

DM

DIAGNOSIS MANUAL **REFORMER SYSTEM**

V1505-T-E4

Kubota

I INFORMATION

INFORMATION

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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.

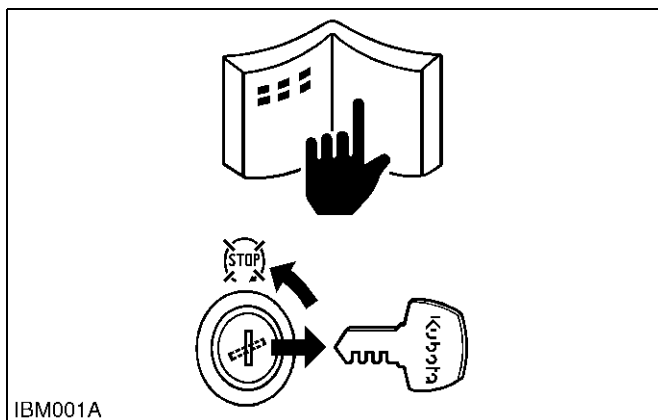
■ IMPORTANT

- 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.

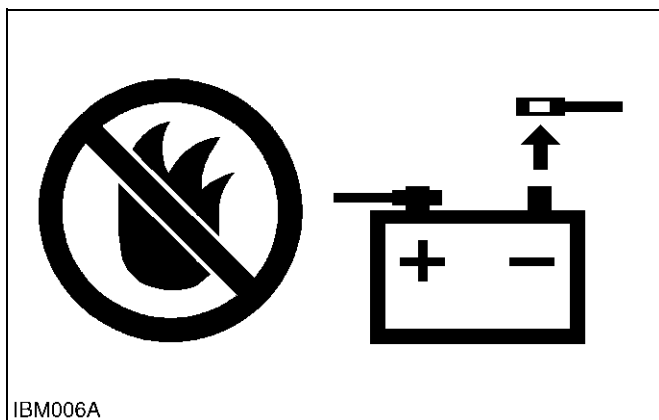
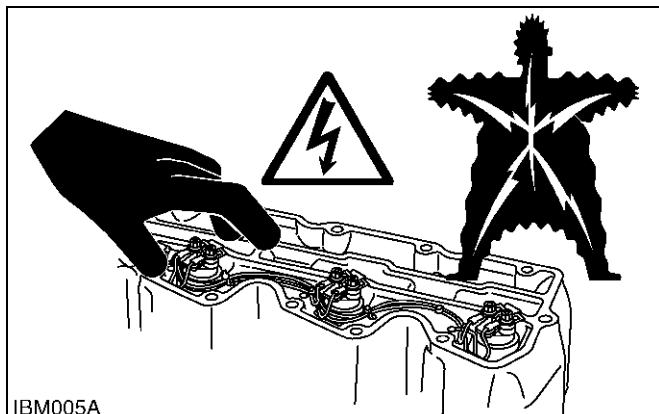
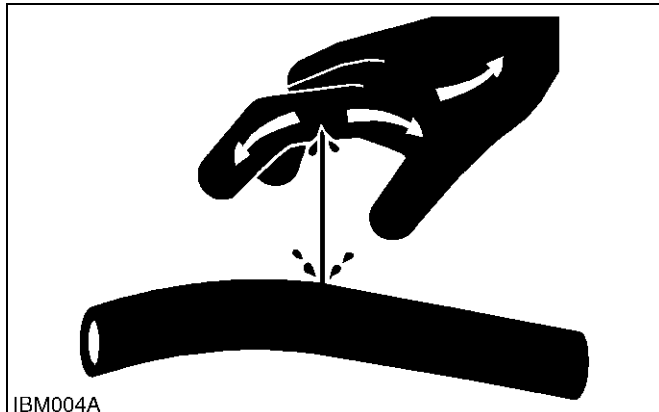
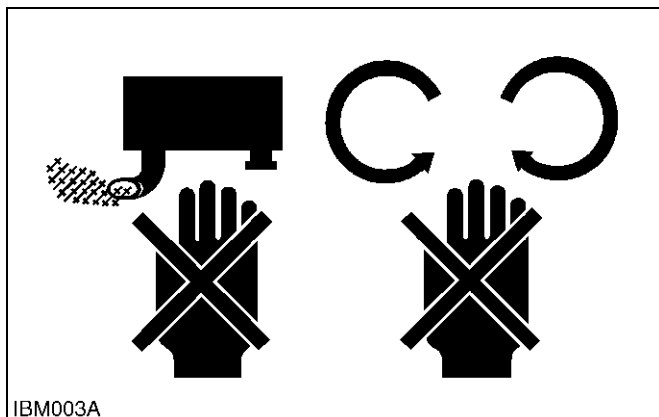
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SAFETY STARTING

- 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

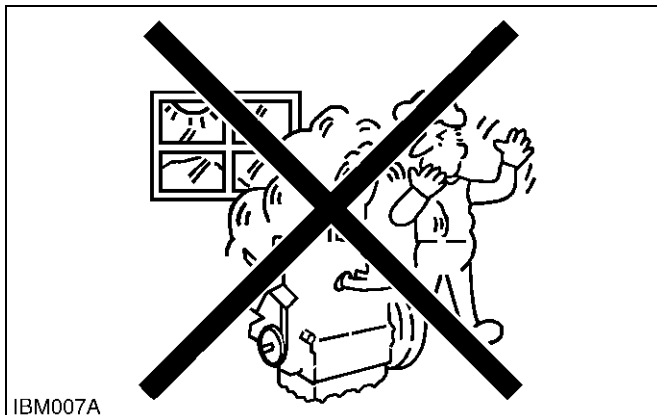
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing 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.

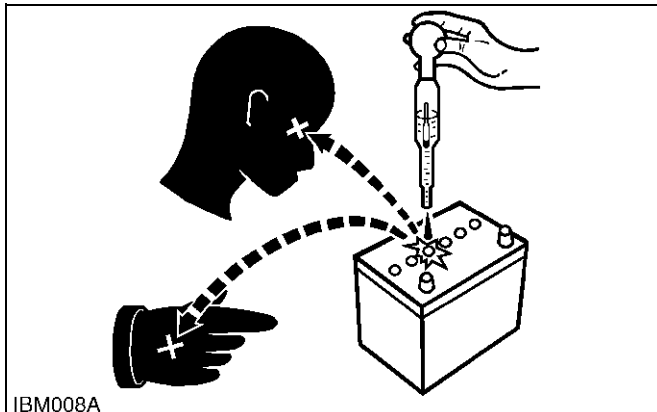
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VENTILATE WORK AREA

- 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.

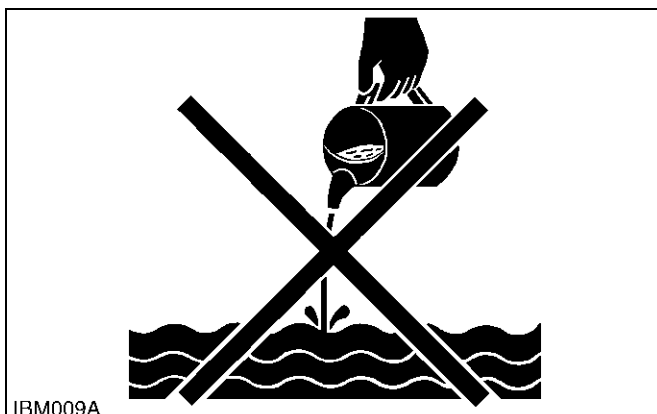
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PREVENT ACID BURNS

- 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.

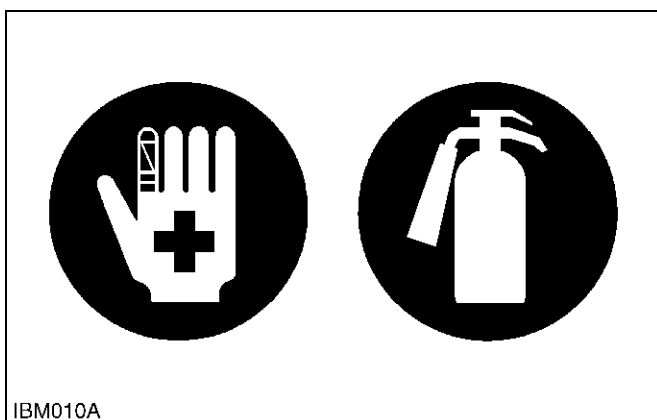
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DISPOSE OF FLUIDS PROPERLY

- 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

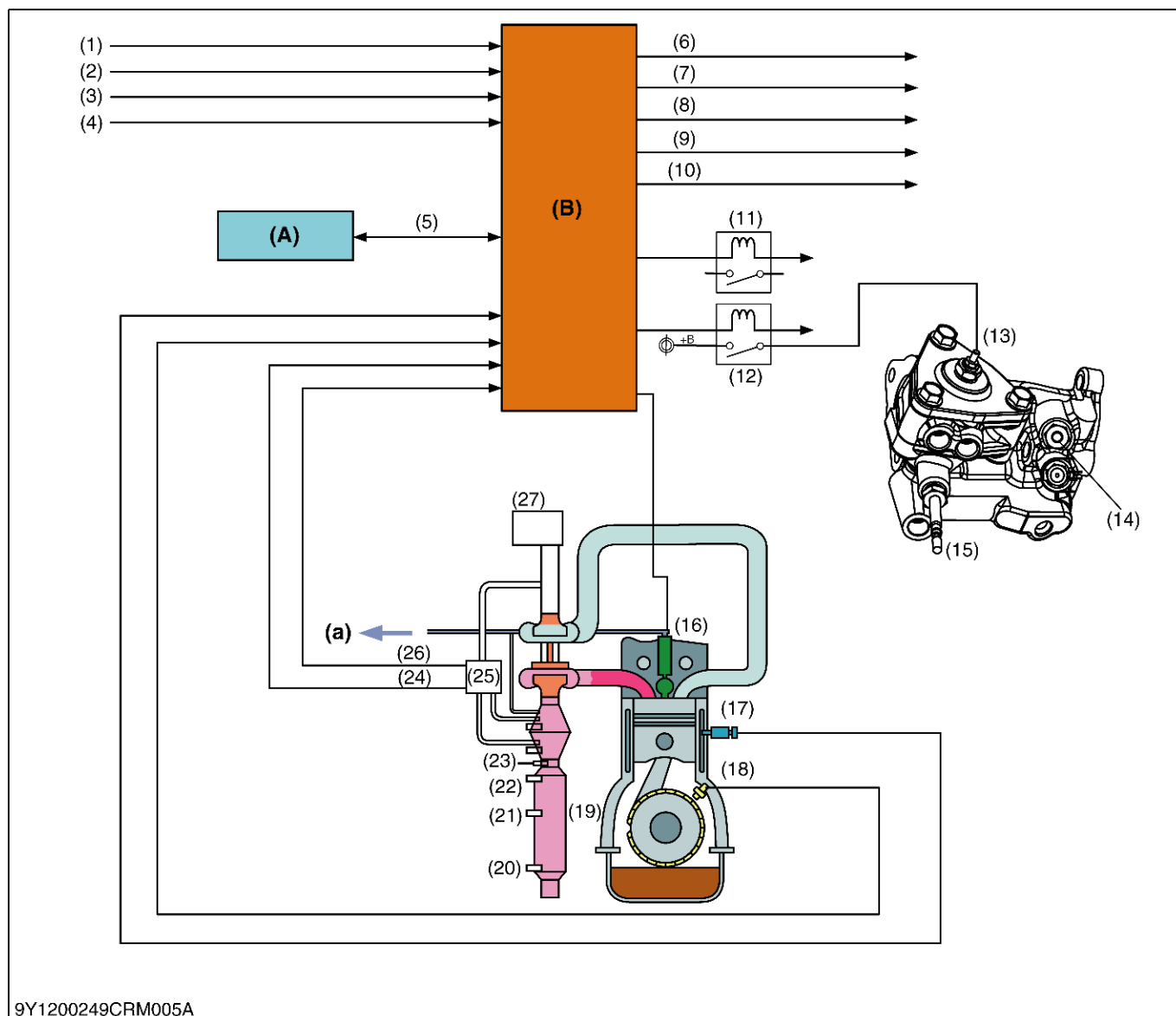
MECHANISM

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1. BASIC SYSTEM INFORMATION

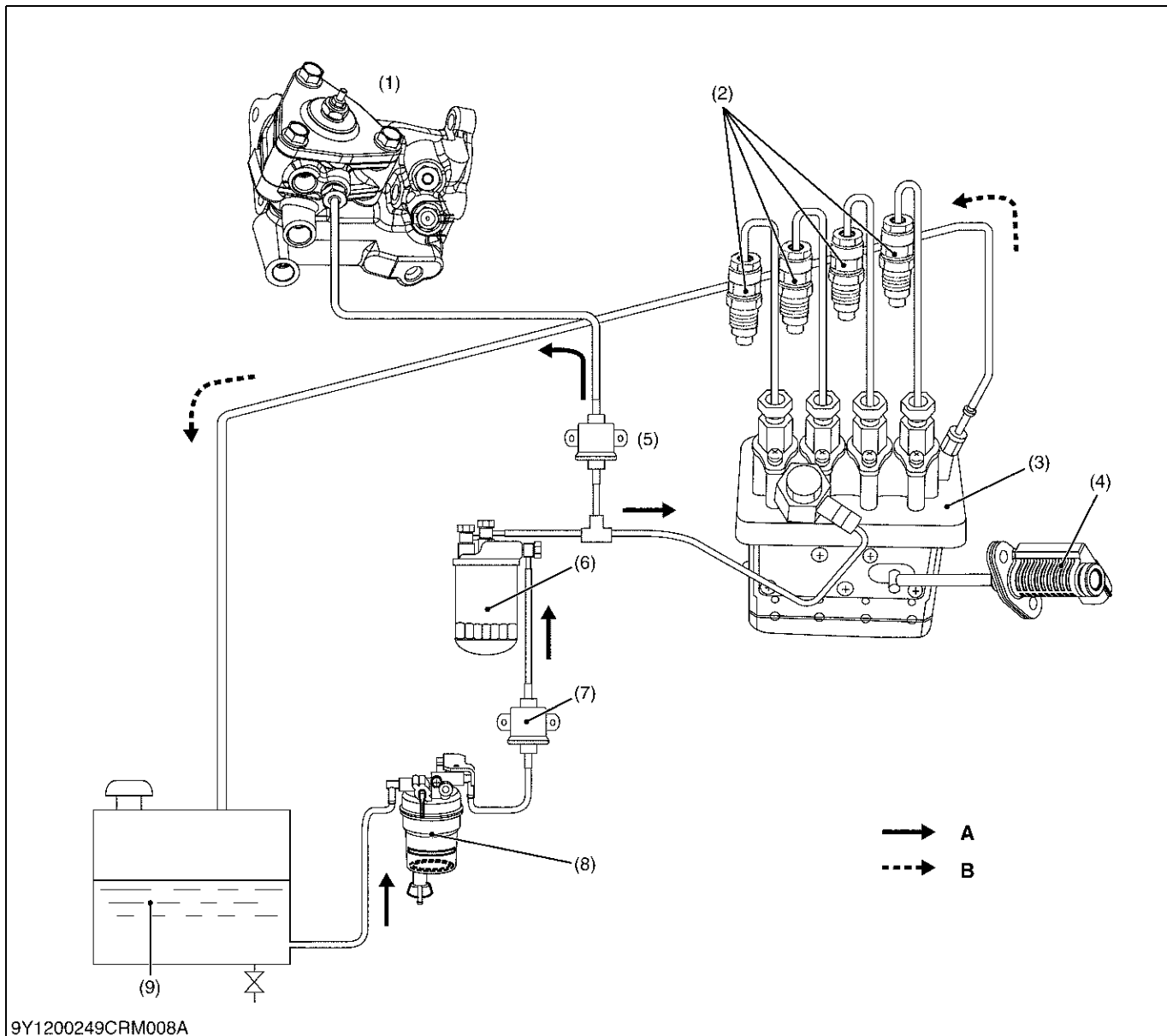
[1] SYSTEM CONFIGURATION



- | | | | |
|--------------------------------------|---------------------------------------|---|--|
| (1) Key Switch ON Signal | (10) Glow Lamp Signal | (19) Diesel Particulate Filter | (23) Differential Pressure Sensor (DPF Differential Pressure) (ΔP) |
| (2) Starter Switch Signal | (11) Starter Relay | (20) Exhaust Gas Temperature Sensor 2 (T2) (DPF Outlet Exhaust Gas Temperature) | (24) Air Valve Signal |
| (3) Emergency Stop Switch | (12) Doser Glow Relay | (21) Exhaust Gas Temperature Sensor 1 (T1) (DPF Inlet Exhaust Gas Temperature) | (25) Blower |
| (4) Oil Pressure Switch | (13) Glow Plug For Fuel Reformer | (22) Exhaust Gas Temperature Sensor 0 (T0) (DOC Inlet Exhaust Gas Temperature) | (26) Blower Motor Signal |
| (5) CAN Communication For Service | (14) Burner Temperature Sensor (T4) | | (27) Air Cleaner |
| (6) Engine Warning Light Signal | (15) Reformer Temperature Sensor (T3) | | |
| (7) Stop Lamp Signal | (16) Injection Nozzle | | |
| (8) Oil Pressure Warning Lamp Signal | (17) Coolant Temperature Sensor | | |
| (9) Overheat Lamp Signal | (18) Engine Speed Sensor | | |
- (A) CAN1 Connector (For Service)**
(B) Engine ECU
(a) To Fuel Tank

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[2] FUEL SYSTEM



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

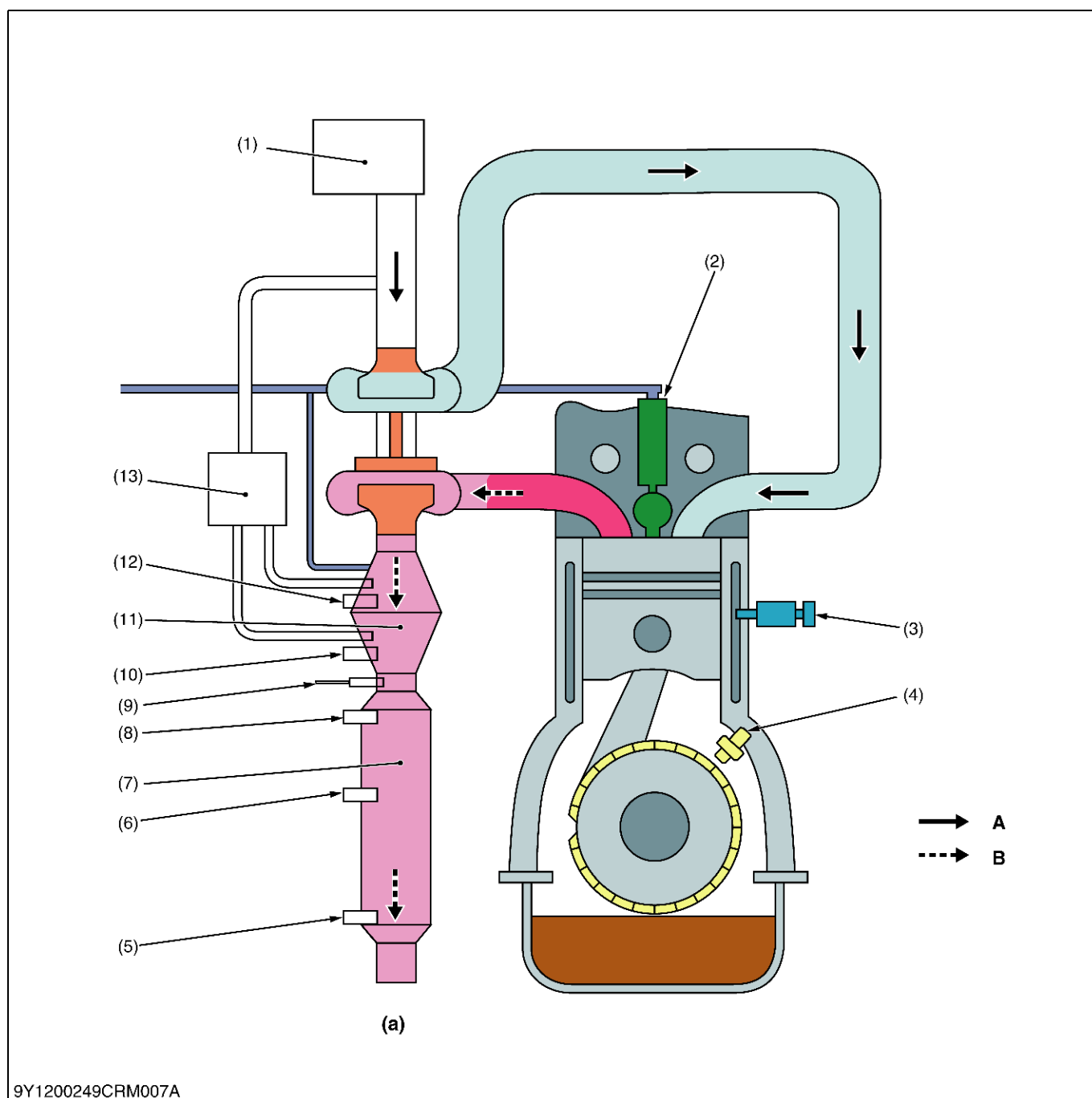
- (4) Rack Position Sensor
- (5) Fuel Feed Pump For Fuel Reformer
- (6) Fuel Filter

- (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					
		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				

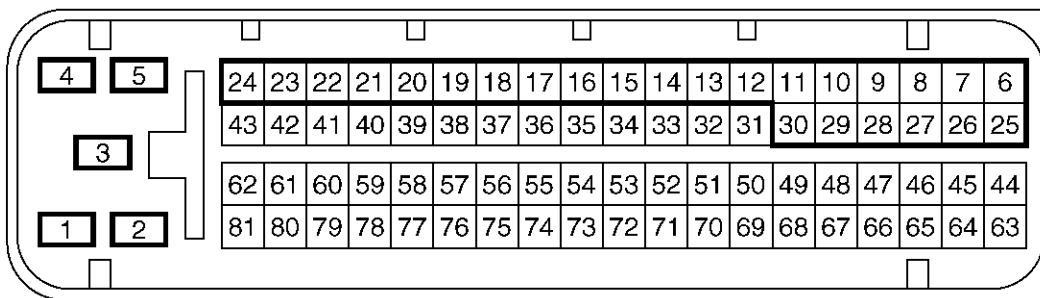
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Classification		Signal Name	Unit	Engine Stops	During Start-Up	Idling	During Acceleration	During No-load Maximum Speed
Out-put	Basic control signal	Engine stop flag	–	ON	OFF	OFF	OFF	OFF
		Actuator	A	When Engine stops: Approx. 0 A When Full stroke: Approx.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

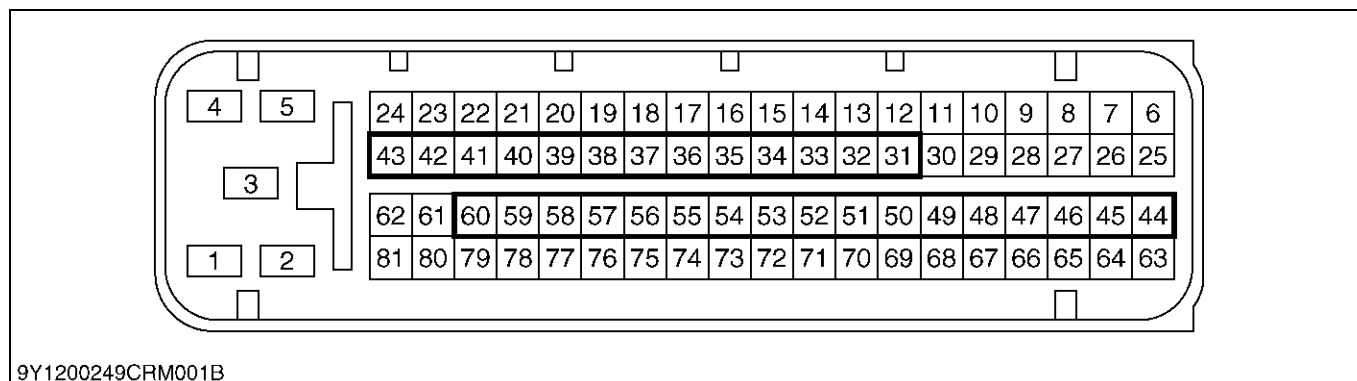
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[5] ECU TERMINAL LAYOUT

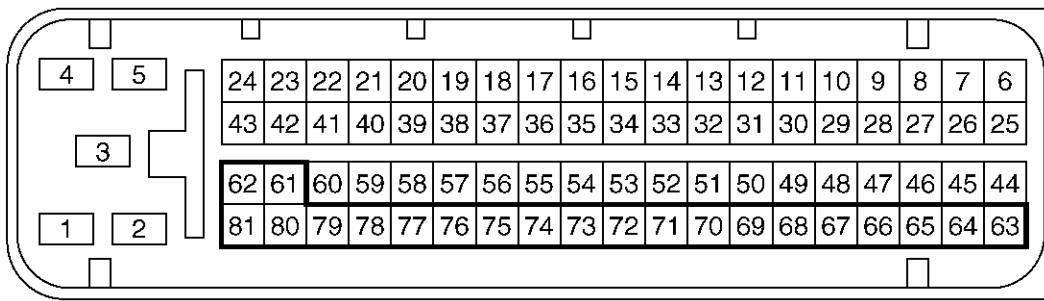


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No.	B3350	F3990
1	Battery (+B)	Battery (+B)
2	Battery (+B)	Battery (+B)
3	Blower motor [Reformer]	Blower motor [Reformer]
4	Blower motor [Reformer]	Blower motor [Reformer]
5	Glow plug [BURNER]	Glow plug [BURNER]
6	Pressure Sensor Signal [Blower]	Pressure Sensor Signal [Blower]
7	Blank	Blank
8	Rack position sensor Signal	Rack position sensor Signal
9	GND(A) [Rack position sensor]	GND(A) [Rack position sensor]
10	GND (A) [Accel position sensor]	GND (A) [Accel position sensor]
11	5V(A) [Rack position sensor]	5V(A) [Rack position sensor]
12	Solenoid(-) [Elc. Gov]	Solenoid(-) [Elc. Gov]
13	Blank	Blank
14	GND [12V Output]	GND [12V Output]
15	Warning Lamp	Engine Error Output
16	12V Output [Engine speed sensor]	12V Output [Engine speed sensor]
17	Fuel Feed Pump [Reformer]	Fuel Feed Pump [Reformer]
18	Blank	Blank
19	GND	GND
20	Solenoid valve 1 [Reformer]	Solenoid valve 1 [Reformer]
21	Solenoid valve 2 [Reformer]	Solenoid valve 2 [Reformer]
22	Starter relay	Starter relay
23	Blank	Blank
24	Fuel feed pump (engine) output	Fuel feed pump (engine) output
25	Pressure Sensor Signal [DPF]	Pressure Sensor Signal [DPF]
26	Accel Position 2	Accel Position 2
27	Accel Position 1	Accel Position 1
28	GND(A) [Pressure Sensor]	GND(A) [Pressure Sensor]
29	5V(A) [Pressure Sensor]	5V(A) [Pressure Sensor]
30	5V(A) [Accel position sensor]	5V(A) [Accel position sensor]



No.	B3350	F3990
31	GND [INJ-Shield]	GND [INJ-Shield]
32	Blank	Blank
33	GND	GND
34	Regeneration Enable Lamp	Auto DPF Regeneration Lamp
35	Parked Regeneration Lamp	Parked Regeneration Lamp
36	Blank	Blank
37	Blank	Blank
38	GND [for Service Tool]	GND [for Service Tool]
39	PTO Select Switch	Blank
40	Starter-Switch [Terminal 50]	Starter-Switch [Terminal 50]
41	Blank	Blank
42	Blank	Blank
43	IG-Switch [Terminal Acc]	IG-Switch [Terminal Acc]
44	Blank	Blank
45	CAN2-H (for Vehicle)	CAN2-H (for Vehicle)
46	Blank	Blank
47	CAN2-L (for Vehicle)	CAN2-L (for Vehicle)
48	GND(A) [Water Temp. Sensor]	GND(A) [Water Temp. Sensor]
49	Blank	Blank
50	Blank	Blank
51	Blank	Blank
52	Blank	Blank
53	GND(A) [Gas Temp. Sensor]	GND(A) [Gas Temp. Sensor]
54	Engine speed sensor Signal	Engine speed sensor Signal
55	DPF IN Temp. Sensor (T1)	DPF IN Temp. Sensor (T1)
56	DOC IN Temp. Sensor (T0)	DOC IN Temp. Sensor (T0)
57	Water temp. sensor [signal]	Water temp. sensor [signal]
58	Reformer Temp. Sensor (T3)	Reformer Temp. Sensor (T3)
59	HST Pedal Switch	PTO Switch
60	PTO ON/OFF Switch	Blank



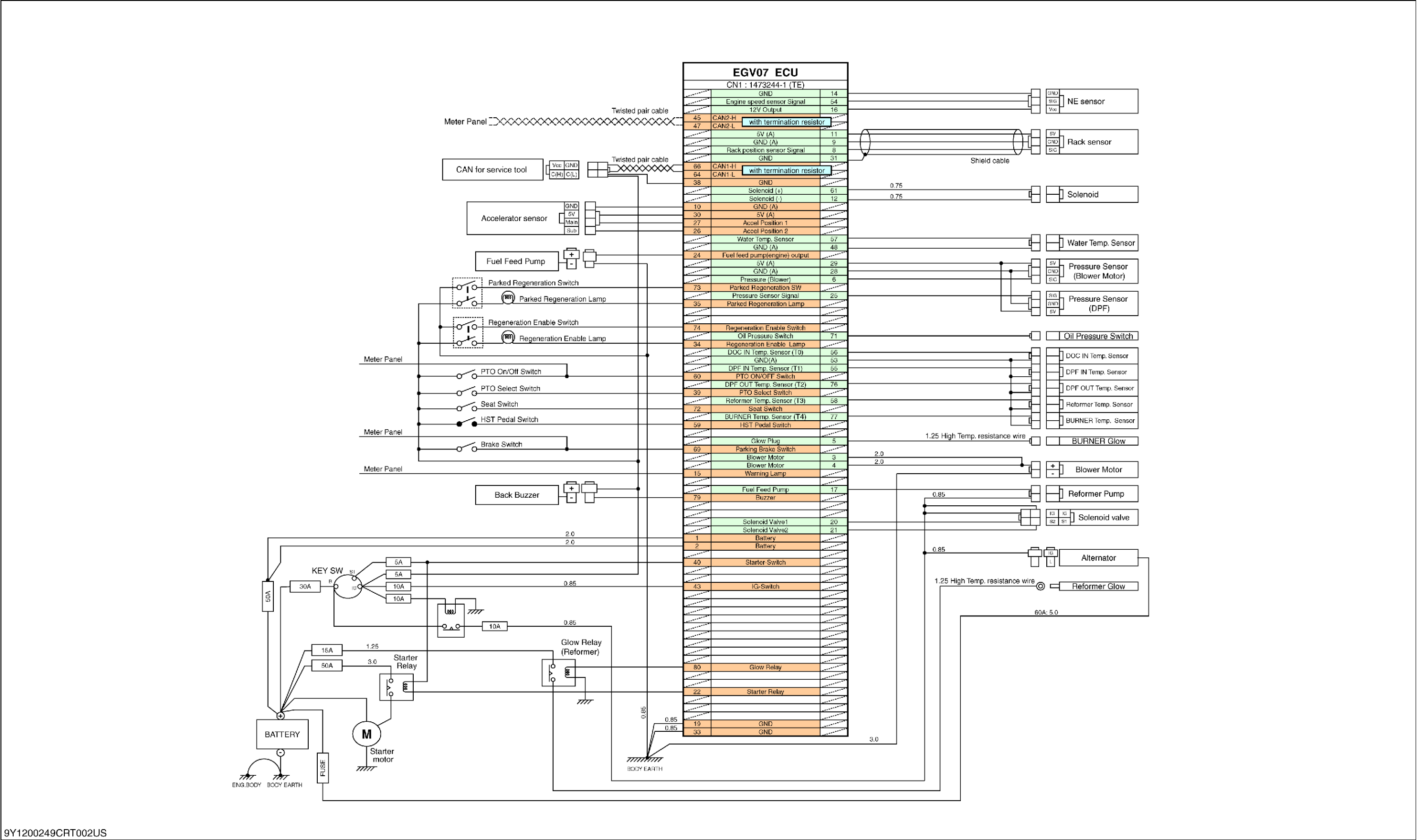
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No.	B3350	F3990
61	Solenoid(+) [Elc. Gov]	Solenoid(+) [Elc. Gov]
62	Blank	Blank
63	Blank	Blank
64	CAN1-L (for Service Tool)	CAN1-L (for Service Tool)
65	Blank	Blank
66	CAN1-H (for Service Tool)	CAN1-H (for Service Tool)
67	Blank	Blank
68	Blank	Blank
69	Parking Brake Switch	Parking Brake Switch
70	Blank	Blank
71	Oil pressure Switch	Blank
72	Seat Switch	Seat Switch
73	Parked Regeneration Switch	Parked Regeneration Switch
74	Regeneration Enable Switch	Auto DPF Regeneration SW
75	Blank	Blank
76	DPF OUT Temp. Sensor (T2)	DPF OUT Temp. Sensor (T2)
77	BURNER Temp. Sensor (T4)	BURNER Temp. Sensor (T4)
78	Blank	Blank
79	Buzzer [DPF]	Horn Relay
80	Glow relay [Reformer]	Glow relay [Reformer]
81	Blank	Blank

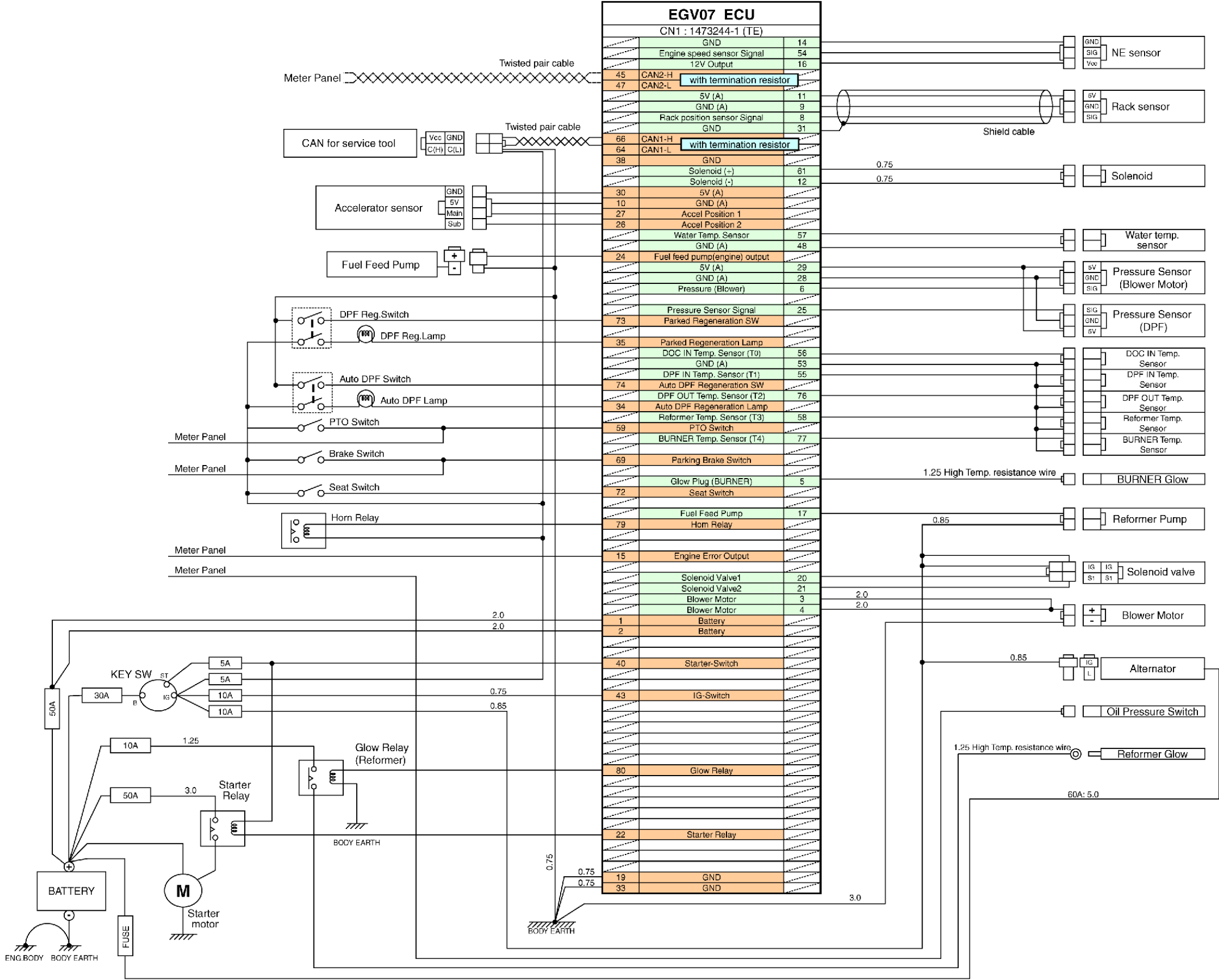
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2. WIRING DIAGRAM

[1] B3350



[2] F3990



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SERVICING

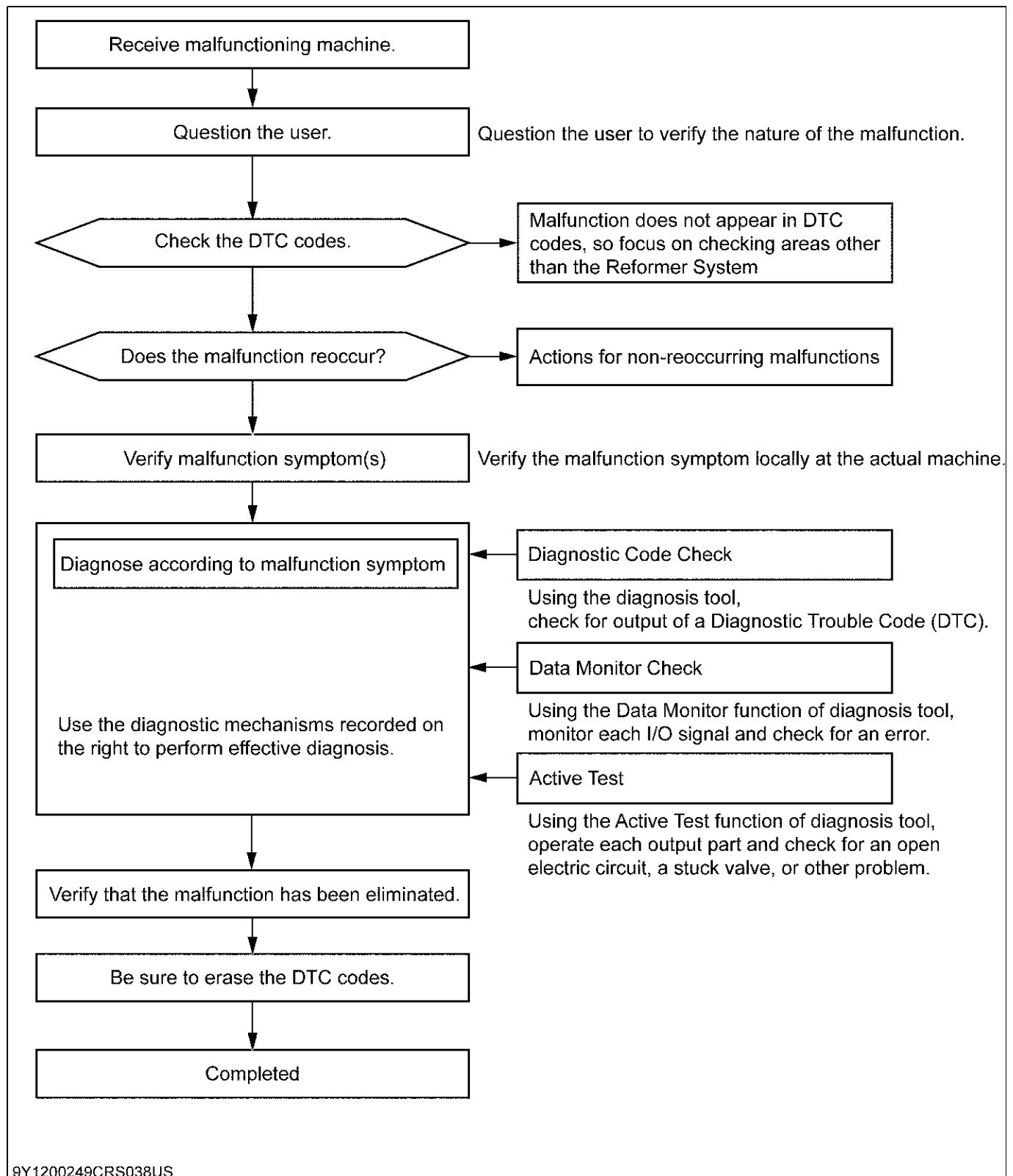
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1. GENERAL

[1] OVERALL DIAGNOSTIC PROCEDURE



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[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.

