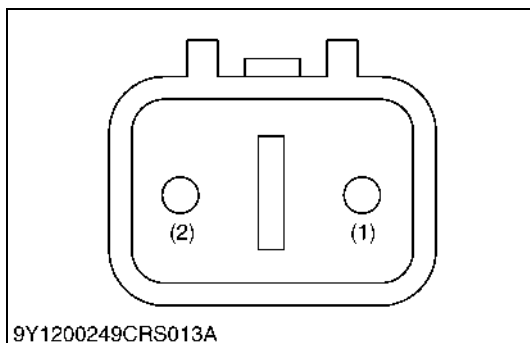
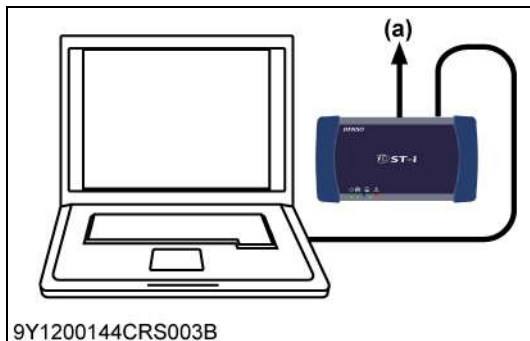
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0230US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Measure the resistance of blower motor".

(a) CAN1 Connector

9Y1200412RSS0231US0

2. Measure the resistance of blower motor

1. Remove the connector from the blower motor.
2. Measure the resistance of blower motor.

Factory specification	0.7 ~ 0.9 Ω
-----------------------	-------------

OK	Go to "3. Check the wiring harness".
NG	Replace the blower motor.

(1) Terminal 1 (No.3:+12 V)

(2) Terminal 2 (GND)

9Y1200412RSS0232US0

3. Check the wiring harness

1. Unplug the ECU wiring harness connector from socket and unplug the battery.
2. Check conduction between the ECU connector side No.3,4 and blower motor connector (+), and between body earth and blower motor connector (-).

Factory specification	Approx. 0 Ω
-----------------------	-------------

OK	Replace the ECU.
NG	Replace the wiring harness.

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0233US0

(13) Circuit of solenoid valve 1 for fuel reformer abnormality (DTC P1808 / 523770-5, P1809 / 523770-4, P1810 / 523770-3)

P1808 / 523770-5: Circuit of solenoid valve 1 for fuel reformer abnormality (Open circuit)

Behavior during malfunction:

- None

Detection item:

- Open circuit of solenoid valve 1 / harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- Open circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0234US0

P1809 / 523770-4: Circuit of solenoid valve 1 for fuel reformer abnormality (Short to GND)

Behavior during malfunction:

- None

Detection item:

- GND short circuit of harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- GND short circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0235US0

P1810 / 523770-3: Circuit of solenoid valve 1 for fuel reformer abnormality (Short to B+)

Behavior during malfunction:

- None

Detection item:

- B+ short circuit of harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- B+ short circuit of harness

Engine warning light:

- ON

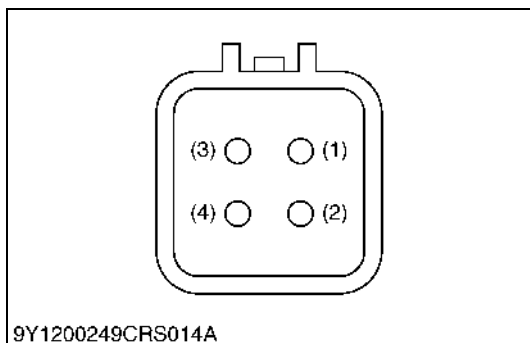
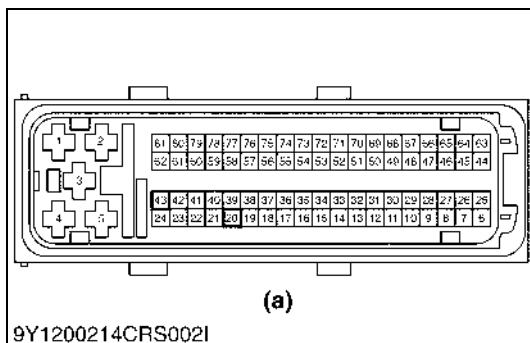
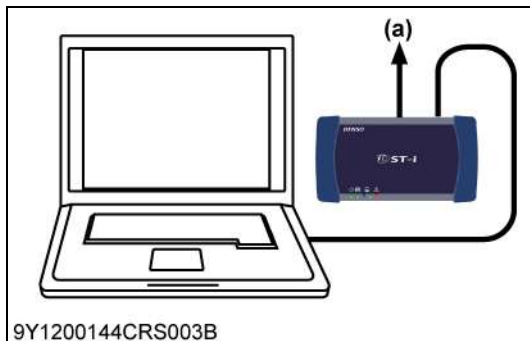
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0236US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the resistance between terminals".

(a) CAN1 Connector

9Y1200412RSS0237US0

2. Check the resistance between terminals

1. Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
2. Measure the resistance between connector terminal No.20 and No.43.

Factory specification	12 Ω $\pm$ 10 %
-----------------------	------------------------

OK	Replace ECU.
NG	Go to "3. Measure the resistance of solenoid valve 1 for fuel reformer".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0238US0

3. Measure the resistance of solenoid valve 1 for fuel reformer

1. Remove the connector from the solenoid valve.
2. Measure the resistance between connector terminal 2 (2) and terminal 4 (4).

Factory specification	12 Ω $\pm$ 10 %
-----------------------	------------------------

OK	Wiring harness open circuit. Check and repair.
NG	Replace blower assembly.

- (1) Terminal 1 (Key Switch: IG)
(2) Terminal 2 (Key Switch: IG)

- (3) Terminal 3
(No.21: Solenoid Valve 2)
(4) Terminal 4
(No.20: Solenoid Valve 1)

9Y1200412RSS0239US0

(14) Circuit of solenoid valve 2 for fuel reformer abnormality (DTC P1811 / 523769-5, P1812 / 523769-4, P1813 / 523769-3)

P1811 / 523769-5: Circuit of solenoid valve 2 for fuel reformer abnormality (Open circuit)

Behavior during malfunction:

- None

Detection item:

- Open circuit of solenoid valve 2 / harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- Open circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0240US0

P1812 / 523769-4: Circuit of solenoid valve 2 for fuel reformer abnormality (Short to GND)

Behavior during malfunction:

- None

Detection item:

- GND short circuit of harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- GND short circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0241US0

P1813 / 523769-3: Circuit of solenoid valve 2 for fuel reformer abnormality (Short to B+)

Behavior during malfunction:

- None

Detection item:

- B+ short circuit of harness

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- B+ short circuit of harness

Engine warning light:

- ON

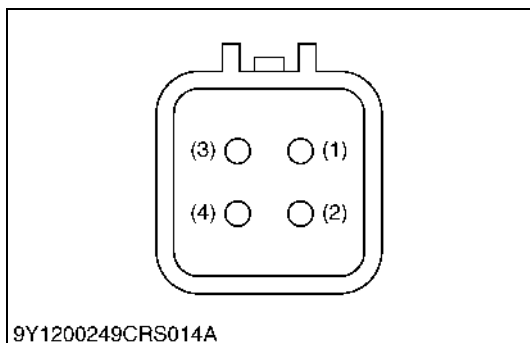
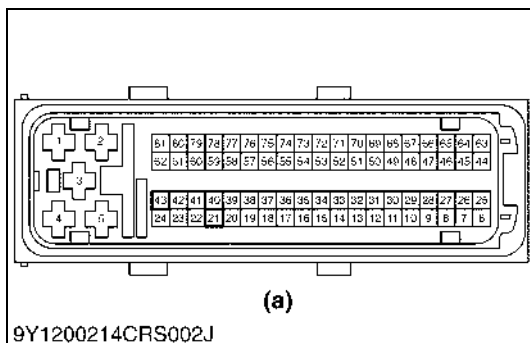
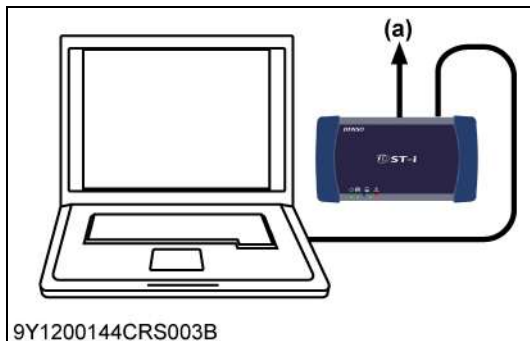
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0242US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the resistance between terminals".

(a) CAN1 Connector

9Y1200412RSS0243US0

2. Check the resistance between terminals

1. Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
2. Measure the resistance between connector terminal No.21 and No.43.

Factory specification	12 Ω $\pm$ 10 %
-----------------------	------------------------

OK	Replace ECU.
NG	Go to "3. Measure the resistance of solenoid valve 2 for fuel reformer".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0244US0

3. Measure the resistance of solenoid valve 2 for fuel reformer

1. Remove the connector from the solenoid valve.
2. Measure the resistance between connector terminal 1 (1) and terminal 3 (3).

Factory specification	12 Ω $\pm$ 10 %
-----------------------	------------------------

OK	Wiring harness open circuit. Check and repair.
NG	Replace blower assembly

- | | |
|---------------------------------|---|
| (1) Terminal 1 (Key Switch: IG) | (3) Terminal 3
(No.21: Solenoid Valve 2) |
| (2) Terminal 2 (Key Switch: IG) | (4) Terminal 4
(No.20: Solenoid Valve 1) |

9Y1200412RSS0245US0

(15) Burner temperature sensor abnormality (DTC P1815 / 523762-3, P1816 / 523762-4)

P1815 / 523762-3: Burner temperature sensor abnormality (High side)

Behavior during malfunction:

- None

Detection item:

- Open circuit or +B short circuit of sensor / harness

DTC set preconditions:

- Coolant temp. $\geq 65\text{ }^{\circ}\text{C}$ ($^{\circ}\text{F}$)
- $100\text{ }^{\circ}\text{C}$ ($212\text{ }^{\circ}\text{F}$) $\leq T0 \leq 800\text{ }^{\circ}\text{C}$ ($1472\text{ }^{\circ}\text{F}$): continues longer than 10 sec. or $100\text{ }^{\circ}\text{C}$ ($212\text{ }^{\circ}\text{F}$) $\leq T1 \leq 800\text{ }^{\circ}\text{C}$ ($1472\text{ }^{\circ}\text{F}$): continues longer than 10 sec. or $100\text{ }^{\circ}\text{C}$ ($212\text{ }^{\circ}\text{F}$) $\leq T2 \leq 800\text{ }^{\circ}\text{C}$ ($1472\text{ }^{\circ}\text{F}$): continues longer than 10 sec.

DTC set parameter:

- Burner temp. sensor (T4) voltage: 4.92 V or more

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- $0\text{ }^{\circ}\text{C}$ [Default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0246US0

P1816 / 523762-4: Burner temperature sensor abnormality (Low side)

Behavior during malfunction:

- None

Detection item:

- GND short circuit of sensor / harness

DTC set preconditions:

- DPF regeneration is not activated
- Sensor supply voltage VCC is normal

DTC set parameter:

- Burner temp. sensor (T4) voltage: 0.08 V or less

Engine warning light:

- ON

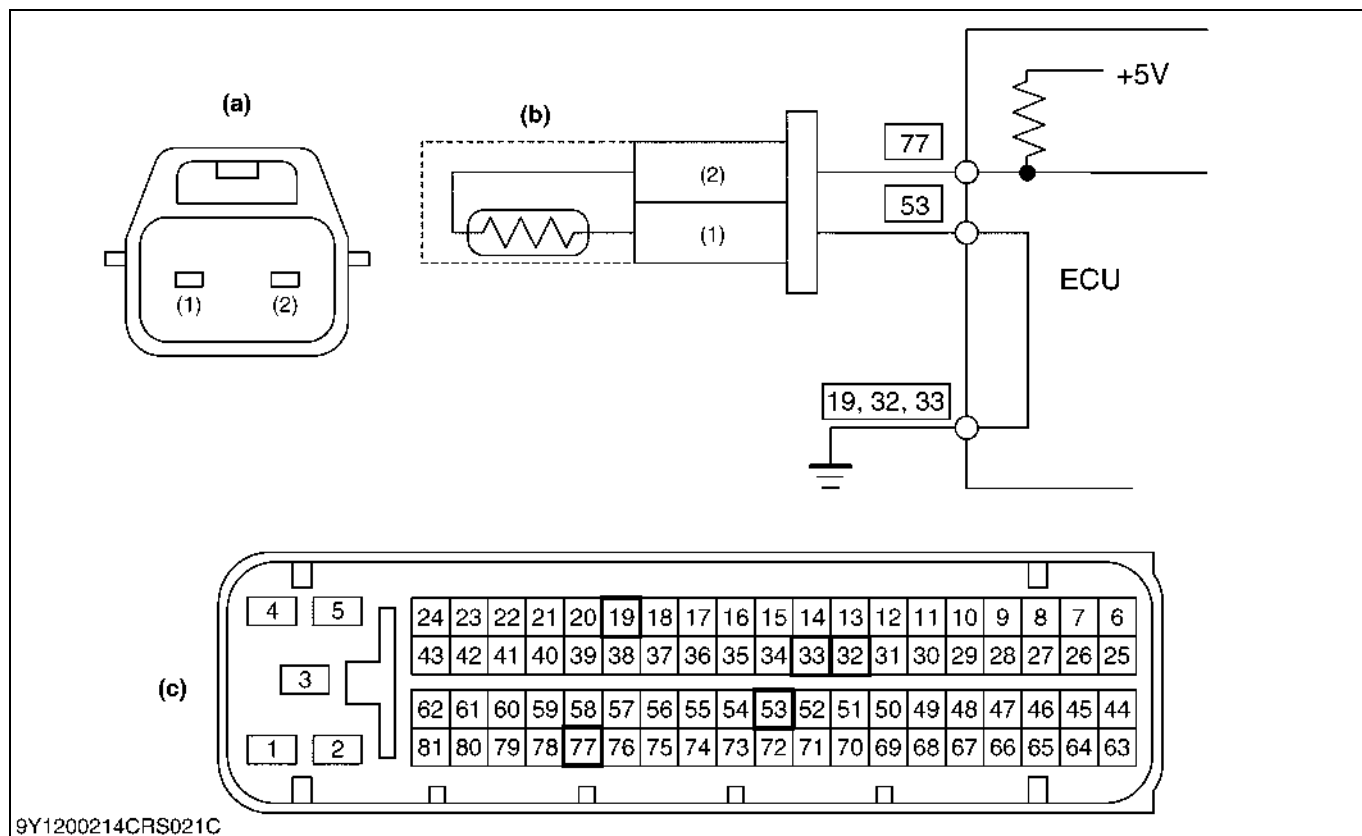
Limp home action by engine ECU (system action):

- $0\text{ }^{\circ}\text{C}$ [Default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0247US0



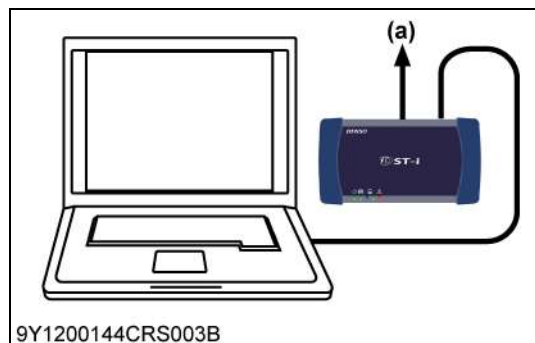
(1) Terminal 1 (No.53: GND)

(2) Terminal 2 (No.77: Burner Temp. Sensor)

(a) Burner Temperature Sensor (c) ECU Connector Terminal Layout

(b) Burner Temperature Sensor

9Y1200412RSS0248US0



1. Check the burner temperature sensor signals

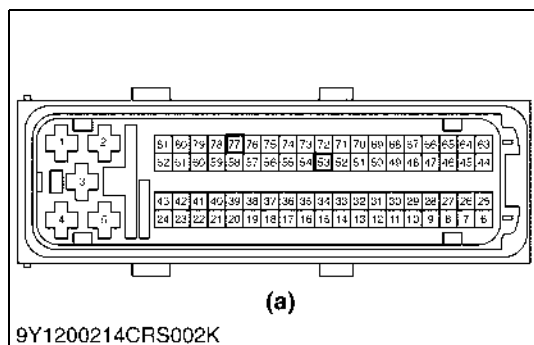
- Place the key switch in the ON position, and check the "Burner Temperature" and "Burner Temperature Voltage" on the diagnosis tool data monitor.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Check the resistance between terminals".	

(a) CAN1 Connector

9Y1200412RSS0249US0



2. Check the resistance between terminals

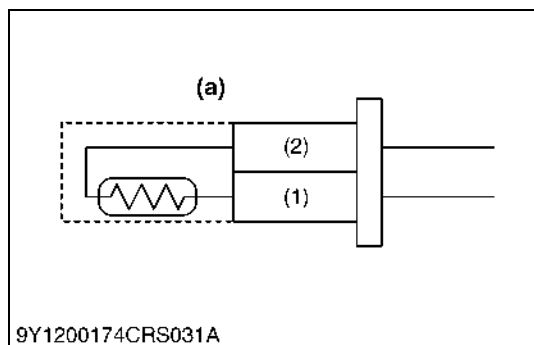
1. Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
2. Measure the resistance between connector terminal No.77 and No.53.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Go to "4. Measure the ECU terminal voltage".
NG	Go to "3. Measure the resistance of burner temperature sensor".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0250US0



3. Check the Sensor

1. Turn the key switch OFF, remove the connector from the sensor side.
2. Measure the resistance between the terminals on the sensor side.

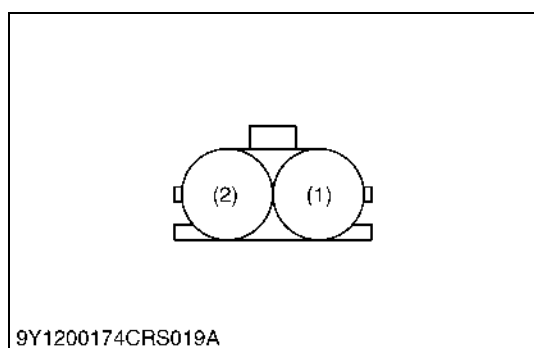
Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Wiring harness open circuit. Check and repair.
NG	Replace the burner temperature sensor.

- (1) Terminal 1 (No.53:GND)
 (2) Terminal 2 (No.77:Burner Temp. Sensor)

(a) Burner Temperature Sensor

9Y1200412RSS0251US0



4. Measure the ECU terminal voltage

1. Plug the ECU wiring harness connector into socket again, and unplug the sensor connector.
2. Place the key switch in the ON position, and measure the voltage between terminals of the sensor connector (at the wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

OK	The ECU connector is faulty or its wiring harness is shorted.
NG	Confirm by using other glow plugs that there is no ground short malfunction before replacing the ECU.

- (1) Terminal 1 (No.53: GND) (2) Terminal 2 (No.77: Burner Temp. Sensor)

9Y1200412RSS0252US0

(16) Blower pressure sensor abnormality (DTC P1818 / 523764-3, P1819 / 523764-4)

P1818 / 523764-3: Blower pressure sensor abnormality (High side)

Behavior during malfunction:

- None

Detection item:

- Open circuit or +B short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Blower pressure sensor voltage: 4.8 V or more

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- 0 °C [Default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0253US0

P1819 / 523764-4: Blower pressure sensor abnormality (Low side)

Behavior during malfunction:

- None

Detection item:

- GND short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Blower pressure sensor voltage: 0.2 V or less

Engine warning light:

- ON

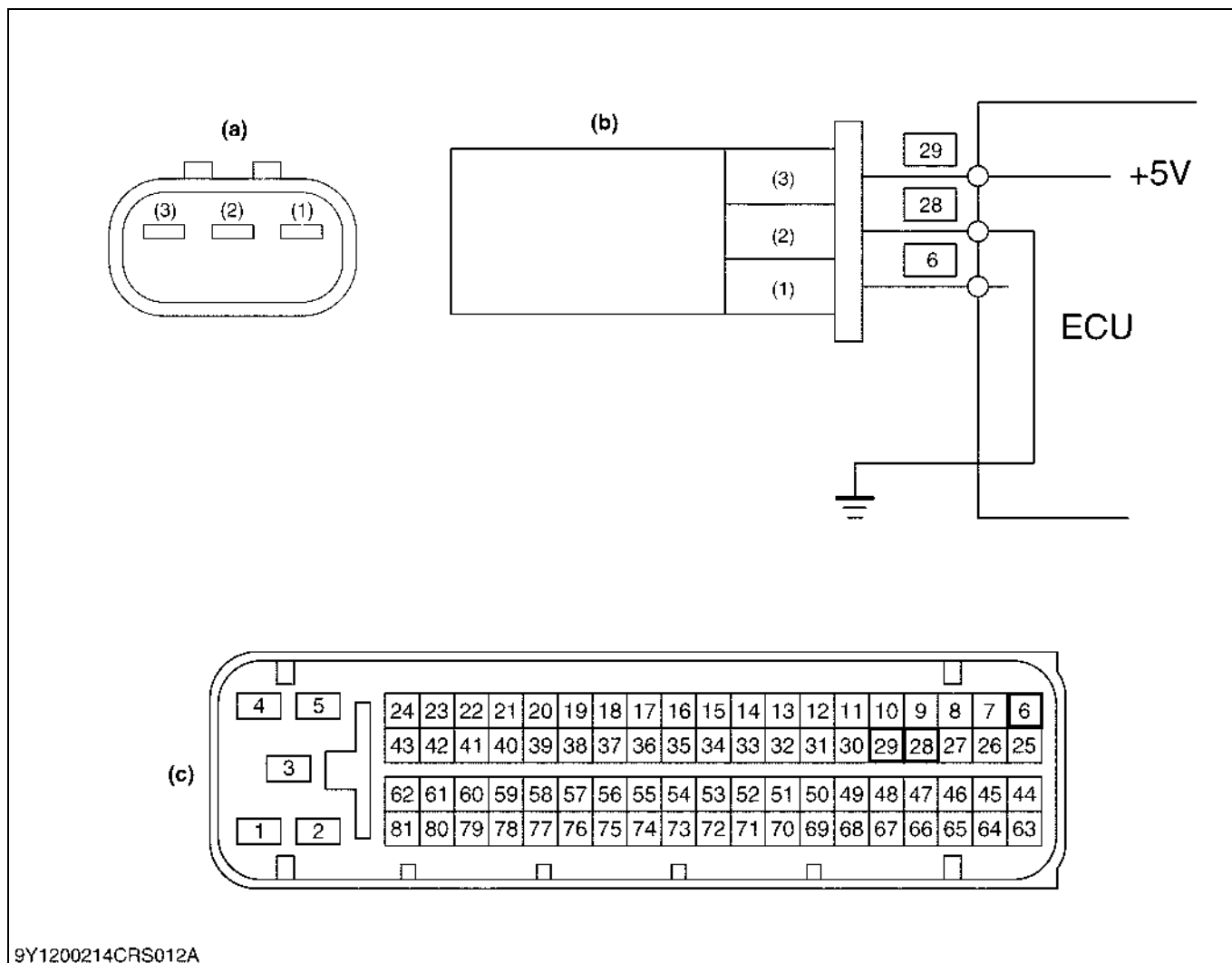
Limp home action by engine ECU (system action):

- 0 °C [Default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

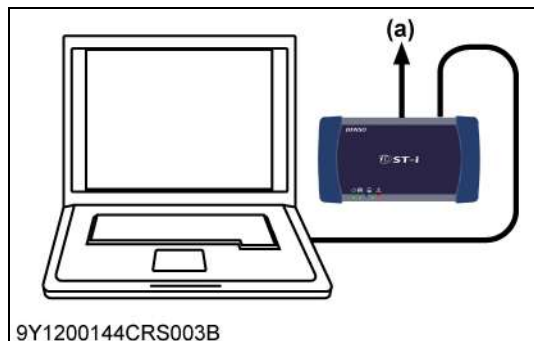
9Y1200412RSS0254US0



- (1) Terminal 1 (No.6: Pressure (Blower))
 (2) Terminal 2 (No.28: GND)
 (3) Terminal 3 (No.29:+5 V)

- (a) Blower pressure sensor Terminal Layout
 (b) Blower pressure sensor
 (c) ECU Connector

9Y1200412RSS0255US0



1. Check the blower pressure sensor signals

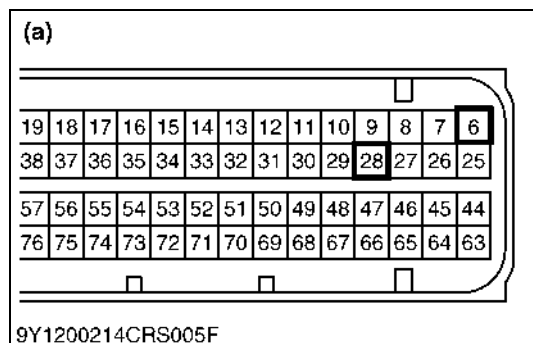
- Place the key switch in the ON position, and check the "Blower Pressure" and "Blower Pressure Voltage" on the diagnosis tool data monitor.

Factory specification		
Engine state	Actual blower pressure	Output voltage
Key switch is ON	Approx. 0 kPa	Approx. 0.7 V

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Measure the ECU terminal voltage".	

- (a) CAN1 Connector

9Y1200412RSS0256US0



2. Measure the ECU terminal Voltage

1. Remove the ECU wiring harness connector cover.
2. Move the key switch from the OFF to ON position, and measure the voltage between ECU terminals No.6 and No.28.

■ IMPORTANT

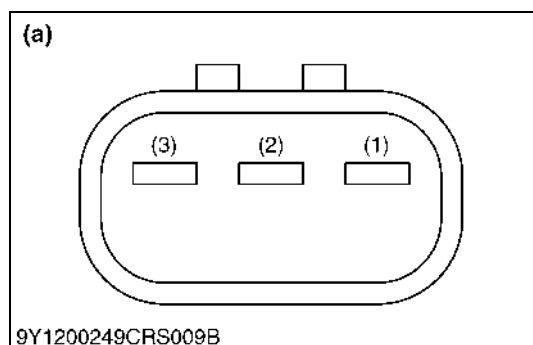
- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	
Engine state	Output Voltage
Key switch is ON	Approx. 0.7 V

OK	Check the harness connectors and ECU pins.	
	OK	Replace ECU.
	NG	Repair or replace the wiring harness or replace ECU.
NG	Go to "3. Measure the Voltage between blower pressure sensor terminals".	

(a) ECU Connector

9Y1200412RSS0257US0



3. Measure the voltage between blower pressure sensor terminals

1. Place the key switch in the ON position, and measure the voltage between terminals (1) and (2) of the blower pressure sensor at the wiring harness side.

■ IMPORTANT

- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

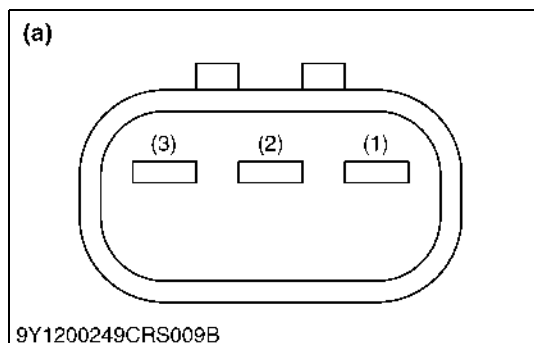
Factory specification	
Engine state	Output Voltage
Key switch is ON	Approx. 0.7 V

OK	Check the wiring harness (Between ECU terminal No.6 and sensor terminal (1)). Repair the faulty area.
NG	Go to "4. Measure the Voltage between blower pressure sensor terminals".

- (1) Terminal 1 (No.6: Pressure (Blower))
- (2) Terminal 2 (No.28: GND)
- (3) Terminal 3 (No.29: +5 V)

(a) Blower Pressure sensor Connector

9Y1200412RSS0258US0



4. Measure the voltage between blower pressure sensor terminals

1. Set the key switch to the OFF position, and unplug the blower pressure sensor connector from the socket.
2. Place the key switch in the ON position, and measure the voltage between terminal **2** (2) and terminal **3** (3) of the blower pressure sensor connector (at the wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

OK	Check the harness connectors and ECU pins.	
	OK	Replace the blower pressure sensor.
	NG	1. Repair or replace the wiring harness. 2. Replace the blower pressure sensor.
NG	Go to "5. Measure the ECU terminal voltage".	

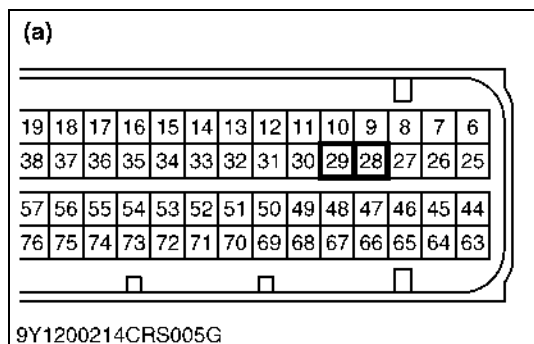
(1) Terminal **1** (No.6: Pressure
(Blower))

(2) Terminal **2** (No.28: GND)

(3) Terminal **3** (No.29: +5 V)

(a) **Blower Pressure sensor
Connector**

9Y1200412RSS0259US0



5. Measure the ECU terminal voltage

1. Remove the ECU wiring harness connector cover.
2. Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.29 and No.28.

Factory specification	Approx. 5 V
-----------------------	-------------

OK	Check the harness connectors and ECU pins.	
	OK	Replace ECU.
	NG	Repair or replace the wiring harness or replace ECU.
NG	Check the wiring harness (Between ECU terminal No.29 and sensor terminal (3) and between ECU terminal No.28 and sensor terminal (2)). Repair the faulty area.	

(a) **ECU Connector**

9Y1200412RSS0260US0

(17) Rack position sensor abnormality (DTC P1827 / 523773-3, P1828 / 523773-4)

P1827 / 523773-3: Rack position sensor abnormality (High side)

Behavior during malfunction:

- Engine stall

Detection item:

- Open circuit or B+ short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Electric governor solenoid current: 1000 mA or less and rack position sensor voltage: 4.8 V or more

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0261US0

P1828 / 523773-4: Rack position sensor abnormality (Low side)

Behavior during malfunction:

- Engine stall

Detection item:

- GND short circuit of sensor / harness
- Mount condition of sensor is incorrect

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Rack position sensor voltage: 0.3 V or less

Engine warning light:

- ON

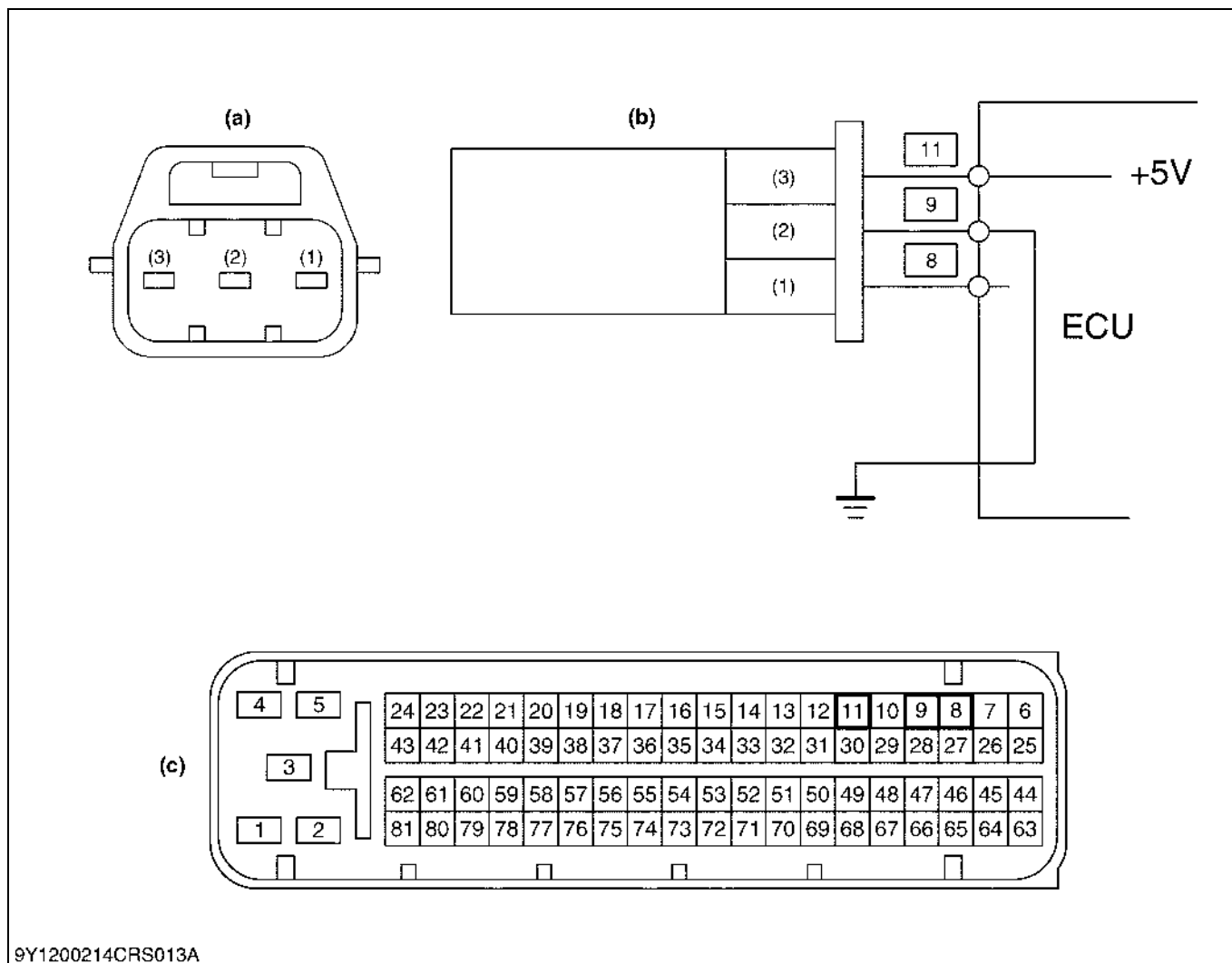
Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0262US0



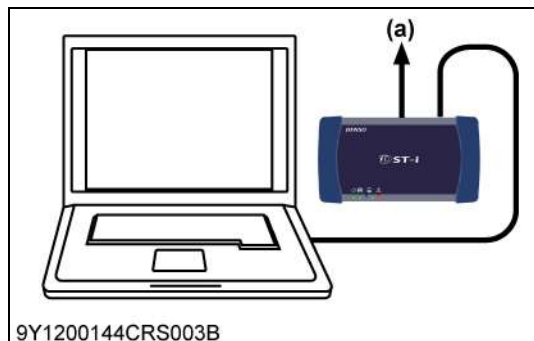
- (1) Terminal 1 (No.8: Rack position sensor)
 (2) Terminal 2 (No.9: GND)

- (3) Terminal 3 (No.11: +5 V)

- (a) Rack Position Sensor Terminal Layout
 (b) Rack Position Sensor

- (c) ECU Connector

9Y1200412RSS0263US0



1. Check the blower pressure sensor signals

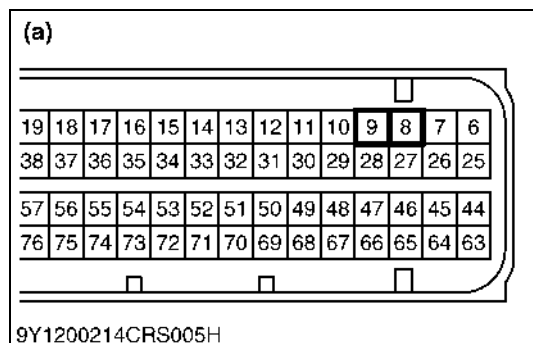
- Place the key switch in the ON position, and check the "Rack Position Sensor Voltage" on the diagnosis tool data monitor.

Factory specification	
Engine state	Output Voltage
Key switch is ON	Approx. 2.5 ~ 3.0 V

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Measure the ECU terminal voltage".	

- (a) CAN1 Connector

9Y1200412RSS0264US0



2. Measure the ECU terminal Voltage

1. Remove the ECU wiring harness connector cover.
2. Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.8 and No.9.

■ IMPORTANT

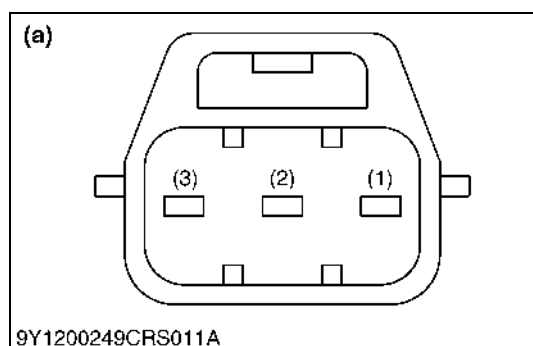
- Refer to "7. [3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	
Engine state	Output Voltage
Key switch is ON	Approx. 2.5 ~ 3.0 V

OK	Check the harness connectors and ECU pins.	
	OK	Replace ECU.
	NG	Repair or replace the wiring harness or replace ECU.
NG	Go to "3. Measure the Voltage between rack position sensor terminals".	

(a) ECU Connector

9Y1200412RSS0265US0



3. Measure the voltage between rack position sensor terminals

1. Place the key switch in the ON position, and measure the voltage between terminals (1) and (2) of the rack position sensor at the wiring harness side.

■ IMPORTANT

- Refer to "7. [3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

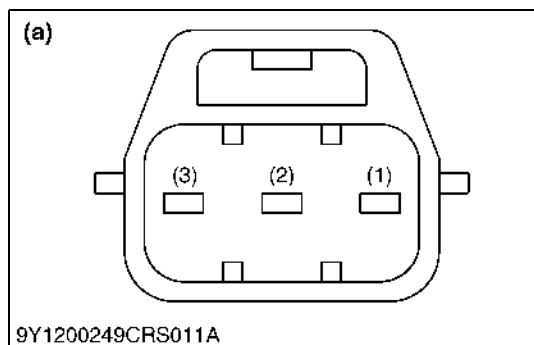
Factory specification	
Engine state	Output Voltage
Key switch is ON	Approx. 2.5 ~ 3.0 V

OK	Check the wiring harness (Between ECU terminal No.8 and sensor terminal (1)). Repair the faulty area.
NG	Go to "4. Measure the Voltage between rack position sensor terminals".

- (1) Terminal 1
(No.8: Rack position sensor)
- (2) Terminal 2 (No.9: GND)
- (3) Terminal 3 (No.11: +5 V)

(a) Rack Position Sensor Connector

9Y1200412RSS0266US0



4. Measure the voltage between rack position sensor terminals

1. Set the key switch to the OFF position, and unplug the rack position sensor connector from the socket.
2. Place the key switch in the ON position, and measure the voltage between terminal 2 (2) and terminal 3 (3) of the rack position sensor connector (at the wiring harness side).

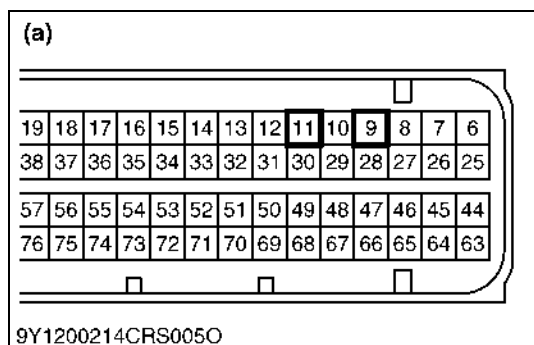
Factory specification	Approx. 5 V
-----------------------	-------------

OK	Check the harness connectors and ECU pins.	
	OK	Replace the rack position sensor.
	NG	1. Repair or replace the wiring harness. 2. Replace the rack position sensor.
NG	Go to "5. Measure the ECU terminal voltage".	

- (1) Terminal 1
(No.8: Rack position sensor)
- (2) Terminal 2 (No.9: GND)
- (3) Terminal 3 (No.11: +5 V)

(a) Rack Position Sensor Connector

9Y1200412RSS0267US0



5. Measure the ECU terminal voltage

1. Remove the ECU wiring harness connector cover.
2. Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.11 and No.9.

■ IMPORTANT

- If you replace the rack position sensor, you should rewrite serial number of rack position sensor and the data of rack position default value to ECU, and update the data at website. (Refer to Utility page)
- Refer to "7. [3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Approx. 5 V
-----------------------	-------------

OK	Check the harness connectors and ECU pins.	
	OK	Replace ECU.
	NG	Repair or replace the wiring harness or replace ECU.
NG	Check the wiring harness (Between ECU terminal No.11 and sensor terminal (3) and between ECU terminal No.9 and sensor terminal (2)). Repair the faulty area.	

(a) ECU Connector

9Y1200412RSS0268US0

(18) Electric governor solenoid circuit abnormality (DTC P1830 / 523771-5, P1831 / 523771-6)

P1830 / 523771-5: Electric governor solenoid circuit abnormality (Open circuit)

Behavior during malfunction:

- Engine stall

Detection item:

- Open circuit of solenoid / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal
- Key switch is ON
- No starter - SW input

DTC set parameter:

- Open circuit of solenoid / harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0269US0

P1831 / 523771-6: Electric governor solenoid circuit abnormality (Short to GND / B+)

Behavior during malfunction:

- Engine stall

Detection item:

- GND short circuit of solenoid / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal
- Key switch is ON

DTC set parameter:

- GND short circuit of solenoid / harness

Engine warning light:

- ON

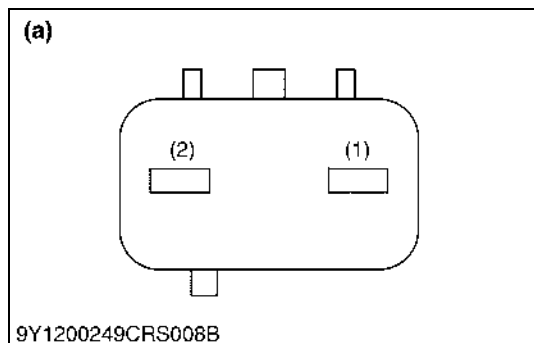
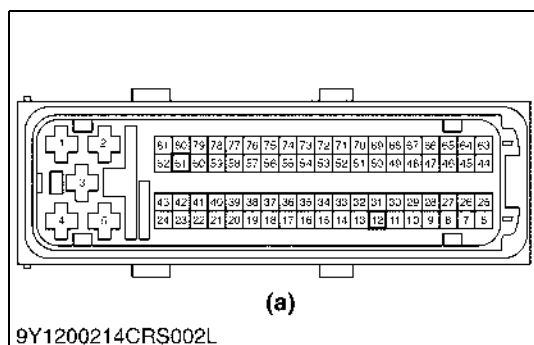
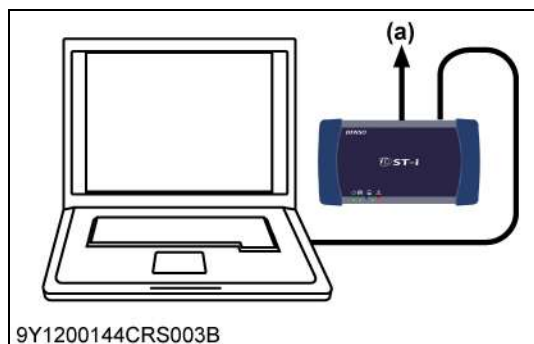
Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0270US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the resistance between terminals".

(a) CAN1 Connector

9Y1200412RSS0271US0

2. Check the resistance between terminals

1. Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
2. Measure the resistance between connector terminal No.12 and No.61.

Factory specification	3 ~ 4 Ω
-----------------------	---------

OK	Replace ECU.
NG	Go to "3. Measure the resistance of electric governor solenoid".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0272US0

3. Measure the resistance of Electric governor solenoid

1. Measure the resistance of electric governor solenoid.

Factory specification	3 ~ 4 Ω
-----------------------	---------

OK	Wiring harness open circuit. Check and repair.
NG	Replace electric governor solenoid.

- (1) Terminal 1 (No.12: Solenoid (-))
(2) Terminal 2 (No.61: Solenoid (+))

(a) Electric Governor Solenoid Connector

9Y1200412RSS0273US0

(19) Reformer temperature sensor abnormality (DTC P1832 / 523763-3, P1833 / 523763-4)

P1832 / 523763-3: Reformer temperature sensor abnormality (High side)

Behavior during malfunction:

- None

Detection item:

- Open circuit or +B short circuit of sensor / harness

DTC set preconditions:

- Coolant temp. ≥ 65 °C
- Fuel reforming control is active

DTC set parameter:

- Reformer temp. sensor (T3) voltage: 4.92 V or more

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- 0 °C [Default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0274US0

P1833 / 523763-4: Reformer temperature sensor abnormality (Low side)

Behavior during malfunction:

- None

Detection item:

- GND short circuit of sensor / harness

DTC set preconditions:

- DPF regeneration is not active
- Sensor supply voltage VCC is normal

DTC set parameter:

- Reformer temp. sensor (T3) voltage: 0.08 V or less

Engine warning light:

- ON

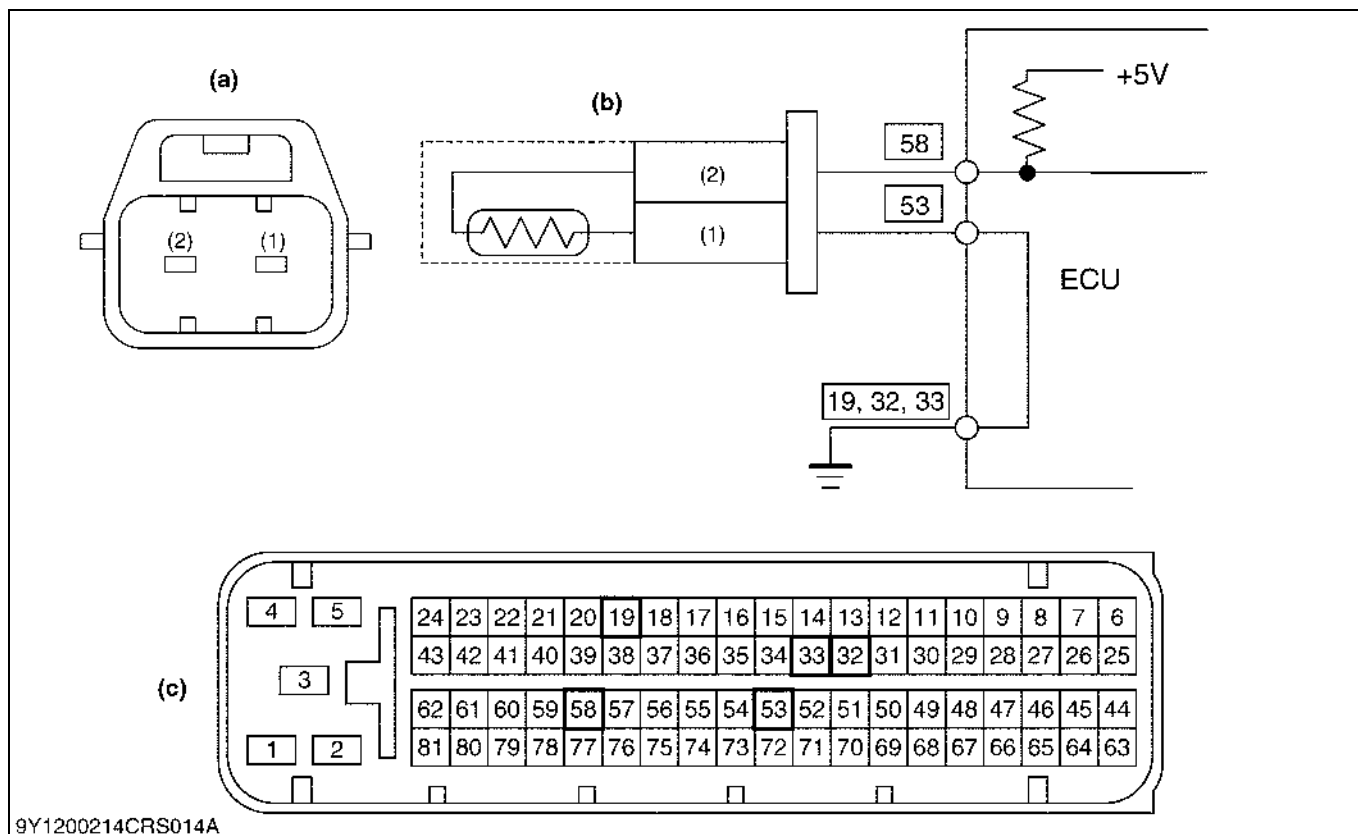
Limp home action by engine ECU (system action):

- 0 °C [Default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0275US0



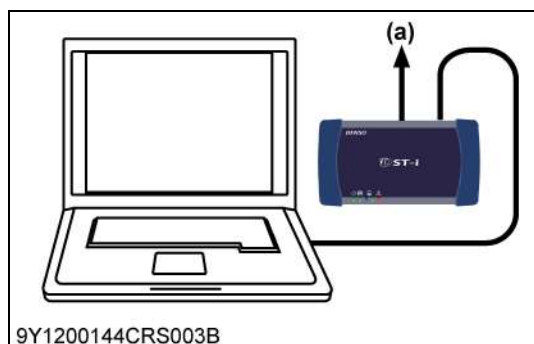
(1) Terminal 1 (No.53:GND)

(2) Terminal 2 (No.58:Reformer Temp. Sensor)

(a) Reformer Temperature Sensor Terminal Layout
(b) Reformer Temperature Sensor

(c) ECU Connector

9Y1200412RSS0276US0



1. Check the reformation temperature sensor signals

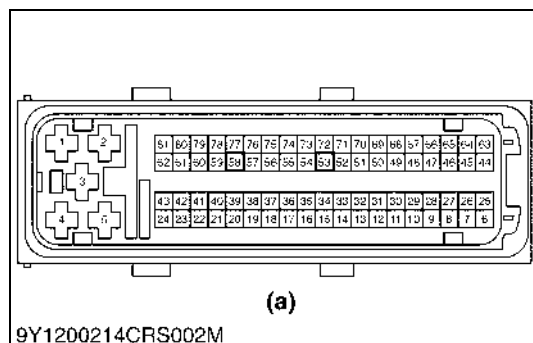
- Place the key switch in the ON position, and check the "Reformer Temperature" and "Reformer Temperature Voltage" on the diagnosis tool data monitor.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Check the resistance between terminals".	