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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.

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Diagram illustrating the layout of the Trouble Check Sheet, showing a vertical column of four rectangular boxes. A label (1) points to the second box from the top.

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:

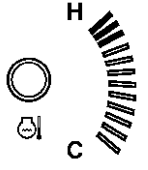
- The malfunction symptom may not be reproduced at the workshop.
- The customer's complaint does not always match the malfunction.
- If the person performing repairs is not working from the correct malfunction symptoms, man-hours will be wasted.

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

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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	<input type="checkbox"/> Yes		<input type="checkbox"/> No
Defective parts	<input type="checkbox"/> Injection Nozzle		<input type="checkbox"/> Fuel Pump
	<input type="checkbox"/> Fuel Filter		<input type="checkbox"/> Others ()
Replace parts details			
Injection Nozzle	Defective Injection Nozzle	<input type="checkbox"/> Injection Nozzle 1	<input type="checkbox"/> Injection Nozzle 2
		<input type="checkbox"/> Injection Nozzle 3	<input type="checkbox"/> Injection Nozzle 4
Actual part replacement	<input type="checkbox"/> Injection Nozzle		<input type="checkbox"/> Fuel Pump
	<input type="checkbox"/> ECU		<input type="checkbox"/> Fuel Filter
	<input type="checkbox"/> Others ()		
Customer complaint			
<input type="checkbox"/> 1. Engine no start	<input type="checkbox"/> a. No initial combustion		<input type="checkbox"/> b. No complete combustion
	<input type="checkbox"/> c. No cranking		
<input type="checkbox"/> 2. Difficult to start	<input type="checkbox"/> a. Engine crank slowly		
	<input type="checkbox"/> b. Others ()		
<input type="checkbox"/> 3. Poor idling	<input type="checkbox"/> a. Incorrect first idle		<input type="checkbox"/> b. Noise
	<input type="checkbox"/> c. Hunting idle from () to () min ⁻¹ (rpm)		
	<input type="checkbox"/> d. High idling () min ⁻¹ (rpm)		
	<input type="checkbox"/> e. Low idling () min ⁻¹ (rpm)		
	<input type="checkbox"/> f. Rough		
	<input type="checkbox"/> g. Others ()		
<input type="checkbox"/> 4. Poor driveability	<input type="checkbox"/> a. Hesitation		<input type="checkbox"/> b. Surging
	<input type="checkbox"/> c. Knocking		<input type="checkbox"/> d. Lack of power
	<input type="checkbox"/> e. Others ()		
<input type="checkbox"/> 5. Abnormal smoke	<input type="checkbox"/> a. Black		<input type="checkbox"/> b. White
	<input type="checkbox"/> c. Others ()		
<input type="checkbox"/> 6. Fuel leakage	<input type="checkbox"/> a. Large quantity		<input type="checkbox"/> b. Blurred
	Leaking from:	<input type="checkbox"/> Injection Nozzle	<input type="checkbox"/> Fuel Pump
		<input type="checkbox"/> Others ()	
<input type="checkbox"/> 7. Engine not stop			
<input type="checkbox"/> 8. Engine stall			
<input type="checkbox"/> 9. Others			

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Condition when problem occurs (Duplicated answers can be possible)		
1. Weather	<input type="checkbox"/> a. Fine	<input type="checkbox"/> b. Cloudy
	<input type="checkbox"/> c. Rainy	<input type="checkbox"/> d. Snow
	<input type="checkbox"/> e. Flood	
	<input type="checkbox"/> f. Others ()	
2. Outdoor temperature	Approx. °C (°F)	
3. Altitude	Approx. m	
4. Engine coolant	<input type="checkbox"/> a. Cold	Write the position of the indicator on coolant temperature gauge.  9Y1200058ENI031A
	<input type="checkbox"/> b. Warming up	
	<input type="checkbox"/> c. After warming up	
	<input type="checkbox"/> d. Any temperature	
	<input type="checkbox"/> e. Others ()	
5. Engine operation	<input type="checkbox"/> a. Starting	<input type="checkbox"/> b. Just after starting
	<input type="checkbox"/> c. Idling	<input type="checkbox"/> d. Racing
	<input type="checkbox"/> e. Acceleration	<input type="checkbox"/> f. Deceleration
	<input type="checkbox"/> g. While at work	
	<input type="checkbox"/> h. Others ()	
6. Problem frequency	<input type="checkbox"/> a. Constant	<input type="checkbox"/> b. Once only
	<input type="checkbox"/> c. Sometime (Time per day/month)	
7. Engine warning light	<input type="checkbox"/> Turn on a light	<input type="checkbox"/> 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	<input type="checkbox"/> a. Yes (Duplicate)	<input type="checkbox"/> b. No (Not occur)
2. Diagnosis trouble code	<input type="checkbox"/> a. Abnormal (What is code)	
	<input type="checkbox"/> b. Normal (No code)	
3. Appearance	<input type="checkbox"/> a. Normal	<input type="checkbox"/> b. Cracked
	<input type="checkbox"/> c. Discolored	
	<input type="checkbox"/> d. Others ()	
4. Fuel condition	<input type="checkbox"/> a. Normal	
	<input type="checkbox"/> b. Abnormal ()	

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[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.

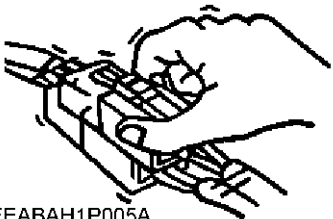
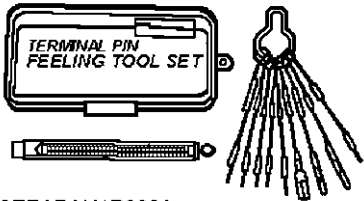
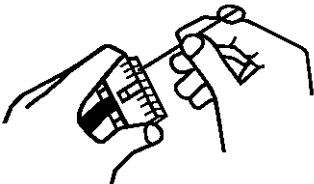
Malfunction symptom	Area of Fault	Cause	Action
Engine overheat	Fuel system	Poor fuel	Switch to the correct fuel (No.2-D diesel fuel).
	Lubrication system	Engine oil deterioration.	Change engine oil.
		Inappropriate engine oil.	Replace with the appropriate engine oil (API Service Classification CJ-4 grade 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.
Faulty starting	Other	Overheat	Refer to "Engine Overheat" items.
	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.

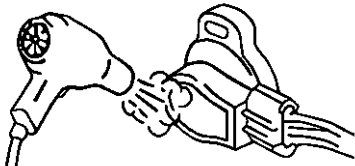
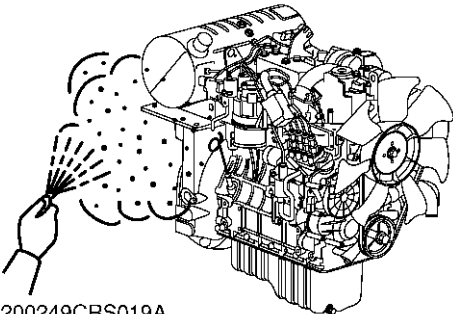
9Y1200249CRS0007US0

[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.

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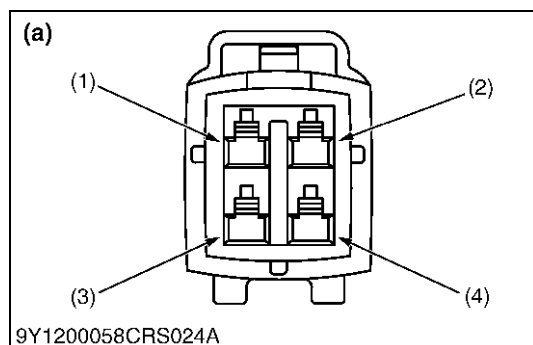
Action	Malfunction symptom		
	Dead battery	Engine will not start	Idle speed abnormal engine stall sluggish poor acceleration
Verify that there is no Diagnostic Trouble Code (DTC) stored in the memory.	—	○	○
Using the trouble check sheet as a base, perform a reoccurrence test in "Reoccurrence" mode. Use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

Action	Malfunction symptom		
	Dead battery	Engine will not start	Idle speed abnormal engine stall sluggish poor acceleration
<p>Heat the accelerator sensor and other electrical components with a hair dryer. Verify whether or not the voltage value (resistance value) changes.</p> <p>■ NOTE</p> <ul style="list-style-type: none"> 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.  <p>3EEABAH1P008A</p>	—	—	○
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.	○	○	○
<p>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.</p> <p>■ NOTE</p> <ul style="list-style-type: none"> 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.  <p>9Y1200249CRS019A</p>	○	○	○

9Y1200249CRS0009US0

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

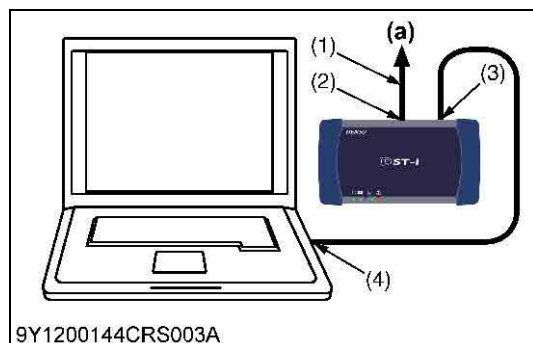
9Y1200249CRS0010US0

[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.

9Y1200249CRS0011US0



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.)

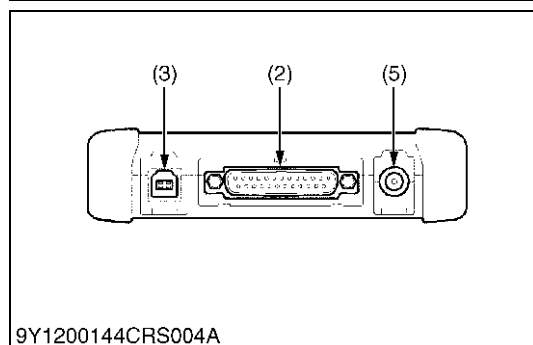
■ NOTE

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

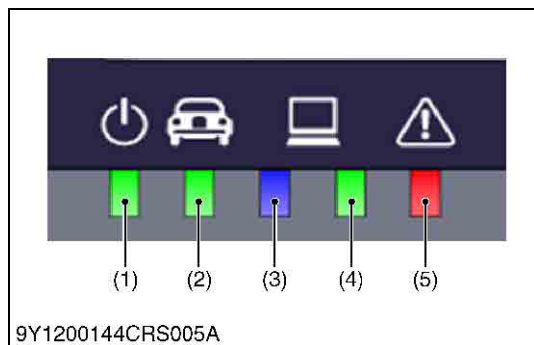
- (1) Cable (To Machine)
 - (2) Interface Connector (To Machine)
 - (3) USB Connector (To PC)*
 - (4) Cable (USB)
 - (5) DC Jack (Reserved)*
- (a) CAN1 Connector

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

9Y1200249CRS0012US0



[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

9Y1200249CRS0013US0

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)

9Y1200249CRS0014US0

[4] CHECKING THE OPERATION OF THE ECU

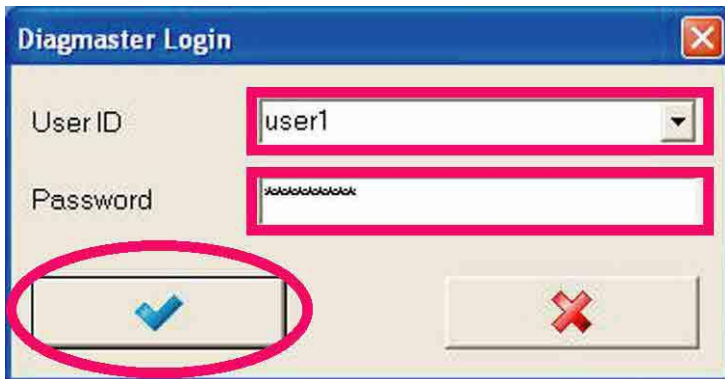
(1) Starting Diagmaster

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

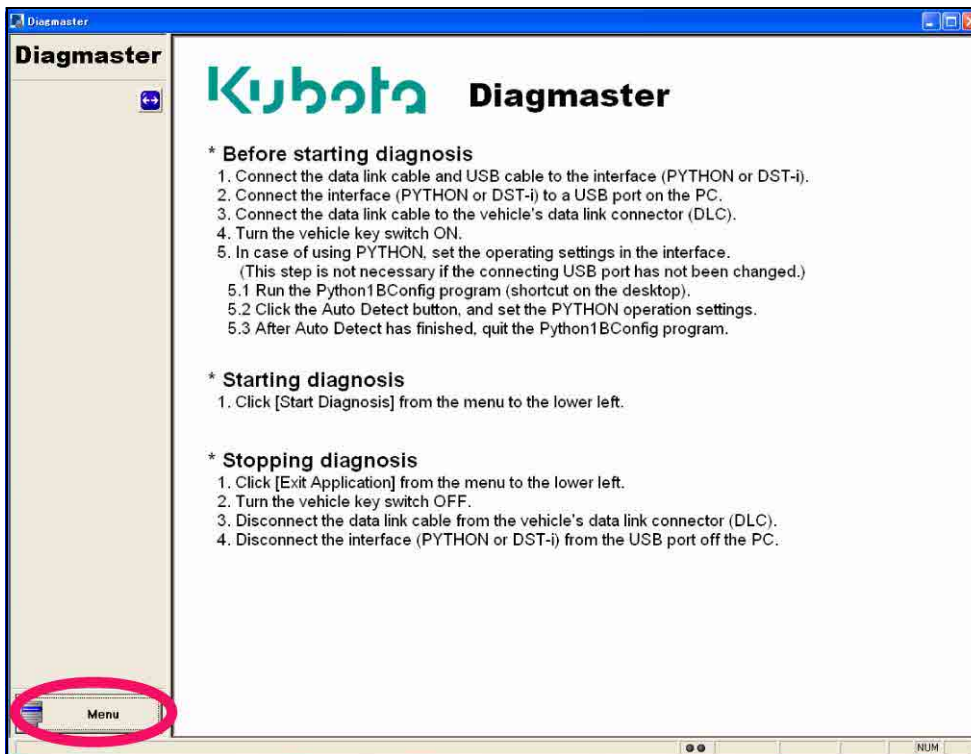


If you connected Diagmaster to ECU already, below screen appears.

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.

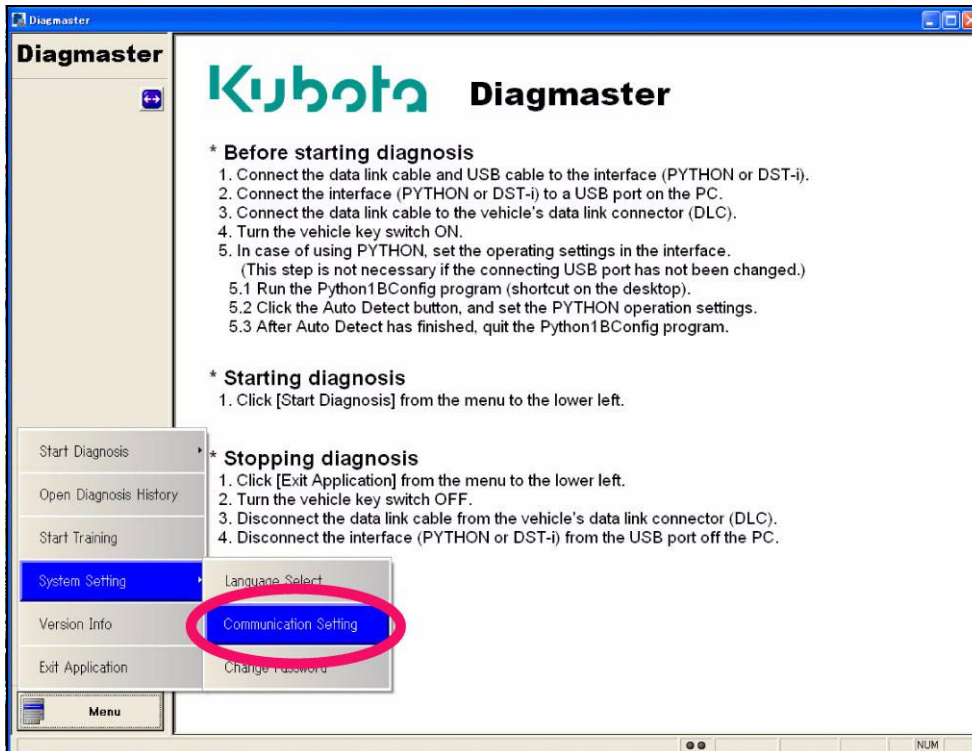


Select the Diagmaster 05, and then click the  button.

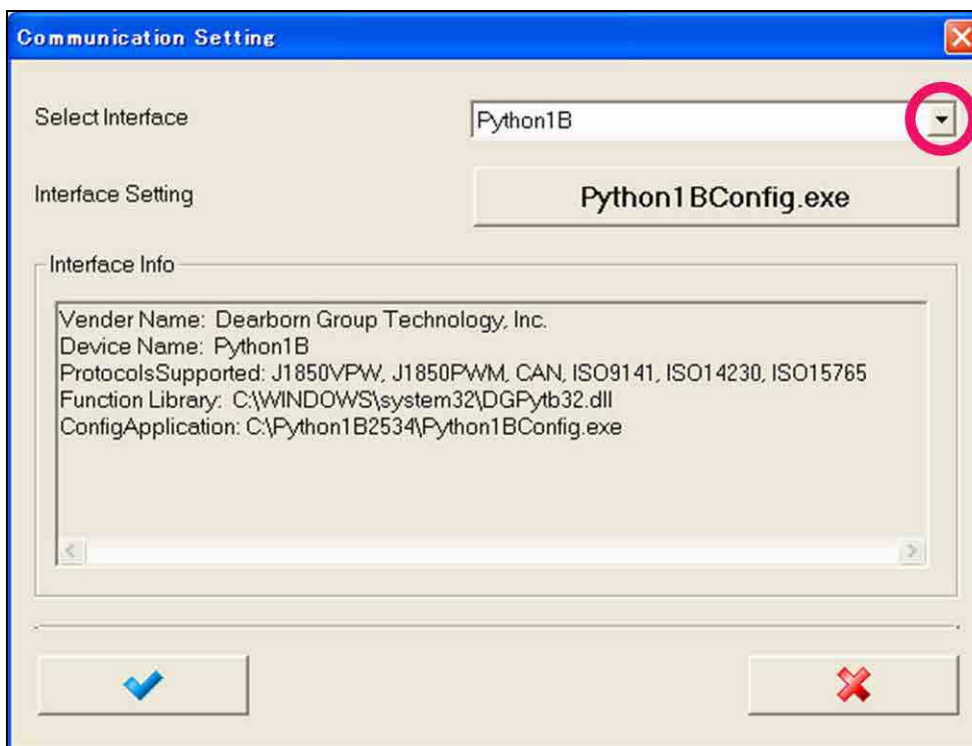
9Y1200249CRS0015US0

(2) DST-i Communication Settings

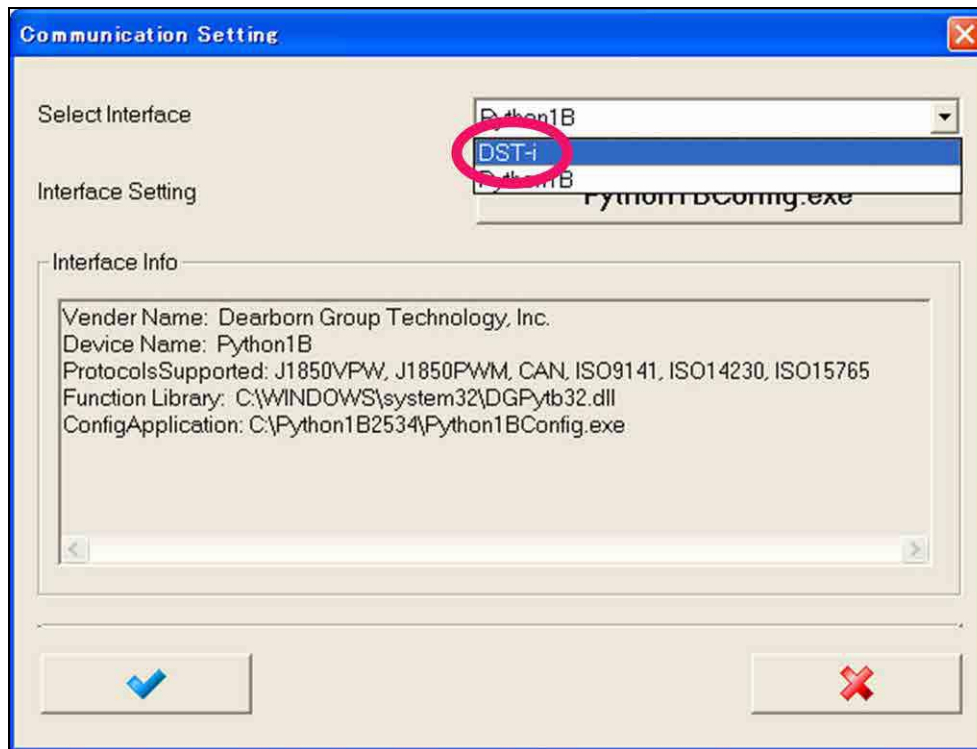
1. From the "Menu", select "System Setting", and then "Communication Setting"



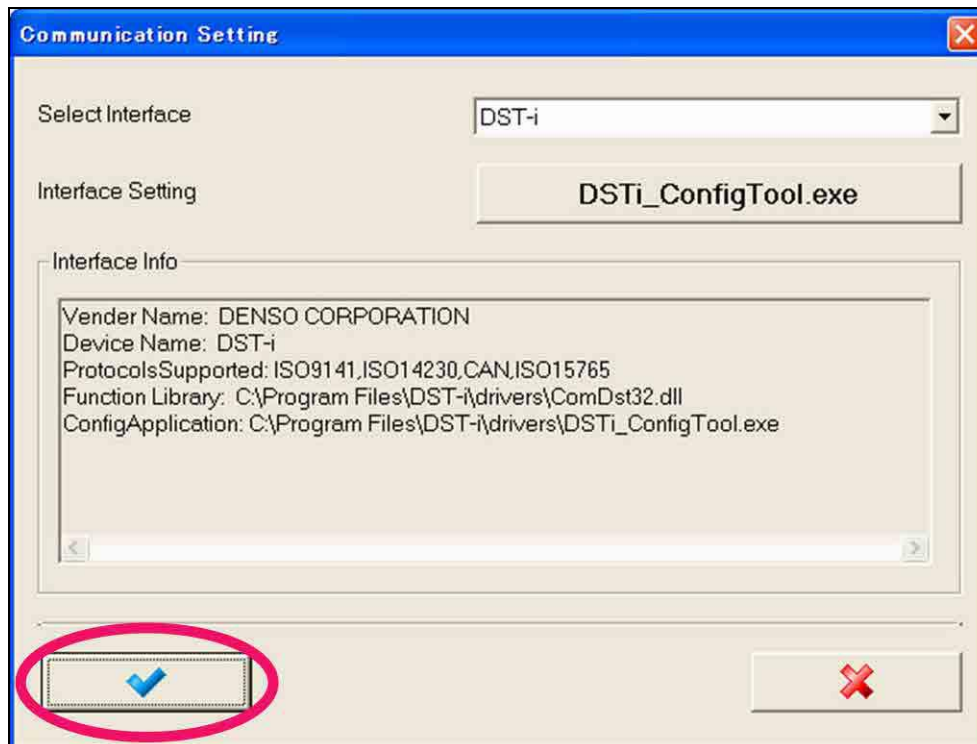
2. Click the interface select button.



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



4. Click the  button.

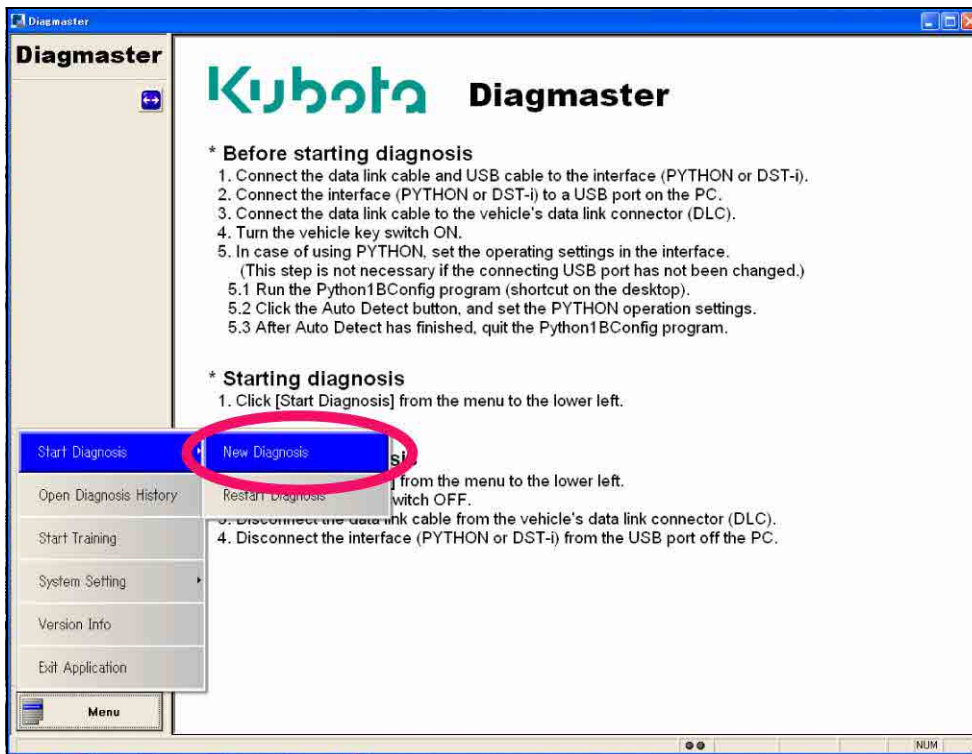


■ NOTE

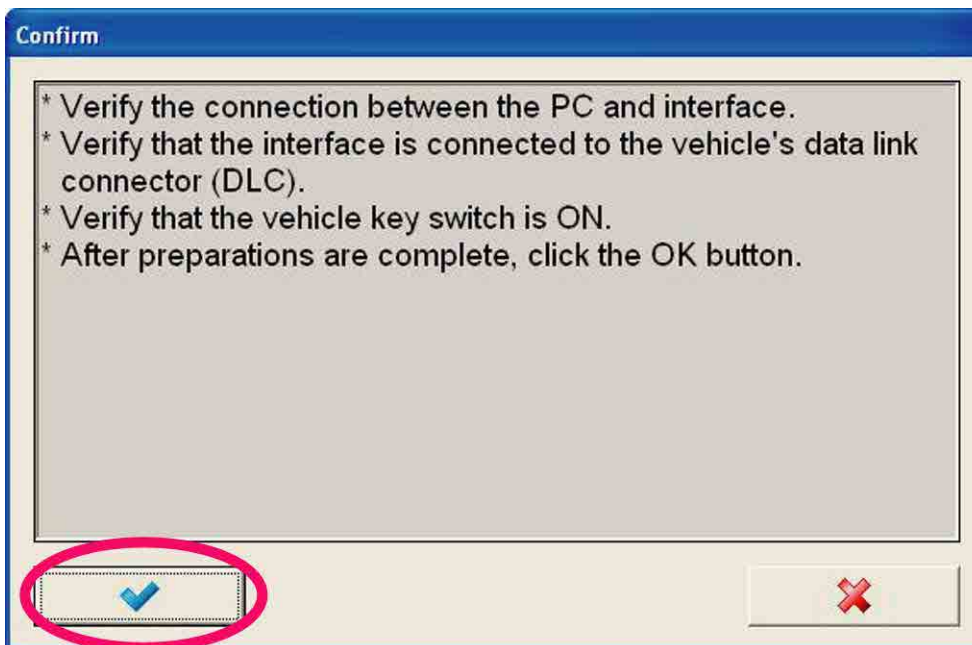
- If you failed in the setting, confirm the connection and start again from procedure 1. to 4..

9Y1200249CRS0016US0

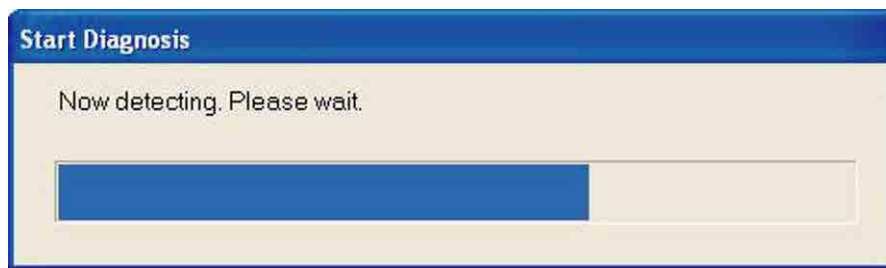
5. From "Menu", select "Start Diagnosis", and then "New Diagnosis".



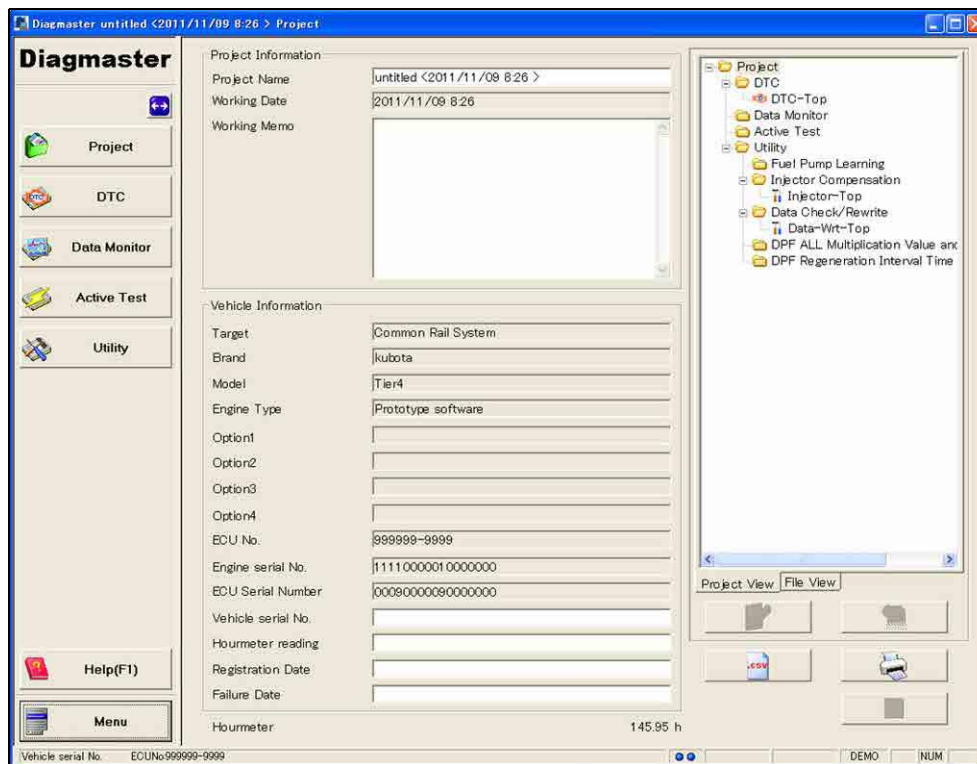
6. Click the  button.



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..

9Y1200249CRS0017US0

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

9Y1200249RSS0001US0

(1) Glow Relay ON/OFF Function

- This test cannot use for this engine.

9Y1200249RSS0002US0

(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

9Y1200249RSS0003US0

(3) Air Valve 1 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 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

9Y1200249RSS0004US0

(4) Air Valve 2 for Fuel Reformer Operate Function

- This test is used when "Reformer abnormal" (P1844) 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

9Y1200249RSS0005US0

(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

9Y1200249RSS0006US0

(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.