(a) CAN1 Connector

9Y1200412RSS0277US0



2. Check the resistance between terminals

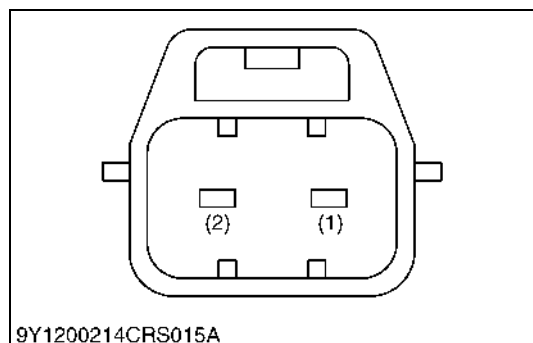
1. Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
2. Measure the resistance between connector terminal No.58 and No.53.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Go to "4".
NG	Go to "3. Measure the resistance of reformer temperature sensor".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0278US0



3. Measure the resistance of reformer temperature sensor

1. Measure the resistance of reformer temperature sensor.

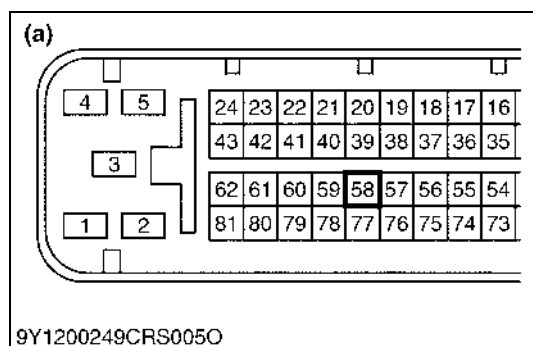
Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Wiring harness open circuit. Check and repair.
NG	Replace the reformer temperature sensor.

(1) Terminal 1 (No.53:GND)

(2) Terminal 2 (No.58:Reformer Temp. Sensor)

9Y1200412RSS0279US0



4. Measure the ECU terminal voltage

1. Remove the ECU wiring harness connector cover.
2. Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.58 and No.53.

■ IMPORTANT

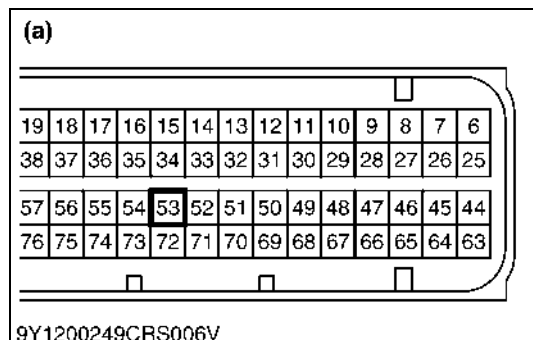
- Refer to "7. [3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Approx. 5 V
-----------------------	-------------

OK	The ECU connector is faulty or its wiring harness is shorted.
NG	Confirm by using other glow plugs that there is no ground short malfunction before replacing the ECU.

(a) ECU Connector

9Y1200412RSS0280US0



(20) Reformer temperature abnormality (DTC P1834 / 523753-0)

Behavior during malfunction:

- None

Detection item:

- Abnormally high reformer temperature

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Reformer temp.: 1000 °C or more

Engine warning light:

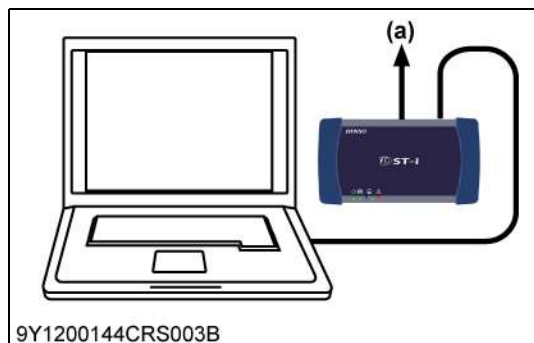
- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF



9Y1200412RSS0281US0

1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the fuel pump for fuel reformer".

(a) CAN1 Connector

9Y1200412RSS0282US0

2. Check the fuel pump for fuel reformer

1. Check the operation of the fuel pump for fuel reformer. (Refer to DTC P0803, P1804, P1805)

OK	Go to "3. Check the solenoid valve 1 for fuel reformer".
NG	Replace the fuel pump for fuel reformer.

9Y1200412RSS0283US0

3. Check the solenoid valve 1 for fuel reformer

1. Check the operation of the solenoid valve 1 for fuel reformer. (Especially check whether bind at full open position) (Refer to DTC P1808, P1809, P1810)

OK	Replace ECU.
NG	Replace the solenoid valve 1 for fuel reformer.

9Y1200412RSS0284US0

(21) Blower pressure abnormal (DTC P1835 / 523751-0)

Behavior during malfunction:

- None

Detection item:

- Abnormally high blower pressure

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Blower pressure: 55 kPa or more

Engine warning light:

- ON

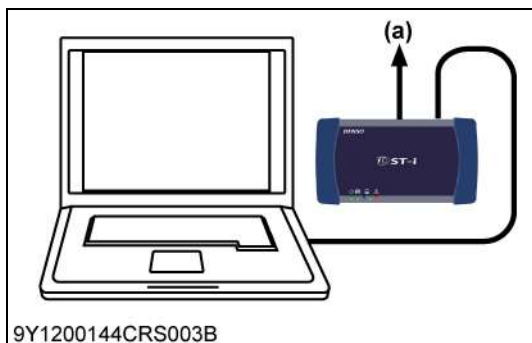
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0285US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the relief part of blower".

(a) CAN1 Connector

9Y1200412RSS0286US0

2. Check the relief part of blower

1. Check the relief part of blower whether dusts are clogged.

OK	Go to "3. Check the outlet of reformer".
NG	Clean the relief part of blower or replace blower assembly.

9Y1200412RSS0287US0

3. Check the outlet of reformer

1. Check the outlet of reformer whether dusts are clogged.

OK	Replace ECU.
NG	Clean the outlet of reformer or replace reformer.

9Y1200412RSS0288US0

(22) Circuit of glow relay for fuel reforming abnormality (DTC P1836 / 523765-3, P1837 / 523765-4)

P1836 / 523765-3: Circuit of glow relay for fuel reforming abnormality (Open / short to B+)

Behavior during malfunction:

- None

Detection item:

- Open circuit or B+ short circuit of relay / harness

DTC set preconditions:

- Battery voltage is normal
- Relay is OFF

DTC set parameter:

- Open circuit / B+ short circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0289US0

P1837 / 523765-4: Circuit of glow relay for fuel reforming abnormality (Short to GND)

Behavior during malfunction:

- None

Detection item:

- GND short circuit of relay / harness

DTC set preconditions:

- Battery voltage is normal
- Relay is ON

DTC set parameter:

- GND short circuit of harness

Engine warning light:

- ON

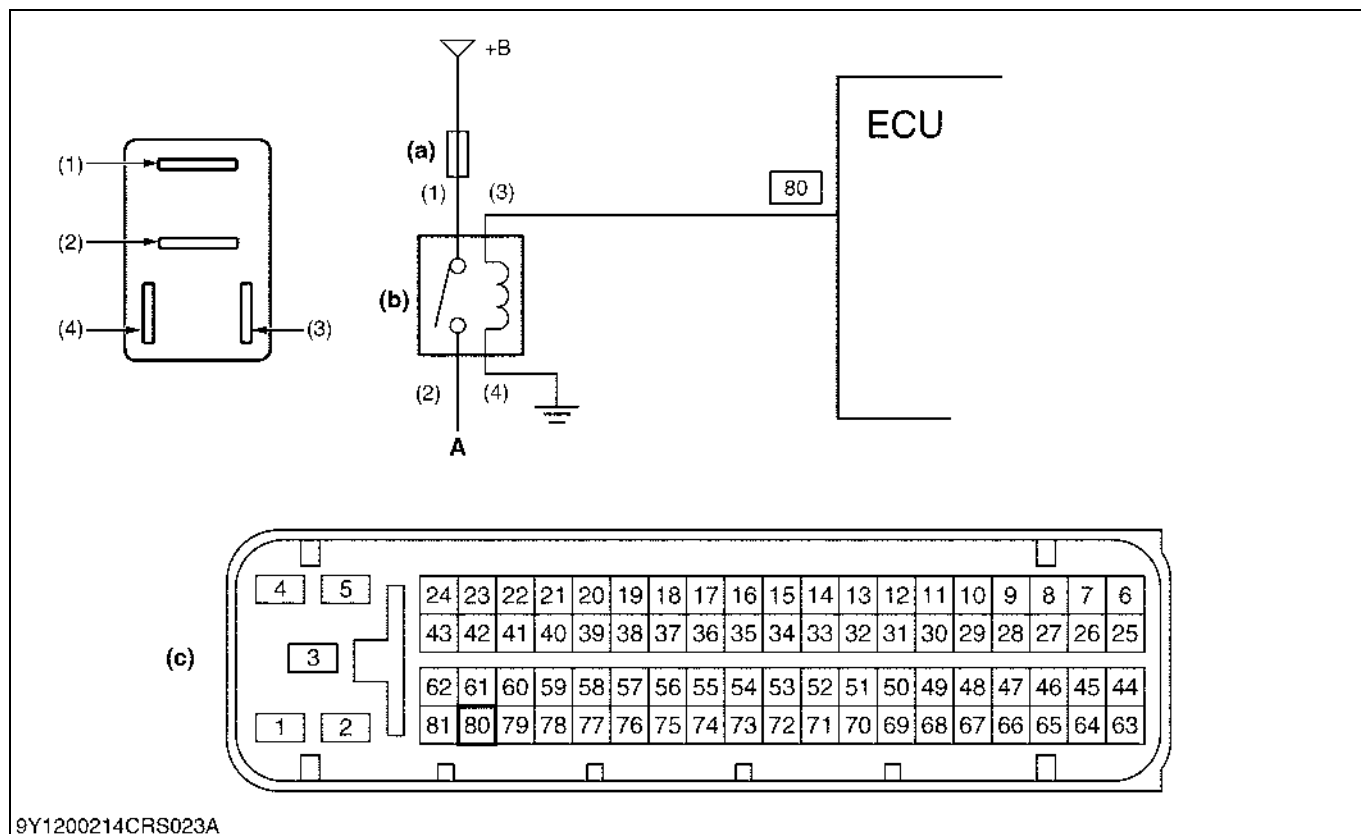
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0290US0

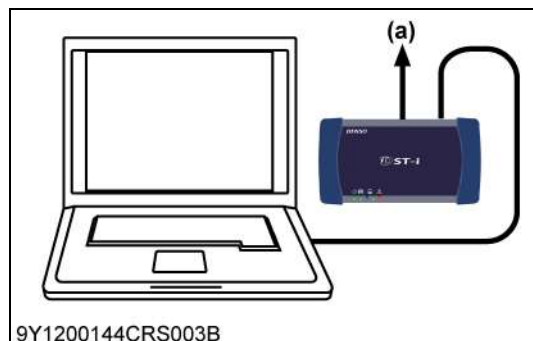


- (1) Terminal 30 (+B (+12 V))
 (2) Terminal 87 (Reformer Glow)
 (3) Terminal 86 (No.80:Glow
 Relay (Reformer))
 (4) Terminal 85 (GND)

- (a) Fuse (10 A)
 (b) Reformer Glow Relay

- (c) ECU Connector
 A: To Reformer Glow

9Y1200412RSS0291US0



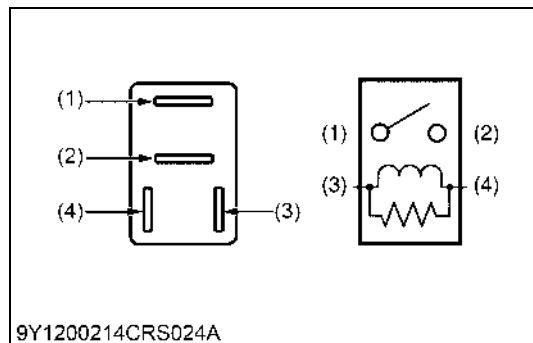
1. Check the DTC signals

- Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
- Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Measure the resistance of glow relay for fuel reforming".

- (a) CAN1 Connector

9Y1200412RSS0292US0



2. Measure the resistance of glow relay for fuel reforming

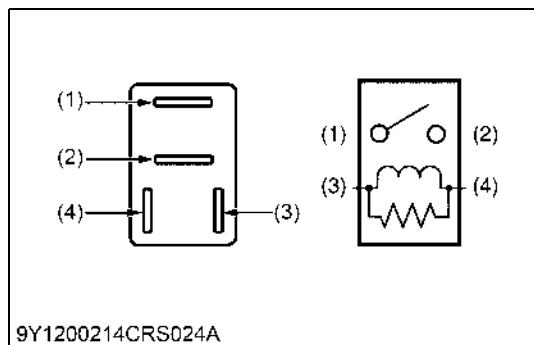
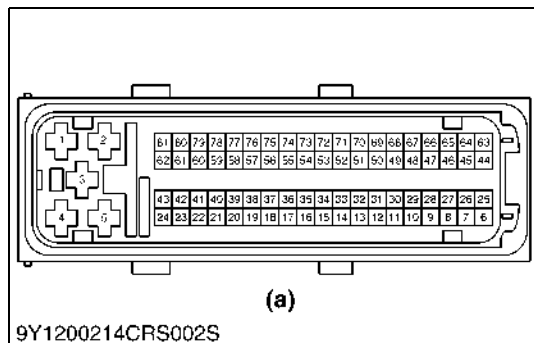
- Measure the resistance of glow relay for fuel reforming.

Factory specification	120 Ω $\pm$ 10 %
-----------------------	-------------------------

OK	Go to "3. Check the wiring harness".
NG	Replace glow relay for fuel reforming.

- (1) Terminal 30
 (2) Terminal 87
 (3) Terminal 86
 (4) Terminal 85

9Y1200412RSS0293US0



3. Check the wiring harness

1. Unplug the ECU wiring harness connector from socket and unplug the battery.
2. Check conduction between the ECU connector side No.80 and glow relay for fuel reforming connector terminal **86** (3), and reformer glow plug and glow relay for fuel reforming connector terminal **87** (2).

Factory specification	Approx. 0 Ω
OK	Replace the ECU.
NG	Replace the wiring harness.

- (1) Terminal **30**
- (2) Terminal **87**
- (3) Terminal **86**
- (4) Terminal **85**

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0294US0

(23) Buzzer circuit abnormality (DTC P1838 / 523759-4, P1839 / 523759-3)**P1838 / 523759-4: Buzzer circuit abnormality (Open / short to GND)****Behavior during malfunction:**

- None

Detection item:

- Open circuit or GND short circuit of buzzer / harness

DTC set preconditions:

- Battery voltage is normal
- Buzzer is OFF

DTC set parameter:

- Open circuit / GND short circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- None

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0295US0

P1839 / 523759-3: Buzzer circuit abnormality (Short to B+)**Behavior during malfunction:**

- None

Detection item:

- B+ short circuit of buzzer / harness

DTC set preconditions:

- Battery voltage is normal
- Buzzer is ON

DTC set parameter:

- B+ short circuit of harness

Engine warning light:

- ON

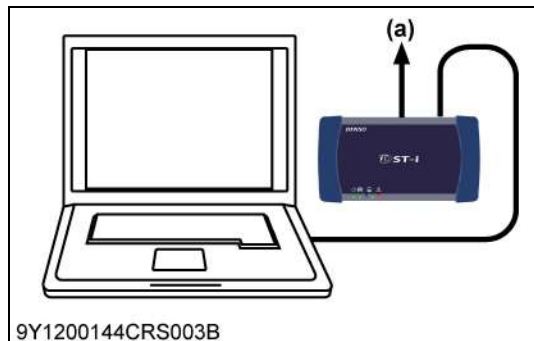
Limp home action by engine ECU (system action):

- None

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0296US0



1. Check the DTC signals

- Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
- Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Measure the resistance of buzzer".

(a) CAN1 Connector

9Y1200412RSS0297US0

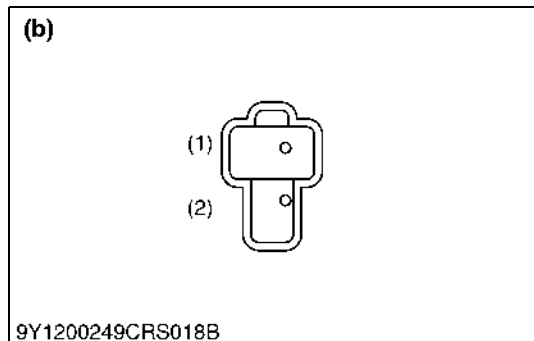
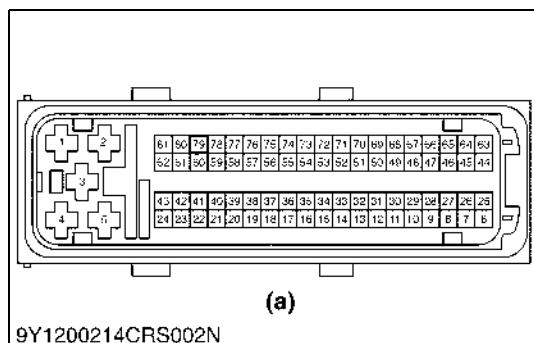
2. Measure the resistance of buzzer

- Measure the resistance of buzzer.

Factory specification	52 ~ 80 Ω
-----------------------	------------------

OK	Go to "3. Check the wiring harness".
NG	Replace buzzer.

9Y1200412RSS0298US0



3. Check the wiring harness

- Unplug the ECU wiring harness connector from socket and unplug the battery.
- Check conduction between the ECU wiring harness connector No.79 and buzzer connector terminal 2 (2) (harness side), and buzzer connector terminal 1 (1) (harness side) and key switch IG terminal.

Factory specification	Approx. 0 Ω
-----------------------	--------------------

OK	Replace the ECU.
NG	Replace the wiring harness.

- (1) Terminal 1 (Key Switch:IG)
 (2) Terminal 2 (No.79:Buzzer (DPF))

- (a) ECU Wiring Harness Connector (Harness Side)
 (b) Buzzer Connector

9Y1200412RSS0299US0

(24) Feed pump circuit abnormality (DTC P1840 / 523761-3, P1841 / 523761-4)**P1840 / 523761-3: Feed pump circuit abnormality (Open / short to B+)****Behavior during malfunction:**

- Insufficient output or Engine stall

Detection item:

- Open circuit or B+ short circuit of pump / harness

DTC set preconditions:

- Battery voltage is normal
- Feed pump is OFF

DTC set parameter:

- Open circuit / B+ short circuit of harness

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- None

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0300US0

P1841 / 523761-4: Feed pump circuit abnormality (Short to GND)**Behavior during malfunction:**

- Insufficient output or Engine stall

Detection item:

- GND short circuit of pump / harness

DTC set preconditions:

- Battery voltage is normal
- Feed pump is ON

DTC set parameter:

- GND short circuit of harness

Engine warning light:

- ON

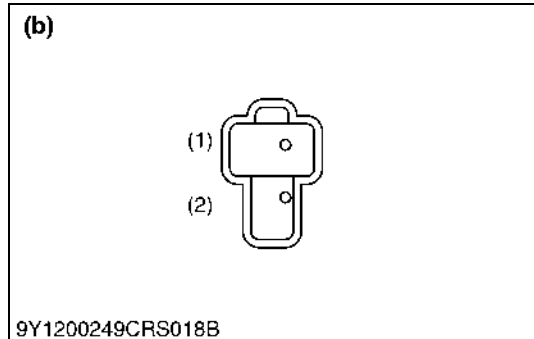
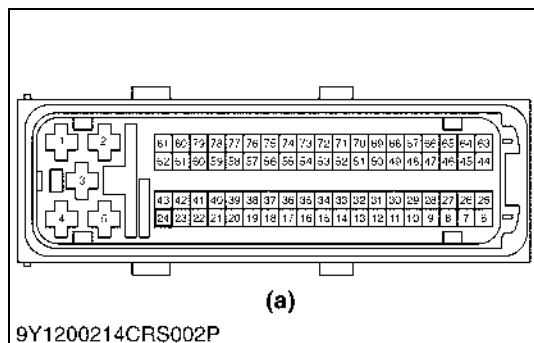
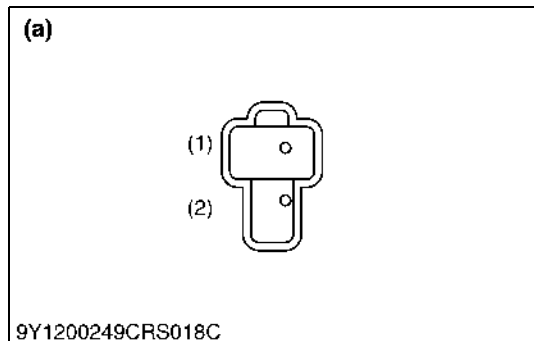
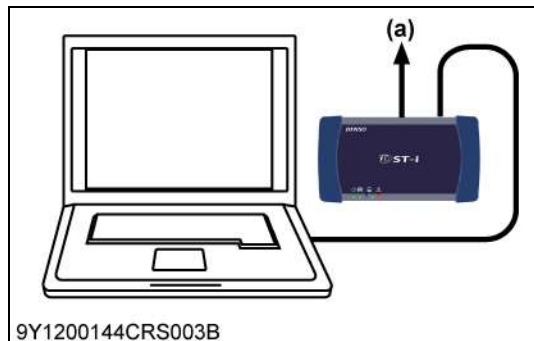
Limp home action by engine ECU (system action):

- None

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0301US0



1. Check the DTC signals

- Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
- Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Measure the resistance of feed pump".

(a) CAN1 Connector

9Y1200412RSS0302US0

2. Measure the resistance of feed pump

- Measure the resistance of feed pump.

Factory specification	120 Ω $\pm$ 10 %
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OK	Go to "3. Check the wiring harness".
NG	Replace feed pump.

(1) Terminal 1 (No.24: Feed Pump)

(a) Feed Pump Connector

(2) Terminal 2 (GND)

9Y1200412RSS0303US0

3. Check the wiring harness

- Unplug the ECU wiring harness connector from socket and unplug the battery.
- Check conduction between the ECU wiring harness connector No.24 and feed pump connector terminal 1 (1) (harness side), and between body earth and feed pump connector terminal 2 (2) (harness side).

Factory specification	Approx. 0 Ω
-----------------------	--------------------

OK	Replace the ECU.
NG	Replace the wiring harness.

(1) Terminal 1 (No.24: Feed Pump)

(a) ECU Wiring Harness Connector (Harness Side)

(2) Terminal 2 (GND)

(b) Feed Pump Connector

9Y1200412RSS0304US0

(25) Reformer abnormal (DTC P1844 / 523755-2)

Behavior during malfunction:

- None

Detection item:

- Reformer is not working when DPF regeneration is active

DTC set preconditions:

- DPF regeneration is activated

DTC set parameter:

- Reformer temp. (T3) < 570 °C three times while reforming catalyst startup sequence is activated

Engine warning light:

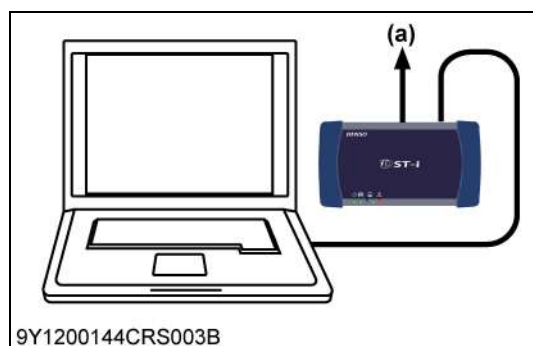
- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF



9Y1200412RSS0305US0

1. Check, save and clear the DTC error codes

1. Place the key switch in the OFF position, connect the Diagmaster Service Tool to the tractor diagnostic connector, [CAN1], and return the key switch to the ON position again.
2. Check for DTC. Save the DTC as CSV files, [FREEZE FRAMES].
3. Clear the DTC, then Go to 2.

(a) CAN1 Connector

9Y1200412RSS0306US0

2. Check 15 A reforming glow relay fuse

1. Check continuity of the reformer glow relay 15 A fuse [fuse is located behind LHS radiator shroud].

OK	Go to 3.
NG	Replace fuse

9Y1200412RSS0307US0

3. Check the wiring harness of glow relay for fuel reformer

1. Check the glow relay and wiring from reformer glow fuse to reformer heater glow plug for continuity.

OK	Go to 4.
NG	Replace defective components.

9Y1200412RSS0308US0

4. Check the operation of air valve 1 for fuel reformer

1. Perform the active test "Air Valve 1 for Fuel Reformer Operate Function" to check the air valve operation.
2. Select the monitor signal group [#Air Valve 1 for Fuel Reformer] and monitor the "Solenoid Air Valve 1 Duty"
3. Also listen for the sound of the solenoid operating.

Monitor Signal	Command Signal	Duration Time	Number of Times
Solenoid Air Valve 1 Duty	60 %	5 sec.	1

OK	Go to 5.
NG	Replace the air blower assembly.

9Y1200412RSS0309US0

5. Check the air blower for fuel reformer

1. Perform the active test "Air Blower for Fuel Reformer ON/OFF Function" to check the operation of the air blower for fuel reformer.
2. Select the monitor signal group [#Air Blower for Fuel Reformer ON/OFF Function] and monitor the air blower current

Monitor Signal	Command Signal	Duration Time	Number of Times
Air Blower Current	10 to 20 A	5 sec.	2

OK	Go to 6.
NG	Replace the air blower assembly

9Y1200412RSS0310US0

6. Check the fuel pump for fuel reformer

1. Perform the active test "Fuel Pump for Fuel Reformer Operate Function" to check the operation of the fuel pump for fuel reformer.
2. Select the monitor signal group [#Fuel Pump for Fuel Reformer Operate Function] and monitor the current frequency of fuel pump.
3. Listen for fuel pump operation sound.

**CAUTION**

- When performing this function, the pump will supply fuel to the reformer. Do not repeat this function repeatedly or the reformer catalyst will get soaked with fuel.

Monitor Signal	Command Signal	Duration Time	Number of Times
Fuel Pump Frequency	2 Hz	5 sec.	1

OK	Go to 7.
NG	Replace the fuel pump for fuel reformer.

9Y1200412RSS0311US0

7. Check the fuel reformer catalyst heater

1. Perform the active test "Catalyst Heater for Fuel Reformer ON/OFF Function" to check the operation of the reformer catalyst heater.
2. Select the monitor signal group [#Catalyst Heater for Fuel Reformer ON/OFF Function]. Connect an ammeter to monitor the reformer catalyst heater current.

Factory specification	2.8 to 4.0 A
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OK	Go to 8.
NG	Replace the fuel reformer. catalyst heater not sold separately -Perform active test "Air Bleeding Function for Fuel Reformer" -Perform "DPF Manual Regeneration Function"

9Y1200412RSS0312US0

8. Perform the purge function for catalyst of fuel reformer

1. Perform the active test "Purge Function for Catalyst of Fuel Reformer" to check the operation of the purge function for catalyst of fuel reformer.
2. Select the monitor signal group [#Purge Function for Catalyst of Fuel Reformer].
3. Follow the procedure below to recover a soaked reformer catalyst.
 - The catalyst may be recovered by performing the "Purge Function for Catalyst of Fuel Reformer".
 - One Purge Active Test Function supplies 20 L/min. of primary air to the reformer for 6 minutes.

■ NOTE

- **When P1848 has occurred, this purge function is not necessary because P1848 is not related to catalyst reactivity.**

[PROCEDURE]

The regeneration process should be confirmed following the Active Test purge as follows:

1. Perform 1 active test purge function. [6 minutes]
 - Perform a "DPF Manual Regeneration Request"
2. If the Manual Regeneration fails, perform 2 active test purge functions. [12 minutes]
 - Perform another "DPF Manual Regeneration Request"
3. If the Manual Regeneration fails, perform 3 active test purge functions. [18 minutes]
 - Perform another "DPF Manual Regeneration Request"

OK	If the Manual Regeneration is successful, no further action required.
NG	Replace the fuel reformer. -Perform active test "Air Bleeding Function for Fuel Reformer" -Perform "DPF Manual Regeneration Function"

9Y1200412RSS0313US0

9. If checks 1-8 are insufficient, refer to the NOTES as below.**■ NOTE**

If the above mentioned checks are insufficient, check the following items:

- Using the Diagmaster Service Tool check whether the blower outlet pressure is within 23 - 29 kPa when the "detailed status" of DPF regeneration control during DPF manual regeneration is "2"
 - If the blower outlet pressure is low: Air may be leaking, determine where the air is leaking.
 - If the blower outlet pressure is high: Air may be restricted, determine where the restriction is.
- Check the fuel lines for kinks or unusual bends which could cause a decrease in fuel supply.
(It is possible for the engine to operate but fuel is not supplied to the reformer.)
- Check for a plugged fuel filter.
- Check the fuel type and age of the fuel in the reservoir.
 - If summer fuel is used during the winter season, the reformer fuel pump may not supply fuel.
- Check whether there is a reverse flow of exhaust gas in the blower pipe or not.
 - When exhaust gas contaminates the reformer catalyst, the efficiency of the catalyst decreases and reformer abnormality will occur.
- If the P1844 regeneration error is still not solved, replace the ECU.

9Y1200412RSS0314US0

(26) Fail to rise DPF temperature (DTC P1845 / 523756-2)

Behavior during malfunction:

- None

Detection item:

- DPF temperature rising control is incomplete when DPF regeneration is active

DTC set preconditions:

- DPF regeneration is activated

DTC set parameter:

- 60 sec. elapsed while following conditions were met
 - a. DOC regeneration is activated
 - b. DPF inlet temp. (T1) < 190 °C (374 °F)

Engine warning light:

- ON

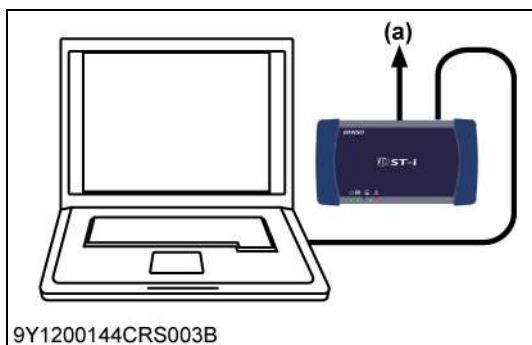
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0315US0



■ NOTE

- If another DTC is happened at the same time, check another one firstly.

9Y1200412RSS0316US0

1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the fuel line of reformer".

(a) CAN1 Connector

9Y1200412RSS0317US0

2. Check the fuel line of reformer

1. Check the fuel line of reformer whether clogged.

OK	Replace the DPF assembly.
NG	Clean up or replace the fuel line of reformer.

9Y1200412RSS0318US0

(27) Over current in circuit of blower motor (DTC P1846 / 523768-6)

Behavior during malfunction:

- None

Detection item:

- Over current in circuit of blower motor for fuel reforming

DTC set preconditions:

- Sensor supply voltage VCC is normal

Engine warning light:

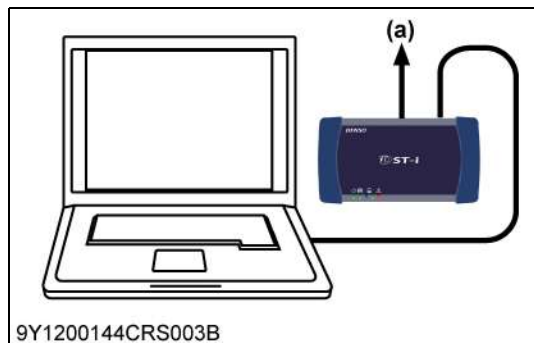
- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF



9Y1200412RSS0319US0

1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Measure the resistance of blower motor".

(a) CAN1 Connector

9Y1200412RSS0320US0

2. Measure the resistance of blower motor

1. Measure the resistance of blower motor. (Refer to P1806, P1807).

Factory specification	0.7 ~ 0.9 Ω
OK	Go to "3. Check the operation of air valve 1/2 for fuel reformer".
NG	Replace (Target replacing parts are referred to P1806, P1807).

9Y1200412RSS0321US0

3. Check the operation of air valve 1/2 for fuel reformer

1. Do the active test "Air Valve 1/2 for Fuel Reformer Operate Function" and check whether the operation sound is happened.

OK	Go to "4. Check the blower inside".
NG	Replace the blower assembly.

9Y1200412RSS0322US0

4. Check the blower inside

1. Check the blower whether a foreign material is bite at inside.

OK	Replace the ECU.
NG	Replace air blower assembly.

9Y1200412RSS0323US0

(28) Fail to ignite burner (DTC P1848 / 523757-2)

Behavior during malfunction:

- None

Detection item:

- Fail to ignite burner (Solenoid valve 2 or ignition glow is not working)

DTC set preconditions:

- Sensor supply voltage VCC is normal
- DPF regeneration is activated

DTC set parameter:

- Fail to ignite reformed gas three times during DPF regeneration
- 120 sec. elapsed while following conditions were met
 - a. DOC regeneration is activated
 - b. Burner temp. (T4) ≤ 400 °C

Engine warning light:

- ON

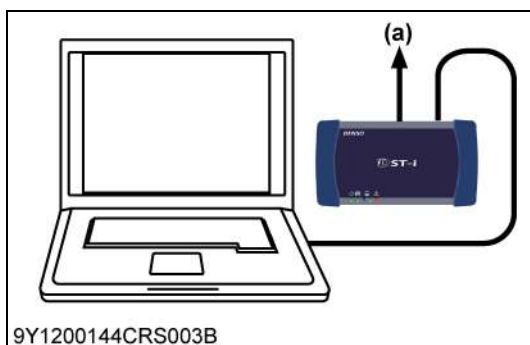
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0324US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Measure the resistance of burner glow".

(a) CAN1 Connector

9Y1200412RSS0325US0

2. Measure the resistance of burner glow

1. Measure the resistance of burner glow. (Refer to P1801, P1802).

Factory specification	0.8 ~ 1.4 Ω
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OK	Go to "3. Check the operation of air valve 2 for fuel reformer".
NG	Replace (Target replacing parts are referred to P1801, P1802).

9Y1200412RSS0326US0

3. Check the operation of air valve 2 for fuel reformer

1. Do the active test "Air Valve 2 for Fuel Reformer Operate Function" and check whether the operation sound is happened.

OK	Go to "4. Check the regeneration gas glow for fuel reformer".
NG	Replace the reformer.

9Y1200412RSS0327US0

4. Check the regeneration gas glow for fuel reformer

1. Do the active test "Regen. Gas Glow for Fuel Reformer ON/OFF Function" and check the operation of the regeneration gas glow for fuel reformer.
2. Check the current value of line of regen. gas glow for fuel reformer with ammeter.

OK	Replace ECU.
NG	Replace the regeneration gas glow for fuel reformer.

9Y1200412RSS0328US0

(29) Low coolant temp. for DPF regeneration (DTC P1849 / 523750-2)

Behavior during malfunction:

- None

Detection item:

- Fail to warm-up coolant temp. for DPF regeneration

DTC set preconditions:

- Sensor supply voltage VCC is normal
- Coolant temp. sensor is normal

DTC set parameter:

- Coolant temp. < 50 °C while reformer warm-up sequence is activated

Engine warning light:

- ON

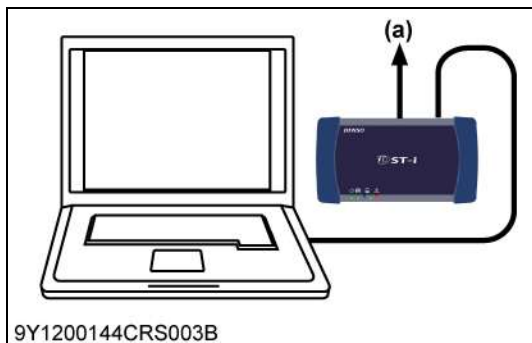
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Diag counter = zero

9Y1200412RSS0329US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the function of thermostat".

(a) CAN1 Connector

9Y1200412RSS0330US0

2. Check the function of thermostat

1. Check the function of thermostat. (Refer to Workshop Manual)

OK	Go to "3. Check the coolant temperature sensor".
NG	Replace thermostat.

9Y1200412RSS0331US0

3. Check the coolant temperature sensor

1. Check the coolant temperature sensor. (Refer to P0117, P0118)

OK	Replace ECU.
NG	Replace (Target replacing parts are referred to P0117, P0118).

9Y1200412RSS0332US0

(30) EEP write error (DTC P1850 / 523749-2)

Behavior during malfunction:

- Insufficient output

Detection item:

- Write failure to EEP-ROM

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- Write completion decision data to the EEP-ROM is invalid

Engine warning light:

- ON

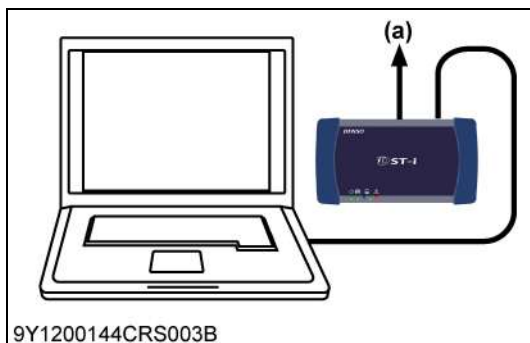
Limp home action by engine ECU (system action):

- Forced Idle (Accelerator=0 %)

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0333US0



1. Check the DTC signals

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the battery (+) terminal".

(a) CAN1 Connector

9Y1200412RSS0334US0

2. Check the battery (+) terminal

1. Place the key switch in the OFF position.
2. Check the connection of battery (+) and wire harness.

OK	Go to "3. Check the wire harness between battery (+) and ECU terminal".
NG	Replace the wiring harness.

9Y1200412RSS0335US0

3. Check the wire harness between battery (+) and ECU terminal

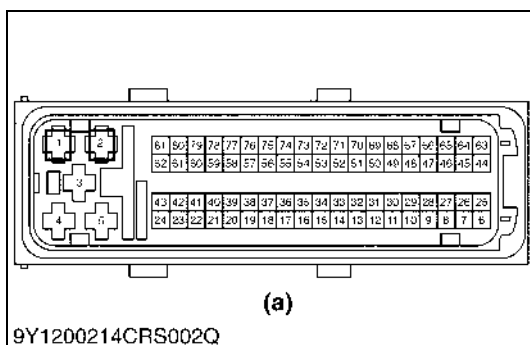
1. Unplug the ECU wiring harness connector from socket and unplug the battery.
2. Check the wire harness between battery (+) cable and ECU wiring harness connector terminal No.1 (No.2).

Factory specification	Approx. 0 Ω
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OK	Go to "3. Check the wire harness".
NG	Replace the wiring harness.

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0336US0



(31) Excessive power consumption during regeneration (DTC P1851 / 523748-2)

Behavior during malfunction:

- None

Detection item:

- Excessive power consumption during DPF regeneration

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- Voltage drop below 12.5 V at the start of regeneration
- Battery voltage during regeneration is 12.5 V or less

Engine warning light:

- OFF

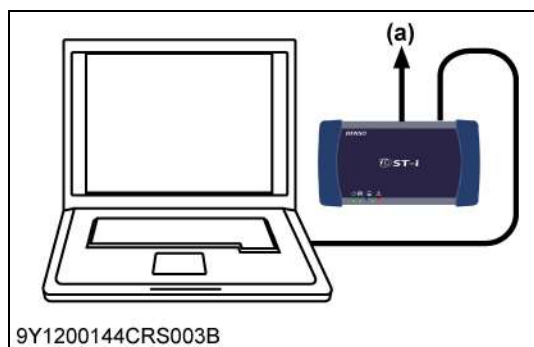
Limp home action by engine ECU (system action):

- Suspension of Regeneration

Recovery from error:

- DPF regeneration is successful completion

9Y1200412RSS0337US0



1. Check the DTC signals

1. Place the key switch in the ON position, and check the "Battery voltage" on the diagnosis tool data monitor.

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Check the battery low voltage".	

(a) CAN1 Connector

9Y1200412RSS0338US0

2. Check the battery low voltage

1. Place the key switch in the OFF position, disconnect the battery harness.
2. Measure the voltage of battery.

OK	Go to "3. Check the connection of alternator (B) terminal".
NG	Replace or charge the battery.

9Y1200412RSS0339US0

3. Check the connection of alternator (B) terminal

1. Check the connection of alternator (B) terminal and wire harness.

Factory specification	Approx. 12 V
OK	Replace the ECU.
NG	Connect the terminal and wire harness.

9Y1200412RSS0340US0

(32) High frequency of the interruption of automatic regeneration (DTC P1856 / 523742-2)

Behavior during malfunction:

- None

Detection item:

- High frequency of the interruption of automatic regeneration during automatic regeneration (DPFst = 2 on and after)
(The interruption by the following incidents, Key switch off, Occurrence of DTC, Engine Stop, Prohibit of regeneration by a switch)

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- The number of times of the interruption of regeneration during automatic regeneration (DPFst = 2 on and after)

Engine warning light:

- OFF

Limp home action by engine ECU (system action):

- The issue of request of parked regeneration

Recovery from error:

- DPF regeneration is successful completion

9Y1200412RSS0341US0

When this DTC occurred, you request parking regeneration from ECU.

Do not do following matter which stops DPF parking regeneration.

1. Engine stall
2. Engine stop
3. Changing DPF reg. permit mode to DPF reg, inhibit mode.

9Y1200412RSS0342US0

(33) EEPROM Check Sum Error (DTC P1990 / 523700-13)

P1990 / 523700-13: EEPROM check sum error

Behaviour during malfunction:

- Engine stall

Detection item:

- EEPROM check sum error

DTC set preconditions:

- Battery voltage is normal
- Key switch is ON

DTC set conditions (Guideline):

- EEPROM check sum error

Engine warning light:

- ON

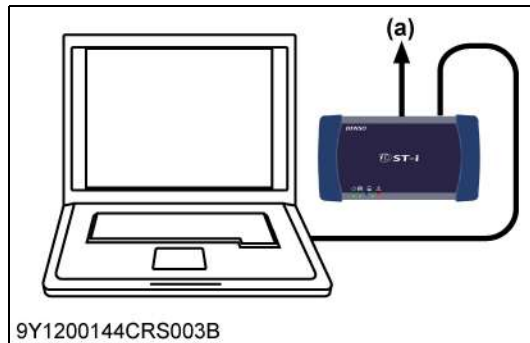
Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0343US0



1. Check the DTC

1. Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again.
2. Clear the DTC, and check whether the same DTC is output again or not.

Factory specification	No DTC is output.
OK	An electromagnetic interference (EMI) may have caused the temporary malfunction. There is no problem if the system has recovered.
NG	Go to "2. Write the Trim Data and Read the DTC Again".