9Y1200249RSS0007US0

(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 current value of line of catalyst heater for fuel reformer with using ammeter.

Factory specification	2.8 to 4.0 A
-----------------------	--------------

9Y1200249RSS0008US0

(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 Current".

Monitor signal	Command signal	Duration time	Number of times
Regen Gas Glow Current	3.5 to 10 A	5 sec.	2

9Y1200249RSS0009US0

(9) Purge Function for Catalyst of Fuel Reformer

- This test is used when "Fail to ignite burner" (P1848) has occurred.
 - Start the active test and check the purge function operation with monitor signal "Solenoid Air Valve 1 Duty".

Monitor signal	Command signal	Duration time	Number of times
Solenoid Air Valve 1 Target Mass Flow	20 L/min	60 sec.	1

9Y1200249RSS0010US0

[2] UTILITY

Utility are below

9Y1200249RSS0011US0

(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 exchanges 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 (1) [Fetch]

After Exchange: 553, 15 degC (2) [Fetch]

Rack Position Offset Correction: 43, -7 (3) [Register] (4) [Output CSV file]

Compensation History

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

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

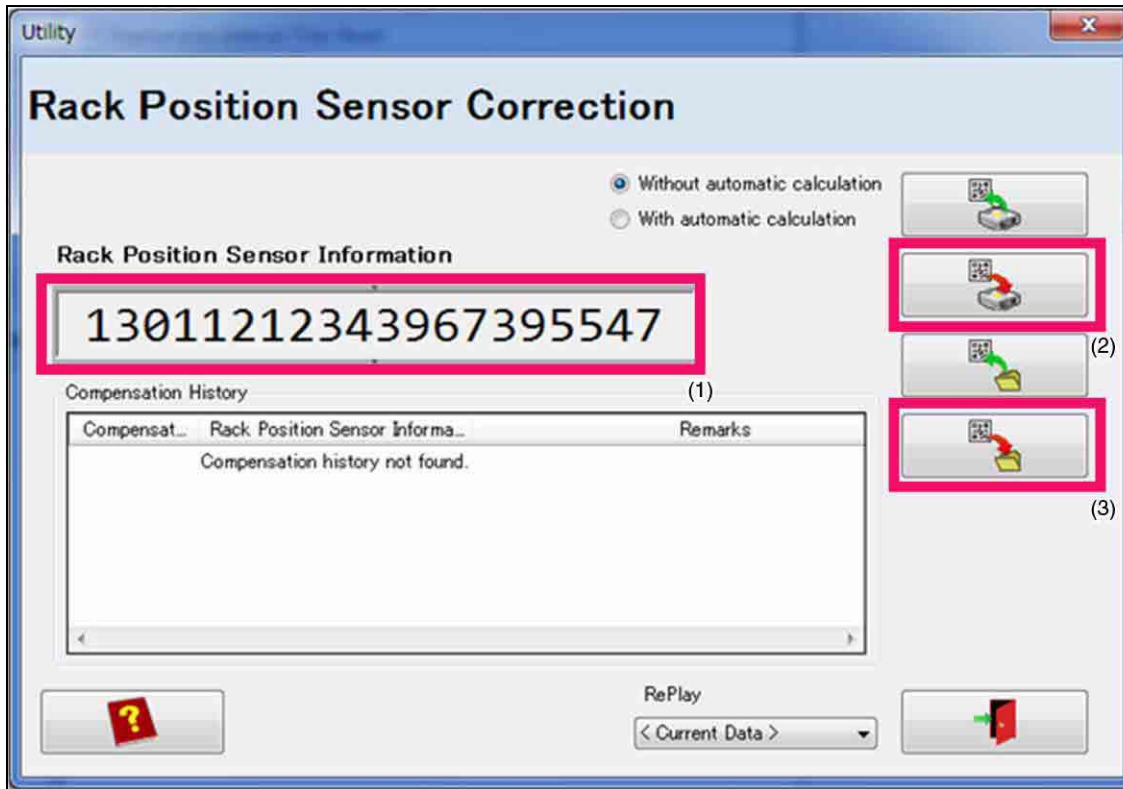
 

7. Write reason and click enter button.
8. Update the ECU data to website with using CSV file. (4)

9Y1200249RSS0102US0

(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)

9Y1200249RSS0103US0

4. REPLACE ECU



9Y1200249CRS022A

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**

9Y1200249CRS0343US0

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.

9Y1200249CRS0021US0

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.

9Y1200249CRS0022US0

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		Fuel quality		Injectors		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			Turbocharge malfunction	Blockage, leakage, malfunction														
1	Engine Warning Light Comes On	<input type="radio"/>		<input type="radio"/>			<input type="radio"/> *1				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>															
2	Engine Does Not Start	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>							<input type="radio"/>								
3	Takes A Long Time Before Engine Starts		<input type="radio"/>			<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>								<input type="radio"/>							
4	Idle Failure									<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>								<input type="radio"/>							
5	Engine Noise						<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			<input type="radio"/>					<input type="radio"/>		<input type="radio"/>	<input type="radio"/>					
6	High Fuel Consumption				<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>						<input type="radio"/>	<input type="radio"/>	<input type="radio"/>							
7	Poor Acceleration (Insufficient Output)				<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>						<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				
8	Black Smoke Emitted				<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>															
9	White Smoke Emitted				<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>															
10	Engine Stalls On Deceleration				<input type="radio"/>					<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																		

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

*2: It emphatically searches for the machine side.

9Y1200249CRS0023US0

[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-S191)
2. Connect diagnosis tool and read DTC. Refer to pertinent DTC diagnosis guidelines and implement diagnosis.

9Y1200249CRS0025US0

(2) Engine Does Not Start

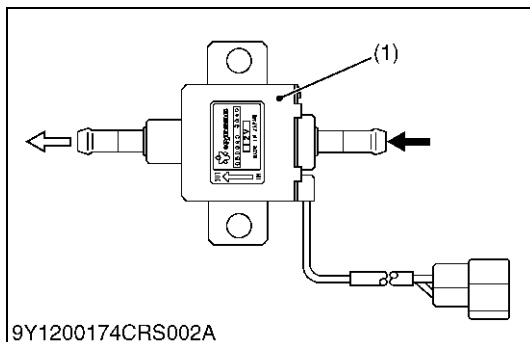
Possible causes:

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.)

9Y1200249CRS0026US0



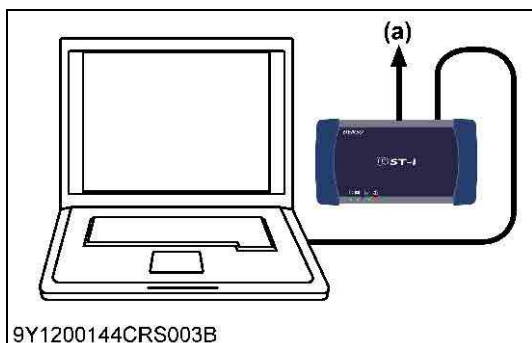
1. Check the Fuel Feed Pump Operation

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-S191)

(1) Fuel Feed Pump

9Y1200249CRS0027US0



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

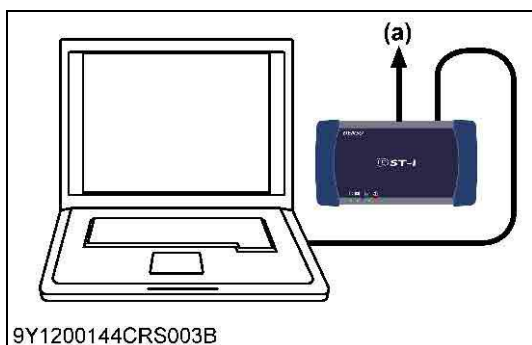
OK	Go to "3. Check the Starting Assist Device".
NG	Check in accordance with the troubleshooting procedures for each DTC.

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

9Y1200249CRS0028US0



3. Check the Starting Assist Device

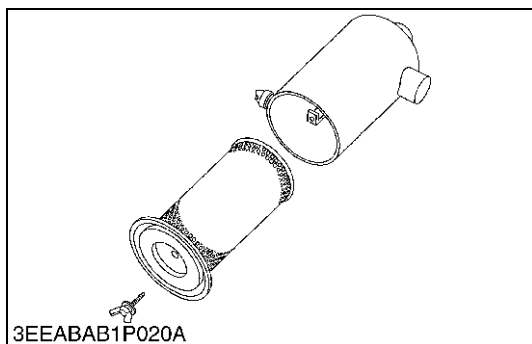
1. Refer to the workshop manual for the machine and check the glow plug and related wiring harness.
2. In case the engine can not start when it is new or after the maintenance, make sure to connect the injector harness connector of the head cover position.
3. If the starter relay is used, neutral condition 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

9Y1200249CRS0029US0

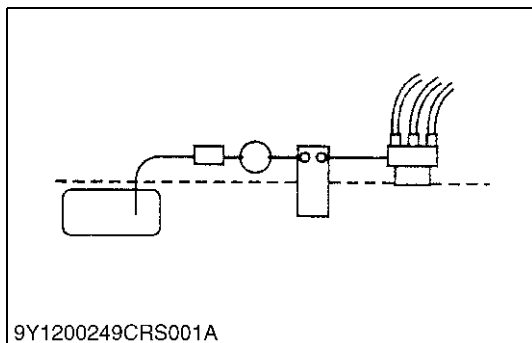


4. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

OK	Go to "5. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

9Y1200249CRS0030US0



5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

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-S188)

(1) Rail

(2) Supply Pump

9Y1200249CRS0031US0

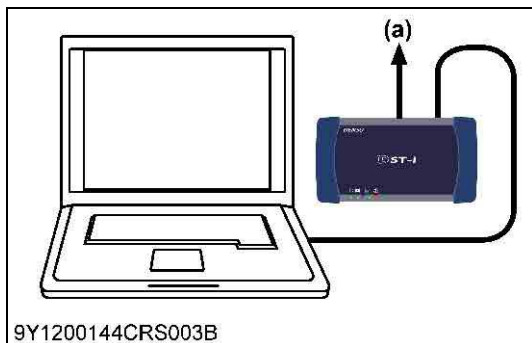
6. Check the ECU Power Supply and Grounding

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

9Y1200249CRS0032US0



7. Check the Engine Speed Sensor Signals

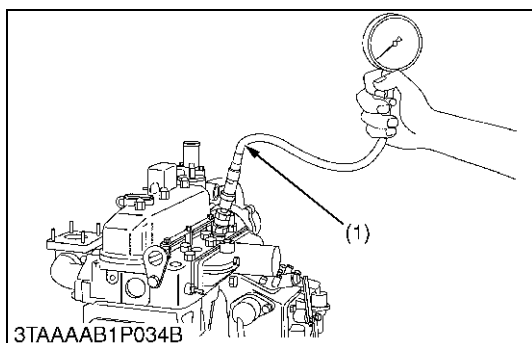
1. Set the key switch to START position and crank the engine. Check the "Engine speed active flag" using the diagnosis tool data monitor function.

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

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

(a) CAN1 Connector

9Y1200249CRS0033US0



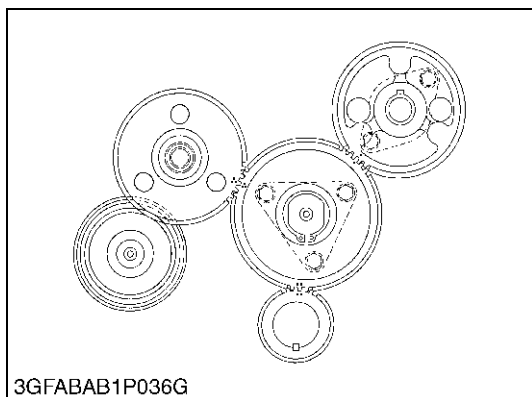
8. Check the Engine

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

OK	Normal.
NG	Repair the malfunction.

(1) Compression Tester

9Y1200249CRS0034US0



(3) Takes A Long Time Before Engine Starts

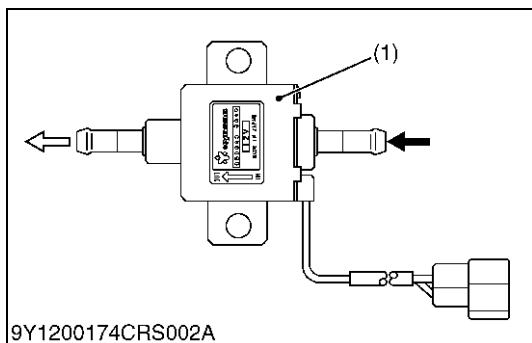
Possible causes:

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.)

9Y1200249CRS0035US0



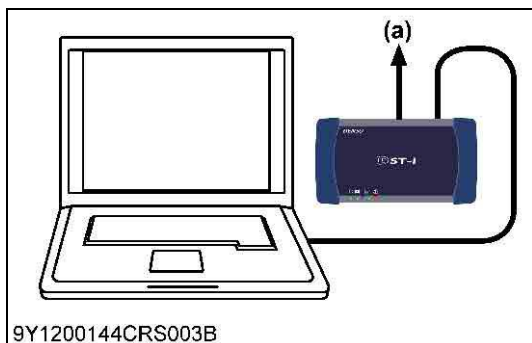
1. Check the Fuel Feed Pump Operation

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-S191)

(1) Fuel Feed Pump

9Y1200249CRS0036US0



2. Check the DTC

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

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

DTC presently existing

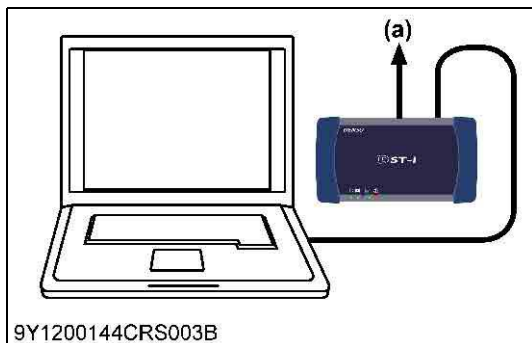
OK	Go to "3. Check the Starting Assist Device".
NG	Check in accordance with the troubleshooting procedures for each DTC.

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

9Y1200249CRS0037US0



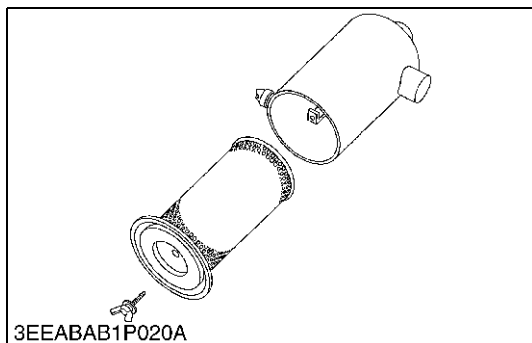
3. Check the Starting Assist Device

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

9Y1200249CRS0038US0

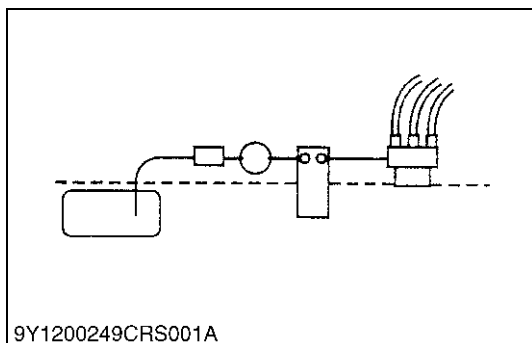


4. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

OK	Go to "5. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

9Y1200249CRS0039US0

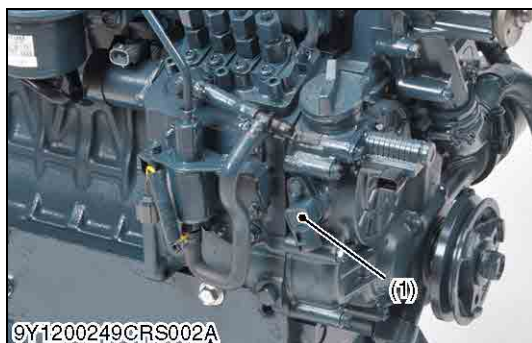


5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

OK	Go to "6. Check the Engine Speed Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

9Y1200249CRS0040US0



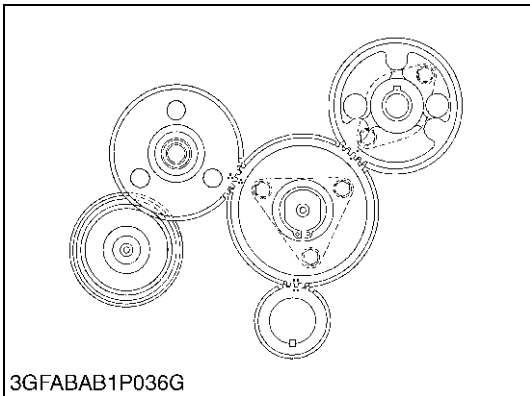
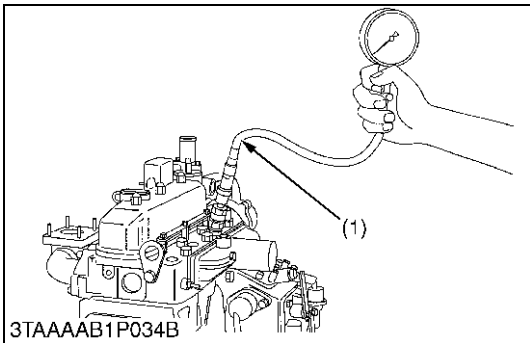
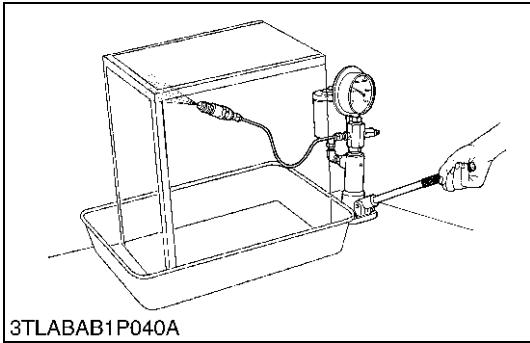
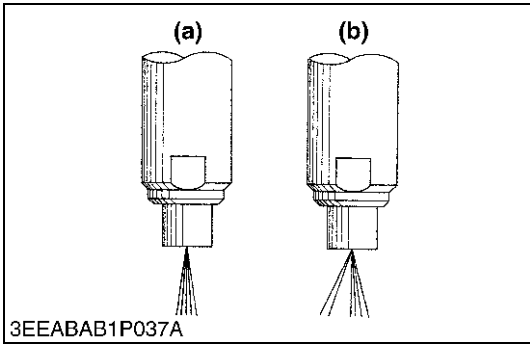
6. Check the Engine Speed Sensor

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

9Y1200249CRS0041US0



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

9Y1200249CRS0042US0

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

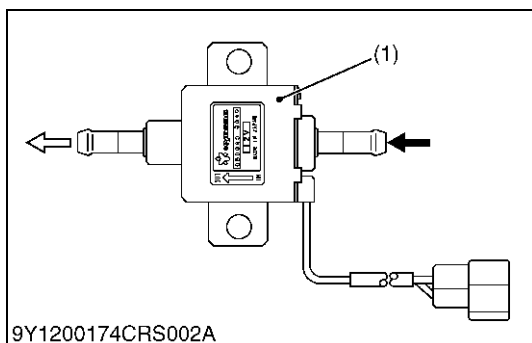
9Y1200249CRS0043US0

(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.)

9Y1200249CRS0044US0



9Y1200174CRS002A

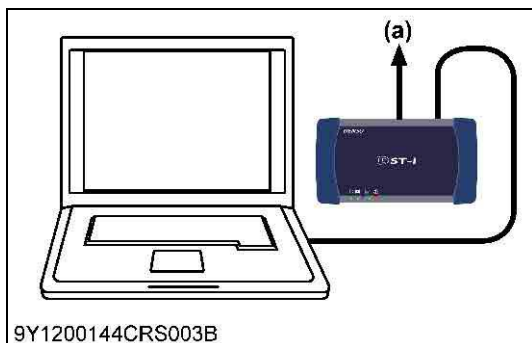
1. Check the Fuel Feed Pump Operation

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-S191)

(1) Fuel Feed Pump

9Y1200249CRS0045US0



9Y1200144CRS003B

2. Check the DTC

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

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

DTC presently existing

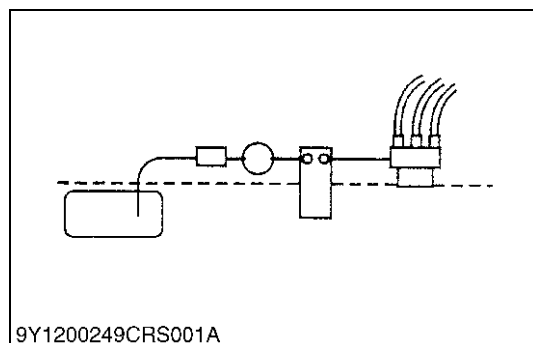
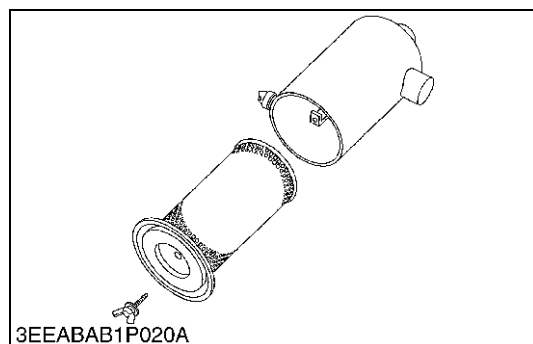
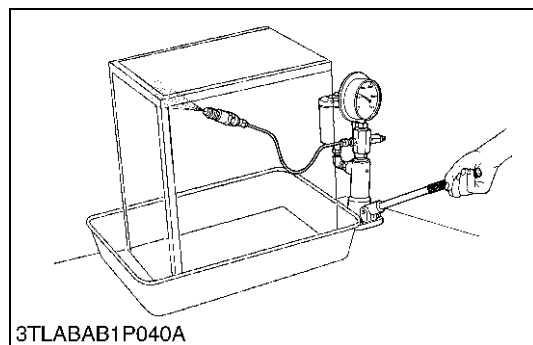
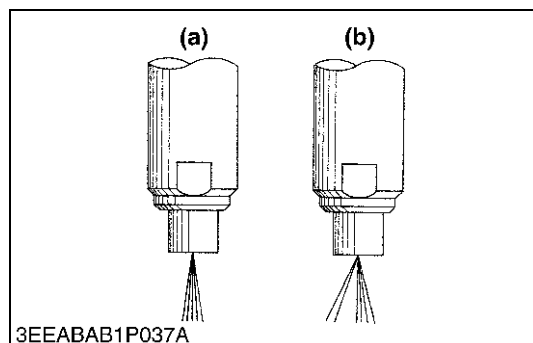
OK	Go to "3. Check the Injector (Including the Pipes, etc.)".
NG	Check in accordance with the troubleshooting procedures for each DTC.

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

9Y1200249CRS0046US0



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

9Y1200249CRS0047US0

4. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

OK	Go to "5. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

9Y1200249CRS0048US0

5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

OK	Go to "6. Check the Accelerator Position Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

9Y1200249CRS0049US0

6. Check the Accelerator Position Sensor



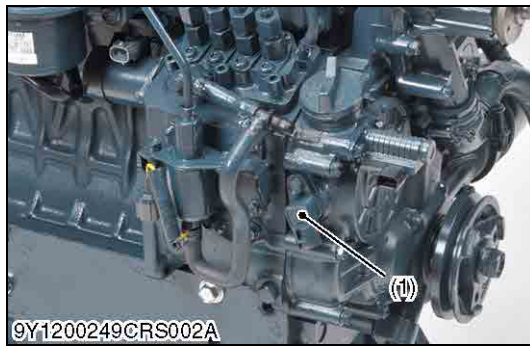
CAUTION

- 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.

9Y1200249CRS0050US0



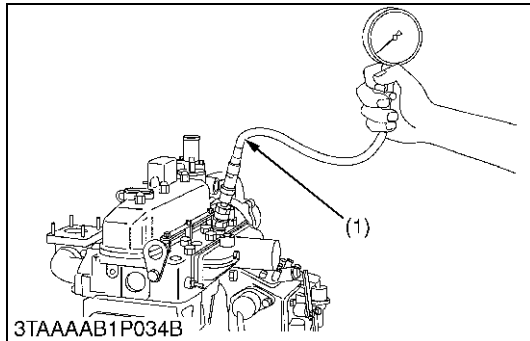
7. Check the Engine Speed Sensor

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

9Y1200249CRS0051US0



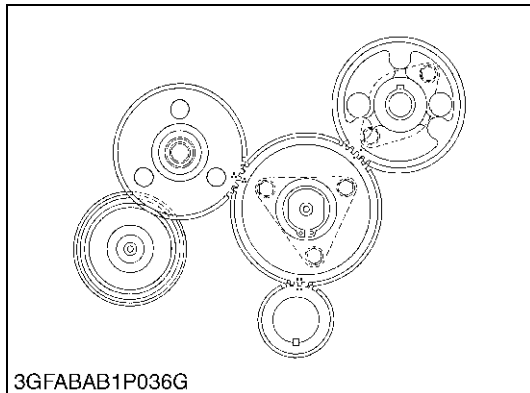
8. Check the Engine

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

OK	Normal.
NG	Repair the malfunction.

- (1) Compression Tester

9Y1200249CRS0052US0



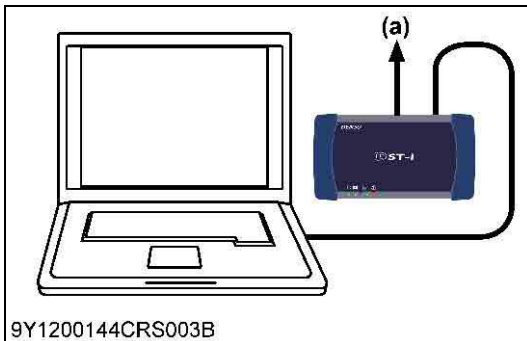
(5) Engine Noise

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)

9Y1200249CRS0053US0



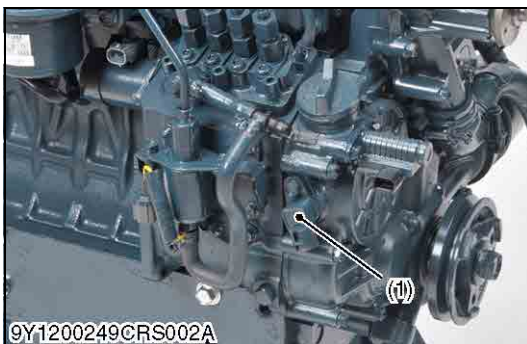
1. Check the DTC

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

9Y1200249CRS0054US0



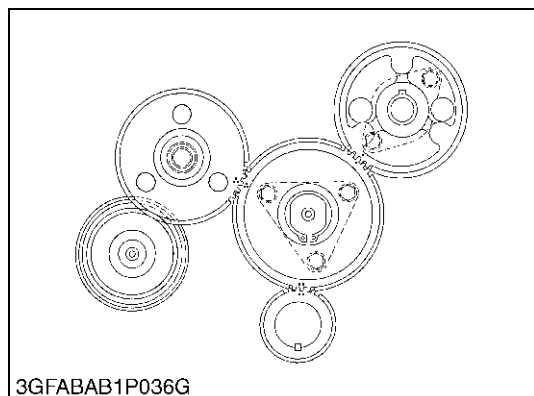
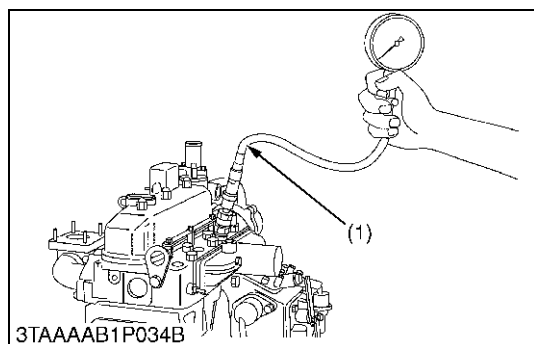
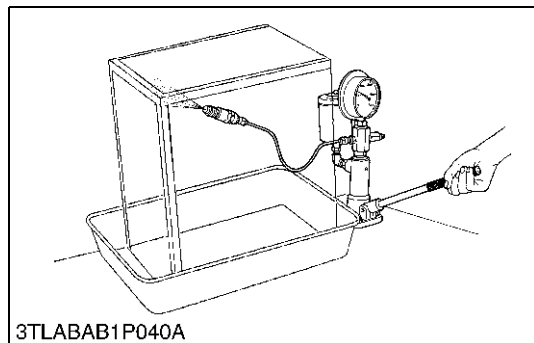
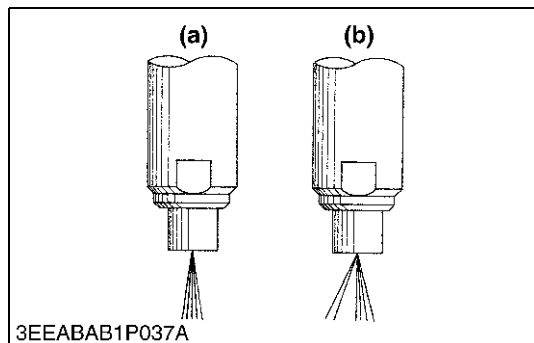
2. Check the Engine Speed Sensor

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

9Y1200249CRS0055US0



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

9Y1200249CRS0057US0

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.

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.).

OK	Normal.
NG	Repair the malfunction.

(1) Compression Tester

9Y1200249CRS0058US0

(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

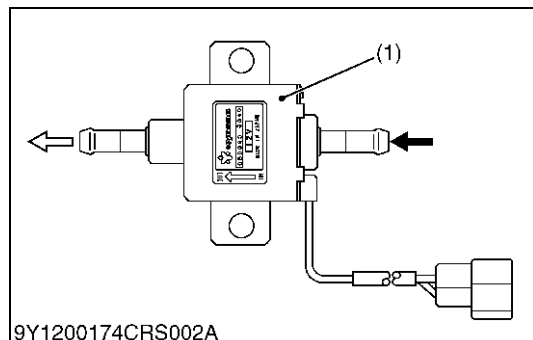
Reduced engine performance is not detected but the fuel consumption is higher.

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

9Y1200249CRS0059US0



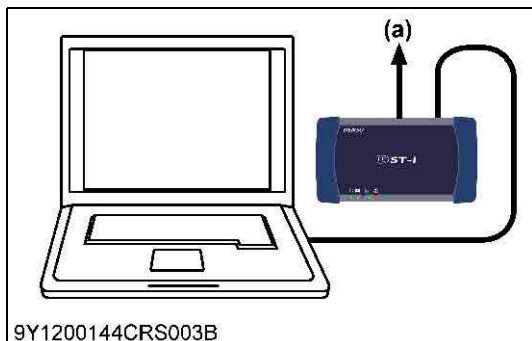
1. Check the Fuel Feed Pump Operation

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-S191)

(1) Fuel Feed Pump

9Y1200249CRS0060US0



2. Check the DTC

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

Factory specification	No DTC is output.
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OK	Go to "3. Comparison of Fuel Economy".
NG	Check in accordance with the troubleshooting procedures for each DTC.

(a) CAN1 Connector

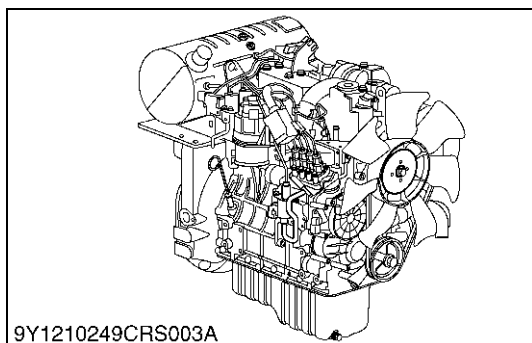
9Y1200249CRS0061US0

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".

9Y1200249CRS0062US0



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.

9Y1200249CRS0063US0

5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

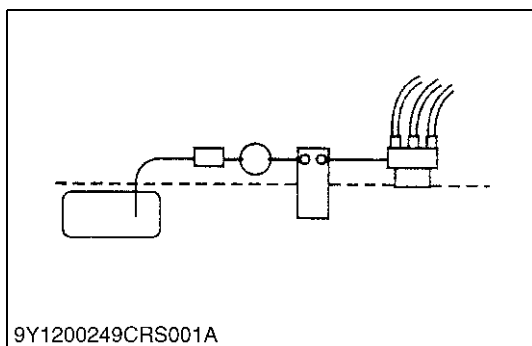
(Reference)

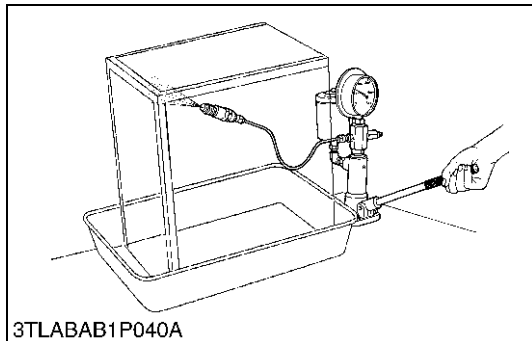
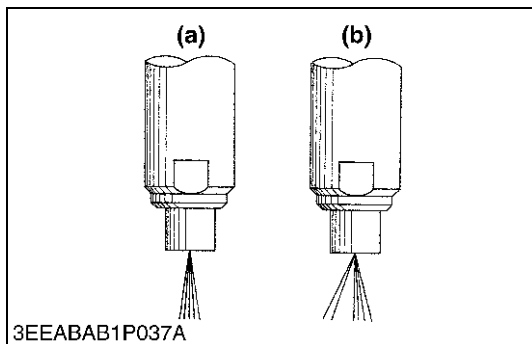
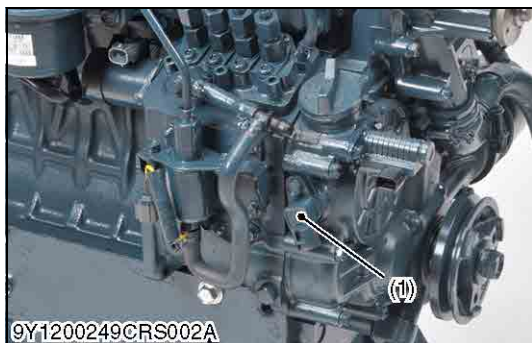
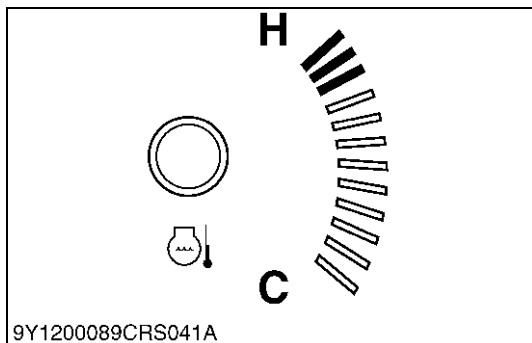
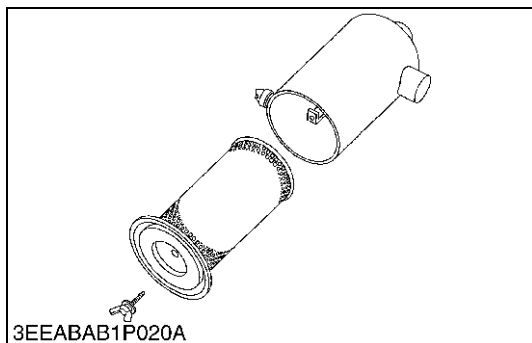
Pay attention particularly to the following two points:

- 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.

9Y1200249CRS0064US0





6. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

(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.

9Y1200249CRS0065US0

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.

9Y1200249CRS0066US0

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.

- Engine Speed Sensor

9Y1200249CRS0067US0

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.