(a) CAN1 Connector

9Y1200412RSS0344US0

(34) Accelerator Position Sensor 1 Abnormality (DTC P2122 / 91-4, P2123 / 91-3)

P2122 / 91-4: Accelerator position sensor 1 abnormality (Low side)

Behaviour during malfunction:

- Insufficient output

Detection item:

- GND short circuit or open circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage (VCC) is normal

DTC set parameter:

- Voltage of accelerator position sensor 1; 0.2 V or less

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- Forced idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0345US0

P2123 / 91-3: Accelerator position sensor 1 abnormality (High side)

Behaviour during malfunction:

- Insufficient output

Detection item:

- B+ short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage (VCC) is normal

DTC set parameter:

- Voltage of accelerator position sensor 1; 4.8 V or more

Engine warning light:

- ON

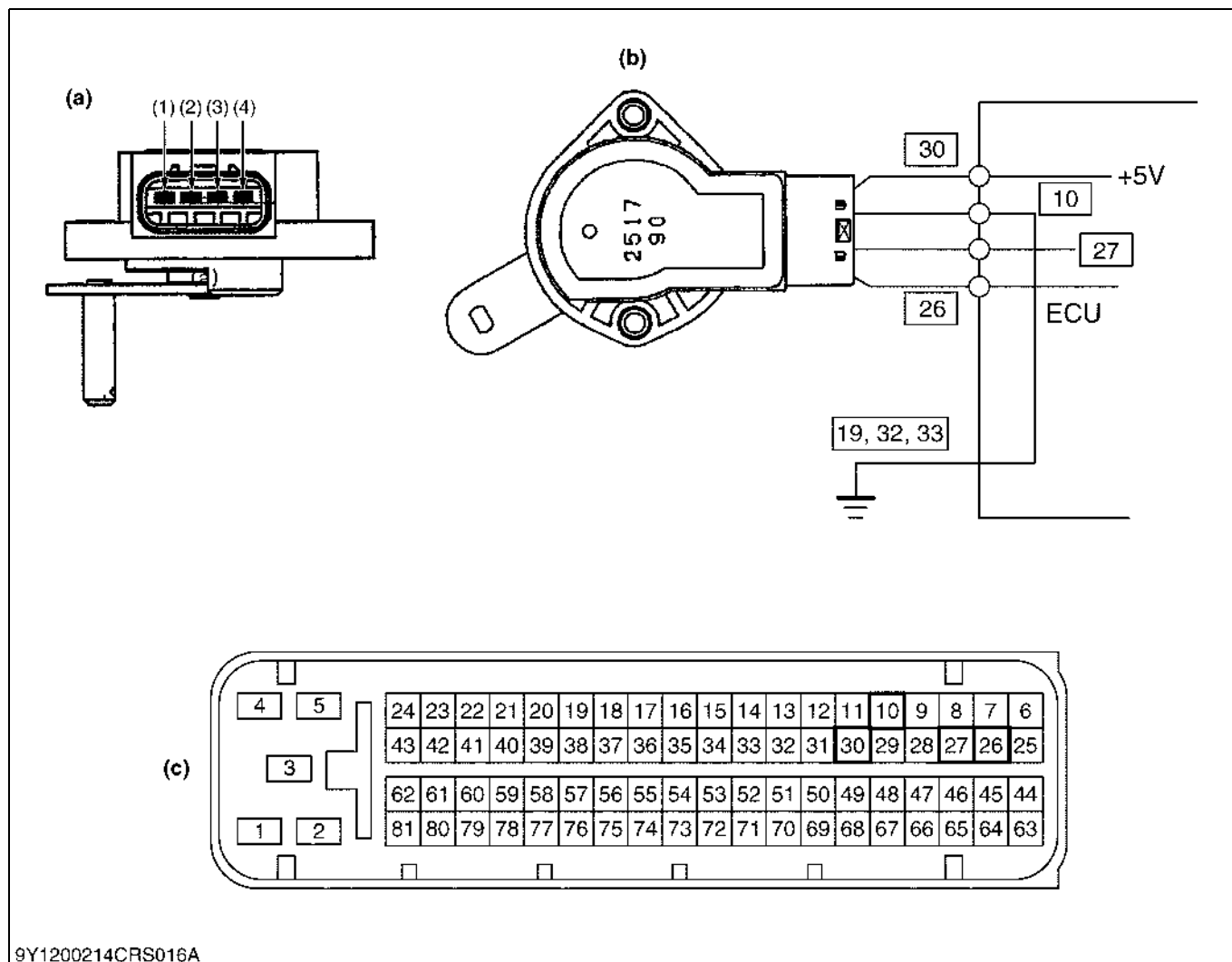
Limp home action by engine ECU (system action):

- Forced idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0346US0

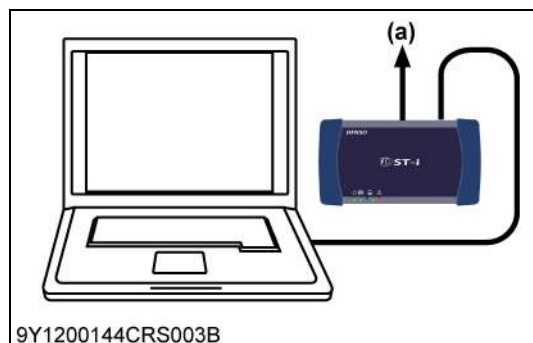


- (1) Terminal 1 (No.26:Accel Position 2)
 (2) Terminal 2 (No.27:Accel Position 1)

- (3) Terminal 3 (No.10:GND)
 (4) Terminal 4 (No.30:+5 V)

- (a) Accelerator Position Sensor Terminal Layout
 (b) Accelerator Position Sensor
 (c) ECU Connector

9Y1200412RSS0347US0



1. Check the Accelerator Position Sensor Signals

- Place the key switch in the ON position, and check the "Accelerator position" and "Accelerator position sensor 1 output voltage" on the diagnosis tool data monitor.

Factory specification		
Engine status	Accelerator pedal position	Output voltage
Key on	0 %	2.5 V to 4.1 V

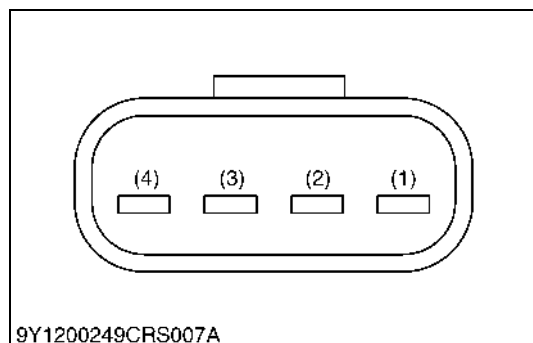
■ NOTE

- "Full close" and "Full open" are with the accelerator position sensor, not with the accelerator pedal or hand accelerator.

OK	Clear the DTC and check whether it is detected again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Measure the Voltage Between Sensor Terminals".	

(a) CAN1 Connector

9Y1200412RSS0348US0



2. Measure the Voltage Between Sensor Terminals

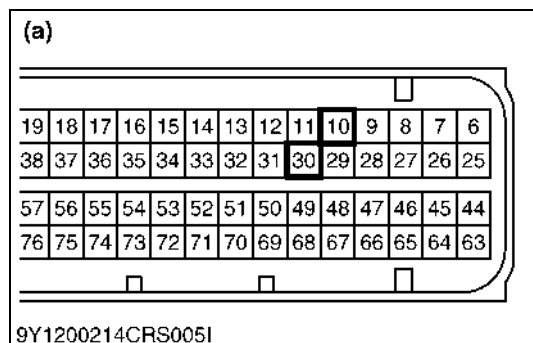
- Place the key switch in the OFF position, unplug the accelerator position sensor connector from the socket, and return the key switch to the ON position again.
- Measure the voltage between terminal 3 (3) and terminal 4 (4) of accelerator position sensor connector (at the machine wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

OK	Go to "4. Measure the ECU Terminal Voltage".
NG	Go to "3. Measure the Terminal Voltage".

- (1) Terminal 1 (No.26: Accel Position 2) (3) Terminal 3 (No.10: GND)
 (2) Terminal 2 (No.27: Accel Position 1) (4) Terminal 4 (No.30: +5 V)

9Y1200412RSS0349US0



3. Measure the Terminal Voltage

- Remove the ECU wiring harness connector cover.
- Move the key switch from the OFF to ON position, and measure the voltage between ECU terminals No.30 and No.10.

■ IMPORTANT

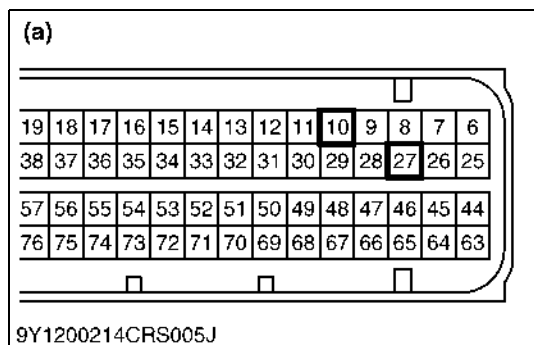
- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Approx. 5 V
-----------------------	-------------

OK	The wiring harness between the ECU and sensor is faulty. → Repair.	
NG	Check the ECU connectors.	
	OK	Faulty ECU → Replace.
	NG	Repair the ECU connectors.

(a) ECU Connector

9Y1200412RSS0350US0



4. Measure the ECU Terminal Voltage

1. Place the key switch in the OFF position, and plug the accelerator position sensor connector into the socket.
2. Place the key switch in the ON position, and measure the voltage between ECU terminals No.27 and No.10.

■ IMPORTANT

- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Engine status: Key on 2.5 V to 4.1 V
-----------------------	--------------------------------------

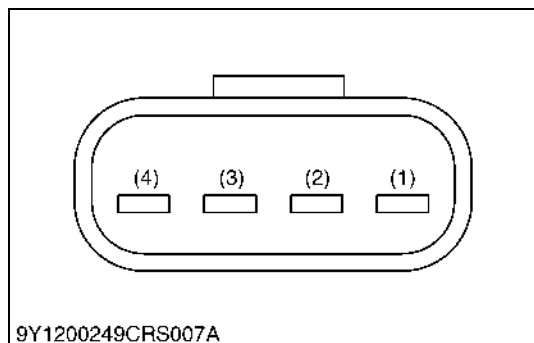
■ NOTE

- "Full close" and "Full open" are with the accelerator position sensor, not with the accelerator pedal or hand accelerator.

OK	Check the ECU connectors.	
	OK	Faulty ECU → Replace.
	NG	Repair the ECU connectors.
NG	Go to "5. Measure the Voltage Between Sensor Terminals".	

(a) ECU Connector

9Y1200412RSS0351US0



5. Measure the Voltage Between Sensor Terminals

1. Keep the accelerator position sensor connector plugged into socket.
2. Measure the voltage between terminal 2 (2) and terminal 3 (3) of accelerator position sensor connector (at the machine wiring harness side).

■ IMPORTANT

- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Engine status: Key on 2.5 V to 4.1 V
-----------------------	--------------------------------------

OK	Wiring harness open circuit, short → Check and repair.
NG	Faulty accelerator sensor → Replace.

- (1) Terminal 1 (No.26:Accel Position 2) (3) Terminal 3 (No.10:GND)
 (2) Terminal 2 (No.27:Accel Position 1) (4) Terminal 4 (No.30:+5 V)

9Y1200412RSS0352US0

(35) Accelerator Position Sensor 2 Abnormality (DTC P2127 / 29-4, P2128 / 29-3)

P2127 / 29-4: Accelerator position sensor 2 abnormality (Low side)

Behaviour during malfunction:

- Insufficient output

Detection item:

- GND short circuit or open circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Voltage of accelerator position sensor 2; 0.2 V or less

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- Forced idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0353US0

P2128 / 29-3: Accelerator position sensor 2 abnormality (High side)

Behaviour during malfunction:

- Insufficient output

Detection item:

- B+ short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Voltage of accelerator position sensor 2; 4.8 V or less

Engine warning light:

- ON

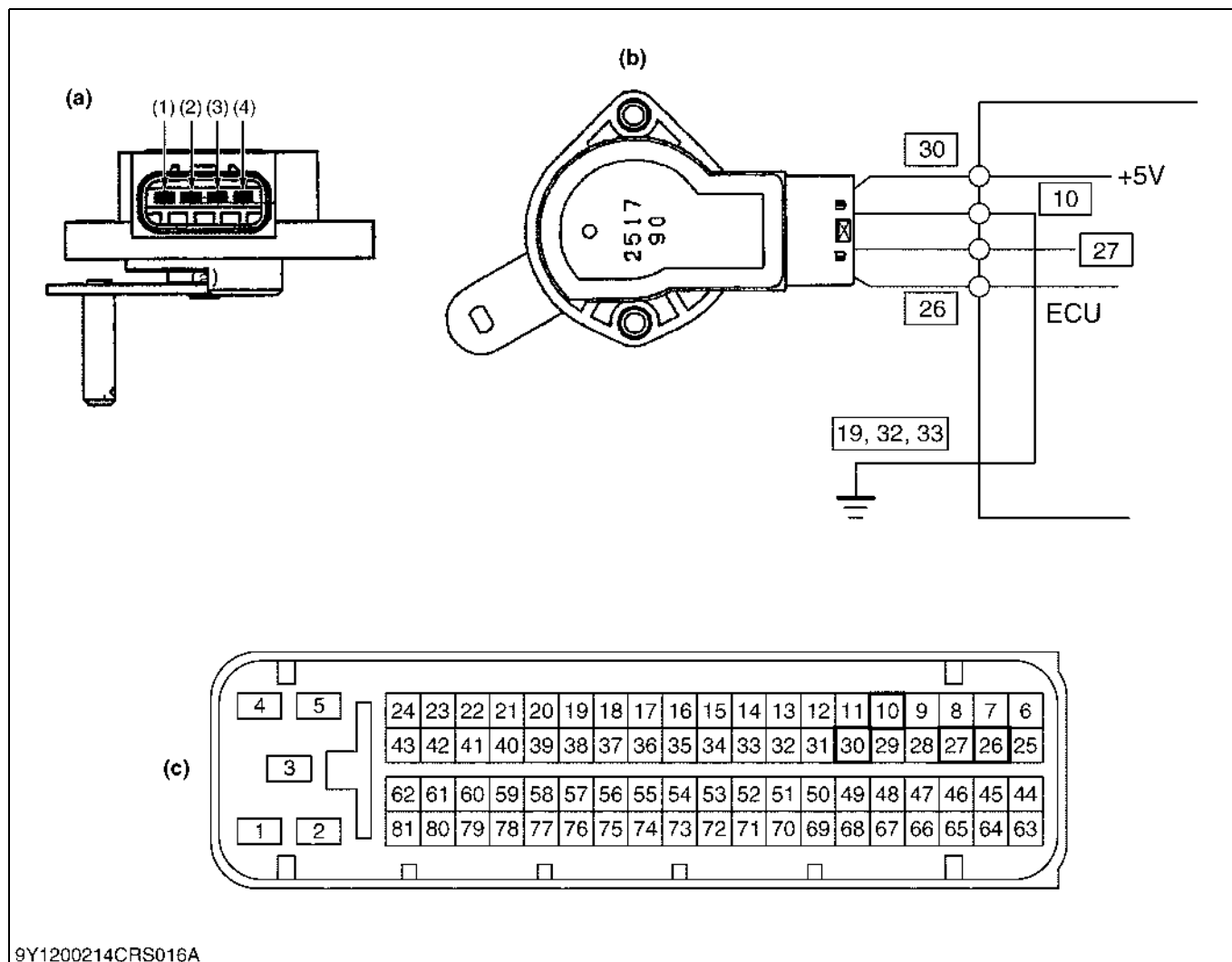
Limp home action by engine ECU (system action):

- Forced idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0354US0

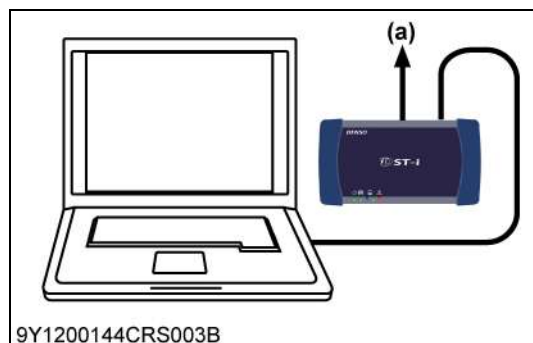


- (1) Terminal 1 (No.26:Accel Position 2)
 (2) Terminal 2 (No.27:Accel Position 1)

- (3) Terminal 3 (No.10:GND)
 (4) Terminal 4 (No.30:+5 V)

- (a) Accelerator Position Sensor Terminal Layout
 (b) Accelerator Position Sensor
 (c) ECU Connector

9Y1200412RSS0355US0



1. Check the Accelerator Position Sensor Signals

- Place the key switch in the ON position, and check the "Accelerator position" and "Accelerator position sensor 2 output voltage" on the diagnosis tool data monitor.

Factory specification		
Engine status	Accelerator pedal position	Output voltage
Key on	0 %	2.5 V to 4.1 V

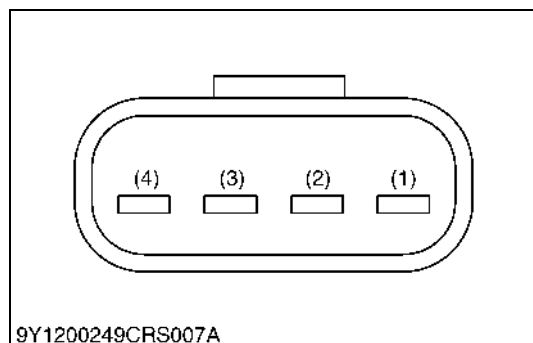
■ NOTE

- "Full close" and "Full open" are with the accelerator position sensor, not with the accelerator pedal or hand accelerator.

OK	Clear the DTC and check whether it is detected again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Measure the Voltage Between Sensor Terminals".	

(a) CAN1 Connector

9Y1200412RSS0356US0



2. Measure the Voltage Between Sensor Terminals

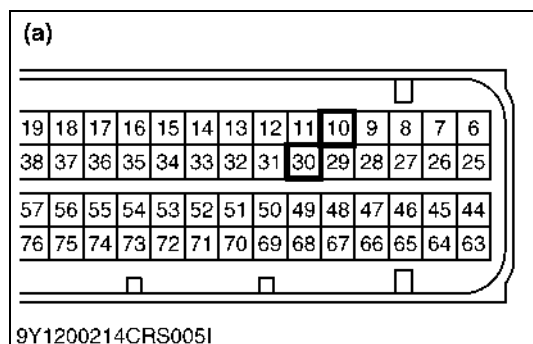
- Place the key switch in the OFF position, unplug the accelerator position sensor connector from the socket, and return the key switch to the ON position again.
- Measure the voltage between terminal 3 (3) and terminal 4 (4) of accelerator position sensor connector (at the machine wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

OK	Go to "4. Measure the ECU Terminal Voltage".
NG	Go to "3. Measure the Terminal Voltage".

- (1) Terminal 1 (No.26:Accel Position 2) (3) Terminal 3 (No.10:GND)
 (2) Terminal 2 (No.27:Accel Position 1) (4) Terminal 4 (No.30:+5 V)

9Y1200412RSS0357US0



3. Measure the Terminal Voltage

- Remove the ECU wiring harness connector cover.
- Move the key switch from the OFF to ON position, and measure the voltage between ECU terminals No.30 and No.10.

■ IMPORTANT

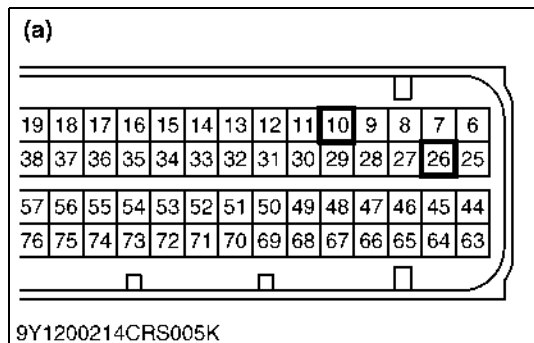
- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Approx. 5 V
-----------------------	-------------

OK	The wiring harness between the ECU and sensor is faulty. → Repair.	
NG	Check the ECU connectors.	
	OK	Faulty ECU → Replace.
	NG	Repair the ECU connectors.

(a) ECU Connector

9Y1200412RSS0358US0



4. Measure the ECU Terminal Voltage

1. Place the key switch in the OFF position, and plug the accelerator position sensor connector into the socket.
2. Place the key switch in the ON position, and measure the voltage between ECU terminals No.26 to No.10.

■ IMPORTANT

- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Engine status: Key on 2.5 V to 4.1 V
-----------------------	--------------------------------------

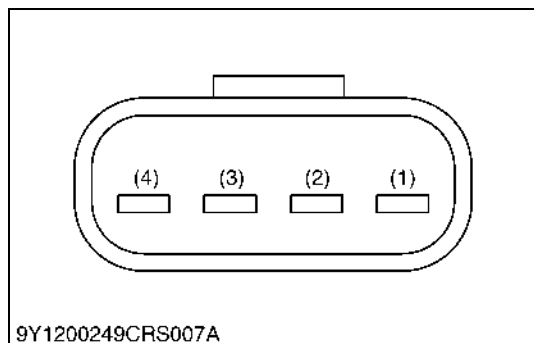
■ NOTE

- "Full close" and "Full open" are with the accelerator position sensor, not with the accelerator pedal or hand accelerator.

OK	Check the ECU connectors.	
	OK	Faulty ECU → Replace.
	NG	Repair the ECU connectors.
NG	Go to "5. Measure the Voltage Between Sensor Terminals".	

(a) ECU Connector

9Y1200412RSS0359US0



5. Measure the Voltage Between Sensor Terminals

1. Keep the accelerator position sensor connector plugged into socket.
2. Measure the voltage between terminal 1 (1) and terminal 3 (3) of accelerator position sensor connector (at the machine wiring harness side).

■ IMPORTANT

- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Engine status: Key on 2.5 V to 4.1 V
-----------------------	--------------------------------------

OK	Wiring harness open circuit, short → Check and repair.
NG	Faulty accelerator sensor → Replace.

- (1) Terminal 1 (No.26:Accel Position 2) (3) Terminal 3 (No.10:GND)
 (2) Terminal 2 (No.27:Accel Position 1) (4) Terminal 4 (No.30:+5 V)

9Y1200412RSS0360US0

(36) Barometric Pressure Sensor Error (DTC P2228 / 108-4, P2229 / 108-3)

P2228 / 108-4: Barometric pressure sensor error (Low side)

Behaviour during malfunction (At high altitude):

- None

Detection item:

- GND short circuit of sensor

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Barometric pressure sensor voltage: 0.2 V or less

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- 65 kPa (0.66 kgf/cm², 9.4 psi) [default value]
- Output limitation; Approximately 50 % of normal condition
- DPF active regeneration is inhibited

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0361US0

P2229 / 108-3: Barometric pressure sensor error (High side)

Behaviour during malfunction (At high altitude):

- None

Detection item:

- B+ short circuit of sensor

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- Barometric pressure sensor voltage: 4.8 V or more

Engine warning light:

- ON

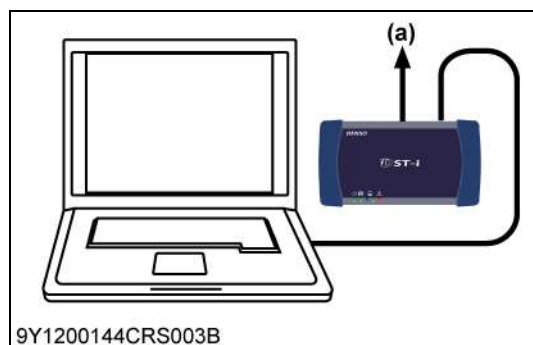
Limp home action by engine ECU (system action):

- 65 kPa (0.66 kgf/cm², 9.4 psi) [default value]
- Output limitation; Approximately 50 % of normal condition
- DPF active regeneration is inhibited

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0362US0



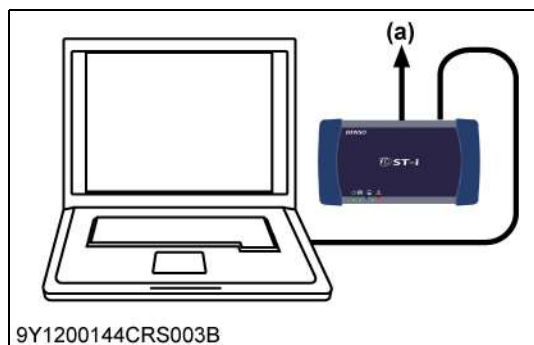
1. Check the Atmospheric Pressure Signals

1. Place the key switch in the ON position, and check the "Atmospheric pressure" on the diagnosis tool data monitor.

Factory specification	Atmospheric pressure Actual atmospheric pressure (Approx. 100 kPa (1.02 kgf/cm ² , 14.5 psi))	
OK	Clear the DTC and check whether it is detected again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Check the DTC".	

(a) CAN1 Connector

9Y1200412RSS0363US0



2. Check the DTC

1. Place the key switch to the OFF position first, then return it to the ON position again.
2. Clear the past DTCs, and check whether the same DTC (P2228 or P2229) is output again or not.

Factory specification	OK
OK	An electromagnetic interference (EMI) may have caused the temporary malfunction. There is no problem if the system has recovered.
NG	Faulty atmospheric pressure sensor → Replace the engine ECU.

(a) CAN1 Connector

9Y1200412RSS0364US0

(37) Exhaust Gas Temperature Sensor 2 (T2) Abnormality (DTC P242C / 3246-4, P242D / 3246-3)

P242C / 3246-4: Exhaust gas temperature sensor 2 (T2) abnormality (Low side)

Behaviour during malfunction:

- None

Detection item:

- GND short circuit of sensor / harness

DTC set preconditions:

- Sensor supply voltage VCC is normal

DTC set parameter:

- DPF outlet temperature sensor (T2) voltage: 0.08 V or less

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- 0 °C (32 °F) [default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0365US0

P242D / 3246-3: Exhaust gas temperature sensor 2 (T2) abnormality (High side)

Behaviour during malfunction:

- None

Detection item:

- Open circuit or +B short circuit of sensor / harness

DTC set preconditions:

- Coolant temperature ≥ 65 °C (149 °F)
- 100 °C (212 °F) $\leq T0 \leq 800$ °C (1472 °F); continues longer than 20 sec. or 100 °C (212 °F) $\leq T1 \leq 800$ °C (1472 °F); continues longer than 20 sec. or 100 °C (212 °F) $\leq T4 \leq 800$ °C (1472 °F); continues longer than 20 sec.

DTC set parameter:

- DPF outlet temperature sensor (T2) voltage: 4.92 V or more

Engine warning light:

- ON

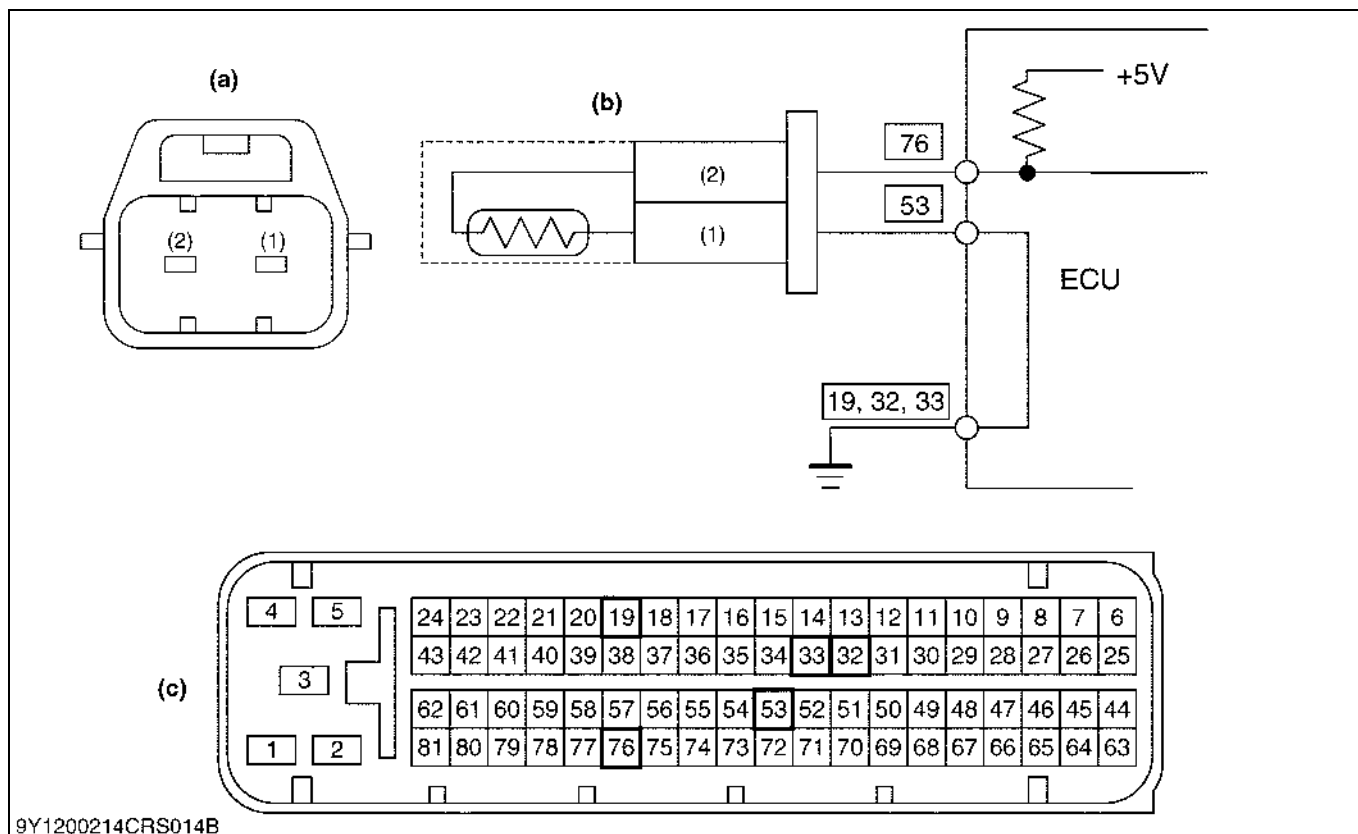
Limp home action by engine ECU (system action):

- 0 °C (32 °F) [default value]
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0366US0



(1) Terminal 1 (No.53:GND)

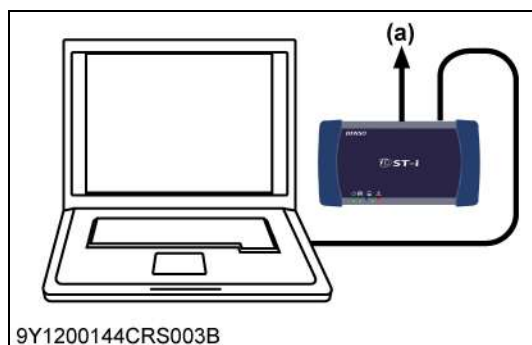
(2) Terminal 2 (No.76:DPF OUT Temp. Sensor)

(a) Exhaust Gas Temperature Sensor Terminal Layout

(b) Exhaust Gas Temperature Sensor

(c) ECU Connector

9Y1200412RSS0367US0



1. Check the Exhaust Gas Temperature Sensor Signals

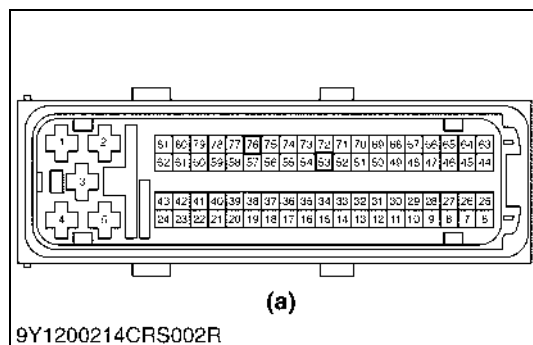
- Place the key switch in the ON position, and check the "Exhaust gas temperature" and "Exhaust gas temperature sensor output voltage" on the diagnosis tool data monitor.

Factory specification		
Actual exhaust gas temperature	Exhaust gas temperature	Output voltage
100 °C (212 °F)	100 °C (212 °F)	Approx. 4.7 V
150 °C (302 °F)	150 °C (302 °F)	Approx. 4.4 V
200 °C (392 °F)	200 °C (392 °F)	Approx. 4.0 V
250 °C (482 °F)	250 °C (482 °F)	Approx. 3.5 V

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Measure the Resistance Between Terminals".	

(a) CAN1 Connector

9Y1200412RSS0368US0



2. Measure the Resistance Between Terminals

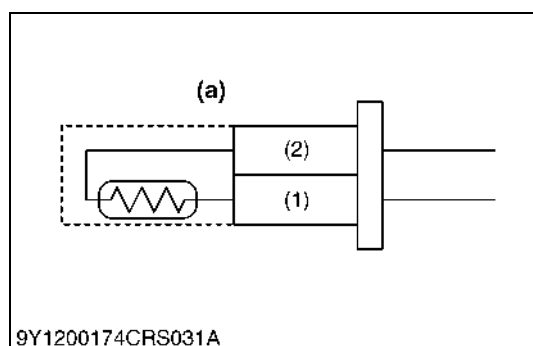
1. Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
2. Measure the resistance between terminals No.76 and No.53 of the connector.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Go to "4. Measure the ECU Terminal Voltage".
NG	Go to "3. Check the Sensor".

(a) ECU Wiring Harness Connector (Harness Side)

9Y1200412RSS0369US0



3. Check the Sensor

1. Turn the key switch OFF, remove the connector from the sensor side.
2. Measure the resistance between the terminals on the sensor side.

Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

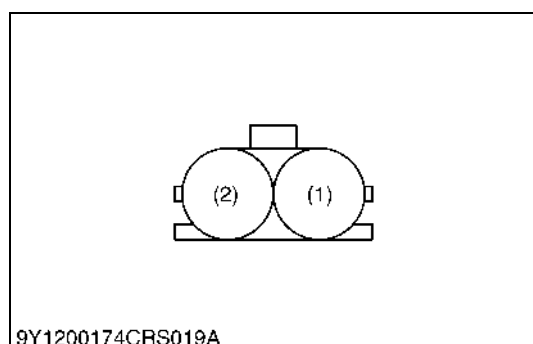
OK	Wiring harness open circuit or connector fault → Check and repair.
NG	Exhaust gas temperature sensor fault → Replace the exhaust gas temperature sensor 2 (T2).

(1) Terminal 1 (No.53:GND)

(2) Terminal 2 (No.76:DPF OUT Temp. Sensor)

(a) Exhaust Gas Temperature Sensor

9Y1200412RSS0370US0



4. Measure the ECU Terminal Voltage

1. Plug the ECU wiring harness connector into socket again, and unplug the sensor connector.
2. Place the key switch in the ON position, and measure the voltage between terminals of the sensor connector (at the wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

OK	The ECU connector is faulty or its wiring harness is shorted.
NG	Confirm by using other sensors that there is no ground short malfunction before replacing the ECU.

(1) Terminal 1 (No.53:GND)

(2) Terminal 2 (No.76:DPF OUT Temp. Sensor)

9Y1200412RSS0371US0

(38) Differential Pressure Sensor 1 Abnormality (DTC P2454 / 3251-4, P2455 / 3251-3)

P2454 / 3251-4: Differential pressure sensor 1 abnormality (Low side)

Behaviour during malfunction:

- Insufficient output

Detection item:

- Sensor / Harness short to ground

DTC set preconditions:

- Sensor supply voltage VCC is normal
- No starter-SW input

DTC set parameter:

- DPF differential pressure sensor voltage: 0.2 V or less

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- 0 kPa (0.0 kgf/cm², 0.0 psi) [default value]
- Output limitation: Approximately 50 % of normal condition
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0372US0

P2455 / 3251-3: Differential pressure sensor 1 abnormality (High side)

Behaviour during malfunction:

- Insufficient output

Detection item:

- Sensor / Harness open circuit and short to +B

DTC set preconditions:

- Sensor supply voltage VCC is normal
- No starter-SW input

DTC set parameter:

- DPF differential pressure sensor voltage: 4.8 V or more

Engine warning light:

- ON

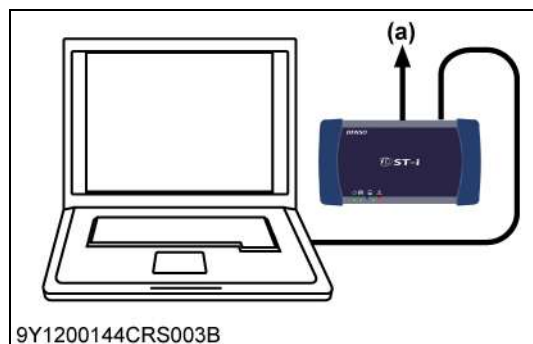
Limp home action by engine ECU (system action):

- 0 kPa (0.0 kgf/cm², 0.0 psi) [default value]
- Output limitation: Approximately 50 % of normal condition
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0373US0



1. Check the Differential Pressure Signals

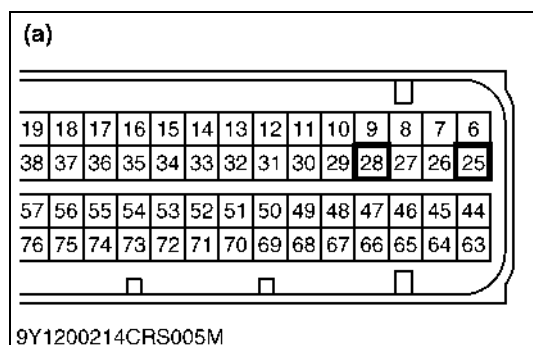
- Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again. Then, check the "Differential pressure" and "Differential pressure sensor output voltage" on the diagnosis tool data monitor.

Factory specification		
Engine state	Actual differential pressure	Output voltage
Key switch is ON	Approx. 0 Pa (0 kgf/cm ² , 0 psi)	Approx. 0.7 V

OK	Clear the DTC and check whether it is output again or not.	
	OK	Normal.
	NG	Replace the ECU.
NG	Go to "2. Measure the ECU Terminal Voltage".	

(a) CAN1 Connector

9Y1200412RSS0374US0



2. Measure the ECU Terminal Voltage

- Remove the ECU wiring harness connector cover.
- Move the key switch from the OFF to ON position, and measure the voltage between ECU terminals No.25 and No.28.

■ IMPORTANT

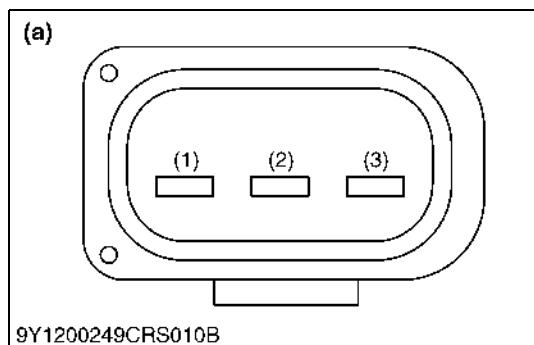
- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	
Engine state	Output voltage
Key switch ON	Approx. 0.7 V

OK	Check the harness connectors and ECU pins.	
	OK	Faulty ECU → Replace.
	NG	Repair or replace the wiring harness, or replace the ECU.
NG	Go to "3. Measure the Voltage Between Differential Pressure Sensor Terminals".	

(a) ECU Connector

9Y1200412RSS0375US0



3. Measure the Voltage Between Differential Pressure Sensor Terminals

- Place the key switch in the ON position, and measure the voltage between terminals (1) and (2) of the differential pressure sensor at the wiring harness side.

■ IMPORTANT

- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	
Engine state	Output voltage
Key switch ON	Approx. 0.7 V

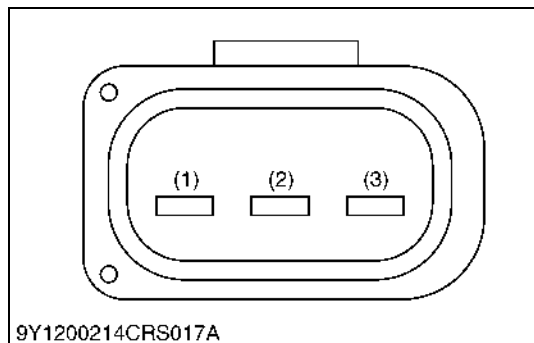
OK	Check the wiring harness (between ECU terminal No.25 and sensor terminal (1)). → Repair the faulty area.
NG	Go to "4. Measure the Voltage Between Differential Pressure Sensor Terminals".

(1) Terminal 1 (No.29:+5 V)

(3) Terminal 3 (No.25:Pressure DPF)

(2) Terminal 2 (No.28:GND)

9Y1200412RSS0376US0



4. Measure the Voltage Between Differential Pressure Sensor Terminals

- Set the key switch to the OFF position, and unplug the differential pressure sensor connector from the socket.
- Place the key switch in the ON position, and measure the voltage between terminals (2) and (3) of the differential pressure sensor connector (at the wiring harness side).

Factory specification	Approx. 5 V
-----------------------	-------------

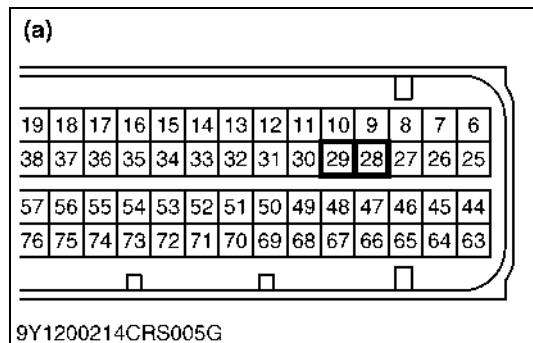
OK	Check the wiring harness connector and sensor pins.	
	OK	Faulty differential pressure sensor → Replace.
	NG	1. Repair or replace the wiring harness. 2. Replace the differential pressure sensor.
NG	Go to "5. Measure the ECU Terminal Voltage".	

(1) Terminal 1 (No.29:+5 V)

(3) Terminal 3 (No.25:Pressure DPF)

(2) Terminal 2 (No.28:GND)

9Y1200412RSS0377US0



5. Measure the ECU Terminal Voltage

1. Remove the ECU wiring harness connector cover.
2. Move the key switch from the OFF to ON position, and measure the voltage between ECU terminals No.28 and No.29.

■ IMPORTANT

- Refer to "7.[3] ELECTRIC SYSTEM INSPECTION PROCEDURE - (1) Basics of Checking Electrical / Electronic Circuit Systems". (Refer to page 1-S208)

Factory specification	Approx. 5 V
-----------------------	-------------

OK	Check the harness connectors and ECU pins.	
	OK	Faulty ECU → Replace.
	NG	Repair or replace the wiring harness, or replace the ECU.
NG	Check the wiring harness (between ECU terminal No.29 and sensor terminal (3) and between ECU terminal No.28 and sensor terminal (2)). → Repair the faulty area.	

■ NOTE

- Check the pipe between diesel particulate filter (DPF) and sensor, When it is damaged, the differential pressure can not reach the sensor.

(a) ECU Connector

9Y1200412RSS0378US0

(39) Exhaust Gas Temperature Sensor 0: Emergency High (DTC P3002 / 4765-0)

Behaviour during malfunction:

- Engine stall
- Inhibit cranking until down to 300 °C (572 °F)

Detection item:

- DOC inlet temperature (T0) high

DTC set preconditions:

- Exhaust gas temperature sensor T0, T1 and T2 are normal
- Sensor supply voltage VCC is normal

DTC set parameter:

- DOC inlet temperature (T0): 700 °C (1292 °F) or more

Engine warning light:

- ON

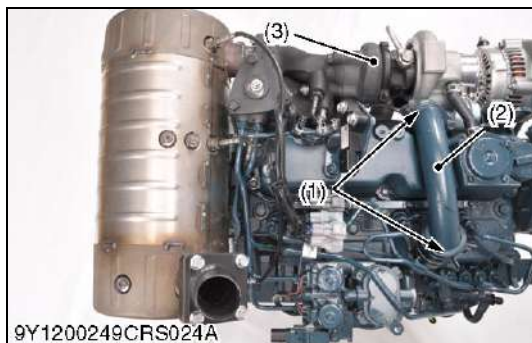
Limp home action by engine ECU (system action):

- Engine stop
- Inhibit starter relay activation until Exhaust Gas Temperature reduces down to 300 °C (572 °F)
- DPF active regeneration is inhibited

Recovery from error:

- Under 300 °C (572 °F) & key switch turn OFF

9Y1200412RSS0379US0



1. Check the Air Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

■ IMPORTANT

- If the two errors occur from "Emergency exhaust gas temperature sensor T0 high", "Emergency exhaust gas temperature sensor T1 high", and "Emergency exhaust gas temperature sensor T2 high" at the same time, check the exhaust gas temperature starting from a bigger number.

■ NOTE

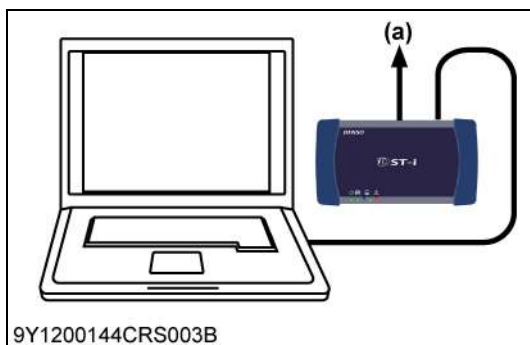
- Check the clogging condition of the air cleaner. If it is very dirty, replace the new one.
- Check if the suction hose of the turbo blower does not come off. If the hose comes off, install it.
- Check the suction path for leaks. (Suction path joints, suction pipes, hoses)
- Check the clogging condition of the fuel filter. If it is very dirty, replace the new one.
- Check the installation of all exhaust gas temperature sensors (T0, T1 and T2).
- Check the engine oil level.
- Check the engine coolant level.

OK	Go to "2. Check the Exhaust Gas Temperature".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

(1) Hose Clamp
(2) Hose

(3) Turbocharger

9Y1200412RSS0380US0



2. Check the Exhaust Gas Temperature

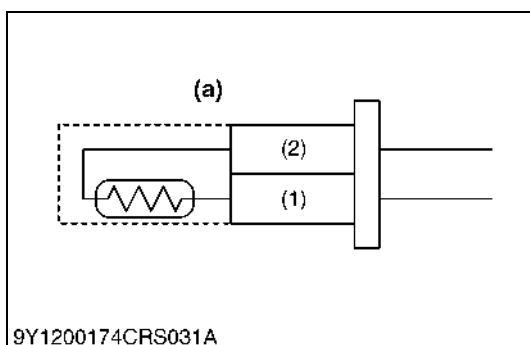
1. Place the key switch in the OFF position, and attach the diagnosis tool to the CAN1 connector.
2. Turn the key switch to the ON position and select the "Exhaust gas temperature Sensor 0", "Exhaust gas temperature Sensor 1" and "Exhaust gas temperature Sensor 2" on the data monitor function.
3. If the exhaust gas temperature is above 300 °C (572 °F), wait till the temperature decreases below 300 °C (572 °F).

Factory specification	The actual exhaust gas temperature and monitoring exhaust gas temperature should be approximately the same.
-----------------------	---

OK	Go to "4. Check the DTC".
NG	Go to "3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)".

(a) CAN1 Connector

9Y1200412RSS0381US0



3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)

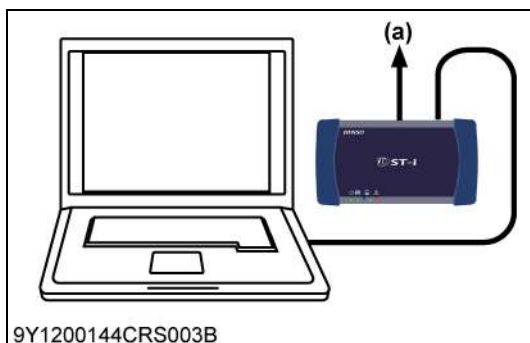
1. Check the exhaust gas temperature sensors (T0, T1 and T2).

OK	Go to "4. Check the DTC".
NG	Repair or replace the exhaust gas temperature sensor or engine combustion main parts. (Follow the diagnostic procedure of items P0543, P0546 and P242C)

- (1) No.53
(2) No.56 or No.55 or No.76

(a) Exhaust Gas Temperature Sensor (T0, T1 and T2)

9Y1200412RSS0382US0



4. Check the DTC

1. Check the engine noise and vibration after starting up the engine.
Check whether turbocharger has abnormality. (sound and externals)
2. Check whether the other DTC is output or not by operating the engine in the normal condition.
3. If it is OK, restart and operate the engine for 10 minutes with the engine in the no-load maximum speed status.
Check whether the DTC is output or not.

Factory specification	No DTC is output.
-----------------------	-------------------

OK	Normal.
NG	Repair or replace the exhaust gas temperature sensor or engine combustion main parts. (Follow the diagnostic procedure of items P0543, P0546 and P242C)

(a) CAN1 Connector

9Y1200412RSS0383US0

(40) Exhaust Gas Temperature Sensor 1: Emergency High (DTC P3003 / 3242-0)

Behaviour during malfunction:

- Engine stall
- Inhibit cranking until down to 300 °C (572 °F)

Detection item:

- DPF inlet temperature (T1) high

DTC set preconditions:

- Exhaust gas temperature sensor T0, T1 and T2 are normal
- Sensor supply voltage VCC is normal

DTC set parameter:

- DPF inlet temperature (T1): 715 °C (1319 °F) or more

Engine warning light:

- ON

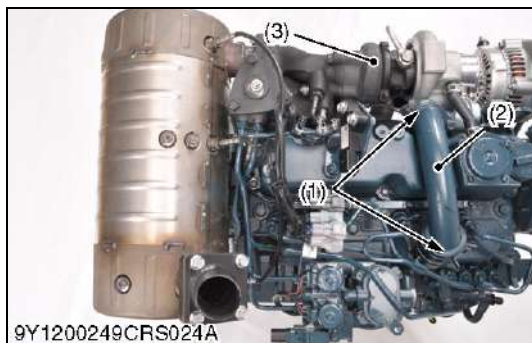
Limp home action by engine ECU (system action):

- Engine stop
- Inhibit starter relay activation until Exhaust Gas Temperature reduces down to 300 °C (572 °F)
- DPF active regeneration is inhibited

Recovery from error:

- Under 300 °C (572 °F) & key switch turn OFF

9Y1200412RSS0384US0



1. Check the Air Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

■ IMPORTANT

- If the two errors occur from "Emergency exhaust gas temperature sensor T0 high", "Emergency exhaust gas temperature sensor T1 high", and "Emergency exhaust gas temperature T2 high" at the same time, check the exhaust gas temperature starting from a bigger number.