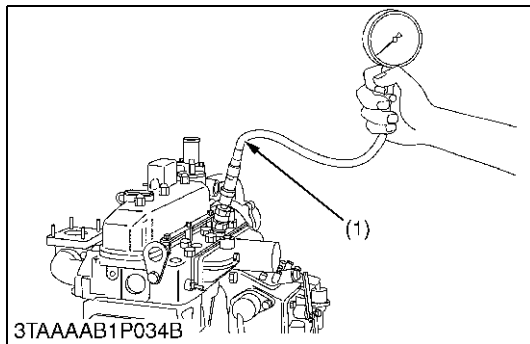
Factory specification	Engine vibration and noise are increased and the rotation speed is reduced when the injection for the corresponding cylinder is stopped. The same results must be attained from all the cylinders.
-----------------------	---

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

9Y1200249CRS0068US0



10. Check the Engine

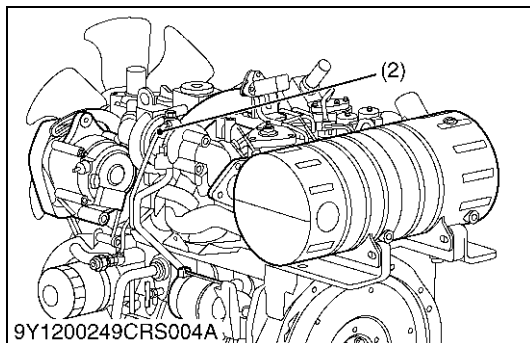
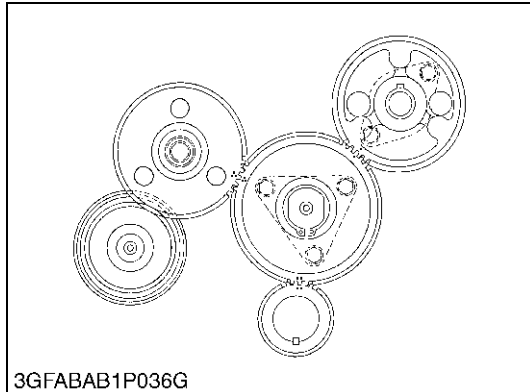
1. Check the compression pressure, valve clearance, valve timing, the inside of the engine and engine oil viscosity.
2. Check the timing gear.
3. Check the turbocharger.

OK	Normal.
NG	Repair or replace the related parts.

(1) Compression Tester

(2) Turbocharger

9Y1200249CRS0069US0



(7) Poor Acceleration (Insufficient Output)

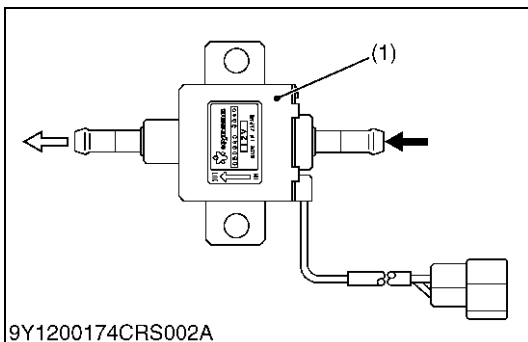
Possible causes:

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

9Y1200249CRS0070US0



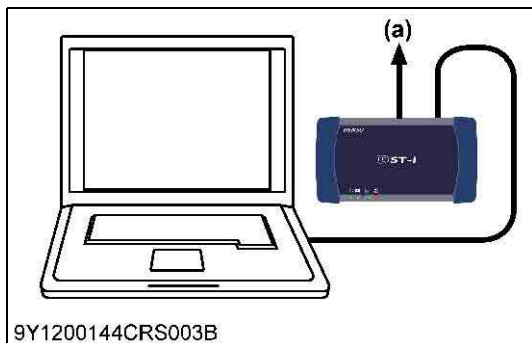
1. Check the Fuel Feed Pump Operation

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-S191)

(1) Fuel Feed Pump

9Y1200249CRS0071US0



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

9Y1200249CRS0072US0

3. Check the Accelerator Position Sensor



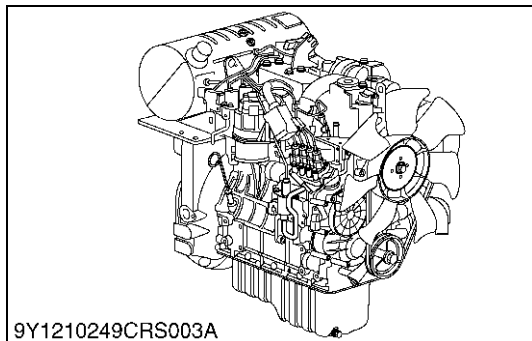
CAUTION

- 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.

9Y1200249CRS0073US0

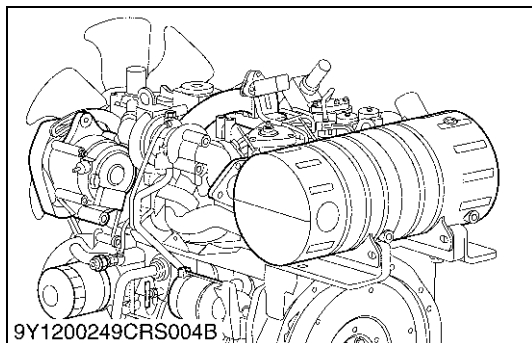


4. Check the Idle Condition

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)

9Y1200249CRS0074US0

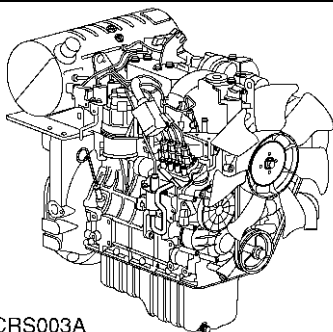


5. Malfunction Verification - 1

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) <ul style="list-style-type: none"> • 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".

9Y1200249CRS0075US0



9Y1210249CRS003A

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.

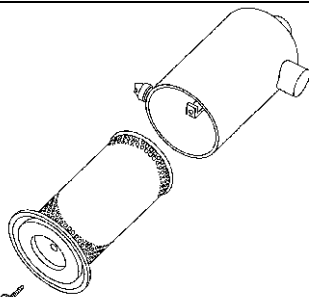
9Y1200249CRS0076US0

7. Check the Intake System

- Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

OK	Go to "8. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

9Y1200249CRS0077US0



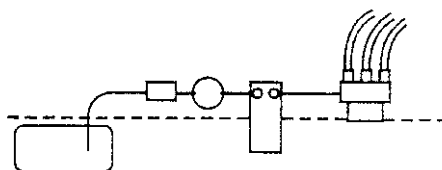
3EEABAB1P020A

8. Check the Fuel System

- Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

OK	Go to "9. Check the Engine Speed Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

9Y1200249CRS0078US0



9Y1200249CRS001A

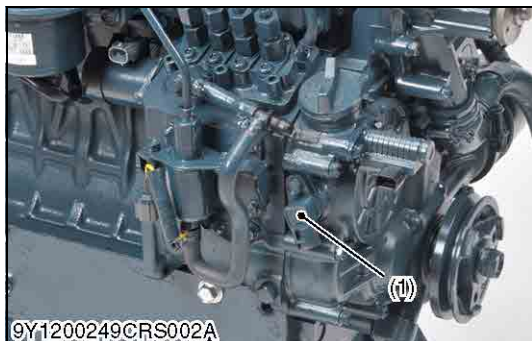
9. Check the Engine Speed Sensor

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

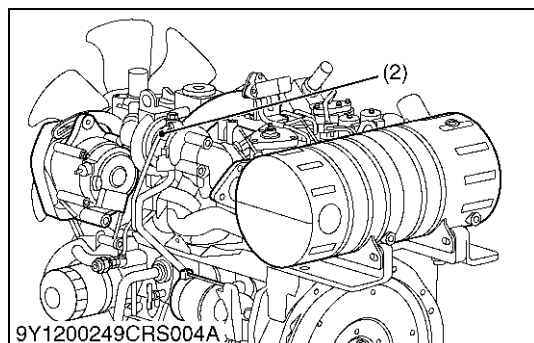
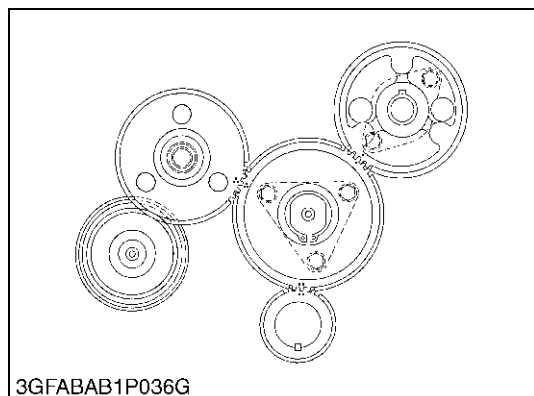
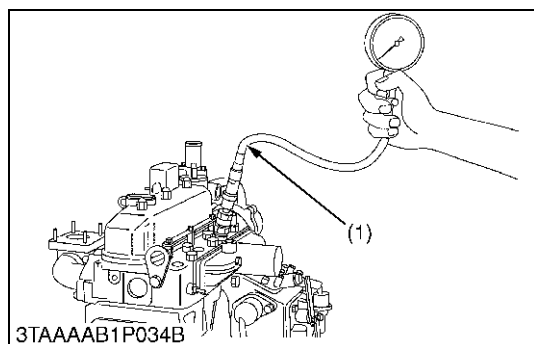
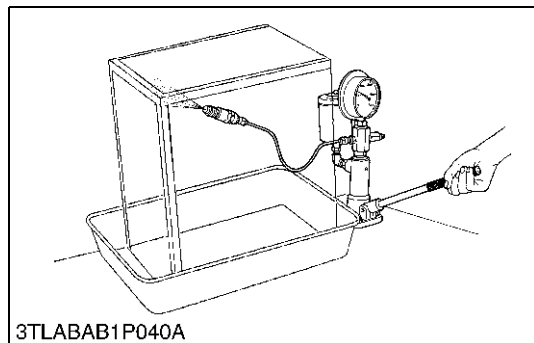
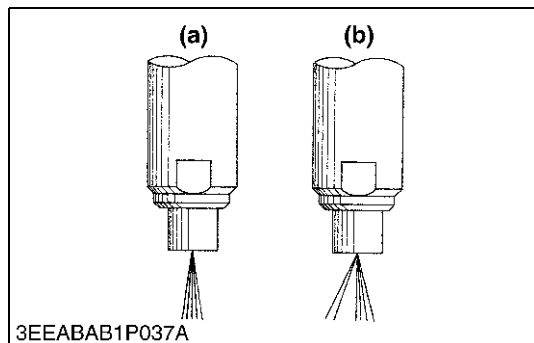
OK	Go to "10. Check the Injection Nozzle and Fuel Pipes".
NG	Repair and replacement of the engine speed sensor-related parts.

- (1) Engine Speed Sensor

9Y1200249CRS0079US0



9Y1200249CRS002A



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

9Y1200249CRS0080US0

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

9Y1200249CRS0081US0

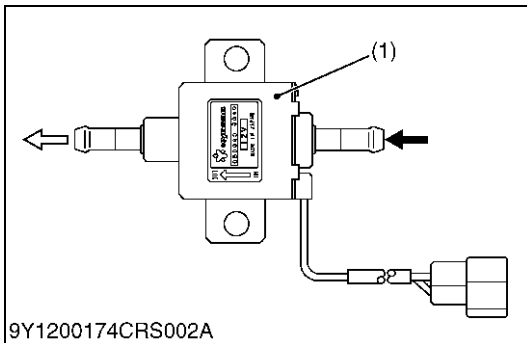
(8) Abnormal Black Smoke Emitted

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)



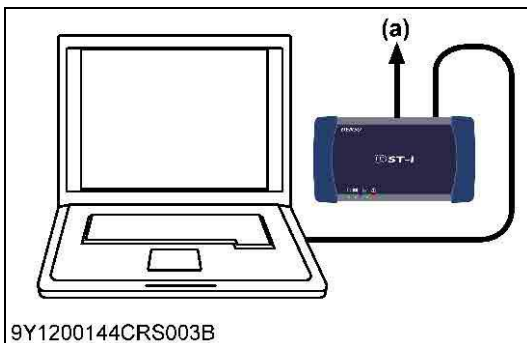
1. Check the Fuel Feed Pump Operation

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-S191)

(1) Fuel Feed Pump



2. Check the DTC

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

Factory specification	No DTC is output.
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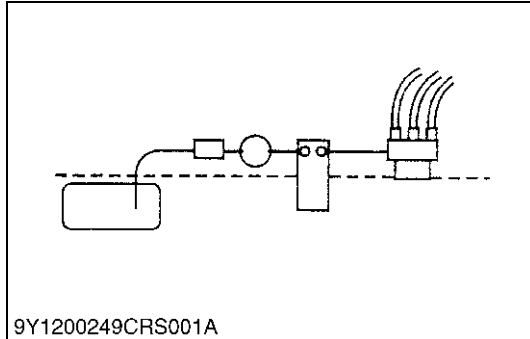
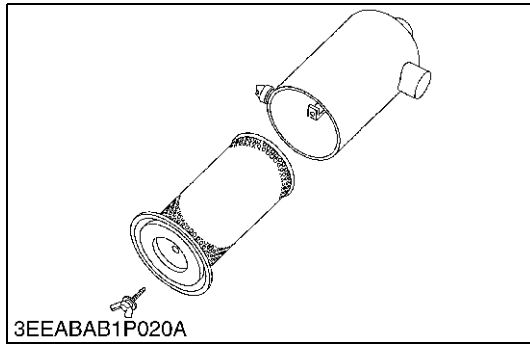
DTC presently existing

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



3. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

OK	Go to "4. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

9Y1200249CRS0085US0

4. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

OK	Go to "5. Check the Accelerator Position Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

9Y1200249CRS0086US0

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.

9Y1200249CRS0087US0

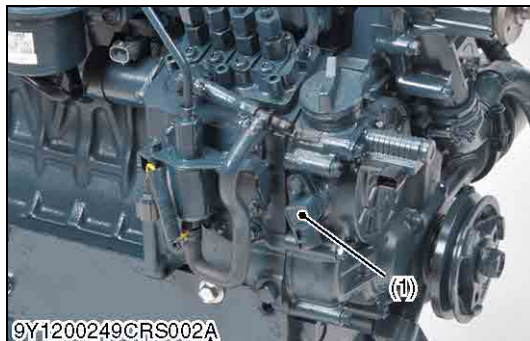
6. Check the Engine Speed Sensor

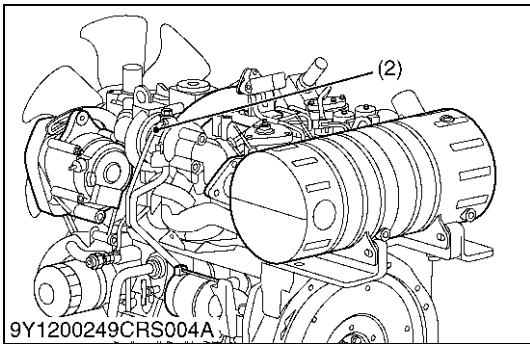
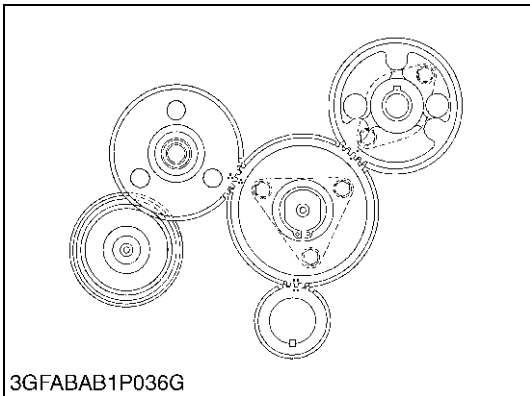
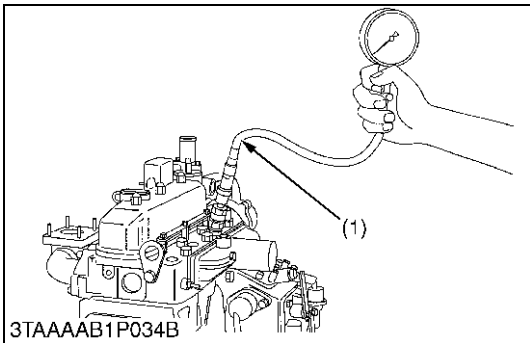
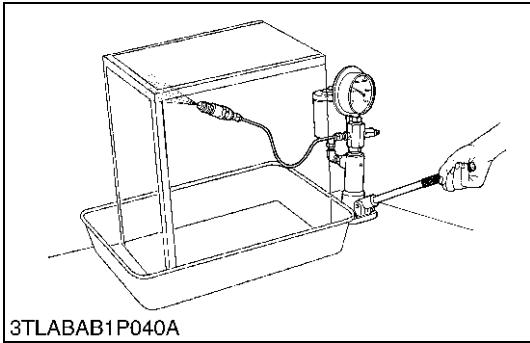
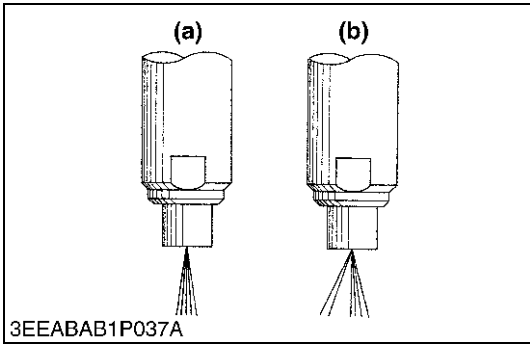
1. Refer to DTC P0335, and implement checking of the engine speed sensor.

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

9Y1200249CRS0088US0





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

9Y1200249CRS0089US0

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

9Y1200249CRS0090US0

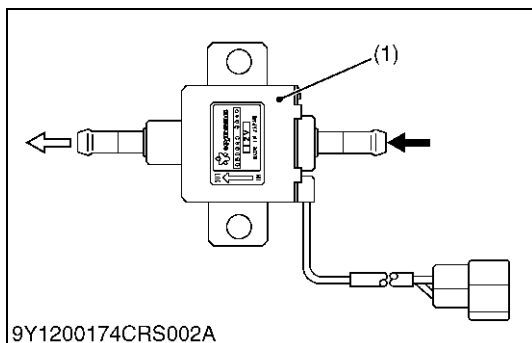
(9) Abnormal White Smoke Emitted

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)

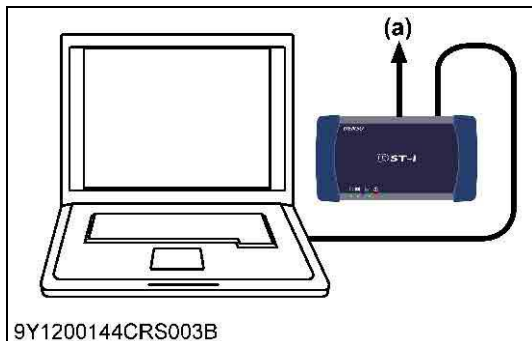


1. Check the Fuel Feed Pump Operation

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-S191)

(1) Fuel Feed Pump



2. Check the DTC

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

Factory specification	No DTC is output.
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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

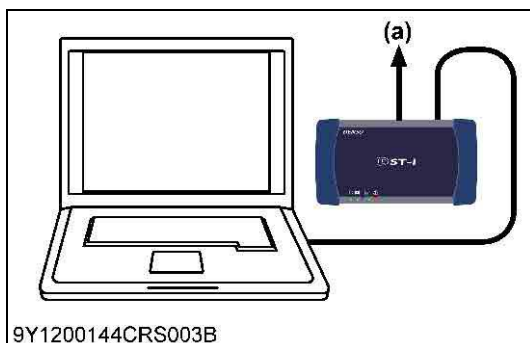
OK	Go to "3. Check the Starting Assist Device".
NG	Reproduce defect by referring to the freeze frame data, etc.

(a) CAN1 Connector

9Y1200249CRS0091US0

9Y1200249CRS0092US0

9Y1200249CRS0093US0



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

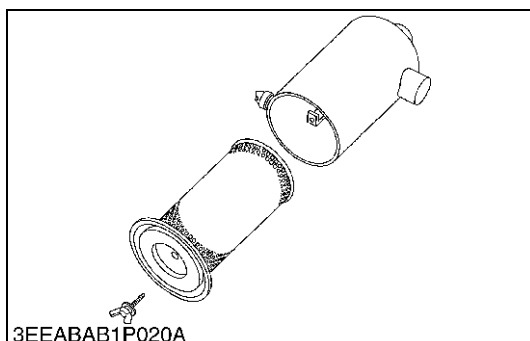
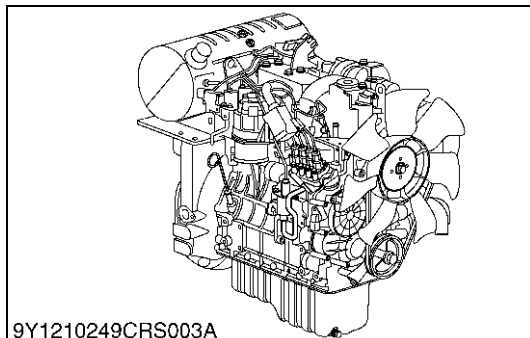
9Y1200249CRS0094US0

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)

9Y1200249CRS0095US0

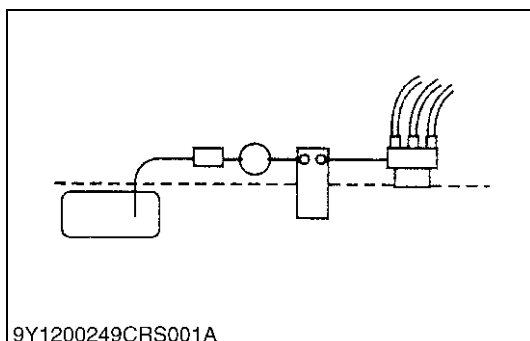


5. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

OK	Go to "6. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

9Y1200249CRS0096US0

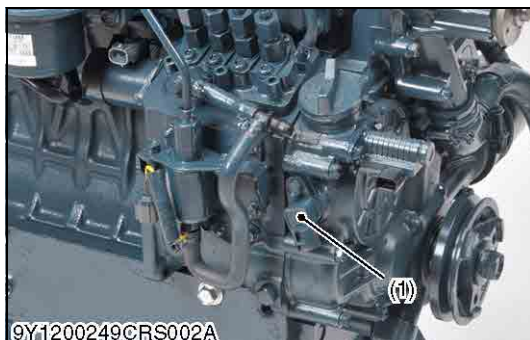


6. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

OK	Go to "7. Check the Engine Speed Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

9Y1200249CRS0097US0



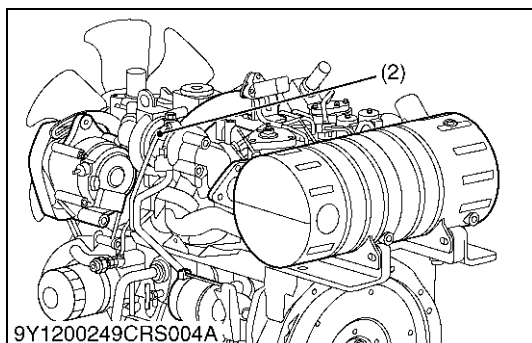
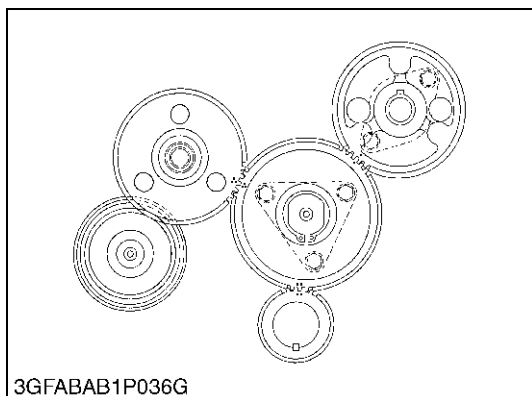
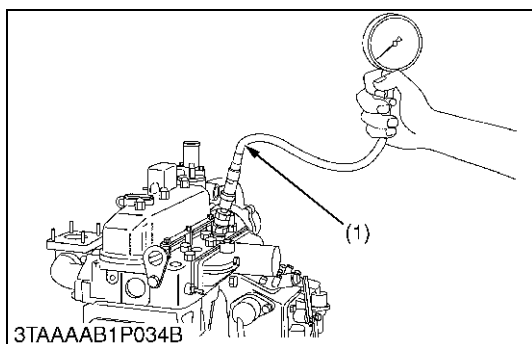
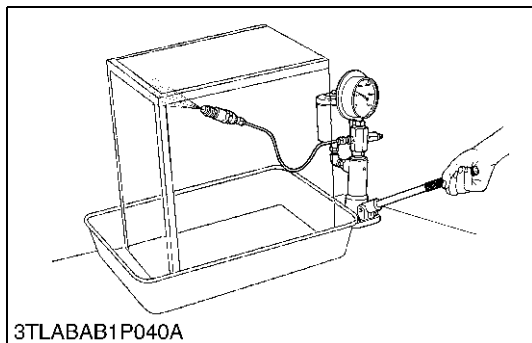
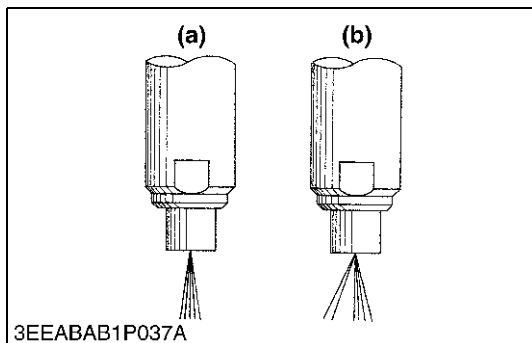
7. Check the Engine Speed Sensor

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

9Y1200249CRS0098US0



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

9Y1200249CRS009US0

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

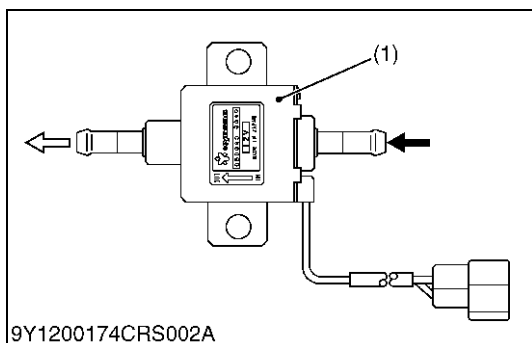
9Y1200249CRS0100US0

(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)

9Y1200249CRS0101US0



9Y1200174CRS002A

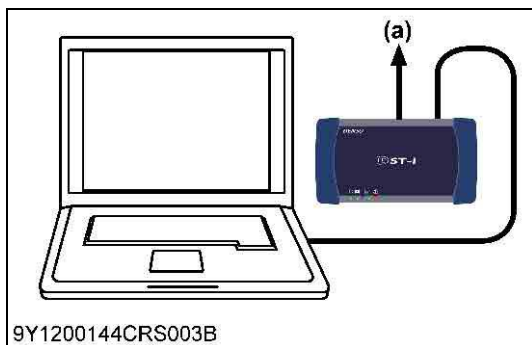
1. Check the Fuel Feed Pump Operation

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-S191)

(1) Fuel Feed Pump

9Y1200249CRS0102US0



9Y1200144CRS003B

2. Check the DTC

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

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

DTC presently existing

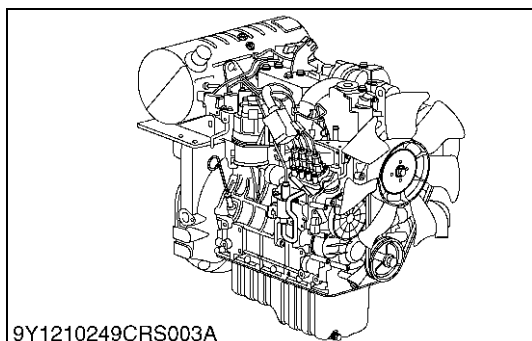
OK	Go to "3. Check the idle condition".
NG	Check in accordance with the troubleshooting procedures for each DTC.

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

9Y1200249CRS0103US0



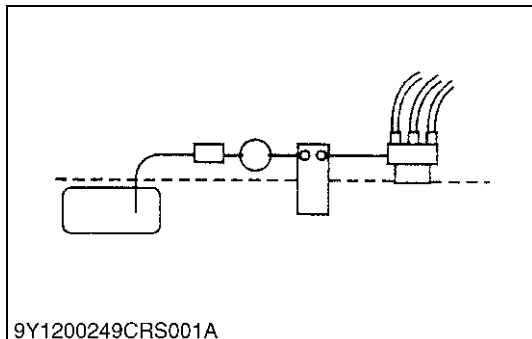
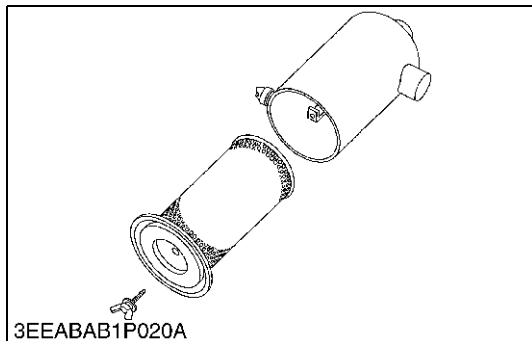
9Y1210249CRS003A

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)

9Y1200249CRS0104US0



4. Check the Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

OK	Go to "5. Check the Fuel System".
NG	Repair in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

9Y1200249CRS0105US0

5. Check the Fuel System

1. Check in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

OK	Go to "6. Check the Accelerator Position Sensor".
NG	Repair in accordance with "6.[2] FUEL SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S188)

9Y1200249CRS0106US0

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.

9Y1200249CRS0107US0

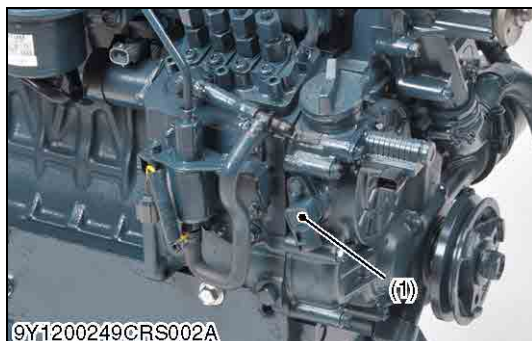
7. Check the Engine Speed Sensor

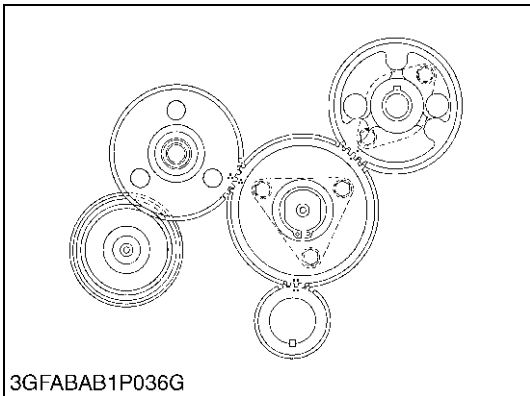
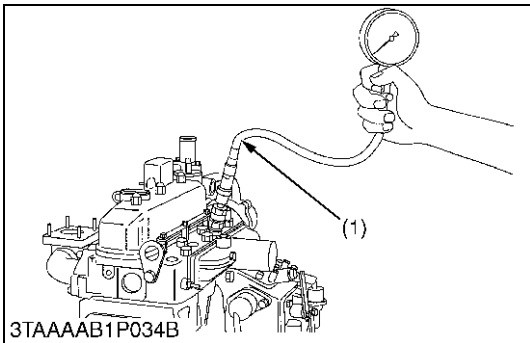
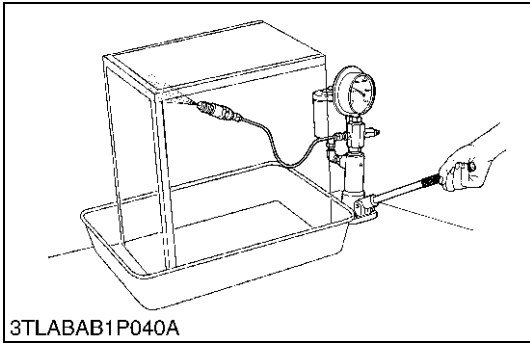
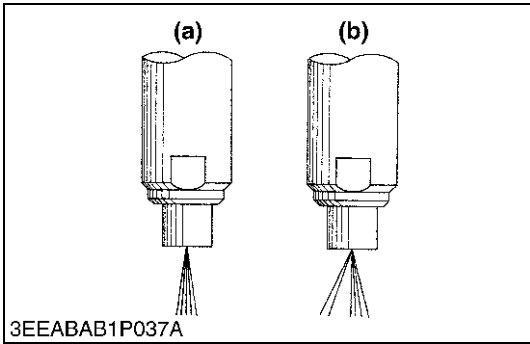
1. Refer to DTC P0335, and implement checking of the engine speed sensor.

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

9Y1200249CRS0108US0





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

9Y1200249CRS0109US0

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

9Y1200249CRS0110US0

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		<ul style="list-style-type: none"> GND short circuit of sensor / harness 	<ul style="list-style-type: none"> Open circuit or +B short circuit of sensor / harness
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Voltage of coolant temperature sensor is 0.1 V or less 	<ul style="list-style-type: none"> Voltage of coolant temperature sensor is 4.8 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> 2.8 sec. or more 	<ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> Sending dummy message: water temp. is 125 °C (257 °F) DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0111US0

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		<ul style="list-style-type: none"> Overheat of engine coolant temperature
DTC Set Preconditions		<ul style="list-style-type: none"> Coolant temperature sensor is normal Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Engine coolant temperature $\geq 125\text{ }^{\circ}\text{C}$ (257 $^{\circ}\text{F}$)
Time to action or number of error detection		<ul style="list-style-type: none"> 5 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Buzzer: off and on
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output Overheat
Engine Warning Light		<ul style="list-style-type: none"> OFF
Recovery from error		<ul style="list-style-type: none"> Diag counter = zero
Delay time for recovery		
Remark		

9Y1200249CRS0112US0

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		

9Y1200249CRS0113US0

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		<ul style="list-style-type: none"> • Open circuit or short circuit of sensor / harness. • Failure of sensor.
DTC Set Preconditions		<ul style="list-style-type: none"> • Sensor supply voltage VCC is normal • Engine is running
DTC set parameter		<ul style="list-style-type: none"> • No recognition of Ne sensor pulse
Time to action or number of error detection		<ul style="list-style-type: none"> • 2 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> • Engine stop • DPF active regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> • Engine stall
Engine Warning Light		<ul style="list-style-type: none"> • ON
Recovery from error		<ul style="list-style-type: none"> • Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0114US0

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		<ul style="list-style-type: none"> GND short circuit of sensor / harness. 	<ul style="list-style-type: none"> Open circuit or +B short circuit of sensor / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> 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 10 sec. or 100°C (212°F) $\leq T2 \leq 800^{\circ}\text{C}$ (1472°F): continues longer than 10 sec. or 100°C (212°F) $\leq T4 \leq 800^{\circ}\text{C}$ (1472°F): continues longer than 10 sec.
DTC set parameter		<ul style="list-style-type: none"> DPF inlet temp. sensor (T1) voltage: 0.08 V or less 	<ul style="list-style-type: none"> DPF inlet temp. sensor (T1) voltage: 4.92 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> 5 sec. or more 	<ul style="list-style-type: none"> 120 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0°C (32°F) <ul style="list-style-type: none"> Output limitation: Approximately 50 % of normal condition DPF active regeneration is inhibited 	[Default value] 0°C (32°F) <ul style="list-style-type: none"> Output limitation: Approximately 50 % of normal condition DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0115US0

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		<ul style="list-style-type: none"> GND short circuit of sensor / harness. 	<ul style="list-style-type: none"> Open circuit or +B short circuit of sensor / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> 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 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. 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 10 sec.
DTC set parameter		<ul style="list-style-type: none"> DOC inlet temp. sensor (T0) voltage: 0.08 V or less 	<ul style="list-style-type: none"> DOC inlet temp. sensor (T0) voltage: 4.92 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> 5 sec. or more 	<ul style="list-style-type: none"> 120 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) <ul style="list-style-type: none"> DPF active regeneration is inhibited 	[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) <ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0116US0

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		<ul style="list-style-type: none"> Open circuit, short circuit or damage of harness. Failure of battery. 	<ul style="list-style-type: none"> Open circuit, short circuit or damage of harness. Failure of battery.
DTC Set Preconditions		<ul style="list-style-type: none"> Key switch is ON Starter switch is OFF Sensor supply voltage VCC is normal 20 sec. elapsed after engine starts 	<ul style="list-style-type: none"> Key switch is ON Starter switch is OFF Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Battery voltage is lower than 8 V (Normal operation) or 12 V (DPF regeneration is requested) 	<ul style="list-style-type: none"> Battery voltage: 16 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> 1 sec. or more 	<ul style="list-style-type: none"> 1 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited 	<ul style="list-style-type: none"> Output limitation: Approximately 50 % of normal condition Accel limitation = 50 % DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Diag counter = zero 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery			—
Remark			

9Y1200249CRS0117US0

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			

9Y1200249CRS0118US0

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		<ul style="list-style-type: none"> • Sensor supply voltage 1 error or recognition error
DTC Set Preconditions		<ul style="list-style-type: none"> • Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> • Voltage to sensor is below the threshold.
Time to action or number of error detection		<ul style="list-style-type: none"> • transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> • Engine stop • DPF active regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> • Engine stall
Engine Warning Light		<ul style="list-style-type: none"> • ON
Recovery from error		<ul style="list-style-type: none"> • Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0119US0

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		<ul style="list-style-type: none"> Over current in circuit of glow 	<ul style="list-style-type: none"> Open circuit or short circuit of harness
DTC Set Preconditions		<ul style="list-style-type: none"> Battery voltage is normal Sensor supply voltage VCC is normal Glow is ON 	<ul style="list-style-type: none"> Battery voltage is normal Glow is ON
DTC set parameter		<ul style="list-style-type: none"> Current at glow: 10 A or more 	<ul style="list-style-type: none"> Current at glow is 0.5 A or less when glow is activated.
Time to action or number of error detection		<ul style="list-style-type: none"> 3 sec. or more 	<ul style="list-style-type: none"> 3 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited 	<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0120US0

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				

9Y1200249CRS0121US0

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		<ul style="list-style-type: none"> • Open circuit or +B short circuit of harness. • Blower motor malfunction 	<ul style="list-style-type: none"> • Open circuit or +B short circuit of harness. • Air-blow malfunction. • Sub blower motor circuit malfunction.
DTC Set Preconditions		<ul style="list-style-type: none"> • Battery voltage is normal • Sensor supply voltage VCC is normal • Blower is activated 	<ul style="list-style-type: none"> • Battery voltage is normal • Sensor supply voltage VCC is normal • Blower motor is activated
DTC set parameter		<ul style="list-style-type: none"> • Open circuit of harness • Over current caused by short circuit 	<ul style="list-style-type: none"> • Open circuit of harness • Over current caused by short circuit
Time to action or number of error detection		<ul style="list-style-type: none"> • 1 sec. or more 	<ul style="list-style-type: none"> • 1 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> • DPF active regeneration is inhibited 	<ul style="list-style-type: none"> • DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> • ON 	<ul style="list-style-type: none"> • ON
Recovery from error		<ul style="list-style-type: none"> • Key switch turn OFF 	<ul style="list-style-type: none"> • Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0122US0

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				

9Y1200249CRS0123US0

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		<ul style="list-style-type: none"> Open circuit of solenoid valve 2 / harness. 	<ul style="list-style-type: none"> GND short circuit of harness. 	<ul style="list-style-type: none"> B+ short circuit of harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Battery voltage is normal 	<ul style="list-style-type: none"> Battery voltage is normal 	<ul style="list-style-type: none"> Battery voltage is normal
DTC set parameter		<ul style="list-style-type: none"> Open circuit of harness 	<ul style="list-style-type: none"> GND short circuit of harness 	<ul style="list-style-type: none"> B+ short circuit of harness
Time to action or number of error detection		<ul style="list-style-type: none"> 1 sec. or more 	<ul style="list-style-type: none"> 1 sec. or more 	<ul style="list-style-type: none"> 1 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited 	<ul style="list-style-type: none"> DPF active regeneration is inhibited 	<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction				
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—	—
Remark				

9Y1200249CRS0124US0

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		<ul style="list-style-type: none"> Open circuit or +B short circuit of sensor / harness. 	<ul style="list-style-type: none"> GND short circuit of sensor / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> DPF regeneration is not activated Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Burner temp. sensor (T4) voltage: 4.92 V or more 	<ul style="list-style-type: none"> Burner temp. sensor (T4) voltage: 0.08 V or less
Time to action or number of error detection		<ul style="list-style-type: none"> 120 sec. or more 	<ul style="list-style-type: none"> 5 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) <ul style="list-style-type: none"> DPF active regeneration is inhibited 	[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) <ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0125US0

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		<ul style="list-style-type: none"> Open circuit or +B short circuit of sensor / harness. 	<ul style="list-style-type: none"> GND short circuit of sensor / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Blower pressure sensor voltage: 4.8 V or more 	<ul style="list-style-type: none"> Blower pressure sensor voltage: 0.2 V or less
Time to action or number of error detection		<ul style="list-style-type: none"> 2.8 sec. or more 	<ul style="list-style-type: none"> 2.8 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 kPa (0 psi) <ul style="list-style-type: none"> DPF active regeneration is inhibited 	[Default value] 0 kPa (0 psi) <ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction		—	—
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0126US0

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		<ul style="list-style-type: none"> Open circuit or B+ short circuit of sensor / harness 	<ul style="list-style-type: none"> GND short circuit of sensor / harness. Mount condition of sensor is incorrect.
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Electric governor solenoid current: 1000 mA or less and rack position sensor voltage: 4.8 V or more 	<ul style="list-style-type: none"> Rack position sensor voltage: 0.3 V or less
Time to action or number of error detection		<ul style="list-style-type: none"> transient 	<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Engine stop 	<ul style="list-style-type: none"> Engine stop
Behaviour During Malfunction		<ul style="list-style-type: none"> Engine stall 	<ul style="list-style-type: none"> Engine stall
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0127US0

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		<ul style="list-style-type: none"> Open circuit of solenoid / harness. 	<ul style="list-style-type: none"> GND short circuit of solenoid / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal Key switch is ON No starter-SW input 	<ul style="list-style-type: none"> Sensor supply voltage VCC is normal Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> Open circuit of solenoid / harness 	<ul style="list-style-type: none"> GND short circuit of solenoid / harness
Time to action or number of error detection		<ul style="list-style-type: none"> 3 sec. or more 	<ul style="list-style-type: none"> 3 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Engine stop DPF active regeneration is inhibited 	<ul style="list-style-type: none"> Engine stop DPF active regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> Engine stall 	<ul style="list-style-type: none"> Engine stall
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0128US0

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		<ul style="list-style-type: none"> Open circuit or +B short circuit of sensor / harness. 	<ul style="list-style-type: none"> GND short circuit of sensor / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Coolant temp. $\geq 65^{\circ}\text{C}$ (149°F) Fuel reforming control is active 	<ul style="list-style-type: none"> DPF regeneration is not active Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Reformer temp. sensor (T3) voltage: 4.92 V or more 	<ul style="list-style-type: none"> Reformer temp. sensor (T3) voltage: 0.08 V or less
Time to action or number of error detection		<ul style="list-style-type: none"> 40 sec. or more 	<ul style="list-style-type: none"> 5 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0°C (32°F) <ul style="list-style-type: none"> DPF active regeneration is inhibited 	[Default value] 0°C (32°F) <ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0129US0

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		<ul style="list-style-type: none"> Abnormally high reformer temperature
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Reformer temp.: 1000 °C (1832 °F) or more
Time to action or number of error detection		<ul style="list-style-type: none"> 210 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0130US0

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		<ul style="list-style-type: none"> Abnormally high blower pressure
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Blower pressure: 55 kPa (8.0 psi) or more
Time to action or number of error detection		<ul style="list-style-type: none"> 30 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0131US0

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		<ul style="list-style-type: none"> Open circuit or B+ short circuit of relay / harness 	<ul style="list-style-type: none"> GND short circuit of relay / harness
DTC Set Preconditions		<ul style="list-style-type: none"> Battery voltage is normal Relay is OFF 	<ul style="list-style-type: none"> Battery voltage is normal Relay is ON
DTC set parameter		<ul style="list-style-type: none"> Open circuit / B+ short circuit of harness 	<ul style="list-style-type: none"> GND short circuit of harness
Time to action or number of error detection		<ul style="list-style-type: none"> 1 sec. or more 	<ul style="list-style-type: none"> 1 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited 	<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0132US0

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		<ul style="list-style-type: none"> Open circuit or GND short circuit of buzzer / harness. 	<ul style="list-style-type: none"> B+ short circuit of buzzer / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Battery voltage is normal Buzzer is OFF 	<ul style="list-style-type: none"> Battery voltage is normal Buzzer is ON
DTC set parameter		<ul style="list-style-type: none"> Open circuit / GND short circuit of harness 	<ul style="list-style-type: none"> B+ short circuit of harness
Time to action or number of error detection		<ul style="list-style-type: none"> 1 sec. or more 	<ul style="list-style-type: none"> 1 sec. or more
Limp Home Action by engine ECU (system action)			
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0133US0

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		<ul style="list-style-type: none"> Open circuit or B+ short circuit of pump / harness. 	<ul style="list-style-type: none"> GND short circuit of pump / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Battery voltage is normal Feed pump is OFF 	<ul style="list-style-type: none"> Battery voltage is normal Feed pump is ON
DTC set parameter		<ul style="list-style-type: none"> Open circuit / B+ short circuit of harness 	<ul style="list-style-type: none"> GND short circuit of harness
Time to action or number of error detection		<ul style="list-style-type: none"> 1 sec. or more 	<ul style="list-style-type: none"> 1 sec. or more
Limp Home Action by engine ECU (system action)			
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output or Engine stall 	<ul style="list-style-type: none"> Insufficient output or Engine stall
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0134US0

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		<ul style="list-style-type: none"> Reformer is not working when DPF regeneration is active.
DTC Set Preconditions		<ul style="list-style-type: none"> DPF regeneration is activated
DTC set parameter		<ul style="list-style-type: none"> Reformer temp. (T3) < 570 °C (1058 °F) three times while reforming catalyst startup sequence is activated
Time to action or number of error detection		<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0135US0

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		<ul style="list-style-type: none"> DPF temperature rising control is incomplete when DPF regeneration is active.
DTC Set Preconditions		<ul style="list-style-type: none"> DPF regeneration is activated
DTC set parameter		<ul style="list-style-type: none"> Following a condition was met while DPF regeneration is activated a. DPF inlet temp. (T1) < 190 °C (374 °F)
Time to action or number of error detection		<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0136US0

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		<ul style="list-style-type: none"> Over current in circuit of blower motor for fuel reforming
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Current in circuit of blower motor: 16 A or more
Time to action or number of error detection		<ul style="list-style-type: none"> 5 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0137US0

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		<ul style="list-style-type: none"> Fail to ignite burner (Solenoid valve 2 or ignition glow is not working.)
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal DPF regeneration is activated
DTC set parameter		<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> 30 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0138US0

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		<ul style="list-style-type: none"> • Fail to warm-up coolant temp. for DPF regeneration
DTC Set Preconditions		<ul style="list-style-type: none"> • Sensor supply voltage VCC is normal • Coolant temp. sensor is normal
DTC set parameter		<ul style="list-style-type: none"> • Coolant temp. < 50 °C (122 °F) while reformer warm-up sequence is activated
Time to action or number of error detection		<ul style="list-style-type: none"> • 2700 sec.
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> • DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> • ON
Recovery from error		<ul style="list-style-type: none"> • Diag counter = zero
Delay time for recovery		—
Remark		

9Y1200249CRS0139US0

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		<ul style="list-style-type: none"> Write failure to EEPROM
DTC Set Preconditions		<ul style="list-style-type: none"> Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> Write completion decision data to the EEPROM is invalid
Time to action or number of error detection		<ul style="list-style-type: none"> Transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Forced Idle (Accelerator=0%)
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249RSS0104US0

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		<ul style="list-style-type: none"> Excessive power consumption during DPF regeneration
DTC Set Preconditions		<ul style="list-style-type: none"> Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> Voltage drop below 12.7V at the start of regeneration Battery voltage during regeneration is 12.5V or less
Time to action or number of error detection		<ul style="list-style-type: none"> Transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Suspension of Regeneration
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> DPF regeneration is successful completion
Delay time for recovery		—
Remark		

9Y1200249RSS0105US0

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		<ul style="list-style-type: none"> • EEPROM check sum error
DTC Set Preconditions		<ul style="list-style-type: none"> • Battery voltage is normal • Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> • EEPROM check sum error
Time to action or number of error detection		<ul style="list-style-type: none"> • 0.5 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> • Engine stop • DPF active regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> • Engine stall
Engine Warning Light		<ul style="list-style-type: none"> • ON
Recovery from error		<ul style="list-style-type: none"> • Key switch turn OFF
Delay time for recovery		—
Remark		

9Y1200249CRS0140US0

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		<ul style="list-style-type: none"> GND short circuit or open circuit of sensor / harness 	<ul style="list-style-type: none"> B+ short circuit of sensor / harness
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Voltage of accelerator position sensor 1: 0.3 V or less 	<ul style="list-style-type: none"> Voltage of accelerator position sensor 1: 4.8 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> transient 	<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Forced Idle(Accelerator = 0 %) (When both position sensor 1 and 2 are failed) 	<ul style="list-style-type: none"> Forced Idle(Accelerator = 0 %) (When both position sensor 1 and 2 are failed)
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output 	<ul style="list-style-type: none"> Insufficient output
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Diag counter = zero 	<ul style="list-style-type: none"> Diag counter = zero
Delay time for recovery			
Remark			

9Y1200249CRS0141US0

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		<ul style="list-style-type: none"> GND short circuit or open circuit of sensor / harness 	<ul style="list-style-type: none"> B+ short circuit of sensor / harness
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Voltage of accelerator position sensor 2: 0.3 V or less 	<ul style="list-style-type: none"> Voltage of accelerator position sensor 2: 4.8 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> transient 	<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Forced Idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed) 	<ul style="list-style-type: none"> Forced Idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output 	<ul style="list-style-type: none"> Insufficient output
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Diag counter = zero 	<ul style="list-style-type: none"> Diag counter = zero
Delay time for recovery			
Remark			

9Y1200249CRS0142US0

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		<ul style="list-style-type: none"> GND short circuit of sensor 	<ul style="list-style-type: none"> B+ short circuit of sensor
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> Barometric pressure sensor voltage: 0.2 V or less 	<ul style="list-style-type: none"> Barometric pressure sensor voltage: 4.8 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> 2.8 sec. or more 	<ul style="list-style-type: none"> 2.8 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 65 kPa (9.4 psi) <ul style="list-style-type: none"> Output limitation Approximately 50 % of normal condition DPF active regeneration is inhibited 	[Default value] 65 kPa (9.4 psi) <ul style="list-style-type: none"> Output limitation Approximately 50 % of normal condition DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Diag counter = zero 	<ul style="list-style-type: none"> Diag counter = zero
Delay time for recovery			
Remark		<ul style="list-style-type: none"> Default value is lower than normal condition considering using at high altitude. 	<ul style="list-style-type: none"> Default value is lower than normal condition considering using at high altitude.

9Y1200249CRS0143US0

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		<ul style="list-style-type: none"> GND short circuit of sensor / harness. 	<ul style="list-style-type: none"> Open circuit or +B short circuit of sensor / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal 	<ul style="list-style-type: none"> 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 $^{\circ}\text{F}$) $\leq T4 \leq 800\text{ }^{\circ}\text{C}$ (1472 $^{\circ}\text{F}$): continues longer than 10 sec.
DTC set parameter		<ul style="list-style-type: none"> DPF outlet temp. sensor (T2) voltage: 0.08 V or less 	<ul style="list-style-type: none"> DPF outlet temp. sensor (T2) voltage: 4.92 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> 5 sec. or more 	<ul style="list-style-type: none"> 120 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) <ul style="list-style-type: none"> DPF active regeneration is inhibited 	[Default value] 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) <ul style="list-style-type: none"> DPF active regeneration is inhibited
Behaviour During Malfunction			
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0144US0

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		<ul style="list-style-type: none"> GND short circuit of sensor / harness. 	<ul style="list-style-type: none"> Open circuit or +B short circuit of sensor / harness.
DTC Set Preconditions		<ul style="list-style-type: none"> Sensor supply voltage VCC is normal No starter-SW input 	<ul style="list-style-type: none"> Sensor supply voltage VCC is normal No starter-SW input
DTC set parameter		<ul style="list-style-type: none"> DPF differential pressure sensor voltage: 0.21 V or less 	<ul style="list-style-type: none"> DPF differential pressure sensor voltage: 4.8 V or more
Time to action or number of error detection		<ul style="list-style-type: none"> 2.8 sec. or more 	<ul style="list-style-type: none"> 2.8 sec. or more
Limp Home Action by engine ECU (system action)		[Default value] 0 kPa (0 psi) <ul style="list-style-type: none"> Output limitation Approximately 50 % of normal condition DPF active regeneration is inhibited 	[Default value] 0 kPa (0 psi) <ul style="list-style-type: none"> Output limitation Approximately 50 % of normal condition DPF active regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output 	<ul style="list-style-type: none"> Insufficient output
Engine Warning Light		<ul style="list-style-type: none"> ON 	<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF 	<ul style="list-style-type: none"> Key switch turn OFF
Delay time for recovery		—	—
Remark			

9Y1200249CRS0145US0

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		<ul style="list-style-type: none"> DOC inlet temp. (T0) high
DTC Set Preconditions		<ul style="list-style-type: none"> Exhaust gas temp. sensor T0, T1 and T2 are normal Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> DOC inlet temp. (T0): 700 °C (1292 °F) or more
Time to action or number of error detection		<ul style="list-style-type: none"> 2 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Engine stop Inhibit starter relay activation until exhaust temp. reduces down to 300 °C (572 °F) DPF active regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> Engine stall Inhibits cranking until down to 300 °C (572 °F)
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Under 300 °C (572 °F) & key switch turn OFF
Delay time for recovery		
Remark		

9Y1200249CRS0146US0

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		<ul style="list-style-type: none"> DPF inlet temp. (T1) high
DTC Set Preconditions		<ul style="list-style-type: none"> Exhaust gas temp. sensor T0, T1 and T2 are normal Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> DPF inlet temp. (T1): 715 °C (1319 °F) or more
Time to action or number of error detection		<ul style="list-style-type: none"> 9 min. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Engine stop Inhibit starter relay activation until exhaust temp. reduces down to 300 °C (572 °F) DPF active regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> Engine stall Inhibits cranking until down to 300 °C (572 °F)
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Under 300 °C (572 °F) & key switch turn OFF
Delay time for recovery		
Remark		

9Y1200249CRS0147US0

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		<ul style="list-style-type: none"> DPF outlet temp. (T2) high
DTC Set Preconditions		<ul style="list-style-type: none"> Exhaust gas temp. sensor T0, T1 and T2 are normal Sensor supply voltage VCC is normal
DTC set parameter		<ul style="list-style-type: none"> DPF outlet temp. (T2): 820 °C (1508 °F) or more
Time to action or number of error detection		<ul style="list-style-type: none"> 2 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Engine stop Inhibit starter relay activation until exhaust temp. reduces down to 300 °C (572 °F) DPF active regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> Engine stall Inhibits cranking until down to 300 °C (572 °F)
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Under 300 °C (572 °F) & key switch turn OFF
Delay time for recovery		
Remark		

9Y1200249CRS0148US0

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		<ul style="list-style-type: none"> PM accumulation level 3
DTC Set Preconditions		<ul style="list-style-type: none"> Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> PM accumulation more than trigger level Regeneration level = 3
Time to action or number of error detection		<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Output limitation Approximately 50 % of normal condition DPF auto regeneration is inhibited Buzzer: off and on
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output
Engine Warning Light		<ul style="list-style-type: none"> BLINK
Recovery from error		<ul style="list-style-type: none"> Diag counter = zero (DPF regeneration is finished normally)
Delay time for recovery		
Remark		<ul style="list-style-type: none"> To minimize PM out put

9Y1200249CRS0149US0

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		<ul style="list-style-type: none"> PM accumulation level 4
DTC Set Preconditions		<ul style="list-style-type: none"> Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> PM accumulation more than trigger level Regeneration level = 4
Time to action or number of error detection		<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Output limitation Approximately 50 % of normal condition DPF auto regeneration is inhibited Buzzer: off and on
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Diag counter = zero (DPF regeneration is finished normally)
Delay time for recovery		
Remark		<ul style="list-style-type: none"> To minimize PM out put

9Y1200249CRS0150US0

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		<ul style="list-style-type: none"> PM accumulation level 5
DTC Set Preconditions		<ul style="list-style-type: none"> Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> PM accumulation more than trigger level Regeneration level = 5
Time to action or number of error detection		<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Output limitation Approximately 50 % of normal condition DPF active regeneration is inhibited Buzzer: off and on
Behaviour During Malfunction		<ul style="list-style-type: none"> Insufficient output
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF (Reset by Service tool)
Delay time for recovery		
Remark		<ul style="list-style-type: none"> To minimize PM out put Engine is not stopped forcibly by ECU. However KUBOTA strongly recommends operator to stop engine as soon as possible.

9Y1200249CRS0151US0

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		

9Y1200249CRS0152US0

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		<ul style="list-style-type: none"> • All exhaust gas temp. sensor failure simultaneously
DTC Set Preconditions		<ul style="list-style-type: none"> • Sensor supply voltage VCC is normal • Engine speed is 1400 min⁻¹ (rpm) or more • Fuel quantity is 10mm³/st or more • Coolant temperature is 65 °C (149 °F) or more • 100 sec. elapsed after engine starts
DTC set parameter		<ul style="list-style-type: none"> • T0 / T1 / T2 / T4 temp. sensor failure (sensor low) simultaneously
Time to action or number of error detection		<ul style="list-style-type: none"> • 100 sec. or more
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> • Output limitation • Approximately 75 % of normal condition • DPF active regeneration is inhibited
Behaviour During Malfunction		
Engine Warning Light		<ul style="list-style-type: none"> • ON
Recovery from error		<ul style="list-style-type: none"> • Diag counter = zero
Delay time for recovery		
Remark		

9Y1200249CRS0153US0

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		—
Remark		

9Y1200249CRS0154US0

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		<ul style="list-style-type: none"> Time interval from the end time to the start time of the regeneration
DTC Set Preconditions		<ul style="list-style-type: none"> Key switch is ON
DTC set parameter		<ul style="list-style-type: none"> Regeneration time interval within 30 min. occurs three times continuously
Time to action or number of error detection		<ul style="list-style-type: none"> transient
Limp Home Action by engine ECU (system action)		<ul style="list-style-type: none"> Output limitation Approximately 50 % of normal condition Auto DPF regeneration is inhibited
Behaviour During Malfunction		<ul style="list-style-type: none"> Worsening exhaust gas performance (NOx)
Engine Warning Light		<ul style="list-style-type: none"> ON
Recovery from error		<ul style="list-style-type: none"> Key switch turn OFF (Reset by Service tool)
Delay time for recovery		
Remark		

9Y1200249CRS0155US0

[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-S102
P0118	110	3		
P0217	110	0	Engine overheat	1-S105
P0219	190	0	Engine overrun	1-S106
P0335	636	8	Engine speed sensor abnormality	1-S107
P0543	3242	4	Exhaust gas temperature sensor 1 (T1) abnormality	1-S109
P0544	3242	3		
P0546	4765	4	Exhaust gas temperature sensor 0 (T0) abnormality	1-S112
P0547	4765	3		
P0562	168	4	Battery voltage abnormality	1-S115
P0563	168	3		
P0605	628	2	ECU FRASH ROM and CPU abnormality	1-S117
P0606	1077	2		
P0642	3509	4	Sensor supply voltage low	1-S118
P1801	523766	6	Circuit of burner glow abnormality	1-S119
P1802	523766	5		
P1803	523767	5	Circuit of fuel pump for fuel reformer abnormality	1-S121
P1804	523767	4		
P1805	523767	3	Blower motor mulfunction	1-S123
P1806	523768	5		
P1807	523768	5	Circuit of solenoid valve 1 for fuel reformer abnormality	1-S125
P1808	523770	5		
P1809	523770	4	Circuit of solenoid valve 2 for fuel reformer abnormality	1-S127
P1810	523770	3		
P1811	523769	5	Circuit of solenoid valve 2 for fuel reformer abnormality	1-S127
P1812	523769	4		
P1813	523769	3	Burner temperature sensor abnormality	1-S129
P1815	523762	3		
P1816	523762	4	Blower pressure sensor abnormality	1-S132
P1818	523764	3		
P1819	523764	4	Rack position sensor abnormality	1-S135
P1827	523773	3		
P1828	523773	4	Electric governor solenoid circuit abnormality	1-S138
P1830	523771	5		
P1831	523771	6		

ISO 14229 P-Code	J1939-73		Name	Reference Page
	SPN	FMI		
P1832	523763	3	Reformer temperature sensor abnormality	1-S140
P1833	523763	4		
P1834	523753	0	Reformer temperature abnormally	1-S143
P1835	523751	0	Blower pressure abnormal	1-S144
P1836	523765	3	Circuit of glow relay for fuel reforming abnormality	1-S145
P1837	523765	4		
P1838	523759	4	Buzzer circuit abnormality	1-S147
P1839	523759	3		
P1840	523761	3	Feed pump circuit abnormality	1-S149
P1841	523761	4		
P1844	523755	2	Reformer abnormal	1-S151
P1845	523756	2	Fail to rise DPF temperature	1-S152
P1846	523768	6	Over current in circuit of blower motor	1-S153
P1848	523757	2	Fail to ignite burner	1-S154
P1849	523750	2	Low coolant temp. for DPF regeneration	1-S155
P1850	523749	2	EEP write error	1-S156
P1851	523748	2	Excessive power consumption during regeneration	1-S157
P1990	523700	13	EEPROM check sum error	1-S158
P2122	91	4	Accelerator position sensor 1 abnormality	1-S159
P2123	91	3		
P2127	29	4	Accelerator position sensor 2 abnormality	1-S162
P2128	29	3		
P2228	108	4	Barometric pressure sensor error	1-S165
P2229	108	3		
P242C	3246	4	Exhaust gas temperature sensor 2 (T2) abnormality	1-S167
P242D	3246	3		
P2454	3251	4	Differential pressure sensor 1 abnormality	1-S170
P2455	3251	3		
P3002	4765	0	Exhaust gas temperature sensor 0: Emergency high	1-S173
P3003	3242	0	Exhaust gas temperature sensor 1: Emergency high	1-S175
P3004	3246	0	Exhaust gas temperature sensor 2: Emergency high	1-S177
P3006	3701	15	Excessive PM3	1-S179
P3007	3701	16	Excessive PM4	1-S180
P3008	3701	0	Excessive PM5	1-S181
P3013	523590	16	Parked regeneration time out	1-S182
P3018	523599	0	All exhaust gas temperature sensor failure	1-S184
P3023	523601	0	High exhaust gas temperature after emergency high temperature DTC	1-S185
P3024	523602	0	High frequency of regeneration	1-S186

9Y1200249RSS0106US0

(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

9Y1200249CRS0176US0

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

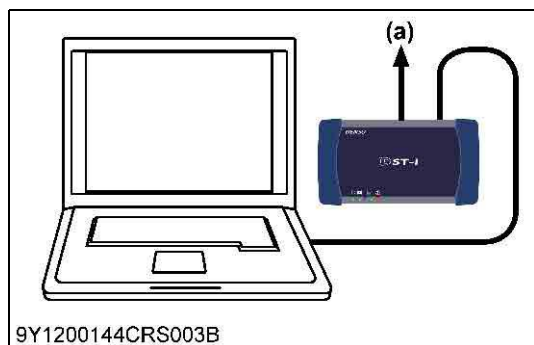
Limp home action by engine ECU (system action):

- 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

9Y1200249CRS0177US0



1. Check the Coolant Temperature Sensor Signals

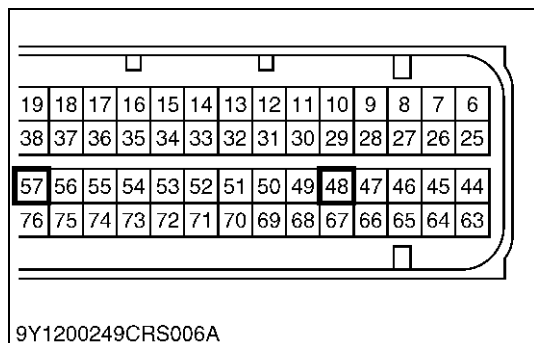
- Place the key switch in the ON position, and check the "Coolant temperature" and "Coolant temperature sensor output voltage" on the diagnosis tool data monitor.

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	Replace the ECU.
NG	Go to "2. Measure the Resistance Between Terminals".	

(a) CAN1 Connector

9Y1200249CRS0179US0



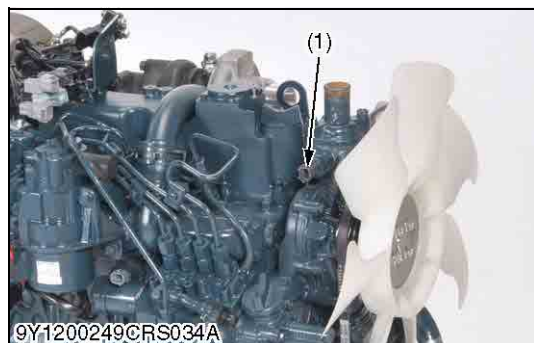
2. Measure the Resistance Between Terminals

- Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket, and 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".

9Y1200249CRS0180US0



3. Check the Sensor

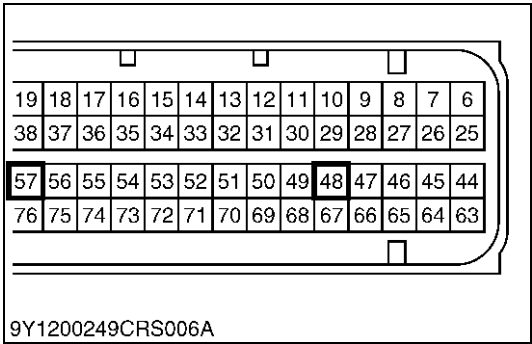
- Turn the key switch OFF, remove the connector from the sensor side and measure the resistance between the terminals on the sensor side.

Factory specification	
Temperature	Resistance
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

9Y1200249CRS0181US0



4. Measure the ECU Terminal Voltage

1. Plug the ECU wiring harness connector into socket again, unplug the sensor connector, and measure the voltage between ECU terminals No.48 and No.57 at the ECU 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.

9Y1200249CRS0182US0

(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 $\geq 125\text{ }^{\circ}\text{C}$ ($257\text{ }^{\circ}\text{F}$)

Engine warning light:

- ON

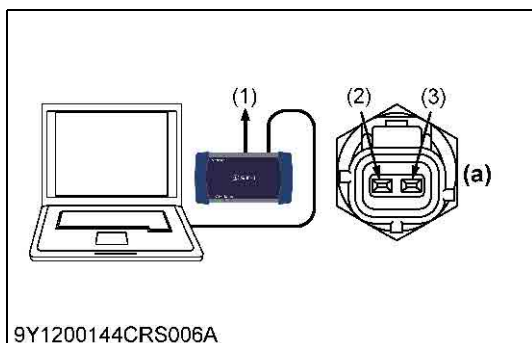
Limp home action by engine ECU (system action):

- Buzzer: Off and on

Recovery from error:

- Diagnostic counter = zero

9Y1200249CRS0183US0



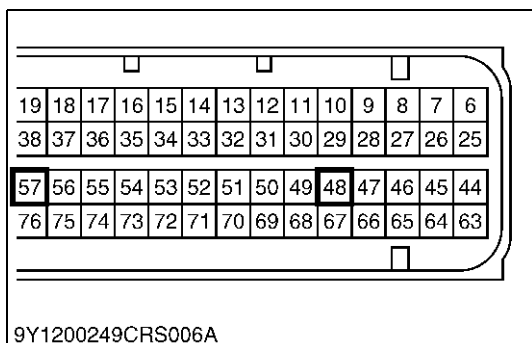
1. Check the Coolant Temperature Sensor Characteristics for An Error

1. Refer to DTC P0117, P0118, and check the 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) No.48
- (3) No.57

(a) Terminal Layout



9Y1200249CRS0185US0

(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

9Y1200249CRS0186US0



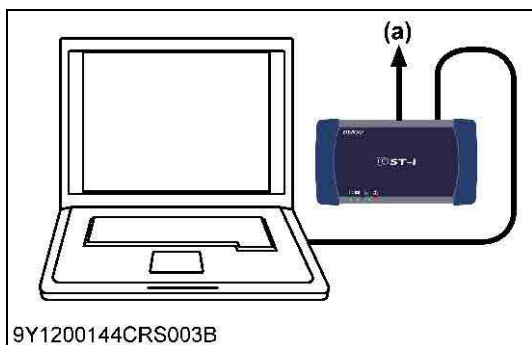
9Y1200249CRS021A

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.

9Y1200249RSS0014US0



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

9Y1200249CRS0187US0

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.

9Y1200249CRS0188US0

(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

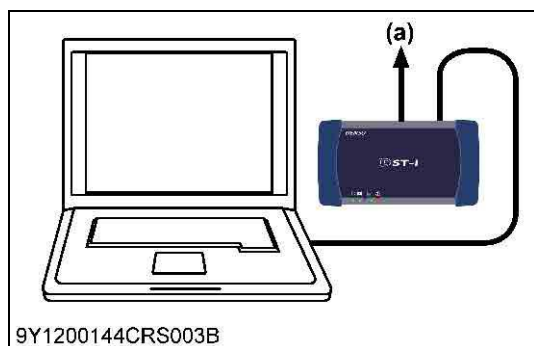
NOTE

- Engine will stop if NE fail

Recovery from error:

- Key switch turn off

9Y1200249CRS0189US0



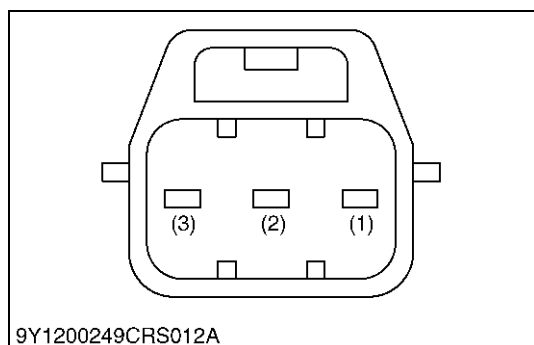
1. Check the Engine Speed Sensor Signals

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

9Y1200249CRS0191US0



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 A-VCC1 terminal and NE- terminal 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) No.16
(2) No.54
(3) No.16

(a) Terminal Layout

9Y1200249CRS0192US0



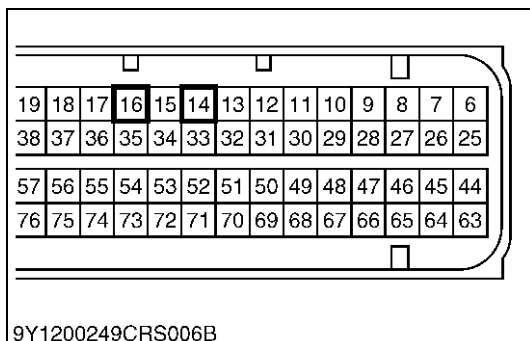
3. Measure the ECU Terminal Voltage

1. Place the key switch in the OFF position, and unplug the ECU wiring harness connector 1 (1) from the socket.
2. Place the key switch in the ON position, and measure the voltage between ECU terminals No.14 and No.16.

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

- (1) ECU Wiring Harness Connector 1 (Engine Side) (2) ECU Wiring Harness Connector 2 (Machine Side)

9Y1200249CRS0193US0

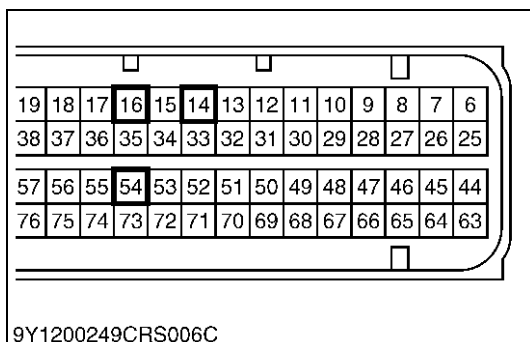


4. Check the Connectors

1. Check ECU terminals No.14, No.16 and No.54 (at the ECU side) and the connectors (at the wiring harness side) 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.

9Y1200249CRS0194US0

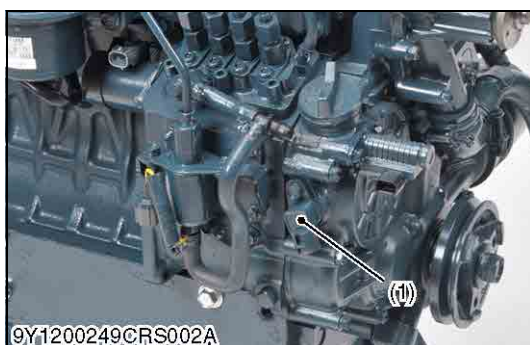
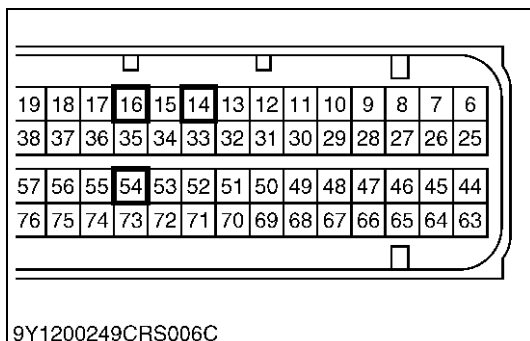


5. Check the Wiring Harness

1. Check the wiring harness being connected to ECU 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.

9Y1200249CRS0195US0



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 pulser and the sensor?
 - Are there any pulser gear abnormalities?