■ NOTE

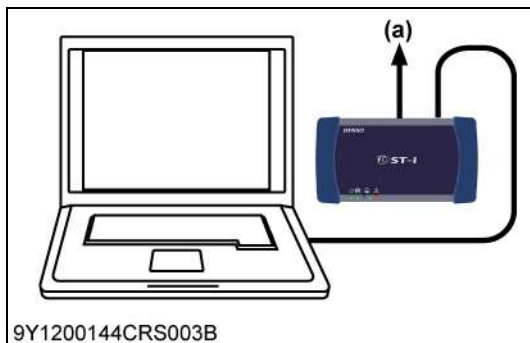
- Check the clogging condition of the air cleaner. If it is very dirty, replace the new one.
- Check if the suction hose of the turbo blower does not come off. If the hose comes off, install it.
- Check the suction path for leaks. (Suction path joints, suction pipes, hoses)
- Check the clogging condition of the fuel filter. If it is very dirty, replace the new one.
- Check the installation of all exhaust gas temperature sensors (T0, T1 and T2).
- Check the engine oil level.
- Check the engine coolant level.

OK	Go to "2. Check the Exhaust Gas Temperature".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

(1) Hose Clamp
(2) Hose

(3) Turbocharger

9Y1200412RSS0385US0



2. Check the Exhaust Gas Temperature

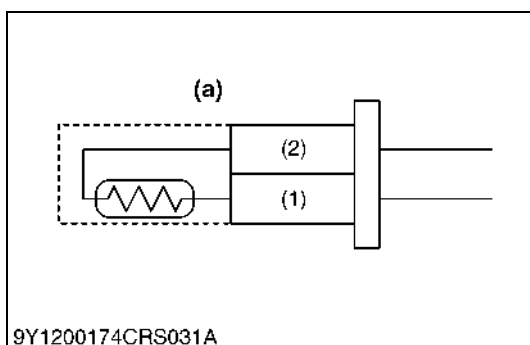
1. Place the key switch in the OFF position, and attach the diagnosis tool to the CAN1 connector.
2. Turn the key switch to the ON position and select the "Exhaust Gas Temperature Sensor 0", "Exhaust Gas Temperature Sensor 1" and "Exhaust Gas Temperature Sensor 2" on the data monitor function.
3. If the exhaust gas temperature is above 300 °C (572 °F), wait till the temperature decreases below 300 °C (572 °F).

Factory specification	The actual exhaust gas temperature and monitoring exhaust gas temperature should be approximately the same.
-----------------------	---

OK	Go to "4. Check the DTC".
NG	Go to "3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)".

(a) CAN1 Connector

9Y1200412RSS0386US0



3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)

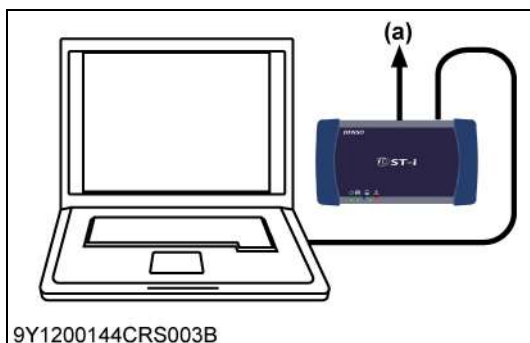
1. Check the exhaust gas temperature sensors (T0, T1 and T2).

OK	Go to "4. Check the DTC".
NG	Repair or replace the exhaust gas temperature sensor or engine combustion main parts. (Follow the diagnostic procedure of items P0543, P0546 and P242C)

- (1) No.53
(2) No.56 or No.55 or No.76

(a) Exhaust Gas Temperature Sensor (T0, T1 and T2)

9Y1200412RSS0387US0



4. Check the DTC

1. Check the engine noise and vibration after starting up the engine. Check whether turbo has abnormality. (sound and externals)
2. Check whether the other DTC is output or not by operating the engine in the normal condition.
3. If it is OK, restart and operate the engine for 10 minutes with the engine in the no-load maximum speed status. Check whether the DTC is output or not.

Factory specification	No DTC is output.
-----------------------	-------------------

OK	Normal.
NG	Replace the DPF assembly.

(a) CAN1 Connector

9Y1200412RSS0388US0

(41) Exhaust Gas Temperature Sensor 2: Emergency High (DTC P3004 / 3246-0)

Behaviour during malfunction:

- Engine stall
- Inhibit cranking until down to 300 °C (572 °F)

Detection item:

- DPF outlet temperature (T2) high

DTC set preconditions:

- Exhaust gas temperature sensor T0, T1 and T2 are normal
- Battery voltage is normal

DTC set parameter:

- DPF outlet temperature (T2): 820 °C (1508 °F) or more

Engine warning light:

- ON

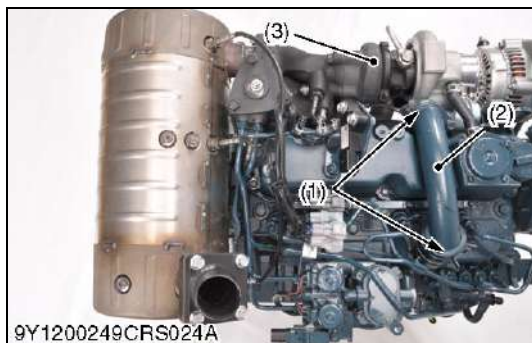
Limp home action by engine ECU (system action):

- Engine stop
- Inhibit starter relay activation until exhaust gas temperature reduces down to 300 °C (572 °F)
- DPF active regeneration is inhibited

Recovery from error:

- Under 300 °C (572 °F) & key switch turn OFF

9Y1200412RSS0389US0



1. Check the Air Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

■ IMPORTANT

- If the two errors occur from "Emergency exhaust gas temperature sensor T0 high", "Emergency exhaust gas temperature sensor T1 high", and "Emergency exhaust gas temperature T2 high" at the same time, check the exhaust gas temperature starting from a bigger number.

■ NOTE

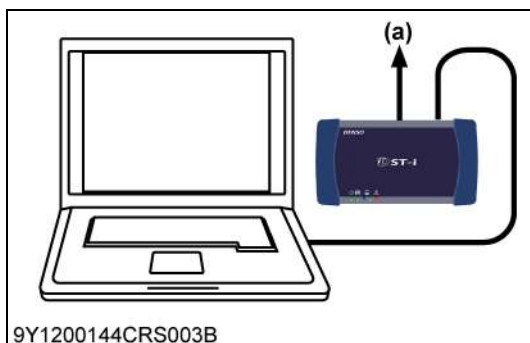
- Check the clogging condition of the air cleaner. If it is very dirty, replace the new one.
- Check if the suction hose of the turbo blower does not come off. If the hose comes off, install it.
- Check the suction path for leaks. (Suction path joints, suction pipes, hoses)
- Check the clogging condition of the fuel filter. If it is very dirty, replace the new one.
- Check the installation of all exhaust gas temperature sensors (T0, T1 and T2).
- Check the engine oil level.
- Check the engine coolant level.

OK	Go to "2. Check the Exhaust Gas Temperature".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

(1) Hose Clamp
(2) Hose

(3) Turbocharger

9Y1200412RSS0390US0



2. Check the Exhaust Gas Temperature

1. Place the key switch in the OFF position, and attach the diagnosis tool to the CAN1 connector.
2. Turn the key switch to the ON position and select the "Exhaust Gas Temperature Sensor 0", "Exhaust Gas Temperature Sensor 1" and "Exhaust Gas Temperature Sensor 2" on the data monitor function.
3. If the exhaust gas temperature is above 300 °C (572 °F), wait till the temperature decreases below 300 °C (572 °F).

Factory specification	The actual exhaust gas temperature and monitoring exhaust gas temperature should be approximately the same.
-----------------------	---

OK	Go to "4. Check the DTC".
NG	Go to "3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)".

(a) CAN1 Connector

9Y1200412RSS0391US0

3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)

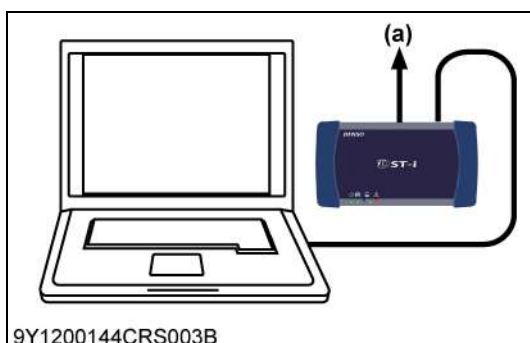
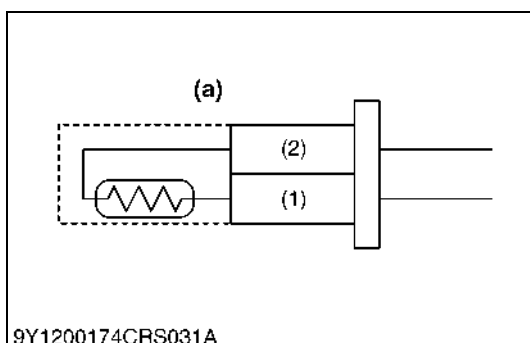
1. Check the exhaust gas temperature sensors (T0, T1 and T2).

OK	Go to "4. Check the DTC".
NG	Repair or replace the exhaust gas temperature sensor or engine combustion main parts. (Follow the diagnostic procedure of items P0543, P0546 and P242C)

- (1) No.53
(2) No.56 or No.55 or No.76

(a) Exhaust Gas Temperature Sensor (T0, T1 and T2)

9Y1200412RSS0392US0



4. Check the DTC

1. Check the engine noise and vibration after starting up the engine. Check whether turbo has abnormality. (sound and externals)
2. Check whether the other DTC is output or not by operating the engine in the normal condition.
3. If it is OK, restart and operate the engine for 10 minutes with the engine in the no-load maximum speed status. Check whether the DTC is output or not.

Factory specification	No DTC is output.
-----------------------	-------------------

OK	Normal.
NG	Go to "5. Check the DPF".

(a) CAN1 Connector

9Y1200412RSS0393US0

5. Check the DPF

1. Check whether the coolant temperature is over 50 °C (149 °F) by operating the engine in the normal condition.
2. Check whether carbon attached to the connecting point between tail-pipe and DPF assembly.

OK	Replace the ECU.
NG	Replace the DPF assembly.

(1) DPF Assembly

9Y1200412RSS0394US0



(42) Excessive PM3 (DTC P3006 / 3701-15)

Behaviour during malfunction:

- Insufficient output

Detection item:

- PM accumulation level3

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- PM accumulation more than trigger level
Regeneration level = 3

Engine warning light:

- Blink

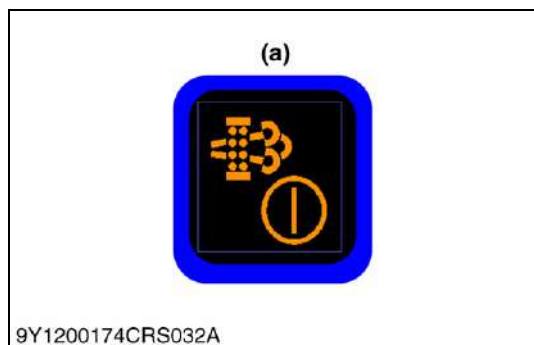
Limp home action by engine ECU (system action):

- Output limitation: Approximately 50 % of normal condition
- DPF active regeneration is inhibited
- Buzzer; off and on

Recovery from error:

- Diagnostic counter = zero (DPF regeneration is finished normally)

9Y1200412RSS0395US0



1. DPF Manual Regeneration

1. Start DPF Manual Regeneration immediately.

■ NOTE

- This DTC means the warning to urge to start regeneration rather than error. (Basically, Service Call is not necessary.)
- Followings are potential causes.
 - A low load operation has been continuing.
 - An engine is often left idling.
 - A short time operation below 30 minutes has been continuing.

- (a) DPF Manual Regeneration
Request Button

9Y1200412RSS0396US0

(43) Excessive PM4 (DTC P3007 / 3701-16)

Behaviour during malfunction:

- Insufficient output

Detection item:

- PM accumulation level4

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- PM accumulation more than trigger level
Regeneration level = 4

Engine warning light:

- ON

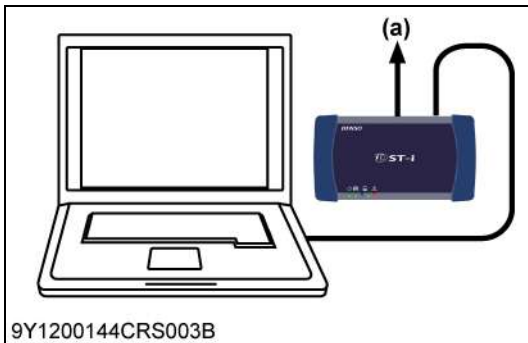
Limp home action by engine ECU (system action):

- Output limitation: Approximately 50 % of normal condition
- DPF active regeneration is inhibited
- Buzzer; off and on

Recovery from error:

- Diagnostic counter = zero (DPF regeneration is finished normally)

9Y1200412RSS0397US0



9Y1200144CRS003B

1. DPF Manual Regeneration Request Function

1. Perform the diagnosis tool active test ("DPF Manual Regeneration").

■ NOTE

- Followings are potential causes.
 - A manual regeneration has not been carried out. Start DPF manual regeneration immediately when the manual regeneration warning light comes ON.

(a) CAN1 Connector

9Y1200412RSS0398US0

(44) Excessive PM5 (DTC P3008 / 3701-0)

Behaviour during malfunction:

- Insufficient output

Detection item:

- PM accumulation level5

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- PM accumulation more than trigger level
Regeneration level = 5

Engine warning light:

- ON

Limp home action by engine ECU (system action):

- Output limitation: Approximately 50 % of normal condition
- DPF active regeneration is inhibited
- Buzzer; off and on

Recovery from error:

- Key switch turn OFF (Reset by service tool)

9Y1200412RSS0399US0



1. Replace of DPF

1. Replace the DPF.

■ NOTE

- Followings are potential causes.
 - A manual regeneration has not been carried out.

(1) DPF Assembly

9Y1200412RSS0400US0

(45) Parked Regeneration Time Out (DTC P3013 / 523590-16)

Behaviour during malfunction:

- None

Detection item:

- Time out error: regeneration incomplete due to low temperature of DPF

DTC set preconditions:

- DPF regeneration is active

DTC set parameter:

- DPF regeneration process is not completed within 2700 sec.
- DOC regeneration process is not completed within 3600 sec.

Engine warning light:

- ON

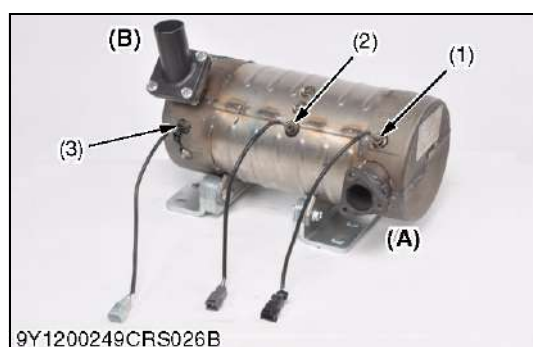
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200412RSS0401US0



1. Check the Installation of Exhaust Gas Temperature sensor

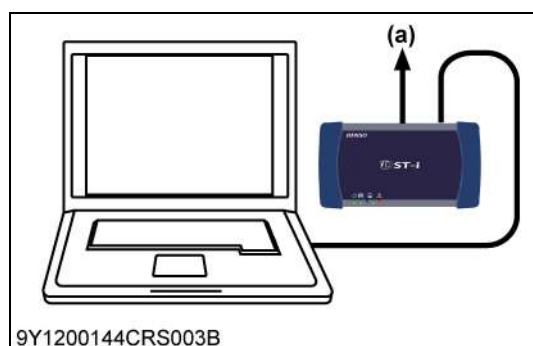
1. Check the installation of all exhaust gas temperature sensors (T0, T1 and T2).
2. Check the installation condition of the thermostat, and whether rust is not occurred.
3. Reinstall or replace the thermostat as necessary.

OK	Go to "2. 2. DPF Manual Regeneration".
NG	Repair or replace the exhaust gas temperature sensor or thermostat. (Follow the diagnostic procedure of items P0543, P0546 and P242C)

- (1) Exhaust Gas Temperature Sensor T0
- (2) Exhaust Gas Temperature Sensor T1
- (3) Exhaust Gas Temperature Sensor T2

(A) Exhaust Inlet Side
(B) Exhaust Outlet Side

9Y1200412RSS0402US0



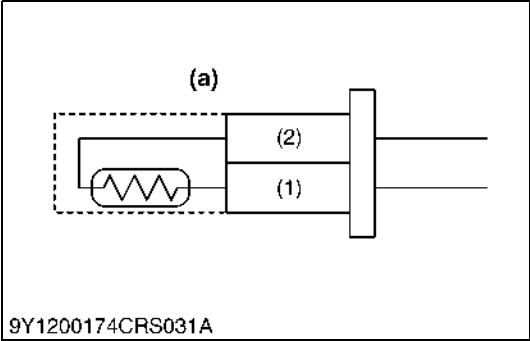
2. DPF Manual Regeneration

1. Place the key switch in the OFF position, and attach the diagnosis tool to the CAN1 connector.
2. Turn the key switch to the ON position and select the "Exhaust Gas Temperature Sensor 0", "Exhaust Gas Temperature Sensor 1" and "Exhaust Gas Temperature Sensor 2" on the data monitor function.
3. Perform the diagnosis tool active test ("DPF Manual Regeneration").

Factory specification	No DTC is output.
OK	Normal.
NG	Go to 3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)".

(a) CAN1 Connector

9Y1200412RSS0403US0



3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)

1. Check the exhaust gas temperature sensors (T0, T1 and T2).

OK	Normal.
NG	Repair or replace the exhaust gas temperature sensor or engine combustion main parts. (Follow the diagnostic procedure of items P0543, P0546 and P242C)

- (1) No.53
- (2) No.56 or No.55 or No.76

(a) Exhaust Gas Temperature Sensor (T0, T1 and T2)

9Y1200412RSS0404US0

(46) All Exhaust Gas Temperature Sensor Failure (DTC P3018 / 523599-0)

Behaviour during malfunction:

- None

Detection item:

- All exhaust gas temperature sensor failure simultaneously

DTC set preconditions:

- Engine speed is 1400 min⁻¹ (rpm) or more
- Fuel quantity is 10 mm³/st or more
- Coolant temperature is 65 °C (149 °F) or more
- Sensor supply voltage VCC is normal
- 100 sec. elapsed after engine starts

DTC set parameter:

- T0 / T1 / T2 / T4 temperature sensor failure (sensor low) simultaneously

Engine warning light:

- ON

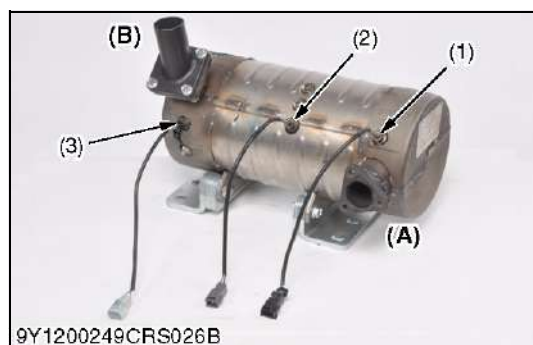
Limp home action by engine ECU (system action):

- Output limitation: Approximately 75 % of normal condition
- DPF active regeneration is inhibited

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0405US0



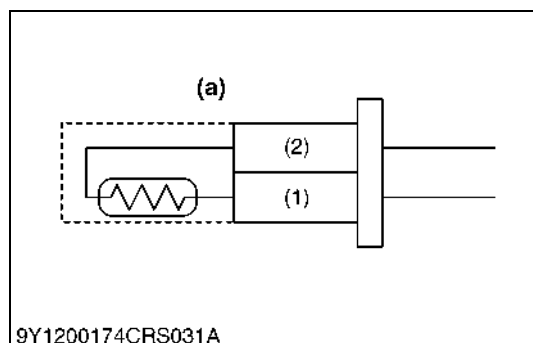
1. Check the Installation of Exhaust Gas Temperature sensor

1. Check the installation of all exhaust gas temperature sensors (T0, T1, T2, T3 and T4).

OK	Go to "2. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)".
NG	Repair or replace the exhaust gas temperature sensor or engine combustion main parts. (Follow the diagnostic procedure of items P0543, P0546 and P242C)

- | | |
|---------------------------------------|--------------------------------|
| (1) Exhaust Gas Temperature Sensor T0 | (A) Exhaust Inlet Side |
| (2) Exhaust Gas Temperature Sensor T1 | (B) Exhaust Outlet Side |
| (3) Exhaust Gas Temperature Sensor T2 | |

9Y1200412RSS0406US0



2. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546, P242C, P1832 and P1815)

1. Check the exhaust gas temperature sensors (T0, T1, T2, T3 and T4).

OK	Normal.
NG	Repair or replace the exhaust gas temperature sensor or engine combustion main parts. (Follow the diagnostic procedure of items P0543, P0546 and P242C)

- | | |
|-----------------------------|---|
| (1) No.53 | (a) Exhaust Gas Temperature Sensor (T0, T1 and T2) |
| (2) No.56 or No.55 or No.76 | |

9Y1200412RSS0407US0

(47) High Exhaust Gas Temperature After Emergency High Temperature DTC (DTC P3023 / 523601-0)

Behaviour during malfunction:

- None

Detection item:

- Exhaust gas temperature sensor 0, 1, 2 output

DTC set preconditions:

- Battery voltage is normal

DTC set parameter:

- All exhaust gas temperature (T0, T1 and T2) reduces down to 300 °C (572 °F)

Engine warning light:

- ON

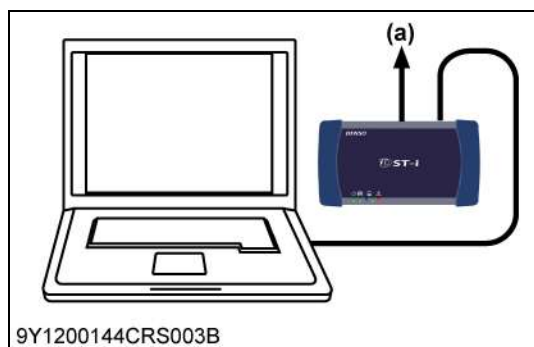
Limp home action by engine ECU (system action):

- Engine stop
- Inhibit starter relay activation until all exhaust gas temperature (T0, T1 and T2) reduces down to 300 °C (572 °F)

Recovery from error:

- Diagnostic counter = zero

9Y1200412RSS0408US0



1. Check the DTC

1. If DTC is output when the key switch is ON, do not start-up the engine. (Engine can not be started-up)
2. Engine can be started up after the DTC goes off.

■ NOTE

- This DTC does not mean error.
This warning indicates that error of emergency exhaust gas temperature sensor has been continuing.