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

- (1) Engine Speed Sensor

9Y1200249CRS0196US0

(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

9Y1200249CRS0197US0

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 10 sec. or 100 °C (212 °F) ≤ T2 ≤ 800 °C (1472 °F): continues longer than 10 sec. or 100 °C (212 °F) ≤ T4 ≤ 800 °C (1472 °F): continues longer than 10 sec.

DTC set parameter:

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

Engine warning light:

- ON

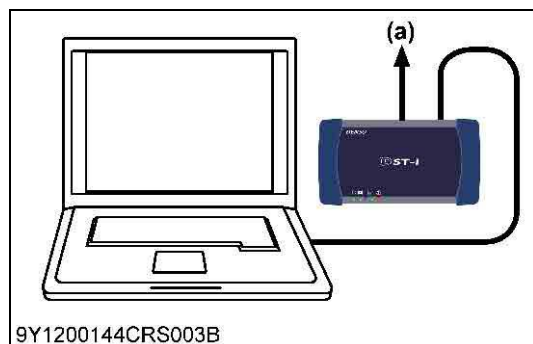
Limp home action by engine ECU (system action):

- 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

9Y1200249CRS0198US0



1. Check the Exhaust Gas Temperature Sensor Signals

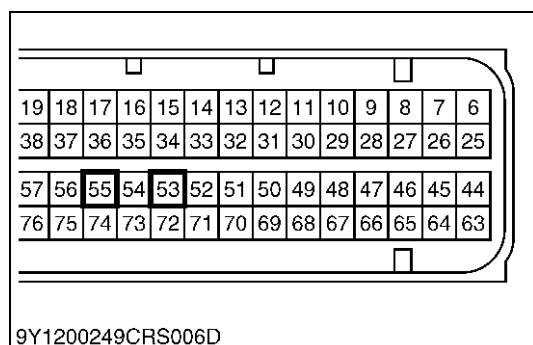
- Place the key switch in the ON position, and check the "Exhaust gas temperature" and "Exhaust gas temperature sensor output voltage" on the diagnosis tool data monitor.

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

9Y1200249CRS0200US0



2. Measure the Resistance Between Terminals

- Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket, and 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".

9Y1200249CRS0201US0

3. Check the Sensor

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

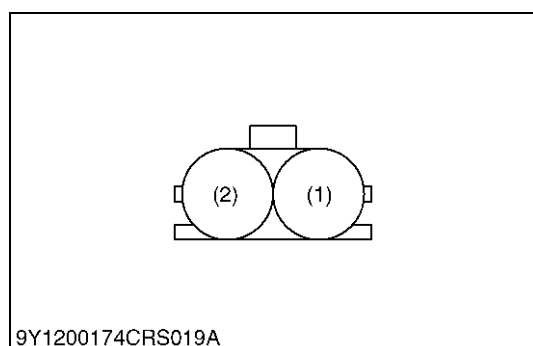
Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

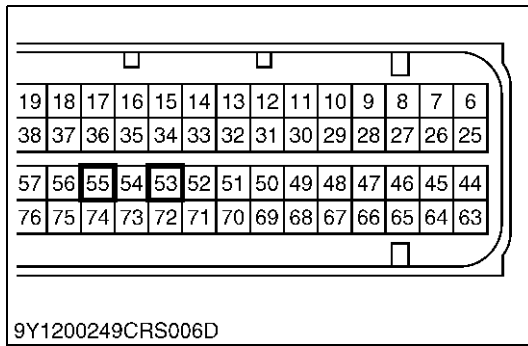
OK	Wiring harness open circuit or connector fault → Check and repair.
NG	Exhaust gas temperature sensor fault → Replace the exhaust gas temperature sensor 1 (T1).

(1) No.53

(2) No.55

9Y1200249CRS0202US0





4. Measure the ECU Terminal Voltage

1. Plug the ECU wiring harness connector into socket again, unplug the sensor connector, and measure the voltage between ECU terminals No.55 and No.53 at the ECU 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.

9Y1200249CRS0203US0

(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

9Y1200249CRS0204US0

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 10 sec. or 100 °C (212 °F) ≤ T2 ≤ 800 °C (1472 °F): continues longer than 10 sec. or 100 °C (212 °F) ≤ T4 ≤ 800 °C (1472 °F) continues longer than 10 sec.

DTC set parameter:

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

Engine warning light:

- ON

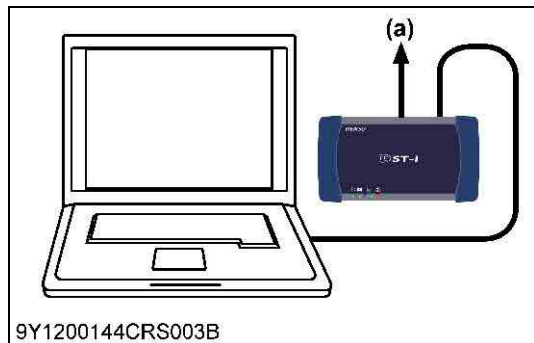
Limp home action by engine ECU (system action):

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

Recovery from error:

- Key switch turn OFF

9Y1200249CRS0205US0



1. Check the Exhaust Gas Temperature Sensor Signals

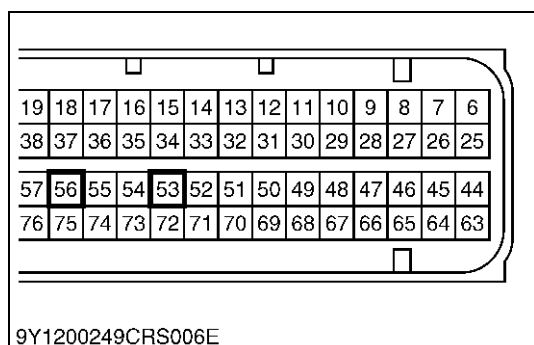
- Place the key switch in the ON position, and check the "Exhaust gas temperature" and "Exhaust gas temperature sensor output voltage" on the diagnosis tool data monitor.

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

9Y1200249CRS0207US0



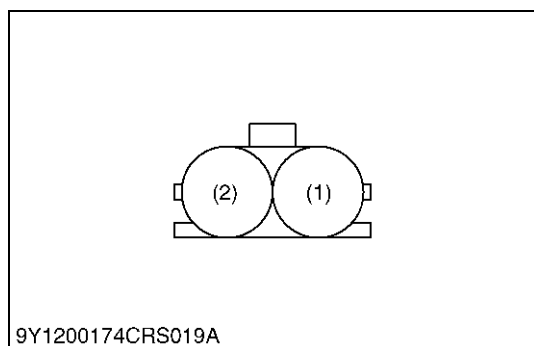
2. Measure the Resistance Between Terminals

- Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket, and 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".

9Y1200249CRS0208US0



3. Check the Sensor

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

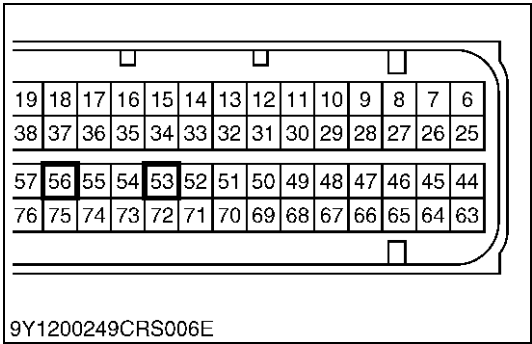
Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

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) No.56

(2) No.53

9Y1200249CRS0209US0



4. Measure the ECU Terminal Voltage

1. Plug the ECU wiring harness connector into socket again, unplug the sensor connector, and measure the voltage between ECU terminals No.56 and No.53 at the ECU 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.

9Y1200249CRS0210US0

(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

9Y1200249CRS0211US0

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

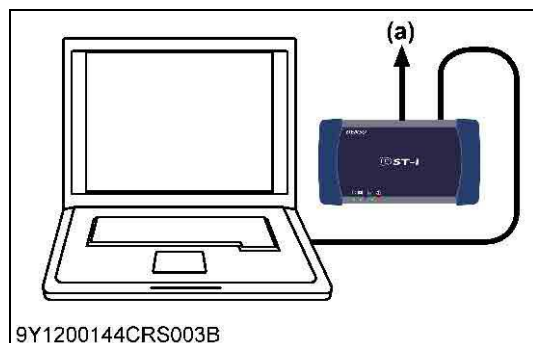
Limp home action by engine ECU (system action):

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

Recovery from error:

- Key switch turn OFF

9Y1200249CRS0212US0



1. Check the ECU Data

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. Then, check the "Battery voltage" status on the data monitor.
2. Change the engine operation status, and check the "Battery voltage".

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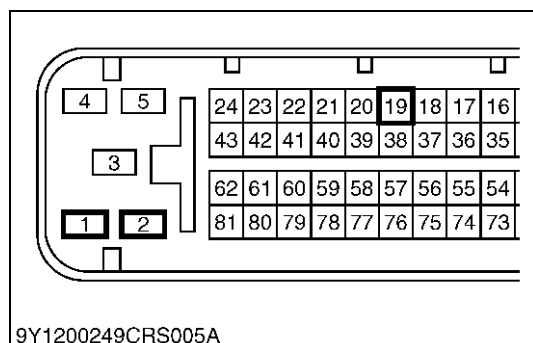
■ NOTE

- 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

9Y1200249CRS0214US0



2. Check the ECU Terminal Voltage (Part 1)

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

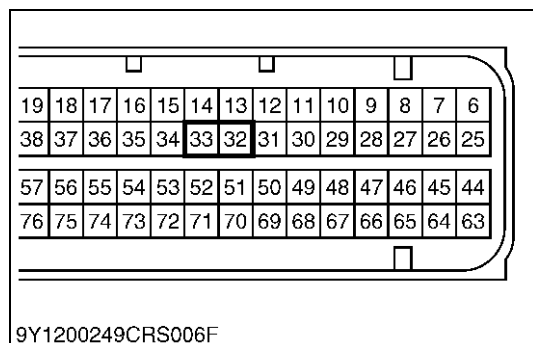
Factory specification	8 V or higher, 15 V or lower (except intense cold temperature)
-----------------------	---

■ 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)".	

9Y1200249CRS0215US0



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.

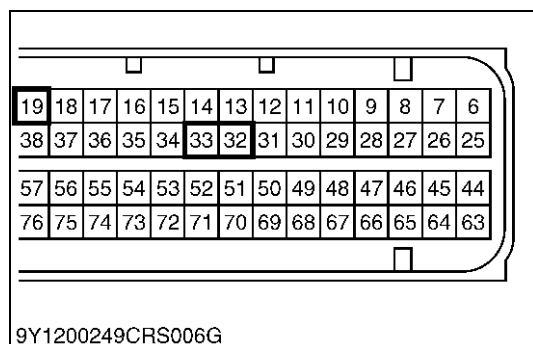
Factory specification	Always 0.5 V or lower
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■ NOTE

- 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.

9Y1200249CRS0216US0



(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

9Y1200249CRS0217US0

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

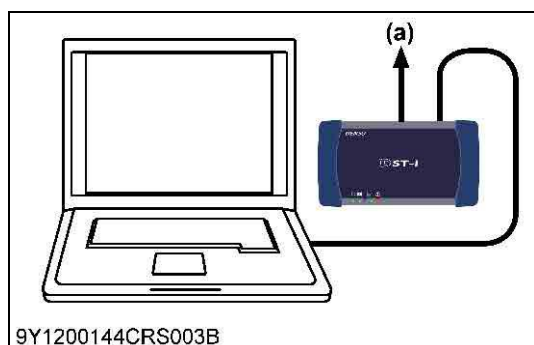
Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249CRS0218US0



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

9Y1200249CRS0219US0

(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

9Y1200249CRS0220US0



9Y1200249CRS022A

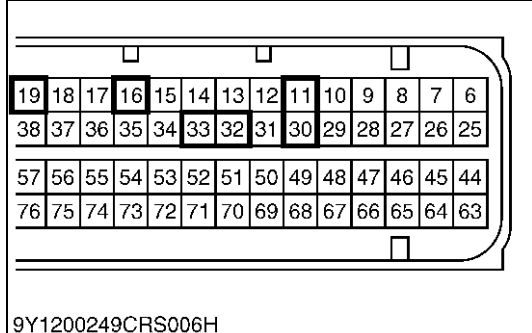
1. Measure the ECU Terminal Voltage

1. Place the key switch in the OFF position, and unplug the ECU wiring harness connector 1 (1) from the socket.
2. Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.11 / No.16 / No.30 and No.19 / No.32 / No.33.

Factory specification	Approx. 5 V
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OK	Check the wiring harness (ECU terminal E13) for a short. → Repair the faulty area.
NG	Check the harness connectors and ECU pins. ↓
OK	Faulty ECU → Replace.
NG	Repair or replace the wiring harness, or replace the ECU.

9Y1200249CRS0222US0



9Y1200249CRS006H

(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: 10A 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

9Y1200249CRS0325US0

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

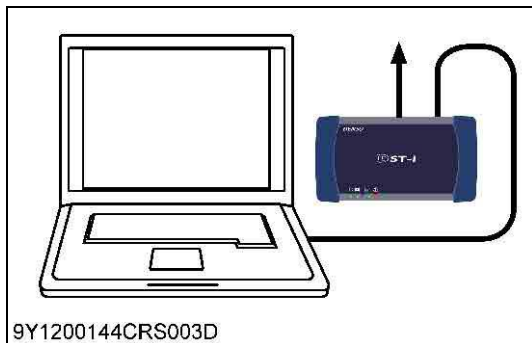
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0015US0



1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
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".

9Y1200249RSS0016US0

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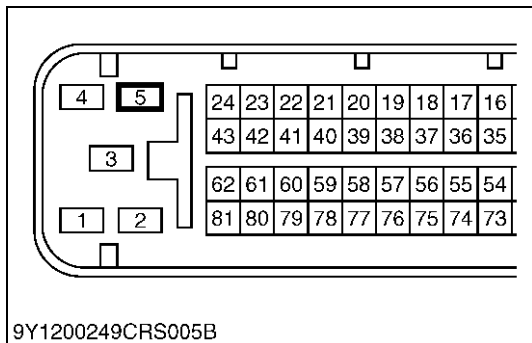
OK	Go to "3. Check the wire harness".
NG	Replace the burner glow plug.



CAUTION

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

9Y1200249RSS0017US0



3. Check the wire harness

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

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

OK	Replace the ECU.
NG	Replace the wiring harness.

9Y1200249RSS0018US0

(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

9Y1200249CRS0326US0

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

9Y1200249RSS0019US0

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

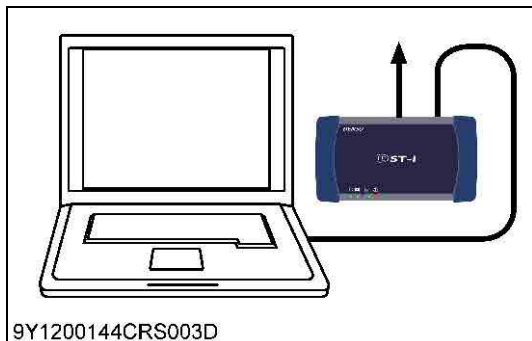
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0020US0

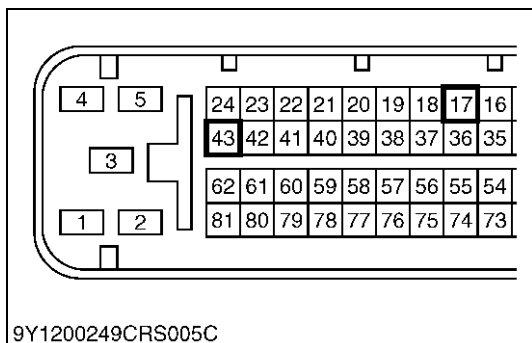


1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

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

9Y1200249RSS0021US0



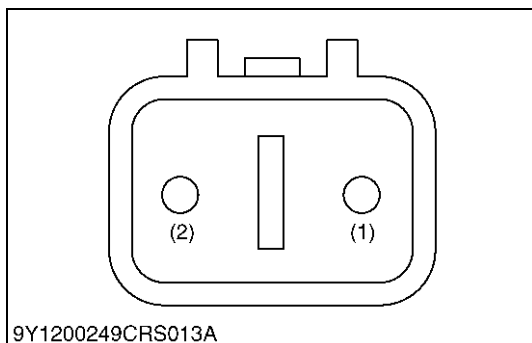
2. Check the resistance between terminals

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 No.43.

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

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

9Y1200249RSS0022US0



3. Measure the resistance of fuel pump for fuel reformer

1. 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) No.17

(2) IG

9Y1200249RSS0023US0

(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

9Y1200249CRS0327US0

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

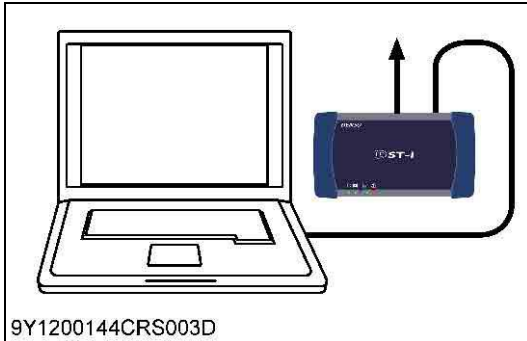
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0024US0

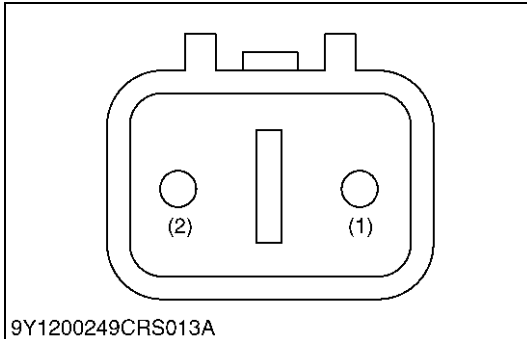


1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
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".

9Y1200249RSS0025US0



2. Measure the resistance of blower motor

1. Measure the resistance of blower motor.

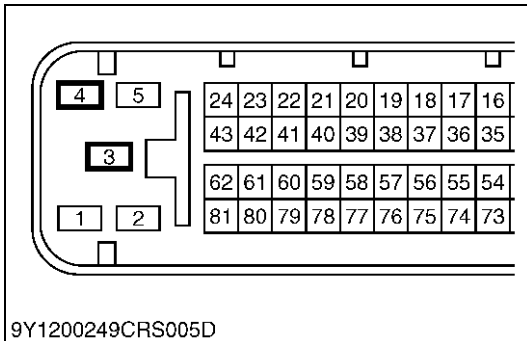
Factory specification	0.7 ~ 0.9 Ω
-----------------------	-------------

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

(1) No.3(+)

(2) No.4(-)

9Y1200249RSS0026US0



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.

9Y1200249RSS0027US0

(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

9Y1200249CRS0328US0

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

9Y1200249RSS0028US0

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

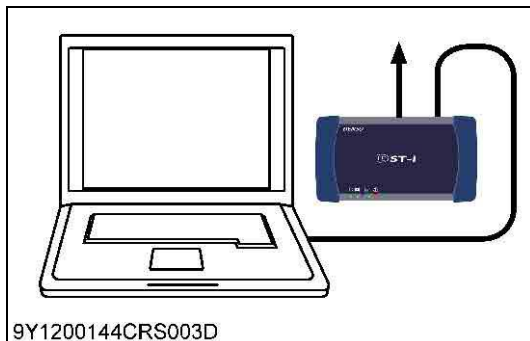
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0029US0

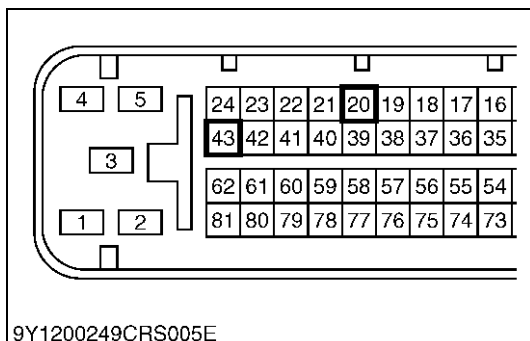


1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

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

9Y1200249RSS0030US0



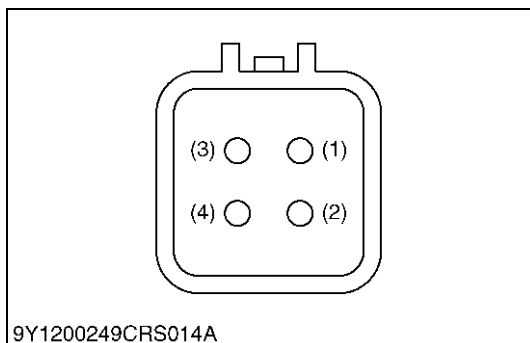
2. Check the resistance between terminals

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".

9Y1200249RSS0031US0



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

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

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

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

- (1) IG
(2) IG

- (3) No.21
(4) No.20

9Y1200249RSS0032US0

(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

9Y1200249CRS0329US0

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

9Y1200249RSS0033US0

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

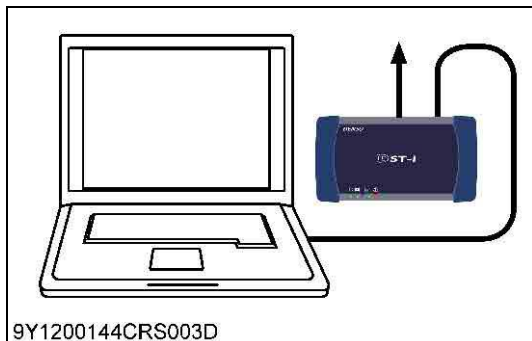
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0034US0

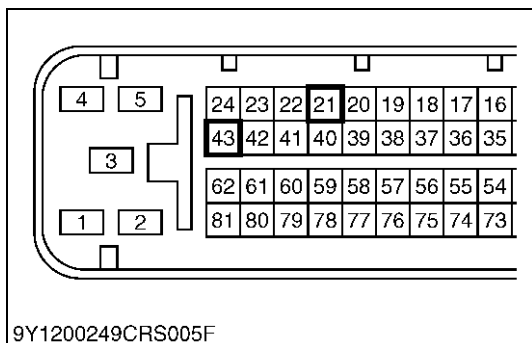


1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

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

9Y1200249RSS0035US0



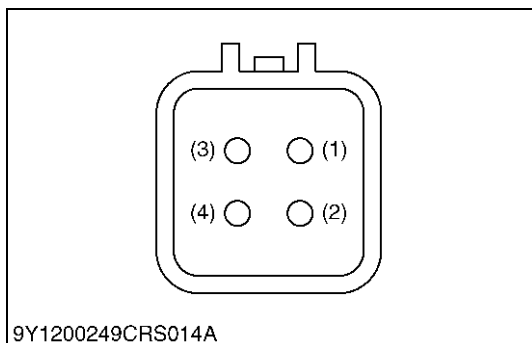
2. Check the resistance between terminals

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".

9Y1200249RSS0036US0



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

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

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

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

(1) IG
(2) IG

(3) No.21
(4) No.20

9Y1200249RSS0037US0

(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

9Y1200249CRS0330US0

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

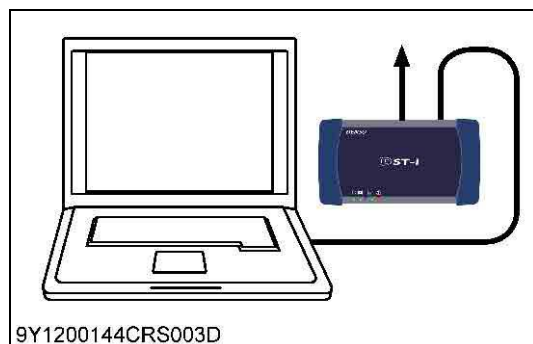
Limp home action by engine ECU (system action):

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

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0038US0



9Y1200144CRS003D

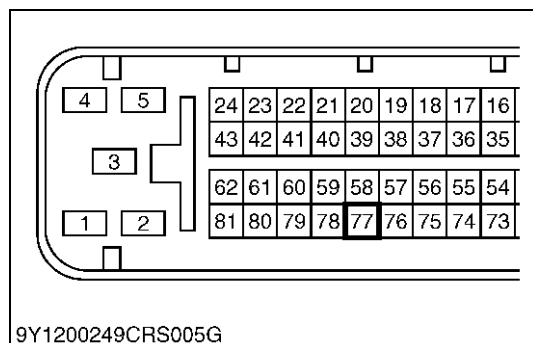
1. Check the burner temperature sensor signals

- 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".	

9Y1200249RSS0039US0



9Y1200249CRS005G

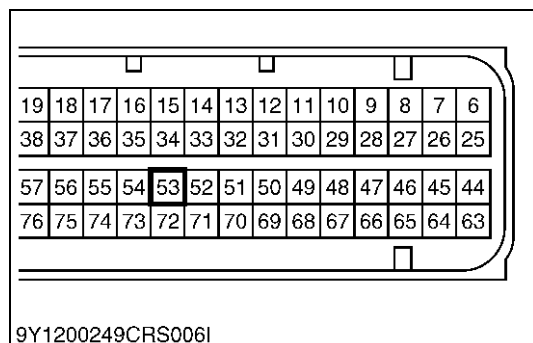
2. Check the resistance between terminals

- Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
- Measure the resistance between 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".

9Y1200249RSS0040US0



9Y1200249CRS006I

3. Measure the resistance of burner temperature sensor

- Measure the resistance of burner temperature sensor.

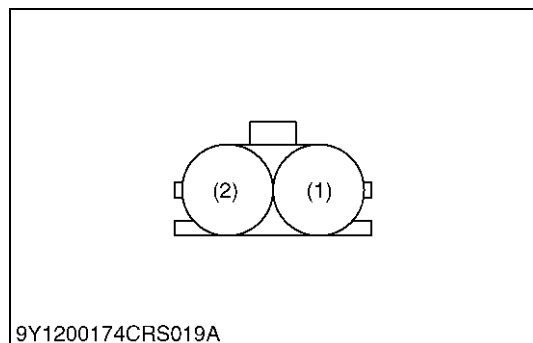
Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

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

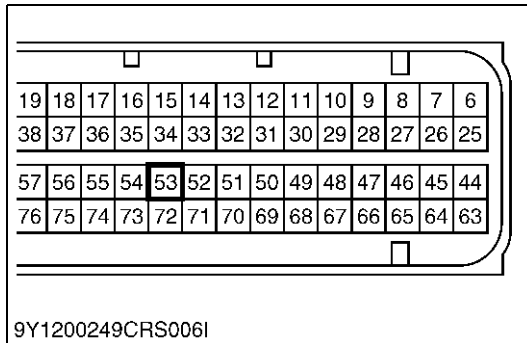
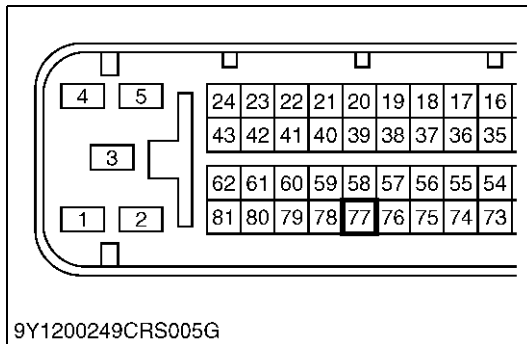
(1) No.77

(2) No.53

9Y1200249RSS0041US0



9Y1200174CRS019A



4. Measure the ECU terminal voltage

1. Plug the ECU wiring harness connector into socket again, unplug the sensor connector, and measure the voltage between ECU terminal No.77 and No.53.

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.

9Y1200249RSS0042US0

(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

9Y1200249CRS0331US0

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

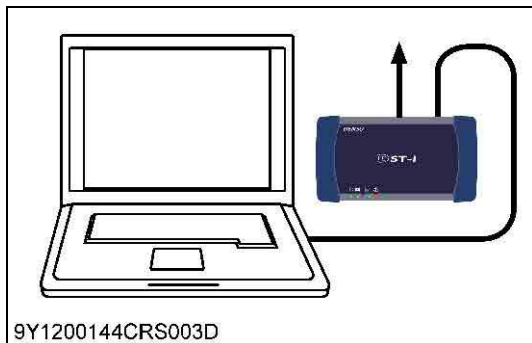
Limp home action by engine ECU (system action):

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

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0043US0



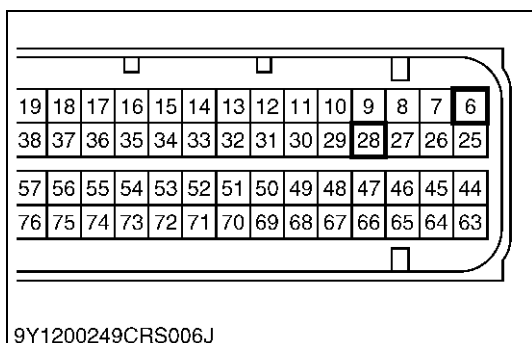
1. Check the blower pressure sensor signals

- 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".	

9Y1200249RSS0044US0



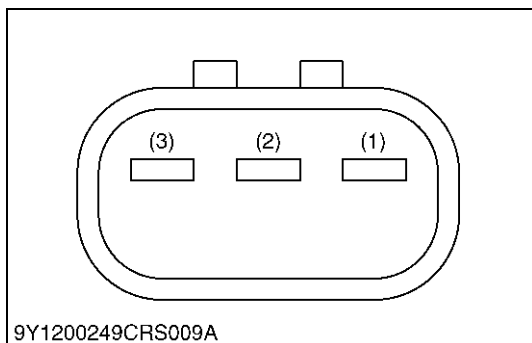
2. Measure the ECU terminal Voltage

- Move the key switch from the OFF to ON position, and measure the voltage between ECU terminals No.6 and No.28.

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".	

9Y1200249RSS0045US0



3. Measure the voltage between blower pressure sensor terminals

- 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.

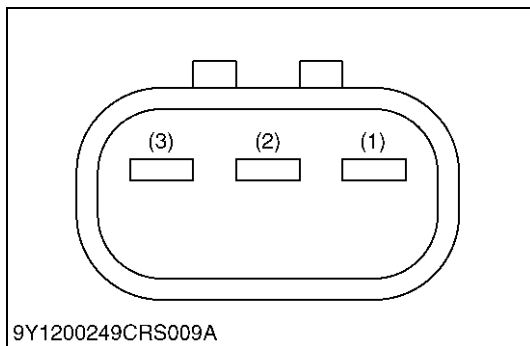
Factory specification	
Engine state	Output Voltage
Key switch is ON	Approx. 0.7 V

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) No.6
(2) No.28

- (3) No.29

9Y1200249RSS0046US0



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) and (3) of the blower pressure sensor connector (at the wiring harness side).

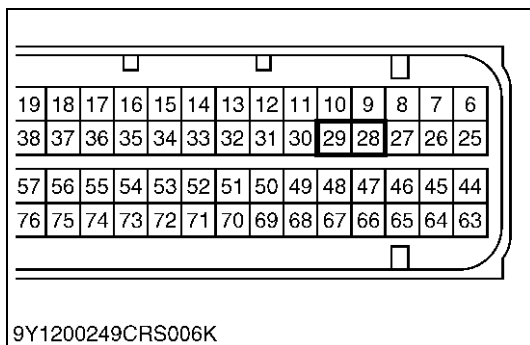
Factory specification	Approx. 5 V
-----------------------	-------------

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) No.6
(2) No.28

(3) No.29

9Y1200249RSS0047US0



5. Measure the ECU terminal voltage

1. 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.	

9Y1200249RSS0048US0

(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

Recovery from error:

- Key switch turn OFF

9Y1200249CRS0332US0

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

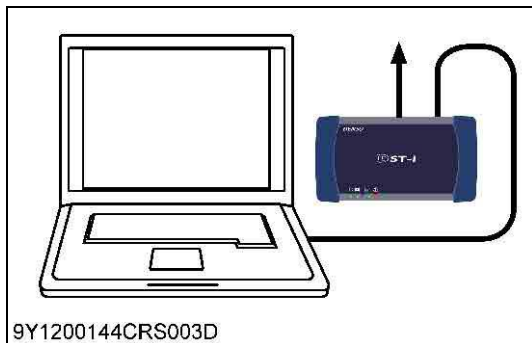
Limp home action by engine ECU (system action):

- Engine stop

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0049US0



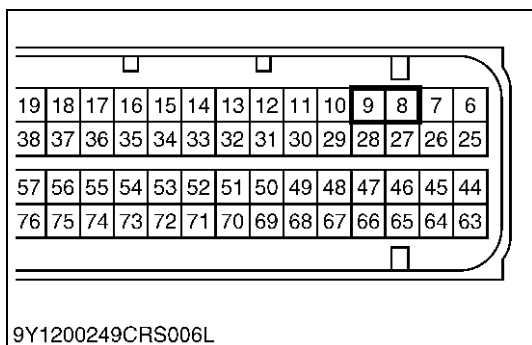
1. Check the blower pressure sensor signals

- 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".	

9Y1200249RSS0050US0



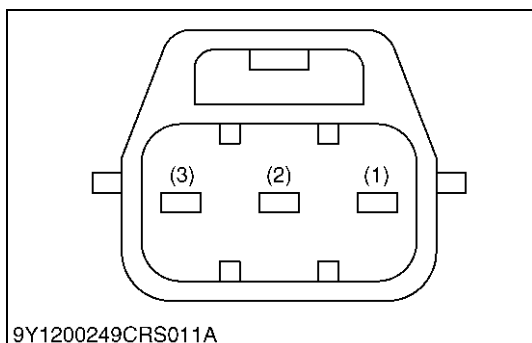
2. Measure the ECU terminal Voltage

- Move the key switch from the OFF to ON position, and measure the voltage between ECU terminals No.8 and No.9.

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".	

9Y1200249RSS0051US0



3. Measure the voltage between rack position sensor terminals

- 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.

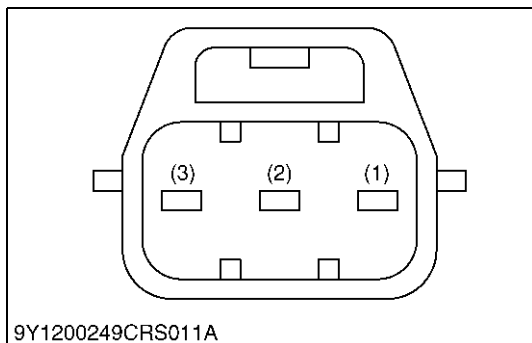
Factory specification	
Engine state	Output Voltage
Key switch is ON	Approx. 2.5 ~ 3.0 V

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) No.8
(2) No.9

(3) No.11

9Y1200249RSS0052US0



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) and (3) of the rack position sensor connector (at the wiring harness side).

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

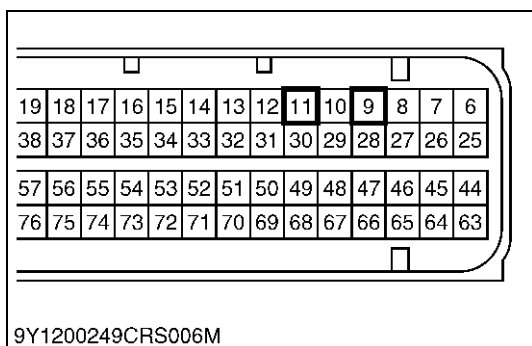
OK	Check the harness connectors and ECU pins.	
	OK	Replace the rack position sensor.
	NG	1. Repair or replace the wiring harness. 2. Replace the rack position sensor.
NG	Go to "5. Measure the ECU terminal voltage".	

(1) No.8

(3) No.11

(2) No.9

9Y1200249RSS0053US0



5. Measure the ECU terminal voltage

1. Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.11 and No.9.

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.	

■ 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)

9Y1200249RSS0054US0

(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

9Y1200249CRS0333US0

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

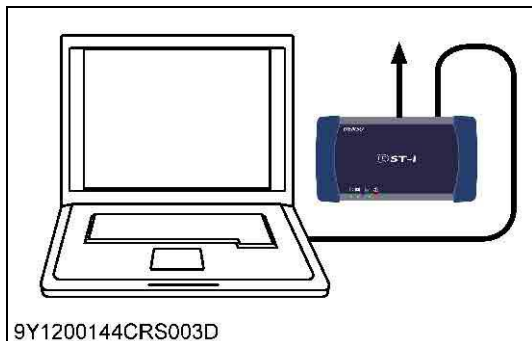
Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0055US0

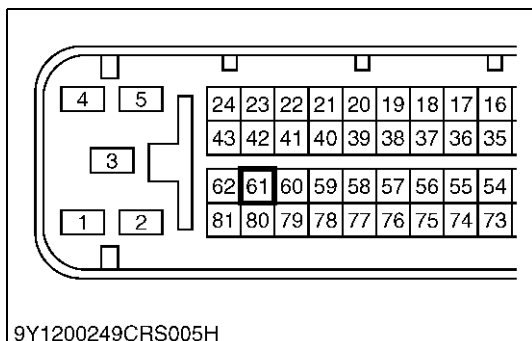


1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

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

9Y1200249RSS0056US0



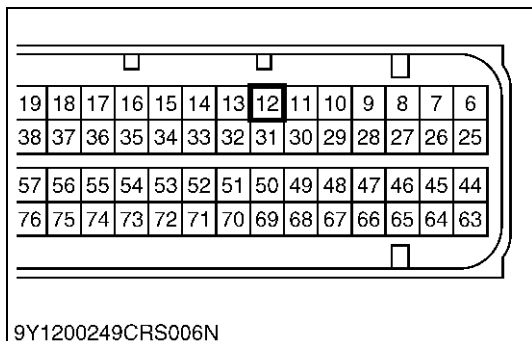
2. Check the resistance between terminals

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".

9Y1200249RSS0057US0



3. Measure the resistance of Electric governor solenoid

1. Measure the resistance of electric governor solenoid.

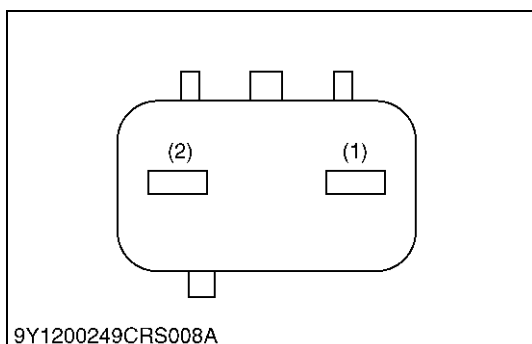
Factory specification	3 ~ 4 Ω
-----------------------	---------

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

(1) No.12

(2) No.61

9Y1200249RSS0058US0



(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

9Y1200249CRS0334US0

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

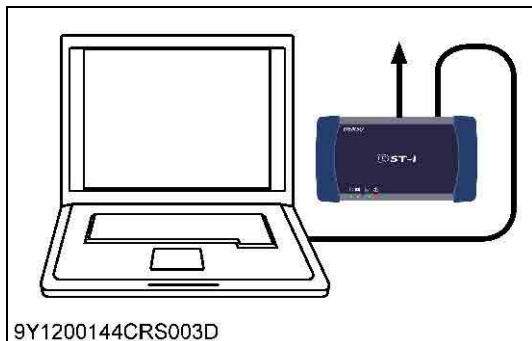
Limp home action by engine ECU (system action):

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

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0059US0



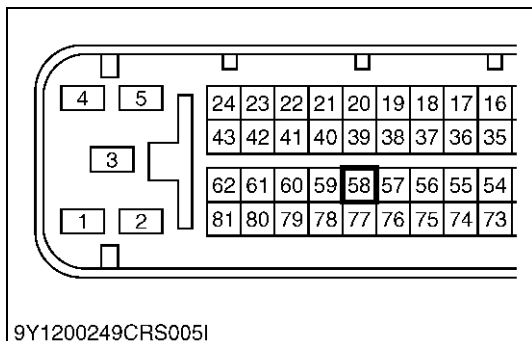
1. Check the reformer temperature sensor signals

- 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".	

9Y1200249RSS0060US0



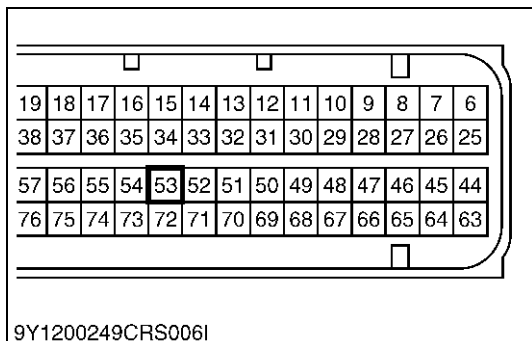
2. Check the resistance between terminals

- Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket.
- Measure the resistance between 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".

9Y1200249RSS0061US0



3. Measure the resistance of reformer temperature sensor

- Measure the resistance of reformer temperature sensor.

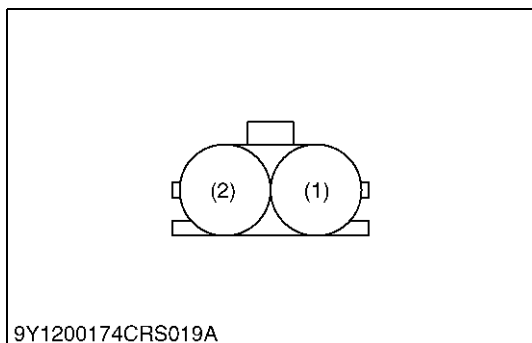
Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

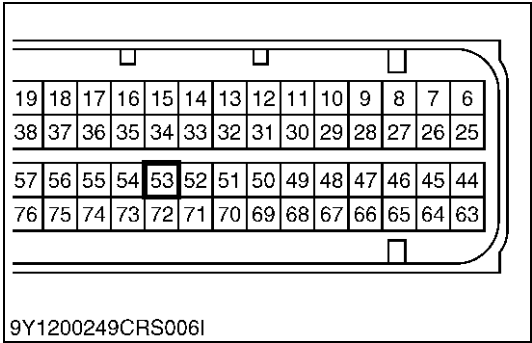
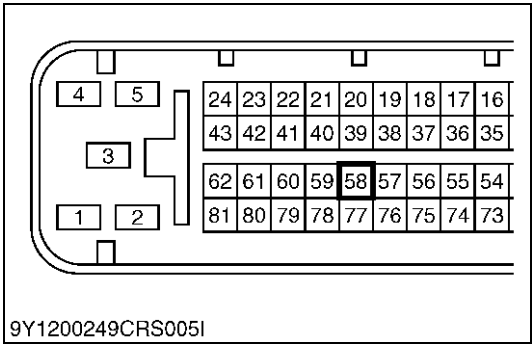
OK	Wiring harness open circuit. Check and repair.
NG	Replace the reformer temperature sensor.

(1) No.58

(2) No.53

9Y1200249RSS0062US0





4. Measure the ECU terminal voltage

1. Measure the voltage between ECU terminal No.58 and No.53.

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.

9Y1200249RSS0063US0

(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:

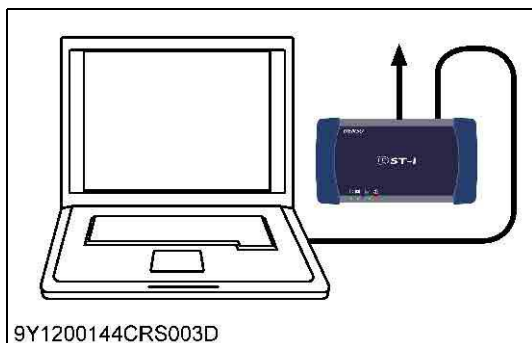
- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF



9Y1200249CRS0335US0

1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
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".

9Y1200249RSS0064US0

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.

9Y1200249RSS0065US0

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.

9Y1200249RSS0066US0

(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

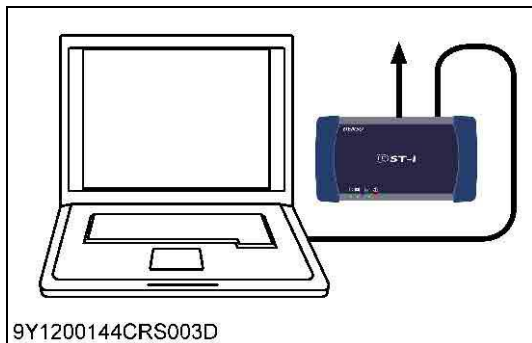
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249CRS0336US0



9Y1200144CRS003D

1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
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".

9Y1200249RSS0067US0

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.

9Y1200249RSS0068US0

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.

9Y1200249RSS0069US0

(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

9Y1200249CRS0337US0

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

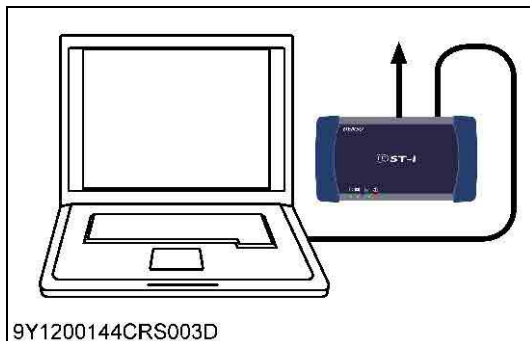
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0070US0

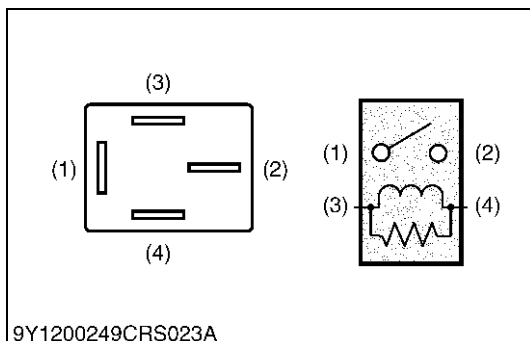


1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. 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".

9Y1200249RSS0071US0



2. Measure the resistance of glow relay for fuel reforming

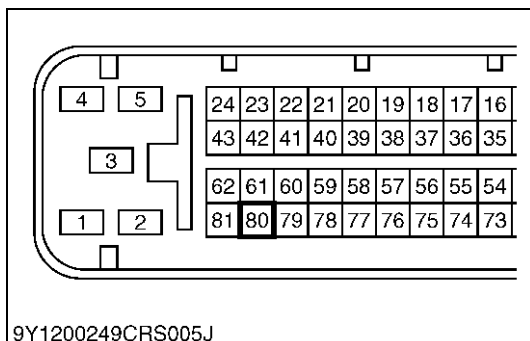
1. Measure the resistance of glow relay for fuel reforming.

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

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

- (1) Terminal 1 (3) Terminal 3
(2) Terminal 2 (4) Terminal 4

9Y1200249RSS0072US0



3. Check the wiring harness

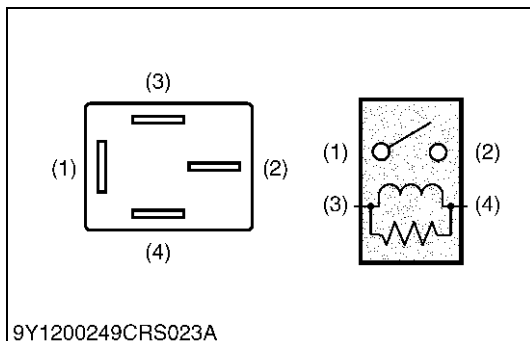
1. Unplug the ECU wiring harness connector from socket and unplug the battery.
2. Check conduction between the ECU connector side No.80 and glow relay for fuel reforming connector terminal No.3, and reformer glow plug and glow relay for fuel reforming connector terminal No.2.

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

OK	Replace the ECU.
NG	Replace the wiring harness.

- (1) Terminal 1 (3) Terminal 3
(2) Terminal 2 (4) Terminal 4

9Y1200249RSS0073US0



(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

9Y1200249CRS0338US0

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

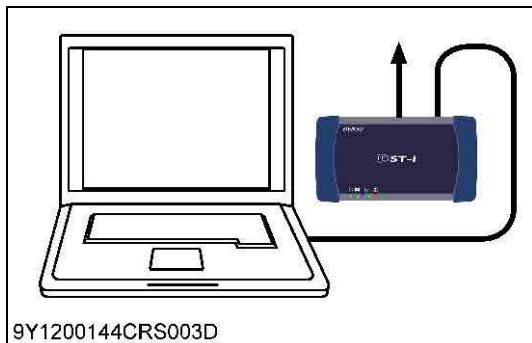
Limp home action by engine ECU (system action):

- None

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0074US0



1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

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

9Y1200249RSS0075US0

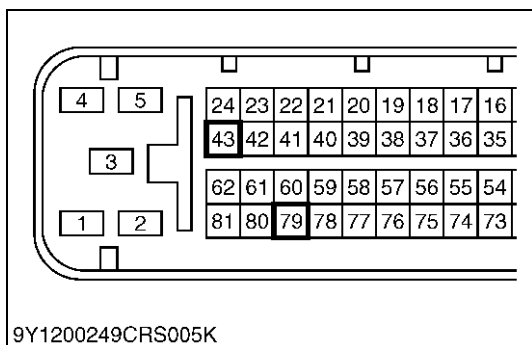
2. Measure the resistance of buzzer

1. Measure the resistance of buzzer.

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

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

9Y1200249RSS0076US0



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.79 and buzzer connector No.43.

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

OK	Replace the ECU.
NG	Replace the wiring harness.

9Y1200249RSS0077US0

(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

9Y1200249CRS0340US0

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

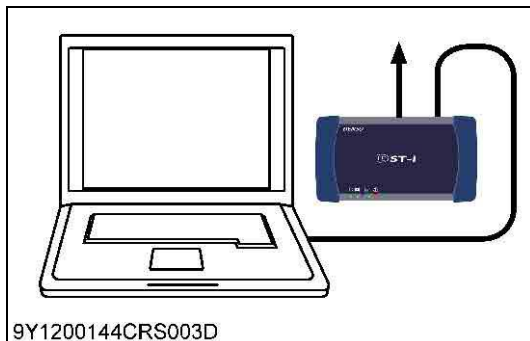
Limp home action by engine ECU (system action):

- None

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0078US0

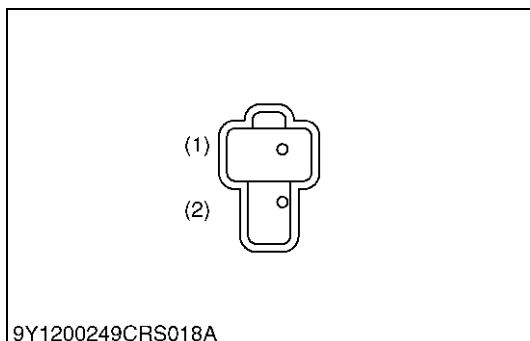


1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

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

9Y1200249RSS0079US0



2. Measure the resistance of feed pump

1. Measure the resistance of feed pump.

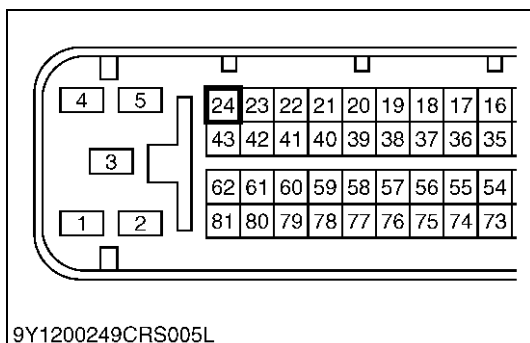
Factory specification	120 Ω \pm 10 %
-----------------------	-------------------------

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

(1) No.24(+)

(2) Connect to body earth (-)

9Y1200249RSS0080US0



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.24 and feed pump connector (+), and between body earth and feed pump connector (-).

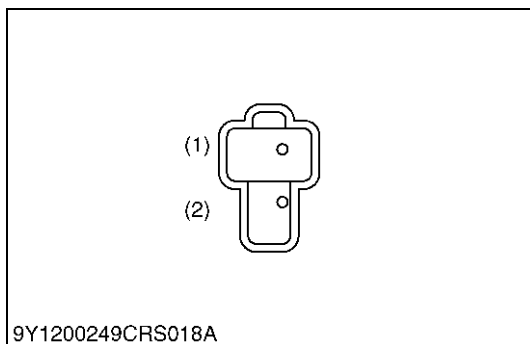
Factory specification	Approx. 0 Ω
-----------------------	--------------------

OK	Replace the ECU.
NG	Replace the wiring harness.

(1) No.24(+)

(2) Connect to body earth (-)

9Y1200249RSS0081US0



(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:

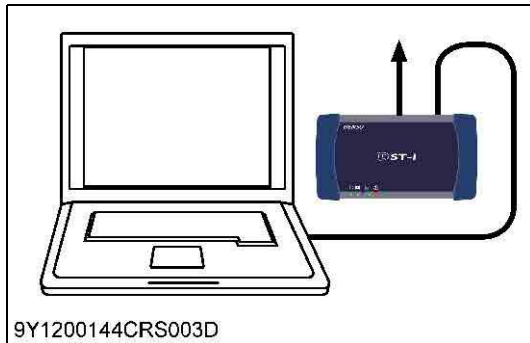
- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF



9Y1200249RSS0082US0

1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the wiring harness of glow relay for fuel reformer".

9Y1200249RSS0083US0

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

1. Check the wiring harness from glow relay for fuel reformer to burner glow plug for fuel reforming. (Refer to P1801, P1802 in detail)

OK	Go to "3. Check the function of air valve 1 for fuel reformer".
NG	Replace (Target replacing parts are referred to P1801, P1802)

9Y1200249RSS0084US0

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

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

OK	Replace the reformer assembly. (Include catalyst for fuel reforming)
NG	Replace air blower assembly.

9Y1200249CRS0341US0

(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:

- Following a condition was met while DPF regeneration is activated
 - a. DPF inlet temp. (T1) < 190 °C

Engine warning light:

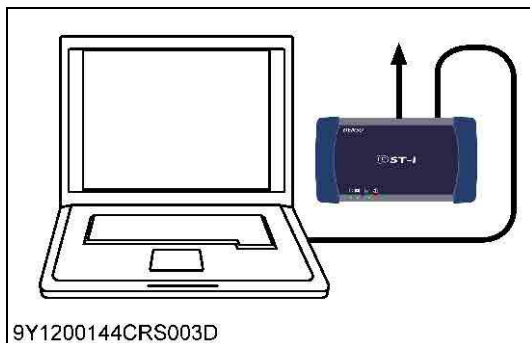
- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF



■ NOTE

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

9Y1200249RSS0086US0

1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
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".

9Y1200249RSS0087US0

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.

9Y1200249RSS0088US0

(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:

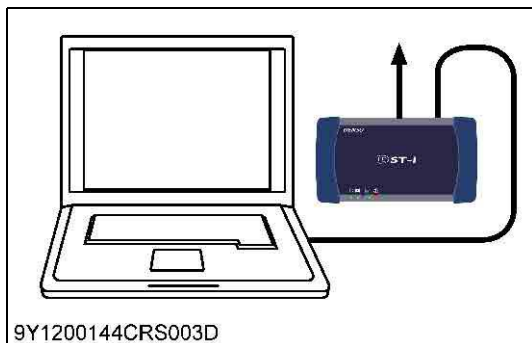
- ON

Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF



9Y1200249RSS0089US0

1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
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".

9Y1200249RSS0090US0

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).

9Y1200249RSS0091US0

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.

9Y1200249RSS0092US0

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.

9Y1200249RSS0093US0

(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

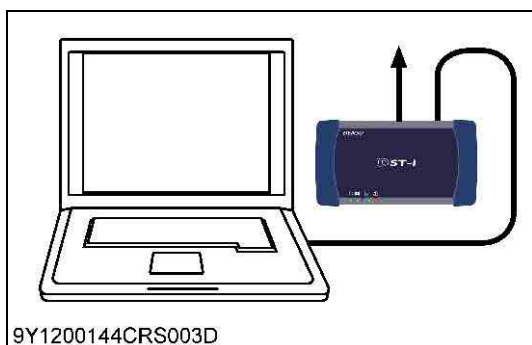
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249RSS0094US0



1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
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".

9Y1200249RSS0095US0

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
-----------------------	--------------------

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

9Y1200249RSS0096US0

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	Replace ECU.
NG	Replace the reformer.

9Y1200249RSS0097US0

(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

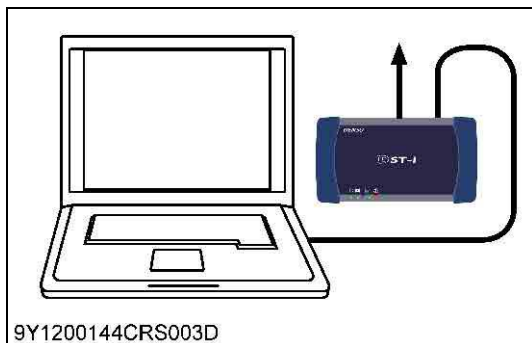
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Diag counter = zero

9Y1200249RSS0098US0



1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the function of thermostat".

9Y1200249RSS0099US0

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.

9Y1200249RSS0100US0

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).

9Y1200249RSS0101US0

(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

9Y1200249RSS0107US0

1. Check the DTC signals

1. Place the key switch in the ON position and connect the scan tool.
2. Clear the DTC and check whether it is output again or not.

OK	Normal.
NG	Go to "2. Check the battery (+) terminal".

9Y1200249RSS0108US0

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.

9Y1200249RSS0109US0

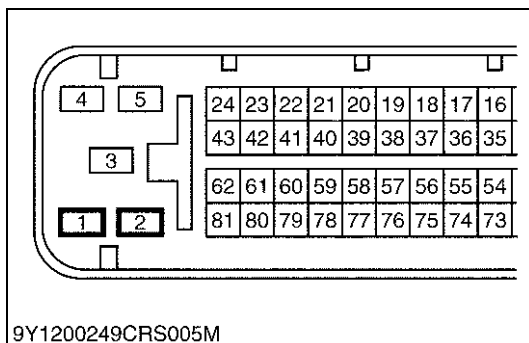
3. Check the wire harness between battery (+) and ECU terminal

1. Place the key switch in the OFF position, disconnect the battery from wiring harness.
2. Check the wire harness between battery (+) and ECU 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.

9Y1200249RSS0110US0



(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 12.7V at the start of regeneration
- Battery voltage during regeneration is 12.5V 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

9Y1200249RSS0111US0

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".	

9Y1200249RSS0112US0

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.

9Y1200249RSS0113US0

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.

9Y1200249RSS0114US0

(32) 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

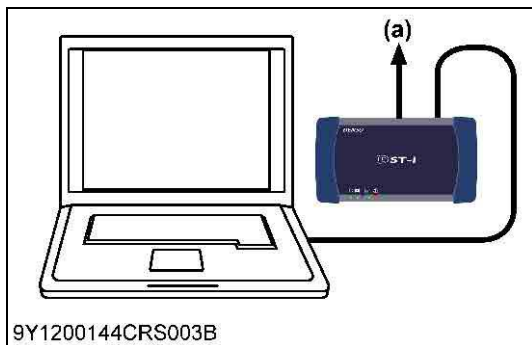
Limp home action by engine ECU (system action):

- Engine stop
- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249CRS0223US0



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

9Y1200249CRS0224US0

(33) 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; 0.3 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

9Y1200249CRS0225US0

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

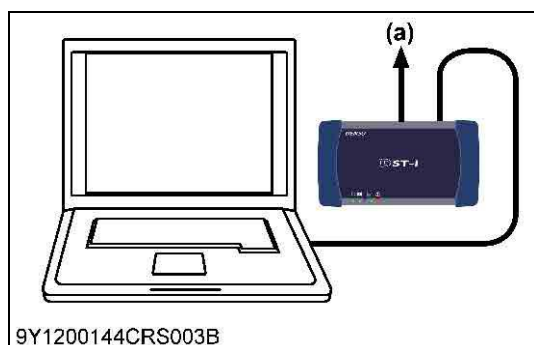
Limp home action by engine ECU (system action):

- Forced idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)

Recovery from error:

- Diagnostic counter = zero

9Y1200249CRS0226US0



1. Check the Accelerator Position Sensor Signals

1. 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

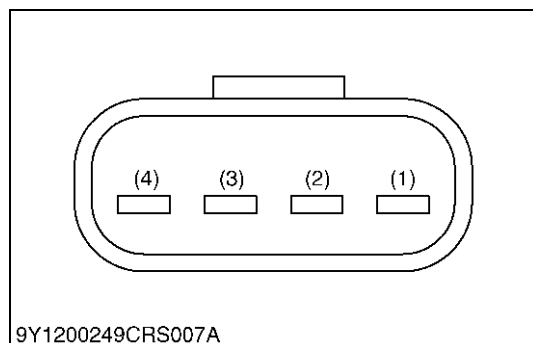
■ NOTE

- "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

9Y1200249CRS0228US0



2. Measure the Voltage Between Sensor Terminals

1. 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.
2. Measure the voltage between terminals (1) and (2) 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".

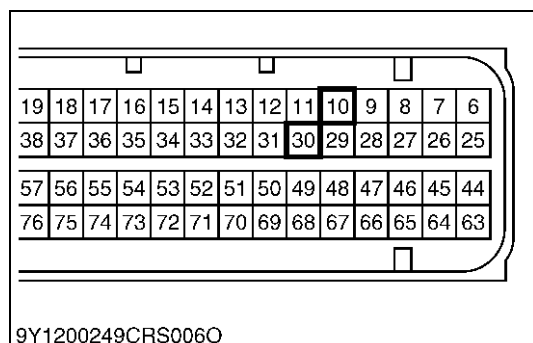
(1) No.10

(3) No.27

(2) No.30

(4) No.26

9Y1200249CRS0229US0



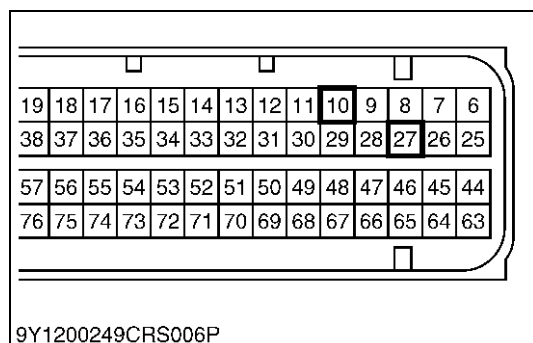
3. Measure the Terminal Voltage

1. Measure the voltage between ECU terminals No.30 and No.10.

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

OK	The wiring harness between the ECU and sensor is faulty. → Repair.			
NG	Check the ECU connectors.			
	<div style="text-align: center;"> </div>			
	<table> <tr> <td>OK</td><td>Faulty ECU → Replace.</td></tr> <tr> <td>NG</td><td>Repair the ECU connectors.</td></tr> </table>	OK	Faulty ECU → Replace.	NG
OK	Faulty ECU → Replace.			
NG	Repair the ECU connectors.			

9Y1200249CRS0230US0



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.

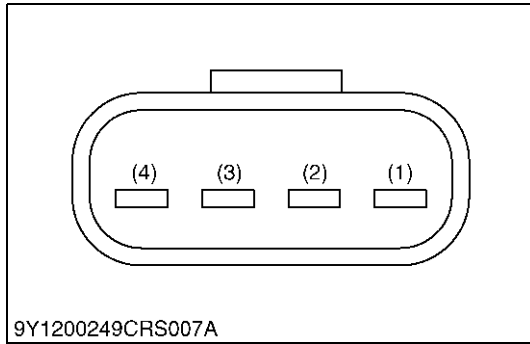
Factory specification	Engine status: Key on 2.5 V to 4.1 V
-----------------------	--------------------------------------

■ 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.			
	<div style="text-align: center;"> </div>			
	<table> <tr> <td>OK</td><td>Faulty ECU → Replace.</td></tr> <tr> <td>NG</td><td>Repair the ECU connectors.</td></tr> </table>	OK	Faulty ECU → Replace.	NG
OK	Faulty ECU → Replace.			
NG	Repair the ECU connectors.			
NG	Go to "5. Measure the Voltage Between Sensor Terminals".			

9Y1200249CRS0231US0

**5. Measure the Voltage Between Sensor Terminals**

1. Keep the accelerator position sensor connector plugged into socket.
2. Measure the voltage between terminals (1) and (3) of accelerator position sensor connector (at the machine wiring harness side).

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) No.10
(2) No.30

(3) No.27
(4) No.26

9Y1200249CRS0232US0

(34) 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; 0.3 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

9Y1200249CRS0233US0

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

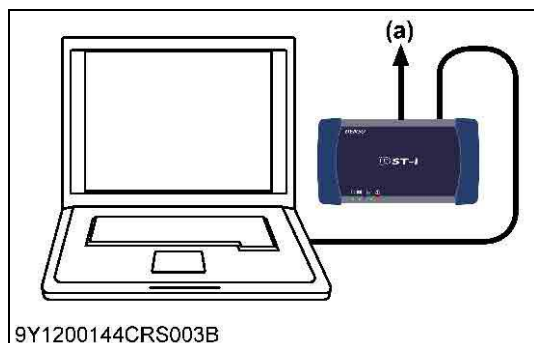
Limp home action by engine ECU (system action):

- Forced idle (Accelerator = 0 %) (When both position sensor 1 and 2 are failed)

Recovery from error:

- Diagnostic counter = zero

9Y1200249CRS0234US0



1. Check the Accelerator Position Sensor Signals

1. 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

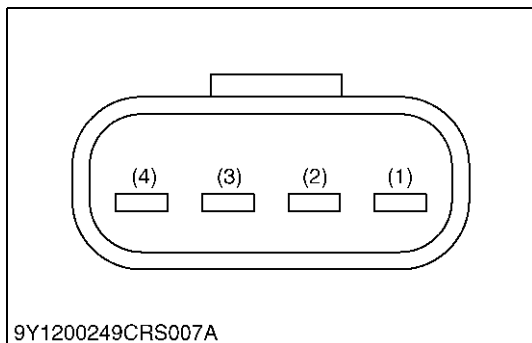
■ NOTE

- "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

9Y1200249CRS0236US0



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 terminals (1) and (2) of accelerator position sensor connector (at the machine wiring harness side).

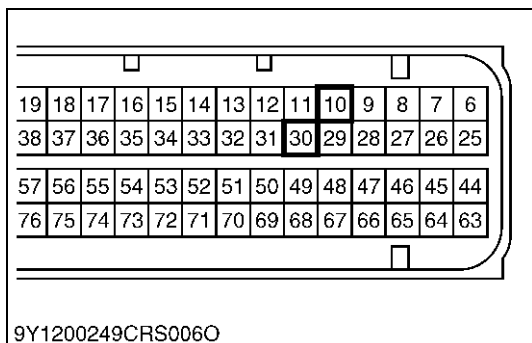
Factory specification	Approx. 5 V
-----------------------	-------------

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

(1) No.10
(2) No.30

(3) No.27
(4) No.26

9Y1200249CRS0237US0



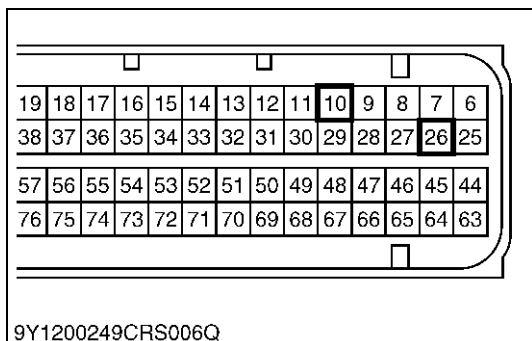
3. Measure the Terminal Voltage

- Measure the voltage between ECU terminals No.30 to No.10.

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.

9Y1200249CRS0238US0



4. Measure the ECU Terminal Voltage

- Place the key switch in the OFF position, and plug the accelerator position sensor connector into the socket.
- Place the key switch in the ON position, and measure the voltage between ECU terminals No.26 to No.10.

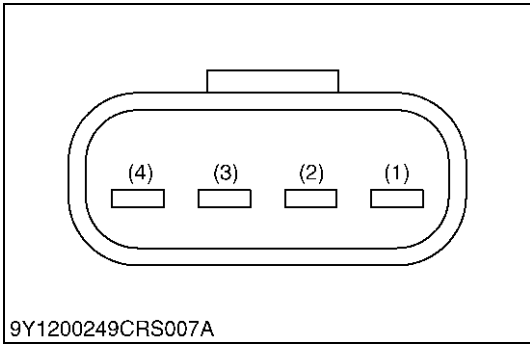
Factory specification	Engine status: Key on 2.5 V to 4.1 V
-----------------------	--------------------------------------

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".

9Y1200249CRS0239US0



5. Measure the Voltage Between Sensor Terminals

- 1. Keep the accelerator position sensor connector plugged into socket.
- 2. Measure the voltage between terminals (1) and (4) of accelerator position sensor connector (at the machine wiring harness side).

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) No.10

(2) No.30
- (3) No.27

(4) No.26

9Y1200249CRS0240US0

(35) 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

9Y1200249CRS0241US0

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

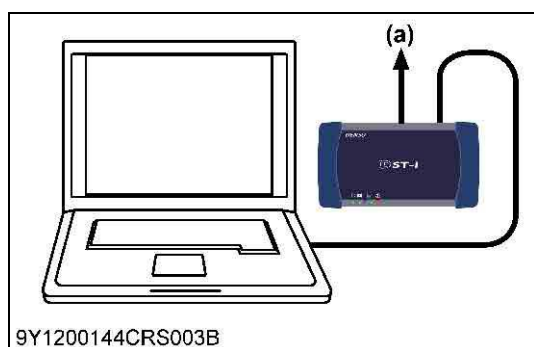
Limp home action by engine ECU (system action):

- 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

9Y1200249CRS0242US0



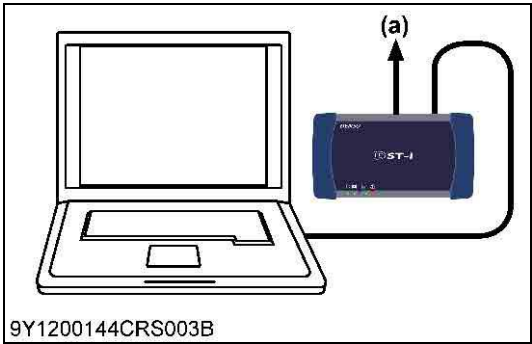
1. Check the Atmospheric Pressure Signals

- 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

9Y1200249CRS0243US0



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

9Y1200249CRS0244US0

(36) 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

9Y1200249CRS0245US0

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 10 sec. or 100 °C (212 °F) $\leq T1 \leq 800$ °C (1472 °F); continues longer than 10 sec. or 100 °C (212 °F) $\leq T4 \leq 800$ °C (1472 °F); continues longer than 10 sec.

DTC set parameter:

- DPF outlet temperature sensor (T2) voltage: 4.92 V or more

Engine warning light:

- ON

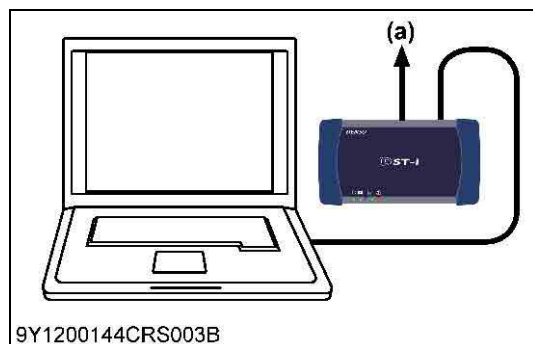
Limp home action by engine ECU (system action):

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

Recovery from error:

- Key switch turn OFF

9Y1200249CRS0246US0



1. Check the Exhaust Gas Temperature Sensor Signals

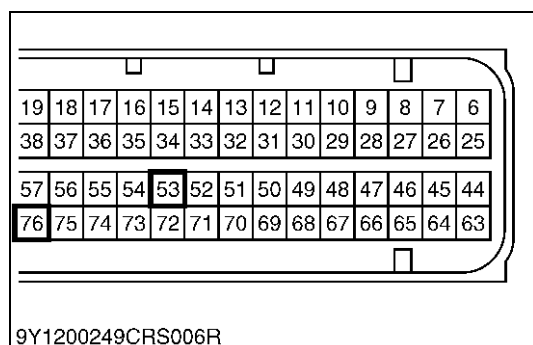
- Place the key switch in the ON position, and check the "Exhaust gas temperature" and "Exhaust gas temperature sensor output voltage" on the diagnosis tool data monitor.