(a) CAN1 Connector

9Y1200412RSS0409US0

(48) High Frequency of Regeneration (DTC P3024 / 523602-0)

Behaviour during malfunction:

- Worsening exhaust gas performance (NOx)

Detection item:

- Time interval from the end time to the start time of the regeneration

DTC set preconditions:

- Key switch is ON

DTC set parameter:

- Regeneration time interval within 30 min. occurs three times continuously

Engine warning light:

- ON

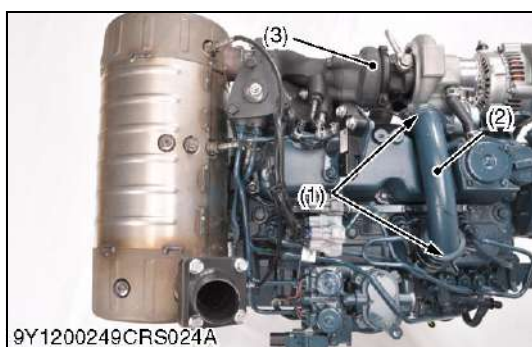
Limp home action by engine ECU (system action):

- Output limitation: Approximately 50 % of normal condition
- Auto DPF regeneration is inhibited

Recovery from error:

- Key switch turn OFF (reset by service tool)

9Y1200412RSS0410US0



1. Check the Air Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

■ NOTE

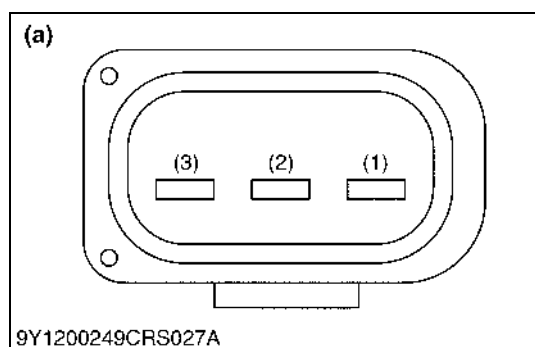
- Check the installation of the differential pressure sensor pipes.
- Check the engine oil maintenance history (Oil consumption).

OK	Go to "2. Check the Differential Pressure Sensor (Refer to items P2454 and P2455)".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S203)

- (1) Hose Clamp
(2) Hose

(3) Turbocharger

9Y1200412RSS0411US0



2. Check the Differential Pressure Sensor (Refer to items P2454 and P2455)

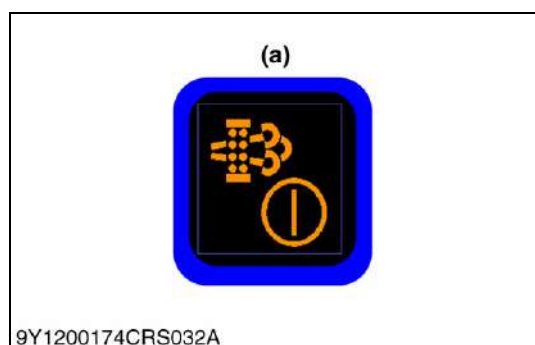
1. Check the differential pressure sensor.

OK	Go to "3. Check the Function of DPF".
NG	Repair or replace the differential pressure sensor or its related parts. (Follow the diagnostic procedure of items P2454 and P2455).

- (1) No.25
(2) No.28
(3) No.29

(a) Differential Pressure Sensor Connector

9Y1200412RSS0412US0



3. Check the Function of DPF

1. Operate the engine for 30 minutes in the normal condition.

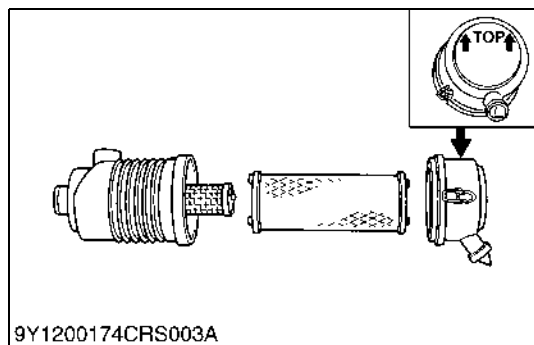
Factory specification	"DPF Regeneration Request" is not detected within 30 minutes.
OK	Normal.
NG	Replace the DPF assembly.

(a) DPF Manual Regeneration Request Button

9Y1200412RSS0413US0

7. INSPECTION PROCEDURE FOR EACH SYSTEM

[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE

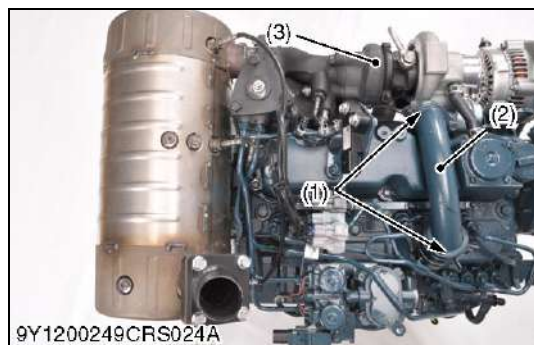


1. Check the Air Cleaner

1. Check the air cleaner for clogging.
 - Clean air cleaner element (Primary and Secondary) every 250 hours.
 - Replace air cleaner element:
Once yearly or after every sixth cleaning, whichever comes first.

OK	Go to "2. Check the Suction Path".
NG	Clean or replace.

9Y1200412RSS0414US0



2. Check the Suction Path

1. Check the suction path for leaks. (including EGR valve, turbocharger, intercooler, etc.)
 - Suction path joints.
 - Suction pipes, hoses.

OK	Normal.
NG	Repair or replace the malfunctioning component.

- (1) Hose Clamp
(2) Hose

- (3) Turbocharger

9Y1200412RSS0415US0

[2] FUEL SYSTEM INSPECTION PROCEDURE

Fuel:

Fuel is flammable and can be dangerous.

You should handle fuel with care.

- Cetane Rating: The minimum recommended Fuel Cetane Rating is 45.
A cetane rating greater than 50 is preferred, especially for ambient temperatures below -20°C (-4°F) or elevations above 1500 m (5000 ft).
- Diesel Fuel Specification Type and Sulfur Content % (ppm) used, must be compliant with all applicable emission regulations for the area in which the engine is operated.
- DO NOT USE Fuels that have sulfur content greater than 0.0015 % (15 ppm).
- Diesel fuels specified to EN 590 or ASTM D975 are recommended.
- No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)
- These engines utilize Interim Tier 4 standards, the use of ultra low sulfur fuel is mandatory for these engines, when operated in US EPA regulated areas.

Therefore, please use No.2-D S15 diesel fuel as an alternative to No.2-D, and use No.1-D S15 diesel fuel as an alternative to No.1-D for ambient temperatures below -10°C (14°F).

1. SAE: Society of Automotive Engineers
2. EN: European Norm
3. ASTM: American Society of Testing and Materials
4. US EPA: United States Environmental Protection Agency
5. No.1-D or No.2-D, S15: Ultra Low Sulfur Diesel (ULSD) 15 ppm or 0.0015 wt. %
 - When biodiesel fuel is used, change the fuel filter cartridge, fuel rubber piping and clamp bands with new ones at intervals half of the usual ones.

■ IMPORTANT

- **Be sure to use a strainer when filling the fuel tank, or dirt or sand in the fuel may cause trouble.**
- **Do not run the fuel tank level too low or completely out of fuel. Additionally, fuel system bleeding may be necessary if air enters the fuel system.**

Biodiesel fuel:

[When the B7 blended fuel is used]

When the finally blended Biodiesel fuel is B7, make sure it conforms to the updated EN590 (European) standard. Be also sure that the mineral oil diesel fuel, if used, conforms to the updated EN590 (European) standard and that the B100 blend conforms to the updated EN14214 (European) standard.

[When the B5 blended fuel is used]

When the finally blended Biodiesel fuel is B5, make sure it conforms to the updated EN590 (European) standard. Be also sure that the mineral oil diesel fuel, if used, conforms to the updated EN590 (European) standard or the ASTM D975 (U.S.) standard and that the B100 blend conforms to the updated EN14214 (European) standard or the ASTM D6751 (U.S.) standard.

(To be continued)

(Continued)**[Precautions in handling Biodiesel fuels]**

1. Keep the fuel tank full whenever possible to prevent water vapor from accumulating inside the fuel tank.
Tighten up the fuel tank filler cap to avoid the entry of moisture.
2. Routinely check the oil level before the operation.
Also strictly follow the specified oil change intervals.
3. Biodiesel fuels (BDF) during the supply process or in the machine easily deteriorate due to oxygen, water, heat and other foreign substances. With this in mind, take the following precautions.
 - Do not leave those fuels in the fuel tank or a metallic drum longer than 3 months.
 - Before storing the engine for a prolonged period, change such fuel for a conventional type of diesel fuel and run the engine for 30 minutes or longer to clean up the fuel system.
4. Bear it in mind that Biodiesel fuels have the characteristics below.
Referring to the servicing intervals specified in the KUBOTA product's Operator's Manuals, be sure to maintain and clean up the fuel system, replace the fuel rubber piping with new ones and take other necessary measures. It is advisable to replace the fuel filter, fuel rubber piping and clamp bands with new ones after half the specified replacement intervals.
(Compared with the use of mineral oil diesel fuels, the filtration performance of fuel filters gets degraded earlier than expected.)
 - Biodiesel fuels easily induce the growth of microorganisms and foul themselves.
This may get the fuel system corroded and the fuel filter clogged.
 - In cold weather, some problems may occur: the clog of the fuel line or fuel system, starting failure, and other unforeseen troubles.
 - Biodiesel fuels easily soak up moisture, which means that they may contain higher moisture content than conventional diesel fuels.
5. Palm oil-based Biodiesel fuels are inferior in low temperature fluidity to soy-based and rapeseed-based Biodiesel fuels.
In cold season in particular, this may clog the fuel filter.
6. If Biodiesel fuels are spilt on a coated surface, the coating may get damaged.
Immediately wipe the spill off the surface.

Fuel filter:

- At least, filter mesh below is required.
5 µm dust - dust collecting efficiency 95 % or more (Standard spec. filter)
 - An additional filter which has higher cleaning efficiency may be required depending on the spec. (working condition) or area. Even the maximum period of operation time is same, in case the cleaning efficiency has improved, it is required to expand the size of a filter (A filter needs to be bigger.).

Criteria at the entrance of supply pump:

- Water content: Less than 0.05 % (500 ppm)
 - Use to compare with the analysis result by the third-party organization.
- Air: No existence (Do not modify the specific fuel pipe)
 - Visually check is possible by using clear hose. Pay sufficient caution to contamination.
- Critical load: (at all operating conditions) –30 kPa or more
 - Perform a measurement of the pressure depending on the situation.

9Y1200412RSS0416US0

1. Check the Fuel System (Remaining Fuel Quantity and Properties)

1. Check the amount of fuel remaining in the tank.
2. Check properties of fuel. Request fuel analysis from a third party as necessary.
 - Color (no color, brownish, white turbidity).
 - Odor (kerosene, heavy oil, irritating odor).
 - Separation of materials (water, foreign objects).
 - Viscosity (high / low viscosity, wax consistency).

■ NOTE

- **Always use the specified fuel.**

OK	Go to "2. Check the Inside of the Tank (Checking for Tank Modification / Additions, Position of Fuel Pipe Inlet / Outlet, Clogging and Holes)".
NG	Add fuel or change fuel (clean tank).

9Y1200412RSS0417US0

2. Check the Inside of the Tank (Checking for Tank Modification / Additions, Position of Fuel Pipe Inlet / Outlet, Clogging and Holes)

1. Check the tank for modifications or additions. Consult with the customer.
 - Fuel inlet / outlet position, tank piping.
 - Foreign material inside the tank, water separation, rust.

■ NOTE

- **Use resin tanks when making tank additions.**
2. Check the tank internal fuel piping for the following.
 - Inlet / outlet position (below position "Empty").
 - Inlet clogging, whether there is bent or deformed piping (crushed pipe).
 - Crushing at pipe connections.

OK	Go to "3. Tank External Fuel Path Conditions (Crushed Hose, Clogging, Air Introduction at Hose Connection)".
NG	Restore the fuel tank.

9Y1200412RSS0418US0

3. Tank External Fuel Path Conditions (Crushed Hose, Clogging, Air Introduction at Hose Connection)

1. Check the condition of the hose.
 - Crushing around bands, over bending.
 - Pinched or crushed by other parts.
2. Check the connection (air introduction).
 - Looseness.
 - Hose deterioration (verify that there is no rubber hardening / splitting by hand or visually).

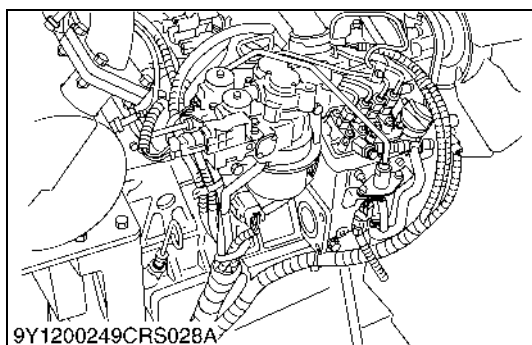
■ NOTE

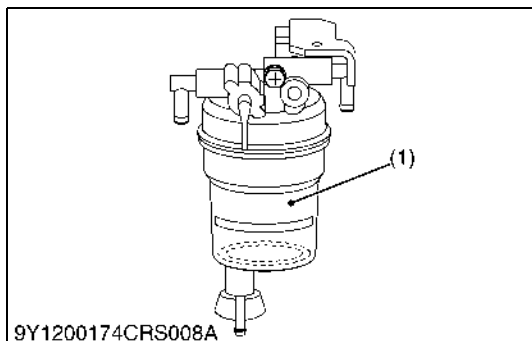
- **Be cautious when vacuum pressure is present, as air will be drawn into the hose.**

OK	Go to "4. Check the Water Separator".
NG	Repair or replace the hose.

(1) to Fuel Pump

9Y1200412RSS0419US0





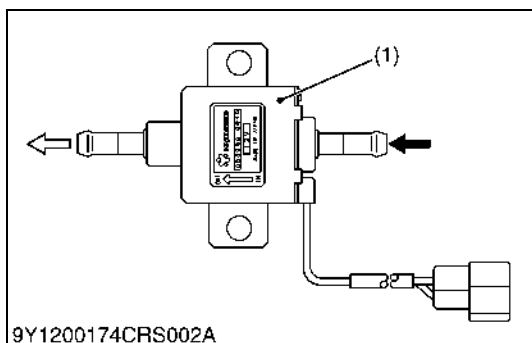
4. Check the Water Separator

1. Check the water level of the water separator and discharge some water as necessary.
2. Check for element deformation and dirt.
Clean or replace the element as necessary.

OK	Go to "5. Check the Fuel Feed Pump".
NG	Replace the filter and drain the water from the water separator.

(1) Water Separator

9Y1200412RSS0420US0



5. Check the Fuel Feed Pump

1. Set the key switch to the ON position, check the fuel feed pump alone, and check and repair the wiring harnesses.
2. Check the operation of the fuel feed pump by touching it directly by hand.

■ NOTE

- If there is a fuel feed pump malfunction, the fuel cannot be supplied.
- Others

OK	Go to "6. Fuel Filter Clogged".
NG	Repair the wiring harness, and replace the fuel feed pump.

(1) Fuel Feed Pump

9Y1200412RSS0421US0

6. Fuel Filter Clogged

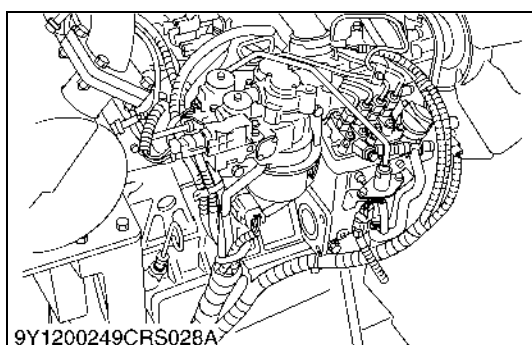
1. Check the fuel filter for clogging and dirt.

■ NOTE

- Replace the fuel filter every 500 operation hours.

OK	Go to "7. Engine Oil Level Increase (Engine Internal Leak)".
NG	Clean or replace the fuel filter and fuel pipe system.

9Y1200412RSS0422US0



7. Engine oil Level Increase (Engine Internal Leak)

1. Check the engine oil level increase with dipstick.
2. Request fuel dilution analysis or oil analysis from a third party as necessary.

OK	Normal.
NG	Check and repair interior pipes.

(1) Dipstick

9Y1200412RSS0423US0

[3] ELECTRIC SYSTEM INSPECTION PROCEDURE

(1) Basics Of Checking Electrical / Electronic Circuit Systems



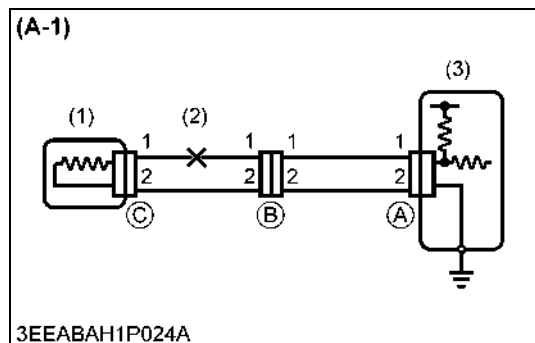
Measure the ECU Terminal Voltage and Resistance

- When measuring the voltage and resistance of each terminal, insert the multimeter probe into the rear side of the wiring harness connector. If connectors are small making it difficult to insert the probe, insert a fine metal wire into the rear of the connector and touch the wire to the probe.

■ IMPORTANT

- When inserting a fine metal wire for measurement purposes, ensure that the connector waterproof rubber is not damaged.

9Y1200412RSS0424US0

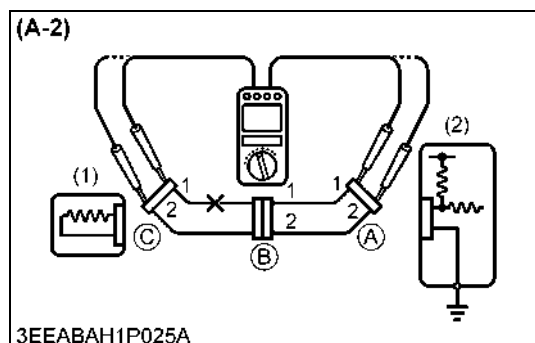


Open Circuit Check

- When dealing with a wiring harness open circuit like that depicted in Figure A-1, check continuity or voltage to determine the location of the open circuit.

- (1) Sensor (3) ECU
(2) Open Circuit

9Y1200412RSS0425US0



Check for Continuity

- Remove connectors "A" and "C" and measure resistance between the two.

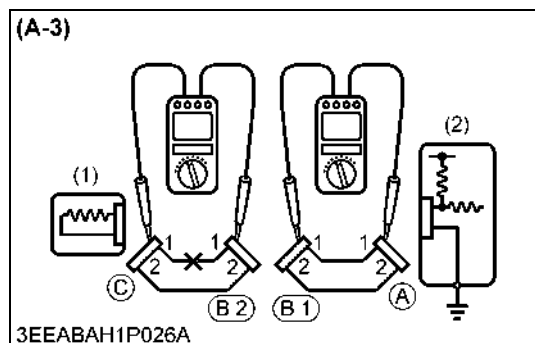
Factory specification	Less than 1 Ω
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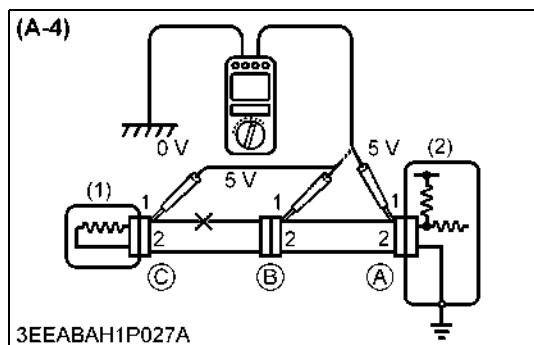
(Reference)

- Measure resistance while gently shaking the wiring harness up and down, and side-to-side.
- In the case of Figure A-2, there is no continuity (open circuit) between terminal 1 of connector "A" and terminal 1 of connector "C". However, there is continuity between terminal 2 of connector "A" and terminal 2 of connector "C". As a result, it can be said that there is an open circuit between terminal 1 of connector "A" and terminal 1 of connector "C".
 - Remove connector "B" and measure the resistance in the connector.
 - In the case of Figure A-3, there is continuity between terminal 1 of connector "A" and terminal 1 of connector "B1". However, there is no continuity (open circuit) between terminal 1 of connector "B2" and terminal 1 of connector "C". As a result, it can be said that there is an open circuit between terminal 1 of connector "B2" and terminal 1 of connector "C".

- (1) Sensor (2) ECU

9Y1200412RSS0426US0





Check Voltage

1. In the case of the circuit that supplies voltage to the ECU connector terminals, check for an open circuit by performing a voltage check.
2. As depicted in Figure **A-4**, measure the voltage of the ECU 5 V output terminal between the body ground and terminal 1 of connector "**A**" with all connectors connected. Next, measure in order the voltage between terminal 1 of connector "**B**" and the body ground, and terminal 1 of connector "**C**" and the body ground.
3. The faulty circuit and measurement results are as per below.

(Measurement Results)

- Voltage between terminal 1 of connector "**A**" and the body ground is 5 V.
- Voltage between terminal 1 of connector "**B**" and the body ground is 5 V.
- Voltage between terminal 1 of connector "**C**" and the body ground is 0 V.

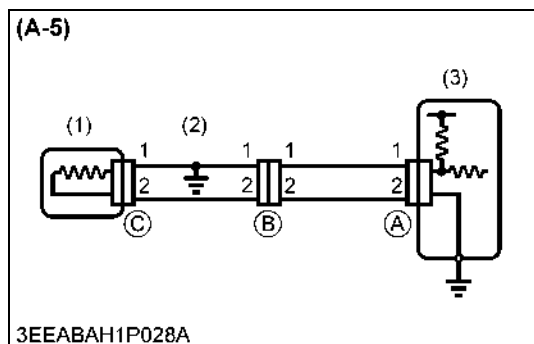
(Faulty Circuit)

- There is an open circuit between terminal 1 of connector "**B**" and terminal 1 of connector "**C**".

(1) Sensor

(2) ECU

9Y1200412RSS0427US0



Short Circuit Check

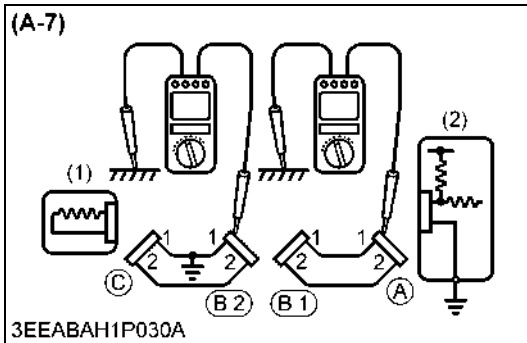
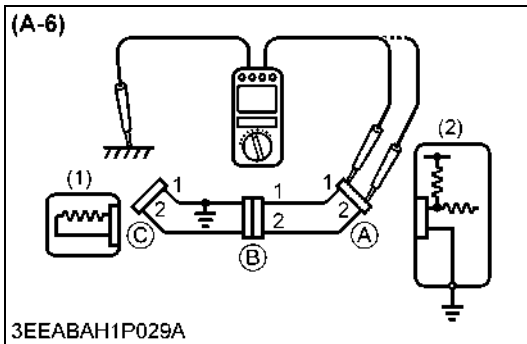
1. As per Figure **A-5**, if there is a short in the wiring harness ground, perform a "**Ground continuity check**" to determine the source of the short.

(1) Sensor

(3) ECU

(2) Short Circuit

9Y1200412RSS0428US0



Ground Continuity Check

1. Remove connector **"A"** and connector **"C"**, then measure the resistance between terminals 1 and 2 of connector **"A"** and ground.

Factory specification	No continuity
-----------------------	---------------

(Reference)

- Measure resistance while gently shaking the wiring harness up and down, and side-to-side.
2. In the case of Figure **A-6**, there is continuity between terminal 1 of connector **"A"** and the body ground (short circuit). However, there is no continuity between terminal 2 of connector **"A"** and the body ground. As a result, it can be said that there is an open circuit between terminal 1 of connector **"A"** and terminal 1 of connector **"C"**.
3. Remove connector **"B"** and measure the resistance between terminal 1 of connector **"A"** and the body ground, and between terminal 1 of connector **"B2"** and the body ground.
4. The faulty circuit and measurement results are as per below.

(Measurement Results)

- No continuity between terminal 1 of connector **"A"** and the body ground.
- Continuity between terminal 1 of connector **"B2"** and the body ground.

(Faulty Circuit)

- There is a short circuit between terminal 1 of connector "**B2**" and terminal 1 of connector "**C**".

(1) Sensor

(2) ECU

9Y1200412RSS0429US0

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