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

9Y1200249CRS0248US0



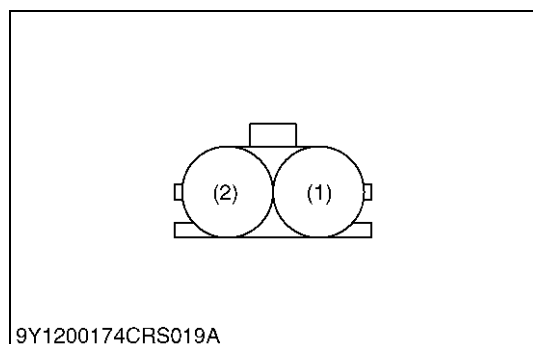
2. Measure the Resistance Between Terminals

- Place the key switch in the OFF position, unplug the ECU wiring harness connector from the socket, and 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".

9Y1200249CRS0249US0



3. Check the Sensor

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

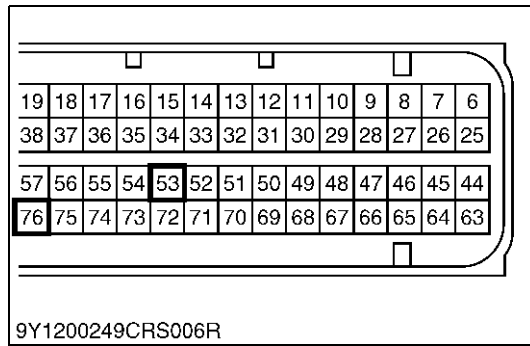
Factory specification	
Temperature	Resistance
100 °C (212 °F)	Approx. 18.3 kΩ
150 °C (302 °F)	Approx. 7.88 kΩ
200 °C (392 °F)	Approx. 4.00 kΩ
250 °C (482 °F)	Approx. 2.30 kΩ

OK	Wiring harness open circuit or connector fault → Check and repair.
NG	Exhaust gas temperature sensor fault → Replace the exhaust gas temperature sensor 2 (T2).

(1) No.76

(2) No.53

9Y1200249CRS0250US0



4. Measure the ECU Terminal Voltage

1. Plug the ECU wiring harness connector into socket again, unplug the sensor connector, and measure the voltage between ECU terminals No.76 and No.53 at the ECU 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.

9Y1200249CRS0251US0

(37) 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: 0.21 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

9Y1200249CRS0252US0

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

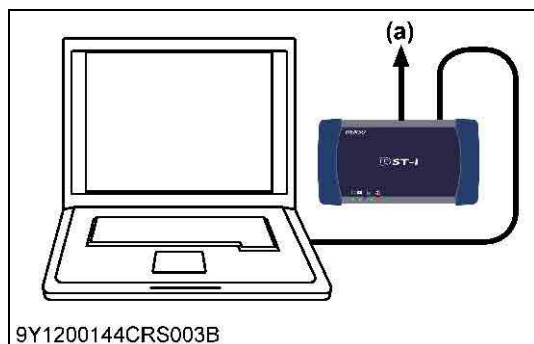
Limp home action by engine ECU (system action):

- 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

9Y1200249CRS0253US0



1. Check the Differential Pressure Signals

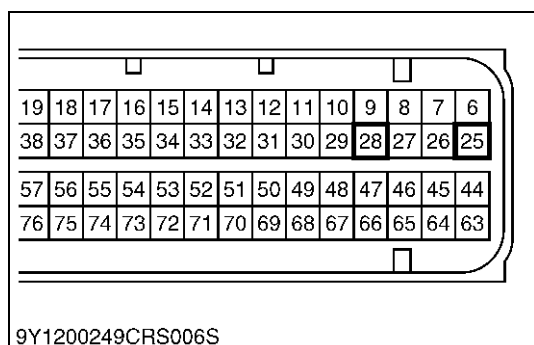
- Place the key switch in the OFF position, attach the diagnosis tool to the CAN1 connector, and return the key switch to the ON position again. Then, check the "Differential pressure" and "Differential pressure sensor output voltage" on the diagnosis tool data monitor.

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

9Y1200249CRS0255US0



2. Measure the ECU Terminal Voltage

- Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.25 and No.28.

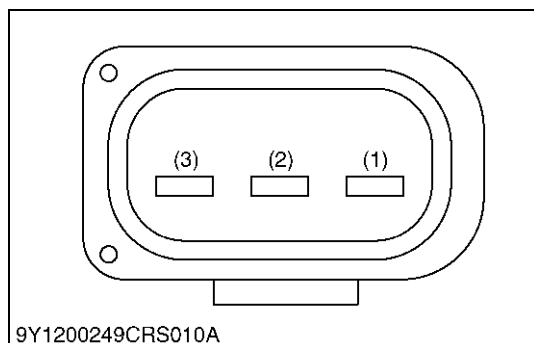
Factory specification	
Engine state	Output voltage
Key switch ON	Approx. 0.7 V

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 1 (Engine Side)

(b) ECU Connector 2 (Machine Side)

9Y1200249CRS0256US0



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.

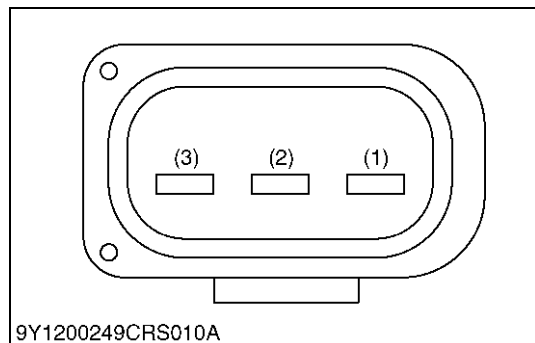
Factory specification	
Engine state	Output voltage
Key switch ON	Approx. 0.7 V

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) No.25
(2) No.28

(3) No.29

9Y1200249CRS0257US0



4. Measure the Voltage Between Differential Pressure Sensor Terminals

1. Set the key switch to the OFF position, and unplug the differential pressure sensor connector from the socket.
2. 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).

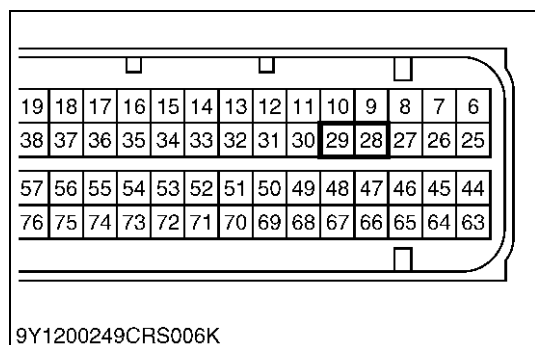
Factory specification	Approx. 5 V
-----------------------	-------------

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) No.25
(2) No.28

(3) No.29

9Y1200249CRS0258US0



5. Measure the ECU Terminal Voltage

1. Move the key switch from the OFF to the ON position, and measure the voltage between ECU terminals No.28 and No.29.

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.

9Y1200249CRS0259US0

(38) 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

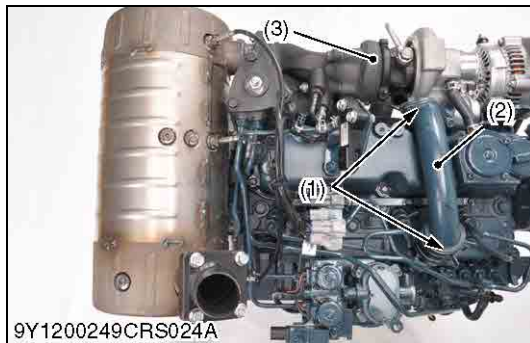
Limp home action by engine ECU (system action):

- 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

9Y1200249CRS0260US0



1. Check the Air Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

■ 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

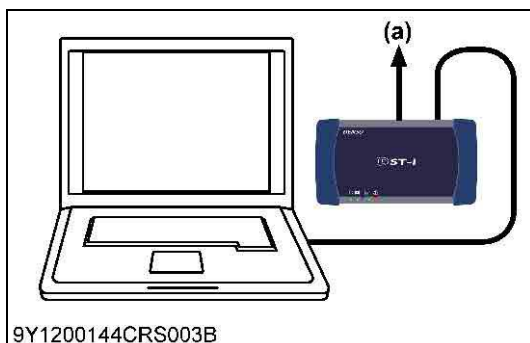
- Check the clogging condition of the air cleaner. If it is very dirty, replace the new one.
- Check if the suction hose of the turbo blower does not come off. If the hose comes off, install it.
- Check the suction path for leaks. (Suction path joints, suction pipes, hoses)
- Check the clogging condition 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-S187)

(1) Hose Clamp
(2) Hose

(3) Turbocharger

9Y1200249CRS0261US0



2. Check the Exhaust Gas Temperature

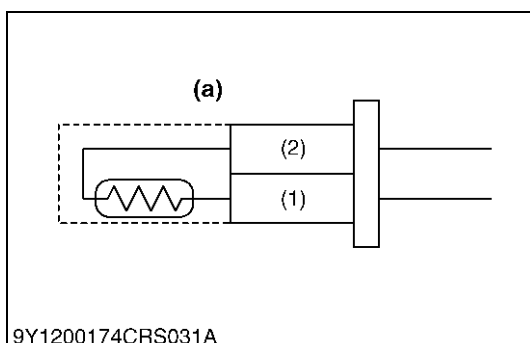
1. Place the key switch in the OFF position, and attach the diagnosis tool to the CAN1 connector.
2. Turn the key switch to the ON position and select the "Exhaust gas temperature Sensor 0", "Exhaust gas temperature Sensor 1" and "Exhaust gas temperature Sensor 2" on the data monitor function.
3. If 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

9Y1200249CRS0262US0



3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)

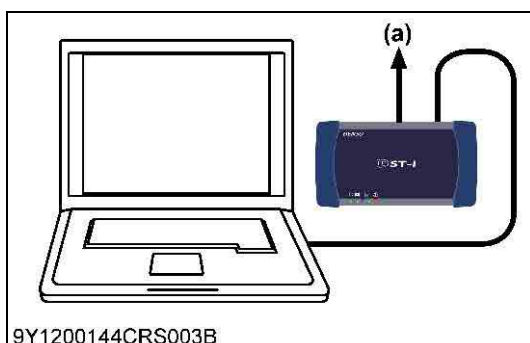
1. Check the exhaust gas temperature sensors (T0, T1 and T2).

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)

9Y1200249CRS0263US0



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

9Y1200249CRS0264US0

(39) 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

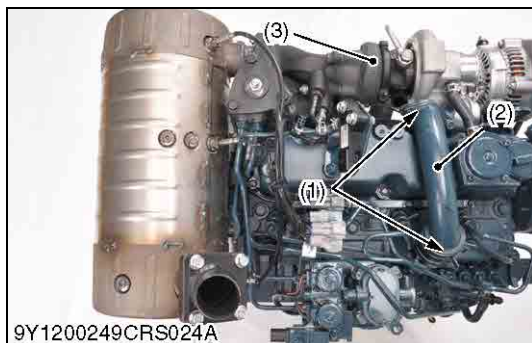
Limp home action by engine ECU (system action):

- 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

9Y1200249CRS0265US0



1. Check the Air Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

■ 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

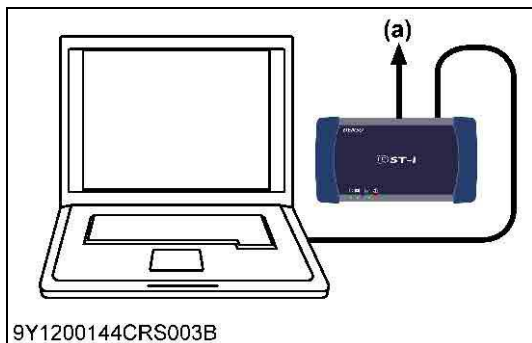
- Check the clogging condition of the air cleaner. If it is very dirty, replace the new one.
- Check if the suction hose of the turbo blower does not come off. If the hose comes off, install it.
- Check the suction path for leaks. (Suction path joints, suction pipes, hoses)
- Check the clogging condition 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-S187)

(1) Hose Clamp
(2) Hose

(3) Turbocharger

9Y1200249CRS0266US0



2. Check the Exhaust Gas Temperature

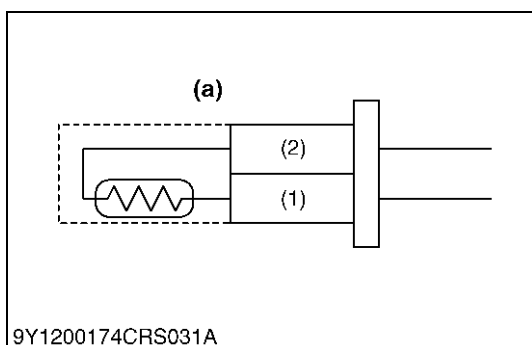
1. Place the key switch in the OFF position, and attach the diagnosis tool to the CAN1 connector.
2. Turn the key switch to the ON position and select the "Exhaust Gas Temperature Sensor 0", "Exhaust Gas Temperature Sensor 1" and "Exhaust Gas Temperature Sensor 2" on the data monitor function.
3. If 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

9Y1200249CRS0267US0



3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)

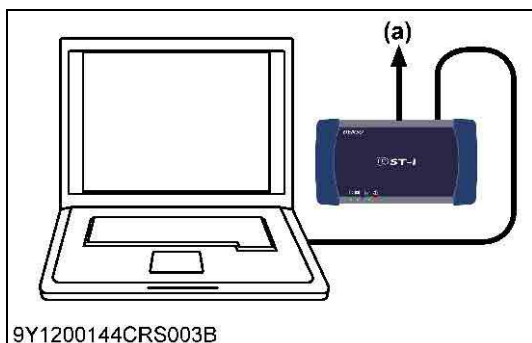
1. Check the exhaust gas temperature sensors (T0, T1 and T2).

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)

9Y1200249CRS0268US0



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

9Y1200249CRS0269US0

(40) 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

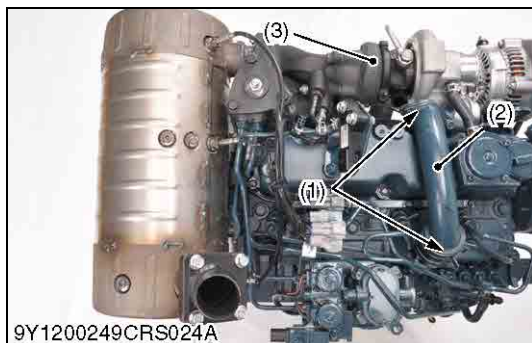
Limp home action by engine ECU (system action):

- 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

9Y1200249CRS0270US0



1. Check the Air Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

■ 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

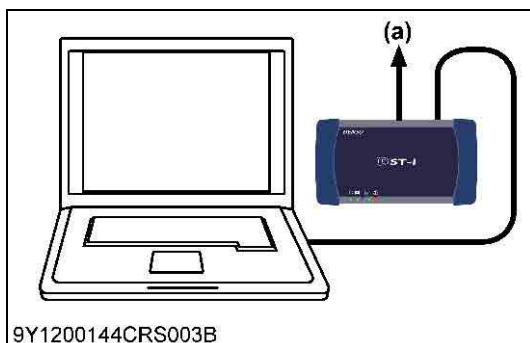
- Check the clogging condition of the air cleaner. If it is very dirty, replace the new one.
- Check if the suction hose of the turbo blower does not come off. If the hose comes off, install it.
- Check the suction path for leaks. (Suction path joints, suction pipes, hoses)
- Check the clogging condition 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-S187)

(1) Hose Clamp
(2) Hose

(3) Turbocharger

9Y1200249CRS0271US0



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

9Y1200249CRS0272US0

3. Check the Exhaust Gas Temperature Sensors (Refer to items P0543, P0546 and P242C)

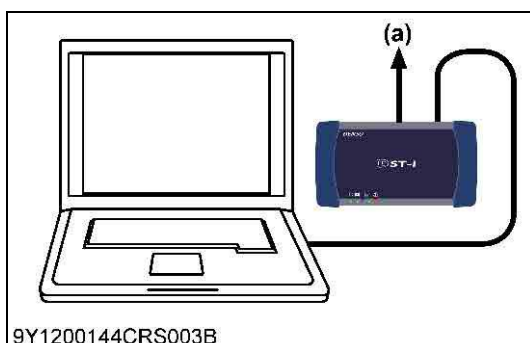
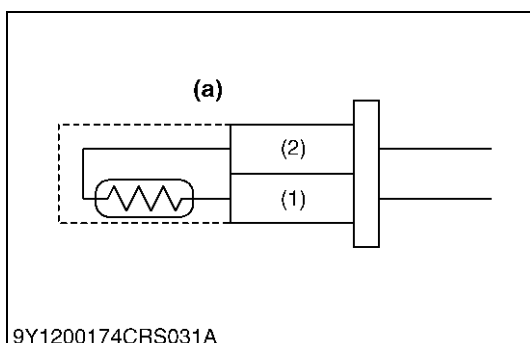
1. Check the exhaust gas temperature sensors (T0, T1 and T2).

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)

9Y1200249CRS0273US0



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

9Y1200249CRS0274US0

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

9Y1200249CRS0275US0



(41) 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

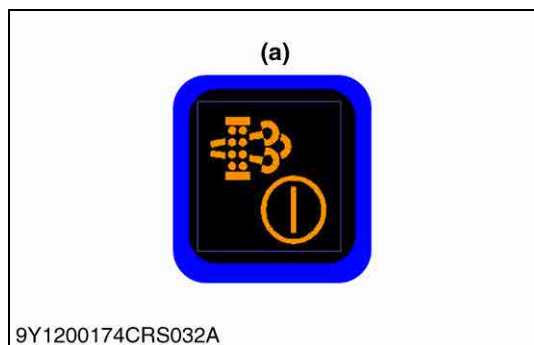
Limp home action by engine ECU (system action):

- 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)

9Y1200249CRS0276US0



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

9Y1200249CRS0277US0

(42) 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

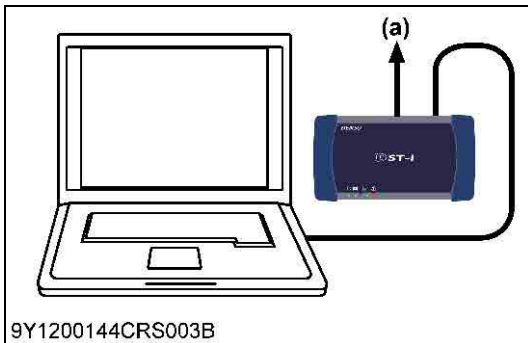
Limp home action by engine ECU (system action):

- 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)

9Y1200249CRS0278US0



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

9Y1200249CRS0279US0

(43) 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)

9Y1200249CRS0280US0



9Y1200249CRS026A

1. Replace of DPF

1. Replace the DPF.

■ NOTE

- Followings are potential causes.
 - A manual regeneration has not been carried out.

- (1) DPF Assembly

9Y1200249CRS0281US0

(44) 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

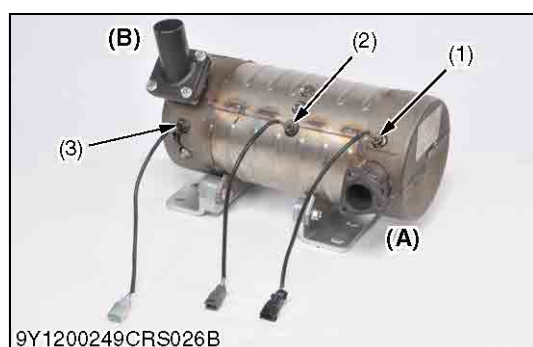
Limp home action by engine ECU (system action):

- DPF active regeneration is inhibited

Recovery from error:

- Key switch turn OFF

9Y1200249CRS0282US0



1. Check the Installation of Exhaust Gas Temperature sensor

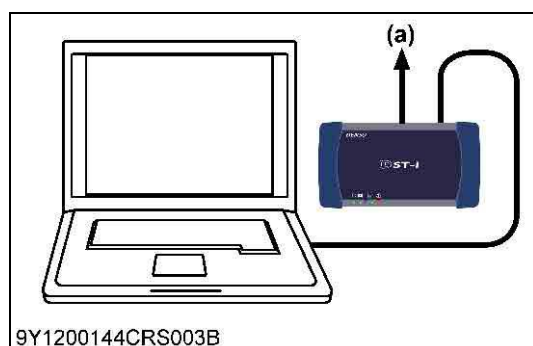
1. Check the installation of all exhaust gas temperature sensors (T0, T1 and T2).
2. Check the installation condition of the thermostat, and whether rust is not occurred.
3. Reinstall or replace the thermostat as necessary.

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

9Y1200249CRS0283US0



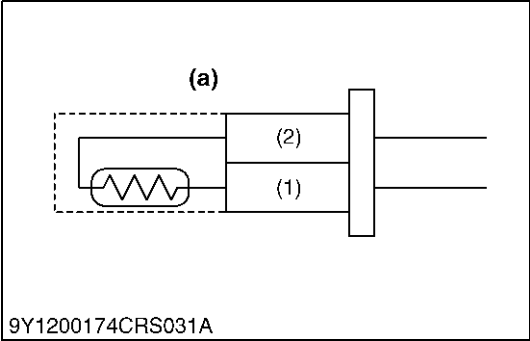
2. DPF Manual Regeneration

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

9Y1200249CRS0284US0



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)

9Y1200249CRS0285US0

(45) 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

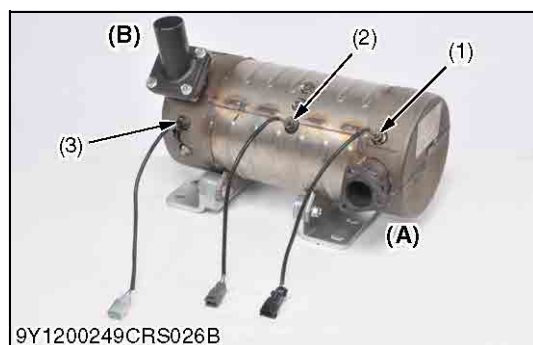
Limp home action by engine ECU (system action):

- Output limitation: Approximately 75 % of normal condition
- DPF active regeneration is inhibited

Recovery from error:

- Diagnostic counter = zero

9Y1200249CRS0286US0



9Y1200249CRS026B

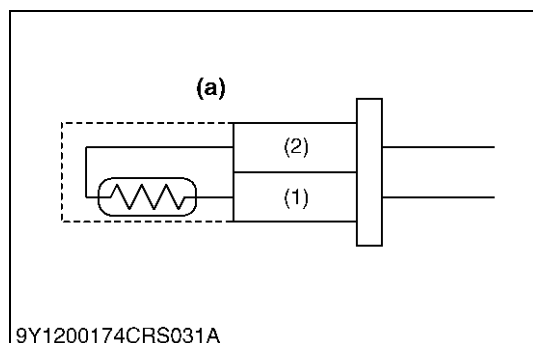
1. Check the Installation of Exhaust Gas Temperature sensor

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 | |

9Y1200249CRS0287US0



9Y1200174CRS031A

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 | |

9Y1200249CRS0288US0

(46) 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

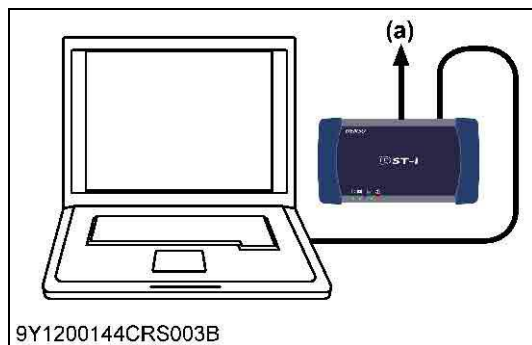
Limp home action by engine ECU (system action):

- 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

9Y1200249CRS0289US0



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

9Y1200249CRS0290US0

(47) 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

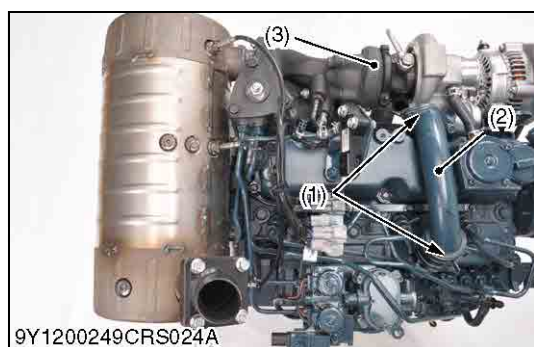
Limp home action by engine ECU (system action):

- Output limitation: Approximately 50 % of normal condition
- Auto DPF regeneration is inhibited

Recovery from error:

- Key switch turn OFF (reset by service tool)

9Y1200249CRS0291US0



1. Check the Air Intake System

1. Check in accordance with "6.[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE". (Refer to page 1-S187)

■ NOTE

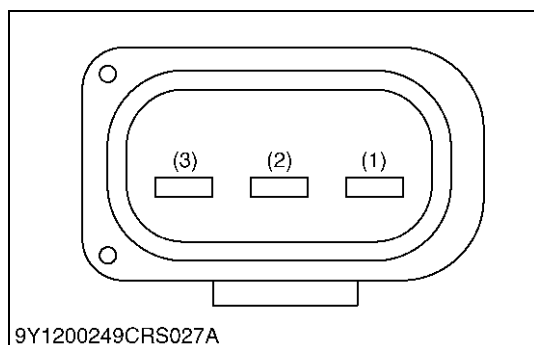
- Check the installation of the differential pressure sensor pipes.
- Check the engine oil maintenance history (Oil consumption).

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-S187)

- (1) Hose Clamp
(2) Hose

(3) Turbocharger

9Y1200249CRS0292US0



2. Check the Differential Pressure Sensor (Refer to items P2454 and P2455)

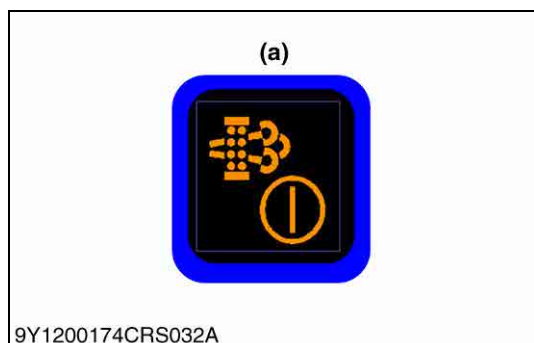
1. Check the differential pressure sensor.

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

9Y1200249CRS0293US0



3. Check the Function of DPF

1. Operate the engine for 30 minutes in the normal condition.

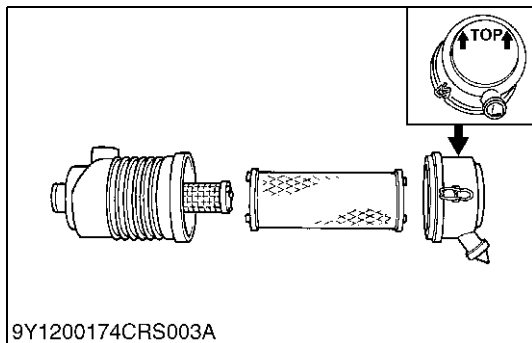
Factory specification	"DPF Regeneration Request" is not detected within 30 minutes.
OK	Normal.
NG	Replace the DPF assembly.

(a) DPF Manual Regeneration Request Button

9Y1200249CRS0294US0

7. INSPECTION PROCEDURE FOR EACH SYSTEM

[1] AIR INTAKE SYSTEM INSPECTION PROCEDURE

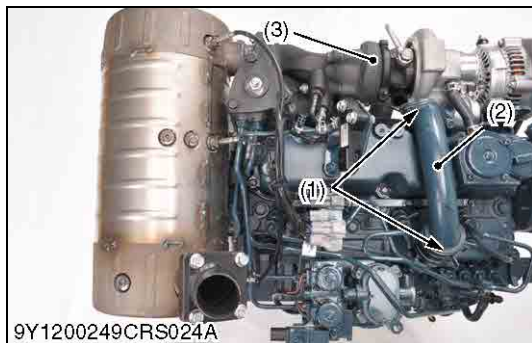


1. Check the Air Cleaner

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.

9Y1200249CRS0295US0



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

9Y1200249CRS0296US0

[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% (500ppm)
 - 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.

9Y1200249CRS0297US0

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 turbidit).
 - 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).

9Y1200249CRS0298US0

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.

9Y1200249CRS0299US0

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).

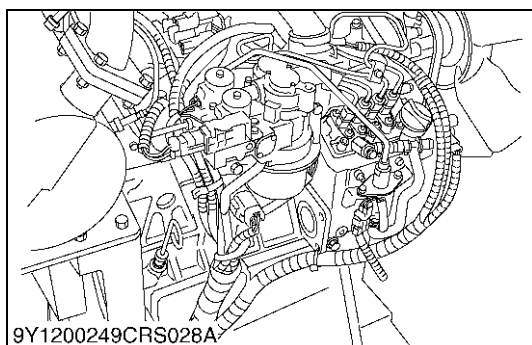
■ **NOTE**

- **Be cautious when vacuum pressure is present, as air will be drawn into the hose.**

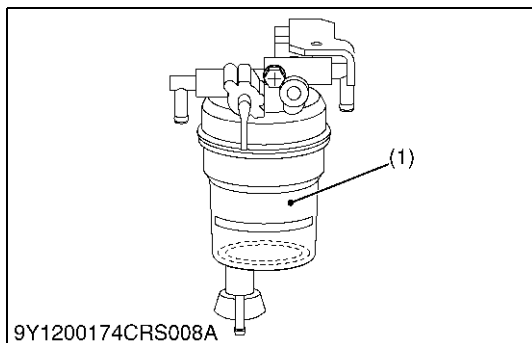
OK	Go to "4. Check the Water Separator".
NG	Repair or replace the hose.

(1) to Fuel Pump

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9Y1200249CRS028A



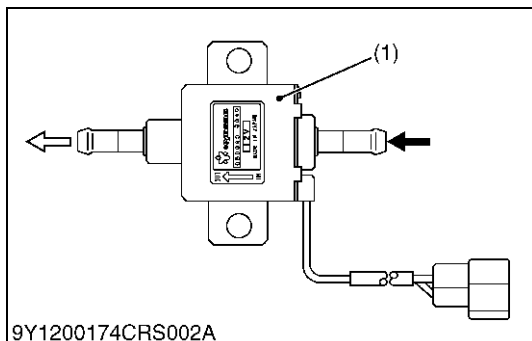
4. Check the Water Separator

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

9Y1200249CRS0301US0



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

9Y1200249CRS0302US0

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.

9Y1200249CRS0303US0

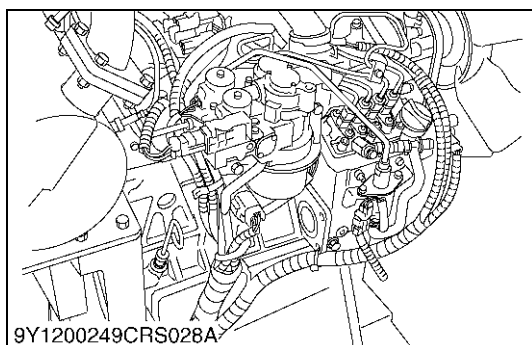
7. Engine oil Level Increase (Engine Internal Leak)

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

9Y1200249CRS0304US0



[3] ELECTRIC SYSTEM INSPECTION PROCEDURE

(1) Basics Of Checking Electrical / Electronic Circuit Systems



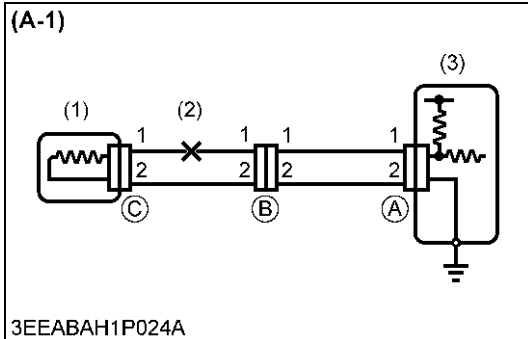
Measure the ECU Terminal Voltage and Resistance

- 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.

9Y1200249CRS0306US0

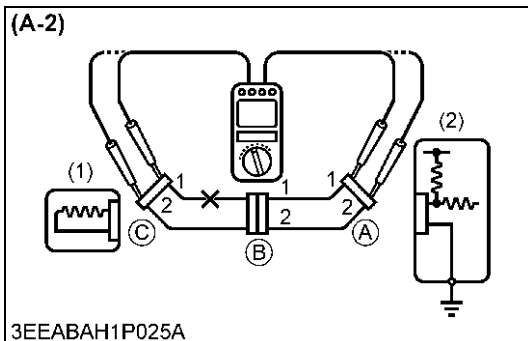


Open Circuit Check

- 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

9Y1200249CRS0307US0



Check for Continuity

- Remove connectors "A" and "C" and measure resistance between the two.

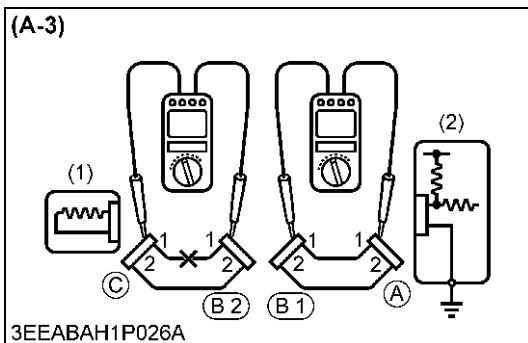
Factory specification	Less than 1 Ω
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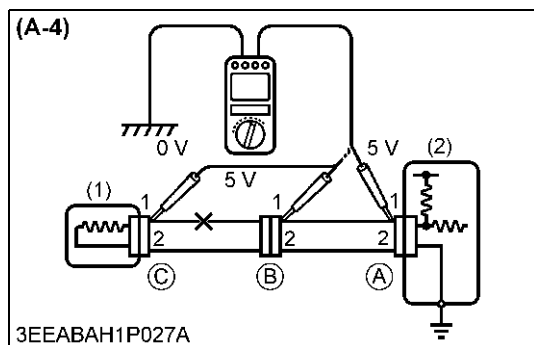
(Reference)

- 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

9Y1200249CRS0308US0





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.

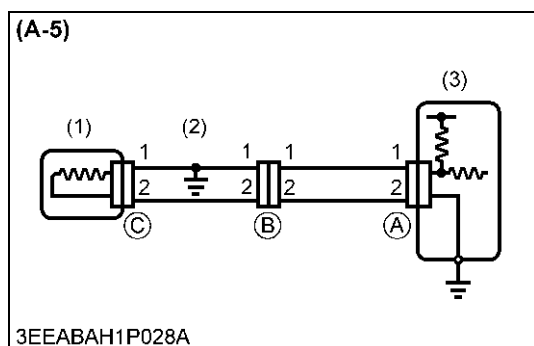
(Faulty Circuit)

- There is an open circuit between terminal 1 of connector "**B**" and terminal 1 of connector "**C**".

(1) Sensor

(2) ECU

9Y1200249CRS0309US0



Short Circuit Check

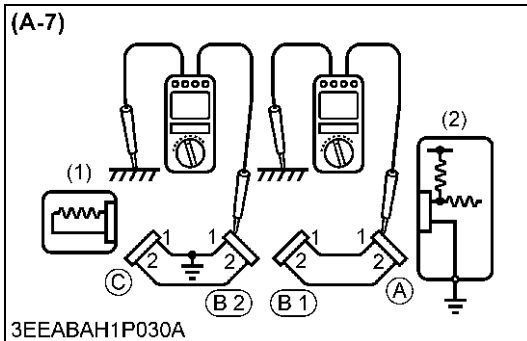
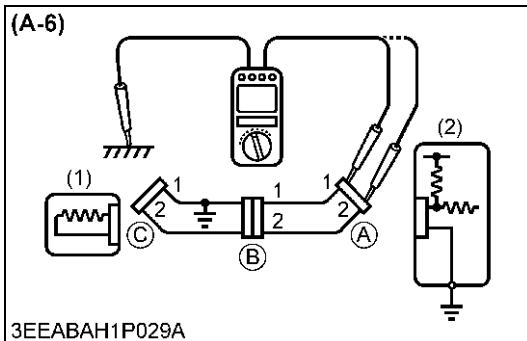
1. As per Figure **A-5**, if there is a short in the wiring harness ground, perform a "**Ground continuity check**" to determine the source of the short.

(1) Sensor

(3) ECU

(2) Short Circuit

9Y1200249CRS0310US0



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

9Y1200249CRS0311US0

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